ENVIRONMENTAL IMPACT ASSESSMENT PROCESS
DRAFT SCOPING REPORT

PROPOSED MAINSTREAM WIND AND SOLAR RENEWABLE ENERGY FACILITY AND ASSOCIATED INFRASTRUCTURE ON A SITE SOUTH-WEST OF POFADDER
NORTHERN CAPE PROVINCE

DEA Ref: 14/12/16/3/3/2/348 (Wind)
14/12/16/3/3/2/347 (Solar)

DRAFT FOR PUBLIC REVIEW

20 AUGUST 2012 – 18 SEPTEMBER 2012

Prepared for:
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PROJECT DETAILS

DEA Reference No.	:	14/12/16/3/3/2/348 (Wind) 14/12/16/3/3/2/347 (Solar)
Title	:	Environmental Impact Assessment Process Draft Scoping Report: Proposed Mainstream Wind and Solar Renewable Energy Facility and Associated Infrastructure on a site south-west of Pofadder, Northern Cape Province
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Project Developer	:	South Africa Mainstream Renewable Power Development (Pty) Ltd
Report Status	:	Draft Scoping Report for public review
Review Period	:	20 August 2012 – 18 September 2012

When used as a reference this report should be cited as: Savannah Environmental (2012) Draft Scoping Report: Proposed Mainstream Wind and Solar Renewable Energy Facility and Associated Infrastructure on a site south-west of Pofadder, Northern Cape Province

PURPOSE OF THE DRAFT SCOPING REPORT

South Africa Mainstream Renewable Power Development (Pty) Ltd (Mainstream) is currently undertaking an Environmental Impact Assessment (EIA) process to determine the environmental feasibility of a proposed renewable energy facility on a site near Pofadder in the Northern Cape Province. Mainstream has appointed Savannah Environmental, as independent environmental consultants, to undertake the EIA. The EIA process is being undertaken in accordance with the requirements of the National Environmental Management Act (NEMA; Act No. 107 of 1998).

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

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

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

The Scoping Report consists of eleven sections:

» **Chapter 1** provides background to the proposed wind and solar project and the environmental impact assessment
» **Chapter 2** provides the strategic context for energy planning in South Africa

- **Chapter 3** describes wind and solar energy as a power option and provides insight to the different technologies
- **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** describes the activities associated with the project (project scope)
- **Chapter 7** presents the evaluation of environmental impacts associated with the wind energy facility
- **Chapter 8** presents the conclusions of the scoping evaluation of the wind energy facility
- **Chapter 9** presents the evaluation of environmental impacts associated with the solar energy facility
- **Chapter 10** presents the conclusions of the scoping evaluation of the solar energy facility
- **Chapter 11** describes the Plan of Study for EIA
- **Chapter 12** 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 **20 August 2012 – 18 September 2012 at:**

» www.savannahsa.com
» Pofadder Public Library

Please submit your comments to
Shawn Johnston of **Sustainable Futures ZA** PO Box 749, Rondebosch, Cape Town, 7701 Tel: 083 325 9965 Fax: 086 510 2537 Email: swjohnston@mweb.co.za
The due date for comments on the Draft Scoping Report is **18 September 2012.**

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

SUMMARY

Background and Project Overview

South Africa Mainstream Renewable Power Development (Pty) Ltd (Mainstream) is proposing to establish a commercial renewable energy facility consisting of both a wind energy facility component and a photovoltaic solar facility component, as well as all 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.

The capacity of the renewable energy facility will depend on the most suitable technologies selected by Mainstream. It is proposed that this renewable energy facility employ both wind turbines and solar panels order to generate electricity, which will be fed into the National power grid. The proposed facility would comprise of a combination of the following technologies:

» Up to 500 wind turbines (each turbine between 1.5 MW – 4MW in capacity).
» An array of either photovoltaic panels (PV) or concentrated photovoltaic panels (CPV) with a generating capacity of up to 250MW.

Specialist software is available to assist developers in selecting the optimum position for each turbine and solar panel arrays 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 renewable energy facility will be developed at the EIA phase of the project. Final placement will be informed by the outcomes of the EIA as well as from the results of the on-site wind resource and solar radiation monitoring. The broader site is proposed to accommodate wind turbines, solar panels as well as the associated infrastructure including, but not limited to:

» Foundations to support both the turbine towers as well as the PV panels;
» Cabling between the project components, to be lain underground where practical;
» A 400 kV substation and 4 (four) 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;
» Internal access roads;
» Workshop area for maintenance and storage; and
» Permanent wind monitoring masts.

The nature and extent of this facility, as well as potential environmental impacts associated with the construction of a facility of this

nature is explored in more detail in this Scoping Report.

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).

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

Evaluation of the Proposed Project

The overarching objective for the 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, solar panels and associated infrastructure on the site in order to minimise impacts on the environment.

Issues identified through this scoping study as being potentially associated with the proposed renewable energy facility near Pofadder include:

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

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

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

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

Positive potential impacts related to the operation of the renewable energy facility iinclude, *inter alia*:

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

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

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

The majority of potential impacts identified to be associated with the construction and operation of the proposed renewable energy facility iare 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 facility to the power grid substations and power lines will be required. A 400 kV substation and 4 (four) 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.

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 renewable energy facility 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 8 and 10 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.

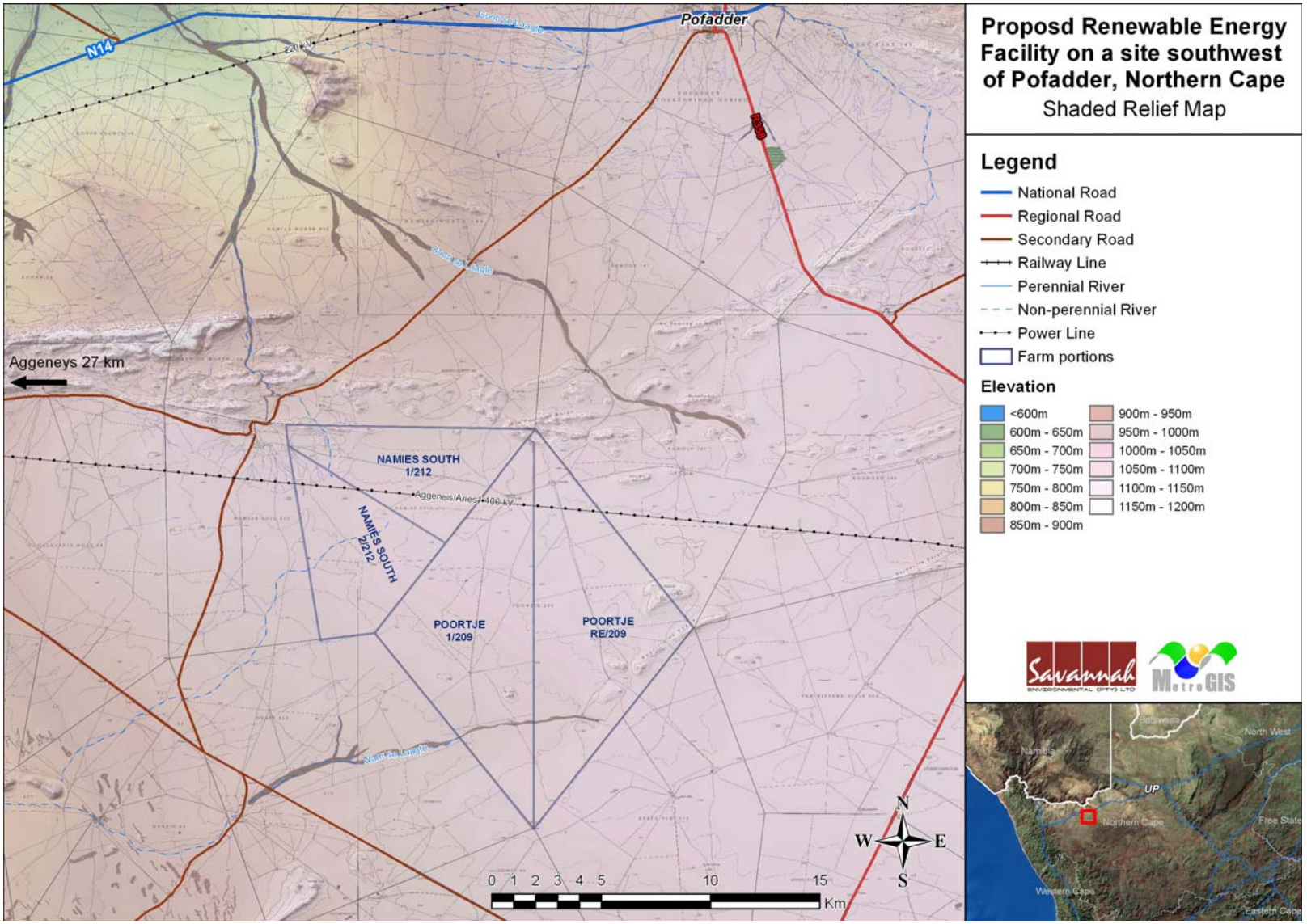

Figure 1: Locality map showing the study area for the establishment of the Renewable Energy facility near Pofadder, Northern Cape

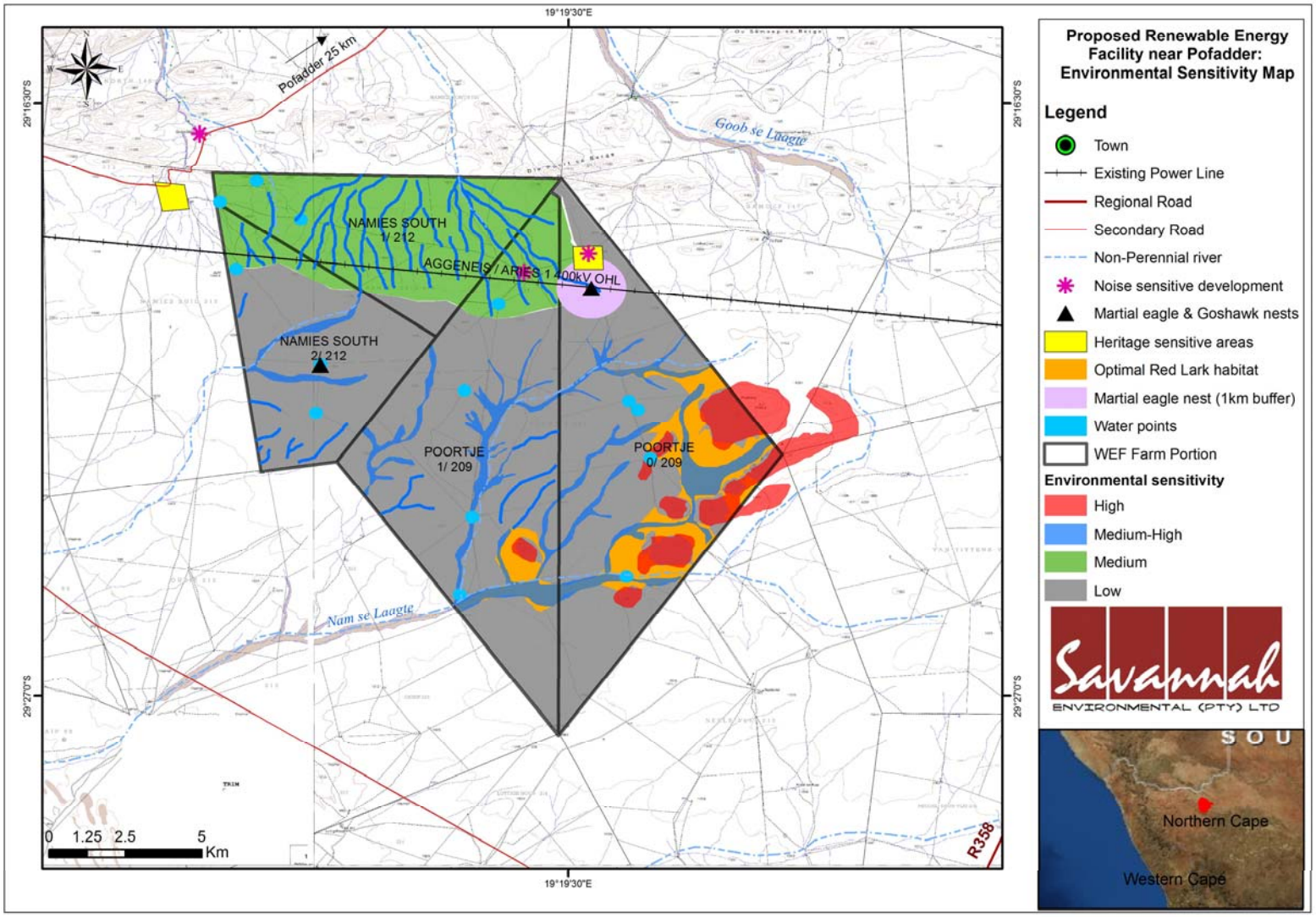

Figure 2: Scoping environmental sensitivity map for the proposed Renewable Energy facility near Pofadder, Northern Cape

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

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

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

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

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

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

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

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

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

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

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

Tower: The tower, which supports the rotor, is constructed from tubular steel. It is approximately 80 – 120 m tall. The nacelle and the rotor are attached to the top of the tower. The tower on which a wind turbine is mounted is not just a support structure. It also raises the wind turbine so that its blades safely clear the ground and so it can reach the stronger winds at higher elevations. Larger wind turbines are usually mounted on towers ranging from 40 to 80 m tall. The tower must be strong enough to support the wind turbine and to sustain vibration, wind loading and the overall weather elements for the lifetime of the wind turbine.

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

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

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

ABBREVIATIONS AND ACRONYMS

BID	Background Information Document
CDM	Clean Development Mechanism
CSIR	Council for Scientific and Industrial Research
CO_2	Carbon dioxide
D	Diameter of the rotor blades
DAFF	Department of Forestry and Fishery
DENC	Northern Cape Department of 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
EMP	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
SANBI	South African National Biodiversity Institute
SANRAL	South African National Roads Agency Limited

INTRODUCTION CHAPTER 1

South Africa Mainstream Renewable Power Development (Pty) Ltd (Mainstream) is proposing to establish a commercial renewable energy facility consisting of both a wind energy facility component and a photovoltaic solar facility component, as well as all 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.

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, solar panels and associated infrastructure on the site. The Scoping Report consists of twelve 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** describes wind and solar energy as a power option and provides insight to technologies for wind turbines
» **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** describes the activities associated with the project (project scope)
» **Chapter 7** presents the evaluation of environmental impacts **for the Wind Energy Facility**
» **Chapter 8** presents the conclusions of the scoping evaluation **for the Wind Energy Facility**
» **Chapter 9** presents the evaluation of environmental impacts **for the Solar Energy Facility**
» **Chapter 10** presents the conclusions of the scoping evaluation **for the Solar Energy Facility**
» **Chapter 11** describes the Plan of Study for EIA
» **Chapter 12** provides a list of references and information sources used in undertaking this Scoping Study.

1.1. Project Overview

The site for the proposed Renewable Wind Energy Facility near Pofadder falls within the Khai-Ma Local Municipality in the Northern Cape Province was confirmed by Mainstream as being potentially suitable for wind and solar energy generation. This area was put forward 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 renewable 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, solar panels and associated infrastructure on the site.

The capacity of the renewable energy facility will depend on the most suitable technologies selected by Mainstream. It is proposed that this renewable energy facility employ both wind turbines and solar panels order to generate electricity, which will be fed into the National power grid. The proposed facility would comprise of a combination of the following technologies:

» Up to 500 wind turbines (each turbine between 1.5 MW – 4MW in capacity).
» An array of either photovoltaic panels (PV) or concentrated photovoltaic panels (CPV) with a generating capacity of up to 250MW.

Specialist software is available to assist developers in selecting the optimum position for each turbine and solar panel arrays 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 renewable energy facility will be developed at the EIA phase of the project. Final placement will be informed by the outcomes of the EIA as well as from the results of the on-site wind resource and solar radiation monitoring. The broader site is proposed to accommodate wind turbines, solar panels as well as the associated infrastructure including, but not limited to:

» Foundations to support both the turbine towers as well as the PV panels;
» Cabling between the project components, to be lain underground where practical;

- A 400 kV substation and 4 (four) 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;
- Internal access roads;
- Workshop area for maintenance and storage; and
- Permanent wind monitoring masts.

The Renewable Energy Facility is 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.

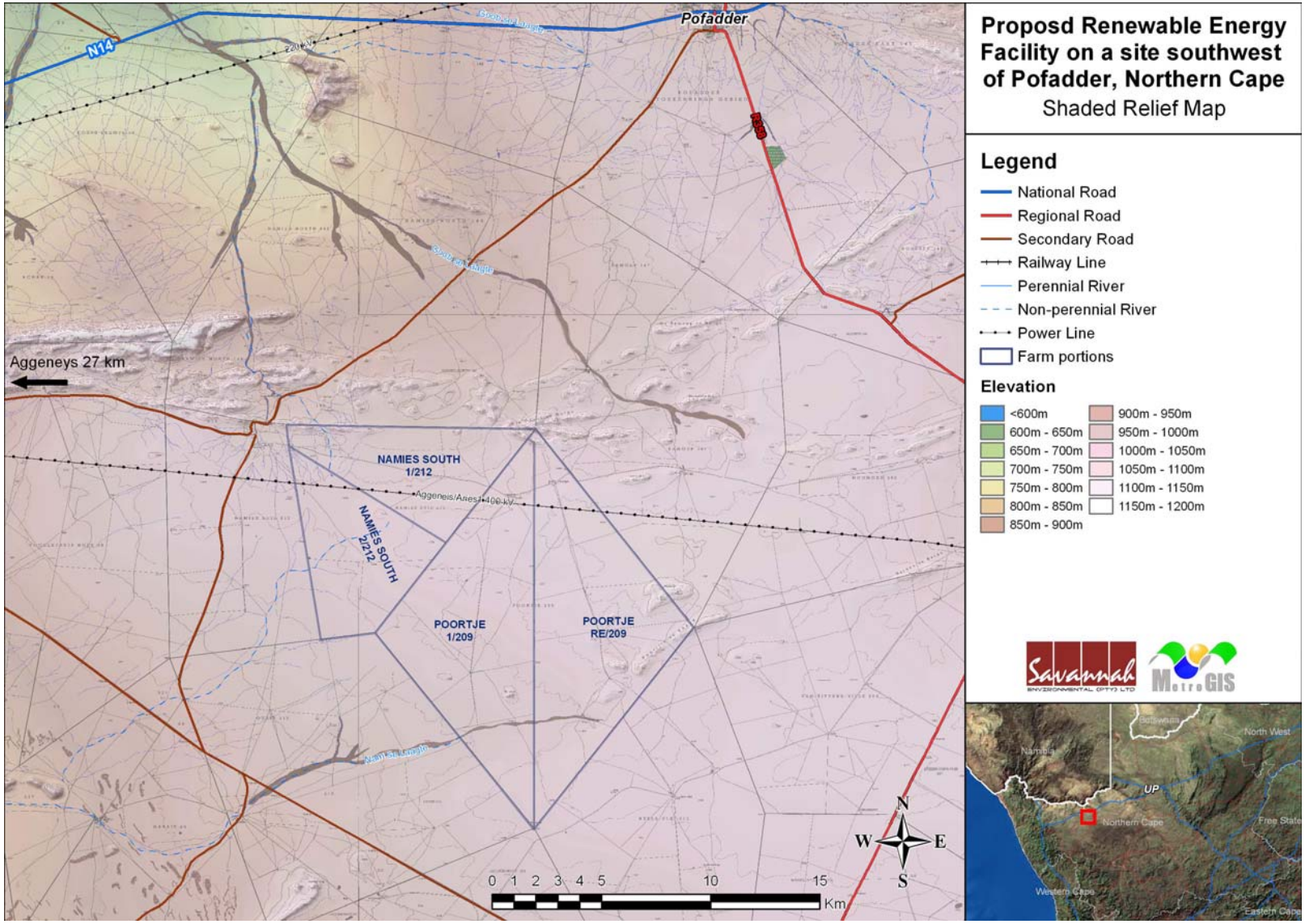


Figure 1.1: Locality map showing the farm portions and study area for the establishment of the Mainstream Renewable Energy Facility near Pofadder, Northern Cape Province

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 a Renewable Energy Facility on a site near Pofadder to add new capacity to the national electricity grid.

The proposed Renewable Energy Facility was 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. The proposed site displays characteristics which makes it a preferred site for a wind and solar energy facility such as land availability, potential for connection to the Eskom grid, existing land-use (grazing of livestock), good wind and solar resources, and access to the site. The proposed farm portions cover an area approximately 175 km^2 in extent and in addition the Eskom Aggeneys–Aries 400kV power line traverses the site (on portion 1 and 2 of Farm Namies South).

1.3. Requirement for an Environmental Impact Assessment Process

The proposed Mainstream Wind and Solar Renewable Energy Facility and associated infrastructure on a site south-west of Pofadder is subject to the requirements of the EIA Regulations published in terms of Section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998). This section provides a brief overview of the EIA Regulations and their application to this project.

NEMA is the national legislation that provides for the authorisation of "listed activities". In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these activities must be considered, investigated, assessed and reported on to the competent authority that has been charged by NEMA with the responsibility of granting environmental authorisations. As this is a proposed electricity generation project and thereby considered to be of national importance 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. Two separate applications for authorisation have been accepted by DEA under Application Reference Numbers 14/12/16/3/3/2/348 (wind) and 14/12/16/3/3/2/347 (solar).

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.

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 – (a) Outside urban areas or industrial complexes with a capacity of more than 33kv but less than 275kv; or (b) Inside urban areas or industrial complexes with a capacity of 275kv or more.	The project will entail construction of high voltage power line/s and a substation (outside an urban area)
GN545	15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more; Except where such physical alteration takes place for: *(i)* Linear development activities. *(ii)* Agriculture or afforestation where activity 16 in this schedule will apply.	The total development footprint will cover an area greater than 20 ha.
GN545	1	The construction of facilities or infrastructure, for the generation of electricity where the output is 20 megawatts or more.	The renewable energy facility will consist of wind turbines and solar panels for electricity generation greater than 20MW.
GN544	13	The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres;	The renewable energy facility will require facilities for storage of fuels / oils that are up to 500m^3.
GN544	11	The construction of: ~~(i) canals;~~ ~~(ii)channels;~~ (iii) bridges; ~~(iv) dams;~~ (v) weirs; ~~(vi) bulk stormwater outlet structures;~~ ~~(vii) marinas;~~ ~~(viii) jetties exceeding 50 square metres in size~~ ~~(ix) slipways exceeding 50 square metres in size~~	The renewable energy facility may include the construction of bridges / buildings (such as storage room) within 32m of a watercourse (to be confirmed based on the design of the facility.

Relevant Notice	Activity No	Description of listed activity	Applicability to the project
		(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.	
GN544	47	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre – (i) where the existing road reserve is wider than 13.5 metres; or (ii) where no reserve exists, where the existing road is wider than 8 metres – excluding widening or lengthening occurring inside urban areas.	The renewable energy facility will require haul roads up to 10m wide and more than 1km in length to be constructed, which will occur in rural/ farming areas.
GN544	22	The construction of a road, outside urban areas, (i) with a reserve wider than 13.5 metres or, (ii) where no road reserve exists where the road is wider than 8 metres, or ~~(iii) for which an environmental authorisation was obtained for the route determination in terms of activity 5 of Government Notice 387 of 2006 or activity 18 of Notice 545 of 2010.~~	The renewable energy facility will require construction haul roads up to 10m wide to be constructed which will occur in rural/ farming areas.

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

1.4. Objectives of the Scoping Phase

The Scoping Phase of the EIA process refers to the process of identifying potential issues associated with the proposed project, and defining the extent of studies required within the EIA Phase. This is achieved through an evaluation of the

proposed project, involving the project proponent, specialists with experience in EIAs for similar projects, and a public consultation process with key stakeholders that includes both government authorities and interested and affected parties (I&APs).

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, solar plant and associated infrastructure can be appropriately planned. The scope of the proposed Renewable Energy Facility (for the construction, operation and decommissioning phases) is discussed in more detail in Chapter 6.

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 15 years of experience consulting in the environmental field. Her key focus is on strategic environmental assessment and advice; management and co-ordination of environmental projects, which includes integration of environmental studies and environmental processes into larger engineering-based projects and ensuring compliance to legislation and guidelines; compliance reporting; the identification of environmental management solutions and mitigation/risk minimising measures; and strategy and guideline development. She is currently responsible for the project management of EIAs for several renewable energy projects across the country.
» *Ravisha Ajodhapersadh* – the principle author of this report holds an Honours Bachelor of Science degree in Environmental Management and has 4 years experience in environmental management. She is currently the responsible EAP for several renewable energy projects across the country.

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

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

Specialist	Area of Expertise
Dave McDonald of Bergwind Botanical Surveys &	Ecology

Tours	
Chris van Rooyen of Chris van Rooyen Consulting	Avifauna
Werner Marias of Animalia Zoological & Ecological Consultation cc	Bats and Fauna
Lourens Du Plessis of MetroGIS	Visual impact
Jason Orton of ACO Associates	Heritage
Tony Barbour Environmental Consulting and Research	Socio-economic
Iain Paton of Outeniqua Geotechnical Services	Soils, erosion and agricultural potential
Morne de Jager of M2 Environmental Connections CC	Noise

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.

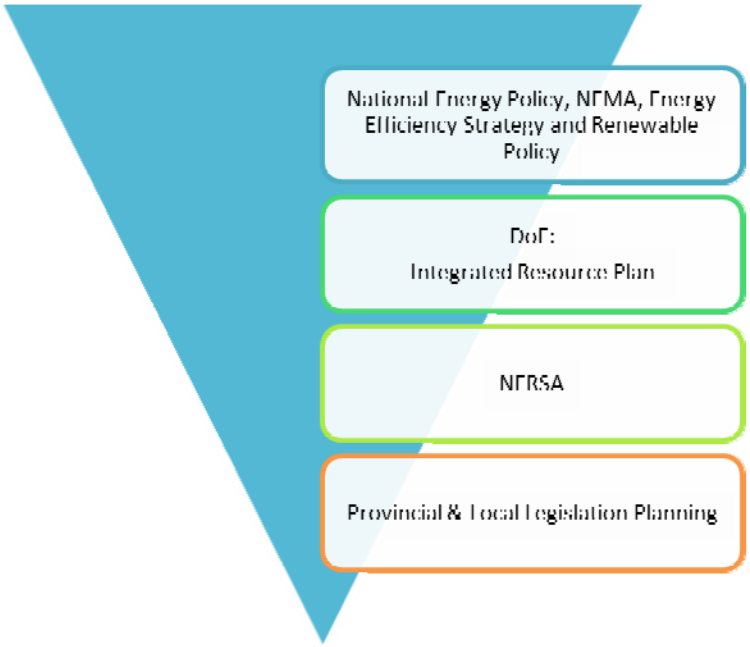


Figure 2.1: Hierarchy of electricity policy and planning documents

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 and

solar energy facility) 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 wind and solar renewable 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 wind and 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 undergo a bidding process 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 IPP Procurement Programme is currently underway. The first IPP Bid submission was in November 2011. The second bid submission was in March 2012. The third Bid submission is planned for October 2012. Mainstream intend bidding the project to the DoE for the Round 5 bid submission, which is scheduled for October 2013. Following the Round 1 and Round 2 bid submissions to the DoE, a total of 15 wind energy facility projects and 30 solar projects were awarded preferred bidders status. Some of these projects are in the Northern Cape Province, which makes the Northern Cape 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 Khâi-Ma Local Municipality Integrated Development Plan (2011/12)

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

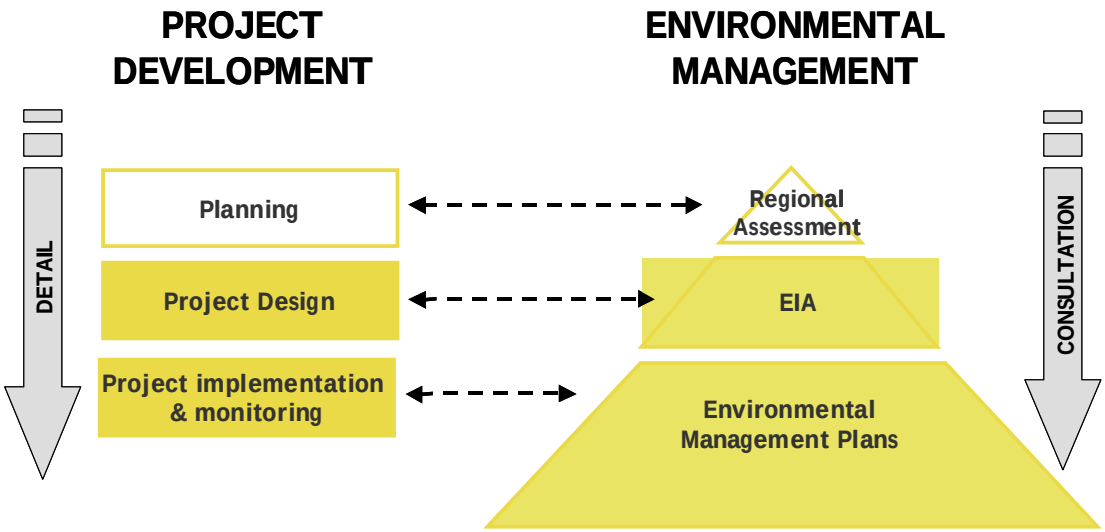
» Socio-economic needs, specifically, improve the income levels for the population within the municipality, reduce unemployment from 39% to below 20%, introduce capacity and skills building programs, introduce awareness campaigns around issues relating to healthcare (HIV/AIDS), water and the environment, 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 renewable energy is 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 (EMP)) are required to be compiled for this proposed project. The EIA is considered as an effective planning and decision-making tool in the planning process of a new power generation facility. It allows potential environmental consequences resulting from a technical facility during its establishment and its operation to be identified and appropriately managed through project design and implementation. The level of detail at a site-specific level is refined through the process, and allows for resolution of potential issue(s) through dialogue with affected parties.

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


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

WIND AND SOLAR ENERGY AS POWER GENERATION OPTIONS CHAPTER 3

3.1 Renewable Energy Technologies

Various renewable energy technologies are available for electricity generation. Mainstream proposes the establishment of a renewable energy facility which will comprise a combination of wind and solar energy technologies in order to generate electricity, which will be fed into the National power grid. Renewable energy technologies including wind turbines and solar panels offer an alternative to fossil fuels, thereby reducing the amount of CO_2 emissions into the atmosphere. It is proposed that this renewable energy facility will employ both wind turbines and solar panels (either PV or CPV). Both wind turbines and solar panels as power generation technologies 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.
» 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 120 m, and rotor diameter of 120 m. These turbines would have a rated capacity of up to 4MW each which means one turbine could operate 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
» 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 120m 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.

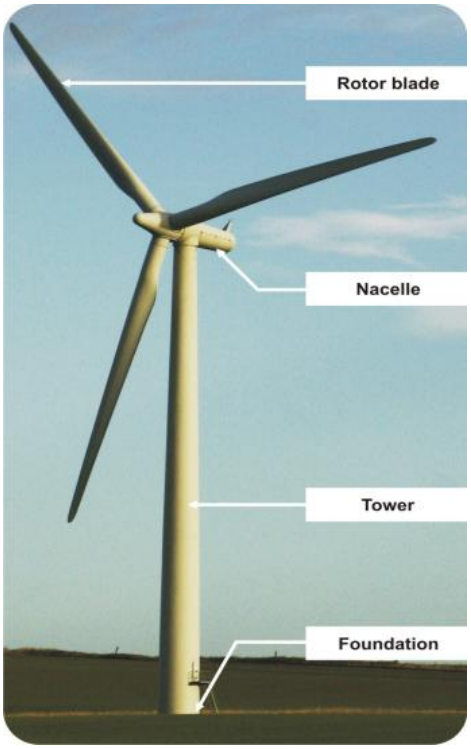


Figure 3.1: Illustration of the main components of a wind turbine

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.

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.

3.3 Solar Energy as a Power Generation Technology

Solar power plants use the conversion of solar energy into a useful form such as electricity. The use of solar energy for electricity generation is also classified as a non-consumptive use of a natural resource and consumes no fuel for continuous operation. Similar in nature to wind energy, solar energy also has the attractive attribute of a free fuel. Detailed and reliable information about the strength and

direction of the incoming solar radiation (i.e. the solar resource) is vital when considering the installation of a solar energy facility, as the solar resource is a critical factor to the success of the installation.

Solar energy facilities produce an insignificant quantity of greenhouse gases over its lifecycle as compared to conventional coal-fired power stations. The operational phase of a solar facility does not produce carbon dioxide, sulphur dioxide, mercury, particulates, or any other type of air pollution, as do fossil fuel power generation technologies.

There are different solar panel technologies available, either Photovoltaic Panels (PV) or Concentrated Photovoltaic Panels (CPV) will be utilised for this project and are described below. The choice of the most appropriate solar panel will depend on the solar irradiation on the site.

3.3.1 How do Solar Energy Facilities Function

Solar energy facilities, such as those using PV or CPV technology use the energy from the sun to generate electricity through a process known as the Photovoltaic Effect. This effect refers to photons of light colliding with electrons, and therefore placing the electrons into a higher state of energy to create electricity. This is achieved through the use of the certain components.

3.3.2 Photovoltaic (PV) Technology

The main components of a photovoltaic facility consist of the following major components:

» PV Solar Panels
» Support structure

PV Cells

An individual PV cell is made of silicone which acts as a semiconductor. The cell absorbs solar radiation which energises the electrons inside the cells and produces electricity. Individual PV cells are linked and placed behind a protective glass sheet to form a photovoltaic panel. A single cell is sufficient to power a small device such as an emergency telephone, however to produce 250 MW of power, the proposed facility will require numerous cells arranged in multiples/arrays which will be fixed to a support structure (refer to Figure 3.3).

Support Structure

The PV panels will be fixed to a support structure which will allow for the PV panels to be set at an angle so to receive the maximum amount of solar radiation. The angle of the panels is dependent on the latitude of the proposed facility and may be adjusted to optimise for summer or winter solar radiation characteristics.

Figure 3.2: Typical PV cell and an array of PV panels (Source: Acciona)

3.3.3 Concentrated Photovoltaic Panels (CPV) Technology

The light energy from the sun is concentrated through Fresnel lenses onto the individual CPV cells. This serves to increase the efficiency of the PV panels (i.e. up to 29% efficiency), as compared to conventional PV technology (i.e. 8 % – 18% efficiency) (refer to Figure 3.4). An inverter is used to convert the electricity which is produced as direct current into alternating current for the purpose of grid connection. A single CPV cell can produce 66kV which can power several houses, however to produce 250 MW, the proposed facility will require numerous CPV cells arranged in multiples/arrays. The CPV Mega Modules will be elevated between 2 - 5m above ground level by a support structure, and will be able to track the path of the sun during the day, thereby increasing the efficiency of the panels (refer to Figure 3.5).

CPV systems require concentrating optics (lenses or mirrors), the solar trackers, and the heat sinking (since photovoltaics are less efficient at high temperature). CPV is less common today than non-concentrated photovoltaics (http://en.wikipedia.org/wiki/Concentrated_photovoltaics).

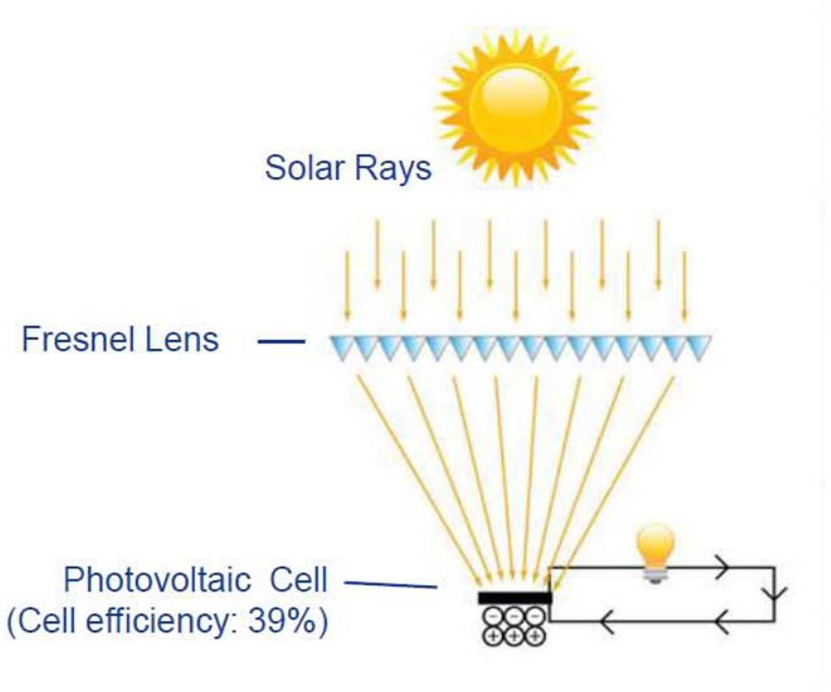


Figure 3.3: The efficiency of the CPV panels is increased through the use of Fresnel Lenses which concentrated the amount of light entering the PV cells (Source of Amonix^{TM})

Figure 3.4: The support structures elevate the panels by 15 m and allow for dual axis tracking of the sun for increased efficiency (Source of Amonix^{TM})

The renewable energy facility will therefore comprise of a wind component and a solar component. Both wind turbines and solar panels can co-exist on this site. In addition, there is sufficient space for the place of wind turbines and solar panels in the site which is ~~175 km^2.

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-sectoral, 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.

At the Provincial Level, the main regulatory agencies are:

» *Northern Cape Department of Environment and Nature Conservation (DENC):* This Department is the commenting authority for this project.

» *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.
» *Department of Water Affairs:* This Department is responsible for evaluating and issuing licenses pertaining to water use.
» *South African National Roads Agency (SANRAL):* This agency of the Department of Transport is responsible for all National road routes.

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 with 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)
  * Integrated Environmental Management Information Series (published by DEA)
» Khâi-Ma Local Municipality Integrated Development Plan (2011/12)
» International guidelines – the Equator Principles and the International Finance Corporation (IFC) and World Bank Environmental, Health, and Safety Guidelines for Wind Energy (2007).

Several other Acts, standards or guidelines have also informed the project process and the scope of issues evaluated in the Scoping 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 Renewable Wind Energy Facility

Legislation	Applicable Sections
National Legislation	
Constitution of the Republic of South Africa (Act No 108 of 1996)	» Bill of Rights (S2) » Environmental Rights (S24) – i.e. the right to an environment which is not harmful to health and well-being » Rights to freedom of movement and residence (S22) » Property rights (S25) » Sufficient water (s27.1.b) » Access to information (S32) » Right to just administrative action (S33) » Recognition of international agreements (S231)
National Environmental Management Act (Act No 107 of 1998)	» National environmental principles (S2), providing strategic environmental management goals and objectives of the government applicable throughout the Republic to the actions of all organs of state that may significantly affect the environment » NEMA EIA Regulations (GN R543 of 18 June 2010) published in terms of Chapter 5 of the NEMA » Public Participation (S2) » The requirement for potential impact on the environment of listed activities must be considered, investigated, assessed and reported on to the competent authority (S24 – Environmental Authorisations) » Duty of Care (S28) requiring that reasonable measures are taken to prevent pollution or degradation from occurring, continuing or recurring, or, where this is not possible, to minimise and rectify pollution or degradation of the environment » Procedures to be followed in the event of an emergency incident which may impact on the environment (S30) » Appeals against decisions made by authorities

Legislation	Applicable Sections
	(S43)
Environment Conservation Act (Act No 73 of 1989)	» National Noise Control Regulations (GN R154 dated 10 January 1992)
National Heritage Resources Act (Act No 25 of 1999)	» Stipulates assessment criteria and categories of heritage resources according to their significance (S7) » Provides for the protection of all archaeological and 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 list ecosystems which are threatened and in need of protection (S52) – none have as yet been published » Provides for the MEC/Minister to identify any process or activity in such a listed ecosystem as a threatening process (S53) - none have as yet been published » A list of threatened & protected species has been published in terms of S 56(1) - Government Gazette 29657. » Three government notices have been published, i.e. GN R 150 (Commencement of Threatened and Protected Species Regulations, 2007), GN R 151 (Lists of critically endangered, vulnerable and protected species) and GN R 152 (Threatened or Protected Species Regulations). » This act also regulates alien and invader species. » Under this Act, a permit would be required for any activity which is of a nature that may negatively impact on the survival of a listed protected species.
National Environmental Management: Air Quality Act (Act	» National, provincial and local ambient air quality standards (S9 - 10 & S11)

Legislation	Applicable Sections
No 39 of 2004)	» Listed Activities (S21) » Atmospheric Emissions Licenses (S22) » Measures in respect of dust control (S32) – no regulations promulgated as yet » Measures to control noise (S34) - no regulations promulgated as yet
Conservation of Agricultural Resources Act (Act No 43 of 1983)	» Prohibition of the spreading of weeds (S5) » Classification of categories of weeds & invader plants (Regulation 15 of GN R1048) and restrictions in terms of where these species may occur » Requirement and methods to implement control measures for alien and invasive plant species (Regulation 15E of GN R1048) » Soil protection/conservation, and erosion control
National Water Act (Act No 36 of 1998)	» National Government is the public trustee of the Nation's water resources (S3) » Entitlement to use water (S4) – entitles a person to use water in or from a water resource for purposes such as reasonable domestic use, domestic gardening, animal watering, fire fighting and recreational use, as set out in Schedule 1 » Duty of Care to prevent and remedy the effects of pollution to water resources (S19) » Procedures to be followed in the event of an emergency incident which may impact on a water resource (S20) » Definition of water use (S21) » Requirements for registration of water use (S26 and S34) » Definition of offences in terms of the Act (S151)
Water Services Act (Act No 108 of 1997)	» No person may dispose of industrial effluent except in a manner approved by the water services provider.
Aviation Act (Act No 74 of 1962)	» 13th amendment of the Civil Aviation Regulations (CARs) 1997 » The Minister of Transport has under section 22(1) of the Aviation Act, 1962 made the regulations in the Schedule hereto. » Obstacle limitations and marking outside aerodrome or heliport - CAR Part 139.01.33
National Environmental Management Waste Act (Act No 59 of 2008)	» Waste management measures » Regulations and schedules (Schedule A & B) » Listed activities requiring waste licenses » Waste disposal practices (S20)

Legislation	Applicable Sections
	» Contamination
National Forests Act (Act No 84 of 1998)	» Protected trees » Conservation of forests
National Roads Act (Act No 7 of 1998)	» Policy concerning use and management of national roads.
Guideline Documents	
South African National Standard (SANS) 10328, Methods for environmental noise impact assessments in terms of NEMA No. 107 of 1998	» Prediction of impact that noise emanating from a proposed development would have on occupants of surrounding land by determining the rating level. » Noise limits are based on the acceptable rating levels of ambient noise contained in SANS 10103
Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads	» Outlines the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits
The White Paper on Renewable Energy (2003)	» National targets for renewable energy generation
Khai-Ma Local Municipality 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 (2006) (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.
World Bank Standards (IFC Guidelines) (2007). Environmental, Health, and Safety Guidelines for Wind Energy	» The EHS Guidelines for wind energy include information relevant to environmental, health, and safety aspects of onshore and offshore wind energy facilities.

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:

» Submission of the two applications for authorisation to DEA with copies submitted to NC DENC.
» These applications were accepted was allocated the following application Reference Numbers: 14/12/16/3/3/2/348 (wind) and 14/12/16/3/3/2/347 (solar). Acceptance was granted to continue with the Scoping Phase (June 2012).

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.

The schematic diagram in Figure 4.2 illustrates some of the key steps in the public participation process. These are discussed further below:

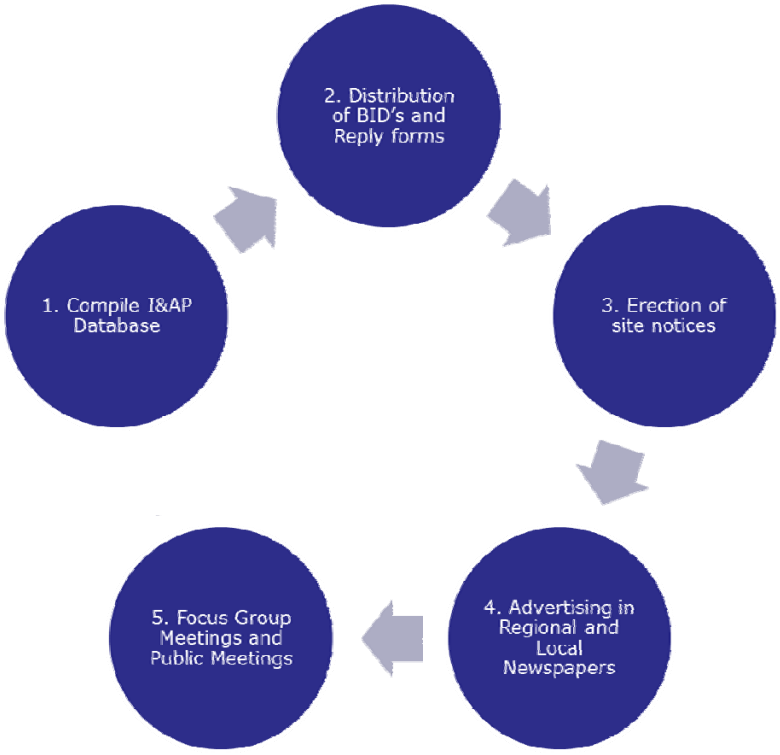


Figure 4.2 Key steps of the Public Participation Process

1. Identification of I&APs and establishment of the I&AP Database

Identification of I&APs was undertaken by Savannah Environmental ans Sustainable Futures ZA 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.
* Local authorities
* Conservation authorities
* 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 newspaper on 01 August 2012.

A second newspaper advert was placed in August 2012 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.

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. The Comments and Response Report includes responses from members of the EIA project team and/or the project developer to either indicate how the issues will be addressed in the EIA Phase, or to provide clarification. Where issues are raised that the EIA team considers beyond the scope and purpose of this EIA process, clear reasoning for this view will be provided.

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 tis approach is to inform the design the renewable ewnergy facility so that the best-practical environmental option is selected for the facility.

Issues (both direct and indirect environmental impacts) associated with the proposed project identified within the scoping process have been evaluated through a fatal flaw study, this scoping study and the EIA phase study. In evaluating potential impacts, Savannah Environmental has been assisted by the following specialist consultants:

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	Bats and Fauna
Lourens Du Plessis of MetroGIS	Visual impact
Jason Orton of ACO Associates	Heritage
Tony Barbour Environmental Consulting and Research	Socio-Economic Study
Iain Paton of Outeniqua Geotechnical Services	Soils, erosion and agricultural potential
Morne de Jager of M2 Environmental Connections CC	Noise

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
» *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 Feedback Meeting

This is the **current stage** of the Scoping Phase. The Draft Scoping Report has been made available for public review from **20 August 2012 – 18 September 2012** at the following locations:

» www.savannahsa.com
» Pofadder Public Library

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

» Date: Thursday, 23 August 2012
» Time: 16:00 - 17:30
» Venue: Blyvooruitsig Community Hall - Pofadder

The public review process and details of the public meeting were advertised in the Gemsbok and Volksblad in August 2012. In addition, all registered I&APs were notified of the availability of the report and public meeting by letter (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.

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 Mainstream Wind and Solar Renewable Energy Facility 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 Renewable Energy Facility is located approximately 22km south-west of Pofadder in the heart of the Northern Cape. 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 Khâi-Ma Local Municipality.The establishment of a renewable energy facility and associated infrastructure is proposed on the following farm portions: Portions 1 and Remaining Extent of Farm 209 (Poortje) and Portions 1 and 2 of Farm 212 (Namies South). A map illustrating the features of the study area is shown in **Figure 5.1**.

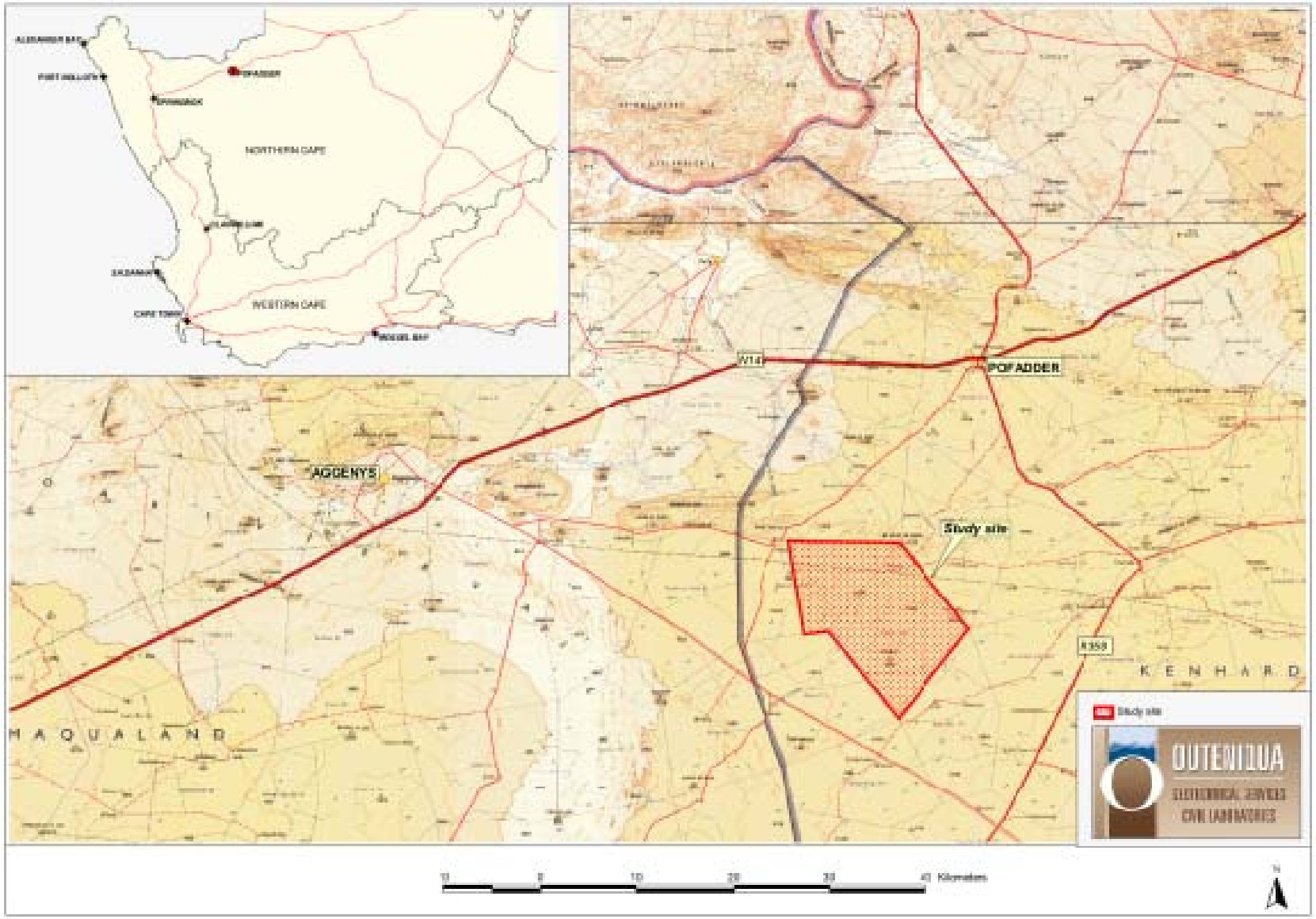


Figure 5.1: Topographical map of the study area

Table 5.1: Photographs of the site

View of Portion1 of Farm 212 (Namies South)	View of Portion1 of Farm 212 (Namies South)
	
View of the site between Portion 1 and Portion 2	View of Portions 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 (Portion 1 and Portion 2 on Farm Namies South 212).

5.2 Climatic Conditions

The climate of the area is very dry (Climatic Weinert No. >10) with an annual precipitation of ±100mm and mean annual evaporation (S-Pan) exceeding 2500mm during the hot summer months (November-February). 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) (Mucina *et al.* 2006). The average midday temperature for Pofadder in July is 23°C, and 37°C during the summer months.

Bushmanland falls within the summer rainfall zone of the Northern Cape Province. It experiences highly unpredictable rainfall either in the summer to autumn months. It 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 shower to occur in one place and for a nearby area to be completely missed, remaining dry.

5.3 Biophysical Characteristics of the Study Site and Surrounds

5.4.1 ***Geology***

A geological map of the site is shown in **Figure 5.2**. 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.

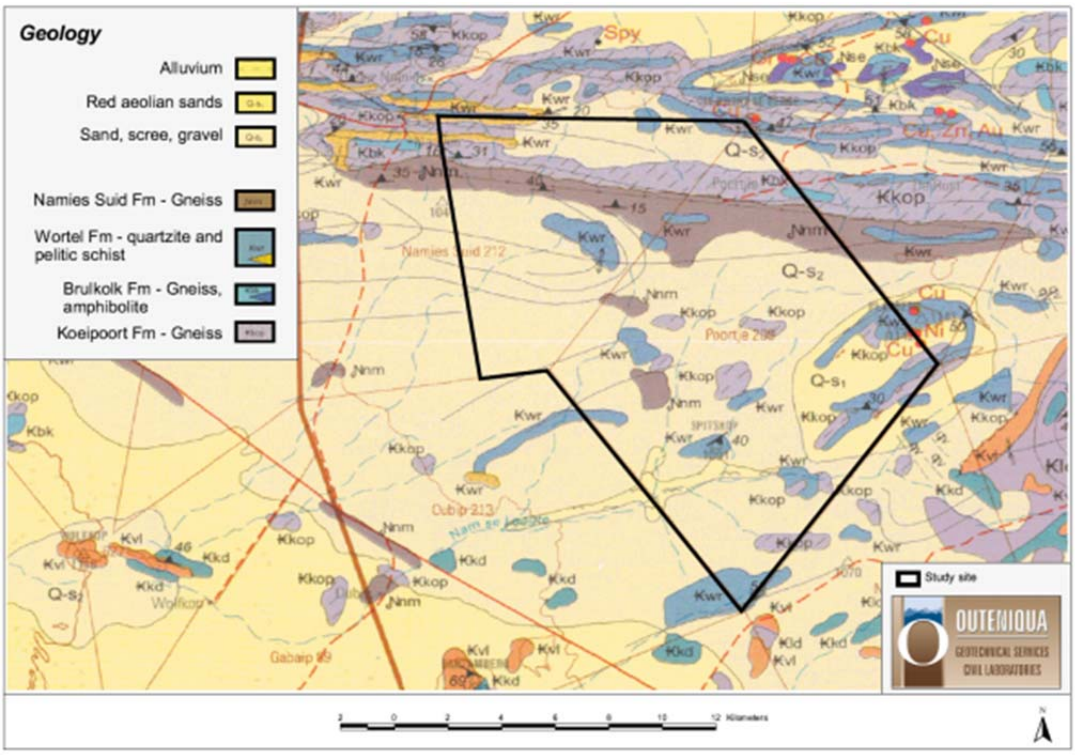


Figure 5.2: Geological map of the study area

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 5.3 and 5.4**). 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 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.

Figure 5.3: A typical drainage line in the study area with white grasses and low to mid-high shrubs on the banks

Figure 5.4: 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 current land use on the proposed site is grazing livestock only (mainly sheep, goats, small game) and there is no crop production. No areas with arable potential occur and this is due to a lack of rainfall or irrigation potential. The carrying capacity is typically 6 – 8 hectares per small stock unit. The site is used mainly as rangeland for sheep-farming and no crops are cultivated.

Information on the agricultural soil types is mainly sourced from independent agricultural reports conducted in the vicinity and the National Landtype Survey. Coarse sandy soils, dominantly red in color with dorbank and hard carbonate underneath, are the dominant soil types occurring on the flat plains. Soil forms such as Garies and Plooysburg, with effective depths of 300 – 700mm are dominant. Shallow Coega, Knersvlakte and Mispah, with coarse sandy topsoils and effective depths varying between 50 and 150mm occur sub-dominantly in the same area. Dundee and deeper Garies and Plooysburg soil forms are found in the depressions/drainage lines. These soils are very sandy with effective depths between 800 and 1200mm.

Natural vegetation of a grass/shrub type occurs dominantly on the property. It is generally sparse, depending on the rainfall. The vegetation growth is moisture dependant and decreases with rainfall gradient. The vegetation is sweet and provides palatable feed all year round. This is typical of vegetation occurring on eutrophic and calcareous soils. More grasses occur along the depressions/ drainage lines.

Agricultural potential is primarily determined by the suitability of the soil profile to support crop production. The combined effect of shallow soils, low rainfall and high evaporation rates result in a serious limitation to agricultural potential and therefore the agricultural potential is limited to small stock production on natural vegetation. Therefore the agricultural potential of the site is low.

There is no cultivated land visible on the Google Earth aerial image of this site. There is no agricultural important infrastructure, i.e. (i.e. silos, irrigation lines, pivot points, channels and feeding structures, etc.) or any conservation works (i.e. contour banks, waterways, etc.) on the site.

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) it is classified as Least Threatened and is not listed in the National List of Threatened Ecosystems (Government Gazette, 2011). . The study area is 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. Vegetation

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 highest mean annual temperature. It is dominated by arid shrublands and grasslands (Mucina *et al.* 2006). The vegetation of the study area at Poortje and Namies South is principally Bushmanland Arid Shrubland occurring on land type Ag 25 (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.

On the edge of Namies South 212/1 and 212/RE the 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 but this shrubland occurs in a fragmented pattern in the eastern sector of Poortjie 209/RE and in one area of Poortjie 209/1.

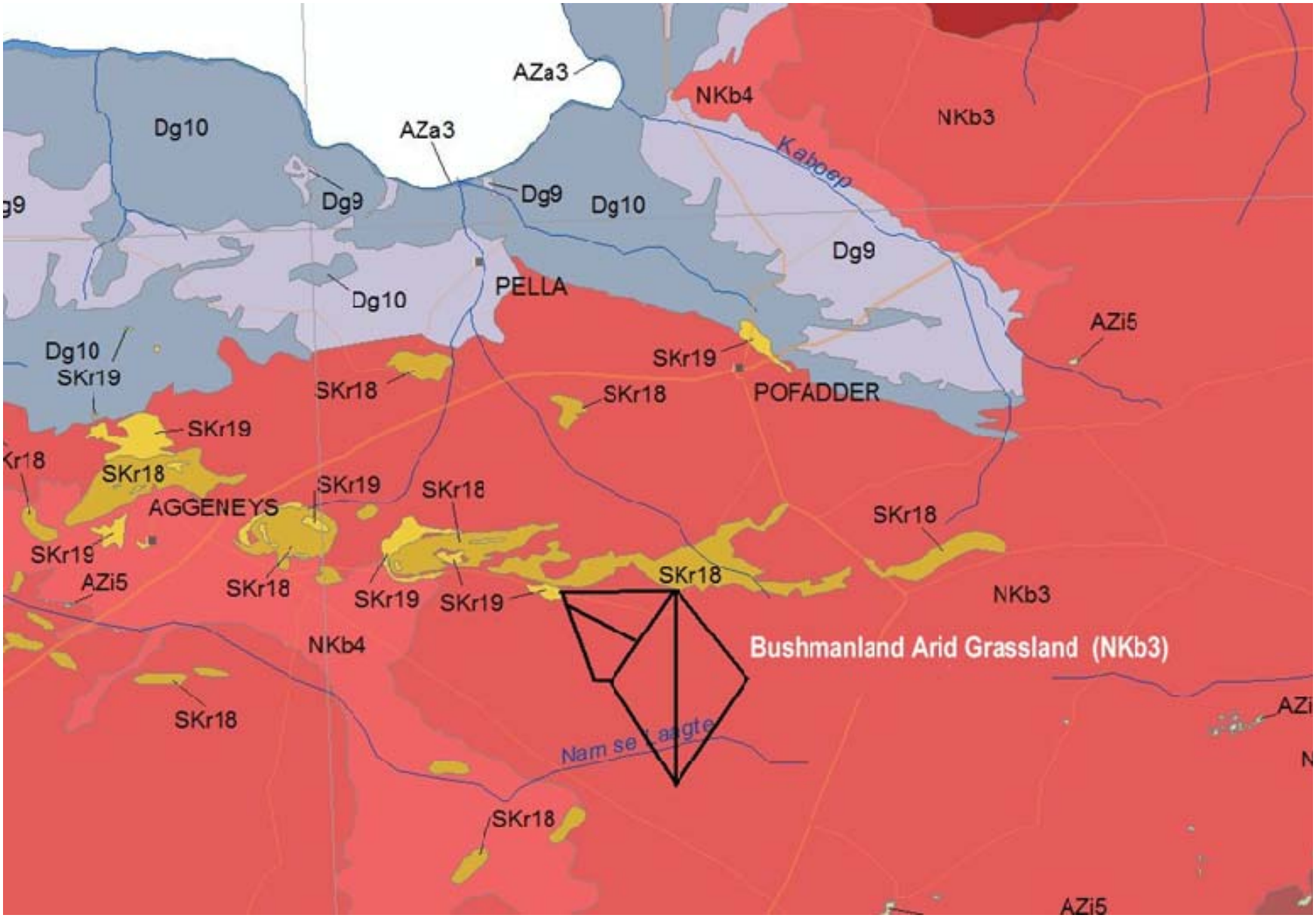


Figure 5.5: Portion of the national vegetation map (Mucina et al. 2005) showing the position of proposed Mainstream Renewable Energy Facility

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 Namies South 212/2 and Poortje 209/1 and 209/RE.

» ***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 on the farm Namies South 212/1 in the northern part of the study area.[1]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. All the drainage lines have similar vegetation; variation depends 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

[1]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.

flash flooding. They are also the 'ecological linking corridors', although the drainage lines do not a high diversity of plant species.

Figure 5.6: A typical drainage line in the study area with white grasses and low to mid-high shrubs on the banks

d. Protected Tree Species

A protected tree species is *Boscia albitrunca* (Shepherd's Tree) is one of the few tree species on the study area (**see Figure 5.7**). These trees 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 5.7: *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. The vegetation seems unlikely to provide faunal roosting sites, however, may be of importance for foraging.

» ***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. These plants are of importance for faunal foraging.

» ***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,	Reptiles	Moderate (sandy and rocky areas	LC

	common geckos		on site)	
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 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 contains a 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 bat	High	Least Concern	Roost in narrow cracks and under slabs of exfoliating 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.

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 *Polemaetus bellicosus,* 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)*

5.4 Social Characteristics of the Study Area and Surrounds

The proposed renewable energy facility is 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 Khâi-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 Khâi-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 Khâi-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 Khâi-Ma Local Municipality is estimated at 12 571 (2007) and makes up approximately 10% of the total population of the greater Namakwa District Municipality (126 494 [2007]). The main towns of Pofadder and Aggeneys account for approximately 64% of the total population (Khâi-Ma IDP, 2011/12). The remainder of the population in the Khâi-Ma Local Municipality is made up of small farming communities. The average population density within the Municipality is very low and is estimated at ~1-3 people/km² (Khâi-Ma IDP, 2011/12). The average population growth for the Khâi-Ma local municipality (2001-2010) is estimated at ~1% (Namakwa DM Economic Profile Report, 2009).

The majority of the population is Coloured (66%), followed by Black Africans (10.5%) and Whites (8.4%). The dominant language within the Municipality is Afrikaans (87.7%) with the remainder made up of Setswana (9.8%), isiXhosa (1.4%), English (0.8%) and other African languages (0.1%).

*5.4.4 **Education***

In terms of education levels, based on the Census 2001 data approximately 6.4% of the population has no formal education, while approximately 24% have less than a Grade 7 (standard 5). When these totals are added to the no formal education figures they indicate that a third of people in the Khâi-Ma Local Municipality (30%) have less than a Grade 7 (standard 5) qualification. This is regarded as the minimum education level required for functional literacy and numeracy. Only 14.6% of the population had a matric qualification, while less than 4% had a tertiary qualification.

*5.4.5 **Employment levels***

Employment data for Khâi-Ma Local Municipality indicates that 53% of the population between the economically active age group of 15 to 65 was employed in the formal sector and the unemployment rate was approximately 10%. The Agricultural sector provided approximately 18% of the formal employment, followed by the Community Services, Mining and Quarrying sectors, which employed between 5% and 4% of the employed population in the area respectively. According to the 2001 Census data, the majority of employment was characterised as 'undetermined' (~66%).

In 2007, the KMLM contributed 10.3% of the total GDP of the greater Namakwa District Municipality, which in turn contributes 16.7% to the Northern Cape GDP (DTI Namakwa District Municipality Profile, 2008).

Based on the data from the 2001 Census, 51% of the population have no formal income and a majority 89.6% of the population earn less than R 800 per month[2]. The low-income levels reflect the limited formal employment opportunities highlighted above. According the DTI NDM Profile (2008), 65% of households in the KMLM were registered as indigent (impoverished) households in 2005. The 2011/2012 Khâi-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.

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.

An assessment of the area was done using the DEAT's Environmental Potential Atlas, with available topographical maps used to identify potential Noise-sensitive developments (NSD) in the area (within area proposed, as well as potential NSD's up to 2 km from boundary of facility). 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 was also confirmed during a site visit. These noise-sensitive developments are highlighted in **Figure 5.8**.

[2]This is the figure used by the South African Government as the official breadline figure. Note that the Census 2011 information is not available as yet.

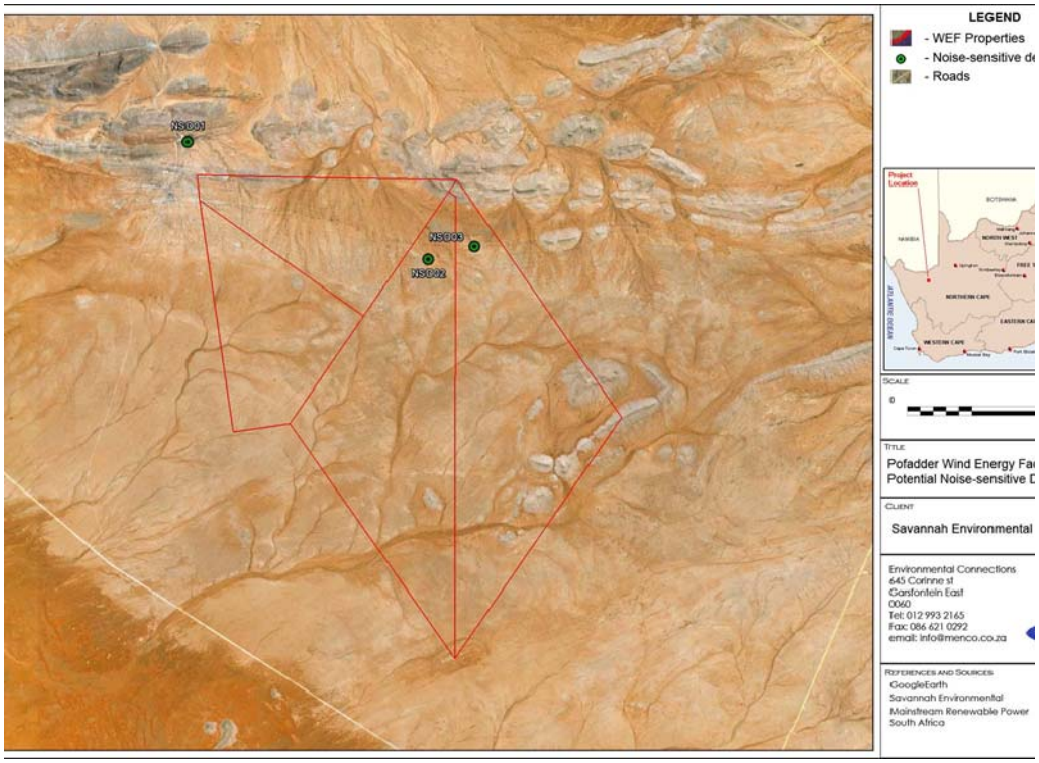


Figure 5.8 Potential Noise Sensitive Developments (green dots) in and around the site

5.5 Heritage and Palaeontological Profile

5.5.1 ***Palaeontology***

The Karoo is well known for its fossil deposits however due to the site being on the very edge of the Karoo region, the potential occurrence of fossils on the site is low. Although igneous and metamorphic rocks generally underlie the study area, fossils are still likely to be present. This is because fossils have been found at Kangnas and Areb areas which are located ~120 km west of the site. The most significant was a fossil believed to represent a dinosaur known as Kangnasaurus coetzeei. The fossil was named by Sidney Haughton in 1915, the generic name referring to the farm and the specific name to the farmer, Coetzee. It is based on holotype SAM 2732, a tooth found at a depth of 34 m in a well on the farm (Haughton 1915, cited in Wikipedia 2011).

5.5.2 ***Archaeology***

a. <u>Early, Middle and Later Stone Age</u>

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.

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 6 & 7). 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 5.9: Grinding grooves in the granite

Figure 5.10: Stone artefacts and ostrich eggshell

b. Rock Art

Rock art is known from the region. Rudner and Rudner (1968) note the scarcity of suitable rock canvases 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 east, rock art occurs near the pan of Gobees. (We now know this to be the incorrect location – the art he describes is to the south of Kangnas on Koeris.

c. 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"

Thompsom (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.

d. 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.

5.5.3 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. 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. 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 5.11: The stone kraal with dung on top of the walls at Poortjie.

Figure 5.12: 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.

The farmer informed us that after heavy summer rain the pan can get deep enough to swim in.

Figure 5.13: The pan alongside the farm werf at Poortjie. The pan has been 'enlarged' through the addition of stone walling.

5.5.4 Cultural Landscape And Sense Of Place

Given that the farms was 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.

SCOPE OF THE RENEWABLE ENERGY FACILITY PROJECT CHAPTER 6

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

6.1 Project Alternatives

6.1.1 Site Alternatives

Through technical studies and this EIA process the developer is being guided to site/locate their proposed renewable energy facility 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 renewable energy facility was determined primarily by the wind and solar 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 and solar energy facility. In addition, a fatal flaw/ environmental screening of the site was undertaken by Aurecon benvironmental consultants which determined that the site did not contain any environmental fatal flaws and should be investigated further through an EIA process.

6.1.2 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 renewable energy facility within the available site. As local level issues were not assessed in sufficient detail at the regional level, these issues are now being considered within the site-specific studies and assessments through the EIA in order to delineate areas of sensitivity within the broader area. Through the process of determining environmental constraining factors, the layout of the wind turbines, solar panels 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.

6.1.3 The 'do nothing' alternative

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

The electricity demand in South Africa is placing increasing pressure on the country's existing power generation capacity. There is therefore a need for additional electricity generation options to be developed throughout the country. The decision to expand South Africa's electricity generation capacity, and the mix of generation technologies is based on **national policy** and informed by on-going strategic planning undertaken by the national Department of Energy (DoE), the 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.

6.2 Renewable Energy Technologies

Various renewable energy technologies are available for electricity generation. Mainstream proposes the establishment of a renewable energy facility which will ultimately comprise a combination of wind and solar energy technologies in order to generate electricity, which will be fed into the National power grid. Renewable energy technologies including wind turbines and solar panels offer an alternative to fossil fuels, thereby reducing the amount of CO_2 emissions into the atmosphere. It is proposed that this renewable energy facility will employ both wind turbines and solar panels (PV or CPV technology). The construction, operational and decommissioning phases of development of the wind and solar energy facility are described in more detail below.

6.3 Construction Phase

In order to construct the proposed renewable energy facility and associated infrastructure, a series of activities will need to be undertaken. The construction process is discussed in more detail below.

6.3.1 Conduct Surveys

Prior to initiating construction, a number of surveys will be required including, but not limited to, a geotechnical survey, a site survey and confirmation of the micro-siting footprint (for wind turbines and solar PV components), survey of substation site/s and survey of power line and road servitudes.

6.3.2 Establishment of Access Roads to the Site

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 micro-siting/positioning of the PV panels and 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. It is, however, more than likely that some access road upgrades will be required. The road bend radii must be amended to accommodate the bending radii needed to transport all wind turbine components and the transportation equipment used by the transport supplier. The extent of upgrade required will be assessed further during the EIA Phase. The final layout of the site specific access roads will be determined following the identification of site related sensitivities.

6.3.3 Transport of Components and Equipment to Site

The components and equipment required for the construction of the proposed renewable energy facility will be brought to site in sections by means of national and provincial roads and then dedicated access/haul road to the site itself. Some of the components (i.e. transformer, turbine tower etc.) may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)[8] by virtue of the dimensional limitations, particularly for wind turbine components (i.e. length and weight). During the construction phase the existing road infrastructure may require alterations (e.g. widening on corners), and protection of road-related structures (i.e. bridges, culverts, portal culverts, retaining walls etc.) as a result of abnormal loading.

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

Typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.) as well as components required for the establishment of the power line.

6.3.4 Undertake Site Preparation

Site preparation activities will include clearance of vegetation at the footprint of each component. These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site.

6.3.5 Establishment of Laydown Areas on Site

Laydown and storage areas will be required for the typical construction equipment which will be required on site. Hard standing areas will also need to be established for the operation of any cranes used on site.

6.3.6 Construct Turbines and Solar Panels

a) <u>Wind Turbines</u>

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

Laydown areas approximately (40m x 40m) will need to be established at each turbine position for the storage and assembly of wind turbine components. The laydown area will need to accommodate the cranes required in tower/turbine assembly. Laydown and storage areas will be required to be established for the normal civil engineering construction equipment which will be required on site.

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

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

be needed for the assembly of the rotor while a large crane will be needed to put it in place.

b) Solar Panels

Either PV or CPV panels will be utilised for the site. PV panels do not require extensive vegetation clearing, only at the panel foundation. CPV panels require the entire area around the panel to be cleared of vegetation. The solar panel will be arranged in arrays. The frames will be fixed onto the ground with the use of concrete, depending on the soil conditions at the site. This will make the installation of the plant less invasive for the territory and facilitate the decommissioning at the end of its production cycle. The height of the PV panel structure will be up to 10 m. and 16m for CPV technology.

6.3.7 Construct Substation

An on-site substation will be required to facilitate the connection between the renewable energy facility and the Eskom electricity grid. The position of the power block within the footprint of the broader site will be informed by the final positioning of the facility components.

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

6.3.8 Establishment of Ancillary Infrastructure

A 400 kV substation and 4 (four) 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.

6.3.9 Connect Substation to Power Grid

A 400 kV substation and 4 (four) 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.

6.3.10 Undertake Site Remediation

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.

6.4 Operational Phase

The electricity that is generated from the solar panels and wind turbines will be stepped up through on-site substations (4 (four) satellite 132 kV substations connecting to a 400 kV substation). The power will be evacuated from the 400kV substation via an overhead power line to turn in and out of the existing Eskom Aggeneys–Aries 400kV power line.

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

6.5 Decommissioning Phase

The renewable energy facility is expected to have a lifespan of approximately 30 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 which would include the following decommissioning activities.

6.5.1 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, construction platform) and the mobilisation of decommissioning equipment.

6.5.2 Disassemble and Recycle Components

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

SCOPING OF ISSUES ASSOCIATED WITH THE WIND ENERGY FACILITY CHAPTER 7

Construction activities for wind energy projects typically include:

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

Operational activities include regular maintenance of the site infrastructure.

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

Environmental issues associated with construction and decommissioning activities may include, among others, noise impacts, heritage impacts, soil erosion, and threats to biodiversity and ecological processes, including habitat alteration and impacts to wildlife.

Environmental issues specific to the **operation** of a wind farm could include visual impacts; noise produced by the spinning of rotor blades; avian/bat mortality resulting from collisions with blades and/or barotrauma; and mortality, injury and disturbance to other faunal species.

The significance of impacts associated with a particular wind farm is dependent on site-specific factors, and therefore impacts can be expected to vary significantly from site to site.

The environmental issues associated with all phases of the proposed Wind Energy Facility of the project have been identified through a scoping evaluation undertaken in accordance with the requirements of the EIA Regulations. **This chapter serves to describe and evaluate the identified potential environmental impacts associated with the wind energy facility component of the project under DEA reference number: 14/12/16/3/3/2/348.** Recommendations for further studies required to be undertaken in the EIA phase, and/or recommendations for the management of these impacts through inclusion in the Environmental Management Programme (EMP).

Tables 7.1 and Table 7.2 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 up to 500 wind turbines (each turbine between 1.5 MW – 4MW in capacity) and this number of turbines depending on the model of turbine that the developer will select. The hub height will be up to 120m 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. up to 500 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 7.1: Evaluation of potential impacts associated with the CONSTRUCTION PHASE of the proposed Wind Energy Facility

Potential Visual Impacts:

Potential visual impacts during the construction phase on observers in close proximity to the 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
Potential visual impacts associated with the construction phase on observers in close proximity to the facility and power line.	Construction of the wind energy facility.	Local	None.
The potential visual impact of the construction of ancillary infrastructure on observers residing in close proximity of the facility.	Construction of associated infrastructure of the wind energy facility (i.e. the substation, associated power line, access road to the site, internal access roads within the site, etc as determined).	Local	None.

Gaps in knowledge & recommendations for further study:

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

It is recommended that:

» It is therefore 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 primarily determined by the suitability of the soil profile to support crop production. The soil needs to be adequately thick to support root development and the drainage characteristics needs to be good to prevent chemical crusting on the surface. In addition to the soil characteristics, climatic factors are also important because the annual rainfall needs to be adequate to sustain a viable crop production.

The agricultural potential of the site is low and limited to extensive grazing due to the low rainfall in the area. The current land use on the proposed site is grazing livestock only (mainly sheep, goats, small game) and there is no crop production. No areas with arable potential occur and this is due to a lack of rainfall or irrigation potential. The carrying capacity is typically 6 – 8 hectares per small stock unit. The site is used mainly as rangeland for sheep-farming and no crops are cultivated.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Loss of agricultural land.	Construction of proposed wind energy facility and associated infrastructure.	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.	None

Gaps in knowledge & recommendations for further study:

The potential impacts on soils and agricultural potential will be assessed in greater detail during the EIA phase of the project.

It is recommended that:

A detailed site visit be conducted as part of the EIA level investigation and the following parameters should be investigated:

» Land capability, current land-use and degradation status of the agricultural resources (i.e. soil and vegetation)

» Agriculturally sensitive areas or areas with agricultural value (i.e. lands, wetlands and watercourses)

Potential Impacts on Soil and Current land Use:

The following activities may have an impact on the soil and agricultural potential and resources of the site:

» Construction and positioning of the concrete foundations of the wind turbines
» Positioning and construction of underground cabling between the wind turbines
» Construction and positioning of the on-site substation
» Construction and positioning of overhead power lines
» Construction and positioning of internal access roads
» Construction and positioning of a workshop, office, maintenance and storage area
» Use of oil, petrol, diesel and other contaminants by the vehicles and equipment on the site during construction.

The proposed wind energy facility will not have large impacts on the current land use of the area. This is mainly due to the low agricultural potential, soils and climatic constraints for the site.

An erosion potential map showing the susceptibility of the soils to water and wind erosion is shown in Figure 7.1. Erosion is generally considered to be the most important impact on soil due to the fact that it can have significant knock-on effects in terms of agricultural potential. Erosion sensitivity can be broadly mapped according to the potential severity of erosion if land disturbing activities occur and this is generally affected by the geology, topography and hydrology. Generally speaking, thick deposits of unconsolidated or partly consolidated fine-grained soils of low plasticity occurring along drainage lines, on moderate to steep slopes or at the base of steep slopes are most vulnerable to severe levels of erosion due to water run-off. Areas where these factors occur simultaneously are typically called “highly sensitive” areas. During peak rainfall events, excess run-off may result in significant erosion along drainage lines (see **Figure7.1**) and in areas that are cleared of vegetation, although in the case of the proposed development, full vegetation clearing is not envisaged across the entire site area. Certain parts of the site have been identified as being sensitive in terms of erosion. The water erosion sensitivity as a function of topography and geology. The sites erosion sensitivity has been classified as follows:

» High: Natural drainage lines/watercourses, steep slopes (high relief areas) are considered to be of high erosion sensitivity. However erosion is presently taking place.
» Medium: 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).
» Low: Areas where rock outcrops at surface are considered to be of low erosion sensitivity.

Issue	Nature of Impact	Extent of Impact	'No go' areas
Soil degradation due to contamination	Spillages of oil, diesel, petrol or other contaminants by the vehicles and equipment, may lead to soil degradation due to contamination. Contamination of the soil may also take place in proposed maintenance and storage sites	Local (construction areas only)	No specific 'no go' areas have been identified at this stage, however areas of high erosion sensitivity are shown in Figure 7.1 and will be investigated further during the EIA phase to determine appropriate mitigation measures
Soil erosion due to increased and concentrated stormwater run-off	Heavy rainstorms do occur in the area. Depending on the placement of the wind turbines and other infrastructure, as well as the erodibility of the soils and the slopes on the site, run-off of stormwater may be increased and concentrated, with both direct and secondary effects on the soil, vegetation and other resources downstream.	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 management, may lead to water erosion and siltation of watercourses downstream.	Regional	
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 potential impacts on soils will be assessed in greater detail during the EIA phase of the project.

It is recommended that:

A detailed site visit will have to be conducted as part of the EIA level investigation and the following parameters will be investigated:

- Geology and soils, with special reference to sensitivity to erosion and factors contributing to erosion (i.e. slopes, etc.
- The following methodology will be adopted for the EIA phase study:
  - Assess the potential direct and indirect impacts using a weighting system that assigns a value to the categories (extent, duration, magnitude, probability) and arrives at a total which depicts the significance of the particular impact;
  - Assess the contribution of the proposed activity in the cumulative impact of the development in the area;
  - Comparatively assess any feasible alternatives (if any);
  - Provide mitigating measures to input into the Environmental Management Plan (EMP).

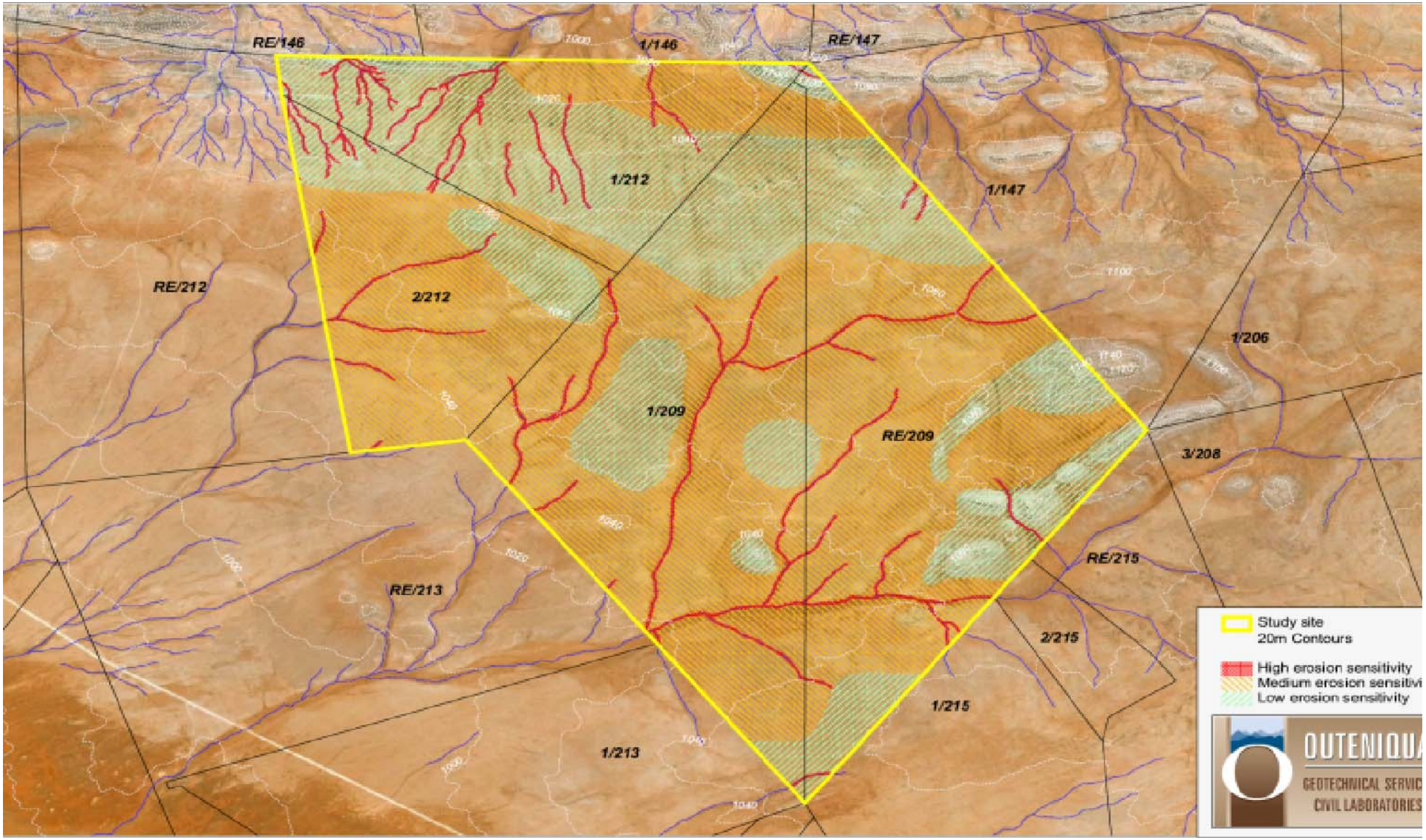


Figure 7.1: An erosion potential map showing the susceptibility of the soils to water and wind

Potential impacts on Vegetation and Terrestrial Fauna:

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) it is classified as **Least Threatened** and is not listed in the National List of Threatened Ecosystems (Government Gazette, 2011). No Critical Biodiversity Areas occur within the study area. Even though a vegetation type may be rated as **Least Threatened** it is still important to observe caution when developing an area where undisturbed vegetation occurs. No rare plant species or plant species of special concern are known to occur.

Flora:

The vegetation of the Poortje and Namies South study area (Pofadder) is part of an extensive vegetation type (Bushman Arid Grassland) with very low turnover of plant species. This means that there is low variation in the species composition. Mucina *et al.* (2006) list numerous species occurring in Bushmanland Arid Grassland with only a few endemic species and one biogeographically important species (*Tridentia dwequensis*). The result is that the vegetation of the study area can be generally described as having a **low to very low botanical sensitivity**, particularly on the open plains. The drainage lines are somewhat more ecologically sensitive and should therefore be buffered (distance to be confirmed) as 'ecological corridors'.

Mapping of the drainage lines is not simple due to their wide-ranging and interlinking nature. Such detailed mapping would be time-consuming and would only be possible with the use of high-resolution, large-scale aerial photography. This presents some difficulties in relation to the location of solar panels since drainage lines should be avoided where possible for practical (potential flood damage) and botanical / ecological reasons.

A sensitivity map of the vegetation of Poortje and Namies South reflects the **low botanical / ecological sensitivity** of the greater part of the study area, with the exception of Namies South 212/1 which is rated as **moderately sensitive** due to the density of small (narrow) drainage lines (see **Figure 7.2**). Drainage lines are rated as highly sensitive to emphasise that they should be well buffered (as determined in the EIA) in any proposed infrastructure layouts. Areas that are sensitive are the drainage lines. These should be buffered by at least 40 m i.e. no construction of 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 sites. It is recognized that this constraint will present challenges in determining the locations of turbines however, it has practical implications as well since the installations would be protected from flash-floods.

Metamorphic rock is exposed as inselbergs to the north of Nam se Laagte and in the eastern sector of the Remainder Poortje 209. All Bushmanland Inselberg Shrubland in the south-central part of Poortje 209/1 and the eastern part of Poortje 209/RE must be avoided. This vegetation occurs on upland sites so this should be easily achieved. The eastern part of Poortje 209/RE extending southwestwards over Poortje 209/1 has large drainage lines and it is suggested

that this part of the study site (which included the inselbergs) should be considered as the least suitable for the proposed renewable energy infrastructure (refer to sensitivity map).

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*, the negative impacts can be kept within acceptable limits. Roads that will cross drainage lines must also be built in such a way as not to impede water-flow when this occurs.

A more detailed botanical assessment of impacts will only be possible once proposed turbine and solar panel arrays layouts are available. Any future botanical assessments in the study area should ideally take place in the growing season and after reasonable rain. The highly desiccated vegetation as seen at the study site in July 2012 is not ideal for comprehensive botanical survey and is a significant limitation to the findings presented here.

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 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 7.3. Figure 7.3 shows areas of Moderate faunal sensitivity which includes 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 facilities when the following activities would be required:

» Construction of access roads.
» Clearing of vegetation for the turbine pedestals and construction of lay-down areas and 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	Local	No specific 'no go' areas have been identified at this stage; however areas 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. In addition, impacts on species of conservation concern could to some extent be mitigated through turbine micrositing and avoiding areas with a high abundance of such species.		very high ecological sensitivity (as shown in Figure 7.2 and Figure 7.3) 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 construction phase as a result of the noise and human activities present. Some mammals and reptiles such as tortoises would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present.	Local	
Disruption of landscape connectivity and ecosystem	Development within intact vegetation would contribute to the fragmentation of the landscape	Local	

processes	and potentially disrupt the connectivity of the landscape for fauna and flora.		

Gaps in knowledge & recommendations for further study:

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

It is recommended that:

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 species within these areas.
» Evaluate the likely presence of listed faunal species at the site and identify associated habitats that should be avoided to prevent impact to such species.
» During the EIA phase food plants that can be utilised by tortoises on site will be determined.
» Evaluate, based on the site attributes, what the most applicable mitigation measures to reduce the impact of the development on the site would be and if there are any areas where specific precautions or mitigation measures should be implemented.
» Assess the impacts identified above in light of the site-specific findings and the final layout to be provided by the developer.
» This information will be summarised together with the sensitivity of plant communities and habitats in a sensitivity map that would be crucial to inform the design phase of the proposed project.

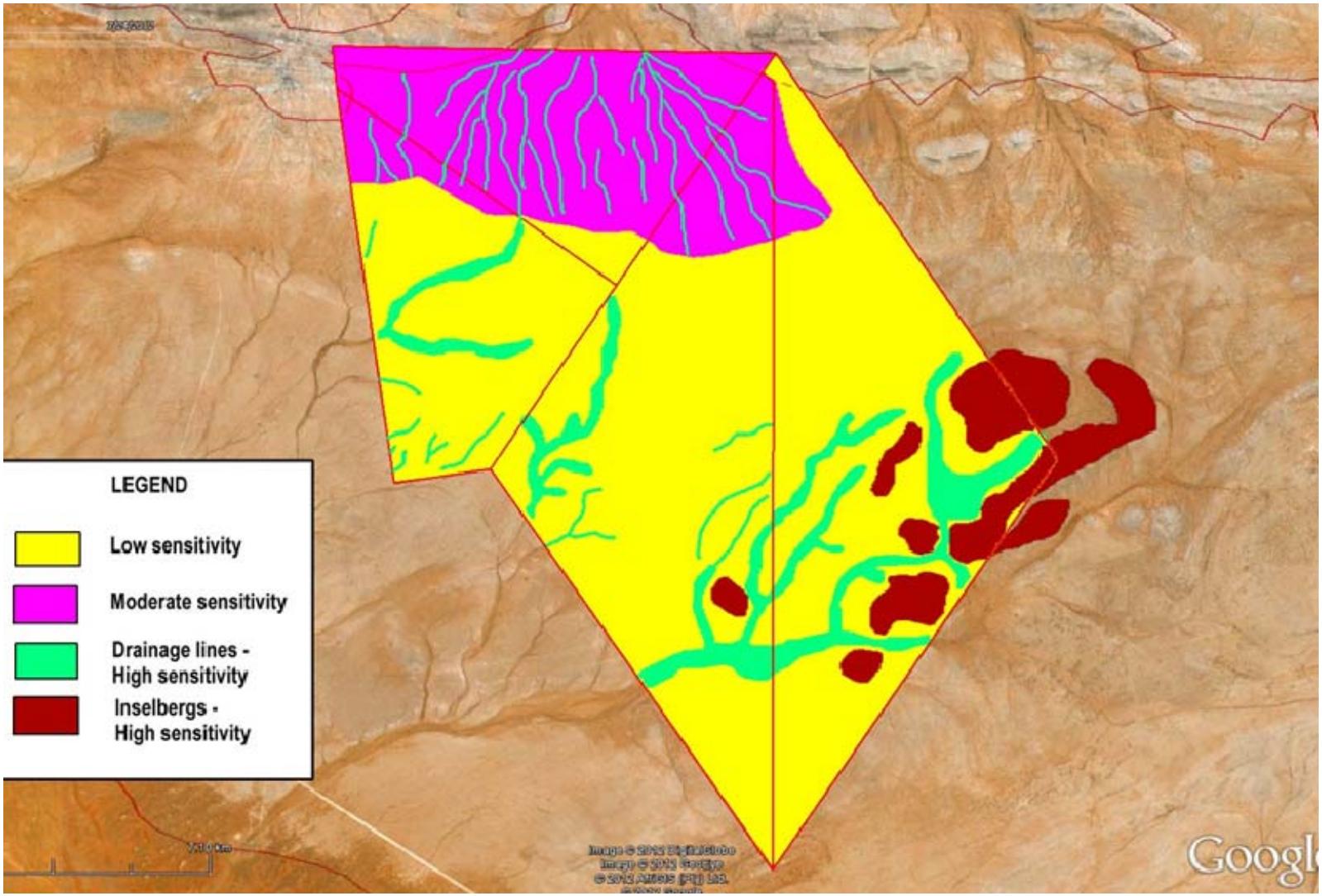
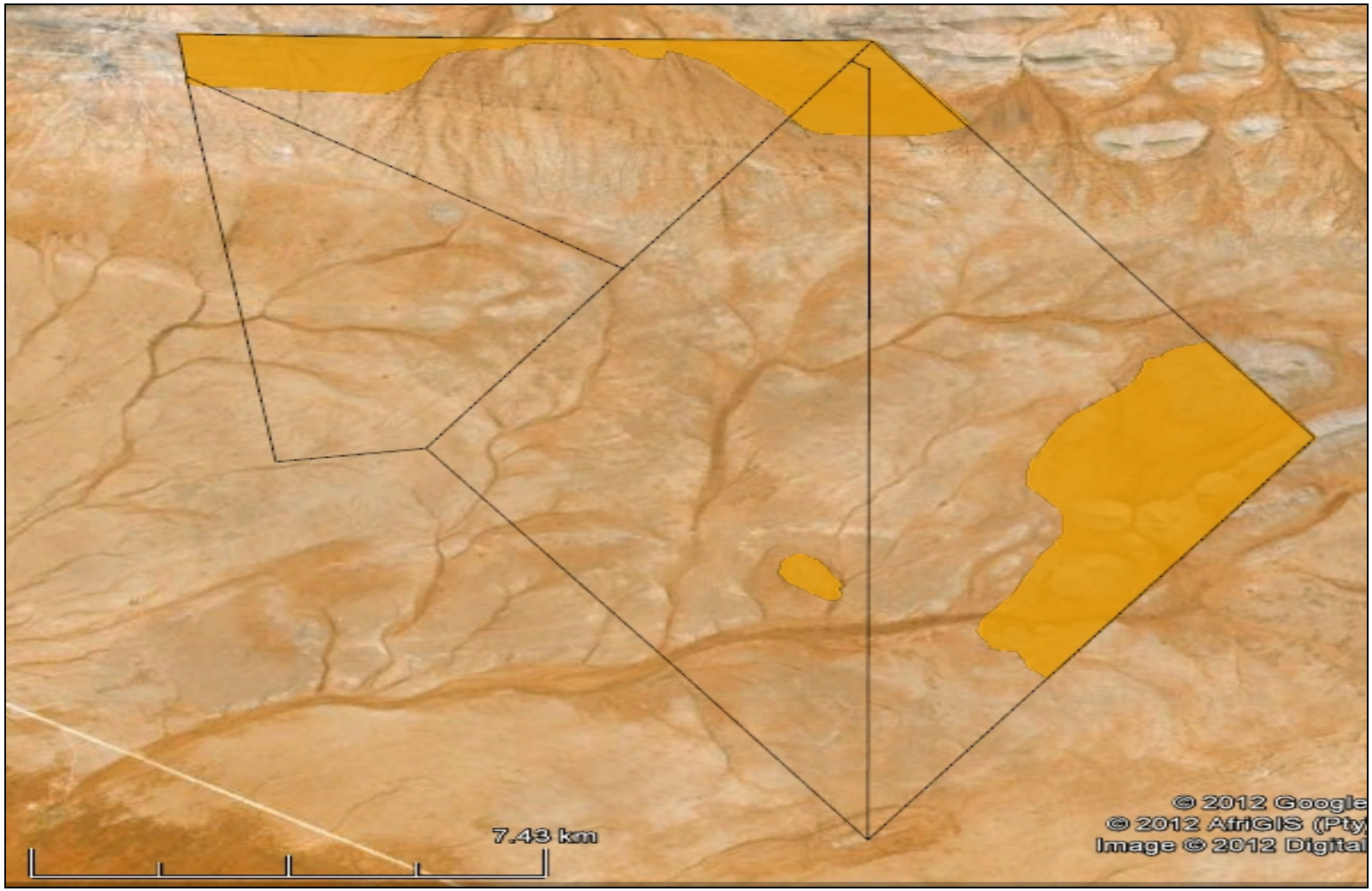


Figure 7.1: Botanical sensitivity of the site



Moderate sensitivity

Figure 7.3: 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 *Polemaetus bellicosus,* 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 (*Polemaetus bellicosus*)
» Ludwig's Bustard (*Neotis ludwigii*)
» Secretarybird (*Sagittarius serpentarius*)
» Kori Bustard (*Ardeotis kori*)
» Lanner Falcon (*Falco biarmicus*)

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:			

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

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 will be supplied as an appendix to the final EIA report (It is, however, recommended that pre-construction monitoring begins a soon as possible, so that data collected can be used to inform the final avifaunal EIA reporting).
» 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.

Potential habitats for bats that may be lost during construction of the facility are illustrated in **Figure 7.4.** Figure 7.4 shows 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 rivers is appropriate. The shaded areas and their buffers indicate areas which may be marked as sensitive and which will be confirmed during the EIA phase.

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

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.
» A bat monitoring program may be required and will be determined during 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:

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. However, two areas of high archaeological value were identified. These are around the structures and ruins at Namies South and the farm and pan at Poortjie (a short way from the pan is a ridge forming the outermost limit of the hollow in which the pan is located and two Later Stone Age occupation sites with stone artefacts, ostrich eggshell fragments, a bead and pottery). Particular attention should also be paid to the alignment of the access road to the site (the buildings and ruins at Namies South are sensitive). The confirmed location of the heritage sites will be considered further and mapped in the EIA phase.

Elsewhere in the study area 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 significance.

Fossils may occur on the site to be considered further in the EIA phase.

Impact on the sense of place will occur due to visual impacts on the wind turbines and associated infrastructure. However, with so few people present in the landscape and the extreme remoteness of the site this impact is not serious enough to prevent the development of the proposed wind and solar energy facility.

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	Local	No 'no- go' areas have not been identified at this stage.

	medium impact on a local scale.		
Impacts on historical finds	The construction of the wind energy facility can directly impact on both the visual context and sense of place of historical sites. There are few structures identified in the south of the study area. Due to the visual nature of a wind farm facility it can also have a direct impact on the sense of place as well as the cultural landscape. The wind farm facility will have a low to medium local impact due to the general physical nature of wind facilities. The sense of place of cultural sites and the cultural landscape will be impacted on a local scale and the impact will be medium.	Local	No 'no- go' areas have not been identified at this stage.
Impacts on burials and cemeteries	The construction and operation of the wind farm facility could directly impact on marked and unmarked graves. Graves dating to the Stone Age can be expected especially close to drainage lines with more recent formal and informal cemeteries anywhere else on the landscape. The facility could have a low to medium impact on a local scale.	Local	No 'no- go' areas have not been identified at this stage.
Gaps in knowledge & recommendations for further study:			

The potential impacts on heritage resources will be assessed in greater detail during the EIA phase of the project. The scoping evaluation was largely based on available information for the broader study area and a short field survey.

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.
» A desktop Palaeontological Impact Assessment will also be conducted.

Potential noise impacts:

Three noise receptors have been identified as shown in Figure 7.7, these are farm homesteads on Namies and Poortjie, other than these homesteads the site is fairly remote and uninhabited. Increased noise levels are directly linked with the various activities associated with the construction of the wind energy facility and related infrastructure. The specific activities relating to construction of the wind energy facility will only be known during the EIA phase of the project. However, in general construction activities may include the following:

» construction of access roads,
» establishment of turbine tower foundations and electrical substation(s),
» establishment of foundations for photovoltaic arrays,
» the possible establishment, operation and removal of concrete batching plants,
» the construction of any buildings,
» digging of trenches to accommodate underground power cables; and
» the erection of turbine towers and assembly of wind turbine generators.
» The equipment likely to be required to complete the above tasks will typically include: excavators/graders, bulldozers, dump trucks, vibratory roller, bucket loader, rock breaker, (potentially) drill rig, excavator/grader, bulldozer, dump truck, flatbed trucks, concrete truck(s), cranes, fork lift and various 4WD and service vehicles.

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.

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:

It is recommended that the potential noise impact be investigated in more detail in the EIA Phase. The following information is considered critical:

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

The following work is planned for the EIA 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 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 the construction phase
» Using the calculated noise levels at the identified NSDs, the projected significance of the wind energy facility 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 wind energy facility.

Potential impacts on the social environment:

A number of key social issues are potentially associated with the construction of the proposed wind energy facility. The potential positive impacts associated with the construction phase relate to the creation of limited employment and skills development opportunities. The potential negative impacts are linked to the presence of construction workers on the site and in the area, the impact on local roads (transport of turbine components), and potential opportunistic in-migration.

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

Gaps in knowledge & recommendations for further study:

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

It is recommended that:

Methodology to be undertaken for the EIA phase:

» 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 and Socio-Economic Assessment Report, including identification of mitigation/optimisation and management measures to be implemented.

The following typical, generic project information informs the Social Impact Assessment:

» 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;
» Information on the nature of the agreements with the affected landowners, specifically with regard to compensation for damage to land, infrastructure etc.

Table 7.2: 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 land use is predominantly agriculture, with stock farming predominating and with some hunting activity in winter. 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 (22 km south-west of the site).

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. 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 infrastructure is the Eskom Aggeneys–Aries 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. Settlements, where these occur, are very limited in extent and domestic in scale. The greater environment with its wide open, undeveloped landscape 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).

The desktop visual exposure (viewshed) (shown in **Figure 7.4**) has been generated by generation of a Digital Terrain Model in a GIS platform, indicates the area from which a wind turbine with a total effective height of 120 m would theoretically be visible. For this analysis, the highest points on each of the affected farms were used, and an additional 120 m was added to these heights to analyse the area from which the turbine (hub height) would be visible. It is unlikely that turbines would be placed on the highest points on each of the farms, so this analysis provides a "worst case scenario" in terms of visibility of the turbines. 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.
- Potentially 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, and 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[9] to the proposed facility and within the region[10].	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.
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	Visual exposure to wind turbines and associated infrastructure.	Local	Cannot be determined at this stage.

[9] 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.

[10] 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.

and office) on observers in close proximity to the proposed facility.			
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 potential visual impacts need to be assessed in greater detail during the EIA phase of the project.

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.

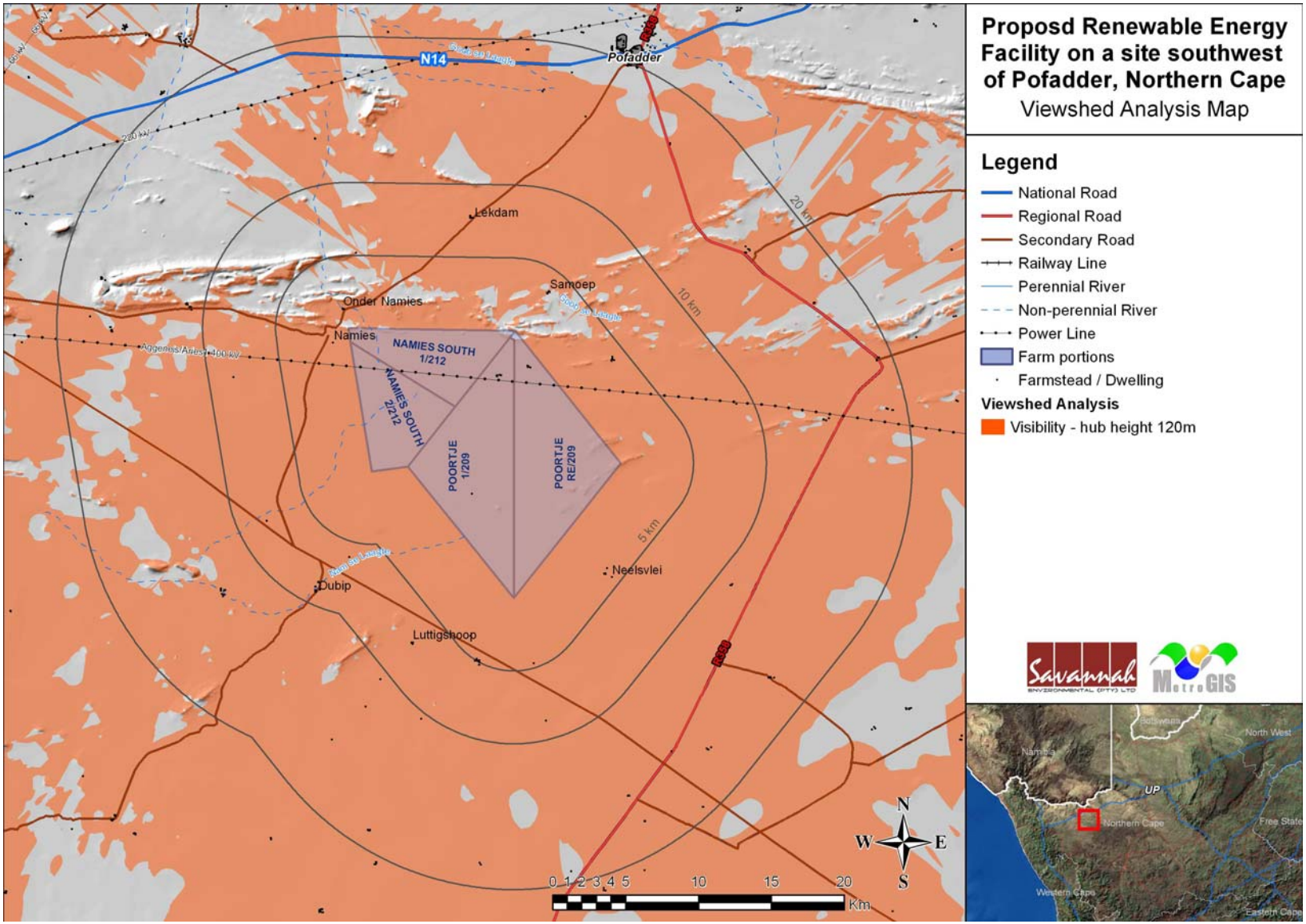

Proposd Renewable Energy Facility on a site southwest of Pofadder, Northern Cape
Viewshed Analysis Map
Legend
National Road
Regional Road
Secondary Road
Railway Line
Perennial River
Non-perennial River
Power Line
Farm portions
Farmstead / Dwelling
Viewshed Analysis
Visibility - hub height 120m
N14
Pofadder
Lekdam
Samoep
Onder Namies
Namies
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
Savannah Environmental (Pty) Ltd
MetroGIS
Namibia
Botswana
North West
Northern Cape
Free State
Western Cape
Eastern Cape

Figure 7.4: Cumulative Viewshed analysis for the proposed Wind & Solar 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:

Gaps in knowledge:

- 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).
- There are no commercial large scale wind energy facilities in South Africa, therefore the impacts on birds in considered in relation to other countries and the resultant impacts on birds.

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

It is recommended that:

The EIA phase will emphasise the outcome of the site visit, which in turn will include:

» The micro habitats on site will be assessed for their suitability for the key species
» The sensitivity zones and suitable buffer zones will be identified and mapped.
» The impacts identified in this scoping phase study will be assessed formally
» If a pre-construction bird monitoring programme has not already been initiated, a framework for such a monitoring programme will be prepared.

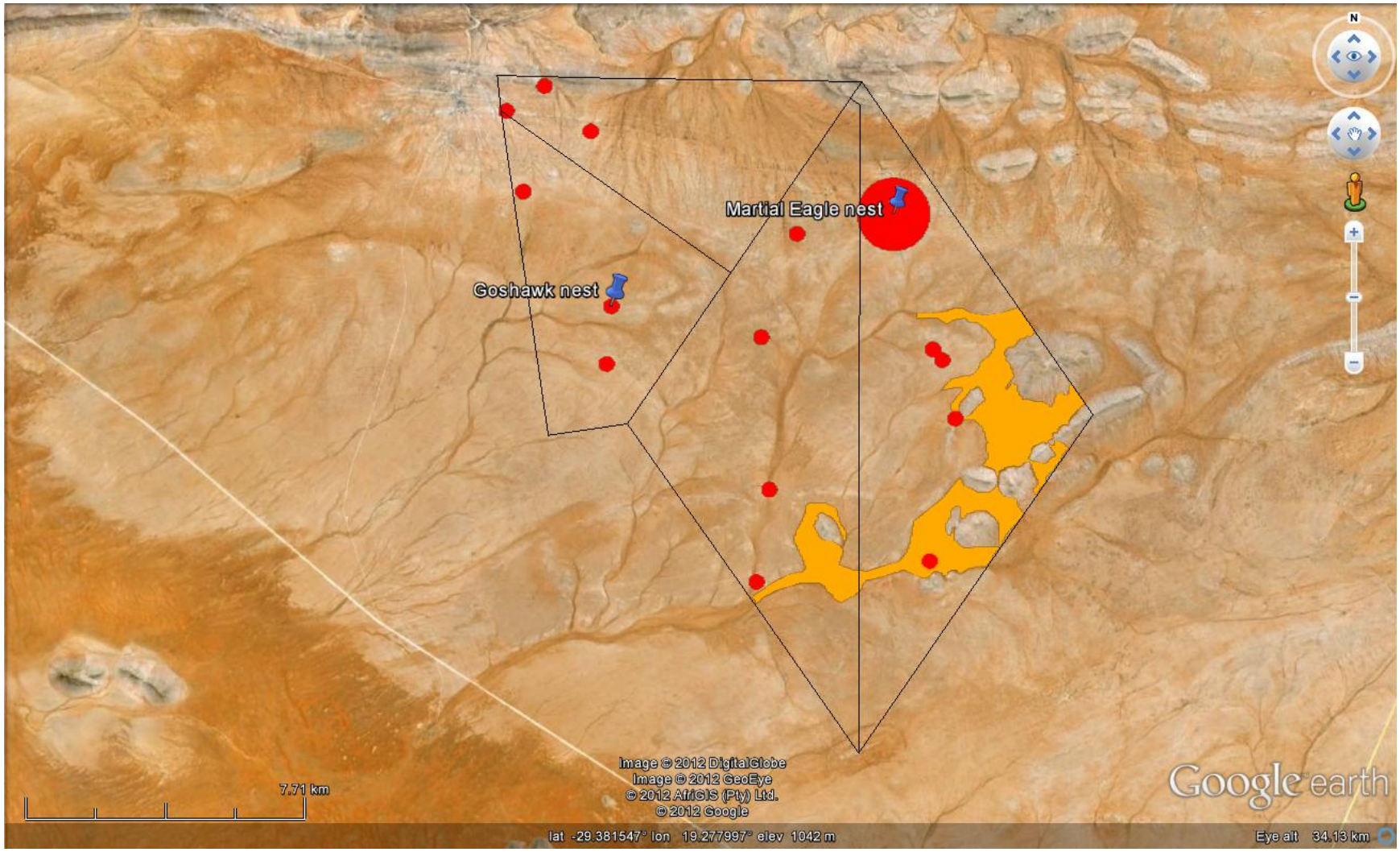


Figure 7.5: Preliminary delineation of sensitive avifaunal habitat. Red = High sensitivity, Yellow = medium sensitivity

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.

Figure 7.6 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 populations of affected species and may affect migration routes of	Cannot be determined at this stage.

		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.

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

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:
  - o Species presence estimates determined through the use of a bat detector system operated whilst driving transect lines across the farm
  - o Surveys to assess and identify potential key areas for roosting such as (but not limited to) buildings, underground sites and trees
  - o 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
  - o 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. 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 accurately.

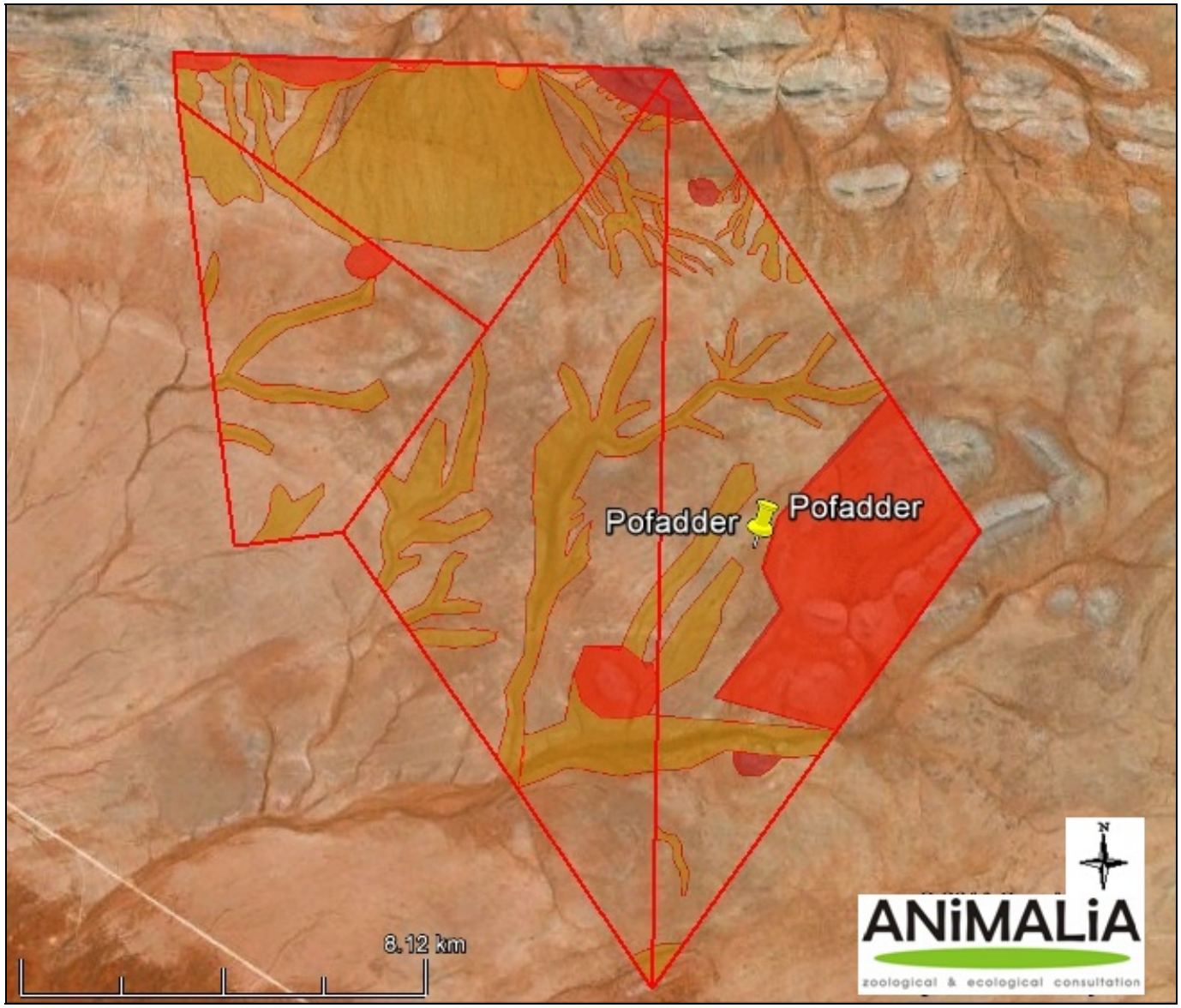

Pofadder
Pofadder
8.12 km
N
ANiMALiA
zoological & ecological consultation

Figure 7.6: Desktop based bat sensitivity map of Pofadder 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.

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.
» In addition, a desktop paelontology will also be undertaken to determine if the site could potentially host significant fossils.

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
» 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 7.7. 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.
» The following information is considered critical:
  o The prevailing night-time background ambient noise levels,
  o The available meteorological data,
  o The exact locations of the various wind turbine generators within the development footprint,
  o The full specifications of the wind turbine generators,
  o The confirmation of the noise-sensitive developments, and;
  o An overview of the equipment, processes and schedules for the construction phase.

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

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.

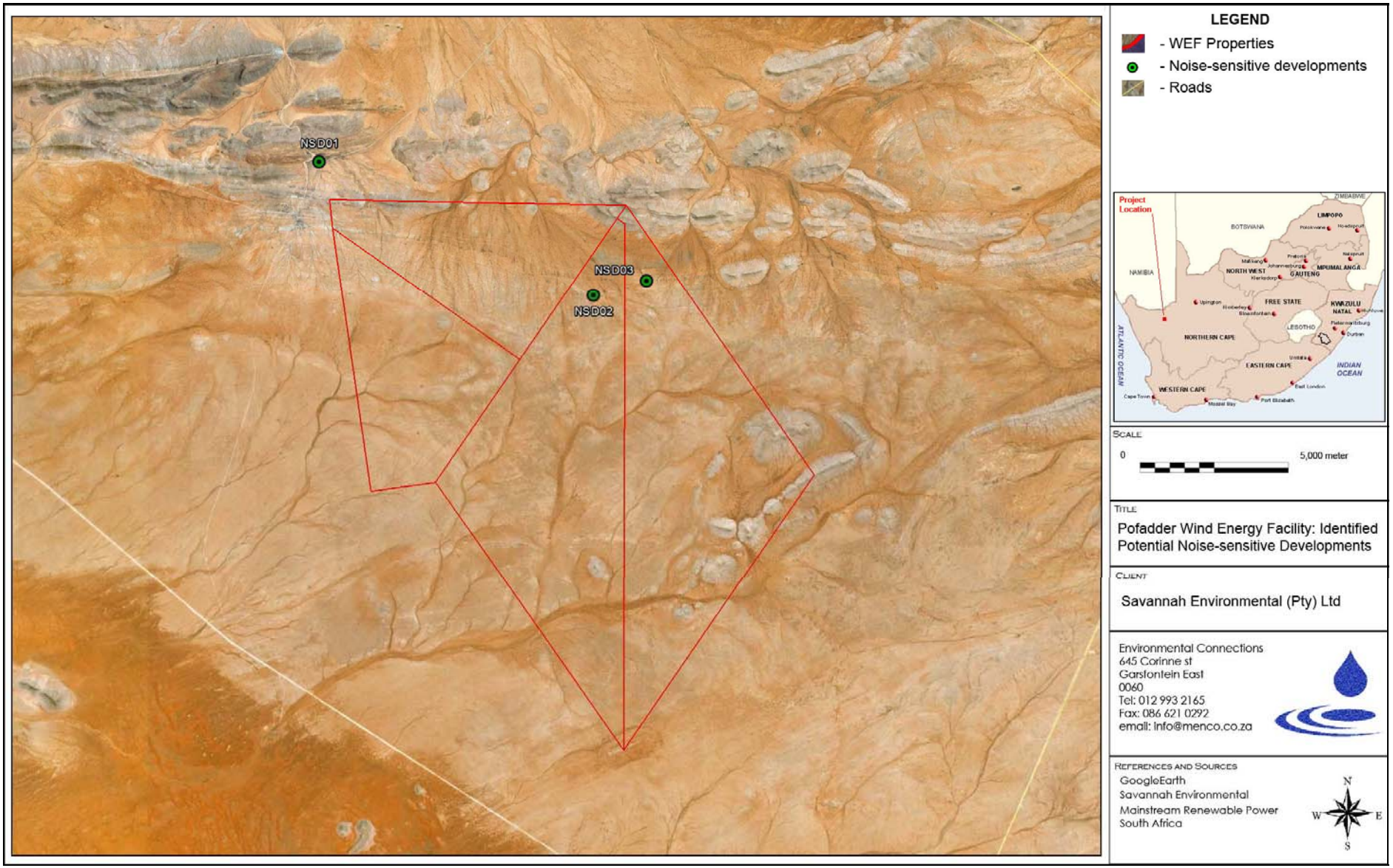

NSD01
NSD03
NSD02
LEGEND
- WEF Properties
- Noise-sensitive developments
- Roads
Project Location
ZIMBABWE
BOTSWANA
NAMIBIA
LIMPOPO
NORTH WEST
GAUTENG
MPUMALANGA
FREE STATE
KWAZULU NATAL
LESOTHO
NORTHERN CAPE
EASTERN CAPE
WESTERN CAPE
ATLANTIC OCEAN
INDIAN OCEAN
SCALE
0
5,000 meter
TITLE
Pofadder Wind Energy Facility: Identified Potential Noise-sensitive Developments
CLIENT
Savannah Environmental (Pty) Ltd
Environmental Connections
645 Corinne st
Garsfontein East
0060
Tel: 012 993 2165
Fax: 086 621 0292
email: info@menco.co.za
REFERENCES AND SOURCES
GoogleEarth
Savannah Environmental
Mainstream Renewable Power
South Africa
N
W
E
S

Figure 7.7: 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
Creation of opportunities to local business during the operational phase, including but not limited to, provision of security, staff transport, and other services	(Positive impact)	Local and Regional	N/A
Potential up and down-stream economic opportunities for the local, regional and national economy	(Positive impact)	Local, Regional and National	N/A
Provision of a clean, renewable energy source for the national grid	(Positive impact)	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 7.3: Evaluation of potential Cumulative Impacts associated with the 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.

Based on the information available at the time of undertaking this EIA, there are two projects that have been authorised north of Pofadder which have received preferred bidder status, and are planned for construction to commence in 2012. These projects are as follows:

1. The KaXu Solar Thermal Plant to be developed by Abengoa Solar South Africa on Portion 4 of the farm Scuit-Klip 92. The proposed facility will have a maximum generating capacity of 310 MW to be comprised of a combination of technologies, including parabolic troughs, power tower and associated heliostat field and photovoltaic panels. The EA was issued in 2011, and a 100 MW trough plant (CSP) project was awarded preferred bidder status in 2011. . Construction will commence this year (2012).
2. The Konkoonsies Solar Facility to be developed by Biotherm Energy, 32 km north-east of Pofadder. This project received preferred bidder status in 2011.

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 renewable energy facility at a site level are expected to be associated with the scale of the project, i.e. solar panels and 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 wind and solar energy facility and associated infrastructure 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 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).

CONCLUSIONS FOR THE WIND ENERGY FACILITY CHAPTER 8

This chapter only deals with the conclusion regarding the wind component of the renewable energy facility under DEA reference number **14/12/16/3/3/2/348.** South Africa Mainstream Renewable Power Development (Pty) Ltd (Mainstream) is proposing to establish a commercial renewable energy facility consisting of both a wind energy facility component and a photovoltaic solar 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 4 (four) 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.

The Scoping Study for the proposed **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 **14/12/16/3/3/2/348.**

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 11 of this report.

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

In identifying and evaluating impacts associated with the proposed wind energy facility, it has been assumed that although during operation, the area affected will comprise of up to 500 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 8.1 and 8.2 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 8.1.

Table 8.1: 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

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

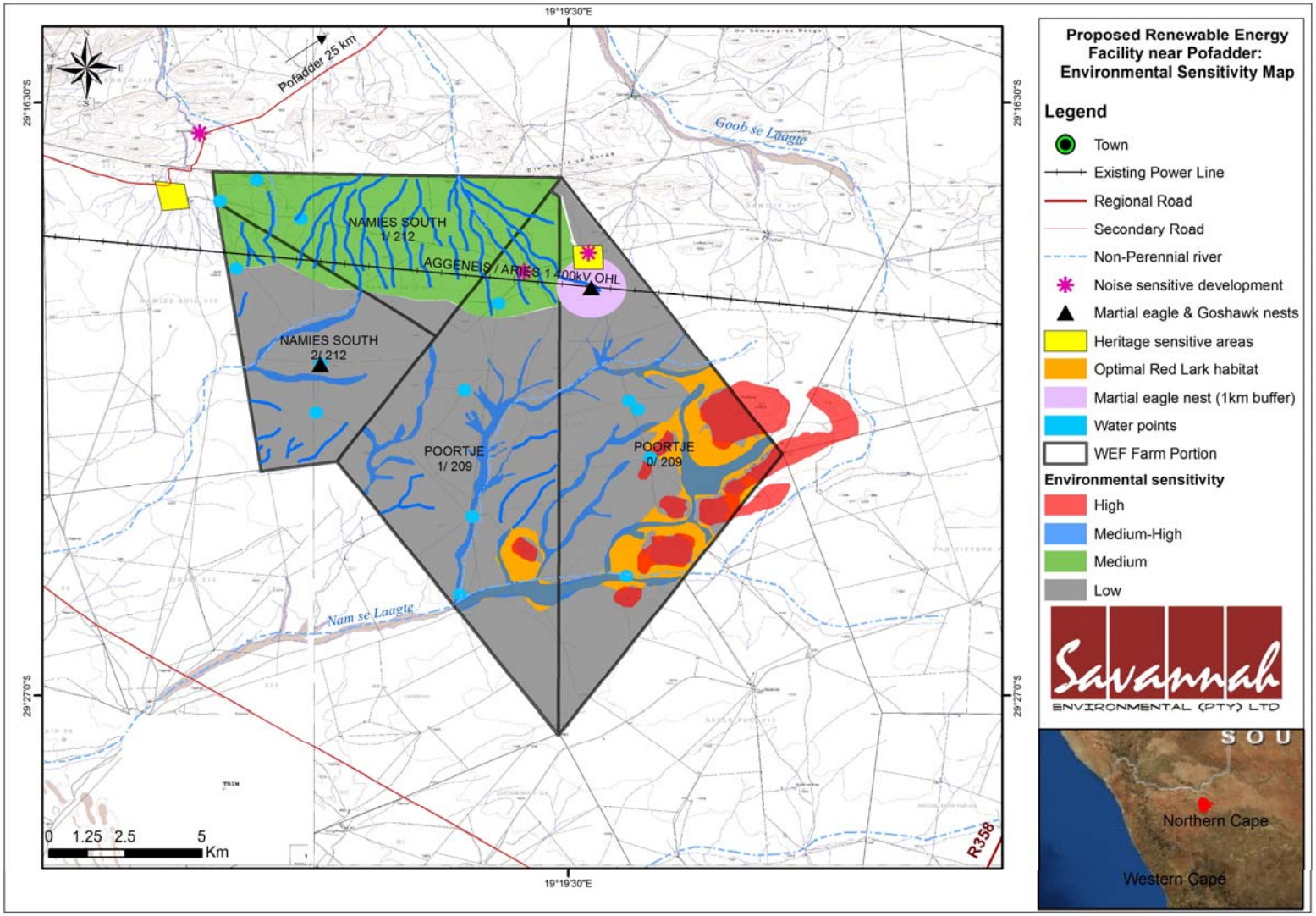


Figure 8.1: Combined environmental sensitivity map for the Pofadder site

The potentially sensitive areas/environmental features that have been identified and are illustrated in Figure 8.1 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. It is recommended that drainage lines should be buffered by:

- at least 40 m (i.e. no construction of turbines should be permitted with 40 m of the drainage lines) to protect the water resource and the riparian vegetation.
- 200 m to protect bat species that potentially will utilise the drainage lines to forage (to be confirmed if utilised by bats through the field survey in the EIA phase).

» **Potential bird and/bat sensitive habitats:**
The environmental sensitivity map shows the location of a 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. 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 map also 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). These areas are more clearly mapped in Figure 8.2 below and will be verified during the EIA phase.

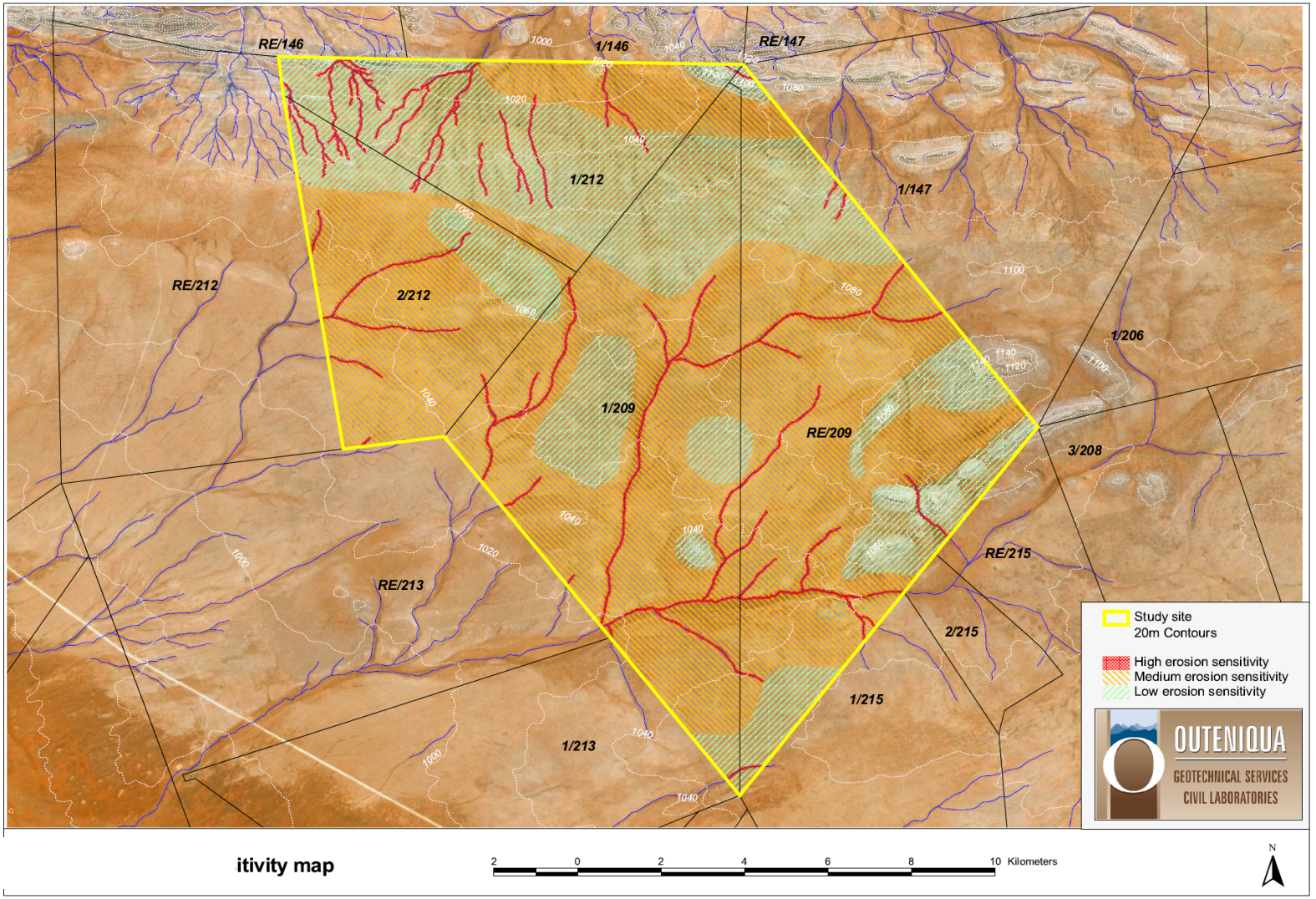


Figure 8.2: An erosion potential map showing the susceptibility of the soils to erosion by water and wind

» **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 7 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.

8.2. 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 power lines will be required. A 400 kV substation and 4 (four) 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.

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).

SCOPING OF ISSUES ASSOCIATED WITH THE PROPOSED SOLAR ENERGY FACILITY CHAPTER 9

The potential impacts of the development (i.e. construction and operation) of the solar energy facility are identified, described and evaluated in this chapter. The majority of the environmental impacts are expected to occur during the construction phase for a facility of this nature.

Potential environmental issues associated with **construction and decommissioning** activities of the solar energy facility are similar and include, among others:

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

Environmental issues specific to the **operation** of the solar energy facility could include, among others:

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

Tables 9.1 and Table 9.2 provide a summary of the findings of the scoping study undertaken for the construction and operation phases of the proposed solar 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 solar 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 arrays of solar panels. The area affected will also include access roads, substation footprint and associated infrastructure. During **construction** a larger area within the approximately 175 km^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 the area occupied by the solar panels and associated infrastructure will be permanently impacted upon.

The **cumulative impacts** associated with the proposed solar energy facility are expected to be associated with the scale of the project, i.e. solar panels with a generating capacity of up to 250MW 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 9.1: Evaluation of potential impacts associated with the CONSTRUCTION PHASE of the Solar Energy Facility

Impacts on Fauna, Flora and Ecology

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) it is classified as **Least Threatened** and is not listed in the National List of Threatened Ecosystems (Government Gazette, 2011). No Critical Biodiversity Areas occur within the study area. Even though a vegetation type may be rated as **Least Threatened** it is still important to observe caution when developing an area where undisturbed vegetation occurs. No rare plant species or plant species of special concern are known to occur.

Flora:

The vegetation of the Poortje and Namies South study area (Pofadder) is part of an extensive vegetation type (Bushman Arid Grassland) with very low turnover of plant species. This means that there is low variation in the species composition. Mucina *et al.* (2006) list numerous species occurring in Bushmanland Arid Grassland with only a few endemic species and one biogeographically important species (*Tridentia dwequensis*). The result is that the vegetation of the study area can be generally described as having a **low to very low botanical sensitivity**, particularly on the open plains. The drainage lines are somewhat more ecologically sensitive and should therefore be buffered (distance to be confirmed) as 'ecological corridors'.

Mapping of the drainage lines is not simple due to their wide-ranging and interlinking nature. Such detailed mapping would be time-consuming and would only be possible with the use of high-resolution, large-scale aerial photography. This presents some difficulties in relation to the location of solar panels since drainage lines should be avoided where possible for practical (potential flood damage) and botanical / ecological reasons.

A sensitivity map of the vegetation of Poortje and Namies South reflects the **low botanical / ecological sensitivity** of the greater part of the study area, with the exception of Namies South 212/1 which is rated as **moderately sensitive** due to the density of small (narrow) drainage lines (see **Figure 9.2**). Drainage lines are rated as highly sensitive to emphasise that they should be well buffered (as determined in the EIA) in any proposed infrastructure layouts. Areas that are sensitive are the drainage lines. These should be buffered by at least 40 m i.e. no construction of 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 sites.

Metamorphic rock is exposed as inselbergs to the north of Nam se Laagte and in the eastern sector of the Remainder Poortje 209. All Bushmanland Inselberg Shrubland in the south-central part of Poortje 209/1 and the eastern part of Poortje 209/RE must be avoided. This vegetation occurs on upland sites so this should be easily achieved. The eastern part of Poortje 209/RE extending southwestwards over Poortje 209/1 has large drainage lines and it is

suggested that this part of the study site (which included the inselbergs) should be considered as the least suitable for the proposed renewable energy infrastructure (refer to sensitivity map).

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*, the negative impacts can be kept within acceptable limits. Roads that will cross drainage lines must also be built in such a way as not to impede water-flow when this occurs.
map).

A more detailed botanical assessment of impacts will only be possible once proposed solar panel arrays layouts are available. Any future botanical assessments in the study area should ideally take place in the growing season and after reasonable rain. The highly desiccated vegetation as seen at the study site in July 2012 is not ideal for comprehensive botanical survey and is a significant limitation to the findings presented here.

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 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 7.3. Figure 7.3 shows areas of Moderate faunal sensitivity which includes 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 solar energy facilities when the following activities would be required:
» Construction of access roads.
» Clearing of vegetation for the solar panels 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 solar 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	Site preparation and construction will result in a lot of disturbance and the loss of currently intact vegetation. Given the relatively low number of	Local	No specific 'no go' areas have

species during site clearing.	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.		been identified at this stage; however areas of very high ecological sensitivity (as shown in Figure 9.1 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 construction phase as a result of the noise and human activities present. Some mammals and reptiles such as tortoises would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present.	Local	
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 potential impacts on ecology will be assessed in greater detail during the EIA phase of the project.

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 that will be lost and/or disturbed and the implication thereof
» Sensitive areas must be identified and mitigation measures put in place.
» Potential weedy species in the area be identified and the accompanying risks assessed.
» Faunal habitats be assessed on the site
» Sensitive faunal species and habitats must be identified and mitigation measures put in place

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 species within these areas.

» Evaluate the likely presence of listed faunal species at the site and identify associated habitats that should be avoided to prevent impact to such species.

» During the EIA phase food plants that can be utilised by tortoises on site will be determined.

» Evaluate, based on the site attributes, what the most applicable mitigation measures to reduce the impact of the development on the site would be and if there are any areas where specific precautions or mitigation measures should be implemented.

» Assess the impacts identified above in light of the site-specific findings and the final layout to be provided by the developer.

» This information will be summarised together with the sensitivity of plant communities and habitats in a sensitivity map that would be crucial to inform the design phase of the proposed project.

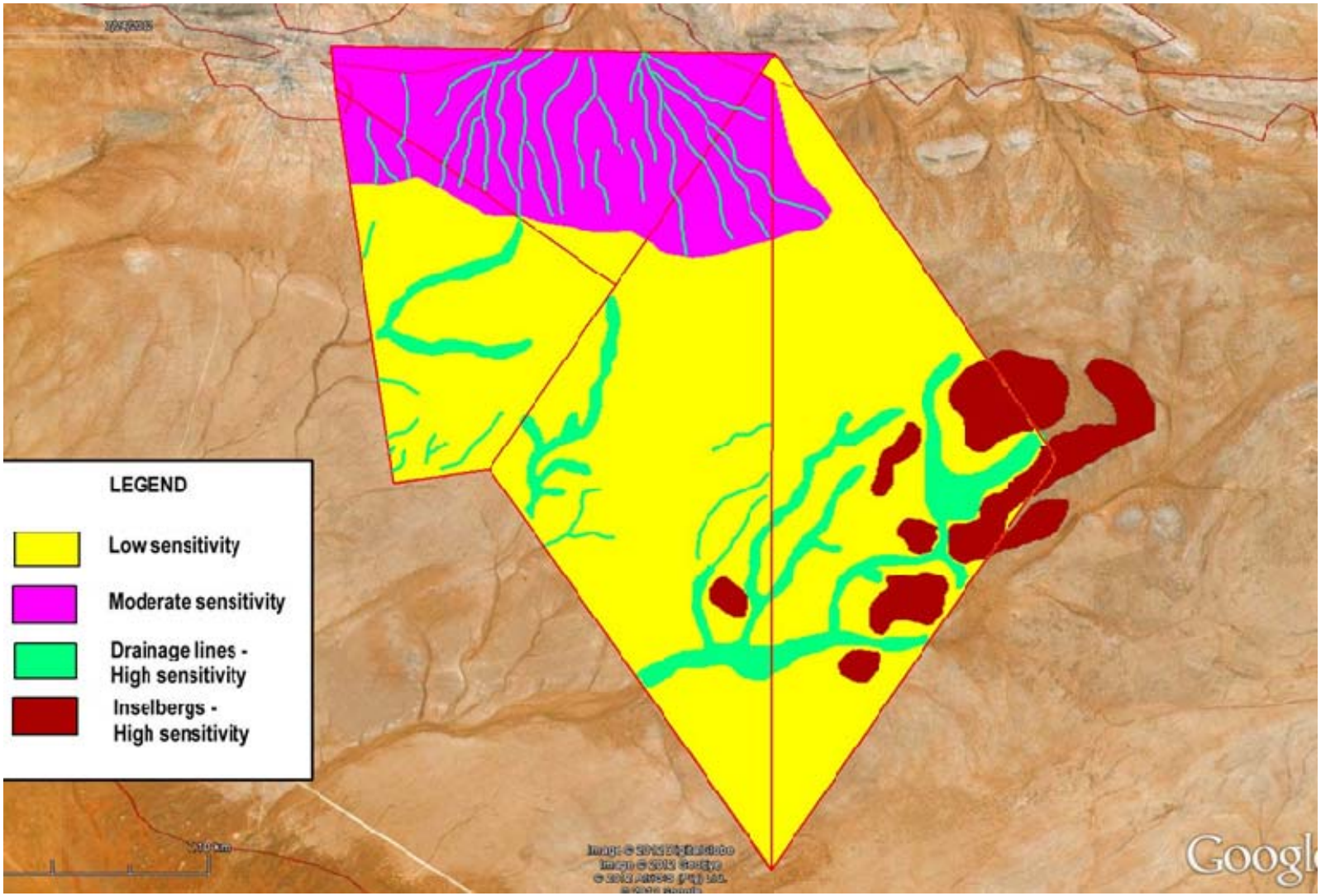
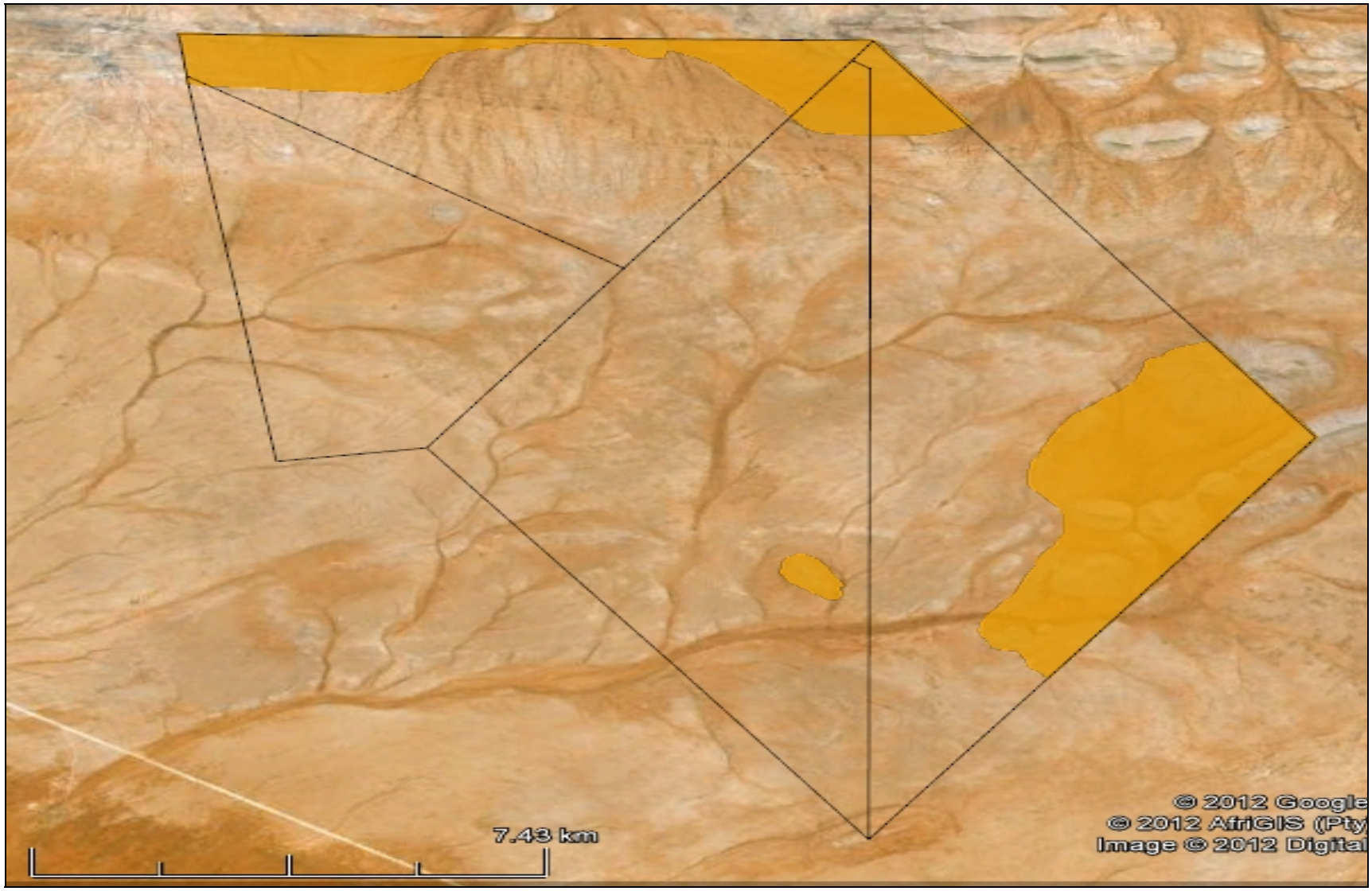


Figure 9.1: Botanical sensitivity of the site



Moderate sensitivity

Figure 9.2: Desktop based fauna sensitivity map of the site

Potential Impacts on Agricultural potential:

Agricultural potential is primarily determined by the suitability of the soil profile to support crop production. The soil needs to be adequately thick to support root development and the drainage characteristics needs to be good to prevent chemical crusting on the surface. In addition to the soil characteristics, climatic factors are also important because the annual rainfall needs to be adequate to sustain a viable crop production.

The agricultural potential of the site is low and limited to extensive grazing due to the low rainfall in the area. The current land use on the proposed site is grazing livestock only (mainly sheep, goats, small game) and there is no crop production. No areas with arable potential occur and this is due to a lack of rainfall or irrigation potential. The carrying capacity is typically 6 – 8 hectares per small stock unit. The site is used mainly as rangeland for sheep-farming and no crops are cultivated. No grazing or agriculture will take place at the footprint of the solar panels and associated infrastructure, however the rest of the site will continue the current land use – i.e. grazing of livestock.

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Loss of agricultural land	Placement of infrastructure for the solar energy facility will affect the land-use on these specific areas.	Local	None identified at this stage.

Gaps in knowledge & recommendations for further study

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

It is recommended that:

» The agricultural potential of the site is considered low and the proposed activity will not have any significant effect on this status. Due to low agricultural potential of the soils and the prevailing climatic limitations for agriculture, impacts are expected to be of low significance.

» Significant impacts to be assessed during the EIA phase: Consideration should be given to the proper placement of the solar arrays and other infrastructure.

Impacts on Soils and Geology

The proposed solar energy facility may have certain impacts on the geological environment and soils which may indirectly affect other natural processes. The geological environment includes the bedrock and the soil cover. The following activities may have an impact on the soil and agricultural potential and resources of the site:

» Construction and positioning of the concrete foundations of the solar arrays

» Positioning and construction of underground cabling between the solar arrays

» Construction and positioning of the on-site substation

» Construction and positioning of overhead power lines

» Construction and positioning of internal access roads

» Construction and positioning of a workshop, office, maintenance and storage area

» Contamination of the soil and other resources by oil, petrol, diesel and other contaminants by the vehicles and equipment on the site

An erosion potential map showing the susceptibility of the soils to water and wind erosion is shown in **Figure 9.3.** Erosion is generally considered to be the most important impact on soil due to the fact that it can have significant knock-on effects in terms of agricultural potential. Erosion sensitivity can be broadly mapped according to the potential severity of erosion if land disturbing activities occur and this is generally affected by the geology, topography and hydrology. Generally speaking, thick deposits of unconsolidated or partly consolidated fine-grained soils of low plasticity occurring along drainage lines, on moderate to steep slopes or at the base of steep slopes are most vulnerable to severe levels of erosion due to water run-off. Areas where these factors occur simultaneously are typically called "highly sensitive" areas. During peak rainfall events, excess run-off may result in significant erosion along drainage lines (see **Figure 8.3**) and in areas that are cleared of vegetation, although in the case of the proposed development, full vegetation clearing is not envisaged across the entire site area. Certain parts of the site have been identified as being sensitive in terms of erosion. The water erosion sensitivity as a function of topography and geology. The sites erosion sensitivity has been classified as follows:

» High: Natural drainage lines/watercourses, steep slopes (high relief areas) are considered to be of high erosion sensitivity. However erosion is presently taking place.
» Medium: 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).
» Low: Areas where rock outcrops at surface are considered to be of low erosion sensitivity.

Issue	Nature of Impact	Extent of Impact	No Go Areas

Soil degradation due to contamination	Spillages of oil, diesel, petrol or other contaminants by the vehicles and equipment, may lead to soil degradation due to contamination. Contamination of the soil may also take place in proposed maintenance and storage sites	Local	None identified at this stage
Soil erosion due to increased and concentrated storm water run-off	Heavy rainstorms do occur in the area. Depending on the placement of the solar arrays and other infrastructure, as well as the erodibility of the soils and the slopes on the site, run-off of storm water may be increased and concentrated, with both direct and secondary effects on the soil, vegetation and other resources downstream.	Local	None identified at this stage
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	None identified at this stage
Siltation of watercourses and other natural resources downstream as a result of improper storm water management and soil erosion due to increased and concentrated water run-off	Improper placement and maintenance of infrastructure, as well as poor storm water management, may lead to water erosion and siltation of water courses downstream.	Regional	None identified at this stage
Dust production	Improper construction, maintenance and use of access roads and construction sites by vehicles and equipment, may lead to dust production.	Local	None identified at this stage
Gaps in knowledge & recommendations for further study The potential impacts on soils will be assessed in greater detail during the EIA phase of the project.			

It is recommended that:

» A detailed site visit will have to be conducted as part of the EIA level investigation

» The following parameters will be investigated.

» Geology and soils, with special reference to sensitivity to erosion and factors contributing to erosion (i.e. slopes, et

- o Assess the potential direct and indirect impacts using a weighting system that assigns a value to the categories (extent, duration, magnitude, probability) and arrives at a total which depicts the significance of the particular impact;
- o Assess the contribution of the proposed activity in the cumulative impact of the development in the area;
- o Comparatively assess any feasible alternatives (if any); and
- o Provide mitigating measures to input into the Environmental Management Plan (EMP).

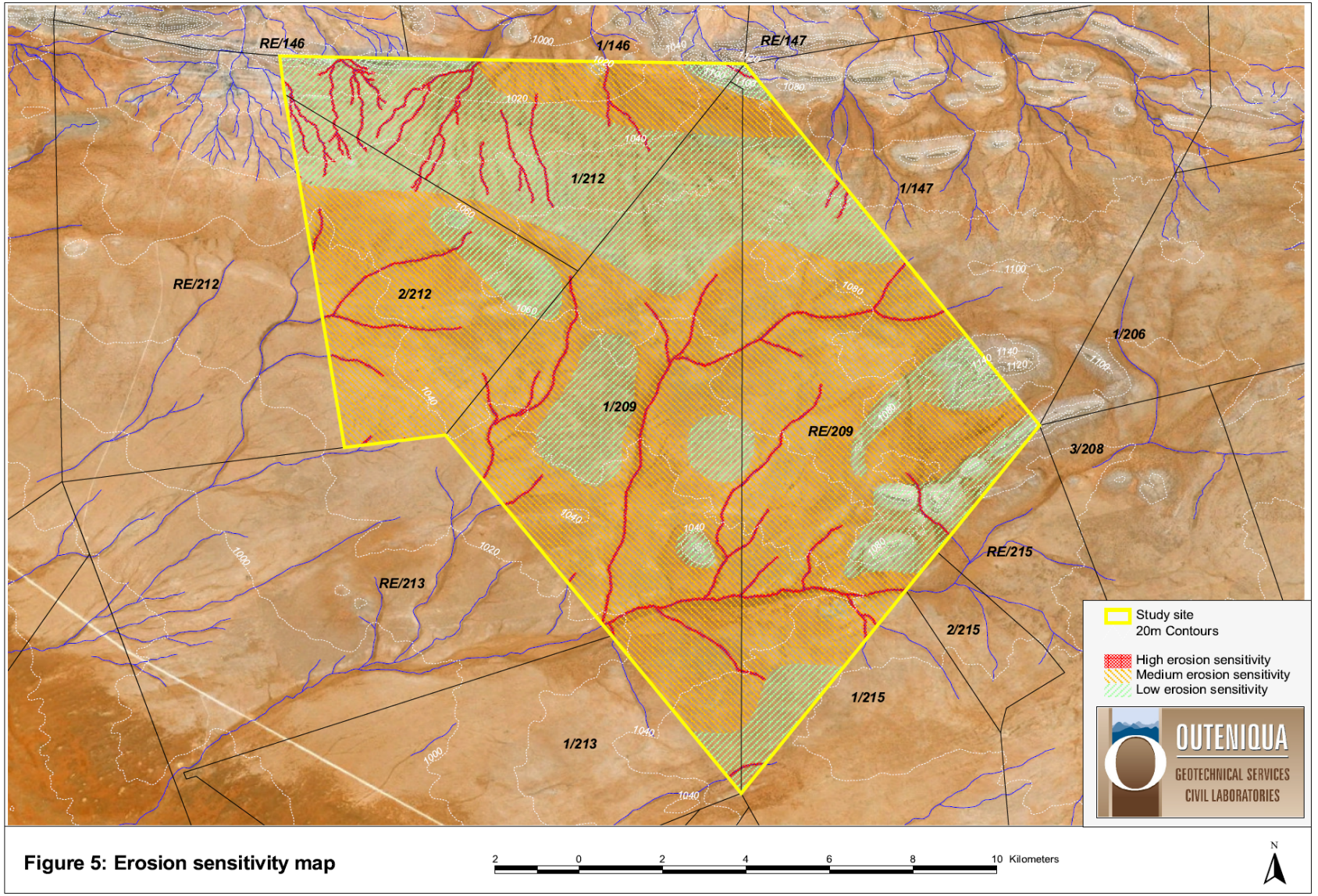


Figure 5: Erosion sensitivity map

Figure 9.3: An erosion potential map showing the susceptibility of the soils to water and wind

Potential impacts on Heritage Resources:

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. However, two areas of high archaeological value were identified. These are around the structures and ruins at Namies South and the farm and pan at Poortjie (A short way from the pan is a ridge forming the outermost limit of the hollow in which the pan is located and two Later Stone Age occupation sites with stone artefacts, ostrich eggshell fragments, a bead and pottery). Particular attention should also be paid to the alignment of the access road to the site (the buildings and ruins at Namies South are sensitive). The confirmed location of the heritage sites will be considered further and mapped in the EIA phase.

Elsewhere in the study area 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 significance.

Fossils may occur on the site to be considered further in the EIA phase.

Impact on the sense of place will occur due to visual impacts on the solar panels and associated infrastructure. However, with so few people present in the landscape and the extreme remoteness of the site this impact is not serious enough to prevent the development of the proposed wind and solar energy facility.

Construction activities such as clearing of land for the solar energy facility, shallow excavations for the solar panel mountings, substation and invertors and well developing access roads could lead to loss or damage of heritage resources.

Issue	Nature of Impact	Extent of Impact	No Go Areas
Impacts on archaeological and paleontological finds	The construction phase of the solar energy facility (excavations and clearing) 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.	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 solar energy facility could directly impact on marked and 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.	Local	No 'no- go' areas have not been identified at this stage.

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

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, ensuring that all the requirements of SAHRA are met.
» A desktop Paleontological Impact Assessment will also be conducted.

Visual Impacts

Construction related activities which could impact on the overall visual aesthetics of the study site through scarring of the landscape caused by construction of access roads, solar panel foundations, substations and power lines. Construction periods are often characterised by an increase in construction vehicles and personnel and their associated impacts such as dust clouds, noise, potential pollution, safety considerations, etc.

Issue	Nature of Impact	Extent of Impact	No Go Areas
Visual impacts	Potential visual impact of the construction period on visual receptors.	Regional	None identified at this stage

Gaps in knowledge & recommendations for further study:

» Visual impacts during the construction phase are expected to be limited to the site and of short duration. These impacts are therefore not expected to be of significance and will not require detailed assessment in the EIA phase.

Impacts on the social environment

The main negative social impacts are associated with the intrusion impacts associated with the construction phase. The most important potential social benefits associated with the construction of the project refer to the job opportunities and possible socio-economic spin-offs created, even of a very limited scale.

Potential social impacts during construction include:

» Job creation (positive impact) – limited opportunities
» Economic spin-offs to local community (positive impact)
» Safety and security risks to farmer's property and livestock (negative impact) due to influx of job seekers to the area
» Construction traffic (negative impact)

Issue	Nature of Impact	Extent of Impact	No Go Areas
Potential impact on	This will be closely linked to the visual impacts associated with the solar panels. The impact on	Local-	None identified

rural sense of place.	sense of place is also linked to the associated 132 kV power line/s.	Regional	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

Gaps in knowledge & recommendations for further study

Gaps in knowledge:

» It is no longer possible to access Census 2001 data at Ward level via the Municipal Demarcation Board. As a result it was not possible to obtain ward level data for the Khai Ma Local Municipality. The social baseline for this part of the study area is therefore described at a broader metropolitan level only.

Recommendations:

Methodology to be undertaken for the EIA phase:

» 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) (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 solar 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.
- Information on the nature of the agreements with the affected landowners, specifically with regard to compensation for damage to land, infrastructure etc.

Table 9.2: Evaluation of potential impacts associated with the Operational Phase

Impacts on Fauna, Flora and Ecology

Following construction the natural vegetation should gradually begin to re-colonise the denuded areas. Although naturally occurring indigenous species will re-establish, invasive weedy species will also colonise the area and may threaten the re-establishment of the natural vegetation. The rate at which the indigenous species re-establish will differ amongst the species and will depend on the extent of the initial disturbance and the amount and types of seeds present in the seed bank. An active revegetation plan should be implemented to assist the return of the natural indigenous species

Disturbance during the construction phase will provide declared weeds and alien invader plant species an opportunity to establish on the disturbed/denuded areas. Monitoring and control of these species during the construction and operational phase of the proposed solar facility is critical. Return of the natural vegetation/habitats on denuded areas could create habitats that can be re-colonised by some faunal components. Natural habitats left between constructed areas could provide habitats for re-colonisation by fauna.

Issue	Nature of Impact	Extent of Impact	'No go' Areas
Re-establishment of natural vegetation	Construction phase disturbed and/or destroyed natural vegetation which has to re-establish on the denuded/disturbed areas	Local	None
Spread of declared weeds and alien invasive species	The spread and establishment of declared weed and alien invader species during and following construction should be monitored and controlled throughout the construction and operational phases.	Local/regional	None
Re-colonisation of habitats	Re-colonisation of suitable habitats by fauna following the construction phase	Local	Sensitive habitats are to be avoided
The potential impact of change in drainage patterns in the area as a result of development and its effect on the drainage system	Increased and/or decreased run-off from developed areas will have to be mitigated. Erosion and silt transportation will have to be monitored and controlled.	Local/regional	Sensitive areas are to be avoided

Gaps in knowledge & recommendations for further study

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 that will be lost and/or disturbed and the implication thereof
» Sensitive areas must be identified and mitigation measures put in place.
» Potential weedy species in the area be identified and the accompanying risks assessed.
» Faunal habitats be assessed on the site
» Sensitive faunal species and habitats must be identified and mitigation measures put in place
» 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 species within these areas.
» Evaluate the likely presence of listed faunal species at the site and identify associated habitats that should be avoided to prevent impact to such species.
» During the EIA phase food plants that can be utilised by tortoises on site will be determined.
» Evaluate, based on the site attributes, what the most applicable mitigation measures to reduce the impact of the development on the site would be and if there are any areas where specific precautions or mitigation measures should be implemented.
» Assess the impacts identified above in light of the site-specific findings and the final layout to be provided by the developer.
» This information will be summarised together with the sensitivity of plant communities and habitats in a sensitivity map that would be crucial to inform the design phase of the proposed project.

Impacts on Agricultural Potential

Agricultural potential is primarily determined by the suitability of the soil profile to support crop production. The soil needs to be adequately thick to support root development and the drainage characteristics needs to be good to prevent chemical crusting on the surface. In addition to the soil characteristics, climatic factors are also important because the annual rainfall needs to be adequate to sustain a viable crop production. The agricultural potential of the site is low and limited to extensive grazing due to the low rainfall in the area. The current land use on the proposed site is grazing livestock only (mainly sheep, goats, small game) and there is no crop production. No areas with arable potential occur and this is due to a lack of rainfall or irrigation potential. The carrying capacity is typically 6 – 8 hectares per small stock unit. The site is used mainly as rangeland for sheep-farming and no crops are cultivated. No grazing or agriculture will take place at the footprint of the solar panels and associated infrastructure, however the rest of the site will continue the current land use – i.e. grazing of livestock. At the end of the project life, it is anticipated that removal of the solar panels would enable majority of the land to be rehabilitated and used for a suitable land-use / activity.

Issue	Issue	Extent	No go' Areas
Long term loss of arable land	Loss of arable land, however, at the end of the project life, it is anticipated that removal of the structures and rehabilitation of the site would allow for a suitable land-use / activity to occur on the site.	Local	None identified at this stage

Gaps in knowledge & recommendations for further study

» The agricultural potential of the site is considered low and the proposed activity will not have any significant effect on this status. Due to low agricultural potential of the soils and the prevailing climatic limitations for agriculture, impacts are expected to be of low significance.

» Significant impacts to be assessed during the EIA phase: Consideration should be given to the proper placement of the solar arrays and other infrastructure.

Impacts on Geology and Soils

During the operation of the solar energy facility, exposed areas / soil could be susceptible to wind/water erosion in the absence of soil erosion control measures. Soil contamination is possible, however marginal due to limited / no use of oils, diesel or fuels as maintenance solar panels and associated infrastructure require little in the way of maintenance (if pollen, dirt, dust, leaves, and other debris collect on the panels, it can be removed by spraying of water on the panels).

Issue	Nature of Impact	Extent of Impact	No go' Areas
Soil erosion and contamination due to maintenance of the solar energy facility.	Accelerated loss of sediment cover through rainfall or artificially concentrated run-off may occur. During maintenance of the solar panels and associated infrastructure any chemicals used have the potential to contaminate the soil.	Local	None identified at this stage

Gaps in knowledge & recommendations for further study

A detailed site visit will be conducted as part of the EIA level investigation and the following parameters will be investigated:

» Geology and soils, with special reference to sensitivity to erosion and factors contributing to erosion (i.e. slopes, etc.
» The following methodology will be adopted for the EIA phase study:
  o Assess the potential direct and indirect impacts using a weighting system that assigns a value to the categories (extent, duration, magnitude, probability) and arrives at a total which depicts the significance of the particular impact;
  o Assess the contribution of the proposed activity in the cumulative impact of the development in the area;
  o Comparatively assess any feasible alternatives (if any);
» Provide mitigating measures to input into the Environmental Management Programme (EMP).

Visual Impacts

Note that the visual impact assessment at this scoping level considered the worst case scenario being the height of the wind turbines, not solar PV panels. During the EIA phase a specific visual assessment for the solar panels will be done based on a layout and location of the solar panels. Therefore the section below described the potential visual impacts without any desktop viewshed analysis.

The visual character of the area is determined by a combination of topography, vegetation, buildings, infrastructural elements and land use patterns. The land use is predominantly agriculture, with stock farming predominating and with some hunting activity in winter. 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.

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. 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 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. 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).

The potential visual impacts are related to the solar panels (despite short height of up to 4-6m), power line and associated infrastructure. Potentially sensitive visual receptors within this visually exposed zone include:

» Residents of the settlements of Namies, Onder Namies, Neelsvlei, Lekdam, Dubip, Luttigshoop

» Users of secondary roads to the west, north west and south west of the site as well as residents of homesteads and settlements.

» Sensitive visual receptors include users of stretches of the N14 in the north, and of the R358 in the east.

» The town of Pofadder lies more than 20km from the proposed site, but will not be visually exposed to the proposed facility.

Issue	Nature of Impact	Extent of Impact	No go' Areas
Potential visual impact of the proposed solar energy facility on sensitive observers.	The solar panels and associated infrastructure such as access roads, substation and power line.	Local (without mitigation)	To be determined in EIA phase.
Change in character of the prevailing use of the area.	The solar panels and associated infrastructure such as access roads, substation and power line	Local (without mitigation)	To be determined in EIA phase.
Introduction of artificial light sources in a rural landscape.	Associated infrastructure of the solar energy facility (i.e. workshop area, storage area and offices).	Local (without mitigation)	To be determined in EIA phase.
Reflection of the solar panels on the sensitive receptors in the region.	Solar panels.	Local (without mitigation)	To be determined in EIA phase.

Gaps in knowledge & recommendations for further study:

The above-mentioned anticipated visual impacts need to be assessed in greater detail during the EIA phase of the project.

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.

» Specific mitigation measures be proposed to lessen any potential visual impact (with specific mention to the height contours).

» Undertake a viewshed to determine actual visual impact.

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
Creation of opportunities to local business during the operational phase, including but not limited to, provision of security, staff transport, and other services	(Positive impact)	Local and Regional	N/A
Potential up and down-stream economic opportunities for the local, regional and national economy	(Positive impact)	Local, Regional and National	N/A
Provision of a clean, renewable energy source for the national grid	(Positive impact)	Local, Regional and National	N/A

Gaps in knowledge & recommendations for further study:

Methodology to be undertaken for the EIA phase:

» 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.

Table 9.3: Evaluation of potential Cumulative Impacts associated with the Solar 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 Solar 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.

Based on the information available at the time of undertaking this EIA, there are two projects that have been authorised in and around the Pofadder area of which two projects are planned for construction currently. These projects are as follows:

1. The KaXu Solar Thermal Plant to be developed by Abengoa Solar South Africa on Portion 4 of the farm Scuit-Klip 92. The proposed facility will have a maximum generating capacity of 310 MW to be comprised of a combination of technologies, including parabolic troughs, power tower and associated heliostat field and photovoltaic panels. The EA was issued in 2011, and a 100 MW trough plant (CSP) project was awarded preferred bidder status in 2011. . Construction will commence this year (2012).
2. The Konkoonsies Solar Facility to be developed by Biotherm Energy, 32 km north-east of Pofadder. This project received preferred bidder status in 2011.

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 renewable energy facility at a site level are expected to be associated with the scale of the project, i.e. solar panels and 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 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 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 wind and solar energy facility and associated infrastructure 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 energy or solar 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).

CONCLUSIONS FOR THE SOLAR ENERGY FACILITY CHAPTER 10

This chapter only deals with the conclusion regarding the solar component of the renewable energy facility under DEA reference number **14/12/16/3/3/2/347.** South Africa Mainstream Renewable Power Development (Pty) Ltd (Mainstream) is proposing to establish a commercial renewable energy facility consisting of both a wind energy facility component and a photovoltaic solar 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 solar energy facility is proposed to include:

» An array of either **photovoltaic panels (PV)** or **concentrated photovoltaic panels (CPV)** with a generating capacity of up to 250MW.
» Common infrastructure between the wind energy facility and the solar energy facility will include:
    * A 400 kV substation and a 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.

The Scoping Study for the proposed **Solar 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 **14/12/16/3/3/2/347.**

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 solar energy facility and associated infrastructure are provided below. Recommendations regarding investigations required to be undertaken within the EIA are provided within the Plan of Study for EIA, contained within Chapter 11 of this report.

10.1. Conclusions drawn from the Evaluation of the Proposed Site for Development of the proposed Solar Energy Facility

In identifying and evaluating impacts associated with the proposed solar energy facility, it has been assumed that although during operation, the area affected will comprise arrays of solar panels (PV or CPV) and associated infrastructure, during construction much of the ~175 km^2 of the proposed site could suffer some level of disturbance. However, once construction is complete, only the area where the solar panels will be placed will be impacted due to vegetation clearing.

Table 10.1 and 10.2 summarises the potential issues associated with the solar 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 solar 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 (relevant to both the wind and solar energy facility which is proposed for the site) including potential noise 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 10.1.

Table 10.1: Potential impacts associated with the Construction/ Decommissioning Phase with the proposed Solar Energy Facility near Pofadder

Construction / Decommissioning Impacts	Extent
Re-establishment of natural vegetation	L
Spread of declared weeds and alien invasive species	L
Disturbance and loss of habitat for fauna.	L
Disruption of landscape connectivity and ecosystem processes	L
Loss of arable land	L
Soil degradation due to accelerated erosion (water or wind)	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 downstream as a result of improper storm water management and soil erosion due to increased and concentrated water run-off	R
Degradation of (seasonal wash) watercourses	R
Dust production	L
Impacts on archaeological and paleontological finds	L
Impacts on burials and cemeteries	L
Visual impacts during construction	R
Temporary job creation during construction phase	L-R
Economic spin-offs to local community.	L
Influx of people into the study areas including members of the construction crews and job seekers	L
Skills development	L-R
Security issues	L
Disturbance of surrounding landowners	L

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

Table 10.1: Potential impacts associated with the Operational Phase with the proposed Solar Energy Facility near Pofadder

Operational Impacts	Extent
Re-establishment of natural vegetation	L
Spread of declared weeds and alien invasive species	L-R
Re-colonisation of habitats	L
Long term loss of arable land	L
Soil erosion and contamination due to maintenance of the solar energy facility.	L
Potential visual impact of the proposed facility on sensitive observers beyond 3 km from the project site	L
Change in character of the prevailing use of the area	L
Introduction of artificial light sources in a rural landscape	L
Reflection of the PV panels on the sensitive receptors in the region	L
Potential impacts on existing tourism and tourism potential of the area	L
Employment opportunities	L-R
Safety and security impacts on the site and surrounds	L
Contribution of clean energy	N

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

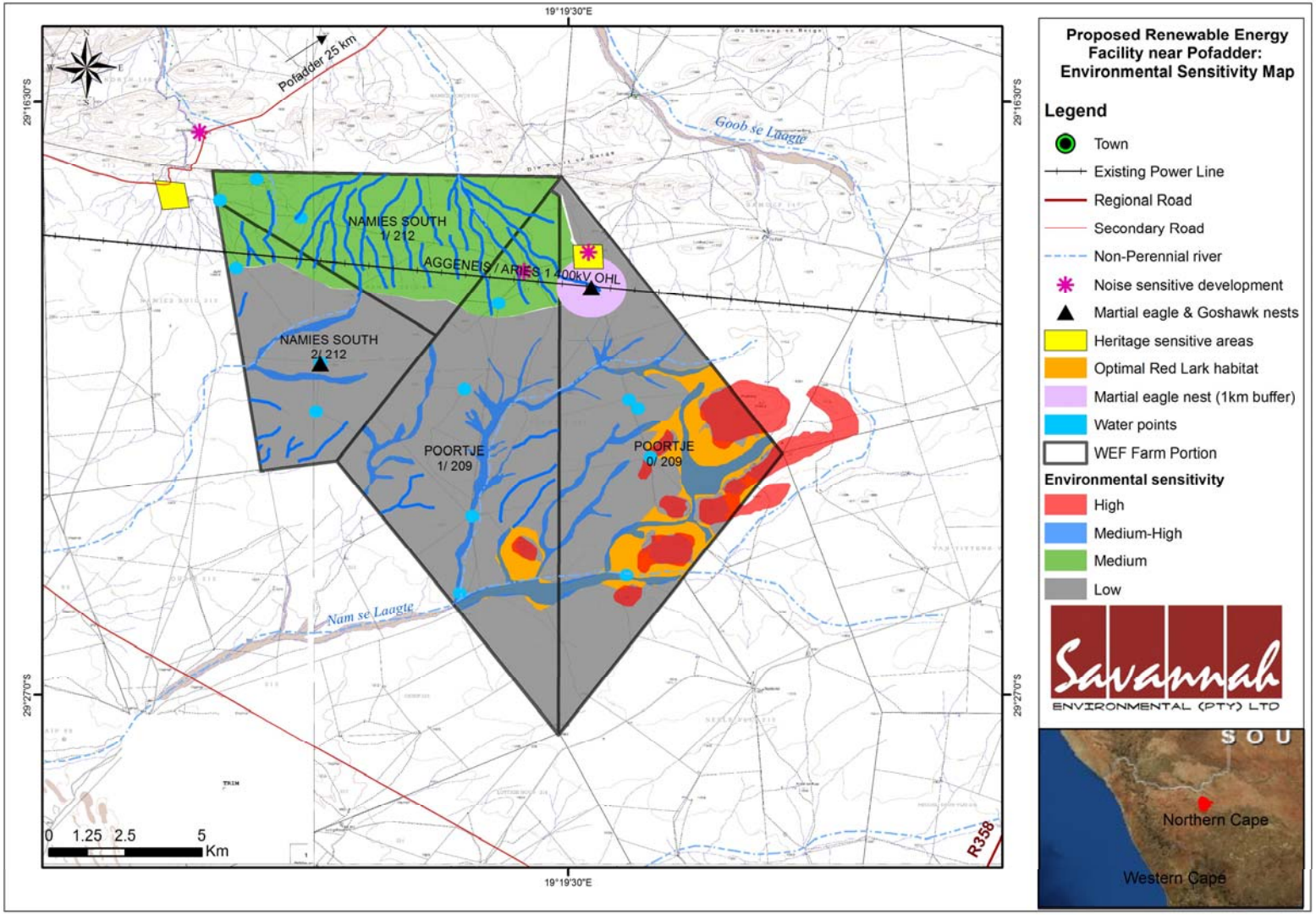


Figure 10.1: Combined environmental sensitivity map (relevant to both the wind and solar energy facility) for the Pofadder site

The potentially sensitive areas/environmental features that have been identified and are illustrated in Figure 10.1 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. It is recommended that drainage lines should be buffered by:

- at least 40 m (i.e. no construction of turbines should be permitted with 40 m of the drainage lines) to protect the water resource and the riparian vegetation.
- 200 m to protect bat species that potentially will utilise the drainage lines to forage (to be confirmed if utilised by bats through the field survey in the EIA phase).

» **Potential bird and/bat sensitive habitats:**
Disturbance to bird, bat and faunal habitat may occur during construction due to clearing of vegetation for the solar panels and associated infrastructure. Disturbance to habitats is what must be minimised with a solar energy facility, and taken into account the following sensitive habitats identified in this report:

- The environmental sensitivity map shows the location of a 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. A 1km buffer has been placed around the Martial Eagle nest,

and is recommended to reduce the risk of disturbance and the potential for collision with the power line, should the birds decide to breed there again. Also included under the high risk area (in terms of disturbance) are water points.

- The map also shows water points which serve as key hotpots for bird species, to be considered in the 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 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 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). These areas are more clearly mapped in Figure 10.2 below and will be verified during the EIA phase.

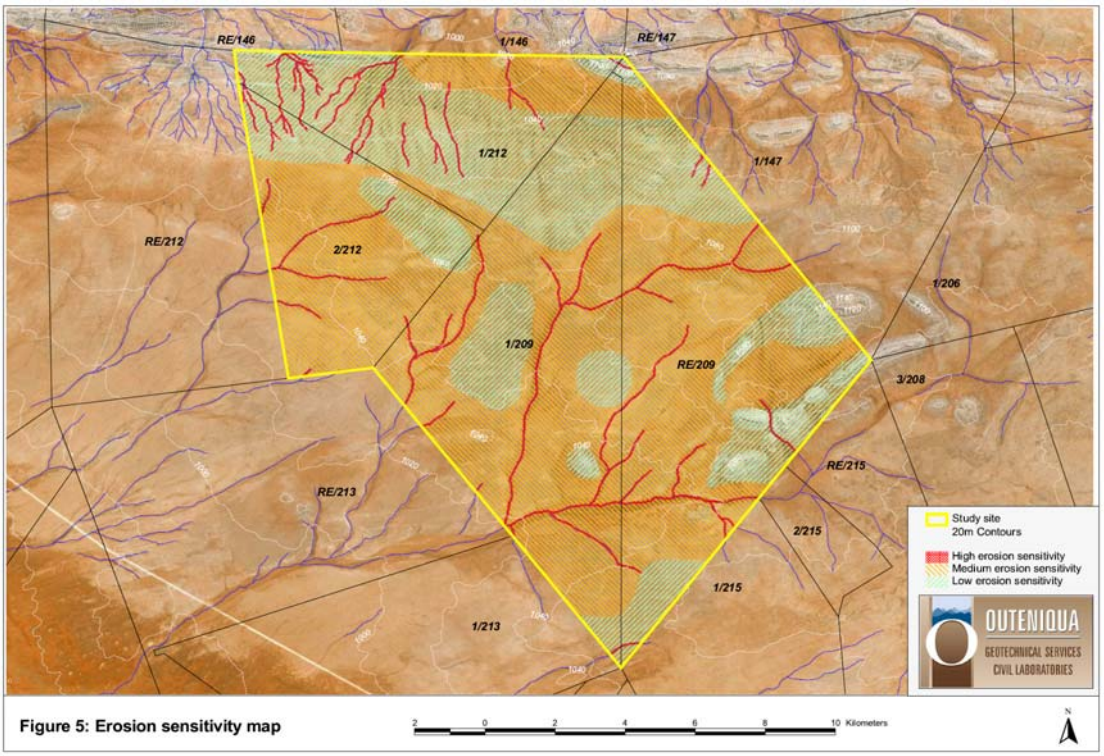


Figure 10.2: An erosion potential map showing the susceptibility of the soils to erosion by water and wind

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 solar energy facility 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 9 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.

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

In order to connect the renewable energy facility to the power grid substations and power lines will be required. A 400 kV substation and a satellite 132 kV substation is 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. This will

be common infrastructure shared by both the wind and solar components of the renewable energy facility.

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 with power lines, and potential impacts on heritage sites.

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

PLAN OF STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT CHAPTER 11

A detailed description of the nature and extent of the proposed Renewable Energy Facility 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).

The Plan of Study describes how the EIA Phase for the proposed wind energy facility project will proceed. **This Plan of Study for the EIA Phase is relevant to the wind and solar components of the renewable energy facility.** 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.

11.1 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 and solar components of the renewable energy facility 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.

11.2 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 allowed as per the requirements of NEMA.
» Submission of a Final Scoping Report to DEA following a 30-day public review period.
» An opportunity for relevant authorities to visit and inspect the site.
» Submission of a Final EIA Report to DEA following a 30-day public review period.

11.3 Consideration of alternatives

The following project alternatives will be investigated in the EIA:

» **The 'do nothing' alternative:** Mainstream does not establish the proposed Renewable Energy Facility (maintain status quo).
» **Site-specific alternatives:** particularly the layout of the wind turbines, solar panels and corridors/servitudes for associated infrastructure such as the access roads and power lines. This will be determined based on the environmental sensitivity mapping done in the EIA.
» **Alternative technologies:** for use in the establishment of the renewable energy component of the facility.
» **Alternative servitudes for power line routing:** Network integration studies, planning and design for the transmission of the power generated at the renewable energy facility 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 4 (four) satellite 132 kV substations and associated power lines 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.

11.4 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 11.1. The specialists involved in the EIA Phase are also reflected in Table 11.1. These specialist studies will consider the site proposed for the development of the renewable energy facility and all associated infrastructure (including alternatives with regards to design, layout, as well as the alternative alignments of access road/s and power lines).

Table 11.1: 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 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.	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 obtain seasonal variance.	Chris van Rooyen Consulting

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	» 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. » 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. » 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 accurately.	Werner Marais of Animalia
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	Iain Paton of Outeniqua

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	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 or areas with high agricultural value. » Identify agricultural infrastructure (i.e. silos, irrigation lines, pivot points, channels, feeding structures, etc.) that will be impacted upon.	Geotechnical Services
Visual impacts	The EIA Phase will include the following methodology relevant to the visual impact of the wind turbines, solar panels and power lines: » 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 facility and solar energy facility, 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; and » Visual absorption capacity (VAC) of the vegetation and other elements.	Lourens Du Plessis of MetroGIS
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,	Archaeology – Tim Hart of ACO Associates

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	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. » A desktop Palaeontology assessment will also be undertaken, in line with SAHRA's requirements.	Palaeontology – to be confirmed.
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.	Morné de Jager of M^2 Environmental Connections
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;	Tony Barbour (Environmental Consultant and Researcher)

Issue	Activities to be undertaken in order to assess significance of impacts	Specialist
	» Preparation of a Social Impact Assessment and socio-economic impact assessment report, including identification of mitigation/optimisation and management measures to be implemented.	

11.5 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 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. 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 30-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.

11.6 Public Participation Process

A public participation process will be undertaken by Savannah Environmental and independently facilitated by Sustainable Futures ZA 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 30-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, then 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).

11.7 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 11.2.

Table 11.2: Envisaged key milestones of the programme for the EIA phase of the project

Key Milestone Activities	Timeline
Public review period for Draft Scoping report	30-day public review period from 20 August 2012 – 18 September 2012
Submission of Final Scoping Report to DEA	September 2012
Authority acceptance of the Environmental Scoping Report and Plan of Study to undertake the EIA	30-days after receiving the Final Scoping Report
Make draft EIA Report and draft EMP available to the public, stakeholders and authorities	30-day public review period
Authority review period for Final EIA report to issue a Environmental Authorisation	Within 105 days after receiving the Final EIA report.

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