Appendix G.13

ANIMAL SPECIES ASSESSMENT

Confidential

ANIMAL SPECIES SPECIALIST ASSESSMENT FOR THE PROPOSED ABO UVEMVANE WIND ENERGY FACILITY 1

August 2026



Submitted to:
WSP Group Africa Pty (Ltd)
Building 1, Maxwell Office Park
Waterfall City, Midrand
Gauteng
South Africa

HAWKHEAD CONSULTING

Report Compiled By:
Andrew Zinn (*Pr.Sci.Nat.*)
Terrestrial Ecologist
Hawkhead Consulting

Contents

ANIMAL SPECIES SPECIALIST ASSESSMENT FOR THE PROPOSED ABO UVEMVANE WIND ENERGY FACILITY 1 1
List of Tables 4
List of Figures 5
Acronyms and Abbreviations 6
Details of the Expertise of the Specialist 8
Declaration of Independence by Specialist 8
1. Introduction 9
1.1. Scope and Purposes of this Report 9
1.2. Project Description 10
1.3. Defining the Project's Area of Influence 13
1.4. Results of the Environmental Screening Tool 16
2. Relevant Legislation and Guidelines 17
3. Study Methodology 20
3.1. Desktop Data Collation and Literature Review 20
3.1.1. Mammals 20
3.1.2. Herpetofauna (Reptiles and Amphibians) 20
3.2. Field Programme 20
3.2.1. Mammals 20
3.2.2. Herpetofauna (reptiles and amphibians) 21
3.3. Assessment of Species of Conservation Concern 21
3.3.1. Fauna Species of Conservation Concern 21
3.3.2. Habitat Suitability Assessments for Species of Conservation Concern 22
3.4. National and Provincial Protected Fauna Species 22
3.5. Assessment of Site Ecological Importance 22
4. Assumptions, Uncertainties and Gaps in Knowledge 23
5. Landscape Context and Existing Impacts on Fauna 24
6. Characterisation of on-site Fauna Habitats 24
6.1. Mountain Bushveld 27
6.2. Rocky Shrubland and Grassland 27
6.3. Watercourses (Rivers and Wetlands) 28
6.4. Natural Dry Grassland 29
6.5. Secondary Grassland 30
6.6. Alien Tree Stands 30

6.7. Cultivated Fields 31
7. Fauna Assessment 32
7.1. Mammals 32
7.1.1. Mammal Species Richness and Habitat Availability 32
7.1.2. Mammal Species of Conservation Concern 37
7.2. Herpetofauna 43
7.2.1. Herpetofauna Richness and Habitat Availability 43
7.2.2. Herpetofauna Species of Conservation Concern 44
8. Key Ecological Attributes and Processes 46
8.1. Habitat Corridors, Resources and Refugia 46
8.2. Dynamic Ecological Processes and Drivers of Change 46
8.2.1. Alien Invasive Species Colonisation 46
8.2.2. Wildfire – Grassland Burning 47
8.2.3. Herbivory – Wildlife and Livestock Grazing and Trampling 47
9. General Sensitivity and Analysis of Site Ecological Importance 48
10. Impact Assessment 53
10.1. Impact Assessment Methodology 53
10.2. Impact Mitigation 54
10.3. Assessment of Impacts on Terrestrial Fauna 55
10.3.1. Construction Phase 55
10.3.2. Operational Phase 61
10.3.3. Decommissioning Phase 62
10.3.4. Cumulative Impacts 64
11. Assessment of the No Go Alternative 66
12. Mitigation Measures 66
13. Monitoring Measures 75
14. Biodiversity Management/Action Plan 75
15. Reasoned Opinion and Environmental Impact Statement 75
15.1. Summary of Main Findings 75
15.2. Conditions to be Included in the Environmental Authorisation 76
15.3. Specialist Opinion 76
16. References 76
Appendix A: Curriculum Vitae – Andrew Zinn 80
Appendix B: Methodology Supplement 84

Appendix C: List of Mammal Species Recorded or Potentially Occurring in the PAOI 90
Appendix E: List of Herpetofauna Species Recorded or Potentially Occurring in the PAOI 95
Appendix F: Compliance with Animal Species Protocol..... 100

List of Tables

Figure 1: Map showing the regional location of the proposed Project's Area of Influence defined for the impact assessment phase. 15
Figure 2: Screening report sensitivity for Animal Species..... 16
Figure 3: Habitat unit map of the PAOI..... 26
Figure 4: Typical Mountain Bushveld..... 27
Figure 5: Typical Mountain Bushveld..... 27
Figure 6: Typical area of Rocky Shrubland and Grassland. 28
Figure 7: Area of Rocky Shrubland and Grassland dominated by Protea caffra trees..... 28
Figure 8: The Suikerbosrand River, flanked by both woody and herbaceous flora species. 29
Figure 9: Valley-bottom wetland, with an artificial farm dam. 29
Figure 10: Mountain valley, characterised by closed-canopy woodland dominated by Olea europaea. 29
Figure 11: Drainage line characterised by Leucosidea sericea thickets. 29
Figure 12: Typical example of natural grassland in the PAOI. 30
Figure 13: Forb dominated area of natural grassland. 30
Figure 14: Eragrostis dominated secondary grassland. 30
Figure 15: Hyparrhenia hirta dominated secondary grassland. 30
Figure 16: Small stand/windrow of Eucalyptus camaldulensis trees..... 31
Figure 17: Stand of Populus x canescens trees encroaching in a wetland in the PAOI. 31
Figure 18: Recently ploughed cultivated field. 31
Figure 19: Mountain Reedbuck (Redunca fulvorufula fulvorufula) – Endangered..... 35
Figure 20: Red Hartebeest (Alcelaphus buselaphus caama)..... 35
Figure 21: Sable Antelope (Hippotragus niger niger) - Vulnerable..... 35
Figure 22: Giraffe (Giraffa camelopardalis giraffa) 35
Figure 23: Serval (Leptailurus serval) – Near Threatened 35
Figure 24: Black-backed Jackal (Canis mesomelas)..... 35
Figure 25: Slender Mongoose (Herpestes sanguineus) 36
Figure 26: Water Mongoose (Atilax paludinosus) 36
Figure 27: Large-spotted Genet (Genetta maculata)..... 36
Figure 28: Porcupine (Hystrix africaeaustralis)..... 36
Figure 29: Warthog (Phacochoerus africanus) 36
Figure 30: Bushpig (Potamochoerus larvatus)..... 36
Figure 31: Xeric Four-stripped Mouse (Rhabdomys species) 37
Figure 32: Vlei Rat (Otomys cf. auratus) – Near Threatened..... 37
Figure 33: Eastern Rock Sengi (Elephantus myurus)..... 37
Figure 34: Rock Hyrax (Procavia capensis)..... 37
Figure 35: Water Monitor (Varanus niloticus) photographed in the PAOI. 44
Figure 36: Common River Frog (Amieta dealandii) caught in the PAOI..... 44

Figure 37: Site Ecological Importance of the PAOI. 52
Figure 38: Mitigation Sequence/Hierarchy 55
Figure 39: Habitat units and the proposed infrastructure layout 58
Figure 40: Other renewable energy projects in the broader region surrounding the PAOI. 65

List of Figures

Table 1: Summary of the proposed Project. 10
Table 2: Affected properties. 13
Table 3: Relevant environmental and biodiversity legislation and guidelines. 17
Table 4: Guidelines for interpreting SEI in the context of the proposed development activities 23
Table 5: Indigenous mammal species recorded in the PAOI. 32
Table 6: Mammal species of conservation concern occurring or potentially occurring in the PAOI. 41
Table 7: Reptile and amphibian species recorded in the PAOI during the field programme 43
Table 8: Reptile species of conservation concern potentially occurring in the PAOI. 45
Table 9: Site Ecological Importance of habitat unit in the PAOI 49
Table 10: Impact Assessment Criteria and Scoring System 53
Table 11: Approximate extent of possible loss/disturbance of habitat units. 57
Table 12: Impact assessment scoring for terrestrial fauna species 63
Table 13: Recommended mitigation and management measures for terrestrial fauna 67

Acronyms and Abbreviations

Abbreviation	Explanation
AIS	Alien Invasive Species
AOO	Area of Occupancy
BESS	Battery Energy Storage System
BI	Biodiversity Importance
CA	Conservation Areas
CBA	Critical Biodiversity Areas
CI	Conservation Importance
C-Plan	Conservation Plan
CR	Critically Endangered
DFFE	Department of Fisheries, Forestry and the Environment
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
EN	Endangered
EOO	Extent of Occurrence
ESA	Ecological Support Area
FEPA	Freshwater Ecosystem Protection Area
FI	Functional Integrity
GDARD	Gauteng Department of Agriculture and Rural Development
Ha	Hectare
IBA	Important Bird Areas
KBA	Key Biodiversity Areas
MBSP	Mpumalanga Biodiversity Sector Plan
MTPA	Mpumalanga Tourism and Parks Agency
NEMA	National Environmental Management Act
NEMBA	National Environmental Management Biodiversity Act
NEMPA	National Environmental Management Protected Areas Act

Abbreviation	Explanation
NFEPA	National Freshwater Ecosystem Priority Areas
NPAES	National Protected Area Expansion Strategy
NT	Near Threatened
O&M	Operation and Maintenance
PA	Protected Areas
PAOI	Project's Area of Influence
QDS	Quarter Degree Square
REEA	Renewable Energy Environmental Authorisation
RR	Receptor Resilience
SANBI	South African National Biodiversity Institute
SAPAD	South African Protected Areas Database
SCC	Species of Conservation Concern
SEI	Site Ecological Importance
SWSA	Strategic Water Source Areas
ToPS	Threatened or Protected Species
VU	Vulnerable
WEF	Wind Energy Facility

Details of the Expertise of the Specialist

	Specialist Information
Name	Andrew Zinn *Pr.Sci.Nat*. - Ecological Science (400687/15)
Designation	Report Author – Terrestrial Ecologist with Hawkhead Consulting
Cell Phone Number	+27 83 361 0373
Email Address	andrew@hawkhead.co.za
Qualifications	M.Sc. Resource Conservation Biology B.Sc. Hons. Ecology and Conservation Biology B.Sc. Zoology and Grassland Science
Affiliations	Member of the South African Council of Natural Scientific Professions Member of the South African Wildlife Management Association Member of the South African Association of Botanists
Summary of Past Experience	Andrew Zinn is a terrestrial ecologist with Hawkhead Consulting. In this role, he conducts varied specialist ecology studies, including flora and fauna surveys, for baseline ecological assessments and ecological impact assessments. Andrew has 17 years of experience working in the fields of ecology and conservation research and is registered as a Professional Natural Scientist (*Pr.Sci.Nat.*) – Ecological Science, with the South African Council of Natural Scientific Professions (SACNASP). Andrew has worked on projects in several African countries including Botswana, Democratic Republic of Congo, Ethiopia, Ghana, Mozambique, South Africa, Tanzania and Zambia.
Refer to Appendix A for a full Curriculum Vitae of Andrew Zinn.	

Declaration of Independence by Specialist

I, Andrew Zinn, declare that I –

- Act as the independent specialist for the undertaking of a specialist section for the proposed ABO Uvemvane Wind Energy Facility 1 Project;
- Do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed;
- Do not have, nor will have, a vested interest in the proposed activity proceeding;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity; and
- Undertake to disclose, to the competent authority, any information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document.



1. Introduction

Hawkhead Consulting was appointed by WSP Group Africa Pty (Ltd), on behalf of ABO Uvemvane Wind Energy Facility 1 (Pty) Ltd, to conduct the Animal Species Specialist Assessment for the proposed ABO Uvemvane Wind Energy Facility 1 Project (hereafter referred to as the 'Project'), near Heidelberg in Gauteng Province and Balfour in Mpumalanga Province, South Africa.

1.1. Scope and Purposes of this Report

This specialist study focused on terrestrial animals (fauna), specifically mammals (excl. bats), herpetofauna (reptiles and amphibians). Avifauna, bats and invertebrates (butterflies) have been assessed as part of a separate specialist studies and are not discussed in this report.

The study has been conducted in line with the 'Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in Terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, When Applying for Environmental Authorisation', and specifically the:

- Protocol for the Specialist Assessment and Minimum Content Requirements for Environmental Impacts on Animal Species.

The primary scope of work included:

- Collating and reviewing information and data on terrestrial fauna species that occur or potentially occur on-site and in the surrounding landscape;
- Conducting a field programme to assess the presence and potential presence of terrestrial fauna species present on-site, with specific focus on species of conservation concern and sensitive habitats;
- Assessing the suitability of the Proposed project and the nature and extent of potential impacts on fauna that may result from proposed Project activities; and
- Recommending mitigation and management measures for inclusion in the proposed Project's Environmental Management Programme (EMP) and/or Biodiversity Management Plan (BMP).

In line with the above scope, the purpose of this report is to; 1) present a baseline description of terrestrial fauna species occurring on-site, highlighting the presence/potential presence of species of conservation concern and sensitive habitats; 2) present the findings of an impact assessment for the proposed Project; 3) recommend applicable biodiversity mitigation and management measures; and, 4) provide an impact statement on the appropriateness of the proposed Project with respects to terrestrial animal species conservation.

This report should be read in conjunction with the other specialist ecology reports for the proposed Project, including *inter alia*, the Terrestrial Biodiversity Specialist Assessment report and Plant Species Specialist Assessment report.

1.2. Project Description

ABO Uvemvane Wind Energy Facility 1 (Pty) Ltd proposes the development of ABO Uvemvane Wind Energy Facility 1 (WEF 1), a commercial wind energy generation facility comprising up to 20 turbines and with a total generation capacity of up to 170 MWac in capacity, as well as associated infrastructure – refer to Table 1 for a summary of the proposed Project description.

The proposed WEF would be located approximately 9 km west of the town of Balfour in the Mpumalanga Province in the Dipaleseng Local Municipality, within the Gert Sibande District Municipality, and approximately 14km south-east of the town Heidelberg in the Gauteng Province in the Lesedi & Midvaal Local Municipalities within the Sedibeng District Municipality.

Table 1: Summary of the proposed Project.

Infrastructure	WEF 1
MWac	Up to 170
Development Footprint	Approx. 67.2 ha
Access Points	Five existing access points
Internal Road Lengths	Up to 31 km
Electrical Infrastructure Hub (with collector substation, substation, and BESS infrastructure)	Three locations to be assessed as options, only one will be constructed (up to 7 ha)
Temporary Laydown Areas	Four, totalling up to 15 ha.

It is anticipated that the proposed WEF would have a total (permanent) development footprint of up to 67.2 ha, which is approximately 1.12% of the total site (i.e., affected properties) area. The affected properties are indicated in Table 2.

A development area (i.e., the full extent of the affected properties as well as beyond, where appropriate) has been identified for the proposed development. Within this identified development area, a development footprint has been defined in a manner which has considered the environmental sensitivities present on the affected properties and intentionally remains outside of highly sensitive areas. All affected properties in their entirety have been considered in this S&EIA process (which includes the independent specialists' assessment undertaken hereunder) and assessed in terms of the suitability from an environmental and social perspective. The location of the proposed Project and the siting of the Project infrastructure within the assessed study area has been informed by the recommendations of the specialists following their field assessments, where relevant.

It is important to note at the outset that the exact specifications of the proposed Project components will be determined during the detailed engineering design phase prior to construction (subsequent to the issuing of an EA, should such an authorisation be granted), but that the information provided below is seen as the maximum development scenario for the proposed development.

The proposed facility would comprise the following (to be located within the proposed development footprint):

- Up to 20 turbines with the following maximum specifications:
    - Maximum hub height 180 m;

    - Maximum blade length 100 m;
    - Maximum rotor diameter 200 m;
    - Maximum capacity per turbine 10 MW;
    - A transformer at the base of each turbine;
    - Concrete turbine foundations up to 1 ha each;
    - Turbine, crane, and blade hardstands (included in the abovementioned 1 ha);
- Primary/main access roads as well as internal road reticulation (note that existing roads/disturbed areas would be used as far as possible, and for the proposed roads, a corridor of up to 12 m wide may be temporarily impacted upon during construction and be rehabilitated to up to 10 m wide after construction), inclusive of stormwater infrastructure where relevant;
- 4 Temporary laydown areas/ construction compounds (includes concrete batching), totalling up to 15 ha, would be fenced with access control; and/or
- Battery Energy Storage System (BESS) to be located within the electrical infrastructure hub described under "associated infrastructure" below.

Associated infrastructure would include the following (to be located within the proposed development footprint):

- Associated internal electrical reticulation/ cabling (i.e., low- and medium voltage powerlines), underground as far as is feasible, and to run within the proposed road footprint/route as far as possible;
- A 33kV overhead/underground line to connect the northern and southern portions of the facility;
- On-site electrical infrastructure hub up to 7 ha in extent (note there are 3 locations to be assessed as options, however only 1 will be constructed) consisting of:
    - On-site substation and associated infrastructure;
    - Additional step-up/ transformation/ collector/switchyard infrastructure;
    - Auxiliary buildings (including, but not limited to, Operation and Maintenance (O&M) building/s, admin building/s, workshop/s, gatehouse/s, security building/s, control centre/s, office/s, visitor centre/s, warehouse/s, etc.);
    - May include the installation of a communications tower and lighting mast on site with a maximum height of 32 m and 25m respectively; and/or
    - BESS.

Five access points are proposed, four of these are off existing unnamed farm roads (originating from the D1220 and P243/1), and one is off Lagerspoort Road from Heidelberg - Balfour Road (R23). Access roads would be developed both to the site and within the site (i.e., between Project components).

The operations of the proposed facility would require some servicing, noting that the operational electrical requirements would be nominal and would be supplied by the facility on site. Water would be required for sanitation use by operational staff (drinking and washing hands, food, etc) as well as for cleaning of equipment, and scheduled internal cleaning of building, and dust control on internal roads (where needed). Water would ideally be sourced from the local municipality, in terms of a Service Level Agreement established between the Municipality and the Proponent. If this is not

possible, then further options, such as sourcing water from a private services provider, will be investigated. Where required, a storage tank (i.e., Jo-Jo tank) of up to approximately 10,000L may be used on site for temporary water storage. Sanitation requirements would be minimal, given that there would not be many operational staff. Sanitation for auxiliary buildings would be connected to the existing municipal sewage system. If the Municipality does not approve, or have capacity for, such a connection, sewage would be stored in the conservancy tank and collected either by a honey-sucker truck or by a service provider (Contractor) for treatment at a licensed disposal site. Alternatively, a standalone system would be used (i.e., porta-loos) which would be regularly serviced by an independent contractor. Note that it is not intended to make use of soakaways or on-site treatment solutions. Refuse/solid waste produced would also be nominal (approximately two wheelie bins per week) and would ideally be removed by the Municipality, however, if this is not possible, the Operator would employ private contractors to remove the refuse and dispose of it appropriately.

The construction phase would also require water and sanitation, with these aspects being the primary responsibility of the Contractor. However, it would be preferable for water to be sourced from the local Municipality (where available), with alternative arrangements (for example, bringing water in with trucks) being made where necessary. Solid waste would also be produced and would be managed in accordance with the requirements in the Environmental Management Programme (EMPr).

Stormwater drainage systems may be constructed on site to ensure that stormwater run-off from site is appropriately managed. Water from these systems is not likely to contain any chemicals or hazardous substances and would be released into the surrounding environment based on the natural drainage contours.

Temporary water pipelines may be installed on site during construction for water supply to inter alia the concrete batching plant and the O&M building complex for domestic use and sanitation. Possible groundwater abstraction on site for purposes of the batching plant could be considered, if required, considering any necessary and relevant legal requirements. There would be no other specific stormwater and/or landscaping initiatives undertaken as part of the proposed WEF, other than any interventions prescribed by the relevant specialist/s through the S&EIA process.

Blade patterning may be implemented as a recommended avian mitigation, in accordance with the Blade Patterning Guidelines (SAWEA & BirdLife South Africa, 2024).

The connection for the project within could occur at these via a new loop-in-loop-out connection or via a direct connection to one of the two nearby substations. Note that the EGI component of the WEFs will be subject to separate environmental impact assessments.

Alternatives:

The proposed development as described above has been assessed with the following alternatives:

1. 33kV overhead/underground line to connect northern and southern parts of the facility:
    - A 100 m assessment corridor should be assessed; the actual servitude width would only be 22m;

- The line is approximately 8km long and a conservative average span length of approximately 100 m can be assumed for assessment purposes, although actual spans may be longer (depending on final engineering design and terrain);
- Two route alternatives to assess;

2. BESS Technology: With regard to the proposed BESS, the technology thereof is dynamic and so the specific type/technology to be developed would be selected based on market demands and technology availability at the time of construction. Therefore, both Lithium-ion and redox-flow are assessed as technology alternatives, with Lithium-ion being the current preferred technology; and
3. The No-go alternative has also been assessed, noting that the property does hold existing development rights (i.e., Agriculture) and so, not developing the proposed development does not necessarily mean that there would be no changes or impacts on the site.

Table 2: Affected properties.

Affected Property	SG Code
The Remaining Extent of Portion 2 of the Farm Lagerspoort Number 406	T0IR00000000040600002
Portion 17 (a Portion of Portion 3) of the Farm Lagerspoort Nr 406	T0IR00000000040600017
Remaining Extent of Portion 4 of the Farm De Hoek 411	T0IR00000000041100004
Portion 45 of the Farm Lagerspoort 406	T0IR00000000040600045
Portion 7 of the Farm Lagerspoort Number 406	T0IR00000000040600007
Portion 19 of the Farm De Hoek No 411	T0IR00000000041100019
Remaining Extent of Portion 2 of the Farm Modderfontein 410	T0IR00000000041000002
The Farm Orion No 413	T0IR00000000041300000
Remaining Extent of Portion 5 of the Farm Lagerspoort 406	T0IR00000000040600005
Portion 7 of the Farm Driefontein 405	T0IR00000000040500007
Remaining Extent of Portion 9 of the Farm Malanskraal No 407	T0IR00000000040700009
Remaining Extent of Portion 2 of the Farm Malanskraal 407	T0IR00000000040700002
Portion 12 (a Portion of Portion 2) of the Farm Malanskraal 407	T0IR00000000040700012
Remaining Extent of Portion 2 of the Farm Driefontein 405	T0IR00000000040500002
Remaining Extent of the Farm Driefontein 405	T0IR00000000040500000
Remainder of Portion 6 (Kingsmead) of the Farm Malanskraal 407	T0IR00000000040700006
Portion 17 (a Portion of Portion 8) of the Farm Malanskraal No 407	T0IR00000000040700017
Farm Bothas Spruit Nr. 404	T0IR00000000040400000
Portion 16 (a Portion of Portion 4) of the Farm Malanskraal No 407	T0IR00000000040700016
Remaining Extent of Portion 13 (a Portion of Portion 2) of the Farm Malanskraal 407	T0IR00000000040700013
Remainder of Portion 18 (a Portion of Portion 3) of the Farm Malanskraal 407	T0IR00000000040700018
Portion 1 of the Farm Weltevreden Nr. 449	T0IR00000000044900001

1.3. Defining the Project's Area of Influence

A Project's Area of Influence (PAOI) is defined according to important ecosystem processes and functions that may be impacted by the proposed Project's infrastructure and activities (SANBI, 2026).

The PAOI delineated for this specialist study consists of the various farms and farm portions identified by the Project Proponent as the technically suitable footprint for the WEF development (Figure 1**Error! Reference source not found.**.). This is the area within which direct and indirect impacts on the biodiversity receptors addressed in this report may arise. It should be noted that during the initial baseline studies a larger study area covering various neighbouring properties was defined and assessed.

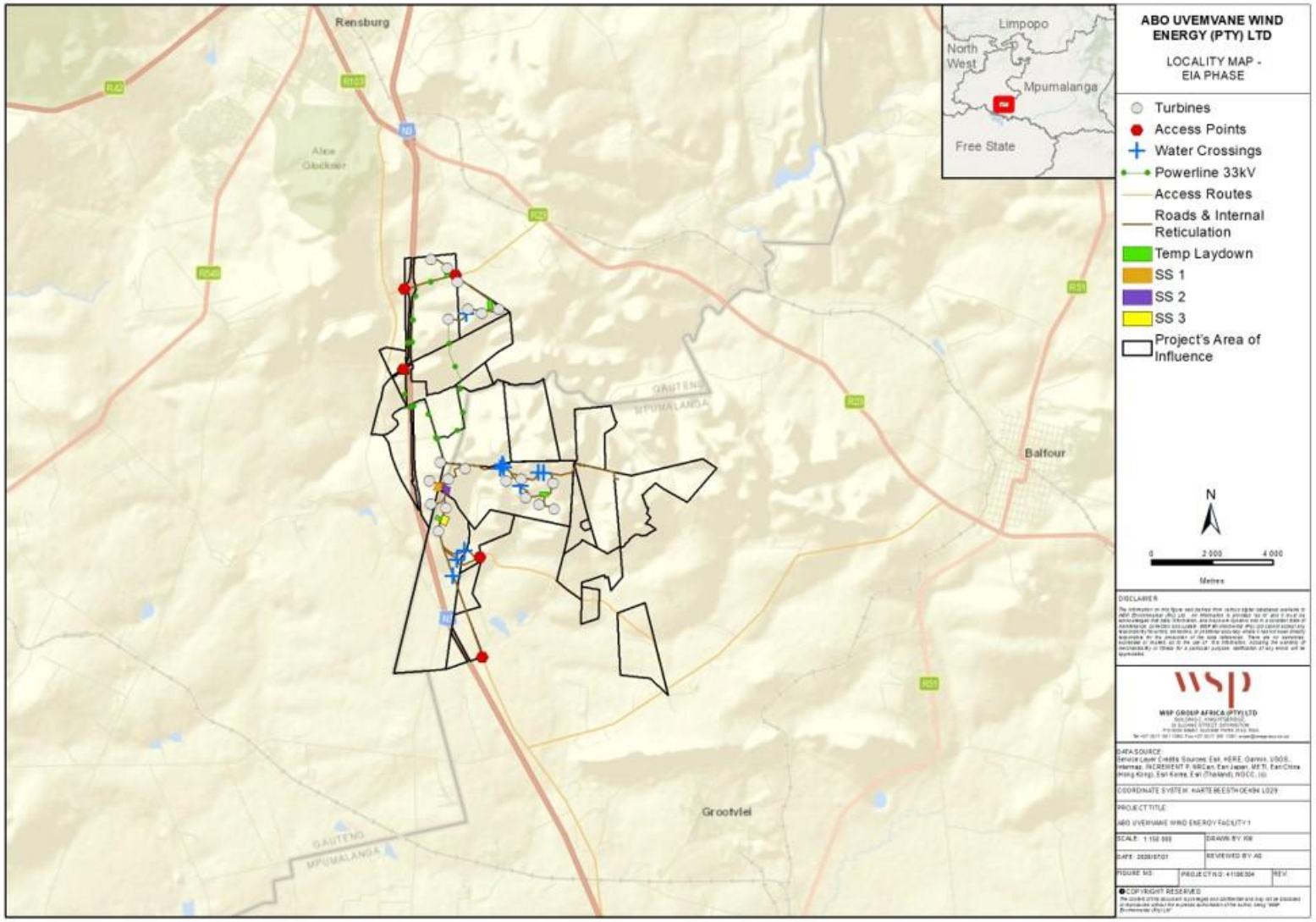


Figure 1: Map showing the regional location of the proposed Project's Area of Influence defined for the impact assessment phase.

1.4. Results of the Environmental Screening Tool

According to the Department of Fisheries, Forestry and the Environment (DFFE) National Web Based Screening Tool, the Animal Species Theme for the PAOI was rated 'High' sensitivity on account of the potential presence of several threatened fauna species listed below:

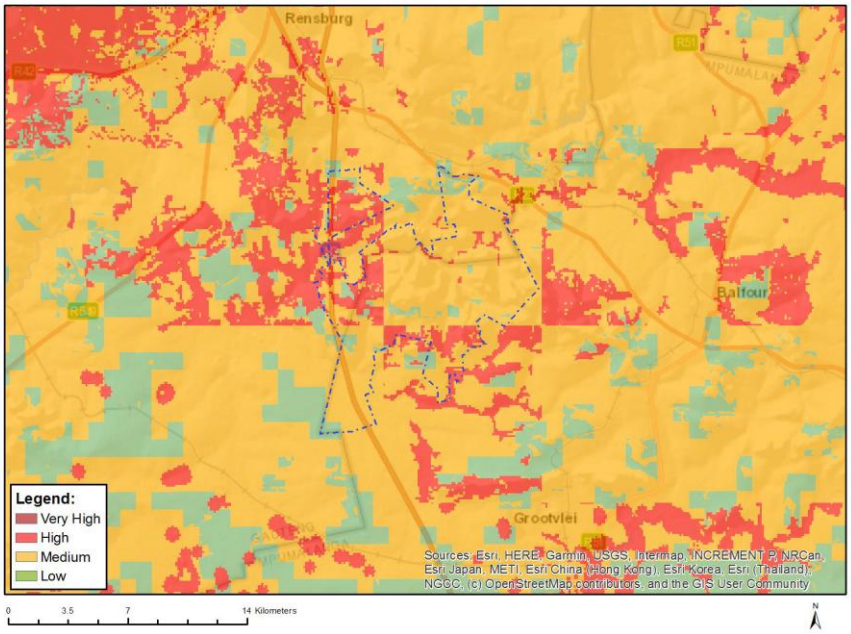


Figure 2: Screening report sensitivity for Animal Species.

- Five bird species:
  - Secretarybird (*Sagittarius serpentarius*);
  - Caspian Tern (*Hydroprogne caspia*);
  - White-bellied Bustard (*Eupodotis senegalensis*);
  - African Marsh Harrier (*Circus ranivorus*);
  - Yellow-billed Stork (*Mycteria ibis*);
- Three mammal species:
  - Maquassie Musk Shrew (*Crocidura maquassiensis*);
  - Spotted-necked Otter (*Hydrictis maculicollis*);
  - Oribi (*Ourebia ourebi ourebi*);
- Three invertebrate species:
  - Potchefstroom Blue (*Lepidochrysops procera*);
  - Highveld Golden Opal (*Chrysoritis aureus*); and
  - Mijburgh's Blue (*Orachrysops mijburghi*).

Of the listed fauna species, the screening tool report listed three bird species as High sensitivity, namely African Marsh Harrier, Secretarybird and the Yellow-billed Stork. The remaining bird, mammal and invertebrate species are listed as Medium sensitivity according to the screening tool report. This specialist assessment focused on the above listed mammal SCC, along with other mammal and herpetofauna SCC that potentially occur in the PAOI. Bird and invertebrate (butterflies) SCC have been assessed as part of a separate specialist studies and are not covered in this report.

2. Relevant Legislation and Guidelines

National and provincial legislation, associated guidelines and policies that are relevant to the environment and biodiversity, and which were used to guide the Animal Species Specialist Assessment are listed in Table 3.

Table 3: Relevant environmental and biodiversity legislation and guidelines.

Applicable Legislation and Guideline	Relevance to the Proposed Project
National Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA)	Section 24 of the NEMA, headed "Environmental Authorisations" sets out the provisions which are to give effect to the general objectives of Integrated Environmental Management, and laid down in Chapter 5 of the NEMA. In terms of section 24(1), the potential impact on the environment of listed activities must be considered, investigated, assessed and reported on to the competent authority charged by the NEMA with granting of the relevant environmental authorisation. In terms of section 24F(1) of the NEMA no person may commence an activity listed or specified in terms of section 24(2)(a) or (b) unless the competent authority has granted an environmental authorisation for the activity. Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the NEMA (1998), when applying for environmental authorisation, the following is relevant to this study: • Protocol for the specialist assessment and report content requirements for environmental impacts on terrestrial biodiversity.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA)	The NEMBA is administered by the Department of Forestry, Fisheries and the Environment (DFFE) and provides the framework under the NEMA for the: • Management and conservation of South Africa's biodiversity; • The protection of species and ecosystems that warrant protection; • The fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources; and • The establishment and functions of a South African National Biodiversity Institute (SANBI). Amongst other components, the NEMBA includes: • Lists of Critically Endangered, Endangered, Vulnerable and Protected Species (February 2007), with associated amendments (December 2007) (ToPS), published under Section 56(10) of NEMBA; • Threatened or Protected Species Regulations (February 2007);

Applicable Legislation and Guideline	Relevance to the Proposed Project
	• National list of threatened terrestrial ecosystems for South Africa (2022 revision), published under Section 51(1)(a) of NEMBA; and • National Biodiversity Offset Guideline (2023), which provides guidance on the need to develop biodiversity offsets. The purpose of ToPS lists and regulations are to regulate the permit system concerning restricted activities involving specimens of listed threatened or protected species. The primary purpose of listing threatened ecosystems is to reduce the rate of ecosystem and species extinction by identifying 'witness' sites' of exceptionally high conservation value and enabling and facilitating proactive management of these ecosystems. Chapter 5 of NEMBA also provides a list of regulations and guidance concerning alien invasive species, including: • A guideline for Monitoring, Control and Eradication Plans (September 2015); • 2020 Alien and Invasive Species Regulations (September 2020); and • Alien and Invasive Species Lists (March 2021).
National Environmental Management: Protected Areas Act (2003) (NEMPA)	• The NEMPA provides the framework under the NEMA for the protection and conservation of South Africa's biodiversity through the establishment of a system of protected areas that represent the country's diverse ecosystems, landscapes, and seascapes; and • The NEMPA sets out mechanisms and processes for declaring and managing protected areas, including protected environments, with an emphasis on intergovernmental cooperation and public involvement.
Mpumalanga Nature Conservation Act (Act No. 10 of 1998)	Amongst other provisions, the Mpumalanga Nature Conservation Act (Act No. 10 of 1998) provides lists of specially protected and protected flora and fauna. Of particular relevance to this specialist study are species of game/wild animals and flora that are listed under: • Schedule 1: Specially Protected Game; • Schedule 2: Protected Game; and • Schedule 4: Protected Wild Animals.
Nature Conservation Ordinance 12 of 1983, as amended by Gauteng General Law Amendment Act 4 of 2005.	Amongst other provisions, the Nature Conservation Ordinance provides lists of specially protected and protected flora and fauna. Of particular relevance are Schedule 2, 2A, 4, 7, 11 and 12 concerning Protected and Specially Protected fauna and flora.
Other Relevant national and Provincial Policies, Plans and Guidelines	Other relevant policies, plans and guidelines that were considered during this study include: • Species Environmental Assessment Guideline, Version 3.1 (2022) and Version 4.1. (2026); • National Protected Area Expansion Strategy (2018);

Applicable Legislation and Guideline	Relevance to the Proposed Project
	• Best practice Guidelines for Implementing the Mitigation Hierarchy in South Africa – Draft February 2023. (EWT, 2023); • Mpumalanga Protected Areas Expansion Strategy – 20 Year Plan; • Mpumalanga Biodiversity Sector Plan (2024); • Gauteng Conservation Plan (Version 4) (2024); • The Ridges Guideline (2019) for Gauteng Province; • Gauteng Department of Agriculture and Rural Development Requirements for Biodiversity Assessments Version 3.

3. Study Methodology

The study methodology comprised a desktop literature review and an on-site field programme, both undertaken in accordance with the Species Environmental Assessment Guidelines, Version 3.1 (SANBI, 2022), with subsequent reporting updated where necessary to align with Version 4.1 (SANBI, 2026). The specific tasks associated with the desktop literature review and field programme are outlined below:

3.1. Desktop Data Collation and Literature Review

The aim of the desktop literature review component was to collate and review data and information pertaining to animal species that may occur in the PAOI and surrounding landscape, based on historic distribution ranges or recent records. Literature and data that were reviewed were obtained from a variety of online and literature sources, as discussed below:

3.1.1. Mammals

- A list of mammal species that are known to occur in the region was compiled based on the historic distribution ranges presented in Stuart and Stuart (2007); and
- These data were cross-referenced with mammal species listed for the 2628CB Quarter Degree Square (QDS) on the MammalMAP database (Fitzpatrick Institute of African Ornithology, 2024) and species of conservation concern data obtained from the Mpumalanga Parks and Tourism Agency (MPTA) (courtesy of M. Lötter) and the Gauteng Department of Agriculture, Rural Development and Conservation (GDARD) (courtesy of S. Veldsman); and
- iNaturalist records were also consulted to identify any mammal species of conservation concern previously observed in close proximity to the PAOI.

3.1.2. Herpetofauna (Reptiles and Amphibians)

- A list of herpetofauna that potentially occur in the PAOI was compiled based on the distribution maps presented in Bates *et al*., (2014) for reptiles, and Du Preez and Carruthers (2009) for amphibians;
- Additional herpetofauna data were also sourced from ReptileMAP and FrogMAP for the 2628CB QDS (Fitzpatrick Institute of African Ornithology, 2024); and
- Data on herpetofauna of conservation concern were also obtained from the MPTA and GDARD for the PAOI;
- iNaturalist records were also consulted to identify any herpetofauna species of conservation concern previously observed in close proximity to the PAOI.

3.2. Field Programme

The field programme comprised two field surveys; a dry-season field survey, which was conducted from the 29th July to 2nd August 2024; and a wet-season field survey, which was conducted from the 20th to 24th January 2025. The sampling methodologies used during the field survey were based on those recommended in the Species Environmental Assessment Guidelines (SANBI, 2022), and included the following:

3.2.1. Mammals

Mammal sampling included both active and passive sampling methodologies:

- Active sampling of mammals included the use of baited motion-triggered camera traps (large- and medium-sized mammals) and Sherman traps (small mammals) placed at select sampling sites in the PAOI:
    - Camera traps were placed at 12 fauna sites, accounting for one trap per 683 ha of the PAOI (shown in Appendix B). Sites were selected based on consideration of a combination of factors, including: 1) habitat type, 2) coverage of the PAOI, 3) proximity to water source/rivers, 4) presence of game trails/paths, and 5) general accessibility to field workers. All devices were programmed to medium-sensitivity, with a one-minute delay between successive photographs to limit repeat triggers. The traps were baited with chicken pieces and operational continuously for the 24-hour cycle of each day, accounting for 1 140 trapping hours during the field programme; and
    - A grid of six Sherman traps was laid at four sampling sites in the PAOI, accounting one trapping grid per 2050 ha and for a total of 2 304 trapping hours during the field programme. A home-made bait consisting of a mixture of oats, peanuts, peanut-butter, syrup and polony was used for the Sherman traps. Sherman traps were inspected each morning of the survey and rebaited as required;
- Passive sampling aimed to record mammals of all sizes and included direct observations, indirect observations and anecdotal evidence:
    - Direct observations were made during opportunistic encounters/visual observations of mammals made while walking, driving and using point scans in the PAOI;
    - Indirect observations included the identification of mammal tracks, faeces, burrows and mounds made while conducting the walked-transects; and
    - Local farmers were also consulted to obtain anecdotal evidence of mammal species presence in the PAOI.

3.2.2. Herpetofauna (reptiles and amphibians)

- Sampling for reptiles and amphibians was based on active searches and opportunistic observations made while driving/working in the PAOI were recorded;
- Night-time amphibian sampling was also conducted at two farm dams in the PAOI during the wet season survey; and
- Local farmers and other land users were also consulted to obtain anecdotal evidence of reptile/amphibian species present in the PAOI.

3.3. Assessment of Species of Conservation Concern

3.3.1. Fauna Species of Conservation Concern

Species of Conservation Concern (SCC) were based on regional Red Lists of threatened species. In line with the internationally endorsed IUCN Red List Categories and Criteria, these include species assigned one of the following conservation statuses: Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT), and Data Deficient – Insufficient Information (DDD) (SANBI, 2010). Relevant Red Lists or databases that were consulted for individual species Red List assessments included:

- Red List of Mammals of South Africa, Lesotho and Swaziland (EWT & SANBI 2025); and

- SANBI's online Red List of South Africa Species (for reptiles, amphibians and invertebrates) (www.speciesstatus.sanbi.org).

3.3.2. Habitat Suitability Assessments for Species of Conservation Concern

Habitat suitability assessments were conducted for SCC that have historically been recorded in the region to determine a 'probability of occurrence' in the PAOI. The following parameters were used in the assessments:

- Habitat requirements: Most threatened species have very specific habitat requirements. The presence of these habitats in the PAOI was evaluated;
- Habitat status: The status or ecological condition of available habitat was assessed. Often a high level of habitat degradation will negate the potential presence of sensitive species; and
- Habitat linkage: Dispersal and movement between natural areas for breeding and feeding are important population-level processes. Habitat connectivity within the PAOI and to surrounding natural habitat and corridors was evaluated to determine the likely persistence of SCC.

Probability of occurrence is presented in the following categories:

- Confirmed (Recorded): Any SCC observed/documented in or close to the PAOI;
- Probable (High): the species is likely to occur in the PAOI due to suitable habitat and resources being present;
- Possible (Medium): The species may occur in the PAOI, or move through the PAOI (in the case of mobile species), due to potential habitat and/or resources; and
- Unlikely (Low): the species will not likely occur in the PAOI due to lack of suitable habitat and resources, or significant differences in its Area of Occupancy (AOO) compared to its Extent of Occurrence (EOO).

3.4. National and Provincial Protected Fauna Species

Fauna species listed as Specially Protected, Protected, or threatened under national and provincial conservation legislation that occur or potentially occur in the PAOI were also highlighted as these have specific conservation management requirements. Relevant legislation included:

- National Environmental Management: Biodiversity Act (Act No. 10 of 2004) - Threatened or Protected Species List (Notice 389 of 2013) (NEMBA ToPS List, 2007);
- Mpumalanga Nature Conservation Act (Act No. 10 of 1998); and
- (Gauteng) Nature Conservation Ordinance 12 of 1983, as amended by Gauteng General Law Amendment Act 4 of 2005.

3.5. Assessment of Site Ecological Importance

The ecological importance of habitat units was determined using the protocol for evaluating site ecological importance (SEI) as published in SANBI's Species Assessment Guideline (SANBI, 2026). SEI is considered to be a function of the biodiversity importance (BI) of a receptor and its resilience to impacts (receptor resilience, RR), as per:

$$SEI = BI + RR.$$

Biodiversity importance is a function of conservation importance (CI) and the functional integrity (FI) of the receptor, as per:

$$BI = CI + FI$$

- **Conservation Importance** is defined as "the importance of a site for supporting biodiversity features of conservation concern present, e.g., populations of IUCN threatened and Near Threatened species (CR, EN, VU and NT), Rare species, range-restricted species, globally significant populations of congregatory species, and areas of threatened ecosystem types, through predominantly natural processes" (SANBI, 2026).
- **Functional Integrity** is defined as "A measure of the ecological condition of the impact receptor as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts" (SANBI, 2026).
- **Receptor Resilience** is defined as "the intrinsic capacity of the receptor to resist major damage from disturbance and/or to recover to its original state with limited or no human intervention" (SANBI, 2026).

For tables detailing the rating criteria for Conservation Importance, Functional Integrity and Receptor Resilience and the scoring matrices, refer to Appendix B. Table 4 presents a guideline for interpreting the SEI (SANBI, 2026).

Table 4: Guidelines for interpreting SEI in the context of the proposed development activities

Site Ecological Importance	Interpretation in relation to proposed development activities
Very High	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e., last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit amount of habitat impacted; limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very Low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.
Source: SANBI (2026).	

4. Assumptions, Uncertainties and Gaps in Knowledge

The following assumptions, uncertainties and gaps in knowledge are highlighted for this specialist study:

- It is assumed that the fauna species data (e.g., species lists and distribution records) obtained from online databases are accurate and up to date. However, it is acknowledged that these resources may contain limitations or discrepancies due to outdated information or misidentifications;
- The field programme comprised two five-day field surveys covering the mid-winter dry season and the mid-summer wet season periods. This accounted for potential seasonal variability in fauna species presence and ecological activity, and accordingly, seasonality is not considered a limiting factor;
- Notwithstanding the above, given the extent of the PAOI and the duration of fieldwork, it remains possible that certain rare, cryptic, migratory, transient, or low-detection probability fauna species were not present and/or were not observed during the field programme;
- The absence or non-recording of a specific fauna species, at a particular time, does not necessarily indicate that 1) the species does not occur there; 2) the species does not utilise resources in that area; or 3) the area does not play an ecological support role in the ecology of that species; and
- Given the difficulty of fully sampling and characterising the abundance and distribution of fauna species in the PAOI during the short period of time allocated to field work, the baseline descriptions were qualitative.

5. Landscape Context and Existing Impacts on Fauna

The following notes summarise the general landscape context and exiting/current impacts observed in the PAOI during the field programme:

- The PAOI is large and encompasses a series of rocky ridges and hills, bisected by the Suikerbosrand River and numerous small water courses and streams;
- Most of the land in the centre of the PAOI remains natural and under wildlife or livestock management, with isolated cultivated fields also present. Cultivated fields are more prevalent along the flat and open periphery of the PAOI;
- Stands of alien invasive trees including *Acacia dealbata, Acacia mearnsii*, *Eucalyptus camaldulensis* and *Populus x canescens* are present in the PAOI, but are not currently abundant or widespread;
- Game/livestock fences typically delineate farm boundaries and numerous internal fences further partition farms into smaller game or grazing camps. The PAOI is also fragmentated by many farm roads/tracks, as well as larger district and national roads, such as the N3 Highway, which bisects the PAOI along its western boundary; and
- Agricultural land uses (i.e., crop production and livestock farming) dominate most of the land surrounding the PAOI, and accordingly large areas are modified by cultivated fields.

6. Characterisation of on-site Fauna Habitats

This section presents a brief description of the primary habitat types in the PAOI, as they relate to fauna resource use and life-cycle requirements. For full habitat unit descriptions refer to the Plant Species Specialist Assessment Report.

Seven habitat units were identified in the PAOI during the field survey. These include four natural habitats and three modified habitats:

Natural Habitats

- Mountain Bushveld;
- Rocky Shrubland and Grassland;
- Watercourses (Rivers and Wetlands);
- Natural Dry Grassland;

Modified Habitats

- Secondary Grassland;
- Alien Tree Stands; and
- Cultivated Fields.

These habitat units are described, with accompanying photographs, in Section 6.1 through to Section 6.7. **Error! Reference source not found.Error! Reference source not found.**A habitat unit map for the PAOI is shown in Figure 3.

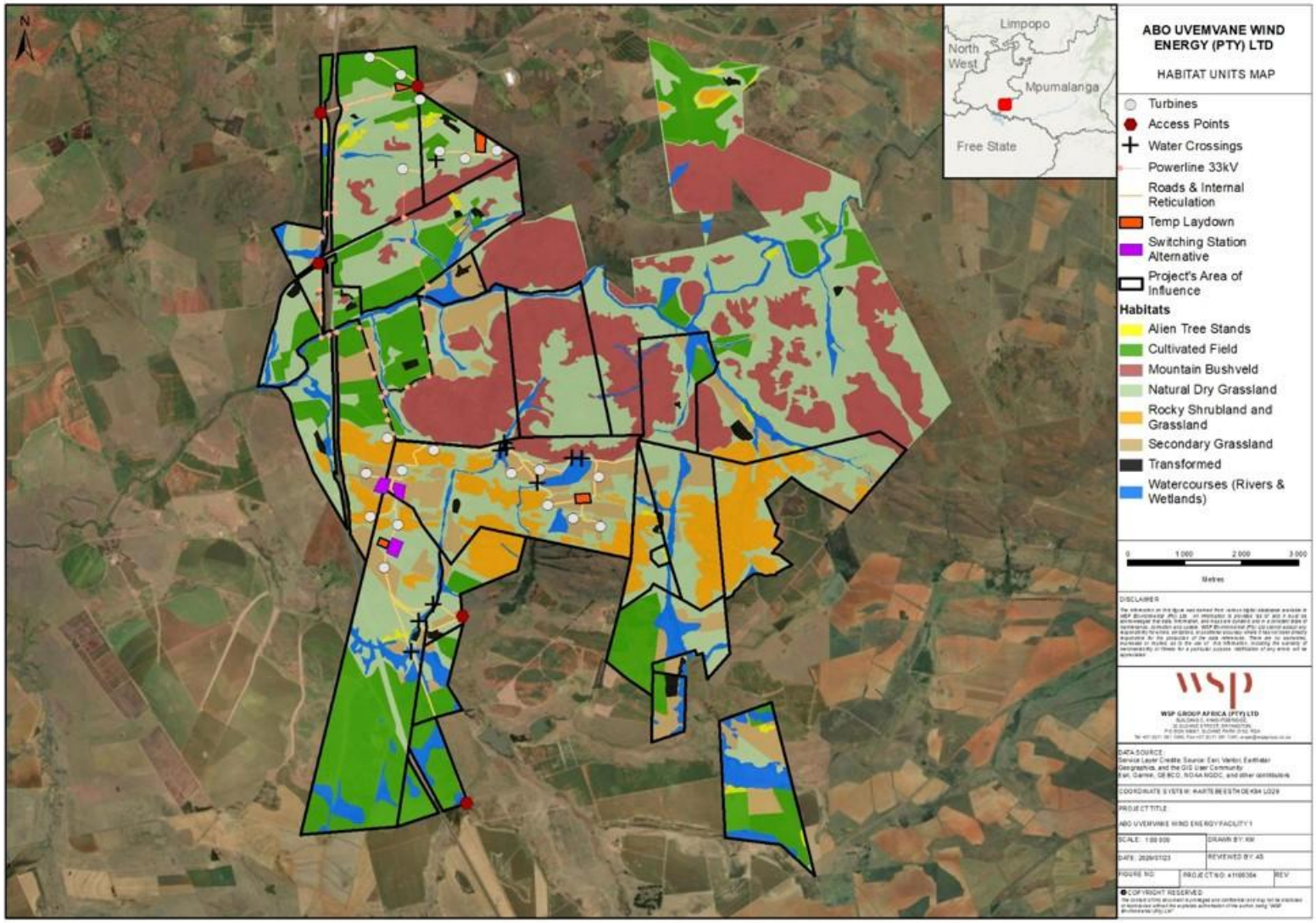


Figure 3: Habitat unit map of the PAOI.

6.1. Mountain Bushveld

Mountain Bushveld is a variable natural habitat unit, that dominates the taller rocky hills and mountains in the north of the PAOI. Vegetation structure ranges from low open bushveld to low- and short closed bushveld depending on slope position, as per Edwards (1983) structural classification, and this habitat unit generally grades into areas of Natural Dry Grassland.

The woody component is dominated by broad-leafed species. The herbaceous layer is moderately- to well-developed, except in very rocky sites, and in most areas is grass dominated, although forbs are common to locally abundant. Dominant woody species generally include *Diospyros lycioides, Searsia leptodictya* and *Searsia pyroides.*

Areas of Mountain Bushveld provide important habitat for a variety of fauna, and at both local- and regional scales they increase habitat heterogeneity and play a vital role as landscape corridors and refugia. In terms of fauna SCC, the Mountain Reedbuck (*Redunca fulvorufula fulvorufula*) – Endangered, was recorded in this habitat unit and several other SCC may be present. Areas of Mountain Bushveld therefore have importance and sensitivity with respects to fauna.



Figure 4: Typical Mountain Bushveld



Figure 5: Typical Mountain Bushveld

6.2. Rocky Shrubland and Grassland

Rocky shrubland and grassland characterises the low, but very rocky hills and ridges in the southern portion of the PAOI. Vegetation structure is variable and ranges from low closed grassland to low- to high open shrubland (*sensu*. Edwards, 1983). Woody vegetation is dominated by broad-leafed species and the herbaceous layer is poor- to moderately developed and generally grass dominated. Dominant woody species include *Protea caffra, Searsia magalismontana* and *Vangueria parvifolia.*

Areas of Rocky Shrubland and Grassland share many of the same sensitivity features as Mountain Bushveld. I.e., they provide important habitat for a variety of fauna, and at both local- and regional scales, they increase habitat heterogeneity and play a vital role as landscape corridors and refugia. No fauna SCC were recorded in this habitat unit during the field programme, but habitat suitability assessments suggest that several fauna SCC may be present. Areas of Rocky Shrubland and Grasslands in the PAOI are therefore considered to have importance and sensitivity with respects to fauna.



Figure 6: Typical area of Rocky Shrubland and Grassland.



Figure 7: Area of Rocky Shrubland and Grassland dominated by Protea caffra trees.

6.3. Watercourses (Rivers and Wetlands)

This is a broad and variable natural habitat unit that is associated with the drainage features in the PAOI, including large watercourses, such as the Suikerbosrand River, as well as smaller drainage lines and wetland systems. Vegetation structure is highly variable; along larger rivers and many streams in wooded areas, vegetation ranges from low- to short open bushveld, with certain areas characterised by low- to short closed bushveld. Common woody species generally recorded along rivers and streams include a mixture of *Celtis africana*, *Diospyros lycioides, Leucosidea sericea, Salix mucronata, Searsia leptodictya* and *Searsia pyroides.* In more open wetland systems, vegetation structure is typically characterised by low- to tall closed grassland (*sensu*. Edwards, 1983).

Watercourse habitats play a crucial role in maintaining terrestrial biodiversity, ecological processes and the hydrological functioning (e.g., filtration and flood attenuation) of the landscape. These habitats significantly increase landscape-scale habitat connectivity, and thus provide important ecological corridors. Fauna SCC recorded in this habitat unit include Serval (*Leptailurus serval*), Cape-clawless Otter (*Aonyx capensis*) and Vlei Rat (*Otomys* cf. *auratus*) – all are listed as Near Threatened. These habitats in the PAOI are considered to have importance and sensitivity with respects to fauna SCC.



Figure 8: The Suikerbosrand River, flanked by both woody and herbaceous flora species.



Figure 9: Valley-bottom wetland, with an artificial farm dam.



Figure 10: Mountain valley, characterised by closed-canopy woodland dominated by Olea europaea.



Figure 11: Drainage line characterised by Leucosidea sericea thickets.

6.4. Natural Dry Grassland

Natural grasslands occur throughout the PAOI, where they typically grade into areas of Mountain Bushveld or Rocky Shrubland and Grassland. Structurally, vegetation comprises low closed grassland, as per Edwards (1983).

Generally, this habitat unit is species rich and considered a primary vegetation community. Compositionally, vegetation is dominated by grasses, although forbs and some woody species are present and can be locally abundant. Common grass species recorded in areas of natural grassland include *Brachiaria serrata, Cymbopogon caesius, Cymbopogon pospischilii, Eragrostis chloromelas, Eragrostis curvula, Harpochloa falx, Hyparrhenia hirta, Melinis nerviglumis, Setaria sphacelata, Themeda triandra* and *Tristachya leucothrix.*

Natural Grasslands provide important habitat for a variety of flora and fauna, and also act as important ecological corridors, increasing local habitat connectivity and facilitating various ecological processes such as, *inter alia*, fauna movement and dispersal. In terms of fauna SCC, Mountain Reedbuck were recorded in this habitat unit during the field programme, and several other SCC are likely to use these areas. Natural Grasslands in the PAOI are considered to have importance and sensitivity with respects to fauna SCC.



Figure 12: Typical example of natural grassland in the PAOI.



Figure 13: Forb dominated area of natural grassland.

6.5. Secondary Grassland

Secondary grasslands characterise former cultivated fields ('old lands') that have been left fallow, and over several years, have regenerated into a recovering (secondary) grassland community. In line with Edwards (1983), vegetation structure is low closed grassland. Compositionally, Secondary Grasslands exhibit lower diversity compared to areas of natural grassland, and are typically dominated by a small number of grass species – mostly *Eragrostis* species, such as *Eragrostis chloromelas, Eragrostis curvula* and *Eragrostis trichophora.*

Secondary grasslands in the PAOI are considered a modified habitat unit; however, have been stable for a long period, and as a result retain some of the functional attributes of natural grasslands. These areas may provide supporting functional habitat for some fauna SCC. Areas of Secondary Grassland however, generally have low importance and sensitivity with respects to fauna SCC.



Figure 14: Eragrostis dominated secondary grassland.



Figure 15: Hyparrhenia hirta dominated secondary grassland.

6.6. Alien Tree Stands

Alien tree stands are a modified habitat unit that occur as small, localised single-species stands. Structurally, they are defined as closed woodland, as per Edwards (1983). Dominant tree species dominating these stands in the PAOI include *Acacia mearnsii*, *Eucalyptus* species and *Populus x*

canescens. Little to no indigenous vegetation is present in well-established alien tree stands. Alien Tree Stands have low importance and sensitivity with respects to fauna SCC.



Figure 16: Small stand/windrow of Eucalyptus camaldulensis trees.



Figure 17: Stand of Populus x canescens trees encroaching in a wetland in the PAOI.

6.7. Cultivated Fields

Several cultivated fields, including both pivot-irrigated and dry-land crop fields, are present across the PAOI. Most occur on the flatter edges of the PAOI, although there are a small number of fields in low-lying areas within the interior of the PAOI. This habitat unit includes both actively/currently used cultivated fields that are regularly disturbed and denuded of indigenous vegetation. Cultivated fields are considered a modified habitat unit, with very low terrestrial biodiversity importance or sensitivity.



Figure 18: Recently ploughed cultivated field.

7. Fauna Assessment

7.1. Mammals

7.1.1. Mammal Species Richness and Habitat Availability

Forty-three mammal species were recorded in the PAOI during the field programme. These are listed in Table 5, with Figure 19 to Figure 34**Error! Reference source not found.** showing select photographs of mammals taken in the PAOI during field work.

Certain farms in the PAOI are managed as game/wildlife farms, and accordingly, twelve of the recorded mammals are actively managed taxa (i.e., species that form part of managed or farmed populations), of which some are extralimital[1]. Actively managed taxa include one megafauna[2] - the Giraffe (*Giraffa camelopardalis giraffa*), and several large- and medium-sized ungulates, such as Sable Antelope (*Hippotragus niger niger*), Black Wildebeest (*Connochaetes gnou*), Plains Zebra (*Equus quagga*), Impala (*Aepyceros melampus*) and Springbok (*Antidorcas marsupialis*).

The remaining 31 mammals are free-roaming taxa (i.e., part of self-sustaining, natural populations that are able to move freely across the landscape). These range from large- to small-sized antelope (e.g., Greater Kudu *Tragelaphus strepsiceros* and Steenbok *Raphicerus campestris*), to carnivores such as the Black-backed Jackal (*Canis mesomelas*) and Serval (*Leptailurus serval*), and finally through to small rodents like the Xeric Four-stripped Mouse (*Rhabdomys* species) and the Vlei Rat (*Otomys* cf. *auratus*).

The sighting of a single Large Grey Mongoose (*Herpestes ichneumon*) during the wet season survey is of interest. The PAOI lies beyond this species' previously documented distribution range (Do Linh San *et al*., 2025). However, recent observations from Gauteng and western Mpumalanga indicate that the Large Grey Mongoose's range may be broader than previously understood (Do Linh San *et al*., 2025), or possibly undergoing expansion (see Swanepoel *et al*., 2018).

The PAOI is characterised by large areas of suitable and heterogeneous natural habitat, supported by high levels of landscape connectivity. This, in conjunction with the prevalence of conservation-orientated game farming and the expected low levels of illegal hunting, suggests that it is likely that several additional mammal species may be present in the PAOI. Indeed, according to the distribution range maps presented in Stuart & Stuart (2007) and EWT & SANBI, (2025), up to 84 mammal species are known from the region, and of these, MammalMAP records indicate that 48 mammal species have previously been documented in the 2628CD QDS (listed in Appendix C).

Table 5: Indigenous mammal species recorded in the PAOI.

Family	Scientific Name	Common Name	Field Programme	
			Dry Season Survey	Wet Season Survey
Bovidae	*Aepyceros melampus*[#]	Impala	x	x
Bovidae	*Alcelaphus buselaphus caama*[#]	Red Hartebeest	x	x

[1] An introduced species, that occurs outside its historical distribution range.

[2] Terrestrial mammal species weighing more than one tonne (*sensu*. Owen-Smith, 1992).

Family	Scientific Name	Common Name	Field Programme	
			Dry Season Survey	Wet Season Survey
Bovidae	*Antidorcas marsupialis*[#]	Springbok	x	x
Bovidae	*Connochaetes gnou*[#]	Black Wildebeest	x	x
Bovidae	*Connochaetes taurinus*[#]	Blue Wildebeest		x
Bovidae	*Hippotragus equinus*[#]	Roan Antelope	x	
Bovidae	*Hippotragus niger niger*[#]	Sable Antelope	x	x
Bovidae	*Kobus ellipsiprymnus ellipsiprymnus*[#]	Waterbuck	x	x
Bovidae	*Pelea capreolus*	Grey Rhebok	x*	
Bovidae	*Raphicerus campestris*	Steenbok	x	x
Bovidae	*Redunca fulvorufula fulvorufula*	Mountain Reedbuck	x	x
Bovidae	*Sylvicapra grimmia*	Common Duiker	x	x
Bovidae	*Taurotragus oryx*[#]	Eland	x	x
Bovidae	*Tragelaphus angasii*[#]	Nyala	x	
Bovidae	*Tragelaphus strepsiceros*	Greater Kudu	x	x
Canidae	*Canis mesomelas*	Black-backed Jackal	x	x
Canidae	*Otocyon megalotis*	Bat-eared Fox	x*	
Cercopithecidae	*Papio ursinus*	Chacma Baboon	x*	
Equidae	*Equus quagga*[#]	Plains Zebra	x	x
Erinaceidae	*Atelerix frontalis*	South African Hedgehog	x*	
Felidae	*Leptailurus serval*	Serval	x	
Felidae	*Caracal caracal*	Caracal	x*	
Giraffidae	*Giraffa camelopardalis giraffa*[#]	Giraffe	x	x
Herpestidae	*Atilax paludinosus*	Water Mongoose	x	x
Herpestidae	*Cynictis penicillata*	Yellow Mongoose	x	
Herpestidae	*Herpestes sanguineus*	Slender Mongoose	x	
Herpestidae	*Herpestes ichneumon*	Large Grey Mongoose		x
Herpestidae	*Suricata suricatta*	Suricate	x	
Hyaenidae	*Parahyaena brunnea*	Brown Hyaena	x*	
Hystricidae	*Hystrix africaeaustralis*	Cape Porcupine	x	x
Leporidae	*Lepus saxatilis*	Scrub Hare	x	
Leporidae	*Pronolagus randensis*	Jameson's Red Rock Rabbit	x	x
Macroscelididae	*Elephantus myurus*	Eastern Rock Sengi	x	x
Muridae	*Otomys* cf. *auratus*[%]	Vlei Rat	x	
Muridae	*Mastomys* sp.	Multi-mammate Mouse	x	

Family	Scientific Name	Common Name	Field Programme	
			Dry Season Survey	Wet Season Survey
Muridae	*Rhabdomys* sp.	Xeric Four-stripped Mouse	x	
Mustelidae	*Aonyx capensis*	Cape Clawless Otter	x	
Oryceropodidae	*Orycteropus afer*	Aardvark	x	
Procaviidae	*Procavia capensis*	Rocky Hyrax	x	
Sciuridae	*Xerus inauris*	Ground Squirrel	x	x
Suidae	*Phacochoerus africanus*	Warthog	x	x
Suidae	*Potamochoerus larvatus*	Bushpig	x	
Viverridae	*Genetta maculata*	Large-spotted Genet	x	x
#Actively managed taxon.				
*Based on anecdotal evidence obtained from farmers D. Van Niekerk and K. Saayman.				
%Species can only be positively identified to species-level based on skull measurements.				



Figure 19: Mountain Reedbuck (Redunca fulvorufula fulvorufula) – Endangered



Figure 20: Red Hartebeest (Alcelaphus buselaphus caama)



Figure 21: Sable Antelope (Hippotragus niger niger) - Vulnerable



Figure 22: Giraffe (Giraffa camelopardalis giraffa)



Figure 23: Serval (Leptailurus serval) – Near Threatened



Figure 24: Black-backed Jackal (Canis mesomelas)



Figure 25: Slender Mongoose (Herpestes sanguineus)



Figure 26: Water Mongoose (Atilax paludinosus)



Figure 27: Large-spotted Genet (Genetta maculata)



Figure 28: Porcupine (Hystrix africaeaustralis)



Figure 29: Warthog (Phacochoerus africanus)



Figure 30: Bushpig (Potamochoerus larvatus)



Figure 31: Xeric Four-stripped Mouse (Rhabdomys species)



Figure 32: Vlei Rat (Otomys cf. auratus) – Near Threatened



Figure 33: Eastern Rock Sengi (Elephantus myurus)



Figure 34: Rock Hyrax (Procavia capensis)

7.1.2. Mammal Species of Conservation Concern

Six free-roaming mammal species recorded in the PAOI during the field programme are listed as species of conservation concern on the regional mammal Red List (EWT & SANBI, 2025), namely Mountain Reedbuck (*Redunca fulvorufula fulvorufula*), Grey Rhebok (*Pelea capreolus*), Serval, Southern African Hedgehog (*Atelerix frontalis*), Cape Clawless Otter (*Aonyx capensis*) and the Vlei Rat. These are discussed in more detail in Section 7.1.2.1 to Section 7.1.2.6.

Two other recorded Red List species, namely Sable Antelope and Roan Antelope (*Hippotragus equinus*) are extralimital, and part of actively managed populations. Extralimital subpopulations of threatened species are currently not included in Red List conservation assessments, as per the International Union for the Conservation of Nature (IUCN) standards, and therefore they are considered of 'uncertain' conservation value. Nonetheless, Sable and Roan are both discussed in more detail in Section 7.1.2.7 and Section 7.1.2.8.

The DFFE national web-based screening tool listed three mammal species as potentially sensitive features for the PAOI, namely the Maquassie Musk Shrew (*Crocidura maquassiensis*), Spotted-necked Otter (*Hydrictis maculicollis*), Oribi (*Ourebia ourebi ourebi*). These are also discussed in more detail in Section 7.1.2.9 to Section 7.1.2.11.

Reviewed literature and datasets further indicates that an additional seven mammal species that occur or potentially occur in the PAOI, are listed as SCC on the regional Red List. These are listed in Table 6Table 6: Mammal species of conservation concern occurring or potentially occurring in the PAOI., along with their conservation statuses, habitat preferences and a 'probability of occurrence' determined through field observations and/or habitat suitability assessments.

7.1.2.1.Mountain Reedbuck

The Mountain Reedbuck is listed as Endangered on the regional Red List (Patel, *et al*., 2025). This medium-sized grazing antelope favours rolling grassy hillsides and mountain slopes above 1 500 m (Estes, 1991). Mountain Reedbuck are territorial and gregarious, and found in small herds ranging from 3 to 6 individuals (Estes, 1991). In 2016, the regional population of Mountain Reedbuck was estimated at 10 217–13 669 mature individuals. However, protected area monitoring data indicate a substantial decline of approximately 77% between 2008 and 2023 (Patel, *et al*., 2025). SANBI (2026) indicate that the area of occupancy of this species is 622.77 km^2. Small herds (3-4 individuals) of Mountain Reedbuck were observed on several occasions in the PAOI, while one individual was recorded on a camera trap. Within the PAOI, this species is likely to be largely confined to the high-lying Mountain Bushveld and Rocky Shrubland and Grassland habitat units, with dispersal across the intervening grassland matrix. Given the abundance of suitable habitat on-site, the Mountain Reedbuck population in the PAOI is likely to be stable and possibly a source population within a local metapopulation dynamic.

7.1.2.2.Grey Rhebok

Grey Rhebok (Near Threatened) are medium-sized, territorial browsing antelope. They are gregarious, living in herds comprising one adult male and 1 to 15 females and young (Estes, 1991). They favour sourveld grassland and scrubland in hills and mountainous areas (Estes, 1991). The regional population size of Grey Rhebok is thought to be about 10 000 individuals, with an estimated density in protected areas of 0.5 to 1.7 individuals per km^2 (Taylor *et al.*, 2025). Grey Rhebok was recorded in PAOI based on an anecdotal account from a local farmer. Important habitat for this species is also likely to centre on the Mountain Bushveld and Rocky Shrubland and Grassland habitat units. Considering the abundance of suitable habitat on-site, the Grey Rhebok population is likely to be a stable.

7.1.2.3.Serval

The Serval (Near Threatened) is a small feline predator. They are solitary and territorial, and favour wetland, tall grassland and well-watered savanna habitats (Estes, 1991). Population densities range from 0.1 to 1.5 individuals per km^2, with a regional population estimated at 10 264 ±812 individuals (Power & da Silva, 2025). This species is frequently found in farmland and mining/industrial land, provided sufficient suitable habitat is present and levels of persecution remain low (Power & da Silva, 2025). The highest known Serval densities (between 76.20 - 101.21 animals per 100 km^2). Serval were recorded on two camera traps in the PAOI and all areas of natural habitat in the PAOI are likely to constitute suitable habitat for this species. Given the abundance of habitat, the Serval population in the PAOI is likely to be a stable, source population.

7.1.2.4.Southern African Hedgehog

The Southern African Hedgehog is listed as Near Threatened on the regional Red List. This nocturnal species occurs in savanna and grassland habitat and is known to occur in residential gardens (Smith

& da Silva, 2025). It generally prefers areas of dense vegetation and rocky outcrops (Smith &da Silva, 2025). The regional population of Southern African Hedgehog is not known; however, it is reported that the number of sightings has reduced over the last 10—20 years (Smith & da Silva, 2025). The EOO of Southern African Hedgehog is estimated at 748 169 km^2, which represents a 5% reduction since 1980 (Smith & da Silva, 2025). Southern African Hedgehog was recorded in PAOI based on an anecdotal account from a local farmer. All areas of natural habitat in the PAOI will likely constitute suitable habitat for this species. It is considered probable that the on-site Southern African Hedgehog is a stable.

7.1.2.5.Cape Clawless Otter

Cape Clawless Otter is listed as Near Threatened on the regional Red List (Power, *et al*., 2025). This species has a fairly widespread, but patchy distribution. Population estimates range from 21 500 to 30 276 animals, with mature individuals numbering between 16 552-19 377 (Power, *et al*., 2025). The Cape-clawless Otter is an aquatic species that is rarely found far from permanent water (Power, *et al*., 2025). It favours riverine habitats, characterised by large rocks, dense vegetation and large areas of long grass (Power, *et al*., 2025). Cape-clawless Otter scat was observed along the Suikerbosrand River in the PAOI. Considering the length of river habitat through the centre of the PAOI, and the presence of numerous farm dams, the Cape-clawless Otter population in the PAOI is likely to be stable and will be a source population.

7.1.2.6.Vlei Rat

The Vlei Rat is listed as Near Threatened on the regional Red List. This species occurs in mesic grassland and wetland habitats, where it favours dense vegetation in close proximity to water (Taylor & a Silva, 2025). Its distribution extends across most of eastern South Africa (Taylor & a Silva, 2025). No population size estimates are available however, population models indicate a continued decline in population size due to direct loss of habitat (e.g., from agriculture), reduction in habitat suitability from overgrazing and projected decrease in AOO due to climate change (Taylor & a Silva, 2025). During the dry season field survey, a single Vlei Rat was caught in a Sherman trap in dense vegetation along the Suikerbosrand River. Considering the length of river and adjacent grassland habitat through the centre of the PAOI, the Vlei Rat population in the PAOI is likely to be fairly large, stable and a source population.

7.1.2.7.Sable Antelope

The Sable Antelope is a large antelope that is listed as Vulnerable on the regional Red List (Muller, *et al*., 2025a). This species occurs at low densities relative to other antelope species, with an estimated regional population size of between 409-1 346 mature individuals (Muller, *et al*., 2025a). Sable occur in savanna woodland, with their historical distribution range extending across the Lowveld of eastern Mpumalanga, northern Limpopo Province, and west into the North-West Province (Muller, *et al*., 2025a). The herd in the PAOI is therefore extralimital, and part of an actively managed/farmed population.

7.1.2.8. Roan Antelope

The Roan Antelope is a large antelope that is listed as Vulnerable on the regional Red List (Muller, *et al*., 2025b). This species favours savanna woodland and grassland (Muller, *et al*., 2025b). Current population estimates suggest that there are 333 individuals in formally protected areas across the Roan's historic distribution range, which extends from Limpopo Province across to the North-West,

Northern Cape and Free State provinces (Muller, *et al*., 2025b). Roan in the PAOI are extralimital, and form part of actively managed/farmed populations.

7.1.2.9.Spotted-necked Otter

Spotted-necked Otter is listed as Vulnerable on the regional Red List. This species has a widespread distribution, but is restricted to areas of permanent, large open-water bodies (Power & Nicholson, 2025). The estimated range of Spotted-necked Otter totals 31 407 km of river, resulting in an estimated population size (taking into account both undisturbed and disturbed river habitats), of 17 117 individuals (Power & Nicholson, 2025). SANBI (2026) indicate that the area of occupancy of this species 12.30 km^2. Spotted-necked Otter was not recorded during the field programme; however, large open water pools are present along numerous reaches of the Suikerbosrand River and several large farms dam are present in the PAOI. There is thus ample suitable habitat for Spotted-necked Otter, and it is probable that this species is present.

7.1.2.10. Maquassie Musk Shrew

Maquassie Musk Shrew (Vulnerable) is a rare shrew species. The EOO is estimated at 284 735 km^2; however, it is thought to be patchily distributed and, based on its preference for wetland habitats, its AOO is inferred at between 40 496 to 47 246 km^2 and 1 790-2 089 km^2 (based on a 500 and 32 m buffer around wetland habitat, respectively) (Russo & da Silva, 2025). SANBI (2026) document the area of occupancy at 0.72 km^2. The population size of Maquassie Musk Shrew is estimated at 179 000 individuals. This species appears to favour moist grassland habitats in savanna and grassland ecosystems (Russo & da Silva, 2025). Although some suitable habitat is present for Maquassie Musk Shrew, there are no post-2000 records of this species this species in either Gauteng or Mpumalanga Provinces. It is therefore unlikely that Maquassie Musk Shrew is present in the PAOI.

7.1.2.11. Oribi

The Oribi (Endangered) is a medium-sized, territorial grazing antelope. They live in monogamous pairs, with a tendency to polygyny (Estes, 1991). They have a widespread, but patchy distribution across their range, and their regional population is facing increasing fragmentation. Oribi densities vary considerably depending on habitat suitability, but in areas where this species is uncommon, its density ranges from 0.1 to 0.4 animals per km^2 (Schrader & da Silva, 2025). The minimum estimated population size of Oribi in South Africa is 3 098 individuals, with approximately 274 occurring on private land in Mpumalanga (Schrader & da Silva, 2025). The area of occupancy of Oribi is estimated at 160.25 km^2 (SANBI, 2026). Oribi favour short open grassland and floodplains, with patches of taller grass (Schrader & da Silva, 2025). Suitable habitat is present for Oribi in the PAOI. However, none of the famers/game farmers interviewed during the field programme indicated that they were aware of the presence of Oribi in the area. It is therefore unlikely that Oribi occurs in the PAOI.

Table 6: Mammal species of conservation concern occurring or potentially occurring in the PAOI.

Family	**Scientific Name**	**Common Name**	**Regional Red List Status (2025)**	**NEMBA ToPS List (2007)**	**Gauteng Protected Status (1983)**	**Mpumalanga Protected Status (1998)**	**Habitat Preferences***	**Probability of Occurrence**
Bovidae	*Hippotragus equinus*	Roan Antelope	Vulnerable	Vulnerable	Protected	Protected	Savanna woodland and grasslands.	Confirmed[#]
Bovidae	*Hippotragus niger niger*	Sable Antelope	Vulnerable	-	Protected	-	Savanna woodland.	Confirmed [#]
Bovidae	*Ourebia ourebi ourebi*	Oribi	Endangered	Endangered	Protected	Protected	Short open grassland, with patches of taller grass.	Unlikely – Suitable habitat present, but species has not been recorded in the region.
Bovidae	*Pelea capreolus*	Grey Rhebok	Near Threatened	-	Protected	Protected	Sourveld grassland and scrubland in hills and mountainous areas.	Confirmed (anecdotal)
Bovidae	*Redunca fulvorufula fulvorufula*	Mountain Reedbuck	Endangered	-	Protected	Protected	Rolling grassy hillsides and mountain slopes.	Confirmed
Chrysochloridae	*Amblysomus septentrionalis*	Highveld Golden Mole	Near Threatened	-	-	-	Sandy soils in grassland areas.	Possible - Suitable habitat present.
Chrysochloridae	*Chrysospalax villosus*	Rough-haired Golden Mole	Vulnerable	Critically Endangered	-	-	Sandy soils in grassland areas.	Possible - Suitable habitat present.
Erinaceidae	*Atelerix frontalis*	South African Hedgehog	Near Threatened	Protected	Protected	Protected	Range of habitats, including grassland and savanna.	Confirmed (anecdotal)
Felidae	*Felis nigripes*	Black-footed Cat	Vulnerable	Protected		-	Open short grass areas in savanna and grassland habitats.	Possible - Suitable habitat present.
Felidae	*Leptailurus serval*	Serval	Near Threatened	Protected	-	-	Wetland, tall grassland and well-watered savanna habitats.	Confirmed
Felidae	*Panthera pardus*	Leopard	Vulnerable	Vulnerable	-	-	Wide range of habitats, including grassland and savanna.	Possible - Suitable habitat present.
Hyaenidae	*Parahyaena brunnea*	Brown Hyaena	Near Threatened	Protected	Protected	Protected	Savanna and grassland habitats.	Confirmed (anecdotal)
Muridae	*Otomys auratus*	Vlei Rat	Near Threatened	-	-	-	Moist grassland and wetland habitats.	Confirmed

Family	**Scientific Name**	**Common Name**	**Regional Red List Status (2025)**	**NEMBA ToPS List (2007)**	**Gauteng Protected Status (1983)**	**Mpumalanga Protected Status (1998)**	**Habitat Preferences***	**Probability of Occurrence**
Muridae	*Mystromys albicaudatus*	White-tailed Rat	Vulnerable	-	-	-	Grassland habitats.	Possible - Suitable habitat present.
Mustelidae	*Aonyx capensis*	Cape Clawless Otter	Near Threatened	Protected	Protected	Protected	Riparian habitats, with permanent water.	Confirmed
Mustelidae	*Hydrictis maculicollis*	Spotted-necked Otter	Vulnerable	Protected	Protected	Protected	Riparian habitats, favouring large, open water bodies.	Probable - Suitable habitat present
Soricidae	*Crocidura maquassiensis*	Maquassie Musk Shrew	Vulnerable	-	-	-	Little is known of habitat preferences. Thought to favour rocky or montane grasslands.	Unlikely - Suitable habitat present, but no post-2000 records of this species in this area of Gauteng and Mpumalanga Provinces.
Soricidae	*Crocidura mariquensis*	Swamp Musk Shrew	Near Threatened	-	-	-	Reedbeds, wetlands and thick moist grassland in riverine habitats.	Probable - Suitable habitat present
*Habitat preferences as per Skinner and Smithers (1990), Stuart and Stuart (2007) and EWT & SANBI, (2025).								
#Actively managed and extralimital taxon.								

7.2. Herpetofauna

7.2.1. Herpetofauna Richness and Habitat Availability

Six reptile species were documented for the PAOI (Table 7). Five species were recorded based on anecdotal evidence from local farmers, and one species, namely the Water Monitor (*Varanus niloticus*) (Figure 35), was observed on-site during the field programme. Three amphibian species were also recorded during a night-time survey in the PAOI. These are also listed in Table 7.

The PAOI is characterised by a variety of habitats that will support a diversity of herpetofauna. These range from rocky hillsides and ridges, open grassland and savanna, through to closed riparian woodland and scrub. Variable aquatic habitats are also present, such as large rivers, small streams wetlands and farm dams. It is thus anticipated that the PAOI has a rich herpetofauna assemblage.

The distribution maps presented in Bates *et al*., (2014), indicate that up to 56 reptile species are known from the region in which the PAOI is located. Of these, ReptileMAP records indicate that 29 species have previously been recorded in the 2628CB QDS (Fitzpatrick Institute of African Ornithology, 2023). Similarly, the distribution maps in Du Preez and Carruthers (2009) indicate that 21 amphibian species have ranges that overlap with the PAOI, and this is corroborated by FrogMAP records, which list 13 taxa for 2628CB QDS.

Table 7: Reptile and amphibian species recorded in the PAOI during the field programme

Family	Scientific Name	Common Name	Field Programme*
Reptile			
Agamidae	*Agama atra*	Southern Rock Agama	Anecdotal
Elapidae	*Hemachatus heamachatus*	Rinkhals	Anecdotal
Lamprophiidae	*Pseudaspis cana*	Mole snake	Anecdotal
Pelomedusidae	*Pelomedusa subrufa*	Marsh Terrapin	Anecdotal
Varanidae	*Varanus niloticus*	Water Monitor	Visual observation
Viperidae	*Bitis arietans*	Puffadder	Anecdotal
Amphibians			
Ranidae	*Amieta dealandii*	Common River Frog	Visual observation
Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	Audio
Bufonidae	*Sclerophrys gutturalis*	Guttural Toad	Audio
*Anecdotal evidence from farmers D. Van Niekerk and Kobus Saayman.			



Figure 35: Water Monitor (*Varanus niloticus*) photographed in the PAOI.



Figure 36: Common River Frog (*Amieta dealandii*) caught in the PAOI.

7.2.2. Herpetofauna Species of Conservation Concern

One reptile SCC potentially occurs in the PAOI, namely Giant Dragon Lizard (*Smaug giganteus*). In addition, the Giant Bullfrog (*Pyxicephalus adspersus*), which is listed as protected on the NEMBA Tops List (2007). These are listed in Table 8, along with their conservation status, habitat preferences and a probability of occurrence.

It noted that according to both the (Gauteng) Nature Conservation Ordinance (12 of 1983) and the Mpumalanga Nature Conservation Act (Act No. 10 of 1998) all species of reptiles, excluding the monitors (e.g., *Varanus niloticus*) and all snakes, are considered 'protected'.

Table 8: Reptile species of conservation concern potentially occurring in the PAOI.

Family	Scientific Name	Common Name	National Red List Status	NEMBA ToPS List (2007)	Gauteng Protected Status (1983)	Mpumalanga Protected Status (1998)	Habitat Preferences*	Probability of Occurrence
Reptiles								
Cordylidae	*Smaug giganteus*	Giant Dragon Lizard	Vulnerable	Endangered	Protected	Protected	Highveld grasslands, often dominated by *Themeda triandra.*	Unlikely - Suitable habitat present, but species has not been previously recorded in the region.
Amphibians								
Pyxicephalidae	*Pyxicephalus adspersus*	Giant Bullfrog	Least Concern	Protected	Protected	Protected	Shallow pans, wetlands and seasonally rained-filled depressions in savanna and grasslands. iNaturalist records indicate that this species has been recorded in the broader Heidelberg region as recently as 2025.	Possible - Suitable habitat present.
*Habitat preferences as per Branch (1998) and Bates *et al.,* (2014).								

8. Key Ecological Attributes and Processes

8.1. Habitat Corridors, Resources and Refugia

The PAOI is characterised by extensive tracts of natural habitat occurring on a topographically diverse landscape. Most of the PAOI is dominated by a series of rocky hills and ridges, which are interspersed by grassy plains and river valleys (e.g. Suikerbosrand River). Modified habitats, such as cultivated fields and old lands, are present, but mostly occur on the edges of the PAOI, or on the flat portions of its interior.

Prominent linear infrastructure in the PAOI includes numerous game fences, internal farm roads and tracks, and larger district and even national roads (i.e., N3 highway). Despite the presence of modified habitat patches and linear infrastructure, overall habitat connectivity within the PAOI, and to the adjacent landscape, remains relatively high.

Rocky outcrops and ridges, such as those in the PAOI, are recognised for their high biodiversity importance, and for their role as landscape corridors, refugia and as critical hydrological features (Pfab, 2001). The combination and interaction of several factors including altitude, aspect, slope, geology, soils, light and hydrological patterns create highly diverse and unique micro-habitats that significantly increase local- and landscape-scale habitat heterogeneity. This in turn, promotes a high degree of both flora and fauna diversity (Pfab, 2001).

Outside the boundary of the PAOI, the landscape is generally flatter and increasingly dominated by modified habitats, primarily cultivated fields. Natural habitats in this broader region tend to exist as smaller, fragmented patches, frequently linked to drainage systems.

On a larger regional scale, the PAOI is not located within, or in close proximity to, a Key Biodiversity Area nor are areas of the POAI mapped as part of Mpumalanga's Intact Grasslands. It is noted though that the rocky ridges and hills within the PAOI are part of a discontinuous chain of mountains extending southeast and northwest. This chain includes Alice Glöckner Provincial Nature Reserve (approximately 3.2 km) and Suikerbosrand Nature Reserve (approximately 13 km) to the northwest. The natural ridge habitat within the PAOI therefore likely plays an important functional role in landscape-scale ecological processes. These include source-sink metapopulations dynamics, such as providing habitat refugia, and facilitating dispersal through corridors or stepping stones. Portions of natural habitat within and adjacent to the PAOI have also been identified as being important for climate change adaptation, with focal areas as well as critical link, core and supporting corridors present.

8.2. Dynamic Ecological Processes and Drivers of Change

The following notes summarise the key ecological processes and drivers of change that are present in the landscape and their possible influence on terrestrial fauna and in particular SCC.

8.2.1. Alien Invasive Species Colonisation

Although present, alien invasive species are not overly abundant in the PAOI. This notwithstanding, stands of large woody taxa such as *Acacia dealbata, Acacia mearnsii*, *Eucalyptus camaldulensis* and *Populus x canescens* were noted. Species like *Acacia dealbata, Acacia mearnsii*, and *Populus x canescens* are particularly aggressive invaders and if not actively controlled, will continue to spread into adjacent natural habitat, where they will shade-out and competitively exclude many indigenous

woody and herbaceous species. This can have several deleterious impacts on the integrity and function of these habitats, such as *inter alia*:

- A loss of natural habitat and floristic diversity, with the resulting habitat patches unable to support diverse fauna communities;
- A reduction in grass productivity for grazing herbivores, and
- Increased exposed soil surfaces and incidences of erosion.

The spread of alien invasive vegetation is therefore considered a significant driver of change in the PAOI and surrounding landscape, and one capable of negatively impacting terrestrial biodiversity. The proposed Project may create temporary and localised sites where alien invasive species could establish and this will need to be managed.

8.2.2. Wildfire – Grassland Burning

Fire is a natural, albeit often human initiated, disturbance agent in both grasslands and savannas, which are considered fire-prone and fire-dependent landscapes. Fire is essential to the maintenance of biodiversity patterns and ecological processes (SANBI, 2013).

Wildfires have several key ecological effects, including:

- Removal of moribund vegetation and increasing plant productivity and palatability, which improves grazing for wild herbivores, and stimulates germination / flowering of fire-adapted flora species (e.g., certain orchid species);
- Controls the encroachment of both alien and indigenous woody plant species and weeds; and
- Increases overall habitat heterogeneity by creating a structural mosaic of tall- and short grassland, and closed- and open wooded areas.

Notwithstanding the positive ecological benefits of fire, wildfires that are too frequent, or too intense, can have negative consequences for terrestrial biodiversity. These include the killing of fauna species (typically slow-moving taxa, or taxa trapped by fences) and fire-sensitive flora species, and the homogenisation of on-site habitat, which can limit the availability of key adaptive resources and reduce biodiversity.

Fire is considered an important driver of change in the PAOI. It is anticipated that the proposed Project could affect fire patterns in the PAOI through increased habitat fragmentation and or an increase in fires from shorting/faulty electrical infrastructure.

8.2.3. Herbivory – Wildlife and Livestock Grazing and Trampling

Both wildlife (game) and livestock faming are common in the PAOI and surrounding landscape. High levels of grazing (overgrazing) and trampling by herbivores is a common cause of dryland degradation (Scholes, 2009). Overgrazing occurs when herbivores (both wildlife and domestic) are kept at excessive stocking rates and/or are able to concentrate their grazing to a limited foraging area, without suitable rest periods.

A common degradation syndrome that is linked to overgrazing, at least in part, is a change in plant species composition. In both grassland and savanna habitats, this typically manifests as a reduction in palatable grass species and a reduction in grassland productivity (Scholes, 2009). In savannas, overgrazing can also lead to bush encroachment, i.e., an increase in woody species and a reduction

in grasses. These phenomena can, in turn, negatively affect local fauna communities. Excessive trampling can also cause soil erosion and gully formation, which can reduce the integrity of terrestrial habitats, as well as aquatic habitats (rivers and streams) through increased sedimentation. Grazing and trampling are considered potentially important drivers of change in the PAOI. It is anticipated that the proposed Project will not impact wildlife and livestock grazing intensity and frequency across the PAOI

9. General Sensitivity and Analysis of Site Ecological Importance

The DFFE National Web Based Screening Tool rated the Animal Species Theme for the PAOI as 'High' sensitivity, based on the confirmed or likely, modelled presence of several fauna SCC (listed in Section 1.4).

- During the field programme, six free-roaming mammal SCC were confirmed in the PAOI, namely Mountain Reedbuck (Endangered), Serval (Near Threatened), Cape Clawless Otter (Near Threatened), Grey Rhebok (Near Threatened), Southern African Hedgehog (Near Threatened), and the Vlei Rat (Near Threatened); and
- Habitat suitability assessments also indicate that several other fauna SCC are likely to be present in the PAOI.

The findings of this study therefore confirm the 'High' sensitivity rating for patches of undisturbed natural habitat in the PAOI. For modified habitat, such as cultivated fields, it is considered 'Low'

The site-specific ecological importance (SEI) of identified habitat units in the PAOI were assessed using the SANBI (2020) protocol (refer to Section 3.4 and Appendix B for the methodology). The results of the assessment are presented in Table 9, and shown in Figure 37.

Table 9: Site Ecological Importance of habitat unit in the PAOI

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Mountain Bushveld	HIGH: Confirmed or highly likely occurrence of CR, EN, VU species (= Mountain Reedbuck, EN & several NT species).	HIGH: Large intact area for any conservation status ecosystem types. Good habitat connectivity with potentially functional ecological corridors. Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.	HIGH	MEDIUM: Habitat that can recover slowly (~ more than 10 years) to restore >75% of the original species composition and functionality of the receptor functionality	HIGH
Rocky Shrubland and Grassland	HIGH: Confirmed or highly likely occurrence of CR, EN, VU species (= Mountain Reedbuck, EN & several NT species).	HIGH: Large intact area for any conservation status ecosystem types. Good habitat connectivity with potentially functional ecological corridors. Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.	HIGH	MEDIUM: Habitat that can recover slowly (~ more than 10 years) to restore >75% of the original species composition and functionality of the receptor functionality	HIGH
Watercourses (Rivers and Wetlands)	HIGH: Confirmed or highly likely occurrence of CR, EN, VU species (=several NT species).	HIGH: Large intact area for any conservation status ecosystem types. Good habitat connectivity with potentially functional ecological corridors.	HIGH	MEDIUM: Habitat that can recover slowly (~ more than 10 years) to restore >75% of the original species composition and functionality of the receptor functionality	HIGH

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
		Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.			
Natural Dry Grassland	HIGH: Confirmed or highly likely occurrence of CR, EN, VU species (= Mountain Reedbuck, EN & several NT species).	HIGH: Large intact area for any conservation status ecosystem types. Good habitat connectivity with potentially functional ecological corridors. Only minor current negative ecological impacts with limited signs of major past disturbance and good rehabilitation potential.	HIGH	MEDIUM: Habitat that can recover slowly (˜ more than 10 years) to restore >75% of the original species composition and functionality of the receptor functionality	HIGH
Secondary Grassland	LOW: No confirmed populations of SCC. < 50% of receptor contains natural habitat.	LOW: Good habitat connectivity, with potentially functional ecological corridors and a regularly used road network. BUT, Several major past and current impacts (=ploughing).	LOW	MEDIUM: Habitat that can recover slowly to restore >75% of the original species composition and functionality.	LOW

Habitat Unit	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Alien Tree Plantations	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	VERY LOW: Several major current negative ecological impacts.	VERY LOW	VERY HIGH: Habitat that can recover rapidly to restore >75% of the original species composition and functionality.	VERY LOW
Cultivated Fields	VERY LOW: No confirmed or highly likely populations of SCC or range-restricted species. No natural habitat remaining.	VERY LOW: Several major current negative ecological impacts.	VERY LOW	VERY HIGH: Habitat that can recover rapidly to restore >75% of the original species composition and functionality.	VERY LOW

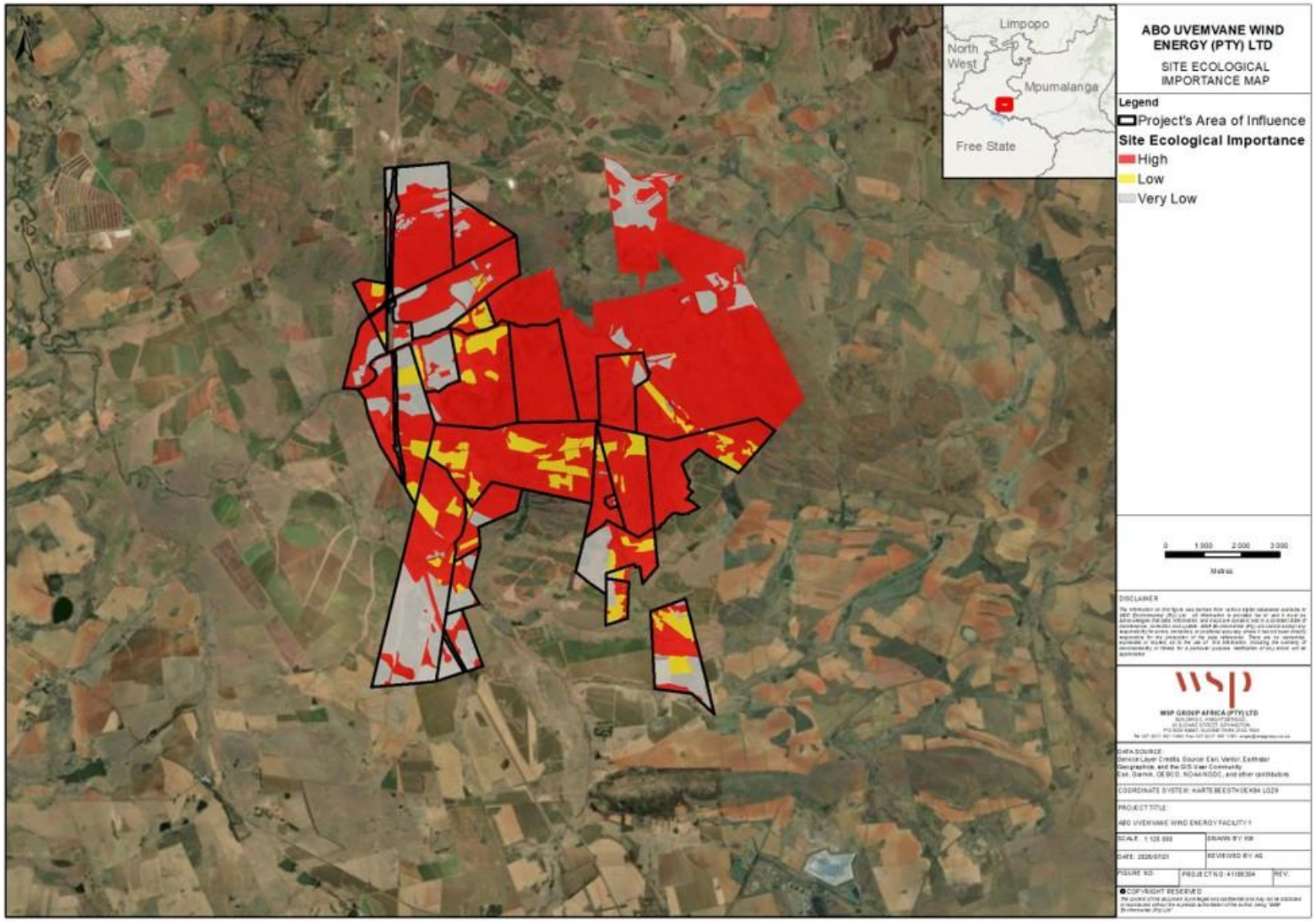


Figure 37: Site Ecological Importance of the PAOI.

10. Impact Assessment

10.1. Impact Assessment Methodology

The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct[3], indirect[4], secondary[5] as well as cumulative[6] impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e., residual impact). The significance of environmental aspects is determined and ranked by considering the criteria[7] presented in Table 10.

Table 10: Impact Assessment Criteria and Scoring System

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action

[3] Impacts that arise directly from activities that form an integral part of the Project.
[4] Impacts that arise indirectly from activities not explicitly forming part of the Project.
[5] Secondary or induced impacts caused by a change in the Project environment.
[6] Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects
[7] The definitions given are for guidance only, and not all the definitions will apply to all the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				
IMPACT SIGNIFICANCE RATING					
Total Score	**4 to 15**	**16 to 30**	**31 to 60**	**61 to 80**	**81 to 100**
Environmental Significance Rating (Negative (-))	**Very low**	**Low**	**Medium**	**High**	**Very High**
Environmental Significance Rating (Positive (+))	**Very low**	**Low**	**Medium**	**High**	**Very High**

10.2. Impact Mitigation

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this report.

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then

considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

The mitigation sequence/hierarchy is shown in Figure 38 below.

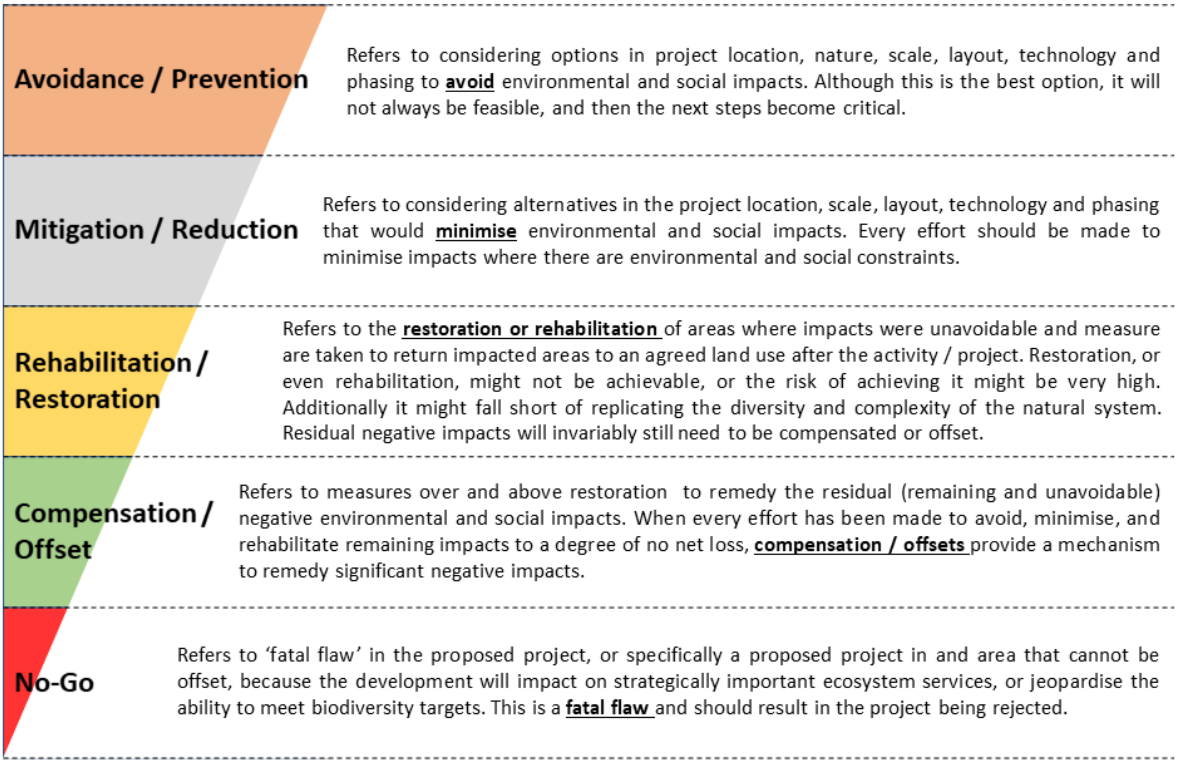


Figure 38: Mitigation Sequence/Hierarchy

A discussion on assessed impacts for each phase (i.e., Construction Operational and Decommissioning) of the proposed Project is provided in the sections below, along with an analysis of anticipated cumulative impacts in Section 10.3.4. A summary table presented in Table 12.

Although there is overlap, the below section should be read alongside the corresponding sections in the Plant Species- and Terrestrial Biodiversity Specialist Assessment reports.

10.3. Assessment of Impacts on Terrestrial Fauna

10.3.1. Construction Phase

10.3.1.1. Direct loss and disturbance of natural habitat

Habitat loss refers to the removal or complete degradation of natural habitat. In terrestrial ecosystems, this primarily occurs through vegetation clearing and bulk earth works during construction. Habitat disturbance refers to the modification of habitat to the extent that it loses important functionality. These impacts can negatively impact ecosystem functioning and integrity, and the viability of local fauna and flora populations, including that of SCC.

In line with the application of the mitigation hierarchy, the infrastructure layout has undergone a series of revisions to reduce potential negative impacts on biodiversity, amongst other environmental and social sensitivities.

From a biodiversity perspective, a key focus of the mitigation strategy has been the spatial avoidance of sensitive habitats, particularly CBAs and threatened vegetation types[8]. Accordingly, most proposed Project infrastructure has been located in patches of modified habitat, such as Secondary Grassland (olds lands) and Cultivated Fields, or to within natural habitat that is not classified as CBAs or a threatened ecosystem. The proposed access road network has also been aligned, wherever feasible, with existing district roads and farm tracks to limit the extent of new disturbance and fragmentation. Nonetheless, it is noted that natural habitat loss and disturbance will still occur as a result of construction activities, such as vegetation clearing and earth works.

Based on the current infrastructure layout, it is anticipated that up to 40.90 ha of natural habitat may be impacted by construction activities - Table 11 presents the approximate extent of habitat loss for each habitat unit, while Figure 39 shows the proposed Project layout in relation to the habitat unit map.

Regarding the proposed Project's alternative substation and powerline options/alternatives:

- From a terrestrial biodiversity perspective, of the three proposed site options Substation Site 2 is preferred. This proposed site is situated entirely within a patch of Secondary Grassland (old lands) that is designated as 'Heavily Modified' by the MBSP (2024). The development of this site would therefore result in the lowest impact on natural habitat. Substation Site 3 is the next most preferred option, as it is located within grassland classified as 'Moderately Modified' by the MBSP (2024). Substation Site 1 intersects a small patch of Natural Dry Grassland mapped as 'Other Natural Areas' by the MBSP (2024), and is therefore the least preferred location for this facility; and
- Regarding the two proposed 33 kV powerline routes, the preferred option is longer (± 8.3 km compared to ± 5.6 km for the alternative), but for most of its alignment it follows major existing linear infrastructure, specifically the N3 highway and a district gravel road, where habitat is already transformed and fragmented. In contrast, the alternative route traverses less fragmented habitat. Given the substantial disturbance zone associated with the N3, co-locating new linear infrastructure along this corridor will reduce additional impacts on terrestrial biodiversity.

Natural habitat loss and disturbance from the proposed Project is of very high magnitude prior to mitigation. Duration of impact will be permanent, and habitat within and potentially adjacent to the development footprints (local) will be impacted. Probability is rated definite. This results in an impact of "high" significance.

In combination with avoidance measures, a suite of additional mitigation measures, centred on minimisation and rehabilitation measures have also been recommended. These include, *inter alia*, the infield micro-siting of infrastructure to localized sites of disturbances, the restriction of disturbance footprints to the minimum area required for construction, and the active rehabilitation

[8] Refer to the Terrestrial Biodiversity Specialist Report for discussion on CBAs and threatened ecosystems.

of disturbed areas footprints, followed by the active control or erosion and eradication of alien invasive plant establishment.

Through the application of the mitigation hierarchy and integration of measures at each step of the hierarchy, the post-mitigation impact magnitude can be reduced to high, while the impact's spatial extent can be reduced to the site only. Duration can be reduced to the life of the proposed Project (i.e. long-term), and probability to low. This results in an after-mitigation impact of "Low" significance

Table 11: Approximate extent of possible loss/disturbance of habitat units.

Habitat Unit	Approx. Extent of Loss & Disturbance (ha)		
	Project Infrastructure (excl. powerlines)	33kV Powerline Route[9]	
		Preferred	Alternative
Mountain Bushveld	0.01	0.01	0.08
Rocky Shrubland and Grassland	3.81	0.00	0.00
Natural Dry Grassland	35.39	0.38	0.29
Watercourse (rivers and wetlands)	1.25	0.05	0.03
Secondary Grassland	31.50	0.09	0.06
Alien Tree Stands	1.78	0.2	0.00
Cultivated Fields	8.36	0.24	0.10

[9] Powerline loss/disturbance calculations based on an inter-pylon span of 100m and an approximate pylon construction/disturbance footprint of 10mx10m.

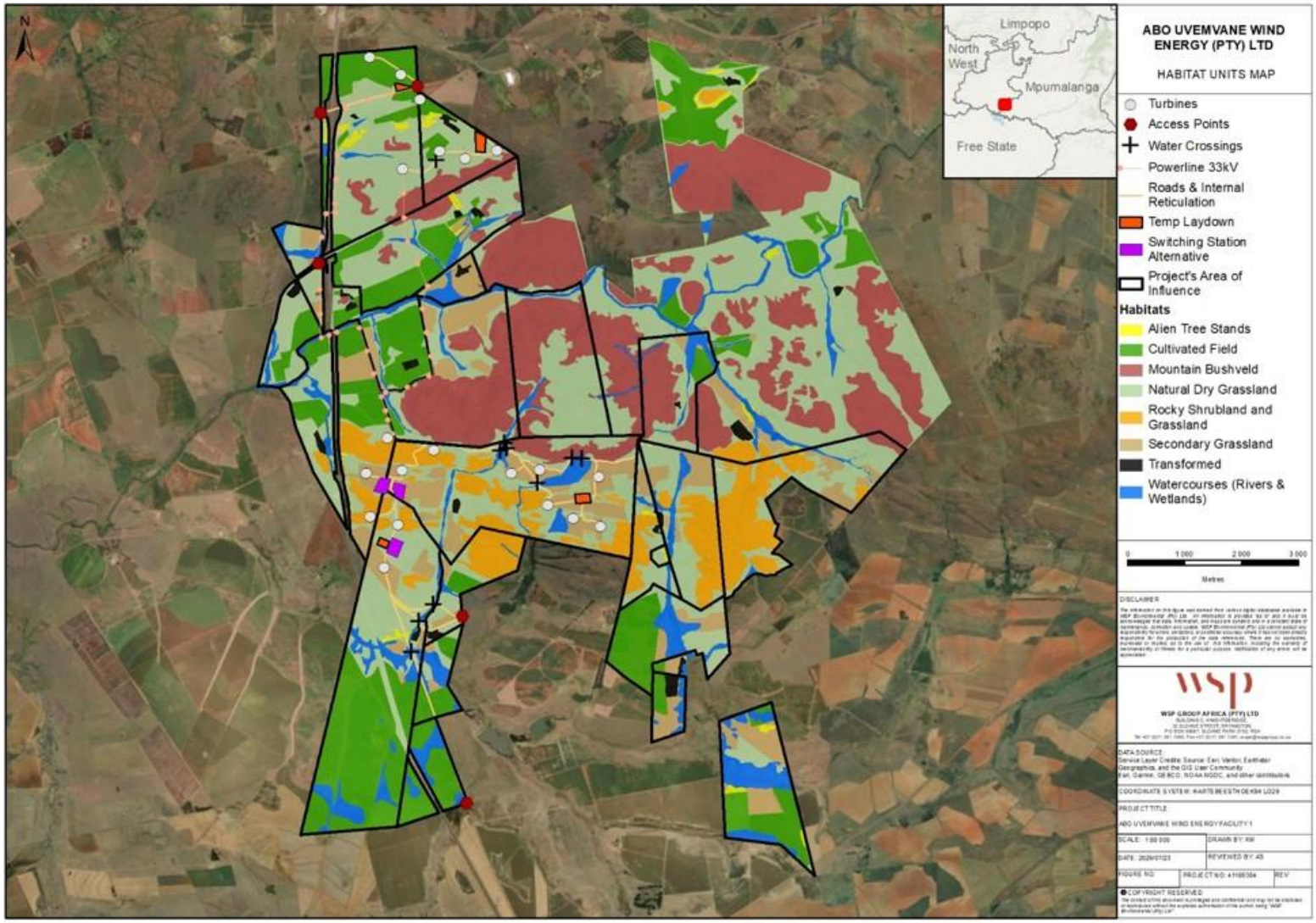


Figure 39: Habitat units and the proposed infrastructure layout.

10.3.1.2. Fragmentation reducing natural habitat connectivity and integrity

Habitat fragmentation is caused when vegetation clearing and/or the development of infrastructure (e.g., fences) result in the partitioning of habitat into smaller, discontinuous patches. This leads to altered habitat configuration that typically manifests as an increase in patch number and isolation, yet a decrease in overall patch size. These alterations change the ecological properties of remaining patches and can affect various ecological processes and metapopulation dynamics, such as fauna dispersal, movement and migration. This can, in turn, affect fauna species richness and population abundances.

The proposed access and internal road network has mostly been aligned with existing district roads and farm tracks. However, existing road upgrades coupled with the cutting of the proposed new access roads is likely to cause some habitat fragmentation, and this may reduce habitat connectivity, which may have negative ecological impacts.

Prior to mitigation, this impact has a high magnitude, permanently affecting natural habitat within and potentially adjacent to the development footprint (local). It is also considered to have a high probability, resulting in an impact of "Medium" significance.

Several mitigation measures can be implemented to reduced habitat fragmentation - these have been discussed under Section 10.3.1.1. With these measures, impact magnitude can be reduced to medium. Duration can be reduced to the long-term, and probability to low, but spatial scale will remain local. This results in a residual impact of "Low" significance.

10.3.1.3. Loss and disturbance of fauna species of conservation concern

Proposed Project activities may negatively impact fauna SCC through the loss of functional habitat (i.e., habitat loss, disturbance and fragmentation) or direct mortality, injury or disturbance from *inter alia*; collisions with construction vehicles, illegal hunting/snaring by construction workers, and excessive sensory disturbances (e.g. dust and noise from construction activities). Several fauna SCC were confirmed in the PAOI during the field programme and these are assessed as individual receptors below:

- **Mountain Reedbuck**

Across its range, the primary anthropogenic threats to Mountain Reedbuck are habitat deterioration and illegal hunting with dogs and these are likely driving substantial population declines (Patel *et al*., 2025). Although the proposed Project will result in some habitat loss and fragmentation, very little of this will occur within the Mountain Bushveld or Rocky Shrubland and Grassland habitat units, which are preferred by Mountain Reedbuck. Consequently, the potential Project-related impacts on this species from habitat loss and fragmentation, as well as any increased accessibility for illegal hunters via an expanded road network are likely to be limited. Prior to mitigation, impacts on Mountain Reedbuck are considered to be of very high magnitude, and will have a short-term impact. The spatial scale is local. It is also considered to have a medium probability, resulting in an impact of "Medium" significance.

With mitigation, which includes a suite of measures to *inter alia*, limiting habitat loss, disturbance and fragmentation and reducing the potential for direct mortality, injury and disturbance through the implementation of various on-site measures and protocols/rules, impact magnitude is reduced

to high and probability of the impact can be reduced to low, and scale to local. This results in a residual impact of "Low" significance

- **Grey Rhebok**

The primary anthropogenic threat to Grey Rhebok is illegal bushmeat and sport hunting with dogs (Taylor *et al.*, 2025). Consistent with the Mountain Reedbuck assessment detailed above, proposed Project infrastructure is mostly located outside large core areas of Mountain Bushveld or Rocky Shrubland and Grassland. Potential negative impacts on Grey Rhebok from habitat loss and fragmentation and potential increased accessibility to illegal hunters that result directly from the proposed Project are therefore likely to be limited. Prior to mitigation, impacts on Grey Rhebok are considered to be of very high magnitude, and will have a short-term impact. The spatial scale is local. It is also considered to have a medium probability, resulting in an impact of "Medium" significance.

With mitigation, which includes a suite of measures to *inter alia*, limiting habitat loss, disturbance and fragmentation and reducing the potential for direct mortality, injury and disturbance through the implementation of various on-site measures and protocols/rules, impact magnitude is reduced to medium and probability of the impact can be reduced to low, and scale to local. This results in a residual impact of "Low" significance

- **Serval**

Serval are known to be able to tolerate high levels of anthropogenic activity and disturbance, with the highest density of Serval on record being documented at an industrial site in Mpumalanga (Loock, *et al.*, 2018). This species favours moist grassland-type habitats, which will only be minimally disturbed at crossing points by the proposed Project activities. Prior to mitigation, the impact of proposed construction activities on Serval is considered to be of very high magnitude and will have a short-term impact prior to mitigation. The spatial scale is local. It is also considered to have a low probability, resulting in an impact of "Low" significance.

With mitigation, which includes a suite of measures to *inter alia*, limiting habitat loss, disturbance and fragmentation and reducing the potential for direct mortality, injury and disturbance through the implementation of various on-site measures and protocols/rules, impact magnitude is reduced to medium and probability of the impact can be reduced to improbable, and scale to local. This results in a residual impact of "Very Low" significance.

- **Cape Clawless Otter**

The Cape Clawless Otter is an aquatic species that is primarily threatened by the deteriorating condition of freshwater ecosystems (Power, *et al*., 2025). Proposed construction activities may lead to minor deterioration of on-site aquatic ecosystems through erosion and excessive sedimentation. The impact of proposed construction activities on Cape Clawless Otter prior to mitigation is considered to be of very high magnitude, and will have a short-term impact. The spatial scale is local. It is also considered to have a low probability, resulting in an impact of "Low" significance.

With mitigation, which includes a suite of measures to *inter alia*, limiting habitat loss, disturbance and fragmentation and reducing the potential for direct mortality, injury and disturbance through the implementation of various on-site measures and protocols/rules, impact magnitude is reduced

to medium and probability of the impact can be reduced to improbable and scale to local. This results in a residual impact of "Very Low" significance

- **Southern African Hedgehog**

The main threat to the Southern African Hedgehog is habitat loss and fragmentation, possibly coupled with illegal harvesting (Smith & da Silva, 2025). The proposed Project may cause limited habitat loss and fragmentation. Prior to mitigation, impacts on Southern African Hedgehog are considered to be of very high magnitude, and will have a short-term impact. The spatial scale is local. It is also considered to have a low probability, resulting in an impact of "Low" significance.

With mitigation, which includes a suite of measures to *inter alia*, limiting habitat loss, disturbance and fragmentation and reducing the potential for direct mortality, injury and disturbance through the implementation of various on-site measures and protocols/rules, impact magnitude is reduced to medium and probability of the impact can be reduced to improbable, and scale to local. This results in a residual impact of "Very Low" significance.

- **Vlei Rat**

The main threat to Vlei Rat population across its range is loss and disturbance of wetland-type habitat caused by agriculture and urban expansion, as well overgrazing from livestock (Taylor & da Silva, 2025). The proposed Project is unlikely to have a large direct negative impact on the preferred habitat of this species, namely grassland and wetland habitats. Prior to mitigation, impacts on Vlei Rat is considered to be of very high magnitude, and will have a short-term impact. The spatial scale is local. It is also considered to have a low probability, resulting in an impact of "Low" significance.

With mitigation, which includes a suite of measures to *inter alia*, limiting habitat loss, disturbance and fragmentation, impact magnitude is reduced to medium and probability of the impact can be reduced to improbable, and scale to the site. This results in a residual impact of "Very Low" significance.

10.3.2. Operational Phase

10.3.2.1. Sensory impacts on fauna SCC from operating wind turbines

Sensory disturbances associated with noise and ground vibrations from operating wind turbines are purported to potentially cause disturbances to some terrestrial fauna species, and this may reduce the extent of suitable habitat for these taxa. It is noted however, that the overall impact of sensory disturbances on terrestrial fauna remain poorly understood and additional research, focusing on the South African context, is required to develop a better understanding of the type and significance of potential impacts, identify particularly sensitive species, and identify effective mitigation measures.

Pursuant to the above, an adaptive approach is recommended with respects to the proposed Project, with the proponent committing to keep abreast with research and developments in this field, and revise and implement additional mitigation measures as they become available.

The impact prior to mitigation is considered to be of very high magnitude, and will have a long-term effect since it could occur throughout the operational lifetime of the project. The spatial scale is local. Following the precautionary principle, it is also considered to have a medium probability, resulting in an impact of "Medium" significance. With mitigation, magnitude is reduced to medium

and probability of the impact can be reduced to low, and scale will remain at local. This results in a residual impact of "Low" significance

10.3.2.2. Impacts on fauna SCC from supporting operational activities

During the operational phase, additional sources of mortality, injury or disturbance to fauna SCC may arise from collisions with maintenance vehicles along access roads, as well as increased hunting or snaring pressure associated with the continued presence of maintenance personnel, coupled with greater general site accessibility. Species most susceptible to these risks include the larger mammal SCC recorded on-site (Mountain Reedbuck, Grey Rhebok, Serval and Cape Clawless Otter), along with any other SCC that may occur in the area.

The impact prior to mitigation is considered to be of very high magnitude, and will have a long-term effect since it could occur throughout the operational lifetime of the project. The spatial scale is local. It is also considered to have a medium probability, resulting in an impact of "Medium" significance. With mitigation, magnitude is reduced to medium and probability of the impact can be reduced to low, and scale will remain at local. This results in a residual impact of "Low" significance.

10.3.3. Decommissioning Phase

10.3.3.1. Impacts on fauna SCC from decommissioning activities

Decommissioning activities, such as the dismantling and removal of Project infrastructure may result in incidences of fauna SCC death and injury. These may occur from vehicle and machinery collisions along access roads and at infrastructure decommissioning sites, as well as through potential increased incidences of hunting and snaring by workers involved in decommissioning activities.

The impact prior to mitigation is considered to be of very high magnitude, and will have a short-term effect. The spatial scale is local. It is also considered to have a medium probability, resulting in an impact of "medium" significance.

With mitigation, magnitude is reduced to medium and probability of the impact can be reduced to low and scale will remain at local. This results in a residual impact of "Low" significance.

Table 12: Impact assessment scoring for terrestrial fauna species

CONSTRUCTION																			
Impact number	**Receptor**	**Description**	**Stage**	**Character**	**Ease of Mitigation**	**Pre-Mitigation**							**Post-Mitigation**						
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**	**(M+**	**E+**	**R+**	**D)x**	**P=**	**S**	**Rating**
Impact 1:	Fauna habitat	Direct loss and disturbance of natural habitat	Construction	Negative	Low	5	2	3	5	5	**75**	**N3**	4	1	3	4	2	**24**	**N1**
					Significance	**N3 - High**							**N1 - Low**						
Impact 2:	Fauna habitat	Fragmentation reducing natural habitat connectivity and integrity	Construction	Negative	Low	5	2	3	5	4	**56**	**N2**	3	2	3	4	2	**24**	**N1**
					Significance	**N2 - Medium**							**N1 - Low**						
Impact 3:	Fauna SCC - Mountain Reedbuck	Loss of fauna species of conservation concern - Mountain Reedbuck	Construction	Negative	High	5	2	5	2	3	**42**	**N2**	4	2	3	1	2	**20**	**N1**
					Significance	**N2 - Medium**							**N1 - Low**						
Impact 4:	Fauna SCC - Grey Rhebok	Loss of fauna species of conservation concern - Grey Rhebok	Construction	Negative	High	5	2	3	2	3	**36**	**N2**	3	2	3	1	2	**18**	**N1**
					Significance	**N2 - Medium**							**N1 - Low**						
Impact 5:	Fauna SCC - Serval	Loss of fauna species of conservation concern - Serval	Construction	Negative	High	5	2	3	2	2	**24**	**N1**	3	2	3	1	1	**9**	**N1**
					Significance	**N1 - Low**							**N1 – Very Low**						
Impact 6:	Fauna SCC - Cape Clawless Otter	Loss of fauna species of conservation concern - Cape Clawless Otter	Construction	Negative	High	5	2	3	2	2	**24**	**N1**	3	2	3	1	1	**9**	**N1**
					Significance	**N1 - Low**							**N1 – Very Low**						
Impact 7:	Fauna SCC - Southern African Hedgehog	Loss of fauna species of conservation concern - Southern African Hedgehog	Construction	Negative	High	5	2	3	2	2	**24**	**N1**	3	1	3	1	1	**8**	**N1**
					Significance	**N1 - Low**							**N1 – Very Low**						
Impact 8:	Fauna SCC - Vlei Rat	Loss of fauna species of conservation concern - Vlei Rat	Construction	Negative	Low	5	2	3	2	2	**24**	**N1**	3	1	3	1	1	**8**	**N1**
						N1 - Low							**N1 – Very Low**						
OPERATIONAL																			
Impact number	**Receptor**	**Description**	**Stage**	**Character**	**Ease of Mitigation**	**Pre-Mitigation**							**Post-Mitigation**						
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**		**(M+**	**E+**	**R+**	**D)x**	**P=**	**S**	
Impact 1:	Fauna SCC	Direct impact on fauna SCC from operating wind turbines	Operational	Negative	Low	5	2	3	4	3	**42**	**N2**	3	2	3	3	2	**22**	**N1**
					Significance	**N2 - Medium**							**N1 - Low**						
Impact 2:	Fauna SCC	Direct impact on fauna SCC from supporting operational activities	Operational	Negative	High	5	2	3	4	3	**42**	**N2**	3	2	3	3	2	**22**	**N1**
					Significance	**N2 - Medium**							**N1 - Low**						
DECOMMISSIONING																			
Impact number	**Receptor**	**Description**	**Stage**	**Character**	**Ease of Mitigation**	**Pre-Mitigation**							**Post-Mitigation**						
						(M+	**E+**	**R+**	**D)x**	**P=**	**S**		**(M+**	**E+**	**R+**	**D)x**	**P=**	**S**	
Impact 1:	Fauna, incl. SCC	Injury and mortality of fauna, including SCC	Decommissioning	Negative	High	5	2	3	2	3	**36**	**N2**	3	2	3	2	2	**20**	**N1**
					Significance	**N2 - Medium**							**N1 - Low**						

10.3.4. Cumulative Impacts

According to the Renewable Energy Environmental Authorisation (REEA) Q4 2024 database and data received from MTPA, several approved renewable energy development projects are located across the broader region surrounding the PAOI (Figure 40). Within a 50 km radius of the PAOI, these include *inter alia*, Suikerbos PV 1 and Suikerbos PV 2, Suikerbos PV 3, Suikerbos PV 4, Waterall Solar Park, Lethabo Power Station Solar PV Facility. It is also noted that additional infrastructure elements associated with this proposed Project, such as the required grid connection (which will form part of a separate authorisation process), will also take place in the surrounding landscape and will have negative ecological impacts.

It is within the context of these various projects that cumulative impacts associated with this proposed Project were assessed below:

10.3.4.1. Cumulative impact on fauna SCC due to natural habitat loss, disturbance and fragmentation

Large portions of the landscape in which the PAOI is located are already modified and fragmented as a consequence of historic and current agriculture, amongst other land uses. This places significant pressure on the functioning and integrity of remaining natural and semi-natural habitat patches, and their ability to support fauna SCC.

Although the individual development footprints of each of the planned/proposed renewable energy developments listed above are expected to be relatively small, the combined effects of habitat loss, fragmentation and disturbance from vegetation clearing and earth works are likely to negatively affect broader-scale ecological habitat integrity and functioning. This in turn, can negatively impact the metapopulation dynamics of local fauna SCC. The combined effects of habitat loss, fragmentation and disturbance of these various renewable energy projects is therefore a cumulative impact of concern with respects to fauna SCC populations.

Prior to any form of mitigation, the cumulative impact on fauna SCC resulting from habitat loss, disturbance and fragmentation is rated 'high'. The proposed Project contribution to cumulative impacts can be minimised by strictly and successfully implementing the mitigation measures detailed in this report, and if required, addressing any significant residual impacts via additional conservation actions. The cumulative impact on fauna SCC can be thus reduced to 'Low' significance.

10.3.4.2. Cumulative impact on fauna SCC due to mortality, injury and disturbance

Construction activities associated with various renewable energy projects in the region, coupled with their general operational and maintenance activities, will lead to an increase in general human activities in the landscape, which may result in an escalation of direct negative impacts on fauna SCC through, *inter alia*, vehicle collisions, increased hunting/snaring, and disturbances through high or excessive levels of noise, vibrations and dust entrainment.

Prior to any form of mitigation, the cumulative impact on fauna SCC from injury, mortality or sensory disturbance is rated 'medium'. With the implementation of the management and mitigation measures presented in this report, the Project contribution to cumulative impacts on terrestrial fauna SCC can be reduced to 'Low' significance.

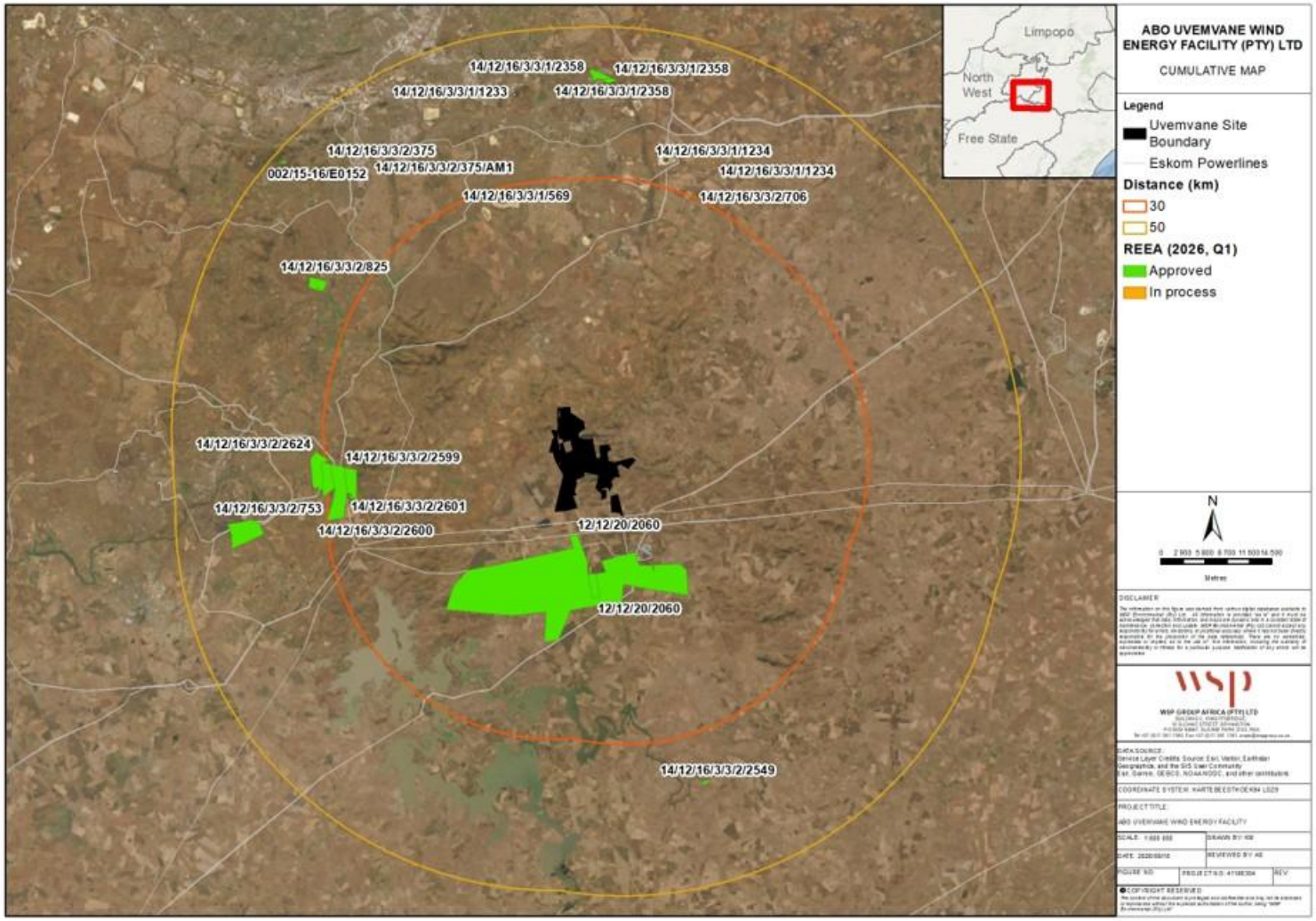


Figure 40: Other renewable energy projects in the broader region surrounding the PAOI.

11. Assessment of the No Go Alternative

Should the proposed Project not proceed, it is anticipated that existing agricultural and game farming activities will persist across the PAOI. Consequently, the ecological condition of on-site natural habitats and the composition of the general fauna community, and specifically that of populations of SCC, will probably remain unchanged from the current status quo. It is, however, noted that the on-site properties hold existing agricultural development rights, and it is therefore possible that portions of the land may be converted for agricultural use (e.g., cultivation) in the future.

12. Mitigation Measures

The following section presents the proposed impact management actions to avoid, minimise and/or manage the potential impacts/risks which were assessed in the preceding section.

As with the assessment of potential impacts/risks, the impact management actions have been arranged according to the following main Project phases:

- Construction, incl. Pre-Construction;
- Operational; and
- Decommissioning.

For each impact management action, the following information is provided:

- Category: The category within which the potential impact/risk occurs;
- Potential impact/risk: Identified potential impact/risk resulting from the pre-construction, construction, operation, and decommissioning of the proposed Project;
- Description: Description of the possible impact management action;
- Prescribed standards or practices: Prescribed environmental standards or practices with which the impact management action must comply. Note that only key standards or practices have been listed;
- Mitigation type: The type of mitigation measure. This includes the following:
    - Avoidance;
    - Minimisation;
    - Rehabilitation or restoration;
    - Offsetting;
- Time period: The time period when the impact management actions must be implemented; and
- Responsible persons: The persons who will be responsible for the implementation of the impact management actions.

Table 13**Error! Reference source not found.** presents a summary of the proposed impact mitigation actions during the construction, operational, and decommissioning phases of the proposed Project.

Table 13: Recommended mitigation and management measures for terrestrial fauna

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
1. Pre-Construction and Construction Phase							

1.1	Fauna Habitats	Direct loss and disturbance of natural habitat	<u>Avoidance</u>
			• As far as possible proposed permanent Project infrastructure should be located in areas of modified habitat (i.e., Cultivated Fields and Secondary Grassland);
			  ○ It is recommended that Substation Site 2 is selected as the preferred site. This site is entirely located within Secondary Grassland (old lands).
			• All temporary construction footprints, (e.g., construction camps, laydown areas), should <u>only</u> be located in areas of modified habitat;
			  ○ It is recommended that Temporary Laydown Area 2 should be relocated to a nearby cultivated field or confined entirely within the Secondary Grassland patch that comprises
				N/A	Avoidance, Minimisation and Rehabilitation	During Pre-Construction and Construction Phase	Project Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			the northern portion of its current footprint; • A pre-construction walkdown of the approved development footprints should be conducted during the wet/growing season to identify sensitive biodiversity and inform the micro-siting of Project infrastructure to already disturbed sites and other relevant management measures. <u>Minimisation</u> • All vegetation clearing for the Project should be restricted to the proposed Project footprints only, with no clearing permitted outside of these footprints; • The footprints to be cleared of vegetation should be clearly demarcated, prior to construction, to prevent unnecessary clearing outside of these areas; • No heavy vehicles should travel beyond the marked/demarked work zones; • Removed topsoil should be stockpiled and used to rehabilitate all disturbed areas.				

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			<u>Rehabilitation</u> A rehabilitation/ landscaping protocol should be developed and implemented to stabilise and revegetate all non-operational sites that have been disturbed by construction activities. The protocol should include: • The correct stockpiling of topsoil that was cleared from development footprints during site preparation; • The correct contouring of the post-construction landform to limit potential erosion; • Compacted soils should be ripped and loosened to facilitate vegetation establishment; • Topsoil removed during construction should be applied to all non-operational sites that were disturbed during construction and require revegetation; and • Active revegetation should be conducted using grass species that are indigenous, locally-occurring and perennial.				

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
1.2	Fauna, incl. SCC	Fragmentation reducing natural habitat connectivity and integrity	<u>Avoidance and Minimisation</u> See mitigation measures for *Direct loss and disturbance of natural habitat*, and • All proposed access roads and powerlines should be aligned, as far as possible, with existing linear infrastructure (roads/tracks), and wherever possible micro-sited to already disturbed sites. <u>Rehabilitation</u> See rehabilitation measures for *Direct loss and disturbance of natural habitat.*	N/A	Minimisation and Rehabilitation	During Pre-Construction and Construction Phase	Project Manager
1.3	Fauna SCC	Loss and disturbance of fauna SCC	<u>Avoidance and Minimisation</u> • An Environmental Control Officer (ECO) should be on-site during vegetation clearing to monitor and manage any wildlife-human interactions; • As appropriate, temporary barriers should be erected around construction trenches and excavations to prevent fauna becoming trapped;	N/A	Avoidance and Minimisation	During Construction Phase	Project Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			• Any fauna species trapped in construction areas, should be safely and correctly relocated to an adjacent area of natural habitat; • A low-speed limit (recommended 20-40 km/h) should be enforced on site to reduce wildlife collisions; • No fauna may be intentionally killed or injured by on-site contractors and workers. Handling, poisoning, snaring and killing of on-site fauna by contractors and workers must be strictly prohibited; • Access to the WEF's interior access road network should be strictly controlled to limit the potential for illegal hunters to gain easy access to the area; • General noise abatement equipment should be fitted to all construction machinery and vehicles; • Dust suppression using water bowsers should be undertaken on all roads and other sites where dust entrainment occurs; • The rules and regulations concerning fauna should be communicated to contractors				

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
			through on-site signage and awareness training; and • An incidence register should be maintained throughout all phases of the Project detailing any fauna mortalities/injuries caused by on-site activities. The register should be used to identify additional biodiversity management requirements.				
2. Operational phase							
2.1	Fauna SCC	Sensory impacts on fauna SCC from operating wind turbines	<u>Minimisation</u> • The Project proponent must keep actively informed about new research in the field of vibration impacts on fauna and potential mitigation options; and • Based on the findings of new research, the biodiversity management plan for the proposed Project should be updated to include additional mitigation measures and these should be implemented on-site.	N/A	Minimisation	During Operational Phase	Facility Manager

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
2.2	Fauna SCC	Impacts on fauna SCC from supporting operational activities.	<u>Avoidance and Minimisation</u> • No off-road driving is permitted for vehicles and mobile machinery used during operations and for maintenance purposes. • A low-speed limit (recommended 20-40 km/h) should be enforced on site to reduce wildlife collisions; • Access to the WEF's interior access road network should be strictly controlled to limit the potential for illegal hunters to gain easy access to the area; • No fauna may be intentionally killed or injured by on-site contractors and workers. Handling, poisoning, snaring and killing of on-site fauna by contractors and workers must be strictly prohibited; • The rules and regulations concerning fauna should be communicated to maintenance personnel through on-site signage and awareness training.	N/A	Avoidance and Minimisation	During Operational Phase	Facility Manager
3. Decommissioning phase							

Ref No.	Category	Potential impact/risk	Description	Prescribed standards or practices	Mitigation type	Time period	Responsible person
3.1	Fauna SCC	Impacts on fauna SCC from decommissioning activities.	<u>Avoidance and Minimisation</u> • No off-road driving is permitted for vehicles and mobile machinery used during decommissioning phases activities; • A low-speed limit (recommended 20-40 km/h) should be enforced on site to reduce wildlife collisions; • Access to the WEF's interior access road network should be controlled to limit the potential for illegal hunters to gain easy access to the area; • The handling, poisoning and killing of on-site fauna by on-site workers must be strictly prohibited; and • The rules and regulations concerning fauna should be communicated to maintenance personnel through on-site signage and awareness training.	N/A	Avoidance and Minimisation	During Decommissioning Phase	Facility Manager

13. Monitoring Measures

No additional monitoring measures are recommended for animal species at this stage.

14. Biodiversity Management/Action Plan

It is recommended that during the pre-construction planning phase all terrestrial biodiversity mitigation and monitoring measures, including those outlined in the Terrestrial Biodiversity, Plant Species, and Animal Species Specialist Assessment Reports, as well as all management measures recommended in other ecological specialist studies, should be consolidated into a single, integrated Biodiversity Management/Action Plan (BMP/BAP) for the proposed Project.

A single, consolidated BMP/BAP will provide an integrated and practical framework that encompasses, aligns and guides all aspects of biodiversity management throughout the various life-cycle phases of the Project.

15. Reasoned Opinion and Environmental Impact Statement

15.1. Summary of Main Findings

The PAOI is characterised by extensive tracts of diverse natural habitat, dominated by rocky hills and ridges and interspersed with grassy plains and river valleys. Many of the individual land portions within the PAOI are also managed as game farming operations. These factors promote a large and diverse fauna assemblage, with 43 mammal species and nine herpetofauna species recorded on-site during the 2024/2025 field programme. Natural habitat within the POAI therefore represents a high-value ecological resource for local fauna communities, which include SCC.

Amongst the recorded mammals, six are free-roaming SCC, namely Mountain Reedbuck (Endangered), Serval (Near Threatened), Cape Clawless Otter (Near Threatened), Grey Rhebok (Near Threatened), Southern African Hedgehog (Near Threatened) and the Vlei Rat (Near Threatened). Habitat suitability assessments further indicate that several additional SCC may also occur within the PAOI. Based on these findings, the 'High' sensitivity rating for the animal species theme assigned by the DFFE National Web-Based Screening Tool, is confirmed.

During the initial site sensitivity verification and scoping phase of the proposed Project, the infrastructure layout underwent a series of revisions in line with the mitigation hierarchy to avoid and minimise potential negative impacts on sensitive biodiversity features. These have *inter alia*, prioritised the placement of wind turbines in areas of modified habitat and the alignment of proposed access roads with existing district gravel roads and farms tracks. Nonetheless, it is expected that direct loss, disturbance and fragmentation of natural habitat will result from construction phase vegetation clearing and earth works. Moreover, it is also anticipated that some fauna SCC may be killed, injured or disturbed during the various Project phases through *inter alia*, vehicle collisions, noise, dust entrainment and illegal hunting/snaring.

These impacts can be effectively avoided and mitigated through the successful implementation of the mitigation measures recommended in this report. It is also recommended that all relevant mitigation and management measures for the proposed Project should be incorporated into an integrated Biodiversity Management/Action Plan.

15.2. Conditions to be Included in the Environmental Authorisation

No additional conditions are recommended for inclusion in the proposed Project's environmental authorisation.

15.3. Specialist Opinion

In accordance with the outcomes of the impact assessment, and taking cognisance of the baseline conditions presented herein, as well as the impact management measures, the proposed Project, is not deemed to present significant negative ecological issues or impacts.

16. References

Bates, M., Branch, W., Bauer, A., Burger, M., Marais, J., Alexander, G. and De Villiers, M. (Eds.) (2014) Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland. Pretoria: Suricata 1, South African Biodiversity Institute.

Do Linh San E, Streicher JP & da Silva JM. 2025. A conservation assessment of *Herpestes ichneumon*. In Patel T, Smith C, Roxburgh L, da Silva JM & Raimondo D, editors. The Red List of Mammals of South Africa, Eswatini and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

Du Preez, L and Carruthers, V. 2009. A Complete Guide to the Frogs of Southern Africa. Struik Nature. Cape Town.

Estes, R.D. (1991). The Behaviour Guide to African Mammals. Russel Friedman Books. Halfway House.

EWT & SANBI (2025). The Red List of Mammals of South Africa, Swaziland and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

Fitzpatrick Institute of African Ornithology (2024). FrogMAP Virtual Museum. Accessed at http://vmus.adu.org.za/?vm=FrogMAP on 2024-07-24.

Fitzpatrick Institute of African Ornithology (2024). MammalMAP Virtual Museum. Accessed at http://vmus.adu.org.za/?vm=MammalMAP on 2024-07-24.

Fitzpatrick Institute of African Ornithology (2024). ReptileMAP, Virtual Museum. Accessed at http://vmus.adu.org.za/?vm=ReptileMAP on 2024-07-24.

Henning, G.A., Terblanche, R.F. and Ball, J.B. (eds) (2009). South African Red Data Book: Butterflies. SANBI Biodiversity Series 13. South African Biodiversity Institute, Pretoria.

Loock, D.J.E., Williams, S.T., Emslie, K.W., Matthews, W.S. and Swanepoel, L.H. (2018). High carnivore population density highlights the conservation value of industrialised sites. Scientific Reports. DOI: 10.1038/s41598-018-34936-0.

Mpumalanga Nature Conservation Act (Act No. 10 of 1998)

Muller KL, Kruger J, da Silva JM & Selier SAJ. 2025. A conservation assessment of *Hippotragus equinus*. In Patel T, Smith C, Roxburgh L, da Silva JM & Raimondo D, editors. The Red List of

Mammals of South Africa, Eswatini and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

Muller KL, Russo IM, da Silva JM, Kruger J & Selier SAJ. 2025. A conservation assessment of *Hippotragus niger*. In Patel T, Smith C, Roxburgh L, da Silva JM & Raimondo D, editors. The Red List of Mammals of South Africa, Eswatini and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

National Environmental Management: Biodiversity Act (NEMBA) (Act No. 10 of 2004) - Lists of Critically Endangered, Endangered, Vulnerable and Protected Species. (2007) (NEMBA ToPS List, 2007). South Africa.

Owen-Smith, R.N. (1992). Megaherbivores: The influence of very large body size on ecology. Cambridge: Cambridge University Press.

Patel T, Taylor A, Power J & da Silva JM. 2025. A conservation assessment of *Redunca fulvorufula*. In Patel T, Smith C, Roxburgh L, da Silva JM & Raimondo D, editors. The Red List of Mammals of South Africa, Eswatini and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

Power RJ & & Nicholson SK. 2025. A conservation assessment of *Hydrictis maculicollis*. In Patel T, Smith C, Roxburgh L, da Silva JM & Raimondo D, editors. The Red List of Mammals of South Africa, Eswatini and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

Power RJ, Nicholson S & da Silva JM. 2025. A conservation assessment of *Aonyx capensis*. In Patel T, Smith C, Roxburgh L, da Silva JM & Raimondo D, editors. The Red List of Mammals of South Africa, Eswatini and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

Russo IM & da Silva JM. 2025. A conservation assessment of *Crocidura maquassiensis*. In Patel T, Smith C, Roxburgh L, da Silva JM & Raimondo D, editors. The Red List of Mammals of South Africa, Eswatini and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa

SANBI (2010). Threatened Species: A guide to Red Lists and their use in conservation. Threatened Species Programme. Pretoria, South Africa. 28 pp.

SANBI (2022). Species Environmental Assessment Guideline. Guideline for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa. South African National Biodiversity Institute, Pretoria. Version 3.1. 2022.

SANBI (2026). Species Environmental Assessment Guideline. Guideline for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa. South African National Biodiversity Institute, Pretoria. Version 4.1. 2026.

SANBI (2024). Red List of South African Species. South African National Biodiversity Institute. Available from: http://speciesstatus.sanbi.org [Accessed February 2024].

Scholes, R.J. (2009). Syndromes of dryland degradation in southern Africa. African Journal of Range and Forage Science. 26(3): 113-215.

Shrader AM & da Silva JM. 2025. A conservation assessment of *Ourebia ourebi*. In Patel T, Smith C, Roxburgh L, da Silva JM & Raimondo D, editors. The Red List of Mammals of South Africa, Eswatini and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

Smith C & da Silva JM. 2025. A conservation assessment of *Atelerix frontalis*. In Patel T, Smith C, Roxburgh L, da Silva JM & Raimondo D, editors. The Red List of Mammals of South Africa, Eswatini and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

Stuart, C. and Stuart, T. (2007) Field Guide to Mammals of Southern Africa. Fourth Edi. Cape Town: Struik Nature

Stuart, C. and Stuart, T. (2013) Field Guide to Tracks and Signs of Southern, Central and East African Wildlife. Fourth Edi. Cape Town: Struik Nature.

Swanepoel, L.H., Loock, D., Matthews, W.S. & Emslie, K.W. (2018). Expanding the geographical distribution of the Egyptian Mongoose *Herpestes ichneumon* (Linnaeus, 1758), in South Africa. Check List 14 (4): 595-599.

Power RJ & da Silva JM. 2025. A conservation assessment of *Leptailurus serval*. In Patel T, Smith C, Roxburgh L, da Silva JM & Raimondo D, editors. The Red List of Mammals of South Africa, Eswatini and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

Taylor A, Patel T & da Silva JM. 2025. A conservation assessment of *Pelea capreolus*. In Patel T, Smith C, Roxburgh L, da Silva JM & Raimondo D, editors. The Red List of Mammals of South Africa, Eswatini and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

Taylor P & da Silva JM. 2025. A conservation assessment of *Otomys auratus*. In Patel T, Smith C, Roxburgh L, da Silva JM & Raimondo D, editors. The Red List of Mammals of South Africa, Eswatini and Lesotho. South African National Biodiversity Institute and Endangered Wildlife Trust, South Africa.

This report has been compiled by Andrew Zinn (Hawkhead Consulting).



Andrew Zinn (*Pr.Sci.Nat*.)

Andrew Zinn BSc. (Hons.) MSc.
Terrestrial Ecologist (*Pr.Sci.Nat*. 400687/15)
Hawkhead Consulting
Email: andrew@hawkhead.co.za
Cell: + 27 83 3610373

Appendix A: Curriculum Vitae – Andrew Zinn

Curriculum Vitae of Andrew Zinn (*Pr.Sci.Nat.)*

Details

Andrew David Zinn
Terrestrial Ecologist
B.Sc. (Hons.), M.Sc., Pr.Sci.Nat.

Email: andrew@hawkhead.com
Mobile: +27 83 361 0373
Address: 58 Central Rd, Linden Ext., Johannesburg, 2195
South Africa
Date of birth: 14 July 1982
Nationality: South African

Profile

I am an ecologist with an M.Sc. Degree in Resource Conservation Biology and 17 years of experience working in biodiversity consulting and ecological research. I am registered with the South African Council of Natural Scientific Professions as a Professional Natural Scientist. I currently work as an independent consulting ecologist, with Hawkhead Consulting. During my career I have worked on projects in remote areas in several African countries including South Africa, Botswana, Democratic Republic of the Congo, Ethiopia, Ghana, Mozambique, Tanzania and Zambia. I have also previously worked in the United Kingdom and the United Arab Emirates.

Education and Qualifications

- University of the Witwatersrand, M.Sc. Resource Conservation Biology (2013).
- University of KwaZulu-Natal, BSc. Hons. Ecology and Conservation Biology (2005).
- University of KwaZulu-Natal, BSc. Zoology and Grassland Science (2004).
- Bryanston High School, Johannesburg. Matric Exemption. (2000).

Affiliations

- Member of the South African Council of Natural Scientific Professions – Professional Natural Scientist (400687/15).
- Member of the South African Wildlife Management Association.
- Member of the South African Association of Botanists.

Work Experience

1. **Independent Ecologist**

Hawkhead Consulting, South Africa
September 2020 – Present
Consulting ecologist focusing on terrestrial ecology. I specialise in conducting baseline flora and fauna surveys, ecological impact assessments, and developing mitigation and management programmes for projects and operations in various industry sectors. Core services and responsibilities include, amongst others:

- Biodiversity study design and implementation;
- Biodiversity baseline and impact assessment reporting;
- Mitigation measure design and application;
- Vegetation surveys and vegetation community mapping;
- Fauna surveys for mammals, birds, reptiles and amphibians;
- Development of biodiversity management plans;
- Development of rehabilitation and revegetation plans; and
- Alien invasive species control and eradication plans.

2. **Ecologist**

Golder Associates Africa, South Africa
June 2011 – September 2020
Ecologist responsible for the management and implementation of baseline biodiversity studies and ecological impact assessments for development projects in the mining, power generation, transport, land development and industrial development sectors throughout sub-Saharan Africa. Role responsibilities included project management, technical review, biodiversity study design and implementation, flora and fauna surveys, biodiversity baseline and impact assessment reporting, development of biodiversity management plans, rehabilitation plans and alien invasive species control and eradication plans. These studies were conducted to satisfy national environmental regulations and/or international financing requirements, including the International Finance Corporation's (IFC) Performance Standard 6 (PS6)

3. **Independent Ecologist**

Subcontracted to KPMG, United Arab Emirates
March – April 2011
Subcontracted to KPMG as a subject matter expert (ecology) on the internal audit of Sir Bani Yas Island's Conservation Department (United Arab Emirates). The audit focused on evaluating the efficacy of the island's various conservation practices, including game management, feed provisioning, carnivore breeding and monitoring, veterinary care and vegetation maintenance.

4. **Environmental Consultant**

WSP Environment and Energy, South Africa
August 2008 – March 2011
Environmental consultant, responsible for a range of environmental projects and services including managing environmental authorisation processes (BAs and EIAs), facilitating stakeholder engagement processes,
conducting compliance audits, developing environmental management programmes and conducting specialist ecological studies.

5. **Research Technician**

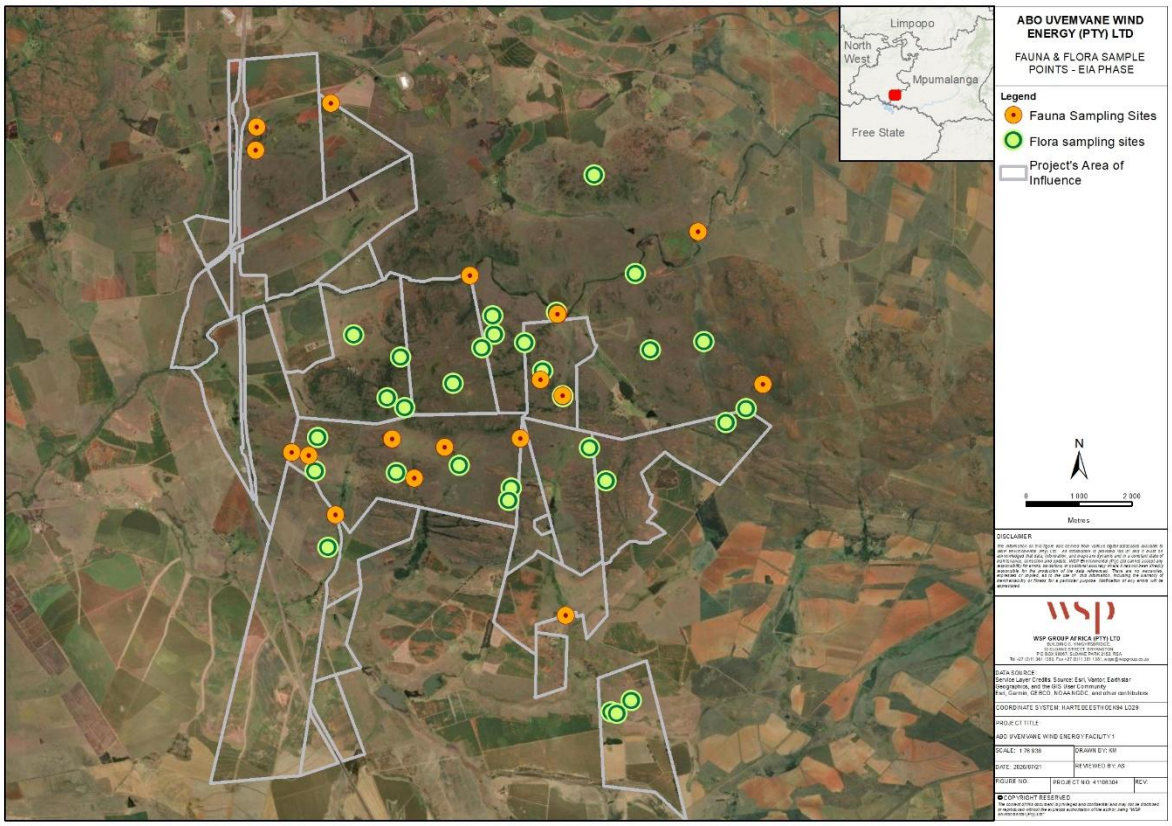
Yale University, Kruger National Park, South Africa
October 2007 – May 2008
Research technician on the Savanna Convergence Experiment (SCE). The SCE project was a long-term cross-continental study that investigated the role of mega-herbivores in fire-grazing interactions and their influence on vegetation dynamics. Responsible for collecting and analysing vegetation composition and productivity data, as well as herbivore distribution data.

Publications

- Zinn, A.D., D.E., Burkepile and D.I. Thompson (In prep). Impacts of fire and herbivores on tree seedling establishment in a South African savanna.
- Burkepile, D.E., C.E. Burns, E. Amendola, G.M. Buis, N. Govender, V. Nelson, C.J. Tambling, D.I. Thompson, A.D. Zinn and M.D. Smith (2013). Habitat selection by large herbivores in a southern African savanna: the relative roles of bottom-up and top-down forces. Ecosphere, 4(11):139.
- Knapp, A.K., D.L. Hoover, J.M. Blair, G. Buis, D.E. Burkepile, A. Chamberlain, S.L. Collins, R.W.S Fynn, K.P. Kirkman, M.D. Smith, D. Blake, N. Govender, P. O'Neal, T. Schreck and A. Zinn (2012). A test of two mechanisms proposed to optimize grassland aboveground primary productivity in response to grazing. Journal of Plant Ecology, 5, 357-365.
- Zinn, A.D., D. Ward and K. Kirkman (2007). Inducible defences in *Acacia sieberiana* in response to giraffe browsing. African Journal of Range and Forage Science, 24, 123-129.
- Zinn, A.D. (2007). Exploitation vs. Conservation: A Burgeoning Fifth Column. African Wildlife, 61, 9-11.
- Andrew Zinn (2006). Conflict Resolution. Africa Birds and Birding. Vol. 11, No. 5, 12-13.

Appendix B: Methodology Supplement

Appendix B 1: Location of field programme sampling points



Appendix B - Figure 1: Location of flora and fauna sampling points.

Appendix B 2: Rating criteria for Conservation Importance, Functional Integrity and Receptor Resilience and the scoring matrices, as per (SANBI, 2026).

The ecological sensitivity of habitats in the PAOI was determined using the protocol for evaluating site ecological importance (SEI) as published in SANBI's Species Assessment Guideline (SANBI, 2020). SEI is considered to be a function of the biodiversity importance (BI) of a receptor and its resilience to impacts (receptor resilience, RR), as per:

$$SEI = BI + RR.$$

Biodiversity importance is a function of conservation importance (CI) and the functional integrity (FI) of the receptor, as per:

$$BI = CI + FI$$

- **Conservation Importance** is defined as "the importance of a site for supporting biodiversity features of conservation concern present, e.g., populations of IUCN threatened and Near Threatened species (CR, EN, VU and NT), Rare species, range-restricted species, globally significant populations of congregatory species, and areas of threatened ecosystems types, through predominantly natural processes" (SANBI, 2020).
- **Functional Integrity** is defined as "A measure of the ecological condition of the impact receptor as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts" (SANBI, 2020).
- **Receptor Resilience** is defined as "the intrinsic capacity of the receptor to resist major damage from disturbance and/or to recover to its original state with limited or no human intervention" (SANBI, 2020).

Table 1: Conservation Importance (CI) criteria.

Conservation Importance (CI)	Fulfilling Criteria
Very High	• Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global EOO of < 10km^2; • Any area of natural habitat of a CR ecosystem type or large area (>0.1 % of the total ecosystem type extent) of natural habitat of an EN ecosystem type; and • Globally significant populations of congregatory species (>10% of global population).
High	• Confirmed of highly likely occurrence of CR, EN, VU species that have a global EOO of > 10km^2, IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. If listed threatened only under Criterion A, include if there are less than 10 locations or < 10 000 mature individuals remaining; • Small area (>0.01% but <0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (>0.1%) of natural habitat of VU ecosystem type; • Presence of Rare species; • Globally significant populations of congregatory species (>1% but < 10% of global population).
Medium	• Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals; • Any area of natural habitat of threatened ecosystem type with status of VU; • Presence of range-restricted species; and • >50% of receptor contains natural habitat to support SCC.
Low	• No confirmed or highly likely populations of SCC; • No confirmed or highly likely populations of range-restricted species; and • <50% of receptor contains natural habitat with limited potential to support SCC.
Very Low	• No confirmed and highly unlikely populations of SCC; • No confirmed and highly unlikely populations of range-restricted species; and • No natural habitat remaining.

Table 2: Functional Integrity (FI) criteria.

Functional Integrity (FI)	Fulfilling Criteria
Very High	• Very large (>100 ha) intact area for any conservation status of ecosystem type or >5a ha for CR ecosystem type; • High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches; • No or minimal current negative ecological impacts with no signs of major disturbance (e.g., ploughing)
High	• Large (>5 ha but < 100 ha) intact area for any conservation status ecosystem types; • Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches; and • Only minor current negative ecological impacts (e.g., few livestock utilising area) with no signs of major past disturbance (e.g., ploughing) and good rehabilitation potential.
Medium	• Medium (>5ha but< 20 ha) semi-intact area for any conservation status ecosystem type or >20 ha for VU ecosystem type; • Only narrow corridors of good connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches; • Mostly minor current negative ecological impacts with some major impacts (e.g., established population of alien invasive flora) and a few signs of minor past disturbance. Moderate rehabilitation potential.
Low	• Small (> 1 ha but <5ha) area; • Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential; and • Several minor and major current negative ecological impacts.
Very Low	• Very small (<1 ha) area; • No habitat connectivity except for flying species or flora with wind-dispersed seeds; • Several major current negative ecological impacts.

BI = CI + FI

Biodiversity Importance (BI) Rating Matrix

Biodiversity Importance (BI)		Conservation Importance				
		Very High	**High**	**Medium**	**Low**	**Very Low**
Functional Integrity	**Very High**	Very High	Very High	High	Medium	Low
	High	Very High	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very Low
	Low	Medium	Medium	Low	Low	Very Low
	Very Low	Medium	Low	Very Low	Very Low	Very Low

Table 3: Receptor Resilience criteria (RR)

Resilience	Fulfilling Criteria
Very High	Habitat that can recover rapidly (˜less than 5 years) to restore >75% of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of remaining at a site even when a disturbance or impacts occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed.
High	Habitat that can recover relatively quickly (˜ 5-10 years) to restore >75% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impacts occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed.
Medium	Habitat that can recover slowly (˜ more than 10 years) to restore >75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impacts occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.
Low	Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ˜less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of remaining at a site even when a disturbance or impacts occurring, or species that have a low likelihood of returning to a site once the disturbance or impact has been removed.
Very Low	Habitat that is unable to recover from major impacts, or species that are unlikely to remain at a site even when a disturbance or impact is occurring, or species that are unlikely to return to a site once the disturbance or impact has been removed.

SEI = BI + RR

Site Ecological Importance (SEI) Rating Matrix

Site Ecological Importance		Biodiversity Importance				
		Very High	**High**	**Medium**	**Low**	**Very Low**
Receptor Resilience	**Very Low**	Very High	Very High	High	Medium	Low
	Low	Very High	Very High	High	Medium	Very Low
	Medium	Very High	High	Medium	Low	Very Low
	High	High	Medium	Low	Very Low	Very Low
	Very High	Medium	Low	Very Low	Very Low	Very Low

Appendix C: List of Mammal Species Recorded or Potentially Occurring in the PAOI

Species highlighted in **bold** text have been recorded in the 2628CB QDS as per MammalMap.

Family	Scientific Name	Common Name	Red List – Regional Status (2016)	NEMBA ToPS List (2007)	Gauteng Status	Mpumalanga Status	Field Programme
Bathyergidae	*Cryptomys hottentotus*	Common Mole-rat	Least Concern				
Bovidae	*Hippotragus niger*	Sable Antelope					x
Bovidae	*Hippotragus equinus*	Roan Antelope					x
Bovidae	*Tragelaphus angasii*	Nyala					x
Bovidae	*Kobus ellipsiprymnus*	Waterbuck					x
Bovidae	***Aepyceros melampus melampus***	**Impala**	**Least Concern**				**x**
Bovidae	***Alcelaphus buselaphus caama***	**Red Hartebeest**	**Least Concern**		**Protected**		**x**
Bovidae	***Antidorcas marsupialis***	**Springbok**	**Least Concern**				**x**
Bovidae	***Connochaetes gnou***	**Black Wildebeest**	**Least Concern**	**Protected**	**Protected**		**x**
Bovidae	*Connochaetes taurinus*	Black Wildebeest	Least Concern				x
Bovidae	***Damaliscus pygargus phillipsi***	**Blesbok**	**Least Concern**				
Bovidae	***Ourebia ourebi ourebi***	**Oribi**	**Endangered**	**Endangered**		**Endangered / Protected**	
Bovidae	***Pelea capreolus***	**Grey Rhebok**	**Near Threatened**		**Protected**	**Protected**	**x**
Bovidae	***Raphicerus campestris***	**Steenbok**	**Least Concern**		**Protected**	**Protected**	**x**
Bovidae	***Redunca arundinum***	**Southern Reedbuck**	**Least Concern**	**Protected**	**Protected**	**Protected**	
Bovidae	***Redunca fulvorufula fulvorufula***	**Mountain Reedbuck**	**Endangered**		**Protected**	**Protected**	**x**
Bovidae	***Sylvicapra grimmia***	**Common Duiker**	**Least Concern**				**x**
Bovidae	***Tragelaphus oryx***	**Eland**	**Least Concern**		**Protected**	**Protected**	**x**
Bovidae	***Tragelaphus strepsiceros***	**Greater Kudu**	**Least Concern**				**x**
Canidae	***Canis mesomelas***	**Black-backed Jackal**	**Least Concern**				**x**
Canidae	*Otocyon megalotis*	Bat-eared Fox	Least Concern				x
Canidae	*Vulpes chama*	Cape Fox	Least Concern	Protected			
Cercopithecidae	*Chlorocebus pygerythrus*	Vervet Monkey	Least Concern				

Family	Scientific Name	Common Name	Red List – Regional Status (2016)	NEMBA ToPS List (2007)	Gauteng Status	Mpumalanga Status	Field Programme
Cercopithecidae	*Papio ursinus*	Chacma Baboon	Least Concern				x
Chrysochloridae	*Amblysomus septentrionalis*	Highveld Golden Mole	Near Threatened			Near Threatened	
Chrysochloridae	*Chrysospalax villosus*	Rough-haired Golden Mole	Vulnerable	Critically Endangered		Vulnerable	
Equidae	***Equus quagga***	**Plains Zebra**	**Least Concern**		**Protected**		**x**
Erinaceidae	*Atelerix frontalis*	South African Hedgehog	Near Threatened	Protected	Protected	Near Threatened / Protected	x
Felidae	***Caracal caracal***	**Caracal**	**Least Concern**				**x**
Felidae	*Felis nigripes*	Black-footed Cat	Vulnerable	Protected		Near Threatened	
Felidae	***Felis silvestris***	**African Wildcat**	**Least Concern**			**Near Threatened**	
Felidae	***Leptailurus serval***	**Serval**	**Near Threatened**	**Protected**		**Near Threatened**	**x**
Felidae	***Panthera pardus***	**Leopard**	**Vulnerable**	**Vulnerable**		**Near Threatened**	
Giraffidae	*Giraffa camelopardalis giraffa*	Giraffe	Least Concern				x
Galagidae	*Galago moholi*	Southern Lesser Galago	Least Concern		Protected		
Gliridae	*Graphiurus murinus*	Woodland Dormouse	Least Concern				
Herpestidae	***Atilax paludinosus***	**Water Mongoose**	**Least Concern**				**x**
Herpestidae	***Cynictis penicillata***	**Yellow Mongoose**	**Least Concern**				**x**
Herpestidae	***Herpestes sanguineus***	**Slender Mongoose**	**Least Concern**				**x**
Herpestidae	*Ichneumia albicauda*	White-tailed Mongoose	Least Concern				
Herpestidae	*Mungos mungo*	Banded Mongoose	Least Concern				
Herpestidae	*Herpestes ichneumon*	Large Grey Mongoose	Least Concern				x
Herpestidae	***Suricata suricatta***	**Suricate**	**Least Concern**				**x**
Hyaenidae	***Parahyaena brunnea***	**Brown Hyaena**	**Near Threatened**	**Protected**	**Protected**	**Near Threatened / Protected**	**x**
Hyaenidae	***Proteles cristata***	**Aardwolf**	**Least Concern**		**Protected**	**Protected**	
Hystricidae	***Hystrix africaeaustralis***	**Cape Porcupine**	**Least Concern**				**x**
Leporidae	***Lepus capensis***	**Cape Hare**	**Least Concern**				
Leporidae	*Lepus saxatilis*	Scrub Hare	Least Concern				x

Family	Scientific Name	Common Name	Red List – Regional Status (2016)	NEMBA ToPS List (2007)	Gauteng Status	Mpumalanga Status	Field Programme
Leporidae	*Pronolagus randensis*	Jameson's Red Rock Rabbit	Least Concern				x
Leporidae	***Pronolagus rupestris***	**Smith's Red Rock Rabbit**	**Least Concern**				
Macroscelididae	***Elephantulus myurus***	**Eastern Rock Sengi**	**Least Concern**				**x**
Muridae	*Aethomys chrysophilus*	Red Veld Rat	Least Concern				
Muridae	***Gerbilliscus brantsii***	**Highveld Gerbil**	**Least Concern**				
Muridae	*Gerbilliscus leucogaster*	Bushveld Gerbil	Least Concern				
Muridae	***Mastomys species***	**Multimammate Mouse**	**Least Concern**				**x**
Muridae	***Micaelamys namaquensis***	**Namaqua Rock Mouse**	**Least Concern**				
Muridae	*Mus minutoides*	Pygmy Mouse	Least Concern				
Muridae	***Otomys angoniensis***	**Angoni Vlei Rat**	**Least Concern**				
Muridae	***Otomys auratus***	**Vlei Rat**	**Near Threatened**				**x**
Muridae	***Rhabdomys pumilio***	**Xeric Four-striped Mouse**	**Least Concern**				**x**
Muridae	*Thallomys nigricauda*	Black-tailed Tree Rat	Least Concern				
Muridae	*Thallomys paedulcus*	Tree Rat	Least Concern				
Muridae	*Dendromus melanotis*	Grey Climbing Mouse	Least Concern				
Muridae	*Dendromus mesomelas*	Brant's Climbing Mouse	Least Concern				
Muridae	*Dendromus mystacalis*	Chestnut Climbing Mouse	Least Concern				
Muridae	*Malacothrix typica*	Large-eared Mouse	Least Concern				
Muridae	*Mystromys albicaudatus*	White-tailed Rat	Vulnerable			Vulnerable	
Muridae	*Steatomys krebsii*	Krebs's Fat Mouse	Least Concern				
Mustelidae	*Aonyx capensis*	Cape Clawless Otter	Near Threatened	Protected		Protected	x
Mustelidae	*Hydrictis maculicollis*	Spotted-necked Otter	Vulnerable	Protected		Near Threatened / Protected	
Mustelidae	*Ictonyx striatus*	Striped Polecat	Least Concern				
Mustelidae	*Poecilogale albinucha*	African Striped Weasel	Near Threatened			Vulnerable	

Family	Scientific Name	Common Name	Red List – Regional Status (2016)	NEMBA ToPS List (2007)	Gauteng Status	Mpumalanga Status	Field Programme
Nycteridae	*Nycteris thebaica*	Egyptian Slit-faced Bat	Least Concern				
Orycteropodidae	*Orycteropus afer*	Aardvark	Least Concern		Protected	Protected	x
Pedetidae	*Pedetes capensis*	Springhare	Least Concern				
Procaviidae	***Procavia capensis***	**Rock Hyrax**	**Least Concern**				**x**
Rhinolophidae	*Rhinolophus blasii*	Peak-saddle Horseshoe Bat	Near Threatened				
Rhinolophidae	*Rhinolophus clivosus*	Geoffroy's Horseshoe Bat	Least Concern				
Rhinolophidae	*Rhinolophus darlingi*	Darling's Horseshoe Bat	Least Concern				
Sciuridae	*Xerus inauris*	Ground Squirrel	Least Concern				x
Soricidae	*Crocidura cyanea*	Reddish-grey Musk Shrew	Least Concern				
Soricidae	*Crocidura hirta*	Lesser Red Musk Shrew	Least Concern				
Soricidae	***Crocidura mariquensis***	**Swamp Musk Shrew**	**Near Threatened**			**Near Threatened**	
Soricidae	*Myosorex varius*	Forest Shrew	Least Concern				
Soricidae	***Suncus infinitesimus***	**Least Dwarf Shrew**	**Least Concern**				
Soricidae	*Suncus varilla*	Lesser Dwarf Shrew	Least Concern				
Suidae	*Phacochoerus africanus*	Warthog	Least Concern				x
Suidae	*Potamochoerus larvatus*	Bushpig	Least Concern				x
Viverridae	***Civettictis civetta***	**African Civet**	**Least Concern**				
Viverridae	*Genetta genetta*	Small-spotted Genet	Least Concern				
Viverridae	*Genetta maculata*	Large-spotted Genet	Least Concern				x
Source: Master list based on distribution maps in Stuart and Stuart (2007).							
Species highlighted in **bold** text have been recorded in the 2628CB QDS as per MammalMap.							

Appendix E: List of Herpetofauna Species Recorded or Potentially Occurring in the PAOI

Reptiles

(Species highlighted in **bold** text have been recorded in the 2628CB QDS, as per ReptileMap)

Family	Scientific Name	Common Name	Red List – Regional Status	NEMBA ToPS List (2007)	Gauteng Status	Mpumalanga Status	Field programme
Agamidae	***Agama aculeata distanti***	**Eastern Ground Agama**	**Least Concern**	**-**	**Protected**	**Protected**	
Agamidae	***Agama atra***	**Southern Rock Agama**	**Least Concern**	-	**Protected**	**Protected**	x
Chamaeleonidae	***Chamaeleo dilepis***	**Flap-neck Chameleon**	**Least Concern**	-	**Protected**	**Protected**	
Colubridae	***Crotaphopeltis hotamboeia***	**Red-lipped Snake**	**Least Concern**	-	-	-	
Colubridae	***Dasypeltis scabra***	**Rhombic Egg-eater**	**Least Concern**	-	-	-	
Colubridae	*Philothamnus hoplogaster*	Green Water Snake	Least Concern	-	-	-	
Cordylidae	*Chamaesaura aenea*	Coppery Grass Lizard	Least Concern	-	Protected	Protected / Near Threatened	
Cordylidae	***Cordylus vittifer***	**Common Girdled Lizard**	**Least Concern**	-	**Protected**	**Protected**	
Cordylidae	***Pseudocordylus melanotus melanotus***	**Common Crag Lizard**	**Least Concern**	-	**Protected**	**Protected**	
Cordylidae	*Smaug giganteus*	Giant Dragon Lizard	Vulnerable	Endangered	Protected	Protected / Vulnerable	
Elapidae	*Aspidelaps scutatus scutatus*	Common Shield Cobra	Least Concern	-	-	-	
Elapidae	***Hemachatus heamachatus***	**Rinkhals**	**Least Concern**	-	-	-	x
Elapidae	*Naja mossambica*	Mozambique Spitting Cobra	Least Concern	-	-	-	
Gekkonidae	*Lygodactylus capensis capensis*	Common Dwarf Gecko	Least Concern	-	Protected	Protected	
Gekkonidae	*Pachydactylus affinis*	Transvaal Gecko	Least Concern	-	Protected	Protected	
Gekkonidae	***Pachydactylus capensis***	**Cape Gecko**	**Least Concern**	-	**Protected**	**Protected**	
Gerrhosauridae	***Gerrhosaurus flavigularis***	**Yellow-throated Plated Lizard**	**Least Concern**	-	**Protected**	**Protected**	
Gerrhosauridae	*Tetradactylus breyeri*	Breyer's Long-tailed Seps	Least Concern	-	-	Vulnerable	
Lacertidae	*Nucras lalandii*	Delalande's Sandveld Lizard	Least Concern	-	Protected	Protected	
Lacertidae	*Pedioplanis burchelli*	Burchell's Sand Lizard	Least Concern	-	Protected	Protected	
Lamprophiidae	*Amblyodipas polylepis polylepis*	Common Purple-glossed Snake	Least Concern	-	-	-	

Family	Scientific Name	Common Name	Red List – Regional Status	NEMBA ToPS List (2007)	Gauteng Status	Mpumalanga Status	Field programme
Lamprophiidae	***Aparallactus capensis***	**Cape centipede-eater**	**Least Concern**	-	-	-	
Lamprophiidae	*Atractaspis bibronii*	Bibron's Stiletto Snake	Least Concern	-	-	-	
Lamprophiidae	***Boaedon capensis***	**Common House Snake**	**Least Concern**	-	-	-	
Lamprophiidae	*Duberria lutrix lutrix*	South African Slug Eater	Least Concern	-	-	-	
Lamprophiidae	*Gonionotophis capensis capensis*	Common Field Snake	Least Concern	-	-	-	
Lamprophiidae	*Homoroselaps dorsalis*	Striped Harlequin Snake	Least Concern	-	-	Near Threatened	
Lamprophiidae	*Homoroselaps lacteus*	Spotted Harlequin Snake	Least Concern	-	-	Near Threatened	
Lamprophiidae	***Lamprophis aurora***	**Aurora Snake**	**Least Concern**	-	-	-	
Lamprophiidae	*Lamprophis guttatus*	Spotted Rock Snake	Least Concern	-	-	-	
Lamprophiidae	***Lycodonomorphus inornatus***	**Live Ground Snake**	**Least Concern**	-	-	-	
Lamprophiidae	***Lycodonomorphus laevissimus***	**Dusky-bellied Water Snake**	**Least Concern**	-	-	-	
Lamprophiidae	*Lycodonomorphus rufulus*	Brown Water Snake	Least Concern	-	-	-	
Lamprophiidae	***Lycophidion capense***	**Cape Wolf Snake**	**Least Concern**	-	-	-	
Lamprophiidae	*Prosymna sundevallii*	Sundevall's Shovel-snout	Least Concern	-	-	-	
Lamprophiidae	*Psammophis brevirostris*	Short-snouted Grass Snake	Least Concern	-	-	-	
Lamprophiidae	***Psammophis crucifer***	**Montane Grass Snake**	**Least Concern**	-	-	-	
Lamprophiidae	***Psammophis leightoni***	**Cape Snake Snake**	**Least Concern**	-	-	-	
Lamprophiidae	*Psammophis subtaeniatus*	Western Yellow-bellied Sand Snake	Least Concern	-	-	-	
Lamprophiidae	*Psammophis trinasalis*	Four-marked Sand Snake	Least Concern	-	-	-	
Lamprophiidae	***Psammophylax rhombeatus rhombeatus***	**Spotted Grass Snake**	**Least Concern**	-	-	-	
Lamprophiidae	*Psammophylax tritaeniatus*	Striped Grass Snake	Least Concern	-	-	-	
Lamprophiidae	***Pseudaspis cana***	**Mole Snake**	**Least Concern**	-	-	-	x
Leptotyphlopidae	*Leptotyphlops incognitus*	Incognito Thread Snake	Least Concern	-	-	-	
Leptotyphlopidae	***Leptotyphlops scutifrons***	**Peter's Thread Snake**	**Least Concern**	-	-	-	
Pelomedusidae	*Pelomedusa subrufa*	Marsh Terrapin	Least Concern	-	Protected	Protected	x
Scincidae	***Acontias gracilicauda***	**Thin-tailed Legless Skink**	**Least Concern**	-	**Protected**	**Protected**	

Family	Scientific Name	Common Name	Red List – Regional Status	NEMBA ToPS List (2007)	Gauteng Status	Mpumalanga Status	Field programme
Scincidae	***Afroablepharus wahlbergii***	**Wahlberg's Snake-eyed Skink**	**Least Concern**	**-**	**Protected**	**Protected**	
Scincidae	***Trachylepis capensis capensis***	**Cape Skink**	**Least Concern**	**-**	**Protected**	**Protected**	
Scincidae	*Trachylepis punctatissima*	Montane Rock Skink	Least Concern	-	Protected	Protected	
Scincidae	*Trachylepis varia*	Variable Skink	Least Concern	-	Protected	Protected	
Typhlopidae	***Afrotyphlops bibronii***	**Bibron's Blind Snake**	**Least Concern**	**-**	**-**	**-**	
Typhlopidae	*Rhinotyphlops lalandei*	Delalande's Beaked Blind Snake	Least Concern	-	-	-	
Varanidae	***Varanus niloticus***	**Water Monitor**	**Least Concern**	**-**	**-**	**-**	**x**
Viperidae	***Bitis arietans arietans***	**Puff Adder**	**Least Concern**	**-**	**-**	**-**	**x**
Viperidae	***Causus rhombeatus***	**Rhombic Night Adder**	**Least Concern**	**-**	**-**	**-**	
Source: Master list based on distribution maps in Bates et al., (2014).							
Species highlighted in **bold** text have been recorded in the 2628CB QDS as per ReptileMap.							

Amphibians

(Species highlighted in **bold** text have been recorded in the 2628CB QDS, as per FrogMap)

Family	Scientific Name	Common Name	Red List – Regional Status	NEMBA ToPS List (2007)	Gauteng Status	Mpumalanga Status	Field Programme
Breviceptidae	*Breviceps adspersus*	Bushveld Rain Frog	Least Concern	-	-	-	
Bufonidae	***Sclerophrys gutturalis***	**Guttural Toad**	**Least Concern**	**-**	**-**	**-**	x
Bufonidae	***Sclerophrys capensis***	**Raucous Toad**	**Least Concern**	-	-	-	
Bufonidae	***Sclerophrys garmani***	**Eastern Olive Toad**	**Least Concern**	**-**	**-**	**-**	
Bufonidae	*Sclerophrys poweri*	Western Olive Toad	Least Concern	-	-	-	
Bufonidae	*Poyntonophrynus vertebralis*	Southern Pygmy Toad	Least Concern	**-**	**-**	**-**	
Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	Least Concern	-	-	-	x
Hyperoliidae	*Semnodactylus wealii*	Rattling Frog	Least Concern	**-**	**-**	**-**	
Phrynobatrachidae	***Phrynobatrachus natalensis***	**Snoring Puddle Frog**	**Least Concern**	-	-	-	
Pipidae	***Xenopus laevis***	**Common Platanna**	**Least Concern**	**-**	**-**	**-**	
Ptychadenidae	*Ptychadena porosissima*	Striped Grass Frog	Least Concern	-	-	-	
Pyxicephalidae	***Amietia dealandii***	**Common River Frog**	**Least Concern**	**-**	**-**	**-**	x
Pyxicephalidae	***Amietia fuscigula***	**Cape River Frog**	**Least Concern**	-	-	-	
Pyxicephalidae	***Cacosternum boettgeri***	**Common Caco**	**Least Concern**	**-**	**-**	**-**	
Pyxicephalidae	*Pyxicephalus adspersus*	Giant Bullfrog	Least Concern	Protected	Protected	Protected / Vulnerable	
Pyxicephalidae	***Strongylopus fasciatus***	**Striped Stream Frog**	**Least Concern**	-	-	-	
Pyxicephalidae	*Strongylopus grayii*	Clicking Stream Frog	Least Concern	**-**	**-**	**-**	
Pyxicephalidae	***Tomopterna cryptotis***	**Tremolo Sand Frog**	**Least Concern**	-	-	-	
Pyxicephalidae	***Tomopterna natalensis***	**Natal Sand Frog**	**Least Concern**	**-**	**-**	**-**	
Pyxicephalidae	*Tomopterna tandyi*	Tandy's Sand Frog	Least Concern	-	-	-	
Bufonidae	***Schismaderma carens***	**Red Toad**	**Least Concern**	**-**	**-**	**-**	
Source: Master list based on distribution maps in Du Preez and Carruthers (2009).							
Species highlighted in **bold** text have been recorded in the 2628CB QDS as per FrogMap.							

Appendix F: Compliance with Animal Species Protocol.

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity	Relevant Section in Report
The assessment must be undertaken in accordance with the Species Environmental Assessment Guideline7; and must;	
2.2.1 identify the SCC which were found, observed or are likely to occur within the PAOI;	Section 7.1.2, Section 7.2.2
2.2.2 provide evidence (photographs or sound recordings) of each SCC found or observed within the PAOI, 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);	Section 7.1
2.2.3 identify the distribution, location, viability and provide a detailed description of population size of the SCC, identified within the PAOI;	Section 7.1.2, Section 7.2.2
2.2.4 identify the nature and the extent of the potential impact of the proposed development on the population of the SCC located within the PAOI;	Section 10.3
2.2.5 determine the importance of the conservation of the population of the SCC identified within the PAOI, 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;	Section 7.1.2, Section 7.2.2
2.2.6 determine the potential impact of the proposed development on the habitat of the SCC located within the PAOI;	Section 10.3
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, include a motivation for the deviation;	Section 7.1.2, Section 7.2.2
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;	Section 9
2.2.9 identify any potential impact of ecological connectivity in relation to the broader landscape, resulting in impacts on the identified SCC and its long-term viability;	Section 9 & Section 10
2.2.10 determine buffer distances as per the Species Environmental Assessment Guidelines used for the population of each SCC;	N/A
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 species10; or roosting and breeding or foraging areas used by migratory species where these species show significant congregations, occurring in the vicinity	Section 7.1.2, Section 7.2.2.
2.2.12 identify any alternative development footprints within the preferred site which would be of “low” or “medium” sensitivity as identified by the screening tool and verified through the site sensitivity verification	Section 9
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	Page 8 & Appendix A

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity	Relevant Section in Report
registration number of the specialist preparing the assessment including a curriculum vitae;	
3.1.2 a signed statement of independence by the specialist;	Page 8
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;	Section 3.2 & Section 4
3.1.4 a description of the methodology used to undertake the site sensitivity verification, impact assessment and site inspection, including equipment and modelling used where relevant;	Section 3 & Section 10.1
3.1.5 a description of the mean density of observations/number of sample sites per unit area and the site inspection observations;	Section 3.2
3.1.6 a description of the assumptions made and any uncertainties or gaps in knowledge or data;	Section 4
3.1.7 details of all SCC found or suspected to occur on site, ensuring sensitive species are appropriately reported;	Section 7.1.2, Section 7.2.2
3.1.8 the online database name, hyperlink and record accession numbers for disseminated evidence of SCC found within the PAOI;	iNaturalist – Andrew Zinn profile
3.1.9 the location of areas not suitable for development and to be avoided during construction where relevant;	N/A
3.1.10 a discussion on the cumulative impacts;	Section 10.3.4
3.1.11 impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	Section 12 & Section 13
3.1.12 a reasoned opinion, based on the findings of the specialist assessment, regarding the acceptability or not of the development 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;	Section 14
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;	N/A
3.2 A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	EAP to incorporate