

## **BASIC ASSESSMENT REPORT:**

Specialist terrestrial fauna study on the potential impacts of the  
proposed Koingnaas Wind Energy Facility, Northern Cape

Prepared by

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**DRAFT REPORT:** 3<sup>rd</sup> Draft



**David Hoare Consulting cc**  
Biodiversity Assessments, Vegetation Description /  
Mapping, Species Surveys

## **REGULATIONS GOVERNING THIS REPORT**

This report has been prepared in terms of the EIA Regulations promulgated under the *National Environmental Management Act* No. 107 of 1998 (NEMA). A Basic Assessment study is undertaken in accordance with Regulation 22 in terms of the EIA Regulations published in Government Notice (GN) R543 of 18 June 2010, in terms of Chapter 5 of Section 24(5) of the National Environmental Management Act (No. 107 of 1998).

### **Appointment of specialist**

David Hoare of David Hoare Consulting cc was commissioned by Savannah Environmental (Pty) Ltd to provide specialist consulting services for the Basic Assessment for a proposed wind energy facility near Koingnaas in the Northern Cape Province. The consulting services comprise a desktop assessment of potential impacts on terrestrial fauna in the study area by the proposed project.

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### **Summary of expertise**

Dr David Hoare:

- Registered professional member of The South African Council for Natural Scientific Professions (Ecological Science, Botanical Science), registration number 400221/05.
- Founded David Hoare Consulting cc, an independent consultancy, in 2001.
- Ecological consultant since 1995.
- Conducted, or co-conducted, over 250 specialist ecological surveys as an ecological consultant.
- Published six technical scientific reports, 15 scientific conference presentations, seven book chapters and eight refereed scientific papers.
- Attended 15 national and international congresses & 5 expert workshops, lectured vegetation science / ecology at 2 universities and referee for 2 international journals.

### **Independence**

David Hoare Consulting cc and its Directors have no connection with Just Palm Tree Power. David Hoare Consulting cc is not a subsidiary, legally or financially, of the proponent. Remuneration for services by the proponent in relation to this project is not linked to approval by decision-making authorities responsible for authorising this proposed project and the

consultancy has no interest in secondary or downstream developments as a result of the authorisation of this project. David Hoare is an independent consultant to Savannah Environmental (Pty) Ltd and has no business, financial, personal or other interest in the activity, application or appeal in respect of which he was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of this specialist performing such work. The percentage work received directly or indirectly from the proponent in the last twelve months is zero.

### **Scope and purpose of report**

The scope and purpose of the report are reflected in the "Terms of reference" section of this report.

### **Conditions relating to this report**

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. David Hoare Consulting cc and its staff reserve the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

## TABLE OF CONTENTS

<b>REGULATIONS GOVERNING THIS REPORT</b> .....	<b>2</b>
APPOINTMENT OF SPECIALIST.....	2
DETAILS OF SPECIALIST .....	2
SUMMARY OF EXPERTISE .....	2
INDEPENDENCE.....	2
SCOPE AND PURPOSE OF REPORT.....	3
CONDITIONS RELATING TO THIS REPORT .....	3
<b>TABLE OF CONTENTS</b> .....	<b>4</b>
<b>INTRODUCTION</b> .....	<b>6</b>
TERMS OF REFERENCE AND APPROACH.....	6
STUDY AREA .....	6
<b>METHODOLOGY</b> .....	<b>7</b>
ASSESSMENT PHILOSOPHY .....	7
ANIMAL SPECIES OF CONCERN.....	7
ASSESSMENT OF IMPACTS.....	8
LIMITATIONS .....	9
<b>DESCRIPTION OF STUDY AREA</b> .....	<b>10</b>
LOCATION AND SITE CONDITIONS.....	10
RED LIST ANIMAL SPECIES OF THE STUDY AREA .....	12
PROTECTED ANIMALS .....	13
<b>RELEVANT LEGISLATIVE AND PERMIT REQUIREMENTS</b> .....	<b>15</b>
LEGISLATION .....	15
<i>National Environmental Management Act, Act No. 107 of 1998 (NEMA)</i> .....	15
<i>Environment Conservation Act No 73 of 1989 Amendment Notice No R1183 of 1997</i> .....	15
<i>National Environmental Management: Biodiversity Act (Act No 10 of 2004)</i> .....	15
<i>GNR 151: Critically Endangered, Endangered, Vulnerable and Protected Species List</i> .....	16
<i>GNR 1187: Amendment of Critically Endangered, Endangered, Vulnerable and Protected Species List</i> .....	16
<i>Northern Cape Nature Conservation Act, No. 9 of 2009</i> .....	16
<i>Other Acts</i> .....	16
<b>IDENTIFICATION OF RISKS AND DESCRIPTION OF POTENTIAL IMPACTS</b> .....	<b>17</b>
DESCRIPTION OF POTENTIAL IMPACTS .....	17
<i>Impact 1: Loss of habitat for threatened/protected terrestrial fauna</i> .....	17
<i>Impact 2: Loss of individuals of threatened/protected terrestrial fauna</i> .....	18
<b>ASSESSMENT OF POTENTIAL IMPACTS</b> .....	<b>20</b>
WIND TURBINES .....	20
<i>Impact 1: Loss of habitat for threatened/protected terrestrial fauna</i> .....	20
<i>Impact 2: Loss of individuals of threatened/protected terrestrial fauna</i> .....	21
INTERNAL ACCESS ROADS AND UNDERGROUND CABLES BETWEEN TURBINES.....	23
<i>Impact 1: Loss of habitat for threatened/protected terrestrial fauna</i> .....	23
<i>Impact 2: Loss of individuals of threatened/protected terrestrial fauna</i> .....	24
ANCILLARY INFRASTRUCTURE, INCLUDING SWITCHING STATION .....	25
<i>Impact 1: Loss of habitat for threatened/protected terrestrial fauna</i> .....	25
<i>Impact 2: Loss of individuals of threatened/protected terrestrial fauna</i> .....	26
OVERHEAD POWER LINE .....	27

<i>Impact 1: Loss of habitat for threatened/protected terrestrial fauna .....</i>	<i>27</i>
<i>Impact 2: Loss of individuals of threatened/protected terrestrial fauna.....</i>	<i>28</i>
<b>DISCUSSION AND CONCLUSIONS.....</b>	<b>30</b>
<b>MANAGEMENT PLAN .....</b>	<b>32</b>
OBJECTIVE: CONTROL IMPACTS ON INDIVIDUALS OF THREATENED / PROTECTED SPECIES .....	32
<b>REFERENCES: .....</b>	<b>34</b>
<b>APPENDIX 1: VERTEBRATE SPECIES OF CONSERVATION CONCERN WITH A GEOGRAPHICAL DISTRIBUTION THAT INCLUDES THE STUDY AREA.....</b>	<b>35</b>
<b>APPENDIX 2: ANIMAL SPECIES WITH A GEOGRAPHICAL DISTRIBUTION THAT INCLUDES THE STUDY AREA.....</b>	<b>38</b>

## **INTRODUCTION**

### **Terms of reference and approach**

Savannah Environmental (Pty) Ltd. was appointed by Just Palm Tree Power to undertake an application for environmental authorisation through a Basic Assessment (BA) process for the proposed "Koingnaas Wind Energy Facility". The project involves the establishment of a commercial wind energy facility for power generation and its associated infrastructure. The facility is proposed to accommodate up to 24 appropriately spaced turbines, for the purpose of electricity generation of <20 MW. The purpose of the BA is to identify environmental impacts associated with the project.

On 14 June 2011 David Hoare Consulting cc was appointed by Savannah Environmental (Pty) Ltd to undertake an ecological assessment of the study area. The specific terms of reference for the terrestrial fauna desktop study include:

- to provide a description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed project;
- to provide a description and evaluation of potential environmental issues and potential impacts (including direct, indirect and cumulative impacts) that have been identified;
- an assessment of the significance of direct, indirect and cumulative impacts in terms of standard criteria;
- a statement regarding the potential significance of the identified issues based on the evaluation of the issue/impacts;
- recommendations regarding practical mitigation measures for potentially significant impacts;
- a description of any assumptions, uncertainties and gaps in knowledge;

This report provides details of the results of the Basic Assessment. The findings of the study are based on a desktop assessment of the study area and detailed aerial photography.

### **Study area**

At a regional level the study area falls within the Northern Cape Province to the south-west of the town of Koingnaas. A more detailed description of the study area is provided in a section below.

## **METHODOLOGY**

The assessment is to be undertaken in a single phase, a Basic Assessment. The objective of the study was to review terrestrial fauna patterns within the study area in order to identify any highly sensitive areas that should be avoided during development. It was therefore necessary to provide checklists of sensitive species that could potentially occur in the study area as well as habitats with high conservation value for ensuring that sensitive species are retained in the landscape. For potential species, only those of high conservation concern are provided.

### **Assessment philosophy**

Many parts of South Africa contain high levels of biodiversity at species and ecosystem level. At any single site there may be large numbers of species or high ecological complexity. Sites also vary in their natural character and uniqueness and the level to which they have been previously disturbed. Assessing the potential impacts of a proposed development often requires evaluating the conservation value of a site relative to other natural areas and relative to the national importance of the site in terms of biodiversity conservation. A simple approach to evaluating the relative importance of a site includes assessing the following:

- Is the site unique in terms of natural or biodiversity features?
- Is the protection of biodiversity features on the site of national/provincial importance?
- Would development of the site lead to contravention of any international, national or provincial legislation, policy, convention or regulation?

Thus, the general approach adopted for this type of study is to identify any critical biodiversity issues that may lead to the decision that the proposed project cannot take place, i.e. to specifically focus on red flags and/or potential fatal flaws. Biodiversity issues are assessed by documenting whether any important biodiversity features occur on site, including species, ecosystems or processes that maintain ecosystems and/or species.

It is not the intention to provide comprehensive lists of all species that occur on site, since most of the species on these lists are usually common or widespread species. Rare, threatened, protected and conservation-worthy species and habitats are considered to be the highest priority, the presence of which are most likely to result in significant negative impacts on the ecological environment. The focus on national and provincial priorities and critical biodiversity issues is in line with National legislation protecting environmental and biodiversity resources, including, but not limited to the following which ensure protection of ecological processes, natural systems and natural beauty as well as the preservation of biotic diversity in the natural environment:

1. Environment Conservation Act (Act 73 of 1989)
2. National Environmental Management Act, 1998 (NEMA) (Act 107 of 1998)
3. National Environmental Management Biodiversity Act, 2004. (Act 10 Of 2004)

### **Animal species of concern**

The purpose of listing Red List animal species is to provide information on the potential occurrence of species of special concern in the study area that may be affected by the proposed infrastructure. Species appearing on these lists can then be assessed in terms of their habitat requirements in order to determine whether any of them have a likelihood of occurring in habitats that may be affected by the proposed infrastructure.

Lists were compiled specifically for any species of conservation concern previously recorded in the area and any other species with potential conservation value.

Provincial and National legislation was evaluated in order to provide lists of any animal species that have protected status. The most important legislation is the following: *National Environmental Management: Biodiversity Act (Act No 10 of 2004)*.

Lists of threatened animal species that have a geographical range that includes the study area were obtained from literature sources (for example, Alexander & Marais 2007, Branch 1988, 2001, du Preez & Carruthers 2009, Friedmann & Daly 2004, Mills & Hes 1997). The likelihood of any of them occurring was evaluated on the basis of habitat preference and habitats available at each of the proposed sites. The three parameters used to assess the probability of occurrence for each species were as follows:

- *Habitat requirements*: most Red Data animals have very specific habitat requirements and the presence of these habitat characteristics within the study area were assessed;
- *Habitat status*: in the event that available habitat is considered suitable for these species, the status or ecological condition was assessed. Often, a high level of degradation of a specific habitat type will negate the potential presence of Red Data species (especially wetland-related habitats where water-quality plays a major role); and
- *Habitat linkage*: movement between areas used for breeding and feeding purposes forms an essential part of ecological existence of many species. The connectivity of the study area to these surrounding habitats and adequacy of these linkages are assessed for the ecological functioning Red Data species within the study area.

For all threatened or protected organisms that occur in the general geographical area of the site, a rating of the likelihood of it occurring on site is given as follows:

- LOW: no suitable habitats occur on site / habitats on site do not match habitat description for species;
- MEDIUM: habitats on site match general habitat description for species (e.g. fynbos), but detailed microhabitat requirements (e.g. mountain fynbos on shallow soils overlying Table Mountain sandstone) are absent on the site or are unknown from the descriptions given in the literature or from the authorities;
- HIGH: habitats found on site match very strongly the general and microhabitat description for the species (e.g. mountain fynbos on shallow soils overlying Table Mountain sandstone);
- DEFINITE: species found in habitats on site.

## Assessment of impacts

Direct, indirect and cumulative impacts of the issues identified through the scoping study, as well as all other issues identified in the EIA phase were assessed in terms of the following criteria:

- » The **nature**, which includes a description of what causes the effect, what will be affected and how it will be affected.
- » The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 was assigned as appropriate (with 1 being local and 5 being global):
- » The **duration**, wherein it was indicated whether:
  - \* the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;

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

The **significance** was calculated by combining the criteria in the following formula:

$$S = (E + D + M)P$$

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

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

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

## Limitations

- Red List species are, by their nature, usually very rare and difficult to locate. Compiling the list of species that could potentially occur in an area is limited by the paucity of collection records that make it difficult to predict whether a species may occur in an area or not. The methodology used in this assessment is designed to reduce the risks of omitting any species, but it is always possible that a species that does not occur on a list may be unexpectedly located in an area.
- This study is based on a desktop assessment only.

## DESCRIPTION OF STUDY AREA

### Location and site conditions

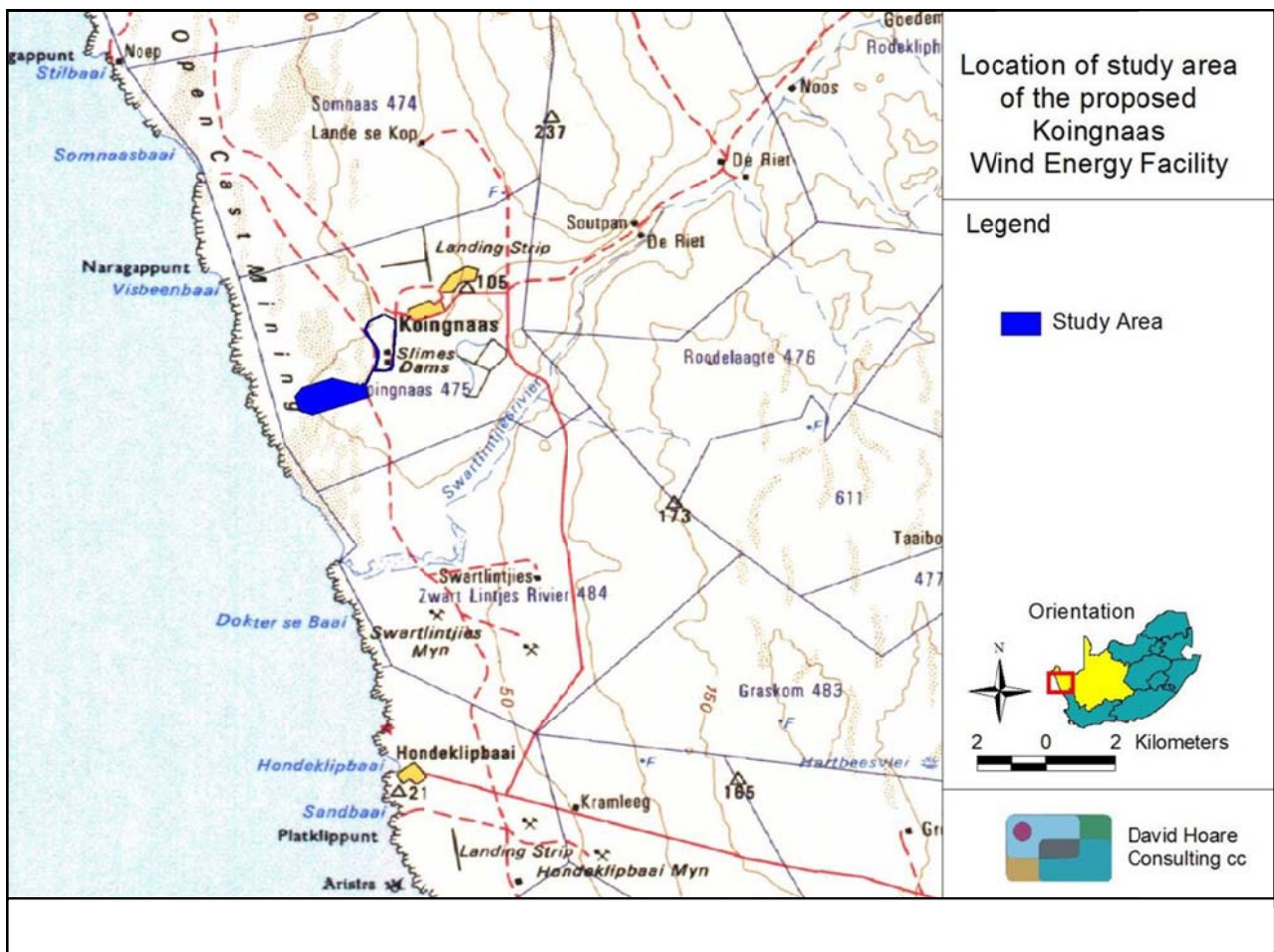
The study site is situated approximately 2.5 km south-west of the town of Koingnaas and 11 km north of the town of Hondeklipbaai within the West Coast coastal part of the Northern Cape (Figure 1). The site falls within the quarter degree grid 3017AB. It is situated just inland (within 1.2km) of the coastline. The proposed facility would occur on the Farms Koingnaas 745, Somnaas 474 and Zwart Lintjes Rivier 484.

No alternative site is currently being considered for the proposed facility. The current site is regarded as favourable due to the wind resource, the disturbed nature of the site (i.e. being within the mining area of De Beers), and proximity to a suitable electricity connection point (i.e. Koingnaas Substation).

The study area is in a remote location, but is accessible from the N7 National Road via Hondeklipbaai. The site is locally accessible via a number of well-built roads constructed for access to mining facilities in the immediate neighbourhood.

The study site is situated in an area with relatively gentle topography. The general slope in this area is from east to west down towards the coastline. On the site itself, there is a slight rise in the centre of the site, before falling again towards the sea. The elevation on site varies from 39 to 64 m above sea level. There are no drainage lines on site.

Detailed soil information is not available for broad areas of the country. As a surrogate,



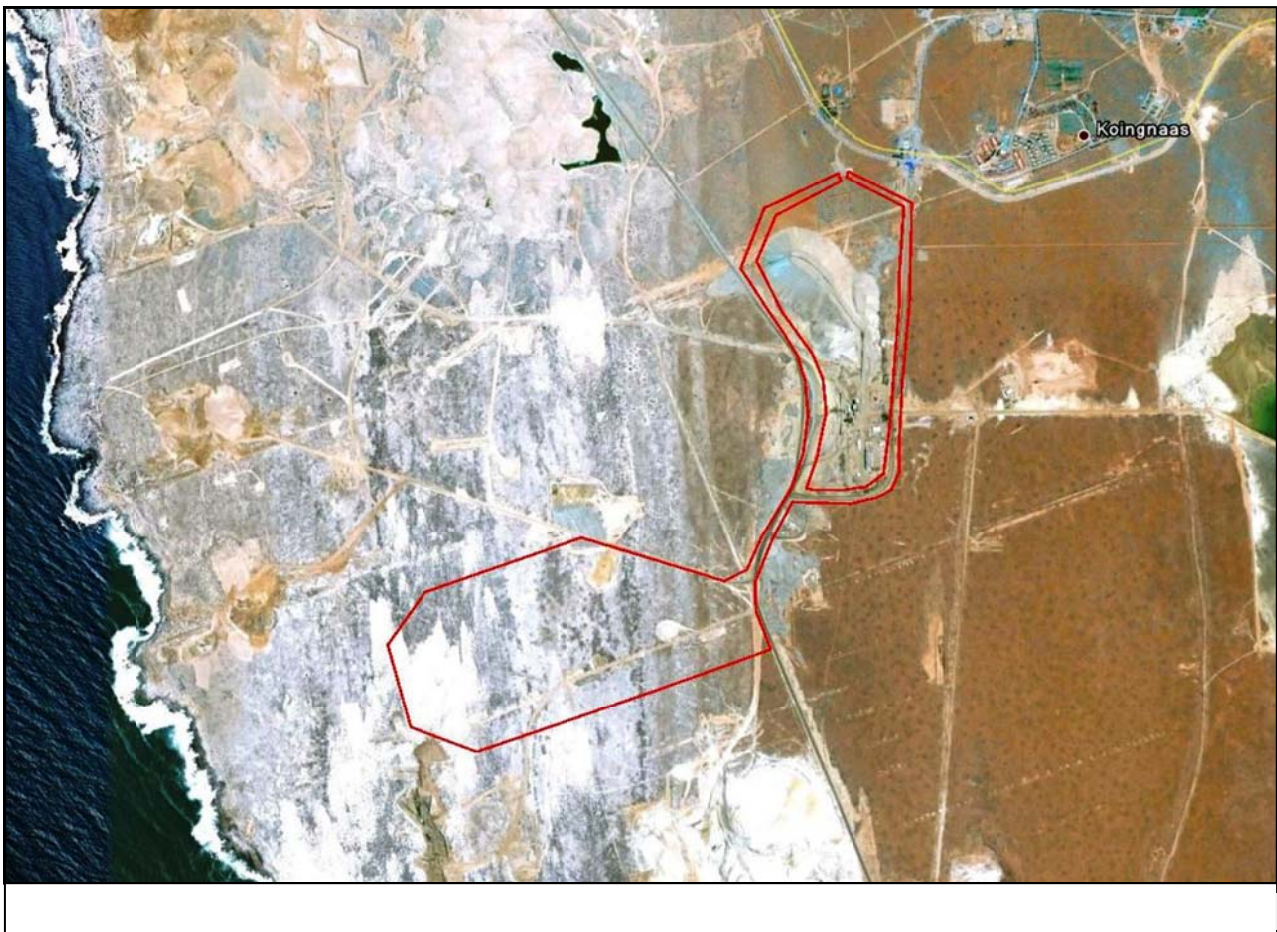
landtype data was used to provide a general description of soils in the study area (landtypes are areas with largely uniform soils, topography and climate). There are two land types in the study area, the Ai and Ah landtypes (Land Type Survey Staff, 1987). Most of the site falls within the Ai landtype, with a small portion on the inland side falling within the Ah landtype.

The A-group of land types refer to yellow and red soils without water tables belonging to one or more of the following soil forms: Inanda, Kranskop, Magwa, Hutton, Griffin, Clovelly. These are red-yellow apedal, freely drained soils. The Ai landtype consists of yellow, high base status soils and the Ah of red and yellow, high base status dystrophic and/or mesotrophic soils (MacVicar et al. 1974). The major soils on site are expected to be quaternary, Aeolian, yellowish or grey to white deep fine sands forming mobile as well as stabilized coastal dunes.

The climate is arid. Rainfall occurs from May to August. Mean annual rainfall is 100 mm to 120 mm per year. All areas with less than 400 mm rainfall are considered to be arid. The study area can therefore be considered to be very arid. Winter dew is common and moisture is also supplemented by fog rolling in from the sea.

The vegetation of the major part of the site is Namaqualand Coastal Duneveld, with a small portion on the inland side consisting of Namaqualand Strandveld. The Namaqualand Coastal Duneveld occurs on the coastal peneplain and contains primarily semimobile sand plains, with highly mobile, sharp, angular dune plumes. The vegetation is a dwarf shrubland dominated by erect succulent shrubs that often have a low hemispheric shape. Namaqualand Strandveld is found on more stable substrates of quaternary stabilized Aeolian, deep red or yellowish-red stable dunes and deep sands. The vegetation is a well-developed coastal shrubland containing a high proportion of succulent shrub species.

A landcover map of the study area (Fairbanks *et al.* 2000) indicates that large proportions of the site consist of "mines and quarries" and the remainder of natural vegetation. The 1:50 000 topocadastral map of the site also indicates that the site is highly disturbed by mining. A



Google image of the site (Figure 2) shows a small area of natural vegetation in parts of the site, otherwise mining activities have affected most of the site. There are areas of mobile to semi-stable dune vegetation visible in the image, but this also appears to be secondary and/or affected by mining activities.

### **Red List animal species of the study area**

All Red List terrestrial vertebrates (mammals, reptiles, amphibians) that could occur in the study area are listed in Appendix 1. Those species with a geographical distribution that includes the study area, and habitat preference that includes habitats available in the study area are discussed further.

There are two mammal species of low conservation concern that could occur in available habitats in the study area, i.e. Grant's Golden Mole and Littledale's Whistling Rat. Both species are classified as Least Concern globally (according to the IUCN website, accessed on 18 June 2011), but Grant's Golden Mole is classified nationally as Vulnerable and Littledale's Whistling Rat nationally as Near Threatened. In both cases the species would have had a high chance of occurring on site in the absence of mining, but mining has disturbed the habitat on site to such a degree that it is considered unlikely that they now occur there.

There are four bat species of conservation concern that could occur on site. These are the Angolan Wing-gland Bat, Natal Long-fingered Bat, the Cape Horseshoe Bat and Geoffroy's Horseshoe Bat. The Angolan Wing-gland Bat is listed as Vulnerable in South Africa (Friedmann & Daly 2004, Monadjem et al. 2010) and Near Threatened globally ([www.iucn.org](http://www.iucn.org)). The other three species are listed nationally as Near Threatened (Friedmann & Daly 2004, Monadjem et al. 2010) and globally as Least Concern ([www.iucn.org](http://www.iucn.org)).

The Angolan Wing-gland Bat is endemic to the west coast of southern Africa and is restricted to the arid western parts, typically in desert and semi-desert conditions. It has been netted in riverine vegetation along dry river beds and may roost in buildings, such as church steeples. The nearby Swartlintjiesrivier may constitute ideal foraging habitat for this species. Based on the proximity to nearby foraging habitat and the fact that the species is found primarily in the type of habitat encountered in the area that includes this site, it is considered that there is a high probability of it being encountered here.

The Cape Horseshoe Bat is of potential concern in South Africa with regards to wind energy development due to the fact that the distribution of this species co-incides closely with the geographical areas where most wind energy facilities are proposed to be located (coastal and escarpment regions from Eastern Cape to Cape Town and northwards up the West Coast). The species is therefore vulnerable to cumulative impacts from multiple wind energy projects. The species is also endemic to South Africa and a small area of southern Namibia and is therefore primarily a South African concern. It is listed as Near Threatened in South Africa (Friedmann & Daly 2004, Monadjem et al. 2010) and Least Concern globally ([www.iucn.org](http://www.iucn.org)), which does not make sense considering it is practically endemic to South Africa. From a biodiversity point of view, it would be sensible to treat it as a Near Threatened species.

The other two bat species (the Natal Long-fingered Bat and Geoffroy's Horseshoe Bat) have a wider distribution and are less likely to be found in the type of habitats encountered in this part of the country. They could potentially occur here, but this is less likely. Also, their wider distribution means that they are less likely to be negatively affected by loss of individuals associated with the current development.

The Desert Rain Frog is the only amphibian species of conservation concern with a distribution that includes the study area and which could occur on site. This species is classified as Vulnerable globally (according to the IUCN website, accessed on 18 June 2011) and in South Africa (du Preez & Carruthers 2009). It is found from the highwater mark up to 10 km inland along the Namaqualand coast in Strandveld Succulent Karoo, including coastal duneveld. Mining has disturbed the habitat on site to such a degree that it is considered unlikely that they now occur there or that the site constitutes important habitat for the species.

There are two reptile species of conservation concern that have a distribution that includes the study area and which could occur in the types of habitats available on site, the Namaqua Dwarf Adder (VU) and the Namaqua Plated Lizard (NT). The Namaqua Dwarf Adder is classified as Vulnerable. It occurs in semi-stable vegetated coastal sand dunes and is threatened by alluvial diamond mining. The species would have had a high chance of occurring on site in the absence of mining, but mining has disturbed the habitat on site to such a degree that it is considered unlikely that they now occur there. The Namaqua Plated Lizard is classified as Near Threatened. A recent assessment of reptiles of southern Africa (Alexander & Marais 2008) considers the species to be more widespread than previously known and that the IUCN status of near threatened is not warranted. It is found in dry sandy areas and bare rocky hillsides. The site is therefore potential habitat for this species, but mining has disturbed the habitat on site to such a degree that it is considered unlikely that they now occur there.

In summary, the following animal species of conservation concern could potentially occur on site (although habitat on site is disturbed by mining) and may therefore be of concern for development of the study area:

1. Grant's Golden Mole (VU),
2. Littledale's Whistling Rat (NT),
3. Angolan Wind-gland Bat (VU),
4. Natal Long-fingered Bat (NT),
5. Cape Horseshoe Bat (NT),
6. Geoffroy's Horseshoe Bat (NT),
7. Desert Rain Frog (VU),
8. Namaqua Dwarf Adder (VU),
9. Namaqua Plated Lizard (NT).

## **Protected animals**

There are a number of animal species protected under the Northern Cape Nature Conservation Act of 2009 (Act 9 of 2009). These are listed in Appendix 6. According to the Northern Cape Nature Conservation Act, "*No person shall without a permit hunt, import, export, transport, keep, possess, breed or trade in a specimen of a (specially) protected animal*". The Act does not imply that habitat for these species should be regarded as sensitive and appears to be primarily concerned with protecting individual animals from hunting or trading. No permit requirements are contained in the Act for cases where such individuals may occur on land for which an application for development is being considered (as in the current case).

Those species protected according to the Northern Cape Nature Conservation Act of 2009 (Act 9 of 2009) that have a geographical distribution that includes the site and that may, therefore, occur on site are listed in Appendix 5, marked with the letter "P". A large proportion of the species (except for the most common) are protected according to the Northern Cape Nature Conservation Act of 2009 (Act 9 of 2009).

There are a number of animal species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004). According to this Act, *"a person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7"*. Such activities include any that are *"of a nature that may negatively impact on the survival of a listed threatened or protected species"*. This implies that any negative impacts on habitats in which populations of protected species occur or are dependent upon would be restricted according to this Act. Those species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) that have a geographical distribution that includes the site are listed in Appendix 5, marked with the letter "N".

Nationally protected species that have a geographical distribution in the study area includes the following: Black-footed Cat, Leopard, Cape Fox, Namaqua Dwarf Adder and Armadillo Girdled Lizard. The first three of these species are mobile animals that are likely to move away in the event of any activities on site disturbing them. They are therefore unlikely to be affected by the proposed development of the wind energy facility. The Namaqua Dwarf Adder and the Armadillo Girdled Lizard are less mobile and could potentially be negatively affected by construction activities on site. According to habitat information, the Armadillo Girdled Lizard was considered to be unlikely to occur on site even though it's geographical distribution includes the site.

In summary, the following animal species protected by National legislation (National Environmental Management: Biodiversity Act) could potentially occur on site (although habitat on site is disturbed by mining) and may therefore be of concern for development of the study area:

1. Namaqua Dwarf Adder (VU),

However, mining has disturbed the habitat on site to such a degree that it is considered unlikely that this species now occurs there.

## RELEVANT LEGISLATIVE AND PERMIT REQUIREMENTS

Relevant legislation is provided in this section to provide a description of the key legal considerations of importance to the proposed project. The applicable legislation is listed below.

### Legislation

#### ***National Environmental Management Act, Act No. 107 of 1998 (NEMA)***

NEMA requires, inter alia, that:

- "development must be socially, environmentally, and economically sustainable",
- "disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied." ,
- "a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions",

NEMA states that "the environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage."

#### ***Environment Conservation Act No 73 of 1989 Amendment Notice No R1183 of 1997***

The ECA states that:

Development must be environmentally, socially and economically sustainable. Sustainable development requires the consideration of inter alia the following factors:

- that pollution and degradation of the environment is avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- that the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;
- that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised; and
- that negative impacts on the environment and on peoples' environmental rights be anticipated and prevented, and where they cannot be altogether prevented are minimised and remedied.

The developer is required to undertake Environmental Impact Assessments (EIA) for all projects listed as a Schedule 1 activity in the EIA regulations in order to control activities which might have a detrimental effect on the environment. Such activities will only be permitted with written authorisation from a competent authority.

#### ***National Environmental Management: Biodiversity Act (Act No 10 of 2004)***

In terms of the Biodiversity Act, the developer has a responsibility for:

- The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations).
- Promote the application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all development within the area are in line with ecological sustainable development and protection of biodiversity.
- Limit further loss of biodiversity and conserve endangered ecosystems.

Chapter 4 of the Act relates to threatened or protected ecosystems or species. According to Section 57 of the Act, "Restricted activities involving listed threatened or protected species":

- (1) A person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit issued in terms of Chapter 7.

Such activities include any that are “of a nature that may negatively impact on the survival of a listed threatened or protected species”.

Chapter 5 of the Act relates to species and organisms posing a potential threat to biodiversity. According to Section 75 of the Act, "Control and eradication of listed invasive species":

- (1) Control and eradication of a listed invasive species must be carried out by means of methods that are appropriate for the species concerned and the environment in which it occurs.
- (2) Any action taken to control and eradicate a listed invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment.
- (3) The methods employed to control and eradicate a listed invasive species must also be directed at the offspring, propagating material and re-growth of such invasive species in order to prevent such species from producing offspring, forming seed, regenerating or re-establishing itself in any manner.

***GNR 151: Critically Endangered, Endangered, Vulnerable and Protected Species List***

Published under Section 56(1) of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004).

***GNR 1187: Amendment of Critically Endangered, Endangered, Vulnerable and Protected Species List***

Published under Section 56(1) of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004).

***Northern Cape Nature Conservation Act, No. 9 of 2009***

This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project:

- No person may hunt, import, export, transport, keep, possess, breed or trade in a specimen of a protected animal.
- Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property;
- Aquatic habitats may not be destroyed or damaged;
- The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species.

The Act provides lists of protected species for the Province.

***Other Acts***

Other Acts that may apply to biodiversity issues, but which are considered to not apply to the current site are as follows:

- Integrated Coastal Zone Management Act (Act No. 24 of 2008)
- National Environmental Management Protected Areas Act (Act No. 57 of 2003)
- Marine Living Resources Act (Act No. 18 of 1998)
- Sea Birds and Seals Protection Act (Act No. 46 of 1973)
- Mountain Catchment Areas Act (Act No. 63 of 1970)
- Lake Areas Development Act (Act No. 39 of 1975)

## IDENTIFICATION OF RISKS AND DESCRIPTION OF POTENTIAL IMPACTS

Potential issues relevant to potential impacts on the faunal ecology of the study area include the following:

- Impacts on biodiversity: this includes any impacts on populations of individual species of concern, including protected species, on overall species richness and on habitats of species of concern. This includes impacts on genetic variability, population dynamics, overall species existence or health and on habitats important for species of concern.
- Secondary and cumulative impacts on ecology: this includes an assessment of the impacts of the proposed project taken in combination with the impacts of other known projects for the area or secondary impacts that may arise from changes in the social, economic or ecological environment.

A number of direct risks to ecosystems that would result from **construction** of the proposed solar energy facility are as follows:

- Clearing of land for construction.
- Construction of access roads.
- Placement of power lines, and cables.
- Establishment of borrow and spoil areas.
- Chemical contamination of the soil by construction vehicles and machinery.
- Operation of construction camps.
- Storage of materials required for construction.

There are also risks associated with **operation** of the proposed facility, as follows:

- Maintenance of surrounding vegetation as part of management of the facility.

### Description of potential impacts

#### ***Impact 1: Loss of habitat for threatened/protected terrestrial fauna***

Nature: Construction of infrastructure will lead to direct loss of vegetation. This will lead to localised or more extensive reduction in the overall extent of habitat for species of concern.

Consequences of the potential impact of loss of habitat occurring may include:

1. general loss of habitat for sensitive species;
2. increased fragmentation of habitat and thus populations of species of concern (depending on location of impact);
3. disturbance to processes maintaining biodiversity and ecosystem goods and services; and
4. loss of ecosystem goods and services.

The following animal species of conservation concern could potentially occur on site (although habitat on site is disturbed by mining) and may therefore be of concern for development of the study area:

1. Grant's Golden Mole (VU),
2. Littledale's Whistling Rat (NT),
3. Desert Rain Frog (VU),
4. Namaqua Dwarf Adder (VU),
5. Namaqua Plated Lizard (NT).

In all five cases the probability of them occurring on site is considered to be low due to the disturbed nature of the site.

### ***Impact 2: Loss of individuals of threatened/protected terrestrial fauna***

Nature: Threatened species include those classified as critically endangered, endangered or vulnerable. For any other species a loss of individuals or localised populations is unlikely to lead to a change in the conservation status of the species. However, in the case of threatened animal species, loss of a population or individuals could lead to a direct change in the conservation status of the species. This may arise if the proposed infrastructure is located where it will impact on such individuals or populations or the habitat that they depend on. Consequences may include:

1. fragmentation of populations of affected species;
2. reduction in area of occupancy of affected species; and
3. loss of genetic variation within affected species.

These may all lead to a negative change in conservation status of the affected species, which implies a reduction in the chances of the species overall survival chances.

The following animal species of conservation concern could potentially occur on site (although habitat on site is disturbed by mining) and may therefore be of concern for development of the study area:

1. Grant's Golden Mole (VU),
2. Littledale's Whistling Rat (NT),
3. Desert Rain Frog (VU),
4. Namaqua Dwarf Adder (VU),
5. Namaqua Plated Lizard (NT).

In all five cases the probability of them occurring on site is considered to be low due to the disturbed nature of the site.

### ***Impact 3: Collision of bats with turbine blades***

Nature: Bats have been found to be particularly vulnerable to being killed by wind turbines. It has long been a mystery why they should be so badly affected since bat echo-location allows them to detect moving objects very well. A recent study in America has found that the primary cause for mortality is a combination of direct strikes and barotrauma (bats are killed when suddenly passing through a low air pressure region surrounding the turbine blade tips causing low pressure damage to the bat's lungs, Baerwald *et al.* 2008). The relative importance of this impact on bat populations depends on which species are likely to be affected, the importance of the site for those species and whether the site is within a migration corridor for particular bat species.

There are four bat species of potential conservation concern that could occur site or in the surrounding areas, Angolan Wing-gland Bat, Natal Long-fingered Bat, Cape Horseshoe Bat and Geoffroy's Horseshoe Bat. The Angolan Wing-gland Bat is listed as Vulnerable in South Africa (Friedmann & Daly 2004, Monadjem *et al.* 2010) and Near Threatened globally ([www.iucn.org](http://www.iucn.org)). The other three species are listed nationally as Near Threatened (Friedmann & Daly 2004, Monadjem *et al.* 2010) and globally as Least Concern ([www.iucn.org](http://www.iucn.org)).

The Angolan Wing-gland Bat is restricted to the arid western parts of southern Africa, typically in desert and semi-desert conditions. It is associated with riverine vegetation along dry river beds, which occur nearby in the Swartlintjiesrivier, and may roost in buildings, which also occur nearby. It is therefore highly likely to be found on site.

The Natal Long-fingered Bat occurs widely in the region, but more often in the southern and eastern parts than the arid west. It is predominantly a temperate to sub-tropical species with the core of its distribution in the savannas and grasslands of southern Africa. It is cave-dependent and congregates in huge numbers in suitable sites.

The Cape Horseshoe Bat roosts in caves and mine adits where it may form colonies of a thousand or more individuals. Its distribution is closely tied to the fynbos and succulent karoo biomes, it but forages predominantly in the canopy of trees.

Geoffroy's Horseshoe Bat occurs widely in southern African region, but less often in arid parts. It roosts in caves and subterranean habitats, such as mine adits, as well as rock hollows.

Areas where caves are likely to be found in relation to the site are inland of the site (a minimum of 25 km away). It is possible that the site forms part of a migration route or foraging area for these species, but it is unlikely that they roost anywhere on site. It is therefore unlikely that the site forms an important locality for the three cave-dwelling species (Natal Long-fingered Bat, Cape Horseshoe Bat and Geoffroy's Horseshoe Bat), although they could be found on site and foraging individuals may be affected by the proposed wind energy facility.

These species will be affected by the operation of the WEF. These species may be negatively impacted by collisions with turbine blades. For two of the three cave-dwelling species (Natal Long-fingered Bat and Geoffroy's Horseshoe Bat), the site may constitute marginal foraging habitat. Loss of some individuals on site is therefore unlikely to have an effect on population numbers. Of greater concern is cumulative impacts from many wind energy facilities, most notably on the Cape Horseshoe Bat. The Angolan Wing-gland Bat is especially vulnerable to effects from the wind energy facility.

## ASSESSMENT OF POTENTIAL IMPACTS

Major potential impacts are described briefly below. These are compiled from a generic list of possible impacts derived from previous projects of this nature and from a literature review of the potential impacts of solar energy facilities on the ecological environment. The major expected negative impact will be due to loss of habitat which may have direct or indirect impacts on individual organisms.

Impacts are assessed for grouped components of infrastructure for the proposed wind energy facility, as follows:

- wind turbines,
- internal access roads and underground cables between turbines,
- ancillary infrastructure (buildings), including on-site 11kV switching station,
- overhead power line.

### Wind turbines

A total of 24 turbines have been proposed for the site. At the most, two of these affect natural habitat, although in poor condition (turbines 1 and 2). The remainder are in disturbed areas or secondary habitat.

#### ***Impact 1: Loss of habitat for threatened/protected terrestrial fauna***

Duration: The impact will be permanent due to the fact that clearing of vegetation for construction purposes cannot be reversed.

Extent: The impact will occur at the site of the proposed facility, which is scored as local.

Magnitude: The potential magnitude of this impact will be small due to the small area of habitat likely to be affected relative to the overall extent of habitat available for species of concern.

Probability: It is likely that there will be impacts on natural habitat, but unlikely that this constitutes known habitat for any of the species of concern.

Potential significance: The significance of this impact could potentially be of low significance (see table below).

Mitigation measures: None required.

<b><i>Nature: Loss of habitat within indigenous natural vegetation</i></b>		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b><i>Extent</i></b>	local (1)	local (1)
<b><i>Duration</i></b>	permanent (5)	permanent (5)
<b><i>Magnitude</i></b>	small (1)	small (1)
<b><i>Probability</i></b>	Improbable (2)	Improbable (2)
<b><i>Significance</i></b>	<b>low (14)</b>	<b>low (14)</b>
<b><i>Status (positive or negative)</i></b>	negative	negative
<b><i>Reversibility</i></b>	Not reversible	Not reversible
<b><i>Irreplaceable loss of resources?</i></b>	Yes	Yes

<b>Can impacts be mitigated?</b>	Not required	
<b>Mitigation:</b> None.		
<b>Cumulative impacts:</b> Extensive loss of habitat due to mining has already occurred. The current project may lead to additional loss of habitat that will exacerbate this impact, but the effect is insignificant compared to existing impacts on the landscape.		
<b>Residual Impacts:</b> Some loss of natural habitat will occur, but this is insignificant relative to the total extent of available habitat.		

\*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

**Impact 2: Loss of individuals of threatened/protected terrestrial fauna**

Duration: The impact will be long-term due to the potential effect on population numbers and the effect this may have on overall population growth potential.

Extent: The impact will occur at the site of the proposed facility, but may have a more widespread effect. It is scored as regional.

Magnitude: The potential magnitude of this impact is likely to be low (may cause a slight impact on population processes). The overall impact is likely to be on small numbers of individuals within a localized area.

Probability: It is highly unlikely that there will be impacts on populations of Threatened / protected species, due to the fact that they are not likely to occur on site and that infrastructure is primarily going to affect disturbed habitats where they are unlikely to occur.

Potential significance: The significance of this impact could potentially be of low significance (see table below).

Mitigation measures: Personnel must be educated on the conservation value and/or protected status of potentially affected species and the fact that individuals of sensitive species may not be impacted on in any way that may affect the survival of the species (according to the National Environmental Management: Biodiversity Act) and that individuals of protected species may not be in the possession of any individual (Northern Cape Nature Conservation Act).

<b>Nature: Destruction/permanent loss of individuals of threatened plant species</b>		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent</b>	Regional (3)	Regional (3)
<b>Duration</b>	Long-term (4)	Long-term (4)
<b>Magnitude</b>	Low (4)	Low (3)
<b>Probability</b>	Highly improbable (1)	Highly improbable (1)
<b>Significance</b>	<b>low (11)</b>	<b>low (10)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>Reversibility</b>	Not reversible	Not reversible
<b>Irreplaceable loss of resources?</b>	Yes	Yes
<b>Can impacts be mitigated?</b>	Yes	
<b>Mitigation:</b> Personnel must be educated on the conservation value and/or protected status of potentially affected species and the fact that individuals of sensitive species may not be impacted on in any way that may affect the survival of the species (according to the National Environmental Management: Biodiversity Act) and that individuals of protected species may not be in the possession of any individual (Northern Cape Nature Conservation Act)..		
<b>Cumulative impacts:</b>		

Extensive loss of habitat due to mining has already occurred. The current project may lead to additional loss of habitat that will exacerbate this impact, but the effect is insignificant compared to existing impacts on the landscape.

**Residual Impacts:**

Some loss of natural habitat will occur, but this is insignificant relative to the total extent of available habitat.

\*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

**Impact 3: Collision of bats with turbine blades**

Duration: The impact will be of long-term duration (operation phase only).

Extent: The impact will occur at the site of the proposed wind energy facility, but may affect populations in surrounding areas or affect migration routes of species and is therefore scored as "regional".

Magnitude: At a local scale, it is likely to be an impact of low magnitude (may cause a slight impact on population processes) for the three Near Threatened species (Natal Long-fingered Bat, Cape Horseshoe Bat and Geoffroy’s Horseshoe Bat) and of moderate magnitude (may result in population processes continuing but in a modified way) on the Vulnerable species (Angolan Wing-gland Bat).

Probability: It is considered that there is a moderate probability of Near Threatened species occurring on site. The probability is therefore rated as "probable" for these three species (Natal Long-fingered Bat, Cape Horseshoe Bat and Geoffroy’s Horseshoe Bat). There is a high probability of the Vulnerable species occurring on site. The probability is therefore rated as "highly probable" for this species (Angolan Wing-gland Bat).

Potential significance: The significance of this impact could potentially be of medium significance (see table below).

Mitigation measures: A preconstruction survey for bats should be undertaken to determine whether bat species of concern occur on site or not and whether roosting habitats or known important maternity roosts occur within close proximity to the site. If this preconstruction survey finds that the presence of bats or roosting habitats of concern occur, then a monitoring programme must be implemented to document the effect on bats of the turbines. The detail of this monitoring programme must be informed by the outcomes of the preconstruction survey. If the turbines are found to have a significant negative impact on bats then further measures will need to be implemented to control the impact, for example, halting operation during low wind conditions. A study done recently showed a 73% drop in bat fatalities when wind farm operations were stopped during low wind conditions, when bats are most active (Arnett et al. 2009).

<b>Nature: Collision of bats with turbine blades causing mortality of individuals</b>		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent</b>	Regional (3)	Regional (3)
<b>Duration</b>	Long-term (4)	Long-term (4)
<b>Magnitude</b>	NT spp: Low (4) VU spp: Moderate (6)	NT spp: minor (2) VU spp: Low (4)
<b>Probability</b>	NT spp: probable (3) VU spp: highly probable (4)	NT spp: improbable (2) VU spp: probable (3)
<b>Significance</b>	<b>NT spp: medium (33)</b> <b>VU spp: medium (52)</b>	<b>NT spp: low (18)</b> <b>VU spp: medium (33)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>Reversibility</b>	To some degree	To some degree
<b>Irreplaceable loss of</b>	Yes	Yes

<b>resources?</b>		
<b>Can impacts be mitigated?</b>	Partially	
<b>Mitigation:</b> A preconstruction survey for bats should be undertaken to determine whether bat species of concern occur on site or not and whether roosting habitats or known important maternity roosts occur within close proximity to the site. If this preconstruction survey finds that the presence of bats or roosting habitats of concern occur, then a monitoring programme should be implemented to document the effect of wind turbines on bat species of concern. If the turbines are found to have a significant negative impact on bats then further measures will need to be implemented to control the impact.		
<b>Cumulative impacts:</b> High number of proposed wind energy facilities will cause cumulative impacts on bats. Some species are more vulnerable to cumulative impacts than others. Of the species potentially affected by this project, the Cape Horseshoe Bat and Angolan Wing-gland Bat are most vulnerable to cumulative impacts.		
<b>Residual Impacts:</b> Some loss of individuals likely to occur, but the magnitude of this depends on the degree to which mitigation measures are applied.		

\*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

### Internal access roads and underground cables between turbines

A total of 24 turbines have been proposed for the site. Internal access roads and underground cables will be established between these turbines. At the most, two turbines affect natural habitat, although in poor condition. The remainder is in disturbed areas or secondary habitat. Internal access roads will therefore affect only a small area of natural habitat.

#### **Impact 1: Loss of habitat for threatened/protected terrestrial fauna**

**Duration:** The impact will be permanent due to the fact that clearing of vegetation for construction purposes cannot be reversed.

**Extent:** The impact will occur at the site of the proposed facility, which is scored as local.

**Magnitude:** The potential magnitude of this impact will be small due to the small area of habitat likely to be affected relative to the overall extent of habitat available for species of concern.

**Probability:** It is likely that there will be impacts on natural habitat, but unlikely that this constitutes known habitat for any of the species of concern.

**Potential significance:** The significance of this impact could potentially be of low significance (see table below).

**Mitigation measures:** None required.

<b>Nature: Loss of habitat within indigenous natural vegetation</b>		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent</b>	local (1)	local (1)
<b>Duration</b>	permanent (5)	permanent (5)
<b>Magnitude</b>	small (1)	small (1)
<b>Probability</b>	Improbable (2)	Improbable (2)
<b>Significance</b>	<b>low (14)</b>	<b>low (14)</b>
<b>Status (positive or negative)</b>	negative	negative
<b>Reversibility</b>	Not reversible	Not reversible

<b>Irreplaceable loss of resources?</b>	Yes	Yes
<b>Can impacts be mitigated?</b>	Not required	
<b>Mitigation:</b> None.		
<b>Cumulative impacts:</b> Extensive loss of habitat due to mining has already occurred. The current project may lead to additional loss of habitat that will exacerbate this impact, but the effect is insignificant compared to existing impacts on the landscape.		
<b>Residual Impacts:</b> Some loss of natural habitat will occur, but this is insignificant relative to the total extent of available habitat.		

\*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

### **Impact 2: Loss of individuals of threatened/protected terrestrial fauna**

**Duration:** The impact will be long-term due to the potential effect on population numbers and the effect this may have on overall population growth potential.

**Extent:** The impact will occur at the site of the proposed internal access roads, but may have a more widespread effect. It is scored as regional.

**Magnitude:** The potential magnitude of this impact is likely to be low (may cause a slight impact on population processes). The overall impact is likely to be on small numbers of individuals within a localized area.

**Probability:** It is highly unlikely that there will be impacts on populations of Threatened / protected species, due to the fact that they are not likely to occur on site and that infrastructure is primarily going to affect disturbed habitats where they are unlikely to occur.

**Potential significance:** The significance of this impact could potentially be of low significance (see table below).

**Mitigation measures:** Personnel must be educated on the conservation value and/or protected status of potentially affected species and the fact that individuals of sensitive species may not be impacted on in any way that may affect the survival of the species (according to the National Environmental Management: Biodiversity Act) and that individuals of protected species may not be in the possession of any individual (Northern Cape Nature Conservation Act).

<b>Nature: Destruction/permanent loss of individuals of threatened plant species</b>		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent</b>	Regional (3)	Regional (3)
<b>Duration</b>	Long-term (4)	Long-term (4)
<b>Magnitude</b>	Low (4)	Low (3)
<b>Probability</b>	Highly improbable (1)	Highly improbable (1)
<b>Significance</b>	<b>low (11)</b>	<b>low (10)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>Reversibility</b>	Not reversible	Not reversible
<b>Irreplaceable loss of resources?</b>	Yes	Yes
<b>Can impacts be mitigated?</b>	Yes	
<b>Mitigation:</b> Personnel must be educated on the conservation value and/or protected status of potentially affected species and the fact that individuals of sensitive species may not be impacted on in any way that may affect the survival of the		

species (according to the National Environmental Management: Biodiversity Act) and that individuals of protected species may not be in the possession of any individual (Northern Cape Nature Conservation Act)..

**Cumulative impacts:**

Extensive loss of habitat due to mining has already occurred. The current project may lead to additional loss of habitat that will exacerbate this impact, but the effect is insignificant compared to existing impacts on the landscape.

**Residual Impacts:**

Some loss of natural habitat will occur, but this is insignificant relative to the total extent of available habitat.

\*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

**Ancillary infrastructure, including switching station**

A small number of additional buildings are required, but these are all proposed to be sited in previously disturbed areas.

**Impact 1: Loss of habitat for threatened/protected terrestrial fauna**

Duration: The impact will be permanent due to the fact that clearing of vegetation for construction purposes cannot be reversed.

Extent: The impact will occur at the site of the proposed facility, which is scored as local.

Magnitude: The potential magnitude of this impact will be minor due to the small area of habitat likely to be affected relative to the overall extent of habitat available for species of concern.

Probability: It is unlikely that there will be impacts on natural habitat that constitutes known habitat for any of the species of concern.

Potential significance: The significance of this impact could potentially be of low significance (see table below).

Mitigation measures: None required.

<b>Nature: Loss of habitat within indigenous natural vegetation</b>		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent</b>	local (1)	local (1)
<b>Duration</b>	permanent (5)	permanent (5)
<b>Magnitude</b>	minor (1)	minor (1)
<b>Probability</b>	Highly improbable (1)	Highly improbable (2)
<b>Significance</b>	<b>low (7)</b>	<b>low (7)</b>
<b>Status (positive or negative)</b>	negative	negative
<b>Reversibility</b>	Not reversible	Not reversible
<b>Irreplaceable loss of resources?</b>	Yes	Yes
<b>Can impacts be mitigated?</b>	Not required	
<b>Mitigation:</b> None.		
<b>Cumulative impacts:</b> Extensive loss of habitat due to mining has already occurred. The current project may lead to additional loss of habitat that will exacerbate this impact, but the effect is insignificant compared to existing impacts on the		

landscape.

**Residual Impacts:**

Some loss of natural habitat will occur, but this is insignificant relative to the total extent of available habitat.

\*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

**Impact 2: Loss of individuals of threatened/protected terrestrial fauna**

Duration: The impact will be long-term due to the potential effect on population numbers and the effect this may have on overall population growth potential.

Extent: The impact will occur at the site of the proposed facility, but may have a more widespread effect. It is scored as regional.

Magnitude: The potential magnitude of this impact is likely to be small (may cause a slight impact on population processes). The overall impact is likely to be on small numbers of individuals within a localized area.

Probability: It is highly unlikely that there will be impacts on populations of Threatened / protected species, due to the fact that they are not likely to occur on site and that infrastructure is going to affect disturbed habitats where affected species are unlikely to occur.

Potential significance: The significance of this impact could potentially be of low significance (see table below).

Mitigation measures: Personnel must be educated on the conservation value and/or protected status of potentially affected species and the fact that individuals of sensitive species may not be impacted on in any way that may affect the survival of the species (according to the National Environmental Management: Biodiversity Act) and that individuals of protected species may not be in the possession of any individual (Northern Cape Nature Conservation Act).

<b>Nature: Destruction/permanent loss of individuals of threatened plant species</b>		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent</b>	Regional (3)	Regional (3)
<b>Duration</b>	Long-term (4)	Long-term (4)
<b>Magnitude</b>	Low (4)	Low (3)
<b>Probability</b>	Highly improbable (1)	Highly improbable (1)
<b>Significance</b>	<b>low (11)</b>	<b>low (10)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>Reversibility</b>	Not reversible	Not reversible
<b>Irreplaceable loss of resources?</b>	Yes	Yes
<b>Can impacts be mitigated?</b>	Yes	
<b>Mitigation:</b> Personnel must be educated on the conservation value and/or protected status of potentially affected species and the fact that individuals of sensitive species may not be impacted on in any way that may affect the survival of the species (according to the National Environmental Management: Biodiversity Act) and that individuals of protected species may not be in the possession of any individual (Northern Cape Nature Conservation Act)..		
<b>Cumulative impacts:</b> Extensive loss of habitat due to mining has already occurred. The current project may lead to additional loss of habitat that will exacerbate this impact, but the effect is insignificant compared to existing impacts on the landscape.		
<b>Residual Impacts:</b> Some loss of natural habitat will occur, but this is insignificant relative to the total extent of available habitat.		

\*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

## Overhead power line

A power line is proposed to be routed alongside an existing road within disturbed habitat. There are two options, a western option (2A) and an eastern option (2B). They travel through similar areas and the assessment is identical for both options.

### ***Impact 1: Loss of habitat for threatened/protected terrestrial fauna***

Duration: The impact will be permanent due to the fact that clearing of vegetation for construction purposes cannot be reversed.

Extent: The impact will occur at the site of the proposed facility, which is scored as local.

Magnitude: The potential magnitude of this impact will be minor due to the small area of habitat likely to be affected relative to the overall extent of habitat available for species of concern.

Probability: It is highly unlikely that there will be impacts on natural habitat that constitutes known habitat for any of the species of concern.

Potential significance: The significance of this impact could potentially be of low significance (see table below).

Mitigation measures: None required.

<b><i>Nature: Loss of habitat within indigenous natural vegetation</i></b>		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b><i>Extent</i></b>	local (1)	local (1)
<b><i>Duration</i></b>	permanent (5)	permanent (5)
<b><i>Magnitude</i></b>	small (1)	small (1)
<b><i>Probability</i></b>	Highly improbable (1)	Highly improbable (1)
<b><i>Significance</i></b>	<b>low (7)</b>	<b>low (7)</b>
<b><i>Status (positive or negative)</i></b>	negative	negative
<b><i>Reversibility</i></b>	Not reversible	Not reversible
<b><i>Irreplaceable loss of resources?</i></b>	Yes	Yes
<b><i>Can impacts be mitigated?</i></b>	Not required	
<b><i>Mitigation:</i></b> None.		
<b><i>Cumulative impacts:</i></b> Extensive loss of habitat due to mining has already occurred. The current project may lead to additional loss of habitat that will exacerbate this impact, but the effect is insignificant compared to existing impacts on the landscape.		
<b><i>Residual Impacts:</i></b> Some loss of natural habitat will occur, but this is insignificant relative to the total extent of available habitat.		

\*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

***Impact 2: Loss of individuals of threatened/protected terrestrial fauna***

Duration: The impact will be long-term due to the potential effect on population numbers and the effect this may have on overall population growth potential.

Extent: The impact will occur at the site of the proposed powerline, but may have a more widespread effect. It is scored as regional.

Magnitude: The potential magnitude of this impact is likely to be low (may cause a slight impact on population processes). The overall impact is likely to be on small numbers of individuals within a localized area.

Probability: It is highly unlikely that there will be impacts on populations of Threatened / protected species, due to the fact that they are not likely to occur on site and that infrastructure is going to affect disturbed habitats where they are unlikely to occur.

Potential significance: The significance of this impact could potentially be of low significance (see table below).

Mitigation measures: Personnel must be educated on the conservation value and/or protected status of potentially affected species and the fact that individuals of sensitive species may not be impacted on in any way that may affect the survival of the species (according to the National Environmental Management: Biodiversity Act) and that individuals of protected species may not be in the possession of any individual (Northern Cape Nature Conservation Act).

<b>Nature: Destruction/permanent loss of individuals of threatened plant species</b>		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>Extent</b>	Regional (3)	Regional (3)
<b>Duration</b>	Long-term (4)	Long-term (4)
<b>Magnitude</b>	Low (4)	Low (3)
<b>Probability</b>	Highly improbable (1)	Highly improbable (1)
<b>Significance</b>	<b>low (11)</b>	<b>low (10)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>Reversibility</b>	Not reversible	Not reversible
<b>Irreplaceable loss of resources?</b>	Yes	Yes
<b>Can impacts be mitigated?</b>	Not required	
<b>Mitigation:</b> Personnel must be educated on the conservation value and/or protected status of potentially affected species and the fact that individuals of sensitive species may not be impacted on in any way that may affect the survival of the species (according to the National Environmental Management: Biodiversity Act) and that individuals of protected species may not be in the possession of any individual (Northern Cape Nature Conservation Act)..		
<b>Cumulative impacts:</b> Extensive loss of habitat due to mining has already occurred. The current project may lead to additional loss of habitat that will exacerbate this impact, but the effect is insignificant compared to existing impacts on the landscape.		
<b>Residual Impacts:</b> Some loss of natural habitat will occur, but this is insignificant relative to the total extent of available habitat.		

\*Significance calculated as (magnitude+duration+extent) x probability. Significance: <30 = low, 30–60 = medium, >60 = high.

## DISCUSSION AND CONCLUSIONS

There are nine animal species of conservation concern that have a geographical distribution that includes the site and habitat preference that includes the type of habitat that could potentially occur on site. This includes the following species:

1. Grant's Golden Mole (VU),
2. Littledale's Whistling Rat (NT),
3. Angolan Wind-gland Bat (VU),
4. Natal Long-fingered Bat (NT),
5. Cape Horseshoe Bat (NT),
6. Geoffroy's Horseshoe Bat (NT),
7. Desert Rain Frog (VU),
8. Namaqua Dwarf Adder (VU),
9. Namaqua Plated Lizard (NT).

Most of the study area is in a disturbed condition due to historical mining activities. There is a small area of natural vegetation on site, but this appears to have been impacted upon by mining activities and is likely to be in poor condition. It is located in the south-eastern corner of the site and is difficult to define exactly due to the fact that it grades into surrounding disturbed areas. The remaining habitat on site is secondary or consists of mined areas. There is therefore a low probability of encountering any of the terrestrial species of concern on site.

Bats are a different issue. They may be affected by turbines, irrespective of whether natural habitat remains on site or not.

A risk assessment was undertaken which identified three potential negative impacts on threatened and/or protected terrestrial fauna species. The potential impacts are loss of habitat for potentially affected terrestrial species due to construction, loss of individuals of potentially affected terrestrial species due to construction and/or the activities of personnel on site and mortality of bats due to collisions with turbine blades. The significance of these impacts was assessed and it was determined both of the impacts on terrestrial species are likely to be of low significance for all infrastructure components (see Table 1 below for a summary of the significance of impacts), whereas impacts on bats could potentially be of medium significance.

On condition there is compliance with the relevant National and Provincial legislation with respect to individuals of threatened / protected species, it is unlikely that the proposed project will have any impacts of medium or high significance on threatened and/or protected terrestrial fauna species.

The potential impact on bats requires a field survey of which bat species occur on site and whether suitable roosting habitat occurs on site or nearby. The impacts on bats are potentially of medium significance, the significance potentially being higher for a species listed as Vulnerable than for species listed as Near Threatened.

Either power line option may be used. The potential impacts are identical for both options.

**Table 5: Summary of the significance of impacts for different infrastructure components before and after mitigation.**

Impact:	Turbines		Internal roads & underground cables		Other buildings		Overhead powerline	
	Without mitigation	Without mitigation	With mitigation	Without mitigation	With mitigation	With mitigation	Without mitigation	With mitigation
1. Loss of habitat for threatened / protected terrestrial fauna	low (14)	low (14)	low (14)	low (14)	low (7)	low (7)	low (7)	low (7)
2. Loss of individuals of threatened / protected terrestrial fauna	low (11)	low (10)	low (11)	low (10)	low (11)	medium (10)	low (11)	low (10)
3. Collision of bats with turbine blades: Near Threatened species	medium (33)	low (18)	zero (0)	zero (0)	zero (0)	zero (0)	zero (0)	zero (0)
4. Collision of bats with turbine blades: Vulnerable species	medium (52)	medium (33)						

\*Significance: <30 = low, 30–60 = medium, >60 = high.

## MANAGEMENT PLAN

Control measures are only proposed for those impacts where mitigation measures are proposed to reduce the significance of impacts, i.e. some impacts are of low significance and thus no mitigation measures are proposed or no mitigation measures are possible or required.

### OBJECTIVE: Control impacts on individuals of threatened / protected species

Project component/s	Any infrastructure or activity that will result in disturbance to natural areas
Potential Impact	Loss of individuals of threatened / protected species due to construction activities and / or activities of personnel.
Activity/risk source	Construction / operation
Mitigation: Target/Objective	Target: no contravention of Provincial / National biodiversity / conservation legislation

Mitigation: Action/control	Responsibility	Timeframe
(1) Personnel must be educated on the conservation value and/or protected status of potentially affected species and the fact that individuals of sensitive species may not be impacted on in any way that may affect the survival of the species (according to the National Environmental Management: Biodiversity Act) and that individuals of protected species may not be in the possession of any individual (Northern Cape Nature Conservation Act)	Construction team, management (environmental officer)	Construction / operation

Performance Indicator	No contravention of National Environmental Management: Biodiversity Act or Northern Cape Nature Conservation Act.
Monitoring	<ul style="list-style-type: none"> <li>Legal compliance.</li> </ul>

**OBJECTIVE: Monitor impacts on bats due to turbine blade collisions**

Project component/s	Turbines
Potential Impact	Loss of individuals of affected bat species
Activity/risk source	Operation
Mitigation:	Target: low mortalities within project control area
Target/Objective	Time period: operation

Mitigation: Action/control	Responsibility	Timeframe
<p>(1) A preconstruction survey for bats should be undertaken to determine whether bat species of concern occur on site or not and whether roosting habitats or known important maternity roosts occur within close proximity to the site.</p> <p>(2) If this preconstruction survey finds that the presence of bats or roosting habitats of concern occur, then a monitoring programme should be implemented to document the effect of wind turbines on bat species of concern.</p> <p>(3) If the turbines are found to have a significant negative impact on bats then further measures will need to be implemented to control the impact, for example, halting operation during low wind conditions.</p>	Management (environmental officer),	operation

Performance Indicator	Number of individuals killed by turbine blades within project area
Monitoring	<ul style="list-style-type: none"> <li>Record bat mortalities and, as far as possible, the circumstances surrounding collisions. Standard protocols should be used when undertaking such surveys.</li> </ul>

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**Appendix 1: Vertebrate species of conservation concern with a geographical distribution that includes the study area.**

**MAMMALS**

Common name	Taxon	Habitat <sup>1</sup>	National status <sup>1</sup>	Global status <sup>2</sup>	Likelihood of occurrence
Grant's Golden Mole	<i>Eremitalpa granti</i>	Strandveld Succulent Karoo, Namib Desert, in subterranean habitats in shifting sands. Species includes two subspecies – Grant's Golden Mole only occurs south of Orange River, Namib Golden Mole found in Namib Desert.	VU (excludes Namib Golden Mole subspecies)	LC (includes Namib Golden Mole subspecies)	<b>MEDIUM</b> , previously recorded in neighbouring grid, substrate properties on site considered to be suitable for this species, but habitat disturbed by mining.
Namaqua Dune Mole-rat	<i>Bathyergus janetta</i>	Sandy soils in arid regions on the north-western coast from just north of the Olifants River to Oranjemund. Limited to seepage areas where soil is moist and workable and tubers occur. Range overlaps with diamond mining area – mining destroys habitat and burrow system.	NT	LC	<b>LOW</b> , habitat is not suitable (no seepage areas on site) & habitat disturbed by mining.
Littledale's whistling rat	<i>Parotomys littledalei</i>	Desert, Karoo. Sandy or gravel open plains. Tends to excavate burrow beneath a shrub, but will also construct stick nest at the base of a shrub. Herbivorous, favouring leaves of <i>Zygophyllum</i> and <i>Mesembryanthemaceae</i> .	NT	LC	<b>MEDIUM</b> , site is in core of distribution range. Habitat suitable on site, but disturbed by mining.
Dassie Rat	<i>Petromus typicus</i>	Rocky barren areas on rocky outcrops and koppies. Flat rock crevices. Eats soft vegetable matter, including leaves of shrubs and flowers of many <i>Asteraceae</i> .	NT	LC	<b>LOW</b> , site is in core of distribution range, but no suitable habitat on site.
Angolan Wing-gland Bat	<i>Cistugo seabrae</i>	Endemic to west coast of southern Africa, restricted to arid western parts, typically in desert and semi-desert conditions. Has been netted in riverine vegetation along dry river beds and may roost in buildings, such as church steeples.	VU	NT	<b>HIGH</b> , site is within known distribution range, species very likely to occur in Buffels River area at Kleinsee and therefore likely to be found on site
Natal long-fingered bat	<i>Miniopterus natalensis</i>	Occurs widely in the region, but more often in the southern and eastern parts than the arid west. It is predominantly a temperate to sub-tropical species with the core of its	NT	LC	<b>MEDIUM</b> , site is within known distribution range, although in peripheral area.

		distribution in the savannas and grasslands of southern Africa. It is cave-dependent and congregates in huge numbers in suitable sites. Uses separate hibernacula and summer maternity roosts. Females migrate between these caves, which may be up to 150 km apart.			No caves on site or nearby.
Cape horseshoe bat	<i>Rhinolophus capensis</i>	Endemic to south-western parts of southern Africa, mostly from the Eastern Cape to Cape Town and then north to southern Namibia. Roosts in caves and subterranean habitats, such as mine adits. May form colonies of a thousand or more individuals. Forages predominantly in the canopies of trees.	NT	LC	<b>MEDIUM</b> , site is within known distribution range, but no suitable roosting on site
Geoffroy's horseshoe bat	<i>Rhinolophus clivus</i>	Occurs widely in southern African region, but less often in arid interior parts. Roosts in caves and subterranean habitats, such as mine adits, as well as rock hollows. May form large colonies of up to several thousand individuals. Associated with a variety of habitats including arid savannah, woodland and riparian forest.	NT	LC	<b>MEDIUM</b> overall geographical distribution includes this area; no suitable roosting habitat likely to occur on site

<sup>1</sup>Distribution and national status according to Friedmann & Daly 2004.

<sup>2</sup>Global status according to IUCN 2010. IUCN Red List of Threatened Species. Version 2010.3. ([www.iucnredlist.org](http://www.iucnredlist.org)). Downloaded on 18 June 2011.

## AMPHIBIANS

Common name	Species	Habitat	Status	Likelihood of occurrence
Desert rain frog	<i>Breviceps macrops</i>	From the highwater mark up to 10 km inland along the Namaqualand coast (Namibia to near Hondeklipbaai. Threatened by diamond mining on west coast.	VU	<b>MEDIUM</b> , site is in core of distribution range. Habitat suitable on site, but disturbed by mining.

<sup>1</sup>Status according to Minter et al. 2004.

<sup>2</sup>Status according to IUCN 2010. IUCN Red List of Threatened Species. Version 2010.3. ([www.iucnredlist.org](http://www.iucnredlist.org)). Downloaded on 18 June 2011.

## REPTILES

Common name	Species	Habitat	Status <sup>3</sup>	Likelihood of occurrence
Namaqua dwarf adder	<i>Bitis schneideri</i>	Semi-stable vegetated coastal sand dunes from Little Namaqualand to Ludertiz. Threatened by alluvial diamond mining	VU	<b>MEDIUM</b> , site is in core of distribution range. Habitat suitable on site, but disturbed by mining.
Armadillo girdled	<i>Cordylus cataphractus</i>	Rock cracks and crevices. Diet consists mainly of termites, beetles and	VU	<b>LOW</b> , no suitable habitat on site.

lizard		grasshoppers		
Namaqua plated lizard	<i>Gerrhosaurus typicus</i>	Dry sandy areas and bare rocky hillsides	NT	<b>MEDIUM</b> , site is in core of distribution range. Habitat suitable on site, but disturbed by mining.
Namaqua day gecko	<i>Phelsuma ocellata</i>	Boulder strewn hillsides and rocky outcrops, but may also be found in trees and bushes	NT	<b>LOW</b> , no suitable habitat on site.
Speckled padloper	<i>Homopus signatus</i>	Rocky or stony areas, often on ridges or plateaus. Horizontal rock crevices.	NT	<b>LOW</b> , no suitable habitat on site.

<sup>3</sup>Distribution according to Marais 2004.

<sup>4</sup>Status according to IUCN 2010. IUCN Red List of Threatened Species. Version 2010.3. ([www.iucnredlist.org](http://www.iucnredlist.org)). Downloaded on 18 June 2011.

## Appendix 2: Animal species with a geographical distribution that includes the study area.

Notes:

1. Species of conservation concern are in red lettering.
2. Species protected according to the Northern Cape Nature Conservation Act of 2009 (Act 9 of 2009) marked with "P"
3. Species protected according to the National Environmental Management: Biodiversity Act of 2004 (Act 10 of 2000) marked with "N"

### Mammals:

<sup>P</sup>Springbok  
<sup>P</sup>Klipspringer  
<sup>P</sup>Gemsbok  
<sup>P</sup>Steenbok  
<sup>P</sup>Cape grysbok  
<sup>P</sup>Common duiker  
Rock hyrax  
Black-backed jackal  
Caracal  
<sup>P</sup>Yellow mongoose  
<sup>NP</sup>Black-footed cat  
<sup>P</sup>African wild cat  
Small grey mongoose  
<sup>P</sup>Small-spotted genet  
<sup>P</sup>Striped polecat  
<sup>P</sup>Bat-eared fox  
<sup>NP</sup>Leopard  
<sup>P</sup>Aardwolf  
<sup>P</sup>Suricate  
<sup>NP</sup>Cape fox  
<sup>P</sup>Cape golden mole  
<sup>P</sup>**Grant's golden mole (VU / LC)**  
<sup>P</sup>Reddish-grey musk shrew  
<sup>P</sup>Lesser dwarf shrew  
<sup>P</sup>Cape/Desert hare  
<sup>P</sup>Scrub/Savannah hare  
<sup>P</sup>Namaqua rock mouse  
<sup>P</sup>**Namaqua dune mole-rat (NT)**  
<sup>P</sup>Common mole-rat  
<sup>P</sup>Short-tailed gerbil  
<sup>P</sup>Hairy-footed gerbil  
<sup>P</sup>Spectacled dormouse  
<sup>P</sup>Porcupine  
<sup>P</sup>Large-eared mouse  
<sup>P</sup>Karoo bush rat  
<sup>P</sup>**Littledale's whistling rat (NT)**  
<sup>P</sup>Springhare  
<sup>P</sup>**Dassie rat (NT)**  
<sup>P</sup>Striped mouse  
<sup>P</sup>Cape rock elephant shrew  
<sup>P</sup>Smith's rock elephant-shrew  
<sup>P</sup>Round-eared elephant shrew

<sup>P</sup>Aardvark  
African straw-coloured fruit bat  
Egyptian rousette  
**Angolan wing-gland bat (VU)**  
Long-tailed serotine bat  
**Natal long-fingered bat (NT)**  
Cape serotine bat  
Egyptian slit-faced bat  
**Cape horseshoe bat (NT)**  
**Geoffroy's horseshoe bat (NT)**  
Robert's flat-headed bat  
Flat-headed free-tailed bat  
Egyptian free-tailed bat

### Reptiles:

<sup>P</sup>Western dwarf chameleon  
<sup>P</sup>Namaqua chameleon  
Puff adder  
Many-horned adder  
Horned adder  
<sup>NP</sup>**Namaqua dwarf adder (VU)**  
Cape cobra  
Black spitting cobra  
Coral snake / coral shield cobra  
Dwarf beaked snake  
Karoo whip snake  
Namib sand snake  
Crossed whip snake  
<sup>P</sup>Brown house snake  
Spotted rock snake  
<sup>P</sup>Mole snake  
<sup>P</sup>Common egg-eater  
Delalande's beaked blind snake  
<sup>P</sup>Southern rock agama  
<sup>P</sup>Southern spiny agama  
<sup>P</sup>Knox's desert lizard  
<sup>P</sup>Smith's desert lizard  
<sup>P</sup>Western sandveld lizard  
<sup>P</sup>Namaqua sand lizard  
<sup>P</sup>Spotted sand lizard  
<sup>P</sup>Legless burrowing skink species  
<sup>P</sup>Striped dwarf burrowing skink  
<sup>P</sup>Cape skink  
<sup>P</sup>Western rock skink  
<sup>P</sup>Variegated skink

**NP Armadillo girdled lizard (VU)**

P Large-scaled girdled lizard

P Karoo girdled lizard

**P Namaqua plated lizard (NT)**

P Dwarf plated lizard

P Striped dwarf leaf-toed gecko

P Giant ground gecko

P Bibron's tubercled gecko

P Austen's dune gecko

P Rough gecko

P Western Cape gecko

P Western gecko species

P Marico gecko

**P Namaqua day gecko (NT)**

P Common barking gecko

**P Speckled padloper (NT)**

P Angulate tortoise

P Karoo tent tortoise

**Amphibians**

**P Desert rain frog (VU)**

P Namaqua rain frog

P Karoo toad

P Common platanna

P Cape river frog

P Cape sand frog