FINAL BASIC ASSESSMENT REPORT

Proposed Development of a 132 kV Overhead Power Line and Supporting Infrastructure for the Proposed Vhuvhili Solar Photovoltaic Energy Facility, near Secunda in the Mpumalanga Province

APPENDIX D.6

Avifauna Assessment

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AVIFAUNAL SPECIALIST ASSESSMENT

Basic Assessment for the Proposed Development of a 132 kV Overhead Transmission Power Line and its associated electrical grid infrastructure in support of the proposed Vhuvhili SEF, near Secunda, Mpumalanga

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Executive Summary

The Project Applicant, Vhuvhili Solar RF (Pty) Ltd (hereinafter referred to as "Vhuvhili Solar" or "the Applicant"), is proposing the construction of a 132 kV overhead transmission power line and associated Electrical Grid Infrastructure (EGI) to feed the electricity generated by the proposed Vhuvhili Solar Energy Facility (SEF) to the switching station at the proposed Mukondeleli Wind Energy Facility (WEF). The electricity will be transferred from the proposed on-site substation at the proposed Vhuvhili SEF via a 132 kV power line which extends approximately 12 km in length to the proposed switching station at the proposed Mukondeleli WEF.

It is important to note that this Basic Assessment (BA) process only includes the assessment of the proposed 132 kV power line to transfer the electricity from the proposed Vhuvhili SEF to the proposed Mukondeleli WEF switching station. The proposed Vhuvhili SEF, including the on-site substation and Battery Energy Storage System (BESS), is subject to a separate Scoping and Environmental Impact Assessment (S&EIA) process which is currently underway (DARDLEA NEAS Reference Number: MPP/EIA/0001063/2022). The proposed Mukondeleli WEF, including the on-site switching station to which the proposed 132 kV power line will connect, is also subject to a separate S&EIA process (DARDLEA NEAS Reference Number: MPP/EIA/0001099/2022).

1 Avifauna

The Southern African Bird Atlas Project 2 (SABAP 2) data indicates that a total of 186 bird species could potentially occur within the Project Area of Impact (PAOI). Of these, 66 species are classified as power line sensitive species and 8 of these are South African Red List species. Of the power line sensitive species, 49 are likely to occur regularly at the PAOI and immediate surrounding area, and another 17 could occur sporadically.

2 Impacts Ratings

2.1 Potential Impacts during the Construction Phase

The following impacts have been identified for the construction phase.

Impact 1: Displacement due to disturbance associated with the construction of the 132kV grid connection and associated infrastructure

This impact is rated as negative, with a site-specific spatial extent and a short-term duration due to the temporary nature of the construction phase. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at the end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a substantial consequence and very likely probability, which will render the impact significance as **moderate**, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance of the impact is reduced to **low**. The recommended mitigation measures are detailed in Section 7.2.3

Impact 2: Displacement due to habitat transformation associated with the construction of the 132kV grid connection and associated infrastructure

This impact is rated as negative, with a site-specific spatial extent and a long-term duration due to the extended timeframe of the operational phase. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at the end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a moderate consequence and

an unlikely probability, which will render the impact significance as **low**, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance will remain at **low**. The recommended mitigation measures are detailed in Section 7.2.3below.

2.2 Potential Impacts during the Operational Phase

The following impacts have been identified for the operational phase.

Impact 1: Mortality of power line sensitive species due to collisions with the 132kV grid connection

This impact is rated as negative, with a local spatial extent and a long-term duration due to the extended timeframe of the operational phase. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at the end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a severe consequence and likely probability, which will render the impact significance as **high**, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance of the impact is reduced to **moderate**. The recommended mitigation measures are detailed in Section 7.3.2.

2.3 Potential Impacts during the Decommissioning Phase

The following impacts have been identified for the decommissioning phase.

Impact 1: Displacement due to disturbance associated with the decommissioning of 132kV grid connection

The noise and movement associated with the potential decommissioning activities relating to the proposed 132kV grid connection will be a source of disturbance which would lead to the displacement of avifauna from the area. This impact is rated as negative, with a site-specific spatial extent and a short-term duration. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a substantial consequence and very likely probability, which will render the impact significance as **moderate,** without the implementation of mitigation measures. With the implementation of mitigation measures, the significance of the impact is reduced to **low**. The recommended mitigation measures are detailed in Section 7.4.2.

2.4 Cumulative impacts

The projects which are considered for the cumulative impacts are those which are located within a 30 km radius around the PAOI that have received EA, or have a BA/EIA in process as at August 2022. The cumulative impact assessed is the collective impact of the proposed 132kV grid connections of the Vhuvhili SEF, the authorised/planned projects listed in section 7.5 and the existing high voltage (HV) lines. The existing HV lines within a 30km radius around the PAOI runs into hundreds of kilometres. According to documents in the public domain, the maximum length of planned and authorised grid connections in the 30km radius, including the planned Vhuvhili SEF and Mukondeleli WEF grid, equals <14km. The total length of planned HV lines associated with renewable energy projects will thus constitute a relatively insignificant proportion of the HV lines once they have been constructed. The pre-mitigation impacts range from **moderate to low** but will be reduced to an overall level of **low** if mitigation is applied.

2.5 Overall impact significance

Overall Impact Significance (Post Mitigation)

Phase	**Overall Impact Significance**
Construction	Low
Operational	Moderate
Decommissioning	Low
Nature of Impact	**Overall Impact Significance**
Cumulative - Construction	Low
Cumulative - Operational	Low
Cumulative - Decommissioning	Low

3 Mitigation measures

The following mitigation measures are proposed to reduce the impact of the proposed project on power line sensitive avifauna:

Construction phase

- Construction activity should be restricted to the immediate footprint of the infrastructure.
- Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of power line sensitive avifauna.
- Measures to control noise and dust should be applied according to current best practice in the industry.
- Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.
- Vegetation clearance should be limited to what is absolutely necessary.
- The mitigation measures proposed by the biodiversity specialist must be strictly enforced.

Operational phase

- Bird flight diverters should be installed on the whole line according to the applicable Eskom standard.

De-commissioning phase

- Decommissioning activity should be restricted to a working corridor as close as practically possible to the footprint of the infrastructure.
- Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of power line sensitive avifauna.
- Measures to control noise and dust should be applied according to current best practice in the industry.
- Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.

4 Impact statement

The expected impacts of the proposed Vhuvhili SEF 132kV grid connection, near Secunda in the Mpumalanga Province, were rated to be **Low to High negative pre-mitigation**. However, with appropriate mitigation, the overall **post-mitigation** significance of all the identified impacts should be reduced to **Low** for all phases of the project, except the operational phase, which will be reduced to Moderate. It is therefore recommended that the activity is authorised, on condition that the proposed mitigation measures as detailed in the Impact Assessment Tables (Section 7) and the Environmental Management Programme (EMPr) are strictly implemented.

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List of Abbreviations

AEWA	Agreement on the Conservation of African-Eurasian Migratory Waterbirds
BA	Basic Assessment
BFDs	Bird Flight Diverters
BGIS	Biodiversity Geographic Information System
BLSA	BirdLife South Africa
CBD	Convention on Biological Diversity
CITES	Convention on the International Trade in Endangered Species of Wild Flora and Fauna
CMS	Convention on Migratory Species
DFFE	Department of Forestry, Fisheries and the Environment
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EGI	Electricity Grid Infrastructure
EMPr	Environmental Management Programme
IBA	Important Bird Area
IUCN	International Union for Conservation of Nature
NEMA	National Environmental Management Act (Act 107 of 1998), as amended)
OHL	Overhead Power line
PAOI	Project Area of Impact
S&EIA	Scoping and Environmental Impact Assessment
SABAP 1	Southern African Bird Atlas Project 1
SABAP 2	Southern African Bird Atlas Project 2
SACNASP	South African Council for Natural and Scientific Professions
SANBI	South African Biodiversity Institute
SAPAD	South Africa Protected Areas Database
UNEP	United Nations Environment Programme
WEF	Wind Energy Facility

Glossary

Definitions	
Project area of impact (PAOI)	A 2km area around the proposed grid corridor, which is regarded as the primary impact zone of the proposed infrastructure.
Broader area	A consolidated data set for a total of 6 pentads where the PAOI is located.
Power line sensitive species	Species which could potentially be impacted by power line collisions or electrocutions, based on specific morphological and/or behavioural characteristics.
Cumulative impact	The past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may be significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities" (NEMA EIA Reg GN R982 of 2014).
Pentad	A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 7.6 km.

AVIFAUNAL IMPACT ASSESSMENT

The Project Applicant, Vhuvhili Solar RF (Pty) Ltd (hereinafter referred to as "Vhuvhili Solar" or "the Applicant") is proposing the construction of a 132 kV overhead transmission power line and associated EGI to feed the electricity generated by the proposed Vhuvhili SEF to the switching station at the proposed Mukondeleli WEF. The electricity will be transferred from the proposed on-site substation at the proposed Vhuvhili SEF via a 132 kV power line which extends approximately 12 km in length to the proposed switching station at the proposed Mukondeleli WEF.

It is important to note that this BAprocess only includes the assessment of the proposed 132 kV power line to transfer the electricity from the proposed Vhuvhili SEF to the proposed Mukondeleli WEF switching station. The proposed Vhuvhili SEF, including the on-site substation and BESS, is subject to a separate S&EIA process which is currently underway (DARDLEA NEAS Reference Number: MPP/EIA/0001063/2022). The proposed Mukondeleli WEF, including the on-site switching station to which the proposed 132 kV power line will connect, is also subject to a separate S&EIA process.

The Project Applicant is currently investigating four power line routing alternatives for the transfer of the electricity generated by the proposed Vhuvhili SEF to the switching station at the proposed Mukondeleli WEF. Please refer to Figure 1 for the power line routing alternatives which are assessed as part of this BA process. The figure also includes the preferred and alternative substation and BESS complexes at the proposed Vhuvhili SEF site and the two switching station alternatives at the proposed Mukondeleli WEF site. Please note that these latter alternatives will be assessed as part of the separate S&EIA processes which are currently being undertaken for the proposed Vhuvhili SEF and the Mukondeleli WEF projects.

The specialists were requested to assess the following power line routing alternatives:

Proposed alternatives should the Vhuvhili on-site substation hub A-B (Preferred) be built:

- *Alternative 1 (Preferred) (A to E as marked in Figure 1)*

  This is the Preferred power line routing should the proposed Preferred on-site substation hub A-B at the Vhuvhili SEF site be built. The proposed 132 kV power line will extend from the Preferred on-site substation hub at the proposed Vhuvhili SEF site to switching station E at the proposed Mukondeleli WEF site.

- *Alternative 2 (A to F as marked in Figure 1)*

  Alternative proposed 132 kV power line that will extend from the Preferred on-site substation hub A-B at the proposed Vhuvhili SEF site to switching station F at the proposed Mukondeleli WEF site.

Proposed alternatives should the Vhuvhili on-site substation hub C-D (Alternative 2) be built:

- *Alternative 3 (Preferred) (C to E as marked in Figure 1)*

  This is the Preferred power line routing should the proposed Alternative 2 on-site substation hub C-D at the Vhuvhili SEF site be built. The proposed 132 kV power line will extend from the Alternative 2 on-site substation hub at the proposed Vhuvhili SEF site to switching station E at the proposed Mukondeleli WEF site.

- *Alternative 4 (C to F as marked in Figure 1)*

Alternative proposed 132 kV power line that will extend from the Alternative 2 on-site substation hub C-D at the proposed Vhuvhili SEF site to switching station F at the proposed Mukondeleli WEF site.

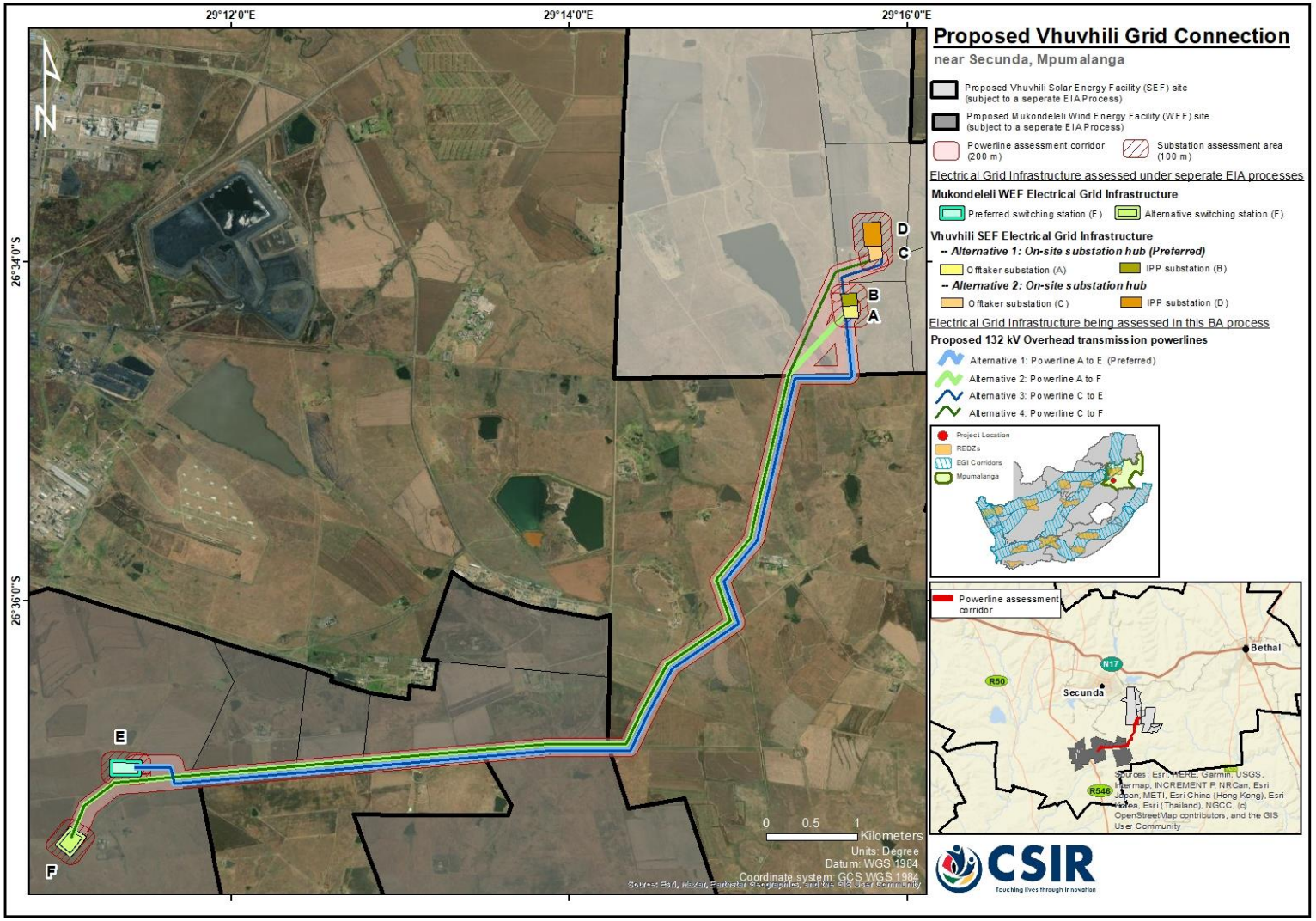


Figure 1: Locality map showing the proposed 132 kV overhead power line routing alternatives (that is the subject of this BA Report), which extends from the proposed Vhuvhili SEF (subject of a separate S&EIA process) to the proposed Mukondeleli WEF hg(subject of a separate S&EIA process).

A description of the key components of the proposed Vhuvhili power line and EGI project is provided in Table 1 below. It is important to note at the outset that the exact specifications of the proposed project components will be determined during the detailed engineering phase (subsequent to the issuing of an Environmental Authorisation (EA), should such authorisation be granted for the proposed power line and EGI project) but that the information provided below is seen as the worst-case scenario for the proposed power line project.

Table 1: Description of the project components for the proposed 132 kV overhead power line and associated EGI

Component	Description
Power line/pylon height	Up to 40 m
Power line length	Approx. 12 km
Power line capacity	Up to 132 kV
Minimum conductor ground clearance	Approx. 8.1 m
Distance between conductors	Between 2.4 m and 3.8 m
Pylon type	Monopole or steel lattice pylons, or combination of both where required.
Servitude width	Once built, the registered servitude will be up to 32 m wide in line with guideline and requirements for 132 kV power lines stipulated in the 2011 Eskom Distribution Guide Part 19. Note that the entire servitude will not be cleared of vegetation. Vegetation clearance within the servitude will be undertaken in compliance with relevant standards and specifications.
Associated Infrastructure	
Service roads	There are a number of existing gravel farm roads (some just jeep tracks) with widths ranging between 4 m and 5 m located around and within the proposed Vhuvhili power line corridor. A service road of approximately 5 m wide will be required below the power line.
Proximity to grid connection	The proposed 132 kV overhead power line will extend approximately 12 km from proposed Vhuvhili SEF to a switching station at the proposed Mukondeleli WEF site.

1. Introduction

1.1. Scope, Purpose and Objectives of this Specialist Report

The specialist report assesses the expected impacts on avifauna of a proposed 132kV Overhead Transmission Power line (OHL) and its associated electrical grid infrastructure in support of the proposed Vhuvhili SEF, near Secunda in the Mpumalanga Province, and provides recommendations for the mitigation of the said impacts to acceptable levels.

1.2. Details of Specialist

This specialist assessment has been undertaken by Albert Froneman and Chris van Rooyen of Chris van Rooyen Consulting. Albert Froneman is registered with the South African Council for Natural and Scientific Professions (SACNASP), with Registration Number 400177/09 in the field of Zoological Sciences. Chris van Rooyen works under the supervision of and in association with Albert Froneman as stipulated by the Natural Scientific Professions Act 27 of 2003. A curriculum vitae is included in Appendix A of this specialist assessment.

In addition, a signed specialist statement of independence is included in Appendix B of this specialist assessment.

1.3. Terms of Reference

The terms of reference for this assessment report can be summarised as follows:

- Describe the affected environment from an avifaunal perspective;
- Discuss gaps in baseline data and other limitations;
- List and describe the expected impacts associated with the proposed 132kV power line grid connections and associated infrastructure;
- Perform an assessment of the potential impacts; and
- Recommend mitigation measures to reduce the significance of the expected impacts.

2. Approach and Methodology

The following methods were employed to conduct this study:

- The Project Area of Impact (PAOI) was defined as a 2km zone around the proposed grid connection.
- Power line sensitive species were defined as species which could potentially be impacted by power line collisions or electrocutions, based on their morphology. Larger birds, particularly raptors and vultures, are more vulnerable to electrocution as they are more likely to bridge the clearances between electrical components than smaller birds. Large terrestrial species and certain waterbirds with high wing loading are less manoeuvrable than smaller species and are therefore more likely to collide with overhead lines.
- Bird distribution data of the Southern African Bird Atlas Project 2 (SABAP 2) was obtained from the University of Cape Town, as a means to ascertain which species occurs within the broader area i.e. within a block consisting of six pentad grid cells each within which the proposed projects are situated. A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 7.6 km. From 2011 to date, a total of 82 full protocol lists (i.e. surveys lasting a minimum of two hours each) have been completed for this area. In addition, 34 ad hoc protocol lists (i.e. surveys lasting less than two hours but still yielding valuable data) have been completed. The SABAP2 data is regarded as a reliable reflection of the avifauna which occurs in the area and is supplemented with data collected at the proposed Vhuvhili SEF and Mukondeleli WEF during the 12 months pre-construction monitoring.
- A classification of the habitat in the development area was obtained from the Southern African Bird Atlas Project 1 (SABAP 1) (Harrison et al., 1997) and the National Vegetation Map (SANBI 2018) from the South African National Biodiversity Institute (SANBI) website (Mucina & Rutherford, 2006; SANBI, 2018).
- The national threatened status of all power line sensitive species was determined with the use of the most recent edition of the Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor et al. 2015), and the latest authoritative summary of southern African bird biology (Hockey et al. 2005).
- The global threatened status of all power line sensitive species was determined by consulting the latest (2021.3) IUCN Red List of Threatened Species (http://www.iucnredlist.org/).
- The Important Bird and Biodiversity Areas of South Africa (Marnewick et al. 2015; http://www.birdlife.org.za/conservation/important-bird-areas) was consulted for information on potentially relevant Important Bird Areas (IBAs).
- Satellite imagery (Google Earth © 2022) was used in order to view the broader area on a landscape level and to help identify bird habitat on the ground.
- The Department of Forestry Fisheries and the Environment (DFFE) National Screening Tool was used to determine the assigned avian sensitivity of the PAOI (September, 2022).
- Guidelines for the Implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for EIAs in South Africa produced by the SANBI on behalf of the Department of Environment, Forestry and Fisheries (2020) were used to assist with the interpretation of the relevant protocol.

- The results of an integrated pre-construction programme conducted over 12-months at the proposed Vhuvhili SEF and Mukondeleli WEF sites, which is also relevant to the current PAOI, from November 2020 to January 2022 were used to inform the current study.

2.1. Information Sources

Data / Information	Source	Date	Type	Description
South African Protected Areas Database (SAPAD)	Department of Forestry, Fisheries and the Environment (DFFE)	2021, Q3	Spatial	Spatial delineation of protected areas in South Africa. Updated quarterly
Southern African Bird Atlas Project 1 (SABAP1)	University of Cape Town	1987-1991	Spatial, reference	SABAP1, which took place from 1987-1991.
Southern African Bird Atlas Project 2 (SABAP2)	University of Cape Town	February 2022	Spatial, database	SABAP2 is the follow-up project to the SABAP1. The second bird atlas project started on 1 July 2007 and is still growing. The project aims to map the distribution and relative abundance of birds in southern Africa.
National Vegetation Map	South African National Biodiversity Institute (SANBI) (BGIS)	2018	Spatial	The National Vegetation Map Project (VEGMAP) is a large collaborative project established to classify, map and sample the vegetation of South Africa, Lesotho and Swaziland.
Red Data Book of Birds of South Africa, Lesotho and Swaziland	BirdLife South Africa	2015	Reference	The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland is an updated and peer-reviewed conservation status assessment of the 854 bird species occurring in South Africa undertaken in collaboration between BirdLife South Africa, the Animal Demography Unit of the University of Cape Town, and the SANBI.
IUCN Red List of Threatened Species (2022.1)	IUCN	2021.3	Online reference source	Established in 1964, the International Union for Conservation of Nature's Red List of Threatened Species is the world's most comprehensive information source on the global extinction risk status of animal, fungus and plant species.
Important Bird and Biodiversity Areas of South Africa	BirdLife South Africa	2015	Reference work	Important Bird and Biodiversity Areas (IBAs), as defined by BirdLife International, constitute a global network of over 13 500 sites, of which 112 sites are found in South Africa. IBAs are sites of global significance for bird conservation, identified nationally through multi-stakeholder processes using globally standardised, quantitative and scientifically agreed criteria.
The National Screening Tool	Department of Forestry, Fisheries and the Environment	September 2022	Spatial	The National Web based Environmental Screening Tool is a geographically based web-enabled

Data / Information	Source	Date	Type	Description
				application which allows a proponent intending to submit an application for environmental authorisation in terms of the Environmental Impact Assessment (EIA) Regulations 2014, as amended to screen their proposed site for any environmental sensitivity.
Pre-construction monitoring	Chris van Rooyen Consulting	2020 – 2022	Spatial and quantitative data	The results of an integrated pre-construction programme conducted over 12-months at the proposed Vhuvhili SEF and Mukondeleli WEF sites from November 2020 – January 2022.

2.2. Assumptions, Knowledge Gaps and Limitations

This study assumed that the sources of information used in this report are reliable. In this respect, the following must be noted:

- It was assumed that the SABAP 2 is an accurate representation of the avifauna that are likely to occur in the broader area, based on the adequate number of completed lists for this area.
- The focus of the study was primarily on the potential impacts of the proposed grid infrastructure on power line sensitive species.
- Power line sensitive species are defined as species which could potentially be impacted by power line collisions or electrocutions, based on their morphology:
  - Larger birds, particularly raptors and vultures, are more vulnerable to electrocution as they are more likely to bridge the gaps between electrical components than smaller birds.
  - Large terrestrial species and certain waterbirds with high wing loading are less manoeuvrable than smaller species and are therefore more likely to collide with overhead lines.
- Conclusions drawn in this study are based on experience of the specialist in relation to the species found on site and similar species in different parts of South Africa. Bird behaviour can never be entirely reduced to formulas that would be valid under all circumstances.

2.3. Consultation Processes Undertaken

No specific consultation processes were undertaken.

3. Legislative and Permit Requirements

3.1 Legislative Framework

There is no legislation pertaining specifically to the impact of wind and or solar facilities and associated electrical grid infrastructure on avifauna.

3.1.1 Agreements and conventions

Relevant international agreements and conventions are described in this section.

Table 2: International agreements and conventions which South Africa is party to, and which are relevant to the conservation of avifauna.

Convention name	Description	Geographic scope
African-Eurasian Waterbird Agreement (AEWA)	The Agreement on the Conservation of AEWA is an intergovernmental treaty dedicated to the conservation of migratory waterbirds and their habitats across Africa, Europe, the Middle East, Central Asia, Greenland and the Canadian Archipelago. Developed under the framework of the Convention on Migratory Species (CMS) and administered by the United Nations Environment Programme (UNEP), AEWA brings together countries and the wider international conservation community in an effort to establish coordinated conservation and management of migratory waterbirds throughout their entire migratory range.	Regional
Convention on Biological Diversity (CBD), Nairobi, 1992	The Convention on Biological Diversity (CBD) entered into force on 29 December 1993. It has three main objectives: • The conservation of biological diversity; • The sustainable use of the components of biological diversity; and • The fair and equitable sharing of the benefits arising out of the utilization of genetic resources.	Global
Convention on the Conservation of Migratory Species of Wild Animals, (CMS), Bonn, 1979	As an environmental treaty under the aegis of the UNEP, CMS provides a global platform for the conservation and sustainable use of migratory animals and their habitats. CMS brings together the States through which migratory animals pass, the Range States, and lays the legal foundation for internationally coordinated conservation measures throughout a migratory range.	Global
Convention on the International Trade in Endangered Species of Wild Flora and Fauna, (CITES), Washington DC, 1973	CITES is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.	Global
Ramsar Convention on Wetlands of International Importance, Ramsar, 1971	The Convention on Wetlands, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.	Global
Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia	The Signatories will aim to take co-ordinated measures to achieve and maintain the favourable conservation status of birds of prey throughout their range and to reverse their decline when and where appropriate.	Regional

3.1.2 National legislation

3.1.2.1 Constitution of the Republic of South Africa, 1996

The Constitution of the Republic of South Africa provides in the Bill of Rights that: Everyone has the right –

(a) to an environment that is not harmful to their health or well-being; and
(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that –
    (i) prevent pollution and ecological degradation;
    (ii) promote conservation; and
    (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

3.1.2.2 The National Environmental Management Act, 1998 NEMA Act No.107 of 1998) as amended (NEMA)

The NEMA creates the legislative framework for environmental protection in South Africa and is aimed at giving effect to the environmental right in the Constitution. It sets out a number of guiding principles that apply to the actions of all organs of state that may significantly affect the environment. Sustainable development (socially, environmentally and economically) is one of the key principles, and internationally accepted principles of environmental management, such as the precautionary principle and the polluter pays principle, are also incorporated.

NEMA also provides that a wide variety of listed developmental activities (via the promulgation of the EIA Regulations 2014, as amended), which may significantly affect the environment, may be performed only after an EIA or BA has been undertaken and environmental authorisation has been obtained from the relevant competent authority. Many of these listed activities can potentially have negative impacts on bird populations in a variety of ways. The clearance of natural vegetation, for instance, can lead to a loss of habitat and may depress prey populations, while erecting structures needed for generating and distributing energy, communication, and so forth can cause mortalities by collision or electrocution.

NEMA makes provision for the prescription of procedures for the assessment and minimum criteria for reporting on identified environmental themes (Sections 24(5)(a) and (h) and 44) when applying for environmental authorisation. The Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020) is applicable in the case of potential impacts on avifauna by power lines.

3.1.2.3 The National Environmental Management: Biodiversity Act 10 of 2004 and the Threatened or Protected Species Regulations, February 2007

The most prominent statute containing provisions directly aimed at the conservation of birds is the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004), as amended (NEMBA)) read with the Threatened or Protected Species Regulations, February 2007 (TOPS Regulations). Chapter 1 sets out the objectives of the Act, and they are aligned with the objectives of the CBD, which are the conservation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of the benefits of the use of genetic resources. The Act also gives effect to CITES, the Ramsar Convention, and the Bonn Convention on Migratory Species of Wild Animals (as noted in

Table 2 above). The State is endowed with the trusteeship of biodiversity and has the responsibility to manage, conserve and sustain the biodiversity of South Africa.

3.1.3 Provincial legislation

The current legislation applicable to the conservation of fauna and flora in Mpumalanga is the Mpumalanga Nature Conservation Act, 1998 (Act No. 10 of 1998). It consolidated and amended the laws relating to nature conservation within the province and provides for matters connected therewith. All birds are classified as Protected Game (Section 4 (1) (b)), except those listed in Schedule 3, which are classified as Ordinary Game (Section 4 (1)(c)).

4. Description of Project Aspects relevant to avifauna

The proposed EGI project will consist of the components listed below. It is important to note at the outset that the exact specifications of the proposed project components will only be determined during the detailed engineering phase prior to construction (subsequent to the issuing of an EA, should such an authorisation be granted for the proposed projects), but that the information provided below is seen as the worst-case scenario for the projects.

- Overhead Transmission Power lines
  - Line capacity: Up to 132 kV
  - Line/pylon height: Up to 40 m
  - Pylon type: Monopole or steel lattice pylons, or combination of both where required.
  - Once built, the registered servitude will be up to 32 m wide in line with guideline and requirements for 132 kV power lines stipulated in the 2011 Eskom Distribution Guide Part 19. The entire servitude will not be cleared of vegetation. Vegetation clearance within the servitude will be undertaken in compliance with relevant Eskom standards and specifications.

- Associated electrical infrastructure
  - There are a number of existing gravel farm roads (some just jeep tracks) with widths ranging between 4 m and 5 m located around and within the proposed Vhuvhili power line corridor. A service road of approximately 5 m wide will be required below the power line.

5. Issues, Risks and Impacts

5.1. Identification of Potential Impacts/Risks

Negative impacts on avifauna by electricity infrastructure generally take two (2) main forms, namely electrocution and collisions (Ledger & Annegarn, 1981; Ledger 1983; Ledger, 1984; Hobbs and Ledger, 1986a; Hobbs & Ledger, 1986b; Ledger, Hobbs & Smith, 1992; Verdoorn, 1996; Kruger & Van Rooyen, 1998; Van Rooyen, 1998; Kruger, 1999; Van Rooyen, 1999; Van Rooyen, 2000; Van Rooyen, 2004; Jenkins et al., 2010). Displacement due to habitat destruction and disturbance associated with the construction of the electricity infrastructure and other associated infrastructure is another impact that could potentially impact on avifauna.

In the case of the Vhuvhili 132kV grid connection, electrocution of avifauna as a potential impact is not foreseen. The proposed clearances on the poles and towers precludes the breaching of the airgap between live components, and live and earthed components by any of the power line sensitive species which could potentially interact with the power line.

The following potential impacts on power line sensitive avifauna have been identified:

Construction Phase

- Displacement due to disturbance associated with the construction of the 132kV power line and associated infrastructure.
- Displacement due to habitat transformation associated with the construction of the 132kV power line and associated infrastructure.

Operational Phase

- Mortality of power line sensitive SCC due to collisions with the 132kV power line.

Decommissioning Phase

- Displacement due to disturbance associated with the decommissioning of the 132kV power line.

Cumulative Impacts

- Displacement due to disturbance associated with the construction and decommissioning of the 132kV power line.
- Displacement due to habitat transformation associated with the 132kV power line and associated infrastructure.
- Collisions with the 132kV overhead power line

5.2. Summary of Issues identified during the Public Consultation Phase

Issues that may be raised following the release of the Draft BA Report for comment during the Public Consultation Phase will be included in the Final Avifauna specialist report which will be included in the Final BA Report.

6. Baseline Environmental Description

6.1 General Description

6.1.1 Natural environment

The PAOI is located within the Soweto Highveld Grassland (Gm8) vegetation ecotype within the Mesic Highveld Grassland Bioregion (SANBI, 2018). This vegetation type covers 14 513 km² of Mpumalanga and Gauteng (and to a very small extent also in the neighbouring Free State and North-West provinces) and occurs at an altitude ranging from 1420 m to 1760 m above sea level (Mucina et al., 2006). The PAOI does not fall within any Centre of Endemism (Van Wyk & Smith, 2001).

Soweto Highveld Grassland is a summer rainfall vegetation (662 mm per annum, mostly September to April), which experiences a cool-temperate climate (mean annual temperature 14.8°C) with thermic continentality. Temperature ranges between 28°C (January) to -0.6°C (July). Frost and frequent grass fires during winter play an important role in limiting the occurrence of trees and shrubs in the region (Mucina et al., 2006). The landscape is gently to moderately undulating on the Highveld plateau, supporting dense tufted grassland dominated by *Themeda triandra*, with a notable herbaceous forb component. In places which have not been disturbed, scattered wetlands, narrow stream alluvia, pans and occasional ridges interrupt the grassland cover.

The conservation status of this vegetation type was listed as “Endangered” by Mucina and Rutherford (2006) (see 7.2.2.). Very few statutorily conserved areas occur in this vegetation type and almost half has been transformed mostly by cultivation, plantations, mining, and urbanisation.

6.1.2 Modified environment

Whilst the distribution and abundance of the bird species in the broader area are mostly associated with natural vegetation, as this comprises virtually all the habitat, it is also necessary to examine the few external modifications to the environment that have relevance for birds.

The following avifaunal-relevant anthropogenic habitat modifications were recorded within the PAOI:

- **Dams:** There are several small dams mostly associated with the Klipspruit River and its tributaries. There is one moderately large dam in the north of the PAOI.
- **Agriculture:** Agricultural activity present within the PAOI comprises cultivated commercial annuals non-pivot cropland (Thompson, 2019), predominately dedicated towards maize production.
- **Alien trees:** Alien trees are present in the PAOI as windbreaks either between agricultural fields or between homesteads (Thompson, 2019)

APPENDIX C provides a photographic record of the habitat at the project site.

6.1.3 Important Bird Areas (IBAs)

The PAOI is not located in an IBA. The closest IBAs are the Amersfoort-Bethal-Carolina IBA SA018 – approximately 23km east of the PAOI, and the Devon Grasslands IBA SA130 – approximately 32km west of the PAOI (Marnewick et al., 2015). It is not envisaged that the proposed power line will impact on avifauna in the IBAs due to the distance from the PAOI.

6.1.4 National Protected Areas

The development area does not fall within a protected area or an area identified in a protected area expansion strategy.

6.1.5 Avifauna

The SABAP2 data indicates that a total of 186 bird species could potentially occur within the PAOI. APPENDIX F provides a comprehensive list of all the species. Of these, 66 species are classified as power line sensitive species and 8 of these are South African Red List species. Of the power line sensitive species, 49 are likely to occur regularly at the PAOI and immediate surrounding area, and another 17 could occur sporadically.

Error! Reference source not found. below lists all the power line sensitive species and the possible i mpact on the respective species by the proposed 132kV overhead power line and associated infrastructure.

Table 3: Power line sensitive species that could occur on the PAOI

NT = Near threatened VU = Vulnerable EN = Endangered H = High M = Medium L = Low

Species name	Scientific name	SABAP2 reporting rate		Status		Recorded during surveys	Likelihood of regular occurrence in the PAOI	Impacts		
		Full protocol	Ad hoc protocol	Global status	Regional status			Collision: HV line	Displacement: disturbance (breeding)	Displacement: habitat transformation
African Black Duck	*Anas sparsa*	8.54	0.00	-	-		M	x		
African Darter	*Anhinga rufa*	26.83	11.76	-	-	x	H	x		
African Fish Eagle	*Haliaeetus vocifer*	1.22	0.00	-	-		L		x	
African Marsh Harrier	*Circus ranivorus*	1.22	0.00	-	EN		L		x	
African Openbill	*Anastomus lamelligerus*	1.22	0.00	-	-		L	x		
African Sacred Ibis	*Threskiornis aethiopicus*	63.41	23.53	-	-	x	H	x		
African Spoonbill	*Platalea alba*	21.95	5.88	-	-	x	H	x		
African Swamphen	*Porphyrio madagascariensis*	6.10	0.00	-	-		M			
Amur Falcon	*Falco amurensis*	34.15	2.94	-	-	x	H			x
Black Heron	*Egretta ardesiaca*	3.66	2.94	-	-		L	x		
Black Sparrowhawk	*Accipiter melanoleucus*	0.00	0.00	-	-	x	M		x	
Black-crowned Night Heron	*Nycticorax nycticorax*	1.22	0.00	-	-		L	x		
Black-headed Heron	*Ardea melanocephala*	81.71	23.53	-	-	x	H	x	x	x
Black-winged Kite	*Elanus caeruleus*	70.73	23.53	-	-	x	H		x	x
Blue Crane	*Grus paradisea*	1.22	2.94	VU	NT	x	M	x	x	x
Blue Korhaan	*Eupodotis caerulescens*	17.07	2.94	NT	LC	x	M	x	x	x
Blue-billed Teal	*Spatula hottentota*	1.22	0.00	-	-		L	x		
Cape Crow	*Corvus capensis*	13.41	5.88	-	-	x	M		x	
Cape Shoveler	*Spatula smithii*	29.27	11.76	-	-	x	H	x		
Cape Teal	*Anas capensis*	2.44	0.00	-	-		L	x		
Common Buzzard	*Buteo buteo*	8.54	0.00	-	-	x	M			x
Common Moorhen	*Gallinula chloropus*	36.59	11.76	-	-		H			
Egyptian Goose	*Alopochen aegyptiaca*	73.17	38.24	-	-	x	H	x	x	
Fulvous Whistling Duck	*Dendrocygna bicolor*	2.44	0.00	-	-		L	x	x	
Glossy Ibis	*Plegadis falcinellus*	36.59	5.88	-	-		H	x		
Goliath Heron	*Ardea goliath*	6.10	2.94	-	-		M	x	x	
Great Crested Grebe	*Podiceps cristatus*	2.44	0.00	-	-		L	x		
Great Egret	*Ardea alba*	6.10	2.94	-	-		M	x		
Greater Flamingo	*Phoenicopterus roseus*	4.88	5.88	-	NT	x	M	x		
Greater Kestrel	*Falco rupicoloides*	6.10	2.94	-	-	x	M		x	x
Grey Heron	*Ardea cinerea*	34.15	14.71	-	-	x	H	x	x	
Hadada Ibis	*Bostrychia hagedash*	79.27	35.29	-	-	x	H	x	x	
Hamerkop	*Scopus umbretta*	9.76	0.00	-	-		M	x	x	
Helmeted Guineafowl	*Numida meleagris*	69.51	20.59	-	-	x	H		x	x

Species name	Scientific name	SABAP2 reporting rate		Status		Recorded during surveys	Likelihood of regular occurrence in the PAOI	Impacts		
		Full protocol	Ad hoc protocol	Global status	Regional status			Collision: HV line	Displacement: disturbance (breeding)	Displacement: habitat transformation
Intermediate Egret	*Ardea intermedia*	23.17	2.94	-	-		H	x		
Jackal Buzzard	*Buteo rufofuscus*	4.88	0.00	-	-		M		x	x
Knob-billed Duck	*Sarkidiornis melanotos*	1.22	0.00	-	-		L	x		
Lanner Falcon	*Falco biarmicus*	4.88	0.00	-	VU	x	M		x	x
Little Egret	*Egretta garzetta*	23.17	14.71	-	-	x	H	x		
Little Grebe	*Tachybaptus ruficollis*	64.63	17.65	-	-	x	H	x		
Long-crested Eagle	*Lophaetus occipitalis*	3.66	0.00	-	-		M		x	x
Maccoa Duck	*Oxyura maccoa*	3.66	0.00	VU	NT		L	x		
Mallard	*Anas platyrhynchos*	8.54	2.94	-	-		M	x		
Marsh Owl	*Asio capensis*	24.39	2.94	-	-	x	H	x	x	x
Northern Black Korhaan	*Afrotis afraoides*	0.00	0.00	-	-	x	L	x	x	x
Pallid Harrier	*Circus macrourus*	1.22	0.00	NT	NT		M			x
Pied Crow	*Corvus albus*	31.71	2.94	-	-	x	H		x	
Purple Heron	*Ardea purpurea*	10.98	0.00	-	-		M	x		
Red-billed Teal	*Anas erythrorhyncha*	35.37	2.94	-	-	x	H	x		
Red-footed Falcon	*Falco vespertinus*	1.22	0.00	NT	NT		L			x
Red-knobbed Coot	*Fulica cristata*	74.39	29.41	-	-	x	H	x		
Reed Cormorant	*Microcarbo africanus*	75.61	20.59	-	-	x	H	x		
Rock Kestrel	*Falco rupicolus*	2.44	2.94	-	-	x	L		x	x
Secretarybird	*Sagittarius serpentarius*	8.54	0.00	EN	VU	x	M	x	x	x
South African Shelduck	*Tadorna cana*	8.54	2.94	-	-	x	M	x		
Southern Pochard	*Netta erythrophthalma*	12.20	0.00	-	-	x	M	x		
Spotted Eagle-Owl	*Bubo africanus*	6.10	0.00	-	-	x	M	x	x	x
Spur-winged Goose	*Plectropterus gambensis*	40.24	8.82	-	-	x	H	x		
Squacco Heron	*Ardeola ralloides*	7.32	0.00	-	-		M	x		
Western Barn Owl	*Tyto alba*	0.00	2.94	-	-		L	x	x	x
Western Cattle Egret	*Bubulcus ibis*	70.73	23.53	-	-	x	H	x		
White Stork	*Ciconia ciconia*	3.66	0.00	-	-	x	L	x		
White-backed Duck	*Thalassornis leuconotus*	3.66	0.00	-	-		L	x		
White-breasted Cormorant	*Phalacrocorax lucidus*	25.61	11.76	-	-	x	H	x		
White-faced Whistling Duck	*Dendrocygna viduata*	14.63	0.00	-	-		H	x		
Yellow-billed Duck	*Anas undulata*	70.73	26.47	-	-	x	H	x		

6.1. Identification of Environmental Sensitivities

6.1.1. Sensitivities identified by the National Web-Based Environmental Screening Tool

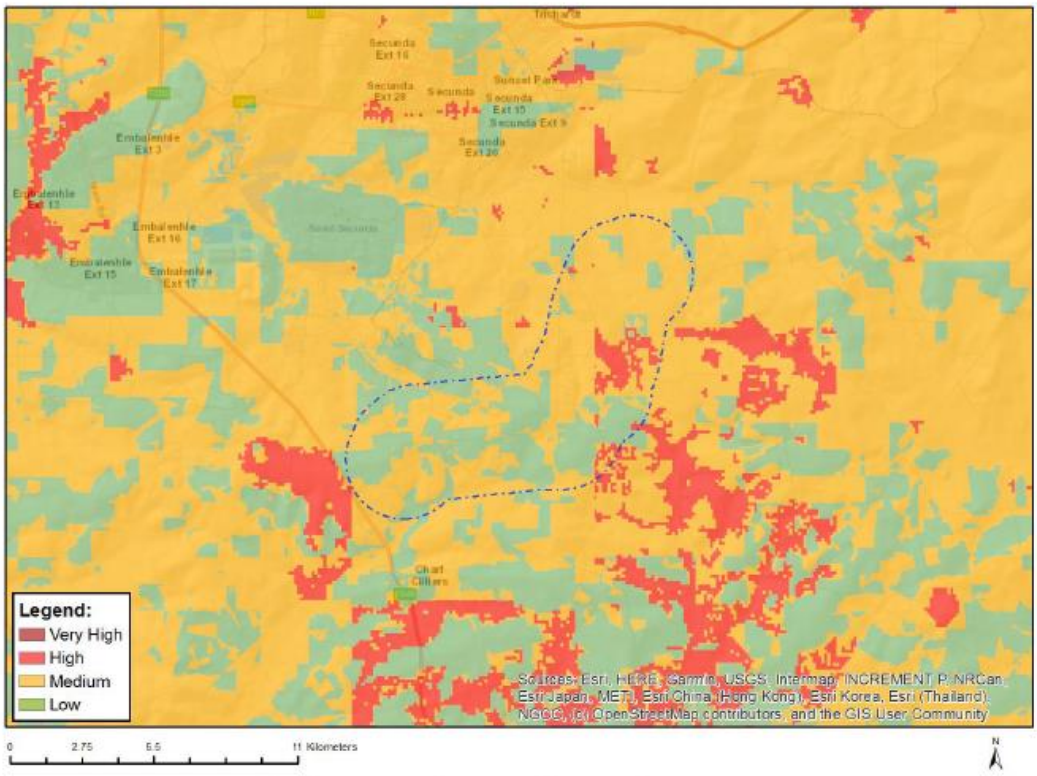
The PAOI is classified as Low (subject to confirmation), Medium and High sensitivity for terrestrial animals according to the Terrestrial Animal Species (Figure 2). The High classification is linked to the potential occurrence of African Marsh Harrier (Globally Least Concern, Regionally Endangered), Secretarybird (Globally Endangered, Regionally Vulnerable) and Caspian Tern (Regionally Vulnerable). The PAOI contains confirmed habitat for these species of conservation concern (SCC) as defined in the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020).

The occurrence of SCC in the PAOI was confirmed during the surveys that were conducted between November 2020 and January 2022. The following SCC were recorded:

- Black-winged Pratincole (Regionally Near-threatened)
- Blue Crane (Regionally Near-threatened, Globally Vulnerable)
- Blue Korhaan (Globally Near-threatened)
- Greater Flamingo (Regionally Near-threatened)
- Lanner Falcon (Regionally Vulnerable)
- Secretarybird (Globally Endangered, Regionally Vulnerable)
- Pallid Harrier (Globally and Regionally Near-threatened)

Therefore, the classification of High sensitivity for avifauna in the screening tool is suggested for the proposed development area.

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Circus ranivorus
High	Aves-Hydroprogne caspia
High	Aves-Sagittarius serpentarius
Low	Subject to confirmation
Medium	Aves-Hydroprogne caspia
Medium	Aves-Circus ranivorus
Medium	Aves-Sagittarius serpentarius
Medium	Aves-Eupodotis senegalensis
Medium	Insecta-Lepidochrysops procera
Medium	Mammalia-Crocidura maquassiensis

Figure 2: The results of the DFFE screening tool for the PAOI. The High classification is linked to the potential occurrence of species of conservation concern (SCC) African Marsh Harrier (Regionally Endangered), Caspian Tern (Regionally Vulnerable), Secretarybird (Globally Endangered, Regionally Vulnerable). The medium

classification is linked to Caspian Tern, African Marsh Harrier, Secretarybird, and White-bellied Korhaan (Regionally Vulnerable).

6.1.2. Specialist Sensitivity Analysis and Verification

The entire PAOI is rated as High sensitivity based on the confirmed occurrence of several power line sensitive SCC. The birds move randomly across the whole PAOI, therefore no specific areas can be delineated as being more sensitive than others.

6.1.3. Sensitivity Analysis Summary Statement

The classification of High and Medium sensitivity in the screening tool is assessed to be accurate as far as the impact of the proposed power line and associated infrastructure on avifauna, and specifically SCC is concerned. This is based on actual conditions recorded on the ground during several site visits to the PAOI during the 12-months of pre-construction monitoring at the Vhuvhili SEF and Mukondeleli WEF project sites in 2020 - 2022 (see APPENDIX C for the Site Sensitivity Verification report).

7. Impact Assessment

7.1 General

Negative impacts on avifauna by electricity infrastructure generally take two (2) main forms, namely electrocution and collisions (Ledger & Annegarn, 1981; Ledger 1983; Ledger, 1984; Hobbs and Ledger, 1986a; Hobbs & Ledger, 1986b; Ledger, Hobbs & Smith, 1992; Verdoorn, 1996; Kruger & Van Rooyen, 1998; Van Rooyen, 1998; Kruger, 1999; Van Rooyen, 1999; Van Rooyen, 2000; Van Rooyen, 2004; Jenkins et al., 2010). Displacement due to habitat destruction and disturbance associated with the construction of the electricity infrastructure and other associated infrastructure is another impact that could potentially impact on avifauna.

7.2 Potential Impacts during the Construction Phase

The following impacts have been identified for the construction phase.

7.2.1 Impact 1: Displacement due to disturbance associated with the construction of the 132kV grid connection and associated infrastructure

The noise and movement associated with the construction activities at the proposed 132kV grid connection and associated infrastructure (roads) will be a source of disturbance which would lead to the displacement of avifauna from the area. The construction activities will inter alia constitute the following:

- Site preparations, construction of servitude access and detailed geotechnical investigations of the power line servitude and grid corridor footprint;
- Preparation of a detailed layout of the grid connection infrastructure;
- Removal of vegetation within the power line servitude and substation site for the placement of pylons and EGI, where necessary;
- Stockpiling of topsoil and vegetation will be retained for replanting, where necessary;
- Establishment of a temporary laydown area for storage of construction equipment and machinery;
- Excavations of pylon infrastructure and associated anchorage, as well as busbar foundations;
- Onsite assembly and erection of pylon tower sections and stringing of the power line cables; and
- Rehabilitation of disturbed areas and removal of equipment and machinery following completion of power line construction.

The above-listed activities impact on birds through disturbance leading to displacement; this could lead to breeding failure if the disturbance happens during a critical part of the breeding cycle. Construction activities in close proximity to breeding locations could be a source of disturbance and could lead to temporary breeding failure or even permanent abandonment of nests. A potential mitigation measure is the timeous identification of nests and the timing of the construction activities to avoid disturbance during a critical phase of the breeding cycle, although in practice that can admittedly be very challenging to implement. Terrestrial species are most likely to be affected by displacement due to disturbance in the study area, and to a lesser extent tree nesters.

The power line sensitive species which are potentially vulnerable to displacement due to disturbance are the following:

- African Fish Eagle
- African Marsh Harrier
- Black Sparrowhawk
- Black-headed Heron
- Black-winged Kite
- Blue Crane
- Blue Korhaan
- Cape Crow
- Egyptian Goose
- Goliath Heron
- Greater Kestrel
- Grey Heron
- Hadada Ibis
- Hamerkop
- Helmeted Guineafowl
- Jackal Buzzard
- Lanner Falcon
- Long-crested Eagle
- Marsh Owl
- Northern Black Korhaan
- Pied Crow
- Rock Kestrel
- Secretarybird
- Spotted Eagle-Owl
- Western Barn Owl

This impact is rated as negative, with a site-specific spatial extent and a short-term duration due to the temporary nature of the construction phase. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a substantial consequence and very likely probability, which will render the impact significance as moderate, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance of the impact is reduced to low. The recommended mitigation measures are detailed in Section 7.2.3 below.

7.2.2 Impact 2: Displacement due to habitat transformation associated with the construction of the 132kV grid connection and associated infrastructure

This impact relates to the total or partial displacement of avifauna due to habitat transformation associated with the presence of the 132kV grid connection and associated service roads. The construction activities could impact on birds breeding, foraging and roosting in or in close proximity of the proposed service roads through transformation of habitat, which could result in temporary or permanent displacement. Unfortunately, very little mitigation can be applied to reduce the significance of this impact as the total permanent transformation of the natural habitat within the footprint of the roads is unavoidable. In the case of the 132kV power line, the direct habitat transformation is limited to the pole footprints and the servitude track under the power line, with very limited vegetation clearing due to the nature of the vegetation. However, the available habitat in the study area is quite extensive from a bird impact perspective, and many of the service roads will be existing roads that will be widened. The loss of a relatively small quantity of the habitat for the power line servitude due to direct habitat transformation associated with the construction of the proposed 132kV overhead power line and associated roads is likely to be low.

The power line sensitive species which are potentially vulnerable to (partial) displacement due to habitat transformation are ground dwelling species and those depending on the natural grassland for foraging. These include the following:

- Amur Falcon
- Black-headed Heron
- Black-winged Kite
- Blue Crane
- Blue Korhaan
- Common Buzzard
- Greater Kestrel
- Helmeted Guineafowl
- Jackal Buzzard
- Lanner Falcon
- Long-crested Eagle
- Marsh Owl
- Northern Black Korhaan
- Pallid Harrier
- Red-footed Falcon
- Rock Kestrel
- Secretarybird
- Spotted Eagle-Owl
- Western Barn Owl

This impact is rated as negative, with a site-specific spatial extent and a long-term duration due to the extended timeframe of the operational phase. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a moderate consequence and an unlikely probability, which will render the impact significance as low, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance will remain at low. The recommended mitigation measures are detailed in Section 7.2.3 below.

7.2.3 Impact Summary Tables: Construction Phase

The rating of the impacts identified for the construction phase is discussed in this section. The assessment methodology is explained in APPENDIX D.

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
CONSTRUCTION PHASE						
Impact 1: Displacement due to disturbance associated with the construction of the 132kV grid connection and associated service roads	*Status*	*Negative*	*Moderate*	▪ *Activity should be restricted to a working corridor as close as possible to the footprint of the infrastructure.* ▪ *Measures to control noise and dust should be applied according to current best practice in the industry.* ▪ *Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum as far as practical.* ▪ *Access to the rest of the property must be restricted.* ▪ *The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint is concerned.*	*Low*	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Substantial*				
	Probability	*Very likely*				
	Reversibility	*High*				
	Irreplaceability	*Low*				

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
CONSTRUCTION PHASE						
Impact 2: Displacement due to habitat transformation associated with the construction of the 132kV grid connection and associated substations	*Status*	*Negative*	*Low*	▪ *Vegetation clearance should be limited to what is absolutely necessary.* ▪ *The mitigation measures proposed by the vegetation specialist must be strictly enforced.*	*Low*	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Moderate*				
	Probability	*Unlikely*				
	Reversibility	*High*				
	Irreplaceability	*Low*				

7.3 Potential Impacts during the Operational Phase

The following impacts have been identified for the operational phase.

7.3.1 Impact 2: Mortality of power line sensitive species due to collisions with the 132kV grid connection

This impact deals with potential collisions with the 132kV grid connection. Collisions are the biggest threat posed by high voltage lines to birds in southern Africa (Van Rooyen, 2004). Most heavily impacted upon are bustards, storks, cranes and various species of waterbirds, and to a lesser extent, vultures. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with transmission lines (Van Rooyen, 2004; Anderson, 2001). In a PhD study, Shaw (2013) provides a concise summary of the phenomenon of avian collisions with transmission lines:

"The collision risk posed by power lines is complex and problems are often localised. While any bird flying near a power line is at risk of collision, this risk varies greatly between different groups of birds, and depends on the interplay of a wide range of factors (APLIC, 1994). Bevanger (1994) described these factors in four main groups – biological, topographical, meteorological and technical. Birds at highest risk are those that are both susceptible to collisions and frequently exposed to power lines, with waterbirds, gamebirds, rails, cranes and bustards usually the most numerous reported victims (Bevanger, 1998; Rubolini et al., 2005; Jenkins et al., 2010).

The proliferation of man-made structures in the landscape is relatively recent, and birds are not evolved to avoid them. Body size and morphology are key predictive factors of collision risk, with large-bodied birds with high wing loadings (the ratio of body weight to wing area) most at risk (Bevanger, 1998; Janss, 2000). These birds must fly fast to remain airborne, and do not have sufficient manoeuvrability to avoid unexpected obstacles. Vision is another key biological factor, with many collision-prone birds principally using lateral vision to navigate in flight, when it is the lower-resolution, and often restricted, forward vision that is useful to detect obstacles (Martin & Shaw, 2010; Martin, 2011; Martin et al., 2012). Behaviour is important, with birds flying in flocks, at low levels and in crepuscular or nocturnal conditions at higher risk of collision (Bevanger, 1994). Experience affects risk, with migratory and nomadic species that spend much of their time in unfamiliar locations also expected to collide more often (Anderson, 1978; Anderson, 2002). Juvenile birds have often been reported as being more collision-prone than adults (e.g. Brown et al., 1987; Henderson et al., 1996).

Topography and weather conditions affect how birds use the landscape. Power lines in sensitive bird areas (e.g. those that separate feeding and roosting areas, or cross flyways) can be very dangerous (APLIC 1994, Bevanger 1994). Lines crossing the prevailing wind conditions can pose a problem for large birds that use the wind to aid take-off and landing (Bevanger 1994). Inclement weather can disorient birds and reduce their flight altitude, and strong winds can result in birds colliding with power lines that they can see but do not have enough flight control to avoid (Brown et al. 1987, APLIC 2012).

The technical aspects of power line design and siting also play a big part in collision risk. Grouping similar power lines on a common servitude, or locating them along other features such as tree lines, are both approaches thought to reduce risk (Bevanger, 1994). In general, low lines with short span lengths (i.e. the distance between two adjacent pylons) and flat conductor configurations are thought to be the least dangerous (Bevanger, 1994; Jenkins et al., 2010). On many higher voltage lines, there is a thin earth (or ground) wire above the conductors, protecting the system from lightning strikes. Earth

wires are widely accepted to cause the majority of collisions on power lines with this configuration because they are difficult to see, and birds flaring to avoid hitting the conductors often put themselves directly in the path of these wires (Brown et al., 1987; Faanes, 1987; Alonso et al., 1994a; Bevanger, 1994)."

From incidental record keeping by the Endangered Wildlife Trust (EWT), it is possible to give a measure of what species are generally susceptible to power line collisions in South Africa (Figure 33).

Power line collisions are generally accepted as a key threat to bustards (Raab et al., 2009; Raab et al., 2010; Jenkins & Smallie, 2009; Barrientos et al., 2012, Shaw, 2013). In a recent study, carcass surveys were performed under high voltage transmission lines in the Karoo for two (2) years, and low voltage distribution lines for one (1) year (Shaw, 2013). Ludwig's Bustard was the most common collision victim (69% of carcasses), with bustards generally comprising 87% of mortalities recovered. Total annual mortality was estimated at 41% of the Ludwig's Bustard population, with Kori Bustards also dying in large numbers (at least 14% of the South African population killed in the Karoo alone). Karoo Korhaan was also recorded, but to a much lesser extent than Ludwig's Bustard. The reasons for the relatively low collision risk of this species probably include their smaller size (and hence greater agility in flight) as well as their more sedentary lifestyles, as local birds are familiar with their territory and are less likely to collide with power lines (Shaw, 2013).

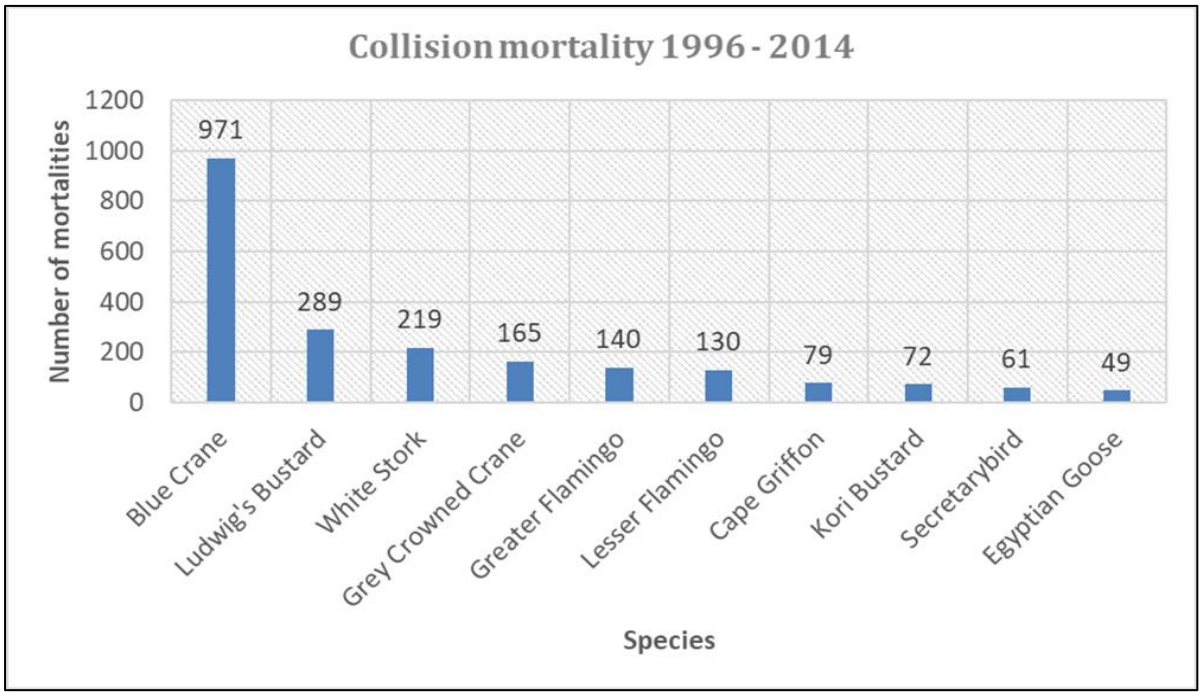


Figure 3: The top 10 collision prone bird species in South Africa, in terms of reported incidents contained in the Eskom/Endangered Wildlife Trust Strategic Partnership central incident register 1996 - 2014 (EWT unpublished data)

Several factors are thought to influence avian collisions, including the manoeuvrability of the bird, topography, weather conditions and power line configuration. An important additional factor that previously has received little attention is the visual capacity of birds; i.e. whether they are able to see obstacles such as power lines, and whether they are looking ahead to see obstacles with enough time to avoid a collision. In addition to helping explain the susceptibility of some species to collision, this factor is key to planning effective mitigation measures. Recent research provides the first evidence that birds can render themselves blind in the direction of travel during flight through voluntary head movements (Martin & Shaw, 2010). Visual fields were determined in three (3) bird species representative of families known to be subject to high levels of mortality associated with power lines i.e.

Kori Bustards, Blue Cranes and White Stork *Ciconia ciconia*. In all species the frontal visual fields showed narrow and vertically long binocular fields typical of birds that take food items directly in the bill under visual guidance. However, these species differed markedly in the vertical extent of their binocular fields and in the extent of the blind areas which project above and below the binocular fields in the forward-facing hemisphere. The importance of these blind areas is that when in flight, head movements in the vertical plane (pitching the head to look downwards) will render the bird blind in the direction of travel. Such movements may frequently occur when birds are scanning below them (for foraging or roost sites, or for conspecifics). In bustards and cranes pitch movements of only 25° and 35°, respectively, are sufficient to render the birds blind in the direction of travel; in storks, head movements of 55° are necessary. That flying birds can render themselves blind in the direction of travel has not been previously recognised and has important implications for the effective mitigation of collisions with human artefacts including wind turbines and power lines. These findings have applicability to species outside of these families especially raptors (A*ccipitridae*) which are known to have small binocular fields and large blind areas similar to those of bustards and cranes, and are also known to be vulnerable to power line collisions.

Despite doubts about the efficacy of line marking to reduce the collision risk for bustards (Jenkins et al., 2010; Martin et al., 2010), there are numerous studies which prove that marking a line with PVC spiral type Bird Flight Diverters (BFDs) generally reduce mortality rates (e.g. Bernardino et al., 2018; Sporer et al., 2013, Barrientos et al., 2011; Jenkins et al., 2010; Alonso & Alonso, 1999; Koops & De Jong, 1982), including to some extent for bustards (Barrientos et al., 2012; Hoogstad, 2015 pers.comm). Beaulaurier (1981) summarised the results of 17 studies that involved the marking of earth wires and found an average reduction in mortality of 45%. Barrientos et al. (2011) reviewed the results of 15 wire marking experiments in which transmission or distribution wires were marked to examine the effectiveness of flight diverters in reducing bird mortality. The presence of flight diverters was associated with a decrease of 55–94% in bird mortalities. Koops and De Jong (1982) found that the spacing of the BFDs was critical in reducing the mortality rates - mortality rates are reduced up to 86% with a spacing of 5m, whereas using the same devices at 10m intervals only reduces the mortality by 57%. Barrientos et al. (2012) found that larger BFDs were more effective in reducing Great Bustard collisions than smaller ones. Line markers should be as large as possible, and highly contrasting with the background. Colour is probably less important as during the day the background will be brighter than the obstacle with the reverse true at lower light levels (e.g. at twilight, or during overcast conditions). Black and white interspersed patterns are likely to maximise the probability of detection (Martin et al., 2010).

Using a controlled experiment spanning a period of nearly eight years (2008 to 2016), the Endangered Wildlife Trust (EWT) and Eskom tested the effectiveness of two (2) types of line markers in reducing power line collision mortalities of large birds on three 400kV transmission lines near Hydra substation in the Karoo. Marking was highly effective for Blue Cranes, with a 92% reduction in mortality, and large birds in general with a 56% reduction in mortality, but not for bustards, including the endangered Ludwig's Bustard. The two (2) different marking devices were approximately equally effective, namely spirals and bird flappers, they found no evidence supporting the preferential use of one (1) type of marker over the other (Shaw et al., 2017).

The power line sensitive species which are potentially vulnerable to this impact are the following:

- African Black Duck
- African Darter
- African Openbill
- African Sacred Ibis
- African Spoonbill
- Black Heron

- Black-crowned Night Heron
- Black-headed Heron
- Blue Crane
- Blue Korhaan
- Blue-billed Teal
- Cape Shoveler
- Cape Teal
- Egyptian Goose
- Fulvous Whistling Duck
- Glossy Ibis
- Goliath Heron
- Great Crested Grebe
- Great Egret
- Greater Flamingo
- Grey Heron
- Hadada Ibis
- Hamerkop
- Intermediate Egret
- Knob-billed Duck
- Little Egret
- Little Grebe
- Maccoa Duck
- Mallard
- Marsh Owl
- Northern Black Korhaan
- Purple Heron
- Red-billed Teal
- Red-knobbed Coot
- Reed Cormorant
- Secretarybird
- South African Shelduck
- Southern Pochard
- Spotted Eagle-Owl
- Spur-winged Goose
- Squacco Heron
- Western Barn Owl
- Western Cattle Egret
- White Stork
- White-backed Duck
- White-breasted Cormorant
- White-faced Whistling Duck
- Yellow-billed Duck

This impact is rated as negative, with a local spatial extent and a long-term duration due to the extended timeframe of the operational phase. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a severe consequence and likely probability, which will render the impact significance as high, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance of the impact is reduced to moderate. The recommended mitigation measures are detailed in Section 7.3.2 below.

7.3.2 Impact Summary Tables: Operational Phase

The rating of the impacts identified for the operational phase is discussed in this section.

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
OPERATIONAL PHASE						
Collision mortality of power line sensitive species due to the 132kV grid connections.	*Status*	*Negative*	*High*	*Bird Flight Diverters must be fitted to the entire grid connection according to the applicable Eskom Engineering Instruction (Eskom Unique Identifier 240 – 93563150: The utilisation of Bird Flight Diverters on Eskom Overhead Lines).*	*Moderate*	*Medium*
	Spatial Extent	*Local*				
	Duration	*Long term*				
	Consequence	*Severe*				
	Probability	*Likely*				
	Reversibility	*High*				
	Irreplaceability	*Low*				

7.4 Potential Impacts during the Decommissioning Phase

The following impacts have been identified for the decommissioning phase.

7.4.1 Impact 1: Displacement due to disturbance associated with the decommissioning of the 132kV grid connection

The noise and movement associated with the potential decommissioning activities relating to the proposed 132kV grid connection will be a source of disturbance which would lead to the displacement of avifauna from the area. This impact is rated as negative, with a site-specific spatial extent and a short-term duration. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a substantial consequence and very likely probability, which will render the impact significance as moderate, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance of the impact is reduced to low. The recommended mitigation measures are detailed in Section 7. 4.2below.

7.4.2 Impact Summary Tables: Decommissioning Phase

The rating of the impacts identified for the decommissioning phase is discussed in this section.

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
DECOMMISSIONING PHASE						
The noise and movement associated with the activities at the PAOI will be a source of	*Status*	*Negative*	*Moderate*	▪ *Activity should be restricted to a working corridor as close as possible to the*	*Low*	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Substantial*				
	Probability	*Very likely*				

disturbance which would lead to the displacement of avifauna from the area.	*Reversibility* *Irreplaceability*	*High* *Low*		*footprint of the infrastructure.* ▪ *Measures to control noise and dust should be applied according to current best practice in the industry.* ▪ *Maximum use should be made of existing access roads during the decommissioning phase and the construction of new roads should be kept to a minimum as far as practical.* ▪ *The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the activity footprint is concerned*		

7.5 Cumulative Impacts

In relation to an activity, cumulative impact means “the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may be significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities” (NEMA EIA Reg GN R982 of 2014).

The projects which are considered for the cumulative impacts are those which are located within a 30 km radius around the PAOI that have received EA, or have a BA/EIA in process as at August 2022 (see Figure 4):

- EIA: Proposed Tutuka Solar Photovoltaic (PV) Energy Facility and Its associated Infrastructure near Standerton within Lekwa, Mpumalanga Province (Approved).
- BA: Becrux Solar Photovoltaic (PV) Energy Facility, Mpumalanga Province (Approved).

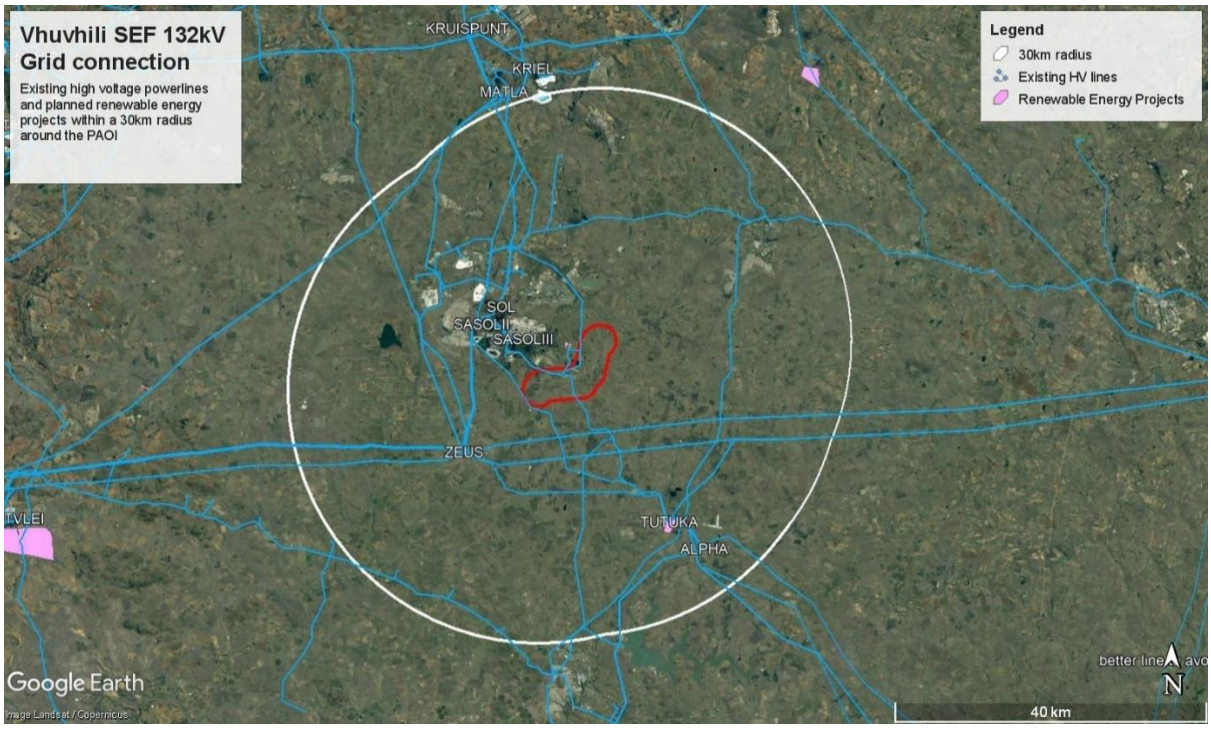


Figure 4: Authorised projects within a 30km radius around the PAOI

The cumulative impact assessed is the collective impact of the proposed 132kV grid connections of the Vhuvhili SEF, the authorised projects listed above, and the existing high voltage (HV) lines.

The existing HV lines within a 30km radius around the PAOI run into hundreds of kilometres (see Figure 4). According to documents in the public domain, the maximum length of planned and authorised grid connections in the 30km radius, including the planned Vhuvhili SEF and Mukondeleli WEF grid, equals <14km. The total length of planned HV lines associated with renewable energy projects will thus constitute a relatively insignificant proportion of the HV lines once they have been constructed. The cumulative impact of the Vhuvhili SEF grid connection, together with the other planned grid connections and substations within a 30km radius, is assessed below.

7.5.1 Impact 1: Construction Phase - Displacement due to disturbance associated with the construction of the 132kV grid connection and associated infrastructure

This impact deals with potential displacement due to disturbance associated with the construction of the 132kV grid connections and associated infrastructure at this and other similar projects in a 30 km radius. This impact is rated as negative, with a site-specific spatial extent and a short-term duration due to the temporary nature of the construction phase. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a moderate consequence and very likely probability, which will render the impact significance as low, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance of the impact is further reduced. The recommended mitigation measures are detailed in Section 7.5.5below.

7.5.2 Impact 2: Construction Phase - Displacement due to habitat transformation associated with the construction of the 132kV grid connection and associated infrastructure

This impact deals with potential displacement due to habitat transformation associated with the construction of the 132kV grid connections and associated infrastructure at this and other similar projects in a 30 km radius. The impact is rated as negative, with a site-specific spatial extent and a long-term duration due to

the extended timeframe of the operational phase. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a moderate consequence and a very likely probability, which will render the impact significance as low, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance will be further reduced. The recommended mitigation measures are detailed in Section 7.5.5below.

7.5.3 Impact 3: Operational Phase - Collisions with the 132kV grid connections

This impact deals with potential collisions with the 132kV grid connections during the operational phase with regards to this and other similar projects in the 30 km radius. This impact is rated as negative, with a regional spatial extent and a long-term duration. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a substantial consequence and likely probability, which will render the impact significance as moderate, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance of the impact is reduced to low. The recommended mitigation measures are detailed in Section 7.5.5below.

7.5.4 Impact 4: Decommissioning Phase - Displacement due to disturbance associated with the decommissioning of the 132kV grid connections and associated infrastructure

The noise and movement associated with the potential decommissioning activities (in terms of this and other similar projects in the 30 km radius) will be a source of disturbance which would lead to the displacement of avifauna from the area. This impact is rated as negative, with a site-specific spatial extent and a short term duration. The impact is rated with a high reversibility (meaning that the potential impact is highly reversible at end of the project life); and low irreplaceability (meaning there is a low irreplaceability of avifaunal species). The potential impact is allocated a moderate consequence and very likely probability, which will render the impact significance as low, without the implementation of mitigation measures. With the implementation of mitigation measures, the significance of the impact is further reduced. The recommended mitigation measures are detailed in Section 7.5.5 below.

7.5.5 Impact Summary Tables: Cumulative Impacts

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
CONSTRUCTION PHASE						
Displacement due to disturbance associated with the construction of the 132kV grids and associated infrastructure	*Status*	*Negative*	*Low*	▪ *Activity should be restricted to a working corridor as close as possible to the footprint of the infrastructure.* ▪ *Measures to control noise and dust should be applied according to current best practice in the industry.* ▪ *Maximum use should be made of existing access roads and the construction of new*	*Low*	*High*
	Spatial Extent	*Site specific*				
	Duration	*Short term*				
	Consequence	*Moderate*				
	Probability	*Very likely*				
	Reversibility	*High*				
	Irreplaceability	*Low*				

Impact	*Impact Criteria*		*Significance and Ranking (Pre-Mitigation)*	*Potential mitigation measures*	*Significance and Ranking (Post-Mitigation)*	*Confidence Level*
				roads should be kept to a minimum as far as practical. ▪ *Access to the rest of the property must be restricted.* ▪ *The recommendations of the ecological and botanical specialist studies must be strictly implemented, especially as far as limitation of the construction footprint is concerned.*		

CONSTRUCTION PHASE						
Displacement due to disturbance associated with the construction of the 132kV grids and associated infrastructure	*Status* *Spatial Extent* *Duration* *Consequence* *Probability* *Reversibility* *Irreplaceability*	*Negative* *Regional* *Long term* *Moderate* *Likely* *High* *Low*	*Low*	▪ *Vegetation clearance should be limited to what is absolutely necessary.* ▪ *The mitigation measures proposed by the vegetation specialist must be strictly enforced.*	*Low*	*High*
OPERATIONAL PHASE						
Collision mortality of power line sensitive species due to the 132kV grid connections.	*Status* *Spatial Extent* *Duration* *Consequence* *Probability* *Reversibility* *Irreplaceability*	*Negative* *Regional* *Long term* *Substantial* *Unlikely* *High* *Low*	*Moderate*	*Bird Flight Diverters must be fitted to the entire grid connection according to the applicable Eskom Engineering Instruction (Eskom Unique Identifier 240 – 93563150: The utilisation of Bird Flight Diverters on Eskom Overhead Lines).*	*Low*	*Medium*
DECOMMISSIONING PHASE						
The noise and movement associated with the activities at the study area will be a source of disturbance which would lead to the displacement of avifauna from the area	*Status* *Spatial Extent* *Duration* *Consequence* *Probability* *Reversibility* *Irreplaceability*	*Negative* *Site specific* *Short term* *Moderate* *Very likely* *High* *Low*	*Low*	▪ *Activity should be restricted to a working corridor as close as possible to the footprint of the infrastructure.* ▪ *Measures to control noise and dust should be applied according to current best practice in the industry.* ▪ *Maximum use should be made of existing access roads during the decommissioning phase and the construction of new roads should be kept to a minimum as far as practical.* ▪ *The recommendations of the ecological and botanical*	*Low*	

				specialist studies must be strictly implemented, especially as far as limitation of the activity footprint is concerned		

8. Impact Assessment Summary

Table 4 summarises the overall impact significance findings, following the implementation of the proposed mitigation measures:

Table 4: Overall Impact Significance (Post Mitigation)

Phase	**Overall Impact Significance**
Construction	Low
Operational	Moderate
Decommissioning	Low
Nature of Impact	**Overall Impact Significance**
Cumulative - Construction	Low
Cumulative - Operational	Low
Cumulative - Decommissioning	Low

9. Selecting a preferred alignment alternative

The four alternative alignments basically follow the same route for the vast majority of the way, with differences only relevant for a small section at the start and end of the power line (see Figure 1). The impacts associated with all four alternative alignments will therefore be practically similar in nature and magnitude, although Alternative 1, being the shortest route, has a marginal benefit in reducing the collision risk. Any of the alternatives will be acceptable, and the choice of a preferred alternative should therefore be decided based on technical issues, and not avifaunal related impacts.

10. Environmental Management Programme Inputs

The key mitigation and monitoring recommendations for each applicable mitigation measure identified for all phases of the project for inclusion in the EMPr or EA are listed below.

Management Plan for the Planning and Design Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
None					

Management Plan for the Construction Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
Avifauna: Displacement due to disturbance					
The noise and movement associated with the construction activities at the development footprint will be a source of disturbance which would lead to the displacement of avifauna from the area	Prevent unnecessary displacement of avifauna by ensuring that contractors are aware of the requirements of the Construction Environmental Management Programme (CEMPr.)	A site-specific CEMPr must be implemented, which gives appropriate and detailed description of how construction activities must be conducted. All contractors are to adhere to the CEMPr and should apply good environmental practice during construction. The CEMPr must specifically include the following: 1. Driving restricted to authorised roads; 2. Maximum use of existing roads, where possible; 3. Measures to control noise and dust according to latest best practice; 4. Restricted access to the rest of the property; 5. Strict application of all recommendations in the biodiversity specialist report pertaining to the limitation of the footprint.	1. Implementation of the CEMPr. Oversee activities to ensure that the CEMPr is implemented and enforced via site audits and inspections. Report and record any non-compliance. 2. Ensure that construction personnel are made aware of the impacts relating to off-road driving. 3. Construction access roads must be demarcated clearly. Undertake site inspections to verify. 4. Monitor the implementation of noise control mechanisms via site inspections and record and report non-compliance. 5. Ensure that the construction area is demarcated clearly and that construction personnel are made aware of these demarcations. Monitor via site inspections and report non-compliance.	1. Monthly 2. Monthly 3. Monthly 4. Monthly 5. Monthly	1. Contractor and ECO 2. Contractor and ECO 3. Contractor and ECO 4. Contractor and ECO 5. Contractor and ECO
Avifauna: Mortality due to collision with the 132kV OHL					
Mortality of avifauna due to collisions with the 132kV OHL.	Reduction of avian collision mortality	OHL to be marked with Eskom approved Bird Flight Diverters (BFDs).	1. Fit Eskom approved BFDs on the earthwire of the OHL.	1. Once-off 2.	1. Contractor and ECO

Management Plan for the Operational Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
Avifauna: Displacement due to habitat transformation in the substations					

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
Total or partial displacement of avifauna due to habitat transformation associated with the vegetation clearance	Prevent unnecessary displacement of avifauna by ensuring that the rehabilitation of transformed areas is implemented where possible by an appropriately qualified rehabilitation specialist.	1. Rehabilitation via site audits and site inspections to ensure compliance with the recommendations of the relevant specialist. 2. Record and report any non-compliance.	1. Appointment of rehabilitation specialist. 2. Site inspections to monitor progress of rehabilitation. 3. Adaptive management to ensure rehabilitation RP goals are met.	1. Once-off 2. Once a year 3. As and when required	1. Facility operator 2. Facility operator 3. Facility operator

Management Plan for the Decommissioning Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	*Frequency*	*Responsibility*
Avifauna: Displacement due to disturbance					
The noise and movement associated with the decommissioning activities will be a source of disturbance which would lead to the displacement of avifauna from the area	Prevent unnecessary displacement of avifauna by ensuring that contractors are aware of the requirements of the Decommissioning EMPr.	A site-specific Decommissioning EMPr (DEMPr) must be implemented, which gives appropriate and detailed description of how activities must be conducted. All contractors are to adhere to the DEMPr and should apply good environmental practice during decommissioning. The DEMPr must specifically include the following: 1. Driving restricted to authorised roads; 2. Maximum use of existing roads during the decommissioning phase and the construction of new roads should be kept to a minimum as far as practical; 3. Measures to control noise and dust according to latest best practice; 4. Strict application of all recommendations in the botanical specialist report pertaining to the limitation of the footprint.	1. Implementation of the DEMPr. Oversee activities to ensure that the DEMPr is implemented and enforced via site audits and inspections. 2. Report and record any non-compliance. 3. Ensure that decommissioning personnel are made aware of the impacts relating to off-road driving. 4. Access roads must be demarcated clearly. Undertake site inspections to verify. 5. Monitor the implementation of noise control mechanisms via site inspections and record and report non-compliance. 6. Ensure that the decommissioning area is demarcated clearly and that personnel are made aware of these demarcations. Monitor via site inspections and report non-compliance.	1. Monthly 2. Monthly 3. Monthly 4. Monthly 5. Monthly 6. Weekly	1. Contractor and ECO 2. Contractor and ECO 3. Contractor and ECO 4. Contractor and ECO 5. Contractor and ECO 6. Contractor and ECO

11. Final Specialist Statement and Authorisation Recommendation

11.1. Statement and Reasoned Opinion

The expected impacts of the proposed Vhuvhili SEF 132kV grid connection, near Secunda in the Mpumalanga Province, were rated to be negative and of Low to High significance pre-mitigation. However, with appropriate mitigation, the overall post-mitigation significance of all the identified impacts should be reduced to Low for all phases of the project, except the operational phase, which will be reduced to Moderate. It is therefore recommended that the activity is authorised, on condition that the

proposed mitigation measures as detailed in the Impact Assessment Tables (Section 7) and the Environmental Management Programme (EMPr) are strictly implemented.

11.2. EA Condition Recommendations

See sections 7, 9 and 11.1 above.

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Appendix A - Specialist Expertise

Curriculum Vitae: Chris van Rooyen

Profession/Specialisation	:	Avifaunal Specialist
Highest Qualification	:	BA LLB
Nationality	:	South African
Years of experience	:	26 years

Key Experience

Chris van Rooyen has twenty-two years' experience in the assessment of avifaunal interactions with industrial infrastructure. He was employed by the Endangered Wildlife Trust as head of the Eskom-EWT Strategic Partnership from 1996 to 2007, which has received international acclaim as a model of co-operative management between industry and natural resource conservation. He is an acknowledged global expert in this field and has consulted in South Africa, Namibia, Botswana, Lesotho, New Zealand, Texas, New Mexico and Florida. He also has extensive project management experience and he has received several management awards from Eskom for his work in the Eskom-EWT Strategic Partnership. He is the author and/or co-author of 17 conference papers, co-author of two book chapters, several research reports and the current best practice guidelines for avifaunal monitoring at wind farm sites. He has completed around 130 power line assessments; and has to date been employed as specialist avifaunal consultant on more than 50 renewable energy generation projects. He has also conducted numerous risk assessments on existing power lines infrastructure. He also works outside the electricity industry and he has done a wide range of bird impact assessment studies associated with various residential and industrial developments. He serves on the Birds and Wind Energy Specialist Group which was formed in 2011 to serve as a liaison body between the ornithological community and the wind industry.

Key Project Experience

Bird Impact Assessment Studies and avifaunal monitoring for wind-powered generation facilities:

1. Eskom Klipheuwel Experimental Wind Power Facility, Western Cape
2. Mainstream Wind Facility Jeffreys Bay, Eastern Cape (EIA and monitoring)
3. Biotherm, Swellendam, (Excelsior), Western Cape (EIA and monitoring)
4. Biotherm, Napier, (Matjieskloof), Western Cape (pre-feasibility)
5. Windcurrent SA, Jeffreys Bay, Eastern Cape (2 sites) (EIA and monitoring)
6. Caledon Wind, Caledon, Western Cape (EIA)
7. Innowind (4 sites), Western Cape (EIA)
8. Renewable Energy Systems (RES) Oyster Bay, Eastern Cape (EIA and monitoring)
9. Oelsner Group (Kerriefontein), Western Cape (EIA)
10. Oelsner Group (Langefontein), Western Cape (EIA)
11. InCa Energy, Vredendal Wind Energy Facility Western Cape (EIA)
12. Mainstream Loeriesfontein Wind Energy Facility (EIA and monitoring)
13. Mainstream Noupoort Wind Energy Facility (EIA and monitoring)
14. Biotherm Port Nolloth Wind Energy Facility (Monitoring)
15. Biotherm Laingsburg Wind Energy Facility (EIA and monitoring)
16. Langhoogte Wind Energy Facility (EIA)
17. Vleesbaai Wind Energy Facility (EIA and monitoring)
18. St. Helena Bay Wind Energy Facility (EIA and monitoring)
19. Electrawind, St Helena Bay Wind Energy Facility (EIA and monitoring)
20. Electrawind, Vredendal Wind Energy Facility (EIA)
21. SAGIT, Langhoogte and Wolseley Wind Energy facilities
22. Renosterberg Wind Energy Project – 12-month preconstruction avifaunal monitoring project
23. De Aar – North (Mulilo) Wind Energy Project – 12-month preconstruction avifaunal monitoring project
24. De Aar – South (Mulilo) Wind Energy Project – 12-month bird monitoring
25. Namies – Aggenys Wind Energy Project – 12-month bird monitoring
26. Pofadder - Wind Energy Project – 12-month bird monitoring
27. Dwarsrug Loeriesfontein - Wind Energy Project – 12-month bird monitoring
28. Waaihoek – Utrecht Wind Energy Project – 12-month bird monitoring
29. Amathole – Butterworth Utrecht Wind Energy Project – 12-month bird monitoring & EIA specialist
30. Phezukomoya and San Kraal Wind Energy Projects 12-month bird monitoring & EIA specialist study (Innowind)
31. Beaufort West Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mainstream)
32. Leeuwdraai Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mainstream)
33. Sutherland Wind Energy Facility 12-month bird monitoring (Mainstream)
34. Maralla Wind Energy Facility 12-month bird monitoring & EIA specialist study (Biotherm)

35. Esizayo Wind Energy Facility 12-month bird monitoring & EIA specialist study (Biotherm)
36. Humansdorp Wind Energy Facility 12-month bird monitoring & EIA specialist study (Cennergi)
37. Aletta Wind Energy Facility 12-month bird monitoring & EIA specialist study (Biotherm)
38. Eureka Wind Energy Facility 12-month bird monitoring & EIA specialist study (Biotherm)
39. Makambako Wind Energy Faclity (Tanzania) 12-month bird monitoring & EIA specialist study (Windlab)
40. R355 Wind Energy Facility 12-month bird monitoring (Mainstream)
41. Groenekloof Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mulilo)
42. Tsitsikamma Wind Energy Facility 24-months post-construction monitoring (Cennergi)
43. Noupoort Wind Energy Facility 24-months post-construction monitoring (Mainstream)
44. Kokerboom Wind Energy Facility 12-month bird monitoring & EIA specialist study (Business Venture Investments)
45. Kuruman Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mulilo)
46. Dassieklip Wind Energy Facility 3 years post-construction monitoring (Biotherm)
47. Loeriesfontein 2 Wind Energy Facility 2 years post-construction monitoring (Mainstream)
48. Khobab Wind Energy Facility 2 years post-construction monitoring (Mainstream)
49. Excelsior Wind Energy Facility 18 months construction phase monitoring (Biotherm)
50. Boesmansberg Wind Energy Facility 12-months pre-construction bird monitoring (juwi)
51. Mañhica Wind Energy Facility, Mozambique, 12-months pre-construction monitoring (Windlab)
52. Vhuvhili Wind Energy Facility, Beaufort West, 12-months pre-construction monitoring (ABO)
53. Pienaarspoort Wind Energy Facility, Touws River, Western Cape, 12-months pre-construction monitoring (ABO).
54. Koup 1 and 2 Wind Energy Facilities, Beaufort West, Western Cape, 12 months pre-construction monitoring (Genesis Eco-energy)
55. Duiker Wind Energy Facility, Vredendal, Western Cape 12 months pre-construction monitoring (ABO)
56. Perdekraal East Wind Energy Facility, Touws River, Western Cape, 18 months construction phase monitoring (Mainstream).
57. Swellendam Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (Veld Renewables)
58. Lombardskraal Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (Enertrag SA)
59. Mainstream Kolkies & Heuweltjies Wind Energy Facilities, Western Cape, 12-month pre-construction monitoring (Mainstream)
60. Great Karoo Wind Energy Facility, Northern Cape, 12-month pre-construction monitoring (African Green Ventures).
61. Mpumalanga & Gauteng Wind and Hybrid Energy Facilities (6x), pre-construction monitoring (Enertrag SA)
62. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (Enertrag SA)
63. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (ACED)
64. Nanibees North & South Wind Energy Facilities, Northern Cape, Screening Report (juwi)
65. Sutherland Wind Energy Facilities, Northern Cape, Screening Report (WKN Windcurrent)
66. Pofadder Wind Energy Facility, Northren Cape, Screening Report (Atlantic Energy)
67. Haga Haga Wind Energy Facility, Eastern Cape, Amendment Report (WKN Windcurrent)
68. Banken Wind Energy Facility, Northern Cape, Screening Report (Atlantic Energy)
69. Hartebeest Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (juwi). **Bird Impact**

Assessment Studies for Solar Energy Plants:

1. Concentrated Solar Power Plant, Upington, Northern Cape.
2. Globeleq De Aar and Droogfontein Solar PV Pre- and Post-construction avifaunal monitoring
3. JUWI Kronos PV project, Copperton, Northern Cape
4. Sand Draai CSP project, Groblershoop, Northern Cape
5. Biotherm Helena PV Project, Copperton, Northern Cape
6. Biotherm Letsiao CSP Project, Aggeneys, Northern Cape
7. Biotherm Enamandla PV Project, Aggeneys, Northern Cape
8. Biotherm Sendawo PV Project, Vryburg, North-West
9. Biotherm Tlisitseng PV Project, Lichtenburg, North-West
10. JUWI Hotazel Solar Park Project, Hotazel, Northern Cape
11. Namakwa Solar Project, Aggeneys, Northern Cape
12. Brypaal Solar Power Project, Kakamas, Northern Cape
13. ABO Vryburg 1,2,3 Solar PV Project, Vryburg, North-West
14. NamPower CSP Facility near Arandis, Namibia
15. Dayson Klip PV Facility near Upington, Northern Cape
16. Geelkop PV Facility near Upington, Northern Cape

17. Oya PV Facility, Ceres, Western Cape
18. Vrede and Rondawel PV Facilities, Free State
19. Kolkies & Sadawa PV Facilities, Western Cape
20. Leeuwbosch PV1 and 2 and Wildebeeskuil PV1 and 2 Facilities, North-West
21. Kenhardt PV 3,4 and 5, Northern Cape
22. Wittewal PV, Grootfontein PV and Hoekdoornen PV Facilities, Touws River, Western Cape

Bird Impact Assessment Studies for the following overhead line projects:

1. Chobe 33kV Distribution line
2. Athene - Umfolozi 400kV
3. Beta-Delphi 400kV
4. Cape Strengthening Scheme 765kV
5. Flurian-Louis-Trichardt 132kV
6. Ghanzi 132kV (Botswana)
7. Ikaros 400kV
8. Matimba-Witkop 400kV
9. Naboomspruit 132kV
10. Tabor-Flurian 132kV
11. Windhoek - Walvisbaai 220 kV (Namibia)
12. Witkop-Overyssel 132kV
13. Breyten 88kV
14. Adis-Phoebus 400kV
15. Dhuva-Janus 400kV
16. Perseus-Mercury 400kV
17. Gravelotte 132kV
18. Ikaros 400 kV
19. Khanye 132kV (Botswana)
20. Moropule – Thamaga 220 kV (Botswana)
21. Parys 132kV
22. Simplon –Everest 132kV
23. Tutuka-Alpha 400kV
24. Simplon-Der Brochen 132kV
25. Big Tree 132kV
26. Mercury-Ferrum-Garona 400kV
27. Zeus-Perseus 765kV
28. Matimba B Integration Project
29. Caprivi 350kV DC (Namibia)
30. Gerus-Mururani Gate 350kV DC (Namibia)
31. Mmamabula 220kV (Botswana)
32. Steenberg-Der Brochen 132kV
33. Venetia-Paradise T 132kV
34. Burgersfort 132kV
35. Majuba-Umfolozi 765kV
36. Delta 765kV Substation
37. Braamhoek 22kV
38. Steelpoort Merensky 400kV
39. Mmamabula Delta 400kV
40. Delta Epsilon 765kV
41. Gerus-Zambezi 350kV DC Interconnector: Review of proposed avian mitigation measures for the Okavango and Kwando River crossings
42. Giyani 22kV Distribution line
43. Liqhobong-Kao 132/11kV distribution power line, Lesotho
44. 132kV Leslie – Wildebeest distribution line
45. A proposed new 50 kV Spoornet feeder line between Sishen and Saldanha
46. Cairns 132kv substation extension and associated power lines
47. Pimlico 132kv substation extension and associated power lines
48. Gyani 22kV
49. Matafin 132kV
50. Nkomazi_Fig Tree 132kV
51. Pebble Rock 132kV
52. Reddersburg 132kV
53. Thaba Combine 132kV
54. Nkomati 132kV
55. Louis Trichardt – Musina 132kV

56. Endicot 44kV
57. Apollo Lepini 400kV
58. Tarlton-Spring Farms 132kV
59. Kuschke 132kV substation
60. Bendstore 66kV Substation and associated lines
61. Kuiseb 400kV (Namibia)
62. Gyani-Malamulele 132kV
63. Watershed 132kV
64. Bakone 132kV substation
65. Eerstegoud 132kV LILO lines
66. Kumba Iron Ore: SWEP - Relocation of Infrastructure
67. Kudu Gas Power Station: Associated power lines
68. Steenberg Booysendal 132kV
69. Toulon Pumps 33kV
70. Thabatshipi 132kV
71. Witkop-Silica 132kV
72. Bakubung 132kV
73. Nelsriver 132kV
74. Rethabiseng 132kV
75. Tilburg 132kV
76. GaKgapane 66kV
77. Knobel Gilead 132kV
78. Bochum Knobel 132kV
79. Madibeng 132kV
80. Witbank Railway Line and associated infrastructure
81. Spencer NDP phase 2 (5 lines)
82. Akanani 132kV
83. Hermes-Dominion Reefs 132kV
84. Cape Pensinsula Strengthening Project 400kV
85. Magalakwena 132kV
86. Benficosa 132kV
87. Dithabaneng 132kV
88. Taunus Diepkloof 132kV
89. Taunus Doornkop 132kV
90. Tweedracht 132kV
91. Jane Furse 132kV
92. Majeje Sub 132kV
93. Tabor Louis Trichardt 132kV
94. Riversong 88kV
95. Mamatsekele 132kV
96. Kabokweni 132kV
97. MDPP 400kV Botswana
98. Marble Hall NDP 132kV
99. Bokmakiere 132kV Substation and LILO lines
100. Styldrift 132kV
101. Taunus – Diepkloof 132kV
102. Bighorn NDP 132kV
103. Waterkloof 88kV
104. Camden – Theta 765kV
105. Dhuva – Minerva 400kV Diversion
106. Lesedi –Grootpan 132kV
107. Waterberg NDP
108. Bulgerivier – Dorset 132kV
109. Bulgerivier – Toulon 132kV
110. Nokeng-Fluorspar 132kV
111. Mantsole 132kV
112. Tshilamba 132kV
113. Thabamoopo - Tshebela – Nhlovuko 132kV
114. Arthurseat 132kV
115. Borutho 132kV MTS
116. Volspruit - Potgietersrus 132kV
117. Neotel Optic Fibre Cable Installation Project: Western Cape
118. Matla-Glockner 400kV
119. Delmas North 44kV
120. Houwhoek 11kV Refurbishment

121. Clau-Clau 132kV
122. Ngwedi-Silwerkrans 134kV
123. Nieuwehoop 400kV walk-through
124. Booysendal 132kV Switching Station
125. Tarlton 132kV
126. Medupi - Witkop 400kV walk-through
127. Germiston Industries Substation
128. Sekgame 132kV
129. Botswana – South Africa 400kV Transfrontier Interconnector
130. Syferkuil – Rampheri 132kV
131. Queens Substation and associated 132kV power lines
132. Oranjemond 400kV Transmission line
133. Aries – Helios – Juno walk-down
134. Kuruman Phase 1 and 2 Wind Energy facilities 132kV Grid connection
135. Transnet Thaba 132kV

Bird Impact Assessment Studies for the following residential and industrial developments:

1. Lizard Point Golf Estate
2. Lever Creek Estates
3. Leloko Lifestyle Estates
4. Vaaloewers Residential Development
5. Clearwater Estates Grass Owl Impact Study
6. Somerset Ext. Grass Owl Study
7. Proposed Three Diamonds Trading Mining Project (Portion 9 and 15 of the Farm Blesbokfontein)
8. N17 Section: Springs To Leandra –"Borrow Pit 12 And Access Road On (Section 9, 6 And 28 Of The Farm Winterhoek 314 Ir)
9. South African Police Services Gauteng Radio Communication System: Portion 136 Of The Farm 528 Jq, Lindley.
10. Report for the proposed upgrade and extension of the Zeekoegat Wastewater Treatment Works, Gauteng.
11. Bird Impact Assessment for Portion 265 (a portion of Portion 163) of the farm Rietfontein 189-JR, Gauteng.
12. Bird Impact Assessment Study for Portions 54 and 55 of the Farm Zwartkop 525 JQ, Gauteng.
13. Bird Impact Assessment Study Portions 8 and 36 of the Farm Nooitgedacht 534 JQ, Gauteng.
14. Shumba's Rest Bird Impact Assessment Study
15. Randfontein Golf Estate Bird Impact Assessment Study
16. Zilkaatsnek Wildlife Estate
17. Regenstein Communications Tower (Namibia)
18. Avifaunal Input into Richards Bay Comparative Risk Assessment Study
19. Maquasa West Open Cast Coal Mine
20. Glen Erasmia Residential Development, Kempton Park, Gauteng
21. Bird Impact Assessment Study, Weltevreden Mine, Mpumalanga
22. Bird Impact Assessment Study, Olifantsvlei Cemetery, Johannesburg
23. Camden Ash Disposal Facility, Mpumalanga
24. Lindley Estate, Lanseria, Gauteng
25. Proposed open cast iron ore mine on the farm Lylyveld 545, Northern Cape
26. Avifaunal monitoring for the Sishen Mine in the Northern Cape as part of the EMPr requirements
27. Steelpoort CNC Bird Impact Assessment Study

Professional affiliations

I work under the supervision of and in association with Albert Froneman (MSc Conservation Biology) (SACNASP Zoological Science Registration number 400177/09) as stipulated by the Natural Scientific Professions Act 27 of 2003.

Curriculum vitae: Albert Froneman

Profession/Specialisation	:	Avifaunal Specialist
Highest Qualification	:	MSc (Conservation Biology)
Nationality	:	South African
Years of experience	:	24 years

Key Qualifications

Albert Froneman (*Pr.Sci.Nat*) has more than 22 years' experience in the management of avifaunal interactions with industrial infrastructure. He holds a M.Sc. degree in Conservation Biology from the University of Cape Town. He managed the Airports Company South Africa (ACSA) – Endangered Wildlife Trust Strategic Partnership from 1999 to 2008 which has been internationally recognized for its achievements in addressing airport wildlife hazards in an environmentally sensitive manner at ACSA's airports across South Africa. Albert is recognized worldwide as an expert in the field of bird hazard management on airports and has worked in South Africa, Swaziland, Botswana, Namibia, Kenya, Israel, and the USA. He has served as the vice chairman of the International Bird Strike Committee and has presented various papers at international conferences and workshops. At present he is consulting to ACSA with wildlife hazard management on all their airports. He also an accomplished specialist ornithological consultant outside the aviation industry and has completed a wide range of bird impact assessment studies. He has co-authored many avifaunal specialist studies and pre-construction monitoring reports for proposed renewable energy developments across South Africa. He also has vast experience in using Geographic Information Systems to analyse and interpret avifaunal data spatially and derive meaningful conclusions. Since 2009 Albert has been a registered Professional Natural Scientist (reg. nr 400177/09) with The South African Council for Natural Scientific Professions, specialising in Zoological Science.

Key Project Experience

Renewable Energy Facilities – avifaunal monitoring projects in association with Chris van Rooyen Consulting:

1. Jeffrey's Bay Wind Farm – 12-months preconstruction avifaunal monitoring project
2. Oysterbay Wind Energy Project – 12-months preconstruction avifaunal monitoring project
3. Ubuntu Wind Energy Project near Jeffrey's Bay – 12-months preconstruction avifaunal monitoring project
4. Bana-ba-Pifu Wind Energy Project near Humansdorp – 12-months preconstruction avifaunal monitoring project
5. Excelsior Wind Energy Project near Caledon – 12-months preconstruction avifaunal monitoring project
6. Laingsburg Spitskopvlakte Wind Energy Project – 12-months preconstruction avifaunal monitoring project
7. Loeriesfontein Wind Energy Project Phase 1, 2 & 3 – 12-months preconstruction avifaunal monitoring project
8. Noupoort Wind Energy Project – 12-months preconstruction avifaunal monitoring project
9. Vleesbaai Wind Energy Project – 12-months preconstruction avifaunal monitoring project
10. Port Nolloth Wind Energy Project – 12-months preconstruction avifaunal monitoring project
11. Langhoogte Caledon Wind Energy Project – 12-months preconstruction avifaunal monitoring project
12. Lunsklip – Stilbaai Wind Energy Project – 12-months preconstruction avifaunal monitoring project
13. Indwe Wind Energy Project – 12-months preconstruction avifaunal monitoring project
14. Zeeland St Helena bay Wind Energy Project – 12-months preconstruction avifaunal monitoring project
15. Wolseley Wind Energy Project – 12-months preconstruction avifaunal monitoring project
16. Renosterberg Wind Energy Project – 12-months preconstruction avifaunal monitoring project
17. De Aar – North (Mulilo) Wind Energy Project – 12-months preconstruction avifaunal monitoring project (2014)
18. De Aar – South (Mulilo) Wind Energy Project – 12-months bird monitoring
19. Namies – Aggenys Wind Energy Project – 12-months bird monitoring
20. Pofadder - Wind Energy Project – 12-months bird monitoring
21. Dwarsrug Loeriesfontein - Wind Energy Project – 12-months bird monitoring
22. Waaihoek – Utrecht Wind Energy Project – 12-months bird monitoring
23. Amathole – Butterworth Wind Energy Project – 12-months bird monitoring & EIA specialist study
24. De Aar and Droogfontein Solar PV Pre- and Post-construction avifaunal monitoring
25. Makambako Wind Energy Faclity (Tanzania) 12-month bird monitoring & EIA specialist study (Windlab)

26. R355 Wind Energy Facility 12-month bird monitoring (Mainstream)
27. Aletta Wind Energy Facility 12-month bird monitoring (Biotherm)
28. Maralla Wind Energy Facility 12-month bird monitoring (Biotherm)
29. Groenekloof Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mulilo)
30. Tsitsikamma Wind Energy Facility 24-months post-construction monitoring (Cennergi)
31. Noupoort Wind Energy Facility 24-months post-construction monitoring (Mainstream)
32. Kokerboom Wind Energy Facility 12-month bird monitoring & EIA specialist study (Business Venture Investments)
33. KurumanWind Energy Facility 12-month bird monitoring & EIA specialist study (Mulilo)
34. Mañhica Wind Energy Facility 12-month bird monitoring & EIA specialist study (Windlab)
35. Klipheuwel-Dassiefontein Wind Energy Facility, Caledon, Western Cape – Operational phase bird monitoring – Year 5 (Klipheuwel-Dassiefontein Wind Energy Facility)
36. Vhuvhili Wind Energy Facility, Beaufort West, 12-months pre-construction monitoring (ABO)
37. Pienaarspoort Wind Energy Facility, Touws River, Western Cape, 12-months pre- construction monitoring (ABO). Koup 1 and 2 Wind Energy Facilities, Beaufort West, Western Cape, 12 months pre-construction monitoring (Genesis Eco-energy)
38. Duiker Wind Energy Facility, Vredendal, Western Cape 12 months pre-construction monitoring (ABO)
39. Perdekraal East Wind Energy Facility, Touws River, Western Cape, 18 months construction phase monitoring (Mainstream).
40. Swellendam Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (Veld Renewables)
41. Lombardskraal Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (Enertrag SA)
42. Mainstream Kolkies & Heuweltjies Wind Energy Facilities, Western Cape, 12-month pre-construction monitoring (Mainstream)
43. Great Karoo Wind Energy Facility, Northern Cape, 12-month pre-construction monitoring (African Green Ventures).
44. Mpumalanga & Gauteng Wind and Hybrid Energy Facilities (6x), pre-construction monitoring (Enertrag SA)
45. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (Enertrag SA)
46. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (ACED)
47. Nanibees North & South Wind Energy Facilities, Northern Cape, Screening Report (juwi)
48. Kappa Solar PV facility, Touwsrivier, Western Cape, pre-construction monitoring (Veroniva)
49. Sutherland Wind Energy Facilities, Northern Cape, Screening Report (WKN Windcurrent)
50. Pofadder Wind Energy Facility, Northren Cape, Screening Report (AtlanticEnergy)
51. Haga Haga Wind Energy Facility, Eastern Cape, Amendment Report (WKN Windcurrent)
52. Banken Wind Energy Facility, Northern Cape, Screening Report (Atlantic Energy)
53. Hartebeest Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (juwi).
54. Iphiko Wind Energy facilities, Laingsburg, Western Cape, screening and pre-construction monitoring (G7 Energies)
55. Kangnas Wind Energy Facility, Northern Cape, Operational Phase 2 years avifaunal monitoring (Mainstream)
56. Perdekraal East Wind Energy Facility, Northern Cape, Operational Phase 2 years avifaunal monitoring (Mainstream)
57. Aberdeen 1, 2 & Aberdeen Kudu (3&4) Wind Energy Facilities, Eastern Cape, 12- month pre-construction monitoring (Atlantic Renewable Energy Partners)
58. Loxton / Beaufort West Wind Energy Facilities, Northern Cape, 12-month pre-construction monitoring (Genesis Eco-Energy Developments)
59. Ermelo & Volksrust Wind Energy Facilities, Northern Cape, Screening Report (WKN Windcurrent)
60. Aardvark Solar PV facility, Copperton, Northern Cape, 12-month pre-construction monitoring (ABO)
61. Bestwood Solar PV facility, Kathu, Northern Cape, pre-construction monitoring (AMDA)
62. Boundary Solar PV facility, Kimberley, Northern Cape, Site sensitivity verification(Atlantic Renewable Energy Partners)
63. Excelsior Wind Energy Facility, Swellendam, Western Cape, Operational Phase 2 years avifaunal monitoring & implementation of Shut Down on Demand (SDOD) pro-active mitigation strategy (Biotherm)
64. De Aar cluster Solar PV facilities, De Aar, Western Cape, Site sensitivity verification (Atlantic Renewable Energy Partners)
65. Rinkhals Solar PV facilities, Kimberley, Northern Cape, Pre-construction monitoring (ABO)
66. Kolkies Sadawa Solar PV facilities, Touwsrivier, Western Cape, pre-construction monitoring (Mainstream)
67. Leeudoringstad Solar PV facilities, Leeudoringstad, North West, Pre-construction

monitoring (Upgrade Energy)
68. Noupoort Umsobomvu Solar PV facilities, Noupoort, Northern Cape, Pre-construction monitoring (EDF Renewables)
69. Oya Solar PV facilities, Matjiesfontein, Western Cape, pre-construction monitoring (G7 Energies)
70. Scafell Solar PV facilities, Sasolburg, Free state, pre-construction monitoring (Mainstream)
71. Vrede & Rondawel Solar PV facilities, Kroonstad, Free state, pre-construction monitoring (Mainstream)
72. Gunstfontein Wind Energy Facilities, Sutherland, Northern Cape, additional pre-construction monitoring (ACED)
73. Ezelsjacht Wind Energy Facility, De Doorns, Western Cape, pre-construction monitoring (Mainstream)
74. Klipkraal Wind Energy Facility, Fraserburg, Northern Cape, avifaunal screening (Klipkraal WEF)
75. Pofadder Wind Energy Facility, Pofadder, Northern Cape, pre-construction monitoring (Atlantic Renewable Energy Partners)

Bird Impact Assessment studies and / or GIS analysis:

1. Aviation Bird Hazard Assessment Study for the proposed Madiba Bay Leisure Park adjacent to Port Elizabeth Airport.
2. Extension of Runway and Provision of Parallel Taxiway at Sir Seretse Khama Airport, Botswana Bird / Wildlife Hazard Management Specialist Study
3. Maun Airport Improvements Bird / Wildlife Hazard Management Specialist Study
4. Bird Impact Assesment Study - Bird Helicopter Interaction – The Bitou River, Western Cape Province South Africa
5. Proposed La Mercy Airport – Bird Aircraft interaction specialists study using bird detection radar to assess swallow flocking behaviour
6. KwaZulu Natal Power Line Vulture Mitigation Project – GIS analysis
7. Perseus-Zeus Power line EIA – GIS Analysis
8. Southern Region Pro-active GIS Blue Crane Collision Project.
9. Specialist advisor ~ Implementation of a bird detection radar system and development of an airport wildlife hazard management and operational environmental management plan for the King Shaka International Airport
10. Matsapha International Airport – bird hazard assessment study with management recommendations
11. Evaluation of aviation bird strike risk at candidate solid waste disposal sites in the Ekurhuleni Metropolitan Municipality
12. Gateway Airport Authority Limited – Gateway International Airport, Polokwane: Bird hazard assessment; Compile a bird hazard management plan for the airport
13. Bird Specialist Study - Evaluation of aviation bird strike risk at the Mwakirunge Landfill site near Mombasa Kenya
14. Bird Impact Assessment Study - Proposed Weltevreden Open Cast Coal Mine Belfast, Mpumalanga
15. Avian biodiversity assessment for the Mafube Colliery Coal mine near Middelburg Mpumalanga
16. Avifaunal Specialist Study - SRVM Volspruit Mining project – Mokopane Limpopo Province
17. Avifaunal Impact Assessment Study (with specific reference to African Grass Owls and other Red List species) Stone Rivers Arch
18. Airport bird and wildlife hazard management plan and training to Swaziland Civil Aviation Authority (SWACAA) for Matsapha and Sikhupe International Airports
19. Bird Impact Assessment Study - Proposed 60 year Ash Disposal Facility near to the Kusile Power Station
20. Avifaunal pre-feasibility assessment for the proposed Montrose dam, Mpumalanga
21. Bird Impact Assessment Study – Proposed ESKOM Phantom Substation near Knysna, Western Cape
22. Habitat sensitivity map for Denham's Bustard, Blue Crane and White-bellied Korhaan in the Kouga Municipal area of the Eastern Cape Province
23. Swaziland Civil Aviation Authority – Sikhuphe International Airport – Bird hazard management assessment
24. Avifaunal monitoring – extension of Specialist Study - SRVM Volspruit Mining project – Mokopane Limpopo Province
25. Avifaunal Specialist Study – Meerkat Hydro Electric Dam – Hope Town, Northern Cape
26. The Stewards Pan Reclamation Project – Bird Impact Assessment study

27. Airports Company South Africa – Avifaunal Specialist Consultant – Airport Bird and Wildlife Hazard Mitigation
28. Strategic Environmental Assessment For Gas Pipeline Development, CSIR
29. Avifaunal Specialist Assessment - Proposed monopole telecommunications mast – Roodekrans, Roodepoort, Gauteng (Enviroworks)
30. Gromis-Nama-Aggeneis 400kv Ipp Integration: Environmental Screening - Avifaunal Specialist Desktop Study
31. Melkspruit - Rouxville 132kV Distribution Line - Avifaunal Amendment and Walk-through Report
32. Gamma - Kappa 2nd 765kV transmission line – Avifaunal impact assessment GIS analysis

Geographic Information System analysis & maps

1. ESKOM Power line Makgalakwena EIA – GIS specialist & map production
2. ESKOM Power line Benficosa EIA – GIS specialist & map production
3. ESKOM Power line Riversong EIA – GIS specialist & map production
4. ESKOM Power line Waterberg NDP EIA – GIS specialist & map production
5. ESKOM Power line Bulge Toulon EIA – GIS specialist & map production
6. ESKOM Power line Bulge DORSET EIA – GIS specialist & map production
7. ESKOM Power lines Marblehall EIA – GIS specialist & map production
8. ESKOM Power line Grootpan Lesedi EIA – GIS specialist & map production
9. ESKOM Power line Tanga EIA – GIS specialist & map production
10. ESKOM Power line Bokmakierie EIA – GIS specialist & map production
11. ESKOM Power line Rietfontein EIA – GIS specialist & map production
12. Power line Anglo Coal EIA – GIS specialist & map production
13. ESKOM Power line Camcoll Jericho EIA – GIS specialist & map production
14. Hartbeespoort Residential Development – GIS specialist & map production
15. ESKOM Power line Mantsole EIA – GIS specialist & map production
16. ESKOM Power line Nokeng Flourspar EIA – GIS specialist & map production
17. ESKOM Power line Greenview EIA – GIS specialist & map production
18. Derdepoort Residential Development – GIS specialist & map production
19. ESKOM Power line Boynton EIA – GIS specialist & map production
20. ESKOM Power line United EIA – GIS specialist & map production
21. ESKOM Power line Gutshwa & Malelane EIA – GIS specialist & map production
22. ESKOM Power line Origstad EIA – GIS specialist & map production
23. Zilkaatsnek Development Public Participation –map production
24. Belfast – Paarde Power line - GIS specialist & map production
25. Solar Park Solar Park Integration Project Bird Impact Assessment Study – avifaunal GIS analysis.
26. Kappa-Omega-Aurora 765kV Bird Impact Assessment Report – Avifaunal GIS analysis.
27. Gamma – Kappa 2nd 765kV – Bird Impact Assessment Report – Avifaunal GIS analysis.
28. ESKOM Power line Kudu-Dorstfontein Amendment EIA – GIS specialist & map production.
29. ProposedHeilbron filling station EIA – GIS specialist & map production
30. ESKOM Lebatlhane EIA – GIS specialist & map production
31. ESKOM Pienaars River CNC EIA – GIS specialist & map production
32. ESKOM Lemara Phiring Ohrigstad EIA – GIS specialist & map production
33. ESKOM Pelly-Warmbad EIA – GIS specialist & map production
34. ESKOM Rosco-Bracken EIA –GIS specialist & map production
35. ESKOM Ermelo-Uitkoms EIA – GIS specialist & map production
36. ESKOM Wisani bridge EIA – GIS specialist & map production
37. City of Tswane – New bulkfeeder pipeline projects x3Map production
38. ESKOM Lebohang Substation and 132kV Distribution Power Line Project Amendment GIS specialist & map production
39. ESKOM Geluk Rural Power line GIS & Mapping
40. Eskom Kimberley Strengthening Phase 4 Project GIS & Mapping
41. ESKOM Vhuvhili fontein - Amandla Amendment Project GIS & Mapping
42. ESKOM Lephalale CNC – GIS Specialist & Mapping
43. ESKOM Marken CNC – GIS Specialist & Mapping
44. ESKOM Lethabong substation and power lines – GIS Specialist & Mapping
45. ESKOM Magopela- Pitsong 132kV line and new substation – GIS Specialist & Mapping
46. Vlakfontein Filling Station – GIS Specialist & Mapping - EIA
47. Prieska – Hoekplaas Solar PV & BESS - GIS Specialist & Mapping – EIA
48. Mulilo Total Hydra Storage (MTHS) De Aar - GIS Specialist & Mapping – EIA
49. Merensky Uchoba Power line, Steelpoort - GIS Specialist & Mapping – EIA
50. Douglas Solar Part 2 Amendment – grid connection - GIS Specialist & Mapping – EIA

Professional affiliations

- South African Council for Natural Scientific Professions (SACNASP) registered Professional Natural Scientist (reg. nr 400177/09) – specialist field: Zoological Science. Registered since 2009.
- Southern African Wildlife Management Association - Member
- Zoological Society of South Africa - Member

Appendix B - Specialist Statement of Independence

I, Chris van Rooyen, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist:
Name of Company: Chris van Rooyen Consulting
Date: 23 September 2022

I, Albert Froneman, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist:
Name of Company: Chris van Rooyen Consulting
Date: 23 September 2022

Appendix C: Site Sensitivity Verification

Prior to commencing with the specialist assessment in accordance with Appendix 6 of the National Environmental Management Act (Act No.107 of 1998), as amended (NEMA) Environmental Impact Assessment (EIA) Regulations of 2014, as amended, a site sensitivity verification was undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tool (Screening Tool).

The details of the site sensitivity verification are noted below:

Date of Site Visit	▪ 19 – 21 November 2020 ▪ 23 – 30 July 2021 and 01 - 04 August 2019 ▪ 13 - 28 September 2021 and 01 October 2021 ▪ 15 – 22 November 2021 and 04 December 2021 ▪ 05 – 10 January 2022
Supervising Specialist Name	Albert Froneman
Professional Registration Number	400177/09
Specialist Affiliation / Company	Chris van Rooyen Consulting

1 METHODOLOGY

- The Project Area of Impact (PAOI) was defined as a 2km zone around the proposed grid connection.
- Power line sensitive species were defined as species which could potentially be impacted by power line collisions or electrocutions, based on their morphology. Larger birds, particularly raptors and vultures, are more vulnerable to electrocution as they are more likely to bridge the clearances between electrical components than smaller birds. Large terrestrial species and certain waterbirds with high wing loading are less manoeuvrable than smaller species and are therefore more likely to collide with overhead lines.
- Bird distribution data of the Southern African Bird Atlas Project 2 (SABAP 2) was obtained from the University of Cape Town, as a means to ascertain which species occurs within the broader area i.e. within a block consisting of six pentad grid cells each within which the proposed projects are situated. A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 7.6 km. From 2011 to date, a total of 82 full protocol lists (i.e. surveys lasting a minimum of two hours each) have been completed for this area. In addition, 34 ad hoc protocol lists (i.e. surveys lasting less than two hours but still yielding valuable data) have been completed. The SABAP2 data is regarded as a reliable reflection of the avifauna which occurs in the area and is supplemented with data collected at the proposed Vhuvhili SEF and Mukondeleli WEF sites during the 12 months pre-construction monitoring.
- A classification of the habitat in the development area was obtained from the Atlas of Southern African Birds 1 (SABAP 1) (Harrison et al., 1997) and the National Vegetation Map (SANBI 2018) from the South African National Biodiversity Institute (SANBI) website (Mucina & Rutherford, 2006; SANBI, 2018).
- The national threatened status of all power line sensitive species was determined with the use of the most recent edition of the Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor et al. 2015), and the latest authoritative summary of southern African bird biology (Hockey et al. 2005).
- The global threatened status of all power line sensitive species was determined by consulting the latest (2021.3) IUCN Red List of Threatened Species (http://www.iucnredlist.org/).
- The Important Bird and Biodiversity Areas of South Africa (Marnewick et al. 2015; http://www.birdlife.org.za/conservation/important-bird-areas) was consulted for information on potentially relevant Important Bird Areas (IBAs).
- Satellite imagery (Google Earth © 2022) was used in order to view the broader area on a landscape level and to help identify bird habitat on the ground.

- The Department of Forestry, Fisheries and the Environment (DFFE) National Screening Tool was used to determine the assigned avian sensitivity of the PAOI (September, 2022).
- Guidelines for the Implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for EIAs in South Africa produced by the South African National Biodiversity Institute on behalf of the Department of Environment, Forestry and Fisheries (2020) were used to assist with the interpretation of the relevant protocol.
- The results of an integrated pre-construction programme conducted over 12-months at the proposed Vhuvhili SEF and Mukondeleli WEF sites, which is also relevant to the current PAOI, from November 2020 to January 2022 were used to inform the Site Sensitivity Verification.

2 RESULTS

2.1.1 Natural environment

The PAOI is located within the Soweto Highveld Grassland (Gm8) vegetation ecotype within the Mesic Highveld Grassland Bioregion (SANBI, 2018). This vegetation type covers 14 513 km² of Mpumalanga and Gauteng (and to a very small extent also in the neighbouring Free State and North-West provinces) and occurs at an altitude ranging from 1420 m to 1760 m above sea level (Mucina et al., 2006). The PAOI does not fall within any Centre of Endemism (Van Wyk & Smith, 2001).

Soweto Highveld Grassland is a summer rainfall vegetation (662 mm per annum, mostly September to April), which experiences a cool-temperate climate (mean annual temperature 14.8°C) with thermic continentality. Temperature ranges between 28°C (January) to -0.6°C (July). Frost and frequent grass fires during winter play an important role in limiting the occurrence of trees and shrubs in the region (Mucina et al., 2006). The landscape is gently to moderately undulating on the Highveld plateau, supporting dense tufted grassland dominated by *Themeda triandra*, with a notable herbaceous forb component. In places which have not been disturbed, scattered wetlands, narrow stream alluvia, pans and occasional ridges interrupt the grassland cover.

Although the conservation status of this vegetation type was listed as “Endangered” by (Mucina & Rutherford (2006) it is listed as “Vulnerable” by the updated NEMA of 2011. Very few statutorily conserved areas occur in this vegetation type and almost half has been transformed mostly by cultivation, plantations, mining, and urbanisation.

2.1.2 Modified environment

Whilst the distribution and abundance of the bird species in the broader area are mostly associated with natural vegetation, as this comprises virtually all the habitat, it is also necessary to examine the few external modifications to the environment that have relevance for birds.

The following avifaunal-relevant anthropogenic habitat modifications were recorded within the PAOI:

- **Dams:** There are several small dams mostly associated with the Klipspruit River and its tributaries. There is one moderately large dam in the north of the PAOI.
- **Agriculture:** Agricultural activity present within the PAOI comprises cultivated commercial annuals non-pivot cropland (Thompson, 2019), predominately dedicated towards maize production.
- **Alien trees:** Alien trees are present PAOI as windbreaks either between agricultural fields or between homesteads (Thompson, 2019)

See Figures 1 – 4 for examples of the habitat features in the PAOI.

Figure 1: Natural grassland

Figure 2: A large dam

Figure 3: Alien tree

Figure 4: Agriculture

Figure 5: Wetland

3 CONCLUSION

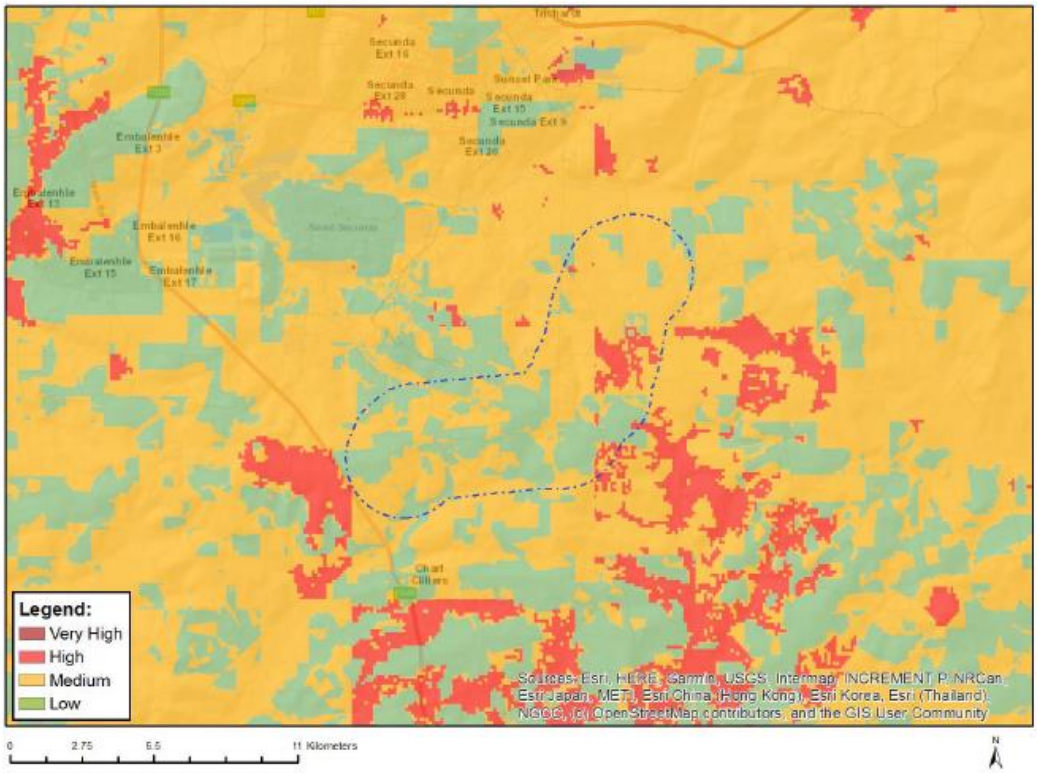
The PAOI is classified as Low (subject to confirmation), Medium and High sensitivity for terrestrial animals according to the Terrestrial Animal Species. The High classification is linked to the potential occurrence of African Marsh Harrier (Globally Least Concern, Regionally Endangered), Secretarybird (Globally Endangered, Regionally Vulnerable) and Caspian Tern (Regionally Vulnerable). The PAOI contains confirmed habitat for these species of conservation concern (SCC) as defined in the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020).

The occurrence of SCC in the PAOI was confirmed during the surveys that took place between November 2020 and January 2022. The following SCC were recorded:

- Black-winged Pratincole (Regionally Near-threatened)
- Blue Crane (Regionally Near-threatened, Globally Vulnerable)
- Blue Korhaan (Globally Near-threatened)
- Greater Flamingo (Regionally Near-threatened)
- Lanner Falcon (Regionally Vulnerable)
- Secretarybird (Globally Endangered, Regionally Vulnerable)
- Pallid Harrier (Globally and Regionally Near-threatened)

Therefore, the classification of High sensitivity for avifauna in the screening tool is suggested for the proposed development area.

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Circus ranivorus
High	Aves-Hydroprogne caspia
High	Aves-Sagittarius serpentarius
Low	Subject to confirmation
Medium	Aves-Hydroprogne caspia
Medium	Aves-Circus ranivorus
Medium	Aves-Sagittarius serpentarius
Medium	Aves-Eupodotis senegalensis
Medium	Insecta-Lepidochrysops procera
Medium	Mammalia-Crocidura maquassiensis

Figure 1: The results of the DFFE screening tool for the PAOI. The High classification is linked to the potential occurrence of species of conservation concern (SCC) African Marsh Harrier (Regionally Endangered), Caspian Tern (Regionally Vulnerable), Secretarybird (Globally Endangered, Regionally Vulnerable). The medium classification is linked to Caspian Tern, African Marsh Harrier, Secretarybird, and White-bellied Korhaan (Regionally Vulnerable).

Appendix D: Impact Assessment Methodology

The impact assessment includes:

- *the nature, significance and consequences of the impact and risk;*
- *the extent and duration of the impact and risk;*
- *the probability of the impact and risk occurring;*
- *the degree to which impacts and risks can be mitigated;*
- *the degree to which the impacts and risks can be reversed; and*
- *the degree to which the impacts and risks can cause loss of irreplaceable resources.*

As per the DEFFT Guideline 5: Assessment of Alternatives and Impacts, the following methodology is applied to the prediction and assessment of impacts and risks. Potential impacts and risks have been rated in terms of the direct, indirect and cumulative:

- *Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.*
- *Indirect impacts of an activity are indirect or induced changes that may occur as a result of the activity. These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.*
- *Cumulative impacts are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.*

The impact assessment methodology includes the following aspects:

- *Nature of impact/risk - The type of effect that a proposed activity will have on the environment.*

- *Status - Whether the impact/risk on the overall environment will be:*
    - *Positive - environment overall will benefit from the impact/risk;*
    - *Negative - environment overall will be adversely affected by the impact/risk; or*
    - *Neutral - environment overall not be affected.*

- *Spatial extent – The size of the area that will be affected by the impact/risk:*
    - *Site specific;*
    - *Local (<10 km from site);*
    - *Regional (<100 km of site);*
    - *National; or*
    - *International (e.g. Greenhouse Gas emissions or migrant birds).*

- *Duration – The timeframe during which the impact/risk will be experienced:*
    - *Very short term (instantaneous);*
    - *Short term (less than 1 year);*
    - *Medium term (1 to 10 years);*
    - *Long term (the impact will cease after the operational life of the activity (i.e. the impact or risk will occur for the project duration)); or*
    - *Permanent (mitigation will not occur in such a way or in such a time span that the impact can be considered transient (i.e. the impact will occur beyond the project decommissioning)).*

- *Consequence – The anticipated consequence of the risk/impact:*

- *Extreme (extreme alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they permanently cease);*
- *Severe (severe alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease);*
- *Substantial (substantial alteration of natural systems, patterns or processes, i.e. where environmental functions and processes are altered such that they temporarily or permanently cease);*
- *Moderate (notable alteration of natural systems, patterns or processes, i.e. where the environment continues to function but in a modified manner); or*
- *Slight (negligible alteration of natural systems, patterns or processes, i.e. where no natural systems/environmental functions, patterns, or processes are affected).*

- *Reversibility of the Impacts - the extent to which the impacts/risks are reversible assuming that the project has reached the end of its life cycle (decommissioning phase):*
  - *High reversibility of impacts (impact is highly reversible at end of project life i.e. this is the most favourable assessment for the environment);*
  - *Moderate reversibility of impacts;*
  - *Low reversibility of impacts; or*
  - *Impacts are non-reversible (impact is permanent, i.e. this is the least favourable assessment for the environment).*

- *Irreplaceability of Receiving Environment/Resource Loss caused by impacts/risks – the degree to which the impact causes irreplaceable loss of resources assuming that the project has reached the end of its life cycle (decommissioning phase):*
  - *High irreplaceability of resources (project will destroy unique resources that cannot be replaced, i.e. this is the least favourable assessment for the environment);*
  - *Moderate irreplaceability of resources;*
  - *Low irreplaceability of resources; or*
  - *Resources are replaceable (the affected resource is easy to replace/rehabilitate, i.e. this is the most favourable assessment for the environment).*

Using the criteria above, the impacts have been further assessed in terms of the following:

- *Probability – The probability of the impact/risk occurring:*
  - *Extremely unlikely (little to no chance of occurring);*
  - *Very unlikely (<30% chance of occurring);*
  - *Unlikely (30-50% chance of occurring)*
  - *Likely (51 – 90% chance of occurring); or*
  - *Very Likely (>90% chance of occurring regardless of prevention measures).*

To determine the significance of the identified impact/risk, the consequence is multiplied by probability (qualitatively as shown in Figure 1).

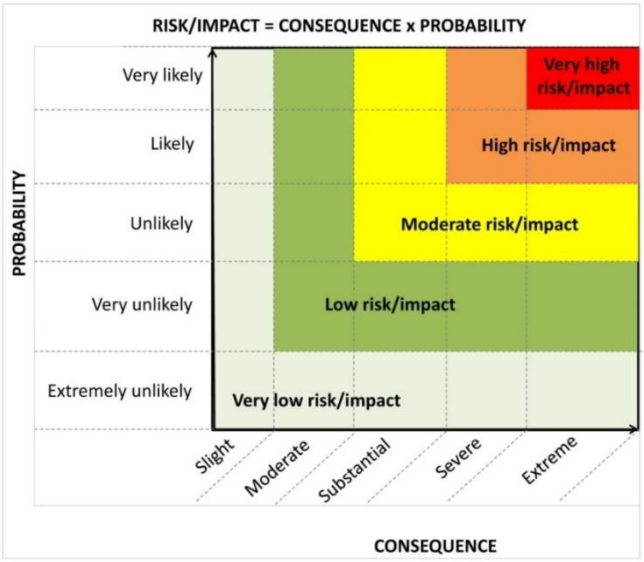


Figure 1. Guide to assessing risk/impact significance as a result of consequence and probability.

- *Significance – Will the impact cause a notable alteration of the environment?*
    - *Very low (the risk/impact may result in very minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);*
    - *Low (the risk/impact may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making);*
    - *Moderate (the risk/impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated);*
    - *High (the risk/impact will result in major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making); and*
    - *Very high (the risk/impact will result in very major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making (i.e. the project cannot be authorised unless major changes to the engineering design are carried out to reduce the significance rating)).*

With the implementation of mitigation measures, the residual impacts/risks are ranked as follows in terms of significance:

- *Very low = 5;*
- *Low = 4;*
- *Moderate = 3;*
- *High = 2; and*
- *Very high = 1.*

Confidence – The degree of confidence in predictions based on available information and specialist knowledge:

- *Low;*
- *Medium; or*
- *High.*

Appendix E: Compliance with the Appendix 6 of the 2014 EIA Regulations (as amended)

Requirements of Appendix 6 (Specialist Reports) of Government Notice R326 (Environmental Impact Assessment (EIA) Regulations of 2014, as amended)	***Section where this has been addressed in the Specialist Report***
1. (1) A specialist report prepared in terms of these Regulations must contain - *a) details of -* *i. the specialist who prepared the report; and* *ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;*	*Appendix A and B*
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	*Appendix B*
c) an indication of the scope of, and the purpose for which, the report was prepared;	*Section 1*
(cA) an indication of the quality and age of base data used for the specialist report;	*Section 2* *Appendix C*
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	*Sections 5 and 7*
d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	*Section 2* *Appendix C*
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	*Section 2*
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	*Section 2*
g) an identification of any areas to be avoided, including buffers;	*N/A*
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	*N/A*
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	*Section 2*
j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	*Sections 5 and 7*
k) any mitigation measures for inclusion in the EMPr;	*Section 7 and 10*
l) any conditions for inclusion in the environmental authorisation;	*Section 11*
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	*Section 10*
n) a reasoned opinion- *i. whether the proposed activity, activities or portions thereof should be authorised;* *(iA) regarding the acceptability of the proposed activity or activities; and* *ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;*	*Section 11*
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	*N/A*
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	*N/A*

Requirements of Appendix 6 (Specialist Reports) of Government Notice R326 (Environmental Impact Assessment (EIA) Regulations of 2014, as amended)	***Section where this has been addressed in the Specialist Report***
q) any other information requested by the competent authority.	*N/A*
(2) Where a government notice by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	*Sections 2 and 6* *Appendix C*

Appendix F: SABAP2 species list for the broader area

Group	Species name	Scientific name	SABAP 2 Full protocol reporting rate	SABAP 2 Ad hoc protocol reporting rate
	Hamerkop	*Scopus umbretta*	9.8	0.0
	Mallard	*Anas platyrhynchos*	8.5	2.9
	Quailfinch	*Ortygospiza atricollis*	32.9	8.8
	Ruff	*Calidris pugnax*	11.0	0.0
	Secretarybird	*Sagittarius serpentarius*	8.5	0.0
Avocet	Pied Avocet	*Recurvirostra avosetta*	6.1	2.9
Barbet	Black-collared Barbet	*Lybius torquatus*	12.2	0.0
Barbet	Crested Barbet	*Trachyphonus vaillantii*	18.3	5.9
Bishop	Southern Red Bishop	*Euplectes orix*	85.4	29.4
Bishop	Yellow-crowned Bishop	*Euplectes afer*	37.8	2.9
Bittern	Little Bittern	*Ixobrychus minutus*	2.4	0.0
Bulbul	Dark-capped Bulbul	*Pycnonotus tricolor*	8.5	0.0
Buzzard	Common Buzzard	*Buteo buteo*	8.5	0.0
Buzzard	Jackal Buzzard	*Buteo rufofuscus*	4.9	0.0
Canary	Black-throated Canary	*Crithagra atrogularis*	36.6	0.0
Canary	Cape Canary	*Serinus canicollis*	1.2	0.0
Canary	Yellow Canary	*Crithagra flaviventris*	11.0	0.0
Canary	Yellow-fronted Canary	*Crithagra mozambica*	2.4	0.0
Chat	Ant-eating Chat	*Myrmecocichla formicivora*	13.4	2.9
Cisticola	Cloud Cisticola	*Cisticola textrix*	19.5	0.0
Cisticola	Desert Cisticola	*Cisticola aridulus*	8.5	0.0
Cisticola	Levaillant's Cisticola	*Cisticola tinniens*	68.3	17.6
Cisticola	Pale-crowned Cisticola	*Cisticola cinnamomeus*	4.9	0.0
Cisticola	Wing-snapping Cisticola	*Cisticola ayresii*	11.0	0.0
Cisticola	Zitting Cisticola	*Cisticola juncidis*	40.2	0.0
Coot	Red-knobbed Coot	*Fulica cristata*	74.4	29.4
Cormorant	Reed Cormorant	*Microcarbo africanus*	75.6	20.6
Cormorant	White-breasted Cormorant	*Phalacrocorax lucidus*	25.6	11.8
Crane	Blue Crane	*Grus paradisea*	1.2	2.9
Crow	Cape Crow	*Corvus capensis*	13.4	5.9
Crow	Pied Crow	*Corvus albus*	31.7	2.9
Cuckoo	Diederik Cuckoo	*Chrysococcyx caprius*	18.3	5.9
Cuckoo	Red-chested Cuckoo	*Cuculus solitarius*	4.9	0.0
Darter	African Darter	*Anhinga rufa*	26.8	11.8
Dove	Cape Turtle Dove	*Streptopelia capicola*	95.1	35.3
Dove	Laughing Dove	*Spilopelia senegalensis*	86.6	11.8
Dove	Namaqua Dove	*Oena capensis*	1.2	0.0
Dove	Red-eyed Dove	*Streptopelia semitorquata*	74.4	17.6

Group	Species name	Scientific name	SABAP 2 Full protocol reporting rate	SABAP 2 Ad hoc protocol reporting rate
Dove	Rock Dove	*Columba livia*	34.1	14.7
Duck	African Black Duck	*Anas sparsa*	8.5	0.0
Duck	Fulvous Whistling Duck	*Dendrocygna bicolor*	2.4	0.0
Duck	Knob-billed Duck	*Sarkidiornis melanotos*	1.2	0.0
Duck	Maccoa Duck	*Oxyura maccoa*	3.7	0.0
Duck	White-backed Duck	*Thalassornis leuconotus*	3.7	0.0
Duck	White-faced Whistling Duck	*Dendrocygna viduata*	14.6	0.0
Duck	Yellow-billed Duck	*Anas undulata*	70.7	26.5
Eagle	African Fish Eagle	*Haliaeetus vocifer*	1.2	0.0
Eagle	Long-crested Eagle	*Lophaetus occipitalis*	3.7	0.0
Eagle-Owl	Spotted Eagle-Owl	*Bubo africanus*	6.1	0.0
Egret	Great Egret	*Ardea alba*	6.1	2.9
Egret	Intermediate Egret	*Ardea intermedia*	23.2	2.9
Egret	Little Egret	*Egretta garzetta*	23.2	14.7
Egret	Western Cattle Egret	*Bubulcus ibis*	70.7	23.5
Falcon	Amur Falcon	*Falco amurensis*	34.1	2.9
Falcon	Lanner Falcon	*Falco biarmicus*	4.9	0.0
Falcon	Red-footed Falcon	*Falco vespertinus*	1.2	0.0
Finch	Cuckoo Finch	*Anomalospiza imberbis*	1.2	0.0
Finch	Red-headed Finch	*Amadina erythrocephala*	7.3	0.0
Fiscal	Southern Fiscal	*Lanius collaris*	87.8	20.6
Flamingo	Greater Flamingo	*Phoenicopterus roseus*	4.9	5.9
Flycatcher	Fiscal Flycatcher	*Melaenornis silens*	1.2	0.0
Flycatcher	Spotted Flycatcher	*Muscicapa striata*	3.7	0.0
Francolin	Grey-winged Francolin	*Scleroptila afra*	1.2	0.0
Francolin	Orange River Francolin	*Scleroptila gutturalis*	19.5	5.9
Francolin	Red-winged Francolin	*Scleroptila levaillantii*	1.2	0.0
Goose	Domestic Goose	*Anser anser domesticus*	2.4	0.0
Goose	Egyptian Goose	*Alopochen aegyptiaca*	73.2	38.2
Goose	Spur-winged Goose	*Plectropterus gambensis*	40.2	8.8
Grebe	Great Crested Grebe	*Podiceps cristatus*	2.4	0.0
Grebe	Little Grebe	*Tachybaptus ruficollis*	64.6	17.6
Greenshank	Common Greenshank	*Tringa nebularia*	18.3	0.0
Guineafowl	Helmeted Guineafowl	*Numida meleagris*	69.5	20.6
Gull	Grey-headed Gull	*Chroicocephalus cirrocephalus*	37.8	17.6
Harrier	African Marsh Harrier	*Circus ranivorus*	1.2	0.0
Harrier	Pallid Harrier	*Circus macrourus*	1.2	0.0
Heron	Black Heron	*Egretta ardesiaca*	3.7	2.9
Heron	Black-crowned Night Heron	*Nycticorax nycticorax*	1.2	0.0

Group	Species name	Scientific name	SABAP 2 Full protocol reporting rate	SABAP 2 Ad hoc protocol reporting rate
Heron	Black-headed Heron	*Ardea melanocephala*	81.7	23.5
Heron	Goliath Heron	*Ardea goliath*	6.1	2.9
Heron	Grey Heron	*Ardea cinerea*	34.1	14.7
Heron	Purple Heron	*Ardea purpurea*	11.0	0.0
Heron	Squacco Heron	*Ardeola ralloides*	7.3	0.0
Hoopoe	African Hoopoe	*Upupa africana*	4.9	2.9
Ibis	African Sacred Ibis	*Threskiornis aethiopicus*	63.4	23.5
Ibis	Glossy Ibis	*Plegadis falcinellus*	36.6	5.9
Ibis	Hadada Ibis	*Bostrychia hagedash*	79.3	35.3
Kestrel	Greater Kestrel	*Falco rupicoloides*	6.1	2.9
Kestrel	Rock Kestrel	*Falco rupicolus*	2.4	2.9
Kingfisher	Giant Kingfisher	*Megaceryle maxima*	2.4	0.0
Kingfisher	Malachite Kingfisher	*Corythornis cristatus*	9.8	0.0
Kingfisher	Pied Kingfisher	*Ceryle rudis*	8.5	5.9
Kite	Black-winged Kite	*Elanus caeruleus*	70.7	23.5
Korhaan	Blue Korhaan	*Eupodotis caerulescens*	17.1	2.9
Lapwing	African Wattled Lapwing	*Vanellus senegallus*	13.4	0.0
Lapwing	Blacksmith Lapwing	*Vanellus armatus*	95.1	35.3
Lapwing	Crowned Lapwing	*Vanellus coronatus*	63.4	20.6
Lark	Pink-billed Lark	*Spizocorys conirostris*	17.1	2.9
Lark	Red-capped Lark	*Calandrella cinerea*	43.9	11.8
Lark	Spike-heeled Lark	*Chersomanes albofasciata*	22.0	0.0
Longclaw	Cape Longclaw	*Macronyx capensis*	70.7	17.6
Martin	Banded Martin	*Riparia cincta*	1.2	2.9
Martin	Brown-throated Martin	*Riparia paludicola*	36.6	11.8
Martin	Rock Martin	*Ptyonoprogne fuligula*	7.3	0.0
Moorhen	Common Moorhen	*Gallinula chloropus*	36.6	11.8
Mousebird	Red-faced Mousebird	*Urocolius indicus*	8.5	0.0
Mousebird	Speckled Mousebird	*Colius striatus*	23.2	5.9
Myna	Common Myna	*Acridotheres tristis*	61.0	23.5
Openbill	African Openbill	*Anastomus lamelligerus*	1.2	0.0
Ostrich	Common Ostrich	*Struthio camelus*	37.8	14.7
Owl	Marsh Owl	*Asio capensis*	24.4	2.9
Owl	Western Barn Owl	*Tyto alba*	0.0	2.9
Painted-snipe	Greater Painted-snipe	*Rostratula benghalensis*	1.2	0.0
Pigeon	Speckled Pigeon	*Columba guinea*	78.0	35.3
Pipit	African Pipit	*Anthus cinnamomeus*	65.9	20.6
Pipit	Plain-backed Pipit	*Anthus leucophrys*	1.2	0.0
Plover	Kittlitz's Plover	*Charadrius pecuarius*	17.1	0.0

Group	Species name	Scientific name	SABAP 2 Full protocol reporting rate	SABAP 2 Ad hoc protocol reporting rate
Plover	Three-banded Plover	*Charadrius tricollaris*	50.0	11.8
Pochard	Southern Pochard	*Netta erythrophthalma*	12.2	0.0
Prinia	Black-chested Prinia	*Prinia flavicans*	7.3	2.9
Prinia	Tawny-flanked Prinia	*Prinia subflava*	3.7	0.0
Quail	Common Quail	*Coturnix coturnix*	15.9	0.0
Quelea	Red-billed Quelea	*Quelea quelea*	39.0	8.8
Robin-Chat	Cape Robin-Chat	*Cossypha caffra*	7.3	0.0
Roller	European Roller	*Coracias garrulus*	2.4	0.0
Sandpiper	Common Sandpiper	*Actitis hypoleucos*	8.5	0.0
Sandpiper	Curlew Sandpiper	*Calidris ferruginea*	3.7	0.0
Sandpiper	Marsh Sandpiper	*Tringa stagnatilis*	4.9	0.0
Sandpiper	Wood Sandpiper	*Tringa glareola*	13.4	2.9
Shelduck	South African Shelduck	*Tadorna cana*	8.5	2.9
Shoveler	Cape Shoveler	*Spatula smithii*	29.3	11.8
Shrike	Lesser Grey Shrike	*Lanius minor*	1.2	0.0
Shrike	Red-backed Shrike	*Lanius collurio*	3.7	0.0
Snipe	African Snipe	*Gallinago nigripennis*	9.8	2.9
Sparrow	Cape Sparrow	*Passer melanurus*	91.5	26.5
Sparrow	House Sparrow	*Passer domesticus*	39.0	5.9
Sparrow	Southern Grey-headed Sparrow	*Passer diffusus*	23.2	0.0
Sparrow-Weaver	White-browed Sparrow-Weaver	*Plocepasser mahali*	2.4	0.0
Spoonbill	African Spoonbill	*Platalea alba*	22.0	5.9
Spurfowl	Swainson's Spurfowl	*Pternistis swainsonii*	64.6	8.8
Starling	Cape Starling	*Lamprotornis nitens*	11.0	2.9
Starling	Pied Starling	*Lamprotornis bicolor*	2.4	2.9
Starling	Wattled Starling	*Creatophora cinerea*	1.2	5.9
Stilt	Black-winged Stilt	*Himantopus himantopus*	19.5	5.9
Stint	Little Stint	*Calidris minuta*	13.4	0.0
Stonechat	African Stonechat	*Saxicola torquatus*	84.1	26.5
Stork	White Stork	*Ciconia ciconia*	3.7	0.0
Swallow	Barn Swallow	*Hirundo rustica*	46.3	2.9
Swallow	Greater Striped Swallow	*Cecropis cucullata*	47.6	5.9
Swallow	South African Cliff Swallow	*Petrochelidon spilodera*	29.3	2.9
Swallow	White-throated Swallow	*Hirundo albigularis*	45.1	14.7
Swamphen	African Swamphen	*Porphyrio madagascariensis*	6.1	0.0
Swift	African Palm Swift	*Cypsiurus parvus*	24.4	14.7
Swift	Little Swift	*Apus affinis*	36.6	2.9
Swift	White-rumped Swift	*Apus caffer*	41.5	0.0
Teal	Blue-billed Teal	*Spatula hottentota*	1.2	0.0

Group	Species name	Scientific name	SABAP 2 Full protocol reporting rate	SABAP 2 Ad hoc protocol reporting rate
Teal	Cape Teal	*Anas capensis*	2.4	0.0
Teal	Red-billed Teal	*Anas erythrorhyncha*	35.4	2.9
Tern	Caspian Tern	*Hydroprogne caspia*	1.2	5.9
Tern	Whiskered Tern	*Chlidonias hybrida*	20.7	2.9
Tern	White-winged Tern	*Chlidonias leucopterus*	2.4	2.9
Thick-knee	Spotted Thick-knee	*Burhinus capensis*	39.0	2.9
Thrush	Groundscraper Thrush	*Turdus litsitsirupa*	0.0	2.9
Thrush	Karoo Thrush	*Turdus smithi*	19.5	8.8
Thrush	Sentinel Rock Thrush	*Monticola explorator*	1.2	0.0
Wagtail	Cape Wagtail	*Motacilla capensis*	64.6	20.6
Warbler	African Reed Warbler	*Acrocephalus baeticatus*	8.5	0.0
Warbler	Great Reed Warbler	*Acrocephalus arundinaceus*	1.2	0.0
Warbler	Lesser Swamp Warbler	*Acrocephalus gracilirostris*	23.2	2.9
Warbler	Little Rush Warbler	*Bradypterus baboecala*	1.2	0.0
Warbler	Marsh Warbler	*Acrocephalus palustris*	1.2	0.0
Warbler	Sedge Warbler	*Acrocephalus schoenobaenus*	1.2	0.0
Warbler	Willow Warbler	*Phylloscopus trochilus*	4.9	0.0
Waxbill	Common Waxbill	*Estrilda astrild*	36.6	11.8
Waxbill	Orange-breasted Waxbill	*Amandava subflava*	3.7	0.0
Weaver	Cape Weaver	*Ploceus capensis*	2.4	0.0
Weaver	Southern Masked Weaver	*Ploceus velatus*	92.7	17.6
Weaver	Village Weaver	*Ploceus cucullatus*	1.2	2.9
Wheatear	Capped Wheatear	*Oenanthe pileata*	28.0	11.8
Wheatear	Mountain Wheatear	*Myrmecocichla monticola*	6.1	0.0
White-eye	Cape White-eye	*Zosterops virens*	9.8	2.9
Whydah	Pin-tailed Whydah	*Vidua macroura*	57.3	8.8
Widowbird	Fan-tailed Widowbird	*Euplectes axillaris*	41.5	2.9
Widowbird	Long-tailed Widowbird	*Euplectes progne*	84.1	26.5
Widowbird	White-winged Widowbird	*Euplectes albonotatus*	19.5	0.0
Wood Hoopoe	Green Wood Hoopoe	*Phoeniculus purpureus*	7.3	0.0
Wryneck	Red-throated Wryneck	*Jynx ruficollis*	2.4	0.0