RENOSTERBERG WIND ENERGY COPORATION
INDUSTRIAL DEVELOPMENT CORPORATION

Proposed Construction of a Wind Farm near De Aar, Northern Cape Province of South Africa

Draft Scoping Report:

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KEY PROJECT INFORMATION

FARM DESCRIPTION	21 DIGIT SURVEYOR GENERAL CODE
Portions 1 of the Farm Blaauwbosch Dam 103	C05700000000010300001
Portions 2 of the Farm Blaauwbosch Dam 103	C05700000000010300002
Portions 3 of the Farm Blaauwbosch Dam 103	C05700000000010300003
Portions 4 of the Farm Blaauwbosch Dam 103	C05700000000010300004
Portions 5 of the Farm Blaauwbosch Dam 103	C05700000000010300005
Remainder of the Farm Blaauwbosch Dam 103	C05700000000010300000
Rhenosterberg 141	C05700000000014100001
Portion 1 of the Farm Rhenosterberg 141	C05700000000014100001
Portion 1 of the Farm Gemsbok Dam 81	C01200000000008100001

TITLE DEEDS: These will be included within the EIR.

PHOTOGRAPHS OF SITE:

General Characteristics of the study area

SENSITIVE VISUAL RECEPTORS: Potentially sensitive areas have been identified but sensitive visual receptors will be identified in detail during the EIA phase of the project.

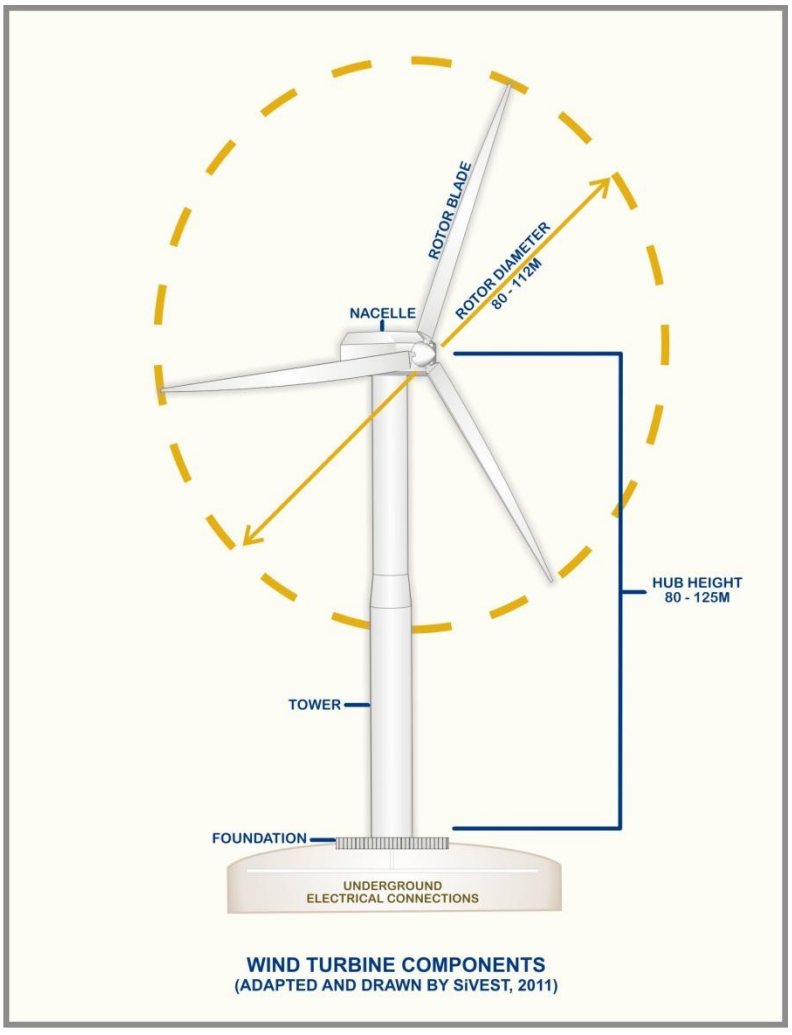
TYPE OF TECHNOLOGY: Wind Energy – Wind Turbines

STRUCTURE HEIGHT: 80-125m hub height of the wind turbines. The final design details are yet to be confirmed. These details will become available in the EIA phase

SURFACE AREA TO BE COVERED: Approximately 800 hectares. The final design details are yet to be confirmed. These details will become available in the EIA phase.

STRUCTURE ORIENTATION: The structures will not be fixed and will be able to rotate in order to catch the prevailing winds.

TURBINE DESIGN: The final design is not available but average specs are presented below:



FOUNDATION DIMENSIONS: Total footprint for each wind turbine and the associated hard standing area will be between 1 574m² to or 4 074m² depending on the type of crane usage required and the associated hard standing area needed. The foundation will be up to 4m deep. Final dimensions will be provided during the EIA phase of the project.

BLADE ROTATION DIRECTION: The blade rotation direction will depend on wind measurement information received later in the process. This will be provided during the EIA phase of the project.

LAYDOWN AREA DIMENSIONS: The area may be up to approximately 80 hectares in size. However, this is likely to be smaller and it is anticipated that 40 hectares will be sufficient for the laydown area. However, final dimensions will be determined during the EIA phase of the project.

GENERATION CAPACITY: Approximately 250 MW.

ONSITE MEASURED WIND PARAMETERS: Data is confidential. The data gathered indicates that there is enough wind resource to construct a viable wind farm.

A3 Maps of all smaller maps included in the report are attached in Appendix 5.

RENOSTERBERG WIND ENERGY CORPORATION – INDUSTRIAL DEVELOPMENT CORPORATION

CONSTRUCTION OF A WIND FARM NEAR DE AAR, NORTHERN CAPE PROVINCE OF SOUTH AFRICA

DRAFT SCOPING REPORT

Executive Summary

The Renosterberg Wind Energy Corporation (RWEC) in partnership with the Industrial Development Corporation (IDC) intends to develop a wind farm and associated infrastructure near De Aar in the Northern Cape Province of South Africa (Figure i). SiVEST Environmental Division has been appointed as independent consultants to undertake the Environmental Impact Assessment (EIA) for the proposed wind farm. The overall objective of the project is to generate electricity to feed into the National Grid by constructing wind turbines (and associated infrastructure).

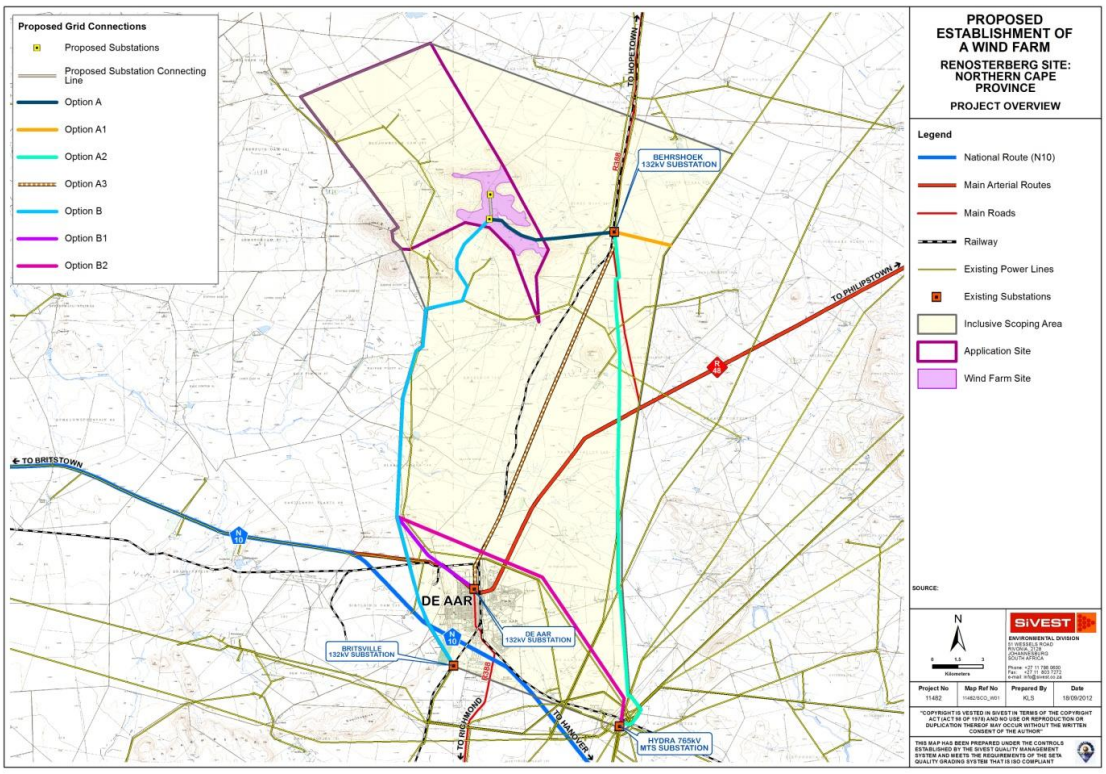


Figure i: Wind Farm and associated infrastructure application site.

The proposed development requires environmental authorisation from the Department of Environmental Affairs (DEA). However, the provincial authority will also be consulted (i.e. the Northern Cape Department of Tourism, Environment and Conservation (NCDTEC). The EIA for the proposed development will be conducted in terms of the newly released EIA Regulations promulgated in terms of Chapter 5 NEMA (National Environmental Management Act), which came into effect on the 2nd of August 2010. In terms of these regulations, a full EIA is required for the proposed project. All relevant legislations and guidelines (including Equator Principles) will be consulted during the EIA process and will be complied with at all times.

The following assessments were conducted during the Scoping phase to identify the issues associated with the proposed development. These assessments will also inform the impact assessment to take place in the Impact phase of the project:

- Biodiversity (including fauna and flora) Assessment
- Avi-faunal Assessment
- Bat Assessment
- Surface Water Impact Assessment
- Soils and Agricultural Potential Assessment
- Noise Impact Assessment
- Visual Impact Assessment
- Heritage Assessment
- Palaeontological Assessment
- Socio-economic Impact Assessment

Based on the scoping studies which were conducted, potentially highly sensitive aspects have been identified within the study area. These will be assessed in more detail during the Environmental Impact Report (EIR) phase so as to choose the best possible location for the proposed development within the project site. The table below summarises the specialist findings of the Scoping Report.

Biodiversity (Flora and Fauna)	▪ A list of plant species that could potentially occur on the site was generated. Species of conservation significance were identified using, amongst others, the IUCN (International Union for the Conservation of Nature) Red Data lists, CITES (Convention on International Trade in Endangered Species) lists and specially protected and protected species listed in the Northern Cape Nature Conservation Act. ▪ In terms of the Northern Cape Nature Conservation Act (Act 9 of 2009), no person may pick, import, export, cultivate or trade in, a specimen of a specially protected, protected or indigenous plant without a permit. Thus the relevant permits must be obtained from the permit section of the Department of Environment and Nature Conservation in the Northern Cape prior to construction. A detailed flora survey will be

	conducted during the EIA phase of the biodiversity assessment. ▪ Mammal species such as the Black Rhinoceros (*Diceros bicornis bicornis*) and Riverine Rabbit (*Bunolagus monticularis*) which are listed as Critically Endangered; the Brown Hyaena (*Hyaena brunnea*) and Honey Badger (*Mellivora capensis*) which are listed as Near Threatened as well as several other recorded large mammal species are not likely to occur in the study area. This is due to anthropogenic activities that have taken place for decades. Amphibians are likely to be present near or within a few wetlands and several drainage systems present throughout the study area. The Giant Bullfrog (*Pyxicephalus adspersus*) is considered to be Near Threatened as its specialised habitat is at risk from increasing urbanisation and agricultural activity. Several reptile species are likely to occur in the study area. Numerous invertebrate species are anticipated to be present on the site. A more detailed investigation of fauna in the study area will be undertaken during the EIA phase of this project. ▪ Sensitive areas have been identified within the boundaries of the study area. These include the plateau as well as the wetlands and drainage areas on the site. These areas are considered sensitive from a biodiversity perspective as species diversity (both floral and faunal) in these areas are expected to differ from the surrounding areas. Furthermore, species from surrounding areas also depend on these areas as food and water sources. A negative mapping exercise will be undertaken in the EIA phase of this project to determine where the PV facility could be located without affecting ecological corridors on the site. ▪ Detailed recommendations on site selection will be undertaken during the EIA phase when layouts and alternatives are made available. The detailed biodiversity assessment during the EIA phase will involve a comprehensive species identification and investigation of impacts.
Avi-fauna	▪ The Renosterberg Wind Farm and Solar PV site are both located in the Platberg-Karoo Conservancy Important Bird Area. The area supports a high number of species which are of conservation significance and which have been identified as priority species that are at risk of being impacted by wind farms. From an avifaunal habitat perspective the Renosterberg plateau (Grassy Karoo) and surrounding steep slopes and cliffs are the most sensitive. This is the area where most of the priority species are likely to occur regularly, and where the potential for interaction with wind turbines, particularly collisions, would be the greatest. The extent to which the plateau habitats are being utilised by priority species will have to be assessed in the EIA phase and through

	pre-construction monitoring.
Surface water	▪ Several impacts may affect the surface water resources (wetlands and drainage systems specifically) of the Renosterberg study area where the buildings and associated structures encroach on these sensitive environments.
Surface water	▪ Several impacts may affect the surface water resources (wetlands and drainage systems specifically) of the Renosterberg study area where the buildings and associated structures encroach on these sensitive environments.
Soils and Agricultural Potential	▪ By taking all the site characteristics (climate, geology, land use, slope and soils) into account, the agricultural potential for the study area is classified as being low for crop production while moderate for grazing. This poor agricultural potential rating is primarily due to restrictive climatic characteristics and soil depth limitations. The Renosterberg site is not classified as high potential, nor is it a unique dry land agricultural resource. ▪ EIA phase study required to satisfy the requirements of the Department of Agriculture.
Noise	▪ This assessment indicated that the proposed project could have an impact of low to high significance on the noise climate of the surrounding area as there are Noise-sensitive developments within the area of influence of the wind turbines. The main factor that will determine the potential noise impact is the distance that the wind turbines would be from a NSD, and the total number of wind turbines that could cumulatively impact on this NSD. ▪ At this preliminary stage it is impossible to determine whether the significance of this noise impact would be low, medium or high. ▪ The results of the scenarios indicated that additional information is critical in order to estimate the noise impact on NSDs during the EIA phase.
Visual	▪ The majority of the study area has a scenic natural rural visual character with a moderate visual sensitivity. The visual impact of the proposed solar development is likely to impact residents of surrounding farmsteads and motorists travelling along N48 and R388, therefore these are regarded to be potentially sensitive visual receptors. The sensitivity of the receptor locations will need to be confirmed through further assessment in the next phase of the study. The nature of the visual impacts associated with a wind farm development of this size on receptors in the study area could be significant.
Heritage	▪ The archival research has indicated the definite existence of archaeological find in the study area and palaeontological finds just

	outside the study area.
Palaeontology	▪ The lower-lying portions of the study area for the proposed wind energy at or near Renosterberg, to the north of De Aar, Northern Cape, are underlain at depth by offshore basinal to nearshore sediments of the Early to Middle Permian Ecca Group (Karoo Supergroup). These subaqueous deposits are variously assigned to the Tierberg Formation or Waterford Formation and are of moderate palaeontological sensitivity, containing locally abundant petrified woods, trace fossil assemblages (including possible large amphibian impressions) and microvertebrate remains (*e.g.* disarticulated teeth, scales of fish). Middle Permian fluvial sediments of the Lower Beaufort Group (Adelaide Subgroup, Karoo Supergroup) crop out along the slopes of the Renosterberg *koppies*, but are largely mantled by colluvial (slope) deposits here. These rocks have recently yielded rare but palaeontologically significant fossil remains of small therapsids ("mammal-like reptiles") and turtle-like parareptiles, *plus* occasional fossil plants and silicified woods, in the escarpment zone east of De Aar. The Ecca – Beaufort transition between subaqueous (Ecca Sea) and terrestrial depositional environments in the De Aar – Philipstown region is of geological interest and is recorded in the slopes of the escarpment zone east of De Aar as well as on isolated koppies such as Renosterberg and Tierberg to the north of De Aar. These *koppies* are capped by substantial sills of unfossiliferous dolerite of the Early Jurassic Karoo Dolerite Suite. Much of the subdued Ecca Group outcrop area is covered by a thin to thick (few dm to several meters) succession of Late Caenozoic (Neogene to Recent) superficial deposits such as alluvium, surface gravels, soils and calcrete hardpans. These younger rocks contain sparse, low diversity fossil assemblages such as rhizoliths (calcified plant root casts) and invertebrate burrows, but locally important vertebrate material (*e.g.* mammalian or reptilian bones and teeth) or even human remains may be expected here. ▪ The same limited spectrum of rock units is represented within the broader "all-inclusive" study region encompassing all the infrastructural components of the proposed alternative energy facilities (including transmission lines, substations *etc*) and extending from the Renosterberg area itself southwards to De Aar and beyond. A sizeable area of Adelaide Subgroup rocks cropping out near the Eskom Hydra substation to the southeast of De Aar is of particular note. ▪ Despite the occurrence in many areas of superficial deposits such as scree and alluvium that are generally of low palaeontological sensitivity, good exposures of potentially fossiliferous mudrocks are found in the

	study region on steep hill slopes as well as in road and railway cuttings and probably also in erosional gullies.
Social	▪ The socio-economic baseline has been determined from a national to a local perspective in the context of the proposed development. The socio-economic baseline included assessment of South Africa, the Northern Cape Province, the Pixley ka Seme District Municipality, the Emthanjeni Local Municipality, and Ward 6 within the Emthanjeni Local Municipality. Ultimately, it was found that several positive and negative impacts are anticipated to be associated with the proposed development that will need to be further investigated in the EIA phase.

Based on the above mentioned studies, the Scoping Report has identified several aspects that warrant further investigation in the EIR Phase. These are as follows:

- Biodiversity (including fauna and flora) Assessment
- Avi-faunal Assessment
- Bat Assessment
- Surface Water Impact Assessment
- Soils and Agricultural Potential Assessment
- Noise Impact Assessment
- Visual Impact Assessment
- Heritage Assessment
- Palaeontological Assessment
- Socio-economic Impact Assessment

A full comparative assessment of layout alternatives will be undertaken during the EIA phase.

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Glossary of Terms

Alluvial: Resulting from the action of rivers, whereby sedimentary deposits are laid down in river channels, floodplains, lakes, depressions etc.

Biodiversity: The variety of life in an area, including the number of different species, the genetic wealth within each species, and the natural areas where they are found.

Cultural Significance: This means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

Cumulative Impact: In relation to an activity, cumulative impact means 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.

"Equator Principles": A financial industry benchmark for determining, assessing and managing social & environmental risk in project financing

Environmental Impact Assessment: 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 the application.

Environmental Impact Report: In-depth assessment of impacts associated with a proposed development. This forms the second phase of an Environmental Impact Assessment and follows on from the Scoping Report.

Environmental Management Programme: A legally binding working document, which stipulates environmental and socio-economic mitigation measures which must be implemented by several responsible parties throughout the duration of the proposed project.

Heritage Significance Grades:
a) Grade I: Heritage resources with qualities so exceptional that they are of special national significance;
(b) Grade II: Heritage resources which, although forming part of the national estate, can be considered to have special qualities which make them significant within the context of a province or a region; and
(c) Grade III: Other heritage resources worthy of conservation.

Heritage Resources: This means any place or object of cultural significance. See also archaeological resources above.

Historical Period: Since the arrival of the white settlers - c. AD 1840 - in this part of the country

Hyrdomorphic / Hydric Soil: Soil that in its undrained condition is saturated or flooded long enough during the growing season to develop anaerobic conditions favouring growth and regeneration of hydrophytic vegetation. These soils are found in and associated with wetlands.

Iron Age: Period covering the last 1800 years, when new people brought a new way of life to southern Africa. They established settled villages, cultivated domestic crops such as sorghum, millet and beans, and they herded cattle as well as sheep and goats. These people, according to archaeological evidence, spoke early variations of the Bantu Language. Because they produced their own iron tools, archaeologists call this the Iron Age.
Early Iron Age AD 200 - AD 900
Middle Iron Age AD 900 - AD 1300
Late Iron Age AD 1300 - AD 1830

Kilovolt (kV): a unit of electric potential equal to a thousand volts (a volt being the standard unit of electric potential. It is defined as the amount of electrical potential between two points on a conductor carrying a current of one ampere while one watt of power is dissipated between the two points).

Macro-geomorphological: Related to / on the scale of geomorphic provinces. A geomorphic province is a spatial entity with common geomorphic attributes.

Precipitation: Any form of water, such as rain, snow, sleet, or hail that falls to the earth's surface.

Red Data Species: All those species included in the categories of endangered, vulnerable or rare, as defined by the International Union for the Conservation of Nature and Natural Resources.

Riparian: The area of land adjacent to a stream or river that is influenced by stream induced or related processes.

Scoping Report: An “issues-based” report which forms the first phase of an Environmental Impact Assessment process.

Stone Age: The first and longest part of human history is the Stone Age, which began with the appearance of early humans between 3-2 million years ago. Stone Age people were hunters, gatherers and scavengers who did not live in permanently settled communities. Their stone tools preserve well and are found in most places in South Africa and elsewhere.
Early Stone Age 2 000 000 - 150 000 Before Present
Middle Stone Age 150 000 - 30 000 BP
Late Stone Age 30 000 - until c. AD 200

List of Abbreviations

AP - Action Plan
BID - Background Information Document
CRM - Cost Recovery Mechanism
DEA - Department of Environmental Affairs
DSR -Draft Scoping Report
DoE - Department of Energy
FSR - Final Scoping Report
DWA - Department of Water Affairs
EAPs - Environmental Assessment Practitioner
EHS - Environmental, Health, and Safety
EIA - Environmental Impact Assessment
EIR - Environmental Impact Report
EMPr - Environmental Management Programme
ENPAT - Environmental Potential Atlas
ECA - Environmental Conservation Act No 73 of 1989
EP - Equator Principles
EPFI - Equator Principles Financial Institutions
FGM - Focus Group Meeting
FSR - Final Scoping Report
GDP - Gross Domestic Product
GIIP - Good International Industry Practice
GIS - Geographic Information System
GPS - Global Positioning System
GW - Gigawatts
HIA - Heritage Impact Assessment
I&AP(s) - Interested and Affected Parties
IBA(s) - Important Bird Area(s)
IDP - Integrated Development Plan
IEP - Integrated Energy Plan
IFC - International Finance Corporation
IPP(s) - Independent Power Producers
IUCN - International Union for the Conservation of Nature and Natural Resources
KSW - Key Stakeholder Workshop
kV - Kilo Volt
LGMSA - Local Government: Municipal Systems Act No. 32 of 2000
MSA - Middle Stone Age
MYPD2 - Multi Year Price Determination 2
MW - Megawatt
MSBL - Multi-Site base load (MSBL)
NCDTEC - Northern Cape Department of Tourism, Environment and Conservation

NEA - The National Energy Act No. 34 of 2008
NERSA - National Energy Regulator of South Africa
ERA - The Electricity Regulation Act No. 4 of 2006
IRP - Integrated Resource Plan
ISMO - Independent System and Market Operator
NEMA - National Environmental Management Act No. 107 of 1998
NEMBA - National Environmental Management: Biodiversity Act No. 10 of 2004
NFEPA - National Freshwater Ecological Priority Areas
NHRA - National Heritage Resources Act No. 25 of 1999
NSBA - National Spatial Biodiversity Assessment
NWA - National Water Act No. 36 of 1998
NEMAA - National Environmental Management: Air Quality Act of 2004
OHSA - Occupational Health and Safety Act No. 85 of 1993
PFA - Project Facilitation Act No. 67 of 1995
PoS - Plan of Study
PM - Public Meeting
PPA - Power Purchase Agreement
PPP - Public Participation Process
REFIT - Renewable Feed-In Tariff Programme
RFP - Request for Proposals
RFQ - Request for Qualifications
SA - South Africa
SABAP 2 - Southern African Bird Atlas Project 2
SAHRA - South African Heritage Resources Agency
SANBI - South African National Biodiversity Institute
SAWS - South African Weather Service
SBO - Single Buyer Office
SDF - Spatial Development Framework
VAC - Visual Absorption Capacity

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CONSTRUCTION OF A WIND FARM NEAR DE AAR, NORTHERN CAPE PROVINCE OF SOUTH AFRICA

DRAFT SCOPING REPORT

1 INTRODUCTION

Renosterberg Wind Energy Corporation (RWEC) in partnership with the Industrial Development Corporation (IDC) intends to develop a wind farm near De Aar in the Northern Cape Province of South Africa. SiVEST Environmental Division has been appointed as independent consultants to undertake the Environmental Impact Assessment (EIA) for the proposed wind farm. The overall objective of the project is to generate electricity to feed into the National Grid by constructing wind turbines (and associated infrastructure).

The proposed development requires environmental authorisation from the Department of Environmental Affairs (DEA). However, the provincial authority will also be consulted (i.e. the Northern Cape Department of Tourism, Environment and Conservation (NCDTEC). The EIA for the proposed development will be conducted in terms of the newly released EIA Regulations promulgated in terms of Chapter 5 NEMA (National Environmental Management Act), which came into effect on the 2nd of August 2010. In terms of these regulations, a full EIA is required for the proposed project. All relevant legislations and guidelines (including Equator Principles) will be consulted during the EIA process and will be complied with at all times.

As previously mentioned, this Scoping Report is compiled in accordance with the Equator Principles (EP), which is a financial industry benchmark for determining, assessing and managing social and environmental risk in project financing (Equator Principles, 2006). This wind farm project is considered a Category B project, which are those with potential limited adverse social or environmental impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures (Equator Principles, 2006). The project will also comply with the International Finance Corporation's Social and Environmental Performance Standards (2006).

1.1 Applicable documentation

The following documentation should be read in conjunction with this Scoping Report:

- "Equator Principles" 2006
- International Finance Corporation's Performance Standards on Social and Environment, April 2006, namely:
    - Performance Standard 1: Social and Environmental Assessment and Management Systems
    - Performance Standard 2: Labour and Working Conditions
    - Performance Standard 3: Pollution Prevention and Abatement
    - Performance Standard 4: Community Health, Safety and Security
    - Performance Standard 5: Land Acquisition and Involuntary Resettlement
    - Performance Standard 6: Biodiversity Conservation and Sustainable Natural Resource Management
    - Performance Standard 7: Indigenous Peoples
    - Performance Standard 8: Cultural Heritage
- International Finance Corporation – World Bank Guidelines, General Environmental Health and Safety (EHS) Guidelines 2007.

The EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). These EHS Guidelines are applied as required by the World Bank's respective policies and standards. These General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues in specific industry sectors.

1.2 Technical Description

At this stage, it is estimated that the proposed project (Figure 1) will encompass the installation of a number of wind turbine generators and their associated components in order to generate electricity that is to be fed into the existing Eskom distribution and/or transmission lines that cross or are located nearby the proposed site. The total power generation capacity limit and the number of wind turbines to be accommodated will ultimately depend on the size of the developable area which will be determined by the EIA. However, it is currently envisaged that approximately 83-138 wind turbines (depending on the maximum output capacity of each wind turbine) are to be developed with a cumulative generation capacity of approximately 250 Megawatts (MW). The maximum output capacity of each wind turbine may range from 1.8 to 3 MW each. The voltage of the connection lines from the wind farm substation to the grid will be dependent on the total

generation capacity and the actual available connection as to be determined by Eskom at a later stage.

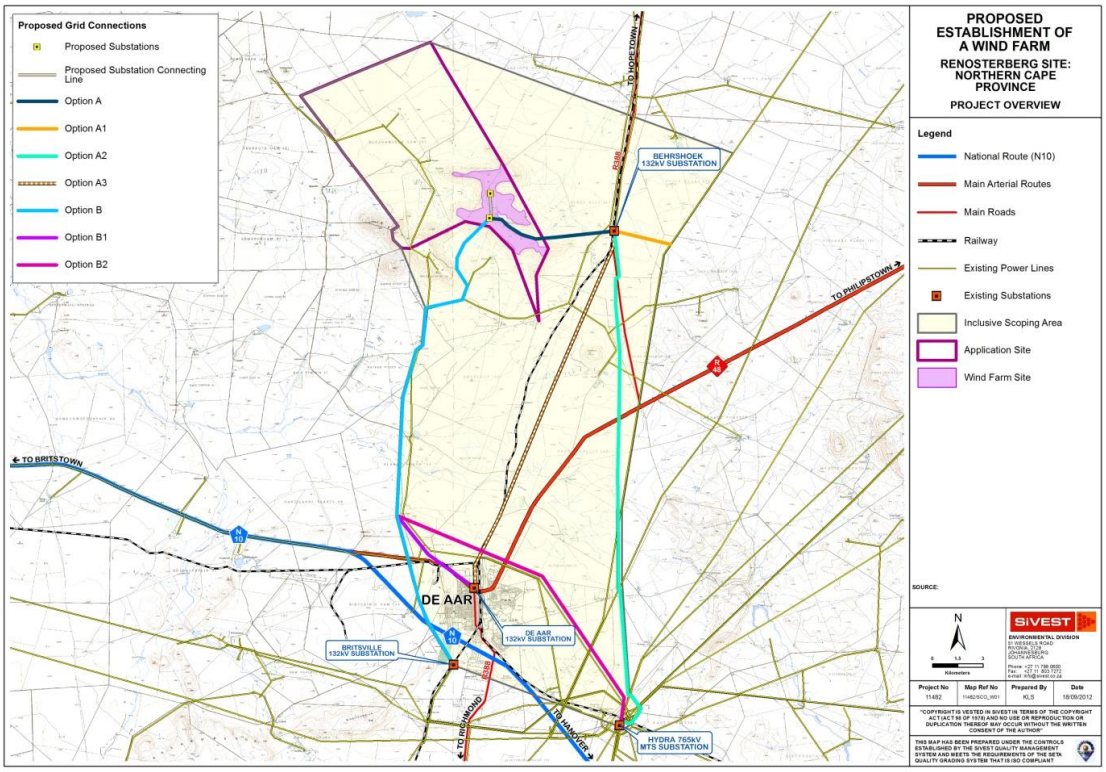


Figure 1: Wind farm study area.

1.2.1 Turbines

Ultimately, the size of the wind turbines will depend on the developable area and the total generation capacity that can be produced as a result. The wind turbines will have a hub height of between 80 to 125m and a rotor diameter of 80 to 112m (Figure 2). The blade rotation direction will depend on wind measurement information received later in the process. The rotation will range from 6 to 20 rpm. The foundation of each wind turbine will be approximately 18m x 18m. The footprint for each wind turbine will therefore be approximately 324m². A hard standing area, of between 50m x 25m (assuming a compact mobile crane) or 150m x 25m (assuming a traditional crawler crane) is anticipated for crane usage for each wind turbine. The total hard standing area will therefore either be 1 250m² or 3 750m² depending on which crane type will be used. This will be decided on at a later stage in the proposed development based on environmental constraints and design factors. The total footprint for each wind turbine and the associated hard standing area will either be 1 574m² or 4 074m². The foundation will be up to 4m deep.

As already mentioned, it is anticipated at this stage that 83-138 wind turbines will be constructed. The total area for all the wind turbines for the Renosterberg study site will therefore be between approximately 26 892m² and approximately 44 712m² (not including the hard standing areas).

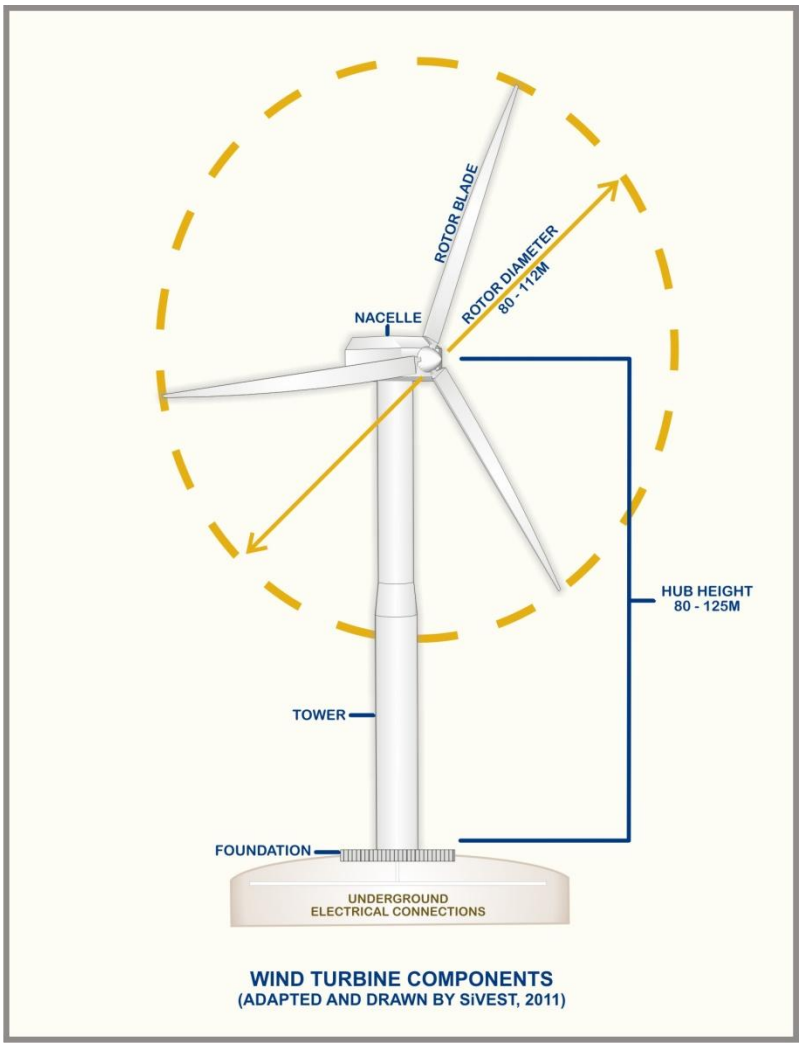


Figure 2: Typical Components of a wind turbine.

1.2.2 Electrical Connections

The wind turbines will be connected to each other and to a substation using buried 33kV voltage cables (Figure 3) except where a technical assessment of the proposed design suggests that overhead lines are appropriate such as over rivers and gullies. Where overhead power lines are to be constructed, the connection will be established using either pole or pylon structures depending on the voltage. The dimensions of the monopole structures will depend on grid safety

requirements and the grid operator. No servitudes will be associated with the wind farm infrastructure although servitudes for Eskom infrastructure may be required on site. As previously mentioned, the electrical connection to the grid will be dependent on the total generation capacity and the actual available connection as determined by Eskom.

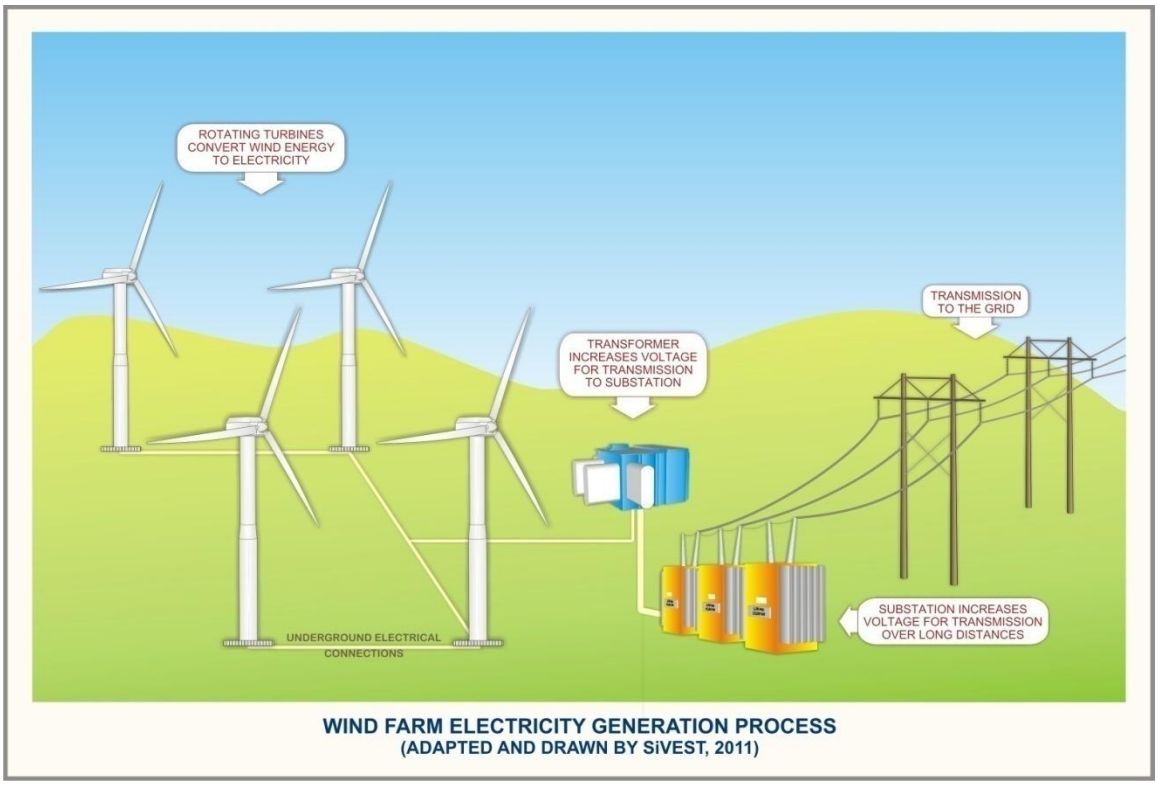


Figure 3. Conceptual wind farm electricity generation process showing electrical connections.

At this stage a number of power line route alternatives have been proposed (Figure 3) and will be further investigated in the EIA phase. The proposed alternatives may either link into existing lines in which case a switchyard will also be required, or alternatively establish a completely new line that will link into an existing Eskom substation. A number of potential Eskom substation have preliminarily been identified including Behrshoek 132kV distribution substation, De Aar 132kV distribution substation, Britsville 132kV distribution substation and Hydra 765kv transmission substation.

1.2.3 Substation

A new substation and associated transformers will be developed which will supply the generated electricity to the Eskom grid. The distribution substation will ideally be located in close proximity to the existing power lines where possible to limit impact. The substation will be a transmission

substation and will include transformer bays which will contain transformer oils. Bunds will be constructed to ensure that any oil spills are suitable attenuated and not released into the environment. The substation will be securely fenced.

Where the substation is beside the line, the connection to the line will be via drop-down conductors. Where the line is remote from the substation, the connection will be by overhead line, using either pole or pylon structures depending on the voltage.

1.2.4 Roads

The access roads are proposed to be 5-8m wide. The roads are anticipated to be gravel roads from the site on to the public road. However, mountain access to the Renosterberg plateau may require upgrading in order to ensure geometric and load bearing suitability for the transportation of the wind turbine components. An internal road network to the turbines and other infrastructure will include:

- Turning circles for large trucks (where required);
- Passing points and culverts over gullies and rivers (where required); and
- Existing roads will be upgraded (where required).

1.2.5 Building infrastructure

The solar field will require an onsite building which will relate to the daily operation of the plant. The wind farm will therefore require an administration building (office). Potential locations for the administration building will be determined at a later stage in the EIA process based on environmental constraints and design factors. The buildings will likely be a single storey building approximately 150 to 350m² which will be required to accommodate the following:

- Control room
- Workshop
- High Voltage (HV) switchgear
- Mess Room
- Toilets
- Supervisory Control And Data Acquisition (SCADA) Room
- Storeroom

1.2.6 Construction Lay-down Area

A general construction lay-down area will be required for the construction phase of the proposed wind farm. The area may be up to approximately 80 hectares in size. However, this is likely to

smaller. The location of the construction lay-down area will be determined at a later stage in the EIA process based on environmental constraints and design factors.

1.3 Alternatives

In terms of the EIA regulations, feasible and reasonable alternatives are required to be considered through the EIA process. Layout Alternatives and the no-go alternative were thus considered in this draft Scoping Report.

An illustration of the provisional wind farm layout in terms of the alternatives being assessed is provided in Figure 1 above. Layout alternatives relate mainly to the associated infrastructure at this stage of the proposed development. At this stage, substation and grid connection alternatives have been investigated (elaborated on below). Alternative locations for the administration building and construction lay-down area will be investigated at a later stage in the EIA process based on environmental constraints and design factors.

1.3.1 Wind Farm Substation

At this stage, two alternative locations have been proposed as potential locations for the substation (Figure 1 above). Substation Alternative 1 is located in the central regions of the Renosterberg Plateau towards the north of the study site. Substation Alternative 2 is located approximately 1.5km directly south from Substation Alternative 2. An overhead interconnecting line between the two substation alternatives for an approximate length of 1.5km is being proposed. However, these locations may be subject to change later in the process depending on environmental constraints and design factors.

1.3.2 Grid Connection Alternatives

As mentioned above, the option of constructing a new power line to link into an existing power line or to link to nearby Eskom substations will be assessed. As such, provisional routes are being investigated. These include Power Line Options A and B. The Power Line Option A has three of sub-alternatives whist Power Line Option B has two sub-alternatives. The details pertaining to the various proposed power line routes alternatives are explored in greater detail below.

- Power Line Route Option A

The Power Line Route Option A has three potential sub-alternatives (A1, A2 and A3). Power Line Route Option A1 will be a direct connection to the Behrshoek 132kV distribution substation. Option A1 will consist of an overhead interconnecting line between the two substation alternatives for an approximate length of 1.5km.

The Power Line Route Option A routes to the east and then south east, traversing the plateau and then the plateau escarpment, before heading in a slightly north but mostly, easterly direction for an approximate length of 6.5km to the Behrshoek 132kV distribution substation. The total length of Option A1 is approximately 6.5km.

Power Line Route Option A1 follows the same path as Option A1 but routes past the Behrshoek 132kv distribution substation for approximately 3km linking into (Loop-in/Loop-out connection via switchyard) the existing 765kV transmission power line running to the Hydra 765kV transmission substation. The total length of the alternative is approximately 11km.

Power Line Route Option A2 likewise follows the same routes as Option A1 routing to the Behrshoek 132kV distribution substation. However, from this point, the sub-alternative will run southwards directly to the Hydra 765kV transmission substation for approximately 30km in length.

Power Line Route Option A3 similarly follows the same routes as Option A1 routing to the Behrshoek 132kV distribution substation. However, from this point, the sub-alternative heads in a southerly direction for an approximate length of 25.5km linking directly into De Aar 132kV distribution substation.

- Power Line Route Option B

PV Power Line Route Option B route heads from the proposed wind farm substation site in a southerly direction for an approximate length of 29km linking directly into Britsville 132kV distribution substation. The total length of PV Power Line Route Option 2B is 35.2km.

PV Power Line Route Option B1 route heads from the proposed wind farm substation site in a southerly direction following the same path as PV Power Line Route Option B for an approximate length of 19.9km but deviates in a south easterly direction for a distance of 5.8km from this point linking directly into De Aar 132kV distribution substation. The total length of PV Power Line Route Option B1 is approximately 32.4km.

PV Power Line Route Option B2 route heads from the proposed wind farm substation site in a southerly direction following the same path as PV Power Line Route Option B for an approximate length of 19.9km but deviates in a south easterly direction for a distance of 18km from this point linking directly into Hydra 765kV transmission substation. The total length of PV Power Line Route Option B2 is approximately 44km.

As a final note, it is important to point out that whilst several power line route options have preliminarily been identified, these fall within a greater 'all inclusive scoping area' that has been proposed for assessment to consider a wider area for potential environmental constraints. This area has been delineated to allow for flexibility in the environmental assessment process should any major constraints be identified. Therefore, the above-mentioned proposed power line routes are subject to change or be refined based on environmental constraints and design factors.

- No-Go Alternative

The 'no-go' alternative is the option of not establishing the proposed wind farm. South Africa is currently under immense pressure to provide electricity generating capacity to accommodate for the pressures which have been identified in this regard. With the current global focus on climate change, the government are under severe pressure to explore alternative energy sources in addition to coal fired power stations. Although the wind farm is not the only solution to solving the energy crisis in South Africa, not establishing the proposed wind farm would be detrimental to the mandate that the government has set to promote the implementation of renewable energy. It is a suitable sustainable solution to the energy crisis and this project would contribute to this solution. This project will aid in achieving South Africa's goals in terms of sustainability, energy security, mitigating energy cost risks, local economic development and national job creation.

1.4 Specialist studies

Specialist studies have been conducted in terms of the stipulations contained within Section 28 (1) of the 2010 NEMA EIA regulations.

The following specialist studies have been conducted for the area:

- Biodiversity (flora and fauna) Assessment
- Avi-fauna Assessment
- Bat Assessment
- Surface Water Impact Assessment
- Soils and Agricultural Potential Assessment
- Noise Impact Assessment
- Visual Impact Assessment
- Heritage Assessment
- Palaeontological Assessment
- Socio-economic Assessment

These studies have been used to identify issues at a scoping level and will be supplemented with more site specific studies during the EIA phase of the project. Key issues relating to the proposed site are discussed below.

1.5 Draft Scoping Report Structure

This Draft Scoping Report (DSR) is structured as follows:

- Chapter 1 introduces the project and the relevance of the Equator Principles as well as the IFC Performance Standards for this project. It describes the project background, describing the project technical components. It also discusses the experience of the Environmental Assessment Practitioners (EAPs), including specialists, who have contributed to the report. Chapter 1 further expands on the relevant legal ramifications applicable to the project and describes relevant development strategies and guidelines. Finally, the chapter provides explanation to the need and desirability of the proposed project, as well as an explanation of the objectives of the scoping phase.
- Chapter 2 provides a description of the region in which the proposed development is intended to be located. Although the chapter provides a broad overview of the region, it is also specific to the application. It contains descriptions of the site and the specialist studies are also summarised.
- Chapter 3 identifies potential impacts associated with the proposed wind farms as well as the substations. The chapter further identifies these impacts per specialist study and discusses potential cumulative impacts.
- Chapter 4 describes the Public Participation Process (PPP) undertaken during the Scoping Phase and tables issues and concerns raised by Interested and Affected Parties (I&APs).
- Chapter 5 provides a conclusion to the DSR and recommendations to be addressed in further assessment.
- Chapter 6 provides an assessment of the report in terms of the Equator Principles.
- Chapter 7 describes the environmental impact reporting phase of the EIA (i.e. the way forward for this study and includes the Plan of Study (PoS for EIA).
- Chapter 8 lists references indicated in the DSR.

1.6 Expertise of Environmental Assessment Practitioner

SiVEST has considerable experience in the undertaking of EIAs. Staff and specialists who have worked on this project and contributed to the compilation of this Scoping Report are detailed in Table 1 below.

Table 1: Project Team

Name and Organisation	Role
Rebecca Thomas – SiVEST	Project Leader
Shaun Taylor – SiVEST	Project Consultant
Faith Kalibbala – SiVEST Dr. Helga Van Der Merwe	Biodiversity (Flora and Fauna)
Chris Van Rooyen – Chris Van Rooyen Consulting	Avi-fauna
Werner Marais – Animalia	Bats
Shaun Taylor – SiVEST	Surface Water
Kurt Barichievy – SiVEST	Agricultural Potential
Kerry Schwartz – SiVEST	GIS and Mapping
Morne de Jager – M² Environmental Connections	Noise
Andrea Gibb – SiVEST	Visual
Wouter Fourie - PGS	Heritage
John Almond – Natura Viva	Palaeontology
Kim Moonsamy – SSI	Social
Nicolene Venter – Imaginative Africa	Public Participation
Shaun Taylor – SiVEST	

Please refer to attached CV's for more information in Appendix 2. Declarations of independence of each specialist are contained in Appendix 3.

1.7 Key Legal and Administrative Requirements Relating to the Proposed Development

1.7.1 National Environmental Management Act No. 107 of 1998 – NEMA EIA Requirements

The National Environmental Management Act (NEMA) No. 107 of 1998 has since been amended on several occasions from the date of its inception. This Act replaces parts of the Environment Conservation Act (ECA) No. 73 of 1989 with exception to certain parts pertaining to Integrated Environmental Management. The act intends to provide for:

- co-operative environmental governance by establishing principles for decision-making on matters affecting the environment;
- institutions that will promote co-operative governance and procedures for coordinating environmental functions exercised by organs of state;

- to provide for the prohibition, restriction or control of activities which are likely to have a detrimental effect on the environment;
- and to provide for matters connected therewith.

NEMA now governs the EIA process with the recent promulgation of the new EIA regulations in June 2010 (Government Gazette No. 33306 of 18th June 2010).

Activities that may significantly affect the environment must be considered, investigated and assessed prior to implementation.

In terms of the EIA Regulations promulgated in terms of Chapter 5 NEMA (National Environmental Management Act), which came into effect on 2nd August 2010, a full EIA is required for the proposed project

1.7.2 NEMA EIA Requirements

In terms of the Regulations, which have been released on the 18th of June 2010 and placed into full effect on the 2nd of August 2010, a full Environmental Impact Assessment is required for the proposed development based on triggered activities. However, several activities which trigger a basic assessment were also identified and need also be specified. Ultimately, these activities will not form a separate assessment, but will fall into the greater EIA.

The following Schedules of the Government Notice No. R. 544 - 545 of the 18th June 2010 are of relevance to the project in question (Table 2). All of the Listed Activities identified in terms of Sections 24(2) and 24D include:

Table 2: Listed activities in terms of the NEMA Regulations

Number and date of the relevant notice:	**Activity No (s)**	**Description of listed activity**
Government Notice R544 (18 June 2010)	Activity 10	The construction of facilities or infrastructure for the transmission and distribution of electricity- *i. outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.* The 132KV distribution power lines are proposed to connect the Wind Energy Farm to the Eskom Grid.
	Activity 11	The construction of (iii) bridges…(xi) infrastructure or structures covering 50 square metres or more, where such infrastructure occurs within a water course or within 32 metres of a watercourse, measured from the edge of the water course….

		The construction of facilities associated with the proposed wind energy farm may affect the dam or its 32m buffer located north of the site. The proposed access road to the site may require a bridge across a drainage line north and east of the site.
	Activity 13	The construction of facilities of 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. A concrete batching plant maybe required on site. Fuel may be stored on site for construction vehicles. The capacities for the above are unknown at this stage.
	Activity 18	The infilling or deposition of any material of more than 5 cubic metres into, or the dredging. Excavation, removal of moving of soil, sand, sand….pebbles or rock from a watercourse may occur during the construction of the access road or any other infrastructure associate with the proposed wind energy farm. The infilling or deposition of any material of more than 5 cubic metres into, or the dredging. Excavation, removal of moving of soil, sand, sand….pebbles or rock from; A watercourse….
	Activity 22	The construction of a road outside urban areas • *with a reserve wider than 13.5 metres* *where no reserve exists where the road is wider than 8 metres* The proposed construction of the access road located on farm land, outside urban areas, and with no road reserve, may be wider than 8 metres.
	Activity 24	The transformation of land bigger than 1000 square metres in size , to residential, retail , commercial, industrial or institutional use, where, at the time of the coming into effect of this schedule such lad was zoned open space, conservation or had an equivalent zoning. The proposed site is currently undeveloped land and is zoned

		agriculture and is approximately 8 000 000 square metres.
Government Notice R545 (18 June 2010)	Activity 1	The construction of facilities or infrastructure, including associated structures or infrastructure, for the generation of electricity where the electricity output is 20 megawatts or more. The project entails the development of a wind energy farm with a maximum electricity generating capacity of 140MW.
	Activity 8	The construction of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more outside and urban area or industrial complex. The associated distribution power lines proposed will have a capacity of 132 kilovolts. There may be strengthening requirements on the 765KV Hydra Main Transmission Substation.
	Activity 15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational , industrial or institutional use where the total area to be transformed is 20 hectares or more; except where such physical alteration takes place for *i) Linear development activities; or* *ii) Agriculture or afforestation where the activity 16 in this schedule will apply* The proposed power lines will traverse undeveloped land and agricultural farm land where the total area to be transformed will probably be 20 hectares or more.
Government Notice R546 (18 June 2010)	Activity 4	The proposed construction of the access road with no road reserve, may be wider than 8 metres, and is located on farm land, in the Northern Cape, outside urban areas, and (possibly) *in:* *a) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *b) Core areas in biosphere reserves;* *c) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve;*

	Activity 12	The clearance of an area of 300 square metres or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation *a) within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;* *b) Within critical biodiversity areas identified in bioregional plans*
	Activity 13	The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required for: 1) The undertaking of a linear activity falling below the thresholds mentioned in Listing Notice 1. a) Critical biodiversity areas and ecological support areas as identified in systematic biodiversity plans adopted by the competent authority. *i) Outside urban areas, the following:* Areas within10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve;
	Activity 14	The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation (a) in the Northern Cape*...(i) all areas outside urban areas.*
	Activity 19	There are some existing roads that may require upgrading (widening more than 4 metres and/or lengthening by more than 1 kilometre) in line with the relevant roads Authority requirements in order to facilitate the transportation of the Wind turbine component and associated construction material from the point of source to the site... (a) in the Northern Cape... *ii) Outside urban areas, in:* *d) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *e) Core areas in biosphere reserves;* *f) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other*

		protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve;

1.7.3 National Heritage Resources Act No. 25 of 1999

This Act requires all developers to undertake archaeological impact studies whenever any type of development activity is undertaken. Preliminary archaeological impact studies will consequently become a common procedure for all development activities, even if such development may be exempted in terms of the NEMA.

The law ensures community participation in the protection of national heritage resources and will involve all three levels of government in the management of the country's national heritage. The South African Heritage Resources Agency (SAHRA) will establish and maintain a national policy, strategy plans and standards for heritage resources management and will monitor the system as a whole.

Heritage authorities will assist and co-operate with individuals and organisations concerned with the study, the conservation, promotion and utilisation of national heritage resources. A newly established National Heritage Resources Fund will provide financial assistance for heritage projects.

A heritage assessment has been conducted to explore how the proposed development may impact on heritage resources as protected by the Act.

1.7.4 National Water Act No. 36 of 1998

The National Water Act (NWA) No 36 of 1998 was promulgated on the 20th August 1998. This Act is important in that it provides a framework to protect water resources against over exploitation and to ensure that there is water for social and economic development, human needs and to meet the needs of the aquatic environment. The Act also recognises that water belongs to the whole nation for the benefit of all people.

It is important to note that water resources are protected under the Act. Under the act, water resources as defined include a watercourse, surface water, estuary or aquifer. A watercourse is defined as a river or spring, a natural channel in which water flows regularly or intermittently, or a wetland, lake or dam into which, or from which water flows.

One of the main aims of the Act is the protection of water resources. 'Protection' in relation to a water resource entails:

- Maintenance of the quality of the water resource to the extent that the water use may be used in a sustainable way;
- Prevention of degradation of the water resource
- The rehabilitation of the water resource

In the context of the proposed development and any potential impact on water resources, the definition of pollution and pollution prevention contained within the Act is relevant. 'Pollution', as described by the Act is the direct or indirect alteration of the physical, chemical or biological properties of a water resource, so as to make it (*inter alia*):

- less fit for any beneficial purpose for which it may reasonably be expected to be used; or
- harmful or potentially harmful to the welfare or human beings, to any aquatic or non-aquatic organisms, or to the resource quality.

This definition of pollution is quite wide ranging, and it applies to all types of water resource. Activities which cause alteration of the biological properties of a watercourse (i.e. the fauna and flora contained within that watercourse are also considered pollution).

In terms of section 19 of the Act owners / managers / people occupying land on which any activity or process undertaken which causes, or is likely to cause pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring. These measures may include (inter alia):

- measures to cease, modify, or control any act or process causing the pollution;
- comply with any prescribed waste standard or management practice;
- contain or prevent the movement of pollutants;
- remedy the effects of the pollution; and
- remedy the effects of any disturbance to the bed and banks of a watercourse.

A surface water assessment has been conducted to explore how the proposed development may impact on water resources as protected by the Act.

1.7.5 Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009)

These are developed to protect both animal and plant species within the various provinces of the country which warrant protection. These may be species which are under threat or which are already considered to be endangered. The provincial environmental authorities are responsible for the issuing of permits in terms of this legislation. The Northern Cape Nature Conservation Act,

2009 (Act No. 9 of 2009) and the Nature and Environmental Conservation Ordinance 19 of 1974 are of relevance to the Northern Cape Province.

A biodiversity assessment has been conducted to explore how the proposed development may impact on biodiversity as protected by the Act.

1.7.6 National Environmental Management: Biodiversity Act No. 10 of 2004

The overarching aim of the National Environmental Management: Biodiversity Act (NEMBA) No. 10 of 2004, within the framework of NEMA, is to provide for:

- The management and conservation of biological diversity within South Africa, and of the components of such biological diversity;
- The use of indigenous biological resources in a sustainable manner; and
- The fair and equitable sharing among stakeholders of benefits arising from bio-prospecting involving indigenous biological resources.

The South African National Biodiversity Institute (SANBI) was established by the NEMBA, its purpose being (*inter alia*) to report on the status of the country's biodiversity and the conservation status of all listed threatened or protected species and ecosystems.

NEMBA provides for a range of measures to protect ecosystems and for the protection of species that are threatened or in need of protection to ensure their survival in the wild, including a prohibition on carrying out a "restricted activity" involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7. Lists of critically endangered, endangered, vulnerable and protected species have been published and a permit system for listed species has been established.

It is also appropriate to undertake a Faunal and Botanical Impact Assessment where proposed developments, in an area that is considered ecologically sensitive, require an environmental authorisation in terms of NEMA, with such Assessment taking place during the basic assessment or EIA. These two studies will be undertaken during the project.

The NEMBA is relevant to the proposed project as the construction of the wind farms and other components (such as power lines and the substations) may impact negatively on biodiversity. The project proponent is therefore required to take appropriate reasonable measures to limit the impacts on biodiversity, to obtain permits if required and to also invite SANBI to provide commentary on any documentation resulting from the proposed development.

1.7.7 National Forests Act, 1998 (Act No. 84 of 1998)

The National Forest Act (NFA), 1998 (No. 84 of 1998) was enacted to:

- Promote the sustainable management and development of forests for the benefit of all;
- Provide special measures for the protection of certain forests and trees;
- Promote the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes;
- Promote greater participation in all aspects of forestry and forest products industry by persons disadvantaged by unfair discrimination.

The NFA enforces the necessity for a license to be obtained prior to destroying any indigenous tree in a natural forest and, subject to certain exemptions, cutting, disturbing, damaging, destroying or removing any protected tree. The list of protected trees is currently contained in Government Gazette 34595, Notice Number 734 of 16 September 2011. Licenses are issued by the Minister and are subject to periods and conditions as may be stipulated.

The NFA is relevant to the proposed project as the removal and/or disturbance and/or clearance of protected vegetation may be required and a license in terms of the NFA may be required for this to be done.

1.7.8 Conservation of Agricultural Resources Act No. 43 of 1983

The Conservation of Agricultural Resources Act (CARA) No. 43 of 1983 controls the utilization of natural agricultural resources in South Africa. The Act promotes the conservation of soil, water sources and vegetation as well as the combating weeds and invader plants. The Act has been amended in part by the Abolition of Racially Based Land Measures Act, No. 108 of 1991.

The primary objective of the Act is to conserve natural agricultural resources by:

- maintaining the production potential of land;
- combating and preventing erosion and weakening or destruction of the water resources;
- protecting vegetation; and
- combating weeds and invaders plants.

The CARA is relevant to the proposed project as the construction of wind energy facilities as well as other components (such as power lines and the substations) may impact on agricultural resources and vegetation on the site. The Act prohibits the spreading of weeds and prescribes control measures that need to be complied with in order to achieve this. As such, measures will need to be taken to protect agricultural resources and prevent weeds and exotic plants from invading the site as a result of the proposed development.

An agricultural potential assessment has been conducted to explore how the proposed development may impact on the agricultural production potential of the proposed site.

1.7.9 Subdivision of Agricultural Land Act No. 70 of 1970, as amended

The Subdivision of Agricultural Land Act No. 70 of 1970 controls the subdivision of all agricultural land in South Africa; prohibiting certain actions pertaining to agricultural land. Under the Act the owner of agricultural land is required to obtain consent from the Minister of Agriculture in order to subdivide agricultural land.

The purpose of the Act is to prevent uneconomic farming units from being created and degradation of prime agricultural land. To achieve this purpose the act also regulates leasing and selling of agricultural land as well as registration of servitudes.

The Act is of relevance to the proposed development as any land within the study area that is zoned for agricultural purposes will be regulated by this Act.

Although the whole of this Act has been repealed by section 1 of the Subdivision of Agricultural Land Act Repeal Act 64 of 1998, this Repeal Act has not been implemented and no date of coming into operation has been proclaimed.
It is important to note that the implementation of this act is problematic as the Act defines 'Agricultural Land' as being any land, except land situated in the area of jurisdiction of a municipality or town council, and subsequent to the promulgation of this Act uninterrupted Municipalities have been established throughout South Africa.

1.7.10 National Road Traffic Act No. 93 of 1996, as amended

The National Road Traffic Act (NRTA) No. 93 of 1996 provides for all road traffic matters and is applied uniformly throughout South Africa. The Act enforces the necessity of registering and licensing motor vehicles. It also stipulates requirements regarding fitness of drivers and vehicles as well as making provision for the transportation of dangerous goods.

All the requirements stipulated in the NRTA will need to be complied with during the construction and operational phases of the proposed wind farm.

1.7.11 Astronomy Geographic Advantage Act No. 21 of 2007

The Astronomy Geographic Advantage Act No. 21 of 2007 provides for:

- The preservation and protection of areas that are uniquely suited for optical and radio astronomy;
- Intergovernmental cooperation and public consultation on matters concerning nationally significant astronomy advantage areas and matters connected therewith.

In terms of section 7(1) and 7(2) of this Act, the Minister declared core astronomy advantage areas on 20 August 2010 under Regulation No. 723 of Government Notice No. 33462. As such, all land within a 3 Kilometer radius of the center of the Southern African large Telescope (SALT) dome located in the Northern Cape Province, falls under the Sutherland Core Astronomy Advantage Area. The declaration also applies to the core astronomy advantage area containing the MeerKAT radio telescope and the core of the planned Square Kilometre Array (SKA) radio telescope.

Under Section 22(1) of the Act the Minister has the authority to protect the radio frequency spectrum for astronomy observations within a core or central astronomy advantage area. As such, the Minister may still under section 23(1) of the Act, declare that no person may undertake certain activities within a core or central astronomy advantage area. These activities include the construction, expansion or operation; of any fixed radio frequency interference source, facilities for the generation, transmission or distribution of electricity, or any activity capable of causing radio frequency interference or which may detrimentally influence the astronomy and scientific endeavours.

The South African SKA have been listed as a Key Stakeholder for the proposed development and comments will be sought in the context of the proposed development.

1.7.12 Additional Relevant Legislation

- Occupational Health and Safety Act No. 85 of 1993
- National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)
- National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
- Development Facilitation Act No. 67 of 1995
- Northern Cape Planning and Development Act, 1998 (Act No. 7 of 1998)

1.8 Key Development Strategies and Guidelines

1.8.1 Integrated Development Plans

An Integrated Development Plan (IDP) is defined in the Local Government: Municipal Systems Act No. 32 of 2000), as an inclusive and strategic plan that:

- Links, integrates and co-ordinates plans and takes into account proposals for the development of the municipality;
- Aligns the resources and capacity of the municipality with the implementation of the plan
- Forms the policy framework on which annual budgets must be based; and
- Is compatible with national and provincial development plans and planning requirements binding on the municipality in terms of legislation.

The main purpose of the IDP is considered the enhancement of service delivery and fighting poverty through an integrated and aligned approach between different role-players and stakeholders.

Each municipality is required to produce an IDP which would address pertinent issues relevant to their municipality. However, common concerns include municipal transformation and development, and service delivery and infrastructural development.

The Renosterberg project site falls within the Emthanjeni Local Municipality (ELM) which is located within the greater Pixley ka Seme District Municipality. In terms of the District IDP 2009-2010 for the Pixley ka Seme District Municipality the core needs in terms of electricity for the District Municipality are to:

- Provide access to electricity or alternative sources of energy to all;
- Upgrading and maintenance of the electricity network.

1.8.2 Integrated Energy Plan for the Republic of South Africa, 2003

The Integrated Energy Plan (IEP), developed by the former DME (now DMR), was formulated to address the energy demand of the country balanced with energy supply, transformation, economics and environmental considerations in concourse with available resources. One of the main objectives of the plan is to promote universal access to clean and affordable energy, with emphasis on household energy supply being co-ordinated with provincial and local integrated development programmes. Another objective is to ensure that environmental considerations in

energy supply, transformation and end use are made. This project is thus a goal in order to implement this plan.

1.9 Authority Consultation

The National Department of Environmental Affairs (DEA) is the competent authority on this project. As such an application was submitted to DEA on the 17th of August 2012. The project application was acknowledged on the 31st of August 2012. Two reference numbers were allocated to the proposed development. These include the DEA reference number 14/12/16/3/3/2/404 and the NEAS reference number DEA/EIA/0001404/2012 (Appendix 4). Authorisation was thus granted to undertake a Scoping study and submit a Scoping Report for the project. A Landowner consent letter, details of the Environmental Assessment Practitioner (EAP) and declaration of interest, a project schedule and locality map formed part of the application form and was accordingly submitted on the same date.

1.10 Project Need and Desirability

According to Eskom, the demand for electricity in South Africa has been growing at approximately 3% per annum. This growing demand, fuelled by increasing economic growth and social development within Southern Africa, is placing increasing pressure on South Africa's existing power generation capacity. Coupled with this, is the growing awareness of environmental impact, climate change and the need for sustainable development. The use of renewable energy technologies, as one of a mix of technologies needed to meet future energy consumption requirements is being investigated as part of Eskom's long-term strategic planning and research process.

As the demand for electricity grows, there is need to establish new generation capacity in South Africa within the next several years. The technologies may differ in their generation costs, state of commercial development and most importantly, suitability to the South African Environment.

The Government of South Africa has also committed to supporting the development of renewable (both solar and wind) electricity generation in order to satisfy sustainable and short term solutions to the current energy crisis.

As one of its strategies to meet future energy consumption requirements, the country is opting for the use of renewable energy technologies, which is fast becoming an important energy option for South Africa. The use of renewable energy technologies is also being investigated as part of Eskom's long-term strategic planning and research process as one of a mix of technologies

needed to meet future energy consumption requirements. It is within this context that RWEC and the IDC plan to establish a wind farm near De Aar, Northern Cape Province.

According to the wind potential layer, developed by Environomics and MetroGIS (2011) for the Strategic Environmental Framework for the Optimal Location of Wind Farms in the Coastal Provinces of South Africa (Phase 1 for REFIT 1) (Figure 4), large parts of the Northern Cape region of South Africa have the highest suitability for the selection of wind farm sites. Hence, the Northern Cape can in general be seen as ideal for the establishment of wind farms. It must be remembered that wind energy is plentiful, renewable, widely distributed, clean and reduces greenhouse gas emissions when it displaces fossil-fuel derived from electricity. In this light, renewable wind energy can be seen as desirable.

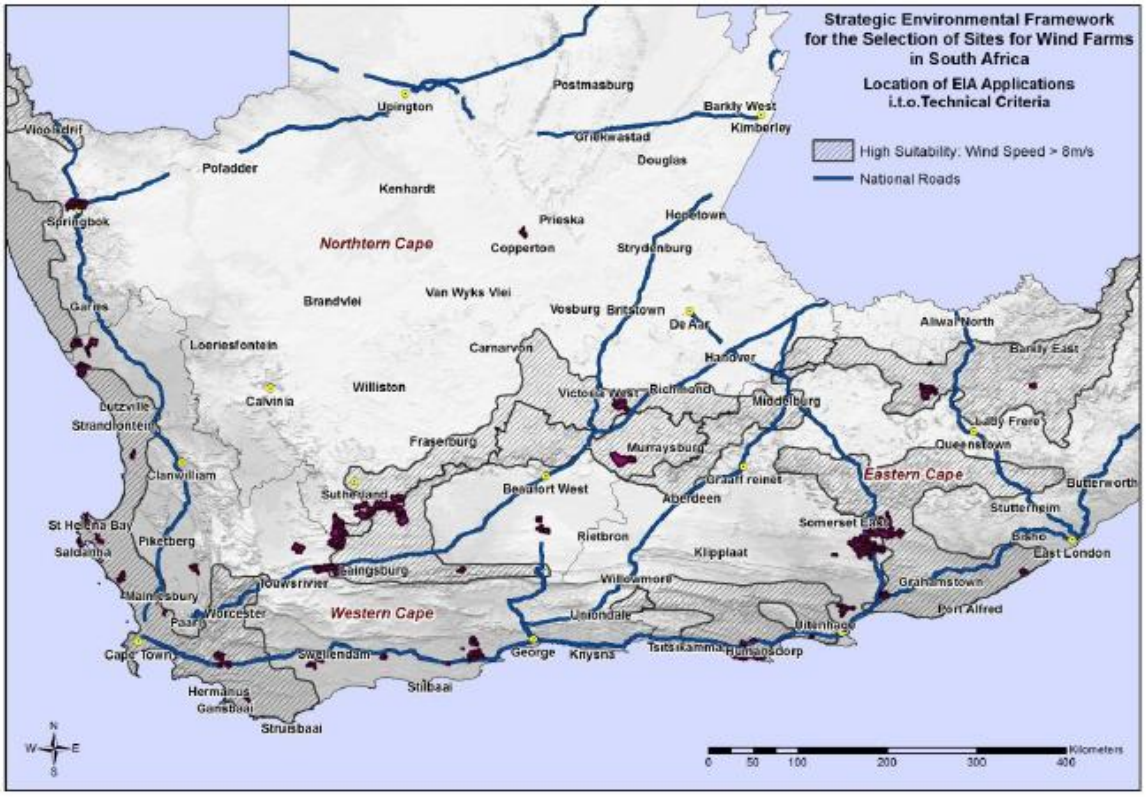


Figure 4: Wind Potential Map (Source: Environomics and MetroGIS, 2011).

1.10.1 Research Supporting Wind Energy

South Africa has abundant reserves of wind and solar energy resources. Electricity generated by means of wind power can provide the country with secure, reliable and clean sources of power while stimulating economic growth and job creation. A recent technical study carried out by Mainstream's Energy Analysis Group confirms SA has potential to generate over 70 000MWs of

wind energy or 42% of the country's forecast total electricity demand for 2025. This research also showed that if 30GW of wind energy were installed, the industry would be able to provide 9GW of power (at a conservative 30% capacity factor) and of this 6GW would be base load, supplied at exactly the times when the country needed it most.

South Africa has a growing energy intensive economy, highly reliant on fossil fuels. 93% from coal fired power plants. SA currently has 44 157MWs of power generation capacity installed, with 248 Terawatt hours of electricity consumed annually. Current forecasts by 2025 indicate that SA will need almost twice today's electricity demand, doubling to approximately 80 000MWs. The generation of electricity from wind energy can contribute substantially to meeting this demand.

1.10.2 Security of Power Supply

In the period immediately after the supply shortage and 2007 / 2008 power blackouts, Eskom announced a number of new power generation facilities including new coal-fired power stations, refurbishment of mothballed stations and oil, diesel or gas powered turbines in order to ensure appropriate supply and the needed reserve margin. In the intervening period several of these projects have experienced delays as the economic recession has lead to reductions in demand pressure. However, with possible recovery looming, the situation may change in 2010 / 2011 and demand growth may resume. Short to medium term electricity supply security is instrumental in securing economic growth and investor confidence (HIS Global Insight, 2009).

The project has the potential of "securing" economic activity by assisting in removing supply constraints if Eskom generation activities result in a supply shortfall. When supply is constrained it represents a limitation to economic growth. When a supply reserve is available, it represents an opportunity for economic growth.

The project will contribute to local economic progress by supporting industry development in line with provincial and regional goals and ensuring advanced skills are drawn to the Northern Cape. The project will likely encounter widespread support from government, civil society and businesses, all of whom see potential opportunities for revenues, employment and business opportunities locally.

1.10.3 Local Employment

According to the Census Survey (2001), seventy three percent (73%) of the eligible workforce of the Emthanjeni Local Municipality (ELM) reside in De Aar, with 57% of those eligible workers, being unemployed. Hence, a large proportion of the population with the ELM do have jobs.

From a more local perspective, the main hub within Ward 6 of the ELM, is De Aar. De Aar is the nearest town in relation to the proposed development. It has a population of around 45,857 inhabitants, and is the second-most important railway junction in the country - situated on the line between Cape Town and Kimberley. Of the total population of 11158 people in 2001, 22% were employed while 13% were unemployed. Demographic and employment data for Ward 6 suggest that the population of the Ward in 2001 was largely not of working age, as approximately 65% of the total Ward population was not categorised as employed or unemployed. Therefore it can be assumed that approximately one third of those of working age do not have jobs.

At 41%, farming accounted for the vast majority of employment in Ward 6 in 2001, followed by social services (18%) and trade and construction with 10% each. The remaining employment categories range between 2% and 5%, with the exception of mining which accounted for less than 1% of the employed population of Ward 6 in 2001.

Given the information above, local development in De Aar may help to raise employment rates in the construction sector by providing income to the unemployed local community. It is within this context that the proposed wind farm can aid unemployment in the local area.

1.10.4 Facts Justifying Wind Energy

Wind is an internationally tried and tested highly reliable form of power generation. It is also the fastest growing form of power generation in the world with 150 000+ MWs installed globally and this is forecast to increase by more than 30 000 MWs each year over the next decade. In 2008, more wind energy capacity was installed in Europe and the US than any other form of power.

- Renewable energy reduces electricity generation costs

SA has some of the most highly subsidised electricity in the world. Diversifying a country's portfolio of generation plants leads to lower overall generation cost. Everywhere wind power has been introduced it has reduced the long term price of electricity and has helped stabilise the price volatility of fossil fuels. It is seen as the cornerstone of German, British, Danish, and Spanish generation.

- Renewable energy reduces fossil fuel prices

Increased levels of renewable energy generation on an electricity system lowers the demand for coal, oil & gas, reducing the price of these commodities and ultimately the cost of electricity.

- Renewable energy decreases greenhouse gas emissions

SA is currently the 12th largest polluter in the world and the largest in Africa. Renewable energy reduces carbon emissions, resulting in avoidable costs to the economy in terms of global obligations and the domestic social and economic impacts of such emissions.

- Renewable energy increases water availability

Agricultural & economic yield is increased due to an increased availability of water resources that would have alternatively been used for coal-fired power generation. Eskom currently uses 1400 Litres of water per 1000 kWh of energy produced.

- Renewable energy creates jobs

Large-scale renewable energy deployment creates significant employment in the development, construction and operation of the wind farms, significantly contributing to rural development, transferring skills and knowledge from abroad and enhancing a domestic manufacturing supply chain.

- Renewable energy aids grid stability

In certain areas, particularly in the south of the country, renewable energy aids grid stability.

1.11 Objectives of the Scoping Phase

The NEMA EIA Regulations (Government Notice. R. 543) states that the objectives of a Scoping study are to identify:

- 27 (e) (i): issues that will be relevant for consideration of the application;
- 27 (e) (ii): the potential environmental impact of the proposed activity; and
- 27 (e) (iii): alternatives to the proposed activity that are feasible and reasonable.

The primary purpose of the Scoping phase is to establish baseline information with regards to the environment within which the project is proposed to take place and to determine feasible and reasonable alternatives associated with the activities. In this context the environment is taken to include the natural, cultural, social and economic environments, with baseline information being the current conditions of the various environments. Various specialists have undertaken studies to ascertain the current conditions in the study area in their specific field, all of which is done within the framework of the project description.

Having established the baseline information, specialists are then required to identify possible impacts of the proposed development on the specific environment that their field encompasses. These potential impacts are set out in several tables below. Note that the impacts detailed in the tables are provisional and additional impacts may be identified during the Environmental Assessment phase, while other identified impacts may fall away.

An additional objective of the scoping phase is to provide Interested and Affected Parties (I&APs) with information regarding the project and also the opportunity to raise issues regarding the

project, submit comments and ask questions. The Public Participation Process (PPP) undertaken during the Scoping phase is also reported on below. The PPP section provides details on the greater process as well as lists comments and concerns raised by I&APs.

2 DESCRIPTION OF THE RECEIVING ENVIRONMENT

The Northern Cape Province is considered to be one of the most suitable regions for the establishment of wind farms. Accordingly, land portions located near De Aar have been identified as a potential site. A general description of the study area is outlined in the section below. The receiving environment in relation to each specialists study is also provided. A site visit was undertaken in June 2012 by selected members of the SiVEST specialist team.

2.1 Regional Locality

The proposed development site is situated within the Emthanjeni Local Municipality in the greater Pixley ka Seme District Municipality, Northern Cape Province. (Figure 5). The Renosterberg wind farm site is located approximately 20km north of the town of De Aar. De Aar can be found approximately 50 km to the east of Britstown, approximately 60km north west of Hanover and approximately 105km to the west of Colesberg The Renosterberg wind farm site is situated to the west of the R388.

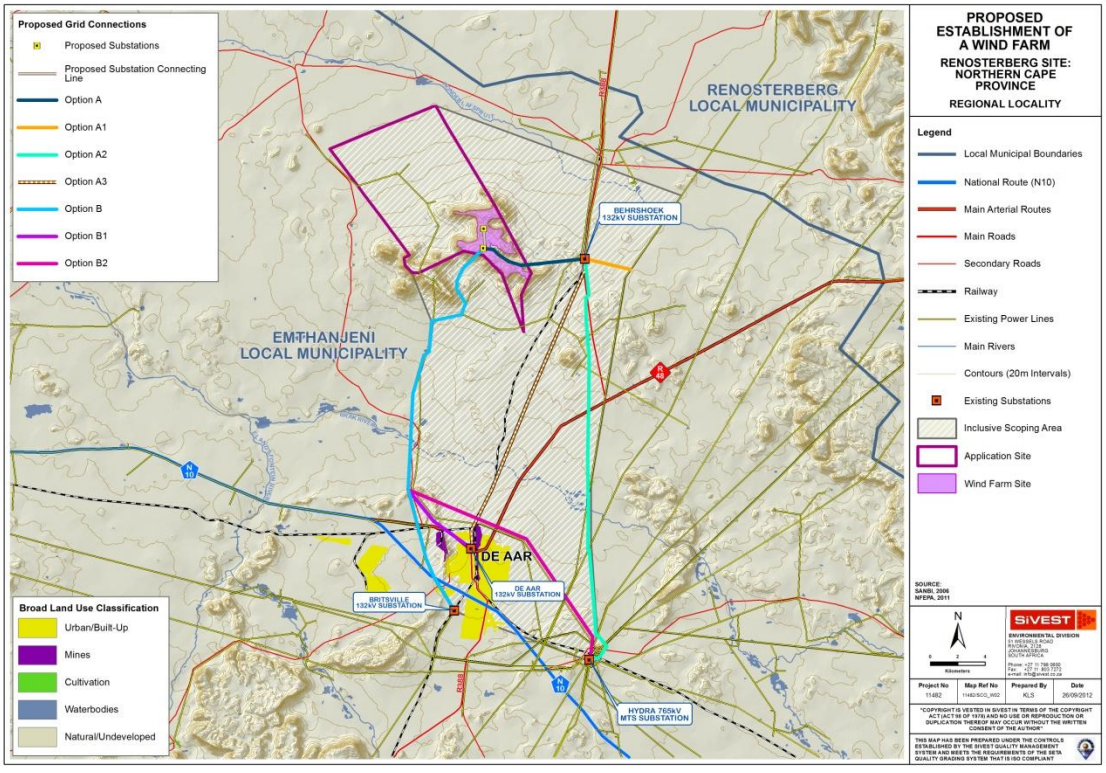


Figure 5: Renosterberg Regional Study Area.

Please note that all maps which are included in Appendix 5 are in A3 format.

2.2 Study Site Description

The sites that are proposed for the wind farm near De Aar are located on the following farms:

- Portion 1 of the Farm Blaauwbosch Dam 103 (± 850 hectares);
- Portion 2 of the Farm Blaauwbosch Dam 103 (± 888 hectares);
- Portion 3 of the Farm Blaauwbosch Dam 103 (± 2 277 hectares);
- Portion 4 of the Farm Blaauwbosch Dam 103 (± 937 hectares);
- Portion 5 of the Farm Blaauwbosch Dam 103 (± 411 hectares);
- Remainder of the Farm Blaauwbosch Dam103 (1 356 hectares);
- Rhenosterberg 141 (± 988 hectares);
- Portion 1 of the Farm Rhenosterberg 141 (± 252 hectares);
- Portion 1 of the Farm Gemsbok Dam 81 (± 57 hectares).

The total area of the wind farm project site is 8065.754ha in size.

2.3 Topography

The topography (Figure 6) of the broader landscape to the northwest of De Aar consists of predominantly flat lowlands with a few flat-topped hills or 'mesas' scattered throughout the landscape. Lowlands characterise most of the study area with the Renosterberg plateau found to the southeast. These lowland areas slope from the southeast to the northwest through an altitudinal range of between 1240-1400m above sea level (asl) reaching the lowest point in the north-western corner of the study site. The plateau areas of the Renosterberg have an altitudinal range varying from approximately 1400 to1630m asl. Furthermore, the ENPAT (Environmental Potential Atlas) database shows that there are relatively steep areas representing the Renosterberg plateau slopes. Consequently the study site displays areas of variable gradient ranging from areas with 0-9%, 9-15% and 15-25% slopes (Figure 7).

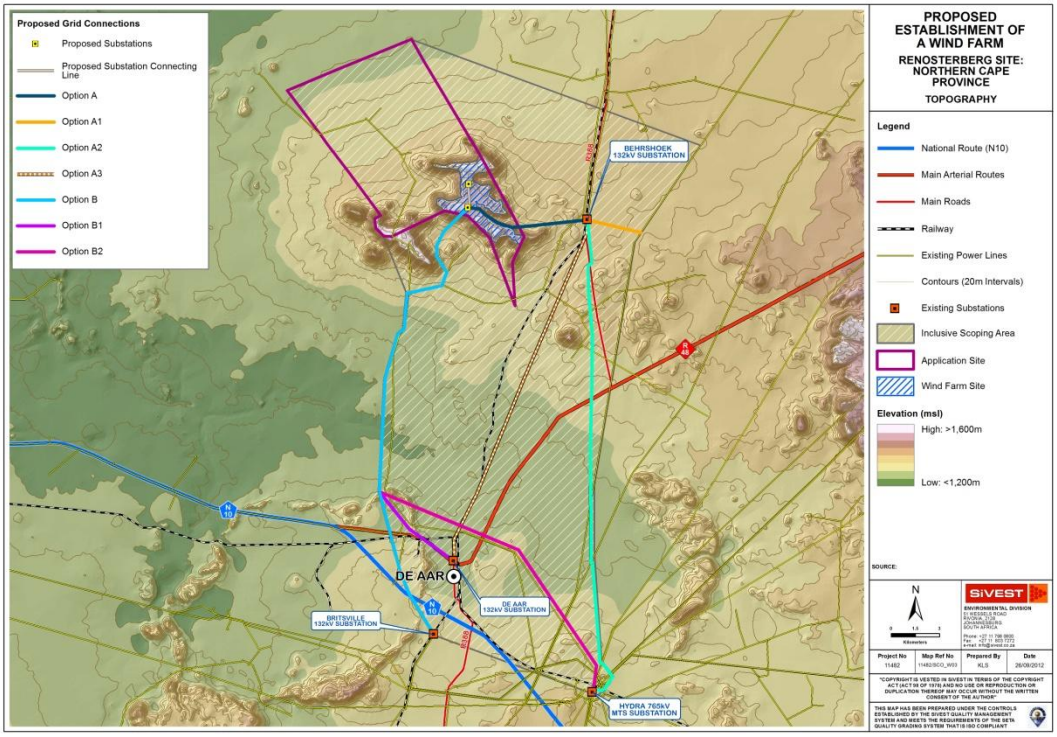


Figure 6: Topography of the study area.

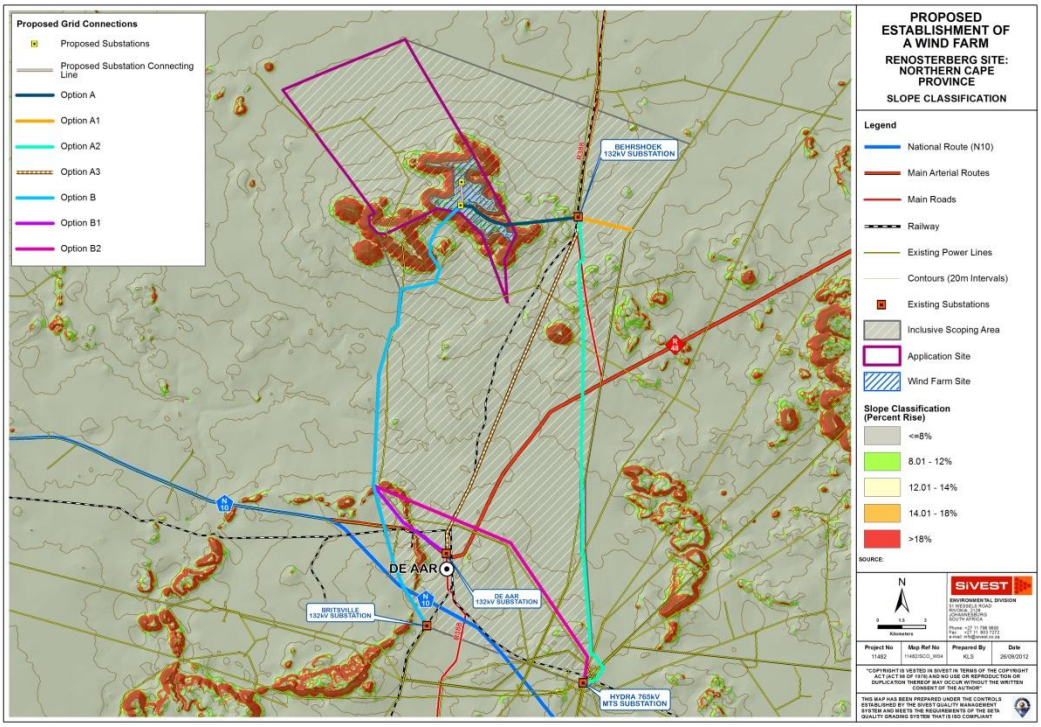


Figure 7: Degree of slope in region of the study area.

2.4 Geology

The geology of the study area can be described as being underlain by flat-lying sedimentary rocks of the Karoo Supergroup. These sedimentary rocks are intruded by innumerable dolerite sills and dykes (Partridge *et al*., 2010). The overlying soils vary from shallow to deep, and range from red-yellow apedal, freely draining soils to very shallow Glenrosa and Mispah forms (Mucina and Rutherford, 2006). Calcrete soils are also prevalent as a result of the climatic conditions and underlying parent material.

2.5 Land use

The primary land use in the greater De Aar area is commercial stock farming mainly with cattle and sheep, and sometimes goats. A number of game farms are also found in the district. The predominant land use class around the study area is natural/undeveloped land (Figure 8).

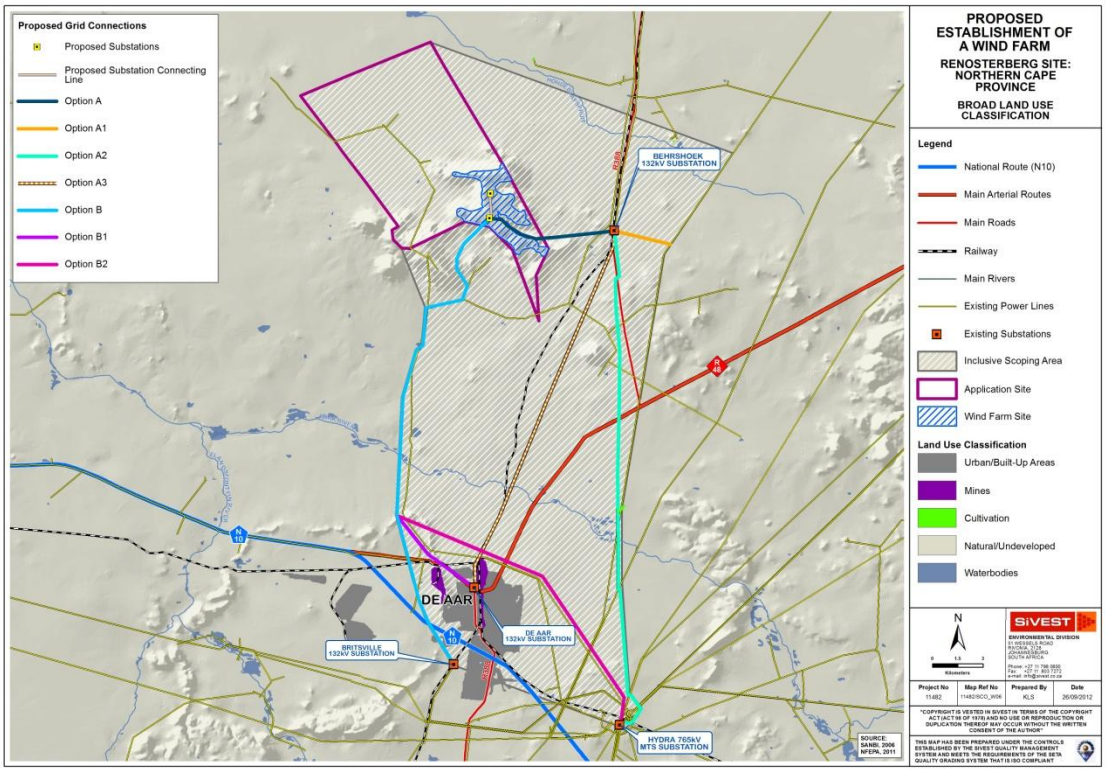


Figure 8: Land use in the region of the study area.

2.6 Climate

The study area has a semi-arid continental climate with a summer rainfall regime i.e. most of the rainfall is confined to summer and early autumn. Mean annual precipitation (MAP) is approximately 300mm per year (Figure 5). De Aar typically experiences hot days and cold nights (Table 1 and Figure 10) with the highest maximum temperature of 40°C having been recorded in January and the lowest minimum temperature of - 8 °C recorded in July and August (Table 3).

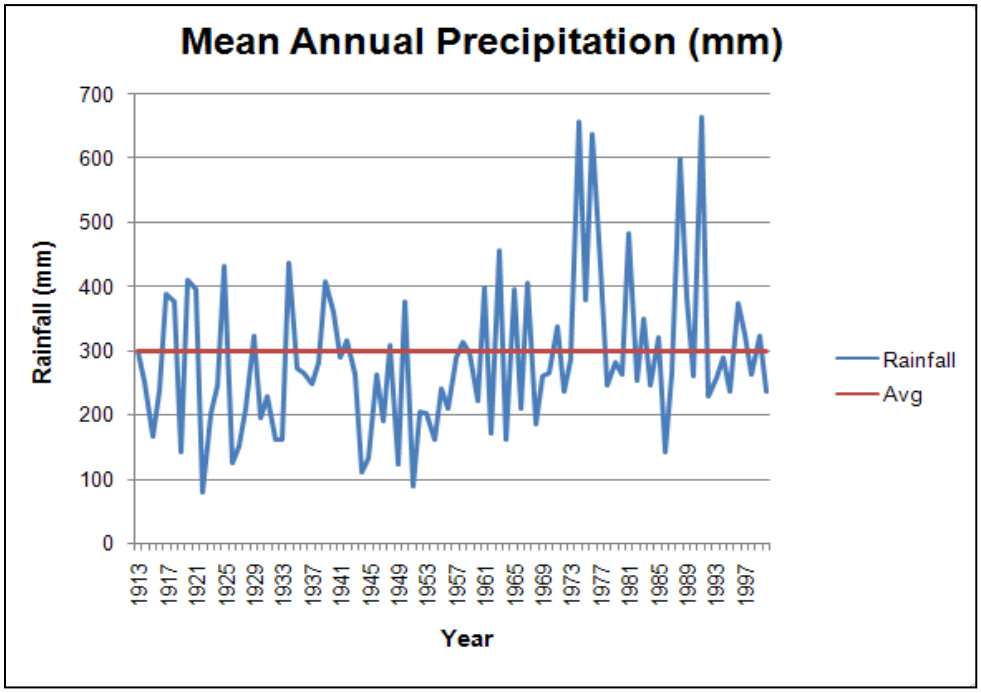


Figure 9: Mean annual rainfall for De Aar (1913 - 1998) (SAWS, 2010)

Table 3: Monthly temperature table for De Aar (SAWS, 2010)

Month	Temperature (°C) (1961 – 1990)			
	Highest Recorded	Average Daily Maximum	Average Daily Minimum	Lowest Recorded
January	40	32	16	7
February	38	31	15	4
March	37	28	13	1
April	34	24	9	-1
May	30	20	4	-5
June	26	16	1	-7

July	25	17	1	-8
August	28	19	2	-8
September	35	23	6	-5
October	36	26	9	-3
November	38	29	12	-1
December	39	31	14	3
Year	**40**	**25**	**9**	**-8**

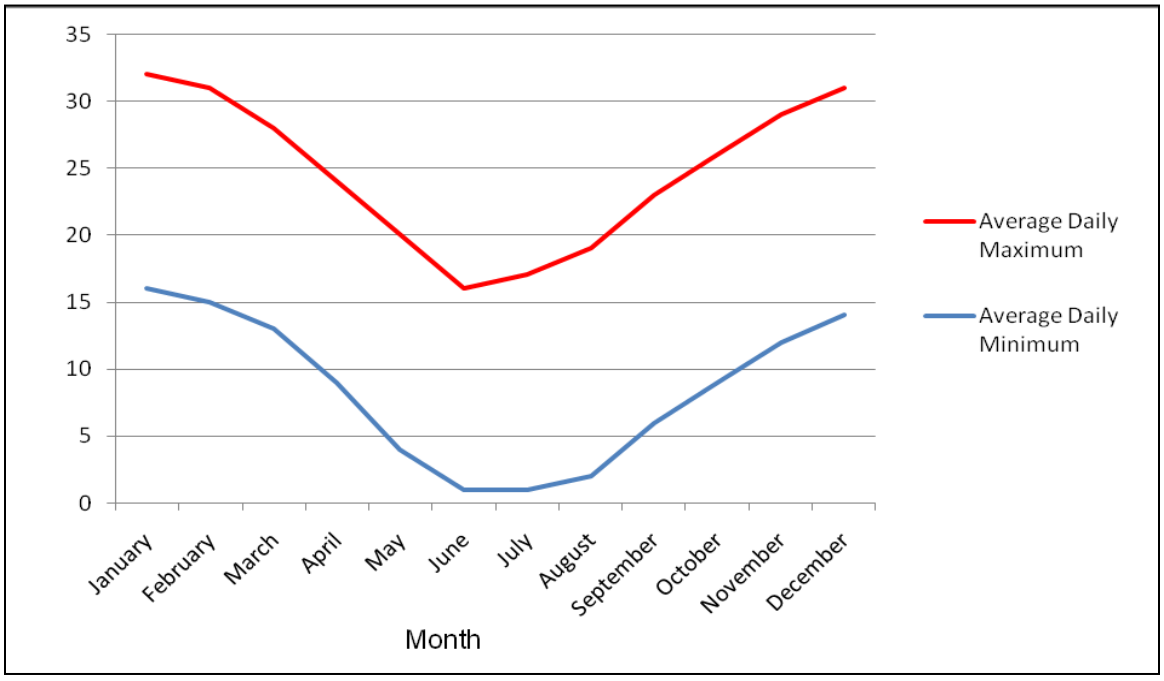


Figure 10: Average daily minimum and maximum temperatures for De Aar (SAWS, 2010)

2.7 Biodiversity (Flora & Fauna)

The Biodiversity Assessment was conducted by SiVEST and reviewed by Dr Helga Van Der Merwe (Appendix 6A). The environmental baseline from a biodiversity perspective is presented below. The ultimate aim of the study was to determine potential impacts of the proposed project on fauna and flora, with special attention given to Red Data species. The findings of this report are based on desk top assessments rather than field verification which will commence in the next phase of the environmental application process.

2.7.1 Vegetation

According to Mucina and Rutherford (2006) the proposed site falls within two bioregions namely, the Upper Karoo Bioregion (Nama Karoo Biome) and the Dry Highveld Grassland Bioregion (Grassland Biome). Two vegetation types are found in the area and include the Northern Upper Karoo (Nku3) and Besemkaree Koppies Shrubland (Gh4) vegetation types. In terms of the conservation status, both vegetation types are considered as Least Threatened (Mucina and Rutherford, 2006).

2.7.2 Habitats

Faunal populations are dependent on the flora and associated habitats that support them. Therefore assumptions regarding the presence of fauna can be made based on the flora and habitats present in the area. The numerous drainage systems and a few wetlands within the site could potentially provide habitat for amphibian and other aquatic species. Various other habitats present such as rocky ridges, could potentially provide habitat for various small mammal as well as reptile species. This aspect will be investigated in more detail during the EIA phase.

2.7.3 Transformation

The Northern Upper Karoo (Nku3) vegetation type has been transformed with about 4% of the vegetation type cleared for cultivation or irreversibly transformed by building dams. Erosion is moderate (46.2%), very low (32%) and low (20%) according to Mucina and Rutherford (2006). About 3% of the Besemkaree Koppies shrubland (Gh4) has been lost through the building of dams while erosion is moderate (68%), high (20%) and low (10%), (Mucina and Rutherford, 2006).

2.7.4 Flora of the Study Area

Two vegetation types are found in the study area (Figure 11) namely, the Northern Upper Karoo (Nku3) and the Besemkaree Koppies Shrubland (Gh4), (Mucina and Rutherford, 2006).

Vegetation type Nku3, Northern Upper Karoo, is dominated by small trees including *Acacia mellifera* subsp. *detinens*, *Boscia albitrunca;* tall shrubs such as *Lycium cinereum, L. oxycarpum* and *Rhigozum trichotomum;* low shrubs namely *Chrysocoma ciliata*, *Gnidia polycephala* and *Pentzia calcarea*; succulent shrubs including *Hertia pallens, Salsola calluna* and *S. glabrescens*; and geophytic herbs, for example, *Moraea pallid*. Endemic taxa found within this vegetation type

include *Lithops hookeri* and *Stomatium pluridens*, *Atriplex spongiosa*, *Galenia exigua*, *Manulea deserticola*. The vegetation unit is considered Least Threatened. None of the vegetation has been conserved in statutory conservation areas. Approximately 4% has been cleared for cultivation or transformed by the building of dams.

The Besemkaree Koppies Shrubland is dominated small trees such as *Cussonia paniculata* and *Ziziphus mucronata*; tall shrubs namely *Diospyros austro-africana*, *Euclea crispa* subsp. *ovata*, *Olea europaea* subsp. *africana* and *Rhus burchellii*; low shrubs include *Asparagus suaveolens*, *Chrysocoma ciliata*, *Amphiglossa triflora* and succulent shrubs for example, *Aloe broomii* and *Chasmatophyllum musculinum* (Mucina and Rutherford, 2006). Endemic species include *Euphorbia crassipes*, *Neohenricia sibettii* and *N. spiculata* (Mucina and Rutherford, 2006). The vegetation unit is considered Least Threatened with about 5% conserved in statutory conservation areas. Approximately 3% has been transformed due to the building of dams.

A list of plant species that could possibly occur in the study area including their IUCN Red Data status, CITES listing and protection status according to the Northern Cape Nature Conservation Act are presented in the specialist Biodiversity report contained in Appendix 6A (See Appendix I in the Biodiviersity Report). Table 2 summarises the species of conservation significance that could possibly occur in the study area. These species are listed as Least Concern in the IUCN Red Data list however, they are listed by the Northern Cape Nature Conservation Act (NCNCA) as having a protected status and one species is listed the specialist Biodiversity report contained in Appendix 6A (See Appendix II in the Biodiviersity Report) of CITES.

Table 4: Flora species of conservation significance that could potentially occur in the study area

Family	Species	Red Data status	NCNCA status	CITES
Mesembryanthemaceae	*Drosanthemum lique*	LC	Protected	
Euphorbiaceae	*Euphorbia rectirama*	LC	Protected	II
Aizoaceae	*Galenia africana*	LC	Protected	
Scrophulariaceae	*Jamesbrittenia atropurpurea* subsp. *atropurpurea*	LC	Protected	
Iridaceae	*Moraea polystachya*	LC	Protected	
Oxalidaceae	*Oxalis depressa*	LC	Protected	
Mesembryanthemaceae	*Psilocaulon coriarium*	LC	Protected	
Mesembryanthemaceae	*Ruschia intricata*	LC	Protected	
Iridaceae	*Syringodea concolor*	LC	Protected	
Aizoaceae	*Tetragonia arbuscula*	LC	Protected	

According to Esler *et al.,* (2006), vegetation cover to be expected in the study area ranges from 20% to 40% on average. It's important to note that this average percentage cover estimate does not apply to large drainage lines as such areas receive additional runoff water. Vegetation cover refers to the percentage of soil overshadowed by plants (Esler *et al.,* 2006).

According to the Northern Cape Nature Conservation Act, no person may pick, import, export, cultivate or trade in, a specimen of a protected plant without a permit. Thus the relevant permits must be obtained from the permit section of the Department of Environment and Nature Conservation in the Northern Cape prior to construction. All other flora species listed in the appendix 1 of this report are considered as 'indigenous species' for which the relevant permits must be obtained from the permit section of the Department of Environment and Nature Conservation in the Northern Cape prior to construction.

Additionally, if tree species listed as protected by the National Forests Act (Act 84 of 1998) are found on the site, the necessary permits will have to be obtained in order for individual trees to be disturbed or destroyed.

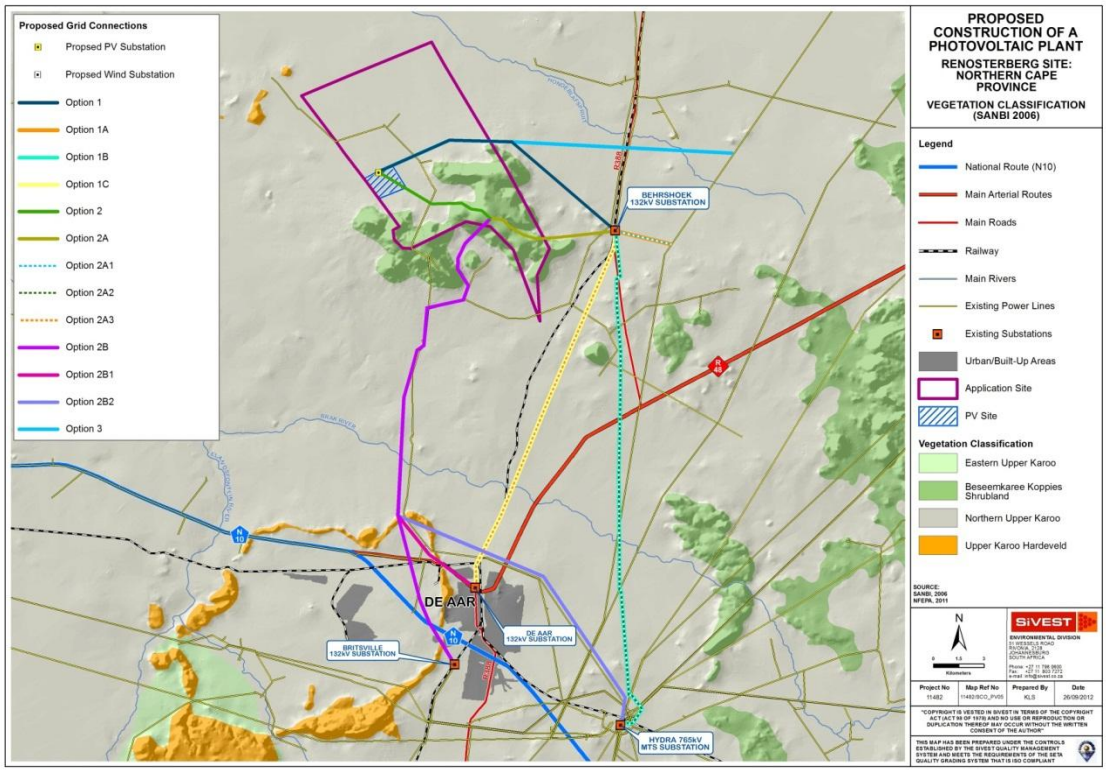


Figure 11: Vegetation of the study area

- Potential impacts

A number of potential impacts are associated with the construction of the proposed solar power facility. Clearing of the natural vegetation for the construction of the solar facility and associated infrastructure will result in a loss of natural vegetation and associated habitats. This can also result in habitat fragmentation due to the loss of ecological corridors which may be present across the site. The clearing and/or disturbance of the natural vegetation could also result in an increase in exotic species establishing in the study area.

2.7.5 Fauna of the Study Area

Friedman and Daly (2004) list several red data mammal species that could potentially occur in the study area. Species such as the Black Rhinoceros (*Diceros bicornis bicornis*) and Riverine Rabbit *(Bunolagus monticularis)* which are listed as Critically Endangered; the Brown Hyaena (*Hyaena brunnea*) and Honey Badger *(Mellivora capensis)* which are listed as Near Threatened as well as several other recorded large mammal species are not likely to occur in the study area. This is due to anthropogenic activities such as stock farming and the associated fencing that have taken place over many years.

Amphibians could potentially occur in the study area however these are likely to be present near or within wetlands and drainage systems. The Giant Bullfrog (*Pyxicephalus adspersus*), for example, is a Red Data species that could possibly occur in the study area and is considered to be Near Threatened as its specialised habitat is at risk from increasing urbanisation and agricultural activity (Du Preez and Carruthers, 2009).

Several reptile species are likely to be present and these potentially occurring species are listed below.

Invertebrate species will be present in the study area and a further investigation of invertebrates will be undertaken during the EIA phase of this project.

It should be noted that a separate avifauna report will be compiled by an avifauna specialist and will form part of the entire environmental impact assessment.

2.7.6 Faunal assemblages

- Mammals

Various mammal species occur within the study area. The specialist Biodiversity report contained in Appendix 6A (See Appendix 2 in the Biodiviersity Report) includes a list of mammals that could potentially occur in study area and an indication of their conservation status. A map was used to correlate the occurrence of the Red Data species with their approximate occurrence within the study area. According to Friedman & Daly (2004), the majority of species within the study area are listed as species of Least Concern (LC). However, a few species are listed as Critically Endangered (CE) and Near Threatened (NT), (Table 5).

Table 5: Near Threatened and Critically Endangered species that could potentially occur in the study area (IUCN Red data status, downloaded 26 September 2012)

Common name	Scientific name	IUCN status
Riverine Rabbit	*Bunolagus monticularis*	CE
Lesueur's Wing-gland Bat	*Cistugo lesueuri*	LC
Black Rhino	*Diceros bicornis bicornis*	CE
Brown Hyaena	*Hyaena brunnea*	NT
Honey Badger	*Mellivora capensis*	LC
Littledale's Whistling Rat	*Parotomys littledalei*	LC
Geoffroy's Horseshoe Bat	*Rhinolophus clivosus*	LC

It is however important to note that the larger mammal species such as *D. bicornis bicornis* and *H. brunnea* that could potentially occur in the study area are no longer present and these species are usually restricted to protected areas. Furthermore, a number of mammal species that could potentially occur in the study area are listed as specially protected species, protected species and common indigenous species in terms of Northern Cape Nature Conservation Act (Act 9 of 2009). A detailed table is presented in Appendix 2 of this report.

In terms of the National Environmental Management: Biodiversity Act, 2004, GN 1187 several mammal species are considered Protected, Vulnerable, Endangered and Critically Endangered (Table 6).

Table 6: Protected, Vulnerable, Endangered and Critically Endangered species that could potentially occur in the study area in terms of NEMBA, GN 1187, December 2007

Common name	Scientific name	Status in terms of NEMBA, GN 1187, December 2007
Cape Clawless Otter	*Aonyx capensis*	Protected
Riverine Rabbit	*Bunolagus monticularis*	Critically Endangered
Black Wildebeest	*Connochaetes gnou*	Protected
Black Rhino	*Diceros bicornis bicornis*	Endangered
Brown Hyaena	*Hyaena brunnea*	Protected
Honey Badger	*Mellivora capensis*	Protected
Leopard	*Panthera pardus*	Vulnerable
Cape Fox	*Vulpes chama*	Protected

- Potential impacts

The proposed solar power facility will result in the destruction of various habitats available to mammal species and could provide potentially new habitats for other species (indigenous and/or exotic). This will be further investigated during the EIA phase.

- Amphibians

Suitable habitat for amphibian species is potentially present in the study area. Apart from the Giant Bullfrog (*Pyxicephalus adspersus*) which is considered Near Threatened (Du Preez and Carruthers 2009) and as Least Concern by the IUCN Red List (downloaded 26 September 2012), all other amphibian species that could potentially occur in the study area are Not Threatened (Table 7). *Pyxicephalus adspersus* breeds in seasonal shallow grassy pans, vleis and other rain filled depressions in open flat areas of grassland or savannah (Du Preez and Carruthers 2009).

Table 7: Amphibian species that could potentially occur in the study area

Common name	Scientific name	Du Preez and Carruthers, 2009
Common River Frog	*Amietia angolensis*	Not Threatened
Cape River Frog	*Amietia fucsigula*	Not Threatened
Gutteral Toad	*Amietophrynus gutturalis*	Not Threatened
Bushveld Rain Frog	*Breviceps adspersus*	Not Threatened
Boettger's Caco	*Cacosternum boettgeri*	Not Threatened
Bubbling Kassina	*Kassina senegalensis*	Not Threatened
Southern Pygmy Toad	*Poyntonophrynus vertebralis*	Not Threatened
Giant Bull Frog	*Pyxicephalus adspersus*	Near Threatened
Clicking Stream Frog	*Strongylopus grayii*	Not Threatened
Tremolo Sand Frog	*Tomopterna cryptotis*	Not Threatened

Common name	Scientific name	Du Preez and Carruthers, 2009
Tandy's Sand Frog	*Tomopterna tandyi*	Not Threatened
Karoo Toad	*Vandijkophrynus gariepensis*	Not Threatened
Common Platanna	*Xenopus laevis*	Not Threatened

Pyxicephalus adspersus is considered a protected species in terms of the National Environmental Management: Biodiversity Act, 2004, GN 1187 and specially protected species in terms of Northern Cape Nature Conservation Act (Act 9 of 2009).

According to Cook (2012), *P. adspersus* is the largest Southern African frog and the second largest frog in the world, with adult males reaching over 250mm in body length and weighing well over a kilogram. Bullfrogs emerge after the first heavy summer rains to breed and feed. Giant Bullfrogs occur over large areas but are rarely seen (Cook, 2012). They spend the majority of their lives underground in a dormant state known as aestivation (Cook, 2012). During this dormant period, bullfrogs remain inactive in a water proof “cocoon” composed of several layers of its own sloughed-off skin (Cook, 2012). The entire body except for the nostrils are covered by the protective cocoon. The cocoon prevents water loss (evaporation) during the dry periods. Bullfrogs can remain buried in their cocoons for several years before they emerge (Cook, 2012).

Large-scale adult emergences occur after heavy summer downpours and adults breed explosively during daylight hours in shallow margins of temporary rain-filled depressions. Bullfrogs require these shallow seasonal habitats to breed successfully in as the eggs are fertilised externally (Cook 2012). A typical breeding pond will contain numerous adult males who aggressively defend a small territory from other intruding male bullfrogs. This ensures that the largest, strongest males are able to defend the best breeding areas around the pan (Cook *et al*. 1996; Cook 2012).

A detailed *P. adspersus* habitat assessment will be undertaken during the EIA phase of this project. The assessment will specifically focus on the availability of suitable breeding habitat as well as suitable dispersal and foraging habitats.

All other amphibian species in Table 7 above are categorised as protected species by the Northern Cape Nature Conservation Act (Act 9 of 2009) and detailed habitat assessments will be undertaken during the EIA phase.

- Potential impacts

The construction of the proposed solar power facility could result in the habitat destruction of various amphibian species if such suitable habitats exist within the proposed development area.

- Reptiles

Several reptile species could potentially occur (Table 6) in the study area. According to the South African Red Data Book of Reptiles and Amphibians (Branch 1988) Fisk's House Snake *(Lamprophis fiskii)* is listed as a rare species. However, this species is listed by the IUCN Red List of Threatened Species as Data Deficient (DD), (downloaded 26 September 2012).

Habitat for various reptile species is currently available on the proposed site and the species most likely to occur on the site are listed in Table 6.

Table 8: Reptile species that potentially occur in the study area

Common name	**Scientific name**	**Northern Cape Nature Conservation Act (Act 9 of 2009)**
Ground Agama	*Agama aculeata aculeata*	Protected species
Anchieta's Agama	*Agama anchietae*	Protected species
Southern Rock Agama	*Agama atra atra*	Protected species
Spiny Agama	*Agama hispida hispida*	Protected species
Coral Snake	*Aspidelaps lubricus lubricus*	Common indigenous
Puff Adder	*Bitis arientans*	Common indigenous
Horned Adder	*Bitis caudalis*	Common indigenous
Karoo Dwarf Chamaeleon	*Bradypodion karroicum*	Specially protected
Namaqua Chamaeleon	*Chamaeleo namaquensis*	Specially protected
Giant Ground Gecko	*Chondrodactylus anglifer angulifer*	Protected species
Cape Girdled Lizard	*Cordylus cordylus cordylus*	Specially protected
Karoo Girdled Lizard	*Cordylus polysonus*	Specially protected
Common or Rhombic Egg Eater	*Dasypeltis scabra*	Protected species
Dwarf Beaked Snake	*Dipsina multimaculata*	Common indigenous
Common Slug Eater	*Duberria lutrix lutrix*	Protected species
Leopard Tortoise	*Geochelone pardalis*	Protected species
Rinkals	*Hemachatus haemachatus*	Common indigenous
Karoo or Boulenger's Padloper	*Homopus boulengeri*	Protected species
Greater Padloper	*Homopus fermorakis*	Protected species
Fisk's House Snake	*Lamprophis fiskii*	Protected species
Brown House Snake	*Lamprophis fuliginosus*	Protected species
Spotted House Snake	*Lamprophis guttatus*	Protected species
Cape Skink	*Mabuya capensis*	Protected species
Red-sided Skink	*Mabuya holalocephala smithii*	Protected species
Western Three-striped Skink	*Mabuya occidentalis*	Protected species
Western Rock Skink	*Mabuya sulcata*	Protected species

Common name	Scientific name	Northern Cape Nature Conservation Act (Act 9 of 2009)
Variegated Skink	*Mabuya variegata variegata*	Protected species
Spotted Desert Lizard	*Meroles suborbitalis*	Protected species
Cape Cobra	*Naja nivea*	Common indigenous
Striped Sandveld Lizard	*Nucras tesselata livida*	Protected species
Striped Sandveld Lizard	*Nucras tessellata tessellata*	Protected species
Cape Gecko	*Pachydactylus capensis capensis*	Protected species
Marico Gecko	*Pachydactylus mariquensis mariquensis*	Protected species
Golden Spotted Gecko	*Pachydactylus oculatus*	Protected species
Western Spotted Gecko	*Pachydactylus serval purcelli*	Protected species
Burchell's Sand Lizard	*Pedioplanis burchelli*	Protected species
Spotted Sand Lizard	*Pedioplanis lineoocellata*	Protected species
Namaqua Sand Lizard	*Pedioplanis namaquensis*	Protected species
Marsh or Helmeted Terrapin	*Pelomedusa subrufa*	Protected species
Striped Leaf-toes Gecko	*Phyllodactylus lineatus rupicolus*	Protected species
Sundevall's Shovel-snout	*Prosymna sundevallii sundevallii*	Protected species
Tent Tortoise	*Psammobates tentorius trimeni*	Protected species
Karoo Sand Snake/Whip Snake	*Psammophis notostictus*	Common indigenous
Spotted or Rhombic Skaapsteker	*Psammophylax rhombeatus*	Common indigenous
Mole Snake	*Pseudaspis cana*	Protected species
Common Barking Gecko	*Ptenopus garrulus maculatus*	Protected species
Namib Tiger Snake	*Telescopus semiannulatus*	Common indigenous
Delalande's Blind Snake	*Tyhlops lalandei*	Common indigenous
Rock or White-throated Monitor	*Varanus exanthematicus albigularis*	Protected species

The Cape and Karoo Girdled Lizards (*Cordylus cordylus cordylus; Cordylus polysonus*) and the Karoo Dwarf and Namaqua Chameleons (*Bradypodion karroicum; Chamaeleo namaquensis*) are considered to be 'specially protected species' according to the Northern Cape Nature Conservation Act (Act 9 of 2009).

In terms of the Northern Cape Nature Conservation Act (Act 9 of 2009), the following species are considered 'protected' species: Rock or White-throated Monitor (*Varanus exanthematicus albigularis),* Brown House Snake (*Lamprophis fuliginosus),* Spotted House Snake (*Lamprophis guttatus),* Fisk's House Snake (*Lamprophis fiskii),* Common Slug Eater (*Duberria lutrix lutrix),* Mole Snake (*Pseudaspis cana)* as well as the Common or Rhombic Egg Eater (*Dasypeltis scabra)*.

The remaining reptilian species excluding the tortoises and terrapins have been categorised 'common indigenous species' in terms of the Northern Cape Nature Conservation Act (Act 9 of 2009).

- Potential impacts

The proposed solar power facility could potentially result in the destruction of habitat suitable for the above-mentioned reptile species.

- Invertebrates

An additional assessment of invertebrate species will be undertaken during the EIA phase. It is however important to note that these species are mobile and are likely to flee the area during construction and will return to suitable habitats during the operational phase. Mitigation measures to reduce habitat destruction will aid in the preservation of habitat for invertebrate species. A large number of arachnid species are likely to be present due to the anticipated rocky nature of the parts of the site. This will be verified during the EIA phase.

2.7.7 Sensitive areas and Route Determination

It is always a recommendation that where possible, new infrastructure follows existing infrastructure such as roads and existing electrical servitudes in order to consolidate impacts. Technically this is not always possible but it is the best option from a biodiversity perspective.

Detailed site layout information is not available at this stage for the proposed solar power facility development but will be available during the EIA phase. It is however, possible to identify areas within the study area which are not preferred options for development. These areas will form the focus of the EIA phase studies.

The plateau as well as the wetlands and drainage areas on the study site are considered sensitive from a biodiversity perspective. It is anticipated that species diversity (both floral and faunal) in these areas differs from the surrounding areas. In addition the wetlands and drainage areas provide unique habitats for floral species as well as faunal species. Furthermore, species from surrounding areas also depend on these areas as a food and water source.

It is important to note that if areas within the study site have been transformed by various anthropogenic activities these transformed areas will be favoured for siting the proposed development and associated infrastructure.

A preliminary sensitivity map was compiled (Figure 8). This map concentrates on areas of the plateau, riparian vegetation and wetland areas. These mapped sensitive areas have been identified for further investigation during the EIA phase of the project in order to inform infrastructure placement. In addition, areas of more pristine vegetation will be assessed in detail during the EIA phase.

A negative mapping exercise will be undertaken in the EIA phase of this project to determine where the wind farm could be placed with the minimum effect on the biodiversity of the site.

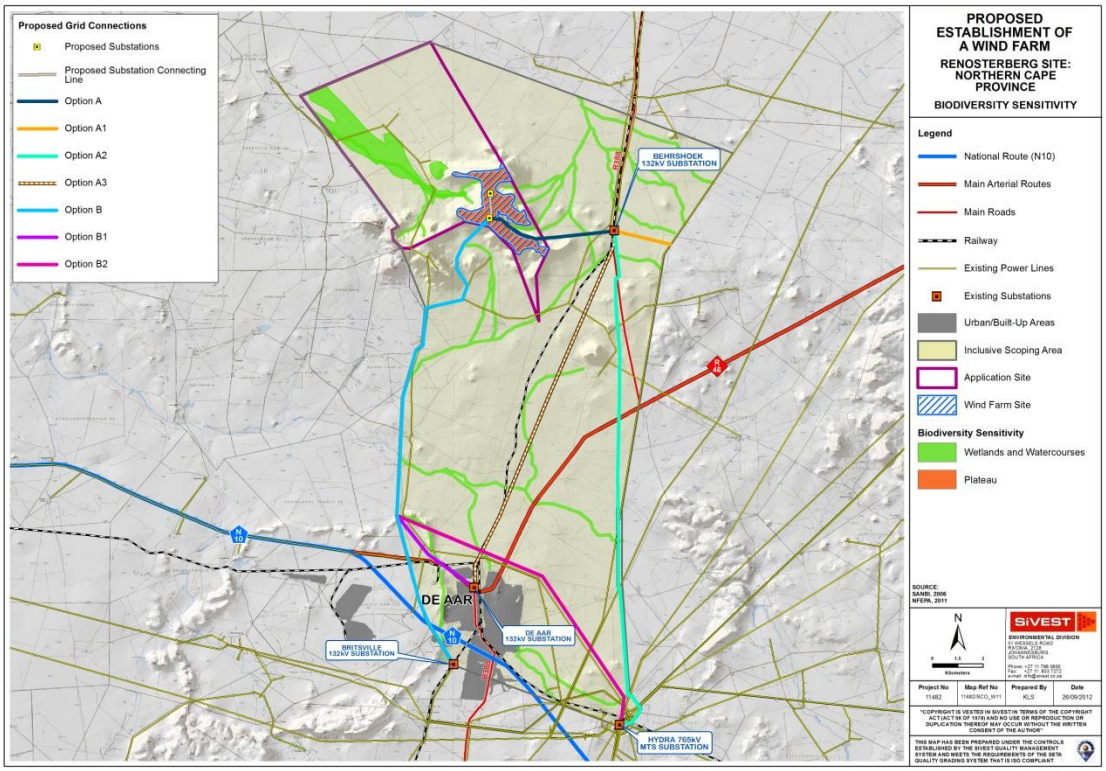


Figure 12: Conceptual biodiversity sensitivity map

2.8 Avi-fauna

The Avi-faunal Assessment was conducted by Chris Van Rooyen Consulting (Appendix 6B). The environmental baseline from an avi-faunal perspective is presented below. The ultimate aim of the study was to determine potential impacts of the proposed project on avi-fauna, with special attention given to Red Data species. The findings of this report are based mainly on desk top assessments however a degree of field verification was undertaken but not to a detailed level.

The detailed avi-faunal assessment will commence in the EIA phase of the environmental application process.

2.8.1 Potential Avi-faunal occurrence

It is estimated that at least 188 bird species could occur at the site (see Appendix 2 and 3 of the specialist Avi-faunal Report in Appendix 6B). Of the birds potentially occurring at the site, 27 are classified as priority species. Seven of these species are classified as near threatened while an additional 7 are listed as vulnerable in the Red Data Book of Birds of South Africa, Lesotho and Swaziland (Barnes, 2000). The priority species potentially occurring at the site can be broadly classified in four groupings namely large terrestrial species, soaring species, waterbirds, and nocturnal species. Each grouping is described in more detail below:

- 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 undertake longer distance flights at higher altitudes, when migrating and / or commuting between foraging and roosting areas. At the wind farm and solar PV site, cranes, bustards, and korhaans are included in this category.
- 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. At the wind farm and solar PV site, these are mostly raptors, and storks.
- Waterbirds: These are species that are generally associated with aquatic habitats. Flight is generally direct and powered. At the wind farm site and solar PV site, these could potentially comprise herons, ducks, waders, and flamingos.
- Nocturnal species: The site may potentially contain at least two species of owl. Flight is usually direct, powered flight interspersed with short glides.

The following relevant details with regards to the avi-faunal scoping assessment can be found in the specialist Avi-faunal Report in Appendix 6B:

- Appendix 1 provides a photographic record of the bird habitat on the site;
- Appendix 2 provides a list of species that could potentially occur at the site;
- Appendix 3 provides a list of priority species with associated habitat and potential impacts that could potentially occur at the site;
- Appendix 4 indicates habitat types;
- Appendix 5 indicates habitat sensitivity from a potential priority species interaction perspective; and
- Appendix 6 indicates habitat sensitivity for the larger all inclusive scoping area.

2.8.2 Relevant avifaunal habitats

It is widely accepted that vegetation structure is more critical in determining bird habitat, than the actual plant species composition (Harrison *et al* 1997). The description of vegetation presented therefore concentrates on factors relevant to the bird species present, and is not an exhaustive list of plant species present. The description of the vegetation types occurring in the study area follows that of the Atlas of Southern African Birds 1 (SABAP1) (Harrison *et al* 1997). The criteria used by the SABAP1 authors to amalgamate botanically defined vegetation units, or to keep them separate were (1) the existence of clear differences in vegetation structure, likely to be relevant to birds, and (2) the results of published community studies on bird / vegetation associations.

- Nama Karoo

The avifaunal habitat on the site can be classified as natural Karoo vegetation which is primarily used for live-stock grazing. The vegetation classified as Nama Karoo (Harrison *et al* 1997) is found in the semi-arid Karoo region and largely comprises of low shrubs and some grasses.

Nama Karoo with isolated stands of taller shrubs and trees (see below) cover most of the flat areas on the site. Priority species that could potentially utilise the low shrub of the Nama Karoo are Secretarybird *Sagittarius serpentarius*, Ludwig's Bustard *Neotis ludwigii*, Lesser Kestrel *Falco naumanni*, Black Harrier *Circus maurus*, Karoo Korhaan *Eupodotis vigorsii*, and Northern Black Korhaan *Afrotis afraoides*. During years of higher rainfall species more closely associated with Grassy Karoo (see below) could potentially also move into the Nama Karoo habitat. Other priority species that could regularly forage in the Nama Karoo habitat on the site are Martial Eagle *Polemaetus bellicosus*, Steppe Buzzard *Buteo vulpinus*, Black-shouldered Kite *Elanus caeruleus*, Tawny Eagle *Aquila rapax*, Southern Pale Chanting Goshawk *Melierax canorus*, and Greater Kestrel *Falco rupicoloides*. Taller structures such as fence posts and existing overhead power lines would be used as hunting perches by these species.

- Grassy Karoo

The mountainous plateau of the Renosterberg has a more grass dominated Karoo vegetation than the low-lying flat areas, similar to the typical Grassy Karoo that occurs naturally further to the east. At the time of the field visit the vegetation on this upper plateau appeared very similar to the Nama Karoo found on the open plains surrounding the mountain but this is likely due to the currently prevailing very dry conditions. It is anticipated that the plateau will contain a substantial grass layer after good rains.

Species closely associated with Grassy Karoo habitats which could occur on the plateau area are Blue Crane *Anthropoides paradiseus*, Black Harrier *Circus maurus*, White Stork *Ciconia ciconia*, and Blue Korhaan *Eupodotis caerulescens*.

The birds of prey mentioned above (which are likely to forage in the Nama Karoo habitat) can equally be expected to forage in the Grassy Karoo. The Renosterberg plateau is the windiest part of the study area, and is therefore likely to attract soaring species due to the favourable wind conditions. Raptors are likely to be regularly present on the plateau, and aggressive aerial interaction between individuals could occur regularly. Overall, a high presence of soaring priority species is expected on the plateau.

It is envisaged that birds of prey and other priority species associated with the steep slopes and cliff faces which surround the mountain (see below) will also frequently fly over the Grassy Karoo plateau from one side of the mountain to the other.

- Trees and taller shrubs along drainage lines

Small trees and shrubs tend to be concentrated along drainage lines in both the Nama and Grassy Karoo. Trees provide perching and nesting sites for some priority species. The priority species likely to occur in close association with these tree clusters are Southern Pale Chanting Goshawk *Melierax canorus*, Black Shouldered Kite *Elanus caeruleus*, and Spotted Eagle-Owl *Bubo africanus*. Kori Bustards *Ardeotis kori* are also known to frequent such areas as they are often seen resting in the shade of small trees during the midday heat. Secretarybirds and Southern Pale Chanting Goshawks could nest in these tree clusters on the site.

- Dams and ephemeral rivers

A few earth-fill farm dams have been constructed to provide drinking water for livestock across some of the drainage lines on the site. These dams hold water only for a limited time during and after the rainy season. There are a few ephemeral rivers which pass through the larger all inclusive scoping area to the south of the Renosterberg mountains. Several water bird species frequent these temporary dams and rivers when sufficient water levels are present. During the field visit large numbers of Yellow-billed Ducks *Anas undulata* and South African Shelducks *Tadorna cana* were observed on farms dams slightly north of the study site. In terms of priority species only Greater Flamingo *Phoenicopterus ruber* has been recorded in the greater area but due to the smallish size of the dams on the site itself it is highly unlikely that that they will occur there or move over the site. African Marsh Harrier *Circus ranivorus* might also move through the area along the reed beds associated with these ephemeral rivers. Windmills with associated livestock drinking troughs provide permanent artificial water sources for numerous bird species occurring on the site. Large raptors such as Martial Eagle and Tawny Eagle use the shallow edges of farm dams and/or drinking troughs for drinking and bathing, usually in the heat of the

day. Lanner Falcons *Falco biarmicus* frequently hunt small passerines when they congregate at water holes. White Storks and Blue Cranes might also be roosting at some of the dams, depending on water levels. Black Storks *Ciconia nigra* could also occur at the dams to forage when sufficient water levels and associated shallow areas are present.

- Steep slopes and cliffs

The steep sides of the Renosterberg mountain and the associated cliff faces around the upper ridge edges will provide suitable habitat for several priority bird species. Several trees and taller shrubs are scattered along the steep slopes and deep valleys along the edge of the mountain. Cliff nesting raptors such as Verreauxs' Eagle *Aquila verreauxii*, and Jackal Buzzard *Buteo rufofuscus* are known to frequent the Renosterberg mountains (pers. obs.), and a few nest sites are likely to be present. Other priority birds of prey which could be associated with this habitat are Lanner Falcon *Falco biarmicus*, Booted Eagle *Aquila pennatus*, Peregrine Falcon *Falco peregrinus* and African Harrier-Hawk *Polyboroides typus*. Black Storks could also be encounterd, as they are known to occur in mountainous areas in the Karoo. Spotted Eagle-Owl *Bubo africanus* and Cape Eagle Owl *Bubo capensis* may occur on the steep boulder strewn slopes of the Renosterberg.

2.8.3 Associated infrastructure

The description of the study area for the wind farm site is also applicable to the associated infrastructure (access roads, temporary construction camp, turbine foundations, lay-down areas and the overhead power lines). Several overhead power line route options are being considered to connect both the wind farm to the existing Eskom grid. In addition the presence of an abandoned quarry to the north west of the town of De Aar with a breeding pair of Verreauxs' Eagle is noted – their nest site is located at 30° 38.078'S 23° 59.596'E. The town itself has limited attraction for priority species but bird hunting falcons such as Lanner Falcon and Peregrine Falcon may occasionally occur there. A known Lesser Kestrel Roost site is located in large trees in the hospital grounds (Visser street, De Aar - 30° 39.554'S 24° 0.479'E).

2.9 Bats

The Bat Assessment was conducted by Werner Marais from Animalia cc. The full report is included in Appendix 6C. The environmental baseline from a bat perspective is presented below.

2.9.1 Vegetation units, geology and climate

According to Mucina and Rutherford (2006) there are three different vegetation units present in the study area, namely the Northern Upper Karoo, the Upper Karoo Hardeveld and the Besemkaree Koppies shrubland.

The Northern Upper Karoo has an altitude varying from 1 000 -1 500 m above sea level (Mucina and Rutherford, 2006). The area is dominated by dwarf karoo shrubs, low trees and *Acacia sp.* The land is characterized as being flat to gently sloping, with the exception of hills in the Karoo Hardeveld and Vaalbos Rocky Shrubland (Mucina and Rutherford 2006). Shales in the underlying geology are comprised of the Volkrust Formation, the Prince Albert Formation (to a lesser extent); both forming part of the Ecca Group, as well as the Dwyka Group Diamicitites (Mucina and Rutherford 2006). Jurassic Karoo dolerite sills and sheets support the vegetation in many areas. Wide stretches of land are covered by superficial deposits, including calcretes of the Kalahari Group (Mucina and Rutherford 2006). Rainfall usually peaks in March with a mean annual precipitation (MAP) of 190 - 400 mm and maximum and minimum temperatures being 37.1 °C and -4.8 °C for De Aar in January and July respectively (Mucina and Rutherford 2006). The shrubland is typically composed of small trees of the *Acacia* and *Boscia sp.*, tall shrubs from the *Lycium, Rhigozum sp.*, low shrubs of the *Chrysocome*, *Gnidia*, *Pentzia*, *Rosenia sp.* as well as many other species. Herbs are also dominant in this vegetation unit (Mucina and Rutherford 2006). This vegetation unit has a low potential for bat roosting space and a low-medium potential for being utilised as foraging area. The low foraging potential being the higher lying areas with low shrubs only and very little moisture, and the medium foraging potential being the drainage areas which supports small trees and limited insects.

The Upper Karoo Hardeveld is an area harboring discrete slopes and ridges including dolerite dykes and sills with altitudes varying from 1 000 – 1 900 m (Mucina and Rutherford 2006). The land becomes steeply sloping in areas leading to koppies, butts, mesas and is often found to be littered with large boulders and stones, which may be utilised as bat roosting habitat by crevice roosting species such as the Egyptian Free-tailed bat, where such koppies and boulders are present. Sedimentary rocks such as mudstones and arenites of the Adelaide Subgroup, of the Karoo Supergroup, and to a lesser extent, the Waterford and Volksrust Formations of the Ecca Group, can be found in the area (Mucina and Rutherford 2006). Other rocks are Jurassic dolerite dykes, sills, butts and mesas with slopes comprised of dolerite boulder. The MAP in this vegetation unit ranges from 150 - 350 mm, accumulating between rocks during rainfall. The incidence of frost is quite high, ranging from 30 days per annum at lower altitudes to over 80 days per annum at high altitudes. Plants found in the area are tall shrubs of the *Lycium*, *Rhigozum*, *Cadaba*, *Diospyros* and *Rhus sp.* Low shrubs of the *Chrysocoma*, *Eriocephalus*, *Euryops*, *Felica* and other species are present. Also present in this vegetation group are succulent shrubs, semi-parasitic shrubs and a variety of herbs (Mucina and Rutherford 2006). This unit has a moderate roosting and foraging potential.

The Besemkaree Koppies Shrubland is extensively dominated by dolerite, occurring at altitudes of 1 120 – 1 680 m (Mucina and Rutherford 2006). The slopes of koppies, butts and tafelbergs are covered by shrubland. The koppies and sills are dolerite, igneous intrusions, having resulted from volcanic activity in the area and are embedded within Karoo Supergroup sediments (Mucina and Rutherford 2006). In places the slopes of mesas and butts occur together with sandstones and mudstones of the Ecca and Beaufort Groups. The MAP is around 280 mm near De Aar. The vegetation is dominated by small trees of the *Cussonia* and *Ziziphus sp*., tall shrubs of the *Diospyros*, *Euclea* and *Olea sp.* Low shrubs of the *Asparagus*, *Chrysocoma*, *Amphiglossa* and *Aptosimum sp.* (Mucina and Rutherford 2006). This unit has a medium-high roosting and foraging potential relative to vegetation units in the Grassland Biome. But this medium-high roosting and foraging potential is only classified as such on the steep slopes of the Rhenosterberg with regards to this site, since these slopes can offer multiple crevice and hollow roosting spaces and supports thick vegetation that are sheltered from wind. Such conditions are favoured by bats, as opposed to the flat and windy plateau of the Rhenosterberg mountain.

2.9.2 Literature species probability of occurrence

Table 9 indicates the probability of species that may be roosting or foraging within the study area. “Probability of Occurrence” is assigned based on likely site specific roosting spaces, and their probability of occurrence based on literature (Monadjem *et al.* 2010) as well as earlier personal bat work in the area. The probability of occurrence is described by a percentage indicative of the expected numbers of individuals present on site and the frequency at which the site will be visited by the species (in other words the likelihood of it encountering it on site).

The column of “Likely risk of impact” describes the likelihood of risk of fatality from direct collision or barotrauma with wind turbine blades for each bat species. The risk was assigned by Sowler and Stoffberg (2012) based on species distributions, altitudes at which they fly and distances they traverse

Table 9: Probability of occurrence and likelihood of impact to bat species in the study area.

Species name	Common name	Probability of Occurrence (%)	Conservation Status	Possible roosting sites occupied on site	Foraging habits (indicative of possible foraging areas on site)	Likely Risk of Impact (Sowler & Stoffberg, 2011)
Rhinolophus clivosus	Geoffroy's horseshoe bat	60 - 70	Least Concern	Roosts gregariously in caves and mine adits, no known caves close to the study site. But may also utilise any other smaller natural or anthropogenic cavities. May be present in the hill slope areas and waterways with denser vegetation.	Establish feeding stations during the night under trees or the verandas of houses. Clutter forager with a diet comprised mainly of Lepidoptera and Coleoptera.	Low
Rhinolophus darlingi	Darling's Horseshoe bat	20 -30	Least Concern	On edge of distribution. Roosts gregariously in caves, no known caves close to the study site. Utilises culverts or rock cavities. May be present in the hill slopes and waterways with denser vegetation.	Clutter forager feeding predominantly on Lepidoptera and Coleoptera	Low

Nycteris thebaica	Egyptian slit-faced bat	50 - 60	Least Concern	Roosts during the day in caves, burrows, culverts and trunks of large trees. Such habitat is scarce on the site, and may be found at the hill slope areas and waterways with denser vegetation.	Clutter forager. Diet varies according to the season between Orthoptera, Coleoptera and Lepidoptera as well as a number of other insects and arachnids.	Low
Tadarida aegyptiaca	Egyptian free-tailed bat	**90 - 100**	Least Concern	Roosts in rock or manmade crevices as well as buildings.	Open-air forager and a high flyer with a diet consisting mainly of Diptera, Hemiptera, Coleoptera and to some extent Lepidoptera.	High
Miniopterus natalensis	Natal long-fingered bat	**70 - 80**	Near Threatened	Cave-dependant, but personal experience has proved culverts to be utilised as roost by individuals or small groups. Undertake migrations (not known for site)	Clutter-edge forager. Feeds on a variety of aerial prey including Diptera, Hemiptera, Coleoptera, Lepidoptera and Isoptera. Wide foraging range.	Medium-High
Eptesicus hottentotus	Long-tailed serotine	60 - 70	Least Concern	Crevice dweller and in buildings. Rock crevices in rocky outcrops.	Clutter-edge forager. Diet comprised predominantly of Coleoptera.	Medium

Myotis tricolor	Temmink's myotis	50 - 60	Least Concern	Roosts gregariously in caves or singly or small groups in rock hollows or manmade hollows such as culverts. Undertake migrations (not known for site)	Clutter-edge forager. Diet consists mainly of Coleoptera, Hemiptera, Diptera, Neuroptera and Hymenoptera	Medium-High
Neoromicia capensis	Cape serotine	**70 - 80**	Least Concern	Roosts in bark of trees, at the base of aloe leaves, under roofs.	Clutter-edge forager feeding mainly on Coleoptera, Hemiptera, Lepidoptera and Neuroptera	Medium-High

2.9.3 Surface rock, topography, climate , surface water and vegetation

The Renosterberg site is overall on a high altitude and has the highest mean annual precipitation near De Aar. Several non-perennial small waterways drain from the centre of the Rhenosterberg mountain top, and drain away from the base of the mountain. There are no major settlements in the area, apart from the farm buildings near the proposed wind farm. The farm buildings may act as a suitable roosting space.

In the proposed wind farm development area at the top of the Rhenosterberg, the berg is in close proximity to the non-perennial Hondeblaf Spruit and other non-perennial drainage systems which may seasonally increase the prevalence of bats in foot hill areas. In the upper drainage area originating from the hilltop plateau the prevalence of larger bushes/vegetation increases, and this combined with water availability and an increased likelihood of insect activity may elevate occurrence of bats. The Rhenosterberg also appears to have a number of boulders, sills and dolerite formations near the crest of the mountain. This may increase bat activity due to the provision of roosting space. Sensitivity areas from a bat perspective are mapped in Figure 13.

For the purpose of this study a buffer of 150 meter have been assigned around the areas with a High bat sensitivity.

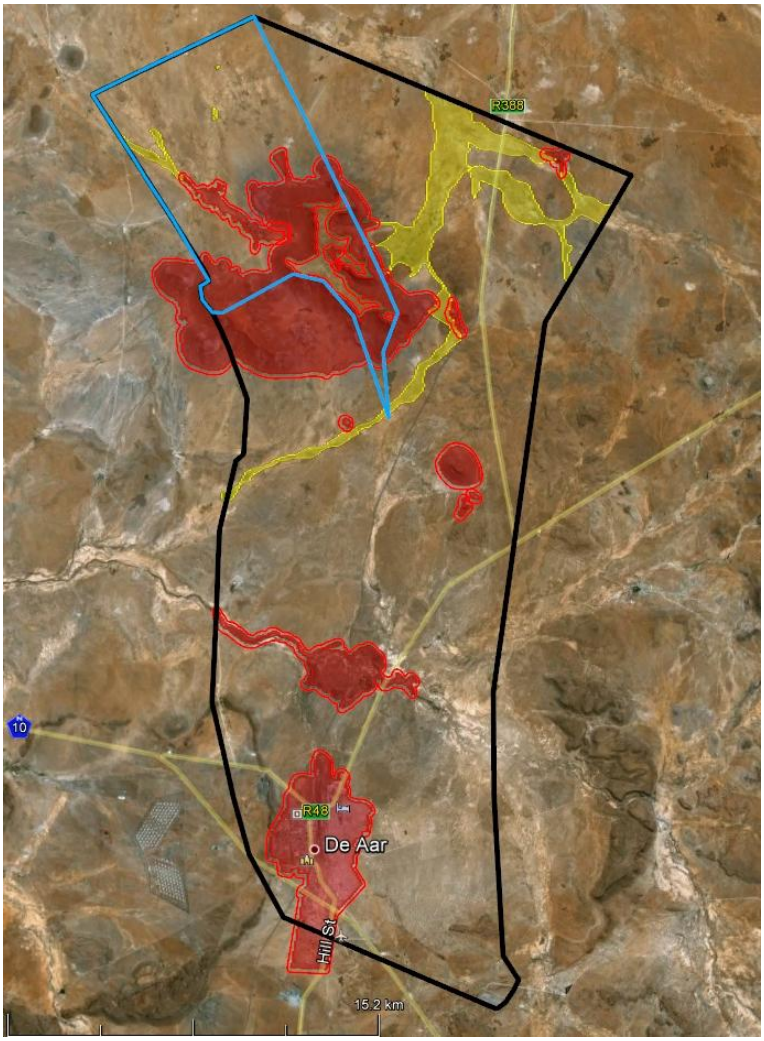


Figure 13: Scoping level bat sensitivity map (Red areas highly sensitive; yellow areas moderate sensitivity; red outlines represent a 150m buffer).

2.10 Surface Water

The Surface Water Assessment was conducted by SiVEST. The full report is included in Appendix 6D. The environmental baseline from a surface water perspective is presented below.

2.10.1 Drainage Context

Drainage and hydrological information in the De Aar area is severely limited and/or inaccessible. Despite this, according to Dollar *et al*. (2007), regions can be grouped that have similar land areas containing a limited range of recurring landforms that reflect comparable erosion, climatic and tectonic influences, and impose broad constraints on lower levels of organisation, e.g., drainage basins, macro-reaches and channel types. Hence, on this basis,

geomorphic provinces (Partridge *et al*. 2010) have been delineated that reflect a relatively common set of climatic, vegetation, geological and topographical characteristics that are akin to one another. Utilising this information, the regional drainage characteristics of the broader study area can be elucidated. Under this context, the study site is located within the Upper Karoo geomorphic province of South Africa.

- Upper Karoo Geomorphic province

According to Partridge *et al.* (2010), this extensive province is underlain predominantly by flat-lying sedimentary rocks of the Karoo Supergroup which have been intruded by innumerable sills and dykes of dolerite, some in the form of transgressive cone-sheets. The relief associated with these lithologies ranges from tabular tafelkoppies (mesas) to sinuous, bouldery ridges and where dissection is advanced, steep-sided mountains such as the Kompasberg near Nieu Bethesda dominate the landscape (Partridge *et al.* 2010). Rivers rising within this province are mostly ephemeral, occupy broad, open valleys, and have braided floodplains and concave longitudinal profiles (Partridge *et al*. 2010).

The Orange Water Management Area (WMA) or catchment encompasses the broader study area whereas, the site's specific quartenary catchment is found divided by a watershed at D62E and D62D. The main river of concern in the context of the proposed development is the Brak River which serves as one of the tributaries to the Orange River (Ewisa, no date). Other ephemeral rivers in the area include the Hondeblaf, Seekoei and Elandsfontein which all have rocky beds with intermittent wide flood-plains that contribute to the Orange River catchment. The perennial Orange River and large Vanderkloof Dam are dominant features in the north and east. Other impoundments consist of small- to medium-sized earthen farm dams on ephemeral rivers and drainage lines. Given the aridity of the area, surface water is at a premium for the overall region to such an extent that groundwater is widely used in the area to supply small towns in combination with surface water resources. However, the development and management of groundwater is seldom done properly, leading to unmanaged boreholes and abstraction from boreholes often resulting in their failure (Ewisa, no date). Proper management and monitoring of groundwater sources by municipalities and other users therefore, are of crucial importance for the adequate allocation of water to the immediate area.

- Biomes

Taking the concept of geomorphic provinces down in scale, smaller regions called biomes can be derived which contain various vegetation units that correlate with common climatic parameters that are ecologically meaningful (Mucina & Rutherford, 2006). Utilising recent information according to Mucina and Rutherford (2006) on biomes and the smaller vegetation units contained within them, the drainage context of the study site can be elucidated. The two biomes that envelop the study area include the Nama-Karoo and Grassland Biome. The specific vegetation units within these two biomes include the Northern Upper Karoo vegetation unit and the Besemkaree shrubland vegetation unit. Both of these vegetation units have been described in detail in Section 2.7.4 above.

The predominant climate for the study site exhibits a relatively strong seasonal shift from dry cold winters to hot summers with rainfall peaking in the late summer and autumn months. Due to the topographical nature of the study site expressing a relatively flat lowland and the prominence of the plateau, orographic convectional rainfall is expected to takes place. The degree of precipitation in the late summer and autumn months is anticipated to supply most of the hydrological input to surface water features on the study site. Drainage from the Plateau areas to the lowland area can be expected.

Variable soil depth will have a variable influence on surface and sub-surface drainage. Areas with rocky outcrops and shallow soils profiles can aid in generating surface run-off especially in the steeper slopes of the Plateau contributing to natural drainage lines or small intermittent to seasonal streams/rivers. Hillslope seepages may be present on the hillslopes as a result of drainage higher up on the Plateau. On the crest of the Plateau, surface water ponding can be expected over the rocky substrate areas. Ponding areas however are not expected to stay present for long and are anticipated to evaporate with high summer temperatures. In areas where deeper soil profiles are present above the Plateau area, water retention (hydroperiod) may be more prolonged depending on the site specific soil depth and soil particle characteristics (soil form).

In the lowland areas, below the Plateau, surface water contributions via direct precipitation or from adjacent natural drainage lines/streams/rivers are anticipated as the primary hydrological sources of prospective surface water resources in the study site. Given the flat nature of the site and relative aridity, pan wetlands and valley bottom (channelled and un-channelled) wetlands can be expected surface water resources in the study site.

2.10.2 Surface Water Resource Occurrence in the Study Area

As identified at a desktop level using available resources, Figure 14 represents an illustration of the surface water resources mapped from the various consulted databases and those delineated via remote sensing utlising Google™ satellite imagery for the Renosterberg wind farm application site.

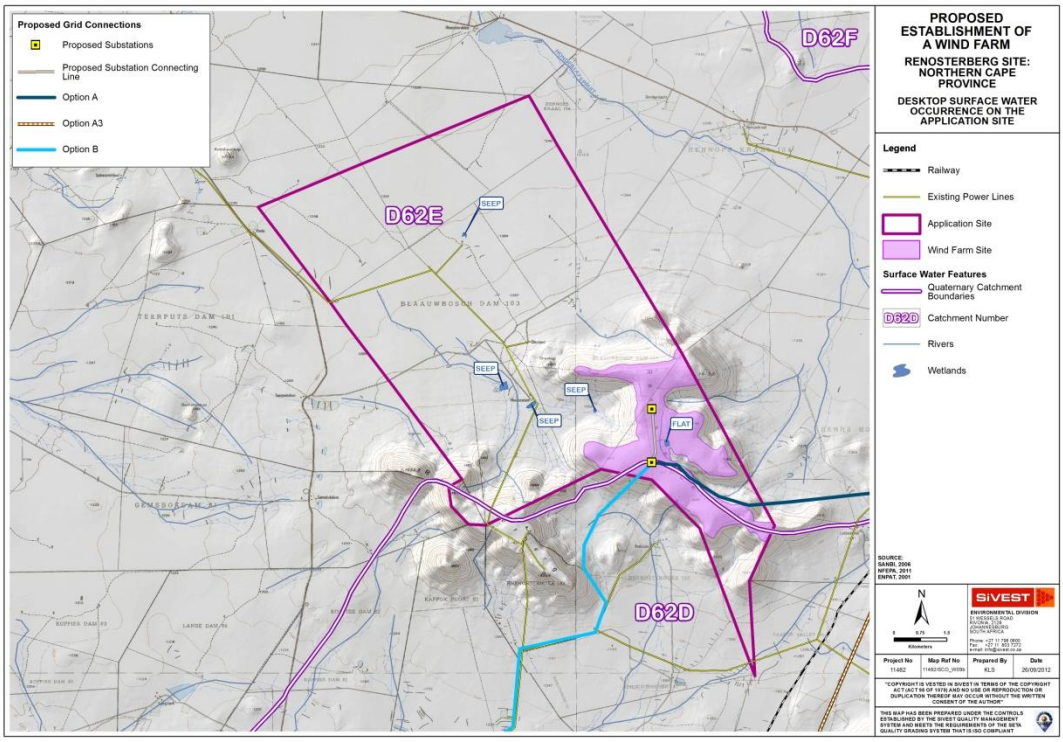


Figure 14: Desktop surface water resources for the Renosterberg wind farm application site.

According to the ENPAT database, several non-perennial rivers traverse the solar PV power plant application site. The non-perennial rivers nearest to the western and southern boundaries of the study site appear to drain toward the west and perform the role of tributaries to the Sandsloot and Brak River. The non-perennial rivers on the study site the eastern boundaries of the study site appear to drain towards the north eventually into the Hondeblafspruit. The NFEPA database identifies the sections of the Hondeblafspruit nearest to the study site to the north as a Class B: Largely Natural river in terms of the Present Ecological Condition recorded in the 1999. Likewise, the NFEPA database identifies the sections of the Brak River nearest to the southern boundaries of the study site as a Class B: Largely Natural river in terms of the Present Ecological Condition recorded in the 1999.

With regards to wetlands, it appears that several artificial wetlands identified from a desktop level occur both in the lowlands and on the Plateau of the greater wind farm application site according to the NFEPA database. More specifically, this includes four artificial hillslope seepage wetlands and one artificial flat (depression/pan) wetland. The ENPAT database shows that there are relatively steep areas representing the Plateau slopes. Consequently the study site displays areas of variable gradient ranging from areas with 0-9%, 9-15% and 15-25%.

Utilising satellite imagery, a number of drainage lines and potential wetland areas were apparent and could be delineated by remote sensing for the all-inclusive study area. Figure 15 represents an illustration of the surface water resources mapped from the various consulted databases for the all-inclusive study area. Surface water delineation results utilising

Google™ satellite imagery and remote sensing for the all-inclusive scoping area are displayed in Figure 16.

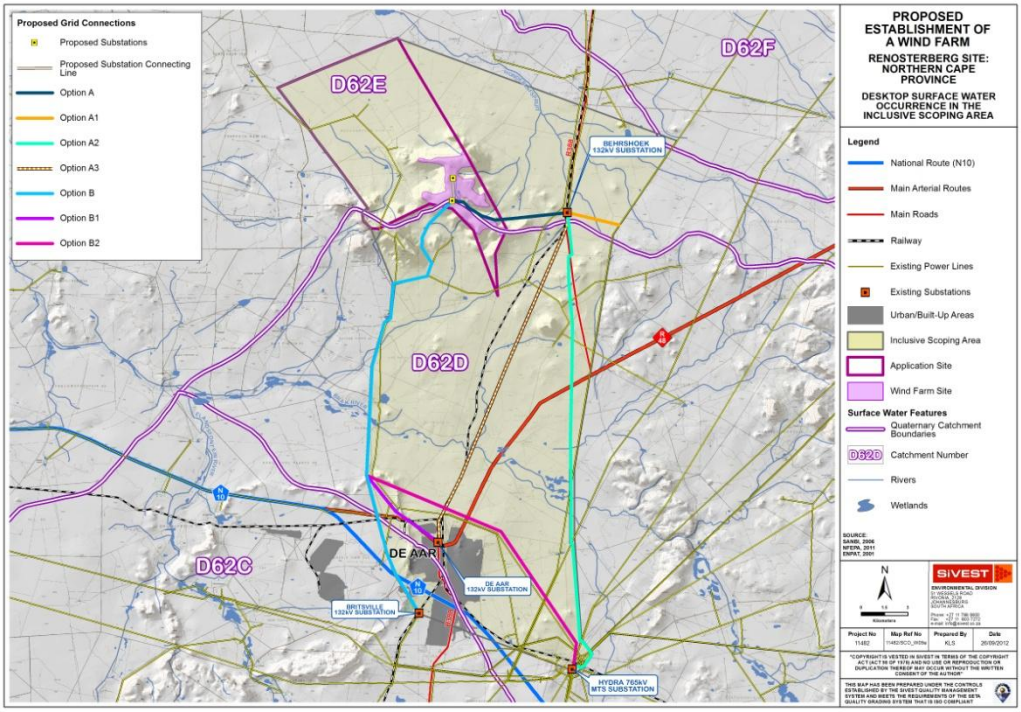


Figure 15: Desktop surface water resources for the Renosterberg all inclusive scoping area.

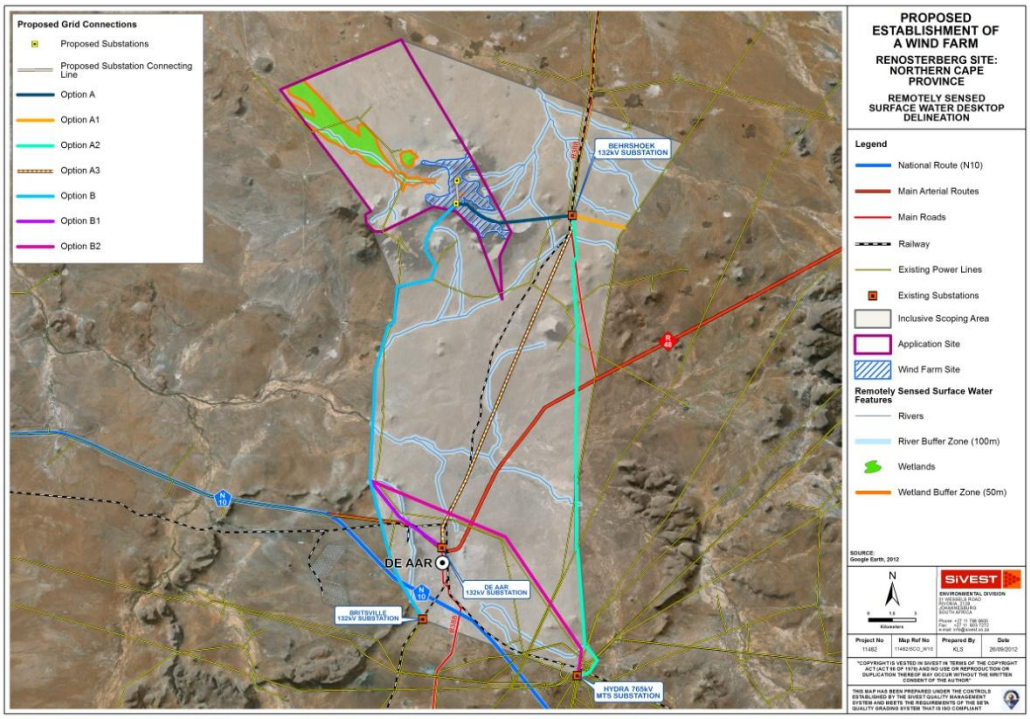


Figure 16: Google Earth Remotely Sensed Surface Water Resources for the Renosterberg all inclusive scoping area.

2.11 Soils and Agricultural Potential

The Soils and Agricultural Potential Assessment was conducted by SiVEST. The full report is included in Appendix 6E. The environmental baseline from a soils and agricultural perspective is presented below.

2.11.1 Geology

The Renosterberg site is underlain by a variety of geological materials including shale, mudstone and tillite (Figure 17). Shale dominates the majority of the study and is formed by the settling and accumulation of clay rich minerals and other sediments, and due to the settling process, this material usually takes the form of parallel rock layers which lithifies over time.

Mudstone is found in the south eastern corner of the site and encircles the footslopes of the Renosterberg. Like shale, mudstone is clastic sedimentary rock, which is formed from the lithification of deposited mud and clay. Mudstone consists of a very fine grain size of less than 0.005 mm but unlike shale it is mostly devoid of bedding. Tillite, consisting of consolidated masses of un-weathered blocks and unsorted glacial till, caps the top of the Renosterberg.

The Broad Scoping Area illustrates a similar Geologic spatial pattern, where shale is the dominant underlying material (Figure 18).

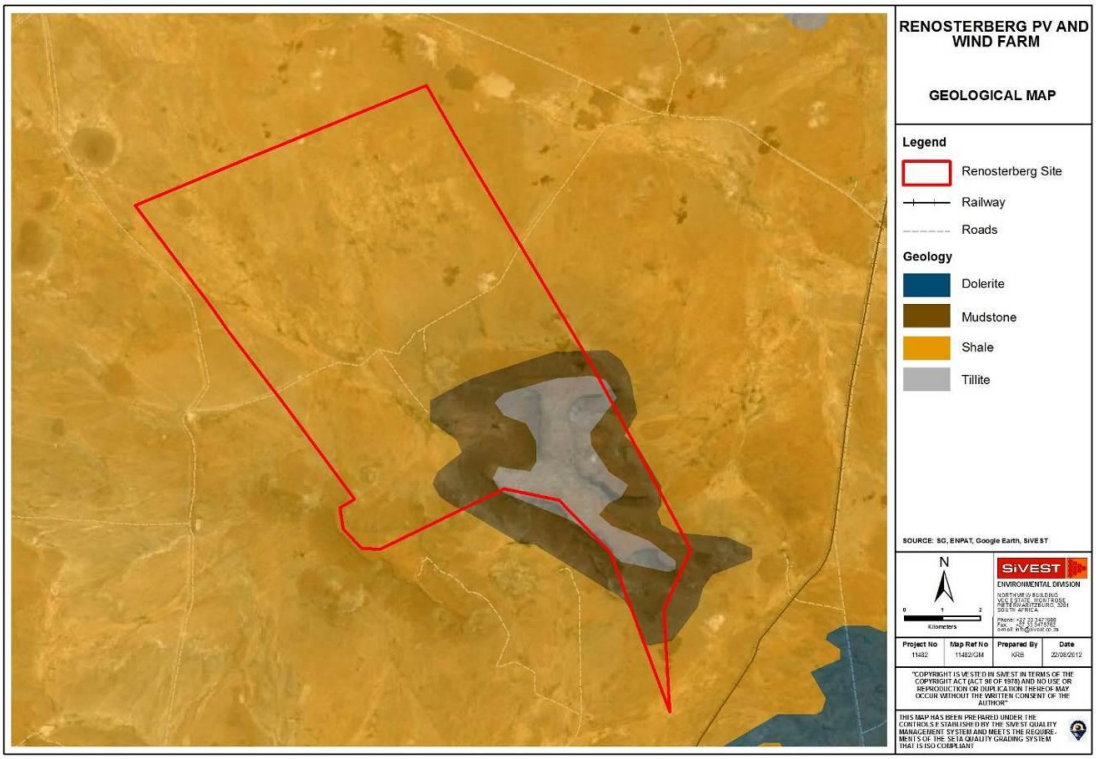


Figure 17: Geological Map for the Renosterberg Site

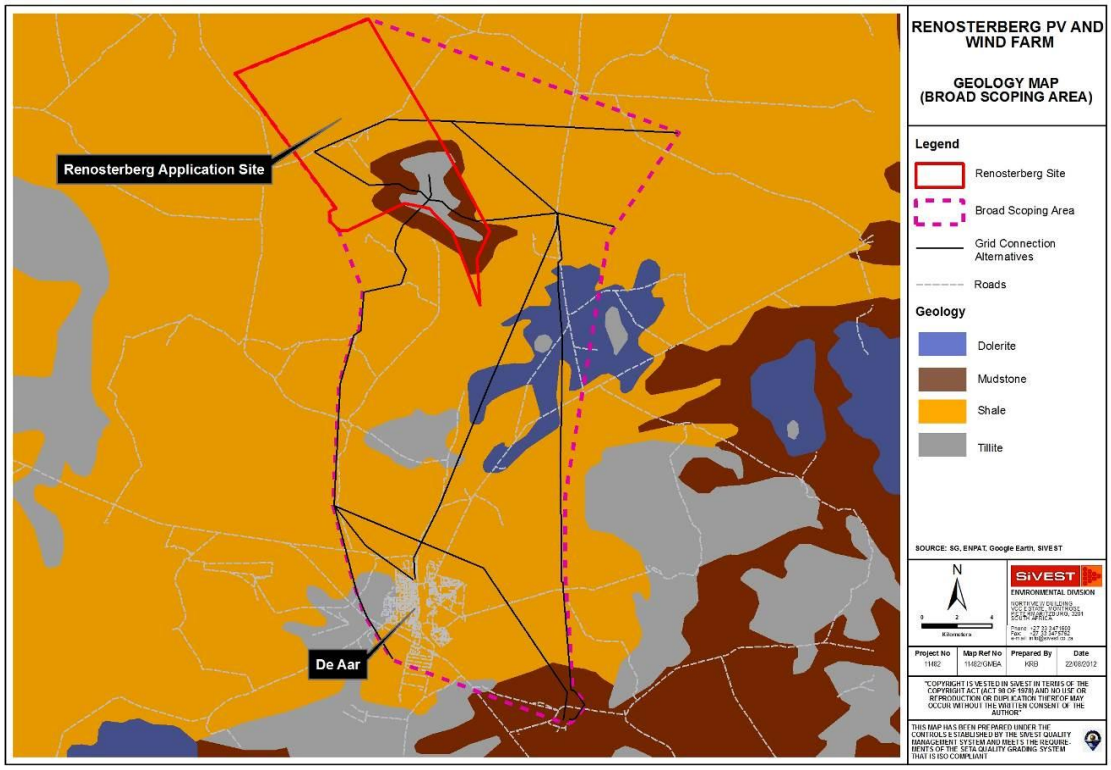


Figure 18: Geology map for the Broad Scoping Area

2.11.2 Slope

Slope, or terrain, is used to describe the lie of the land. Terrain influences climate and soils characteristics and thus plays a dominant role in determining whether land is suitable for agriculture. In most cases sloping land is more difficult to cultivate and usually less productive than flatland, and is subject to higher rates of water runoff and soil erosion (FAO, 2007).

The Renosterberg Site is characterised by two distinct topographical regions. The north eastern portion of the site is characterised by flat and gently sloping topography with an average gradient of less than 5% (**Figure 19**), making this area ideal for intensive agriculture with a high potential for large scale mechanisation. The flat topography also makes the study area ideal for the proposed development, as minimal earthworks will be required to prepare this portion of the site. Conversely, the south western portion is dominated by steep slopes and includes the Renosterberg. The Renosterberg can be described as a Mesa landform, which is an elevated area of land with a flat top and steep sides (Internet 1). These steep slopes are limiting to arable agriculture and are also associated sever engineering constraints (Figure 20). The flat areas atop the Renosterberg could, however, form part of the wind farm development layout.

Like the Renosterberg Site, the Broad Scoping Area is dominated by flat and gently sloping topography with sporadic rocky outcrops (Figure 20).

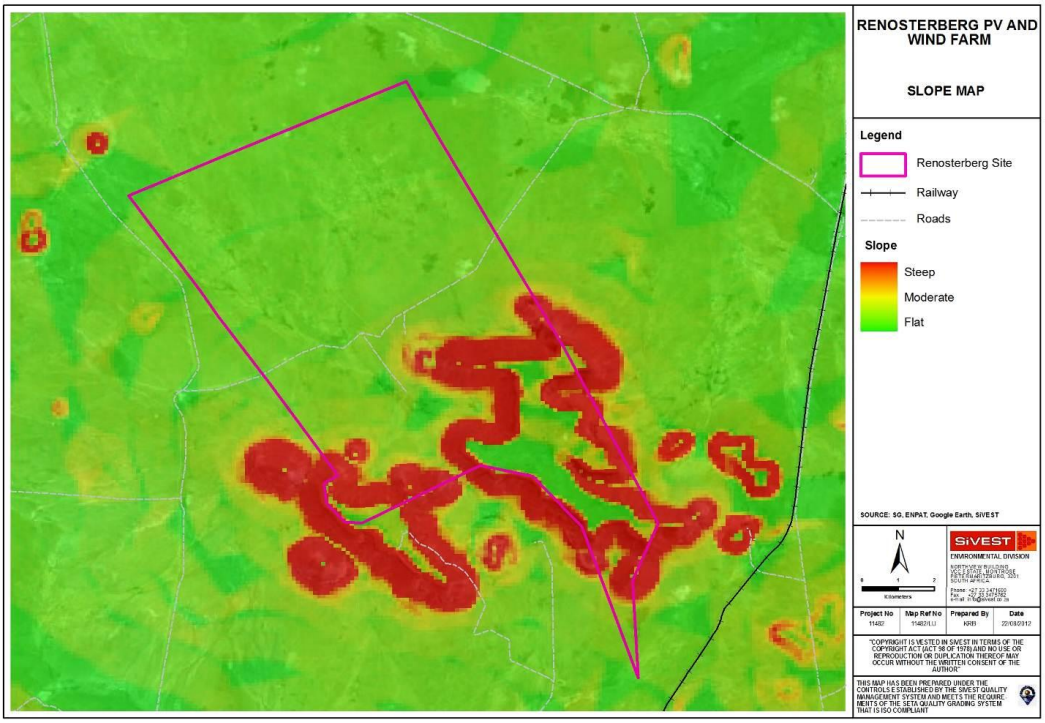


Figure 19: Slope Map for the Renosterberg Site

Figure 20: The steep sides of the Renosterberg

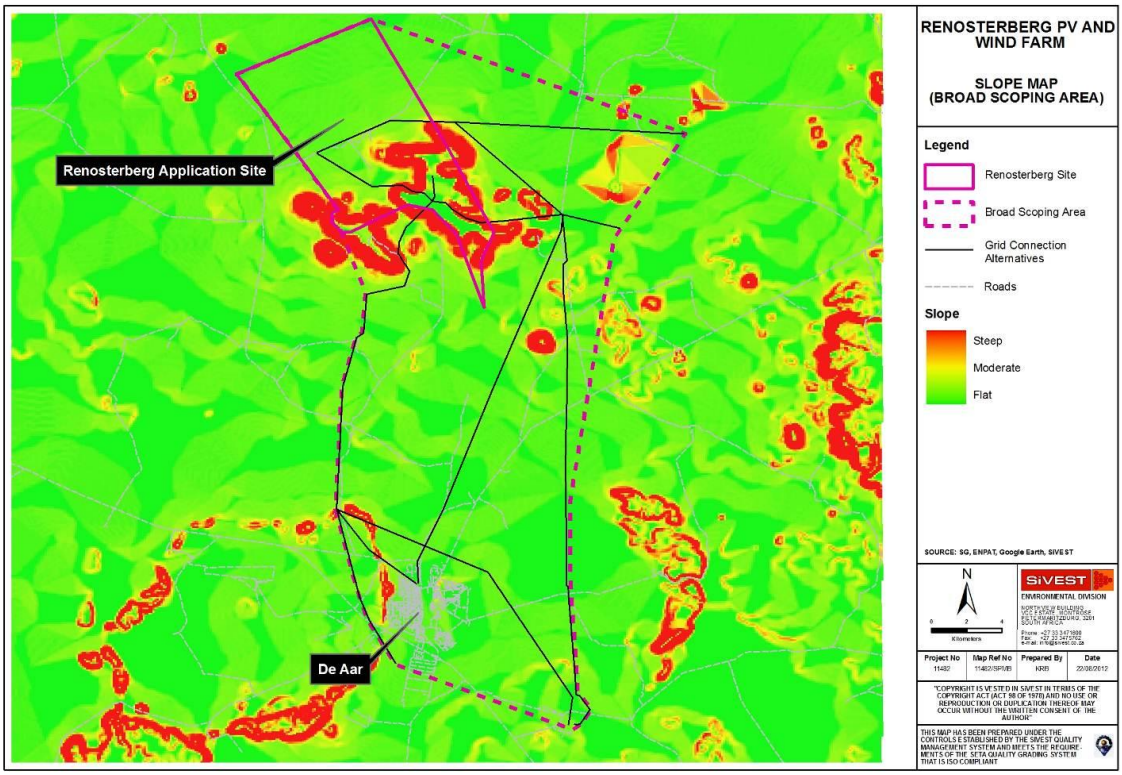


Figure 21: Slope map for the broad study area

2.11.3 Land Use

According to Mucina and Rutherford (2006) the flat northern and central plains are classified by the *Northern Karoo* vegetation type, which is located in the Nama-Karoo Biome. The steeper slopes, including the Renosterberg are classified as Besemkaree Koppies Shrubland.

The entire Renosterberg Site consists of a mix of natural veld and vacant land, which is used as general grazing land for livestock (Figure 22 and Figure 24). Vast grazing land is interspersed with non-perennial stream beds which flow intermittently and seasonal pans dot the landscape. According to the spatial databases there are no cultivated fields or irrigated lands which could be detrimentally impacted upon by the proposed development. The land uses surrounding the assessment area are virtually identical to the site itself and included grazing land for livestock and game.

The Broad Scoping Area is also dominated by unimproved veld, while the urban center of De Aar is located in the south western corner of the encompassing study area (Figure 23).

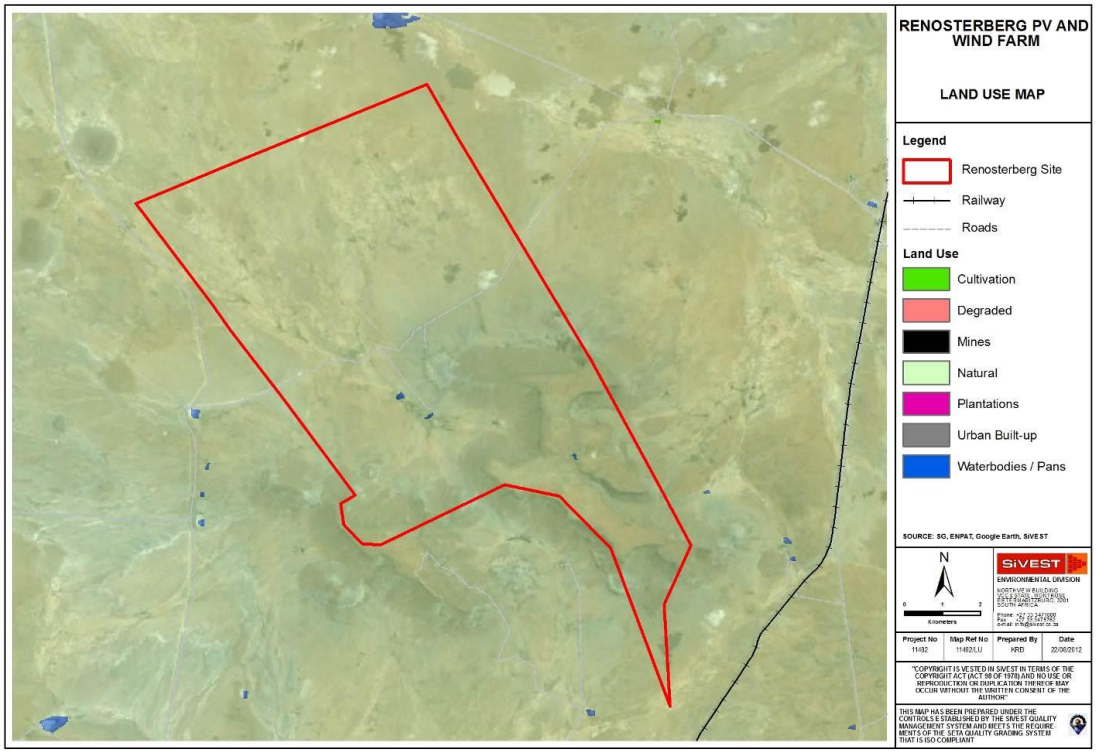


Figure 22: Land Use Map for the Renosterberg Site

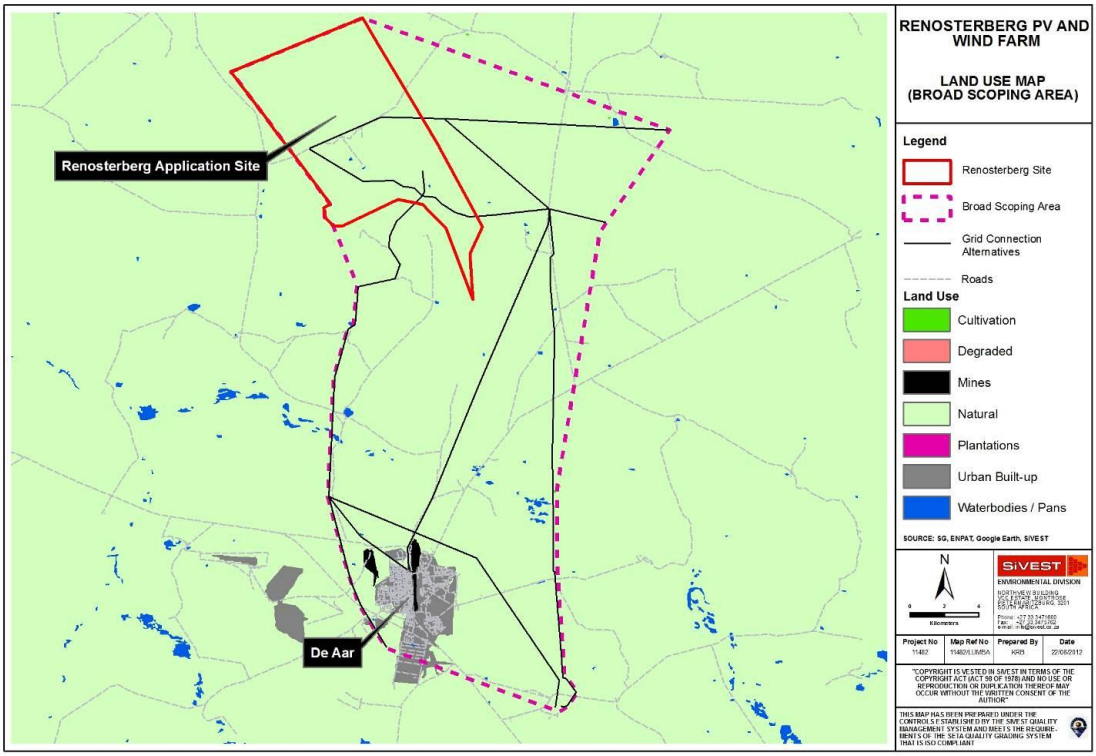


Figure 23: Land use for the Broad Scoping Area

Figure 24: Unimproved grazing land dominates the site.

2.11.1 Soil Characteristics and Soil Potential

The ENPAT spatial dataset for the Northern Cape Province also provides details pertaining to the broad soil type and approximate agricultural potential for the study area. Figure 25 provides a spatial characterisation of the major soil groups which underlie the Renosterberg Site.

The central and eastern portions of the site are underlain by red apedal soil types. Apedal soils lack well formed peds[1], other than porous micro-aggregates, and are weakly structured. Apedal soils tend to be freely drained, and the red colour generally signifies good aeration in the soil profile. The north western corner of the site is underlain by Glenrosa and Mispah soil forms. These forms are associated with shallow soils, where parent rock is found close to the land surface. These soils have an inherently low agricultural potential due to a prohibitive rooting depth. As expected shallow, rocky soils correspond to the steeper slopes which encircle the Renosterberg.

According to the ENPAT database, the flat areas atop the Renosterberg are the underlain by strongly structured duplex type soils. The defining characteristic of duplex soils is the enrichment of clay within the soil profile and lead to the development of pedo- and prismacutanic horizons. Duplex soils are mostly found in the drier parts of South Africa and

[1] A ped is an individual natural soil aggregate (**Soil Classification Working Group**, **1991**)

have in common the development of a strong structure in the B-horizon and a marked increase in clay compared to the overlying horizon (Fey, 2010). This strong structure can, in certain circumstances, be considered an impediment to root growth and water movement.

The Broad Scoping Area illustrates a similar soil spatial pattern, where shallow red Apedal soil types dominate the encompassing assessment area. Shallow, rocky soils are associated with steeper slopes and outcrops (Figure 26).

The entire study area is classified as having an effective soil depth (depth to which roots can penetrate the soil) of less than 0.45 m deep, which is a limiting factor in terms of sustainable crop production (Figure 27 and Figure 28). According to the AGIS database the soils in the assessment area are associated with low organic carbon content and a basic pH.

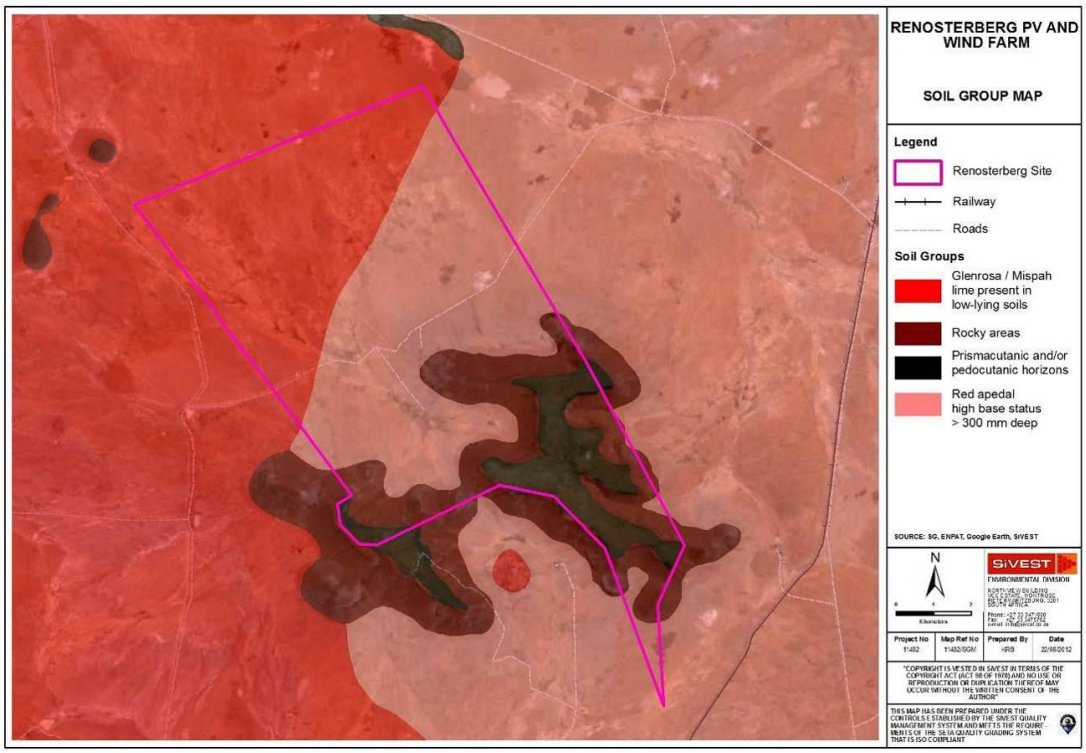


Figure 25: Soil map for the Renosterberg Site

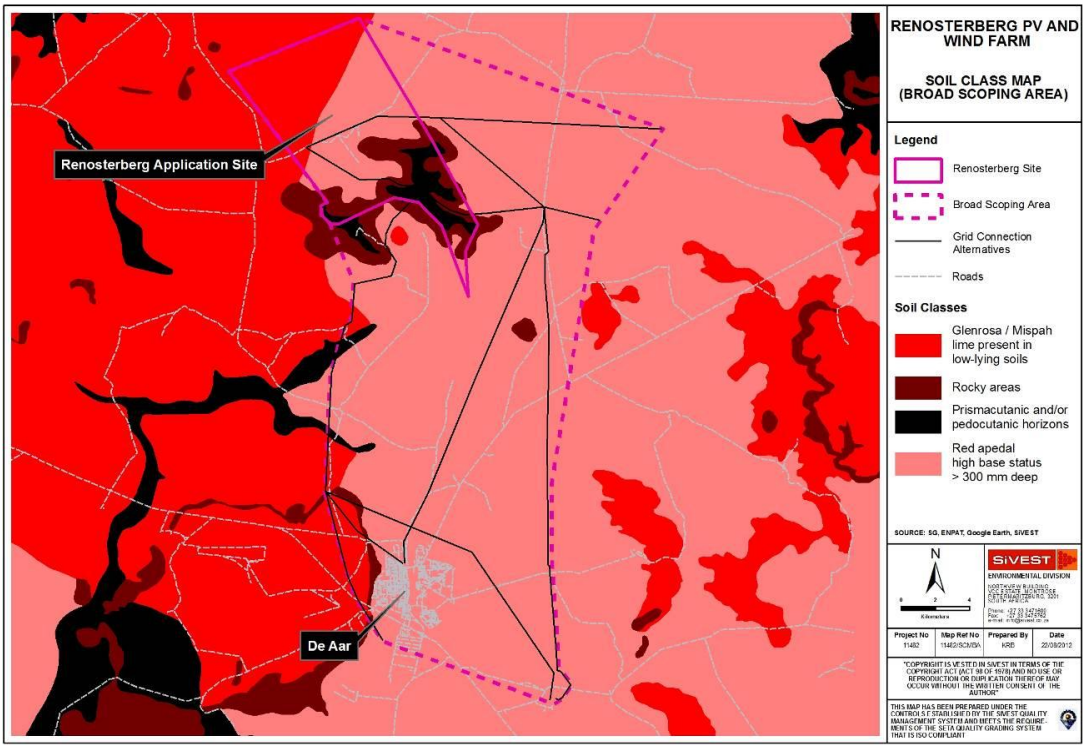


Figure 26: Soil map for the Broad Scoping Area

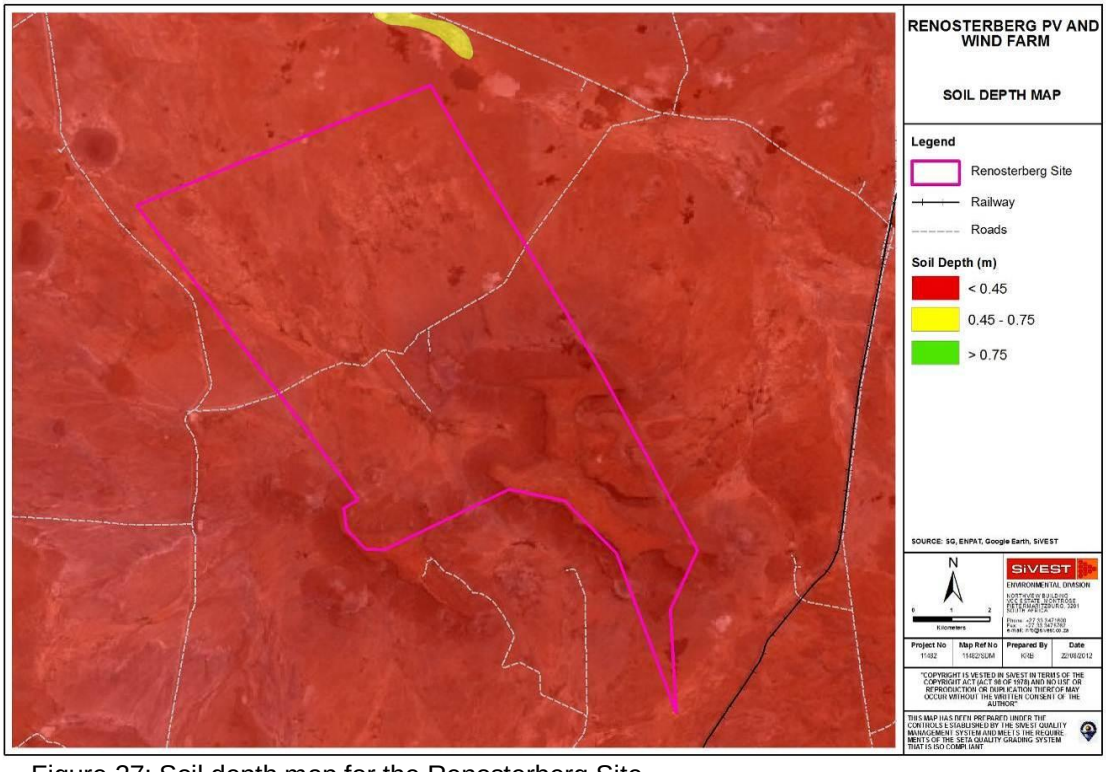


Figure 27: Soil depth map for the Renosterberg Site

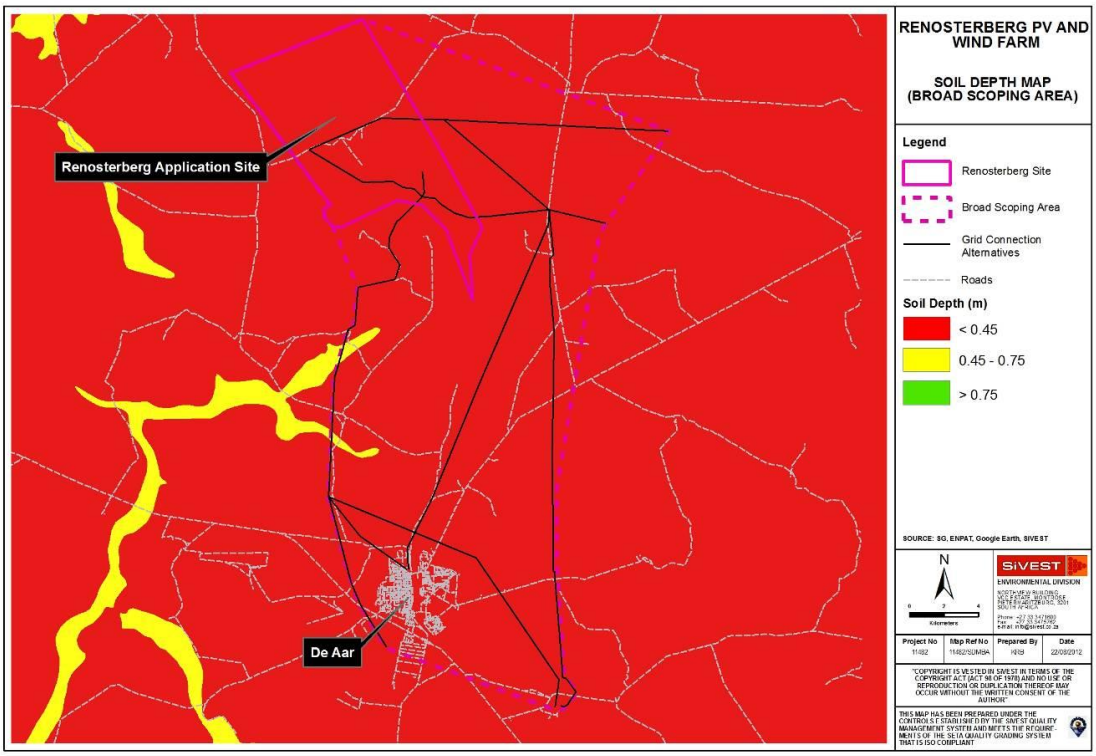


Figure 28: Soil depth map for the broad study area

The ENPAT Database also provides an overview of the study area's agricultural potential, based on its soil characteristics, although it should be noted this spatial dataset does not take *prevailing climate into account*. According to the ENPAT agricultural dataset the vast majority of the Renosterberg Site is dominated by soils which are not suited for arable agriculture, but which can still be used as grazing land (Figure 29). The steeper slopes giving rise to the Renosterberg are only suitable for conservation and for water catchments.

Like the smaller Renosterberg Site, the Broad Scoping Area (Figure 30) is dominated by soils, which are not suited for arable agriculture, but which can still be used as grazing land. Small pockets of soil, which have a slightly higher suitability for arable agriculture, are located the eastern and western edges of the encompassing study area. Restrictive climate characteristics, due to a low and strong seasonal rainfall regime further reduces the agricultural potential of the entire study area.

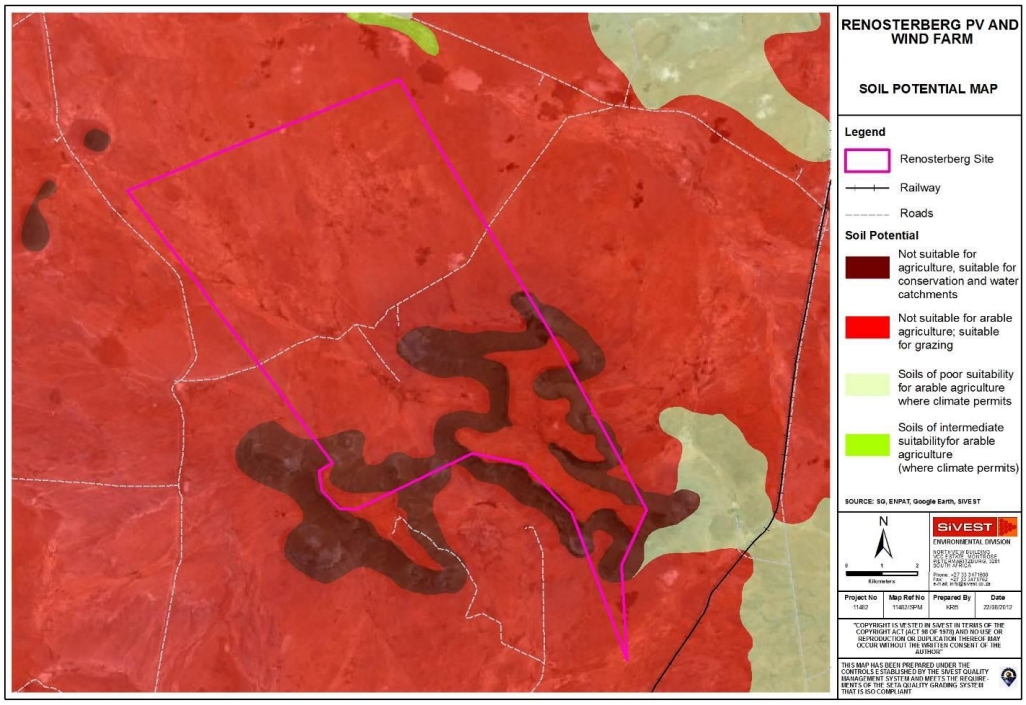


Figure 29: Soil potential map for the Renosterberg Site

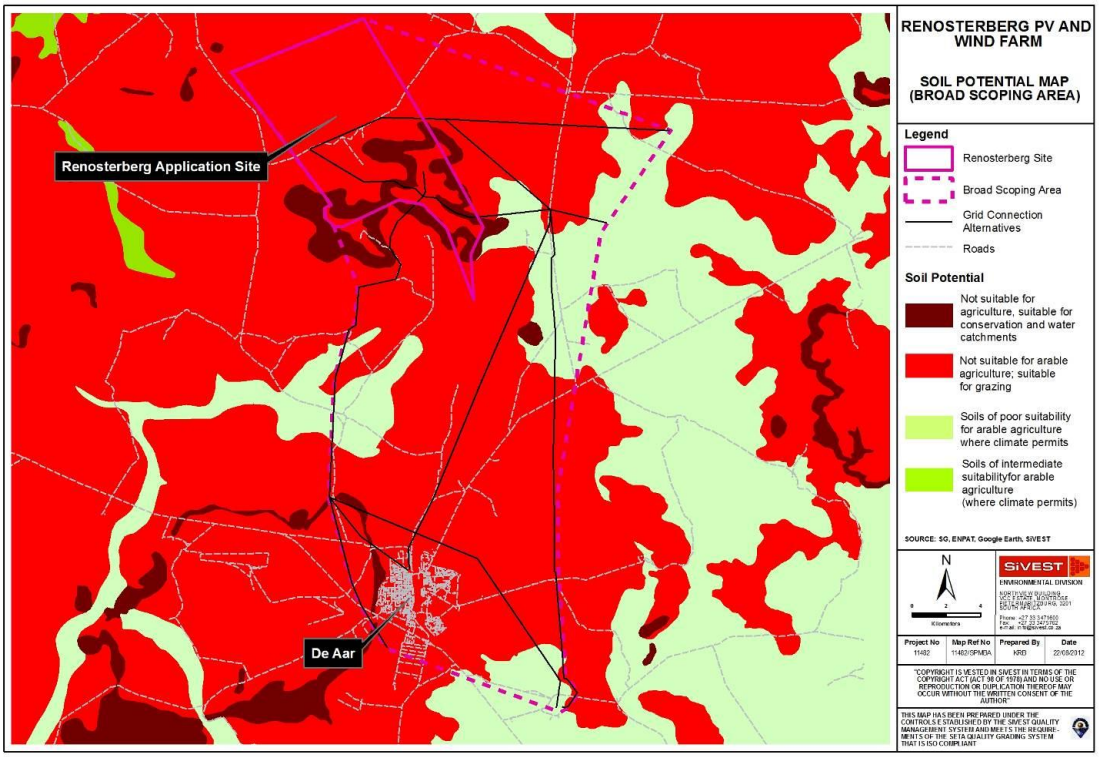


Figure 30: Soil potential map for the Broad Scoping Area.

2.11.2 Desktop Agricultural Assessment: Result Summary

By taking all the site characteristics (climate, geology, land use, slope and soils) into account, the agricultural potential for the Renosterberg Site and Board Scoping Area is classified as being low for crop production while moderate for grazing. This poor agricultural potential rating is primarily due to restrictive climatic characteristics and soil depth limitations. The site is not classified as high potential, nor is it a unique dry land agricultural resource.

2.12 Noise

The Noise Assessment was conducted by Morne De Jager from M² Environmental Connections. The full report is included in Appendix 6F. The environmental baseline from a noise perspective is presented below.

This noise assessment is based in a desktop study as well as a propagation model. Only important concepts, conceptual scenarios and the potential impact that the facility will have on the surrounding acoustic environment was reviewed.

Based on the ambient sound levels, total number of wind turbines to be constructed, their distance from Noise-Sensitive Developments (NSD's) and the prevailing meteorological conditions, there might be NSD's that are affected by the facility. A number of potentially NSD's in this case residential dwellings were identified being within 2 000 meters from the proposed area for the wind turbines, namely, NSD01 and NSD03 (refer to Figure 31 in the specialist report for further information)**.**

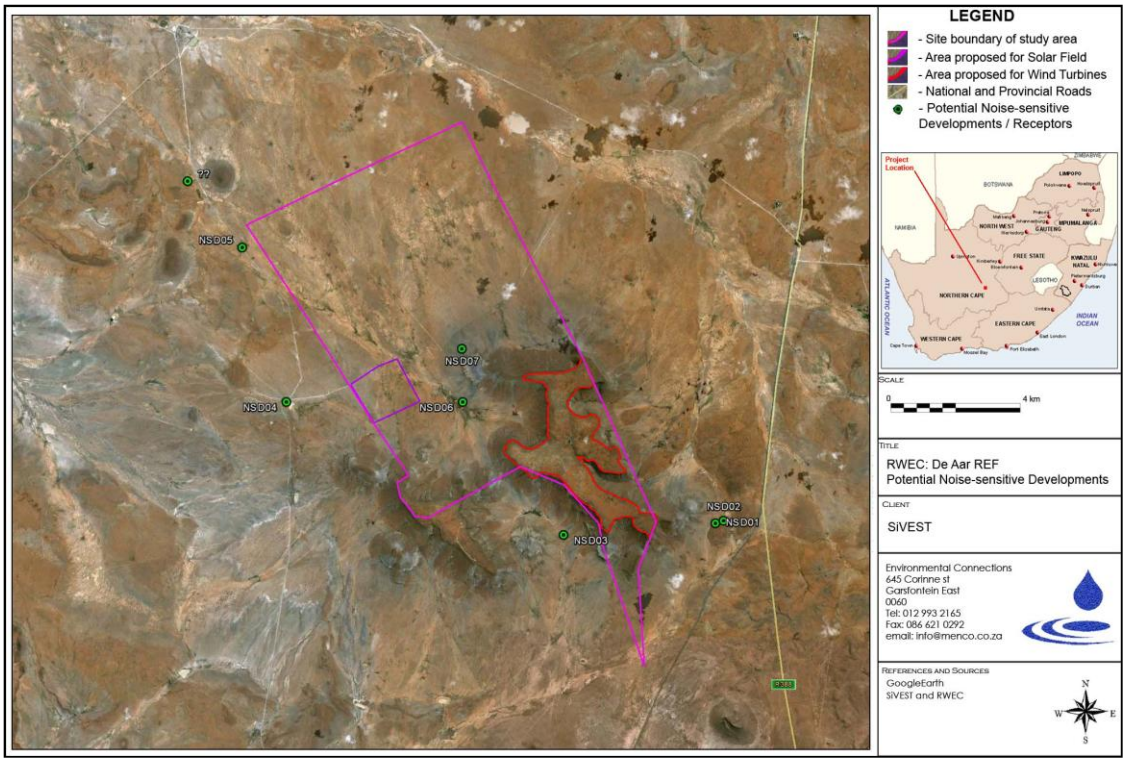


Figure 31: Potentially Sensitive Receptors identified using Topographical maps and GoogleEarth®.

Noise levels are directly related and linked with the various activities associated with the construction and operational phase of the activity. The most significant stage relating to noise is the operational phase as the duration of activities during the construction phase are generally short. The noise impact can only be modelled in detail once the Wind Turbine Generators (WTG's) exact locations have been finalised. However, increased noise levels have been discussed in a general manner.

The area is expected to be very quiet based on ambient sound measurements which were conducted in the general area.

There could be a low to high impact significance on the noise climate as there are NSD's within the area. The main factors that will determine the potential noise impact are:

- Distance that the turbines would be from a NSD and
- Total number of wind turbines that could cumulatively impact on the NSD

The prevailing wind direction is of critical importance to allow the estimation of the impact on potential receptors.

At this preliminary stage it is impossible to determine the significance of the noise impact; low medium or high. It is recommended that the potential noise impact associated with the proposed Wind Energy Facility be investigated in more detail in the Environmental Impact Assessment phase.

It is recommended that with the implementation of correct mitigation measures it would be possible to minimise the potential noise risks and reduce the noise impacts to a more acceptable low significance.

The construction phase will be dealt with in more detail during the EIA phase. Construction activities such as the (potential) borrow pit, concrete batching (if any)/delivery, foundation preparation, the digging of trenches and increased traffic (deliveries and movement onsite) will be considered.

The estimated impact of the operational phase was assessed using five different scenarios. Each scenario was modelled to hard ground conditions (-3 dBA penalty) (worst case scenario) and soft ground conditions (potential impact that ground conditions such as vegetation could have) (more realistic scenario). The five scenarios include the following:

- Scenario 1: One wind turbine operating upwind from a Potentially Sensitive Receptor,
- Scenario 2: Five wind turbines operating upwind from a Potentially Sensitive Receptor,
- Scenario 3: Thirteen (13) wind turbines operating upwind from a Potentially Sensitive Receptor,
- Scenario4: Fifty-two (52) wind turbines operating upwind from a Potentially Sensitive Receptor,
- Scenario 5: Fifty-two (52) wind turbines operating downwind from a Potentially Sensitive Receptor.

The results of the propagation model are provided in Table 10 below.

Table 10: Summary of the results obtained from the modeling scenarios

	All hard ground scenario (worst case)
	All soft ground scenario (more realistic case)

Wind turbine operating from a potentially sensitive receptor	Potential receptor noise level (dBA)	Background ambient noise level (dBA)	Change of noise level (dBA)	Cumulative effect (dBA)
1	36.7	28	8.7	
	28	28	0	
5	42.9			Increase of 6.2 from 1 turbine scenario
	Exceeding 32			Increase of 4 from 1 turbine scenario
13	More than 45.7			Increase of 2.8 from a 5 turbine scenario
	Exceeding 34	28	6	Increase of 2

				from a 5 turbine scenario
52 (upwind)	49.8			Increase of 4.1 from a 13 turbine scenario
52 (downwind)	30.2			Decrease of 3.8 from a 13 turbine scenario

Note:

- Distance of the receptor from the conceptual wind turbine/s is 1500 meters.
- A 7 dBA increase (cumulative effect) defines a potential 'disturbing noise'.
- $L_{Req,N}$ of **35dBA** as proposed by SANS 10103 has been used as the appropriate Zone Sound Levels for noise sensitive activities (e.g. sleeping, places of worship, schools, etc.).

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 this Scoping report the LReq,N of 35dBA as proposed by SANS 10103 is used.

The previous conceptual scenarios (worst case) illustrates the situation where atmospheric conditions are favorable for sound propagation, with the wind speeds above the cut-in speeds of the WTG, but before wind induced noises start to mask the noises from the WTG.

Depending on the ambient sound levels, total number of wind turbines to be constructed, their distance from Noise-sensitive developments and the prevailing meteorological conditions, there might be NSDs that could be affected by the facility. However, due to various unknowns and uncertainties, the actual potential impact from low frequency noises will only be considered during the EIA phase when field measurements have been taken into consideration. Potential impacts have however, been identified and scoped.

2.13 Visual

The Visual Assessment was conducted by SiVEST. The full report is included in Appendix 6G. The environmental baseline from a soils and agricultural perspective is presented below.

2.13.1 Visual Character and Sensitivity of the study

The physical and land use related characteristics are outlined below as they are important factors contributing to the visibility of a development and visual character of the study area. Defining the visual character is an important part of assessing visual impacts as it establishes the visual baseline or existing visual environment in which the development would be constructed. The visual impact of a development is measured according to this visual baseline by establishing the degree to which the development would contrast or conform with the visual character of the surrounding area.

The visual character also needs to be defined in order to establish the visual absorption capacity (VAC) of an area, or ability of an area / landscape to absorb development without noticeable intrusion or change to the visual character. The inherent sensitivity of the area to visual impacts or visual sensitivity is thereafter determined based on various factors which include; the pristine character of the visual landscape, cultural or open space value of the environment and presence of visual receptors.

2.13.2 Physical and Land Use Characteristics

- Topography

The prevailing topography within the application site displays an extreme variation in form. The northern parts of the site is characterised by relatively flat to gently undulating terrain, typical of much of the Karoo, that slopes down gradually in a northerly direction. In contrast, the southern part of the site covers a large portion of the Renosterberg Mountain Range, which are characterised by very steep slopes that rise up and form a relatively extensive level plateau (Figure 32 and Figure 33).

Figure 32: Google Earth aerial view of the application site showing the high-lying plateaus in the southern part of the site.

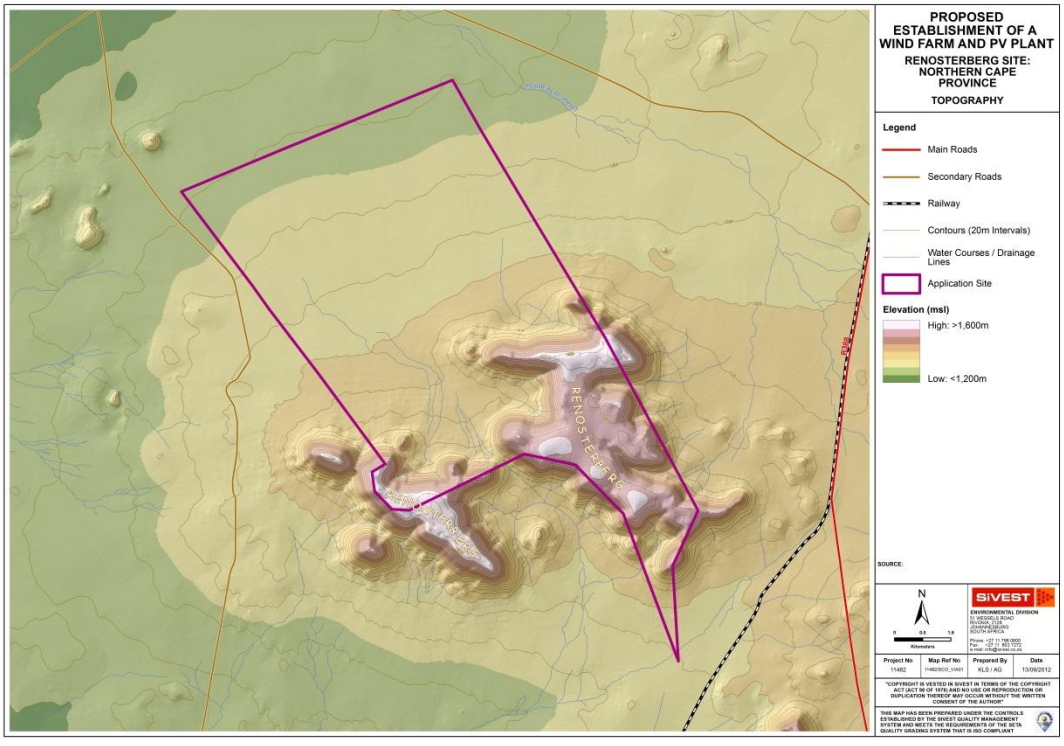


Figure 33: Topography within the application site.

The mixed nature of the terrain across the study area has differing visual implications. The mountainous terrain would constrain the viewshed and limit views of certain parts of the proposed site from farmsteads located to the south and east as well as from the R48 and R388. Conversely, if the development is positioned on the high-lying plateau the structures would be highly visible from the surrounding area in all directions. Bearing in mind the fact

that wind turbines are very large structures, the visual impact would be exacerbated, if the wind farm were to be located on these high lying areas.

- Land cover

The site falls partly within the Grassland biome and partly within the Nama-Karoo biome. As such, it is characterised by shrubs of various sizes, intermixed with grasses, succulents, geophytes and annual forbs. The dominant vegetation unit in the southern part of the site is the Northern Upper Karoo which is a typical Karoo shrubland, dominated by shrubs and grasses. The Renosterberg Mountain Range in the southern part of the site forms part of the Beseemkaree Koppies Shrubland. In these high lying areas, a two layered shrubland characterised by a lower layer of small-leaved dwarf shrubs and an upper layer of taller shrubs and trees is prevalent (Figure 34) (Mucina and Rutherford, 2006).

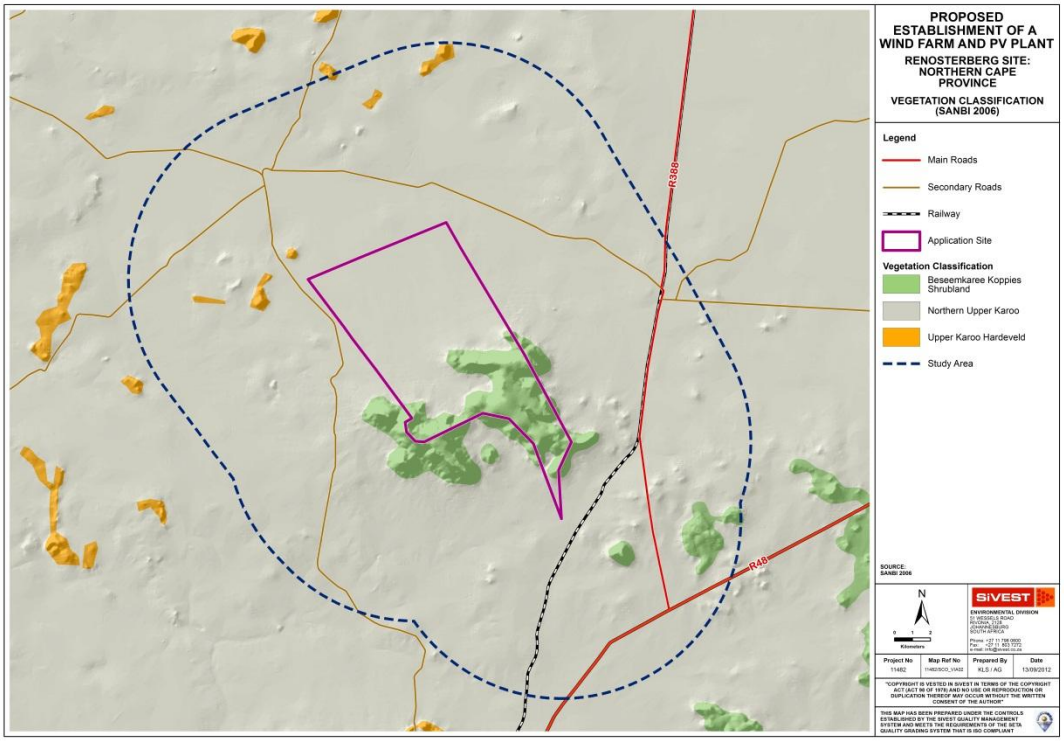


Figure 34: Map showing the vegetation within the study area.

The closest built up area is the town of De Aar which is located approximately 20km from the proposed site. Although a site visit was not been undertaken, it is expected that the built form in the study area would be limited to isolated farmsteads, gravel access roads, ancillary farm buildings and other structures associated with a typical pastoral environment. There are no built-up areas in within a 10km radius of the proposed site.

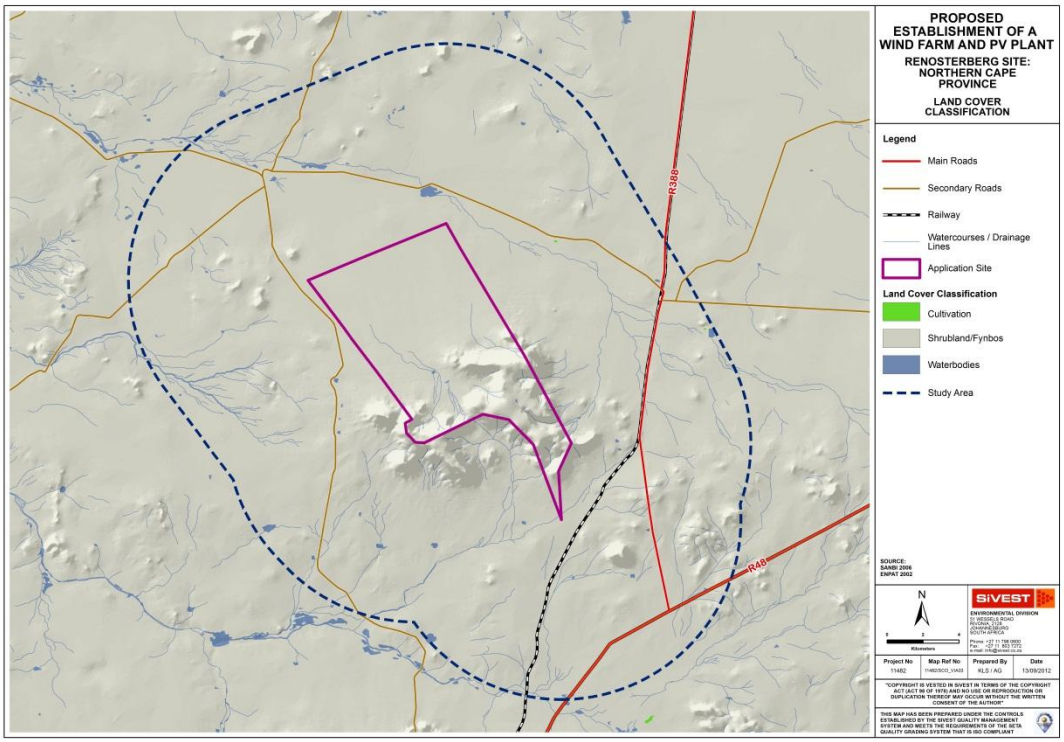


Figure 35: Map showing the land use within the study area

The degree of transformation as well as the on-site infrastructure present on the site will be ground truthed during the next phase of this study.

The relatively short vegetation cover in the northern part of the site will provide limited visual screening. In contrast, although more dense wooded vegetation is present on the Renosterberg Mountain Range in the southern part of the site, this vegetation type is only likely to offer partial visual screening, as the development is of such a height that it would rise above this shrub layer. The land use in the surrounding environment is typical of a rural / pastoral landscape with limited anthropogenic features present, which will influence the visual character of the area, as described below.

2.13.3 Visual Character

The above physical and land use-related characteristics of the study area contribute to its visual character. Visual character can be defined based on the level of change or transformation from a completely natural setting, which would represent a natural baseline in which there is little evidence of human transformation. Varying degrees of human transformation would produce different visual characteristics, with a highly modified urban or industrial landscape being at the opposite end of the scale to a largely natural undisturbed landscape. Visual character is also influenced by the presence of unique natural features or built infrastructure, such as buildings, roads and power lines.

Built infrastructure within the proposed study area is limited to the R48 and R388 access routes, a railway line, a network of gravel access roads, several farm boundary fences, distribution power lines and a few farm buildings. Despite these localised anthropogenic features the study area is considered to have a rural or pastoral visual character, as uninhabited Karoo vegetation still prevails, thus retaining the natural appearance of the landscape. This is important in the context of potential visual impacts associated with the proposed development as introducing a wind and solar energy facility would be considered a degrading factor that does not conform to the typical character of the area.

The scenic quality of the landscape is also an important factor that contributes to the visual character or inherent sense of place. Visual appeal is often associated with unique natural features or distinct variations in form. As such, the Renosterberg Mountain Range in the southern part of the application site is an important topographical feature that creates a focal point within the relatively uniform nature of the surrounding flat terrain (Figure **36**). The mountain range not only increases the visual appeal and visual interest in the surrounding area, but may also be valued for its ability to provide mental well-being to surrounding residents.

Figure 36: View of the Renosterberg Mountain Range (Phil R Hamar)

Overall, the study area has a natural scenic visual character, typical of a pastoral environment. The Renosterberg Mountain Range further contributes to the natural scenic character and unique visual appeal.

2.13.4 Cultural, Historical and Open Space Value

The greater area surrounding the proposed development site can be considered to be typical of a Karoo or “platteland” landscape that would characteristically be encountered across the high-lying dry western and central interior of South Africa. Much of South Africa’s dry Karoo interior consists of wide open, uninhabited spaces sparsely punctuated by widely scattered farmsteads and small towns.

The typical Karoo landscape consisting of wide open plains, and isolated relief, interspersed with isolated farmsteads, windmills and stock holding pens, is an important 'cultural landscape' that is part of the cultural matrix of the South African environment. The Karoo farmstead is an important representation of how the harsh arid nature of the environment in this part of the country has shaped the predominant land use and economic activity practiced in the area, as well as the patterns of human habitation and interaction. The presence of small Karoo towns, such as De Aar, engulfed by an otherwise rural environment, form an integral part of the wider Karoo landscape. As such, the Karoo landscape as it exists today has value as a cultural landscape in the South African context. In the context of the types of cultural landscape listed above, the Karoo cultural landscape would fall into the second category, that of an organically evolved, "continuing" landscape.

The study area, as visible to the viewer, represents a typical Karoo cultural landscape. This is important in the context of potential visual impacts associated with the proposed development of a wind farm and PV plant as introducing this type of development could be considered to be a degrading factor in the context of the natural Karoo character of the study area.

Motorists travelling along the R388 between Hope Town and De Aar and along R48 as they approach De Aar from Philipstown are likely to be visually exposed to the proposed wind and solar development. People travelling along this road section will not necessarily be adversely affected by the visual intrusion of the wind and solar energy facility, as the roads do not form part of any major tourism routes and are mainly used by local farmers (Figure 37). Although the mountainous terrain will screen portions of the proposed development site from these roads, wind turbines located on the plateau and eastern and southern edges of the escarpment are expected to be highly visible from the R388 and R48.

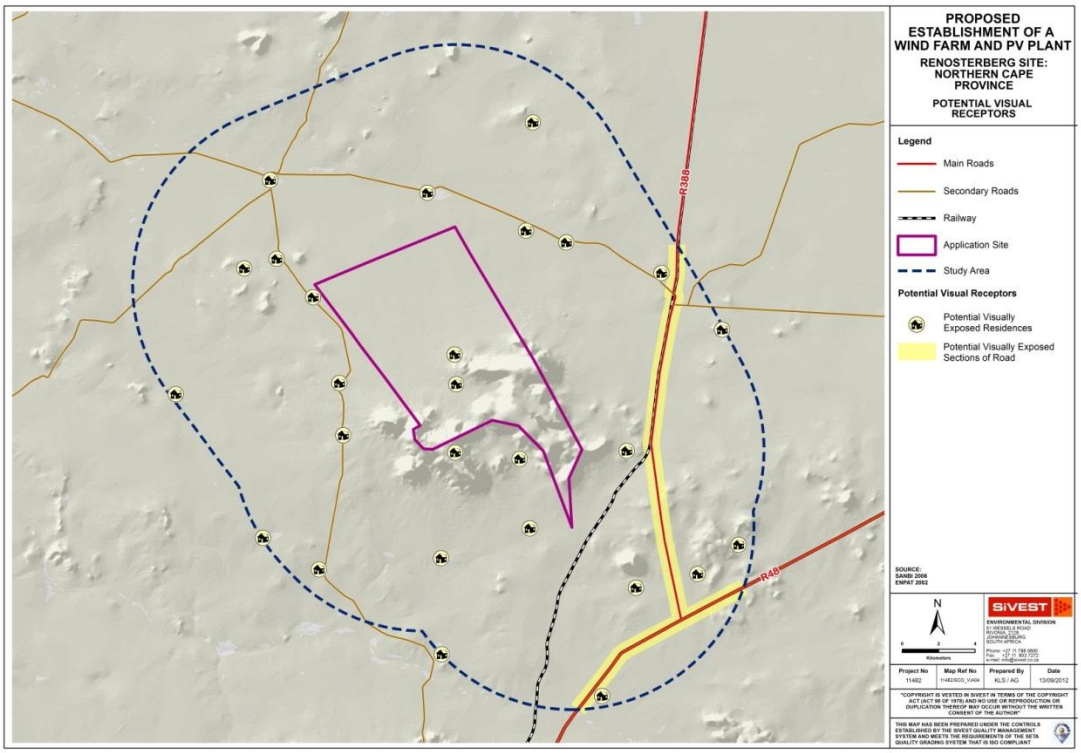


Figure 37: Map showing potential visual receptors within the study area

The nearest human settlement to the development site is the town of De Aar, which is located approximately 20km to the south of the proposed development site. It is not regarded as a visual receptor as people residing within this town are situated too far away to be visually exposed to the development.

Farmhouses within the boundaries of the proposed site and in the surrounding area may be exposed to day and night time visual impacts associated with the proposed wind energy facility (Figure 37). These farmsteads may be sensitive receptor locations, depending on the sensitivity of the people that inhabit them to visual impacts and the value placed by these people on the natural characteristics of the area.

The sensitivity of the farmsteads and nearby sections of the R388 and R48 to visual impacts will need to be clarified and further assessed in the impact phase visual study. This will be done by further assessing the tourism significance of the local routes, the scenic value of the area and the potential sensitivity of people residing within these farmsteads to the visual intrusion associated with the proposed wind farm.

It is important to note that visual impacts are only experienced when there are receptors present; thus in a context where there are no human receptors or viewers present there are unlikely to be any visual impacts.

2.14 Heritage

The Heritage Assessment was conducted by Wouter Fourie of Professional Grave Solutions. The full report is included in Appendix 6H. The environmental baseline from a heritage perspective is presented below.

2.14.1 Archival findings

The aim of the archival background research is to identify possible heritage resources that could be encountered during the field work. The archival research included in this report covers the larger study area and will be updated with detailed information based on discussions with the local landowners and inhabitants during the field work in the EIA phase of the HIA.

Evaluation of archaeological work completed on the Perseus Hydra Transmission line that traverses the eastern section of the study area have produced some ground thruthed information on archaeology to be expected in the study area. Further to this Archaeological Impact Assessments (AIA) and Heritage Impact Assessments (HIA) completed by Archer, Kaplan (2010), Kruger (2012), Orton (2012), PGS (2012) and Van Ryneveld (2008), has revealed a rich archaeological and historical back ground to the greater study area ranging from Earlier Stone Age (ESA) through to the Later Stone Age (LSA) and herder settlements represented by stonewalled kraals along numerous ridges throughout the study area (Figure 38). The colonial period is represented by abandoned and current historical farmsteads dating from the mid to late 1800's (Kruger 2012, Orton, 2012 and PGS, 2011), while remnants of stone walling and ash middens dating from the turn of the 20th Century representing the South African War (Orton, 2012 and PGS, 2012).

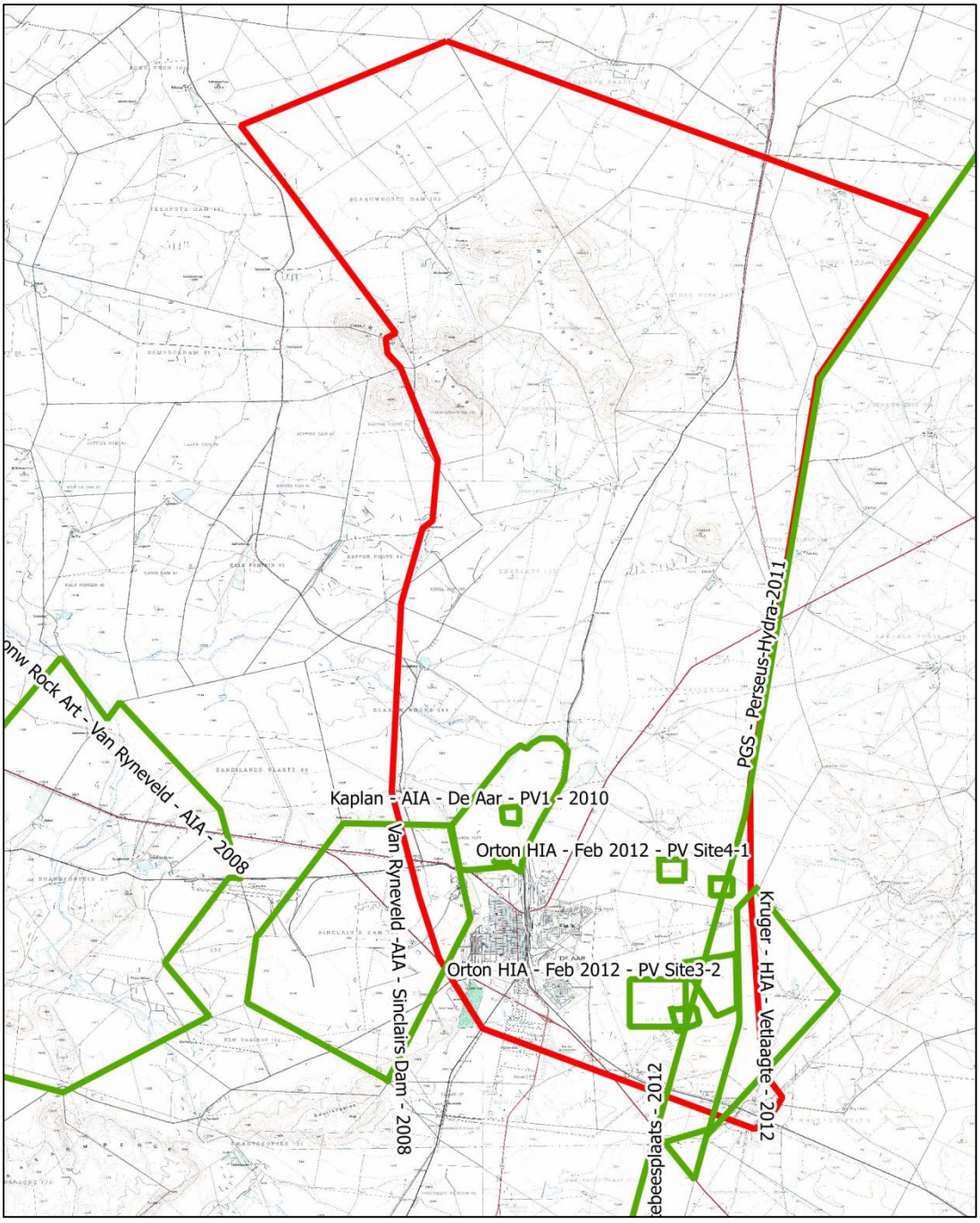


Figure 38: The study area for this Scoping Report (red) with previous heritage studies conducted indicated (green)

Initial desktop studies completed created a map indicating that area exposed to sheet erosion produced more Stone Age finds as deflated site was exposed during erosion (Figure 39).

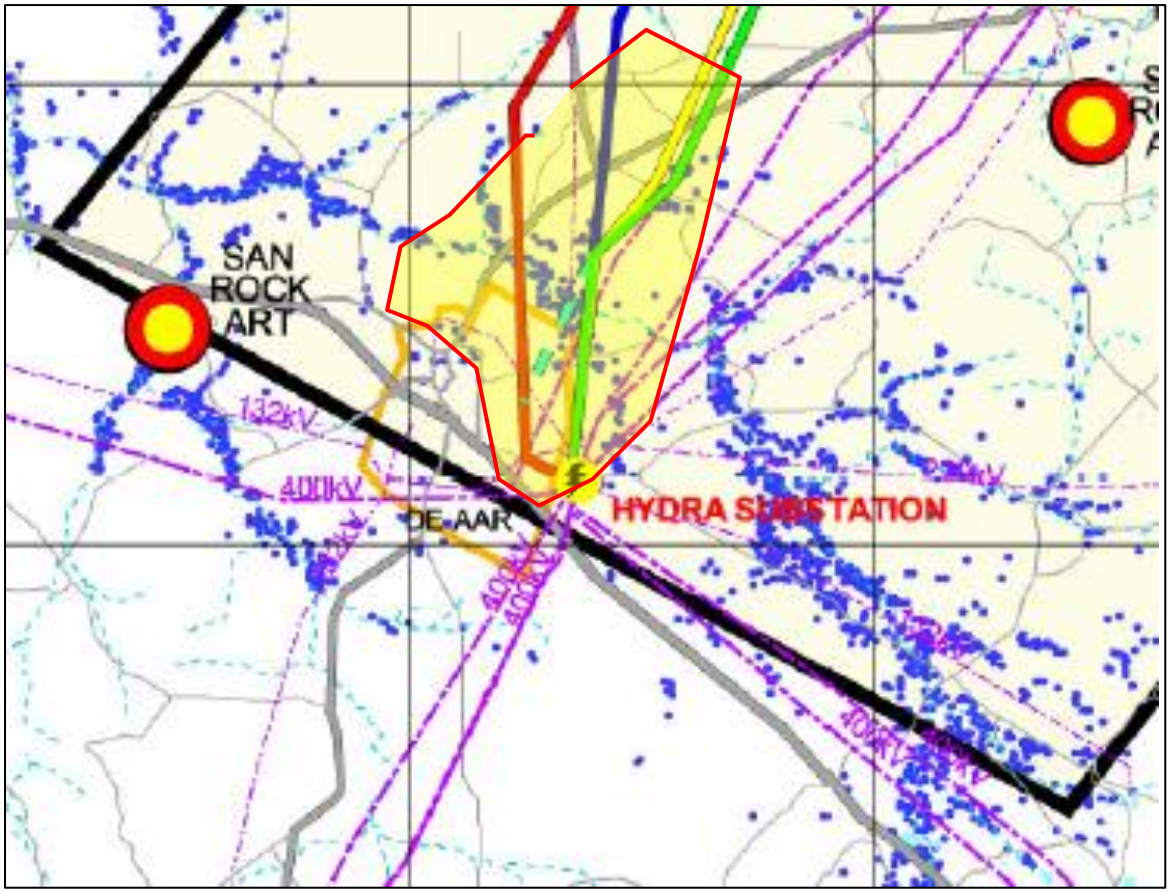


Figure 39: The greater De Aar region indicating San Rock Art finds – Blue spot indicate areas of sheet erosion (Red outline study area) (Van Jaarsveld, 2006)

Follow up field work by PGS Heritage & Grave Relocation Consultants, have provided some valuable information on the archaeology and palaeontology in the study area where the Perseus Hydra line traverses the study area.

- Archaeology

The PGS (2010) revealed numerous find spots from single low concentration Stone Age finds (Figure 40) in eroded areas to larger significant Middle Stone Age Scatters (Figure 41) in the sections of the study area impacted by the Perseus Hydra Transmission line that runs east of the Renosterberg down to De Aar.

Figure 40: Low density scatter of MSA finds

Figure 41: Area scattered with eroded MSA artefacts – Renosterberg in the background

- Historical Context

De Aar Junction played key strategic role during the South Africa War (Anglo-Boer War) and specifically two battles: the Battle of Stormberg and the Battle of Colenso. It acted as both the supply strategic place between Cape Town and the west central regions of South Africa

through the Karoo, which remained devoid of any battles during the war. It is located central western region of the country, South Africa.

The town of De Aar was established just after the South African War after two Friedlander brothers, Isaac and Wolf, surveyed the land on farm De Aar which they had purchased during the construction of a junction in the late 1800's when the railway line between Cape Town and Kimberley was built. The site for the construction of the junction was first identified in 1881 and by 1899 the Friedlander brothers were already operating a trading store and a hotel at the junction. It is during this time that they purchased the farm De Aar which the later built the town of De Aar in 1900. However, it took another 5 years after the war had ended (1902) and 6 years after the creation of the town municipality (1900) for the town to elect its first municipal mayor in 1907. The name, De Aar, means 'Artery' after the underground water supply and is the second most important South African rail junction.

- Understanding the Importance of De Aar during the Second South Africa War

Two South African war battles become important in the history of De Aar; the Battle of Stormberg and the Battle of Colenso. The Battle of Stormberg was one of the famous encounters between the Boers and the British in the South African war. This skirmish/battle took place when the Boers were triumphant and it formed part of a chain of disasters which the British termed the 'The Black Week' (Meintjes, 1969).

The first involvements of De Aar in the war can be dated to November 1899 when the Boers moved southward from the areas of their strong hold the Orange Free State and the Transvaal. On the 1st of November 1899 a small detachment of Boers from the Orange Free State, had seized the railway bridge over the Orange River at Norvalspont. This bridge was at the time guarded by only six policemen who were quickly overcome by the Boers. On the same day Hans Swanepoel of Smithfield and Floris du Plooy of Bethulie with a combined commando of 900 men and two guns crossed the Bethulie bridges over the Orange River and headed from Naauwpoort and Stormberg (Meintjes, 1969). Up until this time the Boers are argued to have deliberately avoided and neglected to occupy some of the principal railway junctions in the Colony, notably: De Aar, Naauwpoort and Stormberg (ibid).

Idea to deliberately neglect these junctions is argued to have been aimed at offending the Schreiner Ministry based on an agreement made between Steyn and Schreiner, which Steyn withdrew in consultation with President Kruger of the Transvaal after it became apparent that the Cape could play a significant role in the war. Steyn then issued proclamations in which parts of the British Bechuanaland and the Northern Cape were annexed to the two Boer Republics, the Transvaal and the Orange Free State. The reason behind these annexations is that, they were made to "...permit commandeering of men and supplies as well as to protect rebels who annexed territories of the Cape Colony and the Protectorate would be guilty of High Treason and perhaps be punishable by execution" (Meintjes, 1969).

When hostility between the British and the Boers across the Orange River commenced, the British had small garrisons at Stormberg Junction, Albert Road, Aliwal North, Norvalspont, Colesberg, Arundel and Naauwpoort (Meintjes, 1969). However, they had no garrison in De Aar which was one of the key strategic supply and distribution junctions. The garrisons along some of the railway line and stations were strategic as the railway lines formed an integral part of the British offensive. During the war they therefore played a significant role throughout South Africa and their disruption became a major target for the Boers; for example, during the capture of armoured train at Kraaipan by De le Ray where the first shots of the war were fired.

Stormberg Junction was chosen as a target junction of annexation, over De Aar Junction, by the Boers advancing south because of its link-up with East London and was an important strategic point for a "*sprong*" up through the eastern Cape to Bloemfontein and Kimberley.

De Aar did, however, play a role during the war times as a stop and transfer junction with the transportation of British brigades and Naval Police from Cape Town to the central interior and for the transportation and transfer of supplies. The Naval Brigades who fought in the Stormberg skirmish pass through the large railway junction De Aar then described as a '...dreary sight of platforms and dusty trains, tin shanties and corrugated iron houses, gray boulders and ashy sky...' (Meintjes, 1969).

The De Aar junction further acted as a major stockpile for stores to be sent forward to the British forces. Doyle (1902) noted that "immense" supplies were gathered at De Aar (Figure 42). Danes (1903) writes, "…*De Aar was a wonderful sight in those days. Hundreds of mules and oxen were there. Countless wagons, packages and cases of food and ammunition, ambulances, hospitals, medical stores*…"

Figure 42: Stockpiles of oats at De Aar (ca. 1900)

This stock piling was due to De Aar being a stopover and staging post for troops and supplies towards the Free State and access point from the Cape and Port Elizabeth. A large Remount Depot (Horse and Mule replenishment) was also present at De Aar, which provided much needed fresh horses and mules for the war effort (Figure 43).

Figure 43: The Remount Depot Garrison at De Aar (December 1899)

Among the people of Note who passed through De Aar during the war is Winston Spencer Churchill. This is during the time when various war correspondents were travelling between the Cape, the Eastern Cape, Northern Cape and the Transvaal. It is suggested that, after staying at the Mount Nelson Hotel in Cape, Churchill travelled by rail to East London, via Matjiesfontein, De Aar, Stormberg, Molteno and Queenstown.

During the Colenso Battle, De Aar was used by the British to transfer guns between the Cape Town, the central interior and the Natal region such as, the long Tom-tom guns. The reason for this is that they were encountering hostile enemy lines along the east coast regions of the country (Martins, 1988). Nasson (1999: 135), for example, argues that "the failure of Black Week had prised things open, almost inviting a capitalizing counterstroke from some bold and resolute Boer leadership. Exposed to a broader offensive, the Cape Colony virtually asked for deeper penetration to throttle the strategic junction of De Aar, thereby severing Methuen's supply lines. On the eastern front, almost all of Natal remained under the enemy thumb, with the British confined or paralysed by the Orange Free State commandos who, in their most southerly groupings, had pegged out substantial swathe of land running down to within 120miles of the Indian Ocean".

2.14.2 Possible finds

Evaluation of aerial photography has indicated the whole of the study area that may be sensitive from a heritage resources perspective (Figure 44). Archaeological surveys and studies in the Northern Cape have shown rocky outcrops, dry river, riverbanks and confluence to be prime localities for archaeological finds and specifically Stone Age sites. Included in the archaeological timeframe is the South African War as well as colonial farmer settlements.

The aerial photography has reference the following as of possible heritage sensitivity:

- Drainage lines

Drainage lines, such as dry river beds, erosion dongas as well as sheet erosion has been shown to yield rich archeological deposits due to the exposure of archaeological material as well as the fact that human settlement is drawn to water sources in arid regions (Kruger 2012; Orton 2012; PGS 2012).

- Farmsteads

Most of the farmsteads in the study area date from the mid to late 1800's and are of great historical and significance r (Kruger 2012; Orton 2012; PGS 2012).

- Structures

Numerous structures and outlines of man mad structures have been identified and rated as possible sensitive heritage resources from the aerial survey. Some of the early settler farmsteads have been abandoned for close to 100 years and only the remnants of the walling, middens and paddocks remain. These sites can be of high heritage significance regions (Kruger 2012; Orton 2012; PGS 2011).

- Pans

Previous research in the Northern Cape has shown that as with drainage line and rivers human occupation is drawn to pans and ephemeral water sources by the chance of water and of hunting due to the availability of game in such areas.

- Ridges

Numerous ridges, koppies and mountains have been identified in the study area and AR associated with human settlement and activity. Stonewalling from herders, rock engravings and knapping sites associated with Later Stone Age manufacturing technology is known to occur in these areas (Kruger 2012; Orton 2012; PGS 2011 and 2012, Van Ryneveld 2008).

- South African War

The archival research has shown that De Aar was a major staging post during the South African War. Along with the infrastructure and remnants found close to town, the railway line running northwards through the study area will have the remains of numerous blockhouse, constructed by the British Forces to protect the railway line from attack, in close vicinity.

- Sensitive areas as indicated from previous HIA's

Sensitive areas as identified in previous HIA's and AIA's have been included in the mapping and are in all cases associates with one or more of the categories listed above.

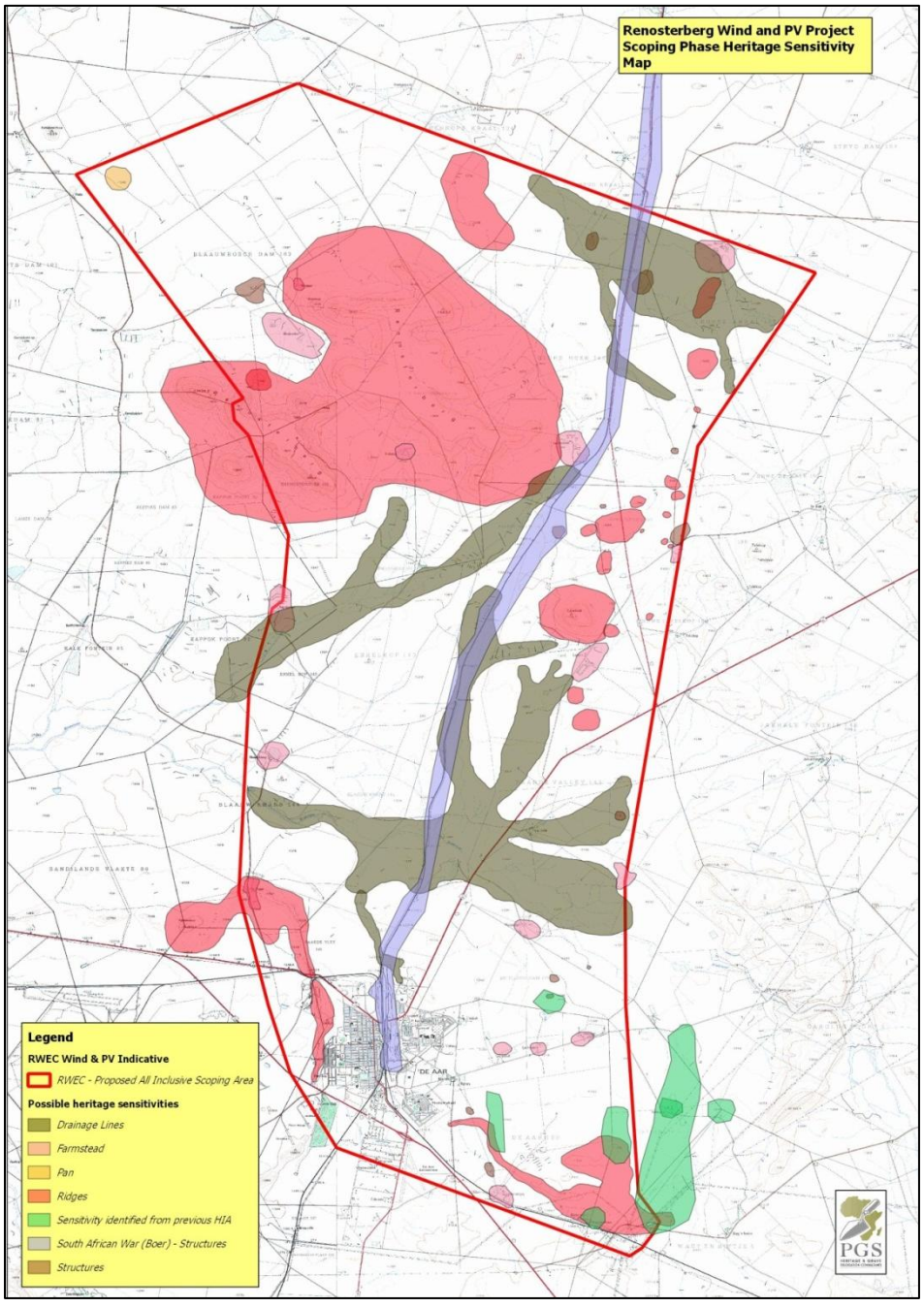


Figure 44: Areas with possible heritage resources present

2.15 Palaeontology

The Palaeontological Assessment was conducted by Dr. John Almond of Natura Viva cc. The full report is included in Appendix 6I. The environmental baseline from a palaeontological perspective is presented below.

2.15.1 Palaeontological Heritage with the Study Area

Fossil biotas recorded from each of the main stratigraphic units mapped in the study area are briefly reviewed below, where an indication of the palaeontological sensitivity of each rock unit is also given. Bedding dips of the Karoo Supergroup sediments in the study region are generally horizontal to very shallow. Low levels of tectonic deformation and cleavage development are expected here, favouring good fossil preservation. However, extensive dolerite intrusion has compromised fossil heritage in portions of the Karoo Supergroup sediments due to resulting thermal metamorphism. In addition, pervasive calcretisation and chemical weathering of many near-surface bedrocks has further compromised their original fossil heritage.

- Upper Ecca Group

The fossil record of the Tierberg Formation has been reviewed in detail by Almond (2008a). Rare body fossil records include disarticulated microvertebrates (e.g. fish teeth and scales) from calcareous concretions in the Koffiefontein sheet area (Zawada 1992) and allochthonous plant remains (drifted leaves, petrified wood). The latter become more abundant in the upper, more proximal (prodeltaic) facies of the Tierberg (e.g. Wickens 1984). Prinsloo (1989) records numerous plant impressions and unspecified “fragmentary vertebrate fossils” (possibly temnospondyl amphibians) within fine-grained sandstones in the Britstown sheet area. Dark carbonaceous Ecca mudrocks are likely to contain palynomorphs (e.g. pollens, spores, acritarchs).

The most common fossils by far in the Tierberg Formation are sparse to locally concentrated assemblages of trace fossils that are often found in association with thin event beds (e.g. distal turbidites, prodeltaic sandstones) within more heterolithic successions. A modest range of ten or so different ichnogenera have been recorded from the Tierberg Formation (e.g. Abel 1935, Anderson 1974, 1976, Wickens 1980, 1984, 1994, 1996, Prinsloo 1989, De Beer *et al*., 2002, Viljoen 2005, Almond 2008a). These are mainly bedding parallel, epichnial and hypichnial traces, some preserved as undertracks. Penetrative, steep to subvertical burrows are rare, perhaps because the bottom sediments immediately beneath the sediment / water interface were anoxic. Most Tierberg ichnoassemblages display a low diversity and low to moderate density of traces. Apart from simple back-filled and / or lined horizontal burrows (*Planolites, Palaeophycus*) they include arthropod trackways (*Umfolozia*) and associated resting impressions (*Gluckstadtella*), undulose fish swimming trails (*Undichna*) that may have been generated by bottom-feeding palaeoniscoids, horizontal epichnial furrows (so-called

Scolicia) often attributed to gastropods (these are also common in the co-eval Collingham Formation; Viljoen 1992, 1994), arcuate, finely-striated feeding excavations of an unknown arthropod (*Vadoscavichnia*), beaded traces ("*Hormosiroidea*" or "*Neonereites*"), small sinusoidal surface traces (*Cochlichnus*), small star-shaped feeding burrows (*Stelloglyphus*) and zigzag horizontal burrows (*Beloraphe*), as well as possible narrow (<1cm) Cruziana scratch burrows. The symmetrical, four-pronged trace *Broomichnium* (= *Quadrispinichna* of Anderson, 1974 and later authors) often occurs in groups of identical size (c. 3.5cm wide) and similar orientation on the bedding plane. This trace has frequently been misinterpreted as a web-footed tetrapod or arthropod trackway (e.g. Van Dijk *et al*. 2002 and references therein). However, Braddy and Briggs (2002) present a convincing case that this is actually a current-orientated arthropod resting trace (cubichnion), probably made by small crustaceans that lived in schools of similar-sized individuals and orientated themselves on the seabed with respect to prevailing bottom currents. Distinctive broad (3-4cm), strap-shaped, horizontal burrows with blunt ends and a more-or-less pronounced transverse ribbing occur widely within the Tierberg mudrocks. They have been described as "fucoid structures" by earlier workers (e.g. Ryan 1967) by analogy with seaweeds, and erroneously assigned to the *ichnogenera Plagiogmus* by Anderson (1974) and *Lophoctenium* by Wickens (1980, 1984). Examples up to one metre long were found in Tierberg mudrocks near Calvinia in 1803 by H. Lichtenstein, who described them as "eel fish". These are among the first historical records of fossils in South Africa (MacRae 1999). These as yet unnamed burrows are infilled with organized arrays of faecal pellets (Werner 2006). Sandstone sole surfaces with casts of complex networks of anastomosing (branching and fusing) tubular burrows have been attributed to the ichnogenus *Paleodictyon* (Prinsloo 1989) but may more appropriately assigned to *Megagrapton* (Almond 1998). These so-called graphoglyptid burrows are associated with turbidite facies from the Ordovician to Recent times and have been interpreted as gardening burrows or *agrichnia* (Seilacher, 2007). Microbial mat textures, such as *Kinneyia*, also occur in these offshore mudrocks but, like the delicate grazing traces with which they are often associated, are generally under-recorded.

It is considered likely that the uppermost Ecca Group rocks in the De Aar study region belong to the Waterford Formation rather than the Tierberg Formation as mapped. Rare fragments of poorly-preserved tetrapod bone are recorded in channel lags within the upper Waterford Formation in the Williston sheet area (Viljoen 1989) and the southern Great Karoo. These probably belong to aquatic temnospondyl amphibians ("*labyrinthodonts*") but large fish and terrestrial therapsids might also be represented. Scattered palaeoniscoid fish scales and fish coprolites are common in the Waterford Formation, and several genera of non-marine bivalves have been described from the southern Karoo (Bender *et al*. 1991, Cooper & Kensley 1984).

Upper delta platform facies of the Waterford Formation (including the Koedoesberg Formation of earlier authors) contain abundant, low diversity trace assemblages of the *Scoyenia ichnofacies*. They are dominated by the rope-like, horizontal and oblique burrows of the *ichnogenus Scoyenia* that has been attributed to small arthropods (possibly insects) and / or earthworms. These tubular, meniscate back-filled scratch burrows characterise intermittently moist, firm substrates such as channel and pond margins on the upper delta platform (Smith

& Almond 1998, Buatois & Mángano 2004, 2007). Good examples, often associated with wave-rippled surfaces, are recorded from Waterford thin-bedded sandstones and siltstones in the Roggeveld Escarpment zone by Wickens (1984, 1996) and Viljoen (1989). Offshore delta platform facies of the Waterford Formation have very impoverished, poorly-preserved ichnofaunas due to rapid sedimentation rates with abundant soft-sediment deformation and perhaps also to fluctuating salinities.

Petrified wood and other plant material of the *Glossopteris* Flora (e.g. *Glossopteris, Phyllotheca*) is also common in the Waterford Formation (Theron 1983, Anderson & Anderson 1985, Viljoen 1989, Wickens 1984, 1996, Rubidge et al. 2000). Leaves and stems of arthrophytes (horsetails) such as Schizoneura have been observed in vertical life position. Substantial fossil logs (so-called "Dadoxylon") showing clearly developed seasonal growth rings are mostly permineralised with silica but partially or completely calcified material is also known (Viljoen 1989). At least two different genera of gymnospermous woods, *Prototaxoxylon* and *Australoxylon*, have been identified so far (Bamford 1999, 2004). Fragments of silicified gymnospermous woods, some showing the original xylem tissue preserved in fine detail (e.g. clear seasonal growth rings), are among the commonest fossil remains from the Ecca Group outcrop area near De Aar reported in the various recent field studies by Almond (2012a, 2012b, 2012c) (Figure 46). Sheetwash and other near-surface gravels overlying the Ecca Group outcrop area consistently contain small cherty fragments of silicified woods reworked from the underlying bedrocks. Larger petrified wood samples also occur within subsurface gravels overlying Ecca bedrocks where these are exposed at surface near De Aar.

The storm-dominated shelf sediments of the Carnarvon-type facies of the Waterford Formation, as seen near De Aar, are typically associated with pervasive low intensity bioturbation by low diversity trace fossil assemblages. The latter have been assigned to the shallow marine *Cruziana* Ichnofacies as well as the marginal marine *Skolithos* and *Scoyenia* Ichnofacies (e.g. Rust et al. 1991 and references therein). Good examples of these traces are illustrated by Siebrits (1987), Prinsloo (1989) and Rust *et al*. (1991) (Figure 45). Prominent trace fossil taxa include cm-sized horizontal to oblique burrows with striated walls (cf *Palaeophycus striatus*) and vertical spreiten burrows of the ichnogenus *Teichichnus*. Non-marine arthropod feeding and resting scratch burrows of the ichnogenera *Cruziana* and *Rusophycus* are also reported here; they may have been generated by crustaceans. Possibly limb and belly impressions of large tempnospondyl amphibians were recorded from a wave-rippled surface northeast of De Aar (Almond 2012a). The Holostratotype section through the Tierberg Formation designated by Viljoen (2005) features a variety of trace fossil occurrences as well as occasional fossil wood material.

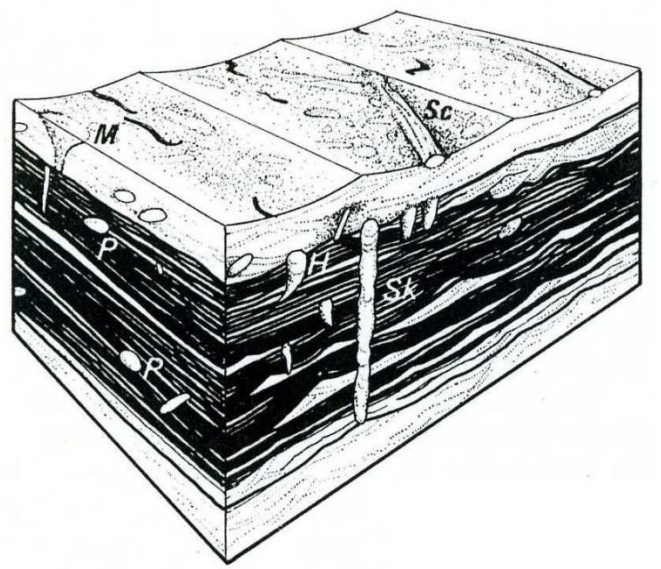


Figure 45: Schematic figure showing typical trace fossil assemblages within the storm-influenced, wave ripple laminated Carnarvon facies of the Waterford Formation (From Rust et al. 1991). Ichnogenera shown here include vertical burrows *Monocraterion* (M), *Skolithos* (Sk) and *Rosselia* or *Histioderma* (H) as well as horizontal burrows *Planolites* (P) and *Palaeophycus* (Sc).

Figure 46: Locally abundant fragments of silicified fossil wood from the Ecca Group (probably Waterford Formation) in the De Aar region (from Almond 2012b) (Scale in cm).

- Adelaide Subgroup

The overall palaeontological sensitivity of the Lower Beaufort Group sediments is high (Rubidge 1995, Almond & Pether 2008). These fluvial and lacustrine sediments have yielded one of the richest fossil records of land-dwelling plants and animals of Permo-Triassic age anywhere in the world. Well-preserved tetrapod fossils, from isolated skulls and post-cranial bones to fully articulated skeletons, are mainly found in overbank mudrocks, often in association with pedogenic calcretes (palaeosol horizons). Disarticulated, water-worn bones occur in the channel lag conglomerates and sandstones (Smith 1980, 1993). Playa lake deposits may be associated with disarticulated amphibian bones and a range of trace fossils (e.g. *Scoyenia*). Fossils embedded within metamorphosed sediments (quartzites, hornfels) adjacent to dolerite intrusions may be well-preserved, but are very difficult to prepare out from the matrix and therefore usually of limited scientific value.

A chronological series of mappable fossil biozones or assemblage zones (AZ), defined mainly on their characteristic tetrapod faunas, has been established for the Main Karoo Basin of South Africa (Rubidge 1995). Maps showing the distribution of the Beaufort assemblage zones within the Main Karoo Basin have been provided by Kitching (1977), Keyser and Smith (1979) and Rubidge (1995). The first two articles do not specify an assemblage zone for the study area near De Aar. The sediments here are assigned to the *Pristerognathus* Assemblage Zone according to the most recent fossil biozonation map of the Beaufort Group published by Van der Walt et al. (2010) (Figure 47). The paucity of fossil data for the Lower Beaufort succession in the Colesberg sheet explanation (Le Roux 1993) also suggests that this region is palaeontologically under-explored; any new fossil finds here are consequently of palaeontological significance. This is emphasized by the absence of fossil records from the De Aar area in the recent maps of Karoo vertebrate fossil sites produced by Nicolas (2007) (Figure 48).

Fossils of the *Pristerognathus* Assemblage Zone characterize the arenaceous Poortjie Member of the Teekloof Formation as well as the uppermost beds of the underlying Abrahamskraal Formation in the western Main Karoo Basin as well as the laterally equivalent beds spanning the Koonap / Middleton Formation boundary in the eastern Karoo (Smith & Keyser 1995). This important terrestrial biota is dominated by various therapsids ("mammal-like reptiles") such as the moderate-sized therocephalian carnivore *Pristerognathus* as well as several gorgonopsian predators / scavengers and herbivorous dicynodonts (Figure 49). The commonest genus by far is the small burrowing dicynodont Diictodon (Keyser and Smith 1977-78, Smith & Keyser 1995b, MacRae 1999, Cole *et al*., 2004, Rubidge 2005, Almond 2010, Nicolas 2007, Nicolas & Rubidge 2010). There are also large, rhino-sized herbivorous pareiasaur reptiles (Bradysaurus spp.), small tortoise-like parareptiles like Eunotosaurus, crocodile-like temnospondyl amphibians (Rhinesuchus), palaeoniscoid bony fish, vascular plant fossils of the Glossopteris Flora (fossil wood, leaves etc) and various trace fossils, including invertebrate and therapsid burrows as well as tetrapod trackways. The comparatively low number of specimens and major taxa represented in fossil collections from this biozone has been highlighted by Nicolas (2007). The fossil biota of the Pristerognathus AZ is of special interest because it possibly represents an impoverished post-extinction

recovery fauna following a late Mid Permian extinction event that preceded the well-known end-Guadalupian biotic crisis (cf Benton 2003, Retallack *et al*., 2006, Lucas 2009).
Most fossils in the *Pristerognathus* Assemblage Zone are found in the softer-weathering mudrock facies (floodplain sediments) that are usually only exposed on steeper hill slopes and in stream gullies. Fossils here are often associated with pedogenic limestone nodules or calcretes (Smith 1993, Smith & Keyser 1995). The mudrocks lie between the more resistant-weathering channel sandstones, which in the Poortjie Member display a distinctive "golden yellow" tint. Fossil skeletal remains also occur in the lenticular channel sandstones, especially in intraformational lag conglomerates towards the base, but are usually very fragmentary and water-worn ("rolled bone").

During recent palaeontological field assessments in the De Aar region a small number of fossil vertebrate specimens have been recorded that are of value for the biostratigraphic zonation of the Adelaide Subgroup rocks here (Almond 2012a). Provisional identifications of the material indicate the presence of the small *dicynodonts Pristerodon* and *Diictodon* as well as the distinctive turtle-like parareptile *Eunotosaurus* (Mike Day & Bruce Rubidge, pers. comm., 2012). These rare finds support as assignation of the lowermost Beaufort Group beds near De Aar to the *Pristerognathus* Assemblage Zone, as discussed above. Other fossils reported from these rocks include vertebrate and arthropod scratch burrows (*Cruziana* and *Scoyenia* respectively), and plant remains such as sphenophyte (horsetail fern) stems and silicified wood showing well-developed seasonal growth rings.

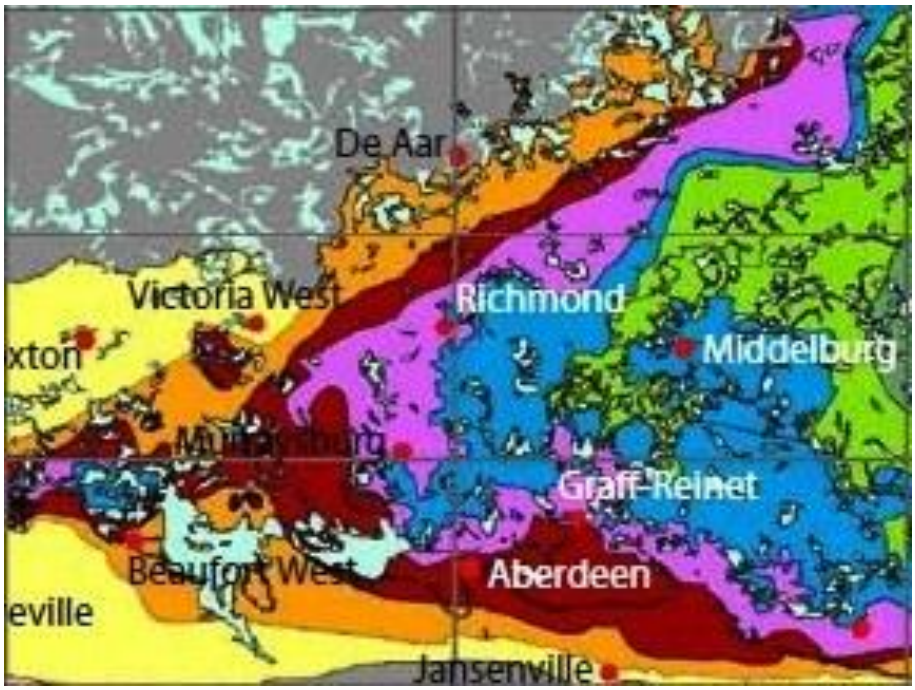


Figure 47: Abstract from recent fossil assemblage zone map for the Main Karoo Basin published by Van der Walt *et al*. (2010). The study region to the north and east of De Aar is assigned here to the *Pristerognathus* Assemblage Zone (orange), with the overlying *Tropidostoma* Assemblage Zone (red) only appearing well to the southeast. It is likely that the map will be refined in future in the light of new vertebrate fossil discoveries.

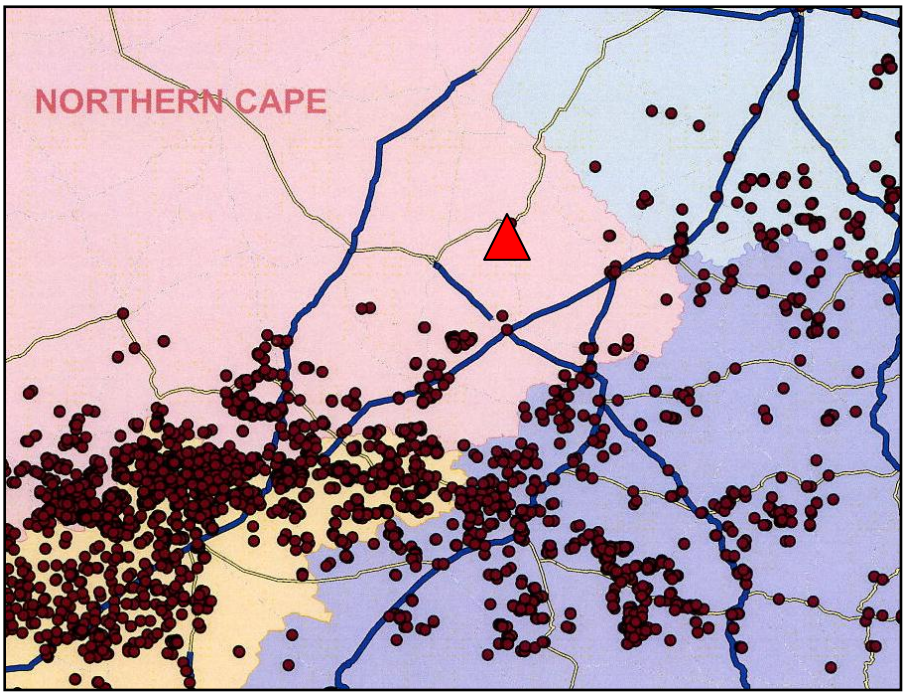


Figure 48: Distribution map of recorded vertebrate fossil sites within the Beaufort Group of the Great Karoo around the junction of the Western, Northern and Eastern Cape and the Free State (From Nicolas 2007). Note absence of documented fossil sites from the De Aar area (red triangle). This is in large part probably due to the low levels of bedrock exposure, as well as general lower abundance of fossils in the *Pristerognathus* Assemblage Zone. Rare vertebrate fossils have been recorded here recently during field studies by Almond (2012a).

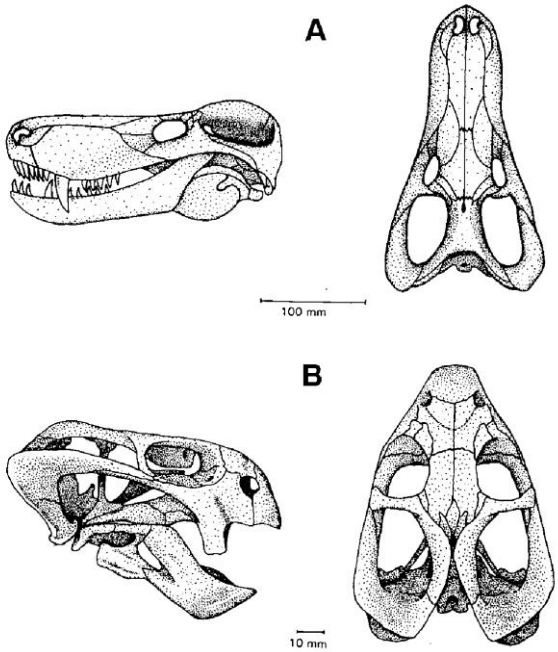


Figure 49: Skulls of typical therapsids from the *Pristerognathus* Assemblage Zone: A. the dog-sized carnivorous therocephalian *Pristerognathus* and B. the small herbivorous dicynodont *Diictodon* (From Smith & Keyser 1995).

Figure 50: Skull of a small dicynodont (probably *Pristerodon*), seen in dorsal view, from the Adelaide Subgroup to the east of De Aar (From Almond 2012a) (Scale in cm and mm).

- Karoo Dolerite Suite

The dolerite outcrops in the Renosterberg / De Aar study area are in themselves of no palaeontological significance. These are high temperature igneous rocks emplaced at depth within the Earth's crust so they do not contain fossils. However, as a consequence of their proximity to large dolerite intrusions in the Great Escarpment zone, some of the Ecca and Beaufort Group sediments in the study area will have been thermally metamorphosed or "baked" (i.e. recrystallised, impregnated with secondary minerals). Embedded fossil material of phosphatic composition, such as bones and teeth, is frequently altered by baking – bones may become blackened, for example - and can be very difficult to extract from the hard matrix by mechanical preparation (Smith & Keyser 1995). Thermal metamorphism by dolerite intrusions therefore tends to reduce the palaeontological heritage potential of Beaufort Group sediments. In some cases (e.g. fossil moulds of mesosaurid reptiles and palaeoniscoid fish) baking may enhance the quality of preservation of Ecca fossils while other fossil groups (e.g. carbonaceous remains of plants, organic-walled palynomorphs) are more likely to be compromised.

- Quaternary to Recent superficial deposits

The central Karoo drift deposits have been comparatively neglected in palaeontological terms. However, they may occasionally contain important fossil biotas, notably the bones, teeth and horn cores of mammals as well as remains of reptiles like tortoises. Good examples are the Pleistocene mammal faunas at Florisbad, Cornelia and Erfkroon in the Free State and elsewhere (Wells & Cooke 1942, Cooke 1974, Skead 1980, Klein 1984, Brink, J.S. 1987, Bousman *et al*. 1988, Bender & Brink 1992, Brink *et al*. 1995, MacRae 1999, Meadows & Watkeys 1999, Churchill et al. 2000 Partridge & Scott 2000). Other late Caenozoic fossil biotas from these superficial deposits include non-marine molluscs (bivalves, gastropods), ostrich egg shells, tortoise remains, trace fossils (e.g. calcretised termitaria, coprolites, invertebrate burrows), and plant material such as peats or palynomorphs (pollens) in organic-rich alluvial horizons (Scott 2000) and diatoms in pan sediments. In Quaternary deposits, fossil remains may be associated with human artefacts such as stone tools and are also of archaeological interest (e.g. Smith 1999 and refs. therein). Ancient solution hollows within extensive calcrete hardpans may have acted as animal traps in the past. As with coastal and interior limestones, they might occasionally contain mammalian bones and teeth (perhaps associated with hyaena dens) or invertebrate remains such as snail shells.

Only sparse fossil to subfossil remains have been reported from Late Caenozoic superficial deposits in the De Aar region. They include three to four centimetre wide vertical spreiten burrows attributed to an unknown invertebrate were recorded from thick bedded alluvium. A systematic search of gravels within these beds might eventually yield Pleistocene vertebrate bones and teeth. Numerous Middle Stone Age artefacts embedded within these gravels point towards a long Pleistocene human occupation of the region, so fossil human remains are also a possibility, albeit a remote one (cf Late Pleistocene skull of Homo sapiens from alluvial deposits in the Eastern Cape Karoo near Hofmeyr, Grine *et al*. 2007). Well-developed calcrete hardpans southeast of De Aar display large calcretized plant root casts or rhizoliths (Almond 2012b) (Figure 51).

Figure 51: Irregular calcretised root casts or rhizoliths within well-developed surface calcretes to the southeast of De Aar (From Almond 2012b) (Hammer = 29 cm).

2.16 Social Environment

The Social Assessment was conducted by Kim Moonsamy of Royal Haskoning DHV. The full report is included in Appendix 6J. The environmental baseline from a social perspective is presented below.

2.16.1 Socio-economic Baseline

This section addresses the presentation and analysis of social and economic data for provincial, municipal and key areas in close proximity to the proposed development area. The development area lies within the Emthanjeni Local Municipality, which in turn forms part of the Pixley ka Seme District Municipality in the Northern Cape province of South Africa.

- South Africa

According to the United Nations Development Program (UNDP) produced Millennium Country Report 2010, indicator values for South Africa, are recorded as:

- Real GDP (2007) R1,750 billion or $248 billion;
- Real GDP per capita (2007) R36,461 o $5,168;

- Adult literacy rate : Male – 87.2 ; Female – 86.9;
- Population total : 49,320,500;
- Male : 23,868,700,
- Female : 25,451,800,
- Age : 0–14 years 15,500,700 and 15–34 years 18,447,000;
- Household size : 13,8 million with an average 3.6 persons;
- Land surface area : 1,220,813km²;
- Provinces : Gauteng, KwaZulu-Natal, North West, Limpopo, Free State, Mpumalanga, Eastern Cape, Western Cape, Northern Cape;
- Key economic sectors : Mining services, transport, energy, manufacturing, tourism, agriculture;
- Official languages : English, isiZulu, isiXhosa, isiNdebele, Afrikaans, siSwati, Sepedi, Sesotho, Setswana, Tshivenda, Xitsonga; and
- Government Constitutional: multiparty, three spheres (local, provincial, national) democracy.

    - South African Poverty Indicators

New estimates of poverty show that the proportion of people living in poverty in South Africa has not changed significantly between 1996 and 2001. However, those households living in poverty have sunk deeper into poverty and the gap between rich and poor has widened. Approximately 57% of individuals in South Africa were living below the poverty income line in 2001, unchanged from 1996 (HSRC, Poverty Fact Sheet, 2004).

While the poverty rate measures the proportion of a region's population living below the poverty line it does not give any indication of how far below the poverty line poor households are. For this, the HSRC has used a measure called the poverty gap (Table 11) that measures the required annual income transfer to all poor households to bring them out of poverty. The HSRC study has shown that the poverty gap has grown from R56-billion in 1996 to R81-billion in 2001 indicating that poor households have sunk deeper into poverty over this period.

Table 11: Poverty Indicators by Province

Province	No. of poor persons (million)	% of population in poverty	Poverty gap (R billion)	Share of poverty gap
Eastern Cape	4.6	72%	14.8	18.2%
Free State	1.8	68%	5.9	7.2%
Gauteng	3.7	42%	12.1	14.9%
KwaZulu-Natal	5.7	61%	18.3	22.5%
Limpopo	4.1	77%	11.5	14.1%
Mpumalanga	1.8	57%	7.1	8.7%
North West	1.9	52%	6.1	7.5%
Northern Cape	0.5	61%	1.5	1.8%
Western Cape	1.4	32%	4.1	5.0%
South Africa	25.7	57%	81.3	100.0%

To measure inequality the HSRC have used the Gini coefficient2, which can vary from 0 in the case of a highly even distribution of income, to 1 in the case of a highly unequal distribution. South Africa's Gini coefficient rose from 0.69 in 1996 to 0.77 in 2001. While historically South Africa has had one of the most unequal distributions of income in the world this rise is likely to place it at the top of the world rankings (HSRC, Poverty Fact Sheet, 2004). In 2006, the Worldbank lists South Africa's Gini coefficient as 67 (http://en.wikipedia.org/wiki/List of Countries by income inequality).

In the past, inequality in South Africa was largely defined along race lines. It has become increasingly defined by inequality within population groups as the gap between rich and poor within each group has increased substantially. According to the HSRC (in HSRC, Poverty Fact Sheet, 2004), the Gini coefficient for the African population has risen from 0.62 in 1991 to 0.72 in 2001. This level of inequality is comparable with the most unequal societies in the world. The white population has a Gini coefficient of 0.60 that is extremely high for a group whose education and occupational profile matches that of societies in highly industrialised countries.

- The Northern Cape Province

The Northern Cape Province is the largest of the nine South African provinces and covers an area of 361 830 km2 constituting approximately 30% of South Africa. Despite being the largest of the nine provinces, it is also the most sparsely populated with a population of approximately 823 000 (according to Census 2001 data) and a population density of just over two people per square kilometre. In 2001 just over 50% of that population consisted of Coloured individuals and a further 35% consisted of Africans. The capital of the province is Kimberley. The province is divided into five district municipalities namely, Frances Baard, Pixley ka Seme, Namakwa, Siyanda and John Taolo Gaetsewe DM, 26 Category-B municipalities and five district management areas
(http://en.wikipedia.org/wiki/Northern_Cape).

[2] The Gini coefficient is perhaps the best known inequality measure and can be derived from the Lorenz curve (see figure below). Mathematically the Gini coefficient varies between zero and one, although in reality, values usually range between 0.20 and 0.30 for countries with a low degree of inequality and between 0.50 and 0.70 for countries with highly unequal income distributions

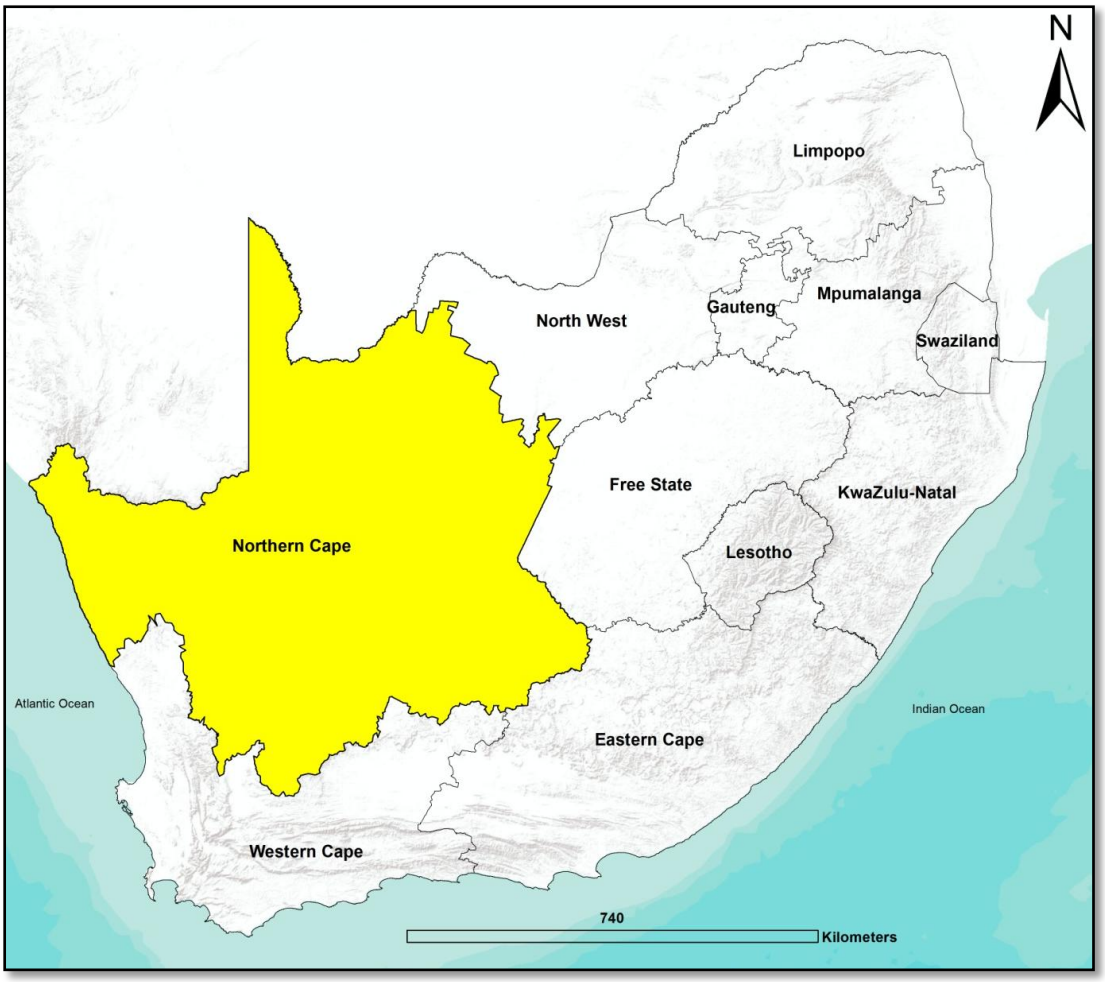
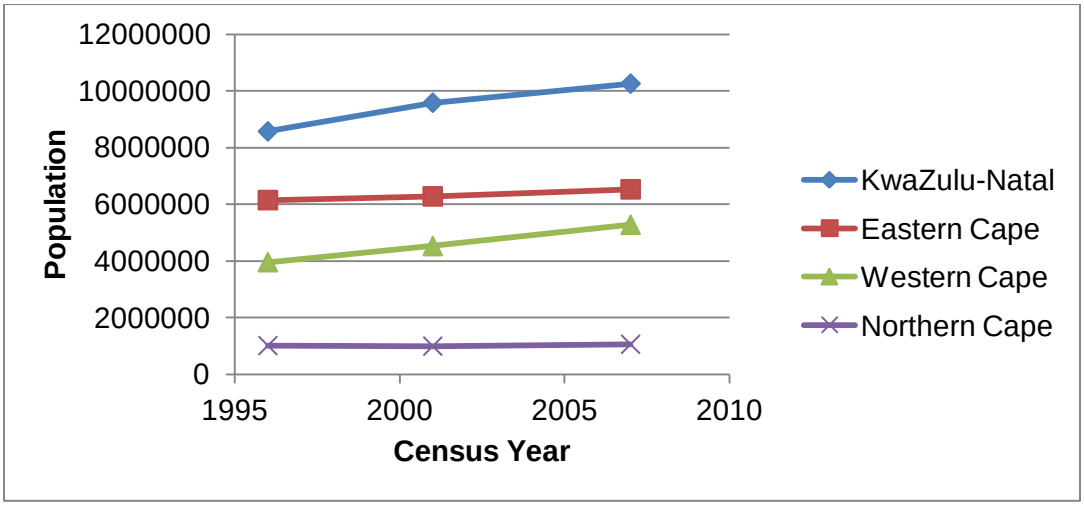


Figure 52: Location of the Northern Cape Province in Relation to Other Provinces in South Africa

The population in the province in 2007 was 1 058 060 inhabitants. The NCPGDS (2004-2014) notes that the population of the province has declined by 2.1% from 1996 to 2001 resulting in a decrease in the population density of an already sparsely populated province from 2.32 to 2.27 persons per km2. However, the Stats SA Community Survey (2007) illustrates that the population of the province increased by 6.7% from 991 919 to 1 058 060 between 2001 and 2007. Furthermore, the number of households in the province also increased by eight percent from 245 086 in 2001 to 264 653 in 2007 (StatsSA Community Survey, 2007).

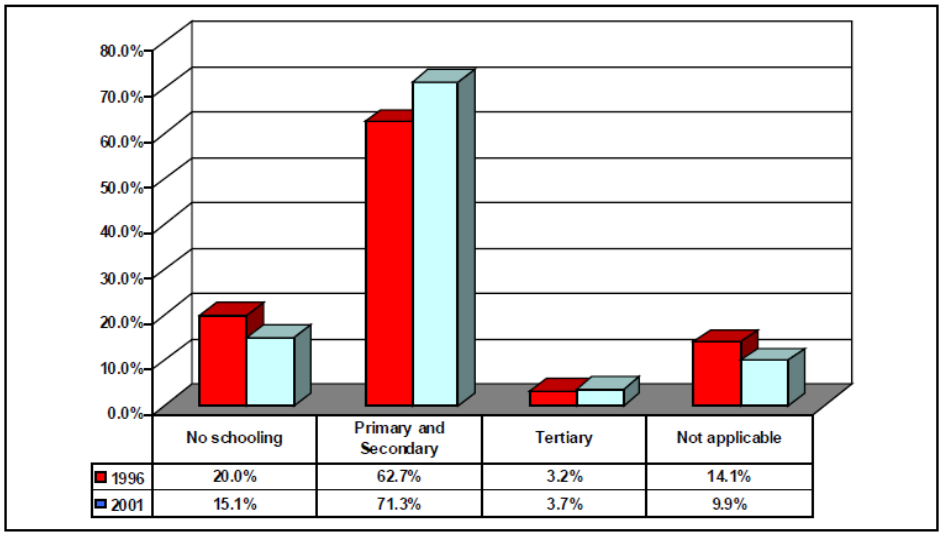


Data source: Statistics South Africa (1998), Statistics South Africa (2003) and Statistics South Africa (2007).

Figure 53. Total population by province - Census 1996, Census 2001 and Community Survey 2007

The Northern Cape as a whole in 2001 had an approximately equal distribution of females and males with there being marginally more females than males.

The official languages of the province are Afrikaans (56.6%), Tswana (33.7%), Xhosa (5.4%), English (2.1%) and Sotho (1.0%) (http://en.wikipedia.org/wiki/Northern_Cape). In terms of education levels, 15.1% of the population has no education while 71.3% have primary or secondary educations. Those with higher qualifications accounted for 3.7% of the population. The graph below indicates an increase in all categories since 1996 except for the 'no schooling' category which decreased by 4.9%. This in itself indicates that a higher percentage of people attended school. This would suggest that there has been an increase in access to education since 1994 (NCPGDS, 2004-2014).



Source : NCPGDS, 2004-2014

Figure 54: Percentage of People by Level of Education for 1996 And 2001

- The Northern Cape's Social and Economic Challenges

According to the NCPGDS, the province's share of South Africa's gross domestic product (GDP) was 2% in 2002, the lowest contribution of the nine provinces. Although the Northern Cape has the smallest economy of the nine provinces, gross domestic product of the region (GDPR) per capita is higher than the national average. The economy of the province is heavily dependent on the primary sectors of the economy, which in 2002 made up 31.0% of the GDPR. Economic advantages which create a positive environment for the province include:

- Abundant mineral and natural resources;
- Infrastructure;
- Unique climate conditions;
- Unique tourism destination;
- Abundant land for economic growth planning; and
- Manageable demographic proportions for economic growth planning.

The most significant challenge that the NCPGDS recognises is that of the reduction of poverty. The strategy notes that most of the other challenges faced by the province emanates largely from the effects of poverty. While addressing poverty, attention needs to be given to a range of societal problems that includes:

- Reducing the backlog of basic needs such as water, sanitation and housing;
- Improving and increasing access to health, education and social services;
- Decreasing the prevalence rate of HIV and AIDS;
- Creating opportunities for employment;
- Reducing crime; and
- Targeting vulnerable groups.

In addition to poverty reduction, unemployment is of concern in the Province. In the Northern Cape the total labour force was estimated to consist of approximately 313 000 or 38% of the total population with an aggregate of a third of the total labour force being unemployed in 2001 (Census, 2001). A direct comparison between the 2001 census data relating to unemployment and the 2007 Community Survey was not possible as unemployment was not considered in depth for the latter survey.

Data gleaned from the NCPGDS Strategy helps to render a social and economic perspective on the Northern Cape Province. These are found below:

- The Province is mostly rural in nature,
- It has a low population density and relative inadequate infrastructure, especially in the remote rural areas,
- The Province has inherited an enormous backlog in basic service delivery and maintenance, and it will take time to eradicate these,
- The population is predominantly poor with high levels of illiteracy and dependency that seriously affect their productivity and ability to compete for jobs,
- The Province is faced with HIV/Aids as a social and economic challenge,

- Available resources are unevenly distributed and offer limited potential for improved delivery of services and growth; and
- Job creation and poverty eradication together with the low level of expertise and skills, stand out as the greatest challenges to be resolved.

    - The Provincial Economy

        - Mining

The exceptional mineral wealth of the Northern Cape Province has ensured the importance, both nationally and internationally, of the province's mining industry. The minerals economy of the Northern Cape is a hundred and fifty years old and continues to remain the mainstay of the provincial economy contributing 23.7% to GGP in 2002. In 1998, the Northern Cape produced around 37% of South Africa's diamond output, 44% of its zinc, 70% of its silver, 84% of its iron-ore, 93% of its lead and 99% if its manganese.

Certain sub-sectors of the mining industry in the Northern Cape are approaching maturity with downscaling already having commenced in the copper and diamond mining industries. This poses serious socio-economic challenges in the affected areas and there is an urgent need to identify and promote alternative economic activities so as to mitigate the negative impact of minerals downscaling. However, at the same time, there are still significant known reserves of a range of minerals as well as many as yet unexploited deposits in other areas that will sustain the provincial mining industry for many years to come.

One of the key challenges faced by planners and those responsible for promoting minerals development is how to ensure that residents of the Northern Cape benefit more extensively from the exploitation of the province's mineral wealth in the future. New minerals legislation, enacted in 2004 has raised the prospect of the transformation of the mining industry through the de-concentration of ownership, increased access to mineral resources on the part of junior and small-scale mining companies and black economic empowerment. At the same time, the new legislation is intended to stimulate new growth in the industry and bring about increased levels of minerals processing and related economic development in the province (NCPGDS, 2004-2014).

        - Agriculture

Agriculture is the other mainstay of the Northern Cape provincial economy contributing 7.3% of GGP in 2002. Despite the largely semi-arid and arid environment in the province, the fertile land that lies alongside the Orange and Vaal rivers supports the production of some of the country's finest quality agricultural products. The province has become a major exporter of table grapes produced along the Orange River and is world renown for the quality of meat which is produced in the province. The Northern Cape is also well known for the production of wool, mohair and karakul pelts as well as dates, citrus products, wine and raisins.

Two major factors currently constrain growth prospects in the agricultural sector in the Northern Cape. Firstly, the need to promote transformation so that new and emerging farmers can take their place as equal members of the commercial agricultural fraternity and in so doing satisfy the need for redistributive justice through increased access by the previously disadvantaged to land and agricultural resources. Secondly, the need to achieve greater levels of diversification in irrigated agriculture in order to spread risk and promote the development of crops that have a high affinity for agro-processing. Because of the potential for growing the agricultural and manufacturing sectors by successfully addressing both of these challenges, promoting transformation and the development of an enlarged agro-processing sector that contributes to growth in manufacturing and job creation are both high priorities for the Northern Cape provincial government (NCPGDS, 2004-2014).

- Manufacturing

The Northern Cape manufacturing sector's contribution to provincial Gross Geographic Product (GGP) is comparatively low at 4.2% in 2002. Moreover, this contribution has been stagnant or declining for a number of years and as a result remains insignificant in the context of national manufacturing statistics. That said, manufacturing enterprises do make a significant contribution to the local economy in those localities where there is some concentration of manufacturing activity, mainly in the Kimberley and Upington areas. Most manufacturing that takes place in the Northern Cape involves value-addition to the province's mineral and agricultural raw material output, or, the fabrication of intermediate products used in those industries. Despite the relative insignificance of the manufacturing sector in aggregate, there is significant scope for growth in certain economic sub-sectors, particularly if conditions conducive to increased investment in manufacturing can be created through institutional support and reform (NCPGDS, 2004-2014).

- Fishing and Mariculture

The cold but nutrient rich up-welling Benguela current that runs along the Namaqualand coast sustains an abundance of marine life that gives rise to enormous potential for the development of fishing and mariculture industries. The area already has a rich fishing and cray-fishing history and research shows that it should be possible under the recently amended legislative and regulatory framework to significantly rejuvenate the fishing industry. However, perhaps the greatest opportunity for economic development based on the exploitation of marine resources today is the development of the pump-ashore mariculture industry. Mariculture entails the cultivation of a range of high value marine species with tremendous potential for exports to lucrative overseas markets. Arguably, the Northern Cape has the best conditions for mariculture out of any area along the South African coast and indications are that mariculture offers sufficient growth potential to replace diamond mining over the long-term as coastal Namaqualand's principal industry. The provincial government is currently working closely with pioneer private sector business persons involved in mariculture to develop new mariculture ventures in the area (NCPGDS, 2004-2014).

- Tourism

In many respects, tourism in the Northern Cape can also be seen as an industry with tremendous growth potential. Since the advent of democratic government in 1994, the Northern Cape tourism industry has blossomed largely as a result of the opening up of South Africa as a long-haul tourist destination for the world's travellers but also because the province has gained exposure to growing numbers of domestic tourists too. The province caters ideally for nature-based eco-tourists looking for a new experience and at the same time offers traditional tourists a great deal owing to its history in the development of the mining industry in South Africa. A number of major new conservation and eco-tourism developments are currently underway in the province in conjunction with the governments of Botswana and Namibia. At varying stages of execution, it is anticipated that these projects will have a major positive impact on the regional tourist economy, particularly if it is possible to use the conservation assets in each case to leverage private sector investment in new tourism plant and capacity (NCPGDS, 2004-2014).

- The District Municipality

Pixley ka Seme District Municipality (PKSDM) is situated in the south-east of the Northern Cape Province and shares its borders with three other provinces, namely, the Free State province to the east, the Eastern Cape to the south-east and the Western Cape to the south-west (Pixley ka Seme IDP, 2011, see Figure 55). It is the second largest municipality in the province covering a total surface area of approximately 102 727 km². The Pixley ka Seme District Municipality is further divided into eight Category B (local) municipalities and a District Management Municipal Area (Pixley ka Seme IDP, 2011). Local municipalities within PKSDM are as follows: Emthanjeni, Kareeberg, Renosterberg, Siyancuma, Siyathemba, Thembelihle, Ubuntu and Umsobomvu local municipalities (Figure 55).

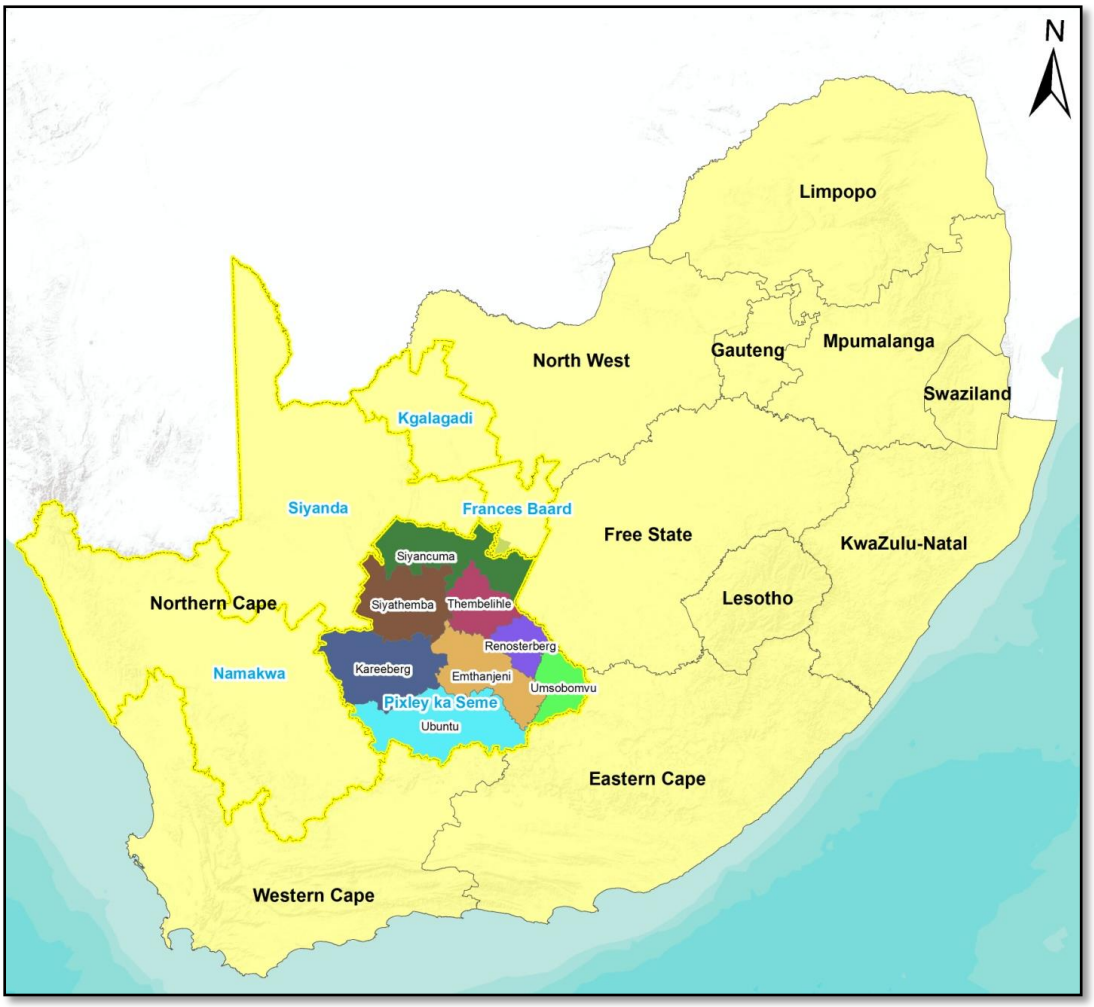


Figure 55: Location of the Pixley ka Seme District Municipality within the Northern Cape and South Africa

- Social and Economic Characteristics

There are approximately 24 towns or settlements within PKSDM which range from medium sized towns with a population of ±30 000 to very small towns with populations of a few thousand people (Pixley ka Seme IDP, 2011). In keeping with the provincial trend of sparse, dispersed distribution of settlement, long distances must often be travelled in order to provide social services and stimulate economic growth.

- Key Strengths in the Pixley ka Seme District

The key economic strengths of the district are community services, agriculture, transport and tourism (Pixley ka Seme IDP, 2011). The small towns function primarily as agricultural service centres, with the main economic activities located in the main urban areas of De Aar, Colesberg, Victoria-West and Carnarvon. Opportunities identified for growth and development include manufacturing, agro-processing, mining and semi-precious stones (Pixley ka Seme IDP, 2011).

In transportation infrastructural terms, PKSDM is intersected by key major routes such as the N1 from the Northern Province, Pretoria and Johannesburg to Cape Town; the N9 route from Colesberg which joins the N10 to Port Elizabeth and the Eastern Cape; the N12 route form Johannesburg via Kimberley to Cape Town; as well as the N10 from Namibia via Upington which links Namibia and the Eastern Cape. The railway network around De Aar is acknowledged as one of the largest in South Africa (Pixley ka Seme IDP, 2011).

Bulk water supply in the district originates from the Orange River and three major dams within the area, namely the Gariep Dam, Vanderkloof Dam and Boegoeberg Dam. In addition to bulk water supply, intensive agriculture is also associated with these water resources (Pixley ka Seme IDP, 2011). The commercial agricultural sector is strong within the PKSDM, predominantly as a result of ready access to irrigation infrastructure and the aforementioned bulk water resource base. Stock farming augments the strength of the agricultural sector, with production of wool, mutton and beef lending further impetus to the sector.

- Key Weaknesses in the Pixley ka Seme District

Given the aridity of the region, economic activities are mostly situated in close proximity to rivers, while peripheral towns often experience water shortages which in turn impacts adversely on local economies (Pixley ka Seme IDP, 2011). Water provision and availability is one of the issues that will have to be addressed in order to improve the economic activity in most towns situated within the area (Pixley ka Seme IDP, 2011). All communities are affected in terms of poverty and development deficits with unemployment levels disconcertingly high at approximately 32% (Pixley ka Seme IDP, 2011). In summary, according to the IDP, key economic and development weakness within the PKSDM are as follows:

- Lack of diversification of the district economy.
- Lack of investment in the region.
- Lack of employment opportunities.
- Lack of skills.
- Lack of entrepreneurship.
- Few SMME's are active in the region.
- Underutilization of the regions natural resources and economic opportunities.
- Lack of water for irrigation farming in outlying areas.

- The Emthanjeni Local Municipality

Emthanjeni Local Municipality (ELM) is one of eight local authorities within the Pixley ka Seme District Municipality (Figure 56).

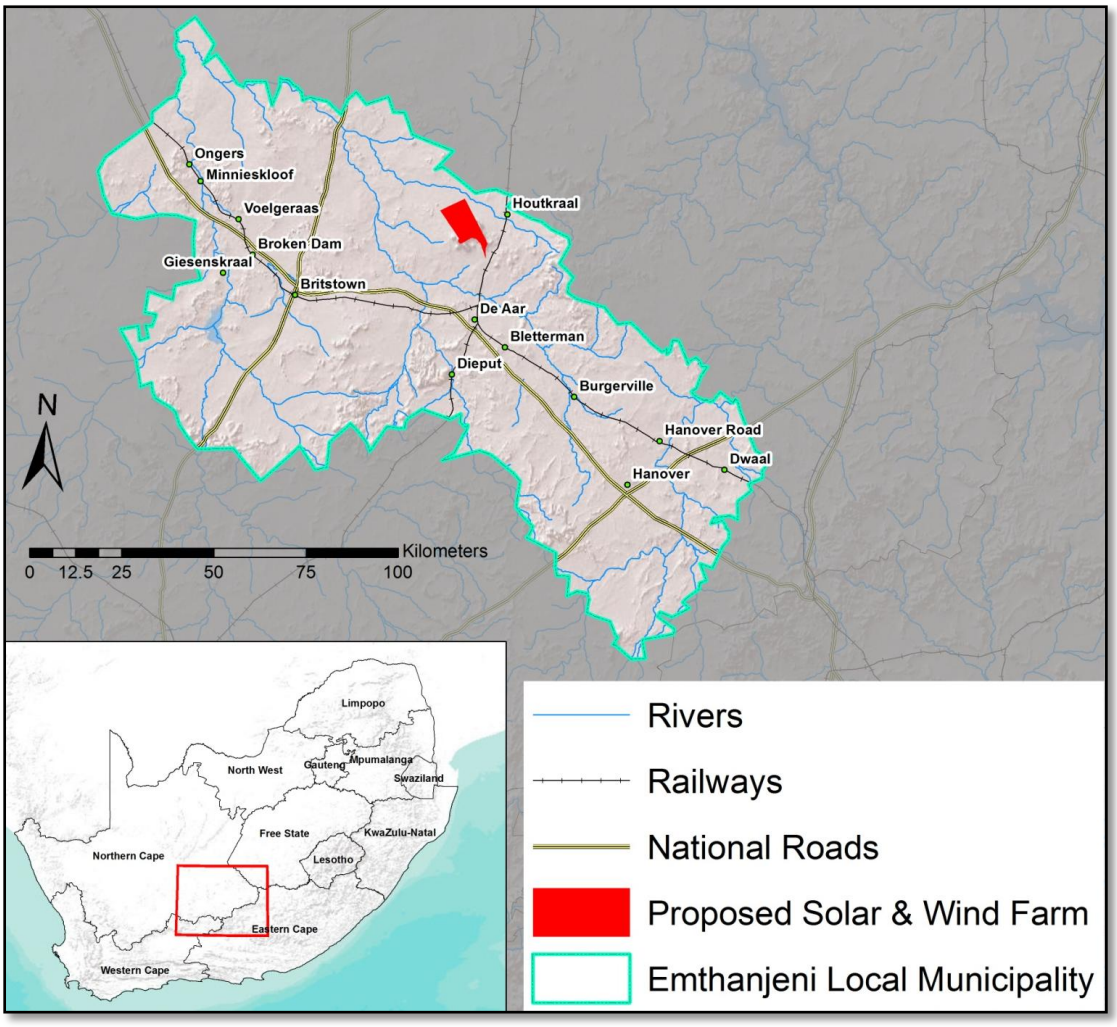


Figure 56: Location of the Emthanjeni Local Municipality

De Aar (see Figure 56) is the largest settlement within the ELM, and means “the artery”, and is described as the lifeblood of the municipality (Emthanjeni Local Municipality IDP, 2012). The head offices of both the Emthanjeni Local Municipality and Pixley Ka Seme District Municipality are located in De Aar. De Aar is furthermore significant from cultural, historic, meteorological and bulk transport infrastructure perspectives.

- Demographics

Emthanjeni had a total population of 38228 in 2007, made up of the following race groups (StatsSA Community Survey, 2007):

- Black African (26.0%)
- Coloured (63.1%)
- Indian/Asian (0.1%)
- White (10.8%)

The population of ELM is distributed amongst some 11650 households with an average size of four members per household (StatsSA Community Survey, 2007). Table 12 below compares the type of households present within ELM in 2001 and 2007.

Table 12: Breakdown of Household Types within Emthanjeni Local Municipality in 2001 and 2007.

	Census 2001	CS 2007
House or brick structure on separate stand or yard	86,9	90,1
Traditional dwelling/hut/structure made of traditional materials	2,5	0,4
Flat in block of flats	1,4	1,8
Town/cluster/semi-detached house (simplex: duplex: triplex)	0,8	3,1
House/flat/room in back yard	1,3	0,7
Informal dwelling/shack In back yard Not in back yard e.g. in an informal/squatter settlement	 1,8 4,8	 1,9 2,1
Room/flat not in back yard but on a shared property	0,4	-
Caravan or tent	0,1	-
Private ship/boat	0,0	-
Workers' hostel (bed/room)	-	-
Other	-	-
Total	**100,0**	**100,0**

- Health and Education Facilities

Health facilities are provided to ELM by the province of the Northern Cape, and consist of six clinics and a district hospital (Emthanjeni Local Municipality IDP, 2012). These are displayed spatially in Figure 57, along with education facilities for the municipality.

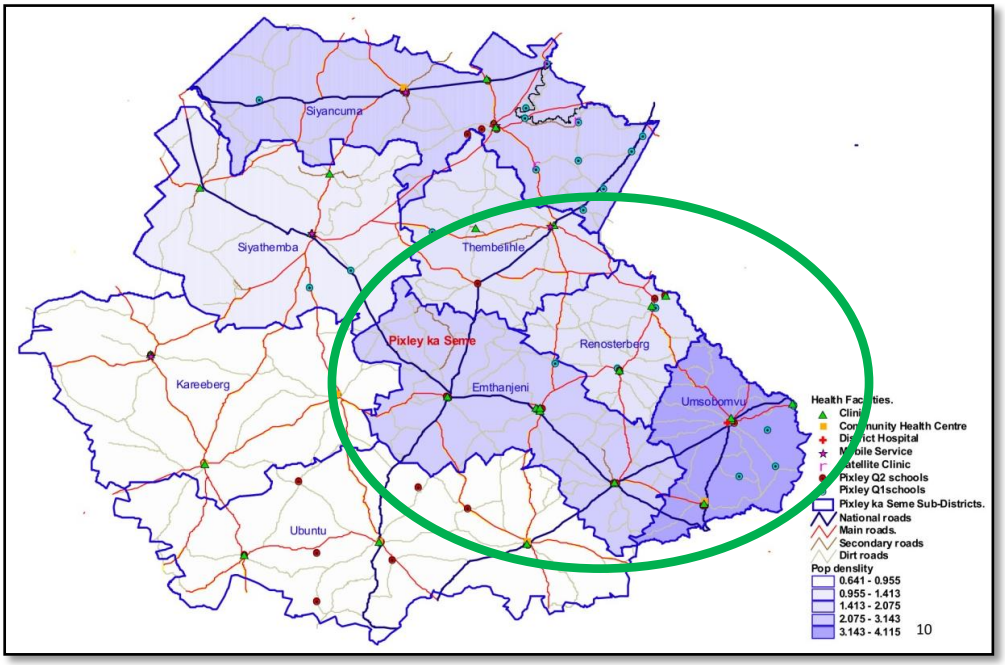


Figure 57. Health Facilities and Schools within the Pixley ka Seme District (Pixley ka Seme IDP, 2011)

- Economic Characteristics
    - Policy

Strategic economic and development planning for the ELM is driven predominantly by national and district level policy in the form of the New Growth Path (NGP, 2009, cited in Emthanjeni Local Municipality IDP, 2012) of 2009 and the Pixley ka Seme Growth and Development Strategy (PKSGDS) respectively. The NGP aims to stimulate job opportunities in both the traditional economic sectors as well as cross-cutting sectors. It further aims to develop strategies that would create the needed jobs in the economy of South Africa over the medium term (Emthanjeni Local Municipality IDP, 2012).
The main indicators for success of the NGP are listed as:

- Jobs (number and quality),
- Growth (the rate, labour intensity & composition of economic growth),
- Equity (lower income and inequality),and
- Environmental outcomes
- Furthermore, the five pillars on which the NGP rests are:
- Infrastructure
- Main Economic Sectors
- Agricultural value chains, and
- Mining value chains
- Seizing the potential of New Economies
- The Green economy
- Investing in Social Capital and Public Services
- Spatial Development
- Measurable improvements in livelihoods for 500 000 households in rural development areas, and
- African regional development.

At the district level, the Pixley ka Seme District Growth and Development Strategy (PKSGDS) furthermore seeks to achieve a shared vision, amongst all sectors of its society, for the achievement of its goal of reducing poverty and improving the quality of life all its citizens. The PKSDGDS reinforces the following principles:

- Integrated, sustainable, holistic and participatory growth and development,
- Providing for the needs of all people,
- Ensuring community and/or beneficiary involvement and ownership,
- Long term sustainability on all levels, and
- Equitable socio-economic development with equitable benefits for all.

The Development Targets identified for the DGDS are as follows:

- To achieve an average annual economic growth rate of between 2%-4%,
- To reduce poverty by 50% by 2014,
- To eradicate the bucket system by 2010,
- To reduce crime by 10% by 2010,

- To decrease the illiteracy rate by half by 2014,
- To reduce unemployment by 50% by 2014,
- To reduce the prevalence rate of HIV/AIDS by 2014, and
- To provide adequate housing for all by 2014.

- Key Economic Activities

As the district municipal capital and an important regional service centre, De Aar is a potential industrial growth point with ample industrial sites, reasonable prices and tariffs, affordable labour and the necessary infrastructure (Emthanjeni Local Municipality IDP, 2012). The Emthanjeni area is becoming increasingly prominent as a centre for supplying Karoo mutton to the rest of South Africa, with De Aar capable of processing in excess of 2000 sheep carcasses per day through several abattoirs (Emthanjeni Local Municipality IDP, 2012). Additional primary economic activities within ELM are shown in Table 13 below.

Table 13: Key Economic Activities within Emthanjeni Local Municipality (ELM IDP, 2012)

Key Economic Activities	Description
Services Sector (Community)	The services sector consist of the various government institutions, NGO;s, CBO's and NPO's that resides within our area of jurisdiction. ABSA, FNB, STANDARD BANK and CAPITEC
Manufacturing	Stone crushers who specialize in the manufacturing of sand, bricks, cements and rocks
	Rocla, Green Akker, Abattoir for meat processing
Retail	Purchasing of goods and services
	Checkers, Shoprite, Mr Price, Ackermans, Sheet Street, Fashion Express etc.
Agriculture	Game Farming
	Sheep, goat, pig and cattle farming
Transport	Rail Infrastructure
	Road Infrastructure
Tourism	To market Emthanjeni as a tourism destination
	To speed up the restoration of existing attractions and the development of new attractions

Source: (Emthanjeni Local Municipality IDP, 2012)

- Employment and Income Demographics

Employment and income demographics are key indicators for social baseline assessments. Table 14 and Table 15, display employment and income demographics for the Emthanjeni Local Municipality as at 2001. Seventy three percent (73%) of the eligible workforce reside in De Aar, with 57% of those eligible workers, being unemployed.

Table 14: Employment Demographics for the Emthanjeni Local Municipality (Census 2001)

Area	Eligible workforce	Permanent Unemployed residents	Seasonal Farm workers	Domestic workers	Permanent Farm workers	Permanent Industry workers	Professional Workers
De Aar	13251	7544	63	763	105	4034	1085
Britstown	1891	1306	9	96	69	392	123
Hanover	1277	829	-	30	9	235	79
Farms	1745	435	15	352	862	1148	51
Emthanjeni Total	**18164**	**10114**	**87**	**1241**	**1045**	**5809**	**1338**

Table 15: Income Demographics for the Emthanjeni Local Municipality adapted to HH level (Census 2001)

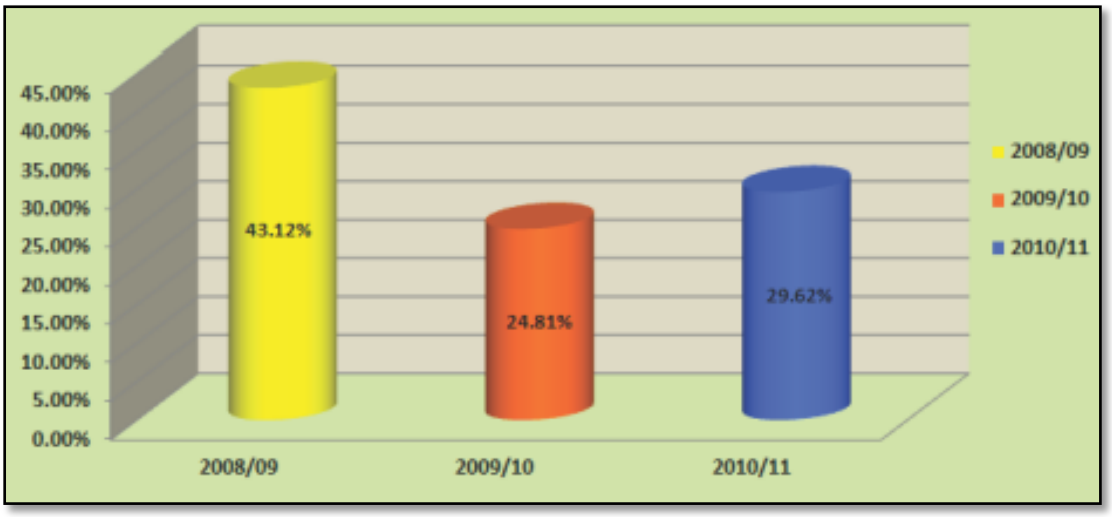
Area	<400	R401-R800	R801-R1600	R1601-R3000	>R3200	Total
De Aar	1347	999	960	884	1261	5452
Britstown	259	252	255	125	97	988
Hanover	275	253	146	121	92	887
Farms	147	295	308	84	131	965
Emthanjeni total	**2027**	**1799**	**1670**	**1214**	**1581**	**8292**

Table 16: Basic Employment Data for the Emthanjeni Local Municipality (Census 2001)

EMPLOYMENT CATEGORY	FEMALE	MALE	TOTAL F & M	% OF TLF F & M	% OF POPULATION F & M
EMPLOYED	3178	4271	7449	33.3%	21.0%
UNEMPLOYED	2848	2320	5168	23.1%	14.5%
NOT ECONOMICALLY ACTIVE	5538	4182	9720	43.5%	27.4%

- Unemployment and Poverty

Unemployment and poverty levels are of concern with ELM, illustrated by the figure below which compares the total number of indigent (poverty-stricken) households within the municipality between 2008 and 2011. Whilst a significant decrease in indigent households is evident between 2008 and 2010, this trend is reversed between 2010 and 2011.



Source: Emthanjeni Local Municipality IDP 2012

Figure 58: Percentage of Indigent Households within Emthanjeni Local Municipality between 2008 and 2011

Economic activity within the area is seen as gradually stagnating as a result of reduced investment and operation in the area by Transnet, among others (Emthanjeni Local Municipality IDP, 2012). Planned strategic economic interventions for the ELM are:

- The new referral Hospital,
- The proposed N12 at Britstown,
- Possible upgrading of railway stations,
- Development of industrial sites in towns,
- Renewal of residential sites in all towns,
- Development N10 corridor,
- Hydroponics plants, and
- Ostrich farming projects.

    - Key Strengths of the Emthanjeni Local Municipality

ELM is noted as having strengths in the following key areas:

- The ELM has been the beneficiary of intervention by both national and provincial spheres of government; i.e. it as seen as a strategic area of investment and growth.
- Key transportation infrastructure intersects and converges within the ELM making it important from a strategic logistics perspective.
- Buy-in from the private sector has been secured which bodes well for economic development through possible public-private partnerships
- Agricultural and retails sectors remain strong, although there is scope for diversification.
- Cultural and heritage areas are becoming increasingly prominent as a generator of revenue and a driver of growth.

    - Key Weaknesses of the Emthanjeni Local Municipality

Numerous challenges face the ELM. These weaknesses or threats are summarised as follows:

- Policy implementation challenges including financial and human capacity;
- Lack of entrepreneurship and/or business leadership to implement large-scale development projects;
- Limited financial capacity to introduce and sustain local economic development;
- The local economy is not diversified, and is currently stagnating. The manufacturing base continues to narrow;
- Limited diversification within the agricultural sector coupled with unsustainable farming techniques;
- Limited natural resources base, water in particular;
- Rising unemployment and poverty due to inability of local economy to generate and sustain jobs;
- Poor public transportation infrastructure; and
- Harsh local climatic conditions are likely to intensify with global climate change.

- Ward 6 within Emthanjeni Municipality

The proposed development site occurs within Ward 6 of the Emthanjeni Local Municipality. Ward 6, delineated in 2011, comprises the consolidation of Wards 2 and 6 as delineated for the purposes of Census 2001. As a result, ward-level data for the proposed development site consists of the summation3 of the data pertaining to these two Wards. It must also be noted that while the South African Community Survey of 2007 may yield more updated data at District level, ward level data is not available.

- The Main Hub

The main hub within Ward 6, is De Aar. It has a population of around 45,857 inhabitants, and is the second-most important railway junction in the country - situated on the line between Cape Town and Kimberley. Major production activities of the area include wool production and livestock farming. The area is also popular for hunting, despite the fact that the region is rather arid (www.wikipedia.org).

There are ancient Khoisan rock engravings on the Nooitgedacht and Brandfontein farms. De Aar is famous amongst paragliding & hang-gliding pilots worldwide as it holds two world records and many countries' national distance records. De Aar was also the host to the XC World Series in 2008 and 2009. During the summer months De Aar is home for several thousand Kestrels (www.wikipedia.org).

Nearest nature reserves include: the Doornkloof Nature Reserve, Karoo Gariep Conservancy, and Rolfontein Nature Reserve. The proposed developments lie approximately 20 km's north

[3] As a result of the data being an extrapolation and consequent summation from Census 2001, it must be noted that up to date statistics may show varying differences.

of De Aar. De Aar itself is not closely situated to other towns. Nearest towns to De Aar include:

- Orania which lies approximately 100 km's north,
- Colesberg which lies approximately 100 km's east,
- Richmond which lies approximately 85 km's south, and
- Britstown which lies approximately 50 km's east (the nearest town by far).

  - Demographics in Ward 6

There were 11158 people living within Ward 6 in 2001, of which 46% were Black African, 45% were Coloured, 0.01% were Indian, 7% were White and 0.8% were categorised as 'Other'. The population of Ward 6 in 2001 was slightly skewed in gender terms towards females by approximately 300 persons.

  - Employment in Ward 6

Of the total population of 11158 people in 2001, 22% were employed while 13% were unemployed. Employment categories for Ward 6 in 2001 are shown by Figure 59.

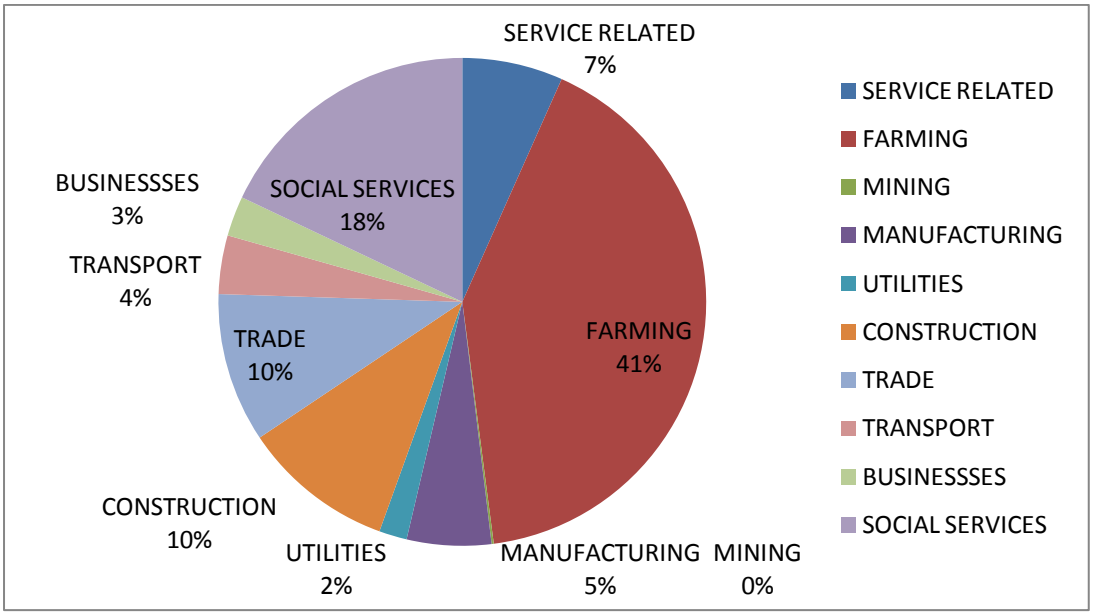


Figure 59. Employment Categories for Ward 6 of the Emthanjeni Municipality in 2001 (Census 2001)

At 41%, farming accounted for the vast majority of employment in Ward 6 in 2001, followed by social services (18%) and trade and construction with 10% each. The remaining employment categories range between 2% and 5%, with the exception of mining which accounted for less than 1% of the employed population of Ward 6 in 2001.

  - Sanitation in Ward 6

Types of sanitation for Ward 6 are shown in Figure 60 below.

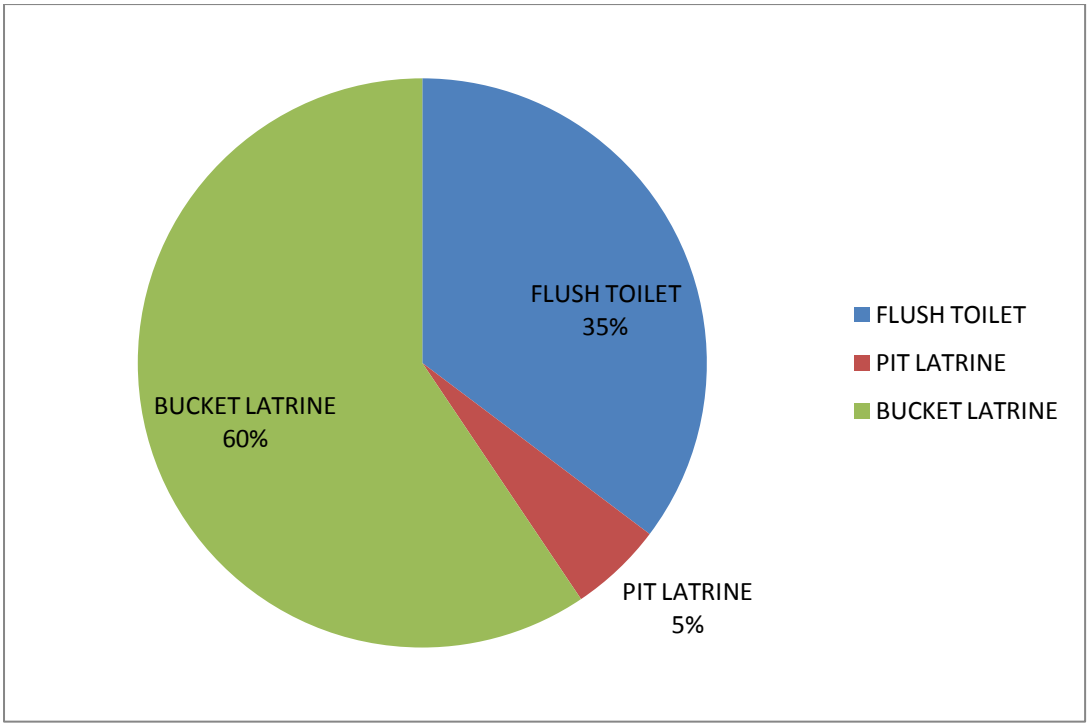


Figure 60. Sanitation Categories for Ward 6 of the Emthanjeni Local Municipality in 2001 (Census 2001)

Bucket latrines (60%) predominate for the households of Ward 6 in 2001, followed by flush toilets (35%) while pit latrines account for just 5% of household sanitation.

- Energy Usage in Ward 6

Given that the proposed development is an energy project, most recent data regarding energy usage in the area is an important indicator of potential socio-economic impacts of the development on proximate communities. To this end, the most recently available census data from 2001 was utilised to indicate which types of energy are used for lighting, cooking and heating respectively for the De Aar area.
Figure 61 compares the use of electric, paraffin, candles, solar and other energy sources for lighting in the De Aar area in 2001.

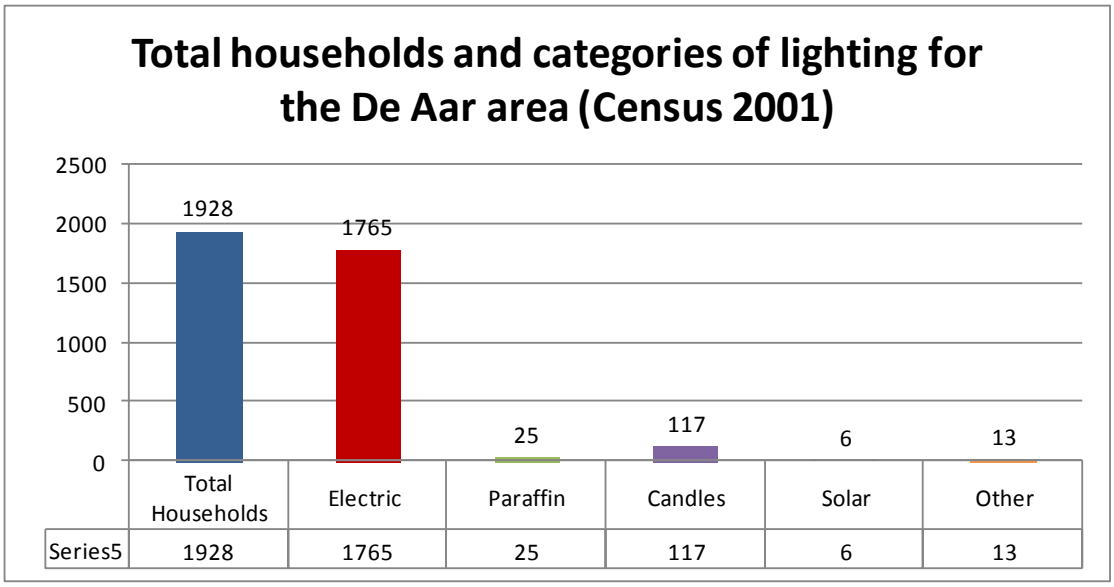


Figure 61. Energy Usage for Lighting by Category for the De Aar Area (Census 2001)

Electric lighting was most used for domestic lighting in 2001, with 91% of households utilising electricity for their lighting needs. Candles were the second most utilised at 6%, with other energy sources making up the remaining 3% in 2001.
Figure 62 compares the use of different categories of energy for cooking in 2001 for the De Aar area.

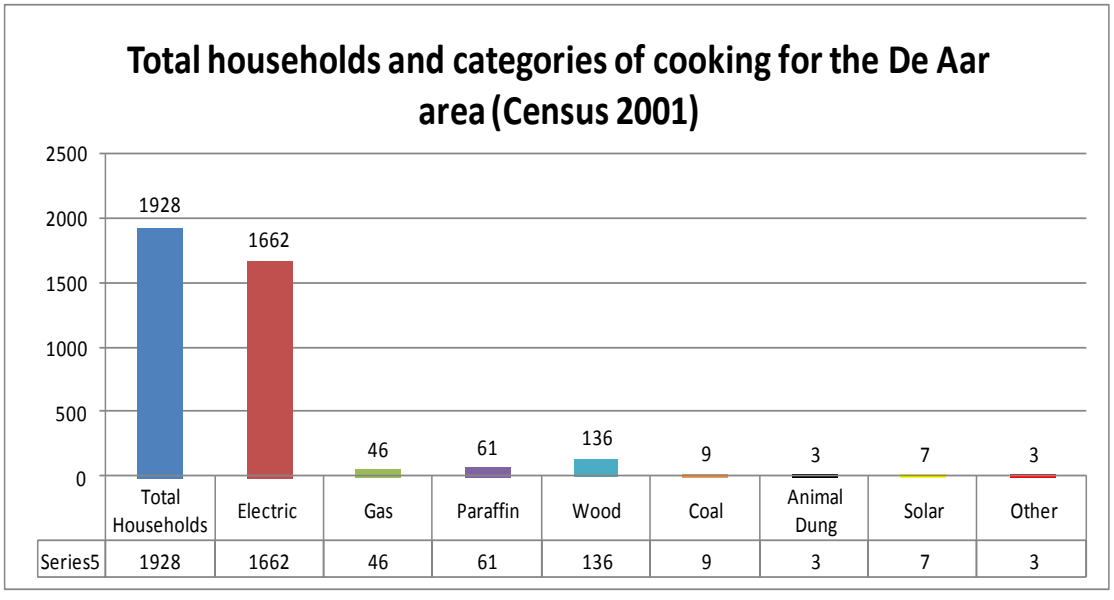


Figure 62. Energy Usage for Cooking By Category for the De Aar Area (Census 2001)

Electric cooking was most popular in 2001, accounting for 82% of households, followed by wood fuelled cooking at 7%. The remaining 11% is made up of the categories: gas, paraffin, coal, animal dung, solar and other.

Figure 63 below compares the use of different categories of energy for heating in 2001 for the De Aar area.

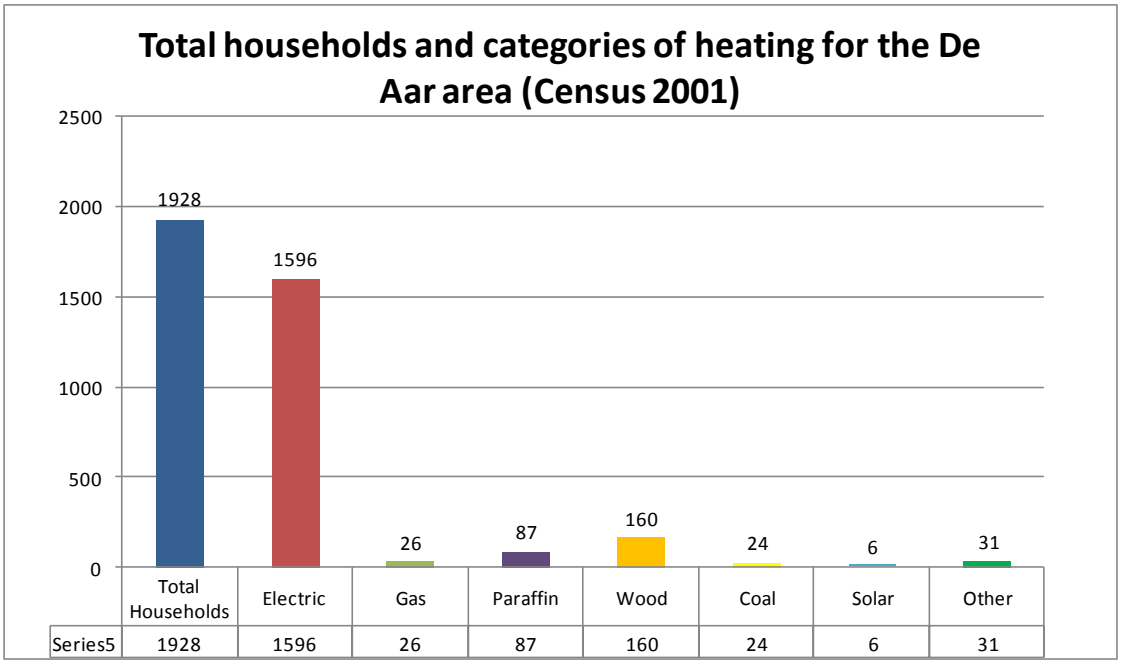


Figure 63. Energy Usage for Heating by Category for the De Aar Area (Census 2001)

In keeping with the trend for lighting and cooking, electric heating predominated in 2001, accounting for 83% of household usage. Wood fuelled heating was second most popular at 7%, with the remaining 10% of households utilising gas, paraffin, coal, solar and other heating sources.

- Conclusions from Ward and Local Level Data

Demographic and employment data for Ward 6 suggest that the population of the Ward in 2001 was largely not of working age, as approximately 65% of the total Ward population was not categorised as employed or unemployed. Farming was by far the most important employment sector in Ward 6 in 2001, whilst the predominance of the bucket latrine sanitation system suggests that the majority of the Ward did not have access to waterborne sanitation in 2001. Data relating to energy usage indicates that there was a strong reliance on electricity for lighting, heating and cooking, with only minor augmentation from other sources.

- Further Augmentation of the Baseline

A further augmentation of the baseline may occur in the later part of the social assessment, as data becomes available.

3 ENVIRONMENTAL ISSUES, POTENTIAL AND CUMULATIVE IMPACTS

3.1 Identification of potential impacts

The proposed development is likely to result in a variety of positive and negative impacts. Moreover, the proposed development could potentially result in collective and long term impacts more commonly known as cumulative impacts. A cumulative impact is 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.

The Scoping report assists in the identification of these potential and cumulative impacts, which will then be assessed at a more detailed level during the EIA stage.

Moreover, further details associated with the construction and operation of the various activities (as listed in the Project Description) in light of the above types of impacts that become available later in the EIA process will be discussed in detail in the EIR Phase.

The impacts that have been identified as being potentially significant are elaborated on in the sub-sections below.

3.1.1 Biodiversity Impacts

The following potential impacts have been identified for the proposed solar power facility development and will be further investigated in the EIA phase of the biodiversity assessment.

- Floral impacts

Table 17: Impact resulting from the loss of natural vegetation

ISSUE	**Impact: loss and disturbance of natural vegetation**
DISCUSSION	Areas will be cleared of natural vegetation and in other areas the natural vegetation will be disturbed by the proposed development.
EXISTING IMPACT	Varies from medium to low across the site. Grazing and other anthropogenic activities will have resulted in the transformation of sections of the site.
PREDICTED IMPACT	Moderate, particularly if the clearing of natural vegetation can be restricted to more transformed areas and disturbance of natural vegetation be limited.

ISSUE	Impact: loss and disturbance of natural vegetation
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Moderate, by limiting vegetation loss and disturbance to designated areas and due to the majority of the site being able to be retained once the infrastructure is in place.

- Faunal impacts

Table 18: Impact of the loss of faunal habitat

ISSUE	Impact: loss of faunal habitat
DISCUSSION	The proposed development could result in a loss of habitat for faunal species, particularly in the areas identified as sensitive.
EXISTING IMPACT	Grazing takes place in the study area and small portions have been transformed by anthropogenic activities e.g. the farm houses and roads.
PREDICTED IMPACT	Moderate, since the EIA phase will identify sensitive or no-go areas and will inform development options and suggest mitigation measures
EIA INVESTIGATION REQUIRED	Yes, to ensure that the least habitat loss for faunal species occurs.
CUMULATIVE EFFECT	Moderate, cumulative impacts could relate to the edge effect and potential long term habitat loss as a result.

- Habitat fragmentation

Table 19: Fragmentation of natural systems

ISSUE	Impact: fragmentation of natural systems
DISCUSSION	Fragmentation could occur if the proposed infrastructure isolates habitats.
EXISTING IMPACT	Currently the fragmentation of the site is fairly low however barriers such as existing roads and buildings are already present.
PREDICTED IMPACT	Moderate, as the placement of infrastructure should limit the disturbance of ecological corridors.
EIA INVESTIGATION REQUIRED	Yes, in order to retain the ecological functioning of the system.
CUMULATIVE EFFECT	Moderate due to the proposed additional development of the site.

- Sensitive areas

Table 20: Impact on sensitive areas

ISSUE	**Impact: disturbance or loss of sensitive areas**
DISCUSSION	Sensitive areas within the landscape could be affected by the proposed development.
EXISTING IMPACT	Low to moderate given the grazing and other anthropogenic activities which are already present.
PREDICTED IMPACT	The impact is predicted to be low as the EIA phase will identify the most suitable areas away from the sensitive areas identified.
EIA INVESTIGATION REQUIRED	Yes, to ensure that infrastructure development does not affect the identified sensitive areas.
CUMULATIVE EFFECT	Low to moderate due to the existing level of impact and mitigation measures that will be put in place if the proposed development takes place.

3.1.2 Avi-faunal impacts

The following potential impacts (Table 21 to Table 24) have been identified for the proposed solar power facility development and will be further investigated in the EIA phase of the biodiversity assessment.

Table 21: Impact of mortalities from collisions with wind turbines.

ISSUE	**Impact:** Mortalities from collisions with wind turbines
DISCUSSION	Various bird species including threatened priority species are at risk of being killed should they collide with the wind turbines.
EXISTING IMPACT	None
PREDICTED IMPACT	Moderate to high as some collisions with turbines are likely to occur which could reduce the local populations of threatened species.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Medium to high – dependent on which species are killed. Bustards and Cranes are prone to high mortalities on power lines, for these species the cumulative impact may well be quite high.

Table 22: Impact of displacement due to disturbance by the wind farm.

ISSUE	**Impact:** Displacement due to disturbance caused by the Wind Farm
DISCUSSION	Various bird species including threatened priority species are at risk of being disturbed by the wind farm.
EXISTING IMPACT	None
PREDICTED IMPACT	Moderate to high as it is likely that some sensitive species may be disturbed by the wind farm
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Medium - The priority species that occur (or are likely to occur) at the proposed site all have large distribution ranges (except perhaps

	Blue Korhaan which is more range restricted), the cumulative impact of displacement would therefore be locally significant, rather than regional or national.

Table 23: Impact of displacement due to habitat transformation at the wind farm.

ISSUE	**Impact:** Displacement due to habitat transformation at the Wind Farm
DISCUSSION	The habitat transformation will be limited to the establishment of hard stand areas for the turbines.
EXISTING IMPACT	None
PREDICTED IMPACT	Low – as the habitat transformation will cover a small area and thus be of a limited extent.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Low – the physical footprint of the wind farm development will be a small percentage of the overall development area.

Table 24: Impact of mortalities from collisions with power lines.

ISSUE	**Impact:** Mortalities from collisions with power lines
DISCUSSION	Collisions with overhead power lines connecting both the solar PV and wind farm site to existing infrastructure pose a collision and (possibly) an electrocution risk to several bird species in the area. Bustards, cranes and large raptors are particularly at risk.
EXISTING IMPACT	Overhead power lines are already present in the larger are but none are located in very close proximity to the Renosterberg itself
PREDICTED IMPACT	Moderate to high – as some collisions and (possibly) or electrocutions are likely. Ludwig's Bustard are particularly vulnerable to power line collisions.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Medium to high cumulative impact. The cumulative impact will depend largely on which species are killed. Bustards, cranes and large eagles suffer high mortality on power lines, for these species the cumulative impacts may well be high.

3.1.3 Bat impacts

The following potential impacts identified in Table 23 to Table 27 has been identified for the proposed solar power facility development and will be further investigated in the EIA phase of the biodiversity assessment.

Table 25: Impact of bat mortalities due to blade collisions and barotrauma during foraging.

IMPACT	Bat mortalities due to blade collisions and barotrauma during foraging
DISCUSSION	The concern of bats and possible wind turbine blade collisions/barotrauma have been discussed. International research and experimentation are up to date unsuccessful in recommending sustainable large scale mitigation that reduces impacts on bats to a degree of "no concern".
EXISTING IMPACT	None known.
PREDICTED IMPACT	High should turbines be placed in areas of High bat sensitivity.

IMPACT	Bat mortalities due to blade collisions and barotrauma during foraging
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	High considering proposed wind farms in surrounding areas and longevity of the impact.

Table 26: Impact of bat mortalities due to blade collisions and barotrauma during migration.

IMPACT	Bat mortalities due to blade collisions and barotrauma during migration
DISCUSSION	The migration paths of South African bats in the Cape Provinces are virtually unknown. Cave dwelling species like Miniopterus natalensis and Myotis tricolor undertake annual migrations. Results obtained during the EIA phase as well as the 12 month long term assessment can indicate whether mass migrations are present on site.
EXISTING IMPACT	None known.
PREDICTED IMPACT	High should turbines be placed in a migration path.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	High since mortalities of migrating bats affects multiple ecosystems.

Table 27: Impact of destruction of bat foraging habitat as a result of the proposed development

IMPACT	Destruction of foraging habitat
DISCUSSION	Some foraging habitat will be destroyed by the construction of the turbines and associated infrastructure.
EXISTING IMPACT	Minimal farm buildings exist on the site.
PREDICTED IMPACT	Low
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Low since the majority of the foraging habitat will potentially recover once the infrastructure is in place.

3.1.4 Surface water Impacts

The following potential impacts (to Table 24) have been identified for the proposed solar power facility development and will be further investigated in the EIA phase of the surface water assessment.

- Construction Phase Impacts

Potential negative impacts associated with the construction phase include the following aspects (Table 28 to Table 35):

- Impacts associated with the foundations of the wind turbines;
- Impacts associated with the foundations of the operation control room and the substation;

- Impacts associated with the clearing of vegetation for wind turbines, substation area, operation control building and internal roads;
- Impacts associated with the abnormal/heavy vehicle access into wetlands and riverine areas;
- Impacts associated with the general access into wetlands and riverine areas;
- Impacts associated with the storm water run-off associated with the internal roads, substation, operation control building construction into nearby surface water resources;
- Impacts associated with the oil leakages from construction vehicles and machinery into nearby surface water resources; and
- Impacts associated with underground/overland cable installation into nearby surface water resources.

Table 28: Impacts associated with the foundations of the wind turbines

ISSUE	Impacts associated with the foundations of the wind turbines
DISCUSSION	Where the placement of the foundations for the wind turbines extend into wetland and river areas (buffer zones included), the excavation of potential wetland soils could potentially result.
EXISTING IMPACT	No structures have been identified in the wetland and riverine areas except for a number of man-made dams.
PREDICTED IMPACT	Minor predicted impact due to the instability of wetland soils it is not likely that the wind turbines will be placed in the wetland and riverine areas. However, wind turbines may need to be placed in the buffer zones.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Minor to moderate predicted cumulative effect given the number of wind turbines that might need to be placed in or near the wetland, riverine areas and the associated buffer zones

Table 29: Impacts associated with the foundations of the operation control building and the substation.

ISSUE	Impacts associated with the foundations of the operation control building and the substation
DISCUSSION	Where the placement of the foundations for the operation control building and substation extend into wetland and river areas (buffer zones included), the excavation of potential wetland soils could potentially result.
EXISTING IMPACT	No structures have been identified in the wetland and riverine areas except for a number of man-made dams.
PREDICTED IMPACT	Minor predicted impact due to the instability of wetland soils it is not likely that the operation control building and substation will be placed in the wetland and riverine areas. However, these structures may need to be placed in the buffer zones.

ISSUE	Impacts associated with the foundations of the operation control building and the substation
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Minor predicted cumulative effect given that the structures can be strategically placed away from the wetland, riverine areas and the associated buffer zones

Table 30: Impacts associated with the clearing of vegetation for wind turbines, substation area, operation control building, construction lay down area, access and internal roads

ISSUE	Impacts associated with the clearing of vegetation for wind turbines, substation area, operation control building, construction lay down area, access and internal roads
DISCUSSION	Vegetation in the footprint of each wind turbine, substation, operation control building, construction lay down area, access and internal roads will be required.
EXISTING IMPACT	No structures have been identified in the wetland and riverine areas except for a number of man-made dams.
PREDICTED IMPACT	Minor to moderate predicted impact due to the need for vegetation to be removed which is not expected to be wetland or riverine vegetation as such but potentially vegetation in the buffer zones.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Minor to moderate predicted cumulative effect given that the proposed development is expected to occupy an area of approximately 800 hectares.

Table 31: Impacts associated with abnormal/heavy vehicle access into wetlands and riverine areas

ISSUE	Impacts associated with abnormal/heavy vehicle access into wetlands and riverine areas
DISCUSSION	During the construction phase, vehicles of variable size will need to access the site. Such vehicles may include conventional construction vehicles in addition to abnormal heavy vehicles that will need to transport the component parts (for example, the blades) of the wind turbines. Where these vehicles need to cross riverine areas and/or wetlands, degradation can be caused to these sensitive environments.
EXISTING IMPACT	No visible access roads currently crossing wetlands and riverine areas evident from a desktop level.
PREDICTED IMPACT	Minor to moderate predicted impact due to the need for the various components to reach all areas of the study site in order to transport materials.
EIA INVESTIGATION	Yes.

ISSUE	Impacts associated with abnormal/heavy vehicle access into wetlands and riverine areas
REQUIRED	
CUMULATIVE EFFECT	Minor to moderate predicted cumulative effect should access and internal roads need to cross any wetlands and riverine areas.

Table 32: Impacts associated with general access into wetlands and riverine areas

ISSUE	Impacts associated with general access into wetlands and riverine areas
DISCUSSION	General access into wetland and river areas refers to activities such as physical destruction of wetlands caused by humans, excavation and degradation of wetlands by construction machinery, use of wetlands for sanitary facilities and ablutions and dumping of materials, waste and litter into wetlands. This specifically relates to any construction areas that take place near rivers or wetlands.
EXISTING IMPACT	From a desktop level no existing impacts could be identified except for the presence of a number of man-made dams.
PREDICTED IMPACT	Minor to moderate predicted impact due to the need for construction activities to take place in most areas of the study site.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Minor to moderate predicted cumulative effect.

Table 33: Impacts associated with the storm water run-off associated with the internal roads, substation, operation control building and construction lay-down area into nearby surface water resources

ISSUE	Impacts associated with the storm water run-off associated with the internal roads, substation, operation control building and construction lay-down area into nearby surface water resources
DISCUSSION	Where the location of internal roads, the substation, the construction lay down area and the operation control building are to be situated near surface water resources, increased run-off caused by rainfall events can produce potential erosion and sedimentation impacts to nearby surface water resources.
EXISTING IMPACT	From a desktop level no existing erosion or sedimentation impacts could be identified.
PREDICTED IMPACT	Minor to moderate predicted impact due to the likelihood of this impact occurring.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Moderate predicted cumulative effect.

Table 34: Impacts associated with the oil leakages from construction vehicles and machinery into nearby surface water resources

ISSUE	Impacts associated with the oil leakages from construction vehicles and machinery into nearby surface water resources
DISCUSSION	Construction activities make use of fuels, oils, and other soluble substances (cement mix) which are necessary for the operation vehicles and in order to produce building materials. These liquids in addition to human feacal and urine waste pose a pollution risk to nearby surface water resources.
EXISTING IMPACT	From a desktop level no pollution impacts could be identified.
PREDICTED IMPACT	Minor to moderate predicted impact due to the likelihood of this impact occurring.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Moderate to high predicted cumulative effect.

Table 35: Impacts associated with underground/overland cable installation into nearby surface water resources

ISSUE	Impacts associated with underground/overland cable installation into nearby surface water resources
DISCUSSION	It is anticipated that the wind turbines are to be connected to each other by an underground cable (approximately 1 metre depth) that will relay the generated energy to the substation and subsequently to the power grid. It is also envisaged that the underground cable may need to be follow an overhead line over wetland and river areas where appropriate. Where overhead crossing is not possible, underground cabling may be required to course through wetlands and rivers.
EXISTING IMPACT	From a desktop level no cabling impacts could be identified.
PREDICTED IMPACT	Minor to moderate predicted impact due to the likelihood of this impact occurring.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Moderate to high predicted cumulative effect.

- Operation Phase Impacts

Potential impacts associated with the construction phase include the following aspects (Table 36 to Table 39):

- Collision and barotrauma risks to fauna associated with wetlands and rivers (avi-fauna and bats);
- Storm water run-off associated with substation and operation control buildings;
- Storm water run-off associated with roads;

- Oil leakages from substations.

Table 36: Collision risks to fauna associated with wetlands and rivers (avi-fauna and bats)

ISSUE	Collision risks to fauna associated with wetlands and rivers (avi-fauna and bats
DISCUSSION	Wind turbines pose serious collision and barotrauma risk to flighted mammals. Power lines similarly pose a collision risk to avi-fauna.
EXISTING IMPACT	There are no existing impacts related to collision and barotrauma that could be identified from a desktop level.
PREDICTED IMPACT	Minor to moderate predicted impact due to the likelihood of this impact occurring.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Moderate to high predicted cumulative effect.

Table 37: Storm-water run-off associated with substation and operation control buildings

ISSUE	Storm-water run-off associated with substation and operation control buildings
DISCUSSION	The impact of stormwater run-off is primarily related to the types of structures and surfaces that will need to be established for the proposed development. Hard impermeable surfaces and foundations are to be laid over the extent of the proposed development of the operation control building and substation. Flat and hard surfaces aid with the acceleration and generation of run-off which can impact on nearby wetlands and rivers\streams through the onset of erosion at the interface between the proposed development and the surface water resources.
EXISTING IMPACT	There are no existing erosion or sedimentation impacts that were visible from a desktop level.
PREDICTED IMPACT	Moderate predicted impact due to the likelihood of this impact occurring.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Moderate to high predicted cumulative effect.

Table 38: Storm-water run-off associated with roads

ISSUE	Storm-water run-off associated with roads
DISCUSSION	The impact of stormwater run-off generated from roads is a possibility
EXISTING IMPACT	There are no existing erosion or sedimentation impacts were visible from a desktop level.
PREDICTED IMPACT	Minor predicted impact due to the likelihood of this impact occurring.

ISSUE	Storm-water run-off associated with roads
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Minor to moderate predicted cumulative effect.

Table 39: Oil leakages from substations

ISSUE	Oil leakages from substations
DISCUSSION	The main potential impact that may result from the operation phase of the substations is the potential spillage of oil from the transducers that are to be housed. If oil were to spill from the substation, site it could be transported via storm water run-off into the adjacent wetlands and rivers, thereby polluting not only the water but the soils as well causing possible groundwater and soil contamination.
EXISTING IMPACT	Pollution impacts were not identifiable from a desktop level.
PREDICTED IMPACT	Minor predicted impact due to the likelihood of this impact occurring.
EIA INVESTIGATION REQUIRED	Yes.
CUMULATIVE EFFECT	Minor to moderate predicted cumulative effect.

3.1.5 Soils and Agricultural Potential Impacts

The following potential impacts (Table 40) have been identified for the proposed solar power facility development and will be further investigated in the EIA phase of the soils and agricultural potential assessment.

Table 40: Summary of potential impacts from the wind farm development

ISSUE	Loss of agricultural land and production.
DISCUSSION	Loss of agricultural land due to the construction of the wind energy facility and associated infrastructure.
EXISTING IMPACT	None
PREDICTED IMPACT	The proposed development will have a very limited impact on agricultural potential or production on the Renosterberg site as normal agricultural activities (grazing) can still take place around the turbines and associated infrastructure. The only loss of grazing land will be directly below the turbine, the crane hardstand footprint, new buildings and within the road servitude. The area lost is typically less than 2% of the total site.
FURTHER INVESTIGATION REQUIRED	In order to assess the application the Department of Agriculture will require a more detailed agricultural assessment, which includes a soil survey and in-field verification.
CUMULATIVE	A number of solar and renewable energy projects have been

EFFECT	proposed in the De Aar area and thus, the cumulative impact of these developments, on surrounding farms could become detrimental to local agricultural resources, if the loss of usable grazing land is not taken into account when determining optimum herd size.

3.1.6 Noise Impacts

The following potential impacts (Table 41) have been identified for the proposed solar power facility development and will be further investigated in the EIA phase of the soils and agricultural potential assessment.

Table 41: Preliminary Impact Estimation: Operational Phase

ISSUE	Impact: Increased noise levels may be disturbing Impact: Ambient noise level could exceed rating level
DISCUSSION	The operation of the wind turbines could create noises that can increase the ambient sound levels in the area at a level that is disturbing or a level higher than the levels considered to be acceptable
EXISTING IMPACT	The area is considered to be very quiet
PREDICTED IMPACT	Cannot be determined at this stage in the noise assessment
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Predicted to be low as there are no other identified noise sources in the area

3.1.7 Visual Impacts

The following potential impacts (Table 42) have been identified for the proposed solar power facility development and will be further investigated in the EIA phase of the soils and agricultural potential assessment.

Table 42: Visual Impact Summary

ISSUE	**Visual Impact of the proposed Wind Farm**
DISCUSSION	Wind turbines are extensive in terms of their scale and height and can be visually intrusive, especially in visually sensitive environments, and where potentially sensitive visual receptors are present.

	Majority of the surrounding area has a natural scenic visual character due to the uninhabited nature of the area and the visual appeal of the Renosterberg Mountain Range. Any structure located on these high lying areas would be highly visible from the surrounding area. Conversely, the mountainous terrain may shield certain parts of the application site from potential sensitive receptor locations to the south and east.
EXISTING IMPACT	There is a very low level of existing visual impact.
PREDICTED IMPACT	- Potential alteration of the natural visual character of the site by introducing numerous wind turbines or by routing the proposed power line in natural areas where other existing infrastructure is not present; - Visual intrusion of the development on motorists travelling along the R388 between Hope Town and De Aar and along R48 between Philipstown and De Aar; - Potential visual intrusion of the proposed power line on motorists travelling along the N10 between Britstown, De Aar and Hanover; - Alteration to the scenic quality of the surrounding area, should the wind farm be located on the high lying plateau of the Renosterberg Mountain Range; - Potential impact of shadow flicker on people residing within close proximity to proposed wind turbines; - Potential creation of a prominent linear feature or 'scar' that texturally contrasts with the natural hillside vegetation, should roads be constructed to access the high lying areas of the Renosterberg Mountain Range or should the power line be routed along the plateau or diagonally down the mountain; - Potential visual intrusion and breaking of the horizon by routing the proposed power line either along the plateau or diagonally down the Renosterberg Mountain Range; - Visual intrusion of the development that could adversely affect farmsteads / homesteads in close proximity; and - Potential alteration of the night-time visual environment by the aviation lighting placed on top of each wind turbine that would create a network of red lights in the night-time sky.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	None anticipated at this stage.

3.1.8 Heritage Impacts

The following potential impacts (Table 43 to Table 46) have been identified for the proposed solar power facility development and will be further investigated in the EIA phase of the soils and agricultural potential assessment.

Table 43: Impact on archaeological sites.

ISSUE	Impact on archaeological sites
DISCUSSION	As seen from the archival work, the possibility of archaeological finds have been identified as being high and thus further field work is required to develop a comprehensive Heritage Management Plan.
EXISTING IMPACT	None known
PREDICTED IMPACT	Unidentified archaeological sites and the discovery of such sites during construction can seriously hamper construction timelines. Field work can thus provide valuable information on such site in the study area and provide timeous management of such site through realignment of development or mitigation of such sites where needed.
EIA INVESTIGATION REQUIRED	Archaeological walk down of impact areas
CUMULATIVE EFFECT	None foreseen at this stage.

Table 44: Impact on palaeontological sites.

ISSUE	Impact on palaeontological sites
DISCUSSION	As seen from the archival work, the possibility of palaeontological finds have been identified as being high and thus further field work is required to develop a comprehensive Heritage Management Plan.
EXISTING IMPACT	Site impacted by existing developments such as transmission lines and road networks.
PREDICTED IMPACT	Unidentified archaeological sites and the discovery of such sites during construction can seriously hamper construction timelines. Field work can thus provide valuable information on such site in the study area and provide timeous management of such site through realignment of development or mitigation of such sites where needed.
EIA INVESTIGATION REQUIRED	Further palaeontological desktop work as well as selected ground thruthing as required by palaeontologist
CUMULATIVE EFFECT	None foreseen at this stage.

Table 45: Impact on historical sites.

ISSUE	Impact on historical sites
DISCUSSION	As seen from the archival work and discussion in Section 2.14.1 the possibility of historical finds have been identified as being high and thus further field work is required to develop a comprehensive Heritage Management Plan.
EXISTING IMPACT	None known
PREDICTED IMPACT	Unidentified historical structure and the discovery of such structures during construction can seriously hamper construction timelines. Field work can thus provide valuable information on such site in the study area and provide timeous management of such site through realignment of development or mitigation of such sites where needed.
EIA INVESTIGATION REQUIRED	Archaeological walk down of impact areas will identify possible impacted sites
CUMULATIVE EFFECT	None foreseen at this stage.

Table 46: Impact on graves and cemeteries sites.

ISSUE	Impact on graves and cemeteries site
DISCUSSION	The existence of graves and cemeteries has not been verified during the archival research. It has however been found that such structures are rarely noted in maps and documents and can only really be identified during field work.
EXISTING IMPACT	None known
PREDICTED IMPACT	Unidentified graves and cemeteries and the discovery of such structures during construction can seriously hamper construction timelines. In the event that these graves and cemeteries could not be avoided a grave relocation process needs to be started. Such a process impacts on the spiritual and social fabric of the next of kin and associated communities. Field work can thus provide valuable information on such site in the study area and provide timeous management of such site through realignment of development or relocation of such sites where needed.
EIA INVESTIGATION REQUIRED	Archaeological walk down of impact areas will identify possible impacted sites
CUMULATIVE EFFECT	None foreseen at this stage.

3.1.9 Palaeontological Impacts

The following potential impacts (Table 47) have been identified for the proposed solar power facility development and will be further investigated in the EIA phase of the palaeontological assessment.

Table 47: Summary of destruction, damage or disturbance of fossil remains potential impacts.

ISSUE	Impact: destruction, damage or disturbance of fossil remains preserved at or beneath the ground surface
DISCUSSION	Negative impacts confined to the construction phase and largely restricted to the development footprint, notably where extensive bedrock excavations occur (*e.g.* wind turbine foundations).
EXISTING IMPACT	Negligible, although fossils at or near the ground surface are constantly being destroyed by weathering and erosion.
PREDICTED IMPACT	Moderate to low, depending on siting of development footprint within the study area, local concentration of fossil heritage, and thickness of relatively unfossiliferous superficial deposits overlying fossil-bearing bedrocks within development footprint.
EIA INVESTIGATION REQUIRED	Yes. Specialist palaeontological field-based assessment of study area is necessary to assess palaeontological sensitivity of rock units represented here, distribution of fossils, and necessity for any further specialist studies and / or mitigation measures.
CUMULATIVE EFFECT	Predicted to be low as given that the majority of the site will potentially be retained once the infrastructure is in place.

3.1.10 Social Impacts

The following potential impact identified in Table 48 has been identified for the proposed solar power facility development and will be further investigated in the EIA phase of the biodiversity assessment.

Table 48: Summary of potential social impacts.

ISSUE AND IMPACT	
ISSUE	Impact: Opportunistic invasion of the development area by people seeking compensation
DISCUSSION	Should people be aware of the proposed development the potential for the setting up of illegal settlements is possible unless controlled.
EXISTING IMPACT	None. There are no people residing on the proposed development land (yet to be confirmed).
PREDICTED IMPACT	None

ISSUE AND IMPACT	
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	None
ISSUE	Impact: Loss of land and crops due to infrastructure construction
DISCUSSION	Land, whether used for the purposes of commercial, subsistence agriculture by legal or illegal farmers or where land is being utilised for the purpose of grazing would prove to be a loss of potential livelihood.
EXISTING IMPACT	The area is largely unused for agricultural or livestock farming (yet to be confirmed)
PREDICTED IMPACT	Low
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Low
ISSUE	Impact: Loss of areas of cultural heritage
DISCUSSION	Site clearing, construction activities and the establishment of facilities could potentially impact areas of cultural significance. Cultural heritage has increased prominence in the respective LM at present.
EXISTING IMPACT	Low. To be confirmed via a heritage study.
PREDICTED IMPACT	Low
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Low
ISSUE	Impact: Community disruption due to physical, economic displacement and land replacement
DISCUSSION	Should people be residing in the area of impact (within the entire inclusive development footprint), there is the potential for disruption.
EXISTING IMPACT	None. There are no people residing on the proposed development land (yet to be confirmed).
PREDICTED IMPACT	None
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	None
ISSUE	Impact: Pressure on existing services and facilities
DISCUSSION	Depending on the number of workers migrating into the area for work purposes, the potential is that the town of De Aar will be impacted due to the increased demand for educational, health, recreational facilities.

ISSUE AND IMPACT	
EXISTING IMPACT	Medium. De Aar is the only established (formal) town in the area. There are no other known formal (peri-urban) or rural settlements in close proximity to the development site. As a result, should additional people migrate to the area, they will in all likelihood settle in De Aar.
PREDICTED IMPACT	Medium. Yet to be confirmed if the impact will remain medium after construction phase.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Low (if impact lasts only for the construction phase)
ISSUE	Impact: Establishment or extension of informal settlements by people seeking work opportunities
DISCUSSION	There is potential for the establishment or extension of informal settlements due to perceived work opportunities. Statistics indicates that of De Aar's 73% of eligible workers, 56% are unemployed. The unemployment figures across the Northern Cape are likely to be similar - thus increasing the number of people seeking work opportunities and possibly migrating to areas of perceived work opportunities.
EXISTING IMPACT	None. There are no known informal settlements in close proximity to the development site.
PREDICTED IMPACT	Low. The expected workforce to be employed is still to be confirmed - this would indicate the demand for local labour and potential for the establishment of such settlements - unless controlled.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Low
ISSUE	Impact: Changes in employment and incomes through project recruitment
DISCUSSION	Should the local labour component be substantial, there is potential that local incomes would increase, improving the earning potential and capacity of local residents.
EXISTING IMPACT	Unknown. Local industry and farms are the biggest employers at present. Existing impact from other similar developments in the LM are yet to be confirmed.
PREDICTED IMPACT	Medium. (assuming there is a substantial local labour component) and employment will last through construction and operational phases of the project.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Medium
ISSUE	Impact: Increased business opportunity through the

ISSUE AND IMPACT	
	procurement of goods and services
DISCUSSION	The specialised nature of the developments may assume procurement of the majority of the goods from outside of the LM and Northern Cape province. However, there is a large amount of goods required that could be sourced locally (food, vehicles, maintenance of wearable equipment, etc)
EXISTING IMPACT	Unknown.
PREDICTED IMPACT	High potential - particularly during construction
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Medium
ISSUE	Impact: Increased opportunity for informal business development
DISCUSSION	Informal traders may take to the opportunity to sell goods and services - depending on the demand during the construction and operational phases.
EXISTING IMPACT	None. At present there are no known informal traders on the land identified for development. (Yet to be confirmed)
PREDICTED IMPACT	Low (if impact lasts only for the construction phase.)
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Low
ISSUE	Impact: Increased business confidence
DISCUSSION	The fact that the power generation will ensure future power supplies may increase business confidence in the Northern Cape and South Africa as a whole. Is has been indicated that the power generation is for the benefit of the national grid.
EXISTING IMPACT	Unknown. (There is evidence of a PV solar plant in De Aar, the existing impact of which should be drawn into this study.)
PREDICTED IMPACT	Low
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Low (as it will be at a national level).
ISSUE	Impact: Inconvenience and danger to proximate residents through increased road traffic and dust, and reduced access to farms and worksites
DISCUSSION	Residents living and working nearby to the development areas are likely to suffer the inconvenience and hazards related to increased road traffic. The rail depot existing in De Aar would act as an access channel for goods coming into and leaving De Aar. The consequence of trucks routing into and out of the town increases road hazard risks to town

ISSUE AND IMPACT	
	residents.
EXISTING IMPACT	Unknown. At present there are no known residents nearby to the development site. There is evidence of one farm north of the development footprint. This is yet to be confirmed.
PREDICTED IMPACT	Medium (if impact lasts only for the construction phase).
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Medium. This is largely dependent on other developments that utilise the De Aar town for various reasons.
ISSUE	Impact: Community disruption by non-local and local workers and opportunity seekers
DISCUSSION	The potential for increased work opportunity may attract others from outside the local areas. In addition the existence of a construction workforce which is not from the local areas may also contribute to socio-political tensions in local areas.
EXISTING IMPACT	Unknown.
PREDICTED IMPACT	Low. This impact depends on the number of workers and the access of workers to local towns and settlements.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Low
ISSUE	Impact: Local improvements to road, power and water infrastructure with benefits to proximate communities
DISCUSSION	The development would in all likelihood open up routes to local communities thereby increasing mobility. Should water and power access be available to the development site, this increases the opportunity for others to gain (legal) access.
EXISTING IMPACT	None. There are no communities in close proximity to the development site apart from De Aar (20 km's away). The town of De Aar is being spatially planned, with the majority of residents having above standard electricity supply, while the sanitation scenario is below standard (given the number of residents in Ward 6 that still utilise the bucket system).
PREDICTED IMPACT	Low
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Low
ISSUE	Impact: Access to well –resourced social facilities by employees and contractors due to the ability to pay fees

ISSUE AND IMPACT	
DISCUSSION	The increase in household income through potential project recruitment will increase a household member's access to facilities for which payment would be made. For example, payment for doctors' consultation fees, school fees for children, etc.
EXISTING IMPACT	Unknown.
PREDICTED IMPACT	Medium. (assuming there is a substantial local labour component) and employment will last through construction and operational phases of the project.
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Medium
ISSUE	Impact: Increased local risk of HIV/AIDS infection with influx of workers and opportunity seekers
DISCUSSION	There is potential for newcomers (non-local) residents to enter the De Aar town (and possibly residential suburbs). The contractor workforce (if housed on site and are not local) may frequent the town. The rail routing into town and the consequent use of trucks for transportation (perhaps even long -haul trucks), increases the chances of the spread of HIV/AIDS due to the increased movement of people.
EXISTING IMPACT	Unknown
PREDICTED IMPACT	High - due to the long term impact of HIV/AIDS
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	High potential - due to the long term impact of HIV/AIDS
ISSUE	Impact: Local dissatisfaction due to finite jobs and perceived preferential access to these jobs and procurement
DISCUSSION	Local unemployed (but eligible) workers may perceive bias in the recruitment/ employment process.
EXISTING IMPACT	Unknown
PREDICTED IMPACT	Low
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Low
ISSUE	Impact: Crime related incidents
DISCUSSION	An area of human development increases the chance of criminal activity. Whether crime takes place in the form of petty theft, vehicle hijackings or even electrical cable theft, the potential will increase as a result of the development.
EXISTING IMPACT	Low
PREDICTED IMPACT	Low - assuming the town does not see a huge influx of non-local people.

ISSUE AND IMPACT	
EIA INVESTIGATION REQUIRED	Yes
CUMULATIVE EFFECT	Low - assuming the town does not see a huge influx of non-local people.

4 PUBLIC PARTICIPATION PROCESS

Public participation is the cornerstone of any EIA. The principles of NEMA as well as the EIA Regulations govern the EIA process, including public participation. These include provision of sufficient and transparent information on an ongoing basis to stakeholders to allow them to comment, and ensuring the participation of previously disadvantaged people, women and the youth.

The public participation process is primarily based on two factors; firstly, ongoing interaction with the environmental specialists and the technical teams in order to achieve integration of technical assessment and public participation throughout. Secondly, to obtain the bulk of the issues to be addressed early on in the process, with the latter half of the process designed to provide environmental and technical evaluation of these issues. These findings are presented to stakeholders for verification that their issues have been captured and for further comment.

Input into the public participation process by members of the public and stakeholders can be given at various stages of the EIA process. Registration on the project can take place at any time during the EIA process up until the final EIA report is submitted to DEA. There are however set periods in which comments are required from Interested and / or Affected Parties (I&APs) in order to ensure that these are captured in time for the submission of the various reports. The comment periods during the scoping phase were implemented according to NEMA EIA Regulations. The comment periods during the scoping phase (as set out by DEA) are as follows:

- Background Information Document (BID): 4 Calendar weeks, but also as and when an I&AP registers.
- Comment period for the Draft Scoping Report (DSR): 5 Calendar weeks (40 days).
- Comment on the Amended DSR: should there be a significant change from the DSR an appropriate comment period will be set out in consultation with DEA. This period may be seven (7) days, fourteen days (14), etc., as to be approved or set by DEA. Should there be no significant changes, then the Final Scoping Report (FSR) will be submitted to DEA.

The EIA regulations emphasise the importance of public participation. In terms of the EIA regulations, registered interested and/or affected parties –

- may participate in the application process;
- may comment on any written communication submitted to the competent authority by the applicant or environmental consultant;
- must comment within the timeframes as stipulated by the EIA Regulations;
- must send a copy of any comments to the applicant or Environmental Assessment Practitioner (EAP) if the comments were submitted directly to the competent authority; and
- must disclose any direct business, financial, personal or other interests that the person has in the application being granted or refused.

Further, in terms of the EIA regulations, the EAP:

- manages the application process;
- must be independent;
- must undertake the work objectively – even if this results in views and findings that are not favourable to the applicant;
- must disclose material information that may influence the decision; and
- must conduct a public participation process.

The following actions were taken upon receiving comments/queries/issues:

- The contact details provided were entered into the project database for use in future notifications.
- Confirmation of receipt of comments.
- Addressed comments in the Issues & Response Report.

4.1 Objectives of Public Participation

An understanding of what the public participation is, and is what it is not, needs to be explored and must be clarified.

- Public Participation is:
    - A communication mechanism to inform I&APs regarding a proposed project.
    - A communication mechanism to record comments and/or concerns raised during the relevant phase of the EIA by I&APs regarding a proposed project.

- What Public Participation is not:
    - A marketing exercise.
    - A process to address grievances but rather to record comments raised.
    - One-on-one consultation with each I&AP during the EIA process (not relevant to possibly affected landowners identified).

The primary aims of the PPP are:

- To inform interested and affected parties (I&APs) and key stakeholders of the proposed development.
- To initiate meaningful and timeous participation of I&APs.
- To identify issues and concerns of key stakeholders and I&APs with regards to the proposed development
- To promote transparency and an understanding of the proposed project and its potential environmental impacts.
- To provide information used for decision-making.
- To provide a structure for liaison and communication with I&APs and key stakeholders.
- To assist in identifying potential environmental impacts associated with the proposed development.
- To ensure inclusivity (the views, needs, interests and values of I&APs must be considered in the decision-making process).
- To focus on issues relevant to the project and issues considered important by I&APs and key stakeholders.
- To provide responses to I&AP queries.
- To encourage co-regulation, shared responsibility and a sense of ownership.

In addition to the guidance of the PPP in the EIA Regulations, every effort was also made to conform to the requirements of the Promotion of Administrative Justice Act 2000 (Act 3 of 2000).

4.2 Overview of the Public Participation Process to date

The public participation process for the EIA was initiated on the 28th September 2012. The stages that will form part of the public participation process to date for this proposed project are reflected in Figure 64 below.

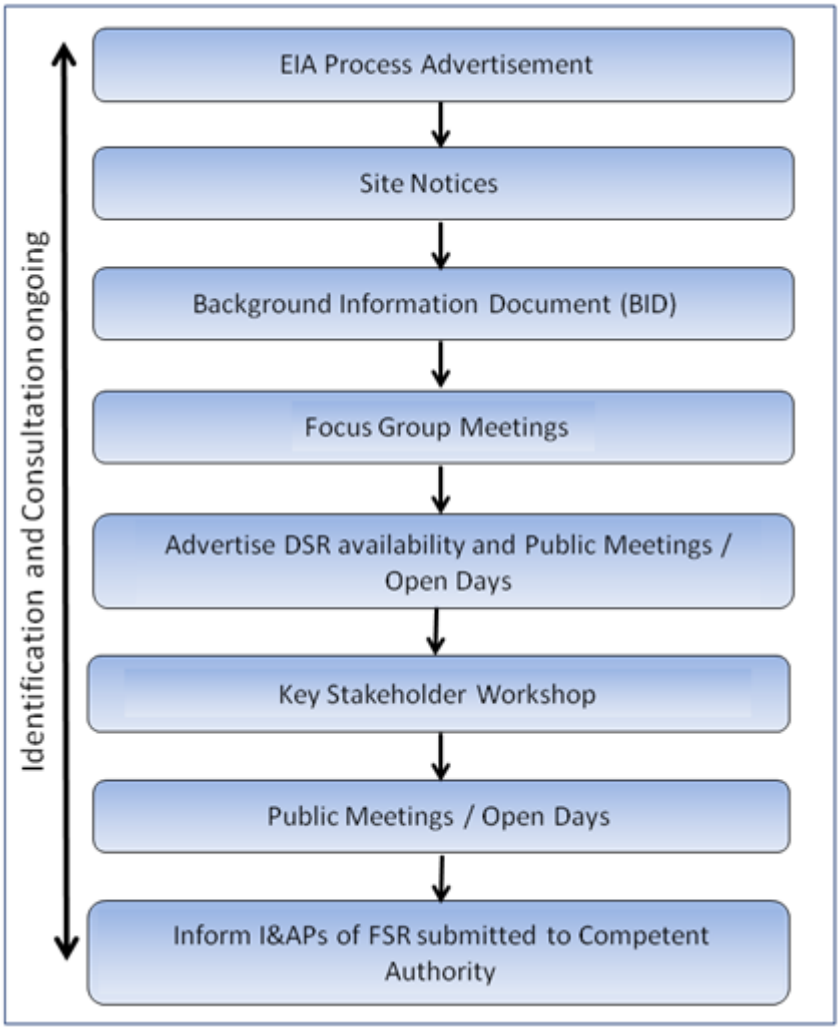


Figure 64: Public Participation Process

Members of the public who wished to be registered on the database as an I&AP were able to do so via telephone, fax, email, mail or SiVEST's website (www.sivest.co.za).

On-going consultation with key stakeholders (e.g. provincial, district and local authorities, relevant government departments, local business etc.) and identified I&APs ensured that I&APs were kept informed regarding the EIA process. Networking with I&APs will effectively continue throughout the scoping phase of the project until the Final Scoping Report and EIA Plan of Study are submitted to DEA. Where required, stakeholders and I&APs were engaged on an individual basis.

During the environmental studies, consultations were held with individuals, businesses, institutions and organisations, and the following sectors of society have been identified and were afforded the opportunity to comment (the full stakeholder database list is included in Appendix 4):

- National Authorities;
- Provincial Authorities;
- Pixley ka Seme District Municipality;
- Emthanjeni Local Municipality;
- Government Structures such as SAHRA, SANRAL, Telkom, etc;
- Agriculture Associations;
- Regional and local media (advertisements and public documents e.g. BID);
- Business and commerce;
- Environmental bodies / NGOs;
- Community representatives, CBOs, development bodies;
- Landowners;
- Square Kilometre Array (SKA); and
- Civil Aviation Authority (CAA).

4.3 Consultation and Public Involvement

Through the consultation process, issues for inclusion within the DSR will be identified and confirmed. Telephonic discussions and one-on-one consultation will be undertaken where relevant. Meetings and focus group meetings are scheduled to take place during the comment period of the DSR in order to identify key issues, needs and priorities for input into the proposed project. Special attention will be paid to the consultation with possibly affected landowners and communities within the study area to try and address their main concerns.

4.4 Stakeholders and I&APs

In order to identify possible I&APs, use was made of:

- print media – EIA process advertisements
    - The De Aar Echo Advertiser (English and Afrikaans)
- site notices throughout the study area (Proofs included in Appendix 4A)
- referrals
- requesting databases and/or contact information from NGOs / CBOs and other organisations

A full database list of registered I&APs was compiled and is included in Appendix 4F.

4.5 Announcing the Opportunity to Participate

The opportunity for stakeholders to participate in the EIA were invited as follows:

- EIA process advert (3 October 2012).
- Copies of the BID were posted to all registered I&APs on the project database.
- Those I&APs with e-mail addressed also received an electronic copy of the BID.
- BIDs were delivered to various locations within the study area:
- The letter of invitation to participate as well as the Registration and Comment Form accompanied the BID.

4.6 Notification of the Potential Interested and Affected Parties

Communication with I&APs were conducted by means of telephone, faxes and email in order to obtain the necessary background information to compile this report. The advertising process was followed in terms of regulation 56 of the EIA Regulations published in R543 in Government Gazette No. 33306 of 18 June 2010, as amended.

Advertisements were placed in the De Aar Echo on the 28th of September 2012.

Accordingly, many site notices (as per regulations) were placed near the study area. The site notices were placed in the following locations:

- On-site
- De Aar Library
- Libra Library
- Phandulwazi Library

As stakeholders responded to these advertisements, they were registered on the project database and sent letters of invitation to participate as well as the BID.

4.6.1 Summary of comments received

I&AP	Date received	Summary of comments
None as yet.	None as yet.	None as yet.

4.7 Proof of Notification

Appendix 4 includes all proof of notification of Interested and Affected Parties. More specifically, the types of proofs are as follows:

- Site notice text (Appendix 4A)
- Photographs of site notices (Appendix 4B)
- Proof of advertisements in the newspapers (Appendix 4C)
- Background Information Document (Appendix 4B)
- Correspondence to registered I&APs and key stakeholders (Appendix 4D)

4.8 Focus Group Meetings

Focus Group Meetings (FGMs) are to be held with the possibly affected landowners and the District and Local Municipalities in November 2012. FGMs are smaller meetings with specific groups or organisations who have similar interests in or concerns about the project. This process is ongoing and will continue throughout the EIA process.

Table 49: Focus Group meetings

Venue	Interested Parties	Date	Time
Emthanjeni LM Boardroom	Councillors and Officials - Pixley ka Seme DM & Emthanjeni LM	Thursday 15 November 2012	14h30 - 16h00
De Aar Public Library	Affected and adjoining Land Owners	Friday 16 November 2012	10h00 - 12h00

Minutes of these meetings will be compiled and forwarded to all attendees for their review and comment. The primary aim of these meetings is to:

- disseminate information regarding the proposed development to I&APs
- provide I&APs with an opportunity to interact with the EIA team and the Mainstream Renewable Energy representatives present.
- supply more information regarding the EIA process;

- answer questions regarding the project and the EIA process;
- receive input regarding the public participation process and the proposed development.

4.9 Key Stakeholder Workshop

A Key Stakeholder Workshop is to take place during the review period in November 2012 and stakeholders will be invited by personalised invitation letters.

The Key Stakeholder Workshop will be held in order to provide stakeholders with any additional information regarding the proposed development, to present the environmental findings of the scoping-phase studies and to invite stakeholders to submit their comments on the DSR and to raise any further comments and/or concerns.

Table 50: Key Stakeholder Workshop

Venue	Date	Time
Dankie Pa Guest House, Kimberley	Thursday 15 November 2012	08h00 - 10h00

Final minutes of this workshop will be compiled and forwarded to all attendees. The final minutes will be included in the Final Scoping Report and will be submitted to the Competent Authority.

4.10 Public Meetings / Open Days

A Public Meeting will take place during the review period of the DSR in November 2012.

This meeting will be advertised in the same newspapers that were used for the EIA process. Advertisement and invitation letters will be sent by mail and e-mail to all registered I&APs on the project's database.

Furthermore, posters advertising the Public Meeting will be displayed at the public venues and various public places frequented by the public (i.e. cafés). Photos of proof of poster advertisements will be included in Appendix 4A.

The Public Meetings / Open Days will be held in order to provide I&APs with information regarding the proposed development, present the environmental findings (desk-top) and invite I&APs to raise any further comments and/or concerns.

The Public Meeting will be held at the following venue and dates:

Table 51: Public Meetings / Open Days

Venue	Date	Time
Libra Community Hall	Thursday 15 November 2012	17h30 - 19h30

Final minutes of this meeting will be compiled and forwarded to all attendees. The final minutes are to be included in the Final Scoping Report and will be submitted to the Competent Authority.

4.11 One-on-One Consultation

Where possible, potentially directly affected landowners were consulted on a one-on-one basis and informed about the proposed project. Any comments and/or concerns received will be noted and included in the Comments and Responses Report.

This consultation process is seen as one of the important aspects of the EIA and Public Participation process. Should the proposed project be granted an Environmental Authorisation, these particular stakeholders will be directly affected and their properties impacted upon. The consultation process will also ensure that as many uncertainties and concerns as possible are raised upfront and channelled to RWEC and the IDC to ensure that the stakeholders and the applicant are informed about these issues throughout the process.

4.12 Comments and Response Report

Issues, comments and concerns raised during the public participation process will be captured in the Comments and Response Report (C&RR) – Appendix 4E as and when they are received. This C&RR provides a summary of the issues raised, as well as responses which were provided to I&APs. This information will be used to feed into the evaluation of social impacts. A separate section to the C&RR will be added to the Final Scoping Report to reflect the comments received during the review period from I&APs on the DSR.

4.13 Public comments on Draft Scoping Report

The Draft Scoping Report will be made available for public review prior to submission of the Final Scoping Report to DEA (the competent authority). The availability of the DSR will be advertised in the De Aar Echo. Proof of the advertisement will be included in Appendix 4C.

The report will be out for public review and comment for a period of 30 calendar days. The comment period will run from **02 November 2012 to 03 December 2012**. Written notice will be given to all registered I&APs as well as all key stakeholders on the database that the DSR was available for public review.

Electronic copies (CD) of the report will also be made available and were distributed on written request. The Draft Scoping Report was made available at the following venues:

Table 52: Venues where Scoping Report will be publically available

Venue	Street Address	Hours	Contact No.
De Aar Public Library	27 Station Street, De Aar	Monday – Fridays 08h00 – 17h00 Saturdays 8h30 – 12h30	078 156 2394
Libra Library	Blossom Street, De Aar	Mondays – Fridays 09h00 – 17h00 Saturdays 08h30 – 12h00	053 632 9150
Phandulwazi Biblioteek	Nanzwakazi location, Hlithani Street	Mondays – Fridays 09h00 – 17h00 Saturdays 09h00 – 12h00	053 632 9149
Emthanjeni Local Municipality Offices	45 Voortrekker Street, De Aar	Mondays – Fridays 07h45 – 16h30	053 632 9100

5 ASSESSMENT IN TERMS OF EQUATOR PRINCIPLES

The Equator Principles ("EP") is a financial industry benchmark for determining, assessing and managing social & environmental risk in project financing. A number of banks, exchanges and organisations worldwide have adopted the Principles as a requirement to be undertaken for funding to be granted. However, certain funding institutions may not have formally adopted the Principles, although will require clients to be compliant with them in order to qualify for loans. The principles are summarised below:

Principle 1: Review and Categorisation
When a project is proposed for financing, the Equator Principles Funding Institution ("EPFI") will categorise the project based on the magnitude of its potential impacts and risks.

Principle 2: Social and Environmental Assessment
For each project assessed as being either Category A or Category B, the client / borrower must conduct a Social and Environmental Assessment ("Assessment") process to address the relevant impacts and risks of the proposed project. The Assessment should also propose mitigation and management measures relevant and appropriate to the nature and scale of the proposed project.

Principle 3: Applicable Social and Environmental Standards
The Assessment will refer to the applicable IFC Performance Standards and applicable Industry Specific EHS Guidelines.

Principle 4: Action Plan and Management System
The client / borrower must prepare an Action Plan ("AP") or management system that addresses the relevant findings, and draws on the conclusions of the Assessment. The AP will describe and prioritise the actions needed to implement mitigation measures, corrective actions and monitoring measures necessary to manage the impacts and risks identified in the Assessment. The management measures are required to comply with applicable host country, social and environmental laws and regulations, and requirements of the applicable Performance Standards and EHS Guidelines, as defined in the AP.

Principle 5: Consultation and Disclosure
The client / borrower or third party expert must consult with project affected communities in a structured and culturally appropriate manner. For projects with significant adverse impacts on affected communities, the process will ensure their free, prior and informed consultation and facilitate their informed participation as a means to establish, to the satisfaction of the EPFI, whether a project has adequately incorporated affected communities' concerns.
In order to accomplish this, the non-technical summaries must be made available to the public by the borrower for a reasonable minimum period in the relevant local language and in a culturally appropriate manner.

Principle 6: Grievance Mechanism

To ensure that consultation, disclosure and community engagement continues throughout construction and operation of the project, the borrower must, scaled to the risks and adverse impacts of the project; establish a grievance mechanism as part of the management system. This will allow the borrower to receive and facilitate resolutions of concerns and grievances about the project's social and environmental performance raised by individuals or groups from among project-affected communities.

Principle 7: Independent Review

For all Category A projects and, as appropriate, for Category B projects, an independent social or environmental expert not directly associated with the borrower must review the Assessment, AP and consultation process documentations in order to assist the EPFIs due diligence, and assess Equator Principles compliance.

Principle 8: Covenants

An important strength of the Principles is the incorporation of covenants linked to compliance. For Category A and B projects, the client / borrower will covenant in financing documentation:

- To comply with all relevant host country, social and environmental laws, regulations and permits in all material respects
- To comply with the AP (where applicable) during the construction and operation of the project in all material respects
- To provide periodic reports in a format agreed with EPFIs (with the frequency of these reports proportionate to the severity of impacts, or as required by law, but not less than annually), prepared by in-house staff or third party experts, that i) document compliance with the AP (where applicable), and ii) provide representation of compliance with relevant local, state and host country social and environmental laws, regulations and permits
- To decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan

Principle 9: Independent Monitoring and Reporting

To ensure ongoing monitoring and reporting over the life of the loan, EPFIs will, for all Category A projects, and as appropriate, for Category B projects, require appointment of an independent environmental and/or social expert, or require that the borrower to retain qualified and experienced external experts to verify its monitoring information, which would be shared with EPFIs.

Principle 10: EPFI Reporting

Each EPFI adopting the Equator Principles commits to report publicly at least annually about its Equator Principles implementation processes and experience, taking into account appropriate confidentiality considerations.

5.1 Assessment Results

This section details the current compliance level with which the solar PV power plant project meets with the Equator Principles and the related Performance Standards which are outlined below.

Table 53: Solar PV power plant Compliance Level in terms of Equator Principles and Related Performance Standards.

The coding key is as follows:

Compliance Level			
Clear			
Not assessed/ determined	Not compliant	Partially compliant	Compliant

Principles	**Compliance Level**	**Reference**
General, Performance Standard 1 Environmental & Social Reporting		
1. Baseline Information		Refer to Chapter 2
2. Impacts and risks		Refer to Chapter 3
3. Global impacts		N/A
4. Transboundary		N/A
5. Disadvantaged / vulnerable groups		To be addressed as part of the EMP during the EIA phase (CSI and Labour Plan)
6. Third party		Refer to section 1.1.
7. Mitigation measures		To be addressed as part of the EMP during the EIA phase
8. Documentation process		Refer to section 1.2
9. Action Plans		To be addressed during the EIA phase
10. Organisational capacity		To be addressed as part of the EMP during the EIA phase (CSI and Labour Plan)
11. Training		To be addressed as part of the EMP during the EIA phase

Principles	Compliance Level	Reference
12. Grievance mechanism		To be addressed during the EIA phase
13. Report content		To be addressed as part of the EMP during the EIA phase
Performance Standard 2, Labour & Working Conditions		
1. Human Resource Policy		To be addressed as part of the EMP during the EIA phase (CSI and Labour Plan)
2. Working relationship		To be addressed as part of the EMP during the EIA phase (CSI and Labour Plan)
3. Working conditions with and terms of employment		To be addressed as part of the EMP during the EIA phase
4. Workers organisation		To be addressed as part of the EMP during the EIA phase (CSI and Labour Plan)
5. Non discrimination and equal opportunities		Refer to Chapter 2, section 2.16. This issue will also be addressed as part of the EMP during the EIA phase (CSI and Labour Plan)
6. Grievance mechanism		To be addressed during the EIA phase
7. Occupational Health and Safety		To be addressed during the EIA phase
8. Non-employee workers		To be addressed as part of the EMP during the EIA phase
9. Supply Chain		N/A
10. Labour Assessment Component of a Social and Environmental Assessment		To be addressed as part of the EMP during the EIA phase (CSI and Labour Plan)
Performance Standard 3, Pollution		
1. Pollution Prevention, Resource Conservation & Energy Efficiency		To be addressed as part of the EMP during the EIA phase
2. Wastes		To be addressed as part of the EMP during the EIA phase
3. Hazardous material		To be addressed as part of the EMP during the EIA phase
4. Emergence preparedness &		To be addressed as part of the

Principles	Compliance Level	Reference
response		EMP during the EIA phase
5. Technical guidance – ambient considerations		To be addressed as part of the EMP during the EIA phase
6. Greenhouse gas emissions		N/A
Performance Standard 4, Health & Safety		
1. Hazardous materials safety		To be addressed as part of the EMP during the EIA phase
2. Environmental and natural resource issues		Refer to sections 2.7-2.16
3. Emergency preparedness and response		To be addressed in the EMP during the EIA phase
Performance Standard 5, Land Acquisition		Refer to Chapter 4
Performance Standard 6, Biodiversity		Refer to Chapter 2, section 2.7
Performance Standard 7, Indigenous People		Refer to Chapter 4
Performance Standard 8, Cultural Heritage		Refer to Chapter 2, section 2.13 and 2.14

It is important to note that, most of the issues listed per performance standard in the table above will only be addressed during the EIA phase. Therefore at this stage (scoping phase), most of the issues are categorised as “not assessed/ to be determined”. Full compliance with the EPs will only be realised following EIA assessments.

6 CONCLUSIONS AND RECOMMENDATIONS

The above report provides a broad introduction to the issues that are pertinent to the proposed Renosterberg wind farm, and highlights important issues to be investigated during the EIA Phase of the project. The EIA Phase will draw on the above information and make use of the recommended specialist studies to reach an objective decision on the overall impact of the proposed development.

The EIA Phase will culminate in the compilation of mitigation measures to reduce impacts, the identification of the least impactful routing of the power lines, the identification of least impactful locations for the turbines, the identification of least impactful locations for building structures and the identification of sensitive areas within the study area which may require

more specific management measures. The EIA Phase will also aim to optimise and improve potential positive impacts that may result from the proposed development.

6.1 Conclusions

No specialist study conducted during the Scoping phase for the proposed development has identified any fatal flaws for the Renosterberg Site.

However, a number of potentially significant (positive and negative) environmental impacts have been identified and will need to be evaluated during the detailed EIR phase of the project. In addition, the EIR Phase will provide a more detailed comparative analysis of these potential impacts against the "no-go" alternative.

Detailed mitigation and management measures will be developed during the Environmental Management Programme (EMPr) phase of the project, in response to the detailed assessment, and will be run towards the end of EIR phase of the project. Should this project receive a positive environmental authorisation, the EMPr will guide the project proponent and appointed contractor(s) through the final design, construction and operational phases of the proposed project.

6.1.1 Layout Alternatives

One of the aims of the Scoping report is to identify a preferred layout for the proposed location of the each of the components of the wind farm to carry through to the EIA phase of the investigation for detailed assessment. The selection of a preferred layout during the scoping phase of the project usually helps to focus future investigations, both in terms of the environmental investigations required and the scope of the public participation process. However, as no fatal flaws have been identified, and as most of the studies have recommended that further detailed EIR-level studies are required in order to comparatively assess the alternatives and recommend a preferred alternative, layout alternatives will only be fully investigated in more detail in the EIA phase of the project. Provisionally, a desktop sensitivity map (Figure 65) has been compiled to earmark areas for further assessment in the EIA phase.

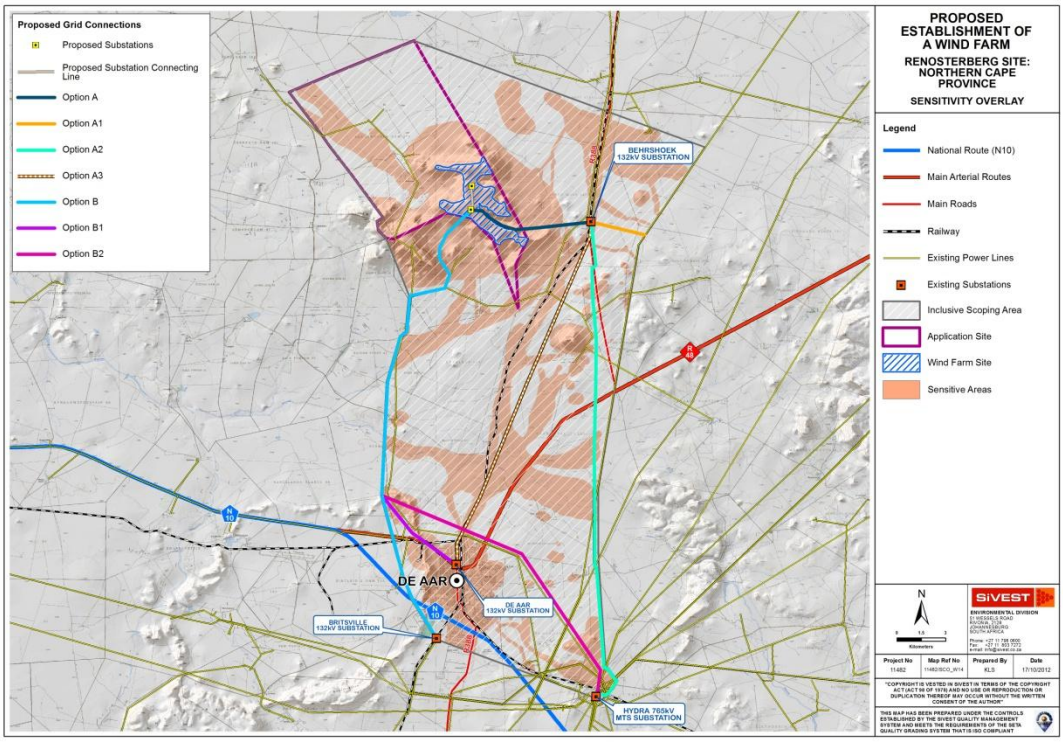


Figure 65: Desktop Sensitivity Map

6.1.2 Summary of Findings

A summary of the findings for each identified environmental impact evaluated in the context of the proposed development (both biophysical and social) is provided in the table below.

Table 54: Summary of environmental issues identified in Specialist Studies.

Aspect	Potential impacts
Biodiversity	▪ Loss and disturbance of natural vegetation; ▪ Loss of faunal habitat; ▪ Fragmentation of natural systems; and ▪ Disturbance or loss of sensitive areas.
Avi-fauna	▪ Displacement due to disturbance at the solar PV site; ▪ Displacement due to habitat transformation at the solar PV site; and ▪ Mortalities from collisions with power lines.
Bats	▪ Bat mortalities due to blade collisions and barotraumas during foraging; ▪ Bat mortalities due to blade collisions and barotraumas during migration; and ▪ Destruction of bat foraging habitat.
Surface Water	Construction Phase Impacts: ▪ Impacts associated with the foundations of the wind turbines; ▪ Impacts associated with the foundations of the operation control room

Aspect	Potential impacts
	and the substation; ▪ Impacts associated with the clearing of vegetation for wind turbines, substation area, operation control building and internal roads; ▪ Impacts associated with the abnormal/heavy vehicle access into wetlands and riverine areas; ▪ Impacts associated with the general access into wetlands and riverine areas; ▪ Impacts associated with the storm water run-off associated with the internal roads, substation, operation control building construction into nearby surface water resources; ▪ Impacts associated with the oil leakages from construction vehicles and machinery into nearby surface water resources; and ▪ Impacts associated with underground/overland cable installation into nearby surface water resources. Operation Phase Impacts ▪ Collision and barotrauma risks to fauna associated with wetlands and rivers (avi-fauna and bats); ▪ Storm water run-off associated with substation and operation control buildings; ▪ Storm water run-off associated with roads; ▪ Oil leakages from substations.
Soils and Agricultural Potential	▪ Loss of agricultural land and production due to construction of the wind farm and associated infrastructure.
Noise	▪ Increased noise levels may be disturbing; and ▪ Ambient noise levels could exceed rating level.
Visual	▪ Visual intrusion of the proposed development that could adversely affect farmsteads / homesteads on and around the proposed site.
Heritage	▪ Impact on archaeological sites; ▪ Impact on palaeontological sites; ▪ Impact on historical sites; and ▪ Impact on graves and cemeteries.
Palaeontology	▪ Impact of destruction, damage or disturbance of fossil remains preserved at or beneath the ground surface.
Social	Negative Impacts ▪ Opportunistic invasion of the development area by people seeking compensation; ▪ Loss of land and crops due to infrastructure construction; ▪ Loss of areas of cultural heritage; ▪ Community disruption due to physical, economic displacement and land replacement; ▪ Pressure on existing services and facilities; ▪ Inconvenience and danger to proximate residents through increased road traffic and dust, and reduced access to farms and worksites;

Aspect	Potential impacts
	▪ Community disruption by non-local and local workers and opportunity seekers; ▪ Increased local risk to HIV/AIDS infection with influx of workers and opportunity seekers; ▪ Local dissatisfaction due to finite jobs and perceived preferential access to these jobs and perceived preferential access to these jobs and procurement; ▪ Crime related impacts; and ▪ Establishment or extension of informal settlements by people seeking work opportunities. Positive Impacts ▪ Changes in employment and incomes through project recruitment; ▪ Increase business opportunity through the procurement of goods and services; ▪ Increased opportunity for informal business development; ▪ Increased business confidence; ▪ Local improvements to road, power and water infrastructure with benefits to proximate communities; ▪ Access to well-resources social facilities by employees and contractors due to the ability to pay fees

Based on the specialist studies, the following conclusions can be reached for each environmental parameter assessed.

Table 55: Conclusions of Specialist Studies.

Biodiversity (Fauna and Flora)	▪ Sensitive areas have been identified within the boundaries of the study area and will be further investigated in the EIA phase. These areas are the plateau as well as the wetlands and drainage areas on the study site. The preservation of these features, as well as conservation of biodiversity should be maximised through the selection of a site that avoids areas of concern. ▪ Specific and detailed recommendations on site selection will be undertaken during the EIA phase when layouts and alternatives are made available. ▪ Detailed assessments will take place during the EIA phase and this will involve more comprehensive species identification and investigation of impacts.
Avi-fauna	▪ The Renosterberg Wind Farm is located in the Platberg-Karoo Conservancy Important Bird Area. The area supports a high number of species which are of conservation significance and which have been identified as priority species that are at risk of being impacted by wind farms. From an avifaunal habitat perspective the Renosterberg plateau (Grassy Karoo) and surrounding steep slopes and cliffs are the most

	sensitive. This is the area where most of the priority species are likely to occur regularly, and where the potential for interaction with wind turbines, particularly collisions, would be the greatest.
Bats	▪ A total of 8 bat species may occur on the site, 3 of which have a higher than 70% probability of being encountered on site. 3 Have a Medium-High risk of being impacted by turbines and 1 species, the Egyptian Free-tailed bat (*Tadarida aegyptiaca*), have a High risk of being impacted by wind turbines. ▪ Bat mortalities during foraging at the proposed wind energy facility is the foreseen impact that is most likely to be of higher significance, should turbines be placed in areas of high bat sensitivity.
Surface water	▪ Several impacts may affect the surface water resources (wetlands and drainage systems specifically) of the Renosterberg study area where the buildings and associated structures encroach on these sensitive environments.
Soils and Agricultural Potential	▪ By taking all the site characteristics (climate, geology, land use, slope and soils) into account, the agricultural potential for the study area is classified as being low for crop production while moderate for grazing. This poor agricultural potential rating is primarily due to restrictive climatic characteristics and soil depth limitations. The Renosterberg site is not classified as high potential, nor is it a unique dry land agricultural resource.
Noise	▪ This assessment indicated that the proposed project could have an impact of low to high significance on the noise climate of the surrounding area as there are Noise-sensitive developments within the area of influence of the wind turbines. The main factor that will determine the potential noise impact is the distance that the wind turbines would be from a NSD, and the total number of wind turbines that could cumulatively impact on this NSD. ▪ At this preliminary stage it is impossible to determine whether the significance of this noise impact would be low, medium or high. ▪ The results of the scenarios indicated that additional information is critical in order to estimate the noise impact on NSDs during the EIA phase.
Visual	▪ The majority of the study area has a scenic natural rural visual character with a moderate visual sensitivity. The visual impact of the proposed solar development is likely to impact residents of surrounding farmsteads and motorists travelling along N48 and R388, therefore these are regarded to be potentially sensitive visual receptors. The sensitivity of the receptor locations will need to be confirmed through further assessment in the next phase of the study. The nature of the visual impacts associated with a wind farm development of this size on receptors in the study area could be significant.
Heritage	▪ The archival research has indicated the definite existence of archaeological find in the study area and palaeontological finds just

	outside the study area.
Palaeontology	▪ The lower-lying portions of the study area for the proposed wind energy at or near Renosterberg, to the north of De Aar, Northern Cape, are underlain at depth by offshore basinal to nearshore sediments of the Early to Middle Permian Ecca Group (Karoo Supergroup). These subaqueous deposits are variously assigned to the Tierberg Formation or Waterford Formation and are of moderate palaeontological sensitivity, containing locally abundant petrified woods, trace fossil assemblages (including possible large amphibian impressions) and microvertebrate remains (*e.g.* disarticulated teeth, scales of fish). Middle Permian fluvial sediments of the Lower Beaufort Group (Adelaide Subgroup, Karoo Supergroup) crop out along the slopes of the Renosterberg *koppies*, but are largely mantled by colluvial (slope) deposits here. These rocks have recently yielded rare but palaeontologically significant fossil remains of small therapsids ("mammal-like reptiles") and turtle-like parareptiles, *plus* occasional fossil plants and silicified woods, in the escarpment zone east of De Aar. The Ecca – Beaufort transition between subaqueous (Ecca Sea) and terrestrial depositional environments in the De Aar – Philipstown region is of geological interest and is recorded in the slopes of the escarpment zone east of De Aar as well as on isolated koppies such as Renosterberg and Tierberg to the north of De Aar. These *koppies* are capped by substantial sills of unfossiliferous dolerite of the Early Jurassic Karoo Dolerite Suite. Much of the subdued Ecca Group outcrop area is covered by a thin to thick (few dm to several meters) succession of Late Caenozoic (Neogene to Recent) superficial deposits such as alluvium, surface gravels, soils and calcrete hardpans. These younger rocks contain sparse, low diversity fossil assemblages such as rhizoliths (calcified plant root casts) and invertebrate burrows, but locally important vertebrate material (*e.g.* mammalian or reptilian bones and teeth) or even human remains may be expected here. ▪ The same limited spectrum of rock units is represented within the broader "all-inclusive" study region encompassing all the infrastructural components of the proposed alternative energy facilities (including transmission lines, substations *etc*) and extending from the Renosterberg area itself southwards to De Aar and beyond. A sizeable area of Adelaide Subgroup rocks cropping out near the Eskom Hydra substation to the southeast of De Aar is of particular note. ▪ Despite the occurrence in many areas of superficial deposits such as scree and alluvium that are generally of low palaeontological sensitivity, good exposures of potentially fossiliferous mudrocks are found in the study region on steep hill slopes as well as in road and railway cuttings and probably also in erosional gullies.
Social	▪ The socio-economic baseline has been determined from a national to a local perspective in the context of the proposed development. The

	socio-economic baseline included assessment of South Africa, the Northern Cape Province, the Pixley ka Seme District Municipality, the Emthanjeni Local Municipality, and Ward 6 within the Emthanjeni Local Municipality. Ultimately, it was found that several positive and negative impacts are anticipated to be associated with the proposed development that will need to be further investigated in the EIA phase.

6.2 Recommendations

Based on the specialist studies, the following recommendations have been proposed for each environmental parameter assessed.

Table 56: Outcomes and recommendations of Specialist Studies

Aspect	Fatal flaws	Site refinement recommendations	Further Investigations
Biodiversity (Fauna and Flora)	None	Detailed recommendations on site selection will be undertaken during the EIA phase when layouts and alternatives are made available.	Yes.
Avi-fauna	None	The extent to which the plateau habitats are being utilised by priority species will have to be assessed in the EIA phase and through pre-construction monitoring.	Yes.
Bats	None	Due to moderate to high risk of significant impacts to bats, and EIA phase assessment will be required.	Yes.
Surface water	None	It is recommended that all structures and associated infrastructure be located outside of any wetlands and rivers\streams as well as their associated buffer zones to avoid and minimise potential impacts adequately. Detailed studies in the impact phase will investigate and verify the findings of this report.	Yes.
Agricultural potential	None	A more detailed agricultural assessment, is required in the Environmental Impact Assessment phase of the environmental process, in order to meet the minimum requirements set out by the Department of Agriculture.	Yes.
Noise	None	This assessment indicated that the development of the proposed RWEC Renewable Energy Facility could have a	Yes.

Aspect	Fatal flaws	Site refinement recommendations	Further Investigations
		potential significant noise impact on the surrounding environment. The layout (main factor) and selection of the wind turbine (minor factor) will determine the potential magnitude of such a noise impact. It is recommended that the potential noise impact associated with the proposed Wind Energy Facility be investigated in more detail in the Environmental Impact Assessment phase. The following information is considered critical: ▪ The available meteorological data, ▪ If available, the wind speed measurements as measured by the developer during the site visit, ▪ The exact locations of the various WTGs in the WEF, ▪ The full specifications of the WTGs, ▪ The available meteorological data, and; ▪ An overview of the equipment, processes and schedules for the construction phase.	
Visual	None	Further assessment will be required in the EIA-phase to investigate the sensitivity of the receptor locations to visual impacts associated with the proposed development and to quantify all impacts that would result.	Yes.
Heritage	None	Further field thruthing through an archaeological walk down and palaeontological study covering the areas to be impacted is required.	Yes.
Palaeontology	None	In view of the potential for significant impacts on fossil heritage within the Karoo Supergroup sediments (Ecca and Beaufort Groups), a pre-construction field assessment of all the land parcels involved in the proposed Renosterberg wind and solar energy developments is necessary	Yes.

Aspect	Fatal flaws	Site refinement recommendations	Further Investigations
		as part of the EIA process. This field study should record significant fossil occurrences and horizons within the broader development footprint and make recommendations for any further specialist palaeontological studies or mitigation that should take place before or during the construction phase. These recommendations should also be incorporated into the Environmental Management Plan for the proposed alternative energy developments.	
Social	None	▪ Social Impact Assessment is required for the proposed development.	Yes.

It is therefore recommended that the following studies be taken through to the EIA Phase:

- Biodiversity (flora and fauna) Assessment (Dr. Helga Van Der Merwe)
- Avifauna Assessment (Chris van Rooyen – Chris Van Rooyen Consulting)
- Surface Water Impact Assessment (Shaun Taylor – SiVEST)
- Soils and Agricultural Potential (Kurt Barichievy – SiVEST)
- Visual Impact Assessment (Andrea Gibb – SiVEST)
- Heritage Assessment (Wouter Fourie – Professional Grave Solutions)
- Palaeontology (John Almond – Natura Viva cc)
- Social Impact Assessment (Kim Moonsamy – SSI)

The proposed scope of work and methodology to assess each of the above impacts has been detailed in the plan of study to undertake an EIA, as per the EIA Regulations. The Plan of Study is included below.

7 PLAN OF STUDY FOR ENVIRONMENTAL IMPACT ASSESSMENT

Issues identified during the Scoping phase will be investigated further during the EIA phase of the project. Various specialist studies will be conducted during the EIA phase to assess these issues. Mitigation measures will be formulated and these will be included in the Environmental Management Programme.

This information will assist DEA in making an informed decision with regards to the proposed development.

7.1 Aim of the EIA Phase

The aim of the impact assessment phase is to:

- Conduct a detailed impact assessment of the issues identified
- Identify potential mitigation measures to reduce impacts
- Ensure information is disseminated to Interested and / or Affected parties and there is a constant flow of communication

The following tasks will form part of the Environmental Impact Assessment Phase:

- A comprehensive Public Participation Process (as above)
- Conduct specialist studies
- Conduct alternatives assessment
- Compilation of an Environmental Impact Report (EIR)
- Compilation of an Environmental Management Programme
- Make Final EIR available for public comment
- Submit Final EIR to DEA
- Await decision

The following specialist studies will form part of the Environmental Impact Report:

- Biodiversity (flora and fauna) Assessment (Dr. Helga Van Der Merwe)
- Avifauna Assessment (Chris van Rooyen – Chris Van Rooyen Consulting)
- Surface Water Impact Assessment (Shaun Taylor – SiVEST)
- Soils and Agricultural Potential (Kurt Barichievy – SiVEST)
- Visual Impact Assessment (Andrea Gibb – SiVEST)
- Heritage Assessment (Wouter Fourie – Professional Grave Solutions)
- Palaeontology (John Almond – Natura Viva cc)
- Social Impact Assessment (Kim Moonsamy – SSI)

The terms of reference for these studies involve assessing the potential impacts that have been identified in the Scoping Report in addition to any new issues that are identified during the detailed assessments. The qualifications of these specialists are included in their CV's which are included in Appendix 2.

7.2 Authority Consultation

The stages at which the competent authority will be consulted are as follows:

- Submission of Draft Scoping Report;
- Submission of Final Scoping Report;

- Receipt of comments and confirmation of approval of the Final Scoping Report;
- Submission of draft Environmental Impact Report for comment;
- Submission of final Environmental Impact Report with comments; and
- Response from competent authority regarding acceptance of final Environmental Impact Report.

Additional consultation may occur with DEA during the EIA process should the need arise.

7.3 Proposed Method of Assessing Environmental Issues

The EIA Methodology assists in evaluating the overall effect of a proposed activity on the environment. The determination of the effect of an environmental impact on an environmental parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the environmental practitioner through the process of the environmental impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

A brief Terms of Reference for each specialist study is included below:

7.3.1 Biodiversity Assessment

The biodiversity assessment will entail field verification which will be utilised to assess the potential impacts and issues that have been identified.

Quantitative data will be collected by undertaking vegetation sampling according to the Braun-Blanquet approach. Additional checklists of plant species will be compiled by traversing areas around each site on foot and recording species as they were encountered.

Consultation with relevant authorities and other specialists will take place to ensure all relevant information is incorporated into the study.

The areas which have been identified as sensitive during the Scoping Phase will be analysed in detail during the EIA phase.

Based on the findings of the Scoping Report, the applicable faunal investigations at EIA level could involve site specific surveys for the following faunal groupings, mammals, avifauna, reptiles, amphibians, and invertebrates. Dependant on the groupings to be investigated, additional specialists may need to be recruited onto the team. This will be determined at the end of the Scoping Phase/beginning of the EIA Phase. The level of these investigations would include pitfall trapping, net sweeping, tracks, scat as well as visual and acoustic sampling.

Field verification will be undertaken during the growing season. The study will focus on habitat provision and the potential occurrence of Red Data species on the site. Sensitivity mapping will be undertaken for all faunal groupings assessed.

The study will culminate in the compilation of a Biodiversity Impact Assessment as well as mitigation measures which will feed into the Environmental Management Programme (EMPr).

7.3.2 Avi-fauna

The assessment of impacts will build on the work that has commenced with this report and will be broadly undertaken in accordance with the guidelines provided in Section 24(4) of NEMA (as amended) and both the DEA and the Northern Cape Department of Environmental Affairs and Nature Conservation guideline documents as appropriate to avifaunal impact assessments. The emphasis will be on a pre-construction monitoring programme with the aim of providing the necessary information on bird occurrence and flight patterns to inform the assessment of the envisaged impacts.

- Objectives of the Pre-construction monitoring programme

The objectives of the pre-construction monitoring programme are to gather baseline data over a period of 12 months on the following aspects pertaining to avifauna; 1) The abundance and diversity of birds at the study area and a suitable control site (to be determined); and 2) Flight patterns of priority species in the study area.

7.3.3 Surface Water Impact Assessment

The surface water assessment during the EIA phase would primarily entail more detailed field investigation of surface water bodies (identified during the scoping phase) within the project site.

The fieldwork would be focused on:

- Larger wetland and drainage systems;
- Those wetland systems identified as sensitive or as having a high functionality; and
- Riparian zones of larger river systems.

The primary aim of the EIA-level assessment would be to determine the boundaries of the relevant wetland / riparian systems so that the wind farm can be placed outside of the wetlands / riparian areas. The wetland / riparian area boundary delineation would be undertaken using the DWAF guideline ‘A practical field procedure for the identification and delineation of wetlands and riparian areas’.

The surface water analysis would propose measures to mitigate any identified potential negative impacts associated with the wind farm, and these would inform the EMP phase. Mitigation measures would possibly entail slight changes to the proposed locations and extent of the wind farms to avoid impacts on surface water bodies, where significant or likely impacts have been predicted.

Input will be given to the proposed layout and buffers recommended.

The study will culminate in the compilation of a Surface Water Impact Assessment as well as mitigation measures which will feed into the Environmental Management Programme (EMPr).

7.3.4 Soils and Agricultural Potential Assessment

A full soils and agricultural assessment during the EIA Phase will encompass the following:

- Field verification of agricultural activities and production potential where necessary;
- Mapping and delineation of agricultural land uses and rating of production value and potential based on satellite imagery and site visits;
- Consultation with farmers and pertinent stakeholders;
- Identifying the potential agriculturally related issues and impacts as a result of the proposed activities;
- Provide mitigation measures and routing recommendations in order to reduce the impacts of the proposed development on soil characteristics agriculture potential.
- Providing responses to I&APs comments;
- Attendance at a specialist workshop in Johannesburg; and
- Compilation of findings and report writing.

This study will comply with the requirements of the Department of Agriculture, Forestry and Fisheries. Additionally, past experience with similar renewable energy projects show that the DEA require the following aspects to be covered in Soils and Agricultural Potential Impact Assessments (these will also be covered by the assessment):

- Identification of soil forms present;
- The size of the area where a particular soil form is found;
- GPS readings of soil survey points;
- The depth of the soil at each survey point;
- Soil colour;
- Limiting factors;
- Clay content;
- Slope of the site;
- A detailed map indicating the soil forms within the proposed development site;
- Size of the site;
- Exact locality of the site;
- Current activities on the site, developments, buildings;
- Surrounding developments/land uses and activities in a radius of 500m of the site;

- Access routes and condition thereof;
- Current status of the land (including erosion, vegetation, and a degradation assessment);
- Possible land use options for the site;
- Water availability, source and quality if available;
- Detailed descriptions of why agriculture should not be the land use of choice;
- Impact of change of land use on the surrounding area; and
- Shapefile containing the soil forms and relevant attribute data as depicted on the soils and agricultural potential map.

The study will culminate in the compilation of a Soils and Agricultural Impact Assessment as well as mitigation measures which will feed into the Environmental Management Programme (EMPr).

7.3.1 Noise Impact Assessment

Measurements of the background noise levels in terms of LAeq (10min) at selected points will be taken to identify the noise levels in terms of sensitive receptors. Measurements will be taken for day and night-time measurements taking into account ambient sound levels, wind speed, temperature and humidity. The LAeq measurements as obtained during fieldwork will be displayed in an appropriate scale on a topographical map, using contours of constant sound levels if relevant. Noise Propagation Modelling for both the Construction and Operational phase, with the resulting total future predicted sound levels will be projected on a topographical map.

The calculated noise levels LAeq will be compared against the measured background noise level as well as the appropriate SANS rating level to determine the potential impact on the surrounding environment, focusing on potential sensitive receptors. The compilation of an EIA Report for the EIA Phase as per SANS 10328:2008.

The study will culminate in the compilation of a Noise Impact Assessment as well as mitigation measures which will feed into the Environmental Management Programme (EMPr).

7.3.2 Visual Impact Assessment

The focus of the EIA-phase will be to undertake a more detailed, GIS-based assessment of both the magnitude and significance of the visual impact of the proposed development in both a day-time and night-time context.

This assessment will focus on areas where potential sensitive receptors are located. Detailed GIS-based assessment will be used to identify the visual envelope of the areas potentially exposed to visual impacts associated with the proposed wind and solar energy facility. Should data be available, digital terrain models will be generated for the areas of focus. This analysis

will be conducted using the ArcView 10, Spatial Analyst and 3D Analyst extensions where necessary. The analysis will rely on the generation of viewsheds from sensitive receptor locations to identify the extent to which the wind and solar power plant would be visible from these points. A further assessment of the intensity of potential visual impact, expressed in terms of bands of differing visual significance will be undertaken. Site visits would allow for the correction and refinement of the analysis.

The overall significance of visual impacts associated with the proposed wind and solar energy facility will be assessed through a rating matrix. Once this has been undertaken, measures to mitigate potential visual impacts will be identified, and if practical, site and layout alternatives within the study area will be considered and suggested to minimise visual impact of the proposed development.

A separate rating matrix will be used to assess the visual impact of the proposed development on the visually sensitive receptors, as identified. This matrix would be based on the distance of a receptor from the proposed development, the primary focus / orientation of the receptor, the presence of screening factors and the visual character of views from the receptors and degree to which the development would conform with the nature visual environment. Thereafter, the alternatives will be comparatively assessed, in order to ascertain the preferred alternative from a visual perspective.

Interested and Affected Parties will be consulted through the public participation process, and if necessary through a detailed consultation process in order to establish how the proposed solar energy facility will be perceived from the various receptor locations and the degree to which this impact will be regarded as negative.

It is envisaged that the main deliverable of the study would be the generation of a spatial databases / maps indicating the zones of visual impact and visualization imagery, as well as a detailed report indicating the findings of the study.

7.3.3 Heritage Assessment

Following information gathered during the scoping phase (including archival research, aerial photographic surveys and modelling). The fieldwork component will consist mainly of an evaluation and visit of the final impact area which will aim at identifying fatal flaws and major issues pertaining to heritage resources falling within (and directly adjacent to) the proposed development footprint. The locations of all heritage resources that are recorded during the survey will be documented using a hand-held GPS. Furthermore, the documentation will reflect a brief qualitative description and statement of significance for each site and includes a photographic record of all the sites.

It is important to also note that informal social consultation (i.e. with local community members, residents and knowledgeable individuals) will be undertaken during the fieldwork

component. The aim of social consultation is to identify any tangible and intangible resources (i.e. sacred places, myths and indigenous knowledge systems) that may exist.

A report will be written which would include the following components:

- the identification and mapping of all heritage resources in the affected area;
- an assessment of the significance of such resources in terms of the heritage assessment criteria;
- an assessment of the impact of the development of such heritage resources;
- if heritage resources will be adversely affected by the proposed development, consideration of the alternatives; and
- proposed mitigation of any adverse effects during and after the completion of the proposed development.

The study will culminate in the compilation of a Heritage Impact Assessment as well as mitigation measures which will feed into the Environmental Management Programme (EMPr).

7.3.4 Palaeontology Assessment

The palaeontological field assessment will provide an illustrated, fully-referenced review of the (a) actual or known as well as (b) inferred palaeontological heritage within all rock units represented in the study area based on the initial desktop study as well as new data from fieldwork and any subsequent palaeontological analysis (e.g. lab identification of fossil material). Palaeontological sensitivity is highly dependent on rock formations whose distribution is depicted on geological maps. A geological map of the study area therefore forms a standard component of a PIA report. It is expected that the PIA report will also incorporate:

- identification and ranking of highlights and sensitivities to development of fossil heritage within the study area (e.g. distribution of sensitive formations and specific fossil sites);
- specific recommendations for further palaeontological mitigation (if any); and
- recommendations and suggestions regarding fossil heritage management on site, including conservation measures as well as promotion of local fossil heritage (e.g. for public education, schools).

The study will culminate in the compilation of a Palaeontology Impact Assessment as well as mitigation measures which will feed into the Environmental Management Programme (EMPr).

7.3.5 Social Impact Assessment

Based on the findings presented in this social baseline report and the scoped impacts at this early stage, this study recommends a three step process scope of work (SoW) to fulfil the requirements for a Social Impact Assessment:

- Step One: Project planning

In this Step it is expected that:

- The project team will be fully briefed by the client on all activities/ actions to date with regard to the proposed development area. This would include a full technical description of the development and its associated facilities;
- All available documentation will be made available to the project team; and
- The Client and project team will together identify a geographical radius (in meters/ kilometres) for primary and areas of impact from the proposed development.

- Step Two: Data Collection

Primary data will be collected through a certain number of open-ended focus group interviews conducted in the study area. The likelihood is that focus group participants would include:

- The directly affected individuals currently facing economic/ physical displacement;
- Government (including appropriate representatives from the respective Municipality);
- Ward Councillors from the appropriate affected Wards within the Municipalities;
- Civil groups (Non-governmental, Community-based, Social and Environmental Action Interest Groups; Ratepayers Association, etc); and
- Local businesses within the Ward/Municipality.
- No more than 6 on site meetings will be undertaken in the appropriate language most familiar to participants. The focus group discussions will represent a qualitative data gathering technique.

It is expected that all previous and related studies will form the secondary data sources required for interrogation at this point in the SIA. This would include the related public consultation meetings of the EIA study.

While the focus of the interviews is to elicit information from participants, it also serves as an opportunity for participants to voice their concerns related to the proposed development as only they can perceive how the development could affect them, their families, their lifestyle and their livelihoods.

The data will be gathered in an unbiased and holistically factual manner from the information received via secondary and primary sources. Should participants prefer not to respond to questions, that is their prerogative, as participants are not persuaded to respond, rather offer information of their own free will.

- Step Three: Analysis and Write Up

Following the data collection activities, and following the compilation of a baseline section for the full Social Impact Assessment Report, the SIA specialist will identify the impacts that will be associated with the development in both the long and short term.

The social and economic baseline is compiled in order to increase and contribute to knowledge of the social and economic characteristics of the people and the place in which they work, own and/or reside. All affected or potentially affected persons that undertake an activity, such as farming, and live in an area in which there is a proposed development, have a right to form part of the focus groups to be interviewed.

Social and economic information is obtained in a variety of ways. The assessment of related studies and published material (secondary data collection) as well as limited focus group interviews (primary data collection) with identified willing participants must take place. In addition, input from the various professionals that may form part of the EIA project team (this includes culture and heritage, traffic, noise, air, etc) is also required to feed into the SIA.

The identification of potential positive and negative impacts will be informed by the all the data collected (which consists of data collection and analysis of primary quantitative information from Census 2001, the focus group meetings, secondary data sources, the ongoing consultation process, and the professional expertise of the project team (this includes other specialist studies, such as, culture and heritage, traffic, noise, air, etc)).

Mitigation measures to address the identified impacts will be recommended and drafted. These measures will be formulated to maximise the positive impacts and reduce the extent of the negative impacts.

- Presentation of the Impacts in 'Impact Categories'

The Impact Report present the various project anticipated impacts within 'Impact categories' such as :

- Population and Politics: this includes changes and impacts related to population structure, migration, welfare balances, and power and authority;
- Economy and Work: this context includes changes and impacts related to national and regional economic networks, entrepreneurial opportunities, tax income, employment levels and patterns, commercial and labour organization, access to jobs and employment equity, labour exploitation and household and community livelihoods;
- Land and Resources: this includes baseline changes and impacts related to the use of and access to natural resources such as land and water, and to location and settlement based on access to such resources;
- Infrastructure and Social Services: the social services context includes changes and impacts related to services infrastructure (water, energy, education, roads, and communication) and demand for these services. Health is considered under this heading, particularly in relation to demand for and access to health services;
- Organisation and Community: changes and impacts related to local government, crime, community organization, development planning, access to decision making, voluntary organizations (CBOs and NGOs), support networks, community stability, response to change, trust in political and social institutions, barriers to access (skills,

literacy), household budgeting and use of income, and cultural resources and practices; and

- Social Divisions: this context focuses on changes and impacts around equity (for example the distribution and circulation of compensation), non-participation, unmet expectations, prevailing social tensions and divisions, the influx of newcomers, and the status of vulnerable groups such as the elderly, women, children and the disabled.

7.4 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e. site, local, national or global whereas Intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in Table 58.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

7.5 Impact Rating System

Impact assessment must take account of the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages:

- Planning;
- Construction;
- Operation; and
- Decommissioning.

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

7.5.1 Rating System Used To Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts have been consolidated into one rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:

Table 57: Description of terms.

NATURE
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.
GEOGRAPHICAL EXTENT

This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	International and National	Will affect the entire country
2	Province/region	Will affect the entire province or region
3	Local/district	Will affect the local area or district
4	Site	The impact will only affect the site
PROBABILITY		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Irreversible	The impact is irreversible and no mitigation measures exist.
2	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
3	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
4	Completely reversible	The impact is reversible with implementation of minor mitigation measures
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		

This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		
1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects
INTENSITY / MAGNITUDE		
Describes the severity of an impact		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).

3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

SIGNIFICANCE

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact Significance Rating	Description
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.

74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

The table below is to be represented in the Impact Assessment section of the report.

Table 58: Rating of impacts.

IMPACT TABLE		
Environmental Parameter	*A brief description of the environmental aspect likely to be affected by the proposed activity e.g. Surface water*	
Issue/Impact/Environmental Effect/Nature	*A brief description of the nature of the impact that is likely to affect the environmental aspect as a result of the proposed activity e.g. alteration of aquatic biota The environmental impact that is likely to positively or negatively affect the environment as a result of the proposed activity e.g. oil spill in surface water*	
Extent	*A brief description indicating the chances of the impact occurring*	
Probability	*A brief description of the ability of the environmental components recovery after a disturbance as a result of the proposed activity*	
Reversibility	*A brief description of the environmental aspect likely to be affected by the proposed activity e.g. Surface water*	
Irreplaceable loss of resources	*A brief description of the degree in which irreplaceable resources are likely to be lost*	
Duration	*A brief description of the amount of time the proposed activity is likely to take to its completion*	
Cumulative effect	*A brief description of whether the impact will be exacerbated as a result of the proposed activity*	
Intensity/magnitude	*A brief description of whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily*	
Significance Rating	*A brief description of the importance of an impact which in turn dictates the level of mitigation required*	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	1
Probability	4	1
Reversibility	4	1
Irreplaceable loss	4	1
Duration	4	1

IMPACT TABLE		
Cumulative effect	4	1
Intensity/magnitude	4	1
Significance rating	-96 (high negative)	-6 (low negative)
Mitigation measures	*Outline/explain the mitigation measures to be undertaken to ameliorate the impacts that are likely to arise from the proposed activity. Describe how the mitigation measures have reduced/enhanced the impact with relevance to the impact criteria used in analyzing the significance. These measures will be detailed in the EMPR.*	

7.6 Recommendations

It is recommended that the specialist studies pertaining to certain aspects be carried forward into the EIR Phase, namely, those studies mentioned above. Various issues and concerns have been identified which require detailed assessment and thus it is recommended that the EIA phase be allowed to continue in order to assess these and the impacts associated.

7.7 Public Participation

The Public Participation during the EIR Phase will involve the following:
The Public Participation during the EIR Phase will involve the following:

Table 59: Public Participation activities still to take place.

ACTIVITY	FUNCTION
Prepare and distribute EIA newsletter	Notify registered I&APs of outcome of the Scoping Phase (including timeframes and when their input is required).
Focus Group Meetings / Key Stakeholder Workshops	Meeting to report back to key stakeholders
Public Meetings	Report back on the process to the general public.
Public comment period	Notification of I&APs of the availability of the EIR report for public comment.
Notification of granting or refusal of Environmental Authorisation	Informing of all registered I&APs of the EA
Environmental Authorisation appeal period	Receive any appeals and forward to DEA

7.8 Proposed Project Schedule going forward

The table below represents the proposed schedule of events for the project till closure upon DEA's decision.

Table 60: Proposed Project Schedule

	December 2012	January 2013	February 2013	March 2013	June 2013
End of FSR Comment period	Dates to be confirmed in the impact phase				
Submission of FSR to DEA	Dates to be confirmed in the impact phase				
DEA Decision on FSR		Dates to be confirmed in the impact phase			
Distribution of EIA Newsletter		Dates to be confirmed in the impact phase			
DEIR Comment period			Dates to be confirmed in the impact phase		
Hold Meetings (FGM, PM and KSW)			Dates to be confirmed in the impact phase		
Submission of FEIR to DEA				Dates to be confirmed in the impact phase	
DEA Decision					Dates to be confirmed in the impact phase

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