ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
DRAFT SCOPING REPORT

PROPOSED MAINSTREAM WIND ENERGY FACILITIES AND ASSOCIATED INFRASTRUCTURES ON A SITE SOUTH-WEST OF POFADDER
NORTHERN CAPE PROVINCE

DEA Ref No.: 14/12/16/3/3/2/680 (Khai-Ma Wind)
14/12/16/3/3/2/681 (Poortjies Wind)
14/12/16/3/3/2/682 (Korana Wind)

DRAFT FOR PUBLIC REVIEW

28 MAY 2014 – 09 JULY 2014

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PROJECT DETAILS

DEA Reference No.	:	14/12/16/3/3/2/680 (Khai-Ma Wind Energy Facility) 14/12/16/3/3/2/681 (Poortjies Wind Energy Facility) 14/12/16/3/3/2/682 (Korana Wind Energy Facility)
Title	:	Environmental Impact Assessment Process Draft Scoping Report: Proposed Mainstream Wind Energy Facilities and Associated Infrastructure on a site south-west of Pofadder, Northern Cape Province
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Project Developer	:	South Africa Mainstream Renewable Power Developments (Pty) Ltd
Report Status	:	Draft Scoping Report for public review
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PURPOSE OF THE DRAFT SCOPING REPORT

South Africa Mainstream Renewable Power Developments (Pty) Ltd (Mainstream) is currently undertaking an Environmental Impact Assessment (EIA) process to determine the environmental feasibility of three proposed wind energy facilities on a site near Pofadder in the Northern Cape Province. These facilities forms part of a larger Renewable Energy Facility which also includes solar energy technology[1]. Mainstream has appointed Savannah Environmental, as independent environmental consultants, to undertake the EIA process. The EIA process is being undertaken in accordance with the requirements of the National Environmental Management Act (NEMA; Act No. 107 of 1998).

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

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

In terms of NEMA, the Scoping Report is submitted to the competent authority (i.e. the National Department of Environmental Affairs (DEA) in this instance[2]) as part of the decision-making process with regard to the proposed wind energy facilities. The Scoping Report is also intended to provide sufficient background information to other Organs of State, non-statutory bodies, the general public, organisations and local communities in order to obtain their commentary and input on the proposed developments. The Scoping Phase of the EIA process identifies and describes potential issues associated with the proposed projects, and defines the extent of the studies required within the EIA Phase of the process. The EIA Phase will assess those identified potential significant environmental impacts and benefits associated with all phases of the project including design, construction, operation and decommissioning, and will recommend appropriate mitigation measures for potentially significant environmental impacts.

[1] The evaluation of the solar energy facility (DEA Ref No.: 16/12/14/3/3/2/683) is considered within a separate Scoping Report

[2] The National DEA is the delegated Competent Authority for power generation and transmission projects

The Scoping Report consists of thirteen sections:

» **Chapter 1** provides background to the proposed wind energy facilities the environmental impact assessment
» **Chapter 2** provides the strategic context for energy planning in South Africa
» **Chapter 3** provides a description of the proposed development
» **Chapter 4** outlines the process which was followed during the Scoping Phase of the EIA process, including the consultation program that was undertaken and input received from interested parties
» **Chapter 5** describes the existing biophysical and socio-economic environment
» **Chapter 6** presents the evaluation of environmental impacts associated with the Khai-Ma Wind Energy Facility
» **Chapter 7** presents the conclusions of the scoping evaluation of the Khai-Ma Wind Energy Facility
» **Chapter 8** presents the evaluation of environmental impacts associated with the Poortjies Wind Energy Facility
» **Chapter 9** presents the conclusions of the scoping evaluation of the Poortjies Wind Energy Facility
» **Chapter 10** presents the evaluation of environmental impacts associated with the Korana Wind Energy Facility
» **Chapter 11** presents the conclusions of the scoping evaluation of the Korana Wind Energy Facility
» **Chapter 12** describes the Plan of Study for EIA for all three wind energy facilities
» **Chapter 13** provides a list of references and information sources used in undertaking this Scoping Study.

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

INVITATION TO COMMENT ON THE DRAFT SCOPING REPORT

Members of the public, local communities and stakeholders are invited to comment on the Draft Scoping Report which has been made available for public review and comment at the following locations from **28 May 2014 – 09 July 2014 at:**

» Pofadder Public Library; and
» www.savannahsa.com.

Please submit your comments to
Gabriele Wood of **Savannah Environmental** Post: PO Box 148, Sunninghill, Johannesburg 2157 Tel: 011 656 3237 Fax: 086 684 0547 Email: gabriele@savannahsa.com www.savannahsa.com
The due date for comments on the Draft Scoping Report is **09 July 2014.**

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

EXECUTIVE SUMMARY

Background and Project Overview

South Africa Mainstream Renewable Power Developments (Pty) Ltd (Mainstream) is proposing to establish a commercial renewable energy facility consisting of three (3) wind energy facilities and a photovoltaic solar facility, as well as associated infrastructure for all three (3) sites on a site located approximately 22 km south-west of Pofadder in the Northern Cape Province. A broader area of approximately 175 km^2 is being considered within which the facilities are to be constructed.

Mainstream is proposing a solar project on the same site which entail the establishment of a solar energy facilities, as well as associated infrastructure for a site located approximately 22 km south-west of Pofadder in the Northern Cape Province (refer to Figure 2). A broader area of approximately 175 km^2 is being considered within which the facilities are to be constructed. Four separate application forms were submitted to the DEA with the following reference numbers were allocated:

- **14/12/16/3/3/2/680 (Khai-Ma wind energy facility);**
- **14/12/16/3/3/2/681 (Poortjies wind energy facility);**
- **14/12/16/3/3/2/682 (Korana wind energy facility);** and
- 14/12/16/3/3/2/683 (Korana solar energy facility).

The capacity of the wind energy facilities will depend on the most suitable technologies selected by Mainstream. The proposed facilities would comprise of the following technology:

- Wind turbines (each turbine between 1.5 MW – 4 MW in capacity).

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 access roads, substations and power line/s. **The preliminary positioning or detailed layout of the components of this wind energy facilities will be developed at the EIA phase of the project.** Final placement will be informed by the outcomes of the EIA as well as from the results of the on-site wind resource. The broader site is proposed to accommodate wind turbines as well as the associated infrastructure including, but not limited to:

- Foundations to support the turbine towers;
- Cabling between the project components, to be layed underground where practical;

- Substations to facilitate grid connection to the existing Eskom Aggeneys–Aries 400kV power line which traverses the site, or alternatively to Eskom's Aggeneys Substation;
- Overhead power line to connect the on-site substation to the existing Eskom Aggeneys–Aries 400kV power line which traverses the site, or alternatively to Eskom's Aggeneys substation;
- Internal access roads;
- Workshop area for maintenance and storage;
- Laydown area for construction;
- Operations and maintenance buildings; and
- Permanent wind monitoring masts.

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

The Scoping Phase for the proposed Wind Energy Facilities has been undertaken in accordance with the EIA Regulations GNR543, published in Government Notice 33306 of 18 June 2010 as amended in December 2010, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No. 107 of 1998).

Environmental Impact Assessment

The Scoping 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-on-one meetings.

» Compilation and maintenance of a database containing the names and addresses of all identified I&APs and key stakeholders.
» Preparation of a Comments and Response Report detailing key issues raised by I&APs as part of the EIA Process.

Evaluation of the Proposed Project

The overarching objective for the planning process is to maximise electricity production through exposure to the wind and solar resource, while minimising infrastructure, operational and maintenance costs, as well as social and environmental impacts. Local level environmental and planning issues will now be considered within site-specific studies to be undertaken as part of the EIA for the project. The assessments through the EIA process will assist in delineating areas of environmental sensitivity within the broader site and ultimately inform the placement of the wind turbines and associated infrastructure on the site in order to minimise impacts on the environment.

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

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

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

» Visual impacts associated with the construction of the facilities and associated infrastructures;
» Impacts on Soils and Agricultural Potential;
» Impacts on Vegetation;
» Impacts on Terrestrial Fauna;
» Impacts on Avifauna;
» Impacts on Bats;
» Impacts on Heritage;
» Impacts on Noise sensitive receptors; and
» Social Impacts.

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

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

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

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

The majority of potential impacts identified to be associated with the construction and operation of the proposed wind energy facilities 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 (refer to Figure 2).

The potentially sensitive areas/environmental features that have been identified include:

» Non-perennial river and drainage lines that occur within the site.
» Potential bird and/bat sensitive habitats.
» Areas of high erosion sensitivity.
» Noise sensitive receptors.

The sensitivity map is a rough scale estimate of sensitivity on the site, and these areas will be subject to survey and ground-truthing during the EIA phase of the project. These potentially sensitive areas will, therefore, be further investigated and assessed through detailed specialist studies (including field surveys) during the EIA phase.

In order to connect the wind energy facilities to the power grid substations and power lines will be required. A 400 kV substation and satellite 132 kV substations (and associated power lines) are proposed to facilitate grid connection via a loop-in loop-out connection to the existing Eskom Aggeneys–Aries 400 kV power line which traverses the site.

Potential issues associated with the proposed overhead distribution power line and substation will include impacts on flora, fauna and ecological processes, visual impacts, impacts on avifauna as a result of collisions and electrocutions, and potential impacts on heritage sites.

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

The proposed design of the wind energy facilities can be based on the

full extent of the site, and therefore utilise the most technically optimal positions on the broader site to the fullest extent. This recommendation does, however, require that due cognisance is taken of the recommendations outlined in Chapter 6 and 11 and above (as well as within individual specialist reports) regarding areas within the study site of potential moderate to high sensitivity. Understanding which area of the site would be least impacted by the development of such a facilities, Mainstream should prepare the detailed infrastructure layouts for consideration within the EIA phase.

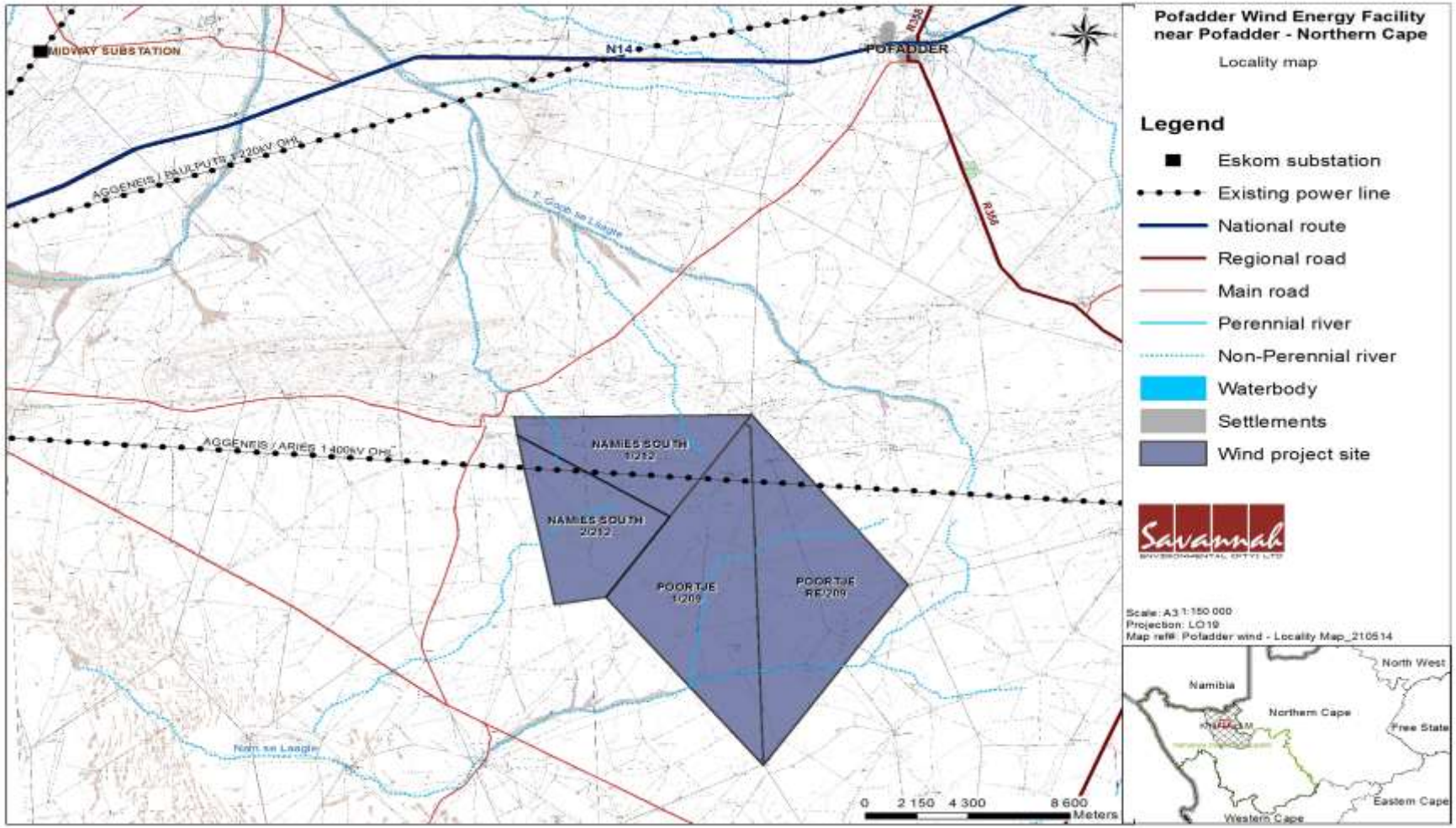

Figure 2: Locality map showing the study area for the establishment of the Renewable Energy facility near Pofadder, Northern Cape Province.

*Note: Wind turbines will also be placed on the same farm portion as the Solar Energy Facility (Namies 212 portion 2).

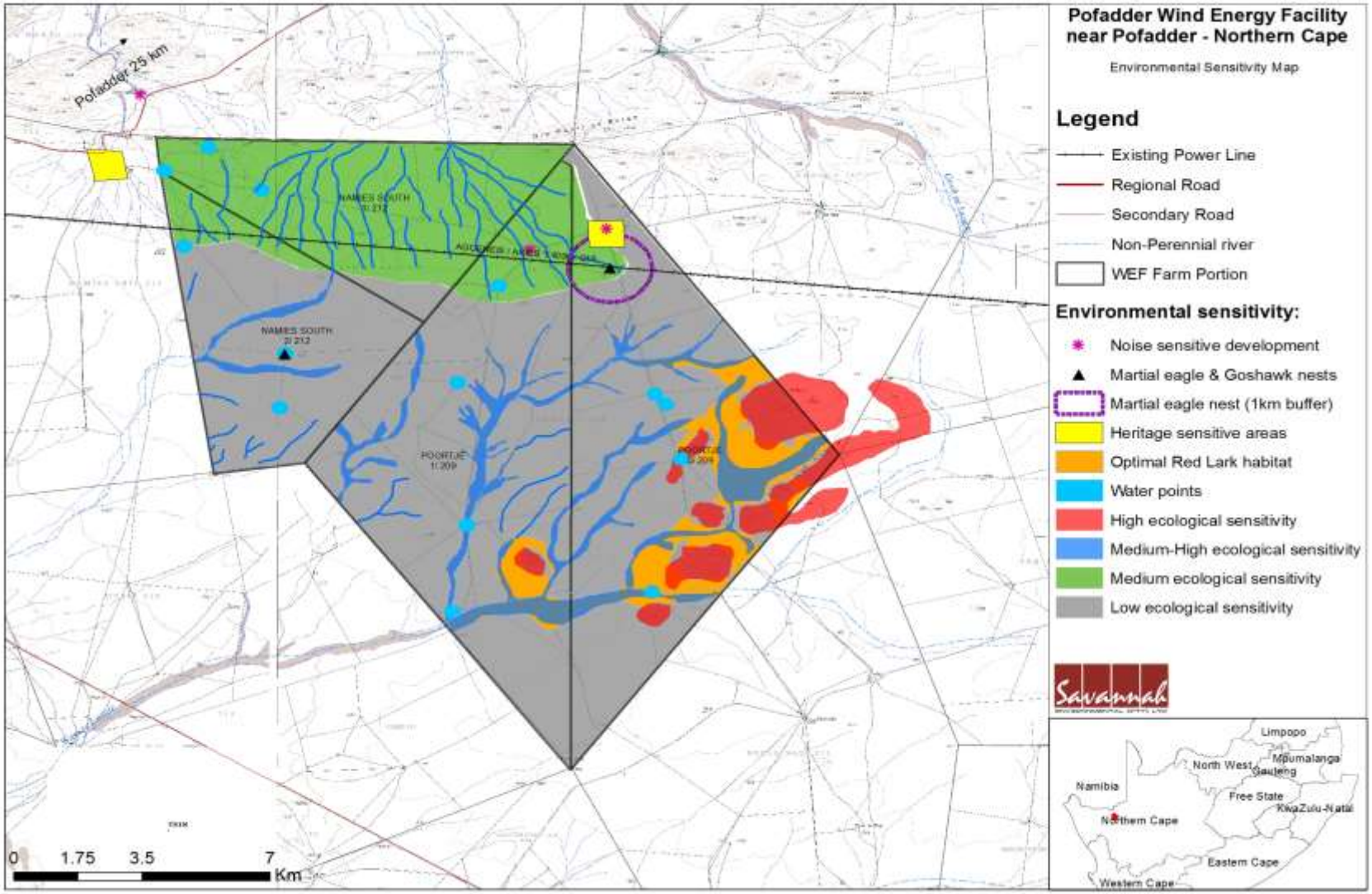

Figure 2: Scoping environmental sensitivity map for the proposed Renewable Energy facility near Pofadder, Northern Cape.

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

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

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.

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.

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).

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 – 140 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. 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
CARA	Conservation of Agricultural Resources Act
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 Environment and Nature Conservation
DEA	National Department of Environmental Affairs
DME	Department of Minerals and Energy
DOT	Department of Transport
DWA	Department of Water Affairs
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
GIS	Geographical Information Systems
GG	Government Gazette
GN	Government Notice
GWh	Giga Watt Hour
Ha	Hectare
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IEP	Integrated Energy Planning
km^2	Square kilometres
km/hr	Kilometres per hour
kV	Kilovolt
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)
SAHRA	South African Heritage Resources Agency
SALA	Subdivision of Agricultural Resources Act
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited

INTRODUCTION CHAPTER 1

South Africa Mainstream Renewable Power Developments (Pty) Ltd (Mainstream) is proposing to establish three (3) commercial wind energy facilities, as well as all associated infrastructure on a site located approximately 22 km south-west of Pofadder in the Northern Cape Province (refer to Figure 1.1). A broader area of approximately 175 km^2 is being considered within which the facilities are to be constructed.

These facilities form part of a larger Renewable Energy Facility which also incorporates a solar energy facility and associated infrastructure. Four separate application forms were submitted to the DEA, and the following reference numbers were allocated:

» **14/12/16/3/3/2/680 (Khai-Ma wind energy facility);**
» **14/12/16/3/3/2/681 (Poortjies wind energy facility);**
» **14/12/16/3/3/2/682 (Korana wind energy facility);** and
» 14/12/16/3/3/2/683 (Korana solar energy facility).

The nature and extent of the proposed facility, as well as potential environmental impacts associated with the construction, operation and decommissioning phases of a facility of this nature is explored in more detail in this Draft Scoping Report. Site specific environmental issues are considered within specialist studies in order to test the environmental suitability of the site for the proposed development, delineate areas of sensitivity within the site, and ultimately inform the placement of the wind turbines and associated infrastructure on the site. The Scoping Report consists of 13 Chapters:

» **Chapter 1** provides background to the proposed wind energy facility and the environmental impact assessment
» **Chapter 2** provides the strategic context for energy planning in South Africa
» **Chapter 3** provides a description of the proposed development
» **Chapter 4** outlines the process which was followed during the Scoping Phase of the EIA process, including the consultation program that was undertaken and input received from interested parties
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» **Chapter 11** presents the conclusions of the scoping evaluation of the Korana Wind Energy Facility
» **Chapter 12** describes the Plan of Study for EIA
» **Chapter 13** provides a list of references and information sources used in undertaking this Scoping Study.

1.1. Project Overview

The proposed project entails the development of three Wind Energy Facilities on a site near Pofadder. The site falls within the Khai-Ma Local Municipality in the Northern Cape Province. The purpose of the proposed wind energy facilities will be to generate electricity to be fed into the National electricity grid.

The site for the Khai-Ma, Poortjies and Korana Wind Energy Facilities was confirmed by Mainstream as being potentially suitable for wind energy generation and this area was identified for consideration within an EIA. This broader area (~175 km^2 in extent) is proposed to be located on the following farm portions (refer to Figure 1.1): Portions 1 and Remaining Extent of Farm 209 (Poortje) and Portions 1 and 2 of Farm 212 (Namies South).

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. As local level environmental and planning issues have not been assessed in detail through the site identification process, these issues are now be considered within site-specific studies and assessments through the EIA process in order to inform the placement of the wind turbines and associated infrastructure on the site.

The capacity of the wind energy facilities will depend on the most suitable technologies selected by Mainstream, but each facility will be a maximum of 140MW.

The preliminary positioning or detailed layout of the components of the wind energy facilities will be developed at the EIA phase of the project. Final placement will be informed by the outcomes of the EIA as well as from the results of the on-site wind

monitoring. The broader site is proposed to accommodate wind turbines as well as the associated infrastructure including, but not limited to:

» Foundations to support both the turbine towers;
» Cabling between the project components, to be lain underground where practical;
» A 400 kV substation and 3 satellite 132 kV substations to facilitate grid connection via a loop-in loop-out connection to the existing Eskom Aggeneys–Aries 400 kV power line which traverses the site;
» Internal access roads;
» Laydown area for construction;
» Operations and maintenance buildings;
» Workshop area for maintenance and storage; and
» Permanent wind monitoring masts.

The Wind Energy Facilities are intended to be registered with the United Nation's Framework Convention for Climate Change as part of the Clean Development Mechanisms Programme. It may also be registered to form part of the various voluntary carbon credit trading schemes across the world.

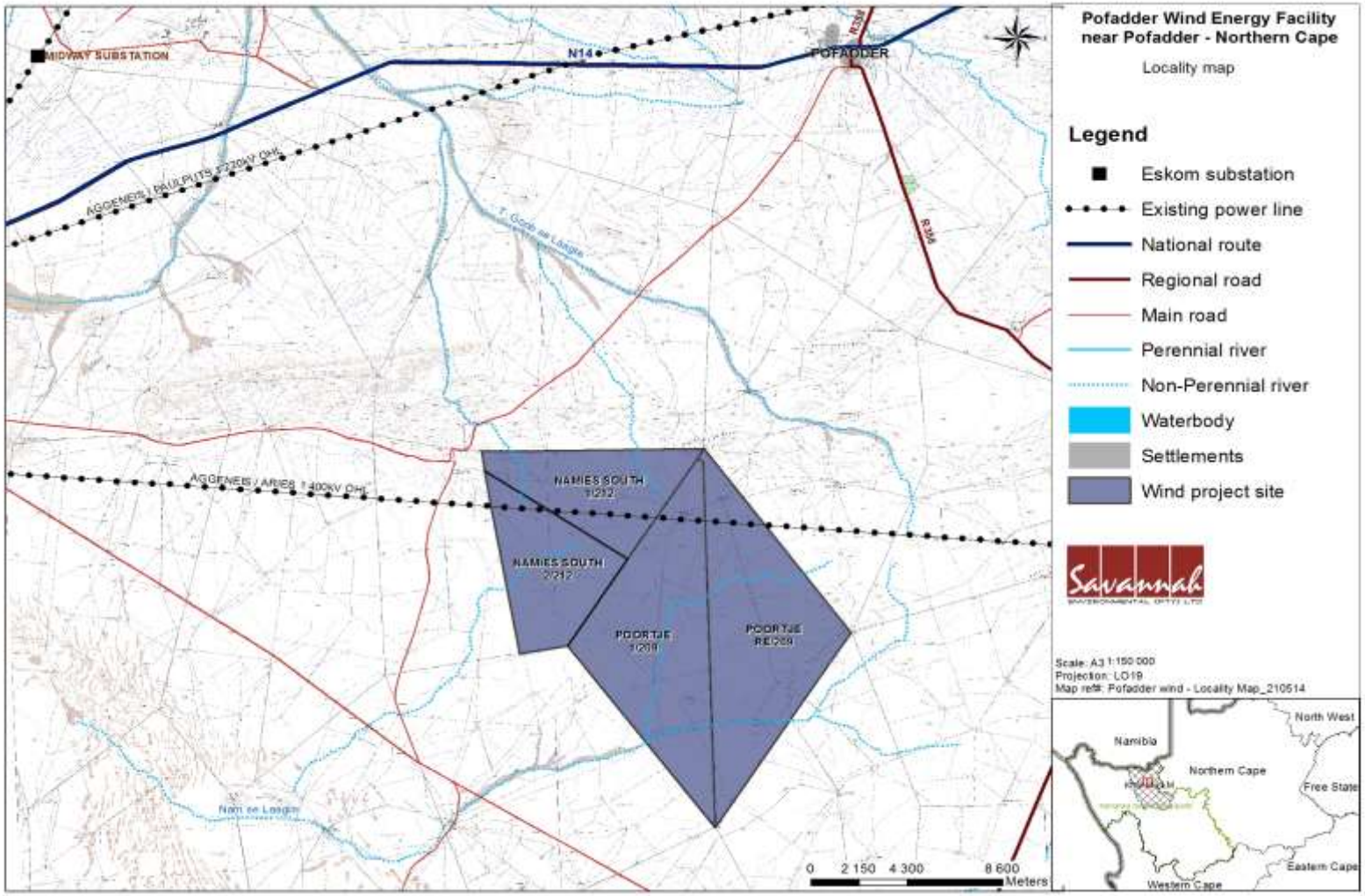


Figure 1.2: Locality map showing the farm portions and study area for the establishment of the Mainstream Renewable Energy Facility near Pofadder, Northern Cape Province

1.2. The Need for the Proposed Project

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 and the rising cost of fossil fuels. In order to meet the long-term goal of a sustainable renewable energy industry and to diversify the energy-generation mix in South Africa, a goal of 17,8GW of renewables by 2030 has been set by the Department of Energy (DoE) within the Integrated Resource Plan (IRP) 2010. This energy will be produced mainly from wind, solar, biomass, and small-scale hydro (with wind and solar comprising the bulk of the power generation capacity). This amounts to ~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, Mainstream proposes the establishment of the three wind energy facilities on a site near Pofadder to add new capacity to the national electricity grid.

The proposed wind energy facilities were identified by Mainstream as a highly desirable site based on a pre-feasibility assessment that was conducted for a larger area within the Northern Cape (Refer to **Appendix O**). The proposed site displays characteristics such as land availability, potential for connection to the Eskom grid, existing land-use (grazing of livestock), good wind resources, and access to the site, which makes it a preferred site for the three wind energy facilities. The proposed farm portions cover an area approximately 175 km^2 in extent.

1.3. Requirement for an Environmental Impact Assessment Process

The proposed wind energy facilities and associated infrastructure are 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 under the Energy Response Plan, 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 separate applications for authorisation have been accepted by DEA under Application Reference Numbers 14/12/16/3/3/2/680 (Khai-Ma wind), 14/12/16/3/3/2/681 (Poortjies wind energy facility) and 14/12/16/3/3/2/682 (Korana wind energy facility).

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. Mainstream appointed Savannah Environmental (Pty) Ltd as the independent environmental consultants to conduct the EIA process for the proposed project.

An EIA is an effective planning and decision-making tool for the project developer as it allows for the identification and management of potential environmental impacts. It provides the opportunity for the developer to be forewarned of potential environmental issues, and allows for resolution of the issues reported on in the Scoping and EIA Reports as well as dialogue with Interested and Affected Parties (I&APs).

In terms of sections 24 and 24D of NEMA, as read with Government Notices R543, R544, R545 and R546, a Scoping and EIA process is required for the proposed project (GG No 33306 of 18 June 2010), as amended in in December 2010. The following listed activities are relevant for all three facilities under consideration within this report:

Relevant Notice	Activity No	Description of listed activity	Applicability to the project
GN544	10	The construction of facilities or infrastructure for the transmission and distribution of electricity – i. Outside urban areas or industrial complexes with a capacity of more than 33kV but less than 275kV	The proposed facility will be required to evacuate electricity into the national grid and include the construction of a distribution line of less than 275kV and the 132kV satellite substation.
GN544	11	The construction of: (iii) bridges;	The wind energy facilities may include the construction of

Relevant Notice	Activity No	Description of listed activity	Applicability to the project
		(v) weirs; (x) buildings exceeding 50 square metres in size; or (xi) infrastructure or structures covering 50 square metres or more- Where such construction occurs within a watercourse or within 32 metres of a watercourse, measures from the edge of a watercourse, excluding where such construction will occur behind the development setback line.	bridges / buildings (such as storage room) within 32m of a watercourse (to be confirmed based on the design of the facility.
GN544	18	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock or more than 5 cubic metres from: (i) a watercourse.	The construction of the wind energy facility will include the infilling or excavation of 5 cubic metres or more of soil from a watercourse.
GN544	22	The construction of a road, outside urban areas, (ii) where no road reserve exists where the road is wider than 8 metres	The wind energy facility will require access roads to be constructed which are likely to be wider than 8m in extent.
GN544	39	The expansion of (iii) bridges within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, where such expansion will result in an increased development footprint	Existing bridges may need to be expanded/ widened.
GN544	47	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre – (ii) where no reserve exists, where the existing road is wider than 8 metres	Existing farm (gravel) access roads may be widened or lengthened.

Relevant Notice	Activity No	Description of listed activity	Applicability to the project
GN545	1	The construction of facilities or infrastructure, for the generation of electricity where the output is 20 megawatts or more	The wind energy facility will consist of wind turbines for electricity generation greater than 20MW. Power lines and substations are ancillary infrastructure for this energy generation process.
GN R.545	8	The construction of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275KV or more, outside an urban area or industrial complex.	New 275kV power lines are being proposed to connect the facility into the Eskom grid.
GN R.545	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	The site for the proposed wind energy facility is currently used for farming, and the footprint of the facility will be transformed to an electricity generation facility on an area greater than 20 hectares.
GN R.546	14(i)	The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation (a) In the Northern Cape i. All areas outside urban areas.	Construction of the wind energy facility will require clearance of indigenous vegetation. The site is located in a rural area in the Northern Cape.

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

1.4. Objectives of the Scoping Phase

The Scoping Phase of the EIA process refers to the process of identifying potential issues associated with the proposed project, and defining the extent of studies required within the EIA Phase. This is achieved through an evaluation of the proposed project, involving the project proponent, specialists with experience in EIAs for similar projects, and a public consultation process with key stakeholders

that includes both government authorities and interested and affected parties (I&APs).

Local level issues are now being considered within site-specific studies and assessment through the EIA process in order to delineate areas of sensitivity within the broader area. Once environmentally constraining factors have been determined through the EIA process, and site-specific wind data is available from wind monitoring on site, the layout of the wind turbines and associated infrastructure can be appropriately planned. The scope of the proposed wind energy facilities (for the construction, operation and decommissioning phases) is discussed in more detail in Chapter 3.

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

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

Savannah Environmental was appointed by Mainstream 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 Mainstream or the proposed project. 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 Environmental Assessment Practitioners (EAPs) from Savannah Environmental who are responsible for this project are:

» *Karen Jodas* - a registered Professional Natural Scientist and holds a Master of Science degree. She has 17 years of experience consulting in the environmental field. Her key focus is on strategic environmental assessment and advice; management and co-ordination of environmental projects, which includes integration of environmental studies and environmental processes into larger engineering-based projects and ensuring compliance to legislation and guidelines; compliance reporting; the identification of environmental management solutions and mitigation/risk minimising measures; and strategy and guideline development. She is currently responsible for the project management of EIAs for several renewable energy projects across the country.
» *Tebogo Mapinga* – is a Senior Environmental Consultant. She holds a BSc degree with 7 years of experience in the environmental field in both public and private sectors. Her competencies lie in environmental impact assessments, compliance monitoring and public participation for small and large scale projects. She is currently in the process of completing her honours degree in Environmental Management.
» *Gabriele Wood* - holds an Honours Degree in Anthropology, obtained from the University of Johannesburg. She has 7 years consulting experience in public participation and social research. Her experience includes the design and implementation of public participation programmes and stakeholder management strategies for numerous development planning and infrastructure projects. Her work focuses on managing the public participation component of the Environmental Impact Assessments and Basic Assessments undertaken by Savannah Environmental.

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

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

Specialist	Area of Expertise
Dave McDonald of Bergwind Botanical Surveys & Tours	Ecology
Chris van Rooyen of Chris van Rooyen Consulting	Avifauna
Werner Marias of Animalia Zoological & Ecological Consultation cc	Fauna (Including bats)
Lourens Du Plessis of MetroGIS	Visual impact
Tim Hart of ACO Associates	Heritage
Tony Barbour Environmental Consulting and Research	Socio-economic
Johann Lanz	Agricultural and soil impact
Morné de Jager of Enviro Acoustic Research cc	Noise
John E Almond of Natura Viva cc	Palaeontology
Jennifer Slack of Arcus Consultancy Services	Bats

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

STRATEGIC CONTEXT FOR ENERGY PLANNING CHAPTER 2

2.1. Strategic Electricity Planning in South Africa

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

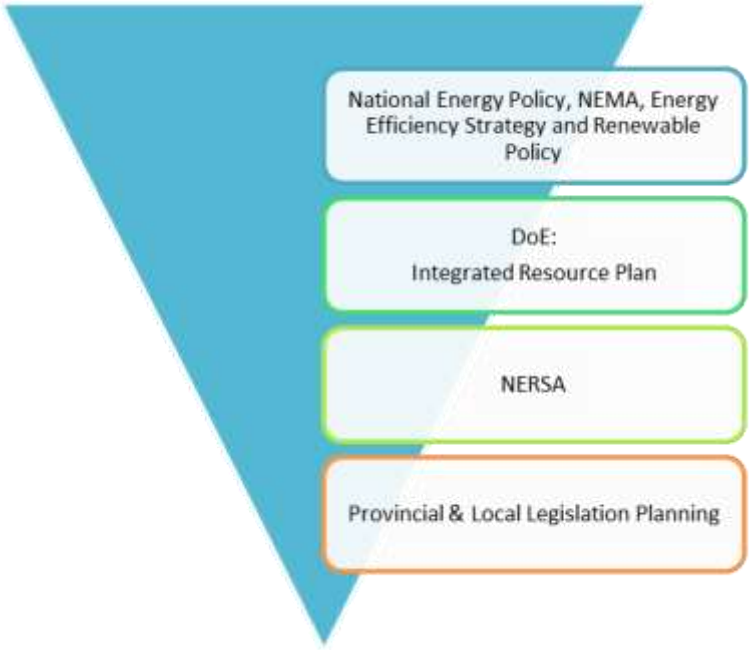


Figure 2.1: Hierarchy of electricity policy and planning documents

2.1.1 The Kyoto Protocol, 1997

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

facilities) is therefore in support of South Africa's international obligations in terms of the Kyoto Protocol.

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

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

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

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

2.1.2. Renewable Energy Policy in South Africa

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

Investment in renewable energy initiatives, such as the proposed wind energy facility, is supported by the National Energy Policy (DME, 1998). This policy recognises that renewable energy applications have specific characteristics which need to be considered. The Energy Policy is "*based on the understanding that renewables are energy sources in their own right, and are not limited to small-scale and remote applications, and have significant medium- and long-term commercial potential*." In addition, the National Energy Policy states that "*Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future*".

The White Paper on Renewable Energy (DME, 2003) supplements the Energy Policy, and sets out Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. It also informs the public and the international community of the Government's vision, and how the Government intends to achieve these objectives; and informs Government agencies and organs of their roles in achieving the objectives.

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

Government policy on renewable energy is therefore concerned with 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*."

2.1.3. Final Integrated Resource Plan 2010 - 2030

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

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

The Policy-Adjusted IRP includes the same amount of coal and nuclear new builds as the RBS, while reflecting recent developments with respect to prices for renewables. In addition to all existing and committed power plants (including 10 GW committed coal), the plan includes 9,6 GW of nuclear; 6,3 GW of coal; 17,8 GW of renewables; and 8,9 GW of other generation sources. The Policy-Adjusted IRP has therefore resulted in an increase in the contribution from renewables from 11.4 GW to 17.8 GW.

2.1.4. Department of Energy process for Independent Power Producers (IPP)

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, Mainstream proposes the establishment of a solar energy facility and associated infrastructure on a site south-west of Pofadder in the Northern Cape Province to add new capacity to the national electricity grid. Mainstream 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 or other relevant parties (i.e. typically for a period of 20 - 25 years) in order to build and operate the proposed solar energy facility. As part of the agreement, Mainstream would be remunerated per kWh by Eskom or a subsequent authority/market operator. Depending on the economic conditions following the lapse of this period, the facility can either be decommissioned, or the power purchase agreement renegotiated and extended.

The IPP will participate in a bidding process called the Renewable Energy Independent Power Producers Procurement Programme (REIPPPPP), in which the Department of Energy (DoE) will determine preferred bidders. A Preferred Bidder will be held to compliance with the price and economic development proposals in its bid, with regular reporting to demonstrate compliance during the life of the project.

The DoE REIPPPPP is currently underway. The first IPP Bid submission was in November 2011, the second submission was in March 2012 and the third submission was in August 2013. Mainstream intends bidding the proposed project to the DoE for the Round 5 bid submission, which is likely to be in August 2015. Following the Round 1, Round 2 and Round 3 bid submissions to the DoE, a total of 22 wind energy facility projects and 33 solar projects were awarded preferred bidders status. A number of these projects are in the Northern Cape Province, which makes the province a hub for wind and solar projects.

2.2. Provincial and Local Level Developmental Policy

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

The Northern Cape Province Provincial Growth and Development Strategy (2004-2014) (NC PGDS) states 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.

The achievement of 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; and
» Enhancing infrastructure for economic growth and social development.

The document 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. The development of energy sources such as solar energy, the natural gas fields, bio-fuels, etc., could be some of the means by which new economic opportunity and activity is generated in the Northern Cape". The NC PGDS also highlights the importance of close co-operation between the public and private sectors in order for the economic development potential of the Northern Cape to be realised.

The NC PGDS notes that the sustainable utilisation of the natural resource base on which agriculture depends is critical in the Northern Cape with its fragile eco-systems and vulnerability to climatic variation. The document also indicates that due to the Province's exceptional natural and cultural attributes, it has the potential to become a preferred adventure and ecotourism destination in South Africa. .

2.2.2 Khai-Ma Local Municipality Integrated Development Plan (2011/12)

The Integrated Development Plan (IDP) enables Local Municipalities like the Khai-Ma Municipality to manage and measure their progress in terms of meeting their development goals. The major developmental challenges facing the Khai-Ma Local Municipality identified in the IDP are:

» Low storage capacity of water which leads to water shortages;
» Unequal access to electricity;
» Waste removal;
» High levels of HIV/AIDS infection;
» Poor roads, electricity, communications, stormwater and sanitation infrastructure;
» Shortage of agricultural land; and
» Poor moral values.

The Khai-Ma Local Municipality IDP identified 5 Key Priorities to address the municipality's development objectives:

» Priority 1: Institutional (Local Governance and Administration);

» Priority 2: Spatial Development and Land Reform;
» Priority 3: Socio-economic Needs;
» Priority 4: Infrastructure Development; and
» Priority 5: Economic Development.

These priorities address the outcome of an analysis of the status quo across numerous sectors within the Municipality and, in turn, inform the 5 key priorities and their associated objectives and strategies. In terms of these priorities, the IDP sets out a number of critical targets. The targets that are relevant to the proposed renewable energy facility include:

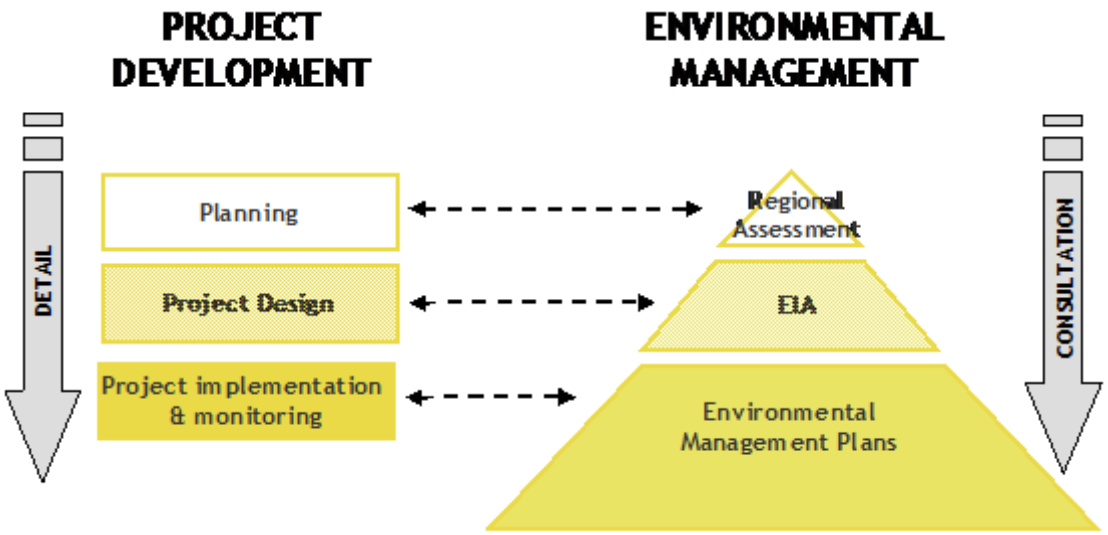
» Socio-economic needs, specifically, improve the income levels for the population within the municipality, reduce unemployment from 39% to below 20%, introduce capacity and skills building programs, introduce awareness campaigns around issues relating to healthcare (HIV/AIDS), water and the environment, improve safety and security to vulnerable and marginalized communities.
» Infrastructure development;
» Economic development (including electricity and roads), specifically, provide support for capacity and skills development.

Therefore the proposed wind energy facilities are compatible with the local level policy regarding infrastructure and economic development in this region.

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

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

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


PROJECT DEVELOPMENT
ENVIRONMENTAL MANAGEMENT
DETAIL
Planning
Project Design
Project implementation & monitoring
Regional Assessment
EIA
Environmental Management Plans
CONSULTATION

DESCRIPTION OF THE PROPOSED DEVELOPMENT CHAPTER 3

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

3.1 Project Alternatives

3.1.1 Site Alternatives

Through technical studies and this EIA process the developer is being guided to site/locate their proposed wind energy facilities within an area/zone of preference. This process is considered acceptable and therefore no location/site alternatives have been considered further. In addition, the location of the wind energy facilities was determined primarily by the wind resource in an area, land availability and grid connection (determined in consultation) with Eskom. The factors determine the technical and financial viability of development a wind energy facilities. In addition, a fatal flaw/ environmental screening of the site was undertaken by Aurecon Environmental Consultants in 2012 which determined that the site did not contain any environmental fatal flaws and should be investigated further through an EIA process.

3.1.2 Site-Specific Alternatives

Once sufficient information is available from an environmental and planning perspective for the broader 175 km^2 site, a detailed micro-siting exercise will be undertaken to effectively 'design' the wind energy facilities within the available site. As local level issues were not assessed in sufficient detail at the regional level, these issues are now being considered within the site-specific studies and assessments through the EIA in order to delineate areas of sensitivity within the broader area. Through the process of determining environmental constraining factors, the layout of the wind turbines and associated infrastructure will be appropriately planned. The overall aim of the planning process would be to maximise electricity production through exposure to the wind resource, while minimising infrastructure, operation and maintenance costs, and social and environmental impacts. Specialist software is available to assist developers in selecting the optimum position for infrastructure. This micro-siting information will then be provided as informed by the specialist impact assessments. The planning process will also include the positioning of other ancillary infrastructure, including

access roads, laydown areas, power line corridors and the substation site. Feasible alternatives in this regard will be assessed in detail in the EIA phase.

3.1.3 The 'do nothing' alternative

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

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

The generation of electricity from renewable energy in South Africa offers a number of socio-economic and environmental benefits. These benefits are explored in further detail in a Guideline published by NERSA (March 2009), and include:

» **Increased energy security:** The current electricity crisis in South Africa highlights the significant role that renewable energy can play in terms of supplementing the power available. In addition, given that renewables can often be deployed in a decentralised manner close to consumers, they offer the opportunity for improving grid strength and supply quality, while reducing expensive transmission and distribution losses.
» **Resource saving:** Conventional coal fired plants are major consumers of water during their requisite cooling processes. It is estimated that the achievement of the targets in the Renewable Energy White Paper will result in water savings of approximately 16.5 million kilolitres, where compared with wet cooled conventional power stations. This translates into revenue saving of more than R26.6 million. As an already water stressed nation, it is critical that South Africa engages in a variety of water conservation measures, particularly as the detrimental effects of climate change on water availability are experienced in the future.
» **Exploitation of our significant renewable energy resource:** At present, valuable national resources (including biomass by-products, solar insulation and

wind) remain largely unexploited. The use of these energy flows will strengthen energy security through the development of a diverse energy portfolio.

» **Pollution reduction:** The releases of by-products of fossil fuel burning for electricity generation have a particularly hazardous impact on human health, and contribute to ecosystem degradation.

» **Climate friendly development:** The uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner, contributing to the mitigation of climate change through the reduction of greenhouse gas emissions. South Africa as a nation is estimated to be responsible for 1% of global GHG emissions and is currently ranked 9th worldwide in terms of per capita CO_2 emissions.

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

» **Employment creation:** The sale, development, installation, maintenance and management of renewable energy facilities have significant potential for job creation in South Africa.

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

» **Support to a new industry sector:** The development of renewable energy offers an opportunity to establish a new industry within the South African economy.

» **Protecting the natural foundations of life for future generations:** Actions to reduce our disproportionate carbon footprint can play an important part in ensuring our role in preventing dangerous anthropogenic climate change; thereby securing the natural foundations of life for generations to come.

At present, South Africa is some way off from exploiting the diverse gains from renewable energy and from achieving a considerable market share in the renewable energy industry. South Africa's electricity supply remains heavily dominated by coal based power generation, with the country's significant renewable energy potential largely untapped to date.

Within a policy framework, the development of renewable energy in South Africa is supported by the White Paper on Renewable Energy (November 2003), which has set a target of 10 000 GWh of renewable energy contribution to final energy consumption by 2013. The target is to be achieved primarily through the development of wind, biomass, solar and small-scale hydro. DME's macroeconomic study on renewable energy, developed under the now completed Capacity Building in Energy Efficiency and Renewable Energy (CaBEERE) project, has established that

the achievement of this target would provide a number of economic benefits, including increased government revenue amounting to R299 million, increased GDP of up to R1 billion per year and the creation of an estimated 20 500 new jobs. In addition, the development of renewable energy beyond the 10 000 GWh target holds further employment benefits and would maximise the number of jobs created per TWh (South Africa Renewable Energy Feed-in Tariff (REFIT) Regulatory Guideline published by NERSA (March 2009)).

Through research, the viability of establishing the Renewable Energy Facility has been established. The 'do nothing' alternative will not assist the South African government in reaching the set targets for renewable energy. In addition the Northern Cape's power supply will not be strengthened by the additional generated power being evacuated directly into the Province's electricity grid.

The current land use of the site would not be lost with the implementation of a renewable energy facility. There would therefore not be any significant impact on current land use associated with the project being developed, or not. The 'do nothing' alternative is, therefore, not a preferred alternative and will therefore not be assessed in further detail during the EIA Phase.

3.1 Renewable Energy Technologies

Various renewable energy technologies are available for electricity generation. Mainstream proposes the establishment of wind energy facilities in order to generate electricity, which will be fed into the National power grid. The construction, operation and decommissioning phases of development of the wind energy facilities are described in more detail below.

3.2 Wind Turbines

3.3.1 The Importance of the Wind Resource for Energy Generation

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

» **Wind speed** is the rate at which air flows past a point above the earth's surface. Average annual wind speed is a critical siting criterion, since this determines the cost of generating electricity. The doubling of wind speed increases the wind power by a factor of 8, so even small changes in wind speed

can produce large changes in the economic performance of a wind farm. Wind turbines can start generating at wind speeds of between ~3 m/s to 4 m/s, with wind speeds greater than 6 m/s currently required for a wind energy facility to be economically viable. Wind speed can be highly variable and is also affected by a number of factors, including surface roughness of the terrain. The effect of height variation/relief in the terrain is seen as a speeding-up/slowing-down of the wind due to the topography. Elevation in the topography influences the flow of air, and results in turbulence within the air stream, and this has to be considered in the placement of turbines.

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

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

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

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

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

Wind turbines typically need to be spaced between 3 and 8 times the rotor diameter apart in order to minimise the induced wake effect the turbines might have on each other. Once a viable footprint for the establishment of the wind energy facility has been determined (through the consideration of both technical and environmental criteria) the spacing requirements will be considered through the process of micro-siting the turbines on the site.

3.3.2 What is a Wind Turbine and How Does It Work

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

the blades is transmitted to the generator within the nacelle via a gearbox and drive train.

Turbines are able to operate at varying speeds. The amount of energy a turbine can harness depends on both the wind velocity and the length of the rotor blades. It is anticipated that the turbines utilised for the proposed wind component of the renewable energy facility will have a hub height of up to 150 m, and rotor diameter of 150 m. These turbines would have a rated capacity of up to 4MW each which means one turbine could generate up to 4MWhr in one hour (in optimal wind conditions).

3.3.3 Main Components of a Wind Turbine

The turbine consists of the following major components:

» The foundation;
» The tower;
» The rotor; and
» The nacelle.

The foundation
The foundation is used to secure each wind turbine to the ground. These structures are commonly made of concrete and are designed for vertical loads (weight) and lateral loads (wind). The foundations are typically 2.5 m – 3 m in depth.

The tower
The tower, which supports the rotor, is constructed from tubular steel or concrete.

It is typically up to 140m tall. The nacelle and the rotor are attached to the top of the tower.

The tower is part of the overall wind turbine structure. It also raises the wind turbine so that its blades safely clear the ground and so it can reach the stronger winds at higher elevations. The tower must be strong enough to support the wind turbine and to sustain vibration, wind loading and the overall weather elements for the lifetime of the wind turbine.

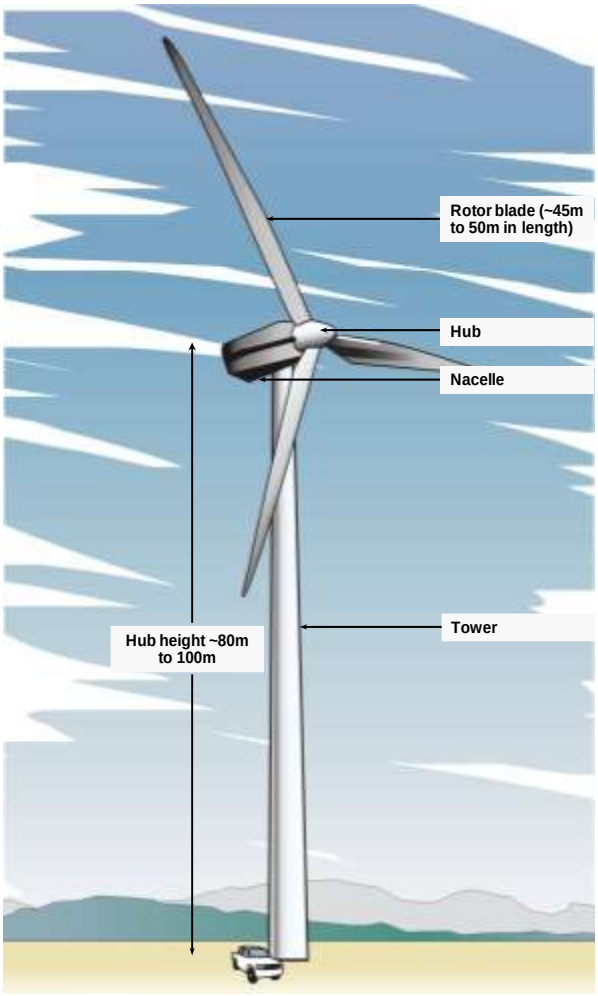


Figure 3.1: Illustration of the main components of a wind turbine

The rotor

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

The nacelle (geared)

The nacelle at the top of the tower accommodates the gears, the generator, anemometer for monitoring the wind speed and direction, cooling and electronic

control devices, and yaw mechanism. Geared nacelles generally have a longer form than a gearless turbine.

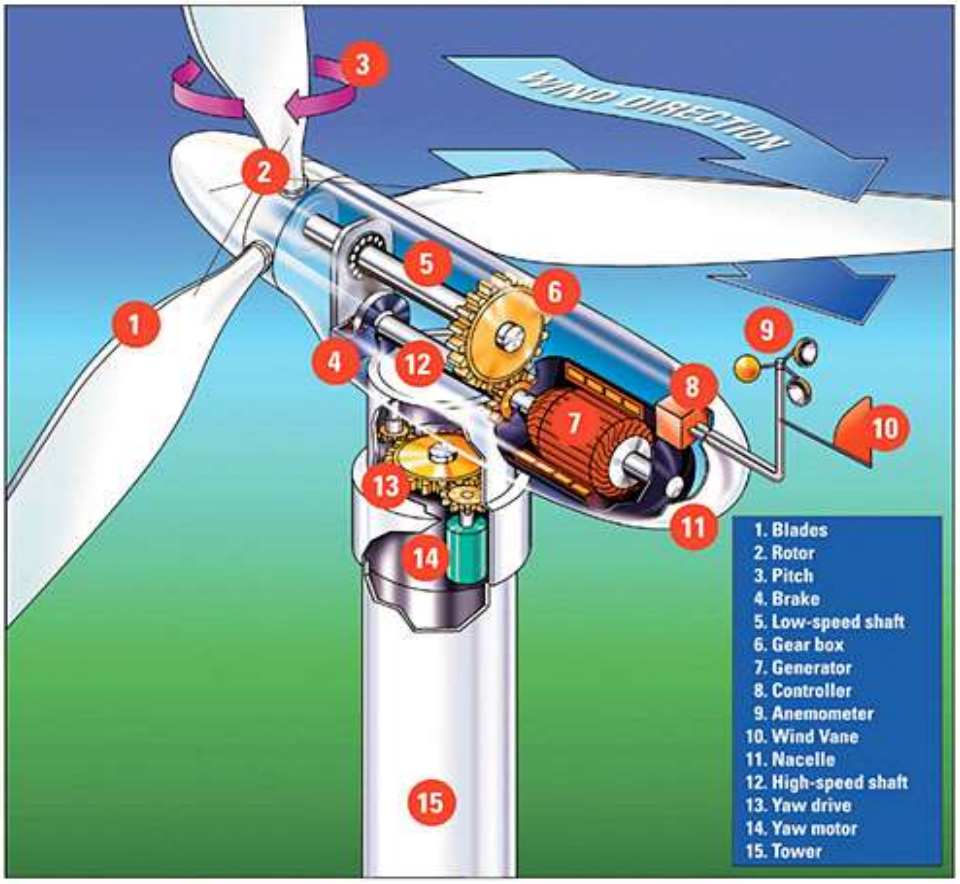


Figure 3.2: Detailed structure of a typical nacelle of a wind turbine (refer to windenergypros.org)

3.3.4 Operating Characteristics of a Wind Turbine

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

The **cut-in speed** is the minimum wind speed at which the wind turbine will generate usable power. This wind speed is typically between 3 m/s and 4 m/s.

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

3.4 Overview of the Construction Phase

In order to construct the proposed project, a series of activities will need to be undertaken. The construction process is discussed in more detail below.

3.4.1 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/s and survey of power line servitudes to determine tower locations.

3.4.2 Establishment of Access Roads

The broader site can be accessed via the N14 and R356 and secondary roads. Within the site itself, access will be required to the individual facility components for construction purposes (and later limited access for maintenance). The road alignments will be informed by the final positioning of the wind turbines and other infrastructure.

Although the secondary access road is unlikely to have been subjected to vehicle numbers and loading of the same scale and intensity to that expected during construction of the facility, it is assumed for the purposes of this assessment that it will be mainly suitable for the construction related traffic in terms of load capability and durability. The final layout of the site specific access roads will be determined following the identification of site related sensitivities.

3.4.3 Undertake Site Preparation

Site preparation activities will include clearance of vegetation at the footprint of each turbine, establishment of laydown areas, 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.

3.4.4 Transport of Components and Equipment to Site

The wind turbine, including tower, will be brought on site by the supplier in sections on flatbed trucks. The equipment will be transported to the site using appropriate National and Provincial routes, and the dedicated access/haul road to the site itself. The transportation study will deal with external roads in this regard.

Turbine units which must be transported to site consist of a tower comprised of segments of approximately 20 m in length, a nacelle weighing approximately 83

tons, and three rotor blades (each of up to 70 m in length). 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 70 m blades) and load limitations (i.e. the nacelle). In addition, components of various specialised construction, lifting equipment and counter weights etc. are required on site (e.g. 200 ton mobile assembly crane and a 750 ton main lift crawler crane) to erect the wind turbines and need to be transported to site.

In addition to the specialised lifting equipment, the normal civil engineering construction equipment will need to be brought to the site for the civil works (e.g. excavators, trucks, graders, compaction equipment, cement mixers, etc.).

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

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

Based on the expected sizes and weights of the project components, the roadways to the site must have the following minimum requirements:

Width: Roads need to be at least 4.5 m wide with a structural clearance of at least 5 m to accommodate the largest parts of 4 m wide. The widest part that has to be transported is the nacelle.

Height: Vertical clearances need to be at least 5 m to ensure no hindrances (e.g. overhead lines, telephone lines etc.).

Length: The maximum length of the abnormal load vehicles is 55 m.

Maximum Weight: The lower tower section and the Nacelle are of the heaviest parts that have to be transported. The maximum weight of abnormal vehicles is 150 ton with a maximum weight per axle 14 ton. The final weights will have to be determined prior to determining the final loads and as part of the detail investigation.

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

Outer Curve Radius: The minimum outer and inner radii for the transport trucks should be at least between 25 m and 35 m, with an obstacle free area inside the curve with a 50 m radius. This will depend on the final lengths of the equipment to be transported and must be evaluated during the detail evaluation of the sites.

Maximum Slope: The maximum slope of roads should typically be lower than 6%. The maximum side inclination/ cross fall should not exceed 2%. The type of loads and weights that will need to be transported together with the vehicles that will be used for the transport will determine the maximum gradients of the access roads. It will be necessary to evaluate these gradients during the detail evaluation phase.

Road Surfaces: Abnormal transport vehicles have low ground clearances and it could be as low as 150 mm. The surfaces of all the tarred national and provincial roads should comply with this requirement. The gravel access roads should also comply with this requirement and will require careful construction control.

2.6.7. Erect Turbine

A large lifting crane will be brought on site which is needed to lift the tower sections into place. The nacelle, which contains the gearbox, generator, and yawing mechanism, will then be placed onto the top of the assembled tower. The next step will be to assemble or partially assemble the rotor (i.e. the blades of the turbine) on the ground. It will then be lifted to the nacelle and bolted in place. A small crane will likely be needed for the assembly of the rotor while a large crane will be needed to put the rotor into place. It will take approximately 1 week 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.

The lifting cranes will be required to move between the turbine sites. The crawler crane is self-powered and can "crawl" between locations should the ground conditions allow. When assembled, the crawler crane has a track width of approximately 11 m, and would require a track of up to 13 m in width to move on. Because of this, crawler cranes will not be used unless there are no other options available.

3.4.5 Establishment of Laydown Areas on Site

Temporary laydown and storage areas will be required for the typical construction equipment which will be required on site.

3.4.6. Construct On-site substation and Power line

An on-site substation and associated power line will be required to evacuate the power into the Eskom grid. Substations are constructed in the following simplified sequence:

Step 1: Survey the area
Step 2: Final design of the substation and placement of the infrastructure
Step 3: Issuing of tenders and award of contract to construction companies
Step 4: Issuing of tenders and award of contract to construction companies
Step 5: Vegetation clearance and construction of access roads (where required)
Step 6: Construction of foundations
Step 7: Assembly and erection of infrastructure on site
Step 8: Connect conductors
Step 9: Rehabilitation of disturbed area and protection of erosion sensitive areas
Step 10: Testing and commissioning

The power line connecting to the existing Eskom Aggeneys–Aries 400kV power line which traverses the site will be constructed as follows:

Step 1: Survey of the route
Step 2: Selection of best-suited conductor, towers, insulators, foundations
Step 3: Final design of line and placement of towers
Step 4: Issuing of tenders and award of contract to construction companies
Step 5: Vegetation clearance and construction of access roads (where required)
Step 6: Tower pegging
Step 7: Construction of foundations
Step 8: Assembly and erection of towers on site
Step 9: Stringing of conductors
Step 10: Rehabilitation of disturbed area and protection of erosion sensitive areas
Step 11: Testing and commissioning

3.4.7. Establishment of Ancillary Infrastructure

A 400 kV substation and satellite 132 kV substations to facilitate grid connection via a loop-in loop-out connection to the existing Eskom Aggeneys–Aries 400kV power line which traverses the site. A workshop, storage areas as well as a contractor's equipment camp will also be required.

The establishment of these facilities/buildings will require the clearing of vegetation and levelling of the development site and the excavation of foundations prior to

construction. A laydown area for building materials and equipment associated with these buildings will also be required.

3.4.8. Undertake Site Rehabilitation

Once construction is completed and once all construction equipment is removed, the site must be rehabilitated where practical and reasonable. On full commissioning of the facility, any access points to the site which are not required during the operational phase must be closed and rehabilitated.

3.5 Operation Phase

The electricity that is generated from the wind turbines will be stepped up through the on-site inverters and transformers at the on-site substation. This electricity will be fed into the electricity grid via a loop in loop out connection to the existing Aggeneys–Aries 400kV power line which traverses the development site. This power line, in turn, connects to the Aggeneys substation.

It is anticipated that a full-time security, maintenance and control room staff will be required on site during operation. Each component within the solar energy facility will be operational except under circumstances of mechanical breakdown, unfavourable weather conditions or maintenance activities.

3.6 Decommissioning Phase

The operation phase of the project is expected to have a lifespan of more than 20 years (with maintenance) and the power plant infrastructure would only be decommissioned once it has reached the end of its economic life. If economically feasible/desirable, the decommissioning activities would comprise the disassembly and replacement of the individual components with more appropriate technology/ infrastructure available at that time. However, if not deemed so, then the facility would be completely decommissioned by undertaking the decommissioning activities described below.

3.7.1 Site Preparation

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

3.7.2 Disassemble and Remove Existing Components

The components would be disassembled, reused and recycled (where possible), or disposed of in accordance with regulatory requirements.

APPROACH TO UNDERTAKING THE SCOPING PHASE CHAPTER 4

An Environmental Impact Assessment (EIA) refers to the process involving the identification and assessment of direct, indirect and cumulative environmental impacts associated with a proposed project. The EIA process comprises two Phases: a **Scoping Phase** and an **EIA Phase**. The Scoping Phase culminates in the submission of a Scoping Report to the Department of Environmental Affairs as the competent authority for review and acceptance before proceeding onto the EIA Phase of the process. The EIA Phase culminates in the submission of an Environmental Impact Report (EIR), including an Environmental Management Programme (EMP), to the competent authority for review and decision-making.

The phases of the EIA process are as follows:

Figure 4.1: The four phases of the EIA process

The Scoping Phase for the proposed Renewable Energy Facility has been undertaken in accordance with the EIA Regulations GNR543, published in Government Notice 33306 of 18 June 2010 as amended in December 2010, in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No. 107 of 1998). This **Draft Scoping Report** aimed to identify and describe potential environmental impacts associated with the proposed project and to define the extent of the specialist studies required within the EIA process. 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, relevant government authorities and **interested and affected parties (I&APs)**. This chapter outlines the process which was followed during the Scoping Phase of the EIA process and outlines the applicable legislation for the proposed project.

4.1 Objectives of the Scoping Phase

The Scoping Phase aims to:

» Describe the **baseline/affected environment** prior to development.
» **Identify potential environmental and social impacts** (both positive and negative) associated with the construction and operation phases of the proposed development, through a desktop review of existing baseline data as well as specialist site surveys and studies.
» Make **recommendations regarding further detailed studies** required in the EIA phase of the process to consider the planned project within the development footprint.
» Provide **interested and affected parties** with an opportunity to have **input** on the proposed project through consultation and review of the Draft Scoping Report.
» Provide the competent and commenting authorities with **sufficient information** in order to make a decision regarding the scope of issues to be addressed in the EIA process, as well as regarding the scope and extent of specialist studies that will be required as part of the EIA Phase.

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

» Describe the **scope** and **nature** of the proposed development.
» Describe the reasonable and feasible project-specific **alternatives** to be considered through the EIA process, including the 'no-go' option.
» Identify and evaluate key **environmental issues or impacts** associated with the proposed project and, through a process of broad-based consultation with I&APs and stakeholders desk-top specialist studies, identify those issues to be assessed in more detail in the EIA Phase of the EIA process.
» Conduct an open, participatory and transparent **public involvement process** and facilitate the inclusion of I&AP and stakeholder concerns regarding the proposed project in the decision-making process.

4.2 Regulatory and Legal Context

The regulatory hierarchy for an energy generation project of this nature consists of three tiers of authority which exercise control through both statutory and non-statutory instruments – that is National, Provincial and local levels.

As wind and solar energy projects are multi-sectorial, encompassing economic, spatial, biophysical, and cultural dimensions, various statutory bodies are likely to be involved in the approval process for the proposed facility.

4.2.1. Regulatory Hierarchy

At the National Level, the main regulatory agencies are:

» *Department of Energy (DOE):* This Department is responsible for policy relating to all energy forms, including renewable energy, and are responsible for forming and approving the IRP (Integrated Resource Plan for Electricity). Wind and solar energy projects are 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 wind energy developments to generate electricity.
» *Department of Environmental Affairs (DEA):* This Department is responsible for environmental policy and is the controlling authority in terms of NEMA and the EIA Regulations. The DEA is the competent authority for this project, and charged with granting the relevant environmental authorisation.
» *The South African Heritage Resources Agency (SAHRA):* The National Heritage Resources Act (Act No 25 of 1999) and the associated provincial regulations provides legislative protection for listed or proclaimed sites.
» *South African Civil Aviation Authority (SACAA):* This Department is responsible for aircraft movements and radar, which are aspects that influence project's location and planning.
» *Department of Agriculture, Forestry and Fisheries (DAFF):* This Department is the custodian of South Africa's agriculture, fisheries and forestry resources and is primarily responsible for the formulation and implementation of policies governing the Agriculture, Forestry and Fisheries Sector. This Department has published a guideline for the development of wind farms on agricultural land.
» *Department of Mineral Resources:* Approval from the Department of Mineral Resources (DMR) may be required to use land surface contrary to the objects of the Act in terms of section 53 of the Mineral and Petroleum Resources Development Act, (Act No 28 of 2002): In terms of the Act approval from the Minister of Mineral Resources is required to ensure that proposed activities do not sterilise a mineral resources that might occur on site.
» South African National Roads Agency (SANRAL): This agency of the Department of Transport is responsible for all National road routes.
» Department of Water Affairs: This Department is responsible for evaluating and issuing licenses pertaining to water use.

At the Provincial Level, the main regulatory agencies are:

» *Northern Cape Department of Environment and Nature Conservation (DENC):* The DENC is the commenting authority for this project. This Department is also responsible for the issuing of permits for impacting on provincially protected plant and animal species.
» *Department of Roads and Public Works (Northern Cape).* This Department is responsible for roads and the granting of exemption permits for the conveyance of abnormal loads on public roads.
» *The Department of Agriculture:* This Department is responsible for all matters which affects agricultural land.

At a local level, the local and municipal authorities are the principal regulatory authorities responsible for planning, land use and the environment. The Khai-Ma Local Municipality was identified as having jurisdiction over the area in which the proposed facility is foreseen to be established. The Khai-Ma Local Municipality forms part of the Namakwa District Municipality (which is based in Springbok). Both of these municipalities will be consulted throughout the EIA process.

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

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

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

» National Environmental Management Act (Act No. 107 of 1998).
» EIA Regulations, published under Chapter 5 of the NEMA (GNR R543 in Government Gazette 33306 of 18 June 2010) as amended in December 2010.
» Guidelines published in terms of the NEMA EIA Regulations, in particular:
  * Companion to the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations of 2010 (Draft Guideline; DEA, 2010);
  * Public Participation in the EIA Process (DEA, 2010); and
  * Integrated Environmental Management Information Series (published by DEA).
» Khai-Ma Local Municipality Integrated Development Plan (2011/12).
» International guidelines – the Equator Principles.

Several other Acts, standards or guidelines have also informed the project process and the scope of issues evaluated in the Scoping Phase and to be addressed in the EIA Phase. A listing of relevant legislation is provided in Table 4.1 below. A more

detailed review of legislative requirements applicable to the proposed project will be included in the EIA Phase.

Table 4.1: Initial review of relevant policies, legislation, guidelines and standards applicable to the proposed Wind Energy Facilities

Legislation	Applicable Requirements
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 GN R543, R544, R545 and R546 of 18 June 2010, a BA is required to be undertaken for the proposed project.
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.
Environment Conservation Act (Act No 73 of 1989)	National Noise Control Regulations (GN R154 dated 10 January 1992)
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 (and then registration of the water use is required). Consumptive water uses may include the taking of water from a water resource and storage - Sections 21a and b. Non-consumptive water uses may include impeding or diverting of flow in a water course - Section 21c; and

Legislation	Applicable Requirements
	altering of bed, banks or characteristics of a watercourse - Section 21i.
Minerals and Petroleum Resources Development Act (Act No 28 of 2002)	A mining permit or mining right may be required where a mineral in question is to be 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. S53 Department of Mineral Resources: Approval from the Department of Mineral Resources (DMR) may be required to use land surface contrary to the objects of the Act in terms of section 53 of the Mineral and Petroleum Resources Development Act, (Act No 28 of 2002): In terms of the Act approval from the Minister of Mineral Resources is required to ensure that proposed activities do not sterilise a mineral resource that might occur on site.
National Environmental Management: Air Quality Act (Act No 39 of 2004)	Measures in respect of dust control (S32) and National Dust Control Regulations of November 2013. Measures to control noise (S34) - no regulations promulgated yet.
National Heritage Resources Act (Act No 25 of 1999)	» Stipulates assessment criteria and categories of heritage resources according to their significance (S7). » Provides for the protection of all archaeological and palaeontological sites, and meteorites (S35). » Provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority (S36). » Lists activities which require developers any person who intends to undertake to notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development (S38). » Requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part of tourism attraction (S44).
National Environmental Management: Biodiversity Act (Act No 10 of 2004)	» Provides for the MEC/Minister to identify any process or activity in such a listed ecosystem as a threatening process (S53) » A list of threatened and protected species has been published in terms of S 56(1) - Government

Legislation	Applicable Requirements
	Gazette 29657. » Three government notices have been published, i.e. GN R 150 (Commencement of Threatened and Protected Species Regulations, 2007), GN R 151 (Lists of critically endangered, vulnerable and protected species) and GN R 152 (Threatened or Protected Species Regulations). » Provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GN 1002), 9 December 2011). » This Act also regulates alien and invader species.
Conservation of Agricultural Resources Act (CARA) (Act No 43 of 1983)	» Prohibition of the spreading of weeds (S5) » Classification of categories of weeds & invader plants (Regulation 15 of GN R1048) & restrictions in terms of where these species may occur. » Requirement & methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R1048).
National Forests Act (Act No. 84 of 1998)	According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that 'no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister'.
National Veld and Forest Fire Act (Act 101 of 1998)	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

Legislation	Applicable Requirements
	for extinguishing fires.
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 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.
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.
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 921 of 29 November 2013), A Basic Assessment or Environmental Impact Assessment is required to be undertaken for identified listed

Legislation	Applicable Requirements
	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 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.
Subdivision of Agricultural Land Act (SALA) (Act No 70 of 1970)	Details land subdivision requirements and procedures. Applies for subdivision of all agricultural land in the Province
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 exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.
Astronomy Geographic Advantage Act (Act No. 21 of 2007)	» The Astronomy Geographic Advantage Act (No. 21 of 2007) provides for the preservation and protection of areas within South Africa that are uniquely suited for optical and radio astronomy; for intergovernmental co-operation and public

Legislation	Applicable Requirements
	consultation on matters concerning nationally significant astronomy advantage areas and for matters connected thereto. » Chapter 2 of the act allows for the declaration of astronomy advantage areas whilst Chapter 3 pertains to the management and control of astronomy advantage areas. Management and control of astronomy advantage areas include, amongst others, the following: » Restrictions on use of radio frequency spectrum in astronomy advantage areas; » Declared activities in core or central astronomy advantage area; » Identified activities in coordinated astronomy advantage area; and » Authorisation to undertake identified activities.
Northern Cape Nature Conservation Act, Act No. 9 of 2009	This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project: » Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property; » Aquatic habitats may not be destroyed or damaged; » The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species. » The Act provides lists of protected species for the Province.
Guideline Documents	
South African National Standard (SANS) 10328, Methods for environmental noise impact assessments.	» Prediction of impact that noise emanating from a proposed development would have on occupants of surrounding land by determining the rating level. » Noise limits are based on the acceptable rating levels of ambient noise contained in SANS 10103.
Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads	Outlines the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in

Legislation	Applicable Requirements
and for other Events on Public Roads.	applying for exemption permits.
Integrated Resource Plan (IRP) 2010-30 (2011).	National targets for renewable energy generation.
Khai-Ma Local Municipality 2010/2011.	To provide the overarching strategic framework for the sustainable long-term management of the relevant municipality.
Draft Guidelines for the Evaluation and Review of Applications Pertaining to Wind and solar Farming on Agricultural Land (Sept 2010).	This document provides an outline of the type of agricultural / soil study required for wind and solar farms and for submission to DAFF.
Equator Principles (2013) (as updated) and IFC performance standards.	The Equator Principles are a set of standards for determining, assessing and managing social and environmental risk in project financing. Lenders who seek finance from foreign banks will have to comply with the Equator Principles.

4.3 Methodology for the Scoping Phase

The Scoping Phase has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of 18 June 2010 as amended in December 2010, in terms of NEMA. Key tasks undertaken within the scoping phase are discussed in more detail below.

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

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

- Three applications for authorisation were submitted to the DEA with copies submitted to NC DENC. These applications were accepted and allocated the following application Reference Numbers: 14/12/16/3/3/2/680 (Khai-Ma wind energy facility), 14/12/16/3/3/2/681 (Poortjies wind energy facility) and 14/12/16/3/3/2/682 (Korana wind energy facility).
- Acceptance was therefore granted to continue with the Scoping Phase (15 April 2014).

A record of all authority consultation undertaken prior to and within the Scoping Phase is included within Appendix B.

4.3.2. Public Participation Process

The aim of the public participation process is primarily to ensure that information containing all relevant facts in respect of the application is made available to potential stakeholders and I&APs. Furthermore, participation by potential I&APs is facilitated in such a manner that all potential stakeholders and I&APs are provided with a reasonable opportunity to comment on the application. And lastly, all comments received from stakeholders and I&APs are recorded, which serve to further direct the specialist studies and the EIA process.

1. **Identification of I&APs and establishment of the I&AP Database**
   Identification of I&APs was undertaken by Savannah Environmental through existing contacts and databases, and newspaper advertisements as well as through the process of networking. The key stakeholder groups identified include:

   * Provincial and local government departments (including DEA, NC DENC, SAHRA, DWA, DAFF, SANRAL, etc.);
   * Government structures (including the provincial roads authority, municipal planning departments, etc);
   * Khai-Ma Local Municipality and the Namakwa District Municipality;
   * Conservation authorities; and
   * CBOs and other NGOs.

   The I&AP details were recorded within an I&AP database (refer to Appendix C for a listing of I&APs). The database will be updated on an on-going basis during the EIA process.

2. **Distribution Background Information Document and Reply Form**
   In order to provide information regarding the proposed project and the EIA process, a background information document (BID) and reply form for the project was compiled (refer to Appendix E). The BID was distributed to identified stakeholders and I&APs, and additional copies were made available at public venues within the broader study area.

3. **Newspaper Advertisements**
   In order to notify and inform the public of the proposed project and register as an I&AP, an advertisement was placed in the Gemsbok and the Volksblad on the 23 April 2014 (refer to Appendix D).

A second round of newspaper advert was placed in 28 May 2014 advertising the availability of the draft scoping report for public review and public meeting. Networking with I&APs will continue throughout the duration of the Scoping and EIA processes.

6. Site Notices

In order to notify and inform the public of the proposed project A3 Site Notices in English and Afrikaans were placed along the Farms Namies South 212 Portion 1 and 2, Poortjie 209 Portion 1 and Poortjie RE209 and at the Khai-Ma Local Municipality (refer to Appendix D).

4.3.3 Identification and Recording of Issues and Concerns

Issues and concerns raised by I&APs during the Scoping Phase have been consolidated in a Comments and Response Report. A Comments and Response Report incorporating all comments from the scoping phase will form part of the Final Scoping Report that will be submitted to DEA.

4.3.4 Evaluation of Issues Identified through the Scoping Process

The approach taken towards the environmental assessment of the site includes:

» An **environmental fatal flaw assessment** / screening study undertaken by Aurecon Consultants in 2012 to provide baseline data and any red flags for the site.
» A **scoping phase** evaluation of the site including field work so the site development envelope could be defined taking into consideration any environmental sensitivities of this site (this scoping report).
» For the **EIA phase**, the developer will provide a design of the facility and wind turbine layout taking into account the environmental sensitivity mapping done for the site. Depending on the level of confidence, any additional site work will be undertaken during the EIA phase, if required.

The purpose of following this approach is to inform the design of the renewable energy facility to ensure that the best-practical environmental option is selected for the facility.

In evaluating potential impacts identified to be associated with the proposed project, Savannah Environmental has been assisted by the following specialist consultants.

Potential direct and indirect environmental impacts that are identified within the Scoping Phase have been evaluated in the scoping phase. In order to evaluate issues and assign an order of priority, it was necessary to identify the characteristics of each potential issue/impact:

» *the nature,* which includes a description of what causes the effect, what will be affected and how it will be affected; and
» *the extent,* wherein it is indicated whether the impact will be local (limited to the immediate area or site of development) or regional.

The specialist reports are attached in **Appendices F-M.**

4.3.5 Public Review of Draft Scoping Report and Focus Group Meeting

The Draft Scoping Report is available for public review from **28 May 2014 – 09 July 2014** at the following locations:

» Pofadder Public Library; and
» www.savannahsa.com.

The public review process was advertised in the Gemsbok and Volksblad in 28 May 2014. In addition, a letter notifying all registered I&APs of the availability of the report and a focus group meeting was distributed in May 2014 (refer to Appendix E).

4.3.6 Final Scoping Report

The final stage in the Scoping Phase will entail the capturing of responses from I&APs on the Draft Scoping Report in order to refine this report. It is this final report upon which the decision-making environmental authorities provide comment, recommendations and acceptance to undertake the EIA Phase of the process.

4.4 Assumptions and Limitations of the EIA Process

Wind energy facilities are a new development in South Africa and have not been implemented on a large scale, to date. Therefore certain gaps in knowledge, assumptions, and uncertainties are likely to occur during the EIA process. In conducting this EIA process, the following general assumptions have been made:

» The motivation for the selection of the proposed development site (including details pertaining to the wind resource etc.) provided by South Africa Mainstream Renewable Power Developments (Pty) Ltd is sufficient and defendable.

- Only one site is available for the establishment of the proposed facilities and will be considered in the EIA, and no other sites are available to be included as alternative sites in the EIA. This is based on desktop wind analysis (with specific measurements on site planned) as well as on land availability, access to the site, grid connectivity, etc.
- It is assumed that the development site identified by South Africa Mainstream Renewable Power Developments (Pty) Ltd represents a technically suitable site for the establishment of wind energy facilities and associated infrastructures.

Details of specific assumptions, limitations and/ gaps in knowledge for each of the specialist studies undertaken are discussed in each individual report and not repeated here (refer to specialist studies contained in **Appendix F - M** for more details).

DESCRIPTION OF THE AFFECTED ENVIRONMENT CHAPTER 5

This section of the Draft Scoping Report provides a description of the environment that may be affected by the proposed Khai-Ma, Poortjies and Korana Wind Energy Facilities near Pofadder. 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 desktop data undertaken by specialists who have a working knowledge of the area, and aims to provide the context within which this EIA is being conducted. A more detailed description of each aspect of the affected environment is included within the specialist scoping reports contained within Appendices F to M.

5.1 Regional Setting and the Study Area

5.3.1 Regional Setting

The site of the proposed Wind Energy Facilities (Portion 1 & 2 of Farm 212 (Namies South), Portion 1 and remaining extent of Farm 209 (Poortjie)) are located approximately 22km south-west of Pofadder in the heart of the Northern Cape (refer to **Figure 5.1**). The town of Pofadder is located on the N14, which links Springbok in south-west with Upington in the north east. The site falls within the Khai-Ma Local Municipality.

Table 5.1: Photographs of the site

View of Portion 1 of Farm 212 (Namies South)	View of Portion 1 of Farm 212 (Namies South)
	
View of the site between Portion 1 and Portion 2	View of Portion 1 of Farm 209 (Poortje)
	

5.3.2 Land-Use Character of the Region

The land use on the site and in the broader development area is mostly sheep farming, with some game and cattle also present. The entire area is divided into fenced off grazing camps, with several boreholes with associated water reservoirs, drinking troughs and a few trees. The small town of Pofadder is the only major settlement in the area which services the surrounding farming communities. There are no large urban or industrial structures in the area and the only major forms of infrastructure are the N14 highway and the Eskom Aggeneys–Aries 400kV power line which traverses the site.

5.2 Climatic Conditions

In general, the study area falls within the spring and autumn rainfall zone of the Northern Cape Province. It experiences highly unpredictable rainfall that can vary between 50 to 200 mm per annum. Rain normally falls as scattered thunder showers when tropical thunderstorm activity extends southwards over the Kalahari. It is not uncommon for a heavy showers to occur in one place and for a nearby area to remaining completely dry.

Summer daytime temperatures can reach above 40 ºC (range 20 – 40+ ºC) whereas the dry winters are mild to cold. Winter daytime temperatures can reach 25 ºC but at night frost can occur and temperatures can average below 0 ºC (-3.3 ºC). A climate diagram for Bushmanland Arid Grassland summarises the climate typically found in the study area.

The upland areas of the site in the north and east is characterised by Bushmanland Inselberg Shrubland have lower rainfall than the plains in the study area but slightly less mean annual potential evaporation. Mean annual temperatures are also marginally lower. These areas will not be affected by the proposed wind energy infrastructures.

5.3 Biophysical Characteristics of the Study Site and Surrounds

5.4.1 Geology

The geology underlying the flatter areas of the site is dominated by late Cainozoic to Recent age superficial sediments consisting of sands and gravels of fluvial and/or sheet wash origin, overlain by coarse to medium grained sands of aeolian origin. Small calcrete concretions are evident in most areas and these constitute the gravelly texture of the soil cover. Calcrete "dorbank" lenses are expected over most of the site below the superficial unconsolidated soil cover. Thicker deposits of red fine sand are located along dry river channels. The surrounding hills and

slightly elevated areas on the farms consist of outcrops of metamorphic basement rock. Basement formations occurring within the site area include the Wortel Formation (quartzite and pelitic schist), Brulkolk Formation (gneiss and amphibolites), Koeipoort Formation (Gneiss), and Namies Suid Formation (biotite gneiss). Copper and nickel deposits are known to occur on the eastern side of the site near the Platberg.

5.4.2 Hydrology, Drainage Lines, Rivers & Wetlands

There are no perennial rivers or wetlands on the site. The drainage lines that do occur on the site are characterised by loose sandy soil or exposed bedrock and boulders in the 'washes' with the banks lined with grasses, shrubs and small trees (as shown in **Figure 5.2 and 5.3**). In the north of the study area (Namies South 212/1) the drainage lines are many narrow channels which follow a dendritic pattern, dissecting the plains. Further south the drainage lines are wider and better defined. The main drainage channel in the southern portion of the site is "Nam se Laagte" that drains towards the south-west. The northern portion of Namies South drains north-westerly towards the Orange River. All the drainage lines have similar vegetation; variation depends on availability and length of duration of flowing water.

In an arid ecosystems such as in the study area the drainage lines are prone to flash flooding. They are also the 'ecological linking corridors'. Although not having a high diversity of plant species they should be observed as ecologically sensitive. The landscape is prone to sheet-wash at times of heavy rain and there are seasonal drainage lines which in some cases are poorly defined whereas in others they are quite distinct. The vegetation of the drainage lines does not differ greatly from that found on site. This is attributed to the drainage lines being mainly dry and only having water-flow for very short periods.

Figure 5.2: A typical drainage line in the study area with white grasses and low to mid-high shrubs on the banks

Figure 5.3: Some drainage lines have mid-high shrubs and trees along their banks together with white grasses

5.4.3 Soils, Land Use and Agricultural Potential

The underlying geology is Gneissic granite of the Namaqualand Metamorphic Complex. The land type classification is a nationwide survey that groups areas of similar soil, terrain and climatic conditions into different land types. The site is located predominantly on two land types, i.e. Ag61 and Ag25, with a very small section on a third, Ib131. All land types are dominated by very shallow, very sandy soils on underlying rock or hard-pan carbonate. The ridges (Ib131) are dominated by rock outcrops (refer to **Figure 5.4**). The soils would fall into the Lithic and

Calcic soil groups according to the classification of Fey (2010).

The study area is located within a sheep farming agricultural region. There is no cultivation on the farm.

Land capability is the combination of soil suitability and climate factors. The area has a land capability classification, on the 8 category scale, of predominantly Class 7 - non-arable, low potential grazing land, with small sections of class 8 – non utilisable wilderness land. The limitations to agriculture are aridity and lack of access to water together with the very shallow soil depth and rockiness on the site. Because of these constraints, agricultural land use is restricted to low intensity grazing only. The natural grazing capacity is low, at mostly 31-40 hectares per animal unit, with the ridges even lower at 41-60 hectares per animal unit.

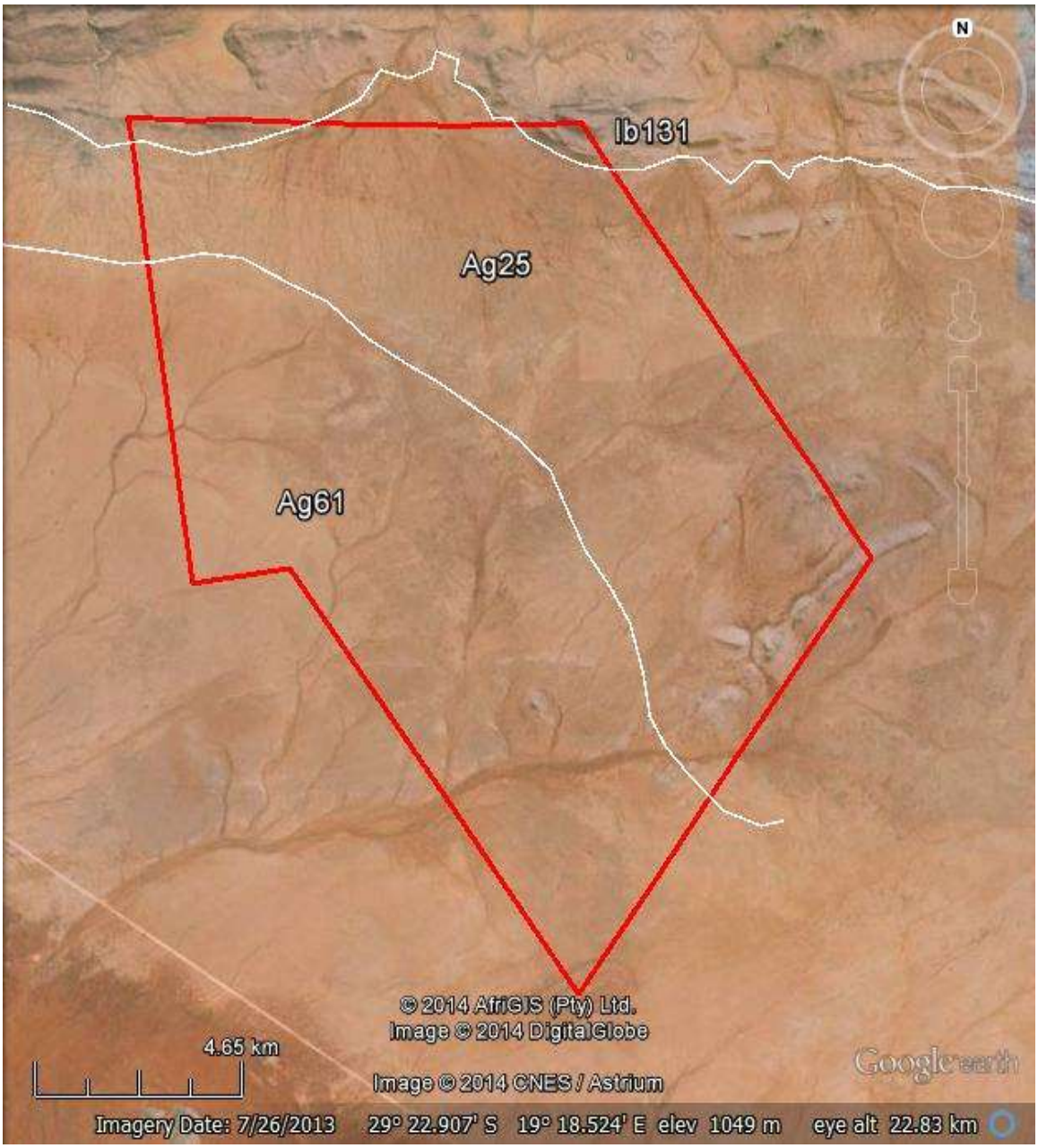


Figure 5.4: Satellite image of site showing land type distribution. Land type labels and boundaries in white and site with red boundary.

5.4.4 Ecological Profile of the Study Area

a. Critical Biodiversity Areas and Conservation Planning

No Critical Biodiversity Areas occur within the site and/ the study area. The principal vegetation type, Bushmanland Arid Grassland and its sub-units as described for the study area occur extensively in the Northern Cape Province. Although there are few statutory conservation areas for this vegetation type, it forms agricultural rangelands which are conserved for their grazing potential. According to the National Spatial Biodiversity Assessment (Rouget et al. 2004)

Bushmanland Arid Grassland is classified as Least Threatened and is not listed in the National List of Threatened Ecosystems (Government Gazette, 2011). The study area is located approximately 69km south west of the Riemvasmaak Community Conservancy.

No rare plant species or plant species of special concern are known to occur in the vicinity of the site. Some endemic species may occur but the very dry condition of the vegetation at the time of the survey made a comprehensive survey impossible and further field work during the EIA phase will be undertaken.

b. <u>Vegetation</u>

The site occurs in the Bushmanland Bioregion. The Bushmanland Bioregion is separated from the other bioregions within the Nama Karoo Biome by having low mean precipitation and high mean annual temperatures. It is dominated by arid shrublands and grasslands (Mucina *et al.* 2006). The vegetation of the study area is principally Bushmanland Arid Shrubland (as shown in **Figure 5.5**). Bushmanland Arid Grassland occurs over a wide expanse in the Northern Cape Province from the Bushmanland Basin in the south to the vicinity of the Orange River in the north and from Prieska in the east to Aggeneys in the west (Mucina *et al.* 2006). It is used mainly as rangeland for sheep-farming and no crops are cultivated.

The site boundary in the northwest cuts marginally through a patch of Aggeneys Gravel Vygieveld. The north boundaries of the properties marginally impinge on Bushmanland Inselberg Shrubland.

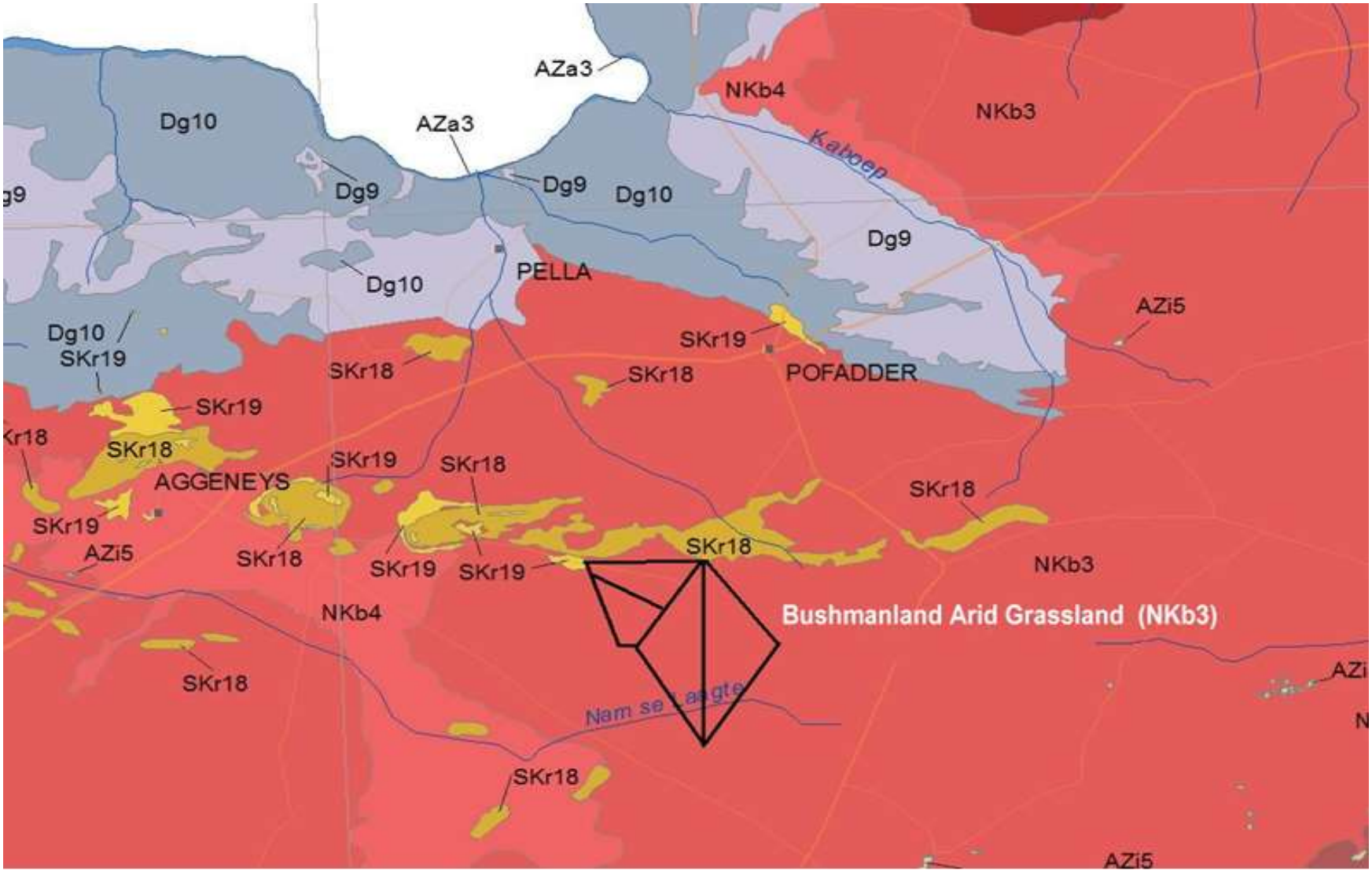


Figure 5.5: Portion of the national vegetation map (Mucina et al. 2005) showing the position of proposed Wind Energy Facilities

c. Plant Communities

Five plant communities or associations are recognised in the study area including:

» Open plains grassland;
» Low to mid-high shrubland;
» Drainage line vegetation;
» Aggeneys Gravel Vygieveld; and
» Bushmanland Inselberg Shrubland.

Neither Aggeneys Gravel Vygieveld nor Bushmanland Inselberg Shrubland are likely to be affected by the proposed renewable energy infrastructure, since it was recommended in the botanical constraints analysis (McDonald, 2012) that the areas where these vegetation types occur should be avoided. These two vegetation types are therefore not described below.

» ***Open plains grassland***
The open plains grassland has a highly distinctive appearance due to the dominance of 'white grasses' (*Stipagrostis* spp.) and is described as semi-desert 'steppe' (Mucina *et al.* 2006). This vegetation occurs on moderately-deep to deep red sandy soils and is found extensively in the central and southern parts of the study area.

» ***Low to mid-high Shrubland***
The low to mid-high shrubby association is found on relatively shallow soils with stones and small boulders on the surface and often over calcrete hardpan. This vegetation is encountered in the northern part of the study area. [4]One species of note occurring on the site is *Aloe claviflora* (kraalaalwyn). Occasionally stands of vegetation dominated by the mid-high shrub *Rhigozum trichotomum* (granaatbos) are encountered in the study area. This species is described by Van Rooyen (2001) as '*widespread throughout the Northern Cape in sandy and calcareous soils on plains, dune valleys and near pans and dry rivers. Often forming dense thickets in overgrazed veld'.*

» ***Drainage Line Vegetation***
The drainage lines on the site are characterised by loose sandy soil or exposed bedrock and boulders in the 'washes' with the banks lined with grasses, shrubs and small trees (refer to Figure 5.4). All the drainage lines have similar vegetation with variation dependent on availability and length of duration of flowing water. In the arid ecosystems such as in the study area the drainage lines are prone to flash flooding. They are also the 'ecological

[4]It was extremely dry at the time of the site visit and most plants were not in a fit state for identification. This was a severe limitation and hence species-lists were not compiled.

linking corridors', although the drainage lines do not have a high diversity of plant species.

d. Protected Tree Species

A protected tree species, *Boscia albitrunca* (Shepherd's Tree) is one of the few tree species which occur within on the study area (**see Figure 5.6**). The trees recorded on site are old and take a long time to grow. The Shepherd's Tree is easily identified with its pale white-coloured trunk and small leaves. These trees are not suited to relocation.

Figure 5.5: *Boscia albitrunca* (Shepherd's Tree) trees are found scattered though the landscape in the study area.

e. Terrestrial Fauna Species

The following vegetation types provide habitat for faunal species:

» ***Bushmanland Sandy Grassland is found to the west of Pofadder site***: This vegetation unit is covered by sparse open grassland with scattered, drought resistant dwarf shrubs.

» ***Bushmanland Basin Shrubland is south-west of the site:*** The vegetation is a dwarf shrubland dominated by a combination of low shrubs and white grasses.

» ***The Eastern Gariep Plains Desert is north of the site***: The vegetation conforms to typical wash vegetation in the breaks between the mountains. Grasslands are dominated by white grasses (*Stipagrostis*) on much of the flats with additional shrubs and herbs in the drainage lines. The vegetation unit consists of flat plains (sheet wash plains) with interspersed rocky hills and

outcrops belonging to other habitat types. These rocky hills and outcrops provide faunal roosting sites.

» ***Eastern Gariep Rocky Desert is also found north of the site***: Comprises hills and mountains, mostly with bare rock outcrops and covered with very sparse shrubby vegetation and low growing trees. This vegetation type may prove useful for bat roosting areas.

Table 5.2 provides a list of faunal species that may occur on the site. The faunal species on conservation importance that may occur on the site include:

» *Felis nigripes (*Small spotted cat)
» *Petromus typicus* (Dassie rat)
» *Family Theraposidae* (Baboon spiders)
» *Stasimopus spp* (Trapdoor spiders)
» *Psammobates spp (*Tent tortoises)
» *Cordylus spp* (Girdled lizards)

Table 5.2: Table of species that may be found in and utilising the study area, based on large scale literature distribution maps. LC = Least Concern; NT = Near Threatened; V = Vulnerable (Stuart & Stuart, 2001; Skinner & Chimimba, 2005; www.iucnredlist.org; www.speciesstatus.sanbi.org). For invertebrates focus is only on Protected species.

Species	Common name	Faunal group	Probability of occurrence on the site	Conservation status
Sylvicapra grimmia	Common duiker	Mammal	Very low-none	LC
Raphicerus campestris	Steenbok	Mammal	Low	LC
Antidorcas marsupialus	Springbok	Mammal	Moderate	LC
Oreatragus oreatragus	Klipspringer	Mammal	Moderate (towards mountains)	LC
Procavia capensis	Rock dassie	Mammal	Moderate (towards mountain)	LC
Caracal caracal	Caracal	Mammal	Confirmed by landowner	LC
Felis nigripes	Small spotted cat	Mammal	Very low due to lack of vegetation cover	VU
Proteles cristatus	Aardwolf	Mammal	Confirmed by landowner A. van Niekerk	LC

Genetta genetta	Small spotted genet	Mammal	Low	LC
Cynictis penicillata	Yellow mongoose	Mammal	Low - Moderate	LC
Suricata suricatta	Meerkat (Suricate)	Mammal	High	LC
Ictonyx striatus	Striped polecat	Mammal	Moderate	LC
Mellivora capensis	Honey badger	Mammal	Moderate	LC
Canis mesomelas	Black-backed jackal	Mammal	High	LC
Vulpes chama	Cape fox	Mammal	Moderate	LC
Otocyon megalotis	Bat-eared fox	Mammal	Moderate	LC
Petromyscus collinus	Pygmy rock mouse	Mammal	Moderate (in rocky mountains)	LC
Parotomys brantsii	Brants's whistling rat	Mammal	Moderate - high (in sandy areas)	LC
Parotomys littledalei	Littledale's whistling rat	Mammal	Moderate - high (in sandy areas)	LC
Rhabdomys pumilio	Striped mouse	Mammal	Moderate	LC
Aethomys namaquensis	Namaqua rock mouse	Mammal	Moderate (in rocky mountains)	LC
Gerbillurus paeba	Hairy-footed gerbil	Mammal	High	LC
Tatera brantsii	Highveld gerbil	Mammal	High	LC
Malacothrix typica	Large-eared mouse	Mammal	Moderate	LC
Petromus typicus	Dassie rat	Mammal	Moderate (only in rocky mountains)	NT
Pronolagus rupestris	Smith's red rock rabbit	Mammal	Low (only in rocky mountains)	LC
Papio cynocephalus ursinus	Savanna baboon	Mammal	Very low (only in rocky mountains, lack of drinking water)	LC
Crocidura cyanea	Reddish-grey musk shrew	Mammal	Low	LC

Family Theraposidae	Baboon spiders	Arachnida	Low due to low occurrence of insect food	Protected
Stasimopus spp	Trapdoor spiders	Arachnida	Low due to low occurrence of insect food	Protected
Opistophthalmus wahlbergi	-	Arachnida (scorpions)	High	LC
Opistophthalmus carinatus	-	Arachnida (scorpions)	High	LC
Hadogenes phyllodes	-	Arachnida (scorpions)	High (in rocky areas)	LC
Uroplectes carinatus	-	Arachnida (scorpions)	High (in northern areas of site)	LC
Parabuthus leavipes	-	Arachnida (scorpions)	Low (uncommon species)	LC
Parabuthus granulatus	-	Arachnida (scorpions)	High	LC
Karasbergia muthueni	-	Arachnida (scorpions)	Low (uncommon species)	LC
Psammobates spp	Tent tortoises	Reptiles	Moderate - High	EN
Ptenopus	Barkong geckos	Reptiles	High	LC
Pachydactylus mariquensis	Marico gecko	Reptiles	High	LC
Pachydactylus spp	Western, rough scaled, common geckos	Reptiles	Moderate (sandy and rocky areas on site)	LC
Chondrodactylus spp	Tubercled geckos	Reptiles	High (rocky)	LC
Chondrodactylus angulifer	Giant ground gecko	Reptiles	High	LC
Cordylosaurus subtessellatus	Dwarf plated lizard	Reptiles	Moderate	LC
Cordylus spp	Girdled lizards	Reptiles	Moderate-high (only in rocky mountains)	Protected
Trachylepis spp	Typical skinks	Reptiles	Moderate (rocky)	LC
Typhlacontias	Legless burrowing skinks	Reptiles	High	LC

Heliobolus spp, *Meroles* spp, *Nucras* spp, *pedioplanus* spp	Sand lizards	Reptiles	High	LC
Chamaeleo namaquensis	Namaqua chameleon	Reptiles	High	LC
Agama spp	Agamas	Reptiles	Moderate	LC
Bitis caudalis	Horned adder	Reptiles	High	LC
Bitis arietans	Puff adder	Reptiles	Confirmed	LC
Naja mossambica	Mosambique spitting cobra	Reptiles	Moderate	LC
Naja nivea	Cape cobra	Reptiles	Moderate	LC
Aspidelaps lubricus	Coral shielded cobra	Reptiles	Moderate	LC
Telescopus spp	Tiger snake	Reptiles	Moderate	LC
Dasypeltis spp	Egg eater	Reptiles	Moderate	LC
Psammophis spp	Sand and Whip snakes	Reptiles	Moderate	LC
Prosymna spp	Shovel snouts	Reptiles	High	LC
Pseudaspis cana	Mole snake	Reptiles	Moderate	LC
Leptotyphlops spp	Worm snakes	Reptiles	Moderate	LC
Rhinotyphlops spp	Beaked blind snakes	Reptiles	Moderate	LC

f. Bats

Three factors are required for most South African bats to be prevalent in an area: a) availability of roosting space, b) food (insects/arthropods or fruit), and c) accessible to open water. However, the dependence of a bat on each of these factors depends on the species and its biology, for example different species of bats utilise different types of roosting spaces. Nevertheless if all three of these factors are common in an area the bat activity and abundance will also most likely be high.

Concerning species of bats that may be impacted by wind turbines, the site was evaluated by comparing the amount of surface rock (possible roosting space), topography (influencing surface rock in most cases), vegetation (possible roosting spaces), climate (can influence insect numbers and availability of fruit), and presence of surface water (influences insects and acts as a drinking source for bats). Species probability of occurrence, based on above mentioned factors, and distribution maps were also estimated for the broader study area.

The site is relatively flat barring the mountainous elevations on the northern and south-western perimeter of the site. These outcrops and inselbergs will provide suitable roosting space for bats. The vegetation present on the site is sparse and consists of small succulent plants which will not provide roosting sites but has the potential to create an area of foraging for insectivorous bats. The farmhouse and buildings provide bat roosting sites. The fruit trees around the landowner's house can technically provide some food for *Eidolon helvum* fruit bats. This bat is a rare occurrence of a non-breeding migrant in South Africa, with a low probability of venturing onto the site.

The study area has a low mean annual precipitation. However, there are drainage channels across the majority of the site. These channels drain in a southerly direction to collect into a larger stream within the site boundary. The channels will provide limited surface water and soil moisture on a seasonal basis during the rainy season for this site, and therefore will make insect prey available to bat fauna.

Table 5.3: List of bat species with a medium or high probability of occurring in the study area.

Species	Common name	Probability of occurrence	Conservation status	Possible roosting habitat to be utilised in study area
Rhinolophus denti	Dent's horseshoe bat	Medium	Data Deficient	Roosts in caves, semi-dark caverns and crevices in rocky outcrops. It is associated with arid habitats.
Nycteris thebaica	Egyptian slit-faced bat	High	Least Concern	Roosts in caves, aardvark burrows, road culverts, and trunks of large trees. It appears to occur throughout savannah and Karoo biomes.
Sauromys petrophilus	Roberts's flat-headed	High	Least Concern	Roost in narrow cracks and under slabs of exfoliating

	bat			rock. Species is closely associated with rocky habitats in dry woodland, mountain fynbos and arid scrub.
Tadarida aegyptiaca	Egyptian free-tailed bat	High	Least Concern	Roost in caves, rock crevices, under exfoliating rocks, in hollow trees, behind the bark of dead trees, and in roofs of houses.
Miniopterus natalensis	Natal long-fingered bat	Medium	Near threatened	Cave-dependent. No known caves in vicinity of site. However mountainous terrain within the landscape could provide suitable caves.
Cistugo seabrae	Angolan wing-gland bat	Medium	Near Threatened	It is restricted to the arid western parts of Southern Africa, typically in desert and semi-desert conditions.
Eptesicus hottentotus	Long-tailed serotine	High	Least Concern	Roosts in caves and rock crevices, usually netted near rocky outcrops.
Neoromicia capensis	Cape serotine	High	Least Concern	Roosts under bark of trees, at the base of aloe leaves and under the roofs of houses.

According to the Pre-construction Bat Monitoring and Assessment report dated February 2014, to date, four bat species and a total of 12,695 bat passes have been recorded on site. Activity was dominated by two species, the Cape Serotine and the Egyptian free-tailed bat which have a medium-high and high likelihood of impact from wind turbines respectively. Bat activity was similar across each of the monitoring locations and bat activity does not appear to be strongly associated with any specific parts of the proposed site. Higher bat activity was recorded at low height than at rotor swept height.

g. Avifauna

Three Important Bird Areas (IBAs) which are broadly similar in habitat and vegetation to the broader development area are situated within a 40km radius from the site, namely the Mattheus Gat Conservation Area (SA034), Haramoep and Black Mountain Mine Nature Reserve (SA035) and Bitterputs Conservation Area (SA 036) (Barnes 1998).

While the distribution and abundance of the bird species in the broader development area are mostly associated with natural vegetation, as this comprises virtually all the habitat, it is also necessary to examine external modifications to the environment that may have relevance for birds.

The following avifaunal-relevant habitat modifications were identified within the broader development area:

» **Water points:** The land use in the broader development area is mostly sheep farming, with some game and cattle also present. The entire area is divided into fenced off grazing camps, with several boreholes with associated water reservoirs, drinking troughs and a few trees. These troughs, reservoirs and trees are a big draw card for several bird species.
» **Transmission lines and telephone lines:** The broader development area is bisected by the Aggeneys – Aries 400kV transmission line. The transmission towers are used by raptors for perching and roosting, and potentially also for breeding. An inactive eagle nest, most likely belonging to a Martial Eagle, was discovered on tower 147. Prey remains and droppings below the nest and other towers indicate recent activity. There is also a telephone line running along the road to the two farm houses, which is used extensively by several species for perching.
» **Farm yards:** The site contains two farm yards, with associated buildings, trees and patches of lawn.

It is estimated that at least 83 bird species could potentially occur in the broader development area (refer to Appendix B of the Avifauna Study for full list). The priority species (Retief et al. 2012) potentially occurring at the site can be broadly classified in four groupings namely medium to large terrestrial species, soaring species, nocturnal species and small birds:

» Medium to large terrestrial species: Medium to large birds that spend most of the time foraging on the ground. They do not fly often and then generally short distances at low to medium altitude, usually powered flight. Some species (bustards) undertake longer distance flights at higher altitudes.
» Soaring species: Species that spend a significant time on the wing in a variety of flight modes including soaring, kiting, hovering and gliding at medium to high altitudes.
» Nocturnal species: Owls - nocturnal predatory birds which fly mostly low with powered flight interspersed with short glides.
» Small birds: These are mainly passerines. Passerines spend most of the time on the ground or calling from perches, but display flights at low to medium height are also undertaken by some species.

The priority species for this study area include:

» Martial Eagle *(Polemaetus bellicosus)*
» Ludwig's Bustard *(Neotis ludwigii)*
» Secretarybird *(Sagittarius serpentarius)*
» Kori Bustard (*Ardeotis kori)*
» Lanner Falcon *(Falco biarmicus)*

According to the winter 2013 and summer 2013/2014 bird monitoring progress report, of the transect recorded species in the study area 5 species (38.5% of recorded species) were priority species (Greater Kestrel *Falco rupicoloides*, Karoo Korhaan *Eupodotis vigorsii*, Ludwig's Bustard, Red Lark and Southern Pale Chanting Goshawk). One species (10% of recorded species) was a priority species at the control site (Karoo Korhaan).

5.4 Social Characteristics of the Study Area and Surrounds

The proposed wind energy facilities are located in the Northern Cape Province, which is the largest province in South Africa and covers an area of 361,830 km^2, and constitutes approximately 30% of South Africa. The province is divided into five district municipalities (DM), namely, Frances Baard, Pixley ka Seme, Namakwa, Siyanda, and John Taolo Gaetsewe DM, twenty-six Category B municipalities and five district management areas. The site itself is located in the Khai-Ma Local Municipality (KMLM), which is a Category B Municipality, and one of seven constituent B-Municipalities that make up the Namakwa District Municipality (NDM) (DC6).

The administrative seat of the Khai-Ma Local Municipality is located in Pofadder, while Springbok is the administrative set for the NDM. The rural/agricultural municipality is approximately 8 332 km² in size (~7.7% of the NDM) and is bordered to the north by the Orange River (the border with the Republic of Namibia), by a District Management Area (NCDMA08, part of the Siyanda District Municipality) to the east, and District Management Area (NCDMA06) to the south and the Nama Khoi Local Municipality to the west. The largest town in the Khai-Ma Local Municipality is Pofadder, while other smaller towns include Aggeneys, Pella and Onseepkans. The KMLM is divided into 4 administrative wards. The study area is located within Ward 4 (Aggeneys).

5.4.1 Economic Development

The Human Development Index (HDI) for the Northern Cape Province is 0.58, which covers four indexed factors – life expectancy, adult literacy, GDP per capita (adjusted for real income) and education attainment, which is substantially below

the South African figure of 0.72. Over the past 8 years there has been little to no variance in the HDI figures, indicating no increase or decrease in the overall standard of living. In contrast, the Kimberley and Springbok areas have the highest HDI of 0.63 to 0.62 respectively, primarily due to the broader economic opportunities and access to services such as infrastructure, schools, and health facilities. Similarly, there has been no significant change over the past 8 years.

The above trend is unlikely to change in the foreseeable future, mainly due to the marginal economic base of the poorer areas, and the consolidation of the economic base in the relatively better off areas. In terms of per capita income, the Northern Cape Province has the third highest per capita income of all nine Provinces. However, income distribution is skewed, with a high percentage of the population living in extreme poverty. The measure used in the PGDS document to measure poverty is the percentage of people living below the poverty line or breadline is used. The poverty line indicates a lack of economic resources to meet basic food needs. The percentage of household income below the poverty breadline of R800 in the Northern Cape Province, the highest being Karoo at 48% and the lowest being Namakwa at 36%.

5.4.2 Economy

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%.

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%.

5.4.3 Population

The population the Khai-Ma Local Municipality (KMLM) is estimated at 12 465 (Census 2011) and makes up approximately 11% of the total population of the

greater Namakwa District Municipality (NDM) (115 842). The main towns of Pofadder and Aggeneys account for approximately 64% of the total population (Khai-Ma IDP, 2011/12). The remainder of the population in the Khai-Ma Local Municipality is made up of small farming communities.

The majority of the population is Coloured (75.1%), followed by Black Africans (17.6%) and Whites (6%). The dominant language within the Municipality is Afrikaans (81.3%) with the remainder made up of Setswana (10.7%), isiXhosa (2.2%) and English (1.2%).

5.4.4 Education

The education levels in both the NDM and KMLM improved for the period 2001 t0 2011, with the percentage of the population over 20 years of age with no schooling in the NDM decreasing from 11.7% to 6.6%. For the KMLM the decrease was from 6.7 % to 3.9 %. The percentage of the population over the age of 20 with matric also increased in both the NDM and KMLM, from 15.7% to 18.8% in the NDM and 14.8% to 18.1% in the KMLM. Despite these increases the figures are significantly lower than the provincial (27.7%) and national (28.4%) averages. Low education levels, specifically higher education, therefore remains a challenge in both the NDM and KMLM.

5.4.5 Employment levels

Based on the data collected, the official unemployment rate in the NDM and KMLM decreased for the ten year period between 2001 and 2011. In the NDM the rate fell from 28.5% to 20.1%, a decrease of 8.4%. However, the unemployment rate in the KMLM increased from a low 15.3% to 22.1%, an increase of 6.8%. Youth unemployment in the KMLM also increased over the same period. The increase in the unemployment rate in the KMLM reflects the limited employment opportunities in the area. However, the unemployment and youth unemployment levels in the NDM and KMLM are lower than the provincial and national averages.

Based on the data from the 2011 Census, 8.4% of the population have no formal income, 2.6% earn between 1 and R 4 800, 5% earn between R 4 801 and R 9 600 per annum (Census 2011). Sixteen % of the population therefore earn less than R 800 per month (This is the figure used by the South African Government as the official breadline figure). The majority of households (40%) earn between R 19 601 and R 38 200 per annum. The low-income levels reflect the limited formal employment opportunities in the KMLM. According the DTI NDM Profile (2008), 65% of households in the KMLM were registered as indigent (impoverished) households in 2005. The 2011/2012 Khai-Ma Local Municipality

IDP indicates that 77% of households in the municipality are indigent and reliant on the state for subsidies and grants.

5.4.6 Noise and Visual receptors

The site is located in a remote area due to its considerable distance from any major metropolitan centres or populated areas. The study area is sparsely populated (less than 1 person per km^2), with the highest concentration of people living in the town of Pofadder, located approximately 22km north-east of the site.

Very few homesteads and settlements are present within the study area. Those present include *Lekdam, Samoep, Namies, Onder Namies, Neelsvlei, Dubip and Luttigshoop* within a 10km radius of the proposed site. It is uncertain whether all of the potentially affected farmsteads are inhabited or not.

The N14 national road is located in the north of the study area, just less than 20km from the proposed site, and the R358 bypasses the site some 10-15km to the east. Other than these main roads, a number of secondary roads cross the study area, mainly extending to the west and east.

The only other built infrastructure in the study area is a 400kV power line which traverses the study area (and the site) from west to east.

There are no formally protected or conservation areas present within the study area, but the greater environment has a vast, undeveloped and rugged character. Where settlements occur, these are very limited in extent and domestic in scale.

The greater environment with its wide open, undeveloped landscapes is considered to have a high visual quality.

This area itself is not known as a tourist destination, but the N14 and R358 are recognised tourist access routes within the region, giving access to visitors to the Green Kalahari, Namaqualand and Namibia (via Onseepkans).

An assessment of the area was done using the DEA's Environmental Potential Atlas, with available topographical maps used to identify potential Noise-sensitive developments (NSD) in the area (within the area proposed, as well as potential NSD's up to 2 km from boundary of facilities). The data was imported into GoogleEarth® to allow a more visual view of the areas where Noise-sensitive developments were identified. The presence of these Noise-sensitive developments were also confirmed during a site visit. These noise-sensitive developments are highlighted in **Figure 5.6**.

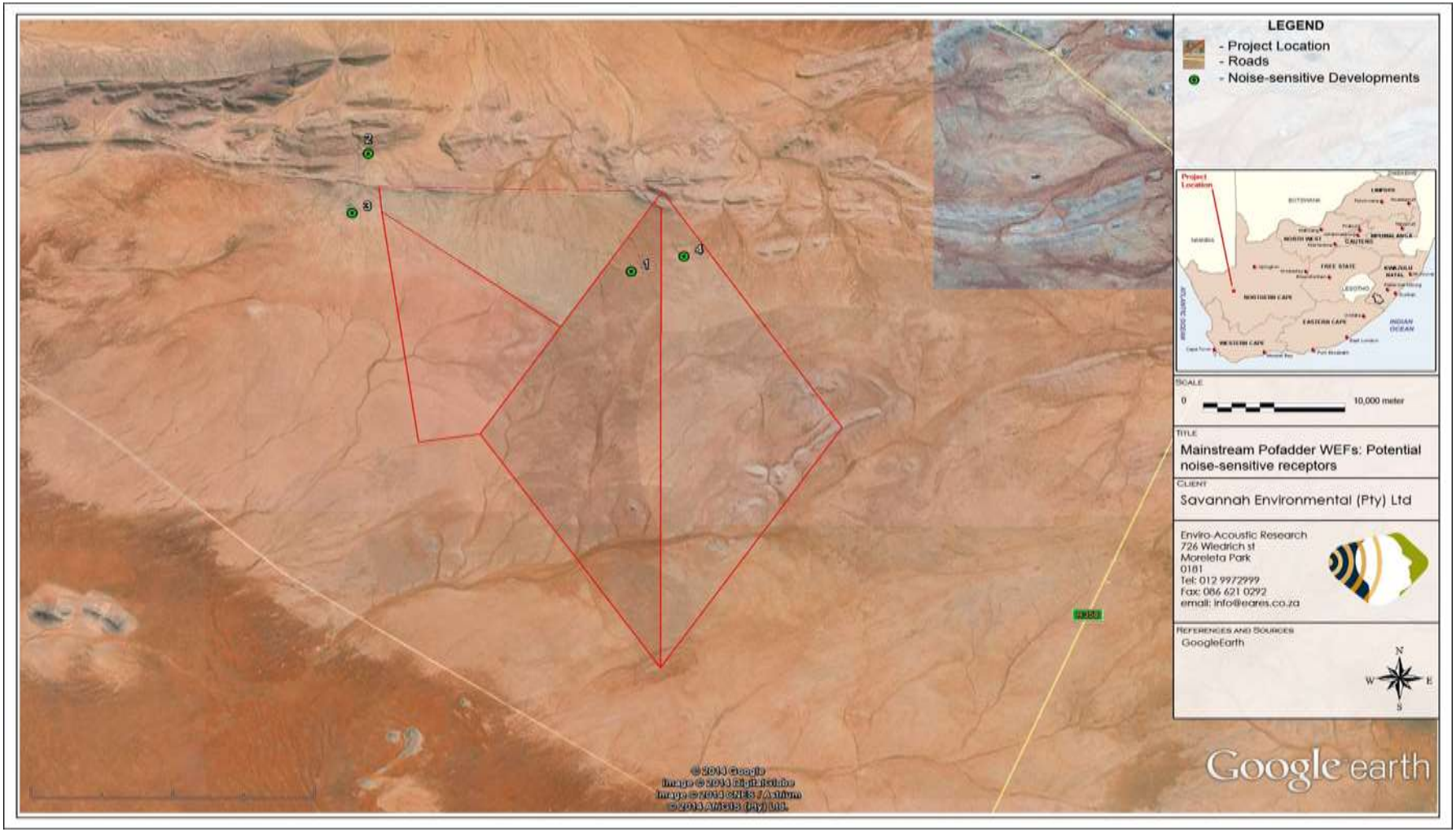


Figure 5.6 Potential Noise Sensitive Developments (green dots) in and around the site

5.5 Heritage and Palaeontological Profile

5.5.1 Palaeontology

The study area for the proposed wind energy facilities is underlain at depth by one to two billion year old Precambrian basement rocks of the Namaqua-Natal Province that are highly metamorphosed and entirely unfossiliferous. Apart from the rugged slopes of the Namiesberge – Die Poort se Berge range of Inselberge on the northern margin of the area and occasional rocky outliers further south, these ancient basement rocks are largely mantled by a variety of Late Caenozoic superficial deposits such as stream alluvium, sheetwash sediments, surface gravels and wind-blown sands that are usually of low palaeontological sensitivity. In general, the various Late Caenozoic superficial sediments represented within the Mainstream study area are either largely unfossiliferous (*e.g.* scree, surface gravels) or only very sparsely fossiliferous (*e.g.* aeolian sands, younger alluvium). In the latter case the fossils concerned are probably of widespread occurrence elsewhere.

Important Miocene vertebrate faunas, including 15 to 16 million year old mammal and reptile remains, are recorded from ancient fluvial sediments of the Koa River Valley (*e.g.* at Bosluis Pan, *c*. 50 km SSW of the study site). This defunct drainage system, a former major tributary of the Orange River, runs from south to north across the Pofadder 1: 250 000 sheet area and is marked by relict pans, fluvial sediments and wind-blown sands. The study area lies just northeast of the potentially fossiliferous Koa River Valley region. However, fossiliferous older (Tertiary / Quaternary) fluvial sediments have not yet been recorded from this northern sector of the Koa River Valley and, if present, they are likely to be deeply buried beneath superficial sediments (*e.g.* younger alluvium, aeolian sands). Likewise the chances of buried fossiliferous crater lake sediments, such as have yielded Cretaceous dinosaur remains at Kangnas *c*. 100 km to the northwest, are considered to be remote within the present study site. Significant impacts on subsurface fossils are therefore not anticipated here.

5.5.2 Archaeology

a. Early, Middle and Later Stone Age

Although little archaeological research has been conducted in the general area around Pofadder, several impact assessment studies have been conducted in recent years. These form the basis of the present background review.

Early (ESA) and Middle Stone Age (MSA) material, including manufacturing sites, have been found on the northern slopes of the Gamsberg, probably positioned so as to gain easy access to a source of stone material on the mountain. Suitable flaking rock is apparently not easily available on the plains (Morris 2010). Pelser (2011) reported MSA and Later Stone Age (LSA) material in an area around the Paulputs substation near Pofadder, although his illustrations appear to be of LSA artefacts made on quartz. He also mentions the presence of ostrich eggshell. East of Aggeneys. Webley and Halkett (2012) found a background scatter of predominantly quartz, and some quartzite artefacts. The material is particularly prevalent in those areas where the soil surface is covered in quartz pebbles and cobbles. The size of the artefacts suggests that they pertain to the Middle Stone Age but diagnostic MSA features were absent. In general, the scatter of stone tools is very widely distributed and does not appear to be concentrated in any specific location.

According to Morris (2011a) LSA sites are the predominant archaeological trace noted in surveys in the Aggeneys-Pofadder region, although his survey of the northern slopes of the Gamsberg identified very few isolated LSA flakes (Morris 2010). However, on the plains below the mountain he did find three LSA settlements. To the northwest of the Gamsberg, he located two stone cairns which could represent graves, as well as a ceramic LSA site. These sites probably represent transient settlement by transhuman hunter-gatherers or herders that moved through the area. Beaumont *et al.* (1995:263) noted that most LSA sites then known in Bushmanland appeared to be ephemeral occupations by small groups of people in the hinterland both north and south of the Orange River. This was in sharp contrast to the substantial herder encampments along the Orange River floodplain itself. Away from the river, LSA material, mainly quartz flakes, appears to often be focused around the base of granite hills (Morris 2011a, b & c; Pelser 2011; Webley & Halkett 2011). (Beaumont *el al.* 1995) agree and add that red dunes and the margins of seasonal pans also served as foci for LSA occupation.

Despite the above observations, archaeological remains are likely to be patchy since, in a 15 km linear survey between Pofadder and Pella, Halkett (2010) failed to record any archaeological material. In general, Morris (2011c) notes that archaeological finds around Aggeneys and Pofadder are sparse.

b. <u>Stone Age Archaeology</u>

Stone Age archaeology was uncommon on the site. The scoping survey was clearly focused on the pan alongside the Poortjie farm werf. Here there were several bedrock outcrops with grooves ground into them (**Figures 5.7 & 5.8**). These grooves would have been used for grinding food (grass and other seeds)

and perhaps also ochre. It is typical to find such grooves around water sources in Bushmanland.

A short way from the pan was a slight ridge forming the outermost limit of the hollow in which the pan is located. On this rise were two Later Stone Age occupation sites with stone artefacts, ostrich eggshell fragments, a bead and pottery. The occupants of these sites may well have made the grooves. These sites have high archaeological significance.

Elsewhere in the study area we located occasional isolated stone artefacts that are part of the background scatter of material that builds up through the many thousands of years that people have occupied the landscape. Many of these artefacts may pertain to the Middle Stone Age. One quarried quartz outcrop was also noted. Stone Age people used the outcrop as a source for rock for making stone artefacts. These finds are all of very low heritage value and /significance.

Figure 5.7: Grinding grooves in the granite

Figure 5.8: Stone artefacts and ostrich eggshell

c. Rock Art

Rock art is known from the region. Rudner and Rudner (1968) note the scarcity of suitable rock canvases in the area and that art is sparsely distributed through the region. Engravings occur along the Orange River (Morris 1998) where suitable rock exists, while in the rocky areas away from the river there are rare rock paintings.

Further to the west, rock art was found south of Kangnas on the farm Koeris.

d. Pre-Colonial History

Historical accounts of travels through southern Africa frequently provide clues to the pre-colonial occupation of the land. In this case, two travellers, John Barrow and George Thompson, passed through this area leaving observations on the local population. Barrow (1801:387) wrote of the plains between the Kamiesberg Mountains and the Orange River that:

"These plains are now desolate and uninhabited. All those numerous tribes of Namaquas, possessed of vast herds of cattle, are, in the course of less than half a century, dwindled away to four hordes, which are not very numerous, and in a great measure subservient to the Dutch peasantry, who dwell among them."

Thompson (1824:288) noted the following:

"The extensive plains, lying between the Gariep and the Kamiesberg, are represented, by old writers, as occupied by a numerous race of people, possessed of large flocks and herds, and living in ease and abundance. Of these, the tribe now resident at Pella and its vicinity, is the only one remaining."

Both texts show that the area was well inhabited in the past but that colonial expansion was taking its toll on the indigenous inhabitants. Nevertheless, these observations suggest that archaeological remains, at least pertaining to the more recent prehistoric period, should be abundant on the landscape.

e. Settlement History

Three towns in the region lie in an arc to the north of the site. While Aggeneys is modern and centred around the mining activities there, Pofadder was founded as a mission station in 1875 by Reverend Christian Schröder. It was named after a Koranna chief, Klaas Pofadder, who was shot by farmers. Colonists began settling around the perennial spring from 1889 but only in 1917 were the first residential plots surveyed (Northern Cape Tourism Board 2007).

Pella, to the north and closer to the Orange River, is also a mission station but it was founded far earlier. It was founded by the London Missionary Society in 1814 as a sanctuary for the indigenous people who were driven from Namibia. The mission was abandoned in 1872 because of drought but reopened by the Roman Catholic Church in 1878 (Northern Cape Tourism Board 2007).

The farms in this area were generally surveyed very late. Poortje 212 was done in 1895 but no survey diagrams were listed on the surveyor general's website for Namies South 209.

f. Built Environment

The Poortjie farm werf is not very old and contains structures dating back to the 1930s or 1940s. A family graveyard is also present. More significant are the old school building and multiple ruins located immediately outside the entrance to the study area. The main school building is likely early 20th century, while the ruins may be older.

Also present on Poortjie is a stone kraal with dung piled on top of the walls (**Figure 5.9**). The kraal probably dates to the 1930s when the first buildings were erected. In the poort after which the farm was named there is an earth dam which has burst (**Figure 5.10**). The internal surface of this dam is stone lined. The dam is probably also from the same period as the other built structures on the farm.

Figure 5.9: The stone kraal with dung on top of the walls at Poortjie.

Figure 5.10: Earth dam with stone lining on the inner wall in the "poort" of Poortjie.

The werf was placed in an area where water was most easily available. Two hand dug wells were present at the werf, though one has been filled in. These would have been dug in the early 20th century. The pan fills up after rains and during the 1930s a dry-stone wall was built along the edge of it to increase its capacity (**Figure 5.11**). The farmer informed us that after heavy summer rain the pan can get deep enough to swim in.

Figure 5.11: The pan alongside the farm werf at Poortjie. The pan has been 'enlarged' through the addition of stone walling.

g. Cultural Landscape and Sense of Place

Given that the farms were only granted in the early 20th century and that all the structures date to this time and later, there are few, if any, cultural landscape elements of concern. The site is very remote and does, as a result, have a distinct sense of place. This pertains to the vast open spaces of Bushmanland which stretch as far as one can see without man-made interruptions. Visual impacts will be very limited due to the remoteness and no scenic routes are within close range of the site, the nearest being the N14 some 20 km to the north. The R358 is also scenic but, being a gravel road, carries far less traffic. It lies some 13 km to the east of the site.

SCOPING OF ISSUES ASSOCIATED WITH THE KHAI-MA WIND ENERGY FACILITY CHAPTER 6

This chapter serves to describe and evaluate the identified potential environmental impacts associated with the proposed Khai-Ma wind farm, and to make recommendations for further studies required to be undertaken in the EIA phase. The scoping process has involved input from specialist consultants, the project proponent, stakeholders, and the public. Specialist scoping reports are included within Appendix F - M.

Potential environmental issues associated with **construction and decommissioning** activities of the Khai-Ma wind energy facility may include, among others:

» Impact on fauna, flora and ecology.
» Impact on agricultural potential and land use.
» Impact on soils and geology.
» Impact on Birds and bats.
» Impact on heritage resources.
» Social impacts (positive and negative).

Potential environmental issues specific to the **operation** of the wind energy facility could include, among others:

» Loss of agricultural land.
» Soil erosion.
» Visual impacts (negative viewer perceptions and visibility of the facility).
» Noise impact.
» Social impacts (positive and negative).
» Impact on birds and bats.

Tables 6.1 and Table 6.2 provide a summary of the findings of the scoping study undertaken for the construction and operation phases of the proposed wind energy facility respectively. Impacts associated with decommissioning are expected to be similar to those associated with construction. Potential direct and indirect impacts of the proposed wind energy facility are evaluated, and recommendations are made regarding further studies required within the EIA phase of the process. Specialist scoping reports are included within Appendix F to M.

In identifying and evaluating impacts associated with the proposed project, it has been assumed that although during the **operational phase** the area affected will comprise of wind turbines (each turbine between 1.5 MW – 4MW in capacity) and the number of turbines will depending on the model of turbine that the developer will select. The hub height will be up to 150m each. The area affected will also include access roads, substation footprint and associated infrastructure. During

construction a larger area within the approximately 175km^2 being considered for the wind energy facility footprint could suffer some level of disturbance as a result of the required activities on site. However, once construction is complete, only a small portion of this area (typically less than 5%) will be permanently impacted by infrastructure associated with the wind energy facility.

The **cumulative impacts** associated with the proposed wind farm are expected to be associated with the scale of the project, i.e. wind turbines that will be located on the proposed site, as well as associated infrastructure. The potential direct cumulative impacts associated with the project are expected to be associated predominantly with the potential visual impact, potential noise impacts, potential vegetation impact, potential heritage impact and potential impacts on avifauna, i.e. bats and birds in the surrounding area. Other cumulative impacts may arise from other neighbouring proposed wind and solar energy facilities. Cumulative effects can only be assessed once a preliminary layout is available, and will be considered in the detailed specialist studies to be undertaken in the EIA phase of the process.

It must be noted that the Draft Scoping Report is a combination of desktop studies and field work undertaken by specialists, and all potential impacts identified through the Scoping phase (indicated as being of low to high significance) will be further assessed and confirmed during the EIA phase.

Table 6.1: Evaluation of potential impacts associated with the CONSTRUCTION PHASE of the proposed Khai-Ma Wind Energy Facility

Potential Visual Impacts:

Potential visual impacts during the construction phase on observers in close proximity to the Khai- Ma wind energy facility and power line are expected to be of a short duration and limited to the site. Then site is fairly remote, with scattered homesteads and the closest town of Pofadder is approximately 22 km from the site.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Visual impacts	Potential visual impact of the construction period on visual receptors.	Local	None identified at this stage.

Gaps in knowledge & recommendations for further study:

The study was undertaken using Geographic Information Systems (GIS) software as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed facility. A detailed Digital Terrain Model (DTM) for the study area was created from 20m interval contours supplied by the Surveyor General.

It is recommended that:

» The severity of the potential visual impact be assessed in further detail in the EIA phase.
» Additional spatial analyses must be undertaken in order to create a visual impact index that will further aid in determining potential visual impact.
» Specific spatial criteria need to be applied to the visual exposure of the proposed facility in order to successfully determine visual impact and ultimately the significance of the visual impact.

Potential Impacts on Agricultural potential:

Agricultural potential is uniformly low across the farm and the choice of placement of the facility on the farm therefore has minimal influence on the significance of agricultural impacts. No agriculturally sensitive areas occur within the site. The farm is located within a sheep farming agricultural region with very low carrying capacity, and there is no cultivation on the farm.

The significance of agricultural impacts is influenced by the extremely limited agricultural capability of the site, with no cultivation currently being undertaken. Therefore, impacts are not likely to be of high significance.

Issue	Nature of Impact	Extent of Impact	Extent of Impact	'No go' areas
Loss of agricultural land.	Placement of infrastructure for the wind energy facility will affect the land-use on these specific areas.	Local in terms of the activity and will be associated with the activity only. The impacts are considered to be of low significance due to the low agricultural potential of the site.	Local	None identified at this stage.

Gaps in knowledge & recommendations for further study:

The study area has not been subject to a field survey. All the information on soils and agricultural potential presented here has been obtained from the AGIS online database, produced by the Institute of Soil, Climate and Water (Agricultural Research Council, undated).

It is recommended that:

» Consideration should be given to the proper placement of the wind turbines and other infrastructure.

Potential Impacts on Soil and Current land Use:

The proposed development is located on level plains with some relief in the Northern Cape interior at an altitude of between about 1000 and 1100 meters. Slopes across the site are predominantly less than 2% but are up to 5% in places. The underlying geology is Gneissic granite of the Namaqualand Metamorphic Complex.

The land type classification is a nationwide survey that groups areas of similar soil, terrain and climatic conditions into different land types. The site is predominantly on two land types, Ag61 and Ag25, with a very small section on a third, Ib131. All land types are dominated by very shallow, very sandy soils on underlying rock or hard-pan carbonate. The ridges (Ib131) are dominated by rock outcrops. The soils would fall into the Lithic and Calcic soil groups according to the classification of Fey (2010). Potential impacts on soils relate mainly to increased erosion potential and loss of soil resources.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Soil erosion due to alteration of the land surface run-off characteristics.	Alteration of run-off characteristics may be caused by construction related land surface disturbance, vegetation removal, and the establishment of hard standing areas, surfaces and roads. Erosion will cause loss and deterioration of soil resources and may occur during all phases of the project.	Local (construction areas only)	No specific 'no go' areas have been identified at this stage
Loss of topsoil due to poor topsoil management.	It is anticipated that the loss of topsoil will result from poor topsoil management (burial, erosion, etc) during construction, related soil profile disturbance (levelling, excavations, road surfacing etc.) and resultant decrease in that soil's agricultural suitability.	Local (construction areas only)	
Soil erosion due to trampling by vehicles and equipment, as well as construction activities	Improper placement, construction, maintenance and use of access roads and construction sites by vehicles and equipment, may lead to the degradation of the soil surface and result in soil erosion (both wind and water erosion).	Local (construction areas only)	
Siltation of watercourses	Improper placement and maintenance of infrastructure, as well as poor stormwater	Regional	

	management, may lead to water erosion and siltation of watercourses downstream.		
Dust production	Improper construction, maintenance and use of access roads and construction sites by vehicles and equipment, may lead to dust production.	Local	

Gaps in knowledge & recommendations for further study:

The study area has not been subject to a field survey. All the information on soils and agricultural potential presented here has been obtained from the AGIS online database, produced by the Institute of Soil, Climate and Water (Agricultural Research Council, undated).

It is recommended that:

» More detailed assessment of soil conditions be conducted. This will include a field investigation of soils and agricultural conditions across the site. This field investigation will be aimed at ground proofing the existing land type information and understanding the specific soil conditions on site. It will not be based on a grid spacing of test pits but will comprise a reconnaissance type of soil mapping exercise based on an assessment of surface conditions, topography, and hand augered samples in strategic places, if necessary. Such a soil investigation is considered adequate for the purposes of this study. A more detailed soil investigation is not considered likely to add anything significant to the assessment of agricultural soil suitability for the purposes of determining the impact of the development on agricultural resources and productivity.
» Assessment of erosion and erosion potential on site.
» Assessment of the impacts of specific construction activities and layout on soil conditions.

Potential impacts on Fauna, Flora and Ecology

Five plant communities or associations are recognized in the study area. They are (1) Open plains grassland (2) Low to mid-high shrubland and (3) Drainage line vegetation, all of which fall within Bushmanland Arid Grassland, (4) Aggeneys Gravel Vygieveld and (5) Bushmanland Inselberg Shrubland. Neither Aggeneys Gravel Vygieveld nor Bushmanland Inselberg Shrubland is likely to be affected by the proposed solar energy infrastructure since it was recommended in the botanical constraints analysis (McDonald, 2012) that the areas where these vegetation types occur should be avoided. These two vegetation types are thus not considered any further here.

The greater part of the study area of the Khai-Ma Energy Facility is not botanically sensitive (Figure 6.1). This would include areas on the open plains in 'Open plains grassland' and 'Low to Mid-high Shrubland'. Areas that are sensitive are the drainage lines. These should be buffered by at least 50 m, i.e. no construction wind turbines should be permitted with 40 m of the drainage lines. This would ensure that there is no negative erosive impact on the drainage lines arising from the construction activities. It is recognized that this constraint will present challenges in determining the locations of the solar PV array, however, it has practical implications as well since the installations would be protected from flash-floods.

Roads are predicted to have a negative effect on the receiving environment but with careful mitigation (e.g. relocation of species such as *Aloe claviflora* and avoidance of trees of *Boscia albitrunca*, *Aloe dichotoma* and *Parkinsonia africana*), the negative impacts can be kept within acceptable limits. Roads that will cross drainage lines must also be constructed in such a way as to not impede water-flow when this occurs.

It is predicted that construction of the proposed wind energy facility would have a low negative impact on the vegetation. This would be due to removal of the vegetation within the footprint of the solar panel array area during construction and subsequently due to shading caused by the panels during operation (refer to Figure 6.1).

Fauna:

The site displays a low level of Red List animal species' probability of occurrence. The Small spotted cat, Dassie rat, Baboon spiders, Trapdoor spiders, Girdled lizards and Tent tortoises known to occur in the area have a Protected status, with the Tent tortoises being the most at risk to be impacted upon during the construction phase. A faunal sensitivity map is shown in Figure 6.2 and indicates areas of Moderate faunal sensitivity being the rocky parts of the site that offer habitat for fauna and a higher variety of biodiversity, compared to the rest of the site. No areas of high sensitivity are expected to be found on the site.

The greatest risk to the vegetation and flora would be during the construction phase of the wind energy facility 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 any on-site substations.
» 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.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Impacts on listed and protected plant species during site clearing.	Site preparation and construction will result in a lot of disturbance and the loss of currently intact vegetation. Given the relatively low number of endangered species at the site, impacts on listed species are likely to be relatively low. Provincially protected species such as various Aloe sp. are however likely to be relatively common and impacts on such species are potentially greater. However, as few of these species are actually rare, the significance of these impacts is not likely to be very high.	Local	No specific 'no go' areas have been identified at this stage; however areas of very high ecological sensitivity (as shown in Figure 6.2 and Figure 6.3) will be investigated further during the EIA phase.
Increased risk of alien plant invasion resulting from the high levels of disturbance.	Alien species are likely to respond to the large amount of disturbance that will accompany the development phase of the project. Invasion of the natural plant communities within the site would be undesirable and could impact diversity of fauna and flora as well as affect ecosystem processes.	Local	
Disturbance and loss of habitat for fauna.	Increased levels of noise, pollution, disturbance and human presence will be detrimental to fauna. Sensitive and shy fauna are likely to move away from the area during the	Local	

	construction phase as a result of the noise and human activities present. Some mammals and reptiles such as tortoises would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present.		
Disruption of landscape connectivity and ecosystem processes	Development within intact vegetation would contribute to the fragmentation of the landscape and potentially disrupt the connectivity of the landscape for fauna and flora.	Local	

Gaps in knowledge & recommendations for further study:

The sensitivity assessment and resulting sensitivity maps are based primarily on literature descriptions.

It is recommended that:

» A site survey be conducted at the appropriate time of the year in order to assess the current state of the vegetation and habitats that will be lost and/or disturbed and the implication thereof.
» Sensitive areas must be identified and mitigation measures recommended to minimise impacts on these areas.
» Potential alien and invasive species in the area be identified, the accompanying risks assessed and appropriate mitigation recommended.
» Sensitive faunal species and habitats must be identified and mitigation measures recommended to minimise impacts.

The sensitivity of the identified areas will need to be verified during the site visits for the EIA phase of the development, and those areas that should be avoided will need to be identified and mapped where necessary.

The following will be undertaken in the EIA Phase of the study:

» Ground-truth and refine the ecological sensitivity map of the site. Particular attention will be paid to mapping the distribution of sensitive ecosystems at the site such as wetlands and drainage systems. The rocky areas will also be specifically investigated on account of the higher potential abundance of listed and protected faunal species within these areas.
» Evaluate the likely presence of faunal species of conservation concern at the site and identify associated habitats that should be avoided to prevent impact to such species.
» Evaluate, based on the site attributes, what the most applicable mitigation measures to reduce the impact of the development on the site would be and if there are any areas where specific precautions or mitigation measures should be implemented.

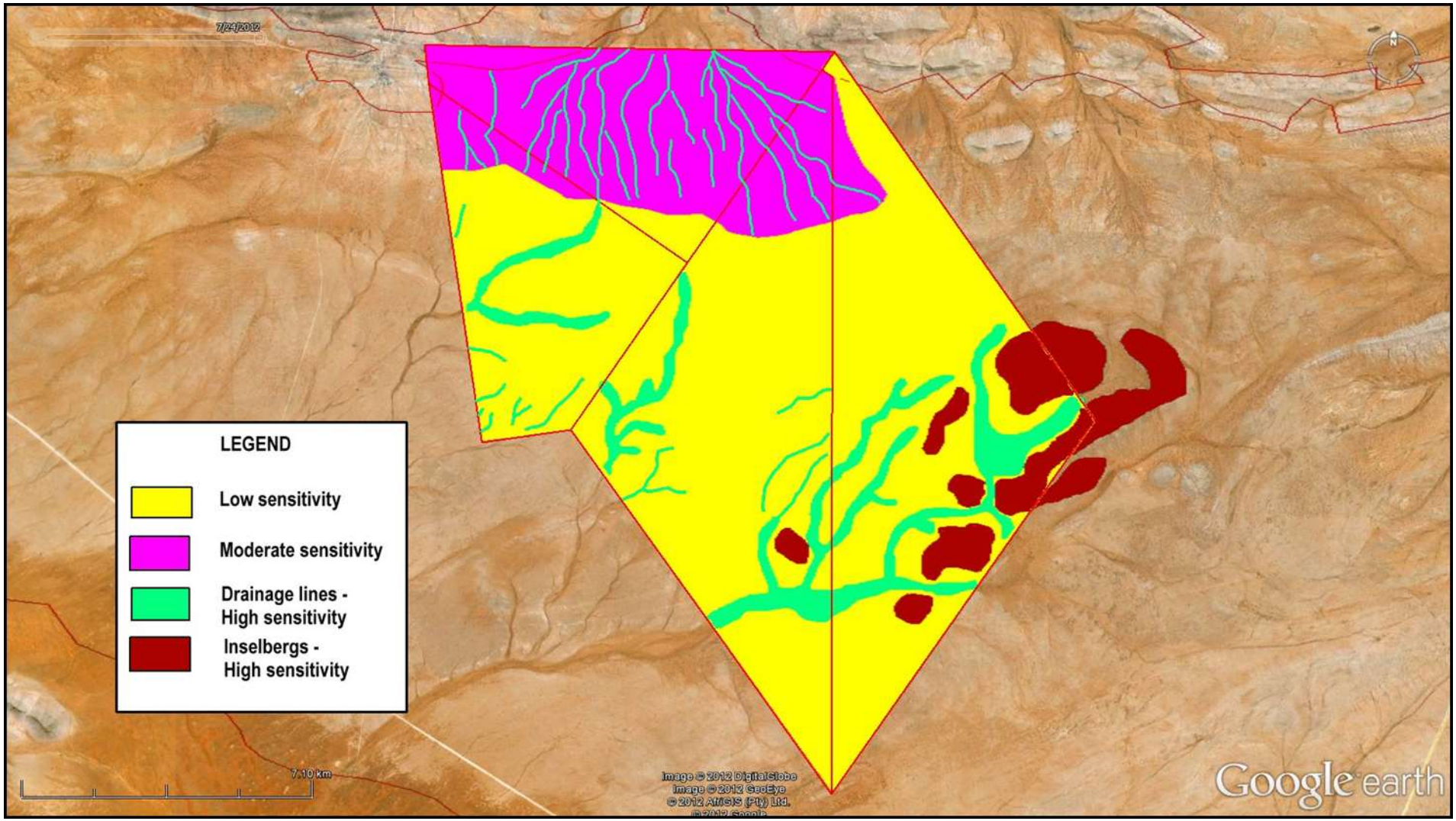
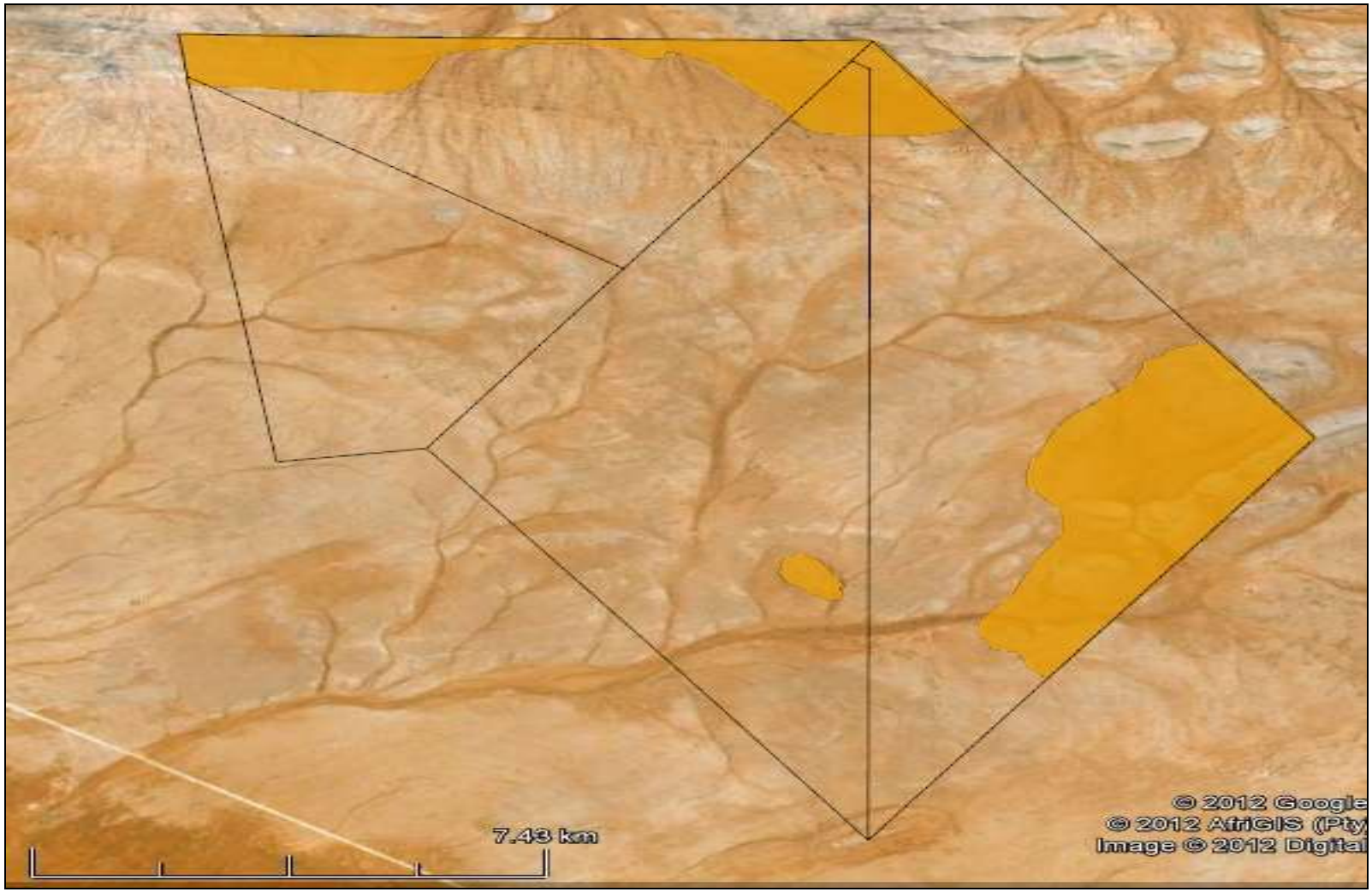


Figure 6.1: Botanical sensitivity of the site



Moderate sensitivity

Figure 6.2: Desktop based fauna sensitivity map of the site.

Potential Impacts on Avifauna (birds):

Destruction of Avifaunal Habitat

Although the final footprint of the wind energy facility is likely to be relatively small (up to 5% of the entire study area of 175km^2), the construction phase of development inevitably incurs quite extensive temporary damage or permanent destruction of habitat, which may be of lasting significance in cases where wind farm sites coincide with critical areas for restricted range, endemic and/or threatened species. During the construction phase and maintenance of power lines and substations, some habitat destruction and alteration inevitably takes place. This happens with the construction of access roads, the clearing of servitudes and the levelling of substation yards. Servitudes have to be cleared of excess vegetation at regular intervals in order to allow access to the line for maintenance, to prevent vegetation from intruding into the legally prescribed clearance gap between the ground and the conductors and to minimise the risk of fire under the line which can result in electrical flashovers. These activities have an impact on birds breeding, foraging and roosting in or in close proximity to the servitude, through the modification of habitat.

Displacement due to disturbance

Displacement of birds may occur during both the construction phases of the wind energy facility, and may be caused by the presence of the turbines themselves through visual, noise and vibration impacts, or as a result of vehicle and personnel movements related to site maintenance. The scale and degree of disturbance will vary according to site- and species-specific factors and must be assessed on a site-by-site basis.

Unfortunately, few studies of displacement due to disturbance are conclusive, often because of the lack of before-and-after and control-impact (BACI) assessments. Onshore, disturbance distances (in other words the distance from wind farms up to which birds are absent or less abundant than expected) up to 800 m (including zero) have been recorded for wintering waterfowl, though 600 m is widely accepted as the maximum reliably recorded distance.

The following avifaunal-relevant habitat modifications were identified within the broader development area:

- **Water points:** The land use in the broader development area is mostly sheep farming, with some game and cattle also present. The entire area is divided into fenced off grazing camps, with several boreholes with associated water reservoirs, drinking troughs and a few trees. These troughs, reservoirs and trees are a big draw card for several bird species.
- **Transmission lines and telephone lines:** The broader development area is bisected by the Aggeneys – Aries 400kV transmission line. The transmission towers are used by raptors for perching and roosting, and potentially also for breeding. An inactive eagle nest, most likely belonging to a Martial Eagle, was discovered on tower 147. Prey remains and droppings below the nest and other towers indicate recent activity. There is also a telephone line running along the road to the two farm houses, which is used extensively by several species for perching.
- **Farm yards:** The site contains two farm yards, with associated buildings, trees and patches of lawn.

The priority species for this study area include:

» Martial Eagle;
» Ludwig's Bustard;
» Secretarybird;
» Kori Bustard; and
» Lanner Falcon.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Loss of bird habitat due to construction of the wind energy facility.	During the construction phase and maintenance of turbines, power lines and substations, some habitat destruction and alteration inevitably takes place. Since the site is situated in an extremely uniform area this impact is not anticipated to of high significance for most of the site. The exception to this will be some of the areas identified in the sensitivity mapping exercise, in particular any surface water sources or drainage lines.	Local	Areas of surface water on site
Disturbance of birds	Construction activities will have an impact on birds breeding, foraging and roosting in or in close proximity to the servitude, through the modification of habitat. This is unlikely to be of high significance for most species, unless breeding on site. The likelihood of target species breeding on site will be assessed during the EIA Phase.	Local	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase.
Displacement of birds from the site and barrier effects	The likelihood of this impact being significant will be assessed during the EIA Phase and is related to how much birds actually use and depend on the site.	Local and Regional	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase
Gaps in knowledge & recommendations for further study:			

- » All quarter degree grid cells (QDGCs) have not been surveyed to the same level by the South African Bird Atlas 2 (SABAP2) – in this instance 2919AD has not been surveyed at all, and only 2 checklists have been completed for 2919AC. Strong reliance was therefore placed on personal observations during the site visit, information provided by the landowners, SABAP1 historical data and SABAP2 data from adjoining QDGCs to form a picture of what avifauna is likely to occur in the broader development area.
- » Inevitably, no comprehensive studies (other than a few environmental impact reports), and no peer-reviewed scientific papers, are available on the impacts wind farms have on birds in South Africa at this point in time. The precautionary principle was therefore applied throughout. The World Charter for Nature, which was adopted by the UN General Assembly in 1982, was the first international endorsement of the precautionary principle (http://www.unep.org). The principle was implemented in an international treaty as early as the 1987 Montreal Protocol and, among other international treaties and declarations, is reflected in the 1992 Rio Declaration on Environment and Development. Principle 15 of the 1992 Rio Declaration states that: "in order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall be not used as a reason for postponing cost-effective measures to prevent environmental degradation."
- » Even in the international arena, many studies lack before and after comparisons, or wind farm area and reference area comparisons, or do not offer any assessment whatsoever of relevant factors such as collision risk and differences in bird behaviour between night and day, or are of inadequate duration to provide conclusive results (Langston & Pullen 2003). In many instances, even where before and after comparisons were conducted, predicted mortality rates are significantly off the mark, indicating that the this is still a fledgling science in many respects, even in developed countries like Spain with an established wind industry (Ferrer *et al.* 2012).

It is recommended that:

The EIA Phase will conduct the following activities:

- » The avifaunal specialist visits the site on two separate occasions, in order to obtain seasonal variance.
- » All identified issues will be investigated in more detail during the EIA phase, and rated according to the prescribed criteria.
- » Landscape factors relevant to this study will be investigated further, and the sensitivity zones described in this report will be "ground truthed" during the site visit, and updated where necessary.
- » The possible impacts of avifauna on the new infrastructure will be identified and discussed in more detail.
- » Suitable mitigation measures will be recommended for all issues identified as significant.
- » The extent to which displacement impacts actually occur will need to be determined through rigorous pre and post construction monitoring, and a protocol outlining details of such a monitoring programme (preconstruction monitoring has already commenced) will be supplied as an appendix to the final EIA report.
- » A site specific avifaunal EMP containing a monitoring programme pre and post construction will be developed and is seen as a critical next step to increase confidence, refine the sensitivity map and to strengthen the mitigation measures in order to have the least impact possible on avifauna in the area.

Impacts on bats:

The rocky outcrops on the northern and south-western border of the site are considered to be suitable roosting sites for bats. The site also offers highly seasonal surface water by means of the drainage channels running through the site. This surface water and soil moisture will attract insects, and in turn bats. Foraging may be limited on the site to these streams and channels. A total of 11 bat species may potentially occur on the site (based on distribution), and six have a high probability of occurring on the site, based on a highly precautionary approach. *Cistugo seabrae* has a moderate probability of occurring on the site and is listed as Near Threatened; however it is not a high flying bat and is presumably less vulnerable to turbine induced mortality. *Miniopterus natalensis* also have a medium probability of occurrence and is listed Near Threatened, considering behaviour and biology this species have a medium to high risk of being impacted on by turbines. From a desktop bat sensitivity point of view the site has a low to medium bat sensitivity. Some foraging habitat will be destroyed by the construction of the turbines and associated infrastructure. This impact is a negative and local impact that will be more significant during construction than during the operation of the wind energy facility. During the construction phase of the project possible bat roosts may be impacted by earthworks and large machinery. Winter roosts, often used for hibernation, may take bats closer to wind farms as their movement patterns change. Bats are known to use topographical features such as ridges to navigate during their migrations. In addition, they may use these features as temporary roosts, foraging areas and shortcuts.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Destruction of foraging habitat and roosts	A certain amount of habitat destruction will occur stemming from the concrete foundation of the turbines, access roads and associated infrastructure. Any reduction in habitat may result in a depletion of food supply for the bats and for this reason, careful consideration needs to be given to the siting of the wind turbines. Where vegetation patches are created by the removal or destruction of vegetation an increase in the movement of bats across the area can be expected	Local and Regional	No specific 'no go' areas have been identified at this stage; however habitat for bats (drainage line, mountainous terrain and rocky areas) are shown in Figure 7.4 and) will be investigated further during the EIA phase.

	as bats are forced to move from patch to patch to feed on insects.		

Gaps in knowledge & recommendations for further study:

The potential impacts on bats will be assessed in greater detail during the EIA phase of the project. The scoping evaluation was based on available information, which is limited to species reported to occur in the area.

It is recommended that:

» A site visit will be conducted in the EIA phase. This will confirm the suitable habitats present on the site, including buildings and other infrastructure present on the site, all of which could provide roosting or feeding facilities for bats.
» An assessment of the significance of direct, indirect and cumulative impacts on bats will be undertaken in the EIA phase.
» Recommendation regarding practical mitigation measures for potentially significant impacts
» An indication of the extent to which the issue could be addressed by the adoption of mitigation measures will be provided.
» Bat monitoring for two seasons has already been conducted, however the results of the monitoring will be discussed in greater detail in the EIA phase.

Information for the EIA phase would include the following monitoring techniques:

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

Potential impacts on Heritage Resources:

Given buffers are likely to be instituted around the farm werf, and water features (pans and streams), it is highly unlikely that significant archaeology or other above ground heritage material will be impacted. The only major impact that will be experienced is that to the sense of place. However, with so few people present in the landscape and the extreme remoteness of the site, the visual impact of the facility despite its size, will not affect many communities.

It can be concluded that the proposed site is suitable for the intended use and the Impact Assessment Phase should continue. No red flag issues have been identified. Two areas of high sensitivity are identified. These are around the structures and ruins at Namies South.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Impacts on archaeological and paleontological finds	The construction phase of the wind energy facility could directly impact on surface and subsurface archaeological sites. There is a medium to high likelihood of finding Stone Age sites scattered over the study area. There is an increased likelihood of finding material around pans if any occur within the study area. The construction of the wind farm facility could have a low to medium impact on a local scale.	Local	No 'no- go' areas have not been identified at this stage.
Impacts on historical finds	Construction activities such as clearing of vegetation and excavations could lead to the discovery or damage to heritage artefacts.	Local	No 'no- go' areas have not been identified at this stage.
Impacts on burials and cemeteries	The construction and operation of the wind energy facility could directly impact on marked and	Local	No 'no- go' areas have not been identified at this stage.

	unmarked graves. Graves dating to the Stone Age can be expected especially close to the river with more recent formal and informal cemeteries anywhere else on the landscape.		

Gaps in knowledge & recommendations for further study:

The study area was not subjected to a field survey as this will be done in the EIA phase. It is assumed that information obtained for the wider area is applicable to the study area.

It is recommended that:
During the EIA phase of the project it is suggested that in order to comply with the National Heritage Resources Act (Act No 25 of 1999) a Phase 1 Archaeological Impact Assessment must be undertaken. The following will form part of this study:

» Sites of archaeological, historical or places of cultural interest will be located, identified, recorded, photographed and described.
» The levels of significance of recorded heritage resources will be determined and mitigation proposed should any significant sites be impacted upon, ensuring that all the requirements of SAHRA are met.
» Significant impacts on palaeontological heritage resources due to the proposed wind energy facility are not anticipated. Therefore, pending the discovery of new fossil remains during development, no further specialist palaeontological heritage studies or mitigation are recommended for this project.

Potential noise impacts:

Wind Turbines do emit noises at sufficient levels to propagate over large distances. The fact that there would be a number wind turbines operating simultaneously in an area where there are noise-sensitive developments increase the possibility that a noise impact could occur. At this preliminary stage it is impossible to determine whether the significance of this noise impact would be low, medium or high.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Noise impacts due to construction equipment	Use of construction equipment on site will generate some level of noise.	Local	Cannot be determined at this stage.
Noise impacts due to construction traffic	Additional traffic to and from the site, as well as traffic on the site will be a significant noise source	Local	Cannot be determined at this stage.

Gaps in knowledge & recommendations for further study:

The potential impacts associated with noise will be assessed in greater detail during the EIA phase of the project. The scoping evaluation was based on available information. Predicted sound levels have only been included for illustrative purposes, as well as to indicate the potential overall spatial extent of noise impacts that wind turbines may have.

It is recommended that:

» A site visit to obtain information regarding background noise levels, the prevailing meteorological conditions during this background noise level survey, as well as confirming and identifying noise-sensitive developments,

» Currently identified (potential) Noise Sensitive Developments (NSDs) be investigated and any additional NSDs should be identified. Their relative sensitivity to noise impacts will be determined. This will be based on the SANS 10103 guideline, as well as current land uses on the properties (residential vs business/industrial).

» Using the data (proposed processes, noise characteristics of the selected equipment, locations of the wind turbine generators) as provided by the project developer, the predicted impact of the wind energy facility on NSDs must be predicted using the CONCAWE method as recommended by SANS 10357:2004 for the construction phase

» Using the calculated noise levels at the identified NSDs, the projected significance of the wind energy facility must be determined using the criteria as proposed (subject to possible changes after any stakeholder input). Further recommendations on the most suitable buffer zone can be made after more information is available for the proposed wind energy facility.

Potential impacts on the social environment:

The establishment of renewable energy facilities is supported at national and provincial level. The proposed site appears to be compatible with the spatial development vision of the Northern Cape Province and the NDM. The potential negative impacts associated with the construction phase include the presence of construction workers on the site, potential impact on farming activities and farm infrastructure and the movement of construction vehicles. The potential positive impacts relate to the creation of local employment and skills development opportunities. This represents a key benefit given the high unemployment and low income levels in the area.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Potential impact on rural sense of place.	This will be closely linked to the visual impacts associated with the wind turbines. The impact on sense of place is also linked to the associated 132 kV power line/s.	Local- Regional	None identified at this stage.
Impact on farming activities	Disruption of farming activities due to the presence of construction workers.	Local	N/A
Influx of job seekers into the area	The influx of job seekers may result in an increase in sexually transmitted diseases, including HIV/AIDS; increase in prostitution; increase in alcohol and drug related incidents; increase in crime; and creation of tension and conflict in the community.	Local	N/A
Employment creation	Creation of employment and business opportunities during the construction phase	Local	N/A
Skills development and training	Creation of potential training and skills development opportunities for local communities and businesses	Local and Regional	N/A

Promotion of clean, renewable energy	Provision of clean, renewable energy source for the national grid	Local, Regional and National	N/A
Potential threat to farm safety	The increase in the number of people in the area and construction workers could have potential threat on the safety of the surrounding farms.	Local	N/A
Potential damage of roads	The transportation of heavy equipment and increased traffic volumes mar result in the damage of roads in the area.	Local and Regional	N/A

Gaps in knowledge & recommendations for further study:

» The information contained in key policy and land use planning documents, such as the Northern Cape Growth and Development Plan etc., does not contain data from the 2011 Census. However, the relevant 2011 Census data is provided at a local and district municipal level.

Recommendation:

» Review of existing project information, including the Planning and Scoping Documents;
» Collection and review of reports and baseline socio-economic data on the area (IDPs, Spatial Development Frameworks etc);
» Site visit and interviews with key stakeholders in the area including local land owners and authorities, local community leaders and councillors, local resident associations and residents, local businesses, community workers etc;
» Identification and assessment of the key social issues and opportunities;
» Preparation of Draft Social Impact Assessment (SIA) Report, including identification of mitigation/optimisation and management measures to be implemented.

The following typical, generic project information is required in order to inform the Social Impact Assessment (Including all related infrastructure such as transmission lines, access roads, office and warehouse components):

» Comments received from I&APs during the public participation process, including comments reflected in the Final Scoping Report;
» A draft illustration (plan) of the proposed lay-out(s) of the wind turbines (including an indication of the phasing sequence on the site), supporting structures and infrastructure;
» Duration of the construction phase (months);
» Number of people employed during the construction phase;
» Breakdown of number of people employed in terms or low skilled, semi-skilled and skilled;

- Estimate of the total wage bill for the construction phase and breakdown in % as per skills categories;
- Estimate of total capital expenditure for construction phase;
- Indication of where construction workers will be housed (on site or in nearest town?);
- Opportunities for on-site skills development and training;
- Description of the typical activities associated with the construction phase, specifically on-site construction activities. This includes a description of how the large components associated with a wind energy facility will be transported to the site and assembled on the site;
- The size of the vehicles needed to transport the components and the routes that will be used to transport the large components to the site, and an estimate of the number of vehicle trips required and duration of each trip; and
- Information on the nature of the agreements with the affected landowners, specifically with regard to compensation for damage to land, infrastructure etc.

Table 6.2: Evaluation of potential impacts associated with the OPERATION PHASE of the proposed Wind Energy Facility

Potential Visual Impacts:

The visual character of the area is determined by a combination of topography, vegetation, buildings, infrastructural elements and land use patterns. The site location can be described as remote due to its considerable distance from any major metropolitan centres or populated areas. The study area is sparsely populated (less than 1 person per km2), with the highest concentration of people living in the town of Pofadder.

Very few homesteads and settlements are present within the study area. These include Lekdam, Samoep, Namies, Onder Namies, Neelsvlei, Dubip and Luttigshoop within a 10km radius of the proposed site.

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

The N14 national road is located in the north of the study area, just less than 20km from the proposed site, and the R358 bypasses the site some 10-15km to the east. Other than these main roads, a number of secondary roads cross the study area, mainly extending to the west and east.

The only other built infrastructure is a power line which traverses the study area (and the site) from west to east. There are no formally protected or conservation areas present within the study area, but the greater environment has a vast, undeveloped and rugged character. Settlements, where these occur, are very limited in extent and domestic in scale. The greater environment with its wide open, undeveloped landscapes is considered to have a high visual quality.

It is expected, from a visual impact perspective, that the wind turbines would constitute the highest potential visual impact of the renewable energy facility; therefore, the viewshed analysis for the facility was undertaken from a number of provisional turbine positions as at offsets of 150m above average ground level (i.e. the approximate 150m hub height of the proposed wind turbines).

This was done to determine the general visual exposure of the area under investigation, simulating the proposed turbine structures associated with the facility. It must be noted that the viewshed analysis does not include the effect of vegetation cover or existing structures on the exposure of the proposed wind turbines, therefore signifying a worst-case scenario.

Figure 6.4 indicates areas from which any number of turbines (with a minimum of one turbine) could potentially be visible as well as proximity offsets from the proposed development area.

The following is evident from the viewshed analyses:

- The proposed facility will have a large core area of potential visual exposure on the project site itself, and within a 5km radius thereof. The low mountains to the north and north-west of the site offer some visual screening to the areas beyond.
- Potential sensitive visual receptors within this visually exposed zone include users of the secondary roads to the north-west and residents of the settlements of Namies, Onder Namies, and Neelsvlei.
- Potential visual exposure remains high in the medium distance (i.e. between 5 and 10km), with visually screened areas in the north west (beyond the low mountains).
- Sensitive visual receptors comprise users of secondary roads to the west, north-west and south-west of the site as well as residents of homesteads and settlements. The latter include Lekdam, Dubip and Luttigshoop.
- In the longer distance (i.e. beyond the 10km offset), the extent of potential visual exposure is slightly reduced, especially in the north west and north east of the study area. Visually exposed areas tend to be concentrated more in the south. Sensitive visual receptors include users of stretches of the N14 in the north, and of the R358 in the east. In addition, users of secondary roads within the study area and residents of homesteads and settlements, particularly in the south, may be visually exposed.
- The town of Pofadder lies more than 20km from the proposed site, but will not be visually exposed to the proposed facility. Other receptor sites at this distance, despite lying within the viewshed, are not likely to visually perceive the facility.

Issue	Nature of Impact	Extent of Impact	'No go' areas
The visibility of the facility from, and potential visual impact on observers travelling along arterial roads and secondary roads in close proximity[10] to the proposed facility and within	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.

[10] For the purpose of this study, close proximity is considered to be within 10km of the proposed wind energy facility. This would be a medium distance view where the structures would be easily and comfortably visible and constitutes a high visual prominence.

the region[11].			
The potential visual impact on the town of Pofadder.	Visual exposure to wind turbines and associated infrastructure.	Local	None
The visibility of the facility from, and potential visual impact on residents of homesteads and settlements in close proximity to the proposed facility and within the region.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
The potential visual impact of ancillary infrastructure (i.e. the substation, overhead power lines, internal access roads, workshop and office) on observers in close proximity to the proposed facility.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
The potential visual impact of the proposed facility on the visual quality of the landscape and sense of place region.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
The potential visual impact of operational, safety and security lighting of the facility at night on observers in close proximity to the facility.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
Potential cumulative visual impacts of the wind energy facility and associated infrastructure.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
Gaps in knowledge & recommendations for further study: The study was undertaken using Geographic Information Systems (GIS) software as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed facility. A detailed Digital Terrain Model (DTM) for the study area was created from 20m interval contours supplied by the			

[11] For the purpose of this study, the region is considered to be beyond the 10km radius of the proposed wind energy facility. This would be a longer distance view where the facility would become part of the visual environment, but would still be visible and constitutes a medium to low visual prominence.

Surveyor General.

It is recommended that the following tasks are undertaken during the EIA phase:

» Establishment of view catchment area, view corridors, viewpoints and receptors;
» Indication of potential visual impacts using established criteria (to be provided by Savannah Environmental and adapted as necessary for applicability to Visual Impact Assessment);
» Assessment of potential lighting impacts at night;
» Description of alternatives, mitigation measures and monitoring programmes;
» Review by independent, experienced visual specialist (if required);
» 3D modelling and photo-simulations / photomontages, with and without mitigation; and
» Review by independent, experienced visual specialist (if required).

It is recommended that the visual impacts be assessed against the following criteria during the EIA phase:

» Visibility of the project;
» Visual exposure;
» Degree of visual intrusion (including the degree of contrast);
» Visual sensitivity of the area;
» Viewer sensitivity;
» Observer proximity; and
» Visual absorption capacity (VAC) of the vegetation and other elements.

Where applicable, the above mentioned criteria will be discussed and numerically weighted according to extent, duration, intensity, probability of occurrence, confidence levels, nature, consequence and significance.

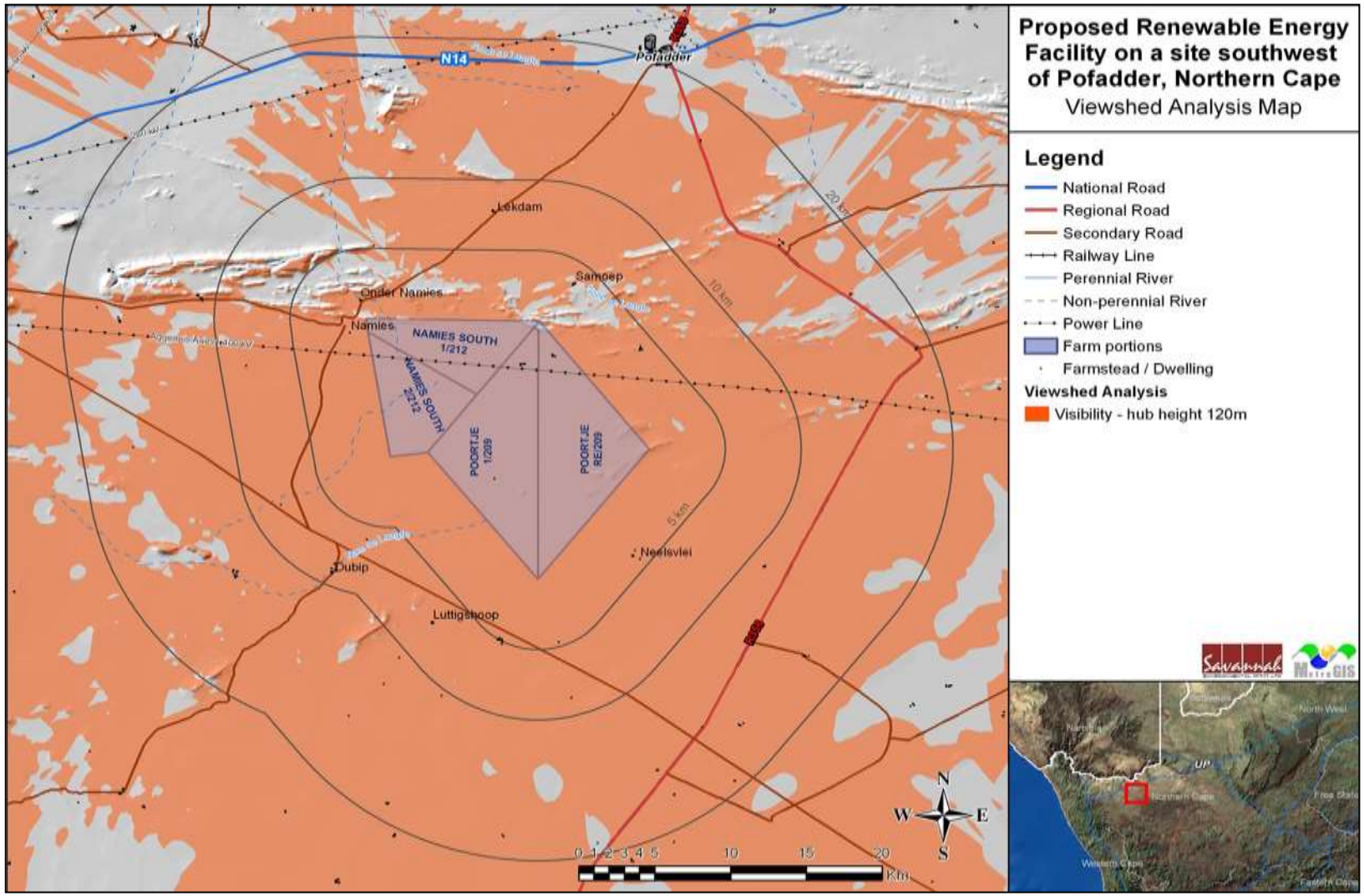

Proposed Renewable Energy Facility on a site southwest of Pofadder, Northern Cape
Viewshed Analysis Map
Legend
National Road
Regional Road
Secondary Road
Railway Line
Perennial River
Non-perennial River
Power Line
Farm portions
Farmstead / Dwelling
Viewshed Analysis
Visibility - hub height 120m
N14
Pofadder
Leekdam
Onder Namies
Namies
Samoep
NAMIES SOUTH 1/212
NAMIES SOUTH 2/212
POORTJIE 1/209
POORTJIE RE/209
Neelsvlei
Dubip
Luttigshoop
20 km
10 km
5 km
N
S
E
W
0 1 2 3 4 5 10 15 20
Km

Figure 6.4: Cumulative Viewshed analysis for the proposed Wind Energy Facility

Impacts on Avifauna:

The effects of a wind energy facility on birds are highly variable and depend on a wide range of factors including the specification of the development, the topography of the surrounding land, the habitats affected and the number and species of birds present. With so many variables involved, the impacts of each wind farm must be assessed individually. The principal areas of concern with regard to effects on birds are listed below. Each of these potential effects can interact with each other, either increasing the overall impact on birds or, in some cases, reducing a particular impact (for example where habitat loss or displacement causes a reduction in birds using an area which might then reduce the risk of collision).

» Collision mortality on the wind turbines
» Collision with the proposed power line
» Displacement due to disturbance
» Habitat change and loss

It is important to note that the assessment is made on the status quo as it is currently on site. The possible change in land use in the broader development area is not taken into account because the extent and nature of future developments are unknown at this stage. It is however highly unlikely that the land use will change in the foreseeable future.

One of the aims of this scoping report is to do a preliminary identification of sensitive areas from an avifaunal perspective. Three sensitivity classes were created namely low, medium and high. Figure 7.5 below indicates the spatial location of these areas. It must be stressed that this is a preliminary classification, and subject to revision as the pre-construction monitoring progresses and the avifaunal dynamics of the site become clearer. The sensitivity of the site in terms of habitat and fight paths for birds is shown in Figure 7.5 are classified as follows:

» **High sensitivity: Included in this area is a 1km no development buffer area around the existing Martial Eagle nest.** Although the nest was not active at the time of the site visit in July 2012, it may well become active again. Prey remains under the nest and fresh droppings indicate that the site may have been active in the not too distant past. The buffer is recommended too reduce the risk of disturbance and collision, should the birds decide to breed there again. Also included under the high risk area is a 200m buffer no development zone around water points. Water points are draw cards for several species, including priority raptors which breed in the trees (e.g. Southern Pale Chanting Goshawk at water point 5) or use the troughs for bathing and drinking. Lanner Falcons and other priority raptors may also hunt small birds at the water points, which could result in them being distracted and colliding with turbines.

» **Medium sensitivity:** This includes an area that is deemed to be the most suitable area within the broader development area for Red Lark. The species is generally sedentary and resident, but local movement triggered by environmental conditions can occur. Only one pair of Red larks was recorded during the site visit, which may point to the broader development area not being optimal habitat for the species. The species is generally associated with red dunes and large seeded grasses, and in optimal habitat, such as the Koa Valley, densities of approximately 1 pair/30 ha can be expected. Although this habitat is present in the broader development area, it is not the dominant habitat. This area should be carefully monitored during the pre-construction programme, to establish if the species is present in larger numbers. At this stage of the investigation, this area need not be excluded from the development area, subject to the results of further monitoring during pre-construction.

» **Low sensitivity:** The remainder of the broad development area is deemed to be of low sensitivity, subject to further pre-construction monitoring. It should however be pointed out that the occurrence of the nomadic Ludwig's Bustard is linked to rainfall events (Hockey *et al* 2005), and numbers of the species, even flocks, may occur all over the development area after rains (this was confirmed by Mr Jan van Niekerk). The whole development area may therefore become temporarily more sensitive while Ludwig's Bustard is present in the area, which is more likely during the late summer/early autumn (February-April), when the majority of rainfall occurs. However, given the evidence currently on bustard interactions with wind farms, this might not automatically result in high collision risk as the birds may well avoid the wind farm entirely.

Issue	**Nature of Impact**	**Extent of Impact**	**'No go' areas**
Collisions of birds with turbines.	Collision with turbine blades	Regional - The impact will occur at the site of the proposed Wind farm, but will have an impact at a more regional level, since it affects entire populations of affected species and may affect migration routes of species.	Figure 7.5 shows area of high avifaunal sensitivity which may be no –go areas and will be investigated further during the EIA phase. These areas include a 1km buffer around a martial eagle nest and 200m around water points/ dams.
Habitat loss – destruction, disturbance and displacement	Habitat loss – destruction, disturbance and displacement due to operation of the facility	Local	
Impacts of associated infrastructure such as power lines.	Due to electrocution with associated power lines as well as the maintenance of substations, power lines, servitudes and roadways. This causes both	Local to Regional	

	temporary and permanent habitat destruction and disturbance.		

Gaps in knowledge & recommendations for further study:

- Any inaccuracies in the above sources of information could limit this study. In particular, the SABAP1 data is now 14 years old (Harrison *et al* 1997).

It is recommended that:

» The micro habitats on site will be assessed for their suitability for the key species.
» The sensitivity zones and suitable buffer zones be identified and mapped.
» The impacts identified in this scoping phase study be assessed formally.
» If a pre-construction bird monitoring programme be initiated.

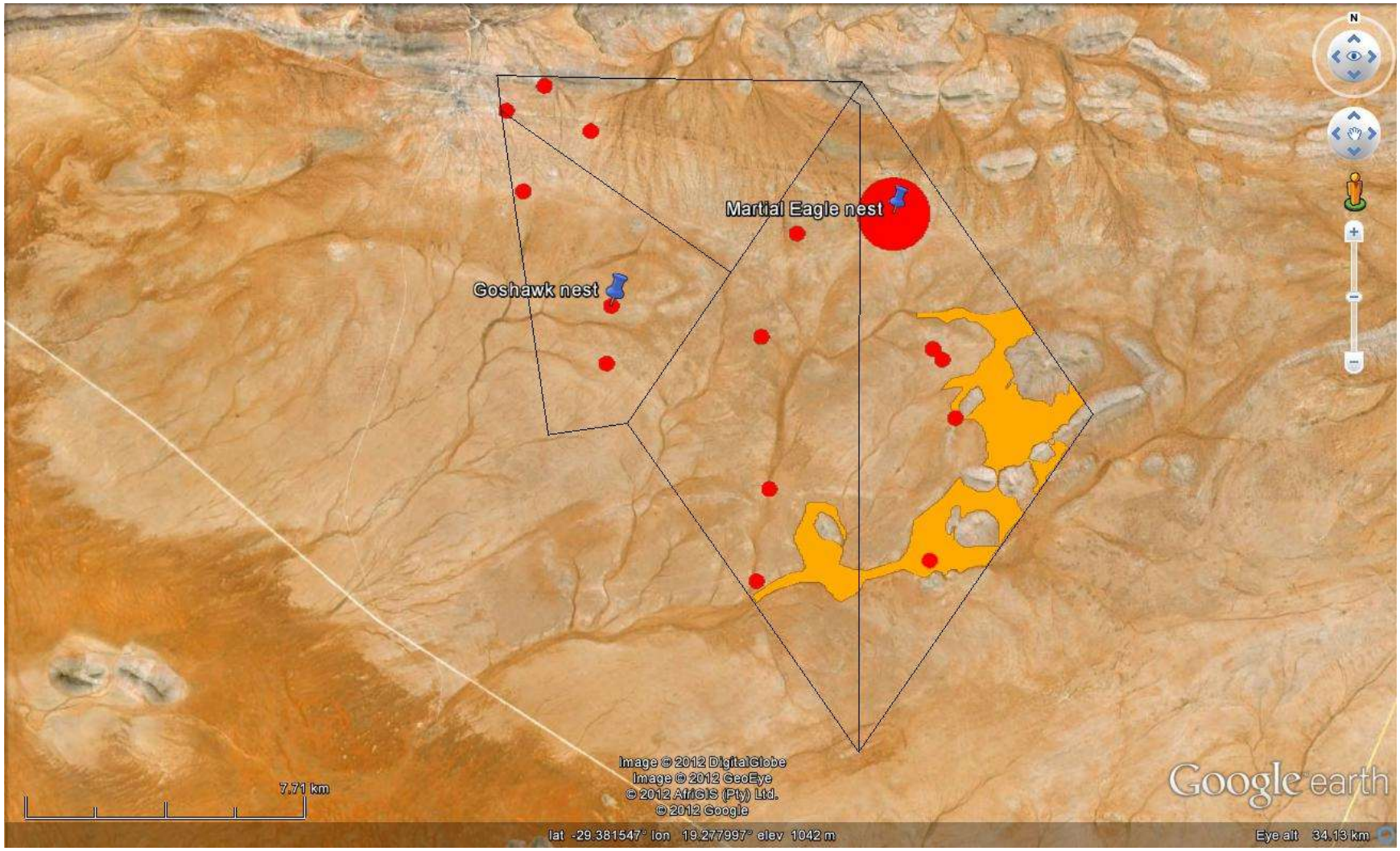


Figure 6.5: Preliminary delineation of sensitive avifaunal habitat. Red = High sensitivity, Yellow = medium sensitivity

Impacts on bats:

The three main hypotheses proposed for bat mortalities associated with wind energy facilities are as follows:

» Collision – a small percentage of the dead bats found show signs of physical injury resulting from collision from the blades of wind turbines (Handwerk 2008).
» Changes in flight patterns – these may be caused by the use of topographical features to migrate, for mating behaviour and because of possibly 'turning-off' their echolocation systems (Cryan undated). Wind turbines may also form barriers to their annual migration and/or daily commutes (Cryan 2011).
» Barotrauma – the sudden drop in air pressure at wind farms causes a bat's lungs to rapidly expand resulting in the death of the bat (Handwerk 2008).

A total of 11 bat species may occur on the site and six have a high probability of occurring on the site, based on a highly precautionary approach. *Cistugo seabrae* has a moderate probability of occurring on the site and is listed as Near Threatened; however it is not a high flying bat and is presumably less vulnerable to turbine induced mortality. *Miniopterus natalensis* also have a medium probability of occurrence and is listed Near Threatened, considering behaviour and biology this species have a medium to high risk of being impacted on by turbines. From a desktop bat sensitivity point of view the Pofadder site has a low - medium bat sensitivity. According to the two seasonal bat monitoring report, the activity recorded indicated moderate levels of bat activity across the site despite the arid local climate and low habitat complexity of the site, features more commonly associated with low bat activity.

Figure 6.6 shows the areas where natural bat roosting space could potentially be available have been marked as sensitive (red shading), and includes the mountainous terrain and rocky outcrops on the site. Possible foraging areas have also been highlighted (orange shading). For the purpose of this study a buffer of 100 m around inland water bodies and 200 m around drainage lines are appropriate. The shaded areas and their buffers indicate areas which may be marked as sensitive during the EIA phase assessment, however the buffers will be detailed and confirmed based on field work.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Bat mortalities due to blade collisions and barotrauma	Rotating turbine blades	Regional - The impact will occur at the site of the proposed wind farm, but will have an impact at a more regional level, since it affects entire	Cannot be determined at this stage.

		populations of affected species and may affect migration routes of species	
Habitat Destruction	Habitat destruction stemming from the concrete foundation of the turbines, access roads and associated infrastructure	Local	Cannot be determined at this stage.

Gaps in knowledge & recommendations for further study:

Gaps in knowledge:

» There is limited information available on bat presence and abundance in the South Africa and for this reason this scoping report has concentrated on bats known to occur in the province rather than the specific locality.

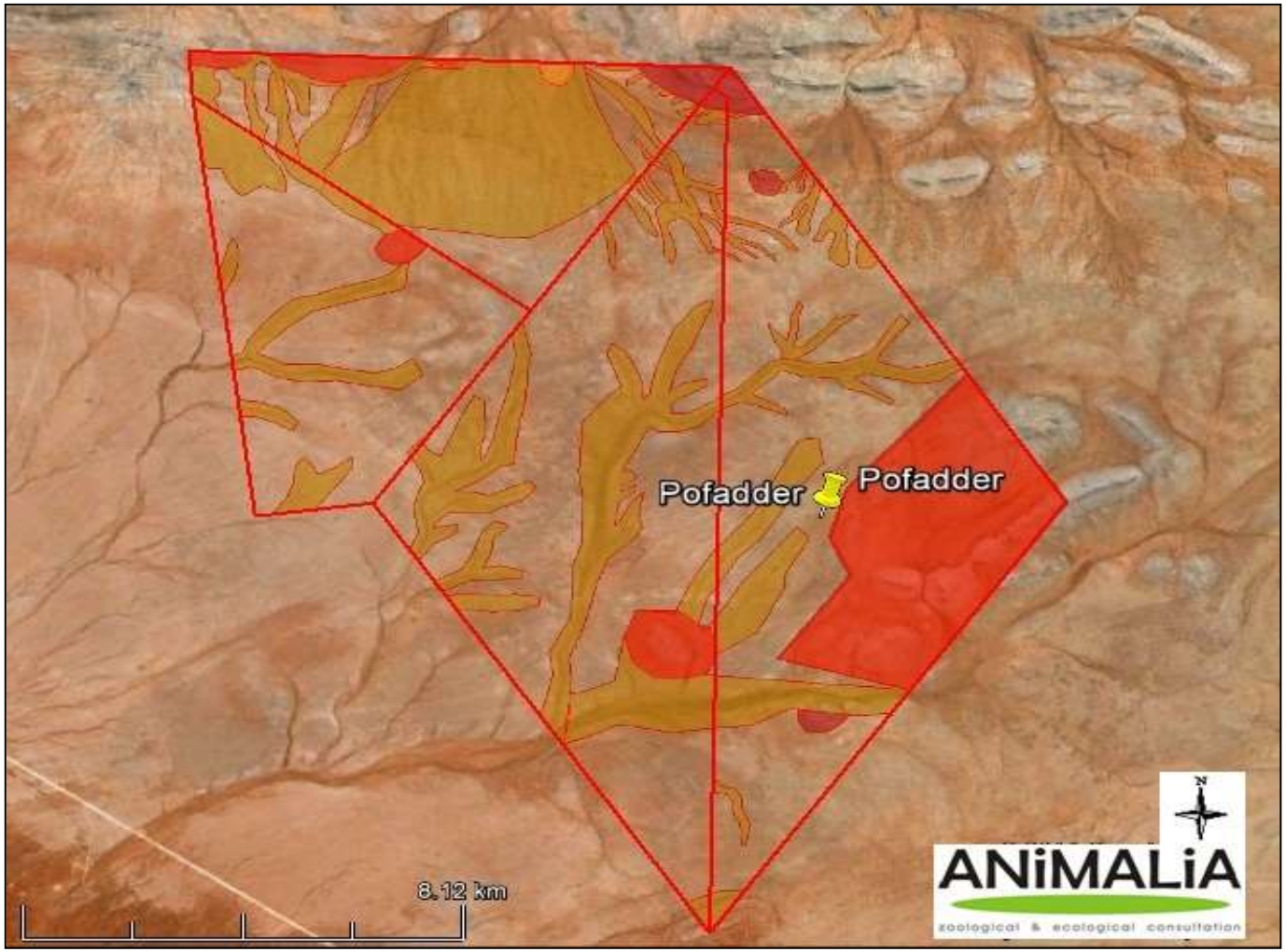
It is recommended that:

» An assessment of the significance of direct, indirect and cumulative impacts.

» Information for the EIA phase would include the following monitoring techniques:
  - Species presence estimates determined through the use of a bat detector system operated whilst driving transect lines across the farm
  - Surveys to assess and identify potential key areas for roosting such as (but not limited to) buildings, underground sites and trees
  - Further roost investigation will be conducted if any areas adjacent to the site are identified and having a high chance of having suitable roost sites
  - Roost surveys will be conducted during day-light hours as well as at dusk and dawn at all infrastructure currently present on the farm;

  General guidance for carrying out manual bat surveys (i.e. driven transects) suggests that they only take place in optimum weather conditions in order to maximise the likelihood of recording bats if they use the site being surveyed. It is advised to avoid heavy rain, strong winds and low temperatures, when bats are least likely to fly in these conditions.

» A bat monitoring program may assist with knowledge of wind energy and bat interaction in South Africa. A bat monitoring has been commissioned for this site. It will be beneficial to collaborate with academic institutions to promote research on the subject, doing affordable long term monitoring and determining the risks more accurately.



Areas that can possibly support bat roosting Most probable foraging areas

Figure 6.6: Desktop based bat sensitivity map of wind energy facilities

Potential Heritage Impacts:

Potential impacts on heritage resources as a result of the operation of the wind farm relate to visual impacts on areas around heritage structures and cultural landscapes, as well as impacts on sense of place. The heritage scoping study revealed that the following heritage sites, features and objects that can be expected within the study area:

» Archaeological finds
» Historical finds

Issue	Nature of Impact	Extent of Impact	'No go' areas
Built environment	Physical structural appearance of the wind farm.	Local	No 'no- go' areas have been identified at this stage.
Cultural landscapes and sense of place	Physical structural appearance of the wind farm.	Unknown at this stage of impact assessment	No 'no- go' areas have been identified at this stage.

Gaps in knowledge & recommendations for further study:

The potential impacts on heritage artefacts will be assessed in greater detail during the EIA phase of the project.

Recommendations:

During the EIA phase of the project it is suggested that in order to comply with the National Heritage Resources Act (Act No 25 of 1999) a Phase 1 Archaeological Impact Assessment must be undertaken. The following will form part of this study:

» Sites of archaeological, historical or places of cultural interest will be located, identified, recorded, photographed and described.
» The levels of significance of recorded heritage resources will be determined and mitigation proposed should any significant sites be impacted upon,

Potential Noise Impacts:

Noise emitted by wind turbines can be associated with two types of noise sources. These are aerodynamic sources due to the passage of air over the wind turbine blades and mechanical sources which are associated with components of the power train within the turbine, such as the gearbox and generator and control equipment for yaw, blade pitch, etc. These sources normally have different characteristics and can be considered separately. In addition there are other less significant noise sources, such as the substations, traffic (maintenance) and transmission line noise.

Increased noise levels can directly be linked with the various activities associated with the operational phase of the activity. During this evaluation, more focus was placed on the impacts on the surrounding noise environment during times when a quiet environment is highly desirable. Noise limits should therefore be appropriate for the most noise-sensitive activity. Noise-sensitive activities such as sleeping, or areas used for relaxation or other activities (places of worship, school, etc) should determine appropriate Zone Sound Levels. However, for the noise Scoping report the $L_{Req,N}$ of **35dBA** as proposed by SANS 10103 was used.

The most common sources of noise during the operational phase include:

» Aerodynamic noise, which is emitted by a wind turbine blade (sound of the wind turbine "cutting" wind – low frequency noise);
» Mechanical noise (from the gear-box / generator);
» Transformer noises (substation);
» Transmission Line noise (Corona noise);
» Low frequency noise; and
» Amplitude modulation of the sound emissions from the wind turbines.

The worst case scenarios as indicated in the noise study (Appendix J) illustrates the situation where atmospheric conditions are favourable for sound propagation, with the wind speeds above the cut-in speeds of the Wind Turbine Generator (WTG), but before wind induced noises start to mask the noises from the wind turbines. Three noise receptors have been identified as shown in Figure 6.7. An appropriate buffer will have to be determined around these identified sensitive receptors during the EIA phase.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Noise impacts associated with the operation of the wind energy facility.	The noise will be a combination of the cumulative effects of multiple wind turbines operating at night. Based on the preliminary impact estimations (as	Regional (i.e. beyond the site boundaries). The noise could impact on receptors	Three noise receptors have been identified as shown in Figure 7.7. An appropriate

	detailed in the noise specialist report contained within Appendix J) there are three potential noise-sensitive developments (NSD) within the potential area of influence. This, however, needs to be confirmed through detailed modelling of the preliminary layout in the EIA phase of the process.	within the potential area of influence (worst case scenario – wind blowing from wind farm towards receptor).	buffer will have to be determined around these identified sensitive receptors during the EIA phase.

Gaps in knowledge & recommendations for further study:

Gaps in knowledge:

» There is no information available regarding the existing soundscape of the area.

» Projected impacts from the construction phase can only be modelled once more information regarding the duration of construction and equipment used are known.

It is recommended that:

» A site visit be undertaken to obtain information regarding background noise levels, the prevailing meteorological conditions during this background noise level survey, as well as confirming and identifying Noise-sensitive developments.

» Currently identified (potential) Noise Sensitive Developments (NSDs) will be investigated during the EIA phase, and any additional NSDs will be identified. Their relative sensitivity to noise impacts will be determined. This will be based on the SANS 10103 guideline, as well as current land uses on the properties (residential vs business/industrial).

» Using the data (proposed processes, noise characteristics of the selected equipment, locations of the wind turbine generators) as provided by the project developer, the predicted impact of the facility on NSDs will be predicted using the CONCAWE method as recommended by SANS 10357:2004 for both the construction and operational phases, as well as the ISO 9613-2 model for the operational phase.

» Using the calculated noise levels at the identified NSDs, the projected significance of the facility (whether construction or operational) will be determined using the criteria as proposed (subject to possible changes after any stakeholder input). Further recommendations on the most suitable buffer zone can be made after more information is available for the proposed facility.

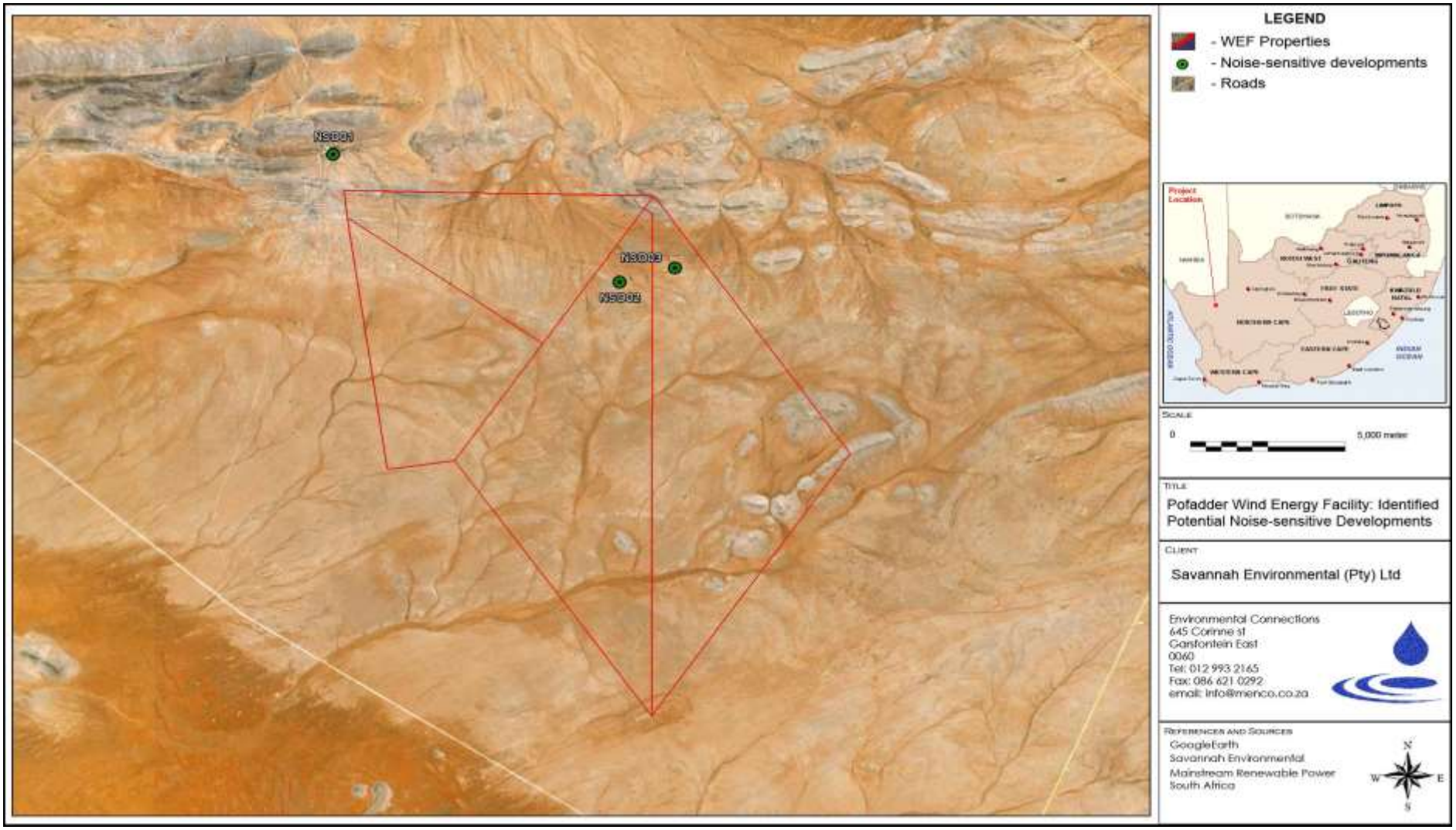


Figure 6.7: Aerial image indicating identified Noise-sensitive developments around the site

Potential Social Impacts:

During the operation phase the potential exists for further, albeit limited, job creation and some skills development (positive impacts). However, there is also the potential for impacts on the social dynamics of the study area. The proposed project could assist with decreasing South Africa's dependency on coal generated electricity thereby strengthening the electricity grid in an "environmentally friendly" way. On a regional scale it could possibly result in positive changes in the quality of lives of many individuals currently living without an efficient and satisfactory electricity supply. On a national scale, the proposed project would also assist in meeting the South African government's target for renewable energy.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Potential impacts on existing tourism and tourism potential of the area	This is considered to be low as the area is not seen as a tourist destination	Local-regional	N/A
Potential visual and sense of place impacts on existing receptors, including nearby rural residences.	Impact closely linked to visual impacts, associated with turbines and associated infrastructure, the power lines proposed.	Local-regional	N/A
Potential impact on job creation.	Creation of opportunities to local business during the operational phase, including but not limited to, provision of security, staff transport, and other services.	Local and Regional	N/A
Potential impact on economic opportunities.	There are potential up and down-stream economic opportunities for the local, regional and national economy.	Local, Regional and National	N/A

Gaps in knowledge & recommendations for further study:

The potential social and socio-economic impacts will be assessed in greater detail during the EIA phase of the project.

It is recommended that:

» Review of existing project information, including the Planning and Scoping Documents will be done;
» Collection and review of reports and baseline socio-economic data on the area (IDPs, Spatial Development Frameworks etc);
» Site visit and interviews with key stakeholders in the area including local land owners and authorities, local community leaders and councillors, local resident associations and residents, local businesses, community workers etc.;
» Identification and assessment of the key social issues and opportunities;
» Preparation of Draft Social Impact Assessment (SIA) Report, including identification of mitigation/optimisation and management measures to be

implemented.

Table 6.3: Evaluation of potential Cumulative Impacts associated with the Khai-Ma Wind Energy Facility

Approach to Cumulative Effects Assessment

Cumulative impacts, in relation to an activity, refer 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. For cumulative effects analysis to help the decision-maker and inform interested parties, it must be limited to effects that can be evaluated meaningfully (DEAT, 2004). Boundaries must be set so analysts are not attempting to measure effects on everything. Therefore, the cumulative impacts associated with the proposed Wind Energy Facility near Pofadder have been viewed from two perspectives within this EIA:

I. Cumulative impacts associated with the scale of the project,
II. Cumulative impacts associated with a) other relevant wind or solar (renewable) projects that have been approved (received an Environmental Authorisation), b) projects which have been awarded preferred bidder status by the Department of Energy and are planned to be constructed in the area within the immediate term, or c) projects which are existing.

Cumulative effects are commonly understood as the impacts which combine from different projects and which result in significant change, which is larger than the sum of all the impacts (DEAT, 2004). The complicating factor is that the projects that need to be considered are from past, present and reasonably foreseeable future development. Cumulative effects can be characterised according to the pathway they follow. One pathway could be the persistent additions from one process. Another pathway could be the compounding effect from one or more processes. Cumulative effects can therefore occur when impacts are:

* additive (incremental);
* interactive;
* sequential; or
* synergistic.

Canter and Sadler (1997) describe a three step process for addressing cumulative effects in an EIA:

* delineating potential sources of cumulative change (i.e. GIS to map the relevant wind energy facilities in close proximity to one another).
* identifying the pathways of possible change (direct impacts)
* indirect, non-linear or synergistic processes; and

* classification of resultant cumulative changes.

» **Potential Cumulative Impacts**

The cumulative impacts associated with the proposed Khai-Ma wind energy facility at a site level are expected to be associated with the scale of the project, i.e. wind turbines which will be located on the proposed site. The potential direct cumulative impacts associated with the project are expected to be associated predominantly with the potential visual impact, ecology and soils and positive social impacts. These cumulative effects can only be assessed once a preliminary layout is available, and will be considered in the detailed specialist studies to be undertaken in the EIA phase.

In addition to cumulative impacts at a site level, cumulative impacts could be associated with this proposed development and other similar developments in the area as listed above. It is important to describe the potential cumulative impacts which may be expected in order to obtain a better understanding of these impacts and the possible mitigation that may be required. The cumulative impacts associated with the proposed facility primarily refer to those impacts associated with visual (including impacts on the cultural landscape), ecological, avifaunal and social impacts, and are mainly associated with the existing projects/ projects under construction and planned facilities in the area.

Potential cumulative impacts associated with numerous solar and/ wind energy facilities within the study area are expected to be associated with:

» *Visual impacts* – The most significant impact associated with the proposed development is the visual impact on the scenic resources and cultural landscape of this region imposed by the components of the facility.
» *Ecology* – natural vegetation within the study area is largely impacted by agricultural activities, and is formally conserved only to a limited extent. Although a wind energy facility generally results in permanent disturbance a small percentage of a broader site, any impacts on natural vegetation in this area are considered significant. Therefore, numerous developments (regardless of their nature) within the study area are expected to have an impact on vegetation at a regional level. However, it must be noted that this impact can be effectively avoided through the placement of infrastructure outside of natural vegetation and sensitive habitats.
» *Avifauna* – Cumulative loss of avifauna habitat associated with development may be an issue in the area. Risk to avifauna resulting from collisions is limited to power lines and solar infrastructure, with no other wind projects proposed in the immediate surrounding area.
» *Social* – The development of numerous renewable energy facilities within the study area will have a cumulative impact on several existing issues within the area, predominately within rural settlements associated with the potential influx of workers and job seekers. With the increased population density, this may lead to a cumulative impact on housing requirements, services (i.e. water, electricity and sanitation), health issues, safety and security. New informal townships are unlikely to have the required infrastructure and services. With the existing rural settlements in the

area this will have a cumulative impact on the environment and health (i.e. in terms of ablution facilities). The main social impact, however, will be in terms of visual impacts and associated impacts on sense of place.

» *Positive impacts* - Cumulative positive impacts are, however, also anticipated should a number of similar wind or solar energy developments be developed in the area, largely due to job creation opportunities, business opportunities for local companies, skills development and training. The development of renewable energy facilities will have a positive impact at a national and international level through the generation of "green energy" which would lessen South Africa's dependency on coal generated energy and the impact of such energy sources on the bio-physical environment. The proposed project would fit in with the government's aim to implement renewable energy projects as part of the country's energy generation mix over the next 20 years as detailed in the Integrated Resource Plan (IRP)) and the Northern Cape SDF.

CONCLUSIONS FOR THE KHAI-MA WIND ENERGY FACILITY CHAPTER 7

South Africa Mainstream Renewable Power Developments (Pty) Ltd (Mainstream) is proposing to establish a commercial wind energy facility component as well as associated infrastructure on a site located approximately 22 km south-west of Pofadder in the Northern Cape Province. A broader area of approximately 175 km^2 is being considered within which the facility is to be constructed.

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

» Foundations to support both the turbine towers;
» Cabling between the project components, to be lain underground where practical;
» Permanent wind monitoring masts.
» Common infrastructure between the wind energy facility and the solar energy facility will include:
  * A 400 kV substation and satellite 132 kV substations to facilitate grid connection via a loop-in loop-out connection to the existing Eskom Aggenys–Aries 400kV power line which traverses the site;
  * Internal access roads;
  * Laydown area for construction;
  * Operations and maintenance buildings; and
  * Workshop area for maintenance and storage.

The Scoping Study for the proposed **Khai-Ma Wind Energy Facility** associated infrastructure has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of GN R543, R544, R545 and R546 (18 June 2010 as amended), in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). This project was registered with the National Department of Environmental Affairs under application reference number **14/12/16/3/3/2/680.**

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

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

A summary of the conclusions of the evaluation of the potential impacts identified to be associated the proposed wind farm and associated power line is provided below. Recommendations regarding investigations required to be undertaken within the EIA are provided within the Plan of Study for EIA, contained within Chapter 12 of this report.

7.1. Conclusions drawn from the Evaluation of the Proposed Site for Development of the proposed Khai-Ma Wind Energy Facility

In identifying and evaluating impacts associated with the proposed wind energy facility, it has been assumed that although during operation, the area affected will comprise of wind turbines (depending on which turbine types are ultimately chosen by the developer) and associated infrastructure, during construction much of the ~175km^2 of the proposed site could suffer some level of disturbance. However, once construction is complete, only a small portion of this area (estimated at ~5%) will be permanently impacted by infrastructure associated with the wind energy facility.

Table 7.1 and 7.2 summarises the potential issues associated with the wind energy facility that have been identified through this 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 range from local to regional in extent. No environmental fatal flaws were identified to be associated with the site. However, areas of potential sensitivity including potential noise / visual sensitive receptors, heritage artefacts, bird and bat sensitive areas, drainage lines and habitats for protected flora and fauna were identified through the scoping phase. These areas of sensitivity are illustrated in the sensitivity map included as Figure 7.1.

Table 7.1: Potential impacts associated with the Construction/ Decommissioning Phase with the proposed Wind Energy Facility near Pofadder

Impacts resulting from the Construction/ Decommissioning Phase	Extent
Potential visual impacts associated with the construction phase	L
Potential visual impact of the construction of ancillary infrastructure on observers in close proximity	L
Loss of agricultural land	L
Soil degradation due to contamination	L
Soil erosion due to increased and concentrated storm water run-off	L
Soil erosion due to trampling by vehicles and equipment, as well as construction activities	L
Siltation of watercourses and other natural resources down stream	R
Dust production	L
Impacts on listed and protected plant species during site clearing	L
Alien plant invasion, habitat fragmentation and loss of landscape connectivity	L
Loss of bird habitat due to construction of the wind energy facility.	L
Disturbance of birds	L
Displacement of birds from the site and barrier effects	L-R
Destruction of foraging habitat and roosts for bats	L-R
Impacts on archaeological and paleontological finds	L
Impacts on historical finds	L
Impacts on burials and cemeteries	L
Noise impacts due to construction equipment	L
Noise impacts due to construction traffic	L
Impact on rural sense of place	L
Impact on farming activities	L
Influx of job seekers into the area	L
Employment creation (positive impact)	L

Impacts resulting from the Construction/ Decommissioning Phase	Extent
Skills development and training (positive impact)	L-R
Promotion of clean, renewable energy (positive impact)	L-R

L **Local** R **Regional** N **National** I **International**

Table 8.2: Potential impacts associated with the Operational Phase of the proposed Wind Energy Facility near Pofadder

Impacts resulting from the Operational Phase	Extent
The visibility of the facility from, and potential visual impact on observers travelling along arterial roads and secondary roads in close proximity to the proposed facility and within the region.	L
The potential visual impact on the town of Pofadder	L
The visibility of the facility from, and potential visual impact on residents of homesteads and settlements in close proximity to the proposed facility and within the region.	L
The potential visual impact of ancillary infrastructure (i.e. the substation, overhead power lines, internal access roads, workshop and office) on observers in close proximity to the proposed facility.	L
The potential visual impact of the proposed facility on the visual quality of the landscape and sense of place region.	L
The potential visual impact of operational, safety and security lighting of the facility at night on observers in close proximity to the facility.	L
Potential cumulative visual impacts of the wind energy facility and associated infrastructure.	L
Collisions of birds with turbines	R
Habitat loss for avifauna as a result of destruction, disturbance and displacement	L
Impacts of associated infrastructure on avifauna	L-R
Bat mortalities due to blade collisions and barotrauma	R
Bat Habitat Destruction	L
Heritage impacts associated with the built environment	L
Impacts on the cultural landscapes and sense of place	Unknown

Impacts resulting from the Operational Phase	Extent
Noise impacts associated with the operation of the wind energy facility	R
Potential impacts on existing tourism and tourism potential of the area	L-R
Potential visual and sense of place impacts on existing receptors, including nearby rural residences.	L-R
Creation of opportunities to local business during the operational phase, including but not limited to, provision of security, staff transport, and other services (positive)	L-R
Potential up and down-stream economic opportunities for the local, regional and national economy (positive impact)	L-N
Provision of a clean, renewable energy source for the national grid (positive impact)	L-N
Potential impact on climate change	I

L **Local** R **Regional** N **National** I **International**

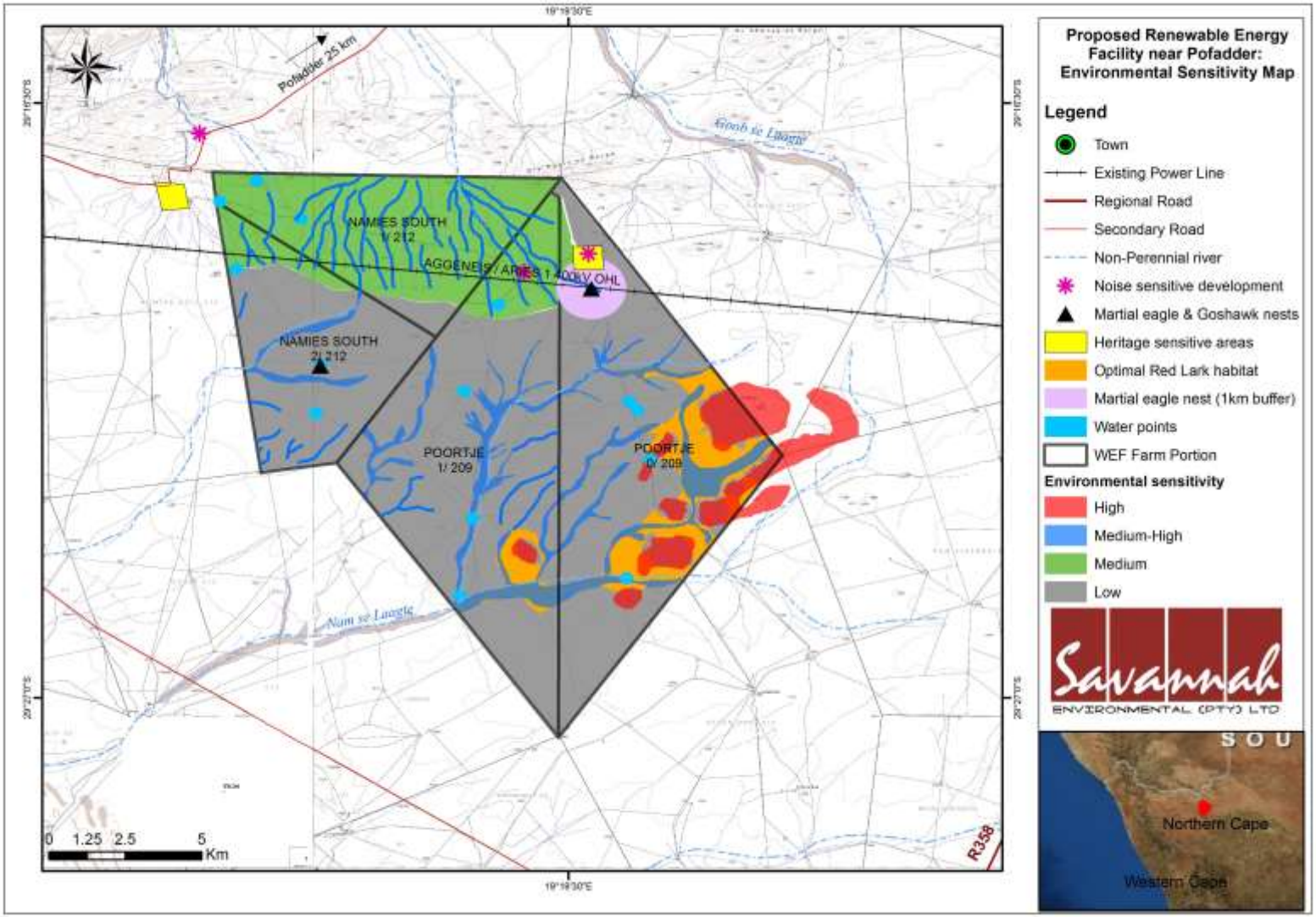


Figure 7.1: Combined environmental sensitivity map for the study area

The potentially sensitive areas/environmental features that have been identified and are illustrated in Figure 7.1 include:

» **Non-perennial river and drainage lines that occur within the site:**
There are no perennial rivers or wetlands on the site. The drainage lines that do occur on the site are characterised by loose sandy soil or exposed bedrock and boulders in the 'washes' with the banks lined with grasses, shrubs and small tree. In the north of the study area (Namies South 212/1), the drainage lines are many narrow channels which follow a dendritic pattern, dissecting the plains. Further south the drainage lines are wider and better defined. The main drainage channel in the southern portion of the site is Nam se Laagte that drains towards the south-west. The northern portion of Namies South drains north-westerly towards the Orange River. All the drainage lines have similar riparian vegetation, and the primary variation between them depends on availability of water and length of duration of flowing water.

In the arid ecosystems such as in the study area the drainage lines are prone to flash flooding. They are also the 'ecological linking corridors'. Although not having a high diversity of plant species they should be observed as ecologically sensitive. The landscape is prone to sheet-wash at times of heavy rain and there are seasonal drainage lines which in some cases are poorly defined whereas in others they are quite distinct. The vegetation of the drainage lines does not differ greatly from that found in the non-drainage-line areas. This is attributed to the drainage lines being mainly dry and only having water-flow for very short periods. Drainage lines will also support birds, bats and faunal species.

» **Potential bird and/bat sensitive habitats:**
A Martial Eagle nest was discovered on site, although the nest was not active at the time of the site visit in July 2012, it may well become active again. Prey remains under the nest and fresh droppings indicate that the site may have been active in the not too distant past. A 1 km buffer has been placed around the Martial Eagle nest during the design of the wind energy facility. The buffer is recommended to reduce the risk of disturbance and collision with the wind turbines or power line, should the birds decide to breed there again. Also included under the high risk area is a water points. Water points are draw cards for bird species and bat/ insect feeders, including priority raptors which breed in the trees (e.g. Southern Pale Chanting Goshawk which was seen on the site) or use the troughs for bathing and drinking. Lanner Falcons and other priority raptors may also hunt small birds at the water points, which could result in them being distracted and colliding with turbines. A Goshawk's nest is also shown on the map. These should be treated as potential no-go areas, to be confirmed during the EIA phase.

The sensitivity map shows water points which serve as key hotpots for bird species, to be considered bint he design of the facility. In the far eastern section of the site (the R/E of farm Poortjie) an orange area has been delineated as being suitable habitat for the suitable area within the Red Lark bird species. This area is of moderate avifaunal sensitivity. The Red Lark is generally sedentary and resident species in an area, but local movement triggered by environmental conditions can occur. Only one pair of Red larks was recorded during the site visit, which may point to the broader development area not being optimal habitat for the species. The species is generally associated with red dunes and large seeded grasses, and in optimal habitat, such as the Koa Valley, densities of approximately 1 pair/30 ha can be expected. Although this habitat is present in the broader development area, it is not the dominant habitat. This area should be carefully monitored during the pre-construction bird monitoring programme, to establish if the species is present in larger numbers. At this stage of the investigation, this area need not be excluded from the development area, subject to the results of further monitoring during pre-construction.

» **Areas of high erosion sensitivity**

Areas of high erosion sensitivity include the drainage lines on the site as well as moderately to gently undulating hills and plains (low relief areas) where unconsolidated sediment occurs. Moderate levels of erosion will occur if land-disturbing activities take place (mainly during construction). Further investigated and assessed through detailed specialist studies (including field surveys) will be required during the EIA phase.

» **Noise sensitive receptors**

Three homesteads have been identified as potential noise sensitive receptors, which may be impacted upon by the low frequency noise that is generated by wind turbines. The noise will be a combination of the cumulative effects of multiple wind turbines operating at night. Based on the preliminary impact estimations (as detailed in the noise specialist report contained within Appendix J) there are three potential noise-sensitive developments (NSD) within the potential area of influence. This, however, needs to be confirmed through detailed modelling of the preliminary layout in the EIA phase of the process.

The sensitivity map is a rough scale estimate of sensitivity on the site, and these areas will be subject to survey and ground-truthing during the EIA phase of the project. These potentially sensitive areas will, therefore, be further investigated and assessed through detailed specialist studies (including field surveys) during the EIA phase.

The proposed design of the wind energy facility (i.e. wind turbines and other infrastructure) can be based on the full extent of the site, and therefore utilise the most technically optimal positions on the broader site to the fullest extent. This recommendation does, however, require that due cognisance is taken of the recommendations outlined in Chapter 6 and above (as well as within individual specialist reports) regarding areas within the study site of potential moderate to high sensitivity. Understanding which area of the site would be least impacted by the development of such a facility, Mainstream should prepare the detailed infrastructure layouts for consideration within the EIA phase.

7.2. Evaluation of the Potential Issues associated with the overhead power line

In order to connect the wind energy facility to the power grid substations and 400kV overhead power lines will be required. A 400 kV substation and satellite 132 kV substations (and associated power lines) are proposed to facilitate grid connection via a loop-in loop-out connection to the existing Eskom Aggenys–Aries 400kV power line which traverses the site.

Potential issues associated with the proposed overhead distribution power line and substation will include impacts on flora, fauna and ecological processes, visual impacts, impacts on avifauna as a result of collisions and electrocutions, and potential impacts on heritage sites.

As the location of the power lines will depend on the substation location (which will be determined by the solar facility layout), the power line options will be considered in detail within the EIA phase in order to assess potential impacts associated with the power line corridor and make recommendations regarding a preferred

alternative alignment and appropriate mitigation measures). These options will however fall within the broader project site evaluated within this Scoping Report.

SCOPING OF ISSUES ASSOCIATED WITH THE POORTJIES WIND ENERGY FACILITY CHAPTER 8

This chapter serves to describe and evaluate the identified potential environmental impacts associated with the proposed Poortjies wind farm, and to make recommendations for further studies required to be undertaken in the EIA phase. The scoping process has involved input from specialist consultants, the project proponent, stakeholders, and the public. Specialist scoping reports are included within Appendix F - M.

Potential environmental issues associated with **construction and decommissioning** activities of the Poortjies wind energy facility may include, among others:

» Impact on fauna, flora and ecology.
» Impact on agricultural potential and land use.
» Impact on soils and geology.
» Impact on birds and bats.
» Impact on heritage resources.
» Social impacts (positive and negative).

Potential environmental issues specific to the **operation** of the wind energy facility could include, among others:

» Loss of agricultural land.
» Soil erosion.
» Visual impacts (negative viewer perceptions and visibility of the facility).
» Noise impact.
» Social impacts (positive and negative).
» Impact on birds and bats.

Tables 8.1 and Table 8.2 provide a summary of the findings of the scoping study undertaken for the construction and operation phases of the proposed wind energy facility respectively. Impacts associated with decommissioning are expected to be similar to those associated with construction. Potential direct and indirect impacts of the proposed wind energy facility are evaluated, and recommendations are made regarding further studies required within the EIA phase of the process. Specialist scoping reports are included within Appendix F to M.

In identifying and evaluating impacts associated with the proposed project, it has been assumed that although during the **operational phase** the area affected will comprise of wind turbines (each turbine between 1.5 MW – 4MW in capacity) and the number of turbines will depending on the model of turbine that the developer will select. The hub height will be up to 140m each. The area affected will also

include access roads, substation footprint and associated infrastructure. During **construction** a larger area within the approximately 175km^2 being considered for the wind energy facility footprint could suffer some level of disturbance as a result of the required activities on site. However, once construction is complete, only a small portion of this area (typically less than 5%) will be permanently impacted by infrastructure associated with the wind energy facility.

The **cumulative impacts** associated with the proposed wind farm are expected to be associated with the scale of the project, i.e. wind turbines that will be located on the proposed site, as well as associated infrastructure. The potential direct cumulative impacts associated with the project are expected to be associated predominantly with the potential visual impact, potential noise impacts, potential vegetation impact, potential heritage impact and potential impacts on avifauna, i.e. bats and birds in the surrounding area. Other cumulative impacts may arise from other neighbouring proposed wind and solar energy facilities. Cumulative effects can only be assessed once a preliminary layout is available, and will be considered in the detailed specialist studies to be undertaken in the EIA phase of the process.

It must be noted that the Draft Scoping Report is a combination of desktop studies and field work undertaken by specialists, and all potential impacts identified through the Scoping phase (indicated as being of low to high significance) will be further assessed and confirmed during the EIA phase.

Table 8.1: Evaluation of potential impacts associated with the CONSTRUCTION PHASE of the proposed Poortjies Wind Energy Facility

Potential Visual Impacts:

Potential visual impacts during the construction phase on observers in close proximity to the Poortjies wind energy facility and power line are expected to be of a short duration and limited to the site. Then site is fairly remote, with scattered homesteads and the closest town of Pofadder is approximately 22 km from the site.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Visual impacts	Potential visual impact of the construction period on visual receptors.	Local	None identified at this stage.

Gaps in knowledge & recommendations for further study:

The study was undertaken using Geographic Information Systems (GIS) software as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed facility. A detailed Digital Terrain Model (DTM) for the study area was created from 20m interval contours supplied by the Surveyor General.

It is recommended that:

» The severity of the potential visual impact be assessed in further detail in the EIA phase.
» Additional spatial analyses must be undertaken in order to create a visual impact index that will further aid in determining potential visual impact.
» Specific spatial criteria need to be applied to the visual exposure of the proposed facility in order to successfully determine visual impact and ultimately the significance of the visual impact.

Potential Impacts on Agricultural potential:

Agricultural potential is uniformly low across the farm and the choice of placement of the facility on the farm therefore has minimal influence on the significance of agricultural impacts. No agriculturally sensitive areas occur within the site. The farm is located within a sheep farming agricultural region with very low carrying capacity, and there is no cultivation on the farm.

The significance of agricultural impacts is influenced by the extremely limited agricultural capability of the site, with no cultivation currently being undertaken. Therefore, impacts are not likely to be of high significance.

Issue	Nature of Impact	Extent of Impact	Extent of Impact	'No go' areas
Loss of agricultural land.	Placement of infrastructure for the wind energy facility will affect the land-use on these specific areas.	Local in terms of the activity and will be associated with the activity only. The impacts are considered to be of low significance due to the low agricultural potential of the site.	Local	None identified at this stage.

Gaps in knowledge & recommendations for further study:

The study area has not been subject to a field survey. All the information on soils and agricultural potential presented here has been obtained from the AGIS online database, produced by the Institute of Soil, Climate and Water (Agricultural Research Council, undated).

It is recommended that:

» Consideration should be given to the proper placement of the wind turbines and other infrastructure.

Potential Impacts on Soil and Current land Use:

The proposed development is located on level plains with some relief in the Northern Cape interior at an altitude of between about 1000 and 1100 meters. Slopes across the site are predominantly less than 2% but are up to 5% in places. The underlying geology is Gneissic granite of the Namaqualand Metamorphic Complex.

The land type classification is a nationwide survey that groups areas of similar soil, terrain and climatic conditions into different land types. The site is predominantly on two land types, Ag61 and Ag25, with a very small section on a third, Ib131. All land types are dominated by very shallow, very sandy soils on underlying rock or hard-pan carbonate. The ridges (Ib131) are dominated by rock outcrops. The soils would fall into the Lithic and Calcic soil groups according to the classification of Fey (2010). Potential impacts on soils relate mainly to increased erosion potential and loss of soil resources.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Soil erosion due to alteration of the land surface run-off characteristics.	Alteration of run-off characteristics may be caused by construction related land surface disturbance, vegetation removal, and the establishment of hard standing areas, surfaces and roads. Erosion will cause loss and deterioration of soil resources and may occur during all phases of the project.	Local (construction areas only)	No specific 'no go' areas have been identified at this stage
Loss of topsoil due to poor topsoil management.	It is anticipated that the loss of topsoil will result from poor topsoil management (burial, erosion, etc) during construction, related soil profile disturbance (levelling, excavations, road surfacing etc.) and resultant decrease in that soil's agricultural suitability.	Local (construction areas only)	
Soil erosion due to trampling by vehicles and equipment, as well as construction activities	Improper placement, construction, maintenance and use of access roads and construction sites by vehicles and equipment, may lead to the degradation of the soil surface and result in soil erosion (both wind and water erosion).	Local (construction areas only)	
Siltation of watercourses	Improper placement and maintenance of infrastructure, as well as poor stormwater	Regional	

	management, may lead to water erosion and siltation of watercourses downstream.		
Dust production	Improper construction, maintenance and use of access roads and construction sites by vehicles and equipment, may lead to dust production.	Local	

Gaps in knowledge & recommendations for further study:

The study area has not been subject to a field survey. All the information on soils and agricultural potential presented here has been obtained from the AGIS online database, produced by the Institute of Soil, Climate and Water (Agricultural Research Council, undated).

It is recommended that:

» More detailed assessment of soil conditions be conducted. This will include a field investigation of soils and agricultural conditions across the site. This field investigation will be aimed at ground proofing the existing land type information and understanding the specific soil conditions on site. It will not be based on a grid spacing of test pits but will comprise a reconnaissance type of soil mapping exercise based on an assessment of surface conditions, topography, and hand augered samples in strategic places, if necessary. Such a soil investigation is considered adequate for the purposes of this study. A more detailed soil investigation is not considered likely to add anything significant to the assessment of agricultural soil suitability for the purposes of determining the impact of the development on agricultural resources and productivity.
» Assessment of erosion and erosion potential on site.
» Assessment of the impacts of specific construction activities and layout on soil conditions.

Potential impacts on Fauna, Flora and Ecology

Five plant communities or associations are recognized in the study area. They are (1) Open plains grassland (2) Low to mid-high shrubland and (3) Drainage line vegetation, all of which fall within Bushmanland Arid Grassland, (4) Aggeneys Gravel Vygieveld and (5) Bushmanland Inselberg Shrubland. Neither Aggeneys Gravel Vygieveld nor Bushmanland Inselberg Shrubland is likely to be affected by the proposed solar energy infrastructure since it was recommended in the botanical constraints analysis (McDonald, 2012) that the areas where these vegetation types occur should be avoided. These two vegetation types are thus not considered any further here.

The greater part of the study area of the Poortjies Wind Energy Facility is not botanically sensitive (Figure 8.1). This would include areas on the open plains in 'Open plains grassland' and 'Low to Mid-high Shrubland'. Areas that are sensitive are the drainage lines. These should be buffered by at least 50 m, i.e. no construction wind turbines should be permitted with 40 m of the drainage lines. This would ensure that there is no negative erosive impact on the drainage lines arising from the construction activities. It is recognized that this constraint will present challenges in determining the locations of the solar PV array, however, it has practical implications as well since the installations would be protected from flash-floods.

Roads are predicted to have a negative effect on the receiving environment but with careful mitigation (e.g. relocation of species such as *Aloe claviflora* and avoidance of trees of *Boscia albitrunca*, *Aloe dichotoma* and *Parkinsonia africana*), the negative impacts can be kept within acceptable limits. Roads that will cross drainage lines must also be constructed in such a way as to not impede water-flow when this occurs.

It is predicted that construction of the proposed wind energy facility would have a low negative impact on the vegetation. This would be due to removal of the vegetation within the footprint of the solar panel array area during construction and subsequently due to shading caused by the panels during operation (refer to Figure 8.1).

Fauna:

The site displays a low level of Red List animal species' probability of occurrence. The Small spotted cat, Dassie rat, Baboon spiders, Trapdoor spiders, Girdled lizards and Tent tortoises known to occur in the area have a Protected status, with the Tent tortoises being the most at risk to be impacted upon during the construction phase. A faunal sensitivity map is shown in Figure 8.2 and indicates areas of Moderate faunal sensitivity being the rocky parts of the site that offer habitat for fauna and a higher variety of biodiversity, compared to the rest of the site. No areas of high sensitivity are expected to be found on the site.

The greatest risk to the vegetation and flora would be during the construction phase of the wind energy facility 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 any on-site substations.
» 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.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Impacts on listed and protected plant species during site clearing.	Site preparation and construction will result in a lot of disturbance and the loss of currently intact vegetation. Given the relatively low number of endangered species at the site, impacts on listed species are likely to be relatively low. Provincially protected species such as various Aloe sp. are however likely to be relatively common and impacts on such species are potentially greater. However, as few of these species are actually rare, the significance of these impacts is not likely to be very high.	Local	No specific 'no go' areas have been identified at this stage; however areas of very high ecological sensitivity (as shown in Figure 6.2 and Figure 6.3) will be investigated further during the EIA phase.
Increased risk of alien plant invasion resulting from the high levels of disturbance.	Alien species are likely to respond to the large amount of disturbance that will accompany the development phase of the project. Invasion of the natural plant communities within the site would be undesirable and could impact diversity of fauna and flora as well as affect ecosystem processes.	Local	
Disturbance and loss of habitat for fauna.	Increased levels of noise, pollution, disturbance and human presence will be detrimental to fauna. Sensitive and shy fauna are likely to move away from the area during the	Local	

	construction phase as a result of the noise and human activities present. Some mammals and reptiles such as tortoises would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present.		
Disruption of landscape connectivity and ecosystem processes.	Development within intact vegetation would contribute to the fragmentation of the landscape and potentially disrupt the connectivity of the landscape for fauna and flora.	Local	

Gaps in knowledge & recommendations for further study:

The sensitivity assessment and resulting sensitivity maps are based primarily on literature descriptions.

It is recommended that:

» A site survey be conducted at the appropriate time of the year in order to assess the current state of the vegetation and habitats that will be lost and/or disturbed and the implication thereof.
» Sensitive areas must be identified and mitigation measures recommended to minimise impacts on these areas.
» Potential alien and invasive species in the area be identified, the accompanying risks assessed and appropriate mitigation recommended.
» Sensitive faunal species and habitats must be identified and mitigation measures recommended to minimise impacts.

The sensitivity of the identified areas will need to be verified during the site visits for the EIA phase of the development, and those areas that should be avoided will need to be identified and mapped where necessary.

The following will be undertaken in the EIA Phase of the study:

» Ground-truth and refine the ecological sensitivity map of the site. Particular attention will be paid to mapping the distribution of sensitive ecosystems at the site such as wetlands and drainage systems. The rocky areas will also be specifically investigated on account of the higher potential abundance of listed and protected faunal species within these areas.
» Evaluate the likely presence of faunal species of conservation concern at the site and identify associated habitats that should be avoided to prevent impact to such species.
» Evaluate, based on the site attributes, what the most applicable mitigation measures to reduce the impact of the development on the site would be and if there are any areas where specific precautions or mitigation measures should be implemented.

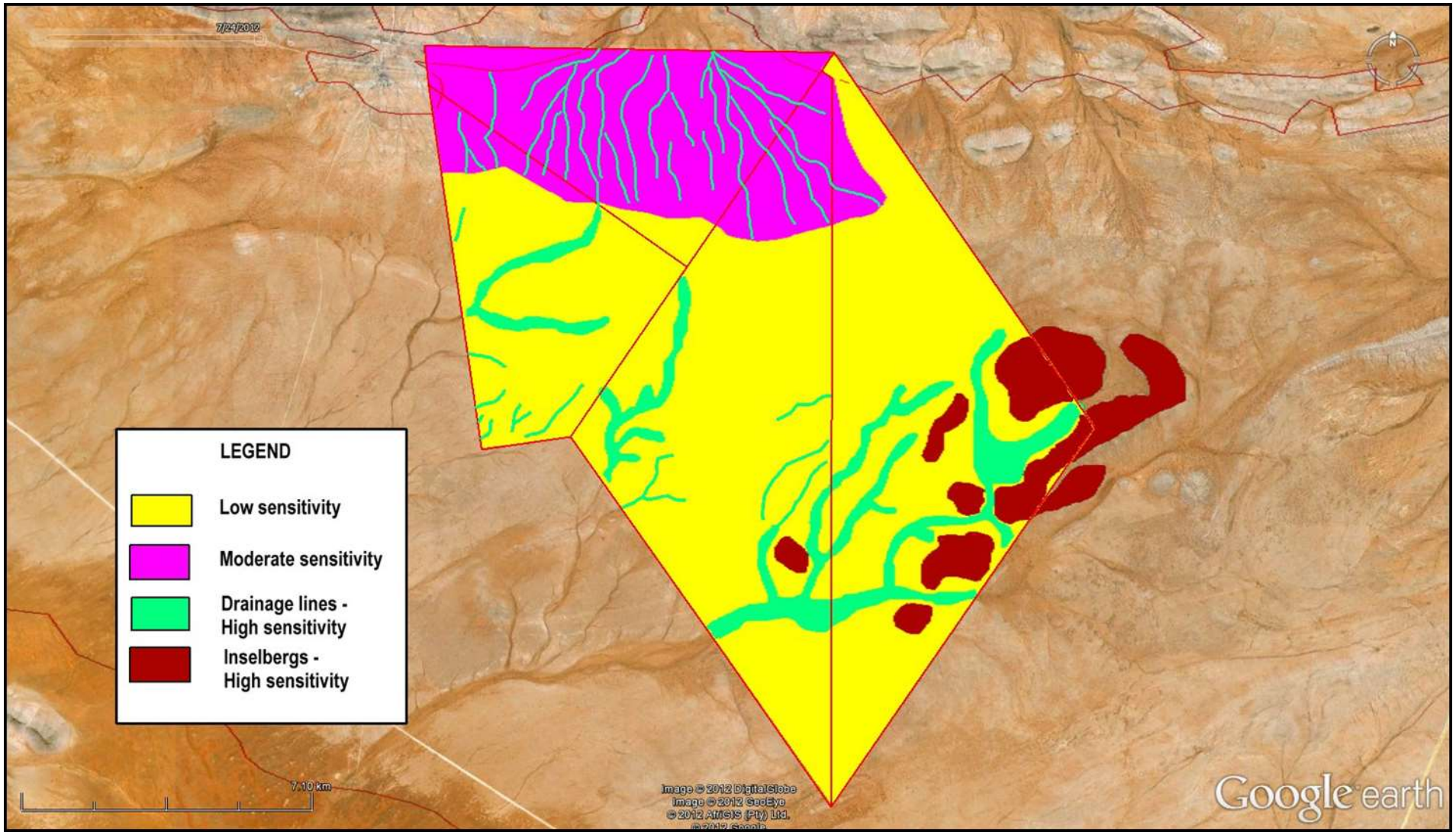
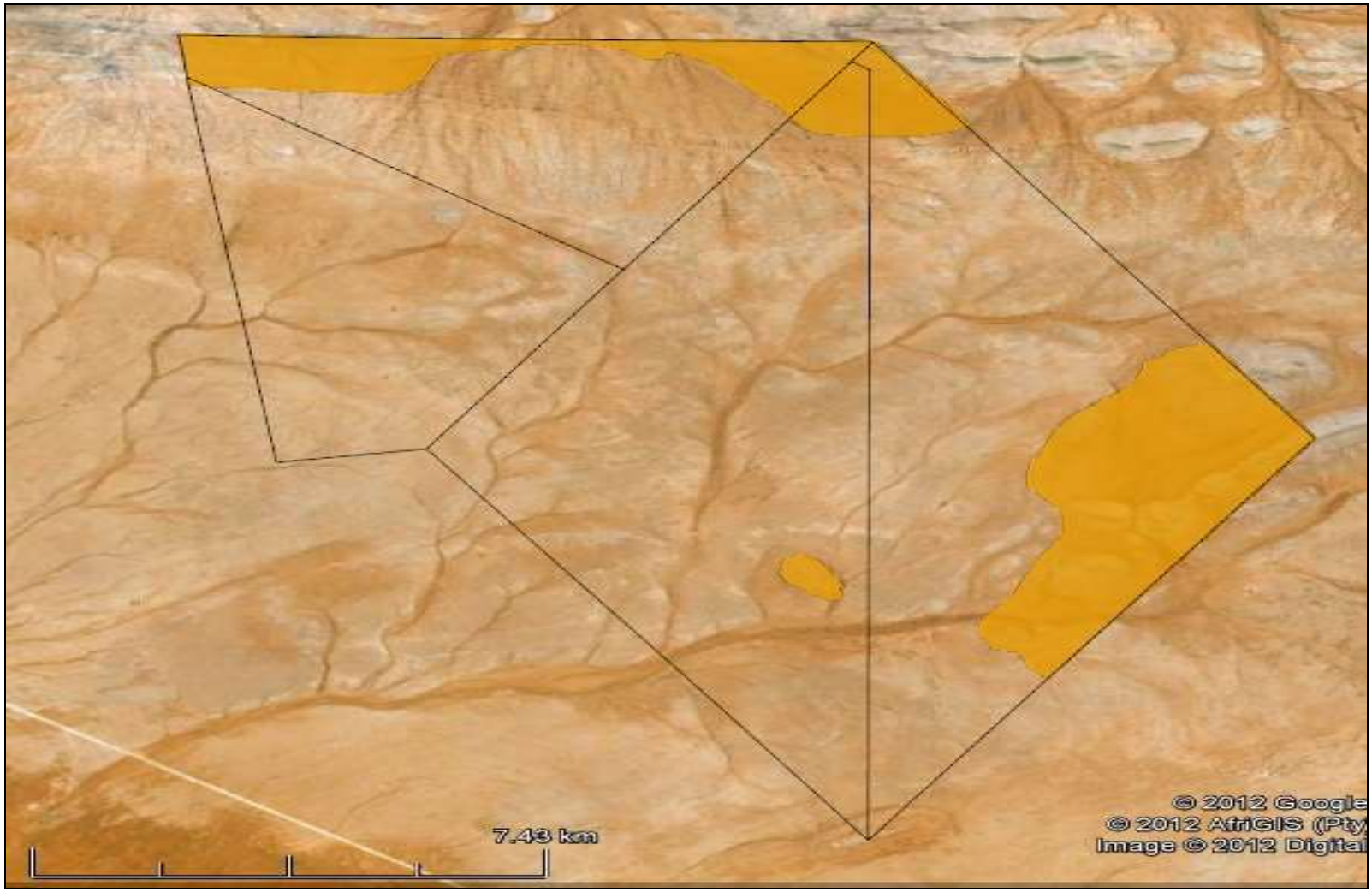

7/24/2012
LEGEND
Low sensitivity
Moderate sensitivity
Drainage lines - High sensitivity
Inselbergs - High sensitivity
7.10 km
Image © 2012 DigitalGlobe
Image © 2012 GeoEye
© 2012 AfriGIS (Pty) Ltd.
Google earth

Figure 8.1: Botanical sensitivity of the site



Moderate sensitivity

Figure 8.2: Desktop based fauna sensitivity map of the site.

Potential Impacts on Avifauna (birds):

Destruction of Avifaunal Habitat

Although the final footprint of the wind energy facility is likely to be relatively small (up to 5% of the entire study area of 175km^2), the construction phase of development inevitably incurs quite extensive temporary damage or permanent destruction of habitat, which may be of lasting significance in cases where wind farm sites coincide with critical areas for restricted range, endemic and/or threatened species. During the construction phase and maintenance of power lines and substations, some habitat destruction and alteration inevitably takes place. This happens with the construction of access roads, the clearing of servitudes and the levelling of substation yards. Servitudes have to be cleared of excess vegetation at regular intervals in order to allow access to the line for maintenance, to prevent vegetation from intruding into the legally prescribed clearance gap between the ground and the conductors and to minimise the risk of fire under the line which can result in electrical flashovers. These activities have an impact on birds breeding, foraging and roosting in or in close proximity to the servitude, through the modification of habitat.

Displacement due to disturbance

Displacement of birds may occur during both the construction phases of the wind energy facility, and may be caused by the presence of the turbines themselves through visual, noise and vibration impacts, or as a result of vehicle and personnel movements related to site maintenance. The scale and degree of disturbance will vary according to site- and species-specific factors and must be assessed on a site-by-site basis.

Unfortunately, few studies of displacement due to disturbance are conclusive, often because of the lack of before-and-after and control-impact (BACI) assessments. Onshore, disturbance distances (in other words the distance from wind farms up to which birds are absent or less abundant than expected) up to 800 m (including zero) have been recorded for wintering waterfowl, though 600 m is widely accepted as the maximum reliably recorded distance.

The following avifaunal-relevant habitat modifications were identified within the broader development area:

» **Water points:** The land use in the broader development area is mostly sheep farming, with some game and cattle also present. The entire area is divided into fenced off grazing camps, with several boreholes with associated water reservoirs, drinking troughs and a few trees. These troughs, reservoirs and trees are a big draw card for several bird species.

» **Transmission lines and telephone lines:** The broader development area is bisected by the Aggeneys – Aries 400kV transmission line. The transmission towers are used by raptors for perching and roosting, and potentially also for breeding. An inactive eagle nest, most likely belonging to a Martial Eagle, was discovered on tower 147. Prey remains and droppings below the nest and other towers indicate recent activity. There is also a telephone line running along the road to the two farm houses, which is used extensively by several species for perching.

» **Farm yards:** The site contains two farm yards, with associated buildings, trees and patches of lawn.

The priority species for this study area include:

» Martial Eagle;
» Ludwig's Bustard;
» Secretarybird;
» Kori Bustard; and
» Lanner Falcon.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Loss of bird habitat due to construction of the wind energy facility.	During the construction phase and maintenance of turbines, power lines and substations, some habitat destruction and alteration inevitably takes place. Since the site is situated in an extremely uniform area this impact is not anticipated to of high significance for most of the site. The exception to this will be some of the areas identified in the sensitivity mapping exercise, in particular any surface water sources or drainage lines.	Local	Areas of surface water on site
Disturbance of birds	Construction activities will have an impact on birds breeding, foraging and roosting in or in close proximity to the servitude, through the modification of habitat. This is unlikely to be of high significance for most species, unless breeding on site. The likelihood of target species breeding on site will be assessed during the EIA Phase.	Local	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase.
Displacement of birds from the site and barrier effects	The likelihood of this impact being significant will be assessed during the EIA Phase and is related to how much birds actually use and depend on the site.	Local and Regional	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase
Gaps in knowledge & recommendations for further study:			

- » All quarter degree grid cells (QDGCs) have not been surveyed to the same level by the South African Bird Atlas 2 (SABAP2) – in this instance 2919AD has not been surveyed at all, and only 2 checklists have been completed for 2919AC. Strong reliance was therefore placed on personal observations during the site visit, information provided by the landowners, SABAP1 historical data and SABAP2 data from adjoining QDGCs to form a picture of what avifauna is likely to occur in the broader development area.
- » Inevitably, no comprehensive studies (other than a few environmental impact reports), and no peer-reviewed scientific papers, are available on the impacts wind farms have on birds in South Africa at this point in time. The precautionary principle was therefore applied throughout. The World Charter for Nature, which was adopted by the UN General Assembly in 1982, was the first international endorsement of the precautionary principle (http://www.unep.org). The principle was implemented in an international treaty as early as the 1987 Montreal Protocol and, among other international treaties and declarations, is reflected in the 1992 Rio Declaration on Environment and Development. Principle 15 of the 1992 Rio Declaration states that: "in order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall be not used as a reason for postponing cost-effective measures to prevent environmental degradation."
- » Even in the international arena, many studies lack before and after comparisons, or wind farm area and reference area comparisons, or do not offer any assessment whatsoever of relevant factors such as collision risk and differences in bird behaviour between night and day, or are of inadequate duration to provide conclusive results (Langston & Pullen 2003). In many instances, even where before and after comparisons were conducted, predicted mortality rates are significantly off the mark, indicating that the this is still a fledgling science in many respects, even in developed countries like Spain with an established wind industry (Ferrer *et al.* 2012).

It is recommended that:

The EIA Phase will conduct the following activities:

- » The avifaunal specialist visits the site on two separate occasions, in order to obtain seasonal variance.
- » All identified issues will be investigated in more detail during the EIA phase, and rated according to the prescribed criteria.
- » Landscape factors relevant to this study will be investigated further, and the sensitivity zones described in this report will be "ground truthed" during the site visit, and updated where necessary.
- » The possible impacts of avifauna on the new infrastructure will be identified and discussed in more detail.
- » Suitable mitigation measures will be recommended for all issues identified as significant.
- » The extent to which displacement impacts actually occur will need to be determined through rigorous pre and post construction monitoring, and a protocol outlining details of such a monitoring programme (pre-construction monitoring has already commenced) will be supplied as an appendix to the final EIA report.
- » A site specific avifaunal EMP containing a monitoring programme pre and post construction will be developed and is seen as a critical next step to increase confidence, refine the sensitivity map and to strengthen the mitigation measures in order to have the least impact possible on avifauna in the area.

Impacts on bats:

The rocky outcrops on the northern and south-western border of the site are considered to be suitable roosting sites for bats. The site also offers highly seasonal surface water by means of the drainage channels running through the site. This surface water and soil moisture will attract insects, and in turn bats. Foraging may be limited on the site to these streams and channels. A total of 11 bat species may potentially occur on the site (based on distribution), and six have a high probability of occurring on the site, based on a highly precautionary approach. *Cistugo seabrae* has a moderate probability of occurring on the site and is listed as Near Threatened; however it is not a high flying bat and is presumably less vulnerable to turbine induced mortality. *Miniopterus natalensis* also have a medium probability of occurrence and is listed Near Threatened, considering behaviour and biology this species have a medium to high risk of being impacted on by turbines. From a desktop bat sensitivity point of view the site has a low to medium bat sensitivity. Some foraging habitat will be destroyed by the construction of the turbines and associated infrastructure. This impact is a negative and local impact that will be more significant during construction than during the operation of the wind energy facility. During the construction phase of the project possible bat roosts may be impacted by earthworks and large machinery. Winter roosts, often used for hibernation, may take bats closer to wind farms as their movement patterns change. Bats are known to use topographical features such as ridges to navigate during their migrations. In addition, they may use these features as temporary roosts, foraging areas and shortcuts.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Destruction of foraging habitat and roosts	A certain amount of habitat destruction will occur stemming from the concrete foundation of the turbines, access roads and associated infrastructure. Any reduction in habitat may result in a depletion of food supply for the bats and for this reason, careful consideration needs to be given to the siting of the wind turbines. Where vegetation patches are created by the removal or destruction of vegetation an increase in the movement of bats across the area can be expected	Local and Regional	No specific 'no go' areas have been identified at this stage; however habitat for bats (drainage line, mountainous terrain and rocky areas) are shown in Figure 7.4 and) will be investigated further during the EIA phase.

	as bats are forced to move from patch to patch to feed on insects.		

Gaps in knowledge & recommendations for further study:

The potential impacts on bats will be assessed in greater detail during the EIA phase of the project. The scoping evaluation was based on available information, which is limited to species reported to occur in the area.

It is recommended that:

» A site visit will be conducted in the EIA phase. This will confirm the suitable habitats present on the site, including buildings and other infrastructure present on the site, all of which could provide roosting or feeding facilities for bats.
» An assessment of the significance of direct, indirect and cumulative impacts on bats will be undertaken in the EIA phase.
» Recommendation regarding practical mitigation measures for potentially significant impacts
» An indication of the extent to which the issue could be addressed by the adoption of mitigation measures will be provided.
» Bat monitoring for two seasons has already been conducted, however the results of the monitoring will be discussed in greater detail in the EIA phase.

Information for the EIA phase would include the following monitoring techniques:

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

Potential impacts on Heritage Resources:

Given buffers are likely to be instituted around the farm werf, and water features (pans and streams), it is highly unlikely that significant archaeology or other above ground heritage material will be impacted. The only major impact that will be experienced is that to the sense of place. However, with so few people present in the landscape and the extreme remoteness of the site, the visual impact of the facility despite its size, will not affect many communities.

It can be concluded that the proposed site is suitable for the intended use and the Impact Assessment Phase should continue. No red flag issues have been identified. Two areas of high sensitivity are identified. These are around the structures and ruins at Namies South.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Impacts on archaeological and paleontological finds	The construction phase of the wind energy facility could directly impact on surface and subsurface archaeological sites. There is a medium to high likelihood of finding Stone Age sites scattered over the study area. There is an increased likelihood of finding material around pans if any occur within the study area. The construction of the wind farm facility could have a low to medium impact on a local scale.	Local	No 'no- go' areas have not been identified at this stage.
Impacts on historical finds	Construction activities such as clearing of vegetation and excavations could lead to the discovery or damage to heritage artefacts.	Local	No 'no- go' areas have not been identified at this stage.
Impacts on burials and cemeteries	The construction and operation of the wind energy facility could directly impact on marked and	Local	No 'no- go' areas have not been identified at this stage.

	unmarked graves. Graves dating to the Stone Age can be expected especially close to the river with more recent formal and informal cemeteries anywhere else on the landscape.		

Gaps in knowledge & recommendations for further study:

The study area was not subjected to a field survey as this will be done in the EIA phase. It is assumed that information obtained for the wider area is applicable to the study area.

It is recommended that:
During the EIA phase of the project it is suggested that in order to comply with the National Heritage Resources Act (Act No 25 of 1999) a Phase 1 Archaeological Impact Assessment must be undertaken. The following will form part of this study:

» Sites of archaeological, historical or places of cultural interest will be located, identified, recorded, photographed and described.
» The levels of significance of recorded heritage resources will be determined and mitigation proposed should any significant sites be impacted upon, ensuring that all the requirements of SAHRA are met.
» Significant impacts on palaeontological heritage resources due to the proposed wind energy facility are not anticipated. Therefore, pending the discovery of new fossil remains during development, no further specialist palaeontological heritage studies or mitigation are recommended for this project.

Potential noise impacts:

Wind Turbines do emit noises at sufficient levels to propagate over large distances. The fact that there would be a number wind turbines operating simultaneously in an area where there are noise-sensitive developments increase the possibility that a noise impact could occur. At this preliminary stage it is impossible to determine whether the significance of this noise impact would be low, medium or high.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Noise impacts due to construction equipment	Use of construction equipment on site will generate some level of noise.	Local	Cannot be determined at this stage.
Noise impacts due to construction traffic	Additional traffic to and from the site, as well as traffic on the site will be a significant noise source	Local	Cannot be determined at this stage.

Gaps in knowledge & recommendations for further study:

The potential impacts associated with noise will be assessed in greater detail during the EIA phase of the project. The scoping evaluation was based on available information. Predicted sound levels have only been included for illustrative purposes, as well as to indicate the potential overall spatial extent of noise impacts that wind turbines may have.

It is recommended that:

» A site visit to obtain information regarding background noise levels, the prevailing meteorological conditions during this background noise level survey, as well as confirming and identifying noise-sensitive developments,

» Currently identified (potential) Noise Sensitive Developments (NSDs) be investigated and any additional NSDs should be identified. Their relative sensitivity to noise impacts will be determined. This will be based on the SANS 10103 guideline, as well as current land uses on the properties (residential vs business/industrial).

» Using the data (proposed processes, noise characteristics of the selected equipment, locations of the wind turbine generators) as provided by the project developer, the predicted impact of the wind energy facility on NSDs must be predicted using the CONCAWE method as recommended by SANS 10357:2004 for the construction phase

» Using the calculated noise levels at the identified NSDs, the projected significance of the wind energy facility must be determined using the criteria as proposed (subject to possible changes after any stakeholder input). Further recommendations on the most suitable buffer zone can be made after more information is available for the proposed wind energy facility.

Potential impacts on the social environment:

The establishment of renewable energy facilities is supported at national and provincial level. The proposed site appears to be compatible with the spatial development vision of the Northern Cape Province and the NDM. The potential negative impacts associated with the construction phase include the presence of construction workers on the site, potential impact on farming activities and farm infrastructure and the movement of construction vehicles. The potential positive impacts relate to the creation of local employment and skills development opportunities. This represents a key benefit given the high unemployment and low income levels in the area.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Potential impact on rural sense of place.	This will be closely linked to the visual impacts associated with the wind turbines. The impact on sense of place is also linked to the associated 132 kV power line/s.	Local- Regional	None identified at this stage.
Impact on farming activities	Disruption of farming activities due to the presence of construction workers.	Local	N/A
Influx of job seekers into the area	The influx of job seekers may result in an increase in sexually transmitted diseases, including HIV/AIDS; increase in prostitution; increase in alcohol and drug related incidents; increase in crime; and creation of tension and conflict in the community.	Local	N/A
Employment creation	Creation of employment and business opportunities during the construction phase	Local	N/A
Skills development and training	Creation of potential training and skills development opportunities for local communities and businesses	Local and Regional	N/A

Promotion of clean, renewable energy	Provision of clean, renewable energy source for the national grid	Local, Regional and National	N/A
Potential threat to farm safety	The increase in the number of people in the area and construction workers could have potential threat on the safety of the surrounding farms.	Local	N/A
Potential damage of roads	The transportation of heavy equipment and increased traffic volumes mar result in the damage of roads in the area.	Local and Regional	N/A

Gaps in knowledge & recommendations for further study:

» The information contained in key policy and land use planning documents, such as the Northern Cape Growth and Development Plan etc., does not contain data from the 2011 Census. However, the relevant 2011 Census data is provided at a local and district municipal level.

Recommendation:

» Review of existing project information, including the Planning and Scoping Documents;
» Collection and review of reports and baseline socio-economic data on the area (IDPs, Spatial Development Frameworks etc);
» Site visit and interviews with key stakeholders in the area including local land owners and authorities, local community leaders and councillors, local resident associations and residents, local businesses, community workers etc;
» Identification and assessment of the key social issues and opportunities;
» Preparation of Draft Social Impact Assessment (SIA) Report, including identification of mitigation/optimisation and management measures to be implemented.

The following typical, generic project information is required in order to inform the Social Impact Assessment (Including all related infrastructure such as transmission lines, access roads, office and warehouse components):

» Comments received from I&APs during the public participation process, including comments reflected in the Final Scoping Report;
» A draft illustration (plan) of the proposed lay-out(s) of the wind turbines (including an indication of the phasing sequence on the site), supporting structures and infrastructure;
» Duration of the construction phase (months);
» Number of people employed during the construction phase;
» Breakdown of number of people employed in terms or low skilled, semi-skilled and skilled;

- Estimate of the total wage bill for the construction phase and breakdown in % as per skills categories;
- Estimate of total capital expenditure for construction phase;
- Indication of where construction workers will be housed (on site or in nearest town?);
- Opportunities for on-site skills development and training;
- Description of the typical activities associated with the construction phase, specifically on-site construction activities. This includes a description of how the large components associated with a wind energy facility will be transported to the site and assembled on the site;
- The size of the vehicles needed to transport the components and the routes that will be used to transport the large components to the site, and an estimate of the number of vehicle trips required and duration of each trip; and
- Information on the nature of the agreements with the affected landowners, specifically with regard to compensation for damage to land, infrastructure etc.

Table 8.2: Evaluation of potential impacts associated with the OPERATION PHASE of the proposed Wind Energy Facility

Potential Visual Impacts:

The visual character of the area is determined by a combination of topography, vegetation, buildings, infrastructural elements and land use patterns. The site location can be described as remote due to its considerable distance from any major metropolitan centres or populated areas. The study area is sparsely populated (less than 1 person per km2), with the highest concentration of people living in the town of Pofadder.

Very few homesteads and settlements are present within the study area. These include Lekdam, Samoep, Namies, Onder Namies, Neelsvlei, Dubip and Luttigshoop within a 10km radius of the proposed site.

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

The N14 national road is located in the north of the study area, just less than 20km from the proposed site, and the R358 bypasses the site some 10-15km to the east. Other than these main roads, a number of secondary roads cross the study area, mainly extending to the west and east.

The only other built infrastructure is a power line which traverses the study area (and the site) from west to east. There are no formally protected or conservation areas present within the study area, but the greater environment has a vast, undeveloped and rugged character. Settlements, where these occur, are very limited in extent and domestic in scale. The greater environment with its wide open, undeveloped landscapes is considered to have a high visual quality.

It is expected, from a visual impact perspective, that the wind turbines would constitute the highest potential visual impact of the renewable energy facility; therefore, the viewshed analysis for the facility was undertaken from a number of provisional turbine positions as at offsets of 150m above average ground level (i.e. the approximate 150m hub height of the proposed wind turbines).

This was done to determine the general visual exposure of the area under investigation, simulating the proposed turbine structures associated with the facility. It must be noted that the viewshed analysis does not include the effect of vegetation cover or existing structures on the exposure of the proposed wind turbines, therefore signifying a worst-case scenario.

Figure 8.4 indicates areas from which any number of turbines (with a minimum of one turbine) could potentially be visible as well as proximity offsets from the proposed development area.

The following is evident from the viewshed analyses:

- The proposed facility will have a large core area of potential visual exposure on the project site itself, and within a 5km radius thereof. The low mountains to the north and north-west of the site offer some visual screening to the areas beyond.
- Potential sensitive visual receptors within this visually exposed zone include users of the secondary roads to the north-west and residents of the settlements of Namies, Onder Namies, and Neelsvlei.
- Potential visual exposure remains high in the medium distance (i.e. between 5 and 10km), with visually screened areas in the north west (beyond the low mountains).
- Sensitive visual receptors comprise users of secondary roads to the west, north-west and south-west of the site as well as residents of homesteads and settlements. The latter include Lekdam, Dubip and Luttigshoop.
- In the longer distance (i.e. beyond the 10km offset), the extent of potential visual exposure is slightly reduced, especially in the north west and north east of the study area. Visually exposed areas tend to be concentrated more in the south. Sensitive visual receptors include users of stretches of the N14 in the north, and of the R358 in the east. In addition, users of secondary roads within the study area and residents of homesteads and settlements, particularly in the south, may be visually exposed.
- The town of Pofadder lies more than 20km from the proposed site, but will not be visually exposed to the proposed facility. Other receptor sites at this distance, despite lying within the viewshed, are not likely to visually perceive the facility.

Issue	Nature of Impact	Extent of Impact	'No go' areas
The visibility of the facility from, and potential visual impact on observers travelling along arterial roads and secondary roads in close proximity[12] to the proposed facility and within	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.

[12] For the purpose of this study, close proximity is considered to be within 10km of the proposed wind energy facility. This would be a medium distance view where the structures would be easily and comfortably visible and constitutes a high visual prominence.

the region[13].			
The potential visual impact on the town of Pofadder.	Visual exposure to wind turbines and associated infrastructure.	Local	None
The visibility of the facility from, and potential visual impact on residents of homesteads and settlements in close proximity to the proposed facility and within the region.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
The potential visual impact of ancillary infrastructure (i.e. the substation, overhead power lines, internal access roads, workshop and office) on observers in close proximity to the proposed facility.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
The potential visual impact of the proposed facility on the visual quality of the landscape and sense of place region.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
The potential visual impact of operational, safety and security lighting of the facility at night on observers in close proximity to the facility.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
Potential cumulative visual impacts of the wind energy facility and associated infrastructure.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
Gaps in knowledge & recommendations for further study: The study was undertaken using Geographic Information Systems (GIS) software as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed facility. A detailed Digital Terrain Model (DTM) for the study area was created from 20m interval contours supplied by the			

[13] For the purpose of this study, the region is considered to be beyond the 10km radius of the proposed wind energy facility. This would be a longer distance view where the facility would become part of the visual environment, but would still be visible and constitutes a medium to low visual prominence.

Surveyor General.

It is recommended that the following tasks are undertaken during the EIA phase:

» Establishment of view catchment area, view corridors, viewpoints and receptors;
» Indication of potential visual impacts using established criteria (to be provided by Savannah Environmental and adapted as necessary for applicability to Visual Impact Assessment);
» Assessment of potential lighting impacts at night;
» Description of alternatives, mitigation measures and monitoring programmes;
» Review by independent, experienced visual specialist (if required);
» 3D modelling and photo-simulations / photomontages, with and without mitigation; and
» Review by independent, experienced visual specialist (if required).

It is recommended that the visual impacts be assessed against the following criteria during the EIA phase:

» Visibility of the project;
» Visual exposure;
» Degree of visual intrusion (including the degree of contrast);
» Visual sensitivity of the area;
» Viewer sensitivity;
» Observer proximity; and
» Visual absorption capacity (VAC) of the vegetation and other elements.

Where applicable, the above mentioned criteria will be discussed and numerically weighted according to extent, duration, intensity, probability of occurrence, confidence levels, nature, consequence and significance.

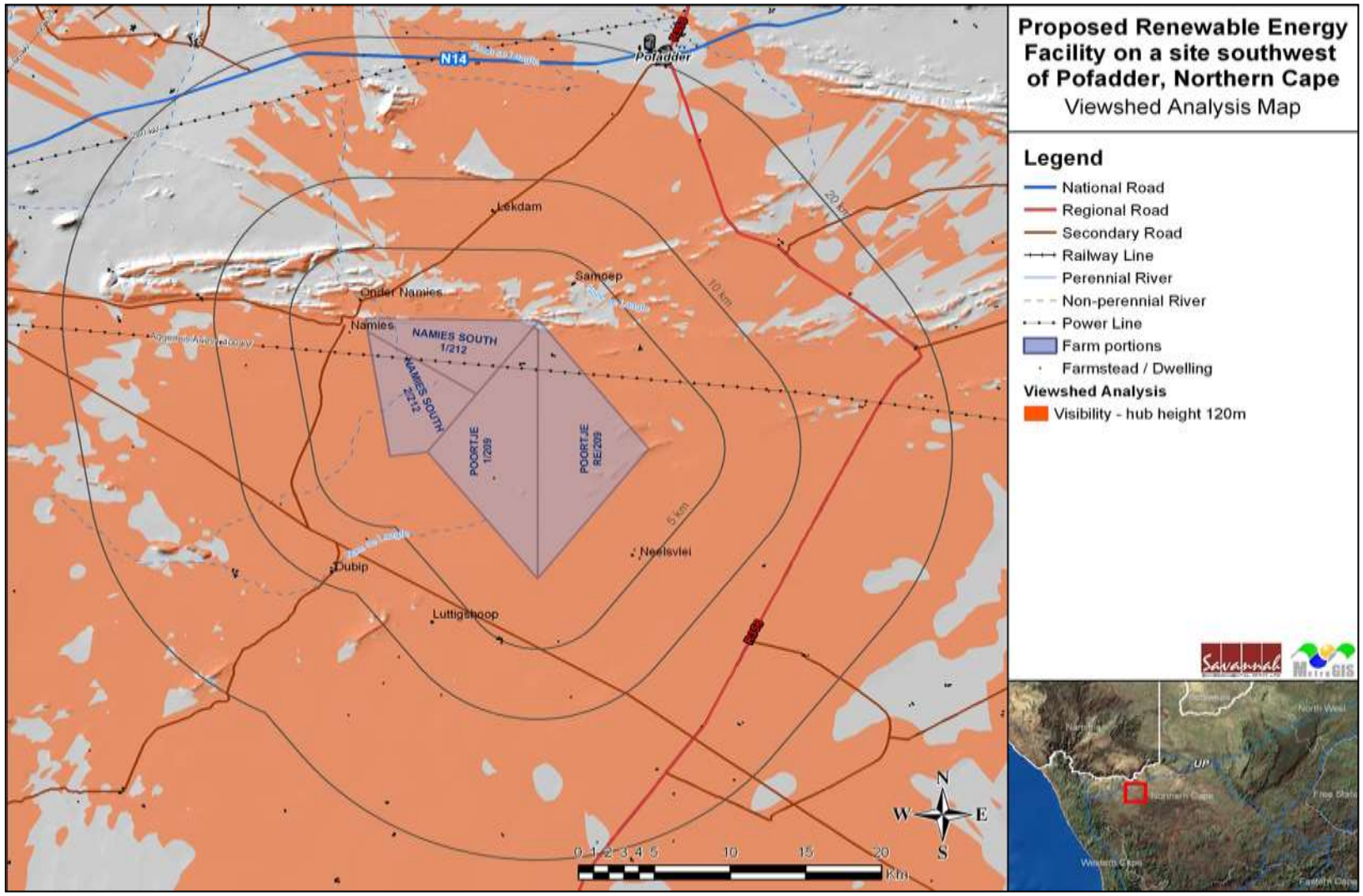

Proposed Renewable Energy Facility on a site southwest of Pofadder, Northern Cape
Viewshed Analysis Map
Legend
National Road
Regional Road
Secondary Road
Railway Line
Perennial River
Non-perennial River
Power Line
Farm portions
Farmstead / Dwelling
Viewshed Analysis
Visibility - hub height 120m
N14
Pofadder
Leekdam
Onder Namies
Namies
Samoep
NAMIES SOUTH 1/212
NAMIES SOUTH 2/212
POORTJIE 1/209
POORTJIE RE/209
Neelsvlei
Dubip
Luttigshoop
20 km
10 km
5 km
N
S
E
W
0 1 2 3 4 5 10 15 20
Km

Figure 8.4: Cumulative Viewshed analysis for the proposed Wind Energy Facility

Impacts on Avifauna:

The effects of a wind energy facility on birds are highly variable and depend on a wide range of factors including the specification of the development, the topography of the surrounding land, the habitats affected and the number and species of birds present. With so many variables involved, the impacts of each wind farm must be assessed individually. The principal areas of concern with regard to effects on birds are listed below. Each of these potential effects can interact with each other, either increasing the overall impact on birds or, in some cases, reducing a particular impact (for example where habitat loss or displacement causes a reduction in birds using an area which might then reduce the risk of collision).

» Collision mortality on the wind turbines
» Collision with the proposed power line
» Displacement due to disturbance
» Habitat change and loss

It is important to note that the assessment is made on the status quo as it is currently on site. The possible change in land use in the broader development area is not taken into account because the extent and nature of future developments are unknown at this stage. It is however highly unlikely that the land use will change in the foreseeable future.

One of the aims of this scoping report is to do a preliminary identification of sensitive areas from an avifaunal perspective. Three sensitivity classes were created namely low, medium and high. Figure 8.5 below indicates the spatial location of these areas. It must be stressed that this is a preliminary classification, and subject to revision as the pre-construction monitoring progresses and the avifaunal dynamics of the site become clearer. The sensitivity of the site in terms of habitat and fight paths for birds is shown in Figure 8.5 are classified as follows:

» **High sensitivity: Included in this area is a 1km no development buffer area around the existing Martial Eagle nest.** Although the nest was not active at the time of the site visit in July 2012, it may well become active again. Prey remains under the nest and fresh droppings indicate that the site may have been active in the not too distant past. The buffer is recommended too reduce the risk of disturbance and collision, should the birds decide to breed there again. Also included under the high risk area is a 200m buffer no development zone around water points. Water points are draw cards for several species, including priority raptors which breed in the trees (e.g. Southern Pale Chanting Goshawk at water point 5) or use the troughs for bathing and drinking. Lanner Falcons and other priority raptors may also hunt small birds at the water points, which could result in them being distracted and colliding with turbines.

» **Medium sensitivity:** This includes an area that is deemed to be the most suitable area within the broader development area for Red Lark. The species is generally sedentary and resident, but local movement triggered by environmental conditions can occur. Only one pair of Red larks was recorded during the site visit, which may point to the broader development area not being optimal habitat for the species. The species is generally associated with red dunes and large seeded grasses, and in optimal habitat, such as the Koa Valley, densities of approximately 1 pair/30 ha can be expected. Although this habitat is present in the broader development area, it is not the dominant habitat. This area should be carefully monitored during the pre-construction programme, to establish if the species is present in larger numbers. At this stage of the investigation, this area need not be excluded from the development area, subject to the results of further monitoring during pre-construction.

» **Low sensitivity:** The remainder of the broad development area is deemed to be of low sensitivity, subject to further pre-construction monitoring. It should however be pointed out that the occurrence of the nomadic Ludwig's Bustard is linked to rainfall events (Hockey *et al* 2005), and numbers of the species, even flocks, may occur all over the development area after rains (this was confirmed by Mr Jan van Niekerk). The whole development area may therefore become temporarily more sensitive while Ludwig's Bustard is present in the area, which is more likely during the late summer/early autumn (February-April), when the majority of rainfall occurs. However, given the evidence currently on bustard interactions with wind farms, this might not automatically result in high collision risk as the birds may well avoid the wind farm entirely.

Issue	**Nature of Impact**	**Extent of Impact**	**'No go' areas**
Collisions of birds with turbines.	Collision with turbine blades	Regional - The impact will occur at the site of the proposed Wind farm, but will have an impact at a more regional level, since it affects entire populations of affected species and may affect migration routes of species.	Figure 7.5 shows area of high avifaunal sensitivity which may be no –go areas and will be investigated further during the EIA phase. These areas include a 1km buffer around a martial eagle nest and 200m around water points/ dams.
Habitat loss – destruction, disturbance and displacement	Habitat loss – destruction, disturbance and displacement due to operation of the facility	Local	
Impacts of associated infrastructure such as power lines.	Due to electrocution with associated power lines as well as the maintenance of substations, power lines, servitudes and roadways. This causes both	Local to Regional	

	temporary and permanent habitat destruction and disturbance.		

Gaps in knowledge & recommendations for further study:

- Any inaccuracies in the above sources of information could limit this study. In particular, the SABAP1 data is now 14 years old (Harrison *et al* 1997).

It is recommended that:

» The micro habitats on site will be assessed for their suitability for the key species.
» The sensitivity zones and suitable buffer zones be identified and mapped.
» The impacts identified in this scoping phase study be assessed formally.
» If a pre-construction bird monitoring programme be initiated.

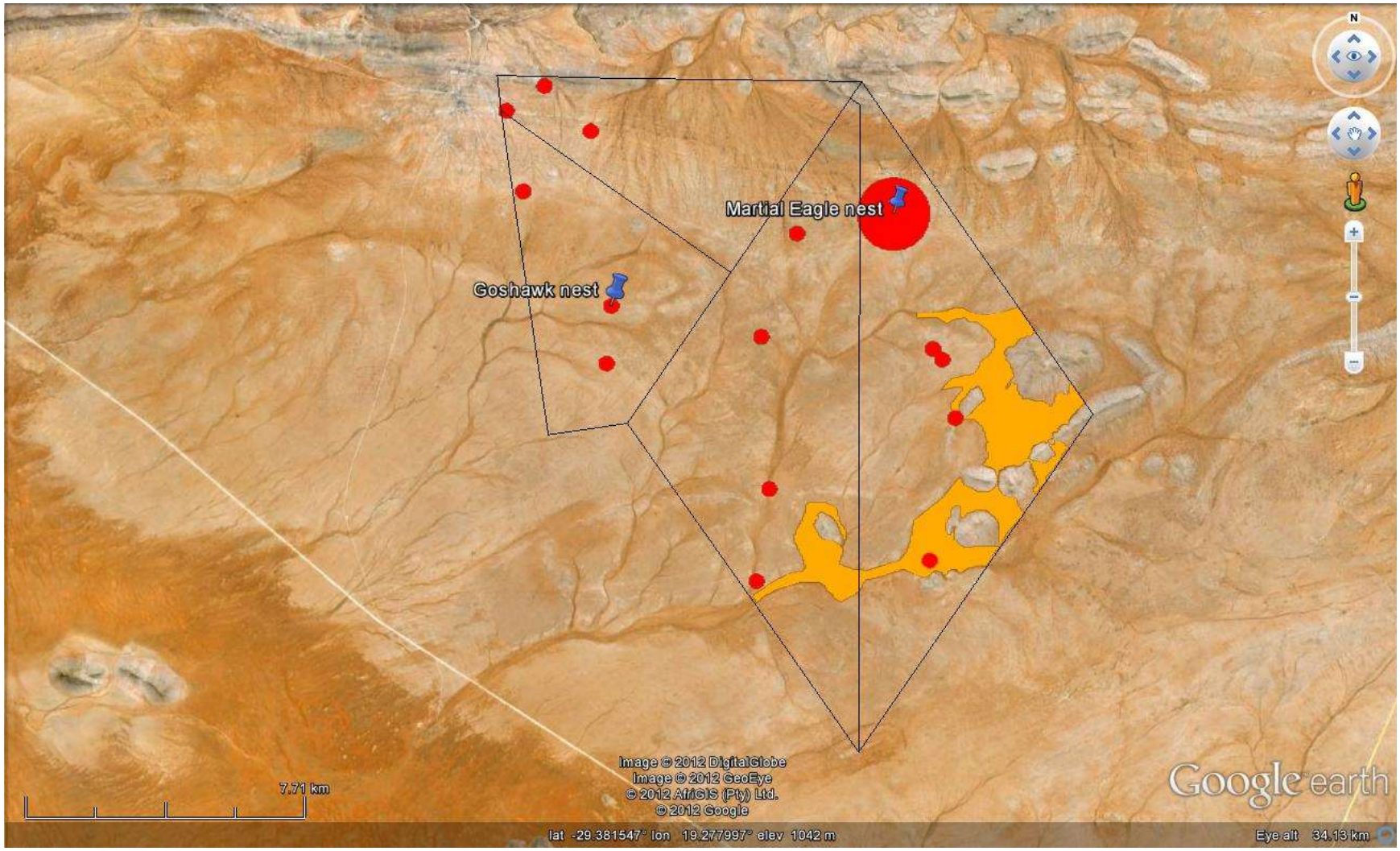


Figure 8.5: Preliminary delineation of sensitive avifaunal habitat. Red = High sensitivity, Yellow = medium sensitivity

Impacts on bats:

The three main hypotheses proposed for bat mortalities associated with wind energy facilities are as follows:

» Collision – a small percentage of the dead bats found show signs of physical injury resulting from collision from the blades of wind turbines (Handwerk 2008).
» Changes in flight patterns – these may be caused by the use of topographical features to migrate, for mating behaviour and because of possibly 'turning-off' their echolocation systems (Cryan undated). Wind turbines may also form barriers to their annual migration and/or daily commutes (Cryan 2011).
» Barotrauma – the sudden drop in air pressure at wind farms causes a bat's lungs to rapidly expand resulting in the death of the bat (Handwerk 2008).

A total of 11 bat species may occur on the site and six have a high probability of occurring on the site, based on a highly precautionary approach. *Cistugo seabrae* has a moderate probability of occurring on the site and is listed as Near Threatened; however it is not a high flying bat and is presumably less vulnerable to turbine induced mortality. *Miniopterus natalensis* also have a medium probability of occurrence and is listed Near Threatened, considering behaviour and biology this species have a medium to high risk of being impacted on by turbines. From a desktop bat sensitivity point of view the Pofadder site has a low - medium bat sensitivity. According to the two seasonal bat monitoring report, the activity recorded indicated moderate levels of bat activity across the site despite the arid local climate and low habitat complexity of the site, features more commonly associated with low bat activity.

Figure 8.6 shows the areas where natural bat roosting space could potentially be available have been marked as sensitive (red shading), and includes the mountainous terrain and rocky outcrops on the site. Possible foraging areas have also been highlighted (orange shading). For the purpose of this study a buffer of 100 m around inland water bodies and 200 m around drainage lines are appropriate. The shaded areas and their buffers indicate areas which may be marked as sensitive during the EIA phase assessment, however the buffers will be detailed and confirmed based on field work..

Issue	Nature of Impact	Extent of Impact	'No go' areas
Bat mortalities due to blade collisions and barotrauma	Rotating turbine blades	Regional - The impact will occur at the site of the proposed wind farm, but will have an impact at a more regional level, since it affects entire	Cannot be determined at this stage.

		populations of affected species and may affect migration routes of species	
Habitat Destruction	Habitat destruction stemming from the concrete foundation of the turbines, access roads and associated infrastructure	Local	Cannot be determined at this stage.

Gaps in knowledge & recommendations for further study:

Gaps in knowledge:

» There is limited information available on bat presence and abundance in the South Africa and for this reason this scoping report has concentrated on bats known to occur in the province rather than the specific locality.

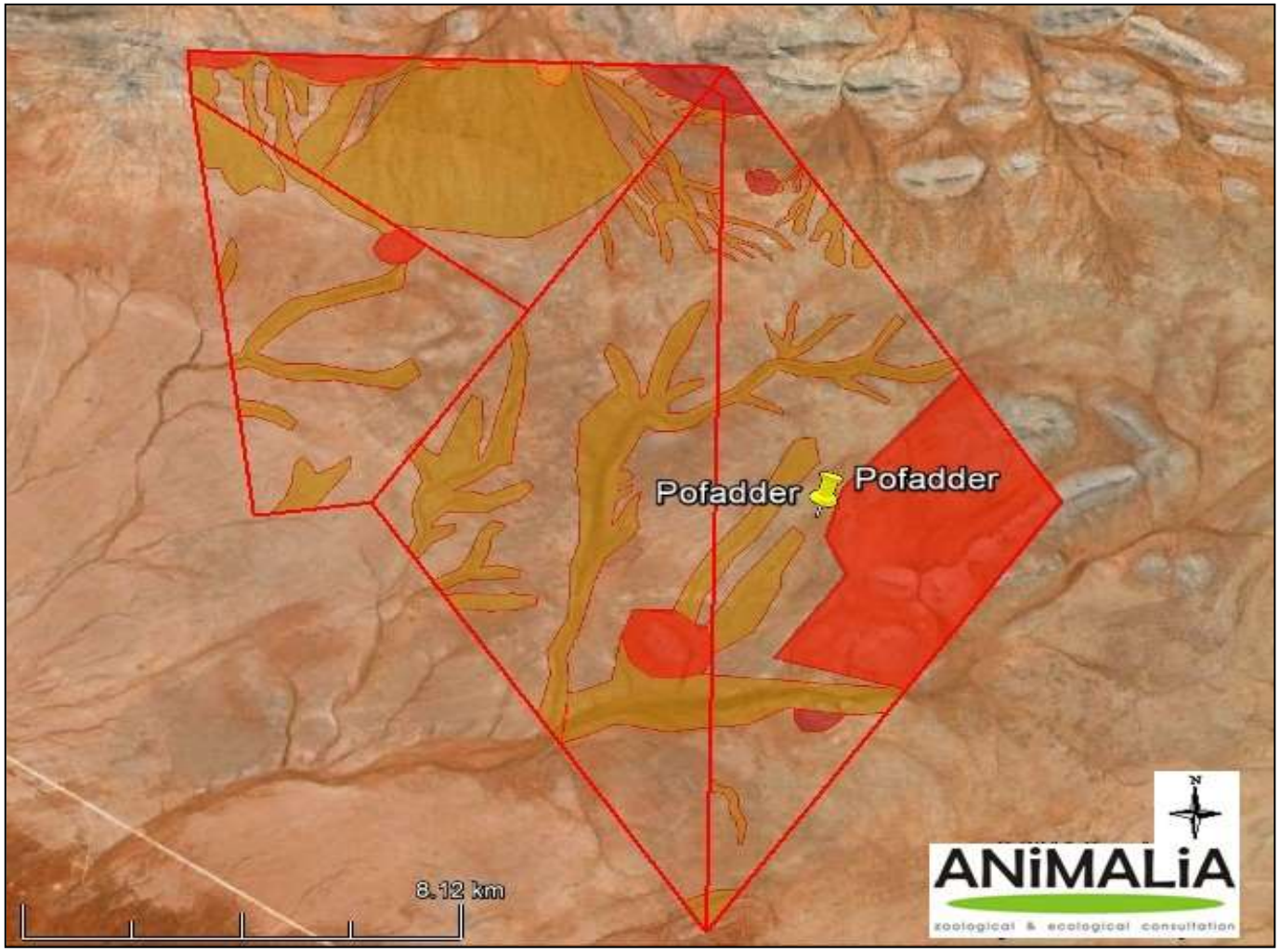
It is recommended that:

» An assessment of the significance of direct, indirect and cumulative impacts.

» Information for the EIA phase would include the following monitoring techniques:
  - Species presence estimates determined through the use of a bat detector system operated whilst driving transect lines across the farm
  - Surveys to assess and identify potential key areas for roosting such as (but not limited to) buildings, underground sites and trees
  - Further roost investigation will be conducted if any areas adjacent to the site are identified and having a high chance of having suitable roost sites
  - Roost surveys will be conducted during day-light hours as well as at dusk and dawn at all infrastructure currently present on the farm;

  General guidance for carrying out manual bat surveys (i.e. driven transects) suggests that they only take place in optimum weather conditions in order to maximise the likelihood of recording bats if they use the site being surveyed. It is advised to avoid heavy rain, strong winds and low temperatures, when bats are least likely to fly in these conditions.

» A bat monitoring program may assist with knowledge of wind energy and bat interaction in South Africa. A bat monitoring has been commissioned for this site. It will be beneficial to collaborate with academic institutions to promote research on the subject, doing affordable long term monitoring and determining the risks more accurately.



Areas that can possibly support bat roosting Most probable foraging areas

Figure 8.6: Desktop based bat sensitivity map of wind energy facility site

Potential Heritage Impacts:

Potential impacts on heritage resources as a result of the operation of the wind farm relate to visual impacts on areas around heritage structures and cultural landscapes, as well as impacts on sense of place. The heritage scoping study revealed that the following heritage sites, features and objects that can be expected within the study area:

» Archaeological finds
» Historical finds

Issue	Nature of Impact	Extent of Impact	'No go' areas
Built environment	Physical structural appearance of the wind farm.	Local	No 'no- go' areas have been identified at this stage.
Cultural landscapes and sense of place	Physical structural appearance of the wind farm.	Unknown at this stage of impact assessment	No 'no- go' areas have been identified at this stage.

Gaps in knowledge & recommendations for further study:

The potential impacts on heritage artefacts will be assessed in greater detail during the EIA phase of the project.

Recommendations:

During the EIA phase of the project it is suggested that in order to comply with the National Heritage Resources Act (Act No 25 of 1999) a Phase 1 Archaeological Impact Assessment must be undertaken. The following will form part of this study:

» Sites of archaeological, historical or places of cultural interest will be located, identified, recorded, photographed and described.
» The levels of significance of recorded heritage resources will be determined and mitigation proposed should any significant sites be impacted upon,

Potential Noise Impacts:

Noise emitted by wind turbines can be associated with two types of noise sources. These are aerodynamic sources due to the passage of air over the wind turbine blades and mechanical sources which are associated with components of the power train within the turbine, such as the gearbox and generator and control equipment for yaw, blade pitch, etc. These sources normally have different characteristics and can be considered separately. In addition there are other less significant noise sources, such as the substations, traffic (maintenance) and transmission line noise.

Increased noise levels can directly be linked with the various activities associated with the operational phase of the activity. During this evaluation, more focus was placed on the impacts on the surrounding noise environment during times when a quiet environment is highly desirable. Noise limits should therefore be appropriate for the most noise-sensitive activity. Noise-sensitive activities such as sleeping, or areas used for relaxation or other activities (places of worship, school, etc) should determine appropriate Zone Sound Levels. However, for the noise Scoping report the $L_{Req,N}$ of **35dBA** as proposed by SANS 10103 was used.

The most common sources of noise during the operational phase include:

» Aerodynamic noise, which is emitted by a wind turbine blade (sound of the wind turbine "cutting" wind – low frequency noise);
» Mechanical noise (from the gear-box / generator);
» Transformer noises (substation);
» Transmission Line noise (Corona noise);
» Low frequency noise; and
» Amplitude modulation of the sound emissions from the wind turbines.

The worst case scenarios as indicated in the noise study (Appendix J) illustrates the situation where atmospheric conditions are favourable for sound propagation, with the wind speeds above the cut-in speeds of the Wind Turbine Generator (WTG), but before wind induced noises start to mask the noises from the wind turbines. Three noise receptors have been identified as shown in Figure 8.7. An appropriate buffer will have to be determined around these identified sensitive receptors during the EIA phase.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Noise impacts associated with the operation of the wind energy facility.	The noise will be a combination of the cumulative effects of multiple wind turbines operating at night. Based on the preliminary impact estimations (as	Regional (i.e. beyond the site boundaries). The noise could impact on receptors	Three noise receptors have been identified as shown in Figure 7.7. An appropriate

	detailed in the noise specialist report contained within Appendix J) there are three potential noise-sensitive developments (NSD) within the potential area of influence. This, however, needs to be confirmed through detailed modelling of the preliminary layout in the EIA phase of the process.	within the potential area of influence (worst case scenario – wind blowing from wind farm towards receptor).	buffer will have to be determined around these identified sensitive receptors during the EIA phase.

Gaps in knowledge & recommendations for further study:

Gaps in knowledge:

» There is no information available regarding the existing soundscape of the area.

» Projected impacts from the construction phase can only be modelled once more information regarding the duration of construction and equipment used are known.

It is recommended that:

» A site visit be undertaken to obtain information regarding background noise levels, the prevailing meteorological conditions during this background noise level survey, as well as confirming and identifying Noise-sensitive developments.

» Currently identified (potential) Noise Sensitive Developments (NSDs) will be investigated during the EIA phase, and any additional NSDs will be identified. Their relative sensitivity to noise impacts will be determined. This will be based on the SANS 10103 guideline, as well as current land uses on the properties (residential vs business/industrial).

» Using the data (proposed processes, noise characteristics of the selected equipment, locations of the wind turbine generators) as provided by the project developer, the predicted impact of the facility on NSDs will be predicted using the CONCAWE method as recommended by SANS 10357:2004 for both the construction and operational phases, as well as the ISO 9613-2 model for the operational phase.

» Using the calculated noise levels at the identified NSDs, the projected significance of the facility (whether construction or operational) will be determined using the criteria as proposed (subject to possible changes after any stakeholder input). Further recommendations on the most suitable buffer zone can be made after more information is available for the proposed facility.

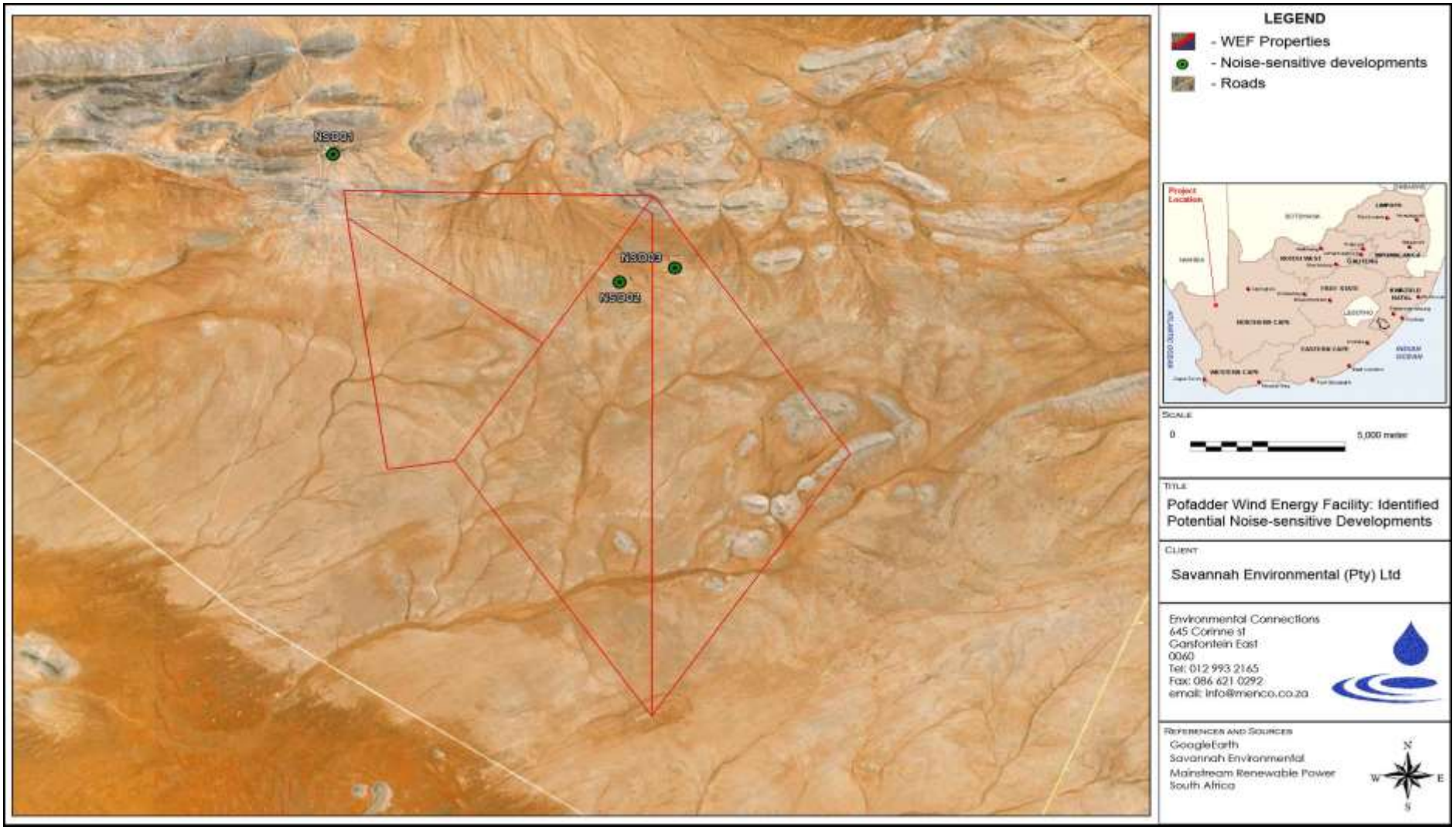


Figure 8.7: Aerial image indicating identified Noise-sensitive developments around the site

Potential Social Impacts:

During the operation phase the potential exists for further, albeit limited, job creation and some skills development (positive impacts). However, there is also the potential for impacts on the social dynamics of the study area. The proposed project could assist with decreasing South Africa's dependency on coal generated electricity thereby strengthening the electricity grid in an "environmentally friendly" way. On a regional scale it could possibly result in positive changes in the quality of lives of many individuals currently living without an efficient and satisfactory electricity supply. On a national scale, the proposed project would also assist in meeting the South African government's target for renewable energy.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Potential impacts on existing tourism and tourism potential of the area	This is considered to be low as the area is not seen as a tourist destination	Local-regional	N/A
Potential visual and sense of place impacts on existing receptors, including nearby rural residences.	Impact closely linked to visual impacts, associated with turbines and associated infrastructure, the power lines proposed.	Local-regional	N/A
Potential impact on job creation.	Creation of opportunities to local business during the operational phase, including but not limited to, provision of security, staff transport, and other services.	Local and Regional	N/A
Potential impact on economic opportunities.	There are potential up and down-stream economic opportunities for the local, regional and national economy.	Local, Regional and National	N/A

Gaps in knowledge & recommendations for further study:

The potential social and socio-economic impacts will be assessed in greater detail during the EIA phase of the project.

It is recommended that:

» Review of existing project information, including the Planning and Scoping Documents will be done;
» Collection and review of reports and baseline socio-economic data on the area (IDPs, Spatial Development Frameworks etc);
» Site visit and interviews with key stakeholders in the area including local land owners and authorities, local community leaders and councillors, local resident associations and residents, local businesses, community workers etc.;
» Identification and assessment of the key social issues and opportunities;
» Preparation of Draft Social Impact Assessment (SIA) Report, including identification of mitigation/optimisation and management measures to be

implemented.

Table 8.3: Evaluation of potential Cumulative Impacts associated with the Poortjies Wind Energy Facility

Approach to Cumulative Effects Assessment

Cumulative impacts, in relation to an activity, refer 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. For cumulative effects analysis to help the decision-maker and inform interested parties, it must be limited to effects that can be evaluated meaningfully (DEAT, 2004). Boundaries must be set so analysts are not attempting to measure effects on everything. Therefore, the cumulative impacts associated with the proposed Wind Energy Facility near Pofadder have been viewed from two perspectives within this EIA:

III. Cumulative impacts associated with the scale of the project,
IV. Cumulative impacts associated with a) other relevant wind or solar (renewable) projects that have been approved (received an Environmental Authorisation), b) projects which have been awarded preferred bidder status by the Department of Energy and are planned to be constructed in the area within the immediate term, or c) projects which are existing.

Cumulative effects are commonly understood as the impacts which combine from different projects and which result in significant change, which is larger than the sum of all the impacts (DEAT, 2004). The complicating factor is that the projects that need to be considered are from past, present and reasonably foreseeable future development. Cumulative effects can be characterised according to the pathway they follow. One pathway could be the persistent additions from one process. Another pathway could be the compounding effect from one or more processes. Cumulative effects can therefore occur when impacts are:

* additive (incremental);
* interactive;
* sequential; or
* synergistic.

Canter and Sadler (1997) describe a three step process for addressing cumulative effects in an EIA:

* delineating potential sources of cumulative change (i.e. GIS to map the relevant wind energy facilities in close proximity to one another).
* identifying the pathways of possible change (direct impacts)
* indirect, non-linear or synergistic processes; and

* classification of resultant cumulative changes.

» **Potential Cumulative Impacts**

The cumulative impacts associated with the proposed Poortjies wind energy facility at a site level are expected to be associated with the scale of the project, i.e. wind turbines which will be located on the proposed site. The potential direct cumulative impacts associated with the project are expected to be associated predominantly with the potential visual impact, ecology and soils and positive social impacts. These cumulative effects can only be assessed once a preliminary layout is available, and will be considered in the detailed specialist studies to be undertaken in the EIA phase.

In addition to cumulative impacts at a site level, cumulative impacts could be associated with this proposed development and other similar developments in the area as listed above. It is important to describe the potential cumulative impacts which may be expected in order to obtain a better understanding of these impacts and the possible mitigation that may be required. The cumulative impacts associated with the proposed facility primarily refer to those impacts associated with visual (including impacts on the cultural landscape), ecological, avifaunal and social impacts, and are mainly associated with the existing projects/ projects under construction and planned facilities in the area.

Potential cumulative impacts associated with numerous solar and/ wind energy facilities within the study area are expected to be associated with:

» *Visual impacts* – The most significant impact associated with the proposed development is the visual impact on the scenic resources and cultural landscape of this region imposed by the components of the facility.
» *Ecology* – natural vegetation within the study area is largely impacted by agricultural activities, and is formally conserved only to a limited extent. Although a wind energy facility generally results in permanent disturbance a small percentage of a broader site, any impacts on natural vegetation in this area are considered significant. Therefore, numerous developments (regardless of their nature) within the study area are expected to have an impact on vegetation at a regional level. However, it must be noted that this impact can be effectively avoided through the placement of infrastructure outside of natural vegetation and sensitive habitats.
» *Avifauna* – Cumulative loss of avifauna habitat associated with development may be an issue in the area. Risk to avifauna resulting from collisions is limited to power lines and solar infrastructure, with no other wind projects proposed in the immediate surrounding area.
» *Social* – The development of numerous renewable energy facilities within the study area will have a cumulative impact on several existing issues within the area, predominately within rural settlements associated with the potential influx of workers and job seekers. With the increased population density, this may lead to a cumulative impact on housing requirements, services (i.e. water, electricity and sanitation), health issues, safety and security. New informal townships are unlikely to have the required infrastructure and services. With the existing rural settlements in the

area this will have a cumulative impact on the environment and health (i.e. in terms of ablution facilities). The main social impact, however, will be in terms of visual impacts and associated impacts on sense of place.

» *Positive impacts* - Cumulative positive impacts are, however, also anticipated should a number of similar wind or solar energy developments be developed in the area, largely due to job creation opportunities, business opportunities for local companies, skills development and training. The development of renewable energy facilities will have a positive impact at a national and international level through the generation of "green energy" which would lessen South Africa's dependency on coal generated energy and the impact of such energy sources on the bio-physical environment. The proposed project would fit in with the government's aim to implement renewable energy projects as part of the country's energy generation mix over the next 20 years as detailed in the Integrated Resource Plan (IRP)) and the Northern Cape SDF.

CONCLUSIONS FOR THE POORTJIES WIND ENERGY FACILITY CHAPTER 9

This chapter only deals with the conclusion regarding the wind component of the renewable energy facility under DEA reference number **14/12/16/3/3/2/681.** South Africa Mainstream Renewable Power Developments (Pty) Ltd (Mainstream) is proposing to establish a commercial wind energy facility component as well as associated infrastructure on a site located approximately 22 km south-west of Pofadder in the Northern Cape Province. A broader area of approximately 175 km^2 is being considered within which the facility is to be constructed.

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

- Foundations to support both the turbine towers;
- Cabling between the project components, to be lain underground where practical;
- Permanent wind monitoring masts.
- Common infrastructure between the wind energy facility and the solar energy facility will include:
  - A 400 kV substation and satellite 132 kV substations to facilitate grid connection via a loop-in loop-out connection to the existing Eskom Aggenys–Aries 400kV power line which traverses the site;
  - Internal access roads;
  - Laydown area for construction;
  - Operations and maintenance buildings; and
  - Workshop area for maintenance and storage.

The Scoping Study for the proposed **Poortjies Wind Energy Facility** associated infrastructure has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of GN R543, R544, R545 and R546 (18 June 2010 as amended), in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). This project was registered with the National Department of Environmental Affairs under application reference number **14/12/16/3/3/2/681.**

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

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

A summary of the conclusions of the evaluation of the potential impacts identified to be associated the proposed wind farm and associated power line is provided below. Recommendations regarding investigations required to be undertaken within the EIA are provided within the Plan of Study for EIA, contained within Chapter 12 of this report.

South Africa Mainstream Renewable Power Developments (Pty) Ltd (Mainstream) is proposing to establish a commercial wind energy facility component as well as associated infrastructure on a site located approximately 22 km south-west of Pofadder in the Northern Cape Province. A broader area of approximately 175 km^2 is being considered within which the facility is to be constructed.

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

» Foundations to support both the turbine towers;
» Cabling between the project components, to be lain underground where practical;
» Permanent wind monitoring masts.
» Common infrastructure between the wind energy facility and the solar energy facility will include:
  * A 400 kV substation and satellite 132 kV substations to facilitate grid connection via a loop-in loop-out connection to the existing Eskom Aggenys–Aries 400kV power line which traverses the site;
  * Internal access roads; and
  * Workshop area for maintenance and storage.

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

In identifying and evaluating impacts associated with the proposed wind energy facility, it has been assumed that although during operation, the area affected will comprise of wind turbines (depending on which turbine types are ultimately chosen by the developer) and associated infrastructure, during construction much of the ~175km^2 of the proposed site could suffer some level of disturbance. However, once construction is complete, only a small portion of this area (estimated at ~5%) will be permanently impacted by infrastructure associated with the wind energy facility.

Table 9.1 and 9.2 summarises the potential issues associated with the wind energy facility that have been identified through this 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 range from local to regional in extent. No environmental fatal flaws were identified to be associated with the site. However, areas of potential sensitivity including potential noise / visual sensitive receptors, heritage artefacts, bird and bat sensitive areas, drainage lines and habitats for protected flora and fauna were identified through the scoping phase. These areas of sensitivity are illustrated in the sensitivity map included as Figure 9.1.

Table 9.1: Potential impacts associated with the Construction/ Decommissioning Phase with the proposed Poortjies Wind Energy Facility near Pofadder

Impacts resulting from the Construction/ Decommissioning Phase	Extent
Potential visual impacts associated with the construction phase	L
Potential visual impact of the construction of ancillary infrastructure on observers in close proximity	L
Loss of agricultural land	L
Soil degradation due to contamination	L
Soil erosion due to increased and concentrated storm water run-off	L
Soil erosion due to trampling by vehicles and equipment, as well as construction activities	L
Siltation of watercourses and other natural resources down stream	R
Dust production	L
Impacts on listed and protected plant species during site clearing	L
Alien plant invasion, habitat fragmentation and loss of landscape connectivity	L
Loss of bird habitat due to construction of the wind energy facility.	L
Disturbance of birds	L
Displacement of birds from the site and barrier effects	L-R
Destruction of foraging habitat and roosts for bats	L-R
Impacts on archaeological and paleontological finds	L
Impacts on historical finds	L
Impacts on burials and cemeteries	L
Noise impacts due to construction equipment	L
Noise impacts due to construction traffic	L
Impact on rural sense of place	L
Impact on farming activities	L
Influx of job seekers into the area	L
Employment creation (positive impact)	L

Impacts resulting from the Construction/ Decommissioning Phase	Extent
Skills development and training (positive impact)	L-R
Promotion of clean, renewable energy (positive impact)	L-R

L **Local** R **Regional** N **National** I **International**

Table 8.2: Potential impacts associated with the Operational Phase of the proposed Poortjies Wind Energy Facility near Pofadder

Impacts resulting from the Operational Phase	Extent
The visibility of the facility from, and potential visual impact on observers travelling along arterial roads and secondary roads in close proximity to the proposed facility and within the region.	L
The potential visual impact on the town of Pofadder	L
The visibility of the facility from, and potential visual impact on residents of homesteads and settlements in close proximity to the proposed facility and within the region.	L
The potential visual impact of ancillary infrastructure (i.e. the substation, overhead power lines, internal access roads, workshop and office) on observers in close proximity to the proposed facility.	L
The potential visual impact of the proposed facility on the visual quality of the landscape and sense of place region.	L
The potential visual impact of operational, safety and security lighting of the facility at night on observers in close proximity to the facility.	L
Potential cumulative visual impacts of the wind energy facility and associated infrastructure.	L
Collisions of birds with turbines	R
Habitat loss for avifauna as a result of destruction, disturbance and displacement	L
Impacts of associated infrastructure on avifauna	L-R
Bat mortalities due to blade collisions and barotrauma	R
Bat Habitat Destruction	L
Heritage impacts associated with the built environment	L
Impacts on the cultural landscapes and sense of place	Unknown

Impacts resulting from the Operational Phase	Extent
Noise impacts associated with the operation of the wind energy facility	R
Potential impacts on existing tourism and tourism potential of the area	L-R
Potential visual and sense of place impacts on existing receptors, including nearby rural residences.	L-R
Creation of opportunities to local business during the operational phase, including but not limited to, provision of security, staff transport, and other services (positive)	L-R
Potential up and down-stream economic opportunities for the local, regional and national economy (positive impact)	L-N
Provision of a clean, renewable energy source for the national grid (positive impact)	L-N
Potential impact on climate change	I

L **Local** R **Regional** N **National** I **International**

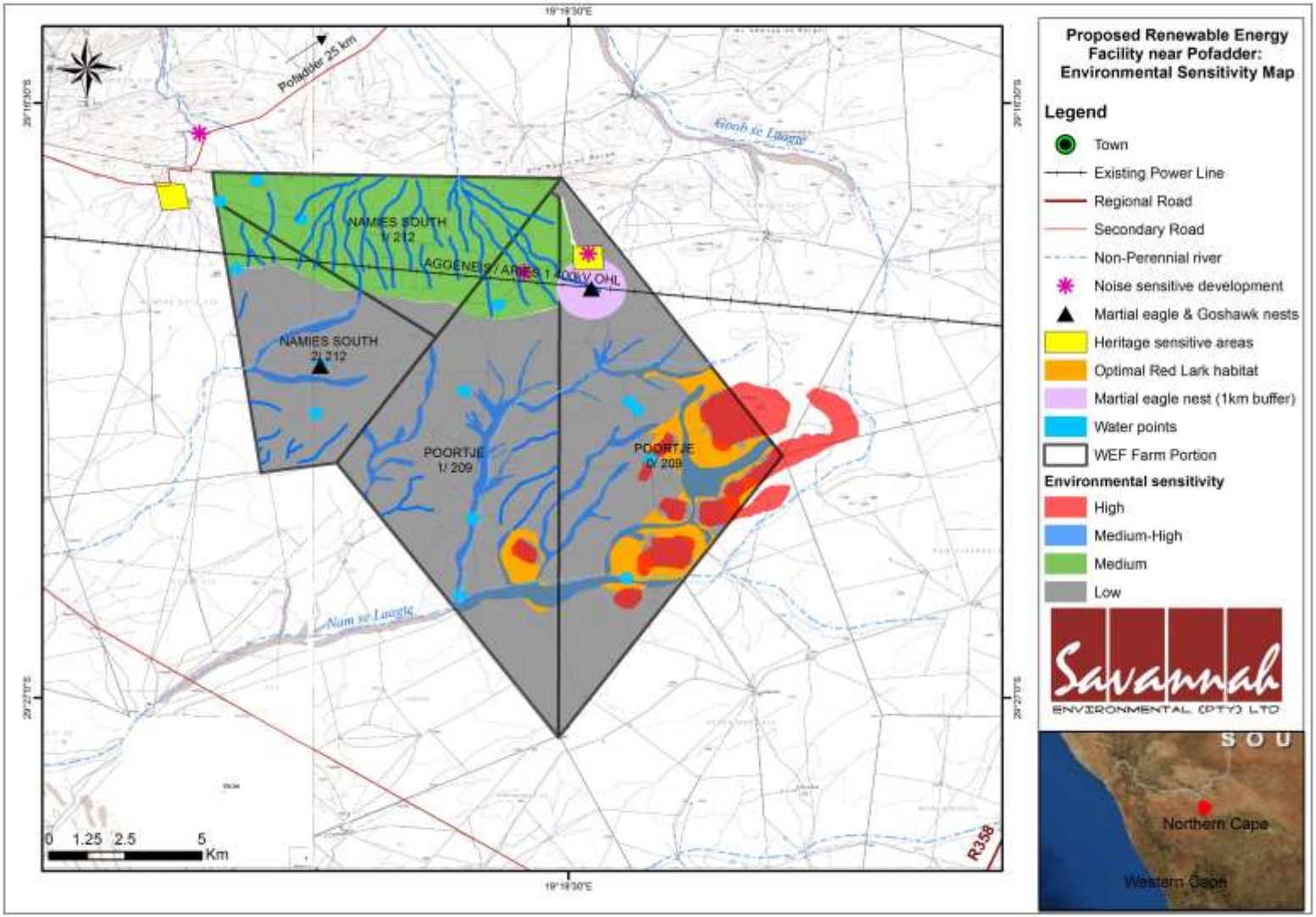


Figure 9.1: Combined environmental sensitivity map for the study area

The potentially sensitive areas/environmental features that have been identified and are illustrated in Figure 9.1 include:

» **Non-perennial river and drainage lines that occur within the site:**
There are no perennial rivers or wetlands on the site. The drainage lines that do occur on the site are characterised by loose sandy soil or exposed bedrock and boulders in the 'washes' with the banks lined with grasses, shrubs and small tree. In the north of the study area (Namies South 212/1), the drainage lines are many narrow channels which follow a dendritic pattern, dissecting the plains. Further south the drainage lines are wider and better defined. The main drainage channel in the southern portion of the site is Nam se Laagte that drains towards the south-west. The northern portion of Namies South drains north-westerly towards the Orange River. All the drainage lines have similar riparian vegetation, and the primary variation between them depends on availability of water and length of duration of flowing water.

In the arid ecosystems such as in the study area the drainage lines are prone to flash flooding. They are also the 'ecological linking corridors'. Although not having a high diversity of plant species they should be observed as ecologically sensitive. The landscape is prone to sheet-wash at times of heavy rain and there are seasonal drainage lines which in some cases are poorly defined whereas in others they are quite distinct. The vegetation of the drainage lines does not differ greatly from that found in the non-drainage-line areas. This is attributed to the drainage lines being mainly dry and only having water-flow for very short periods. Drainage lines will also support birds, bats and faunal species.

» **Potential bird and/bat sensitive habitats:**
A Martial Eagle nest was discovered on site, although the nest was not active at the time of the site visit in July 2012, it may well become active again. Prey remains under the nest and fresh droppings indicate that the site may have been active in the not too distant past. A 1 km buffer has been placed around the Martial Eagle nest during the design of the wind energy facility. The buffer is recommended to reduce the risk of disturbance and collision with the wind turbines or power line, should the birds decide to breed there again. Also included under the high risk area is a water points. Water points are draw cards for bird species and bat/ insect feeders, including priority raptors which breed in the trees (e.g. Southern Pale Chanting Goshawk which was seen on the site) or use the troughs for bathing and drinking. Lanner Falcons and other priority raptors may also hunt small birds at the water points, which could result in them being distracted and colliding with turbines. A Goshawk's nest is also shown on the map. These should be treated as potential no-go areas, to be confirmed during the EIA phase.

The sensitivity map shows water points which serve as key hotpots for bird species, to be considered bint he design of the facility. In the far eastern section of the site (the R/E of farm Poortjie) an orange area has been delineated as being suitable habitat for the suitable area within the Red Lark bird species. This area is of moderate avifaunal sensitivity. The Red Lark is generally sedentary and resident species in an area, but local movement triggered by environmental conditions can occur. Only one pair of Red larks was recorded during the site visit, which may point to the broader development area not being optimal habitat for the species. The species is generally associated with red dunes and large seeded grasses, and in optimal habitat, such as the Koa Valley, densities of approximately 1 pair/30 ha can be expected. Although this habitat is present in the broader development area, it is not the dominant habitat. This area should be carefully monitored during the pre-construction bird monitoring programme, to establish if the species is present in larger numbers. At this stage of the investigation, this area need not be excluded from the development area, subject to the results of further monitoring during pre-construction.

» **Areas of high erosion sensitivity**

Areas of high erosion sensitivity include the drainage lines on the site as well as moderately to gently undulating hills and plains (low relief areas) where unconsolidated sediment occurs. Moderate levels of erosion will occur if land-disturbing activities take place (mainly during construction).). Further investigated and assessed through detailed specialist studies (including field surveys) will be required during the EIA phase.

» **Noise sensitive receptors**

Three homesteads have been identified as potential noise sensitive receptors, which may be impacted upon by the low frequency noise that is generated by wind turbines. The noise will be a combination of the cumulative effects of multiple wind turbines operating at night. Based on the preliminary impact estimations (as detailed in the noise specialist report contained within Appendix J) there are three potential noise-sensitive developments (NSD) within the potential area of influence. This, however, needs to be confirmed through detailed modelling of the preliminary layout in the EIA phase of the process.

The sensitivity map is a rough scale estimate of sensitivity on the site, and these areas will be subject to survey and ground-truthing during the EIA phase of the project. These potentially sensitive areas will, therefore, be further investigated and assessed through detailed specialist studies (including field surveys) during the EIA phase.

The proposed design of the wind energy facility (i.e. wind turbines and other infrastructure) can be based on the full extent of the site, and therefore utilise the most technically optimal positions on the broader site to the fullest extent. This recommendation does, however, require that due cognisance is taken of the recommendations outlined in Chapter 6 and above (as well as within individual specialist reports) regarding areas within the study site of potential moderate to high sensitivity. Understanding which area of the site would be least impacted by the development of such a facility, Mainstream should prepare the detailed infrastructure layouts for consideration within the EIA phase.

9.2. Evaluation of the Potential Issues associated with the overhead power line

In order to connect the wind energy facility to the power grid substations and 400kV overhead power lines will be required. A 400 kV substation and satellite 132 kV substations (and associated power lines) are proposed to facilitate grid connection via a loop-in loop-out connection to the existing Eskom Aggenys–Aries 400kV power line which traverses the site.

Potential issues associated with the proposed overhead distribution power line and substation will include impacts on flora, fauna and ecological processes, visual impacts, impacts on avifauna as a result of collisions and electrocutions, and potential impacts on heritage sites.

As the location of the power lines will depend on the substation location (which will be determined by the solar facility layout), the power line options will be considered in detail within the EIA phase in order to assess potential impacts associated with the power line corridor and make recommendations regarding a preferred

alternative alignment and appropriate mitigation measures). These options will however fall within the broader project site evaluated within this Scoping Report.

SCOPING OF ISSUES ASSOCIATED WITH THE KORANA WIND ENERGY FACILITY CHAPTER 10

This chapter serves to describe and evaluate the identified potential environmental impacts associated with the proposed Korana wind farm, and to make recommendations for further studies required to be undertaken in the EIA phase. The scoping process has involved input from specialist consultants, the project proponent, stakeholders, and the public. Specialist scoping reports are included within Appendix F - M.

Potential environmental issues associated with **construction and decommissioning** activities of the Korana wind energy facility may include, among others:

» Impact on fauna, flora and ecology.
» Impact on agricultural potential and land use.
» Impact on soils and geology.
» Impact on Birds and bats.
» Impact on heritage resources.
» Social impacts (positive and negative).

Potential environmental issues specific to the **operation** of the wind energy facility could include, among others:

» Loss of agricultural land.
» Soil erosion.
» Visual impacts (negative viewer perceptions and visibility of the facility).
» Noise impact.
» Social impacts (positive and negative).

Impact on Birds and bats.

Tables 10.1 and Table 10.2 provide a summary of the findings of the scoping study undertaken for the construction and operation phases of the proposed wind energy facility respectively. Impacts associated with decommissioning are expected to be similar to those associated with construction. Potential direct and indirect impacts of the proposed wind energy facility are evaluated, and recommendations are made regarding further studies required within the EIA phase of the process. Specialist scoping reports are included within Appendix F to M.

In identifying and evaluating impacts associated with the proposed project, it has been assumed that although during the **operational phase** the area affected will comprise of wind turbines (each turbine between 1.5 MW – 4MW in capacity) and the number of turbines will depending on the model of turbine that the developer will select. The hub height will be up to 150m each. The area affected will also include access roads, substation footprint and associated infrastructure. During

construction a larger area within the approximately 175km^2 being considered for the wind energy facility footprint could suffer some level of disturbance as a result of the required activities on site. However, once construction is complete, only a small portion of this area (typically less than 5%) will be permanently impacted by infrastructure associated with the wind energy facility.

The **cumulative impacts** associated with the proposed wind farm are expected to be associated with the scale of the project, i.e. wind turbines that will be located on the proposed site, as well as associated infrastructure. The potential direct cumulative impacts associated with the project are expected to be associated predominantly with the potential visual impact, potential noise impacts, potential vegetation impact, potential heritage impact and potential impacts on avifauna, i.e. bats and birds in the surrounding area. Other cumulative impacts may arise from other neighbouring proposed wind and solar energy facilities. Cumulative effects can only be assessed once a preliminary layout is available, and will be considered in the detailed specialist studies to be undertaken in the EIA phase of the process.

It must be noted that the Draft Scoping Report is a combination of desktop studies and field work undertaken by specialists, and all potential impacts identified through the Scoping phase (indicated as being of low to high significance) will be further assessed and confirmed during the EIA phase.

Table 10.1: Evaluation of potential impacts associated with the CONSTRUCTION PHASE of the proposed Korana Wind Energy Facility

Potential Visual Impacts:

Potential visual impacts during the construction phase on observers in close proximity to the Korana wind energy facility and power line are expected to be of a short duration and limited to the site. Then site is fairly remote, with scattered homesteads and the closest town of Pofadder is approximately 22 km from the site.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Visual impacts	Potential visual impact of the construction period on visual receptors.	Local	None identified at this stage.

Gaps in knowledge & recommendations for further study:

The study was undertaken using Geographic Information Systems (GIS) software as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed facility. A detailed Digital Terrain Model (DTM) for the study area was created from 20m interval contours supplied by the Surveyor General.

It is recommended that:

» The severity of the potential visual impact be assessed in further detail in the EIA phase.
» Additional spatial analyses must be undertaken in order to create a visual impact index that will further aid in determining potential visual impact.
» Specific spatial criteria need to be applied to the visual exposure of the proposed facility in order to successfully determine visual impact and ultimately the significance of the visual impact.

Potential Impacts on Agricultural potential:

Agricultural potential is uniformly low across the farm and the choice of placement of the facility on the farm therefore has minimal influence on the significance of agricultural impacts. No agriculturally sensitive areas occur within the site. The farm is located within a sheep farming agricultural region with very low carrying capacity, and there is no cultivation on the farm.

The significance of agricultural impacts is influenced by the extremely limited agricultural capability of the site, with no cultivation currently being undertaken. Therefore, impacts are not likely to be of high significance.

Issue	Nature of Impact	Extent of Impact	Extent of Impact	'No go' areas
Loss of agricultural land.	Placement of infrastructure for the wind energy facility will affect the land-use on these specific areas.	Local in terms of the activity and will be associated with the activity only. The impacts are considered to be of low significance due to the low agricultural potential of the site.	Local	None identified at this stage.

Gaps in knowledge & recommendations for further study:

The study area has not been subject to a field survey. All the information on soils and agricultural potential presented here has been obtained from the AGIS online database, produced by the Institute of Soil, Climate and Water (Agricultural Research Council, undated).

It is recommended that:

» Consideration should be given to the proper placement of the wind turbines and other infrastructure.

Potential Impacts on Soil and Current land Use:

The proposed development is located on level plains with some relief in the Northern Cape interior at an altitude of between about 1000 and 1100 meters. Slopes across the site are predominantly less than 2% but are up to 5% in places. The underlying geology is Gneissic granite of the Namaqualand Metamorphic Complex.

The land type classification is a nationwide survey that groups areas of similar soil, terrain and climatic conditions into different land types. The site is predominantly on two land types, Ag61 and Ag25, with a very small section on a third, Ib131. All land types are dominated by very shallow, very sandy soils on underlying rock or hard-pan carbonate. The ridges (Ib131) are dominated by rock outcrops. The soils would fall into the Lithic and Calcic soil groups according to the classification of Fey (2010). Potential impacts on soils relate mainly to increased erosion potential and loss of soil resources.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Soil erosion due to alteration of the land surface run-off characteristics.	Alteration of run-off characteristics may be caused by construction related land surface disturbance, vegetation removal, and the establishment of hard standing areas, surfaces and roads. Erosion will cause loss and deterioration of soil resources and may occur during all phases of the project.	Local (construction areas only)	No specific 'no go' areas have been identified at this stage
Loss of topsoil due to poor topsoil management.	It is anticipated that the loss of topsoil will result from poor topsoil management (burial, erosion, etc) during construction, related soil profile disturbance (levelling, excavations, road surfacing etc.) and resultant decrease in that soil's agricultural suitability.	Local (construction areas only)	
Soil erosion due to trampling by vehicles and equipment, as well as construction activities	Improper placement, construction, maintenance and use of access roads and construction sites by vehicles and equipment, may lead to the degradation of the soil surface and result in soil erosion (both wind and water erosion).	Local (construction areas only)	
Siltation of watercourses	Improper placement and maintenance of infrastructure, as well as poor stormwater	Regional	

	management, may lead to water erosion and siltation of watercourses downstream.		
Dust production	Improper construction, maintenance and use of access roads and construction sites by vehicles and equipment, may lead to dust production.	Local	

Gaps in knowledge & recommendations for further study:

The study area has not been subject to a field survey. All the information on soils and agricultural potential presented here has been obtained from the AGIS online database, produced by the Institute of Soil, Climate and Water (Agricultural Research Council, undated).

It is recommended that:

» More detailed assessment of soil conditions be conducted. This will include a field investigation of soils and agricultural conditions across the site. This field investigation will be aimed at ground proofing the existing land type information and understanding the specific soil conditions on site. It will not be based on a grid spacing of test pits but will comprise a reconnaissance type of soil mapping exercise based on an assessment of surface conditions, topography, and hand augered samples in strategic places, if necessary. Such a soil investigation is considered adequate for the purposes of this study. A more detailed soil investigation is not considered likely to add anything significant to the assessment of agricultural soil suitability for the purposes of determining the impact of the development on agricultural resources and productivity.
» Assessment of erosion and erosion potential on site.
» Assessment of the impacts of specific construction activities and layout on soil conditions.

Potential impacts on Fauna, Flora and Ecology

Five plant communities or associations are recognized in the study area. They are (1) Open plains grassland (2) Low to mid-high shrubland and (3) Drainage line vegetation, all of which fall within Bushmanland Arid Grassland, (4) Aggeneys Gravel Vygieveld and (5) Bushmanland Inselberg Shrubland. Neither Aggeneys Gravel Vygieveld nor Bushmanland Inselberg Shrubland is likely to be affected by the proposed solar energy infrastructure since it was recommended in the botanical constraints analysis (McDonald, 2012) that the areas where these vegetation types occur should be avoided. These two vegetation types are thus not considered any further here.

The greater part of the study area of the Korana Wind Energy Facility is not botanically sensitive (Figure 10.1). This would include areas on the open plains in 'Open plains grassland' and 'Low to Mid-high Shrubland'. Areas that are sensitive are the drainage lines. These should be buffered by at least 50 m, i.e. no construction of wind turbines should be permitted with 40 m of the drainage lines. This would ensure that there is no negative erosive impact on the drainage lines arising from the construction activities. It is recognized that this constraint will present challenges in determining the locations of the solar PV array, however, it has practical implications as well since the installations would be protected from flash-floods.

Roads are predicted to have a negative effect on the receiving environment but with careful mitigation (e.g. relocation of species such as *Aloe claviflora* and avoidance of trees of *Boscia albitrunca*, *Aloe dichotoma* and *Parkinsonia africana*), the negative impacts can be kept within acceptable limits. Roads that will cross drainage lines must also be constructed in such a way as to not impede water-flow when this occurs.

It is predicted that construction of the proposed wind energy facility would have a low negative impact on the vegetation. This would be due to removal of the vegetation within the footprint of the solar panel array area during construction and subsequently due to shading caused by the panels during operation (refer to Figure 10.1).

Fauna:

The site displays a low level of Red List animal species' probability of occurrence. The Small spotted cat, Dassie rat, Baboon spiders, Trapdoor spiders, Girdled lizards and Tent tortoises known to occur in the area have a Protected status, with the Tent tortoises being the most at risk to be impacted upon during the construction phase. A faunal sensitivity map is shown in Figure 10.2 and indicates areas of Moderate faunal sensitivity being the rocky parts of the site that offer habitat for fauna and a higher variety of biodiversity, compared to the rest of the site. No areas of high sensitivity are expected to be found on the site.

The greatest risk to the vegetation and flora would be during the construction phase of the wind energy facility 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 any on-site substations.
» 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.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Impacts on listed and protected plant species during site clearing.	Site preparation and construction will result in a lot of disturbance and the loss of currently intact vegetation. Given the relatively low number of endangered species at the site, impacts on listed species are likely to be relatively low. Provincially protected species such as various Aloe sp. are however likely to be relatively common and impacts on such species are potentially greater. However, as few of these species are actually rare, the significance of these impacts is not likely to be very high.	Local	No specific 'no go' areas have been identified at this stage; however areas of very high ecological sensitivity (as shown in Figure 6.2 and Figure 6.3) will be investigated further during the EIA phase.
Increased risk of alien plant invasion resulting from the high levels of disturbance	Alien species are likely to respond to the large amount of disturbance that will accompany the development phase of the project. Invasion of the natural plant communities within the site would be undesirable and could impact diversity of fauna and flora as well as affect ecosystem processes.	Local	
Disturbance and loss of habitat for fauna.	Increased levels of noise, pollution, disturbance and human presence will be detrimental to fauna. Sensitive and shy fauna are likely to move away from the area during the	Local	

	construction phase as a result of the noise and human activities present. Some mammals and reptiles such as tortoises would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present.		
Disruption of landscape connectivity and ecosystem processes	Development within intact vegetation would contribute to the fragmentation of the landscape and potentially disrupt the connectivity of the landscape for fauna and flora.	Local	

Gaps in knowledge & recommendations for further study:

The sensitivity assessment and resulting sensitivity maps are based primarily on literature descriptions.

It is recommended that:

» A site survey be conducted at the appropriate time of the year in order to assess the current state of the vegetation and habitats that will be lost and/or disturbed and the implication thereof.
» Sensitive areas must be identified and mitigation measures recommended to minimise impacts on these areas.
» Potential alien and invasive species in the area be identified, the accompanying risks assessed and appropriate mitigation recommended.
» Sensitive faunal species and habitats must be identified and mitigation measures recommended to minimise impacts.

The sensitivity of the identified areas will need to be verified during the site visits for the EIA phase of the development, and those areas that should be avoided will need to be identified and mapped where necessary.

The following will be undertaken in the EIA Phase of the study:

» Ground-truth and refine the ecological sensitivity map of the site. Particular attention will be paid to mapping the distribution of sensitive ecosystems at the site such as wetlands and drainage systems. The rocky areas will also be specifically investigated on account of the higher potential abundance of listed and protected faunal species within these areas.
» Evaluate the likely presence of faunal species of conservation concern at the site and identify associated habitats that should be avoided to prevent impact to such species.
» Evaluate, based on the site attributes, what the most applicable mitigation measures to reduce the impact of the development on the site would be and if there are any areas where specific precautions or mitigation measures should be implemented.

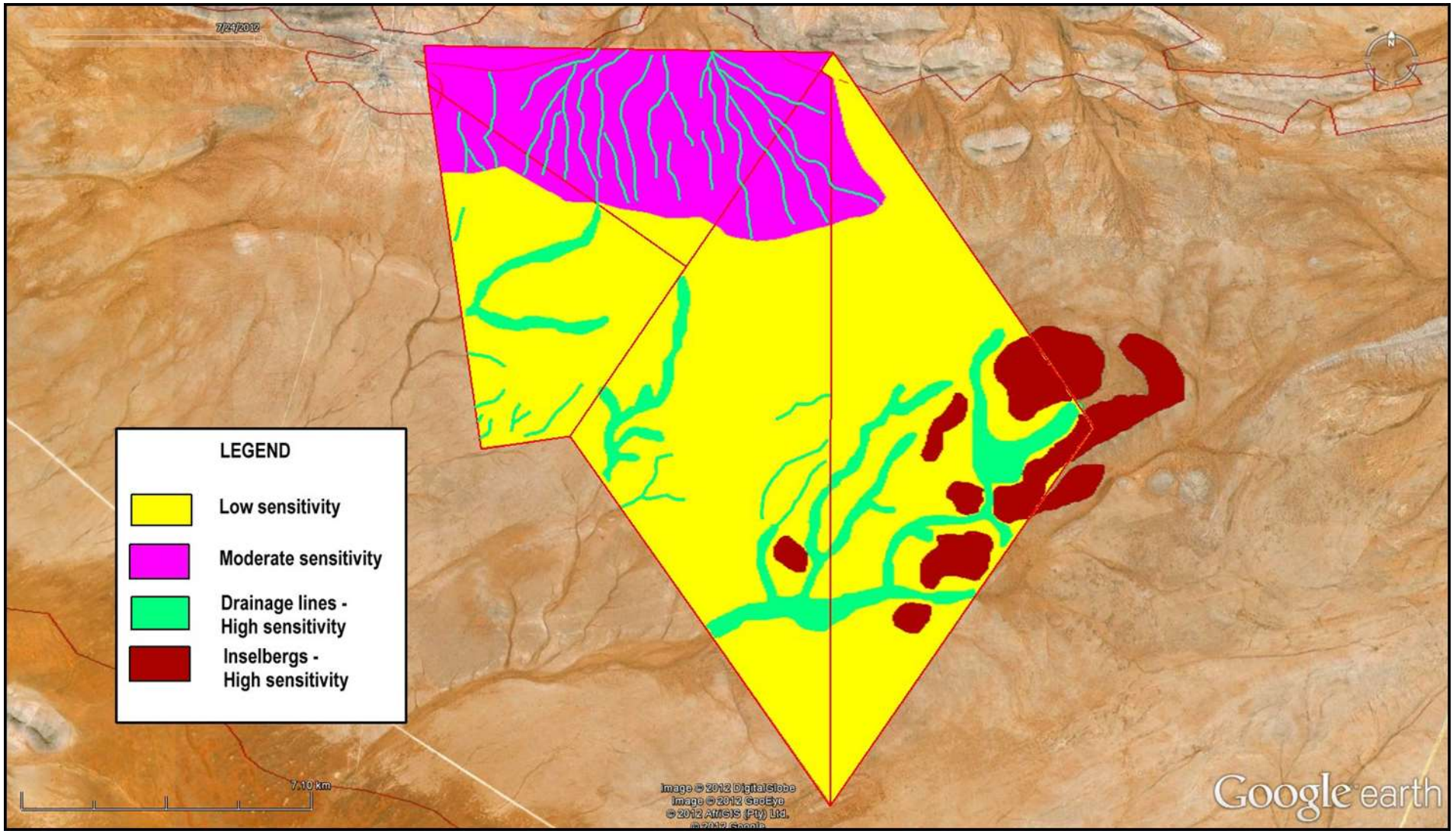
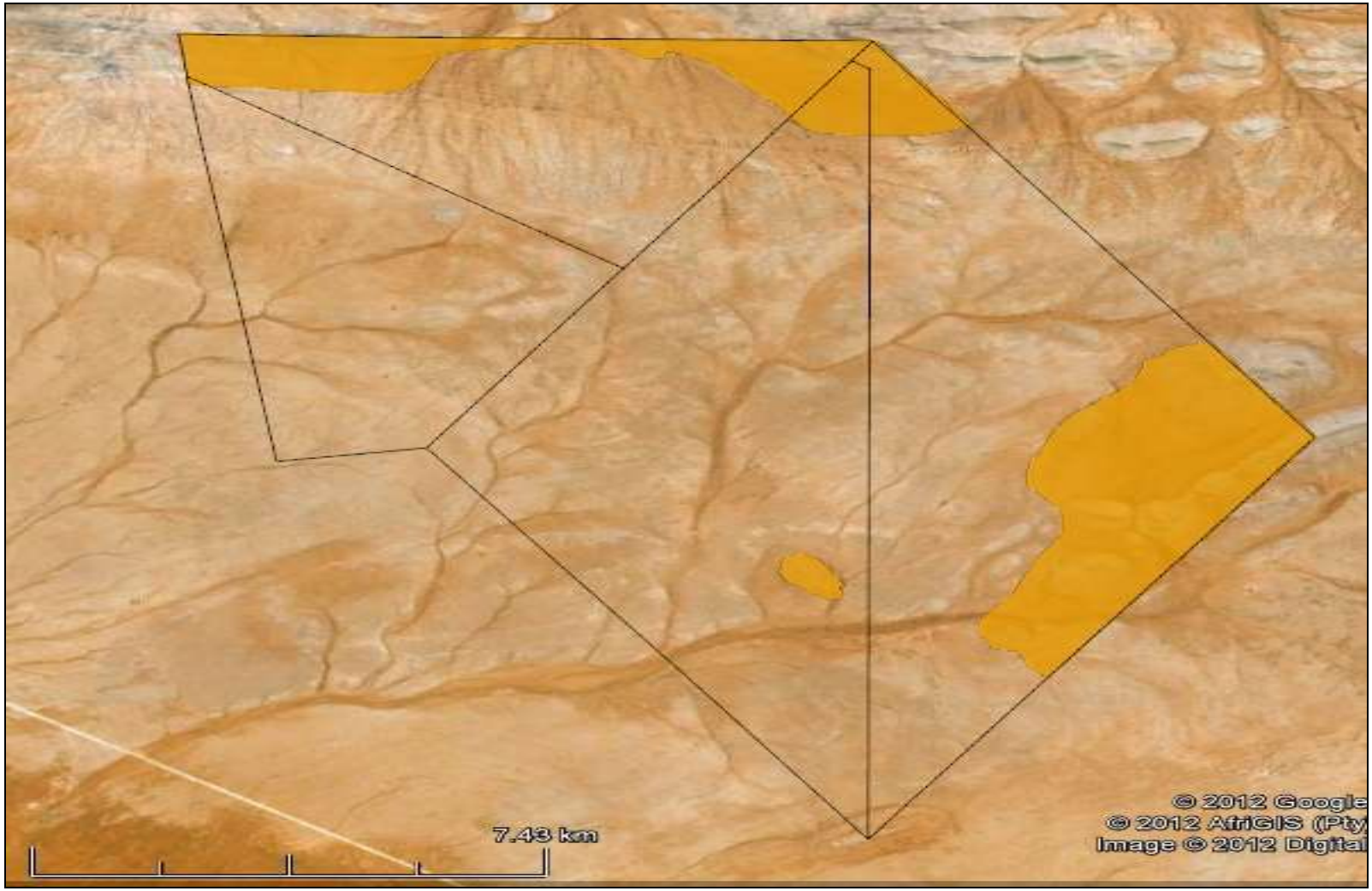

7/24/2012
LEGEND
Low sensitivity
Moderate sensitivity
Drainage lines - High sensitivity
Inselbergs - High sensitivity
7.10 km
Image © 2012 DigitalGlobe
Image © 2012 GeoEye
© 2012 AfriGIS (Pty) Ltd.
Google earth

Figure 10.1: Botanical sensitivity of the site



Moderate sensitivity

Figure 10.2: Desktop based fauna sensitivity map of the site.

Potential Impacts on Avifauna (birds):

Destruction of Avifaunal Habitat

Although the final footprint of the wind energy facility is likely to be relatively small (up to 5% of the entire study area of 175km^2), the construction phase of development inevitably incurs quite extensive temporary damage or permanent destruction of habitat, which may be of lasting significance in cases where wind farm sites coincide with critical areas for restricted range, endemic and/or threatened species. During the construction phase and maintenance of power lines and substations, some habitat destruction and alteration inevitably takes place. This happens with the construction of access roads, the clearing of servitudes and the levelling of substation yards. Servitudes have to be cleared of excess vegetation at regular intervals in order to allow access to the line for maintenance, to prevent vegetation from intruding into the legally prescribed clearance gap between the ground and the conductors and to minimise the risk of fire under the line which can result in electrical flashovers. These activities have an impact on birds breeding, foraging and roosting in or in close proximity to the servitude, through the modification of habitat.

Displacement due to disturbance

Displacement of birds may occur during both the construction phases of the wind energy facility, and may be caused by the presence of the turbines themselves through visual, noise and vibration impacts, or as a result of vehicle and personnel movements related to site maintenance. The scale and degree of disturbance will vary according to site- and species-specific factors and must be assessed on a site-by-site basis.

Unfortunately, few studies of displacement due to disturbance are conclusive, often because of the lack of before-and-after and control-impact (BACI) assessments. Onshore, disturbance distances (in other words the distance from wind farms up to which birds are absent or less abundant than expected) up to 800 m (including zero) have been recorded for wintering waterfowl, though 600 m is widely accepted as the maximum reliably recorded distance.

The following avifaunal-relevant habitat modifications were identified within the broader development area:

- **Water points:** The land use in the broader development area is mostly sheep farming, with some game and cattle also present. The entire area is divided into fenced off grazing camps, with several boreholes with associated water reservoirs, drinking troughs and a few trees. These troughs, reservoirs and trees are a big draw card for several bird species.
- **Transmission lines and telephone lines:** The broader development area is bisected by the Aggeneys – Aries 400kV transmission line. The transmission towers are used by raptors for perching and roosting, and potentially also for breeding. An inactive eagle nest, most likely belonging to a Martial Eagle, was discovered on tower 147. Prey remains and droppings below the nest and other towers indicate recent activity. There is also a telephone line running along the road to the two farm houses, which is used extensively by several species for perching.
- **Farm yards:** The site contains two farm yards, with associated buildings, trees and patches of lawn.

The priority species for this study area include:

» Martial Eagle;
» Ludwig's Bustard;
» Secretarybird;
» Kori Bustard; and
» Lanner Falcon.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Loss of bird habitat due to construction of the wind energy facility.	During the construction phase and maintenance of turbines, power lines and substations, some habitat destruction and alteration inevitably takes place. Since the site is situated in an extremely uniform area this impact is not anticipated to of high significance for most of the site. The exception to this will be some of the areas identified in the sensitivity mapping exercise, in particular any surface water sources or drainage lines.	Local	Areas of surface water on site
Disturbance of birds	Construction activities will have an impact on birds breeding, foraging and roosting in or in close proximity to the servitude, through the modification of habitat. This is unlikely to be of high significance for most species, unless breeding on site. The likelihood of target species breeding on site will be assessed during the EIA Phase.	Local	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase.
Displacement of birds from the site and barrier effects	The likelihood of this impact being significant will be assessed during the EIA Phase and is related to how much birds actually use and depend on the site.	Local and Regional	No specific 'no go' areas have been identified at this stage and will be investigated further during the EIA phase
Gaps in knowledge & recommendations for further study:			

- » All quarter degree grid cells (QDGCs) have not been surveyed to the same level by the South African Bird Atlas 2 (SABAP2) – in this instance 2919AD has not been surveyed at all, and only 2 checklists have been completed for 2919AC. Strong reliance was therefore placed on personal observations during the site visit, information provided by the landowners, SABAP1 historical data and SABAP2 data from adjoining QDGCs to form a picture of what avifauna is likely to occur in the broader development area.
- » Inevitably, no comprehensive studies (other than a few environmental impact reports), and no peer-reviewed scientific papers, are available on the impacts wind farms have on birds in South Africa at this point in time. The precautionary principle was therefore applied throughout. The World Charter for Nature, which was adopted by the UN General Assembly in 1982, was the first international endorsement of the precautionary principle (http://www.unep.org). The principle was implemented in an international treaty as early as the 1987 Montreal Protocol and, among other international treaties and declarations, is reflected in the 1992 Rio Declaration on Environment and Development. Principle 15 of the 1992 Rio Declaration states that: "in order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall be not used as a reason for postponing cost-effective measures to prevent environmental degradation."
- » Even in the international arena, many studies lack before and after comparisons, or wind farm area and reference area comparisons, or do not offer any assessment whatsoever of relevant factors such as collision risk and differences in bird behaviour between night and day, or are of inadequate duration to provide conclusive results (Langston & Pullen 2003). In many instances, even where before and after comparisons were conducted, predicted mortality rates are significantly off the mark, indicating that the this is still a fledgling science in many respects, even in developed countries like Spain with an established wind industry (Ferrer *et al.* 2012).

It is recommended that:

The EIA Phase will conduct the following activities:

- » The avifaunal specialist visits the site on two separate occasions, in order to obtain seasonal variance.
- » All identified issues will be investigated in more detail during the EIA phase, and rated according to the prescribed criteria.
- » Landscape factors relevant to this study will be investigated further, and the sensitivity zones described in this report will be "ground truthed" during the site visit, and updated where necessary.
- » The possible impacts of avifauna on the new infrastructure will be identified and discussed in more detail.
- » Suitable mitigation measures will be recommended for all issues identified as significant.
- » The extent to which displacement impacts actually occur will need to be determined through rigorous pre and post construction monitoring, and a protocol outlining details of such a monitoring programme (pre-construction monitoring has already commenced) will be supplied as an appendix to the final EIA report.
- » A site specific avifaunal EMP containing a monitoring programme pre and post construction will be developed and is seen as a critical next step to increase confidence, refine the sensitivity map and to strengthen the mitigation measures in order to have the least impact possible on avifauna in the area.

Impacts on bats:

The rocky outcrops on the northern and south-western border of the site are considered to be suitable roosting sites for bats. The site also offers highly seasonal surface water by means of the drainage channels running through the site. This surface water and soil moisture will attract insects, and in turn bats. Foraging may be limited on the site to these streams and channels. A total of 11 bat species may potentially occur on the site (based on distribution), and six have a high probability of occurring on the site, based on a highly precautionary approach. *Cistugo seabrae* has a moderate probability of occurring on the site and is listed as Near Threatened; however it is not a high flying bat and is presumably less vulnerable to turbine induced mortality. *Miniopterus natalensis* also have a medium probability of occurrence and is listed Near Threatened, considering behaviour and biology this species have a medium to high risk of being impacted on by turbines. From a desktop bat sensitivity point of view the site has a low to medium bat sensitivity. Some foraging habitat will be destroyed by the construction of the turbines and associated infrastructure. This impact is a negative and local impact that will be more significant during construction than during the operation of the wind energy facility. During the construction phase of the project possible bat roosts may be impacted by earthworks and large machinery. Winter roosts, often used for hibernation, may take bats closer to wind farms as their movement patterns change. Bats are known to use topographical features such as ridges to navigate during their migrations. In addition, they may use these features as temporary roosts, foraging areas and shortcuts.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Destruction of foraging habitat and roosts	A certain amount of habitat destruction will occur stemming from the concrete foundation of the turbines, access roads and associated infrastructure. Any reduction in habitat may result in a depletion of food supply for the bats and for this reason, careful consideration needs to be given to the siting of the wind turbines. Where vegetation patches are created by the removal or destruction of vegetation an increase in the movement of bats across the area can be expected	Local and Regional	No specific 'no go' areas have been identified at this stage; however habitat for bats (drainage line, mountainous terrain and rocky areas) are shown in Figure 7.4 and) will be investigated further during the EIA phase.

	as bats are forced to move from patch to patch to feed on insects.		

Gaps in knowledge & recommendations for further study:

The potential impacts on bats will be assessed in greater detail during the EIA phase of the project. The scoping evaluation was based on available information, which is limited to species reported to occur in the area.

It is recommended that:

» A site visit will be conducted in the EIA phase. This will confirm the suitable habitats present on the site, including buildings and other infrastructure present on the site, all of which could provide roosting or feeding facilities for bats.
» An assessment of the significance of direct, indirect and cumulative impacts on bats will be undertaken in the EIA phase.
» Recommendation regarding practical mitigation measures for potentially significant impacts
» An indication of the extent to which the issue could be addressed by the adoption of mitigation measures will be provided.
» Bat monitoring for two seasons has already been conducted, however the results of the monitoring will be discussed in greater detail in the EIA phase.

Information for the EIA phase would include the following monitoring techniques:

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

Potential impacts on Heritage Resources:

Given buffers are likely to be instituted around the farm werf, and water features (pans and streams), it is highly unlikely that significant archaeology or other above ground heritage material will be impacted. The only major impact that will be experienced is that to the sense of place. However, with so few people present in the landscape and the extreme remoteness of the site, the visual impact of the facility despite its size, will not affect many communities.

It can be concluded that the proposed site is suitable for the intended use and the Impact Assessment Phase should continue. No red flag issues have been identified. Two areas of high sensitivity are identified. These are around the structures and ruins at Namies South.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Impacts on archaeological and paleontological finds	The construction phase of the wind energy facility could directly impact on surface and subsurface archaeological sites. There is a medium to high likelihood of finding Stone Age sites scattered over the study area. There is an increased likelihood of finding material around pans if any occur within the study area. The construction of the wind farm facility could have a low to medium impact on a local scale.	Local	No 'no- go' areas have not been identified at this stage.
Impacts on historical finds	Construction activities such as clearing of vegetation and excavations could lead to the discovery or damage to heritage artefacts.	Local	No 'no- go' areas have not been identified at this stage.
Impacts on burials and cemeteries	The construction and operation of the wind energy facility could directly impact on marked and	Local	No 'no- go' areas have not been identified at this stage.

	unmarked graves. Graves dating to the Stone Age can be expected especially close to the river with more recent formal and informal cemeteries anywhere else on the landscape.		

Gaps in knowledge & recommendations for further study:

The study area was not subjected to a field survey as this will be done in the EIA phase. It is assumed that information obtained for the wider area is applicable to the study area.

It is recommended that:
During the EIA phase of the project it is suggested that in order to comply with the National Heritage Resources Act (Act No 25 of 1999) a Phase 1 Archaeological Impact Assessment must be undertaken. The following will form part of this study:

» Sites of archaeological, historical or places of cultural interest will be located, identified, recorded, photographed and described.
» The levels of significance of recorded heritage resources will be determined and mitigation proposed should any significant sites be impacted upon, ensuring that all the requirements of SAHRA are met.
» Significant impacts on palaeontological heritage resources due to the proposed wind energy facility are not anticipated. Therefore, pending the discovery of new fossil remains during development, no further specialist palaeontological heritage studies or mitigation are recommended for this project.

Potential noise impacts:

Wind Turbines do emit noises at sufficient levels to propagate over large distances. The fact that there would be a number wind turbines operating simultaneously in an area where there are noise-sensitive developments increase the possibility that a noise impact could occur. At this preliminary stage it is impossible to determine whether the significance of this noise impact would be low, medium or high.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Noise impacts due to construction equipment	Use of construction equipment on site will generate some level of noise.	Local	Cannot be determined at this stage.
Noise impacts due to construction traffic	Additional traffic to and from the site, as well as traffic on the site will be a significant noise source	Local	Cannot be determined at this stage.

Gaps in knowledge & recommendations for further study:

The potential impacts associated with noise will be assessed in greater detail during the EIA phase of the project. The scoping evaluation was based on available information. Predicted sound levels have only been included for illustrative purposes, as well as to indicate the potential overall spatial extent of noise impacts that wind turbines may have.

It is recommended that:

» A site visit to obtain information regarding background noise levels, the prevailing meteorological conditions during this background noise level survey, as well as confirming and identifying noise-sensitive developments,

» Currently identified (potential) Noise Sensitive Developments (NSDs) be investigated and any additional NSDs should be identified. Their relative sensitivity to noise impacts will be determined. This will be based on the SANS 10103 guideline, as well as current land uses on the properties (residential vs business/industrial).

» Using the data (proposed processes, noise characteristics of the selected equipment, locations of the wind turbine generators) as provided by the project developer, the predicted impact of the wind energy facility on NSDs must be predicted using the CONCAWE method as recommended by SANS 10357:2004 for the construction phase

» Using the calculated noise levels at the identified NSDs, the projected significance of the wind energy facility must be determined using the criteria as proposed (subject to possible changes after any stakeholder input). Further recommendations on the most suitable buffer zone can be made after more information is available for the proposed wind energy facility.

Potential impacts on the social environment:

The establishment of renewable energy facilities is supported at national and provincial level. The proposed site appears to be compatible with the spatial development vision of the Northern Cape Province and the NDM. The potential negative impacts associated with the construction phase include the presence of construction workers on the site, potential impact on farming activities and farm infrastructure and the movement of construction vehicles. The potential positive impacts relate to the creation of local employment and skills development opportunities. This represents a key benefit given the high unemployment and low income levels in the area.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Potential impact on rural sense of place.	This will be closely linked to the visual impacts associated with the wind turbines. The impact on sense of place is also linked to the associated 132 kV power line/s.	Local- Regional	None identified at this stage.
Impact on farming activities	Disruption of farming activities due to the presence of construction workers.	Local	N/A
Influx of job seekers into the area	The influx of job seekers may result in an increase in sexually transmitted diseases, including HIV/AIDS; increase in prostitution; increase in alcohol and drug related incidents; increase in crime; and creation of tension and conflict in the community.	Local	N/A
Employment creation	Creation of employment and business opportunities during the construction phase	Local	N/A
Skills development and training	Creation of potential training and skills development opportunities for local communities and businesses	Local and Regional	N/A

Promotion of clean, renewable energy	Provision of clean, renewable energy source for the national grid	Local, Regional and National	N/A
Potential threat to farm safety	The increase in the number of people in the area and construction workers could have potential threat on the safety of the surrounding farms.	Local	N/A
Potential damage of roads	The transportation of heavy equipment and increased traffic volumes mar result in the damage of roads in the area.	Local and Regional	N/A

Gaps in knowledge & recommendations for further study:

» The information contained in key policy and land use planning documents, such as the Northern Cape Growth and Development Plan etc., does not contain data from the 2011 Census. However, the relevant 2011 Census data is provided at a local and district municipal level.

Recommendation:

» Review of existing project information, including the Planning and Scoping Documents;
» Collection and review of reports and baseline socio-economic data on the area (IDPs, Spatial Development Frameworks etc);
» Site visit and interviews with key stakeholders in the area including local land owners and authorities, local community leaders and councillors, local resident associations and residents, local businesses, community workers etc;
» Identification and assessment of the key social issues and opportunities;
» Preparation of Draft Social Impact Assessment (SIA) Report, including identification of mitigation/optimisation and management measures to be implemented.

The following typical, generic project information is required in order to inform the Social Impact Assessment (Including all related infrastructure such as transmission lines, access roads, office and warehouse components):

» Comments received from I&APs during the public participation process, including comments reflected in the Final Scoping Report;
» A draft illustration (plan) of the proposed lay-out(s) of the wind turbines (including an indication of the phasing sequence on the site), supporting structures and infrastructure;
» Duration of the construction phase (months);
» Number of people employed during the construction phase;
» Breakdown of number of people employed in terms or low skilled, semi-skilled and skilled;

- Estimate of the total wage bill for the construction phase and breakdown in % as per skills categories;
- Estimate of total capital expenditure for construction phase;
- Indication of where construction workers will be housed (on site or in nearest town?);
- Opportunities for on-site skills development and training;
- Description of the typical activities associated with the construction phase, specifically on-site construction activities. This includes a description of how the large components associated with a wind energy facility will be transported to the site and assembled on the site;
- The size of the vehicles needed to transport the components and the routes that will be used to transport the large components to the site, and an estimate of the number of vehicle trips required and duration of each trip; and
- Information on the nature of the agreements with the affected landowners, specifically with regard to compensation for damage to land, infrastructure etc.

Table 10.2: Evaluation of potential impacts associated with the OPERATION PHASE of the proposed Korana Wind Energy Facility

Potential Visual Impacts:

The visual character of the area is determined by a combination of topography, vegetation, buildings, infrastructural elements and land use patterns. The site location can be described as remote due to its considerable distance from any major metropolitan centres or populated areas. The study area is sparsely populated (less than 1 person per km2), with the highest concentration of people living in the town of Pofadder.

Very few homesteads and settlements are present within the study area. These include Lekdam, Samoep, Namies, Onder Namies, Neelsvlei, Dubip and Luttigshoop within a 10km radius of the proposed site.

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

The N14 national road is located in the north of the study area, just less than 20km from the proposed site, and the R358 bypasses the site some 10-15km to the east. Other than these main roads, a number of secondary roads cross the study area, mainly extending to the west and east.

The only other built infrastructure is a power line which traverses the study area (and the site) from west to east. There are no formally protected or conservation areas present within the study area, but the greater environment has a vast, undeveloped and rugged character. Settlements, where these occur, are very limited in extent and domestic in scale. The greater environment with its wide open, undeveloped landscapes is considered to have a high visual quality.

It is expected, from a visual impact perspective, that the wind turbines would constitute the highest potential visual impact of the renewable energy facility; therefore, the viewshed analysis for the facility was undertaken from a number of provisional turbine positions as at offsets of 150m above average ground level (i.e. the approximate 150m hub height of the proposed wind turbines).

This was done to determine the general visual exposure of the area under investigation, simulating the proposed turbine structures associated with the facility. It must be noted that the viewshed analysis does not include the effect of vegetation cover or existing structures on the exposure of the proposed wind turbines, therefore signifying a worst-case scenario.

Figure 10.4 indicates areas from which any number of turbines (with a minimum of one turbine) could potentially be visible as well as proximity offsets from the proposed development area.

The following is evident from the viewshed analyses:

- The proposed facility will have a large core area of potential visual exposure on the project site itself, and within a 5km radius thereof. The low mountains to the north and north-west of the site offer some visual screening to the areas beyond.
- Potential sensitive visual receptors within this visually exposed zone include users of the secondary roads to the north-west and residents of the settlements of Namies, Onder Namies, and Neelsvlei.
- Potential visual exposure remains high in the medium distance (i.e. between 5 and 10km), with visually screened areas in the north west (beyond the low mountains).
- Sensitive visual receptors comprise users of secondary roads to the west, north-west and south-west of the site as well as residents of homesteads and settlements. The latter include Lekdam, Dubip and Luttigshoop.
- In the longer distance (i.e. beyond the 10km offset), the extent of potential visual exposure is slightly reduced, especially in the north west and north east of the study area. Visually exposed areas tend to be concentrated more in the south. Sensitive visual receptors include users of stretches of the N14 in the north, and of the R358 in the east. In addition, users of secondary roads within the study area and residents of homesteads and settlements, particularly in the south, may be visually exposed.
- The town of Pofadder lies more than 20km from the proposed site, but will not be visually exposed to the proposed facility. Other receptor sites at this distance, despite lying within the viewshed, are not likely to visually perceive the facility.

Issue	Nature of Impact	Extent of Impact	'No go' areas
The visibility of the facility from, and potential visual impact on observers travelling along arterial roads and secondary roads in close proximity[14] to the proposed facility and within	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.

[14] For the purpose of this study, close proximity is considered to be within 10km of the proposed wind energy facility. This would be a medium distance view where the structures would be easily and comfortably visible and constitutes a high visual prominence.

the region[15].			
The potential visual impact on the town of Pofadder.	Visual exposure to wind turbines and associated infrastructure.	Local	None
The visibility of the facility from, and potential visual impact on residents of homesteads and settlements in close proximity to the proposed facility and within the region.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
The potential visual impact of ancillary infrastructure (i.e. the substation, overhead power lines, internal access roads, workshop and office) on observers in close proximity to the proposed facility.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
The potential visual impact of the proposed facility on the visual quality of the landscape and sense of place region.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
The potential visual impact of operational, safety and security lighting of the facility at night on observers in close proximity to the facility.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
Potential cumulative visual impacts of the wind energy facility and associated infrastructure.	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
Gaps in knowledge & recommendations for further study: The study was undertaken using Geographic Information Systems (GIS) software as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed facility. A detailed Digital Terrain Model (DTM) for the study area was created from 20m interval contours supplied by the			

[15] For the purpose of this study, the region is considered to be beyond the 10km radius of the proposed wind energy facility. This would be a longer distance view where the facility would become part of the visual environment, but would still be visible and constitutes a medium to low visual prominence.

Surveyor General.

It is recommended that the following tasks are undertaken during the EIA phase:

» Establishment of view catchment area, view corridors, viewpoints and receptors;
» Indication of potential visual impacts using established criteria (to be provided by Savannah Environmental and adapted as necessary for applicability to Visual Impact Assessment);
» Assessment of potential lighting impacts at night;
» Description of alternatives, mitigation measures and monitoring programmes;
» Review by independent, experienced visual specialist (if required);
» 3D modelling and photo-simulations / photomontages, with and without mitigation; and
» Review by independent, experienced visual specialist (if required).

It is recommended that the visual impacts be assessed against the following criteria during the EIA phase:

» Visibility of the project;
» Visual exposure;
» Degree of visual intrusion (including the degree of contrast);
» Visual sensitivity of the area;
» Viewer sensitivity;
» Observer proximity; and
» Visual absorption capacity (VAC) of the vegetation and other elements.

Where applicable, the above mentioned criteria will be discussed and numerically weighted according to extent, duration, intensity, probability of occurrence, confidence levels, nature, consequence and significance.

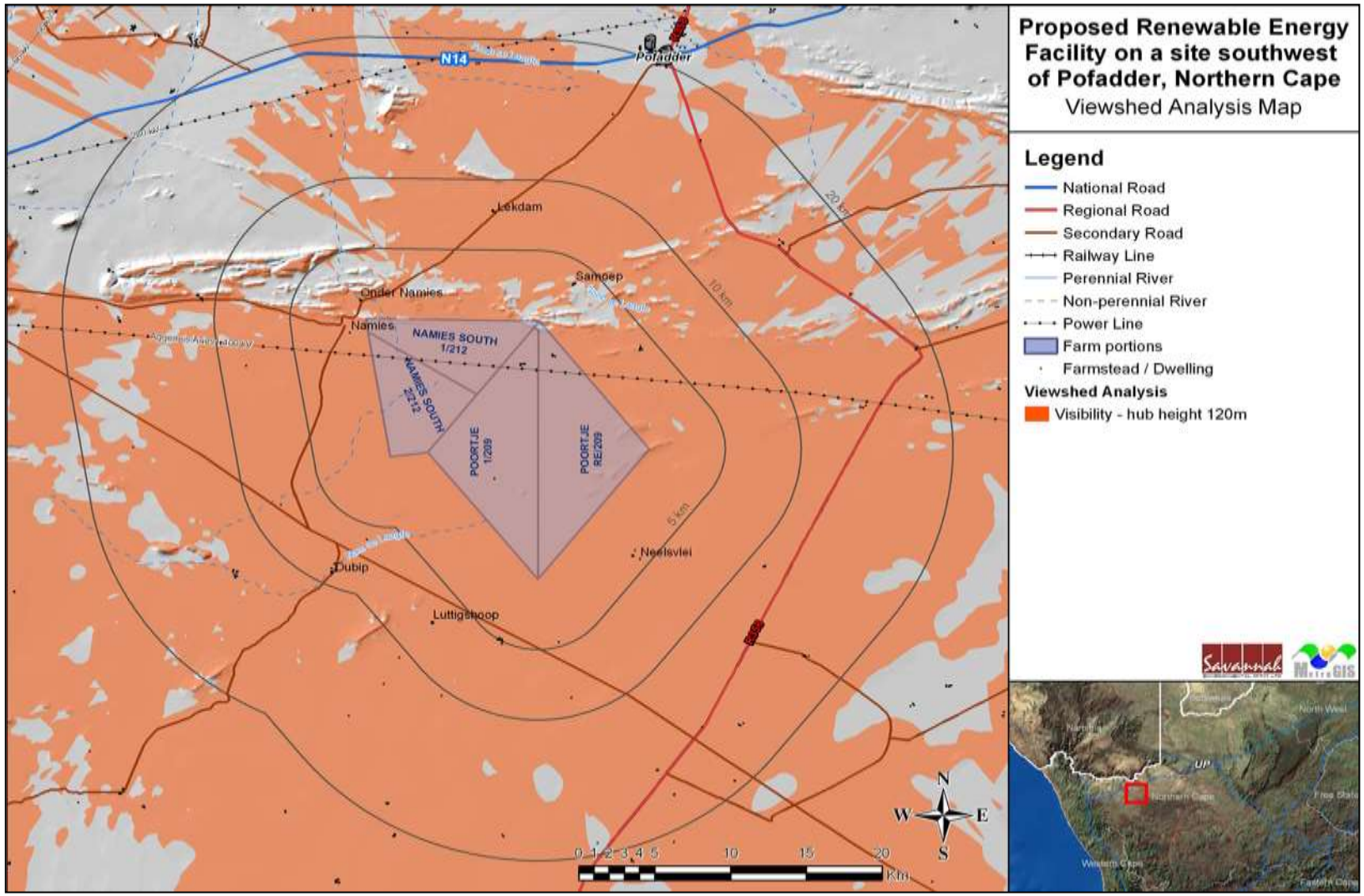

Proposed Renewable Energy Facility on a site southwest of Pofadder, Northern Cape
Viewshed Analysis Map
Legend
National Road
Regional Road
Secondary Road
Railway Line
Perennial River
Non-perennial River
Power Line
Farm portions
Farmstead / Dwelling
Viewshed Analysis
Visibility - hub height 120m
N14
Pofadder
Lekdam
Onder Namies
Namies
Samoep
NAMIES SOUTH 1/212
NAMIES SOUTH 2/212
POORTJIE 1/209
POORTJIE RE/209
Neelsvlei
Dubip
Luttigshoop
20 km
10 km
5 km
N
S
E
W
0 1 2 3 4 5 10 15 20
Km

Figure 10.4: Cumulative Viewshed analysis for the proposed Wind Energy Facility

Impacts on Avifauna:

The effects of a wind energy facility on birds are highly variable and depend on a wide range of factors including the specification of the development, the topography of the surrounding land, the habitats affected and the number and species of birds present. With so many variables involved, the impacts of each wind farm must be assessed individually. The principal areas of concern with regard to effects on birds are listed below. Each of these potential effects can interact with each other, either increasing the overall impact on birds or, in some cases, reducing a particular impact (for example where habitat loss or displacement causes a reduction in birds using an area which might then reduce the risk of collision).

» Collision mortality on the wind turbines
» Collision with the proposed power line
» Displacement due to disturbance
» Habitat change and loss

It is important to note that the assessment is made on the status quo as it is currently on site. The possible change in land use in the broader development area is not taken into account because the extent and nature of future developments are unknown at this stage. It is however highly unlikely that the land use will change in the foreseeable future.

One of the aims of this scoping report is to do a preliminary identification of sensitive areas from an avifaunal perspective. Three sensitivity classes were created namely low, medium and high. Figure 10.5 below indicates the spatial location of these areas. It must be stressed that this is a preliminary classification, and subject to revision as the pre-construction monitoring progresses and the avifaunal dynamics of the site become clearer. The sensitivity of the site in terms of habitat and fight paths for birds is shown in Figure 10.5 are classified as follows:

» **High sensitivity: Included in this area is a 1km no development buffer area around the existing Martial Eagle nest.** Although the nest was not active at the time of the site visit in July 2012, it may well become active again. Prey remains under the nest and fresh droppings indicate that the site may have been active in the not too distant past. The buffer is recommended too reduce the risk of disturbance and collision, should the birds decide to breed there again. Also included under the high risk area is a 200m buffer no development zone around water points. Water points are draw cards for several species, including priority raptors which breed in the trees (e.g. Southern Pale Chanting Goshawk at water point 5) or use the troughs for bathing and drinking. Lanner Falcons and other priority raptors may also hunt small birds at the water points, which could result in them being distracted and colliding with turbines.

» **Medium sensitivity:** This includes an area that is deemed to be the most suitable area within the broader development area for Red Lark. The species is generally sedentary and resident, but local movement triggered by environmental conditions can occur. Only one pair of Red larks was recorded during the site visit, which may point to the broader development area not being optimal habitat for the species. The species is generally associated with red dunes and large seeded grasses, and in optimal habitat, such as the Koa Valley, densities of approximately 1 pair/30 ha can be expected. Although this habitat is present in the broader development area, it is not the dominant habitat. This area should be carefully monitored during the pre-construction programme, to establish if the species is present in larger numbers. At this stage of the investigation, this area need not be excluded from the development area, subject to the results of further monitoring during pre-construction.

» **Low sensitivity:** The remainder of the broad development area is deemed to be of low sensitivity, subject to further pre-construction monitoring. It should however be pointed out that the occurrence of the nomadic Ludwig's Bustard is linked to rainfall events (Hockey *et al* 2005), and numbers of the species, even flocks, may occur all over the development area after rains (this was confirmed by Mr Jan van Niekerk). The whole development area may therefore become temporarily more sensitive while Ludwig's Bustard is present in the area, which is more likely during the late summer/early autumn (February-April), when the majority of rainfall occurs. However, given the evidence currently on bustard interactions with wind farms, this might not automatically result in high collision risk as the birds may well avoid the wind farm entirely.

Issue	**Nature of Impact**	**Extent of Impact**	**'No go' areas**
Collisions of birds with turbines.	Collision with turbine blades	Regional - The impact will occur at the site of the proposed Wind farm, but will have an impact at a more regional level, since it affects entire populations of affected species and may affect migration routes of species.	Figure 7.5 shows area of high avifaunal sensitivity which may be no –go areas and will be investigated further during the EIA phase. These areas include a 1km buffer around a martial eagle nest and 200m around water points/ dams.
Habitat loss – destruction, disturbance and displacement	Habitat loss – destruction, disturbance and displacement due to operation of the facility	Local	
Impacts of associated infrastructure such as power lines.	Due to electrocution with associated power lines as well as the maintenance of substations, power lines, servitudes and roadways. This causes both	Local to Regional	

	temporary and permanent habitat destruction and disturbance.		

Gaps in knowledge & recommendations for further study:

- Any inaccuracies in the above sources of information could limit this study. In particular, the SABAP1 data is now 14 years old (Harrison *et al* 1997).

It is recommended that:

» The micro habitats on site will be assessed for their suitability for the key species.
» The sensitivity zones and suitable buffer zones be identified and mapped.
» The impacts identified in this scoping phase study be assessed formally.
» If a pre-construction bird monitoring programme be initiated.

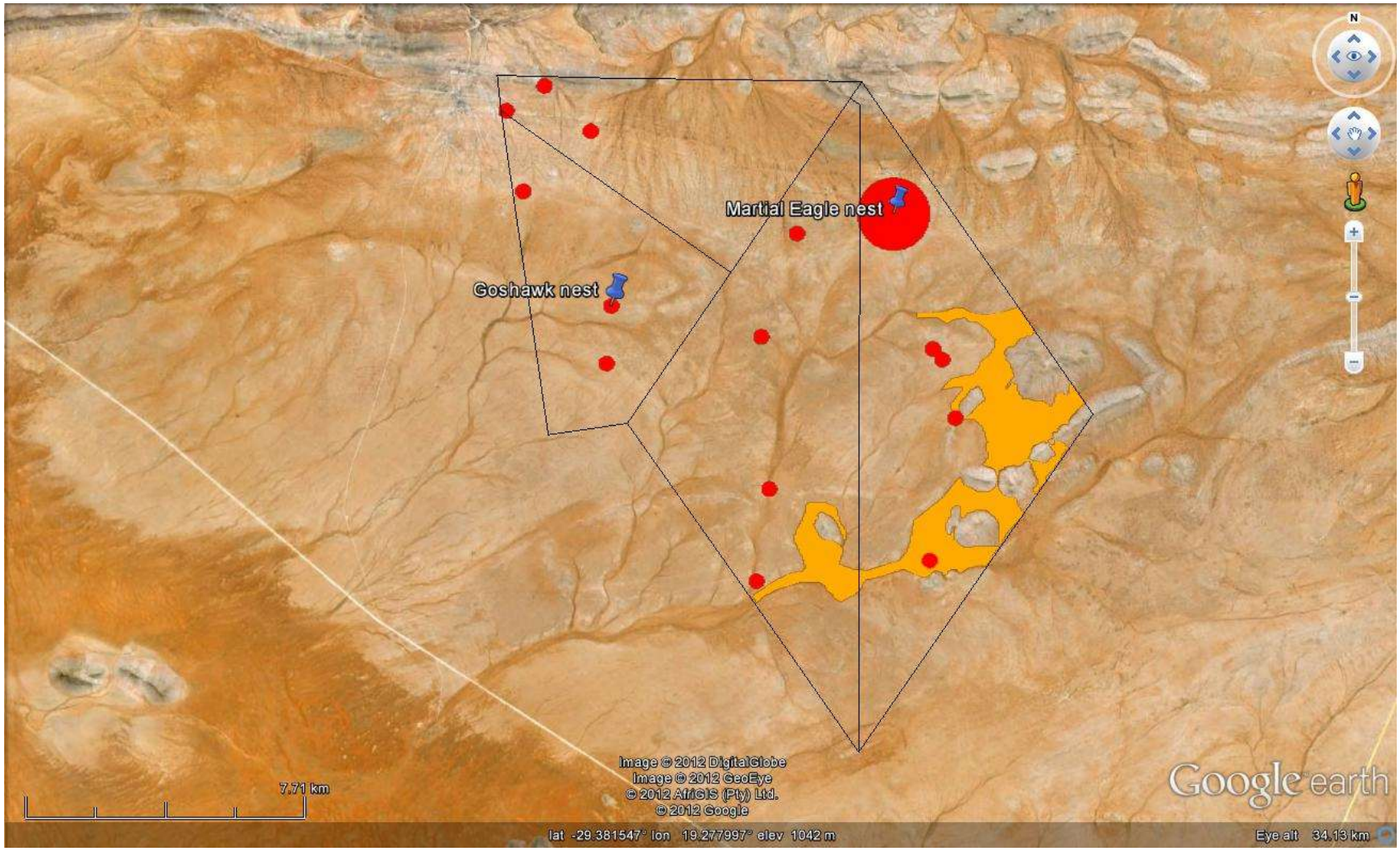


Figure 10.5: Preliminary delineation of sensitive avifaunal habitat. Red = High sensitivity, Yellow = medium sensitivity

Impacts on bats:

The three main hypotheses proposed for bat mortalities associated with wind energy facilities are as follows:

» Collision – a small percentage of the dead bats found show signs of physical injury resulting from collision from the blades of wind turbines (Handwerk 2008).
» Changes in flight patterns – these may be caused by the use of topographical features to migrate, for mating behaviour and because of possibly 'turning-off' their echolocation systems (Cryan undated). Wind turbines may also form barriers to their annual migration and/or daily commutes (Cryan 2011).
» Barotrauma – the sudden drop in air pressure at wind farms causes a bat's lungs to rapidly expand resulting in the death of the bat (Handwerk 2008).

A total of 11 bat species may occur on the site and six have a high probability of occurring on the site, based on a highly precautionary approach. *Cistugo seabrae* has a moderate probability of occurring on the site and is listed as Near Threatened; however it is not a high flying bat and is presumably less vulnerable to turbine induced mortality. *Miniopterus natalensis* also have a medium probability of occurrence and is listed Near Threatened, considering behaviour and biology this species have a medium to high risk of being impacted on by turbines. From a desktop bat sensitivity point of view the Pofadder site has a low - medium bat sensitivity. According to the two seasonal bat monitoring report, the activity recorded indicated moderate levels of bat activity across the site despite the arid local climate and low habitat complexity of the site, features more commonly associated with low bat activity.

Figure 10.6 shows the areas where natural bat roosting space could potentially be available have been marked as sensitive (red shading), and includes the mountainous terrain and rocky outcrops on the site. Possible foraging areas have also been highlighted (orange shading). For the purpose of this study a buffer of 100 m around inland water bodies and 200 m around drainage lines are appropriate. The shaded areas and their buffers indicate areas which may be marked as sensitive during the EIA phase assessment, however the buffers will be detailed and confirmed based on field work..

Issue	Nature of Impact	Extent of Impact	'No go' areas
Bat mortalities due to blade collisions and barotrauma	Rotating turbine blades	Regional - The impact will occur at the site of the proposed wind farm, but will have an impact at a more regional level, since it affects entire	Cannot be determined at this stage.

		populations of affected species and may affect migration routes of species	
Habitat Destruction	Habitat destruction stemming from the concrete foundation of the turbines, access roads and associated infrastructure	Local	Cannot be determined at this stage.

Gaps in knowledge & recommendations for further study:

Gaps in knowledge:

» There is limited information available on bat presence and abundance in the South Africa and for this reason this scoping report has concentrated on bats known to occur in the province rather than the specific locality.

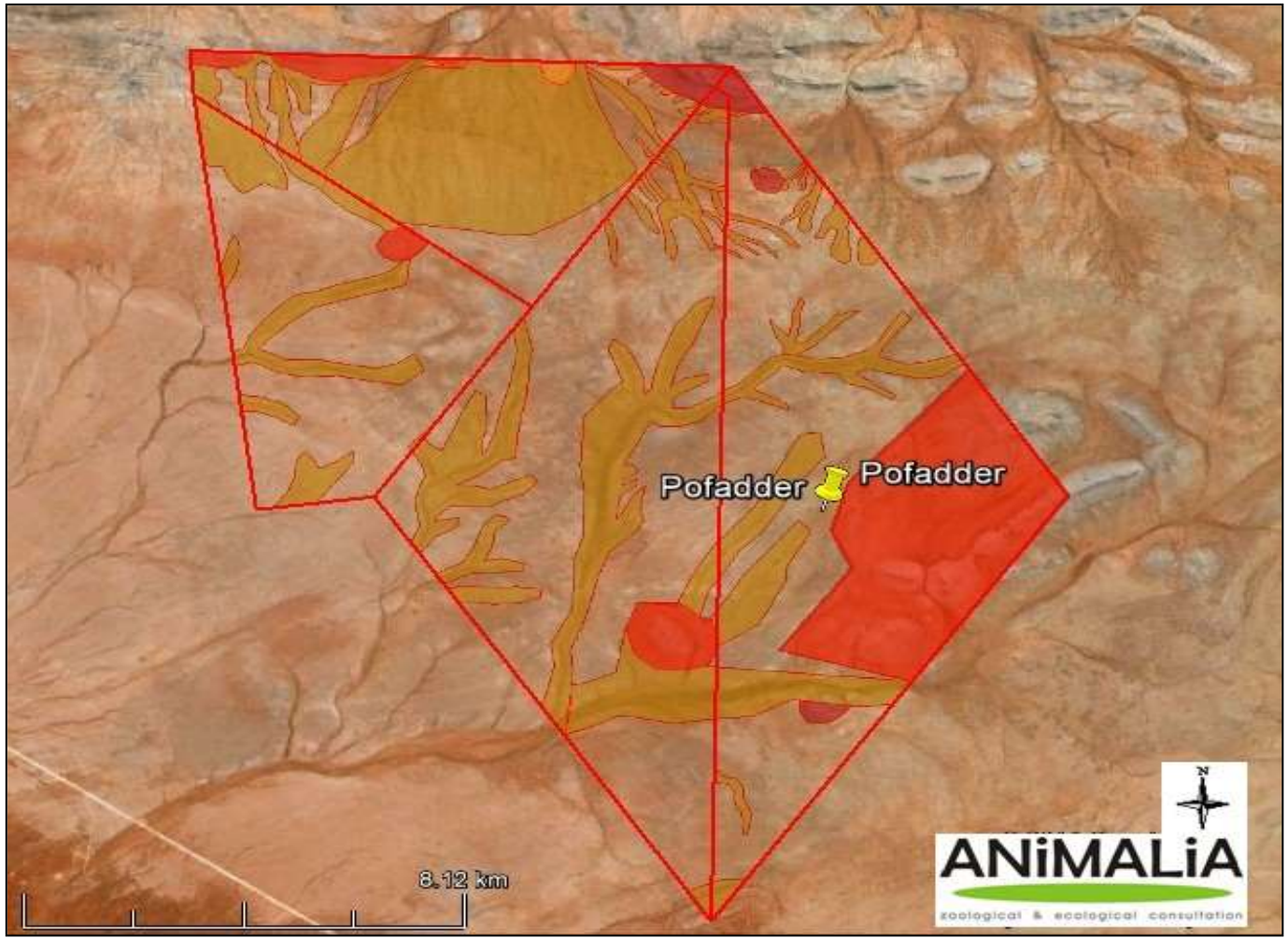
It is recommended that:

» An assessment of the significance of direct, indirect and cumulative impacts.

» Information for the EIA phase would include the following monitoring techniques:
  - Species presence estimates determined through the use of a bat detector system operated whilst driving transect lines across the farm
  - Surveys to assess and identify potential key areas for roosting such as (but not limited to) buildings, underground sites and trees
  - Further roost investigation will be conducted if any areas adjacent to the site are identified and having a high chance of having suitable roost sites
  - Roost surveys will be conducted during day-light hours as well as at dusk and dawn at all infrastructure currently present on the farm;

  General guidance for carrying out manual bat surveys (i.e. driven transects) suggests that they only take place in optimum weather conditions in order to maximise the likelihood of recording bats if they use the site being surveyed. It is advised to avoid heavy rain, strong winds and low temperatures, when bats are least likely to fly in these conditions.

» A bat monitoring program may assist with knowledge of wind energy and bat interaction in South Africa. A bat monitoring has been commissioned for this site. It will be beneficial to collaborate with academic institutions to promote research on the subject, doing affordable long term monitoring and determining the risks more accurately.



Areas that can possibly support bat roosting Most probable foraging areas

Figure 10.6: Desktop based bat sensitivity map of wind energy facility site

Potential Heritage Impacts:

Potential impacts on heritage resources as a result of the operation of the wind farm relate to visual impacts on areas around heritage structures and cultural landscapes, as well as impacts on sense of place. The heritage scoping study revealed that the following heritage sites, features and objects that can be expected within the study area:

» Archaeological finds
» Historical finds

Issue	Nature of Impact	Extent of Impact	'No go' areas
Built environment	Physical structural appearance of the wind farm.	Local	No 'no- go' areas have been identified at this stage.
Cultural landscapes and sense of place	Physical structural appearance of the wind farm.	Unknown at this stage of impact assessment	No 'no- go' areas have been identified at this stage.

Gaps in knowledge & recommendations for further study:

The potential impacts on heritage artefacts will be assessed in greater detail during the EIA phase of the project.

Recommendations:

During the EIA phase of the project it is suggested that in order to comply with the National Heritage Resources Act (Act No 25 of 1999) a Phase 1 Archaeological Impact Assessment must be undertaken. The following will form part of this study:

» Sites of archaeological, historical or places of cultural interest will be located, identified, recorded, photographed and described.
» The levels of significance of recorded heritage resources will be determined and mitigation proposed should any significant sites be impacted upon,

Potential Noise Impacts:

Noise emitted by wind turbines can be associated with two types of noise sources. These are aerodynamic sources due to the passage of air over the wind turbine blades and mechanical sources which are associated with components of the power train within the turbine, such as the gearbox and generator and control equipment for yaw, blade pitch, etc. These sources normally have different characteristics and can be considered separately. In addition there are other less significant noise sources, such as the substations, traffic (maintenance) and transmission line noise.

Increased noise levels can directly be linked with the various activities associated with the operational phase of the activity. During this evaluation, more focus was placed on the impacts on the surrounding noise environment during times when a quiet environment is highly desirable. Noise limits should therefore be appropriate for the most noise-sensitive activity. Noise-sensitive activities such as sleeping, or areas used for relaxation or other activities (places of worship, school, etc) should determine appropriate Zone Sound Levels. However, for the noise Scoping report the $L_{Req,N}$ of **35dBA** as proposed by SANS 10103 was used.

The most common sources of noise during the operational phase include:

» Aerodynamic noise, which is emitted by a wind turbine blade (sound of the wind turbine "cutting" wind – low frequency noise);
» Mechanical noise (from the gear-box / generator);
» Transformer noises (substation);
» Transmission Line noise (Corona noise);
» Low frequency noise; and
» Amplitude modulation of the sound emissions from the wind turbines.

The worst case scenarios as indicated in the noise study (Appendix J) illustrates the situation where atmospheric conditions are favourable for sound propagation, with the wind speeds above the cut-in speeds of the Wind Turbine Generator (WTG), but before wind induced noises start to mask the noises from the wind turbines. Three noise receptors have been identified as shown in Figure 10.7. An appropriate buffer will have to be determined around these identified sensitive receptors during the EIA phase.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Noise impacts associated with the operation of the wind energy facility.	The noise will be a combination of the cumulative effects of multiple wind turbines operating at night. Based on the preliminary impact estimations (as	Regional (i.e. beyond the site boundaries). The noise could impact on receptors	Three noise receptors have been identified as shown in Figure 7.7. An appropriate

	detailed in the noise specialist report contained within Appendix J) there are three potential noise-sensitive developments (NSD) within the potential area of influence. This, however, needs to be confirmed through detailed modelling of the preliminary layout in the EIA phase of the process.	within the potential area of influence (worst case scenario – wind blowing from wind farm towards receptor).	buffer will have to be determined around these identified sensitive receptors during the EIA phase.

Gaps in knowledge & recommendations for further study:

Gaps in knowledge:

» There is no information available regarding the existing soundscape of the area.

» Projected impacts from the construction phase can only be modelled once more information regarding the duration of construction and equipment used are known.

It is recommended that:

» A site visit be undertaken to obtain information regarding background noise levels, the prevailing meteorological conditions during this background noise level survey, as well as confirming and identifying Noise-sensitive developments.

» Currently identified (potential) Noise Sensitive Developments (NSDs) will be investigated during the EIA phase, and any additional NSDs will be identified. Their relative sensitivity to noise impacts will be determined. This will be based on the SANS 10103 guideline, as well as current land uses on the properties (residential vs business/industrial).

» Using the data (proposed processes, noise characteristics of the selected equipment, locations of the wind turbine generators) as provided by the project developer, the predicted impact of the facility on NSDs will be predicted using the CONCAWE method as recommended by SANS 10357:2004 for both the construction and operational phases, as well as the ISO 9613-2 model for the operational phase.

» Using the calculated noise levels at the identified NSDs, the projected significance of the facility (whether construction or operational) will be determined using the criteria as proposed (subject to possible changes after any stakeholder input). Further recommendations on the most suitable buffer zone can be made after more information is available for the proposed facility.

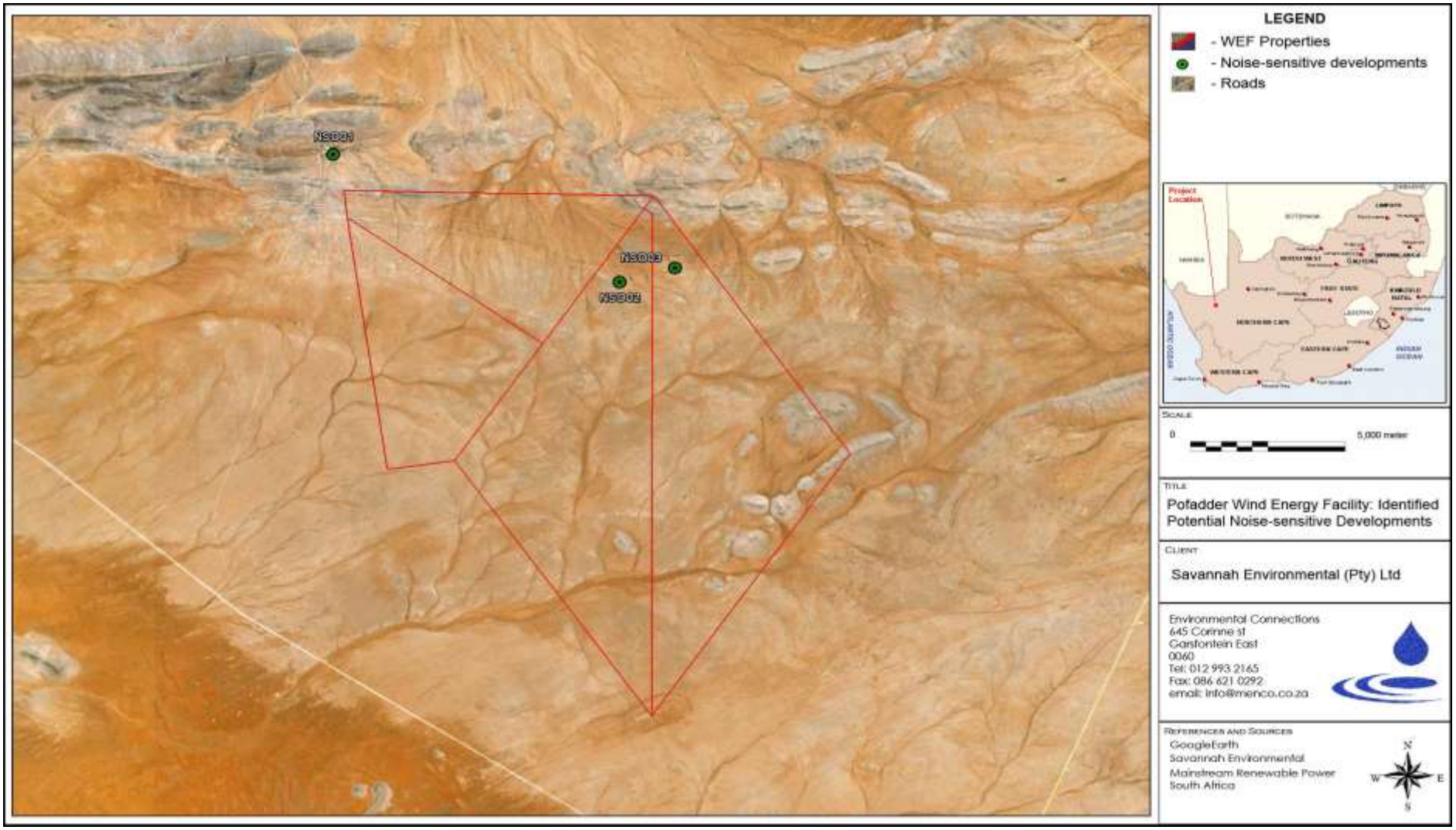


Figure 10.7: Aerial image indicating identified Noise-sensitive developments around the site

Potential Social Impacts:

During the operation phase the potential exists for further, albeit limited, job creation and some skills development (positive impacts). However, there is also the potential for impacts on the social dynamics of the study area. The proposed project could assist with decreasing South Africa's dependency on coal generated electricity thereby strengthening the electricity grid in an "environmentally friendly" way. On a regional scale it could possibly result in positive changes in the quality of lives of many individuals currently living without an efficient and satisfactory electricity supply. On a national scale, the proposed project would also assist in meeting the South African government's target for renewable energy.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Potential impacts on existing tourism and tourism potential of the area	This is considered to be low as the area is not seen as a tourist destination	Local-regional	N/A
Potential visual and sense of place impacts on existing receptors, including nearby rural residences.	Impact closely linked to visual impacts, associated with turbines and associated infrastructure, the power lines proposed.	Local-regional	N/A
Potential impact on job creation.	Creation of opportunities to local business during the operational phase, including but not limited to, provision of security, staff transport, and other services.	Local and Regional	N/A
Potential impact on economic opportunities.	There are potential up and down-stream economic opportunities for the local, regional and national economy.	Local, Regional and National	N/A

Gaps in knowledge & recommendations for further study:

The potential social and socio-economic impacts will be assessed in greater detail during the EIA phase of the project.

It is recommended that:

» Review of existing project information, including the Planning and Scoping Documents will be done;
» Collection and review of reports and baseline socio-economic data on the area (IDPs, Spatial Development Frameworks etc);
» Site visit and interviews with key stakeholders in the area including local land owners and authorities, local community leaders and councillors, local resident associations and residents, local businesses, community workers etc.;
» Identification and assessment of the key social issues and opportunities;
» Preparation of Draft Social Impact Assessment (SIA) Report, including identification of mitigation/optimisation and management measures to be

implemented.

Table 10.3: Evaluation of potential Cumulative Impacts associated with the Korana Wind Energy Facility

Approach to Cumulative Effects Assessment

Cumulative impacts, in relation to an activity, refer 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. For cumulative effects analysis to help the decision-maker and inform interested parties, it must be limited to effects that can be evaluated meaningfully (DEAT, 2004). Boundaries must be set so analysts are not attempting to measure effects on everything. Therefore, the cumulative impacts associated with the proposed Wind Energy Facility near Pofadder have been viewed from two perspectives within this EIA:

V. Cumulative impacts associated with the scale of the project,
VI. Cumulative impacts associated with a) other relevant wind or solar (renewable) projects that have been approved (received an Environmental Authorisation), b) projects which have been awarded preferred bidder status by the Department of Energy and are planned to be constructed in the area within the immediate term, or c) projects which are existing.

Cumulative effects are commonly understood as the impacts which combine from different projects and which result in significant change, which is larger than the sum of all the impacts (DEAT, 2004). The complicating factor is that the projects that need to be considered are from past, present and reasonably foreseeable future development. Cumulative effects can be characterised according to the pathway they follow. One pathway could be the persistent additions from one process. Another pathway could be the compounding effect from one or more processes. Cumulative effects can therefore occur when impacts are:

* additive (incremental);
* interactive;
* sequential; or
* synergistic.

Canter and Sadler (1997) describe a three step process for addressing cumulative effects in an EIA:

* delineating potential sources of cumulative change (i.e. GIS to map the relevant wind energy facilities in close proximity to one another).
* identifying the pathways of possible change (direct impacts)
* indirect, non-linear or synergistic processes; and

* classification of resultant cumulative changes.

» **Potential Cumulative Impacts**

The cumulative impacts associated with the proposed Korana wind energy facility at a site level are expected to be associated with the scale of the project, i.e. wind turbines which will be located on the proposed site. The potential direct cumulative impacts associated with the project are expected to be associated predominantly with the potential visual impact, ecology and soils and positive social impacts. These cumulative effects can only be assessed once a preliminary layout is available, and will be considered in the detailed specialist studies to be undertaken in the EIA phase.

In addition to cumulative impacts at a site level, cumulative impacts could be associated with this proposed development and other similar developments in the area as listed above. It is important to describe the potential cumulative impacts which may be expected in order to obtain a better understanding of these impacts and the possible mitigation that may be required. The cumulative impacts associated with the proposed facility primarily refer to those impacts associated with visual (including impacts on the cultural landscape), ecological, avifaunal and social impacts, and are mainly associated with the existing projects/ projects under construction and planned facilities in the area.

Potential cumulative impacts associated with numerous solar and/ wind energy facilities within the study area are expected to be associated with:

» *Visual impacts* – The most significant impact associated with the proposed development is the visual impact on the scenic resources and cultural landscape of this region imposed by the components of the facility.
» *Ecology* – natural vegetation within the study area is largely impacted by agricultural activities, and is formally conserved only to a limited extent. Although a wind energy facility generally results in permanent disturbance a small percentage of a broader site, any impacts on natural vegetation in this area are considered significant. Therefore, numerous developments (regardless of their nature) within the study area are expected to have an impact on vegetation at a regional level. However, it must be noted that this impact can be effectively avoided through the placement of infrastructure outside of natural vegetation and sensitive habitats.
» *Avifauna* – Cumulative loss of avifauna habitat associated with development may be an issue in the area. Risk to avifauna resulting from collisions is limited to power lines and solar infrastructure, with no other wind projects proposed in the immediate surrounding area.
» *Social* – The development of numerous renewable energy facilities within the study area will have a cumulative impact on several existing issues within the area, predominately within rural settlements associated with the potential influx of workers and job seekers. With the increased population density, this may lead to a cumulative impact on housing requirements, services (i.e. water, electricity and sanitation), health issues, safety and security. New informal townships are unlikely to have the required infrastructure and services. With the existing rural settlements in the

area this will have a cumulative impact on the environment and health (i.e. in terms of ablution facilities). The main social impact, however, will be in terms of visual impacts and associated impacts on sense of place.

» *Positive impacts* - Cumulative positive impacts are, however, also anticipated should a number of similar wind or solar energy developments be developed in the area, largely due to job creation opportunities, business opportunities for local companies, skills development and training. The development of renewable energy facilities will have a positive impact at a national and international level through the generation of "green energy" which would lessen South Africa's dependency on coal generated energy and the impact of such energy sources on the bio-physical environment. The proposed project would fit in with the government's aim to implement renewable energy projects as part of the country's energy generation mix over the next 20 years as detailed in the Integrated Resource Plan (IRP)) and the Northern Cape SDF.

CONCLUSIONS FOR THE KORANA WIND ENERGY FACILITY CHAPTER 11

South Africa Mainstream Renewable Power Developments (Pty) Ltd (Mainstream) is proposing to establish a commercial wind energy facility component as well as associated infrastructure on a site located approximately 22 km south-west of Pofadder in the Northern Cape Province. A broader area of approximately 175 km^2 is being considered within which the facility is to be constructed.

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

» Foundations to support both the turbine towers;
» Cabling between the project components, to be lain underground where practical;
» Permanent wind monitoring masts.
» Common infrastructure between the wind energy facility and the solar energy facility will include:
  * A 400 kV substation and satellite 132 kV substations to facilitate grid connection via a loop-in loop-out connection to the existing Eskom Aggenys–Aries 400kV power line which traverses the site;
  * Internal access roads;
  * Laydown area for construction;
  * Operations and maintenance buildings; and
  * Workshop area for maintenance and storage.

The Scoping Study for the proposed **Korana Wind Energy Facility** associated infrastructure has been undertaken in accordance with the EIA Regulations published in Government Notice 33306 of GN R543, R544, R545 and R546 (18 June 2010 as amended), in terms of Section 24(5) of the National Environmental Management Act (NEMA; Act No 107 of 1998). This project was registered with the National Department of Environmental Affairs under application reference number **14/12/16/3/3/2/682.**

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

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

A summary of the conclusions of the evaluation of the potential impacts identified to be associated the proposed wind farm and associated power line is provided below. Recommendations regarding investigations required to be undertaken within the EIA are provided within the Plan of Study for EIA, contained within Chapter 12 of this report.

11.1. Conclusions drawn from the Evaluation of the Proposed Site for Development of the proposed Korana Wind Energy Facility

In identifying and evaluating impacts associated with the proposed wind energy facility, it has been assumed that although during operation, the area affected will comprise of wind turbines (depending on which turbine types are ultimately chosen by the developer) and associated infrastructure, during construction much of the ~175km^2 of the proposed site could suffer some level of disturbance. However, once construction is complete, only a small portion of this area (estimated at ~5%) will be permanently impacted by infrastructure associated with the wind energy facility.

Table 11.1 and 11.2 summarises the potential issues associated with the wind energy facility that have been identified through this 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 range from local to regional in extent. No environmental fatal flaws were identified to be associated with the site. However, areas of potential sensitivity including potential noise / visual sensitive receptors, heritage artefacts, bird and bat sensitive areas, drainage lines and habitats for protected flora and fauna were identified through the scoping phase. These areas of sensitivity are illustrated in the sensitivity map included as Figure 11.1.

Table 11.1: Potential impacts associated with the Construction/ Decommissioning Phase with the proposed Poortjies Wind Energy Facility near Pofadder

Impacts resulting from the Construction/ Decommissioning Phase	Extent
Potential visual impacts associated with the construction phase	L
Potential visual impact of the construction of ancillary infrastructure on observers in close proximity	L
Loss of agricultural land	L
Soil degradation due to contamination	L
Soil erosion due to increased and concentrated storm water run-off	L
Soil erosion due to trampling by vehicles and equipment, as well as construction activities	L
Siltation of watercourses and other natural resources down stream	R
Dust production	L
Impacts on listed and protected plant species during site clearing	L
Alien plant invasion, habitat fragmentation and loss of landscape connectivity	L
Loss of bird habitat due to construction of the wind energy facility.	L
Disturbance of birds	L
Displacement of birds from the site and barrier effects	L-R
Destruction of foraging habitat and roosts for bats	L-R
Impacts on archaeological and paleontological finds	L
Impacts on historical finds	L
Impacts on burials and cemeteries	L
Noise impacts due to construction equipment	L
Noise impacts due to construction traffic	L
Impact on rural sense of place	L
Impact on farming activities	L
Influx of job seekers into the area	L
Employment creation (positive impact)	L

Impacts resulting from the Construction/ Decommissioning Phase	Extent
Skills development and training (positive impact)	L-R
Promotion of clean, renewable energy (positive impact)	L-R

L **Local** R **Regional** N **National** I **International**

Table 11.2: Potential impacts associated with the Operational Phase of the proposed Poortjies Wind Energy Facility near Pofadder

Impacts resulting from the Operational Phase	Extent
The visibility of the facility from, and potential visual impact on observers travelling along arterial roads and secondary roads in close proximity to the proposed facility and within the region.	L
The potential visual impact on the town of Pofadder	L
The visibility of the facility from, and potential visual impact on residents of homesteads and settlements in close proximity to the proposed facility and within the region.	L
The potential visual impact of ancillary infrastructure (i.e. the substation, overhead power lines, internal access roads, workshop and office) on observers in close proximity to the proposed facility.	L
The potential visual impact of the proposed facility on the visual quality of the landscape and sense of place region.	L
The potential visual impact of operational, safety and security lighting of the facility at night on observers in close proximity to the facility.	L
Potential cumulative visual impacts of the wind energy facility and associated infrastructure.	L
Collisions of birds with turbines	R
Habitat loss for avifauna as a result of destruction, disturbance and displacement	L
Impacts of associated infrastructure on avifauna	L-R
Bat mortalities due to blade collisions and barotrauma	R
Bat Habitat Destruction	L
Heritage impacts associated with the built environment	L
Impacts on the cultural landscapes and sense of place	Unknown

Impacts resulting from the Operational Phase	Extent
Noise impacts associated with the operation of the wind energy facility	R
Potential impacts on existing tourism and tourism potential of the area	L-R
Potential visual and sense of place impacts on existing receptors, including nearby rural residences.	L-R
Creation of opportunities to local business during the operational phase, including but not limited to, provision of security, staff transport, and other services (positive)	L-R
Potential up and down-stream economic opportunities for the local, regional and national economy (positive impact)	L-N
Provision of a clean, renewable energy source for the national grid (positive impact)	L-N
Potential impact on climate change	I

L **Local** R **Regional** N **National** I **International**

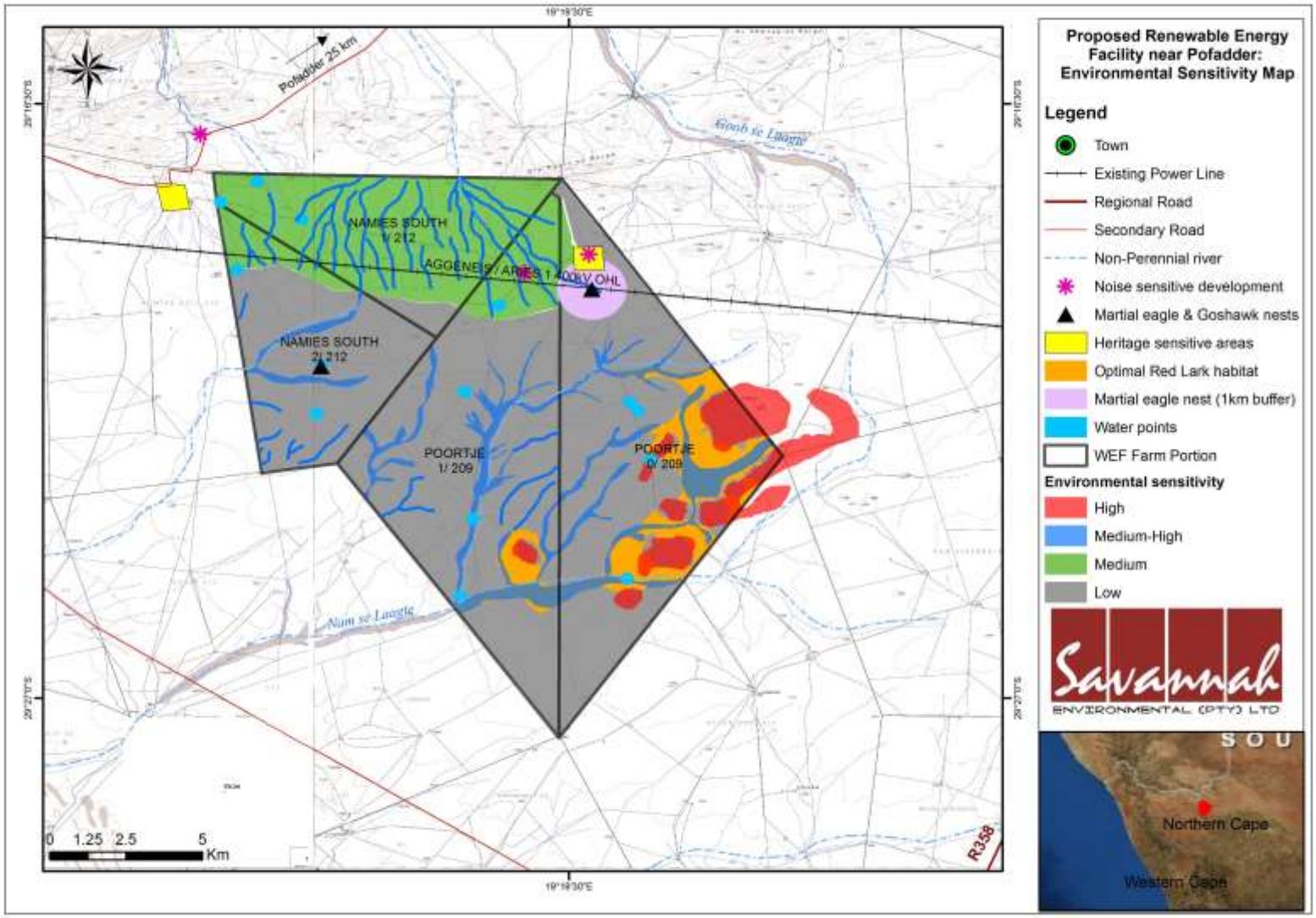


Figure 11.1: Combined environmental sensitivity map for the study area

The potentially sensitive areas/environmental features that have been identified and are illustrated in Figure 11.1 include:

» **Non-perennial river and drainage lines that occur within the site:**
There are no perennial rivers or wetlands on the site. The drainage lines that do occur on the site are characterised by loose sandy soil or exposed bedrock and boulders in the 'washes' with the banks lined with grasses, shrubs and small tree. In the north of the study area (Namies South 212/1), the drainage lines are many narrow channels which follow a dendritic pattern, dissecting the plains. Further south the drainage lines are wider and better defined. The main drainage channel in the southern portion of the site is Nam se Laagte that drains towards the south-west. The northern portion of Namies South drains north-westerly towards the Orange River. All the drainage lines have similar riparian vegetation, and the primary variation between them depends on availability of water and length of duration of flowing water.

In the arid ecosystems such as in the study area the drainage lines are prone to flash flooding. They are also the 'ecological linking corridors'. Although not having a high diversity of plant species they should be observed as ecologically sensitive. The landscape is prone to sheet-wash at times of heavy rain and there are seasonal drainage lines which in some cases are poorly defined whereas in others they are quite distinct. The vegetation of the drainage lines does not differ greatly from that found in the non-drainage-line areas. This is attributed to the drainage lines being mainly dry and only having water-flow for very short periods. Drainage lines will also support birds, bats and faunal species.

» **Potential bird and/bat sensitive habitats:**
A Martial Eagle nest was discovered on site, although the nest was not active at the time of the site visit in July 2012, it may well become active again. Prey remains under the nest and fresh droppings indicate that the site may have been active in the not too distant past. A 1 km buffer has been placed around the Martial Eagle nest during the design of the wind energy facility. The buffer is recommended to reduce the risk of disturbance and collision with the wind turbines or power line, should the birds decide to breed there again. Also included under the high risk area is a water points. Water points are draw cards for bird species and bat/ insect feeders, including priority raptors which breed in the trees (e.g. Southern Pale Chanting Goshawk which was seen on the site) or use the troughs for bathing and drinking. Lanner Falcons and other priority raptors may also hunt small birds at the water points, which could result in them being distracted and colliding with turbines. A Goshawk's nest is also shown on the map. These should be treated as potential no-go areas, to be confirmed during the EIA phase.

The sensitivity map shows water points which serve as key hotpots for bird species, to be considered bint he design of the facility. In the far eastern section of the site (the R/E of farm Poortjie) an orange area has been delineated as being suitable habitat for the suitable area within the Red Lark bird species. This area is of moderate avifaunal sensitivity. The Red Lark is generally sedentary and resident species in an area, but local movement triggered by environmental conditions can occur. Only one pair of Red larks was recorded during the site visit, which may point to the broader development area not being optimal habitat for the species. The species is generally associated with red dunes and large seeded grasses, and in optimal habitat, such as the Koa Valley, densities of approximately 1 pair/30 ha can be expected. Although this habitat is present in the broader development area, it is not the dominant habitat. This area should be carefully monitored during the pre-construction bird monitoring programme, to establish if the species is present in larger numbers. At this stage of the investigation, this area need not be excluded from the development area, subject to the results of further monitoring during pre-construction.

» **Areas of high erosion sensitivity**

Areas of high erosion sensitivity include the drainage lines on the site as well as moderately to gently undulating hills and plains (low relief areas) where unconsolidated sediment occurs. Moderate levels of erosion will occur if land-disturbing activities take place (mainly during construction).). Further investigated and assessed through detailed specialist studies (including field surveys) will be required during the EIA phase.

» **Noise sensitive receptors**

Three homesteads have been identified as potential noise sensitive receptors, which may be impacted upon by the low frequency noise that is generated by wind turbines. The noise will be a combination of the cumulative effects of multiple wind turbines operating at night. Based on the preliminary impact estimations (as detailed in the noise specialist report contained within Appendix J) there are three potential noise-sensitive developments (NSD) within the potential area of influence. This, however, needs to be confirmed through detailed modelling of the preliminary layout in the EIA phase of the process.

The sensitivity map is a rough scale estimate of sensitivity on the site, and these areas will be subject to survey and ground-truthing during the EIA phase of the project. These potentially sensitive areas will, therefore, be further investigated and assessed through detailed specialist studies (including field surveys) during the EIA phase.

The proposed design of the wind energy facility (i.e. wind turbines and other infrastructure) can be based on the full extent of the site, and therefore utilise the most technically optimal positions on the broader site to the fullest extent. This recommendation does, however, require that due cognisance is taken of the recommendations outlined in Chapter 6 and above (as well as within individual specialist reports) regarding areas within the study site of potential moderate to high sensitivity. Understanding which area of the site would be least impacted by the development of such a facility, Mainstream should prepare the detailed infrastructure layouts for consideration within the EIA phase.

11.2. Evaluation of the Potential Issues associated with the overhead power line

In order to connect the wind energy facility to the power grid substations and 400kV overhead power lines will be required. A 400 kV substation and satellite 132 kV substations (and associated power lines) are proposed to facilitate grid connection via a loop-in loop-out connection to the existing Eskom Aggenys–Aries 400kV power line which traverses the site.

Potential issues associated with the proposed overhead distribution power line and substation will include impacts on flora, fauna and ecological processes, visual impacts, impacts on avifauna as a result of collisions and electrocutions, and potential impacts on heritage sites.

As the location of the power lines will depend on the substation location (which will be determined by the solar facility layout), the power line options will be considered in detail within the EIA phase in order to assess potential impacts associated with the power line corridor and make recommendations regarding a preferred

alternative alignment and appropriate mitigation measures). These options will however fall within the broader project site evaluated within this Scoping Report.

PLAN OF STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT CHAPTER 12

A detailed description of the nature and extent of the proposed Khai-Ma, Poortjies and Korana Wind Energy Facilities and associated infrastructure on a site near Pofadder, details regarding the Scoping Phase followed, as well as the issues identified and evaluated through the Scoping Phase (to date) have been included in this Draft Scoping Report. This section of the report provides the context for a Plan of Study for Environmental Impact Assessment (EIA) for all three wind energy facilities proposed by Mainstream .

The Plan of Study describes how the EIA Phase for the proposed wind energy facility projects will proceed. **This Plan of Study for the EIA Phase is relevant to the three wind energy facilities.** The EIA Phase of the study includes detailed specialist studies for those impacts recorded to be of significance as well as on-going public consultation. The key findings of the Scoping Phase (which includes inputs from authorities, the public, the proponent and the EIA specialist team) are used to inform the Plan of Study for EIA, together with the requirements of the NEMA EIA Regulations and applicable guidelines. It must be noted that separate EIA processes will be undertaken for each facility under consideration, as it is the intention of the applicant to obtain a stand-alone Environmental Authorisation for each facility. Elements of the processes will however be combined.

12.1 Aims of the EIA Phase

The EIA Phase will aim to achieve the following:

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

The EIA will address potential environmental impacts and benefits (direct, indirect and cumulative impacts) associated with all phases of the project including design, construction, operation and decommissioning, and will aim to provide the environmental authorities with sufficient information to make an informed decision

regarding the proposed project. All identified feasible alternatives (including the 'do nothing' alternative) will be assessed.

12.2 Authority Consultation

Consultation with the regulating authorities (i.e. DEA and NC DENC) will continue throughout the EIA process. On-going consultation will include the following:

» Submission of a Draft Scoping Report to NC DENC and other relevant Organs of State for review and comment. A 40-day review period will be provided in accordance with the requirements of NEMA.
» Submission of a Final Scoping Report to DEA following a 40-day public review period.
» An opportunity for relevant authorities to visit and inspect the site proposed for each facility.
» Submission of a Final EIA Report for each facility to DEA following a 40-day public review period.

12.3 Consideration of alternatives

The following project alternatives will be investigated in the EIA:

» **The 'do nothing' alternative:** Mainstream does not establish the proposed Wind Energy Facilities (maintain status quo).
» **Site-specific alternatives:** particularly the layout of the wind turbines and corridors/servitudes for associated infrastructure such as the access roads and power lines. This will be determined based on the detailed environmental sensitivity mapping undertaken in the EIA.
» **Alternative servitudes for power line routing:** Network integration studies, planning and design for the transmission of the power generated at the wind energy facilities is still being finalised. This will be informed through understanding the local power requirements and the stability of the local electricity network. At this stage, a 400 kV substation and a satellite 132 kV substation and associated power lines for each facility will be required to facilitate grid connection via a loop-in loop-out connection to the existing Eskom Aggeneys–Aries 400kV power line which traverses the site.
» The power line options will be considered in detail within the EIA phase in order to assess potential impacts associated with the power line corridor and make recommendations regarding a preferred alternative alignment and appropriate mitigation measures.

12.4 Assessment of Potential Impacts and Recommendations regarding Mitigation Measures

A summary of the issues which require further investigation within the EIA phase, as well as the proposed activities to be undertaken in order to assess the significance of these potential impacts is provided within Table 12.1. The specialists involved in the EIA Phase are also reflected in Table 12.1. These specialist studies will consider the site proposed for the development of the wind energy facilities and all associated infrastructures (including alternatives with regards to design, layout, as well as the alternative alignments of access road/s and power lines).Further Palaeontological Assessment for the Wind Energy Facilities will not be required as the proposed site has a low palaeontological sensitivity. Significant impacts on palaeontological heritage resources due to the proposed wind energy facilities are not anticipated. Therefore, pending the discovery of new fossil remains during development, no further specialist palaeontological heritage studies or mitigation are recommended for this project.

Table 12.1: Summary of the issues which require further investigation within the EIA phase and activities to be undertaken in order to assess the significance of these potential impacts

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
Impact on Ecology (Flora and Fauna)	The EIA Phase will include the following: » Ground-truth and refine the ecological sensitivity map of the site. Particular attention will be paid to mapping the distribution of sensitive ecosystems at the site such as drainage systems. The rocky areas will also be specifically investigated on account of the higher potential abundance of listed and protected species within these areas. » Conduct fieldwork to locate and describe the vegetation on the study area, key focus on the impact footprint. » Evaluate the likely presence of listed faunal species at the site such as the Small spotted cat, Dassie rat, Baboon spiders, Trapdoor spiders, Girdled lizards and Tent tortoises and identify associated habitats that should be avoided to prevent impact to such species. » Determine the plant species present and localities within each vegetation type present. » Assess the impacts identified above in light of the site-specific findings and the layouts to be provided by the developer. » Generate a vegetation map showing the sites in relation to any ecological corridors. » Describe the areas where indigenous vegetation has been transformed. » Determine alien species present; their distribution within the study area and recommended management actions. » Note and record the position of protected or unusually large specimens of trees. » Provide a detailed vegetation and faunal sensitivity map of the site, including mapping of disturbance and transformation on site. » Evaluate, based on the site attributes, what the most applicable mitigation measures to reduce the impact of the development on the site would be and if there are any areas where specific precautions or mitigation measures should be implemented. » Provide monitoring requirements as input into the Environmental Management Programme (EMP), as well as generic rehabilitation and re-vegetation guidelines. » Assess cumulative impacts associated with the proposed wind energy facilities.	Dave McDonald of Bergwind Botanical Surveys and Tours – Flora Werner Marais of Animalia – Fauna
Impacts on avifauna	The EIA Phase will include the following: » A site visit was conducted in June 2012. The avifaunal specialist will re-visit the site in order to	Chris van Rooyen Consulting

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	obtain seasonal variance. » All identified issues will be investigated in more detail during the EIA phase, and rated according to the prescribed criteria. » Landscape factors relevant to this study will be investigated further, and the sensitivity zones described in this scoping report will be "ground truthed" during the site visit, and updated where necessary. » Generate a sensitivity map showing the sensitivity zones in relation to proposed infrastructure. » The possible impacts of avifauna on the new infrastructure will be identified and assessed in detail. » Suitable mitigation measures will be recommended for all issues identified as significant. » Assess cumulative impacts associated with the proposed project. » The extent to which collision and displacement impacts actually occur will need to be determined through rigorous pre and post construction monitoring, and a protocol outlining details of such a monitoring programed will be supplied as an appendix to the final EIA report. » A site specific avifaunal EMP as well as a monitoring programme pre- and post- construction is seen as a critical next step to increase confidence, refine the sensitivity map and to strengthen the mitigation measures in order to have the least impact possible on avifauna in the area.	
Impacts on bats	The EIA Phase will include the following: » A site visit will be conducted for the EIA phase of this project to more accurately determine bat presence. » A site visit will provide more guidance regarding the appropriate positioning of the wind turbines, solar panels and associated infrastructure. » All identified issues will be investigated in more detail during the EIA phase, and rated according to the prescribed criteria. » Generate a sensitivity map showing the sensitivity zones in relation to proposed infrastructure. » Assess cumulative impacts associated with the proposed project. » Provide recommendations for input into the Environmental Management Programme (EMP). » A bat monitoring program may assist with knowledge of wind energy and bat interaction in South Africa. During the EIA phase it will be determined if a bat monitoring program is required for this site. It will be beneficial to collaborate with academic institutions to promote research on the subject, doing affordable long term monitoring and determining the risks more	Jennifer Slack of Arcus Consulting

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	accurately.	
Impacts on geology, soils and agricultural potential study	The EIA Phase will include the following: » Determination of land capability, current land-use and degradation status of the agricultural resources (i.e. soil and vegetation) » Determination of geology and soils, with special reference to sensitivity to erosion and factors contributing to erosion (i.e. slopes, etc.) » Consideration of the climate of the site » Identify agriculturally sensitive areas. » Identify agricultural infrastructure (i.e. silos, irrigation lines, pivot points, channels, feeding structures, etc.) that will be impacted upon. » Assess the potential impacts of the facility on agriculture. » Assess cumulative impacts associated with the proposed project.	Johann Lanz
Visual impacts	The EIA Phase will include the following methodology relevant to the visual impact of the wind turbines and associated infrastructure: » Establishment of view catchment area, view corridors, viewpoints and receptors; » Indication of potential visual impacts using established criteria; » Assessment of potential lighting impacts at night; » Description of alternatives, mitigation measures and monitoring programmes; » Review by independent, experienced visual specialist (if required); » 3D modelling and photo-simulations / photomontages, with and without mitigation. » Separate viewsheds will be generated for the wind energy facilities, as well as the cumulative viewshed of both components and shared infrastructure such as the power line. The visual impacts be assessed against the following criteria during the EIA phase: » Visibility of the project; » Visual exposure; » Degree of visual intrusion (including the degree of contrast); » Visual sensitivity of the area; » Viewer sensitivity; » Observer proximity; » Visual absorption capacity (VAC) of the vegetation and other elements; and	Lourens Du Plessis of MetroGIS

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	» Cumulative impacts	
Impacts on heritage resources	In order to comply with the National Heritage Resources Act (Act No 25 of 1999) a Phase 1 Archaeological Impact Assessment will be undertaken. During this study the following will be conducted: » Sites of archaeological, historical or places of cultural interest will be located, identified, recorded, photographed and described. » The levels of significance of recorded heritage resources will be determined and mitigation proposed » Should any significant sites be impacted upon recommendation will be made to ensure that all the requirements of SAHRA are met. » Assess cumulative impacts associated with the proposed project.	Archaeology – Tim Hart of ACO Associates
Noise impacts	The following will be conducted during the Environmental Impact Assessment phase: » A site visit to obtain information regarding background noise levels, the prevailing meteorological conditions during this background noise level survey, as well as confirming and identifying noise-sensitive developments, » Currently identified (potential) Noise Sensitive Developments (NSDs) will be investigated during the EIA phase, and any additional NSDs will be identified. Their relative sensitivity to noise impacts will be determined. This will be based on the SANS 10103 guideline, as well as current land uses on the properties (residential vs business/industrial). » Using the data (proposed processes, noise characteristics of the selected equipment, locations of the Wind Turbine Generators) as provided by the project developer, the predicted impact of the wind energy facility on NSDs will be predicted using the CONCAWE method as recommended by SANS 10357:2004 for both the construction and operational phases, as well as the ISO 9613-2 model for the operational phase. » Using the calculated noise levels at the identified NSDs, the projected significance of wind energy facility (whether construction or operational) will be determined using the criteria as proposed (subject to possible changes after any stakeholder input). Further recommendations on the most suitable buffer zone can be made after more information is available for the proposed facility. » Assess cumulative impacts associated with the proposed project.	Morné de Jager of Anviro Acoustic Research

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
Social impacts	The following will be conducted during the Environmental Impact Assessment phase: » Identification of key interested and affected parties, specifically landowners; » Site visit and interviews with key stakeholders in the area including local landowners and authorities, local community leaders and councillors, local resident associations and residents, local businesses, community workers etc; » Identification and assessment of the key social issues and opportunities; » Preparation of a Social Impact Assessment and socio-economic impact assessment report, including identification of mitigation/optimisation and management measures to be implemented; and » Assess cumulative impacts associated with the proposed project.	Tony Barbour (Environmental Consultant and Researcher)
Cumulative impacts	Results of all cumulative assessment of the specialist studies will be considered in assessing the overall cumulative impact of the facility, and associated power line alternatives	Savannah Environmental

12.5 Methodology for the Assessment of Potential Impacts

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

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional:
  - local extending only as far as the development site area – assigned a score of 1;
  - limited to the site and its immediate surroundings (up to 10 km) – assigned a score of 2;
  - will have an impact on the region – assigned a score of 3;
  - will have an impact on a national scale – assigned a score of 4; or
  - will have an impact across international borders – assigned a score of 5.
- The **duration**, wherein it will be indicated whether:
  - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
  - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
  - medium-term (5–15 years) – assigned a score of 3;
  - long term (> 15 years) - assigned a score of 4; or
  - permanent - assigned a score of 5.
- The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
  - 0 is small and will have no effect on the environment;
  - 2 is minor and will not result in an impact on processes;
  - 4 is low and will cause a slight impact on processes;
  - 6 is moderate and will result in processes continuing but in a modified way;
  - 8 is high (processes are altered to the extent that they temporarily cease); and
  - 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale, and a score assigned:
  - Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
  - Assigned a score of 2 is improbable (some possibility, but low likelihood);
  - Assigned a score of 3 is probable (distinct possibility);
  - Assigned a score of 4 is highly probable (most likely); and
  - Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).

» the **significance**, which shall be determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.
» the **status**, which will be described as either positive, negative or neutral.
» the degree to which the impact can be reversed.
» the degree to which the impact may cause irreplaceable loss of resources.
» the *degree* to which the impact can be *mitigated.*

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

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

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

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

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

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

The results of the specialist studies and other available information will be integrated and synthesised into an EIA Report by the Savannah Environmental project team. In addition, the cumulative impacts associated with the proposed development in addition to other proposed facilities in the area will be assessed. A report will be compiled for each wind energy facility project under consideration. The EIA Report will include:

» **detailed description** of the proposed activity
» a description of the property(ies) on which the activity is to be undertaken and the location of the activity on the property(ies)

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

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

12.6 Public Participation Process

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

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

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

The draft EIA report will be made available for public review for a 40-day period prior to finalisation and submission to the DEA for review and decision-making. In order to provide an overview of the findings of the EIA process and facilitate comments, a public feedback meeting will be held during this public review period. Should there be significant changes between the draft EIA report and final EIA report, the public would be provided with an opportunity to provide comment on the Final EIA report directly to DEA (reporting will be released for public review for a further period of 21 days).

12.7 Key Milestones of the programme for the EIA

The envisaged key milestones of the programme for the EIA phase of the project are outlined in Table 12.2.

Table 12.2: Envisaged key milestones of the programme for the EIA phase of the project

Key Milestone Activities	Timeline
Public review period for Draft Scoping report	40-day public review period from 28 May 2014 – 09 July 2014
Submission of Final Scoping Report to DEA	July 2014
Authority acceptance of the Scoping Report and Plan of Study to undertake the EIA	30-days after receiving the Final Scoping Report
Make draft EIA Report and draft EMPr available to the public, stakeholders and authorities	40-day public review period
Authority review period for Final EIA report to issue a Environmental Authorisation	Within 119 days after receiving the Final EIA report.

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