AVIFAUNAL COMPLIANCE STATEMENT

132kV Grid Connection for Vlakfontein Solar PV Facility near Parys, Free State

June 2021

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Executive Summary

SLR Consulting was appointed by Mainstream Renewable Power Developments (Pty) Ltd to manage the Environmental Impact Assessment (EIA) process for the proposed Scafell Photovoltaic (PV) Solar Energy Cluster. The project sites are located 19 km west of the town Sasolburg, in Ward 7 of the Ngwathe Local Municipality of the Free State Province. Access to the project sites is obtained via an unnamed tarred road to the north of the project site and routes above the N1 national road for 4 km in a westerly direction. This road connects to the Boundary Road at the Vaal Eden intersection. The Boundary Road can be reached via the R59 (located 6 km south of the project site) of the N1. The cluster will consist of the following projects:

- Damlaagte Solar PV Facility
- Vlakfontein Solar PV Facility
- Scafell Solar PV Facility
- Ilikwa Solar PV Facility

Each of the solar PV facilities will be associated with a separate grid connection, comprising a 33 / 132 kV substation and an overhead power line of up to 132 kV to facilitate a grid connection between each solar PV facility and an Eskom Substation. For the Scafell Cluster Project, the solar PV facilities will be connected to the existing Scafell Main Transmission Substation (MTS), located 2 km south-east of the project site. The project site is located within the Central Strategic Transmission Corridor – a node for the development and expansion of large-scale electricity / grid connection infrastructure, i.e. power lines and substations, etc. Existing grid connection infrastructure within the vicinity of the project site include the following:

- Scafell Main Transmission Substation;
- Mercury – Zeus 765 kV Power Line;
- Olympus – Scafell 1 275 kV Power Line,
- Scafell – Snowdon 1 275 kV Power Line; and
- Makalu – Scafell 1 275 kV Power Line.

All of the above-mentioned power lines connect to the Scafell MTS. The grid connection infrastructure associated with the proposed Vlakfontein Solar PV Facility would either be a direct connection or loop in / loop out connection to the Scafell MTS. A Basic Assessment (BA) process is being undertaken for this proposed grid connection infrastructure. Chris van Rooyen Consulting was appointed by SLR Consulting to compile a Compliance Statement for each PV grid connection as part of the Basic Assessment process. This statement is specifically for the **Vlakfontein Solar PV Facility Grid Connection**.

AVIFAUNA

A total of 194 species could potentially occur within the pentad where the project is located (see Appendix C). Of these, 38 are classified as priority species. Of the 38 priority species, 24 have a medium to high probability of occurring in the development site. Of the 24 priority species with a medium to high probability of occurrence, 16 were recorded during site surveys. **No species of conservation concern (SCC) were recorded by SABAP2 in this pentad or during site surveys**.

POTENTIAL IMPACTS

The potential impacts identified in the course of the study are:

Construction Phase

- Displacement due to disturbance associated with the construction of the grid connection.

Operational Phase

- Collisions with the 132kV OHL.

Decommissioning Phase

- Displacement due to disturbance associated with the dismantling of the grid.

Environmental parameter	Issues	Significance rating prior to mitigation	Significance rating post mitigation
Avifauna	*Displacement of priority species due to disturbance during the construction of the OHL*	Low	Low
	Mortality of priority species due to collisions with the OHL	High	Medium
	Displacement of priority species due to disturbance during the dismantling of the OHL	Low	Low

ENVIRONMENTAL SENSITIVITIES

The study area and immediate environment is classified as **Low to Medium** sensitivity for terrestrial animals according to the Terrestrial Animal Species Theme (see Figure 11). The medium sensitivity classification is not linked to avifauna. The development site contains no confirmed habitat for 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, namely listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable. The absence of SCC was confirmed during the site surveys undertaken from 18 – 23 January 2021. Based on these criteria, the study area is correctly classified as **Low** sensitivity for avifauna. See Appendix B for the site sensitivity verification report.

Specialist Sensitivity Analysis and Verification

The following avifaunal sensitivities were identified in the study area:

- Wetlands: The study area contains several drainage lines with associated wetlands. Wetlands are important refuges for a number of priority species, including the Marsh Owl that often breeds in the tall rank grassland around wetlands. The proposed grid connection poses a potential collision risk to birds commuting between wetlands in the study area.

MANAGEMENT ACTIONS

The following management actions have been proposed in this assessment:

<u>Construction phase</u>

- 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 priority species.
- Measures to control noise and dust should be applied according to current best practice in the industry.
- Maximum used should be made of existing access roads and the construction of new roads should be kept to a minimum.

<u>Operational phase</u>

- The avifaunal specialist must conduct a walk-through prior to implementation to demarcate sections of powerline that need to be marked with Eskom approved bird flight diverters. The bird flight diverters should be installed on the full span length on the earthwire (according to Eskom guidelines - five metres apart). Light and dark colour

devices must be alternated to provide contrast against both dark and light backgrounds respectively. These devices must be installed as soon as the conductors are strung.

De-commissioning phase

- Decommissioning activity should be restricted to the immediate footprint of the infrastructure as far as possible.
- Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species.
- Measures to control noise and dust should be applied according to current best practice in the industry. Maximum used should be made of existing access roads and the construction of new roads should be kept to a minimum.

ASSESSMENT OF ALTERNATIVES

From an avifaunal perspective, no preferred powerline alternative was determined for the grid connection, as both were considered acceptable and optimal as their impacts were determined identical in terms of significance and nature.

STATEMENT AND REASONED OPINION

The study area is classified as Low to Medium sensitivity for terrestrial animals according to the Terrestrial Animal Species Theme. The medium sensitivity classification is not linked to avifauna. The development site contains no confirmed habitat for 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, namely listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable. The absence of SCC was confirmed during the site surveys undertaken from 18 – 23 January 2021. Based on these criteria, the study area is correctly classified as Low sensitivity for avifauna. **No fatal flaws were discovered during the investigations.** It is therefore recommended that the activity is authorised, on condition that the proposed mitigation measures as detailed in the Impact Tables (Section 9 of the report) and the EMPr (Appendix D) are strictly implemented.

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List of Abbreviations

BA	Basic Assessment
BGIS	Biodiversity Geographic Information System
BLSA	BirdLife South Africa
DFFE	Department of Forestry, Fisheries and the Environment.
EIA	Environmental Impact Assessment
EGI	Electricity Grid Infrastructure
EMPr	Environmental Management Programme
IBA	Important Bird Area
IKA	Index of Kilometric Abundance

IUCN	International Union for Conservation of Nature
NEMA	National Environmental Management Act (Act 107 of 1998, as amended)
NPAES	National Protected Areas Expansion Strategy
PV	Photovoltaic
REDZs	Renewable Energy Development Zones
SABAP 1	South African Bird Atlas 1
SABAP 2	South African Bird Atlas 2
SACNASP	South African Council for Natural and Scientific Professions
SANBI	South African Biodiversity Institute
SAPAD	South Africa Protected Areas Database

Glossary

Definitions	
Study area	A 2km area around the proposed grid corridors, which is regarded as the impact zone of the proposed grid.
Broader area	A consolidated data set for the 2645_2735 pentad where the study area is located.
Priority species	Priority species were defined as species which could potentially be impacted by power line collisions or electrocutions, based on specific morphological and/or behavioural characteristics[1]. Priority species were further subdivided into raptors, waterbirds, terrestrial birds and corvids.

[1] Other species were also considered in the case of potential displacement due to disturbance associated with the construction of the grid.

1. Introduction

SLR Consulting was appointed by Mainstream Renewable Power Developments (Pty) Ltd to manage the Environmental Impact Assessment (EIA) process for the proposed Scafell Photovoltaic (PV) Solar Energy Cluster. The project sites are located 19 km west of the town Sasolburg, in Ward 7 of the Ngwathe Local Municipality of the Free State Province. Access to the project sites is obtained via an unnamed tarred road to the north of the project site and routes above the N1 national road for 4 km in a westerly direction. This road connects to the Boundary Road at the Vaal Eden intersection. The Boundary Road can be reached via the R59 (located 6 km south of the project site) of the N1. The cluster will consist of the following projects:

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Each of the solar PV facilities will be associated with a separate grid connection, comprising a 33 / 132 kV substation and an overhead power line of up to 132 kV to facilitate a grid connection between each solar PV facility and an Eskom Substation. For the Scafell Cluster Project, the solar PV facilities will be connected to the existing Scafell Main Transmission Substation (MTS), located 2 km south-east of the project site. The project site is located within the Central Strategic Transmission Corridor – a node for the development and expansion of large-scale electricity / grid connection infrastructure, i.e. power lines and substations, etc. Existing grid connection infrastructure within the vicinity of the project site include the following:

- Scafell Main Transmission Substation;
- Mercury – Zeus 765 kV Power Line;
- Olympus – Vlakfontein 1 275 kV Power Line,
- Scafell – Snowdon 1 275 kV Power Line; and
- Makalu – Vlakfontein 1 275 kV Power Line.

All of the above-mentioned power lines connect to the Scafell MTS. The grid connection infrastructure associated with the proposed Vlakfontein Solar PV Facility would either be a direct connection or loop in / loop out connection to the Scafell MTS. A Basic Assessment (BA) process is being undertaken for this proposed grid connection infrastructure.

See Figure 1 for a map of the proposed Scafell PV Cluster and grid connections.

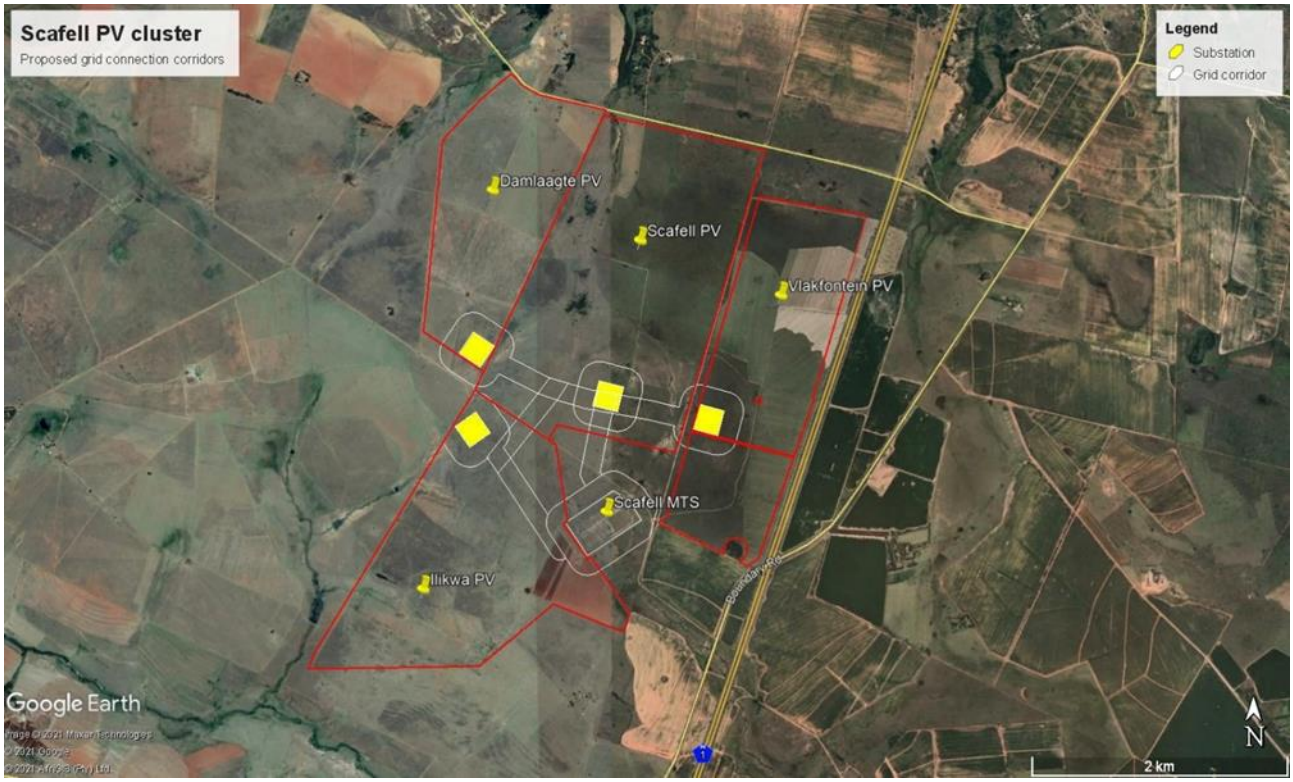

Figure 1: Map of the proposed the proposed Scafell PV Cluster and grid connections.

Chris van Rooyen Consulting was appointed by SLR Consulting to compile a Compliance Statement for each PV grid connection as part of the Basic Assessment process. This statement is specifically for the Vlakfontein Solar PV Facility Grid Connection.

See below the technical description of the project.

Component	Vlakfontein Solar PV Facility Grid Connection	
Property details:	Vlakfontein 161 Portion 6 Willow Grange 246 Portion 3 Proceederfontein 100 Portion 5 Scafell 448 Remaining Extent	
Grid Connection Corridor Length & Width:	**Alternative 1:** 150 m wide and up to 3.52 km long **Alternative 2:** 150 m wide and up to 4.67 km long	
Servitude width:	Up to 31 m	
Grid connection corridor coordinates:	Start	26°48'19.03"S 27°38'45.78"E
	End	26°48'41.90"S 27°38'18.46"E
Substation coordinates:	26°48'19.03"S 27°38'45.78"E	
Power Line capacity:	Up to 132 kV	
Substation capacity:	Up to 33 / 132 kV	
Substation footprint:	Up to 2.5 ha	
Power Line structures:	Monopole or Lattice power line structures	
Power Line pylon height:	Up to 40 m	
Access to power line servitude:	A 12 m wide and 2 km long jeep track will be required and constructed during the construction phase of the proposed project. Existing roads and jeep	

	tracks within existing servitudes in the study area will be used as far as possible to gain access to the grid connection corridor during the construction phase, and the servitude during the operation phase of the proposed project.

1.1 Project Alternatives

Location alternatives are being considered by Mainstream for the placement of the grid connection infrastructure. Thus, two 150 m wide (extending up to 500 m around the footprint of the switching station) and up to 5 km long grid connection corridors are being assessed for the proposed project and are described in the following sections:

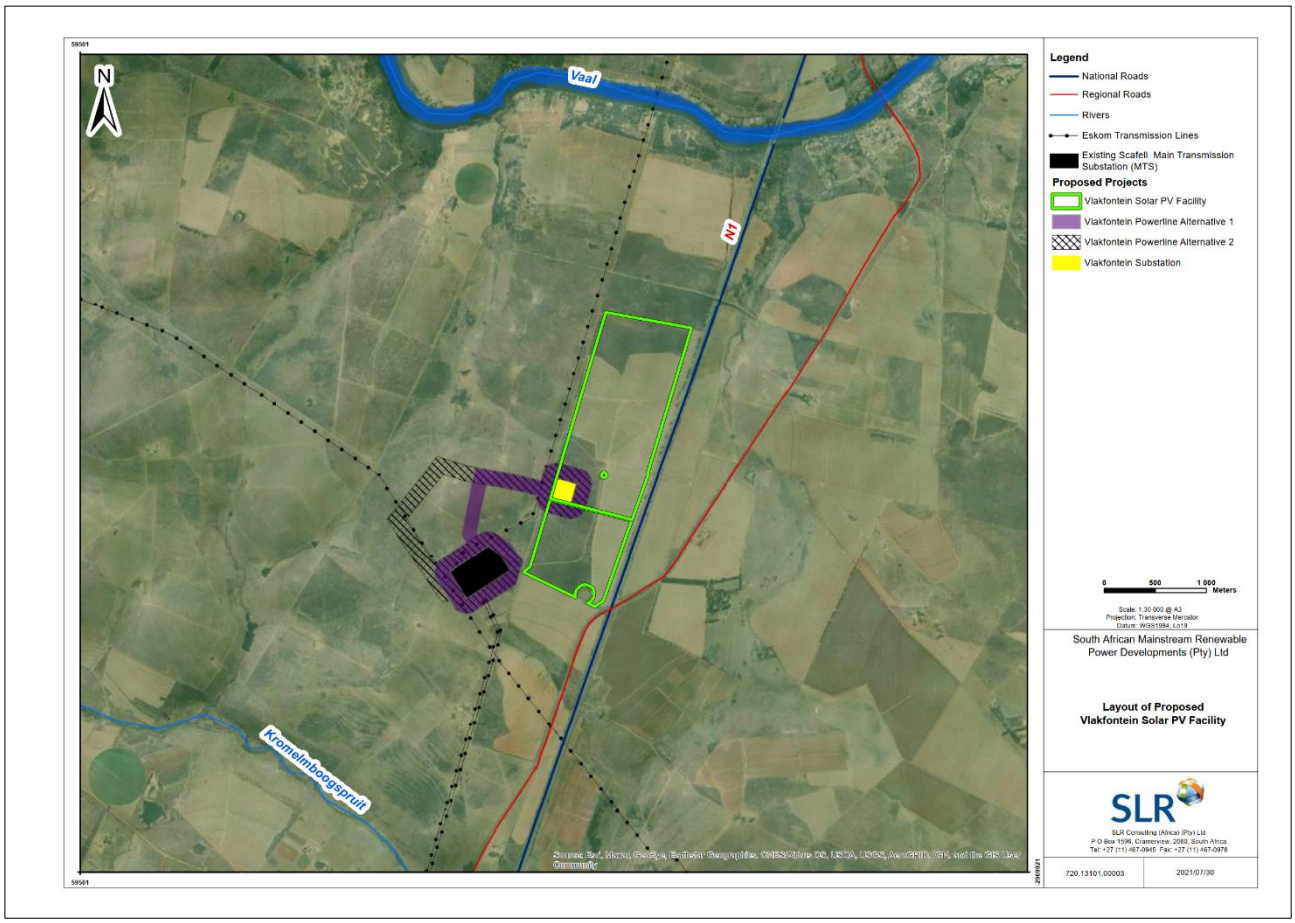

Figure 2: Locality map illustrating the location of the grid connection corridor alternatives for the Vlakfontein Solar PV Facility

- **Grid Connection Corridor Alternative 1**
  This alternative is 150 m wide (and extends up to 500 m around the footprint of the Switching Station) and up to 3.52 km in length. This alternative corridor starts at the footprint of the Switching Station for the Vlakfontein Solar PV Facility and intersects the existing Olympus – Scafell 1 275 kV transmission line at 130 m from the footprint of the proposed Switching Station. From this intersection, the corridor continues to extend towards the west for at least 600 m before reaching the footprint of the proposed Switching Station footprint for the Scafell Solar PV Facility where it subsequently makes a 90° turn towards the south-east (i.e., towards the footprint of the Scafell MTS). Prior to reaching the footprint of the Scafell MTS, this corridor again intersects the existing Olympus – Scafell 1 275 kV transmission line. From the intersection, the corridors continues to form a 150 m wide loop around the footprint of the substation. Within the loop, the corridor intersects the existing Snowdown 1 275 kV, Makalu – Scafell 1 275 kV and Mercury – Zeus 1 765 kV transmission lines in the south section of the substation. The corridor completes the loop by routing parallel to the Mercury – Zeus 1 765 kV transmission line for approximately 400 m. This corridor traverse the properties, Portion 6 of the Farm Vlakfontein 161, Portion 3 of the Farm Willow Grange 246 and the Remaining Extent of the Farm Scafell 400.

- **Grid Connection Corridor Alternative 2**
  This alternative is 150 m wide (and extends up to 500 m around the footprint of the Switching Station) and approximately up to 4.67 km in length. This alternative starts at the proposed footprint of the Switching Station for the Vlakfontein Solar PV Facility and intersects the existing Olympus – Scafell 1 275 kV transmission line at 130 m from the footprint of the proposed Switching Station. The corridor continues in a westerly direction intersecting the footprint of the proposed Switching Station for the Scafell Solar PV Facility and making a 90° turn towards the south-east for approximately 1 km. The corridor then routes for approximately 580 m before intersecting the existing Mercury – Zeus 1 765 kV transmission line and subsequently making a turn towards the south-east to the Scafell MTS. From the turn, the corridor routes approximately for 1 km parallel to the Mercury – Zeus 1 765 kV transmission line before forming the 150 m wide loop around the footprint of the Scafell MTS. Within the loop, the corridor intersects with the Scafell – Snowdown 1 275 kV and the Makalu – Scafell 1 275 kV transmission lines. This alternative traverse the properties, Portion 6 of the Farm Vlakfontein 161, Portion 3 of the Farm Willow Grange 246, Portion 5 of the Farm Proceederfontein 100 and the Remaining Extent of the Farm Saafell 400.

1.2 Scope, Purpose and Objectives of this Compliance Statement

The purpose of the statement is to assess the potential impacts of the Vlakfontein Solar PV Facility Grid Connection on avifauna, to provide a reasoned opinion on whether the projects should proceed or not from an avifaunal impact perspective, and to recommend measures for the mitigation of identified impacts, should the project proceed.

1.3 Terms of Reference

The terms of reference for the Compliance Statement are as follows:

- Describe the affected environment from an avifaunal perspective.
- Discuss gaps in baseline data and other limitations.
- Describe the methodology that was used for the field surveys.
- Compare the site sensitivity recorded in the field with the sensitivity classification in the DFFE National Screening Tool and adjust if necessary.
- Provide an overview of all applicable legislation.
- Provide an overview of assessment methodology.
- Identify and assess the potential impacts of the proposed development on avifauna.
- Provide sufficient mitigation measures to include in the Environmental Management Programme (EMPr).
- Conclude with an impact statement.

2. Approach and Methodology

The following approach was followed to conduct this study:

- Bird distribution data from the Southern African Bird Atlas Project 2 (SABAP 2) was obtained (http://sabap2.adu.org.za/), in order to ascertain which species occur in the pentad where the proposed development area is located. A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 7.6 km. The SABAP2 data covers the period 2007 to 2020. The relevant pentad is 2645_2735 (henceforth referred to as the “broader area”). A total of 31 SABAP2 full protocol lists had been completed for the pentad where the proposed project is located (i.e. bird listing surveys lasting a minimum of two hours each). In addition, 36 ad hoc protocol lists (i.e. bird listing surveys lasting less than two hours but still giving useful data) were also recorded. The SABAP2 data was therefore regarded as an adequate indicator of the avifauna which could occur at the study area, and it was further supplemented by data collected during the on-site surveys.

- A classification of the vegetation types in the development area was obtained from the Atlas of Southern African Birds 1 (SABAP1) and the National Vegetation Map (2018) accessed via the South African National Biodiversity Institute (SANBI) Biodiversity Geographic Information System (BGIS) map viewer (SANBI 2020).
- The national threatened status of all priority 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).
- The global threatened status of all priority species was determined by consulting the latest (2021.1) International Union for Conservation of Nature (IUCN) Red List of Threatened Species.
- The Important Bird and Biodiversity Areas of South Africa (Marnewick *et al.* 2015) was consulted for information on potentially relevant Important Bird Areas (IBAs).
- The DFFE National Screening Tool was used to determine the assigned avian sensitivity of the study area.
- Satellite imagery was used to view the broader area on a landscape level and to help identify bird habitat on the ground.
- On-site surveys were conducted from 18 – 23 January 2021 based on the best practice guidelines for avifaunal impact studies for solar developments, compiled by BirdLife South Africa (BLSA) in 2017 (Jenkins *et al*. 2017). Monitoring was conducted in the following manner:
    - Three drive transects of 6.2 km, 6.75 km and 3.5 km respectively were identified in the study area and counted six times over a period of 7 days. One observer driving slowly recorded all birds on both sides of the transect. The observer stopped at regular intervals and moved a distance away from the vehicle to listen to bird calls and to scan the environment with binoculars.
    - The following variables were recorded:
        - Species;
        - Number of birds;
        - Date;
        - Start time and end time;
        - Estimated distance from transect (m);
        - Wind direction;
        - Wind strength (estimated Beaufort scale 1 - 7);
        - Weather (sunny; cloudy; partly cloudy; rain; mist);
        - Temperature (cold; mild; warm; hot);
        - Behaviour (flushed; flying-display; perched; perched-calling; perched-hunting; flying- foraging; flying-commute; foraging on the ground.
    - All incidental sightings of priority species were recorded.

See Figure 3 below for the extent of the broader area.

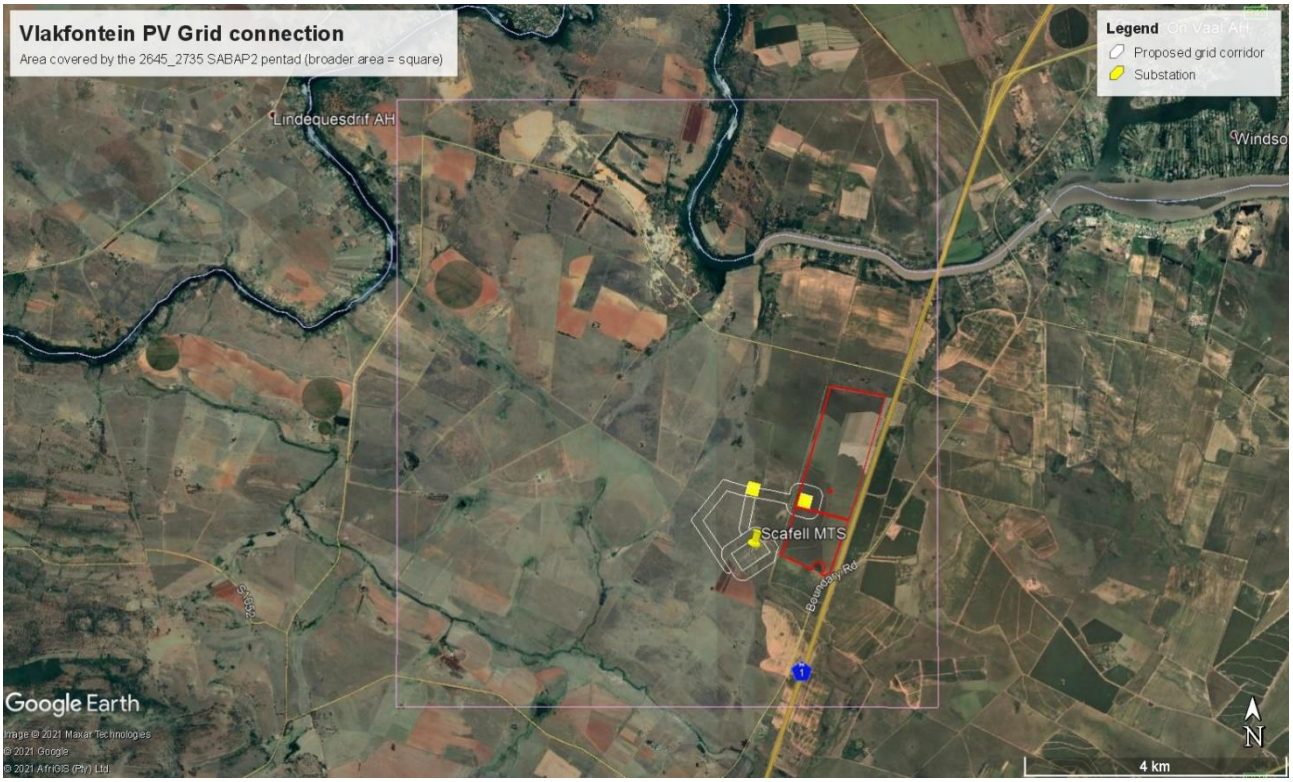

Figure 3: Area covered by the 2645_2735 SABAP 2 pentad (broader area = square).

See Figure 4 for the extent of the study area.

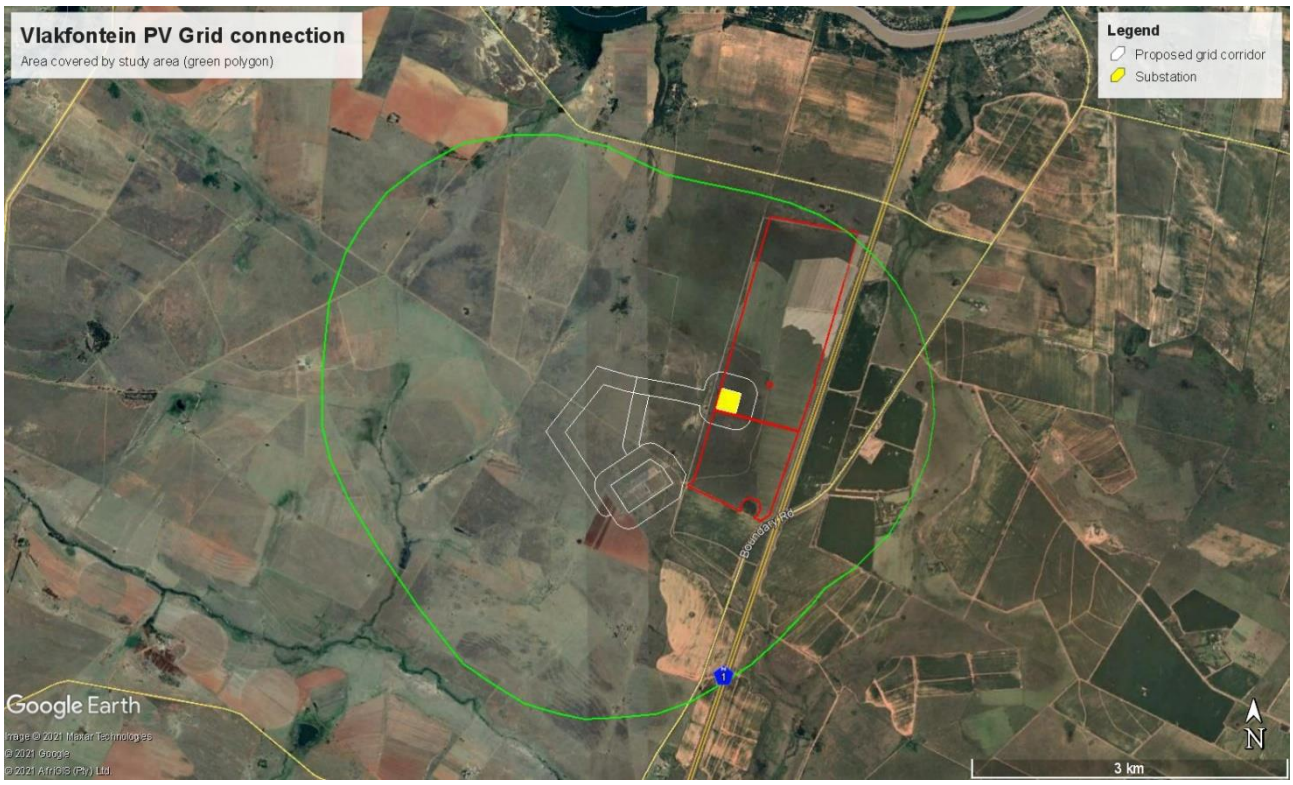

Figure 4: The extent of the study area is indicated by the green border.

2.1 Information Sources

The following data sources were used to compile this report:

Data / Information	Source	Date	Type	Description
South African Protected Areas Database (SAPAD)	Department of Environment, Forestry and Fisheries (DEFF)[2]	2020, Q2	Spatial	Spatial delineation of protected areas in South Africa. Updated quarterly
Atlas of Southern African Birds 1 (SABAP1)	University of Cape Town	1987-1991	Spatial, reference	SABAP1, which took place from 1987-1991.
South African Bird Atlas Project 2 (SABAP2)	University of Cape Town	April 2021	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 (2020.2)	IUCN	2021. 1	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

[2] Now referred to as the Department of Forestry, Fisheries, and the Environment.

Data / Information	Source	Date	Type	Description
				multi-stakeholder processes using globally standardised, quantitative and scientifically agreed criteria.
Strategic Environmental Assessment for wind and solar photovoltaic energy in South Africa	Department of Environmental Affairs, 2015. Strategic Environmental Assessment for wind and solar photovoltaic energy in South Africa. CSIR Report Number: CSIR/CAS/EMS/ER/2015/0001/B. Stellenbosch.	2015	SEA	The SEA identifies areas where large scale wind and solar PV energy facilities can be developed in terms of Strategic Infrastructure Project (SIP) 8 and in a manner that limits significant negative impacts on the natural environment, while yielding the highest possible socio-economic benefits to the country. These areas are referred to as Renewable Energy Development Zones (REDZs).
The National Screening Tool	Department of Environment, Forestry and Fisheries	April 2021	Spatial	The National Web based Environmental Screening Tool is a geographically based web-enabled 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.

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:

- A total of 31 SABAP2 full protocol lists had been completed for the broader area where the proposed project is located (i.e. bird listing surveys lasting a minimum of two hours each). In addition, 36 ad hoc protocol lists (i.e. bird listing surveys lasting less than two hours but still giving useful data) were also recorded. The SABAP2 data was therefore regarded as an adequate indicator of the avifauna which could occur at the study area, and it was further supplemented by data collected during the on-site surveys.
- The focus of the study was primarily on the potential impacts of the proposed grid on priority species. Priority species were defined as species which could potentially be impacted by power line collisions or electrocutions, based on specific morphological and/or behavioural characteristics. Priority species were further subdivided into raptors, waterbirds, terrestrial birds and corvids.
- The assessment of impacts is based on the baseline environment as it currently exists at the study area.
- Conclusions drawn in this study are based on experience of the specialist on the species found on site and similar species in different parts of South Africa. Bird behaviour can never be entirely reduced to formulas that will be valid under all circumstances.
- The **broader area** is defined as the area encompassed by the 2645_2735 pentad where the project is located (see Figure 3 above). The **study area** is defined as a 2km area around the proposed grid corridor, which is regarded as the impact zone of the proposed grid.

3. Legislative and Permit Requirements

3.1 Legislative Framework

There is no legislation pertaining specifically to the impact of electrical grid infrastructure on avifauna.

3.1.1 Agreements and conventions

International agreements and conventions are described in this section.

Table 1: International agreements and conventions which South Africa is party to and which is 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 NEMA (Act 107 of 1998, as amended)

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 powerline developments.

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 (Act 10 of 2004, as amended) 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 Convention on Biological Diversity, 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 5 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

3.1.3.1 Free State Nature Conservation ordinance 8 of 1969

This statute provides for the conservation of fauna and flora and the hunting of animals causing damage and for matters incidental thereto.

4. Description of Project Aspects relevant to Avifauna

Distribution Lines:

- **Grid Connection Corridor Alternative 1**
  This corridor is 150 m wide and is approximately 2.0 km in length. The proposed grid connection is from the on-site substation (Switching Station) of the proposed Vlakfontein Solar Facility located on Vlakfontein 6/161 and extends for about 0.8 km in a westerly direction across Willow Grange 3/246 before turning about 90° south for 0.6 km across Scafell RE/448, then turning slightly southeast for 0.3 km, terminating at the Scafell Eskom MTS. This is the shortest most direct route to connect to the Scafell Eskom MTS.

- **Grid Connection Corridor Alternative 2**
  This corridor is 150 m wide and is approximately 3.0 km in length. The proposed grid connection is from the on-site substation (Switching Station) of the proposed Vlakfontein Solar Facility located on Vlakfontein 6/161 and extends for about 1.2 km in a westerly direction across Willow Grange 3/246, then 0.7 km in a south-westerly direction across Procedeerfontein 5/100, a further 0.9 km in a south-easterly direction and then turns northeast for 0.2 km before terminating at the Scafell Eskom MTS located on Scafell RE/448.

5. Baseline Environmental Description

5.1 General Description

5.1.1 Important Bird Areas (IBAs)

The Suikerbosrand Nature Reserve IBA SA022 is the closest IBA and is located approximately 60km north-east of the site. The proposed development is not expected to have any impact on the avifauna in this IBA due to the distance from the development.

5.1.2 Protected Areas

The site does not form part of a formally protected area. The closest protected area is the Cloudy Creek Bird Sanctuary and Nature Reserve which is located approximately 8km away at its closest point. The proposed development is not expected to have any impact on the avifauna in this nature reserve due to the distance from the development.

5.1.3 The Strategic Environmental Assessment for Wind and Solar Photovoltaic Energy in South Africa

The site does not fall within a Renewable Energy Zone (REDZ), but it does fall within the Central Strategic Transmission Corridor.

5.1.4 Bird Habitat

The study area falls within the Grassland Biome (Mucina & Rutherford). The dominant vegetation type in the study area is Soweto Highveld Grassland (Mucina & Rutherford 2006). However, vegetation structure, rather than the actual plant species, is more significant for bird species distribution and abundance (Harrison *et al.* 1997). Man-made modifications to the environment can also constitute a distinct avifaunal habitat class e.g. man-made dams and powerlines. The following bird habitats were recorded in the study area:

- Medium to tall grassland
- Wetlands, including drainage lines
- Clumps of natural woodland, mostly *Vachellia karroo.*
- High voltage lines
- Agriculture (mostly cultivated grazing)
- Alien trees

See Figures 5 – 10 below for examples of the bird habitat in the study area.

Figure 5: Medium to tall grassland

Figure 6: A wetland and dam in a drainage line

Figure 7: Natural woodland

Figure 8: High voltage lines

Figure 9: Cultivated grazing

Figure 10: Alien trees

5.1.5 Avifauna

- **Southern African Bird Atlas 2**

A total of 194 species could potentially occur within the pentad where the project is located (see Appendix C). Of these, 38 are classified as priority species. Of the 38 priority species, 24 have a medium to high probability of occurring in the development site. Of the 24 priority species with a medium to high probability of occurrence, 16 were recorded during site surveys. **No species of conservation concern (SCC) were recorded by SABAP2 in this pentad or during site surveys**. The probability of a priority species occurring regularly in the study area is indicated in Table 2.

Table 2 below lists all the priority species and the possible impact on the respective species by the proposed grid connection.

Table 2: Priority species occurring in the broader area. The likelihood of regular occurrence in the study area is also indicated.

Species	Taxonomic name	Full protocol reporting rate	Ad hoc protocol reporting rate	Powerline priority species	Raptor	Waterbird	Possibility of regular occurrence	Recorded during surveys	Grassland	Agriculture	Woodland	Wetlands and dams	HV lines	Alien trees	Displacement due to disturbance	Powerline collisions
African Black Duck	*Anas sparsa*	9.68	0.00	x		x	L					x				x
African Darter	*Anhinga rufa*	41.94	8.33	x		x	L					x				x
African Fish-eagle	*Haliaeetus vocifer*	25.81	0.00	x	x		M	x				x	x	x		x
African Spoonbill	*Platalea alba*	12.90	0.00	x		x	L					x				x
Amur Falcon	*Falco amurensis*	6.45	2.78	x	x		M		x	x			x	x		
Barn Owl	*Tyto alba*	3.23	0.00	x	x		L		x	x	x			x		x
Black Sparrowhawk	*Accipiter melanoleucus*	3.23	0.00	x	x		L							x		x
Black-headed Heron	*Ardea melanocephala*	58.06	8.33	x		x	H	x	x	x			x	x		x
Black-winged Kite	*Elanus caeruleus*	77.42	22.22	x	x		H	x	x	x	x		x	x		
Cattle Egret	*Bubulcus ibis*	67.74	13.89	x		x	H	x	x	x				x		x
Common Buzzard	*Buteo vulpinus*	29.03	5.56	x	x		H	x	x	x	x	x	x	x		
Egyptian Goose	*Alopochen aegyptiacus*	83.87	13.89	x		x	H	x		x		x				x
Fulvous Whistling Duck	*Dendrocygna bicolor*	6.45	0.00	x		x	M	x				x				x
Glossy Ibis	*Plegadis falcinellus*	22.58	2.78	x		x	M	x				x				x
Great Egret	*Egretta alba*	6.45	0.00	x		x	L					x				x
Greater Kestrel	*Falco rupicoloides*	3.23	0.00	x	x		M	x	x				x			
Grey Heron	*Ardea cinerea*	25.81	2.78	x		x	L					x				x
Helmeted Guineafowl	*Numida meleagris*	100.00	16.67	x			H	x	x	x	x		x	x	x	x
Lesser Kestrel	*Falco naumanni*	6.45	0.00	x	x		M		x	x			x	x		
Little Egret	*Egretta garzetta*	16.13	0.00	x		x	L					x				x
Long-crested Eagle	*Lophaetus occipitalis*	3.23	0.00	x	x		M		x	x	x	x	x	x		x
Marsh Owl	*Asio capensis*	3.23	2.78	x	x		M		x						x	x

Species	Taxonomic name	Full protocol reporting rate	Ad hoc protocol reporting rate	Powerline priority species	Raptor	Waterbird	Possibility of regular occurrence	Recorded during surveys	Grassland	Agriculture	Woodland	Wetlands and dams	HV lines	Alien trees	Displacement due to disturbance	Powerline collisions
Northern Black Korhaan	*Afrotis afraoides*	90.32	5.56	x			H	x	x						x	x
Osprey	*Pandion haliaetus*	0.00	2.78	x	x		L					x				x
Peregrine Falcon	*Falco peregrinus*	3.23	0.00	x	x		L		x	x			x	x		x
Pied Crow	*Corvus albus*	16.13	16.67	x			M		x	x	x		x	x		
Purple Heron	*Ardea purpurea*	6.45	0.00	x		x	L					x				x
Red-billed Teal	*Anas erythrorhyncha*	12.90	0.00	x		x	M	x				x				x
Red-knobbed Coot	*Fulica cristata*	29.03	0.00	x		x	H	x				x				x
Reed Cormorant	*Phalacrocorax africanus*	58.06	5.56	x		x	H					x				x
South African Shelduck	*Tadorna cana*	16.13	0.00	x	x	x	M					x				x
Spotted Eagle-owl	*Bubo africanus*	3.23	0.00	x	x		M		x	x	x		x	x	x	
Spur-winged Goose	*Plectropterus gambensis*	64.52	11.11	x		x	H	x		x		x				x
Striated Heron	*Butorides striata*	3.23	0.00	x		x	L					x				x
White-breasted Cormorant	*Phalacrocorax carbo*	32.26	2.78	x		x	H	x				x				x
White-faced Duck	*Dendrocygna viduata*	3.23	2.78	x		x	L									
Yellow-billed Duck	*Anas undulata*	61.29	0.00	x		x	M	x				x				x
Yellow-billed Egret	*Egretta intermedia*	6.45	0.00	x		x	L					x				x

- Pre-construction surveys

As noted above, on-site surveys were conducted from 18 – 23 January 2021 during the high (wet) season. Surveys were conducted according to a Regime 1 site (low sensitivity) as defined in the best practice guidelines for avifaunal impact studies at solar developments, compiled by BLSA in 2017 (Jenkins *et al.* 2017).

The abundance of priority species (Index of Kilometric Abundance i.e. birds/km = IKA) recorded during the drive transects is displayed in Figure 10 below.

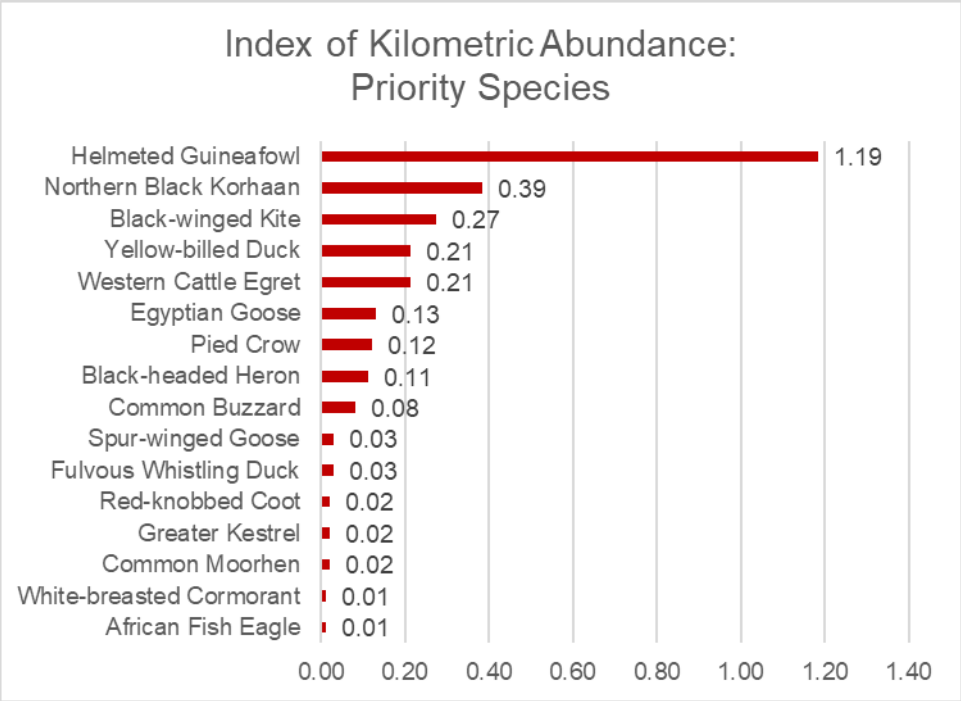

Figure 11: Index of kilometric abundance for priority species recorded during transect counts.

The overall index of kilometric abundance (IKA) for priority species was 2.86 birds/km, which is moderate.

Table 3 lists the priority species which were recorded as incidental records.

Table 3: Priority species recorded as incidental records.

Species	Taxonomic name
Yellow-billed Duck	*Anas undulata*
Common Buzzard	*Buteo buteo*

5.2. Identification of Environmental Sensitivities

5.2.1 Sensitivities identified by the National Web-Based Environmental Screening Tool

The study area and immediate environment is classified as **Low to Medium** sensitivity for terrestrial animals according to the Terrestrial Animal Species Theme (see Figure 11). The medium sensitivity classification is not linked to avifauna. The development site contains no confirmed habitat for 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, namely listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable. The absence of SCC was confirmed during the site surveys undertaken from 18 – 23 January 2021. Based

on these criteria, the study area is correctly classified as **Low** sensitivity for avifauna. See Appendix B for the site sensitivity verification report.

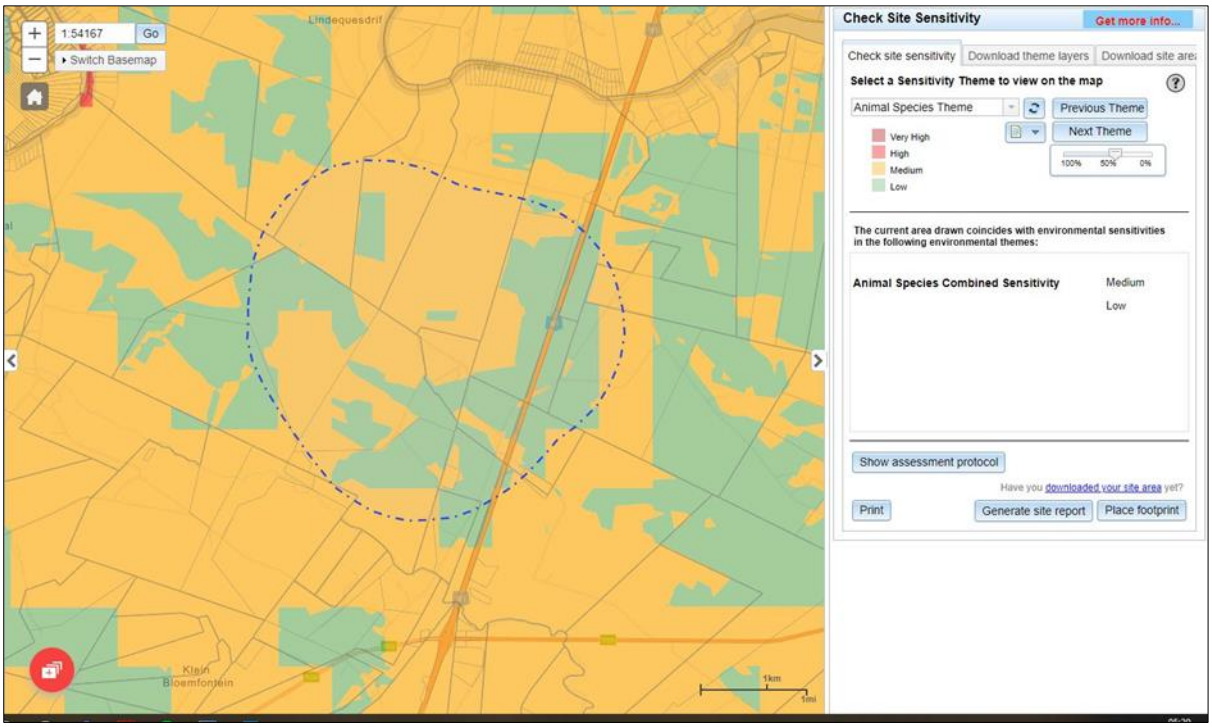

Figure 12: The National Web-Based Environmental Screening Tool map of the combined study area, indicating sensitivities for the Terrestrial Animal Species theme. The medium sensitivity classification is not linked to avifauna.

5.2.2 Specialist Sensitivity Analysis and Verification

The following avifaunal sensitivities were identified in the study area:

- Wetlands: The study area contains several drainage lines with associated wetlands. Wetlands are important refuges for a number of priority species, including the Marsh Owl that often breeds in the tall rank grassland around wetlands. The proposed grid connection poses a potential collision risk to birds commuting between wetlands in the study area.

6. Issues, Risks and Impacts

6.1 Identification of Potential Impacts/Risks

The potential impacts identified in the course of the study are:

6.1.1 Construction Phase

- Displacement due to disturbance associated with the construction of the grid connection.

6.1.2 Operational Phase

- Collisions with the 132kV OHL

6.1.3 Decommissioning Phase

- Displacement due to disturbance associated with the dismantling of the grid.

7. Impact Assessment

7.1 General

Negative impacts on avifauna by electricity infrastructure generally take two 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 is another impact that could potentially impact on avifauna.

7.2 Electrocutions

Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (Van Rooyen 2004). The electrocution risk is largely determined by the pole/tower design. In the case of the proposed power lines, no electrocution risk is envisaged because the proposed design of the 132kV line, namely the steel monopole and self-supporting lattice structures, **should not pose an electrocution threat to any of the bird species which are likely to occur in the study area**.

7.3 Collisions

Collisions are the biggest threat posed by transmission 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, it is possible to give a measure of what species are generally susceptible to power line collisions in South Africa (see Figure 13 below).

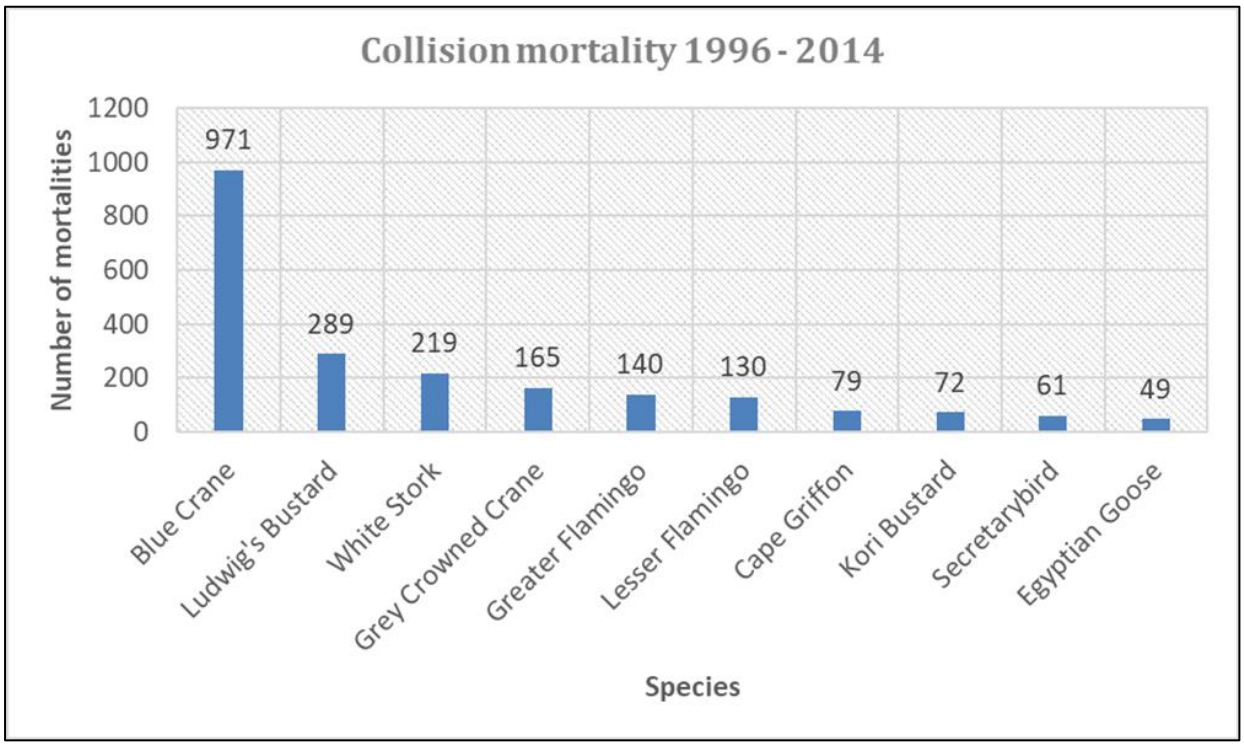

Figure 13: The top 10 collision prone bird species in South Africa, in terms of reported incidents contained in the Eskom/Endangered Wildlife Trust Strategic Partnership central incident register 1996 - 2014 (EWT unpublished data)

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 years, and low voltage distribution lines for one 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).

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 bird species representative of families known to be subject to high levels of mortality associated with power lines i.e. Kori Bustards *Ardeotis kori*, Blue Cranes *Anthropoides paradiseus* and White Storks *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 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 different marking devices were approximately equally effective, namely spirals and bird flappers, they found no evidence supporting the preferential use of one type of marker over the other (Shaw *et al*. 2017).

The priority species which are potentially vulnerable to this impact are listed in Table 2, and below. The highest risk is for waterbirds, followed by terrestrial species and then raptors.

- African Black Duck
- African Darter
- African Fish-eagle
- African Spoonbill
- Barn Owl
- Black Sparrowhawk
- Black-headed Heron
- Cattle Egret
- Egyptian Goose
- Fulvous Whistling Duck
- Glossy Ibis
- Great Egret
- Grey Heron
- Helmeted Guineafowl
- Little Egret
- Long-crested Eagle
- Marsh Owl
- Northern Black Korhaan
- Osprey
- Peregrine Falcon
- Purple Heron
- Red-billed Teal
- Red-knobbed Coot
- Reed Cormorant
- South African Shelduck
- Spur-winged Goose
- Striated Heron
- White-breasted Cormorant
- Yellow-billed Duck
- Yellow-billed Egret

7.4 Displacement due to disturbance

Fortunately, due to the nature of the vegetation, and judged by the existing power lines, very little if any vegetation clearing will be required in the power line servitudes, which means the impact of habitat transformation will be practically zero. Apart from direct habitat destruction, construction activities also impact on birds through **disturbance**; 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 and ground nesting raptors are most likely to be affected by displacement due to disturbance.**

The priority species which are potentially vulnerable to this impact are listed in Table 2, and below.

- Helmeted Guineafowl
- Marsh Owl
- Northern Black Korhaan
- Spotted Eagle-owl

7.5 No-go option

The no-go option will result in no additional impacts on avifauna and will result in the ecological status quo being maintained, which will be to the advantage of the avifauna. However, no fatal flaws were identified during the investigations.

8. Impact rating

See Appendix E for the explanation of the impact criteria.

9 Impact Assessments

Then tables below summarise the potential impacts on avifauna of the proposed grid connection.

9.1 Construction Phase

Displacement of priority species due to disturbance associated with construction of the grid connection		
CRITERIA	**WITHOUT MITIGATION**	**WITH MITIGATION**
Intensity	Medium	Medium
Duration	Short term	Short term
Extent	Local	Local
Consequence	Low	Low
Probability	Probable	Possible
Significance	**Low**	**Low**
Status	Negative	Negative
Confidence	High	High
Degree to which impact can be reversed	High	
Degree to which impact may cause irreplaceable loss of resources	Low	
Degree to which impact can be mitigated	Low	
PROPOSED MITIGATION		
• Construction activity should be restricted to the immediate footprint of the infrastructure where possible. • Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. • 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.		

9.2 Operational Phase

Mortality of priority species due to collisions with the 132kV OHL		
CRITERIA	**WITHOUT MITIGATION**	**WITH MITIGATION**
Intensity	High	High
Duration	Long term	Long term
Extent	Local	Local
Consequence	High	High
Probability	Probable	Possible
Significance	**High**	**Medium**
Status	Negative	Negative
Confidence	High	High
Degree to which impact can be reversed	Medium	
Degree to which impact may cause irreplaceable loss of resources	High	
Degree to which impact can be mitigated	Medium	
PROPOSED MITIGATION		
The avifaunal specialist must conduct a walk-through prior to implementation to demarcate sections of powerline that need to be marked with Eskom approved bird flight diverters. The bird flight diverters should be installed on the full span length on the earthwire (according to Eskom guidelines - five metres apart). Light and dark colour devices must be alternated to provide contrast against both dark and light backgrounds respectively. These devices must be installed as soon as the conductors are strung.		

9.3 Decommissioning Phase

Displacement of priority species due to disturbance associated with dismantling of the grid connection		
CRITERIA	**WITHOUT MITIGATION**	**WITH MITIGATION**
Intensity	Medium	Medium
Duration	Short term	Short term
Extent	Local	Local
Consequence	Low	Low
Probability	Probable	Possible
Significance	**Low**	**Low**
Status	Negative	Negative
Confidence	High	High
Degree to which impact can be reversed	High	
Degree to which impact may cause irreplaceable loss of resources	Low	
Degree to which impact can be mitigated	Low	
PROPOSED MITIGATION		
• Dismantling activity should be restricted to the immediate footprint of the infrastructure where possible. • Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. • 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.		

A comparison between pre-and post-mitigation phases is shown in Table 4 below.

Table 4: Comparison of impacts on environmental parameters pre- and post-mitigation

Environmental parameter	Issues	Significance rating prior to mitigation	Significance rating post mitigation
Avifauna	*Displacement of priority species due to disturbance during the construction of the OHL*	Low	Low
	Mortality of priority species due to collisions with the OHL	High	Medium
	Displacement of priority species due to disturbance during the dismantling of the OHL	Low	Low

10. Environmental Management Programme Inputs

Refer to Appendix D for a description of the key mitigation and monitoring recommendations for each applicable mitigation measure identified for all phases of the project.

11. Assessment of alternatives

From an avifaunal perspective, no preferred powerline alternative was determined for the grid connection, as both were considered acceptable and optimal as their impacts were determined identical in terms of significance and nature.

12. Final Specialist Statement and Authorisation Recommendation

12.1 Statement and Reasoned Opinion

The study area is classified as Low to Medium sensitivity for terrestrial animals according to the Terrestrial Animal Species Theme. The medium sensitivity classification is not linked to avifauna. The development site contains no confirmed habitat for 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, namely listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable. The absence of SCC was confirmed during the site surveys. Based on these criteria, the study area is correctly classified as Low sensitivity for avifauna. No fatal flaws were discovered during the investigations. It is therefore recommended that the activity is authorised, on condition that the proposed mitigation measures as detailed in the Impact Tables (Section 9 of the report) and the EMPr (Appendix D) are strictly implemented.

13. References

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Appendices

Appendix A: Specialist Expertise

Appendix B: Site sensitivity verification

Appendix C: Species List

Appendix D: Environmental Management Plan

Appendix E: Impact Assessment Criteria

Appendix A - Specialist Expertise

Curriculum vitae: Chris van Rooyen

Profession/Specialisation	:	Avifaunal Specialist
Highest Qualification	:	BA LLB
Nationality	:	South African
Years of experience	:	22 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. Kwagga 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 Vlakfontein & 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. Scatec Solar Kenhardt PV 4, PV 5 and PV6 Projects, Kenhardt, Northern Cape
15. NamPower CSP Facility near Arandis, Namibia
16. Dayson Klip PV Facility near Upington, Northern Cape
17. Geelkop PV Facility near Upington, Northern Cape
18. Oya PV Facility, Ceres, Western Cape
19. Vrede and Rondawel PV Facilities, Free State
20. Veroniva Ceres PV Facilities, Western Cape
21. Leeudoringstad PV Facility, North-West

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 powerlines
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	:	20 years

Key Qualifications

Albert Froneman **(**Pr.Sci.Nat) has more than 18 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 Utrecht 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. Groenekloof Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mulilo)
28. Tsitsikamma Wind Energy Facility 24-months post-construction monitoring (Cennergi)
29. Noupoort Wind Energy Facility 24-months post-construction monitoring (Mainstream)
30. Kokerboom Wind Energy Facility 12-month bird monitoring & EIA specialist study (Business Venture

Investments)

31. Kuruman Wind Energy Facility 12-month bird monitoring & EIA specialist study (Mulilo)
32. Mañhica Wind Energy Facility 12-month bird monitoring & EIA specialist study (Windlab)
33. Kwagga Wind Energy Facility, Beaufort West, 12-months pre-construction monitoring (ABO)
34. 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)
35. Duiker Wind Energy Facility, Vredendal, Western Cape 12 months pre-construction monitoring (ABO)
36. Perdekraal East Wind Energy Facility, Touws River, Western Cape, 18 months construction phase monitoring (Mainstream).
37. Swellendam Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (Veld Renewables)
38. Lombardskraal Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (Enertrag SA)
39. Mainstream Vlakfontein & Heuweltjies Wind Energy Facilities, Western Cape, 12-month pre-construction monitoring (Mainstream)
40. Great Karoo Wind Energy Facility, Northern Cape, 12-month pre-construction monitoring (African Green Ventures).
41. Mpumalanga & Gauteng Wind and Hybrid Energy Facilities (6x), pre-construction monitoring (Enertrag SA)
42. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (Enertrag SA)
43. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (ACED)
44. Nanibees North & South Wind Energy Facilities, Northern Cape, Screening Report (juwi)
45. Sutherland Wind Energy Facilities, Northern Cape, Screening Report (WKN Windcurrent)
46. Pofadder Wind Energy Facility, Northern Cape, Screening Report (Atlantic Energy)
47. Haga Haga Wind Energy Facility, Eastern Cape, Amendment Report (WKN Windcurrent)
48. Banken Wind Energy Facility, Northern Cape, Screening Report (Atlantic Energy)
49. Hartebeest Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (juwi).

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 Powerline 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. Avifaunal Impact Scoping & EIA Study - Renosterberg Wind Farm and Solar PV site
20. Bird Impact Assessment Study - Proposed 60 year Ash Disposal Facility near to the Kusile Power Station

21. Avifaunal pre-feasibility assessment for the proposed Montrose dam, Mpumalanga
22. Bird Impact Assessment Study – Proposed ESKOM Phantom Substation near Knysna, Western Cape
23. Habitat sensitivity map for Denham's Bustard, Blue Crane and White-bellied Korhaan in the Kouga Municipal area of the Eastern Cape Province
24. Swaziland Civil Aviation Authority – Sikhuphe International Airport – Bird hazard management assessment
25. Avifaunal monitoring – extension of Specialist Study - SRVM Volspruit Mining project – Mokopane Limpopo Province
26. Avifaunal Specialist Study – Rooikat Hydro Electric Dam – Hope Town, Northern Cape
27. The Stewards Pan Reclamation Project – Bird Impact Assessment study
28. Airports Company South Africa – Avifaunal Specialist Consultant – Airport Bird and Wildlife Hazard Mitigation

Geographic Information System analysis & maps

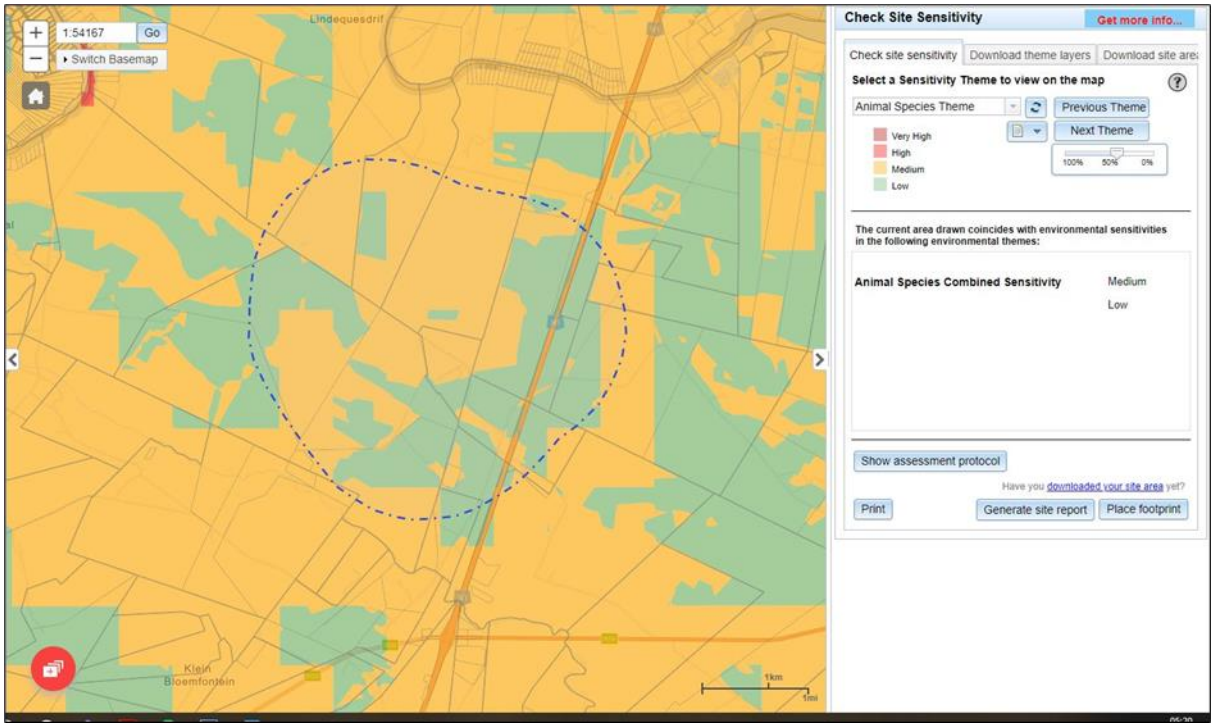
1. ESKOM Power line Makgalakwena EIA – GIS specialist & map production
2. ESKOM Power line Benficosa EIA – GIS specialist & map production
3. ESKOM Power line Riversong EIA – GIS specialist & map production
4. ESKOM Power line Waterberg NDP EIA – GIS specialist & map production
5. ESKOM Power line Bulge 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. Proposed Heilbron 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 x3 Map production
38. ESKOM Lebohang Substation and 132kV Distribution Power Line Project Amendment GIS specialist & map production
39. ESKOM Geluk Rural Powerline GIS & Mapping
40. Eskom Kimberley Strengthening Phase 4 Project GIS & Mapping
41. ESKOM Kwaggafontein - Amandla Amendment Project GIS & Mapping
42. ESKOM Lephalale CNC – GIS Specialist & Mapping
43. ESKOM Marken CNC – GIS Specialist & Mapping
44. ESKOM Lethabong substation and powerlines – GIS Specialist & Mapping
45. ESKOM Magopela- Pitsong 132kV line and new substation – GIS Specialist & Mapping

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.

Appendix B: Site Sensitivity Verification

Prior to commencing with the specialist assessment in accordance with Appendix 6 of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) Environmental Impact Assessment (EIA) Regulations of 2014, 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:

1 Methodology

- Bird distribution data from the Southern African Bird Atlas Project 2 (SABAP 2) was obtained (http://sabap2.adu.org.za/), in order to ascertain which species occur in the pentad where the proposed development area is located. A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 7.6 km. The SABAP2 data covers the period 2007 to 2020. The relevant pentad is 2645_2735 (henceforth referred to as the “broader area”). A total of 31 SABAP2 full protocol lists had been completed for the pentad where the proposed project is located (i.e. bird listing surveys lasting a minimum of two hours each). In addition, 36 ad hoc protocol lists (i.e. bird listing surveys lasting less than two hours but still giving useful data) were also recorded. The SABAP2 data was therefore regarded as an adequate indicator of the avifauna which could occur at the study area, and it was further supplemented by data collected during the on-site surveys.
- A classification of the vegetation types in the development area was obtained from the Atlas of Southern African Birds 1 (SABAP1) and the National Vegetation Map (2018) accessed via the South African National Biodiversity Institute (SANBI) Biodiversity Geographic Information System (BGIS) map viewer (SANBI 2020).
- The national threatened status of all priority 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).
- The global threatened status of all priority species was determined by consulting the latest (2021.1) International Union for Conservation of Nature (IUCN) Red List of Threatened Species.

- The Important Bird and Biodiversity Areas of South Africa (Marnewick et al. 2015) was consulted for information on potentially relevant Important Bird Areas (IBAs).
- The DFFE National Screening Tool was used to determine the assigned avian sensitivity of the study area.
- Satellite imagery was used to view the broader area on a landscape level and to help identify bird habitat on the ground.
- On-site surveys were conducted on 18 January 2021.

2 Results

The study area and immediate environment is classified as Low to Medium sensitivity for terrestrial animals according to the Terrestrial Animal Species Theme (see Figure above). The medium sensitivity classification is not linked to avifauna. The development site contains no confirmed habitat for 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, namely listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered or Vulnerable. The absence of SCC was confirmed during the site surveys. Based on these criteria, the study area is correctly classified as **Low** sensitivity for avifauna.

Appendix C: Species occurring in the broader area

Species	Taxonomic name	Full protocol reporting rate	Ad hoc protocol reporting rate	Recorded during surveys
Acacia Pied Barbet	*Tricholaema leucomelas*	54.84	0.00	x
African Black Duck	*Anas sparsa*	9.68	0.00	
African Black Swift	*Apus barbatus*	3.23	0.00	
African Darter	*Anhinga rufa*	41.94	8.33	
African Firefinch	*Lagonosticta rubricata*	3.23	0.00	
African Fish-eagle	*Haliaeetus vocifer*	25.81	0.00	x
African Hoopoe	*Upupa africana*	48.39	0.00	
African Jacana	*Actophilornis africanus*	6.45	0.00	
African Palm-swift	*Cypsiurus parvus*	45.16	2.78	x
African Paradise-flycatcher	*Terpsiphone viridis*	12.90	0.00	
African Pied Wagtail	*Motacilla aguimp*	0.00	2.78	
African Pipit	*Anthus cinnamomeus*	74.19	2.78	x
African Purple Swamphen	*Porphyrio madagascariensis*	3.23	0.00	
African Quailfinch	*Ortygospiza atricollis*	38.71	5.56	
African Red-eyed Bulbul	*Pycnonotus nigricans*	93.55	5.56	x
African Reed-warbler	*Acrocephalus baeticatus*	16.13	2.78	
African Sacred Ibis	*Threskiornis aethiopicus*	45.16	13.89	
African Snipe	*Gallinago nigripennis*	16.13	0.00	
African Spoonbill	*Platalea alba*	12.90	0.00	
African Stonechat	*Saxicola torquatus*	90.32	5.56	x
African Wattled Lapwing	*Vanellus senegallus*	25.81	0.00	
Amethyst Sunbird	*Chalcomitra amethystina*	9.68	0.00	
Amur Falcon	*Falco amurensis*	6.45	2.78	
Anteating Chat	*Myrmecocichla formicivora*	87.10	5.56	x
Ashy Tit	*Parus cinerascens*	3.23	0.00	
Banded Martin	*Riparia cincta*	6.45	2.78	x
Barn Owl	*Tyto alba*	3.23	0.00	
Barn Swallow	*Hirundo rustica*	38.71	19.44	x
Bar-throated Apalis	*Apalis thoracica*	25.81	5.56	
Black Crake	*Amaurornis flavirostris*	3.23	0.00	
Black Sparrowhawk	*Accipiter melanoleucus*	3.23	0.00	
Black-chested Prinia	*Prinia flavicans*	90.32	5.56	x
Black-collared Barbet	*Lybius torquatus*	32.26	2.78	
Black-headed Heron	*Ardea melanocephala*	58.06	8.33	x

Species	Taxonomic name	Full protocol reporting rate	Ad hoc protocol reporting rate	Recorded during surveys
Black-shouldered Kite	*Elanus caeruleus*	77.42	22.22	x
Blacksmith Lapwing	*Vanellus armatus*	93.55	5.56	x
Black-throated Canary	*Crithagra atrogularis*	80.65	8.33	x
Black-winged Stilt	*Himantopus himantopus*	6.45	0.00	
Blue Waxbill	*Uraeginthus angolensis*	83.87	2.78	
Bokmakierie	*Telophorus zeylonus*	45.16	0.00	x
Brown-crowned Tchagra	*Tchagra australis*	32.26	0.00	x
Brown-hooded Kingfisher	*Halcyon albiventris*	16.13	0.00	
Brown-throated Martin	*Riparia paludicola*	74.19	0.00	
Buffy Pipit	*Anthus vaalensis*	6.45	0.00	x
Burchell's Coucal	*Centropus burchellii*	9.68	0.00	
Cape Glossy Starling	*Lamprotornis nitens*	61.29	2.78	x
Cape Longclaw	*Macronyx capensis*	74.19	8.33	x
Cape Robin-chat	*Cossypha caffra*	77.42	2.78	x
Cape Sparrow	*Passer melanurus*	87.10	0.00	x
Cape Turtle-dove	*Streptopelia capicola*	93.55	27.78	
Cape Wagtail	*Motacilla capensis*	48.39	0.00	
Cape White-eye	*Zosterops virens*	41.94	2.78	
Capped Wheatear	*Oenanthe pileata*	6.45	2.78	
Cardinal Woodpecker	*Dendropicos fuscescens*	12.90	0.00	
Cattle Egret	*Bubulcus ibis*	67.74	13.89	
Chestnut-backed Sparrowlark	*Eremopterix leucotis*	3.23	0.00	
Chestnut-vented Tit-babbler	*Parisoma subcaeruleum*	83.87	5.56	x
Chinspot Batis	*Batis molitor*	22.58	0.00	
Cinnamon-breasted Bunting	*Emberiza tahapisi*	9.68	0.00	
Cloud Cisticola	*Cisticola textrix*	29.03	5.56	x
Common (Southern) Fiscal	*Lanius collaris*	100.00	8.33	x
Common Moorhen	*Gallinula chloropus*	29.03	0.00	x
Common Myna	*Acridotheres tristis*	80.65	2.78	x
Common Ostrich	*Struthio camelus*	41.94	0.00	
Common Quail	*Coturnix coturnix*	0.00	2.78	
Common Sandpiper	*Actitis hypoleucos*	3.23	0.00	
Common Scimitarbill	*Rhinopomastus cyanomelas*	6.45	0.00	
Common Starling	*Sturnus vulgaris*	3.23	0.00	
Common Waxbill	*Estrilda astrild*	35.48	2.78	x
Coqui Francolin	*Peliperdix coqui*	6.45	0.00	

Species	Taxonomic name	Full protocol reporting rate	Ad hoc protocol reporting rate	Recorded during surveys
Crested Barbet	*Trachyphonus vaillantii*	74.19	8.33	x
Crowned Lapwing	*Vanellus coronatus*	87.10	11.11	x
Dark-capped Bulbul	*Pycnonotus tricolor*	0.00	5.56	
Desert Cisticola	*Cisticola aridulus*	25.81	2.78	x
Diderick Cuckoo	*Chrysococcyx caprius*	32.26	0.00	x
Eastern Clapper Lark	*Mirafra fasciolata*	16.13	0.00	x
Egyptian Goose	*Alopochen aegyptiacus*	83.87	13.89	x
European Bee-eater	*Merops apiaster*	41.94	5.56	x
Familiar Chat	*Cercomela familiaris*	3.23	0.00	
Fiscal Flycatcher	*Sigelus silens*	83.87	2.78	
Fulvous Duck	*Dendrocygna bicolor*	6.45	0.00	x
Garden Warbler	*Sylvia borin*	3.23	0.00	
Giant Kingfisher	*Megaceryle maximus*	12.90	2.78	
Glossy Ibis	*Plegadis falcinellus*	22.58	2.78	x
Golden-tailed Woodpecker	*Campethera abingoni*	12.90	0.00	
Goliath Heron	*Ardea goliath*	9.68	0.00	
Great Egret	*Egretta alba*	6.45	0.00	
Greater Honeyguide	*Indicator indicator*	6.45	0.00	
Greater Kestrel	*Falco rupicoloides*	3.23	0.00	x
Greater Striped Swallow	*Hirundo cucullata*	48.39	2.78	x
Green Wood-hoopoe	*Phoeniculus purpureus*	19.35	2.78	
Green-backed Heron	*Butorides striata*	3.23	0.00	
Green-winged Pytilia	*Pytilia melba*	38.71	0.00	
Grey Heron	*Ardea cinerea*	25.81	2.78	
Grey-headed Gull	*Larus cirrocephalus*	3.23	0.00	
Hadeda Ibis	*Bostrychia hagedash*	93.55	8.33	x
Hamerkop	*Scopus umbretta*	6.45	2.78	
Helmeted Guineafowl	*Numida meleagris*	100.00	16.67	x
House Sparrow	*Passer domesticus*	48.39	0.00	
Jameson's Firefinch	*Lagonosticta rhodopareia*	3.23	0.00	
Kalahari Scrub-robin	*Cercotrichas paena*	70.97	5.56	
Karoo Thrush	*Turdus smithi*	54.84	2.78	
Laughing Dove	*Streptopelia senegalensis*	100.00	8.33	x
Lesser Grey Shrike	*Lanius minor*	3.23	2.78	
Lesser Honeyguide	*Indicator minor*	9.68	0.00	
Lesser Kestrel	*Falco naumanni*	6.45	0.00	

Species	Taxonomic name	Full protocol reporting rate	Ad hoc protocol reporting rate	Recorded during surveys
Lesser Swamp-warbler	*Acrocephalus gracilirostris*	12.90	0.00	
Levaillant's Cisticola	*Cisticola tinniens*	83.87	8.33	x
Little Egret	*Egretta garzetta*	16.13	0.00	
Little Grebe	*Tachybaptus ruficollis*	16.13	2.78	x
Little Sparrowhawk	*Accipiter minullus*	3.23	0.00	
Little Swift	*Apus affinis*	54.84	11.11	x
Long-crested Eagle	*Lophaetus occipitalis*	3.23	0.00	
Long-tailed Paradise-whydah	*Vidua paradisaea*	12.90	0.00	
Long-tailed Widowbird	*Euplectes progne*	87.10	13.89	x
Malachite Kingfisher	*Alcedo cristata*	6.45	2.78	
Marsh Owl	*Asio capensis*	3.23	2.78	
Namaqua Dove	*Oena capensis*	32.26	2.78	
Natal Spurfowl	*Pternistis natalensis*	12.90	2.78	x
Neddicky	*Cisticola fulvicapilla*	87.10	2.78	x
Northern Black Korhaan	*Afrotis afraoides*	90.32	5.56	x
Orange River Francolin	*Scleroptila levaillantoides*	25.81	2.78	x
Orange River White-eye	*Zosterops pallidus*	38.71	2.78	
Orange-breasted Waxbill	*Amandava subflava*	19.35	0.00	
Osprey	*Pandion haliaetus*	0.00	2.78	
Peregrine Falcon	*Falco peregrinus*	3.23	0.00	
Pied Avocet	*Recurvirostra avosetta*	6.45	0.00	
Pied Crow	*Corvus albus*	16.13	16.67	x
Pied Kingfisher	*Ceryle rudis*	9.68	0.00	
Pied Starling	*Spreo bicolor*	48.39	0.00	
Pink-billed Lark	*Spizocorys conirostris*	3.23	0.00	
Pin-tailed Whydah	*Vidua macroura*	45.16	2.78	x
Plain-backed Pipit	*Anthus leucophrys*	3.23	0.00	
Purple Heron	*Ardea purpurea*	6.45	0.00	
Rattling Cisticola	*Cisticola chiniana*	19.35	0.00	
Red-backed Shrike	*Lanius collurio*	3.23	0.00	
Red-billed Firefinch	*Lagonosticta senegala*	9.68	0.00	
Red-billed Quelea	*Quelea quelea*	48.39	5.56	
Red-billed Teal	*Anas erythrorhyncha*	12.90	0.00	x
Red-capped Lark	*Calandrella cinerea*	6.45	0.00	
Red-chested Cuckoo	*Cuculus solitarius*	22.58	2.78	x
Red-chested Flufftail	*Sarothrura rufa*	3.23	0.00	

Species	Taxonomic name	Full protocol reporting rate	Ad hoc protocol reporting rate	Recorded during surveys
Red-collared Widowbird	*Euplectes ardens*	45.16	0.00	
Red-eyed Dove	*Streptopelia semitorquata*	93.55	8.33	x
Red-faced Mousebird	*Urocolius indicus*	77.42	2.78	x
Red-headed Finch	*Amadina erythrocephala*	22.58	0.00	
Red-knobbed Coot	*Fulica cristata*	29.03	0.00	x
Red-throated Wryneck	*Jynx ruficollis*	12.90	0.00	x
Reed Cormorant	*Phalacrocorax africanus*	58.06	5.56	
Rock Dove	*Columba livia*	22.58	0.00	
Rock Martin	*Hirundo fuligula*	3.23	0.00	
Rufous-naped Lark	*Mirafra africana*	64.52	5.56	x
Scaly-feathered Finch	*Sporopipes squamifrons*	58.06	0.00	x
South African Cliff-swallow	*Hirundo spilodera*	48.39	8.33	x
South African Shelduck	*Tadorna cana*	16.13	0.00	
Southern Grey-headed Sparrow	*Passer diffusus*	90.32	2.78	x
Southern Masked-weaver	*Ploceus velatus*	100.00	19.44	x
Southern Red Bishop	*Euplectes orix*	96.77	8.33	x
Speckled Mousebird	*Colius striatus*	61.29	8.33	
Speckled Pigeon	*Columba guinea*	93.55	0.00	x
Spike-heeled Lark	*Chersomanes albofasciata*	16.13	0.00	x
Spotted Eagle-owl	*Bubo africanus*	3.23	0.00	
Spotted Flycatcher	*Muscicapa striata*	9.68	2.78	
Spotted Thick-knee	*Burhinus capensis*	16.13	0.00	x
Spur-winged Goose	*Plectropterus gambensis*	64.52	11.11	x
Squacco Heron	*Ardeola ralloides*	6.45	0.00	
Common Buzzard	*Buteo vulpinus*	29.03	5.56	x
Streaky-headed Seedeater	*Crithagra gularis*	12.90	0.00	
Swainson's Spurfowl	*Pternistis swainsonii*	70.97	8.33	x
Swallow-tailed Bee-eater	*Merops hirundineus*	16.13	0.00	
Tawny-flanked Prinia	*Prinia subflava*	32.26	5.56	x
Thick-billed Weaver	*Amblyospiza albifrons*	3.23	0.00	
Three-banded Plover	*Charadrius tricollaris*	22.58	0.00	
Wailing Cisticola	*Cisticola lais*	6.45	0.00	x
Wattled Starling	*Creatophora cinerea*	38.71	0.00	
Whiskered Tern	*Chlidonias hybrida*	9.68	0.00	
White Stork	*Ciconia ciconia*	0.00	2.78	
White-backed Mousebird	*Colius colius*	38.71	0.00	x

Species	Taxonomic name	Full protocol reporting rate	Ad hoc protocol reporting rate	Recorded during surveys
White-bellied Sunbird	*Cinnyris talatala*	38.71	2.78	
White-breasted Cormorant	*Phalacrocorax carbo*	32.26	2.78	x
White-browed Sparrow-weaver	*Plocepasser mahali*	100.00	11.11	
White-faced Duck	*Dendrocygna viduata*	3.23	2.78	
White-fronted Bee-eater	*Merops bullockoides*	9.68	0.00	
White-rumped Swift	*Apus caffer*	48.39	2.78	x
White-throated Swallow	*Hirundo albigularis*	41.94	0.00	x
White-winged Widowbird	*Euplectes albonotatus*	25.81	5.56	x
Willow Warbler	*Phylloscopus trochilus*	19.35	0.00	
Wing-snapping Cisticola	*Cisticola ayresii*	6.45	0.00	x
Wood Sandpiper	*Tringa glareola*	3.23	0.00	
Yellow Canary	*Crithagra flaviventris*	61.29	0.00	x
Yellow-billed Duck	*Anas undulata*	61.29	0.00	x
Yellow-billed Egret	*Egretta intermedia*	6.45	0.00	
Yellow-crowned Bishop	*Euplectes afer*	70.97	2.78	x
Zitting Cisticola	*Cisticola juncidis*	51.61	8.33	x

Appendix D: Environmental Management Programme

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. No off-road driving; 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;	1. Implementation of the CEMPr. Oversee activities to ensure tha 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. On a daily basis 2. Weekly 3. Weekly 4. Weekly 5. Weekly	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	Demarcate sections of the OHL to be marked with Eskom approved Bird Flight Diverters (BFDs).	1. Walk-through by avifaunal specialist. 2. Fit Eskom approved Bird Flight Diverters on the earthwire at the demarcated sections of the OHL.	1. Once-off 2. Once-off	1. Contractor 2. Contractor and ECO

Management Plan for the Operational Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
Avifauna: Mortality of avifauna due to collision with the 132kV OHL					
Mortality of avifauna due to collisions with the 132kV OHL.	Reduction of avian collision mortality	1. Monitor the collision mortality on the OHL. 2. Apply additional BFDs if collision hotspots are discovered.	1. Avifaunal specialist to conduct quarterly inspections of the OHL for a period of two years. 2. Apply additional BFDs if collision hotspots are discovered.	1. Quarterly 2. As and when required	1. 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 construction 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. No off-road driving; 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. Restricted access to the rest of the property;	1. Implementation of the DEMPr. Oversee activities to ensure that the DEMPr is implemented and enforced via site audits and inspections. Report and record any non-compliance. 2. Ensure that decommissioning personnel are made aware of the impacts relating to off-road driving. 3. 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 decommissioning area is demarcated clearly and that personnel are made aware of these demarcations. Monitor via site inspections and report non-compliance.	1. On a daily basis 2. Weekly 3. Weekly 4. Weekly 5. Weekly	1. Contractor and ECO 2. Contractor and ECO 3. Contractor and ECO 4. Contractor and ECO 5. Contractor and ECO

Appendix E: Impact Assessment Methodology

Method for Impact Identification and Evaluation

The identification and assessment of environmental impacts is a multi-faceted process, using a combination of quantitative and qualitative descriptions and evaluations. It involves applying scientific measurements and professional judgement to determine the significance of environmental impacts associated with the proposed project. The process involves consideration of, *inter alia*: the purpose and need for the project; views and concerns of interested and affected parties (I&APs); social and political norms, and general public interest.

Identification and Description of Impacts

Identified impacts are described in terms of the nature of the impact, compliance with legislation and accepted standards, receptor sensitivity and the significance of the predicted environmental change (before and after mitigation). Mitigation measures may be existing measures or additional measures that were identified through the impact assessment and associated specialist input. The impact rating system considers the confidence level that can be placed on the successful implementation of mitigation.

Evaluation of Impacts and Mitigation Measures

INTRODUCTION

Impacts are assessed using SLR's standard convention for assessing the significance of impacts, a summary of which is provided below.

In assigning significance ratings to potential impacts before and after mitigation the approach presented below is to be followed.

1. **Determine the impact consequence rating:** This is a function of the "intensity", "duration" and "extent" of the impact (see Section 0). The consequence ratings for combinations of these three criteria are given in Section 0.
2. **Determine impact significance rating:** The significance of an impact is a function of the consequence of the impact occurring and the probability of occurrence (see Section 0). Significance is determined using the table in Section 0.
3. **Modify significance rating (if necessary):** Significance ratings are based on largely professional judgement and transparent defined criteria. In some instances, therefore, whilst the significance rating of potential impacts might be "low", the importance of these impacts to local communities or individuals might be extremely high. The importance/value which interested and affected parties attach to impacts will be highlighted, and recommendations should be made as to ways of avoiding or minimising these perceived negative impacts through project design, selection of appropriate alternatives and / or management.
4. **Determine degree of confidence of the significance assessment:** Once the significance of the impact has been determined, the degree of confidence in the assessment will be qualified (see Section 0). Confidence in the prediction is associated with any uncertainties, for example, where information is insufficient to assess the impact.

CRITERIA FOR IMPACT ASSESSMENT

The criteria for impact assessment are provided below.

Criteria	Rating	Description
Criteria for ranking of the INTENSITY (SEVERITY) of environmental impacts	**ZERO TO VERY LOW**	Negligible change, disturbance or nuisance. The impact affects the environment in such a way that natural functions and processes are not affected. People / communities are able to adapt with relative ease and maintain pre-impact livelihoods.
	LOW	Minor (Slight) change, disturbance or nuisance. The impact on the environment is not detectable or there is no perceptible change to people's livelihood.
	MEDIUM	Moderate change, disturbance or discomfort. Where the affected environment is altered, but natural functions and processes continue, albeit in a modified way. People/communities are able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support.
	HIGH	Prominent change, disturbance or degradation. Where natural functions or processes are altered to the extent that they will temporarily or permanently cease. Affected people/communities will not be able to adapt to changes or continue to maintain-pre impact livelihoods.
Criteria for ranking the DURATION of impacts	**SHORT TERM**	< 5 years.
	MEDIUM TERM	5 to < 15 years.
	LONG TERM	> 15 years, but where the impact will eventually cease either because of natural processes or by human intervention.
	PERMANENT	Where mitigation either by natural processes or by human intervention will not occur in such a way or in such time span that the impact can be considered transient.
Criteria for ranking the EXTENT / SPATIAL SCALE of impacts	**LOCAL**	Impact is confined to project or study area or part thereof, e.g. limited to the area of interest and its immediate surroundings.
	REGIONAL	Impact is confined to the region, e.g. catchment, municipal region, etc.
	NATIONAL	Impact is confined to the country as a whole, e.g. South Africa, etc.
	INTERNATIONAL	Impact extends beyond the national scale.
Criteria for determining the PROBABILITY of impacts	**IMPROBABLE**	Where the possibility of the impact to materialise is very low either because of design or historic experience, i.e. ≤ 30% chance of occurring.
	POSSIBLE	Where there is a distinct possibility that the impact would occur, i.e. > 30 to ≤ 60% chance of occurring.
	PROBABLE	Where it is most likely that the impact would occur, i.e. > 60 to ≤ 80% chance of occurring.
	DEFINITE	Where the impact would occur regardless of any prevention measures, i.e. > 80% chance of occurring.
	LOW	≤ 35% sure of impact prediction.

Criteria	Rating	Description
Criteria for determining the DEGREE OF CONFIDENCE of the assessment	**MEDIUM**	> 35% and ≤ 70% sure of impact prediction.
	HIGH	> 70% sure of impact prediction.
Criteria for the DEGREE TO WHICH IMPACT CAN BE MITIGATED - the degree to which an impact can be reduced / enhanced	**NONE**	No change in impact after mitigation.
	VERY LOW	Where the significance rating stays the same, but where mitigation will reduce the intensity of the impact.
	LOW	Where the significance rating drops by one level, after mitigation.
	MEDIUM	Where the significance rating drops by two to three levels, after mitigation.
	HIGH	Where the significance rating drops by more than three levels, after mitigation.
Criteria for LOSS OF RESOURCES - the degree to which a resource is permanently affected by the activity, i.e. the degree to which a resource is irreplaceable	**LOW**	Where the activity results in a loss of a particular resource but where the natural, cultural and social functions and processes are not affected.
	MEDIUM	Where the loss of a resource occurs, but natural, cultural and social functions and processes continue, albeit in a modified way.
	HIGH	Where the activity results in an irreplaceable loss of a resource.
Criteria for REVERSIBILITY - the degree to which an impact can be reversed	**IRREVERSIBLE**	Where the impact is permanent.
	PARTIALLY REVERSIBLE	Where the impact can be partially reversed.
	FULLY REVERSIBLE	Where the impact can be completely reversed.

DETERMINING CONSEQUENCE

Consequence attempts to evaluate the importance of a particular impact, and in doing so incorporates extent, duration and intensity. The ratings and description for determining consequence are provided below.

Rating	Description *
VERY HIGH	Impacts could be EITHER: of ***high intensity*** at a ***regional level*** and endure in the ***long term***; OR of ***high intensity*** at a ***national level*** in the ***medium term***; OR of ***medium intensity*** at a ***national level*** in the ***long term.***
HIGH	Impacts could be EITHER: of ***high intensity*** at a ***regional level*** and endure in the ***medium term***; OR of ***high intensity*** at a ***national level*** in the ***short term***; OR of ***medium intensity*** at a ***national level*** in the ***medium term;*** OR of ***low intensity*** at a ***national level*** in the ***long term***; OR of ***high intensity*** at a ***local level*** in the ***long term***; OR of ***medium intensity*** at a ***regional level*** in the ***long term.***
MEDIUM	Impacts could be EITHER: of ***high intensity*** at a ***local level*** and endure in the ***medium term***;

Rating	Description *
	OR of ***medium intensity*** at a ***regional level*** in the ***medium term***; OR of ***high intensity*** at a ***regional level*** in the ***short term***; OR of ***medium intensity*** at a ***national level*** in the ***short term***; OR of ***medium intensity*** at a ***local level*** in the ***long term***; OR of ***low intensity*** at a ***national level*** in the ***medium term;*** OR of ***low intensity*** at a ***regional level*** in the ***long term.***
LOW	Impacts could be EITHER of ***low intensity*** at a ***regional level*** and endure in the ***medium term***; OR of ***low intensity*** at a ***national level*** in the ***short term***; OR of ***high intensity*** at a ***local level*** and endure in the ***short term***; OR of ***medium intensity*** at a ***regional level*** in the ***short term***; OR of ***low intensity*** at a ***local level*** in the ***long term***; OR of ***medium intensity*** at a ***local level*** and endure in the ***medium term.***
VERY LOW	Impacts could be EITHER of ***low intensity*** at a ***local level*** and endure in the ***medium term***; OR of ***low intensity*** at a ***regional level*** and endure in the ***short term***; OR of ***low to medium intensity*** at a ***local level*** and endure in the ***short term.*** OR **Zero to very low intensity** with any combination of extent and duration.

* Note: For any impact that is considered to be "Permanent" or "International" apply the "Long-Term" and "National" ratings, respectively.

DETERMINING SIGNIFICANCE

The consequence rating is considered together with the probability of occurrence in order to determine the overall significance using the table below.

		PROBABILITY			
		IMPROBABLE	**POSSIBLE**	**PROBABLE**	**DEFINITE**
CONSEQUENCE	**VERY LOW**	**INSIGNIFICANT**	**INSIGNIFICANT**	**VERY LOW**	**VERY LOW**
	LOW	**VERY LOW**	**VERY LOW**	**LOW**	**LOW**
	MEDIUM	**LOW**	**LOW**	**MEDIUM**	**MEDIUM**
	HIGH	**MEDIUM**	**MEDIUM**	**HIGH**	**HIGH**
	VERY HIGH	**HIGH**	**HIGH**	**VERY HIGH**	**VERY HIGH**

In certain cases it may not be possible to determine the significance of an impact. In these instances the significance is **UNKNOWN**.