

**BASIC ASSESSMENT REPORT:**

**Ecological study on the potential impacts of the proposed rerouting of 132kV lines and associated infrastructure at Eskom Watershed Substation near Lichtenburg, North West Province**

Prepared by

Dr David Hoare  
(Ph.D., Pr.Sci.Nat.)

David Hoare Consulting cc  
41 Soetdoring Ave  
Lynnwood Manor,  
Pretoria

for

Environmental Impact Management Services (Pty) Ltd  
P O Box 2083,  
Pinegowrie  
2123

on behalf of  
Eskom

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**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 Environmental Impact Management Services (Pty) Ltd to provide specialist consulting services for the Basic Assessment for the proposed rerouted 132kV lines and associated infrastructure at Eskom Watershed Substation near Lichtenburg, North West Province. The consulting services comprise an assessment of potential impacts on the general ecology in the study area by the proposed project.

### **Details of specialist**

Dr David Hoare  
David Hoare Consulting cc  
Postnet Suite no. 116  
Private Bag X025  
Lynnwood Ridge, 0040

Telephone: 012 804 2281  
Cell: 083 284 5111  
Fax: 086 550 2053  
Email: [dhoare@lantic.net](mailto:dhoare@lantic.net)

### **Summary of expertise**

Dr David Hoare:

- Has majors in Botany and Zoology with distinction from Rhodes University, Grahamstown, an Honours Degree (with distinction) in Botany from Rhodes University, an MSc (cum laude) from the Department of Plant Science, University of Pretoria, and a PhD in Botany from the Nelson Mandela Metropolitan University, Port Elizabeth with a focus on species diversity.
- 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, with working experience in Gauteng, Mpumalanga, Limpopo, North West, Eastern Cape, Western Cape, Northern Cape and Free State Provinces, Tanzania, Kenya, Mozambique and Swaziland.
- Conducted, or co-conducted, over 330 specialist ecological surveys as an ecological consultant. Areas of specialization include general ecology, biodiversity assessments, vegetation description and mapping, plant species surveys and remote sensing of vegetation. Has undertaken work in grassland, thicket, forest, savannah, fynbos, coastal vegetation, wetlands and nama-karoo vegetation, but has a specific specialization in grasslands and wetland vegetation.

- 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 Eskom. 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 Environmental Impact Management Services (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.

## **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.

## EXECUTIVE SUMMARY

David Hoare Consulting cc was appointed by EIMS to undertake a general ecology assessment of the study area. This report provides details of the results of the Basic Assessment study, based on a desktop assessment of the study area, mapping from aerial imagery and a field assessment of the study area.

The study area is located in the North-West Province approximately 5km north of Lichtenburg located in the quarter degree grid 2626AA. The study site is situated in an area with relatively gentle topography.

The study area consists of an existing sub-station surrounded by natural vegetation. There is one regional vegetation types occurring in the study area, Carletonville Dolomite Grassland. This vegetation is listed as Vulnerable in the scientific literature, but is not listed in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011). The site is in close proximity to the Lichtenburg Game Breeding Centre, a factor which has contributed to the site being classified in the North-West Province Biodiversity Conservation Assessment as having elevated conservation value.

There are two Declining plant species (low conservation priority) and one Vulnerable plant species (high conservation priority) that could occur in habitats that are available in the study area. None of these species were found on site and it is considered unlikely that they would occur there. No protected trees (according to the National Forest Act) or protected plants (according to the National Environmental Management: Biodiversity Act) were found on site or are likely to occur there.

There are no threatened amphibian or reptile species of conservation concern that have a geographical distribution that includes the study area and habitat requirements which are met by those found on site. There are six bird species of conservation concern that could potentially use the site, mostly for foraging. The protected species, the Brown Hyaena, Black-footed Cat, Honey Badger and some of the birds (Martial Eagle, Tawny Eagle and Lesser Kestrel) have a likelihood of occurring on site, but are all considered to be mobile animals that are unlikely to be affected by the proposed development of the proposed infrastructure .

A risk assessment was undertaken which identified five potential negative impacts due to construction or operation of the proposed infrastructure. The potential impacts are as follows:

1. loss of indigenous natural vegetation,
2. loss of populations or individuals of threatened or near threatened plant species,
3. establishment and spread of declared weeds and alien invader plants,
4. loss or fragmentation of habitat for threatened or protected terrestrial fauna, and
5. mortality of birds due to collisions with overhead powerlines.

The assessment of the impacts is summarised in the Table below. This shows that all potential impacts due to this proposed project are likely to be of low negative significance after mitigation.

**Table: Comparison of summarised impacts on environmental parameters**

Environmental parameter	Issues	Rating prior to mitigation	Rating post mitigation
Natural vegetation	Loss or fragmentation	-10	-5.25
Threatened plants	Loss of individuals	-3.5	-1
Threatened / protected fauna	Loss of habitat	-1	-1

	Loss of individuals due to collisions with powerlines	-7.5	-4.5
Alien plants	Spread	-11.25	-3

Due to the low sensitivity of ecological receptors on site and the low significance of potential impacts, the project is supported from an ecological point of view.

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## **INTRODUCTION**

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

Environmental Impact Management Services (Pty) Ltd was appointed by Eskom to undertake an application for environmental authorisation through a Basic Assessment (BA) for the proposed "rerouting/relocation of 4x 132kV lines and associated infrastructure at Eskom Watershed Substation ". The purpose of the BA is to identify environmental impacts associated with the project.

On 18 October 2013 David Hoare Consulting cc was appointed by Environmental Impact Management Services (Pty) Ltd to undertake a general ecology assessment of the study area. It was agreed that the study would include the following:

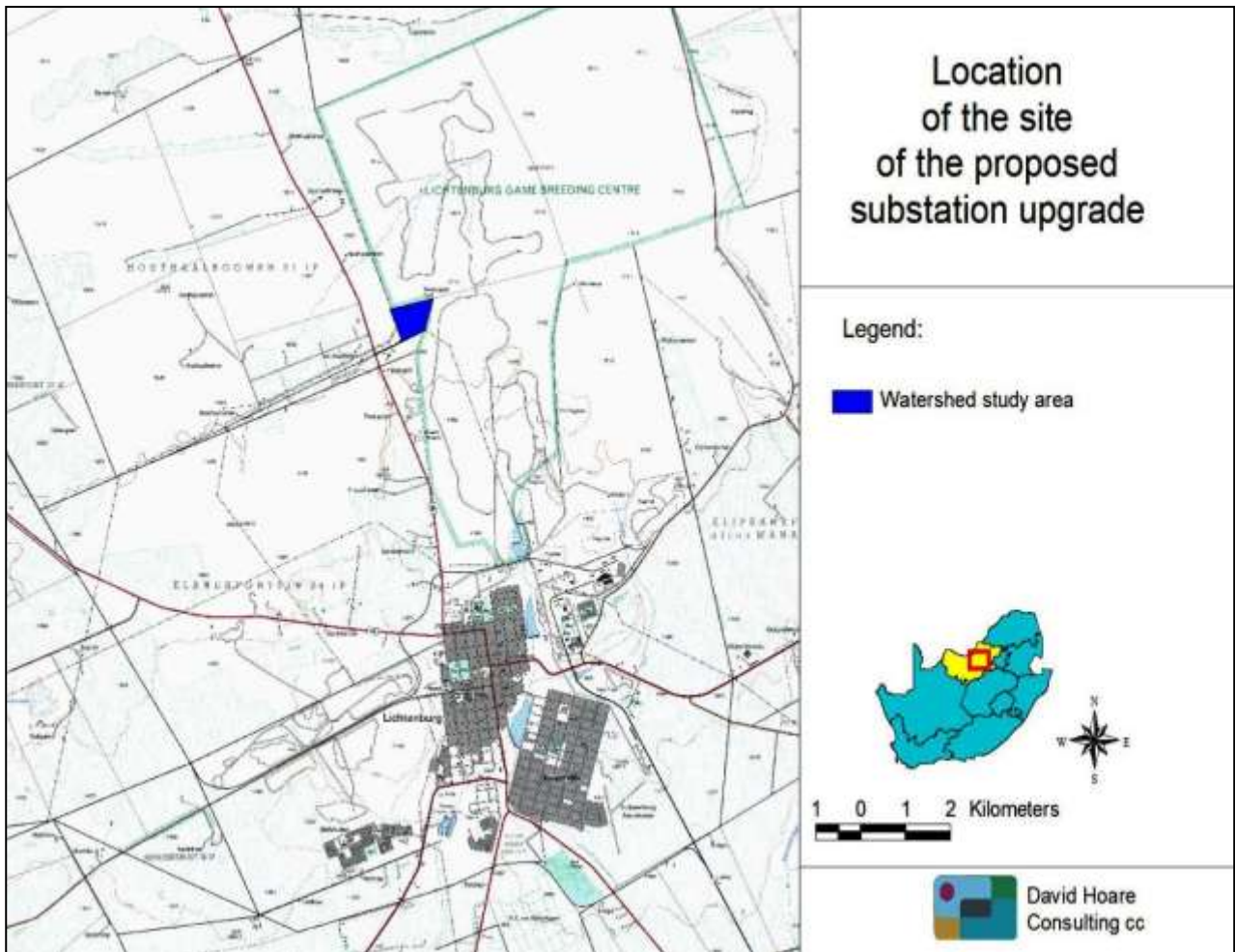
- Description of the general surrounding as well as site specific environment (within the defined study area on a relevant scale) with respect to the specific specialist field;
- Identification of potential sensitivities related to the field of expertise (e.g. red data species, protected species, etc) – sensitivities to be represented as a GIS sensitivity map of the study area;
- Attendance of relevant specialists at the site visit;
- Identification of potential impacts arising from all project development phases (planning and conceptualisation, design, construction, and implementation) using accepted methodology;
- Identified potential impacts (cumulative, direct and indirect) will be quantified (where possible) and fully described for each feasible alternative;
- Identified potential impacts will be evaluated in accordance with the agreed methodology to determine significance. Significance will be determined by considering and quantifying where possible the nature, extent, duration, intensity, and probability of each potential impact;
- Comparative assessment of the identified alternatives (if any);
- Recommendations must be made regarding mitigation and / or management measures to address the unavoidable impacts identified;
- The recommendations and mitigation / management measures must include a detailed description of implementation and means of measuring their success. An indication of methods for implementation, timeframes, costs and responsibilities should be given;
- Residual impacts after mitigation must then be evaluated (in accordance with the assessment methodology described above) such that actual implemented results can be measured against those predicted and
- Preparation of a detailed Specialist Assessment Report (for inclusion as an annexure to the Basic Assessment Report) applicable to the specific field of expertise.

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, mapping from aerial imagery and other sources and a field assessment of the study area.

### **Location of the project**

The study area is located in the North West Province approximately 5km north of Lichtenburg in the quarter degree grid 2626AA. There is an existing substation on site within a servitude that borders on the Lichtenburg Game Breeding Centre property.





**Figure 1: Location of site to the north of Lichtenburg.**

### **Proposed infrastructure upgrade**

Figure 2 (next page) shows the proposed new position of the 132kV powerlines on site. In this figure, new line positions are shown in green and the substation property boundary in orange.



**Figure 2: Proposed rerouting/relocation of 132kV lines (green).**

## **METHODOLOGY**

The assessment is to be undertaken in a single phase, a Basic Assessment. The objective of the study was to review fauna and flora 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 potential species, only those of high conservation concern are provided. It was also intended to provide a habitat/sensitivity map of the study area based on available maps and database information.

### **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. These can be organised in a hierarchical fashion, as follows:

#### Species

1. threatened plant species
2. protected trees

#### Ecosystems

1. threatened ecosystems
2. protected ecosystems
3. critical biodiversity areas
4. areas of high biodiversity
5. centres of endemism

#### Processes

1. corridors
2. mega-conservancy networks
3. rivers and wetlands
4. important topographical features

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)

### **Plant species of conservation concern**

There are two types of species of concern for the site under investigation, (i) those listed by conservation authorities as being on a Red List and are therefore considered to be at risk of extinction, and (ii) those listed as protected according to National and/or Provincial legislation.

#### ***Red List plant species***

Determining the conservation status of a species is required in order to identify those species that are at greatest risk of extinction and, therefore, in most need of conservation action. South Africa has adopted the IUCN Red List Categories and Criteria to provide an objective, rigorous, scientifically founded system to identify Red List species. A published list of the Red List species of South African plants (Raimondo et al. 2009) contains a list of all species that are considered to be at risk of extinction. This list is updated regularly to take new information into account, but these are not published in book/paper format. Updated assessments are provided on the SANBI website (<http://redlist.sanbi.org/>). According to the website of the Red List of Southern African Plants (<http://redlist.sanbi.org/>), *the conservation status of plants indicated on the Red List of South African Plants Online represents the status of the species within South Africa's borders. This means that when a species is not endemic to South Africa, only the portion of the species population occurring within South Africa has been assessed. The global conservation status, which is a result of the assessment of the entire global range of a species, can be found on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species: <http://www.iucnredlist.org>.* The South African assessment is used in this study.

The purpose of listing Red List plant species is to provide information on the potential occurrence of species at risk of extinction 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 at risk of extinction (Red List species) previously recorded in the area. Historical occurrences of threatened plant species were obtained from the South African National Biodiversity Institute (<http://posa.sanbi.org>) for the quarter degree square/s within which the study area is situated. Habitat information for each species was obtained from various published sources. The probability of finding any of these species was then assessed by comparing the habitat requirements with those habitats that were found, during the field survey of the site, to occur there.

#### ***Protected trees***

Regulations published for the National Forests Act (Act 84 of 1998) as amended, provide a list of protected tree species for South Africa. The species on this list were assessed in order to determine which protected tree species have a geographical distribution that coincides with the study area and habitat requirements that may be met by available habitat in the study

area. The distribution of species on this list were obtained from published sources (e.g. van Wyk & van Wyk 1997) and from the SANBI Biodiversity Information System website (<http://sibis.sanbi.org/>) for quarter degree grids in which species have been previously recorded. Species that have been recorded anywhere in proximity to the site (within 100 km), or where it is considered possible that they could occur there, were listed and were considered as being at risk of occurring there. The site was searched for these species during the field survey and any individuals or concentrations noted.

### **Other protected plant species**

National legislation was evaluated in order to provide lists of any plant or animal species that have protected status. The most important legislation is the following:

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

This legislation contains lists of species that are protected. These lists were scanned in order to identify any species that have a geographical range that includes the study area and habitat requirements that are met by those found on site. These species were searched for within suitable habitats on site or, where relevant, it was stated that it was considered possible that they could occur on site.

There is additional legislation that provides lists of protected species, but the legislation to which these are attached deal primarily with harvesting or trade in listed species and do not seem to specifically address transformational threats to habitat or individuals. This includes the following legislation:

- *Northern Cape Nature Conservation Act (Act No 9 of 2009)*
- *CITES: Convention on the Trade in Endangered Species of Wild Fauna and Flora.*

### **Species probability of occurrence**

Some species of plants may be cryptic, difficult to find, rare, ephemeral or generally not easy to spot while undertaking a survey of a large area. An assessment of the possibility of these species occurring there was therefore provided. For all threatened or protected flora 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. karoo shrubland), but detailed microhabitat requirements (e.g. mountain shrubland on shallow soils overlying 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 shrubland on shallow soils overlying sandstone);
- **DEFINITE**: species found in habitats on site.

### **Habitat sensitivity**

The purpose of producing a habitat sensitivity map is to provide information on the location of potentially sensitive features in the study area. This was compiled by taking the following into consideration:

1. The general status of the vegetation of the study area (which areas are transformed versus those that are still in a natural status).

2. Habitats in which species of animals occur that may be protected or are considered to have high conservation status are considered to be sensitive.

An explanation of the different sensitivity classes is given in Table 1. Areas containing untransformed natural vegetation that is important for Red List organisms are considered potentially sensitive. In contrast, any transformed area that has no importance for the functioning of ecosystems is considered to potentially have low sensitivity.

**Table 1: Explanation of sensitivity ratings.**

Sensitivity	Factors contributing to sensitivity	Example of qualifying features
"NO-GO" areas	Indigenous natural areas that are highly positive for the following: <ul style="list-style-type: none"> <li>• presence of habitats critical for the survival of populations of threatened species (Critically Endangered, Endangered, Vulnerable).</li> </ul>	<ul style="list-style-type: none"> <li>• Confirmed presence of habitats essential for the survival of populations of threatened species.</li> </ul>
HIGH	Indigenous natural areas that are highly positive for <u>any</u> of the following: <ul style="list-style-type: none"> <li>• presence of threatened species (Critically Endangered, Endangered, Vulnerable).</li> </ul> And may also be positive for the following: <ul style="list-style-type: none"> <li>• <u>High</u> intrinsic biodiversity value (<u>high</u> species richness and/or turnover, unique habitat)</li> <li>• presence of habitat highly suitable for threatened species (Critically Endangered, Endangered, Vulnerable species).</li> <li>• <u>Low</u> ability to respond to disturbance (low resilience, dominant species very old).</li> </ul>	<ul style="list-style-type: none"> <li>• Confirmed presence of populations of threatened species.</li> <li>• Habitat where a threatened species could potentially occur (habitat is suitable, but no confirmed records).</li> <li>• Confirmed habitat for species of lower threat status (near threatened, rare).</li> <li>• Habitat where a species of lower threat status (e.g. (near threatened, rare) could potentially occur (habitat is suitable, but no confirmed records).</li> <li>• Habitat with exceptionally high diversity (richness or turnover).</li> <li>• Habitat with unique species composition and narrow distribution.</li> </ul>
MEDIUM	<ul style="list-style-type: none"> <li>• Other indigenous natural areas in which factors listed above are of no particular concern.</li> <li>• May also include natural buffers around ecologically sensitive areas and natural</li> </ul>	



Sensitivity	Factors contributing to sensitivity	Example of qualifying features
	<p>links or corridors in which natural habitat is still ecologically functional.</p> <ul style="list-style-type: none"> <li>Degraded or disturbed indigenous natural vegetation. May also include secondary vegetation in an advanced state of development in which habitat is still ecologically functional and which could potentially provide habitat for species of concern.</li> </ul>	
LOW	No natural habitat remaining.	

### Assessment of impacts

The impact assessment methodology is guided by the requirements of the NEMA EIA Regulations (2010). The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/likelihood (P) of the impact occurring. This determines the environmental risk. In addition other factors, including cumulative impacts, public concern, and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S).

#### **Determination of Environmental Risk:**

The significance (S) of an impact is determined by applying a prioritisation factor (PF) to the environmental risk (ER).

The environmental risk is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and reversibility (R) applicable to the specific impact.

For the purpose of this methodology the consequence of the impact is represented by:

$$C = \frac{(E+D+M+R)}{4} \times N$$

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table 2.

**Table 2: Criteria for Determining Impact Consequence**

Aspect	Score	Definition
Nature	-1	Likely to result in a negative / detrimental impact
	+1	Likely to result in a positive / beneficial impact
Extent	1	Activity (i.e. limited to the area applicable to the specific activity)
	2	Site (i.e. within the development property boundary)
	3	Local (i.e. the area within 5 km of the site)
	4	Regional (i.e. extends between 5 and 50 km from the site)
	5	Provincial / National (i.e. extends beyond 50 km from the site)
Duration	1	Immediate (<1 year)
	2	Short term (1-5 years),
	3	Medium term (6-15 years),
	4	Long term (the impact will cease after the operational life span of the

Magnitude / intensity		project),
	5	Permanent (no mitigation measure of natural process will reduce the impact after construction).
	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),
	2	Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected),
	3	Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way),
	4	High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or
	5	Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease).
Reversibility	1	Impact is reversible without any time and cost.
	2	Impact is reversible without incurring significant time and cost.
	3	Impact is reversible only by incurring significant time and cost.
	4	Impact is reversible only by incurring prohibitively high time and cost.
	5	Irreversible Impact

Once the C has been determined the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/scored as per Table 3.

**Table 3: Probability scoring**

Probability	1	Improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <25%),
	2	Low probability (there is a possibility that the impact will occur; >25% and <50%),
	3	Medium probability (the impact may occur; >50% and <75%),
	4	High probability (it is most likely that the impact will occur- > 75% probability), or
	5	Definite (the impact will occur),

The result is a qualitative representation of relative ER associated with the impact. ER is therefore calculated as follows:

$$ER = C \times P$$

**Table 4: Determination of Environmental Risk**

Consequence	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
<b>Probability</b>						



The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in Table 5.

**Table 5: Significance classes.**

<b>Environmental Risk Score</b>	
<b>Value</b>	<b>Description</b>
<9	Low (i.e. where this impact is unlikely to be a significant environmental risk),
≥9-<17	Medium (i.e. where the impact could have a significant environmental risk),
≥17	High (i.e. where the impact will have a significant environmental risk).

The impact ER will be determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post implementation of relevant management and mitigation measures (post-mitigation). This allows for a prediction in the degree to which the impact can be managed/mitigated.

### **Limitations and exclusions**

- 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.

## DESCRIPTION OF STUDY AREA

### Site conditions

The study site is situated in an area with relatively gentle topography. The general slope in this area is from north to south. The elevation on site varies from 1512 to 1519 m above sea level.

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). The landtypes described below provide a generalized description of soils on site that may differ in detail from site-specific patterns, but not in overall trends. There is one land type in the study area that is affected by the proposed infrastructure. This is the Fa landtype (Land Type Survey Staff, 1987).

The C-group of land types refers to pedologically young landscapes that are not predominantly rock and nor predominantly alluvial or aeolian and in which the dominant soil-forming processes have been rock weathering, the formation of orthic topsoil horizons and, commonly, clay illuviation, giving rise typically to lithocutanic horizons (MacVicar et al. 1974). The soil forms that epitomise these processes are Glenrosa and Mispah. The Fa landtype consists of land in which lime in the soil is not encountered regularly in any part of the landscape



**Figure 3: General view of habitat on site.**

(MacVicar et al. 1974).

Rainfall occurs from November to May. Mean annual rainfall is 535 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 intermediate, neither moist nor dry. Winter frost is common.

### **Landuse and landcover of the study area**

A landcover map of the study area (Fairbanks *et al.* 2000) indicates that most of the study area consists of "mines and quarries" (the area occupied by the existing substation) and natural vegetation. The 1:50 000 topocadastral maps of the study area, aerial imagery (Figure 4) and field observations confirm this pattern.

### **Broad vegetation patterns**

The vegetation of the study area indicates that there are two regional vegetation types occurring in the broad study area, but only one within the site and surroundings. This is Carletonville Dolomite Grassland. Almost 6 km away is the boundary of Western Highveld Sandy Grassland. The distribution of these vegetation types relative to the proposed infrastructure is shown in Figure 5. The vegetation type that is directly affected by the proposed infrastructure is briefly described below.

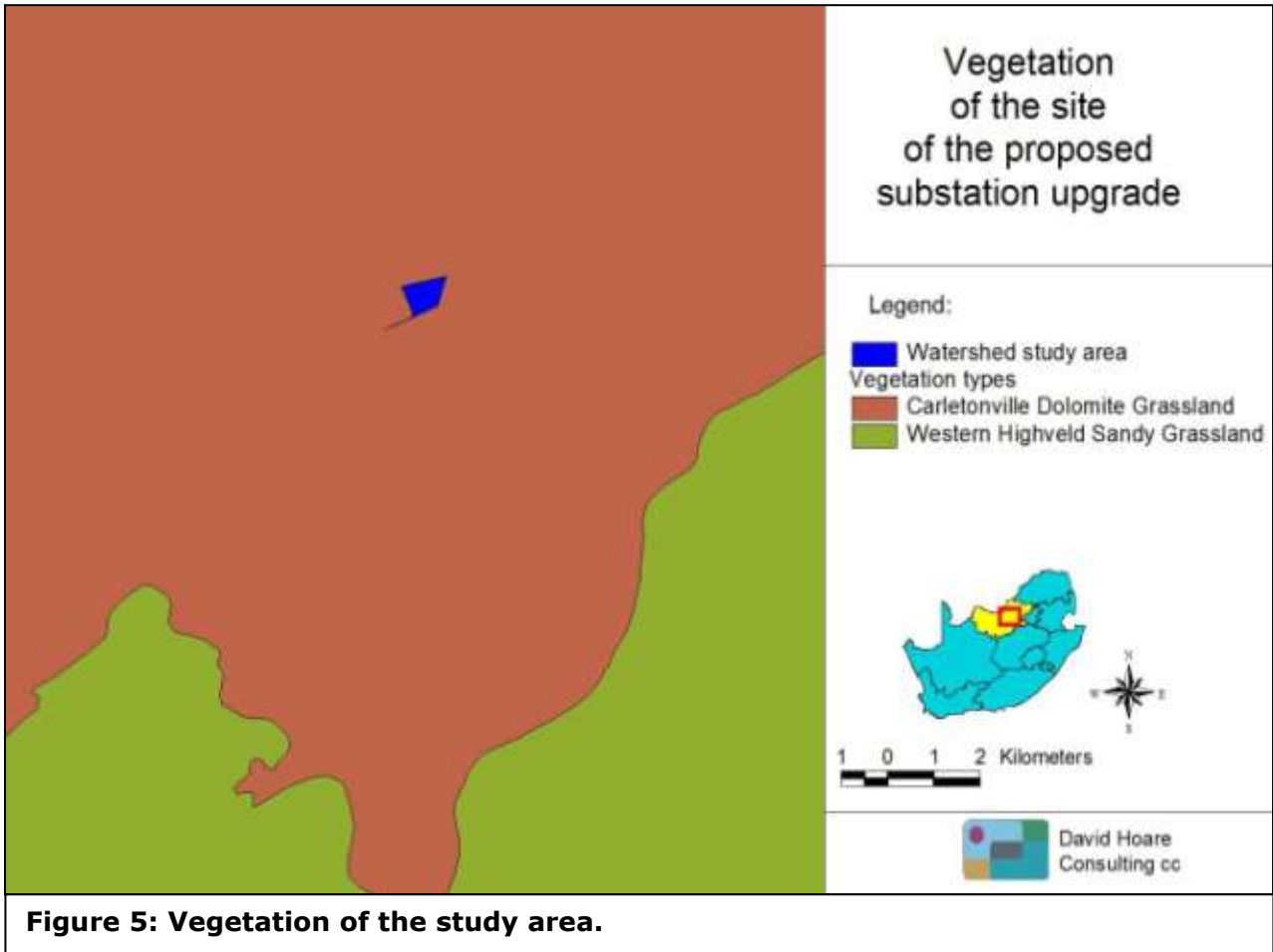
### **Carletonville Dolomite Grassland**



**Figure 4: Aerial image of the study area.**



This vegetation type is found on solitary hills, slopes and escarpments of mesas, which creates a mosaic of habitats ranging from open grassland to shrubland (Mucina et al. 2006). Tall shrubs and sometimes small trees are sheltered against frequent periods of frost during the winter months and regular veld fires in late winter to early spring. The medium-high evergreen shrublands are dominated by a combination of *Olea europea* subsp. *africana*, *Euclea crispa* subsp. *crispa*, *Gymnosporia buxifolia*, *Diospyros lycioides*, *Rhus burchellii*, *Rhus ciliata*, *Rhus erosa*, *Clutia pulchella* and *Grewia occidentalis* (Mucina et al. 2006). Trees such as *Rhus lancea*, *Celtis africana* and *Ziziphus mucronata* are found in more deeply incised drainage



lines.

### Conservation status of broad vegetation types

On the basis of a scientific approach used at national level by SANBI (Driver *et al.* 2005), vegetation types can be categorised according to their conservation status which is, in turn, assessed according to the degree of transformation relative to the expected extent of each vegetation type. The status of a habitat or vegetation type is based on how much of its original area still remains intact relative to various thresholds. The original extent of a vegetation type is as presented in the most recent national vegetation map (Mucina, Rutherford & Powrie 2005) and is the extent of the vegetation type in the absence of any historical human impact. On a national scale the thresholds are as depicted in Table 6, as determined by best available scientific approaches (Driver *et al.* 2005). The level at which an ecosystem becomes Critically Endangered differs from one ecosystem to another and varies from 16% to 36% (Driver *et al.* 2005).

**Table 6: Determining ecosystem status (Driver et al. 2005).** \*BT = biodiversity target (the minimum conservation requirement).

Habitat remainin g (%)	80-100	least threatened	LT
	60-80	vulnerable	VU
	*BT-60	endangered	EN
	0-*BT	critically endangered	CR

**Table 7: Conservation status of different vegetation types occurring in the study area, according to Driver et al. 2005 and Mucina et al. 2005.**

Vegetation Type	Target (%)	Conserved (%)	Transformed (%)	Conservation status	
				Driver et al. 2005; Mucina et al., 2006	National Ecosystem List (NEM:BA)
Carletonville Dolomite Grassland	24	3	24	Vulnerable	Not listed

According to scientific literature (Driver et al. 2005; Mucina et al., 2006), as shown in Table 7, Carletonville Dolomite Grassland is listed as Vulnerable.

The National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), lists national vegetation types that are afforded protection on the basis of rates of transformation. The thresholds for listing in this legislation are higher than in the scientific literature, which means there are fewer ecosystems listed in the National Ecosystem List versus in the scientific literature.

Carletonville Dolomite Grassland is not listed in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011).

The project overview document for the North-West Province Biodiversity Conservation Assessment (<http://bgis.sanbi.org>) indicates the following:

- *"The province does not have an up and running biodiversity information system.*
- *The current conservation assessment is relying very heavily on coarse-scale biodiversity surrogates such as habitat models that have not yet been ground-truthed."*

Biodiversity attributes for the site in the supplied map (<http://bgis.sanbi.org>) include the following:

1. ESA PA1: Protected area buffer (within 1 km of an informal protected area (Lichtenburg Game Breeding Centre);
2. CBA feature: biodiversity features identified in the existing SDF – the nature of this feature is not indicated for the current site;
3. Terrestrial CBA category 2 (note that large parts of the remaining vegetation of the Province fall into this category);
4. Terrestrial ESA category 1 (from the map provided this appears to be the 1 km buffer around the Lichtenburg Game Breeding Centre, considered to be an informal protected area).

It appears therefore that the main concern for the site is its proximity to an existing informal protected area. Natural vegetation on site may also have biodiversity value in a Provincial context.

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

Lists of plant species previously recorded in the quarter degree grids in which the study area is situated were obtained from the South African National Biodiversity Institute. These are listed in Appendix 1. Additional species that could occur in similar habitats, as determined from database searches and literature sources, but have not been recorded in these grids are also listed.

The species on this list were evaluated to determine the likelihood of any of them occurring on site on the basis of habitat suitability. Of the species that are considered to occur within the geographical area under consideration, there are two Declining plant species and one Vulnerable plant species that could occur in habitats that are available in the study area (see Appendix 1). These species are *Crinum macowanii*, *Boophone disticha*, and *Brachystelma incanum*. *Crinum macowanii* is found in mountain grassland and stony slopes in hard dry shale, and in gravelly soil or on sandy flats. Conditions on site do not match this description, but it was nevertheless considered possible that it could occur there. No individuals of this species were found on site. *Boophone disticha*, occurs in dry grassland and rocky areas, but is most often found as a single plant or very sparse populations. No individuals of this species were found on site. *Brachystelma incanum* occurs in the Coligny, Lichtenburg and Wolmaransstad area. It is found in sandy loam soils in bushveld, which does not match the conditions found on site. The species has been previously recorded in the grid to north of site, but not in the grid in which the site is located. It was nevertheless considered possible that it could occur on site or nearby. No individuals of this species were found on site.

In conclusion, it is considered that there is a low probability of any plant species of conservation concern occurring on site. There is therefore a very low likelihood of any such plants being affected by the proposed project.

### **Protected plants (National Environmental Management: Biodiversity Act)**

Plant species protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) are listed in Appendix 4. There are no plant species on this list that have a geographical distribution that includes the site. One plant species that appears on this list that could potentially occur in the general region, although it has not previously been recorded in the grids of the study area, is *Harpagophytum procumbens*. Within South Africa this species occurs in the Northern Cape, North West, Free State, and Limpopo Provinces. The distribution of this species ends approximately 100 km to the west of the site. It occurs in well drained sandy habitats in open savanna and woodlands. No suitable conditions occur on site, and the species was not found on site. It has not been previously recorded in this grid. It is considered highly unlikely that this species could occur on site. There are therefore no protected plant species that are affected by the proposed project.

### **Protected trees**

Tree species protected under the National Forest Act are listed in Appendix 2. There are four species that are known to have a geographical distribution that includes the grids in which the

proposed infrastructure is to be located, namely *Acacia erioloba*, *Boscia albitrunca*, *Combretum imberbe* and *Sclerocarya birrea* subsp. *caffra*. None of these species were found on site. Despite having a geographical distribution that broadly includes the study area, collection records for these species obtained from the SANBI website (<http://sibis.sanbi.org/>) shows that none of these species, except for *Acacia erioloba*, have previously been recorded in the grid in which the study area is located, or any surrounding grids. No habitat suitable for these species was found on site or in any surrounding area. The species are not considered likely to occur in the study area.

In summary, no protected tree species were found on site or are likely to occur there. The development of the proposed infrastructure will not lead to loss of individuals of protected trees, irrespective of the project alternatives selected. This potential impact is therefore not applicable to the current project and is not evaluated further.

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

All threatened (Critically Endangered, Endangered or Vulnerable) or near threatened vertebrate animals (mammals, reptiles, amphibians) that could occur in the study area are listed in Appendix 4. Those vertebrate 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 no threatened amphibian or reptile species of conservation concern that have a geographical distribution that includes the study area and habitat requirements which are met by those found on site.

There are three mammal species of conservation concern that could potentially occur on site, namely the Black-footed Cat, Brown Hyaena and the Honey Badger. All three are highly mobile species that will not be affected by habitat disturbance during the construction phase of the project. There are therefore no mammal species of concern that will be affected by the proposed project.

There are six bird species of conservation concern that could potentially use the site, mostly for foraging. There are no bird species of conservation concern that are considered to possibly breed on site. The six species, if they occurred there, would only use the site for occasional foraging. These are the following species (First value is the national status according to Barnes 2000, second value is the global status according to IUCN Red List of Threatened Species. Version 2010.3 ([www.iucnredlist.org](http://www.iucnredlist.org))): Martial Eagle (VU), Tawny Eagle (VU/LC), Lanner Falcon (NT/LC), Black Harrier (VU), Lesser Kestrel (VU/LC) and Secretarybird (NT/VU). In all cases, the site does not constitute important habitat for any of these species, but there is still a possibility that they may occur there. Development of the site is unlikely to cause a significant loss of habitat for any of these species.

In summary, the following threatened or near threatened animal species could potentially occur within the footprint of the proposed infrastructure and may therefore be of concern for development of the site:

1. Martial Eagle (VU)
2. Tawny eagle (VU/LC)
3. Lanner Falcon (NT/LC)
4. Black harrier (VU)
5. Lesser Kestrel (VU/LC)
6. Secretarybird (NT/VU)

## **Protected animals**

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 6, marked with the letter "N". This includes the following species: White Rhinoceros, Black Rhinoceros, Black Wildebeest, Cape Clawless Otter, Black-footed Cat, Brown Hyaena, Spotted-necked Otter, Honey Badger, Cape Fox, Southern African Hedgehog, Southern African Python, Giant Bullfrog, Blue Crane, Martial Eagle, Tawny Eagle, African Marsh Harrier, Lesser Kestrel, African Grass Owl, Pink-backed Pelican, Black Stork and Cape Vulture.

Due to habitat and forage requirements, only the Brown Hyaena, Black-footed Cat, Honey Badger and some of the birds (Martial Eagle, Tawny Eagle and Lesser Kestrel) have a likelihood of occurring on site. All 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 substation and associated infrastructure.

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

1. None.



## **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).

***National Veld and Forest Fire Act (Act No. 101 of 1998)***

Provides requirements for veldfire prevention through firebreaks and required measures for fire-fighting. Chapter 4 of the Act places a duty on landowners to prepare and maintain firebreaks. Chapter 5 of the Act places a duty on all landowners to acquire equipment and have available personnel to fight fires.

## **IDENTIFICATION OF RISKS AND DESCRIPTION OF POTENTIAL IMPACTS**

Potential issues relevant to potential impacts on the 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 infrastructure are as follows:

- Excavation of foundations.
- 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 infrastructure, as follows:

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

### **Description of potential impacts**

#### ***Impact 1: Impacts on indigenous natural vegetation (terrestrial)***

The regional vegetation type in the broad study area is Carletonville Dolomite Grassland, classified as Vulnerable in the scientific literature, but not listed in the National List of Ecosystems that are Threatened and need of protection (GN1002 of 2011).

According to the project proposal, it is likely that some loss of habitat will occur, but the area affected will be insignificant in comparison to the total area of the vegetation type concerned. Only the powerlines traverse a small area of natural habitat and this is adjacent to an existing powerline. Powerlines typically occupy a very small footprint on the ground. Access/service roads potentially have a greater impact on natural habitat than the power line tower structures. Development of the infrastructure will not cause fragmentation of natural vegetation, when assessed at a regional level.

#### ***Impact 2: Impacts on threatened plants***

Nature: Plant species are especially vulnerable to infrastructure development due to the fact that they cannot move out of the path of the construction activities, but are also affected by overall loss of habitat.

There are no threatened plant species listed for the grids that include the study area. There are two Declining plant species and one Vulnerable plant species with a geographical

distribution that includes the site. However, none are considered to have a high probability of occurring on site and none were found during the field survey of the site. It is considered highly unlikely that any such species will be affected by the proposed project.

**Impact 3: Establishment and spread of declared weeds and alien invader plants**

Major factors contributing to invasion by alien invader plants includes *inter alia* high disturbance (such as clearing for construction activities) and negative grazing practices (Zachariades *et al.* 2005). Exotic species are often more prominent near infrastructural disturbances than further away (Gelbard & Belnap 2003, Watkins *et al.* 2003). Consequences of this may include:

1. loss of indigenous vegetation;
2. change in vegetation structure leading to change in various habitat characteristics;
3. change in plant species composition;
4. change in soil chemical properties;
5. loss of sensitive habitats;
6. loss or disturbance to individuals of rare, endangered, endemic and/or protected species;
7. fragmentation of sensitive habitats;
8. change in flammability of vegetation, depending on alien species;
9. hydrological impacts due to increased transpiration and runoff; and
10. impairment of wetland function.

There is a moderate possibility that alien plants could be introduced to areas within the footprint of the proposed infrastructure from surrounding areas in the absence of control measures. The potential consequences may be of low seriousness for surrounding natural habitats due to the fact that little natural vegetation still remains on site. Control measures could prevent the impact from occurring.

**Impact 4: Loss or fragmentation of habitat for threatened/protected terrestrial fauna**

Construction of infrastructure may lead to direct loss of habitat for threatened or protected fauna, although there is a low likelihood of any species being directly or seriously affected due to the mobile nature of all the species that could potentially occur on site.

The following animal species of conservation concern could potentially occur on site and may therefore be of concern for development within the study area (First value is the national status according to Barnes 2000, second value is the global status according to IUCN Red List of Threatened Species. Version 2010.3 ([www.iucnredlist.org](http://www.iucnredlist.org))):

1. Martial Eagle (VU)
2. Tawny eagle (VU/LC, protected)
3. Lanner Falcon (NT/LC)
4. Black harrier (VU)
5. Lesser Kestrel (VU/LC, protected)
6. Secretarybird (NT/VU)
7. Brown Hyaena (NT/NT, protected)
8. Black-footed Cat (LC/VU, protected)
9. Honey Badger (NT/LC, protected).

**Impact 5: Collision of birds with powerlines**

There are six bird species of potential conservation concern that could occur in the surrounding areas (First value is the national status according to Barnes 2000, second value is the global status according to IUCN Red List of Threatened Species. Version 2010.3

([www.iucnredlist.org](http://www.iucnredlist.org))), Martial Eagle (VU), Tawny Eagle (VU/LC), Lanner Falcon (NT/LC), Black Harrier (VU), Lesser Kestrel (VU/LC) and Secretarybird (NT/VU).

Larger birds, especially low-flying species, are known to be affected by collisions with overhead powerlines. Of the species listed above, only the Secretarybird potentially falls into this category. Also, the project proposal is to construct the powerlines adjacent to an existing overhead transmission line. The effect of the new powerline is therefore very small due to the fact that it may only aggravate an existing impact, rather than creating a new impact.

## ASSESSMENT OF IMPACTS

The following section provides a detailed assessment of the potential impacts identified in the sections above. Impacts are assessed according to Construction, Operations and Decomisioning phases of the project and, where applicable, for each component of infrastructure, i.e., power lines, access/service roads and substation / switching station. Mitigation measures are proposed for reducing impacts and an assessment is provided for each impact following application of mitigation measures.

### Construction Phase

#### ***Loss/fragmentation of natural vegetation***

A small section of natural vegetation is potentially affected. The main impact of the powerline is due to construction of the tower structures, each of which occupies only a very small local footprint (approximately 1m<sup>2</sup> around each foot).

<b>Loss/fragmentation of natural vegetation</b>		
Issue/Impact/Environmental Effect/Nature	<i>Loss of fragmentation of natural habitat</i>	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Duration	3	2
Intensity/magnitude	2	1
Reversibility	3	2
Probability	4	3
Significance rating	-10 (medium negative)	-5.25 (low negative)
Mitigation measures	<i>Use existing service roads / access roads (existing transmission powerline).            Keep impacts within servitude of the powerline.            Clear only necessary footprint of tower structures.            Rehabilitate disturbed areas as soon as possible.</i>	

#### ***Impacts on threatened plants***

A small section of natural vegetation is potentially affected. The main impact of the powerline is due to construction of the tower structures, each of which occupies only a very small local footprint (approximately 1m<sup>2</sup> around each foot). Populations of plant species of concern are not considered to be likely to be affected.

<b>Loss/fragmentation of individuals of threatened plants</b>		
Issue/Impact/Environmental Effect/Nature	<i>Loss of individuals of threatened plants</i>	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	1
Duration	5	1
Intensity/magnitude	4	1
Reversibility	3	1
Probability	1	1
Significance rating	-3.5 (low negative)	-1 (low negative)

Mitigation measures	<i>Undertake a walk-through survey of affected areas to determine whether any populations of plant species occur there or not..</i>
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**Loss/fragmentation of habitat for threatened terrestrial fauna**

A small section of natural vegetation is potentially affected. These habitats may potentially be used by a relatively small number of threatened or protected animal species, all of which are highly mobile species.

<b>Loss/fragmentation of habitat for threatened/protected animals</b>		
Issue/Impact/Environmental Effect/Nature	<i>Loss of habitat</i>	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Duration	1	1
Intensity/magnitude	1	1
Reversibility	1	1
Probability	1	1
Significance rating	-1 (low negative)	-1 (low negative)
Mitigation measures	<i>None required.</i>	

**Operational Phase**

**Establishment and spread of declared weeds and alien invader plants**

The existence of infrastructure represents a disturbance in the landscape that could advance conditions in which declared weeds and alien invader plants could potentially be favoured.

<b>Establishment and spread of declared weeds and alien invader plants</b>		
Issue/Impact/Environmental Effect/Nature	<i>Establishment and spread of declared weeds and alien invader plants</i>	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	3	2
Duration	4	1
Intensity/magnitude	4	1
Reversibility	4	2
Probability	3	2
Significance rating	-11.25 (medium negative)	-3 (low negative)
Mitigation measures	<i>Existing concentrations of alien plants within the zone of control on site should be eradicated. Areas disturbed due to construction activities should be rehabilitated as quickly as possible. Soil stockpiles should not be translocated from areas with alien plants into the site and within the site alien plants on stockpiles must be</i>	

	<p><i>controlled so as to avoid the development of a soil seed bank of alien plants within the stock-piled soil. Any alien plants must be immediately controlled to avoid establishment of a soil seed bank. An ongoing monitoring programme should be implemented to detect and quantify any aliens that may become established and provide information for the management of aliens. This should form part of an alien management programme.</i></p>
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**Collision of birds with powerlines**

Any vertical infrastructure poses a collision risk for flying animals. The proposed powerline will be adjacent to an existing transmission powerline. There is therefore a small risk that a small number of individuals may be killed or become injured through collisions due to the new powerline.

<b>Collision of birds with overhead powerlines</b>		
Issue/Impact/Environmental Effect/Nature	<i>Loss of individuals due to collision impacts with overhead powerlines.</i>	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Duration	4	4
Intensity/magnitude	2	1
Reversibility	2	2
Probability	3	2
Significance rating	-7.5 (low negative)	-4.5 (low negative)
Mitigation measures	<i>If necessary, attach devices to powerlines to make them more visible to flying birds.</i>	



## DISCUSSION AND CONCLUSIONS

The study area consists of natural vegetation surrounding an existing sub-station. This means that large proportions of the infrastructure will be within transformed areas within the existing substation boundary, but some power-line infrastructure will be within natural vegetation.

There are a small number of threatened or protected species that could potentially be affected by the proposed project. This includes two plant species listed as Declining and one listed as Vulnerable, three mammal species and six threatened bird species. There are no threatened reptile or amphibian species that are likely to occur in the study area and there are no protected tree or plant species that will occur on site.

A risk assessment was undertaken which identified five potential negative impacts due to construction or operation of the proposed infrastructure. The potential impacts are as follows:

1. loss of indigenous natural vegetation,
2. loss of populations or individuals of threatened or near threatened plant species,
3. establishment and spread of declared weeds and alien invader plants,
4. loss or fragmentation of habitat for threatened or protected terrestrial fauna, and
5. mortality of birds due to collisions with overhead powerlines.

The assessment of the impacts is summarised in the Table below. This shows that all potential impacts due to this proposed project are likely to be of low or medium negative significance. There are mitigation measures that could potentially reduce some of these impacts further. With mitigation measures taken into account, all potential impacts can be reduced to low significance.

**Table 8: Comparison of summarised impacts on environmental parameters**

Environmental parameter	Issues	Rating prior to mitigation	Rating post mitigation
Natural vegetation	Loss or fragmentation	-10	-5.25
Threatened plants	Loss of individuals	-3.5	-1
Threatened / protected fauna	Loss of habitat	-1	-1
	Loss of individuals due to collisions with powerlines	-7.5	-4.5
Alien plants	Spread	-11.25	-3

## Conclusion

Due to the low sensitivity of the site in combination with the application of appropriate mitigation measures, the overall impacts of this proposed project are of low significance. Taking this assessment into consideration this project is supported from an ecological point of view.

## REFERENCES:

- ALEXANDER, G. & MARAIS, J. 2007. A guide to the reptiles of southern Africa. Struik, Cape Town.
- BRANCH, W.R. (1988) South African Red Data Book—Reptiles and Amphibians. South African National Scientific Programmes Report No. 151.
- DU PREEZ, L. & CARRUTHERS, V. 2009. A complete guide to the frogs of southern Africa. Random House Struik, Cape Town.
- FAIRBANKS, D.H.K., THOMPSON, M.W., VINK, D.E., NEWBY, T.S., VAN DEN BERG, H.M & EVERARD, D.A. 2000. The South African Land-Cover Characteristics Database: a synopsis of the landscape. *S.Afr.J.Science* 96: 69-82.
- FRIEDMANN, Y. & DALY, B. (eds.) 2004. The Red Data Book of the Mammals of South Africa: A Conservation Assessment: CBSG Southern Africa, Conservation Breeding Specialist Group (SSC/IUCN), Endangered Wildlife Trust, South Africa.
- IUCN (2001). *IUCN Red Data List categories and criteria: Version 3.1*. IUCN Species Survival Commission: Gland, Switzerland.
- MARAIS, J. 2004. A complete guide to the snakes of southern Africa. Struik Publishers, Cape Town.
- MILLS, G. & HES, L. 1997. The complete book of southern African mammals. Struik Publishers, Cape Town.
- MINTER, L.R., BURGER, M., HARRISON, J.A., BRAACK, H.H., BISHOP, P.J. and KLOEPFER, D. (eds.) 2004. Atlas and Red Data Book of the Frogs of South Africa, Lesotho and Swaziland. SI/MAB Series #9. Smithsonian Institution, Washington, DC.
- MONADJEM, A., TAYLOR, P.J., COTTERILL, E.P.D. & SCHOEMAN, M.C. 2010. Bats of southern and central Africa. Wits University Press, Johannesburg.
- MUCINA, L. AND RUTHERFORD, M.C. (editors) 2006. Vegetation map of South Africa, Lesotho and Swaziland: an illustrated guide. *Strelitzia* 19, South African National Biodiversity Institute, Pretoria.
- MUCINA, L., RUTHERFORD, M.C. AND POWRIE, I.W. (editors) 2005. Vegetation map of South Africa, Lesotho and Swaziland, 1:1 000 000 SCALE SHEET MAPS South African National Biodiversity Institute, Pretoria.
- PASSMORE, N.I. & CARRUTHERS, V.C. (1995) South African Frogs; a complete guide. Southern Book Publishers and Witwatersrand University Press. Johannesburg.
- SKELTON, P. 2001. A complete guide to the freshwater fishes of southern Africa. Struik Publishers, Cape Town.
- TOLLEY, K. & BURGER, M. 2007. Chameleons of southern Africa. Struik Publishers, Cape Town.

**APPENDICES:****Appendix 1: Plant species of conservation importance (Threatened, Near Threatened and Declining) that have historically been recorded in the study area.**

Sources: South African National Biodiversity Institute in Pretoria.

Family	Taxon	Status	Habitat	Likelihood of occurrence in study area
AMARYLLIDACEAE	<i>Crinum macowanii</i>	Declining	Mountain grassland and stony slopes in hard dry shale, gravely soil or sandy flats.	MEDIUM
FABACEAE	<i>Acacia erioloba</i>	Declining	Savanna, semi-desert and desert areas with deep, sandy soils and along drainage lines in very arid areas, sometimes in rocky outcrops.	LOW
AMARYLLIDACEAE	<i>Boophone disticha</i>	Declining	Dry grassland and rocky areas.	HIGH
APOCYNACEAE	<i>Brachystelma incanum</i>	Vulnerable	Coligny, Lichtenburg and Wolmaransstad. Sandy loam soils in bushveld. Recorded in grid to north of site.	MEDIUM
CAPPARACEAE	<i>Cleome conrathii</i>	Near threatened	Kuruman to Pretoria. Stony quartzite slopes, usually in red sandy soil, grassland or deciduous woodland, all aspects.	LOW

\* Conservation Status Category assessment according to IUCN Ver. 3.1 (IUCN, 2001), as evaluated by the Threatened Species Programme of the South African National Biodiversity Institute in Pretoria. \*IUCN (3.1) Categories: VU = Vulnerable, EN = Endangered, CR = Critically Endangered, NT = Near Threatened.

## Appendix 2: List of protected tree species (National Forests Act).

<b>Acacia erioloba</b>	<i>Acacia haematoxylon</i>
<i>Adansonia digitata</i>	<i>Azelia quanzensis</i>
<i>Balanites</i> subsp. <i>maughamii</i>	<i>Barringtonia racemosa</i>
<b>Boscia albitrunca</b>	<i>Brachystegia spiciformis</i>
<i>Breonadia salicina</i>	<i>Bruguiera gymnorhiza</i>
<i>Cassipourea swaziensis</i>	<i>Catha edulis</i>
<i>Ceriops tagal</i>	<i>Cleistanthus schlechteri</i> var. <i>schlechteri</i>
<i>Colubrina nicholsonii</i>	<b>Combretum imberbe</b>
<i>Curtisia dentata</i>	<i>Elaeodendron (Cassine) transvaalensis</i>
<i>Erythrophysa transvaalensis</i>	<i>Euclea pseudebenus</i>
<i>Ficus trichopoda</i>	<i>Leucadendron argenteum</i>
<i>Lumnitzera racemosa</i> var. <i>racemosa</i>	<i>Lydenburgia abottii</i>
<i>Lydenburgia cassinoides</i>	<i>Mimusops caffra</i>
<i>Newtonia hildebrandtii</i> var. <i>hildebrandtii</i>	<i>Ocotea bullata</i>
<i>Ozoroa namaensis</i>	<i>Philenoptera violacea (Lonchocarpus capassa)</i>
<i>Pittosporum viridiflorum</i>	<i>Podocarpus elongatus</i>
<i>Podocarpus falcatus</i>	<i>Podocarpus henkelii</i>
<i>Podocarpus latifolius</i>	<i>Protea comptonii</i>
<i>Protea curvata</i>	<i>Prunus africana</i>
<i>Pterocarpus angolensis</i>	<i>Rhizophora mucronata</i>
<b>Sclerocarya birrea subsp. caffra</b>	<i>Securidaca longependunculata</i>
<i>Sideroxylon inerme</i> subsp. <i>inerme</i>	<i>Tephrosia pondoensis</i>
<i>Warburgia salutaris</i>	<i>Widdringtonia cedarbergensis</i>
<i>Widdringtonia schwarzii</i>	

*Acacia erioloba*, *Boscia albitrunca*, *Combretum imberbe* and *Sclerocarya birrea subsp. caffra* have a geographical distribution that coincides with the study area.

**Appendix 3: Vertebrate species of conservation concern with a geographical distribution that includes the study area.**

**MAMMALS (excluding bats)**

Common name	Taxon	Habitat <sup>1</sup>	National status <sup>1</sup>	Global status <sup>2</sup>	Likelihood of occurrence
White rhinoceros	<i>Ceratotherium simum</i>	Temperate grasslands. Bulk grazer in short grass areas within savanna and bushveld. Requires some woody cover and permanent water.	LC <sup>1</sup> Protected (NEMBA)	NT <sup>2</sup>	<b>LOW</b> , not likely to occur outside formal protection.
Black rhinoceros	<i>Diceros bicornis minor</i>	Savanna. Browser in bushveld habitats, requiring dense cover, sufficient browse and permanent water. Occurs primarily in formal conservation areas as well as on private land.	VU <sup>1</sup> Protected (NEMBA)	CR <sup>2</sup>	<b>LOW</b> , occurs in formal protection only.
Black wildebeest	<i>Connochaetes gnou</i>	Temperate grassland. Selective grazer in open areas with short grass.	LC <sup>1</sup> Protected (NEMBA)	LC <sup>2</sup>	<b>LOW</b> , occurs in formal protection only.
Black-footed cat	<i>Felis nigripes</i>	Savanna, shrubland, grassland, desert. Short-grass specialist eating small mammals, birds, invertebrates and reptiles. Not previously recorded in grid, but within known distribution.	LC <sup>1</sup> Protected (NEMBA)	VU <sup>2</sup>	<b>MEDIUM-LOW</b> , marginally suitable habitat.
Brown hyaena	<i>Hyaena brunnea</i>	Savanna, shrubland, grassland, urban areas. Scavenger.	NT <sup>1</sup> Protected (NEMBA)	NT <sup>2</sup>	<b>MEDIUM</b> , suitable habitat.
Spotted-necked otter	<i>Lutra maculicollis</i>	Permanent, unsilted and unpolluted rivers, streams and freshwater lakes, where sufficient numbers of its prey are present. Adequate riparian vegetation is essential to provide cover during periods of inactivity.	NT <sup>1</sup> Protected (NEMBA)	LC <sup>2</sup>	<b>LOW</b> , no suitable habitat.
Honey badger	<i>Mellivora capensis</i>	Savanna, shrubland, grassland, desert. Generalist predator, commensural with humans.	NT <sup>1</sup> Protected (NEMBA)	LC <sup>2</sup>	<b>MEDIUM</b> , suitable habitat.
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 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.	NT <sup>1,3</sup>	LC <sup>2</sup>	<b>LOW</b> , overall geographical distribution includes this area; but no suitable roosting habitat occurs on site
Geoffroy's horseshoe bat	<i>Rhinolophus clivosus</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.	NT <sup>1,3</sup>	LC <sup>2</sup>	<b>LOW</b> , overall geographical distribution includes this area;

		May form large colonies of up to several thousand individuals. Associated with a variety of habitats including arid savannah, woodland and riparian forest.			but no suitable roosting habitat occurs on site
White-tailed rat	<i>Mystromus albicaudatus</i>	Highveld and montane grassland, requires sandy soils with good cover. The species occurs in shrubland and grassland areas. A major requirement of the species is black loam with good vegetation cover. Found throughout South Africa. Low capture rate experienced during surveys suggest that numbers are extremely low.	EN <sup>1</sup>	EN <sup>2</sup>	<b>LOW</b> , substrate and habitat properties on site not considered to be suitable for this species

<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 30 January 2014.

<sup>3</sup>Status according to Monadjem et al. 2001.

## AMPHIBIANS

Common name	Species	Habitat	Status	Likelihood of occurrence
Giant Bullfrog	<i>Pyxicephalus adspersus</i>	Widely distributed in southern Africa, mainly at higher elevations. Inhabits a variety of vegetation types where it breeds in seasonal, shallow, grassy pans in flat, open areas; also utilises non-permanent vleis and shallow water on margins of waterholes and dams. Prefer sandy substrates although they sometimes inhabit clay soils.	NT <sup>1</sup> LC <sup>2</sup> Protected (NEMBA)	<b>LOW</b> , within known distribution range, but no suitable habitat occurs on site. Not previously recorded in grid.

<sup>1</sup>Status according to Du Preez & Carruthers 2009 and as reported on the website of The Virtual Museum of the Animal Demography Unit, University of Cape Town. (<http://vmus.adu.org.za>). Downloaded on 30 January 2014.

<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 30 January 2014.

## REPTILES

Common name	Species	Habitat	Status <sup>3</sup>	Likelihood of occurrence
Southern African Python	<i>Python sebaea natalensis</i>	Widespread in various habitats, but prefers rocky outcrops in arid and moist savannah as well as in lowland forest. Common in moist, rocky, well-wooded valeys. Frequently found in and around water.	VU <sup>1</sup> LC <sup>2</sup> Protected (NEMBA)	<b>LOW</b> , partially suitable habitat occurs on site. Not previously recorded in grid.

<sup>1</sup>Status according to Branch 1988.

<sup>2</sup>Status according to the South African Reptile Conservation Assessment as reported on the website of The Virtual Museum of the Animal Demography Unit, University of Cape Town. (<http://vmus.adu.org.za>). Downloaded on 30 January 2014.

## BIRDS

Common name	Species	Habitat	Status	Importance of site for species
Blue Crane	<i>Anthropoides paradisea</i>	Midland and highland grassveld, edge of karoo, cultivated land, edges of vleis. Roosts on ground	VU Protected	LOW, breeding, LOW, foraging

Common name	Species	Habitat	Status	Importance of site for species
		or in shallow water. Uncommon resident in study area. <i>Nest</i> : Scrape on bare ground or rock (klipplaat) in open grassveld, often in moist places; sometimes thinly lined or ringed with pebbles, sheep droppings or bits of plant material.	(NEMBA)	
Martial Eagle	<i>Polemaetus bellicosus</i>	The Martial Eagle is widespread but uncommon throughout South Africa and neighbouring countries. It tolerates a wide range of vegetation types, being found in open grassland, scrub, Karoo and woodland. It relies on large trees (and electricity pylons) to provide nest sites. It is found typically in flat country and is rarer in mountains and forests. One of the main reason it is declining is because of persecution on private land. This species has been recorded from the study area and many surrounding areas. Common resident in study area.	VU <sup>1</sup> VU <sup>2</sup> Protected (NEMBA)	LOW, breeding, MEDIUM, foraging
Tawny eagle	<i>Aquila rapax</i>	Lightly wooded savanna; absent from dense forests and highlands. Able to colonise Nama Karoo and treeless grasslands by br on pylons and alien trees. Uncommon resident in study area. Edge of known range.	VU <sup>1</sup> LC <sup>2</sup> Protected (NEMBA)	LOW, breeding, MEDIUM, foraging
Lanner Falcon	<i>Falco biarmicus</i>	Most frequent in open grassland, open or cleared woodland, and agricultural areas. Breeding pairs generally favour habitats where cliffs available as nest and roost sites, but will use alternative sites (eg trees, electricity pylons, buildings) if cliffs absent. Widespread species, occurring in Afrotropics, Middle East and western Palearctic. Occurs in mountains or open country from semidesert to woodland and agricultural land; also cities (Durban, Harare). Common resident in study area.	NT <sup>1</sup> LC <sup>2</sup>	LOW, breeding, MEDIUM, foraging
Greater Flamingo	<i>Phoenicopterus ruber</i>	Large bodies of shallow water, both inland and coastal; saline and brackish waters preferred. Common resident in study area.	NT	ZERO, breeding, ZERO, foraging
Lesser Flamingo	<i>Phoenicopterus minor</i>	Larger brackish or saline inland and coastal waters. Common resident in study area.	NT	ZERO, breeding, ZERO, foraging
African marsh harrier	<i>Circus ranivorus</i>	Almost exclusively inland and coastal wetlands.	VU <sup>1</sup> LC <sup>2</sup>	ZERO, breeding, ZERO, foraging
Black harrier	<i>Circus maurus</i>	Grassveld, karoo scrub, mountain fynbos, cultivated lands, subalpine vegetation, semidesert. Endemic to southern Africa. Uncommon non-breeding migrant in study area. Dry grassland, Karoo scrub and agricultural fields.	VU <sup>1</sup> VU <sup>2</sup>	ZERO, breeding, MEDIUM, foraging
Pallid harrier	<i>Circus macrourus</i>	Grasslands associated with open pans or flood plains; also croplands. Uncommon non-breeding migrant in study area.	NT <sup>1</sup> NT <sup>2</sup>	ZERO, breeding, MEDIUM, foraging
Lesser Kestrel	<i>Falco</i>	Open grassveld, mainly on highveld, usually near	VU <sup>1</sup>	ZERO, breeding,

Common name	Species	Habitat	Status	Importance of site for species
	<i>naumannii</i>	towns or farms. Common non-breeding migrant in study area.	LC <sup>2</sup>	HIGH, foraging
Half-collared Kingfisher	<i>Alcedo semitorquata</i>	Clear, fast-flowing perennial streams, rivers and estuaries, usually narrow and secluded, with dense marginal vegetation; often near rapids. Also well-vegetated lake shores and coastal lagoons.	NT <sup>1</sup> NT <sup>2</sup>	ZERO, breeding, ZERO, foraging
Melodious lark	<i>Mirafracheniana</i>	Grassland. Occasionally in planted pastures of Weeping Lovegrass and Teff Grass. Avoids wet lowlands, favouring fairly short grassland (< 0.5 m), with open spaces between tussocks, at 550-1 750 m altitude, with annual rainfall 400-800 mm. Uncommon resident in study area.	NT <sup>1</sup> NT <sup>2</sup>	LOW, breeding, LOW, foraging
Short-clawed Lark	<i>Certhilauda chuana</i>	Semi-arid Acacia savanna, sparsely vegetated with short grass and scattered low bushes. Avoids dense stands of bushes, tall trees, dense or tall grass and rocky ground. Uncommon resident in study area.	NT <sup>1</sup> NT <sup>2</sup>	LOW, breeding, LOW, foraging
African grass owl	<i>Tyto capensis</i>	Most common in areas with 700-800 mm annual rainfall <sup>40</sup> . Often in treeless areas associated with damp substrata, mainly marshes and vleis. Favours patches of tall, rank grass, sedges or weeds. Also areas with dense ground cover in scattered thorn scrub, low fynbos and renosterveld, usually close to water and among thick stands of grass ( <i>Stenotaphrum</i> sp) and sedge ( <i>Juncus</i> sp). Sometimes hunts at night in much drier and more open habitats near roost site. Uncommon resident in study area.	VU <sup>1</sup> LC <sup>2</sup>	ZERO, breeding, LOW, foraging
Great White Pelican	<i>Pelecanus onocrotalus</i>	Shallow lakes, flood plain pans, estuaries and dams; also sheltered coastal bays and lagoons <sup>54</sup> . Roosts on dry land in open areas, usually on islands or peninsulas where access by terrestrial predators limited.	NT <sup>1</sup> NT <sup>2</sup>	ZERO, breeding, ZERO, foraging
Pink-backed pelican	<i>Pelecanus rufescens</i>	Wide range of wetlands, incl lakes, dams and slow-flowing rivers, saline pools, lagoons, estuaries and sheltered bays; rarely on open sea in s Africa, but sometimes forages close to shore at low tide in s Mozambique. Uncommon resident in study area.	VU <sup>1</sup> LC <sup>2</sup>	ZERO, breeding, ZERO, foraging
Chestnut-banded plover	<i>Charadrius pallidus</i>	Largest concentrations in natural coastal embayments in Namibia (Sandwich Harbour, Walvis Bay). Elsewhere, mainly in natural and man-made saltpans. Less often in coastal lagoons, shallow bays and estuaries; rarely in freshwater habitats. Uncommon resident in study area.	NT <sup>1</sup> NT <sup>2</sup>	ZERO, breeding, ZERO, foraging
Black-winged pratincole	<i>Glareola nordmanni</i>	Breeds mainly on alkaline flats and saltpans in river valleys and lake depressions, also on fields and fallow lands devoid of vegetation. Large colonies always near water and damp meadows	NT <sup>1</sup> NT <sup>2</sup>	ZERO, breeding, LOW, foraging



Common name	Species	Habitat	Status	Importance of site for species
		or marshes overgrown with dense grass; access to drinking water important. In winter quarters, prefers open grassland, edges of pans and cultivated fields, but most common in seasonally wet grasslands and pan systems. Attracted to damp ground after rains, also to agricultural activities, incl mowing and ploughing, and to newly flooded grasslands. Common non-breeding migrant in study area.		
Secretarybird	<i>Sagittarius serpentarius</i>	Widespread across South Africa, occurring in savanna and open grassland from coastal regions to high altitudes, but avoids thick bush and forest. Sensitive to disturbance and high human population numbers - higher numbers usually found in conservation areas. Common resident in study area.	NT <sup>1</sup> VU <sup>2</sup>	LOW, breeding, MEDIUM, foraging
Greater painted snipe	<i>Rostratula benghalensis</i>	Dams, pans and marshy river flood plains. Favours waterside habitats with substantial cover and receding water levels with exposed mud among vegetation, departing when water recedes beyond fringes of vegetation <sup>43</sup> . Rare in seasonally flooded grassland and palm savanna in Ovamboland, Namibia <sup>6</sup> . Uncommon resident in study area.	NT <sup>1</sup> LC <sup>2</sup>	ZERO, breeding, ZERO, foraging
Black Stork	<i>Ciconia nigra</i>	Feeds in or around marshes, dams, rivers and estuaries; breeds in mountainous regions. Common resident in study area.	NT <sup>1</sup> LC <sup>2</sup> Protected (NEMBA)	ZERO, breeding, LOW, foraging
Marabou stork	<i>Leptoptilos crumeniferus</i>	Both aquatic and terrestrial habitats, favouring open and semi-arid areas; largely absent from forest areas and true desert. Common at wetlands, incl dams, pans and rivers, and in wildlife reserves and ranching areas. Uncommon resident in study area.	NT <sup>1</sup> LC <sup>2</sup>	ZERO, breeding, LOW, foraging
Yellow-billed Stork	<i>Mycteria ibis</i>	Mainly inland waters; rivers, dams, pans, floodplains, marshes; less often estuaries. Uncommon non-breeding migrant in study area.	NT <sup>1</sup> LC <sup>2</sup>	ZERO, breeding, ZERO, foraging
Caspian tern	<i>Hydroprogne caspia</i>	Along coast, mostly in sheltered bays and estuaries. Inland, at large water bodies, both natural and man-made, with preference for saline pans and large impoundments. Coastal br habitat primarily offshore islands, but with increasing use of sandy beaches and islands in saltworks, where protection offered. Inland, breeds on small, low islets in pans and dams. Uncommon resident in study area.	NT <sup>1</sup> LC <sup>2</sup>	ZERO, breeding, ZERO, foraging
Cape vulture	<i>Gyps coprotheres</i>	Wide range of habitats up to ca 3 000 m; closely linked to subsistence communal-grazing areas, where stock losses high. Uncommon resident in study area. Nests on cliff ledges.	VU <sup>1</sup> VU <sup>2</sup>	ZERO, breeding, LOW, foraging
Egyptian	<i>Neophron</i>	Dry open habitats, incl plains and semi-desert,	RE <sup>1</sup>	ZERO, breeding,

Common name	Species	Habitat	Status	Importance of site for species
Vulture	<i>percnopterus</i>	occasionally on the seashore. Rare and vagrant in the study area.	EN <sup>2</sup>	LOW, foraging
Lappet-faced Vulture	<i>Torgos tracheliotus</i>	Open woodland in arid- and semi-arid regions, incl Acacia spp, Shepherds-tree Boscia albitrunca, Purple-pod Cluster-leaf Terminalia prunioides and Mopane Colophospermum mopane. Common resident in study area.	VU <sup>1</sup> VU <sup>2</sup>	ZERO, breeding, LOW, foraging
White-backed Vulture	<i>Gyps africanus</i>	Lightly wooded arid savanna, incl Mopane Colophospermum mopane woodland; absent from forests, true deserts, and treeless grassland and shrubland of s and c Karoo. Uncommon resident in study area.	VU <sup>1</sup> EN <sup>2</sup>	ZERO, breeding, LOW, foraging

<sup>1</sup>Status according to Barnes 2000.

<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 3 December 2013.

## Appendix 4: 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 National Environmental Management: Biodiversity Act of 2004 (Act 10 of 2000) marked with "N"

### Mammals:

Red hartebeest  
Springbok  
<sup>N</sup>White rhinoceros  
<sup>N</sup>Black wildebeest  
Blue wildebeest  
Blesbok  
<sup>N</sup>Black rhinoceros  
Plains zebra  
Klipspringer  
Gemsbok  
Warthog  
Steenbok  
Common duiker  
Eland  
Kudu  
Rock hyrax  
<sup>N</sup>Cape clawless otter  
Water mongoose  
Black-backed jackal  
Caracal  
Yellow mongoose  
<sup>N</sup>Black-footed cat  
African wild cat  
Slender mongoose  
Small-spotted genet  
Large-spotted genet  
<sup>N</sup>Brown hyaena  
White-tailed mongoose  
Striped polecat  
<sup>N</sup>Spotted-necked otter  
<sup>N</sup>Honey badger  
Banded mongoose  
Bat-eared fox  
Leopard  
African weasel  
Aardwolf  
Suricate  
<sup>N</sup>Cape fox  
**Natal long-fingered bat**  
Cape serotine bat  
Egyptian slit-faced bat  
Rusty bat  
**Geoffroy's horseshoe bat**  
Darling's horseshoe bat  
Flat-headed free-tail bat  
Yellow house bat  
Egyptian free-tailed bat

<sup>N</sup>South African hedgehog  
Reddish-grey musk shrew  
Tiny musk shrew  
Lesser red musk shrew  
Swamp musk shrew  
Lesser grey-brown musk shrew  
Cape hare  
Scrub hare  
Jameson's red rock rabbit  
Vervet monkey  
Southern lesser galago  
Chacma baboon  
Red veld rat  
Tete veld rat  
Namaqua rock mouse  
Common mole-rat  
Grey climbing mouse  
Short-tailed gerbil  
Woodland dormouse  
Porcupine  
Single-striped mouse  
Large-eared mouse  
Multimammate mouse  
Desert pygmy mouse  
**White-tailed rat**  
Angoni vlei rat  
Vlei rat  
Tree squirrel  
Springhare  
Striped mouse  
Pouched mouse  
Kreb's fat mouse  
Highveld gerbil  
Bushveld gerbil  
Tree rat  
Greater cane rat  
Cape ground squirrel  
Rock elephant shrew  
Aardvark

### Reptiles:

Puff adder  
Rhombic night adder  
Cape cobra  
Snouted cobra  
Mozambique spitting cobra  
Rinkhals  
Boomslang

Vine snake  
 Southern stiletto snake  
 Short-snouted whip snake  
 Kalahari sand snake  
 Western stripe-bellied sand snake  
 Crossed whip snake  
 Spotted skaapsteker  
 Striped skaapsteker  
 Common tiger snake  
 Herald snake  
 Black-headed centipede eater  
 Bicoloured quill-snouted snake  
<sup>N</sup>Southern African python  
 Brown house snake  
 Aurora house snake  
 Common brown water snake  
 Mole snake  
 Two-striped shovel-snout  
 Spotted bush snake  
 Green water snake  
 Western natal green snake  
 Common slug-eater  
 Common wolf snake  
 Southern file snake  
 Common egg-eater  
 Delalande's beaked blind snake  
 Bibron's blind snake  
 Peter's worm snake  
 Incognito worm snake  
 Distant's ground agama  
 Southern rock agama  
 Southern tree agama  
 Common flap-necked chameleon  
 Rock monitor  
 Water monitor  
 Holub's sandveld lizard  
 Spotted sandveld lizard  
 Spotted sand lizard  
 Common rough-scaled lizard  
 Cape worm lizard  
 Dusky worm lizard  
 Thin-tailed legless skink  
 Cape skink  
 Speckled rock skink  
 Variable skink  
 Jone's girdled lizard  
 Common girdled lizard  
 Yellow-throated plated lizard  
 Black-spotted dwarf gecko  
 Common dwarf gecko  
 Cape gecko  
 Marsh terrapin  
 Lobatse hinged tortoise  
 Serrated / Kalahari tent tortoise  
 Leopard tortoise

## Amphibians

Bushveld rain frog  
 Eastern olive toad  
 Guttural toad  
 Western olive toad  
 Raucous toad  
 Northern pygmy toad  
 Red toad  
 Bubbling kassina  
 Banded rubber frog  
 Snoring puddle frog  
 Common platanna  
 Boettger's caco  
 Common river frog  
<sup>N</sup>Giant bullfrog  
 Tremolo sand frog  
 Natal sand frog  
 Tandy's sand frog

## Birds

Apalis Bar-throated  
 Avocet Pied  
 Babbler Arrow-marked  
 Babbler Southern Pied  
 Barbet Acacia Pied  
 Barbet Black-collared  
 Barbet Crested  
 Batis Chinspot  
 Batis Pririt  
 Bee-eater Blue-cheeked  
 Bee-eater European  
 Bee-eater Little  
 Bee-eater Swallow-tailed  
 Bee-eater White-fronted  
 Bishop Southern Red  
 Bishop Yellow-crowned  
 Bittern Dwarf  
 Bittern Little  
 Bokmakierie Bokmakierie  
 Boubou Southern  
 Brubru  
 Buffalo-Weaver Red-billed  
 Bulbul African Red-eyed  
 Bulbul Dark-capped  
 Bunting Cape  
 Bunting Cinnamon-breasted  
 Bunting Golden-breasted  
 Bunting Lark-like  
 Bush-Shrike Grey-headed  
 Buttonquail Kurrichane  
 Buzzard European Honey-  
 Buzzard Jackal  
 Buzzard Steppe  
 Camaroptera Grey-backed  
 Canary Black-throated  
 Canary Yellow

Canary Yellow-fronted  
 Chat Ant-eating  
 Chat Familiar  
 Chat Mocking Cliff-  
 Cisticola Cloud  
 Cisticola Desert  
 Cisticola Lazy  
 Cisticola Levaillant's  
 Cisticola Rattling  
 Cisticola Tinkling  
 Cisticola Wing-snapping  
 Cisticola Zitting  
 Coot Red-knobbed  
 Cormorant Reed  
 Cormorant White-breasted  
 Coucal Burchell's  
 Courser Double-banded  
 Courser Temminck's  
 Crake African  
 Crake Baillon's  
 Crake Black  
 Crake Spotted  
<sup>N</sup>Crane Blue VU  
 Crombec Long-billed  
 Crow Cape  
 Crow Pied  
 Cuckoo African  
 Cuckoo Black  
 Cuckoo Common  
 Cuckoo Diderick  
 Cuckoo Great Spotted  
 Cuckoo Jacobin  
 Cuckoo Klaas's  
 Cuckoo Levaillant's  
 Cuckoo Red-chested  
 Cuckooshrike Black  
 Darter African  
 Dove Cape Turtle-  
 Dove Emerald-spotted Wood-  
 Dove Laughing  
 Dove Namaqua  
 Dove Red-eyed  
 Dove Rock  
 Drongo Fork-tailed  
 Duck African Black  
 Duck Comb  
 Duck Fulvous  
 Duck Maccoa  
 Duck White-backed  
 Duck White-faced  
 Duck Yellow-billed  
 Eagle African Fish-  
 Eagle African Hawk-  
 Eagle Black-chested Snake-  
 Eagle Booted  
 Eagle Brown Snake-  
<sup>N</sup>Eagle Martial VU

<sup>N</sup>Eagle Tawny VU  
 Eagle Wahlberg's  
 Egret Cattle  
 Egret Great  
 Egret Little  
 Egret Yellow-billed  
 Eremomela Burnt-necked  
 Eremomela Yellow-bellied  
 Falcon Amur  
 Falcon Lanner NT  
 Falcon Red-footed  
 Finch Cuckoo  
 Finch Cut-throat  
 Finch Red-headed  
 Finch Scaly-feathered  
 Firefinch Jameson's  
 Firefinch Red-billed  
 Fiscal Common  
 Flamingo Greater NT  
 Flamingo Lesser NT  
 Flufftail Red-chested  
 Flycatcher African Paradise-  
 Flycatcher Chat  
 Flycatcher Fairy  
 Flycatcher Fiscal  
 Flycatcher Marico  
 Flycatcher Southern Black  
 Flycatcher Spotted  
 Francolin Coqui  
 Francolin Crested  
 Francolin Orange River  
 Go-away-bird Grey  
 Goose Egyptian  
 Goose Spur-winged  
 Goshawk Gabar  
 Goshawk Southern Pale Chanting-  
 Grebe Black-necked  
 Grebe Great Crested  
 Grebe Little  
 Greenshank Common  
 Guineafowl Helmeted  
 Gull Grey-headed  
 Hamerkop  
<sup>N</sup>Harrier African Marsh- VU  
 Harrier Black VU  
 Harrier Montagu's  
 Harrier Pallid NT  
 Hawk African Harrier-  
 Heron Black  
 Heron Black-crowned Night-  
 Heron Black-headed  
 Heron Goliath  
 Heron Green-backed  
 Heron Grey  
 Heron Purple  
 Heron Squacco  
 Hobby Eurasian

Honeyguide Greater  
 Honeyguide Lesser  
 Hoopoe African  
 Hornbill African Grey  
 Hornbill Southern Yellow-billed  
 Ibis African Sacred  
 Ibis Glossy  
 Ibis Hadedda  
 Indigobird Purple  
 Indigobird Village  
 Jacana African  
 Kestrel Greater  
<sup>N</sup>Kestrel Lesser VU  
 Kestrel Rock  
 Kingfisher Brown-hooded  
 Kingfisher Giant  
 Kingfisher Half-collared NT  
 Kingfisher Malachite  
 Kingfisher Pied  
 Kingfisher Striped  
 Kingfisher Woodland  
 Kite Black  
 Kite Black-shouldered  
 Kite Yellow-billed  
 Korhaan Northern Black  
 Korhaan Red-crested  
 Lapwing African Wattled  
 Lapwing Blacksmith  
 Lapwing Crowned  
 Lark Eastern Clapper  
 Lark Eastern Long-billed  
 Lark Fawn-coloured  
 Lark Melodious NT  
 Lark Monotonous  
 Lark Pink-billed  
 Lark Red-capped  
 Lark Rufous-naped  
 Lark Sabota  
 Lark Short-clawed NT  
 Lark Spike-heeled  
 Longclaw Cape  
 Mannikin Bronze  
 Martin Banded  
 Martin Brown-throated  
 Martin Common House-  
 Martin Rock  
 Martin Sand  
 Moorhen Common  
 Mousebird Red-faced  
 Mousebird Speckled  
 Mousebird White-backed  
 Myna Common  
 Neddicky  
 Nightjar European  
 Nightjar Fiery-necked  
 Nightjar Freckled  
 Nightjar Rufous-cheeked

Oriole Black-headed  
 Oriole Eurasian Golden  
 Osprey  
 Ostrich Common  
<sup>N</sup>Owl African Grass VU  
 Owl African Scops  
 Owl Barn  
 Owl Marsh  
 Owl Southern White-faced Scops-  
 Owl Spotted Eagle-  
 Owl Verreaux's Eagle-  
 Owlet Pearl-spotted  
 Pelican Great White NT  
<sup>N</sup>Pelican Pink-backed VU  
 Petronia Yellow-throated  
 Pigeon African Green-  
 Pigeon African Olive-  
 Pigeon Speckled  
 Pipit African  
 Pipit Buffy  
 Pipit Bushveld  
 Pipit Long-billed  
 Pipit Plain-backed  
 Pipit Striped  
 Plover Caspian  
 Plover Chestnut-banded NT  
 Plover Common Ringed  
 Plover Kittlitz's  
 Plover Three-banded  
 Plover White-fronted  
 Pochard Southern  
 Pratincole Black-winged NT  
 Prinia Black-chested  
 Prinia Tawny-flanked  
 Puffback Black-backed  
 Pytilia Green-winged  
 Quail Common  
 Quail Harlequin  
 Quailfinch African  
 Quelea Red-billed  
 Rail African  
 Robin Kalahari Scrub-  
 Robin White-browed Scrub-  
 Robin-Chat Cape  
 Robin-Chat White-throated  
 Roller European  
 Roller Lilac-breasted  
 Roller Purple  
 Ruff  
 Sandgrouse Namaqua  
 Sandpiper Common  
 Sandpiper Curlew  
 Sandpiper Marsh  
 Sandpiper Wood  
 Scimitarbill Common  
 Secretarybird NT  
 Seedeater Streaky-headed

Shelduck South African  
 Shikra  
 Shoveler Cape  
 Shrike Crimson-breasted  
 Shrike Lesser Grey  
 Shrike Magpie  
 Shrike Red-backed  
 Shrike Southern White-crowned  
 Shrike White-crested Helmet-  
 Snipe African  
**Snipe Greater Painted-NT**  
 Sparrow Cape  
 Sparrow Great  
 Sparrow House  
 Sparrow Southern Grey-headed  
 Sparrowhawk Black  
 Sparrowhawk Little  
 Sparrowhawk Ovambo  
 Sparrowlark Chestnut-backed  
 Sparrowlark Grey-backed  
 Spoonbill African  
 Spurfowl Natal  
 Spurfowl Swainson's  
 Starling Burchell's  
 Starling Cape Glossy  
 Starling Pied  
 Starling Red-winged  
 Starling Violet-backed  
 Starling Wattled  
 Stilt Black-winged  
 Stint Little  
 Stonechat African  
 Stork Abdim's  
<sup>N</sup>**Stork Black NT**  
**Stork Marabou NT**  
 Stork White  
**Stork Yellow-billed NT**  
 Sunbird Amethyst  
 Sunbird Marico  
 Sunbird White-bellied  
 Swallow Barn  
 Swallow Greater Striped  
 Swallow Lesser Striped  
 Swallow Pearl-breasted  
 Swallow Red-breasted  
 Swallow South African Cliff-  
 Swallow White-throated  
 Swamphen African Purple  
 Swift African Black  
 Swift African Palm-  
 Swift Alpine  
 Swift Common  
 Swift Horus  
 Swift Little  
 Swift White-rumped  
 Tchagra Black-crowned  
 Tchagra Brown-crowned

Teal Cape  
 Teal Hottentot  
 Teal Red-billed  
**Tern Caspian NT**  
 Tern Whiskered  
 Tern White-winged  
 Thick-knee Spotted  
 Thrush Groundscraper  
 Thrush Karoo  
 Thrush Kurrichane  
 Thrush Short-toed Rock-  
 Tinkerbird Yellow-fronted  
 Tit Ashy  
 Tit Cape Penduline-  
 Tit Southern Black  
 Tit-Babbler Chestnut-vented  
<sup>N</sup>**Vulture Cape VU**  
<sup>N</sup>**Vulture Egyptian RE**  
<sup>N</sup>**Vulture Lappet-faced VU**  
 Vulture Palm-nut  
**Vulture White-backed VU**  
 Wagtail African Pied  
 Wagtail Cape  
 Wagtail Yellow  
 Warbler African Reed-  
 Warbler Garden  
 Warbler Great Reed-  
 Warbler Icterine  
 Warbler Little Rush-  
 Warbler Marsh  
 Warbler Rufous-eared  
 Warbler Sedge  
 Warbler Willow  
 Waxbill Black-faced  
 Waxbill Blue  
 Waxbill Common  
 Waxbill Orange-breasted  
 Waxbill Sweet  
 Waxbill Violet-eared  
 Weaver Cape  
 Weaver Sociable  
 Weaver Southern Masked-  
 Weaver Village  
 Weaver White-browed Sparrow-  
 Wheatear Capped  
 Wheatear Mountain  
 White-eye Cape  
 Whitethroat Common  
 Whydah Long-tailed Paradise-  
 Whydah Pin-tailed  
 Whydah Shaft-tailed  
 Widowbird Long-tailed  
 Widowbird Red-collared  
 Widowbird White-winged  
 Wood-Hoopoe Green  
 Woodpecker Bearded  
 Woodpecker Bennett's

Woodpecker Cardinal  
Woodpecker Golden-tailed

Wren-Warbler Barred



**Appendix 5: Flora and vertebrate animal species protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)**

(as updated in R. 1187, 14 December 2007)

**CRITICALLY ENDANGERED SPECIES**

**Flora**

Adenium swazicum  
Aloe pillansii  
Diaphanthe millarii  
Dioscorea ebutsniorum  
Encephalartos aemulans  
Encephalartos brevifoliolatus  
Encephalartos cerinus  
Encephalartos dolomiticus  
Encephalartos heenanii  
Encephalartos hirsutus  
Encephalartos inopinus  
Encephalartos latifrons  
Encephalartos middelburgensis  
Encephalartos nubimontanus  
Encephalartos woodii

**Reptilia**

Loggerhead sea turtle  
Leatherback sea turtle  
Hawksbill sea turtle

**Aves**

Wattled crane  
Blue swallow  
Egyptian vulture  
Cape parrot

**Mammalia**

Riverine rabbit  
Rough-haired golden mole

**ENDANGERED SPECIES**

**Flora**

Angraecum africae  
Encephalartos arenarius  
Encephalartos cupidus  
Encephalartos horridus  
Encephalartos laevifolius  
Encephalartos lebomboensis  
Encephalartos msinganus  
Jubaeopsis caffra  
Siphonochilus aethiopicus  
Warburgia salutaris  
Newtonia hilderbrandi

**Reptilia**

Green turtle  
Giant girdled lizard  
Olive ridley turtle  
Geometric tortoise

**Aves**

Blue crane  
Grey crowned crane  
Saddle-billed stork  
Bearded vulture  
White-backed vulture  
Cape vulture  
Hooded vulture  
Pink-backed pelican  
Pel's fishing owl  
Lappet-faced vulture

**Mammalia**

Robust golden mole  
Tsessebe  
Black rhinoceros  
Mountain zebra  
African wild dog  
Gunning's golden mole  
Oribi  
Red squirrel  
Four-toed elephant-shrew

**VULNERABLE SPECIES**

**Flora**

Aloe albida  
Encephalartos cycadifolius  
Encephalartos Eugene-maraisii  
Encephalartos ngovanus  
Merwillia plumbea  
Zantedeschia jucunda

**Aves**

White-headed vulture  
Tawny eagle  
Kori bustard  
Black stork  
Southern banded snake eagle  
Blue korhaan  
Taita falcon  
Lesser kestrel  
Peregrine falcon  
Bald ibis

Ludwig's bustard  
Martial eagle  
Bataleur  
Grass owl

### **Mammalia**

Cheetah  
Samango monkey  
Giant golden mole  
Giant rat  
Bontebok  
Tree hyrax  
Roan antelope  
Pangolin  
Juliana's golden mole  
Suni  
Large-eared free-tailed bat  
Lion  
Leopard  
Blue duiker

### **PROTECTED SPECIES**

#### **Flora**

Adenia wilmsii  
Aloe simii  
Clivia mirabilis  
Disa macrostachya  
Disa nubigena  
Disa physodes  
Disa procera  
Disa sabulosa  
Encephelartos altensteinii  
Encephelartos caffer  
Encephelartos dyerianus  
Encephelartos frederici-guilielmi  
Encephelartos ghellinckii  
Encephelartos humilis  
Encephelartos lanatus  
Encephelartos lehmannii  
Encephelartos longifolius  
Encephelartos natalensis  
Encephelartos paucidentatus  
Encephelartos princeps  
Encephelartos senticosus  
Encephelartos transvenosus  
Encephelartos trispinosus  
Encephelartos umbeluziensis  
Encephelartos villosus  
Euphorbia clivicola  
Euphorbia meloformis  
Euphorbia obesa  
Harpagophytum procumbens

Harpagophytum zeyherii  
Hoodia gordonii  
Hoodia currorii  
Protea odorata  
Stangeria eriopus

### **Amphibia**

Giant bullfrog  
African bullfrog

### **Reptilia**

Gaboon adder  
Namaqua dwarf adder  
Smith's dwarf chameleon  
Armadillo girdled lizard  
Nile crocodile  
African rock python

### **Aves**

Southern ground hornbill  
African marsh harrier  
Denham's bustard  
Jackass penguin

### **Mammalia**

Cape clawless otter  
South African hedgehog  
White rhinoceros  
Black wildebeest  
Spotted hyaena  
Black-footed cat  
Brown hyaena  
Serval  
African elephant  
Spotted-necked otter  
Honey badger  
Sharpe's grysbok  
Reedbuck  
Cape fox