

# Terrestrial Animal Biodiversity Assessment

prepared in accordance with the  
*"Protocol for the Specialist Assessment and minimum report content requirements for  
environmental impacts on Terrestrial Animal Species"*

Green Hydrogen and Ammonia Facility  
near Hendrina in Mpumalanga Province



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## Hendrina Green Hydrogen and Ammonia Facility near Hendrina in Mpumalanga Province

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For: ENERTRAG South Africa

16 September 2022

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# SPECIALIST DETAILS & DECLARATION

This report has been prepared in accordance with the "Protocol for the specialist assessment and minimum report content requirements for environmental impacts on **terrestrial animal species**", as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), published in GN. No. 320 dated 20 March 2020. It has been prepared independently of influence or prejudice by any parties.

The details of Specialists are as follows:

Table 1: Details of Specialist

Specialist	Qualification and accreditation
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## Details of Author:

Dr David Hoare

PhD (Botany) – Nelson Mandela Metropolitan University, Port Elizabeth

## Main areas of specialisation

- Vegetation and general ecology (grasslands, savanna, Albany thicket, fynbos, coastal systems, wetlands).
- Plant biodiversity and threatened plant species specialist.
- Alien plant identification and control / management plans.
- Remote sensing, analysis and mapping of vegetation.
- Specialist consultant for environmental management projects.

Professional Natural Scientist, South African Council for Natural Scientific Professions, Reg. no. 400221/05 (Ecology, Botany)

Member, International Association of Vegetation Scientists (IAVS)

Member, Ecological Society of America (ESA)

Member, International Association for Impact Assessment (IAIA)

Member, Herpetological Association of Africa (HAA)

## Employment history

- 1 December 2004 – present, Director, David Hoare Consulting (Pty) Ltd. Consultant, specialist consultant contracted to various companies and organisations.
- 1 January 2009 – 30 June 2009, Lecturer, University of Pretoria, Botany Dept.
- 1 January 2013 – 30 June 2013, Lecturer, University of Pretoria, Botany Dept.
- 1 February 1998 – 30 November 2004, Researcher, Agricultural Research Council, Range and Forage Institute, Private Bag X05, Lynne East, 0039. Duties: project management, general vegetation ecology, remote sensing image processing.

## Declaration of independence:

David Hoare Consulting (Pty) Ltd in an independent consultant and hereby declares that it does not have any financial or other vested interest in the undertaking of the proposed activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998). In addition, remuneration for services provided by David Hoare Consulting (Pty) Ltd is not subjected to or based on approval of the proposed project by the relevant authorities responsible for authorising this proposed project.

## Disclosure:

David Hoare Consulting (Pty) Ltd undertakes to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) and will provide the competent authority with access to all information at its disposal regarding the application, whether such information is favourable to the applicant or not.

Based on information provided to David Hoare Consulting (Pty) Ltd by the client and in addition to information obtained during the course of this study, David Hoare Consulting (Pty) Ltd presents the results and conclusion within the associated document to the best of the author's professional judgement and in accordance with best practise.



Dr David Hoare

Date

16 September 2022

# TERMS OF REFERENCE

The specialist study is required to follow the published Protocols, provided in full below for the assessment of impacts on Terrestrial Biodiversity. Note that the Protocols require determination of the level of sensitivity, which then determines the level of assessment required, either a full assessment, or a Compliance Statement.

## PROTOCOL FOR THE SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR ENVIRONMENTAL IMPACTS ON TERRESTRIAL ANIMAL SPECIES

This site sensitivity assessment follows the requirements of The Environmental Impact Assessment Regulations, as promulgated in terms of Section 24 (5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), published in GN. No. 320 dated 20 March 2020.

### General information

1.1 An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of “**very high**” or “**high**” sensitivity for terrestrial animal species, must submit a **Terrestrial Animal Species Specialist Assessment Report**.

1.2 An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of “**medium sensitivity**” for terrestrial animal species, must submit either a **Terrestrial Animal Species Specialist Assessment Report** or a **Terrestrial Animal Species Compliance Statement**, depending on the outcome of a site inspection undertaken in accordance with paragraph 4.

1.3 An applicant intending to undertake an activity identified in the scope of this protocol, on a site identified by the screening tool as being of “**low**” sensitivity for terrestrial animal species, must submit a **Terrestrial Animal Species Compliance Statement**.

1.4 Where the information gathered from the site sensitivity verification differs from the screening tool designation of “very high” or “high” for terrestrial animal species sensitivity on the screening tool, and it is found to be of a “low” sensitivity, then a **Terrestrial Animal Species Compliance Statement** must be submitted.

1.5 Where the information gathered from the site sensitivity verification differs from the screening tool designation of “low” terrestrial animal species sensitivity and it is found to be of a “very high” or “high” terrestrial animal species sensitivity, a **Terrestrial Animal Species Specialist Assessment** must be conducted.

1.6 If any part of the development falls within an area of confirmed “very high” or “high” sensitivity, the assessment and reporting requirements prescribed for the “very high” or “high” sensitivity, apply to the entire development footprint. Development footprint in the context of this protocol, means the area on which the proposed development will take place and includes the area that will be disturbed or impacted.

1.7 The **Terrestrial Animal Species Specialist Assessment** and the **Terrestrial Animal Species Compliance Statement** must be undertaken within the study area.

1.8 Where the nature of the activity is not expected to have an impact on species of conservation concern (SCC) beyond the boundary of the preferred site, the study area means the proposed development footprint within the preferred site.

1.9 Where the nature of the activity is expected to have an impact on SCC beyond boundary of the preferred site, the project areas of influence (PAOI) must be determined by the specialist in accordance with Species Environmental Assessment Guideline, and the study area must include the PAOI, as determined.

## **Terrestrial Animal Species Specialist Assessment**

2.1 The assessment must be undertaken by a specialist registered with the South African Council for Natural Scientific Professions (SACNASP), within a field of practice relevant to the taxonomic groups (“taxa”) for which the assessment is being undertaken.

2.2 The assessment must be undertaken in accordance with the Species Environmental Assessment Guideline and must:

2.2.1 Identify the SCC which were found, observed or are likely to occur within the study area;

2.2.2 provide evidence (photographs) of each SCC found or observed within the study area, which must be disseminated by the specialist to a recognized online database facility immediately after the site inspection has been performed (prior to preparing the report contemplated in paragraph 3);

2.2.3 identify the distribution, location, viability and detailed description of population size of the SCC identified within the study area;

2.2.4 identify the nature and the extent of the potential impact of the proposed development to the population of the SCC located within the study area;

2.2.5 determine the importance of the conservation of the population of the SCC identified within the study area, based on information available in national and international databases including the IUCN Red List of Threatened Species, South African Red List of Species, and/or other relevant databases;

2.2.6 determine the potential impact of the proposed development on the habitat of the SCC located within the study area;

2.2.7 include a review of relevant literature on the population size of the SCC, the conservation interventions as well as any national or provincial species management plans for the SCC. This review must provide information on the need to conserve the SCC and indicate whether the development is compliant with the applicable species management plans and if not, a motivation for the deviation;

2.2.8 identify any dynamic ecological processes occurring within the broader landscape, that might be disrupted by the development and result in negative impact on the identified SCC, for example, fires in fire-prone systems;

2.2.9 identify any potential impact on ecological connectivity in relation to the broader landscape, resulting in impacts on the identified SCC and its long term viability;

2.2.10 determine buffer distances as per the Species Environmental Assessment Guidelines used for the population of each SCC;

2.2.11 discuss the presence or likelihood of additional SCC including threatened species not identified by the screening tool, Data Deficient or Near Threatened Species, as well as any undescribed species, or roosting and breeding or foraging areas used by migratory species where these species show significant congregations, occurring in the vicinity; and

2.2.12 identify any alternative development footprints within the preferred development site which would be of “low” or “medium” sensitivity as identified by the screening tool and verified through the site sensitivity verification.

2.3 The findings of the assessment must be written up in a **Terrestrial Animal Species Specialist Assessment Report**.

## **Terrestrial Animal Species Specialist Assessment Report**

3.1 This report must include as a minimum the following information:



3.1.1 contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the assessment including a curriculum vitae;

3.1.2 a signed statement of independence by the specialist;

3.1.3 a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;

3.1.4 a description of the methodology used to undertake the site sensitivity verification and impact assessment and site inspection, including equipment and modelling used where relevant;

3.1.5 a description of the mean density of observations/number of samples sites per unit area of site inspection observations;

3.1.6 a description of the assumptions made and any uncertainties or gaps in knowledge or data;

3.1.7 details of all SCC found or suspected to occur on site, ensuring sensitive species are appropriately reported;

3.1.8 the online database name, hyperlink and record accession numbers for disseminated evidence of SCC found within the study area;

3.1.9 the location of areas not suitable for development and to be avoided during construction where relevant;

3.1.10 a discussion on the cumulative impacts;

3.1.11 impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);

3.1.12 a reasoned opinion, based on the findings of the specialist assessment, regarding the acceptability or not, of the development related to the specific theme considered, and if the development should receive approval or not, related to the specific theme being considered, and any conditions to which the opinion is subjected if relevant; and

3.1.13 a motivation must be provided if there were any development footprints identified as per paragraph 2.2.12 above that were identified as having “low” or “medium” terrestrial animal species sensitivity and were not considered appropriate.

3.2 A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.

## **Terrestrial Animal Species Compliance Statement**

5.1 The compliance statement must be prepared by a SACNASP registered specialist under one of the two fields of practice (Zoological Science or Ecological Science).

5.2 The compliance statement must:

5.2.1 be applicable within the study area;

5.2.2 confirm that the study area is of “low” sensitivity for terrestrial animal species; and

5.2.3 indicate whether or not the proposed development will have any impact on SCC.

5.3 The compliance statement must contain, as a minimum, the following information:

5.3.1 contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the compliance statement including a curriculum vitae;

5.3.2 a signed statement of independence by the specialist;

5.3.3 a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;

5.3.4 a description of the methodology used to undertake the site survey and prepare the compliance statement, including equipment and modelling used where relevant;

5.3.5 the mean density of observations/ number of samples sites per unit area;

5.3.6 where required, proposed impact management actions and outcomes or any monitoring requirements for inclusion in the EMPr;

5.3.7 a description of the assumptions made and any uncertainties or gaps in knowledge or data;

5.3.8 any conditions to which the compliance statement is subjected.

A signed copy of the Terrestrial Animal Species Compliance Statement must be appended to the Basic Assessment Report or the Environmental Impact Assessment Report.

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# INTRODUCTION

## Project Background

ENERTRAG South Africa (hereafter “ENERTRAG SA”) is a subsidiary of the German-based ENERTRAG AG, a hydrogen and renewable energy developer founded in 1992. ENERTRAG AG has an established track-record of renewable energy projects around the world, comprising over 100 wind turbines with an installed capacity of over 760MW, and over 500 employees. Current Projects are in Germany, United Kingdom, France, Poland, Bulgaria and Belarus.

ENERTRAG SA was established in 2017, with the intention to investigate and develop renewable energy projects in South Africa. The transition from coal-based energy supply to renewables in the Country is inevitable, as coal resources are depleted, coal-based power stations reach the end of their economic life and considering international obligations and commitments to reduced emissions. The Project development area is blanketed with numerous coal prospecting and mining rights. Coal mining and energy derived from coal mining is the likely alternative to the Project. ENERTRAG SA are developing renewable energy projects to contribute to the Just Transition that promises to decarbonise South Africa's energy sector and aims to:

- replace coal-based electricity with renewable electricity
- decarbonise different sectors of the economy through the replacement of fossil-based hydrogen and ammonia with green hydrogen and ammonia.

ENERTRAG SA proposes to develop the Hendrina Renewable Energy Complex, the complex comprises of five separate projects. The projects are:

- Hendrina North Wind Energy Facility (up to 200MW) over 3600ha;
- Hendrina South Wind Energy Facility (up to 200MW) over 2900ha;
- Hendrina North Grid Infrastructure (up to 275kV) – 15km;
- Hendrina South Grid Infrastructure (up to 275kV) – 16km;
- **Green Hydrogen and Ammonia Facility (up to 25ha).**

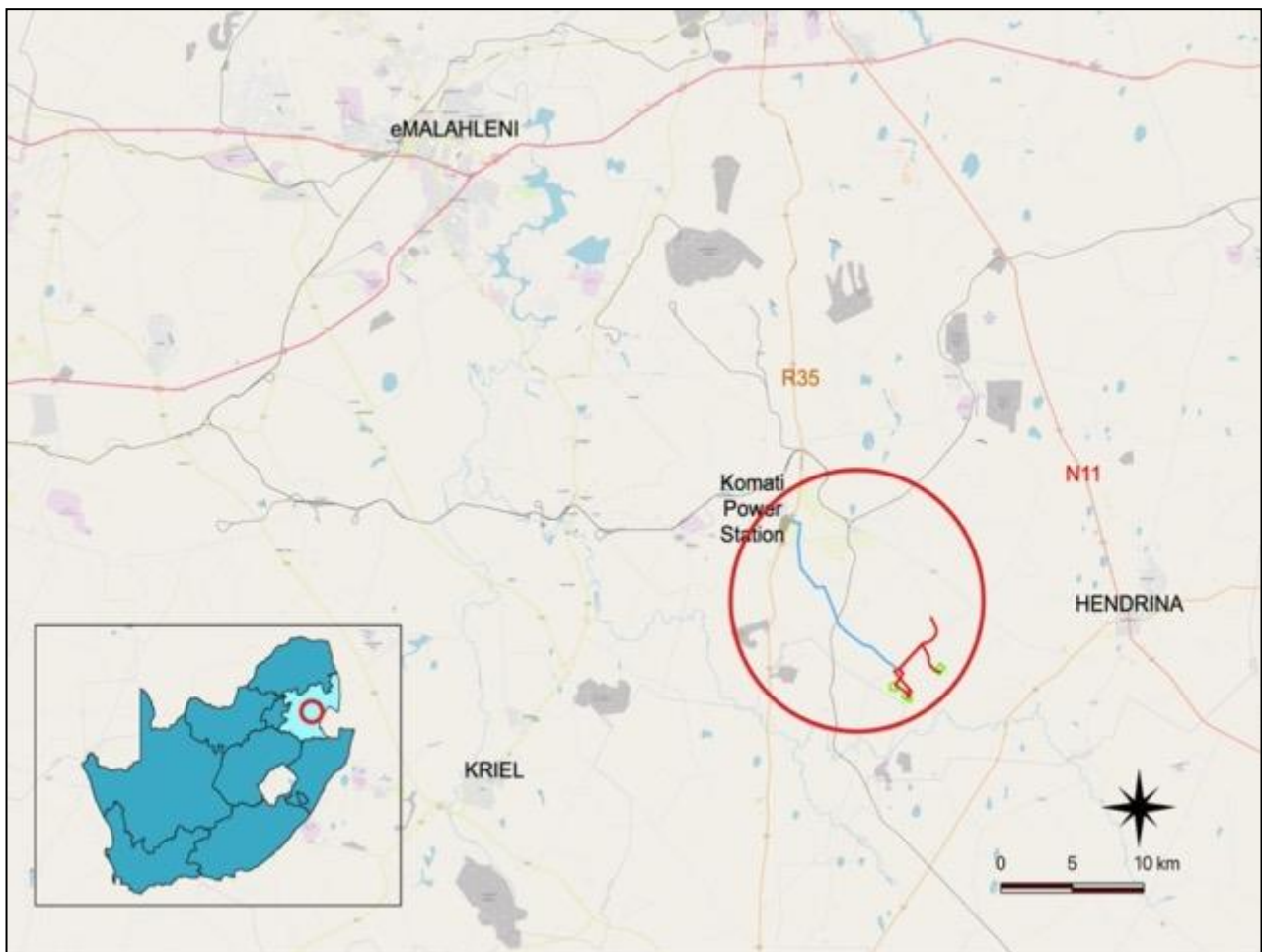
Each of these projects are being assessed, as part of the Complex development, and involve the undertaking of Listed Activities identified in the Environmental Impact Assessment (EIA) Regulations, 2014 (as amended) and as such require an Environmental Authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) before being undertaken.

This report pertains specifically to the **Green Hydrogen and Ammonia Facility** (“the Project”).

This document is intended to provide a description of the proposed Project. The Project is being developed for private off-take by nearby mining and industrial operations. This project description is intended to provide sufficient project detail to facilitate effective Environmental Impact Assessment (EIA) for the proposed project in different specialist disciplines.

## Project description

The Project is located 17km west of Hendrina, in the Steve Tshwete Local Municipality of the Nkangala District Municipality, Mpumalanga Province (Figure 1). It is located approximately halfway between Hendrina and Kriel and about 45 km south-east of eMalahleni. The Olifants River is located 2 km south of the site, Komati Power Station is north-west and there are scattered opencast and underground coal mines in the vicinity of the site.



**Figure 1: Location of the proposed infrastructure.**

Three alternative Project locations are being investigated for the development of the proposed Project:

**Site Alternative 1** is located on Portion 3 of the Farm Dunbar 189IS, at the site of an old abandoned farmyard and has three powerline options from the associated Hendrina North and South Wind Energy Facilities (“WEF”) as follows:

- Powerline option 1 is up to 2km in length, to the Hendrina North WEF substation Option 1 on Portion 1 of the Farm Dunbar 189IS;
- Powerline option 2 is up to 7km in length, to the Hendrina North WEF substation Option 2 on Portion 3 of the Farm Hartebeestkuil 185IS;
- Powerline option 3 is up to 1.5km in length, to the Hendrina South WEF substation on Portion 3 of the Farm Dunbar 189IS.

Site alternative 1 water supply to the Site: construction of a new pipeline (up to 16km) from the Komati Power Station.

**Site Alternative 2** is located on Portion 3 of the Farm Dunbar 189IS and Portion 18 of the Farm Weltevreden 193IS, adjacent to the proposed Hendrina South WEF substation and has three powerline options from the associated wind farms as follows:

- Powerline option 1 is up to 3km in length to the Hendrina North WEF Option 1 substation on Portion 1 of the Farm Dunbar 189IS;
- Powerline option 2 is up to 8km in length to the Hendrina North WEF substation Option 2 on Portion 3 of the Farm Hartebeestkuil 185IS;
- Powerline option 3 is up to 0.5km in length to the Hendrina South WEF substation on Portion 3 of the Farm Dunbar 189IS;

Site Alternative 2 water supply to the Site: construction of a new pipeline (up to 17km) from the Komati Power Station

**Site Alternative 3** is located on Portions 14 and 15 of the Farm Weltevreden 193IS and has three powerline options from the associated wind farms as follows:

- Powerline option 1 is up to 5km in length to the Hendrina North WEF Option 1 substation on Portion 1 of the Farm Dunbar 189IS;
- Powerline option 2 is up to 5km in length to the Hendrina North WEF substation Option 2 on Portion 3 of the Farm Hartebeestkuil 185IS;
- Powerline option 3 is up to 7km in length to the Hendrina South WEF substation on Portion 3 of the Farm Dunbar 189IS.

Site Alternative 3 water supply to the Site: construction of a new pipeline (up to 19km) from the Komati Power Station.

The Project, and associated water pipeline and powerlines, is proposed to affect the following farm portions:

Parent Farm	Farm No	Portion No
<b>Facility Alternative Site 1</b>		
Dunbar	189IS	3
<b>Facility Alternative Site 2</b>		
Dunbar	189IS	3
Weltevreden	193IS	18
<b>Facility Alternative Site 3</b>		
Weltevreden	193IS	14
Weltevreden	193IS	15
<b>Associated pipelines and powerlines may affect portions of the following land parcels:</b>		
Bultfontein	187IS	1
Bultfontein	187IS	2
Bultfontein	187IS	3
Bultfontein	187IS	4
Bultfontein	187IS	6
Bultfontein	187IS	10
Bultfontein	187IS	14
Dunbar	189IS	0
Dunbar	189IS	1
Dunbar	189IS	2
Dunbar	189IS	4
Dunbar	189IS	5
Dunbar	189IS	6
Dunbar	189IS	7
Geluk	26IS	6
Geluk	26IS	7
Hartebeestkuil	185IS	3
Komati Power Station	56IS	0
Wilmansrust	47IS	1
Wilmansrust	47IS	3
Wilmansrust	47IS	9

## Identified Theme Sensitivities

A sensitivity screening report from the DFFE Online Screening Tool was requested in the application category:

Infrastructure | Localised infrastructure | Storage | Dangerous Goods | Chemicals

The animal species theme indicates that the site is within one sensitivity class, namely **MEDIUM** (Figure 2).

The DFFE Screening Tool report for the area indicates the following ecological sensitivities:

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Animal Species Theme			X	

***Animal Species theme***

The animal species theme was highlighted as being of Medium sensitivity due the potential presence of the following species:

Sensitivity	Feature(s)
Medium	Aves-Hydroprogne caspia
Medium	Aves-Eupodotis senegalensis
Medium	Aves-Tyto capensis
Medium	Mammalia-Crocidura maquassiensis
Medium	Mammalia-Hydrictis maculicollis
Medium	Mammalia-Ourebia ourebi ourebi

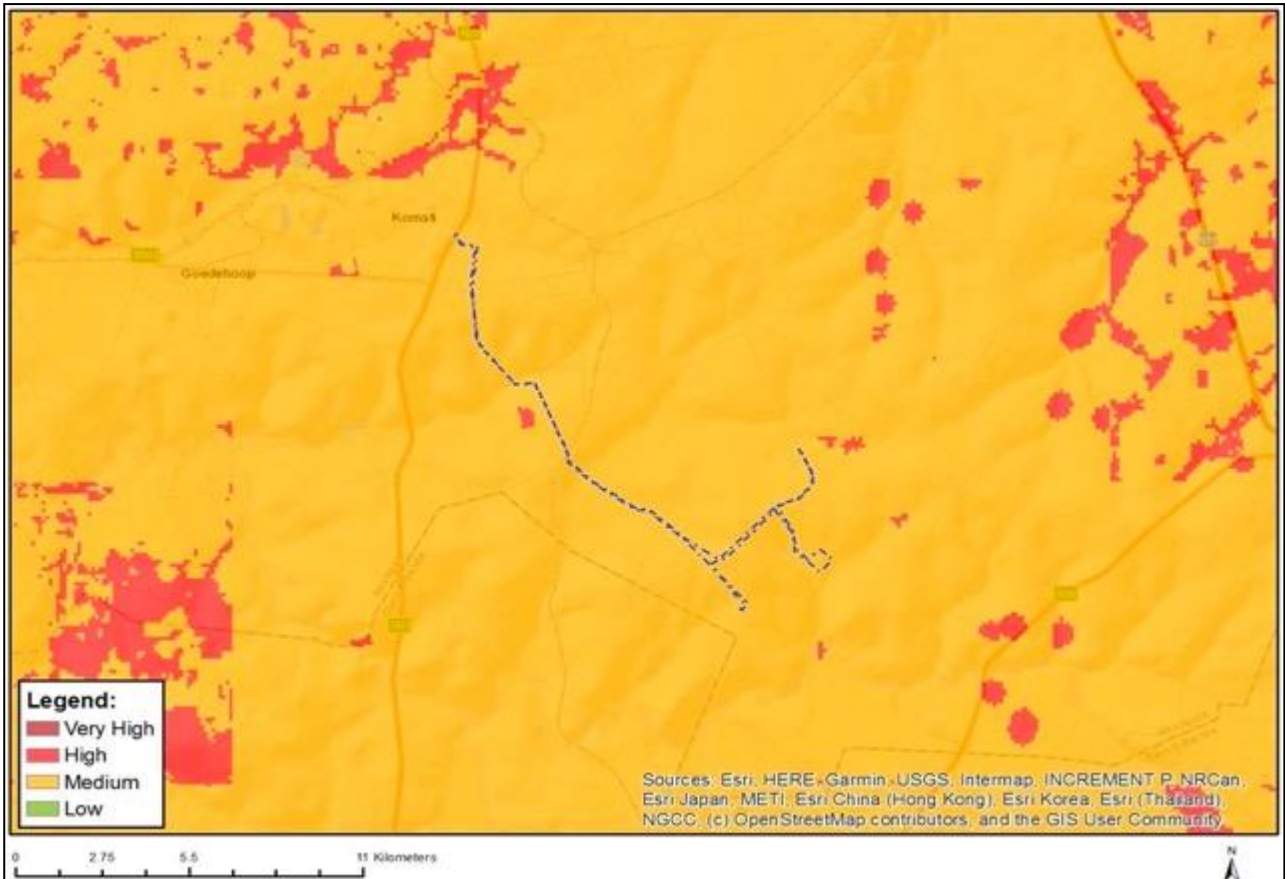


Figure 2: DFFE Screening Tool extract: animal theme.



# Listed species that could occur on site

## Animal species flagged for the study area

The following species have been flagged for the site in the DFFE Screening Report:

### ***Hydroprogne caspia***

The Caspian Tern is listed globally as Least Concern and as Vulnerable in South Africa. It has a cosmopolitan but scattered distribution. Their breeding habitat is large lakes and ocean coasts in North America, Europe, Asia, Africa, and Australasia (Australia and New Zealand). European and Asian birds spend the non-breeding season in the Old World tropics. African and Australasian birds are resident or disperse over short distances. Within South Africa, it is found in estuaries and sheltered bays along the coastline, and at large, permanent inland waterbodies. The study area is marginal for the species and there is no suitable habitat on site. It is therefore unlikely to occur there. A detailed avifaunal assessment has been undertaken for this project where additional information can be obtained regarding this species.

### ***Eupodotis senegalensis***

The White-bellied Korhaan, listed as Vulnerable, is patchily distributed in the Afrotropics from West Africa to South Africa. It is the most-commonly sighted Korhaan at high altitudes in KwaZulu-Natal and southern Mpumalanga. It is near-endemic to the Grassland Biome. It requires longer grass than other bustards and generally avoids overgrazed and recently burnt areas, although they do occasionally move into open areas in winter to forage. The species could possibly occur in the study area, although there is limited amounts of suitable habitat available. A detailed avifaunal assessment has been undertaken for this project where additional information can be obtained regarding this species.

### ***Tyto capensis***

The African Grass Owl is listed as Vulnerable. It is confined to the higher rainfall areas in the eastern half of South Africa, where it typically roosts and breeds in tall, rank grass or sedges associated with damp substrates, such as permanent and non-perennial wetlands and streams. The Olifants River is an important corridor for the species, and there is an important (No-Go) location mapped on the Endangered Wildlife Trust website 8 km to the east of the site. It is possible that extends up the connected drainage lines into the study area. It is almost certain that this species occurs on site and that it traverses the areas within and adjacent to the Olifants River and associated floodplain, as well as within surrounding natural grasslands and wetlands. A detailed avifaunal assessment has been undertaken for this project where additional information can be obtained regarding this species.

### ***Crocidura maquassiensis***

The Maquassie Musk Shrew (*Crocidura maquassiensis*), listed as Vulnerable, is endemic to South Africa, Eswatini and Zimbabwe, where it is found in moist grassland habitats in Savannah and Grassland Biomes. It appears to tolerate a wide range of habitats, although threats to the species have been inferred as being related to loss or degradation of moist, productive areas, such as rank grassland and wetlands. The species is patchily distributed within the north-eastern quadrant of South Africa. The study area is within the known distribution of this species in the sense that there are records in quarter degree grids throughout the Highveld, although not from the current grid or any nearby grids. It is, however, flagged in the DFFE Online Screening Tool as potentially occurring on site. It is therefore considered possible that it could occur on site and individuals could therefore possibly be affected by construction activities.

### ***Hydriectis maculicollis***

The Spotted-necked Otter (*Hydriectis maculicollis*), listed as Vulnerable, is widely but patchily distributed in the higher parts of the eastern half of South Africa. It is also found in lakes and large rivers throughout much of Africa south of 10°N. They are restricted to areas of permanent fresh water where there is good shoreline cover and an abundant prey base (small fishes). They prefer water that is not silt-laden and is unpolluted, but are known to occur in relatively polluted rivers, such as the Braamfonteinspruit, Jukskei and Blesbokspruit in Gauteng. The site is within the known distribution of this species and there are historical records for one nearby grid to the north-east, although not from the current grid. There is no suitable habitat for this species within the direct footprint of the proposed project and it is therefore unlikely to occur there.

### ***Ourebia ourebi ourebi***

The Oribi (*Ourebia ourebi*), listed as Endangered in South Africa and Least Concern globally, has a geographical distribution that includes the study area. It is widely distributed in Africa, but the subspecies found in South Africa has a more limited distribution that includes South Africa and Mozambique. The species inhabits savanna woodlands, floodplains and other open grasslands from sea level to 2200 m asl (in Mpumalanga). They reach their highest density on floodplains and moist tropical grasslands. They prefer open grassland in good condition containing a mosaic of short grass for feeding and tall grass for feeding and shelter. It has not been recorded in the grid in which the site is located, which is one of a group of grids in south-western Mpumalanga where the species does not appear to occur. Nevertheless, the area is within the overall distribution range of the species. Based on the gap in the distribution of the species, there is a low likelihood that it could occur on site within any suitable habitat, although it is flagged for the project in the Screening Tool.

## Other listed species for the study area

Vertebrate species (mammals, reptiles, amphibians) with a geographical distribution that includes the study area are listed in Appendix 1. All threatened (Critically Endangered, Endangered or Vulnerable) or near threatened vertebrate animals that could occur in the study area and have habitat preference that includes habitats available in the study area are discussed further.

### Grey Rhebok

The Grey Rhebok (*Pelea capreolus*), listed as Near Threatened, is endemic to South Africa, Lesotho and parts of Eswatini. They are predominantly browsers, feeding on ground-hugging forbs, and largely water independent, obtaining most of their water requirements from their food. Local declines in their population have been attributed to increased densities of natural predators, such as Black-backed Jackal, Caracals and Leopards. It has not been recorded in the grid in which the site is located, but has been recorded in grids to the north-east and many grids further to the south, so the site is within the overall distribution range of the species. There is therefore a moderate likelihood that it could occur on site within any suitable habitat. However, it is a relatively mobile species and not necessarily dependent on any particular habitat. It is likely to move away from the path of any construction and development of parts of the study area.

### Black-footed Cat

The Black-footed Cat (*Felis nigripes*), listed as Vulnerable, has been previously recorded in the grid in which the project is located, as well as in four surrounding grids. Its known distribution is on the inland part of most of South Africa, but seemingly not within the winter-rainfall part of the country. It also occurs in Botswana and Namibia. The current project area is towards the edge of the distribution range of the species but the species is highly likely to occur in the area. The species is nocturnal and carnivorous, favouring any vegetation cover that is low and not too dense. They make use of dens in the daytime, which can be abandoned termite mounds, or dens dug by other animals, such as armadillo, springhares or cape ground squirrels. Local declines in their population have been attributed to increased densities of natural predators, such as Black-backed Jackal, Caracals and Leopards. They are highly vulnerable to domestic carnivores. The study area is suited to this species and it probably occurs there.

### Leopard

The Leopard (*Panthera pardus*), listed as Vulnerable, has a wide habitat tolerance, but with a preference for densely wooded areas and rocky areas. They have large home ranges, but do not migrate easily, males having ranges of about 100 km<sup>2</sup> and females 20 km<sup>2</sup>. It has not been recorded in any of the adjacent or nearby grids and the overall distribution shows a gap in its distribution that includes the current study area. There is therefore a low probability of this species occurring on site, and if it did occur there it would probably be at very low densities.

### Cape Clawless Otter

The Cape Clawless Otter (*Aonyx capensis*), listed as Near Threatened, is widely but patchily distributed throughout South Africa, and is also the most widely found otter in Africa. It is aquatic and seldom found far from permanent water, which needs to be fresh. The site is within the known distribution of this species and there are historical records for one adjacent grid to the north-east, although not from the current grid. There is potentially suitable habitat for this species on site, although water quality may be an issue. It is therefore considered possible that it occurs on site.

#### African Striped Weasel

The African Striped Weasel (*Poecilogale albinucha*), listed as Near Threatened, is found throughout most of South Africa, except for the arid interior, and into central Africa. It has not been recorded in the grid in which the site is located, but has been recorded in two adjacent grids, and the site is within the overall distribution range for the species. It is found primarily in moist grasslands and fynbos, where adequate numbers of prey may be found. It is considered likely that it could occur on site.

#### Brown Hyaena

The Brown Hyaena (*Parahyaena brunnea*), listed as Near Threatened, is found in a band running down the centre of the country, expanding into the entire northern parts of the country. There is a gap in the distribution around the current study area, but there is a possibility that vagrant individuals could extend into this area. The species is found in desert areas, particularly along the west coast, semi-desert, open scrub and open woodland savannah (Mills & Hes 1997). It is a solitary scavenger that travels vast distances every day in search of food. It has a medium chance of occurring in the study area since the distribution range includes the study area, however there are no historical records from nearby. It is a mobile animal that is likely to move away from the path of any construction and development of parts of the site is therefore highly unlikely to have any negative effect on the species. It is considered that there is a low likelihood of it occurring on site.

#### South African Hedgehog

The South African Hedgehog (*Atelerix frontalis*), listed as Near Threatened, is found in a large part of the central part of South Africa, extending down to the south-eastern coast, and is also found in Namibia, Botswana, Zimbabwe, Lesotho and Eswatini. It requires ample ground cover for cover, nesting and foraging and prefers dense vegetation and rocky outcrops. The site is well-within the known distribution of this species and there are historical records for nearby grids in all directions, and it has been recorded from the current grid. There is therefore a high probability of the study area being suitable for this species. It is considered likely that it could occur on site.

#### Swamp Musk Shrew

The Swamp Musk Shrew (*Crocidura mariquensis*), listed as Near Threatened, is found in a large part of the north-eastern part of South Africa, extending down to the south-eastern coast. It occurs in wetlands and waterlogged grasslands, predominantly in KwaZulu-Natal, Mpumalanga, Limpopo, Gauteng and eastern North West Provinces. The site is well-within the known distribution of this species and there are historical records for nearby grids in all directions, and it has been recorded from the current grid. There is therefore a high probability of the study area being suitable for this species. It is considered likely that it could occur on site.

#### Highveld Golden Mole

The Highveld Golden Mole (*Amblysomus septentrionalis*), listed as Near Threatened, is found across the Mpumalanga Highveld from Wakkerstroom northwards to Ermelo and Barberton and westwards through Standerton to north-eastern Free State. It occurs within meadows and edges of marshes in high-altitude grassland in Mpumalanga. They are restricted to friable soils in valleys and on mountainsides. The site is within the known distribution of this species, although higher densities of records occur further east. There are historical records for an adjacent grid to the south-west, but it has not been recorded from the current grid. There is therefore a medium probability of the study area being suitable for this species. It is considered possible that it could occur on site and individuals could be affected by construction activities, if suitable habitat is damaged.

#### White-tailed Rat

The White-tailed Rat (*Mystromys albicaudatus*), listed as Vulnerable, is endemic to South Africa and Lesotho, where it is found primarily in Highveld grasslands, but extending into adjacent Fynbos and Karoo areas. It is terrestrial, but never found in soft, sandy substrates, rocks, wetlands or river banks, and do not occur in transformed habitat. The study area is on the edge of the known distribution of this species, with most of Mpumalanga appearing to be a "hole" in the occurrence of the species. There is therefore a low probability of the study area being suitable for this species. It is considered unlikely that it would occur on site.

#### Vlei Rat

The Vlei Rat (Grassland-type) (*Otomys auratus*), listed as Near Threatened, is near-endemic to South Africa, occurring in the north-eastern half of the country, associated with mesic grasslands and wetlands within alpine, montane and sub-montane regions. It is likely to be associated with sedges and grasses in densely vegetated wetlands with wet soils.

The study area is well within the known distribution of this species and there are historical records for the grid in which the study area is located, as well as two adjacent grids. There is therefore a high probability of the study area being suitable for this species. It is considered likely that it occurs on site and the proposed development could therefore affect this species.

#### Coppery grass lizard

The Coppery Grass Lizard (*Chamaesaura aenea*), listed as Near Threatened, is endemic to South Africa, where it is found in western Eswatini, Limpopo, Mpumalanga, Gauteng, KwaZulu-Natal, north-eastern Free State and Eastern Cape. It is found on grassy slopes and plateau of the eastern escarpment and Highveld, where it probably shelters in the base of grass tussocks. The study area is within the known distribution of this species and there are historical records for two adjacent grids to the north and south, although not from the current grid. There is therefore a moderate probability of the study area being suitable for this species, including suitable habitat within the project area.

#### Large-scaled grass lizard

The Large-scaled Grass Lizard (*Chamaesaura macrolepis*), listed as Near Threatened, is endemic to South Africa, Eswatini and Zimbabwe. In South Africa it is found in Limpopo, Mpumalanga, and KwaZulu-Natal. It is found in grassland, especially rocky, grassy hillsides. Its main distribution is within the Indian Ocean Coastal Belt part of KwaZulu-Natal, but there are scattered records on the Highveld. The study area is marginally within the known distribution of this species in the sense that there are records in quarter degree grids up to Gauteng and there are historical records for one nearby grid to the north-east, although not from the current grid. There is therefore a moderate to low probability of the study area being suitable for this species, including suitable habitat within the project area. It is considered a low likelihood that it could occur on site.

#### Breyer's Long-tailed Seps

The Breyer's Long-tailed Seps (*Tetradactylus breyeri*), listed as Vulnerable, is endemic to South Africa, where it is found in Free State, Mpumalanga, and KwaZulu-Natal. It is found in montane and Highveld grassland. The study area is marginally within the known distribution of this species in the sense that there are records in quarter degree grids throughout the Highveld, extending from Blyde River Canyon to the Drakensberg, although not from the current grid or any nearby grids. There is therefore a low probability of the study area being suitable for this species, including suitable habitat within the project area. It is considered unlikely that it would occur on site.

#### Striped Harlequin Snake

The Striped Harlequin Snake (*Homoroselaps dorsalis*), listed as Near Threatened, is endemic to South Africa, where it is found in western Eswatini, Limpopo, Mpumalanga, Gauteng, KwaZulu-Natal, and Free State. It is partly fossorial and known to inhabit old termitaria in grassland habitat. Most of its range is at moderately high elevations, but it also occurs close to sea level in KwaZulu-Natal. The study area is within the known distribution of this species and there are historical records for one adjacent grid to the north, although not from the current grid. There is therefore a moderate probability of the study area being suitable for this species, including suitable habitat within the project area. It is considered likely that it could occur on site.

#### The Giant Bull Frog

The Giant Bull Frog (*Pyxicephalus adspersus*) previously listed as Near Threatened, is found in seasonal shallow grassy pans, vleis and other rain-filled depressions in open flat areas of grassland or savanna and, at the limits of its distribution, in Nama Karoo and thicket. For most of the year the species remains buried up to 1 m underground. They emerge only during the peak of the rainy season to forage and breed. If conditions are extremely dry, they may remain cocooned underground for several years. Long distances often separate suitable breeding sites. To breed, they require shallow, rain-filled depressions that retain water long enough for the tadpoles to metamorphose. Before and after breeding, bullfrogs forage in open grassland, feeding mostly on insects, but also on other frogs, lizards, snakes, small birds and rodents. After breeding males generally bury themselves within 100 m of the breeding site, but females may disperse up to 1 km away. Based on habitat requirements, there is a medium probability that this species occurs in the study area.

## Protected animals

There are a number of animal species protected according to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (see Appendix 3). 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 3, marked with the letter “N”. This includes the following species:

1. Black Wildebeest (does not occur on site),
2. Oribi (unlikely to occur on site),
3. White Rhinoceros (does not occur on site),
4. Black-footed Cat,
5. Serval,
6. Leopard (probably does not occur on site),
7. Cape Clawless Otter,
8. Spotted-necked Otter,
9. Cape Fox,
10. Honey Badger,
11. South African Hedgehog,
12. Brown Hyena,
13. Giant Bullfrog.

There are additional species protected under the Mpumalanga Nature Conservation Act (Act No. 10 of 1998) (see Appendix 2). These include the following that have a geographical distribution that includes the site:

1. Giant Bullfrog,
2. South African Hedgehog,
3. Honey Badger,
4. Aardwolf,
5. Brown Hyaena,
6. Mountain Reedbuck,
7. Black Wildebeest,
8. Klipspringer,
9. Orbi,
10. Steenbok,
11. Eland,
12. Cape Clawless Otter
13. Spotted-necked Otter,
14. All species of reptiles, except the water leguaan, rock leguaan and all species of snakes, of which the following have a geographical distribution that includes the site:
  - Marsh terrapin
  - Leopard tortoise
  - Common dwarf gecko
  - Spotted dwarf gecko
  - Van Son’s gecko
  - Delalande’s sandveld lizard
  - Burchell’s sand lizard
  - (Spotted sand lizard)
  - Coppery grass lizard
  - Cape grass lizard
  - Large-scaled grass lizard
  - Common girdled lizard
  - Common crag lizard
  - Yellow-throated plated lizard
  - Breyer’s long-tailed seps

- Short-headed legless skink
- Thin-tailed legless skink
- Wahlberg's snake-eyed skink
- Cape skink
- Red-sided skink
- Speckled rock skink
- Variable skink
- Montane dwarf burrowing skink
- Common flap-necked chameleon
- Eastern ground agama
- Southern rock agama

# METHODOLOGY

The detailed methodology followed as well as the sources of data and information used as part of this assessment is described below.

## Survey timing

The study commenced as a desktop-study followed by a site-specific field study from 3–7 February 2020. The site is within the Grassland Biome with a peak rainfall season in summer, which occurs from October to March (Figure 3). There is, however, a delay between rainfall and vegetation growth, which means the peak growing season is from November to April, with most perennial species characteristic of the vegetation being easily identifiable from January to March. The timing of the survey was therefore ideal in terms of assessing the vegetation condition in terms of suitable animal habitat on the site.

## Field survey approach

During the field survey, all major natural variation on site was assessed and select locations were traversed on foot.

Aerial imagery from Google Earth was used to identify and assess habitats suitable for animal species that could occur on site. Patterns identified from satellite imagery were verified on the ground. During the field survey, particular attention was paid to ensuring that all habitat variability was covered physically on the ground.

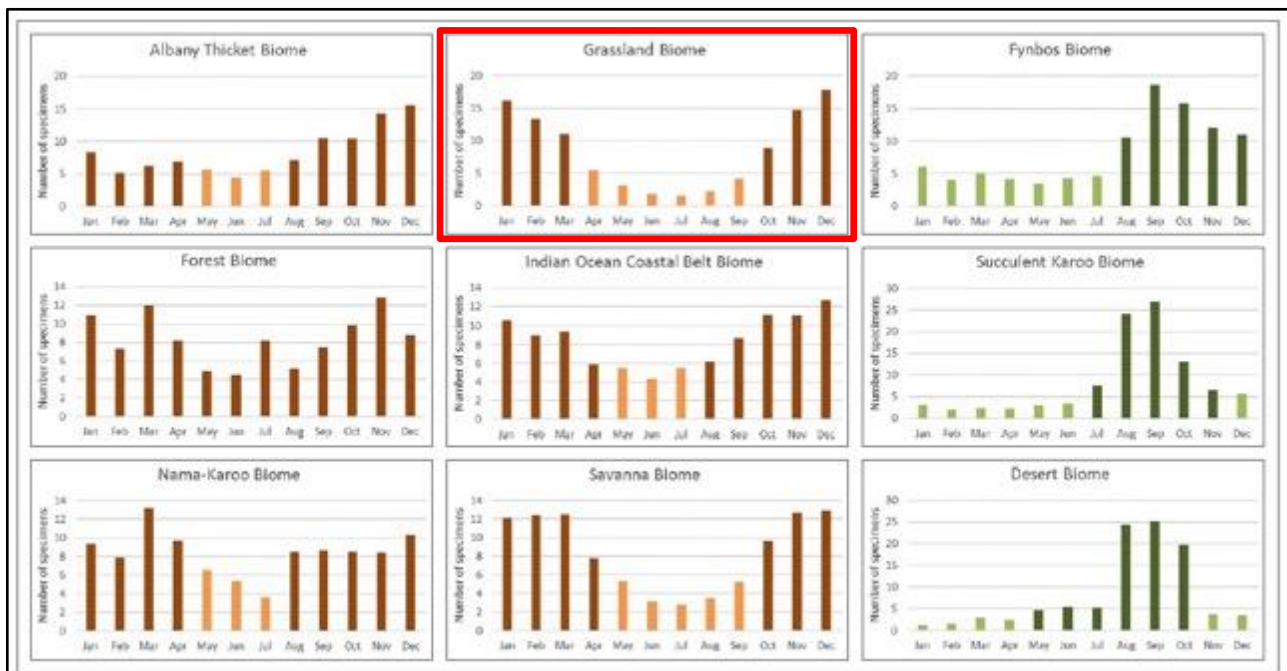


Figure 3: Recommended survey periods for different biomes (Species Environmental Assessment Guidelines).

## Sources of information

### **Animals**

- Lists of animal species that have a geographical range that includes the study area were obtained from literature sources (Bates et al., 2014 for reptiles, du Preez & Carruthers 2009 for frogs, Mills & Hes 1997 and Friedmann and Daly, 2004 for mammals). This was supplemented with information from the Animal Demography Unit website ([adu.uct.ac.za](http://adu.uct.ac.za)) and literature searches for specific animals, where necessary.

## Limitations, Assumptions & Uncertainties

The following assumptions, limitations, uncertainties are listed regarding the assessment of the Hendrina site:

- Inventory surveys of animal species occurring on a site are difficult to achieve within the time-frames associated with an EIA. In order to compile a comprehensive site-specific list of the biota on site, studies would be required that would include different seasons, be undertaken over a number of years and include extensive sampling. It is more important to know of fauna of value, as well as ecological processes. Therefore, the assessment attempts to identify threatened and other significant species, important habitats, and ecological processes.
- Compiling the list of species that could potentially occur on site is limited by the density of collection records for the area. The list of animal species that could potentially occur on site was therefore taken from a wider area and from literature sources that may include species that do not occur on site and may miss species that do occur on site.
- The assessment is based on a field survey conducted 3-7 February 2020. The current study is based on an extensive site visit as well as a desktop study of the available information. The time spent on site was adequate for understanding general patterns across affected areas. The seasons in which the fieldwork (peak summer flowering period) was conducted was ideal for assessing the composition and condition of the vegetation, which is also suitable for assessing habitat condition and suitability for animals.



# ASSESSMENT OUTCOMES

## Habitats on site

The site is within an area of natural grassland. The grassland contains variation due to changes in topography, slope inclination, surface rockiness and the influence of water-flow and water retention in the landscape. A broad classification of the natural habitat units on site, which also reflects relatively uniform plant species compositional units, is as follows:

Natural habitats:

1. **Grassland** (open grassland on undulating plains);
2. **Wetlands** (seasonal wetlands in drainage valleys);

There are also various degraded and transformed land cover units on site (not indicated) that include the following:

3. **Secondary wetlands** (cultivated or previously cultivated wetland areas);
4. **Secondary grassland** (secondary grasslands on old lands);
5. **Cultivation** (areas currently cultivated and fallow lands);
6. **Alien trees** (stands of exotic trees);
7. **Degraded areas** (disturbed areas with weeds or waste ground);
8. **Transformed** (mines, buildings, bare areas).

A map of habitats within the study area and adjacent areas is provided in Figure 4.

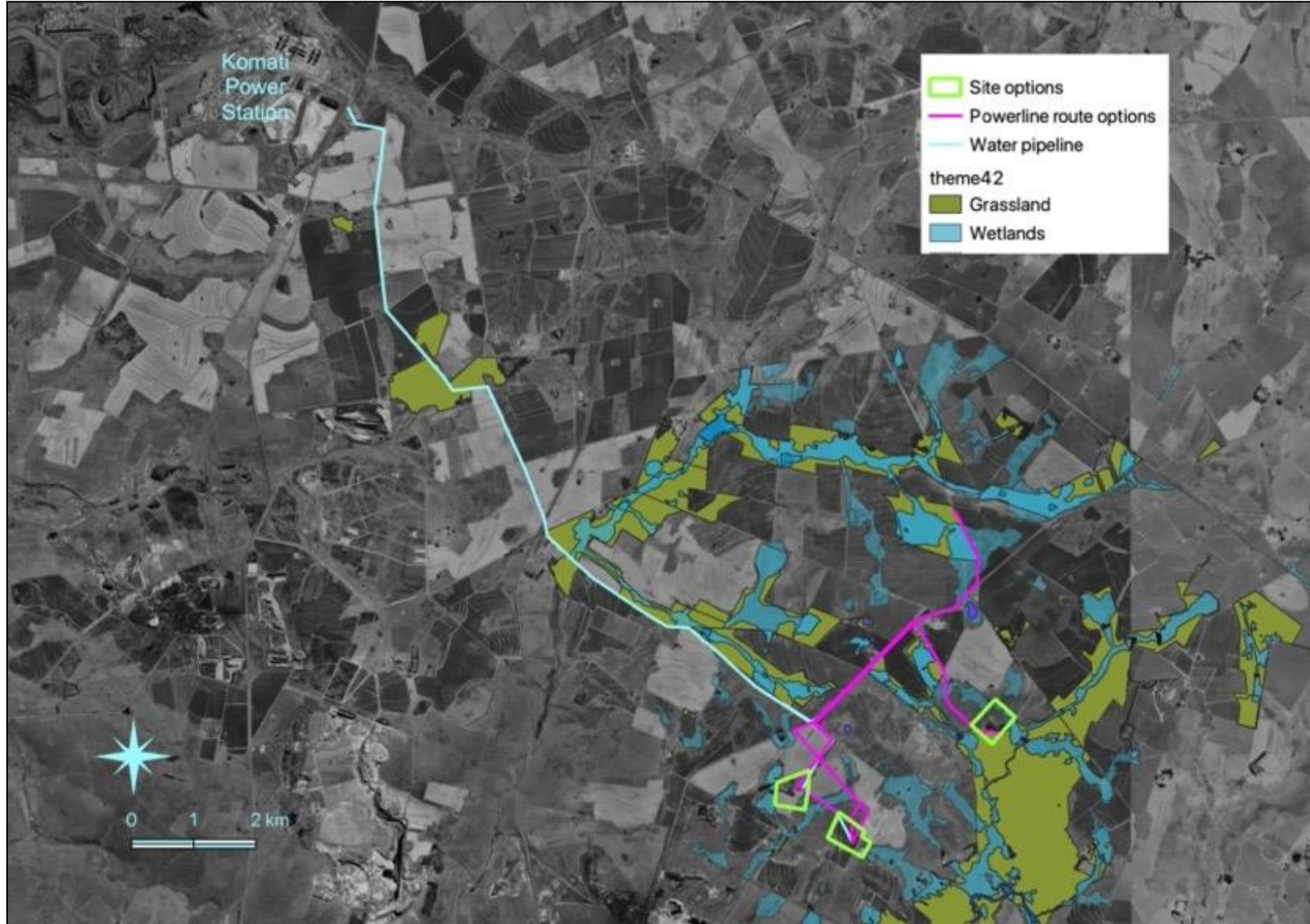


Figure 4: Main habitats of the study area.

### ***Grassland***

The natural vegetation of the study area is characterised by an open grassland on undulating hills and plains. It is generally a short to moderate height tussock grassland with closed canopy cover. The soil depth varies, as does the amount of surface rock cover. This was the most widespread vegetation community on site, occurring on all the relatively flat plains areas. These plains are also the area that has been most subject to cultivation.

The main grassland areas on site are important faunal habitat. The areas in the south of the site linked to the Olifants River floodplain are foraging habitat for the African Grass Owl. It is the most likely habitat for the Maquassie Musk Shrew. There are a number of other species that could potentially occur within the grasslands on site.

Secondary grassland on site has the structural appearance of primary grassland, but a fraction of the species richness, usually dominated by a small number of perennial grasses, as well as various weedy species. It provides habitat for animals, but the diverse structure and composition limits the value for some animal species.

### ***Wetlands***

The drainage areas are important habitat for animals, providing refuge and shelter, water, when it is available, palatable vegetation, when surrounding areas are in drought, and softer and deeper soils for burrowing animals. The habitat is also an important flood-attenuation component of the landscape, and a reservoir for soil water. If it occurs on site, this is the habitat in which the protected Giant Bullfrog would be found.

The wetlands are potential habitat for the African Grass Owl. The margins of wetlands are also potential habitat for the Maquassie Musk Shrew, flagged for the site.

Secondary wetlands occur in areas where the original wetlands have been ploughed. They often return to a functional state with time that sometimes has similar species composition to the original wetlands. The exception is in seepage areas, where specialized plant communities are often permanently lost.

### ***Transformed and degraded areas***

Degraded and disturbed areas, as well as completely transformed areas, no longer have vegetation cover. This includes cultivated areas. Areas with alien trees are usually monospecific stands with virtually no plant biodiversity, but sometimes provide important cover and/or roosting habitat.

# DESCRIPTION OF POTENTIAL IMPACTS

## Potential sensitive receptors in the general study area

A summary of the potential ecological issues for the study area is as follows (issues assessed by other specialists, e.g. on birds and on wetland and hydrological function, are not included here):

- Possible presence of various listed animal species on site.
- Presence of important habitat on site for animal species.
- Importance of the site as a corridor through the landscape, primarily due to connected areas of wetlands and grasslands.

## Construction Phase Impacts

Direct impacts include the following:

1. Loss of faunal habitat;
2. Fragmentation of faunal habitat;
3. Direct mortality of fauna due to machinery, construction and increased traffic;

## Operational Phase Impacts

Ongoing direct impacts will include the following:

1. Direct mortality of fauna through traffic, illegal collecting, poaching and collisions and/or entanglement with infrastructure.

## Decommissioning Phase Impacts

These will include the following:

1. Loss of faunal habitat;
2. Fragmentation of faunal habitat;
3. Direct mortality of fauna due to machinery, construction and increased traffic;

## Cumulative impacts

Cumulative impacts result from impacts from a number of different projects impacting on faunal populations through habitat loss, habitat fragmentation, and direct mortality of individuals.

# ASSESSMENT OF IMPACTS

A detailed assessment, as per the requirements of the protocol for the specialist assessment and minimum report content requirements of environmental impacts on terrestrial animal species for activities requiring environmental authorisation, (20 March 2020), of the significance of all impacts during all phases of the project (Construction, Operation, Decommissioning and Cumulative) is provided below. This also includes all proposed mitigation measures and provides assessment before and after the implementation of proposed mitigation measures.

The proposed site is identified by the national web-based environmental screening tool as being medium sensitivity for Animal Species, and the protocol therefore requires that the sensitivity be confirmed on site, and the level of assessment determined by the outcome of the sensitivity verification. If animal SCC are confirmed or suspected to occur on site then the results must be written up in a Terrestrial Animal Species Assessment Report.

Detailed discussion of each impact, including justification for assigned scores, is provided below.

## Construction Phase Impacts

### *Direct loss of faunal habitat*

Impact 1		Direct loss of faunal habitat due to clearing for construction	
Issue	The impact will occur due to clearing of vegetation comprising faunal habitat for the purposes of construction of infrastructure		
Description of Impact			
During the construction phase there will be activity on site over a period of time, where vegetation is cleared for construction. These activities have the potential to cause additional direct and/or indirect loss of natural habitat for fauna. However the infrastructure will not be located in favourable habitat for fauna, therefore it is unlikely that habitat loss will occur.			
Type of Impact	Direct		
Nature of Impact	Negative		
Phases	Construction		
Criteria	Without Mitigation	With Mitigation	
Extent	1	1	
Duration	1	1	
Reversibility	5	5	
Magnitude (severity of impact)	1	1	
Probability	1	1	
Significance	8 (INSIGNIFICANT)	8 (INSIGNIFICANT)	
Mitigation actions			
The following measures are recommended:	1. Restrict impact to development footprint only and limit disturbance in surrounding areas. 2. Prior to commencement of construction, compile a Rehabilitation Plan including monitoring specifications, to be included into the EMPr during final approval.		
Monitoring			
The following monitoring is recommended:	As per management plans.		

**Fragmentation of faunal habitat**

<b>Impact 2</b>		
<b>Fragmentation of faunal habitat due to clearing for construction</b>		
Issue	The impact will occur due to clearing of vegetation comprising faunal habitat for the purposes of construction of infrastructure	
Description of Impact		
The impact will occur due to clearing of indigenous vegetation for the purposes of construction of infrastructure. Where this intersects with linear systems, it will result in fragmentation that may inhibit normal population processes, including movement. Infrastructure will mostly be located outside of favourable habitat, therefore fragmentation of habitat is unlikely to occur		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Construction	
Criteria	Without Mitigation	With Mitigation
Extent	1	1
Duration	1	1
Reversibility	5	5
Magnitude (severity of impact)	1	1
Probability	1	1
Significance	8 (INSIGNIFICANT)	8 (INSIGNIFICANT)
Mitigation actions		
The following measures are recommended:	1. Restrict impact to development footprint only and limit disturbance in surrounding areas. 2. Prior to commencement of construction, compile a Rehabilitation Plan including monitoring specifications, to be included into the EMPr during final approval.	
Monitoring		
The following monitoring is recommended:	As per management plans.	

**Direct mortality of fauna due to machinery, construction and increased traffic**

<b>Impact 3</b>		
<b>Direct loss of individuals of threatened fauna due to various factors</b>		
Issue	<b>Direct loss of individuals of threatened fauna due to various factors</b>	
Description of Impact		
The impact will occur due to presence of traffic and heavy machinery		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Construction	
Criteria	Without Mitigation	With Mitigation
Extent	1	1
Duration	1	1
Reversibility	5	5
Magnitude (severity of impact)	1	1
Probability	1	1
Significance	8 (INSIGNIFICANT)	8 (INSIGNIFICANT)
Mitigation actions		

The following measures are recommended:	<ol style="list-style-type: none"> <li>1. Restrict activities to footprint areas only.</li> <li>2. No driving of vehicles off-road outside of construction areas.</li> <li>3. Sensitize staff to presence of animals and the importance of their protection.</li> <li>4. A trained expert should be available for consultation should snakes be encountered. Snakes need to be relocated by a trained snake handler.</li> </ol> <p>A full list of other possible mitigation measures is provided in a section below..</p>
<b>Monitoring</b>	
The following monitoring is recommended:	As per management plans.

## Operational Phase Impacts

***Direct mortality of fauna through traffic, illegal collecting, poaching and collisions and/or entanglement with infrastructure***

<b>Impact 4</b>		
<b><i>Direct loss of individuals of threatened fauna due to various factors</i></b>		
Issue	<b><i>Direct loss of individuals of threatened fauna due to various factors</i></b>	
Description of Impact		
The impact will occur due to presence of traffic and heavy machinery		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Construction	
Criteria	Without Mitigation	With Mitigation
Extent	1	1
Duration	1	1
Reversibility	5	5
Magnitude (severity of impact)	1	1
Probability	1	1
Significance	8 (INSIGNIFICANT)	8 (INSIGNIFICANT)
Mitigation actions		
The following measures are recommended:	<ol style="list-style-type: none"> <li>1. Restrict activities to footprint areas only.</li> <li>2. No driving of vehicles off-road outside of construction areas.</li> <li>3. Sensitize staff to presence of animals and the importance of their protection.</li> <li>4. A trained expert should be available for consultation should snakes be encountered. Snakes need to be relocated by a trained snake handler.</li> <li>5. Fences to demarcate activity areas, prevent activities in no-go areas, protocols, education, keep products and items properly stored that could be dangerous to animals, no open pits or holes. A full list of possible mitigation measures is provided in a section below.</li> </ol>	
<b>Monitoring</b>		
The following monitoring is recommended:	As per management plans.	

# Decommissioning Phase Impacts

As for construction phase

## Cumulative Impacts

Impact 5		
Direct loss of faunal habitat, fragmentation and loss of SCC due to cumulative impacts of clearing for construction		
Issue	Cumulative impacts on loss of faunal habitat and resulting fragmentation and possible loss of SCC from construction clearing due to a number of projects	
Description of Impact		
The probability of the impact occurring increases with the number of projects that are constructed.		
Type of Impact	Direct	
Nature of Impact	Negative	
Phases	Construction	
Criteria	Without Mitigation	With Mitigation
Extent	3	2
Duration	2	2
Reversibility	5	5
Magnitude (severity of impact)	2	1
Probability	1	1
Significance	12 (INSIGNIFICANT)	10 (INSIGNIFICANT)
Mitigation actions		
The following measures are recommended:	1. Restrict impact to development footprint only and limit disturbance in surrounding areas. 2. Prior to commencement of construction, compile a Rehabilitation Plan including monitoring specifications, to be included into the EMPr during final approval.	
Monitoring		
The following monitoring is recommended:	As per management plans.	



## Summary of mitigation measures

The following mitigation measures are recommended to address known potential impacts:

- Restrict impact to development footprint only and limit disturbance spreading into surrounding areas.
- Footprints of infrastructure, laydown areas, construction sites, roads and substation sites should be clearly demarcated.
- Ensure all possible steps are taken to limit erosion of surfaces, including proper management of storm-water runoff.
- Control alien invasive plant species.
- Compile a Rehabilitation Plan prior to the commencement of construction.
- No additional clearing of vegetation should take place without a proper assessment of the environmental impacts and authorization from relevant authorities, unless for maintenance purposes, in which case all reasonable steps should be taken to limit damage to natural areas.
- No driving of vehicles off-road outside of construction areas.
- It is a legal requirement to obtain permits for specimens or protected species that will be lost due to construction of the project.
- Limit clearing of natural habitat designated as sensitive, especially riparian habitats, where possible.
- Pre-construction walk-through, undertaken in the correct season, in front of construction must be undertaken to move any individual animals, such as tortoises, prior to construction.
- Personnel on site should undergo environmental induction training, including the need to abide by speed limits, the increased risk of collisions with wild animals on roads in rural areas.
- Proper waste management must be implemented, ensuring no toxic or dangerous substances are accessible to wildlife. This should also apply to stockpiles of new and used materials to ensure that they do not become a hazard.
- No collecting, hunting or poaching of any plant or animal species.
- A trained expert should be available for consultation should snakes be encountered. Snakes need to be relocated by a trained snake handler.
- Report any mortality of protected species to conservation authorities.
- Personnel to be educated about protection status of species, including distinguishing features, to be able to identify protected species.
- Report any illegal collection to conservation authorities.
- Appropriate lighting should be installed to minimize impacts on nocturnal animals, as per visual specialist assessment.
- No additional clearing of vegetation should take place during the operational phase without a proper assessment of the environmental impacts and authorization from relevant authorities, unless for maintenance purposes, in which case all reasonable steps should be taken to limit damage to natural areas.
- Personnel and vehicles should be restricted to access / internal roads and no off-road driving should occur.
- Noise and light pollution should be managed according to guidelines from the noise specialist study and visual specialist assessment respectively.

# DISCUSSION AND CONCLUSIONS

There are a small number of animal species that are flagged for the site, as well as others not directly flagged that may occur there. These animals may make use of various habitats available in the general study area, which consists mostly of grasslands and wetlands within shallow drainage valleys. The infrastructure planned for the site has been located primarily in transformed areas (areas with no remaining natural habitat). If Option 1 or 2 is selected, then there will be almost no impact on any natural habitats. Vertical infrastructure is widely dispersed and will therefore have a limited impact on habitats. An assessment of these impacts indicates that they will have a significance of insignificant (very low).

The main concern in terms of threatened animal species is direct loss of habitat, but this will be limited for this project. Fragmentation of habitat will be very limited due to the placement of infrastructure as well as existing patterns of transformation on site. There may also be direct mortality of individual animals, but this is not very likely due to the placement of most of the infrastructure away from natural habitats.

Of the animal species flagged for the site, none are likely to occur there. Only the Maquassie Musk Shrew has a distribution and habitat preference that would indicate that there is a possibility of it occurring in the study area. However, based on the poor quality of most habitat on site, it is not suspected that this species would be found on site. The site therefore has LOW sensitivity with respect to the Animal Species Theme.

In conclusion, desktop information, field data collection and mapping from aerial imagery provides the following verifications of patterns for the Animal Species Theme:

1. Most of the site consists of secondary and/ or degraded areas, including areas heavily invaded by alien invasive shrubs. There are small patches of grassland and wetland remaining in the study area.
2. The habitat on site is mostly transformed, degraded and/or fragmented. No animal species of concern are suspected to occur on site. The site therefore has been assessed as having low sensitivity in terms of the Animal Species Theme.
3. The proposed development is mostly within areas mapped as degraded / secondary that have low biodiversity value and sensitivity. The development is therefore supported.
4. Alternative 1 and Alternative 2 are preferred over Alternative 3, because they affect almost no natural areas. However, all options are feasible.

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# APPENDICES:

## Appendix 1: 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) (see Appendix 6) marked with "N"

### **Mammals:**

#### ARTIODACTYLA:

##### Bovidae:

Red hartebeest

Springbok

<sup>N</sup>Black wildebeest

Blue wildebeest

Blesbok

Plains zebra

Klipspringer

<sup>N</sup>Oribi EN

Grey rhebok NT

Warthog

Bushpig

Steenbok

Mountain reedbuck

Common duiker

Eland

Bushbuck

#### PERRISODACTYLA:

##### Rhinocerotidae:

<sup>N</sup>White rhinoceros

#### HYRACOIDEA:

##### Procavidae:

Rock hyrax

#### CARNIVORA:

##### Felidae:

Caracal

<sup>N</sup>Black-footed cat VU

African wild cat

<sup>N</sup>Serval

<sup>N</sup>Leopard VU

##### Mustelidae:

<sup>N</sup>Cape clawless otter NT

Striped polecat

<sup>N</sup>Spotted-necked otter NT

<sup>N</sup>Honey badger

African striped weasel NT

##### Herpestidae:

Water mongoose

Yellow mongoose

Slender mongoose

Dwarf mongoose

Banded mongoose

White-tailed mongoose

Suricate

##### Canidae:

Black-backed jackal

<sup>N</sup>Cape fox

##### Viveridae:

Small-spotted genet

Large-spotted genet

##### Hyaenidae:

<sup>N</sup>Brown hyaena NT

Aardwolf

#### INSECTIVORA:

##### Eulipotyphla:

<sup>N</sup>South African hedgehog NT

Reddish-grey musk shrew

Greater musk shrew

Tiny musk shrew

Maquassie musk shrew VU

Swamp musk shrew NT

Lesser grey-brown musk shrew

Dark-footed forest shrew

Forest shrew

Least dwarf shrew

Lesser dwarf shrew

##### Chrysochloridae:

Highveld golden mole NT

#### LAGOMORPHA:

##### Leporidae:

Cape/desert hare

Scrub/savannah hare

Natal red rock rabbit

Hewitt's red rock rabbit

#### PRIMATA:

##### Cercopithecidae:

Vervet monkey

#### RODENTIA:

##### Muridae:

Tete veld rat

Namaqua rock mouse

Common mole rat  
Grey climbing mouse  
Brant's climbing mouse  
Chesnut climbing mouse  
Multimammate mouse  
Pygmy mouse  
**White-tailed rat VU**  
Angoni vlei rat  
**Vlei rat (grassland type) NT**  
Striped mouse  
Pouched mouse  
Fat mouse  
Highveld gerbil  
Tree rat  
Bathyergidae:  
Cape mole-rat  
Myoxidae:  
Woodland dormouse  
Rock dormouse  
Hystricidae:  
**Cape porcupine**  
Thryonomyidae:  
Greater cane rat

MACROSCELIDEA:  
Macroscelididae:  
Eastern rock sengi

TUBULIDENTATA:  
Orycteropodidae:  
**Aardvark**

### **Reptiles:**

Pelomedusidae:  
(Marsh terrapin)  
Testudinidae:  
(Leopard tortoise)  
Gekkonidae:  
(Common dwarf gecko)  
Spotted dwarf gecko  
Van Son's gecko  
Amphisbaenidae:  
Lacertidae:  
Delalande's sandveld lizard  
Burchell's sand lizard  
(Spotted sand lizard)  
Cordylidae:  
**Coppery grass lizard NT**  
Cape grass lizard  
**(Large-scaled grass lizard NT)**  
Common girdled lizard  
Common crag lizard  
Platysauridae:  
Gerrhosauridae:  
Yellow-throated plated lizard  
**(Breyer's long-tailed seps VU)**

Scincidae:  
Short-headed legless skink  
Thin-tailed legless skink  
Wahlberg's snake-eyed skink  
Cape skink  
Red-sided skink  
Speckled rock skink  
Variable skink  
Montane dwarf burrowing skink  
Varanidae:  
**(Southern rock monitor)**  
Nile monitor  
Chamaeleonidae:  
(Common flap-necked chameleon)  
Agamidae:  
Eastern ground agama  
Southern rock agama  
Typhlopidae:  
Bibron's blind snake  
Leptotyphlopidae:  
Peter's thread snake  
Pythonidae  
Viperidae:  
Puff adder  
Rhombic night adder  
Lamprophiidae:  
Black-headed centipede eater  
(Bibron's stiletto snake)  
**Striped harlequin snake NT**  
Spotted harlequin snake  
Common house snake  
Aurora snake  
Yellow-bellied snake  
Spotted rock snake  
Olive ground snake  
Dusky-bellied water snake  
Brown water snake  
Cape wolf snake  
(Short-snouted grass snake)  
Cross-marked grass snake  
Spotted grass snake  
Striped grass snake  
Many-spotted snake  
South African slug eater  
Mole snake  
Elapidae:  
Sundevall's garter snake  
Rinkhals  
Colubridae:  
Red-lipped snake  
Southern brown egg-eater  
Rhombic egg eater  
(Boomslang)  
(Southeastern green snake  
Western Natal green snake  
Spotted bush snake

## **Amphibians**

Bushveld rain frog  
Mozambique rain frog  
Guttural toad  
Flat-backed toad  
Raucous toad  
Red toad  
Painted reed frog  
(Yellow-striped reed frog)  
Bubbling kassina  
Rattling frog  
Snoring puddle frog  
Striped grass frog  
Common platanna  
Boettger's caco  
Bronze caco  
(Mountain caco)  
Common river frog  
Cape river frog  
**N**Giant bullfrog  
Striped stream frog  
Clicking stream frog  
Tremolo sand frog  
Natal sand frog  
Tandy's sand frog

## Appendix 2: Fauna protected under the Mpumalanga Nature Conservation Act No. 10 of 1998.

### SCHEDULE 1: SPECIALLY PROTECTED GAME (SECTION 4 (1) (a))

Common name	Scientific name
Elephant	<i>Loxodonta africana</i>
All species of rhinoceros	All species of the Family Rhinocerotidae

### SCHEDULE 2: PROTECTED GAME (SECTION 4 (1) (b))

Common name	Scientific name
AMPHIBIANS, REPTILES AND MAMMALS	
bullfrog	<i>Pyxicephalus adspersus</i>
All species of reptiles excluding the water leguaan, rock leguaan and all species of snakes	All species of the Class Reptilia excluding <i>Varanus niloticus</i> , <i>Varanus exanthematicus</i> and all species of the Sub Order Serpentes
Riverine rabbit	<i>Bungolagus monticularis</i>
hedgehog	<i>Atelerix frontalis</i>
Samango monkey	<i>Cercopithecus mitis</i>
bushbaby	<i>Otolemur crassicaudatus</i>
Lesser bushbaby	<i>Galago moholi</i>
Honey-badger	<i>Mellivora capensis</i>
pangolin	<i>Manis temminckii</i>
aardwolf	<i>Proteles cristatus</i>
Cape hunting dog	<i>Lycaon pictus</i>
Brown hyaena	<i>Hyaena brunnea</i>
antbear	<i>Orycteropus afer</i>
Mountain zebra	<i>Equus zebra zebra</i>
Hartmann's zebra	<i>Equus zebra hartmannae</i>
hippopotamus	<i>Hippopotamus amphibius</i>
giraffe	<i>Girrafa camelopardalis</i>
nyala	<i>Tragelaphus angasi</i>
Red duiker	<i>Cephalophus natalensis</i>
Blue duiker	<i>Philantomba monticola</i>
reedbuck	<i>Redunca arundinum</i>
Mountain reedbuck	<i>Redunca fulvorufula</i>
Sable antelope	<i>Hippotragus niger</i>
Roan antelope	<i>Hippotragus equinus</i>
Black wildebeest	<i>Connochaetes gnou</i>
tsessebe	<i>Damaliscus lanatus</i>
Lichtenstein's hartebeest	<i>Alcelaphus lichtensteinii</i>
klipspringer	<i>Oreotragus oreotragus</i>
oribi	<i>Ourebia ourebi</i>
steenbok	<i>Raphicerus campestris</i>
Sharpe's grysbok	<i>Raphicerus sharper</i>
sunni	<i>Neotragus moschatus</i>
Grey rhebok	<i>Pelea capreolus</i>
eland	<i>Taurotragus oryx</i>
waterbuck	<i>Kobus ellipsiprymnus</i>
Cape clawless otter	<i>Aonyx capensis</i>
Spotted necked otter	<i>Lutra maculicollis</i>

SCHEDULE 4: PROTECTED WILD ANIMALS (SECTION 4 (1) (d))

<b>Common name</b>	<b>Scientific name</b>
Spotted hyaena	Crocuta Crocuta
Cheetah	Acinonyx jubatus
Leopard	Panthera pardus
Lion	Panthera leo
African buffalo	Syncerus caffer



# Appendix 3: 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

### 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

### 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

### 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

### 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