AVIFAUNAL IMPACT ASSESSMENT

Msenge Emoyeni Wind Energy Facility Powerline Deviation, located near Bedford the Eastern Cape Province

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EXECUTIVE SUMMARY

Chris van Rooyen Consulting has been appointed by Nala Environmental Consulting, to undertake an Avifaunal Specialist Study for the proposed construction and operation of the Msenge Emoyeni Wind Energy Facility 66kV powerline grid connection. Environmental Authorisation (EA) for the construction of the aforementioned powerline and its associated on-site substation infrastructure was granted by the Department of Environmental Affairs (DEA) now Department of Forestry, Fisheries and the Environment (DFFE Reference: 12/12/20/1754/2). Since the issuing of the EA, it was determined that in order to provide suitable setbacks, in addition to following the existing Albany-Poseidon 132kV powerline as closely as possible, while reducing/optimizing the crossing points, the authorised 132kV powerline routing must be deviated from the authorised route alignment.

The grid connection project is comprised of an overhead line (OHL) that is approximately 22.7km in length, 7m wide access tracks and a 33kV/132kV on-site substation with a footprint occupying an area of 250m x 200m, within a 300m radius to allow movement where possible. The project is located approximately 20km south of the town of Bedford in the Eastern Cape Province. The grid connection infrastructure related to the authorised WEF is located within the Cookhouse Renewable Energy Development Zone ("REDZ") and Eastern Power Corridor.

1 PROJECT ALTERNATIVES

A single OHL grid connection alignment is proposed, within a 300m wide corridor (i.e. 150m either side of the proposed centreline of the OHL) in addition to a 300m radius surrounding the on-site substation footprint, allowing for minor alignment adjustments based on sensitive features.

2 AVIFAUNA

The SABAP2 data indicates that a total of 213 bird species could potentially occur within the PAOI and immediate surroundings – Appendix 4 provides a comprehensive list of all the species. Of these, 51 species are classified as priority species (see definition of priority species in section 4) and 14 are South African Red List species. Of the priority species, 41 are likely to occur regularly at the Project Area of Impact (PAOI) and immediate surrounding area, with the remaining ten occurring sporadically.

The site visit produced a combined list of 58 species (Appendix 4 - highlighted in grey), covering both the PAOI and to a limited extent, the surrounding area. Twenty-two priority species were observed along the proposed powerline alignment. Species of conservation concern (SCC) recorded during the field survey are Cape Vulture *G. coprotheres*, Verreaux's Eagle *A. verreauxii*, Martial Eagle *P. bellicosus*, Blue Crane *G. paradisea*, Denham's Bustard *N. denhami* and Secretarybird *S. serpentarius*. All other observations were of small passerine and game bird species that are common to this area.

3 POTENTIAL IMPACTS

The following impacts have been identified in the Avifaunal Specialist Assessment.

3.1 Construction Phase

- Displacement due to disturbance associated with the construction of the proposed Msenge Emoyeni WEF 66kV OHL and on-site substation; and
- Displacement due to habitat transformation associated with the construction of the proposed Msenge Emoyeni WEF 66kV OHL and on-site substation.

3.2 Operational Phase

- Collisions with the proposed Msenge Emoyeni WEF 66kV OHL;

- Electrocution on the proposed 66kV OHL infrastructure; and
- Electrocution of priority species on the electrical infrastructure within the proposed on-site substation.

3.3 Decommissioning Phase

- Displacement due to disturbance associated with the decommissioning of the Msenge Emoyeni WEF 66kV OHL and on-site substation.

3.4 Cumulative Impacts

- Displacement due to disturbance associated with the construction and decommissioning of the proposed Msenge Emoyeni WEF 66kV OHL and on-site substation;
- Displacement due to habitat transformation associated with the Msenge Emoyeni WEF 66kV OHL and on-site substation;
- Collisions with the proposed Msenge Emoyeni WEF 66kV OHL;
- Electrocution of vultures and large raptors on the proposed Msenge Emoyeni WEF 66kV OHL infrastructure; and
- Electrocution of priority species on the electrical infrastructure within the proposed on-site substation.

4 ENVIRONMENTAL SENSITIVITIES

4.1 High Sensitivity

At a site-specific level, environmentally sensitive features present within the primary PAOI are Red List priority species nest locations, and the permanent and ephemeral waterbodies. These areas are deemed to be areas of **HIGH** sensitivity. The construction of the proposed 66kV single circuit OHL across or within close proximity to the waterbodies will necessitate the marking of the powerline with bird flight diverters to mitigate the collision impact.

Site specific recommendations for the management of any potential disturbance impacts associated with Red List priority species nest locations will be provided following the final avifaunal walk-through (inspection) when the pole positions have been identified.

4.2 Medium to High Sensitivity

The remainder of the PAOI is considered to be of MEDIUM - HIGH sensitivity, given its propensity to support Denham's Bustard, Ludwig's Bustard, Kori Bustard, Blue Crane, Cape Vulture and Secretarybird, and will therefore also require marking of the powerline with bird flight diverters to mitigate the collision impact. In practice this means the entire OHL needs to be marked with bird flight diverters.

5 MANAGEMENT ACTIONS

The following management actions have been proposed in this assessment:

5.1 Planning & Design phase

- The final pylon type must be finalized closer to construction, based on detailed design and Geo-technical investigations. The pylon designs must comply with the latest Eskom-EWT "bird-friendly" guidelines/designs and must be finalized in consultation with an avifaunal specialist and the EWT Wildlife and Energy Working Groups.

5.2 Construction phase

- Conduct an inspection (avifaunal walk-through) as soon as the 66kV OHL pole positions have been finalised to identify species of conservation concern (SCC) that may be breeding within the infrastructure footprints. If a nest is occupied, the avifaunal specialist must consult with the contractor to find ways of minimising the potential disturbance to the breeding birds during the construction period. This could include measures such as delaying some of the activities until after the breeding season or other measures deemed suitable and practical at the time.
- Bird Flight Diverters must be fitted to the entire OHL according to the applicable Eskom Engineering Instruction (*Eskom Unique Identifier 240 – 93563150: The utilisation of Bird Flight Diverters on Eskom Overhead Lines*). These devices must be installed as soon as the conductors and earthwires are strung.
- 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 use should be made of existing access roads and the construction of new roads should be kept to a minimum.
- Vegetation clearance should be limited to what is absolutely necessary.
- The mitigation measures proposed by the vegetation specialist must be strictly enforced.

5.3 Operational phase

- No management actions are required for the operational phase

5.4 De-commissioning phase

- Conduct an avifaunal inspection of the OHL prior to its decommissioning to identify nests on the poles/towers.
- 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.

6 IMPACT RATING

The table below indicates the overall impact significance for each phase before and after mitigation, as well as cumulative impacts.

Nature of the Impact	Rating prior to mitigation	Rating post mitigation
*Displacement of priority species due to **disturbance** associated with construction of the OHL powerline and onsite substation*	MEDIUM	LOW
*Displacement of priority species due to **habitat transformation** associated with construction of the on-site substation*	MEDIUM	LOW
*Displacement of priority species due to **habitat transformation** associated with construction of the OHL powerline*	LOW	LOW
*Mortality of priority species due to **collisions** with the OHL powerline*	HIGH	MEDIUM
*Mortality of priority species due to **electrocution** if constructed as a 66kV powerline*	HIGH	LOW
*Mortality of priority species due to **electrocution** on the infrastructure within the on-site substation*	MEDIUM	LOW
*Displacement of priority species due to **disturbance** associated with decommissioning of the OHL powerline*	MEDIUM	LOW

7 CUMULATIVE IMPACTS

The proposed Msenge Emoyeni WEF 66kV OHL grid connection deviation project equates to a maximum of 22.7kms. There are approximately 14 existing transmission powerlines and significantly more distribution and reticulation lines totalling hundreds of kilometres of existing medium and high voltage lines within the 30km radius around the Msenge Emoyeni WEF 66kV OHL grid connection PAOI (Figure 10). In addition, at least 7 operational and/or planned renewable energy facilities are located within a 30km radius around the proposed project. The combined length of the grid connections associated with these renewable energy facilities could not be established despite extensive internet searches, but it can be assumed to exceed 100km.

The Msenge Emoyeni WEF 66kV OHL grid connection deviation will increase the total number of existing and planned high voltage lines by a very small percentage. The contribution of the proposed grid connection deviation to the cumulative impact of all the high voltage lines is thus LOW. However, the combined cumulative impact of the existing and proposed powerlines on avifauna within a 30km radius is considered to be MODERATE to HIGH.

The cumulative impact of displacement due to disturbance and habitat transformation at the on-site substation, occupying an area of 250m x 200m is considered to be LOW, due to the small size of the footprint and the availability of similar habitat within the 30km radius. The cumulative impact of potential electrocutions within the on-site substation yard is also likely to be LOW as it is expected to be a rare event. .

8 NO-GO ALTERNATIVE

The no-go alternative will result in the current status quo i.e. natural habitat being maintained at the proposed development site as far as the avifauna is concerned, which would be beneficial to the avifauna currently occurring there.

9 CONCLUDING STATEMENT

The expected impacts of the proposed Msenge Emoyeni 66kV OHL grid connection deviation and on-site substation project range from MEDIUM to HIGH significance and negative status pre-mitigation. However, with appropriate mitigation, the post-mitigation significance of the identified impacts should be reduced to MEDIUM and LOW negative. No fatal flaws were discovered in the course of the investigation. 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 6) are strictly implemented.

CONTENTS

Minimum report requirements listed 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)

HIGH SENSITIVITY RATING FOR TERRESTRIAL ANIMAL SPECIES	
SITE SENSITIVITY VERIFICATION	
The site sensitivity verification must be undertaken by an environmental assessment practitioner or specialist.	Section 6, Appendices 1, 2 and 3
The site sensitivity verification must be undertaken through the use of: (a) a desk top analysis, using satellite imagery; (b) a preliminary on-site inspection; and (c) any other available and relevant information.	Section 3, Section 6 and Appendix 3
The outcome of the site sensitivity verification must be recorded in the form of a report that: (a) confirms or disputes the current use of the land and environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.; (b) contains a motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity; and (c) is submitted together with the relevant assessment report prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.	Appendix 3
SPECIALIST ASSESSMENT & MINIMUM REPORT CONTENT REQUIREMENTS	
Contact details and relevant experience as well as the SACNASP Registration number of the specialist preparing the assessment including a curriculum vitae;	Appendix 1
A signed statement of independence by the specialist;	Appendix 2
A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	Section 2 and Section 3
A description of the methodology used to undertake the site sensitivity verification, impact assessment and site inspection, including equipment and modelling used where relevant;	Section 3
A description of the mean density of observations/number of sample sites per unit area and the site inspection observations;	Section 6 and Section 7
A description of the assumptions made and any uncertainties or gaps in knowledge or data;	Section 4
details of all SCC found or suspected to occur on site, ensuring sensitive species are appropriately reported;	Section 7
the online database name, hyperlink and record accession numbers for disseminated evidence of SCC found within the PAOI;	N/A
The location of areas not suitable for development and to be avoided during construction where relevant;	Section 9
a discussion on the cumulative impacts;	Section 9
Impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	Section 10 and Appendix 6
A reasoned opinion, based on the findings of the specialist assessment, regarding the acceptability or not of the development and if the development should receive approval or not, related to the specific theme being considered, and any conditions to which the opinion is subjected if relevant; and	Section 11
A motivation must be provided if there were any development footprints identified as per paragraph 2.2.12 above that were identified as having “low” or “medium” terrestrial animal species sensitivity and were not considered. appropriate.	N/A

1 INTRODUCTION

1.1 Project background

Environmental Authorisation (EA) for the construction of the Msenge Emoyeni Wind Energy Facility (WEF) and its associated on-site substation and overhead line (OHL) infrastructure was granted by the Department of Environmental Affairs (DEA) now Department of Forestry, Fisheries and the Environment (DFFE Reference: 12/12/20/1754/2). Since the issuing of the EA, it was determined that in order to provide suitable setbacks i.e. the minimum separation distance between the base of the Amakhala and Nojoli WEFs' turbines and the authorised powerline in addition to following the existing Albany-Poseidon 132kV powerline as closely as possible, while reducing/optimizing the crossing points, the authorised 132kV powerline routing has deviated from the authorised route alignment and now lies outside of the previously assessed and authorised 20-30m wide servitude.

Msenge Emoyeni Wind Farm (Pty) Ltd is proposing the construction and operation of a 66kV single circuit OHL within a corridor of 300m, that will evacuate power from the proposed 33/132kV Msenge Emoyeni WEF onsite substation to the Poseidon Main Transmission Substation (MTS). The proposed OHL grid connection is routed across nine land portions of the farms: Leeuw Fontein, Normandale, Plat House Kop Leegte, Farm 260, Farm 242, Farm 148 and Van Wyks Kraal. The OHL will be approximately 22.7km in length, with 7m wide access tracks and a 33kV/132kV on-site substation with a footprint occupying an area of 250m x 200m, within a 300m radius to allow movement where possible. The project is located approximately 20km south of the town of Bedford in the Eastern Cape Province. The grid connection infrastructure related to the authorised WEF is located within the Cookhouse Renewable Energy Development Zone ("REDZ") and Eastern Power Corridor (Figure 1). The proposed Msenge Emoyeni WEF grid connection is the subject of this impact assessment report.

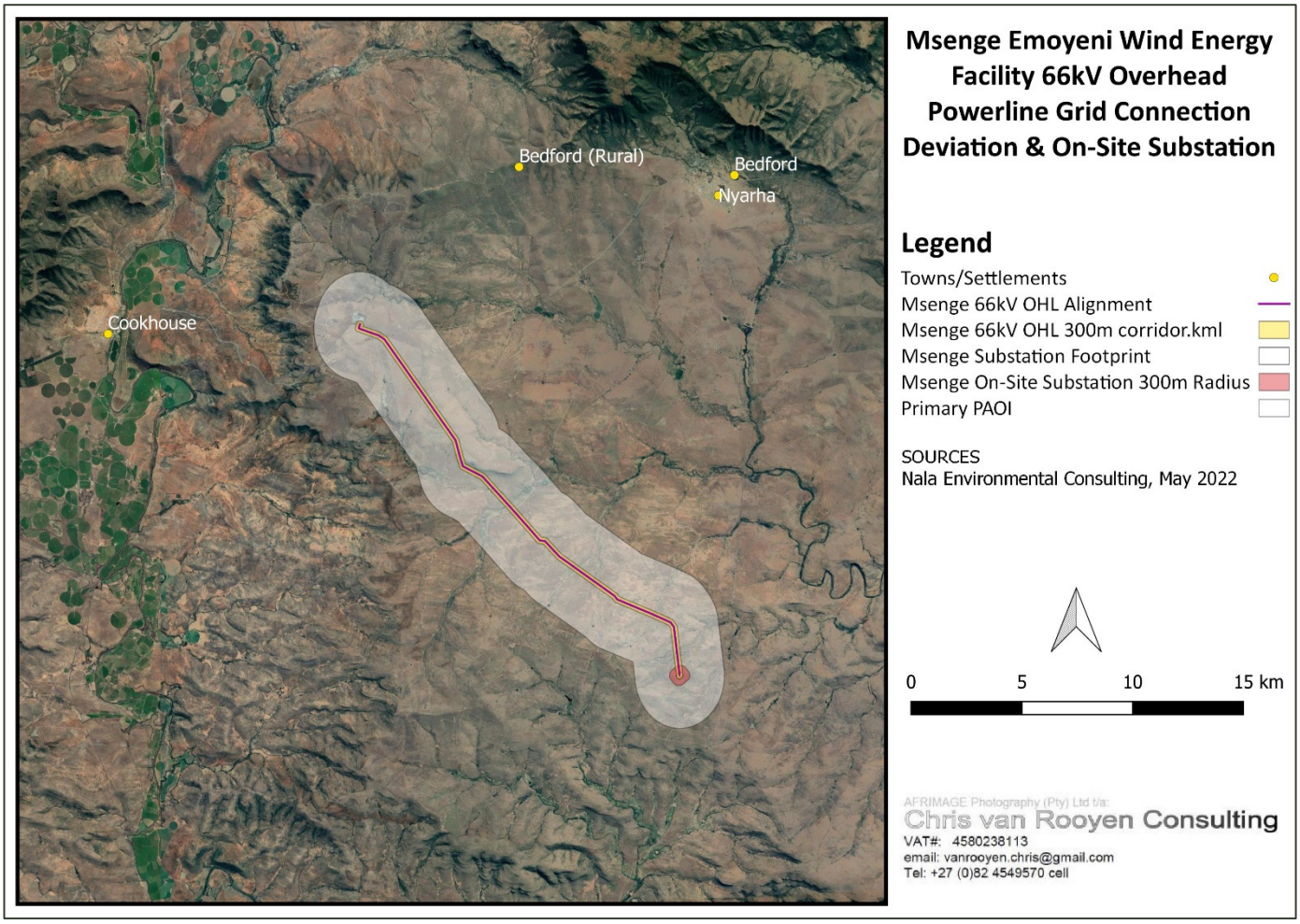


Figure 1: Locality map indicating the location of the Msenge Emoyeni WEF 66kV OHL grid connection deviation and on-site substation within the primary Project Area of Impact (PAOI) near Bedford, Eastern Cape Province.

1.2 Project Alternatives

A single OHL grid connection alignment is proposed, within a 300m wide corridor (i.e. 150m either side of the proposed centreline of the OHL) in addition to a 300m radius surrounding the on-site substation footprint, allowing for minor alignment adjustments based on sensitive features.

2 PROJECT SCOPE

The terms of reference for this assessment report are as follows:

- Conduct a site sensitivity verification (Appendix 3) through the use of a desk top analysis of primary species occurrence data emanating from a single season (austral autumn) site survey, conducted along the Msenge Emoyeni WEF 66kV grid connection alignment in addition to secondary avifaunal data sets (detailed below);
- Describe the affected environment from an avifaunal perspective;
- Discuss gaps in baseline data and other limitations;
- List and describe the expected impacts associated with the proposed OHL grid connection;
- Perform an assessment of the potential impacts; and
- Recommend mitigation measures to reduce the significance of the expected impacts.

3 OUTLINE OF METHODOLOGY AND INFORMATION REVIEWED

The following methods were employed to conduct this study:

- Priority species are defined as those species which could potentially be impacted by powerline collisions or electrocutions, based on specific morphological and/or behavioural characteristics. These include both Species of Conservation Concern (SCC) as defined by the *Species Environmental Assessment Guideline: Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa (2020)* i.e. those species listed on the IUCN Red List of Threatened Species or South Africa's National Red List website as Critically Endangered, Endangered, Vulnerable, Near Threatened and Data Deficient, as well as certain other species.
- The primary PAOI is defined as a 2km zone around the proposed grid connection corridor.
- Bird distribution data from the Southern African Bird Atlas Project 2 (SABAP2) was obtained (http://sabap2.adu.org.za/), in order to ascertain which species occur in the pentads where the proposed development 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. To get a more representative impression of the birdlife, a consolidated data set was obtained for a total of six pentads, some of which intersect and others that are near the primary PAOI. This area was designated as the broader area. The decision to include multiple pentads around the primary PAOI was influenced by the fact that the pentads within which the proposed development is located have few completed full protocol surveys. The additional pentads and their data augment the bird distribution data. The six pentad grid cells are the following: 3240_2555, 3240_2600, 3245_2555, 3245_2600, 3250_2555 and 3250_2600 (Figure 2). A total of 118 full protocol lists (i.e. bird listing surveys lasting a minimum of two hours each) and 79 ad hoc protocol lists (surveys lasting less than two hours but still yielding valuable data) have been completed to date for broader area. The SABAP2 data is regarded as a reliable reflection of the avifauna which occurs in the area and is supplemented with data collected during the site visit and extensive general knowledge of the area;
- A classification of the vegetation types in the PAOI was obtained from the Atlas of Southern African Birds 1 (SABAP1) and the National Vegetation Map compiled by the South African National Biodiversity Institute (Mucina & Rutherford 2006);

- 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), and the latest authoritative summary of southern African bird biology (Hockey *et al.* 2005);
- The global threatened status of all priority species was determined by consulting the latest (2021.3) IUCN Red List of Threatened Species (http://www.iucnredlist.org/);
- The Important Bird and Biodiversity Areas of South Africa (Marnewick *et al.* 2015; http://www.birdlife.org.za/conservation/important-bird-areas) was consulted for information on potentially relevant Important Bird Areas (IBAs);
- Satellite imagery (Google Earth © 2022) was used in order to view the broader area on a landscape level and to help identify bird habitat on the ground;
- The South African National Biodiversity BGIS map viewer was used to determine the locality of the PAOI relative to National Protected Areas in the Eastern Cape Province;
- The DFFE National Screening Tool was used to determine the assigned avian sensitivity of the PAOI*: Deviation of the authorised Msenge Emoyeni WEF Powerline and associated infrastructure* dated 8 May, 2022;
- Procedures for the Assessment and Minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of NEMA when applying for Environmental Authorisation (Gazetted October 2020)
- Guidelines for the Implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for EIAs in South Africa produced by the South African National Biodiversity Institute on behalf of the Department of Environment, Forestry and Fisheries (2020) were consulted to determine the applicable protocol to be used;
- The avifaunal specialist report titled *Msenge Emoyeni Wind Energy Facility: Avian Impact Risk Assessment & Mitigation Scheme*, compiled by Dr Andrew Jenkins of Avisense Consulting (2013) were consulted for background information, and
- Primary avifaunal diversity and abundance data were collected during a single season, two-day site visit to the primary and broader area conducted on 26-30 March 2022. Data was collected by means of incidental counts (Figure 3).

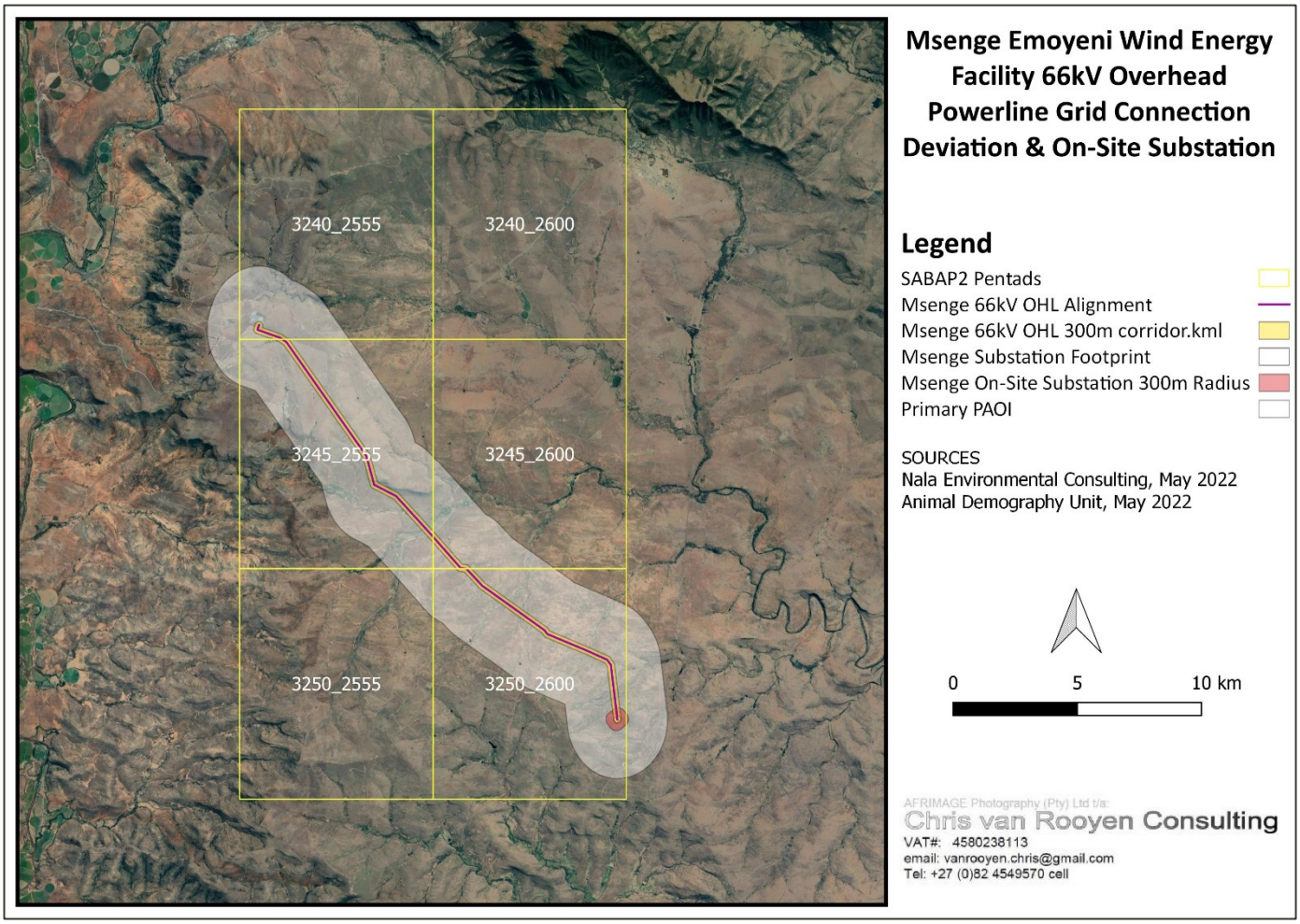


Figure 2: Location of the six South African Bird Atlas Project 2 (SABAP2) pentad grid cells (broader area) that were considered for the proposed Msenge Emoyeni WEF 66kV OHL grid connection deviation and on-site substation project.

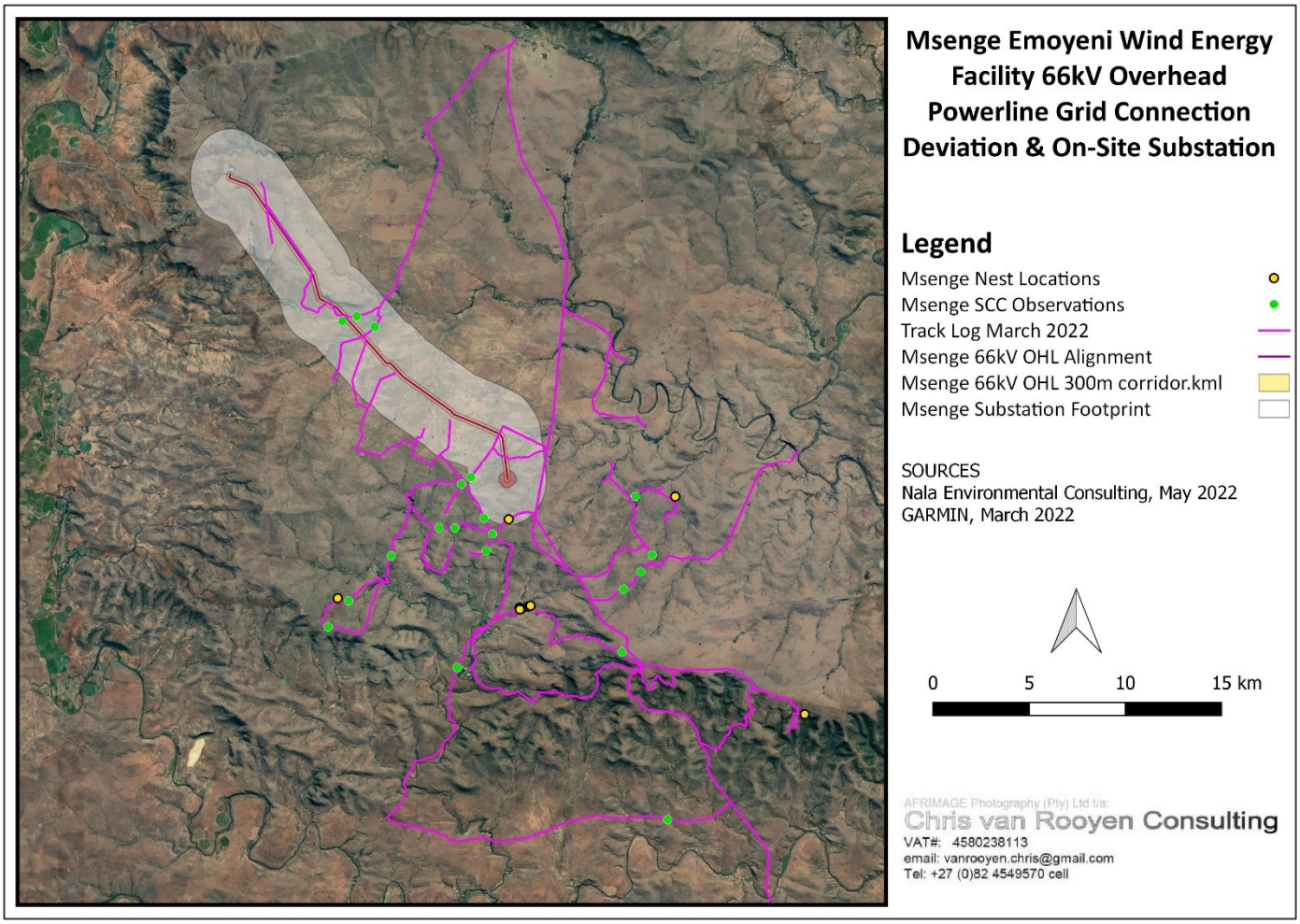


Figure 3: Regional map detailing the incidental count observations, nest locations and tracks surveyed during the field survey to the PAOI conducted on 26-30 March 2022.

4 ASSUMPTIONS AND LIMITATIONS

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

- The focus of this assessment is primarily on the potential impacts of Msenge Emoyeni WEF 66kV grid connection and on-site substation on priority species.
- The assessment of impacts is based on the baseline environment as it currently exists in the Project Area of Interest (PAOI).
- Cumulative impacts include all wind energy facility (WEF) and Solar Energy Facility (SEF PV) projects, grid connections and existing transmission and distribution powerlines for which information could be sourced in the public domain, within a 30km radius that currently have open applications or have been approved by the Competent Authority as per the 2021 Q4 database from the Department of Forest Fisheries and Environment (DFFE).
- Conclusions in this study are based on experience of these 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.

5 LEGISLATIVE CONTEXT

5.1 Agreements and Conventions

Table 1 below lists agreements and conventions which South Africa is party to and which is relevant to the conservation of avifauna[1].

Table 1: 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 African-Eurasian Migratory Waterbirds (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 3 main objectives: The conservation of biological diversity The sustainable use of the components of biological diversity 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 United Nations Environment Programme, 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 (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) 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

5.2 National Legislation

5.2.1 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.

[1] (BirdLife International (2021) Country profile: South Africa. Available from: http://www.birdlife.org/datazone/country/south_africa. Checked: 2021-08-27).

5.2.2 The National Environmental Management Act 107 of 1998 (NEMA)

The National Environmental Management Act 107 of 1998 (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, which may significantly affect the environment, may be performed only after an environmental impact assessment has been done and authorization has been obtained from the relevant 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 was published on 30 October 2020. This protocol applies also for the assessment of impacts caused by powerlines on avifauna.

5.2.3 The National Environmental Management: Biodiversity Act 10 of 2004 (NEMBA) and the Threatened or Protected Species Regulations, February 2007 (TOPS Regulations)

The most prominent statute containing provisions directly aimed at the conservation of birds is the National Environmental Management: Biodiversity Act 10 of 2004 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. The State is endowed with the trusteeship of biodiversity and has the responsibility to manage, conserve and sustain the biodiversity of South Africa.

5.2.4 The National Environmental Management: Protected Areas Act 57 of 2003

The National Environmental Management: Protected Areas Act (No. 57 of 2003), as amended in 2014, provides for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes. The Act also provides for the establishment of a national register of all national, provincial and local protected areas that are managed in accordance with national norms and standards; and to endure intergovernmental co-operation and public consultation in matters concerning protected areas. Protected areas are declared in order to regulate the area as a buffer zone for protection of a special nature reserve, world heritage site or nature reserve; to enable owners of land to take collective action to conserve biodiversity on their land and to seek legal recognition therefor; to protect the area if the area is sensitive to development due to its- (i) biological diversity; (ii) natural characteristics; (iii) scientific, cultural, historical, archaeological or geological value; (iv) scenic and landscape value; or (v) provision of environmental goods and services; to protect a specific ecosystem outside of a special nature reserve, world heritage site or nature reserve; to ensure that the use of natural resources in the area is sustainable. This Act explicitly states that no development, construction or farming may be permitted in a nature reserve or world heritage site without the prior written approval of the management authority.

5.2.5 The National Environmental Management Act 107 of 1998 (NEMA) Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal and Avifaunal Species

This protocol provides the criteria for the specialist assessment and minimum report content requirements for impacts on terrestrial animal and/or avifaunal species for activities requiring environmental authorisation. This protocol replaces the requirements of Appendix 6 of the Environmental Impact Assessment Regulations. The assessment and reporting requirements of this protocol are associated with a level of environmental sensitivity identified by the national web based environmental screening tool (screening tool) for terrestrial animal species. The relevant terrestrial animal species data in the screening tool has been provided by the South African National Biodiversity Institute (SANBI).

5.3 Provincial Legislation

The current legislation applicable to the conservation of fauna and flora in the Eastern Cape are:

5.3.1 Cape Nature and Environmental Conservation Ordinance 19 of 1974

To consolidate and amend the laws relating to nature and environmental conservation and to provide for matters incidental thereto in the former Cape Province, excluding the former Transkei and Ciskei.

5.3.2 Ciskei Nature Conservation Act 1987

To consolidate and amend the laws relating to the conservation, management and protection of fauna, flora and fish and their habitats generally, to provide for the establishment and management of nature reserves, hiking trails, water catchment areas and a coastal conservation areas, to provide for matters relating to the sea and the seashore and to provide for incidental matters.

5.3.3 Transkei Environmental Conservation Decree 9 of 1992

The Transkei Environmental Conservation Decree 9 of 1992 consolidates and amends the laws relating to the conservation, management, protection and commercial utilization of indigenous fauna and flora and their habitats on land, in fresh water and in the sea excluding national parks; to provide for the establishment of the Council for the Environment; to provide for the establishment and management of national wildlife reserves, protected natural environments limited development areas, camping areas, hiking trails, water catchment areas and coastal conservation areas.

5.3.4 Eastern Cape Biodiversity Conservation Plan (2019)

This biodiversity conservation plan addresses the urgent need to identify and map critical biodiversity areas and priorities for conservation in the Province. It also provides land use planning guidelines, recommending biodiversity-friendly activities in priority areas. Spatial mapping information can be used both reactively and strategically to guide future development away from sensitive and priority biodiversity areas.

5.3.5 Eastern Cape Environmental Management Bill in terms of Rule 147 (2019)

This bill rationalises, consolidates and reforms the law regulating environmental management and to provide for the harmonisation of provincial legislation with national legislation regulating protected areas, biodiversity, waste management and air quality; and to provide for matters connected therewith. This Bill has not yet been signed into law.

5.4 Species Assessment Guidelines

The SANBI *Species Environmental Assessment Guideline* provides background and context to the assessment and minimum reporting criteria contained within the Terrestrial Animal and Plant Species Protocols; and provides guidance on sampling and data collection methodologies for the different taxonomic groups that are represented in the respective protocols. This guideline is intended for specialist studies undertaken for activities that have triggered a listed and specified activity in terms of the National Environmental Management Act, 1998 (No. 107 of 1998) (NEMA), as identified by the EIA Regulations, 2014 (as amended) and Listing Notices 1-3.

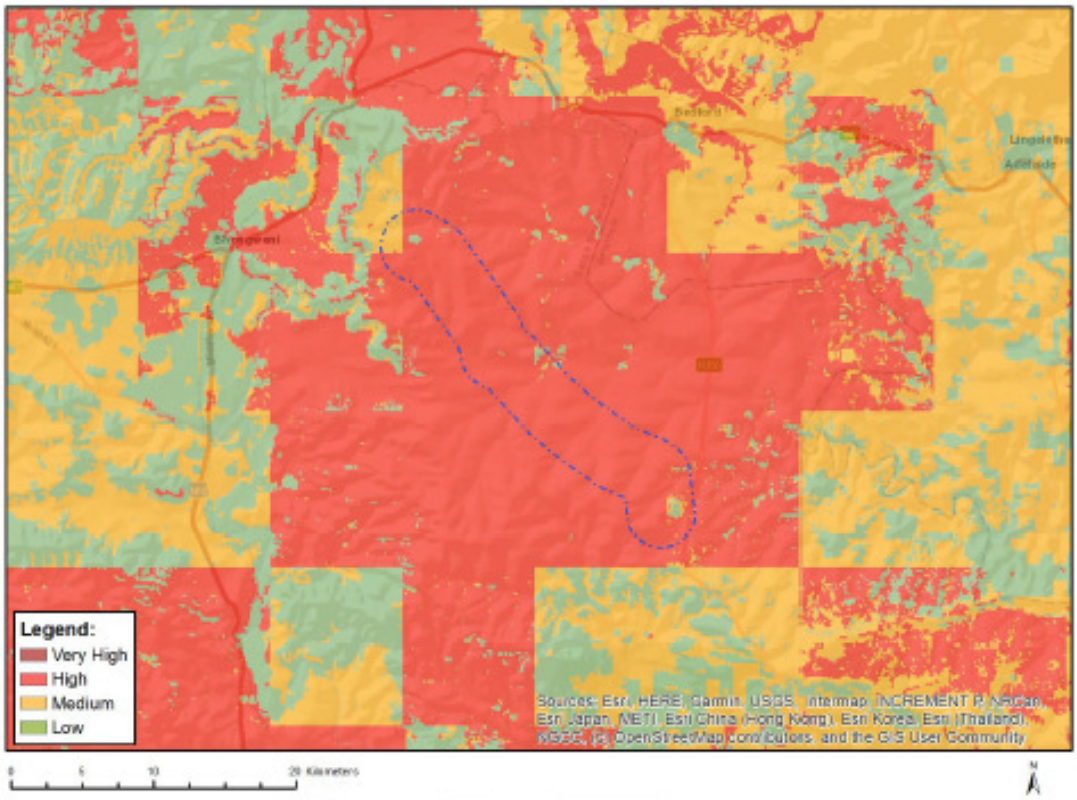
6 BASELINE ASSESSMENT

6.1 DFFE National Screening Tool

The PAOI is classified as **MEDIUM and HIGH** (but mostly HIGH) sensitivity for terrestrial animals according to the Terrestrial Animal Species Theme (Figure 4). These classifications are linked to the potential occurrence of Denham's Bustard *Neotis denhami* (Regionally Vulnerable), Ludwig's Bustard *Neotis ludwigii* (Globally and Regionally Endangered), Black Harrier *Circus maurus* (Globally and Regionally Endangered), Burchell's Courser *Cursorius rufus* (Regionally Vulnerable), Martial Eagle *Polemaetus bellicosus* (Globally and Regionally Endangered), Southern Black Korhaan *Afrotis afra* (Globally and Regionally Vulnerable) and White-bellied Bustard *Eupodotis senegalensis* (Regionally Vulnerable).

The PAOI contains confirmed habitat for the above-mentioned and other SCCs 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). It is important to note that Black Harrier *C. maurus* has not been recorded during the SABAP2 atlassing period to date, nor during the field survey in March 2022. However, this species was recorded during transect and vantage point monitoring conducted in 2010-2011 at the proposed Msenge Emoyeni WEF. It was identified as a locally resident or visiting raptor, foraging in or moving through the broader area, that will be vulnerable to collision and displacement impacts associated with a development of this kind. Both Ludwig's Bustard *N. ludwigii* and Denham's Bustard *N. denhami* have been recorded during the SABAP2 surveys, the latter also observed during the field survey. Based on these and observations of Blue Crane *Grus paradisea*, Secretarybird *Sagittarius serpentarius*, Cape Vulture *Gyps coprotheres*, Verreaux's Eagle *Aquila verreauxii* and Martial Eagle *Polemaetus bellicosus* made during the March 2022 surveys, the classification of **HIGH** sensitivity for avifauna in the screening tool is therefore confirmed for the PAOI (Figure 4).

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



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

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Neotis denhami
High	Aves-Cursorius rufus
High	Aves-Circus maurus
High	Aves-Neotis ludwigii
High	Aves-Polemaetus bellicosus
High	Aves-Afrotis afra
High	Aves-Eupodotis senegalensis
Low	Subject to confirmation
Medium	Aves-Circus maurus
Medium	Aves-Neotis denhami
Medium	Aves-Stephanoaetus coronatus
Medium	Aves-Neotis ludwigii
Medium	Aves-Afrotis afra

Figure 4: The National Web-Based Environmental Screening Tool map of the primary PAOI, indicating sensitivities for the Terrestrial Animal Species theme. The High and Medium sensitivity classifications are linked to Denham's Bustard *Neotis denhami* (Regionally Vulnerable), Ludwig's Bustard *Neotis ludwigii* (Globally and Regionally Endangered), Black Harrier *Circus maurus* (Globally and Regionally Endangered), Burchell's Courser *Cursorius rufus* (Regionally Vulnerable), Martial Eagle *Polemaetus bellicosus* (Globally and Regionally Endangered), Southern Black Korhaan *Afrotis afra* (Globally and Regionally Vulnerable) and White-bellied Korhaan *Eupodotis senegalensis* (Regionally Vulnerable).

6.2 Protected Areas

Two protected areas occur within a 30km radius of the primary PAOI. The Somerset East Bosberg Nature Reserve and Molweni Protected Environment (Figure 5). The Somerset East Bosberg Nature Reserve is characterised by, tall forest, grassy plains as well as Karoo succulents and mountain fynbos that support at least 83 species of birds. No information could be obtained for the Molweni Protected Environment, but it is assumed that the diversity and abundance of avifauna in the reserve will be similar to the surrounding area. It is not expected that the proposed project will impact on avifauna in these reserves due to the distance from the project.

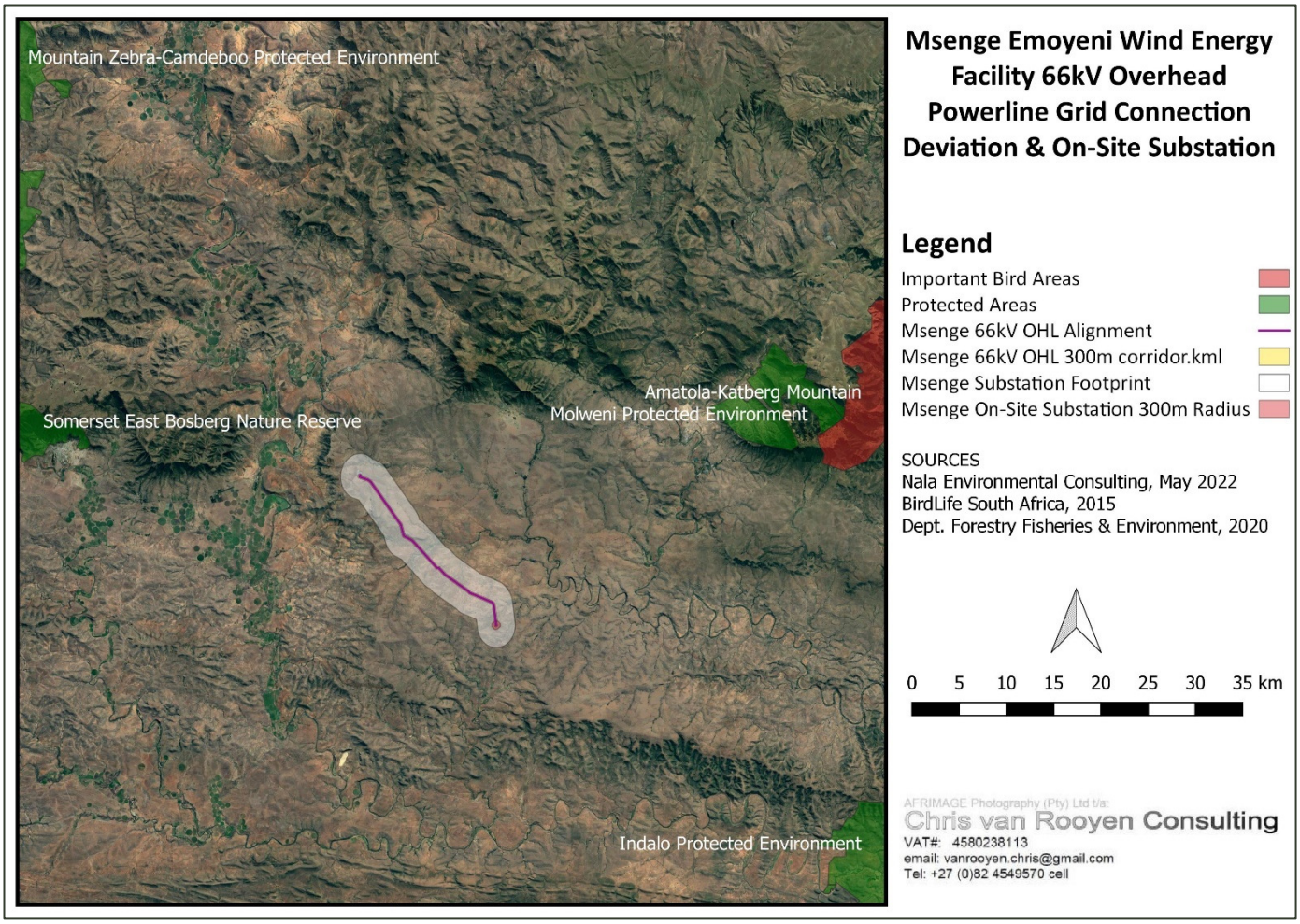


Figure 5: Regional map detailing the location of the proposed Msenge Emoyeni 66kV OHL grid connection deviation and on-site substation project in relation to Important Bird Areas (IBAs) and Protected Areas.

6.3 Important Bird Areas

The Primary POAI does not overlap with any Important Bird Areas (IBAs). The closest IBA is the Amatola-Katberg Mountain IBA (SA092) which is located approximately 35km to the north-east (Figure 5) of the proposed Msenge Emoyeni WEF 66kV grid connection and on-site substation (BLSA, 2015). This IBA is centred on the rugged Amatola Mountain range with its steep slopes, thickly forested gorges and high altitude grasslands. These habitats support globally threatened species such as Blue Crane *G. paradiseus* , Denham's Bustard *N. denhami*, Grey Crowned Crane *Balearica regulorum* (flocks of up to 200 individuals have been recorded), Secretarybird *S. serpentarius*, Crowned Eagle *Stephanoaetus coronatus,* Kynsna Woodpecker *Campethera notata* and Bush Blackcap *Campethera notata*. Regionally threatened species that feature prominently include Cape Parrot *Poicephalus robustus robustus* (300–500 individuals), African Marsh Harrier *Circus ranivorus*, Lanner Falcon *Falco biarmicus* and Orange Ground Thrush *Zoothera gurneyi*. In addition, range and biome-restricted species that are fairly common include Forest Buzzard *Buteo trizonatus*, Knysna Turaco *Turaco corythaix*, Grey Cuckooshrike *Coracina caesia*, Buff-streaked Chat *Campicoloides bifasciata*, Chorister Robin-Chat *Cossypha dichroa*, White-starred Robin *Pogonocichla stellata*, Barratt's Warbler *Bradypterus barratti*, Yellow-throated Woodland Warbler *Phylloscopus ruficapilla*, Olive Bush-

Shrike *Chlorophoneus olivaceus*, Grey Sunbird *Cyanomitra veroxii*, Swee Waxbill *Coccopygia melanotis* and Forest Canary *Crithagra scotops* (BLSA, 2015).

This IBA is a considerable distance from the proposed development area, and will therefore not be directly affected by the construction and operation of the proposed Msenge Emoyeni WEF 66kV grid connection and on-site substation. It must however be noted that similar vegetation types i.e. grassland and thicket do occur within the development area and species that are supported by these vegetation units within the IBA, are also likely to occur in the proposed PAOI and may be impacted on by the construction and operation of the 66kV OHL and on-site substation. These impacts will negatively affect these species if the necessary avoidance and mitigation measures are not implemented.

6.4 Biomes and Vegetation Types

The primary PAOI is located within the Grassland biome (Mucina & Rutherford 2012), and comprises of a single vegetation unit i.e. Bedford Dry Grassland (Figure 6), a sub-escarpment grassland type. This vegetation unit is found east of Fort Beaufort and is located on gently undulating plains that supports open, dry grassland interspersed with *Acacia karroo* woodland vegetation, especially along drainage lines. The grassland is relatively short (10-100cm in height) and is dominated by *Digitaria argyrograpta, Tragus koelerioides, Eragrostis curvula* and *Cymbopogon caesius*. It may also contain a dwarf shrubby component of karroid origin.

Whilst the distribution and abundance of the bird species in the development area are typical of the broad vegetation types, it is also necessary to examine bird habitats in more detail as it may influence the distribution and behaviour of priority species. These are discussed in more detail below. The priority species most likely associated with the various bird habitat features are listed in Table 2.

6.5 Bird Habitats

6.5.1 Grassland

Grassland habitat dominates that PAOI and represents a significant feeding area for many bird species. Specifically, open grassland areas typically attract the following power line sensitive species: Blue Crane *G. paradiseus*,Grey Crowned Crane *B. regulorum* Secretarybird *S. serpentarius*, Denham's Bustard *N. denhami*, Ludwig's Bustard *N. ludwigii*, Kori Bustard *A. kori*, White-bellied Bustard *E. senegalensis*, Southern Black Korhaan *Afrotis afra*, Amur Falcon *F. amurensis*, Lanner Falcon *F. biarmicus* Greater Kestrel *Falco rupicoloides*, Lesser Kestrel *F. naumanni*, Black-winged Kite *Elanus caeruleus* and White-necked Raven *Corvus albicollis.* Small passerine species such as larks and pipits are also likely to feature prominently within this habitat type. Although these smaller species may not suffer direct mortality as a result of the proposed development, they may be displaced from the area through the loss of habitat and/or disturbance during construction activities.

6.5.2 Shrubland/Thicket

A much smaller proportion of the PAOI is comprised of the Great Fish Thicket vegetation type (Mucina & Rutherford 2006). This is the easternmost vegetation unit assigned to the Albany Thicket Biome and is characterised by deep, wide river valleys supporting short, medium and tall thicket types, where both the woody trees and shrubs and the succulent component are well developed, with many spinescent shrubs. This habitat type will typically attract Kori Bustard *A. kori*, White-bellied Bustard *E. senegalensis* and raptors such as Martial Eagle *P. bellicosus,* Common Buzzard *Buteo buteo*, Jackal Buzzard *Buteo rufofuscus*, Pale Chanting Goshawk *Melierax canorus*, African Harrier Hawk *Polyboroides typus*, Yellow-billed Kite *Milvus aegyptius* and Little Sparrowhawk *Accipiter minullus* in addition to small non-Red List passerine species.

6.5.3 Rivers & Drainage Lines

Thirteen species of waterbird are mostly restricted to riverine habitat in southern Africa. Rivers are extremely important sources of water for most bird species and will be regularly utilised not only as a source of drinking water and food, but also for bathing. Although the proposed on-site substation sites and 66kV OHL do not intersect any major rivers, the Great Fish River is a prominent feature in the broader area. Smaller unnamed tributaries and ephemeral drainage lines bisect the PAOI and systems like these may act as corridors of microhabitat for waterbirds. Large pools that form after good rains may persist well into the dry season and aquatic organisms that are found in those pools could provide potential sources of food for both Red List species and the many non-Red List waterbird species (i.e. ducks, herons, grebes and cormorants that have been recorded in the PAOI. In the drier seasons, these shrubby riparian strips probably hold a relatively high species diversity, this is probably mostly comprised of small passerine species, which are generally considered to be at less risk of impact from the construction and operation of powerlines. However, the utilisation of these areas by large terrestrial species cannot be discounted particularly since it is in these areas where small trees occur that are attractive to tree nesters like Secretarybird *S. serpentarius,* Pale Chanting Goshawk *M. canorus* and Gabar Goshawk *M. gabar.*

6.5.4 Surface Waterbodies (Wetlands & Dams)

Many thousands of earthen and other dams exist in the southern African landscape. Whilst dams have altered flow patterns of streams and rivers, and affected many bird species detrimentally, a number of species have benefited from their construction. The construction of these dams has probably resulted in a range expansion for many water bird species that were formerly restricted to areas of higher rainfall. Man-made impoundments can be very important for a variety of birds, particularly waterbirds (Harrison *et al.* 1997). Apart from the water quality, the structure of the dam, and specifically the margins and the associated shoreline and vegetation, plays a big role in determining the species that will be attracted to the dam. Wetlands are characterized by slow flowing seasonal water (or permanently wet) and tall emergent vegetation (rooted or floating) and provide habitat for many water birds. The conservation status of many of the bird species that are dependent on wetlands reflects the critical status of wetlands worldwide, with many having already been destroyed. The wetland areas and dams contained within the PAOI are associated with the river & drainage line systems. These waterbodies are likely to attract Blue Crane *A. paradiseus*, Grey Crowned Crane *B. regulorum*, Black Stork *C. nigra*, African Spoonbill *Platalea alba* as well as the many raptors recorded in the area, that will frequent this habitat for their drinking and bathing needs (Young 2003). Common avifaunal families in the PAOI that could use dams, dam edges and wetlands include ducks, herons, geese, grebes, cormorants and lapwings.

6.5.5 Mountains, Ridges and Rocky Outcrops

The PAOI contains low mountains, exposed ridges and rocky outcrops. Large ridges and cliff lines will provide a suitable breeding substrate, prey base and present favourable air currents, which are typically utilised by raptors. In addition, these areas hold different vegetation (often more woody species) to the plains and as such attract a slightly different suite of bird species. Large eagles such as Verreaux's Eagle *A. verreauxii* are likely to feature prominently in this habitat type. Black Stork *C. nigra* and Lanner Falcon *F. biarmicus* may also breed on these cliffs. Other raptor species that will frequent this habitat type include Jackal Buzzard *B. rufofuscus*, Booted Eagle *Hieraaetus pennatus*, Spotted Eagle-Owl *B. africanus*, African Harrier Hawk *P. typus*, Rock Kestrel *F. rupicolus*, and Yellow-billed Kite *M. aegyptius*.

6.5.6 Alien trees

Although stands of *Eucalyptus* are strictly speaking invader species, they have become important refuges for certain species of raptors, particularly Amur Falcon *F. amurensis*, a Palearctic migrant, which will commonly roost in small stands of *Eucalyptus* in suburbs of small towns. Relevant to this project Amur Falcon *F. amurensis*, Lanner Falcon *F. biarmicus*, Lesser Kestrel *F. naumanni*, Greater Kestrel *F. rupicoloides*, Little Sparrowhawk *A. minullus*, Yellow-billed Kite *M. aegyptius*, Martial Eagle *P. bellicosus* and Booted Eagle *H. pennatus* may utilise this habitat type occasionally.

6.5.7 High voltage lines

Fourteen existing high voltage powerlines are operational within primary PAOI, one of which runs parallel to the proposed Msenge Emoyeni 66kV OHL grid connection deviation alignment, within the 300m grid connection corridor (Figure 6). Transmission lines are an important breeding and roosting substrate for raptors and will typically attract Marital Eagle *P. bellicosus*, Verreaux's Eagle *A. verreauxii*, Booted Eagle *H. pennatus*, Great Kestrel *F. rupicoloides*, Lesser Kestrel *F. naumanni* and Cape Vulture *G. coprotheres,* the latter being observed perching on the high voltage lines during the field survey in March 2022 (Jenkins *et al.* 2013).

See Appendix 5 for photographic record of habitat features in the PAOI, within which the proposed Msenge Emoyeni WEF 66kV OHL grid connection and on-site substation developments occur, and the immediate surroundings.

Table 4-1 details the habitat classes that each Red List bird species typically frequents in the primary and broader areas and Appendix 5 provides a photographic record of the avian habitats in the PAOI.

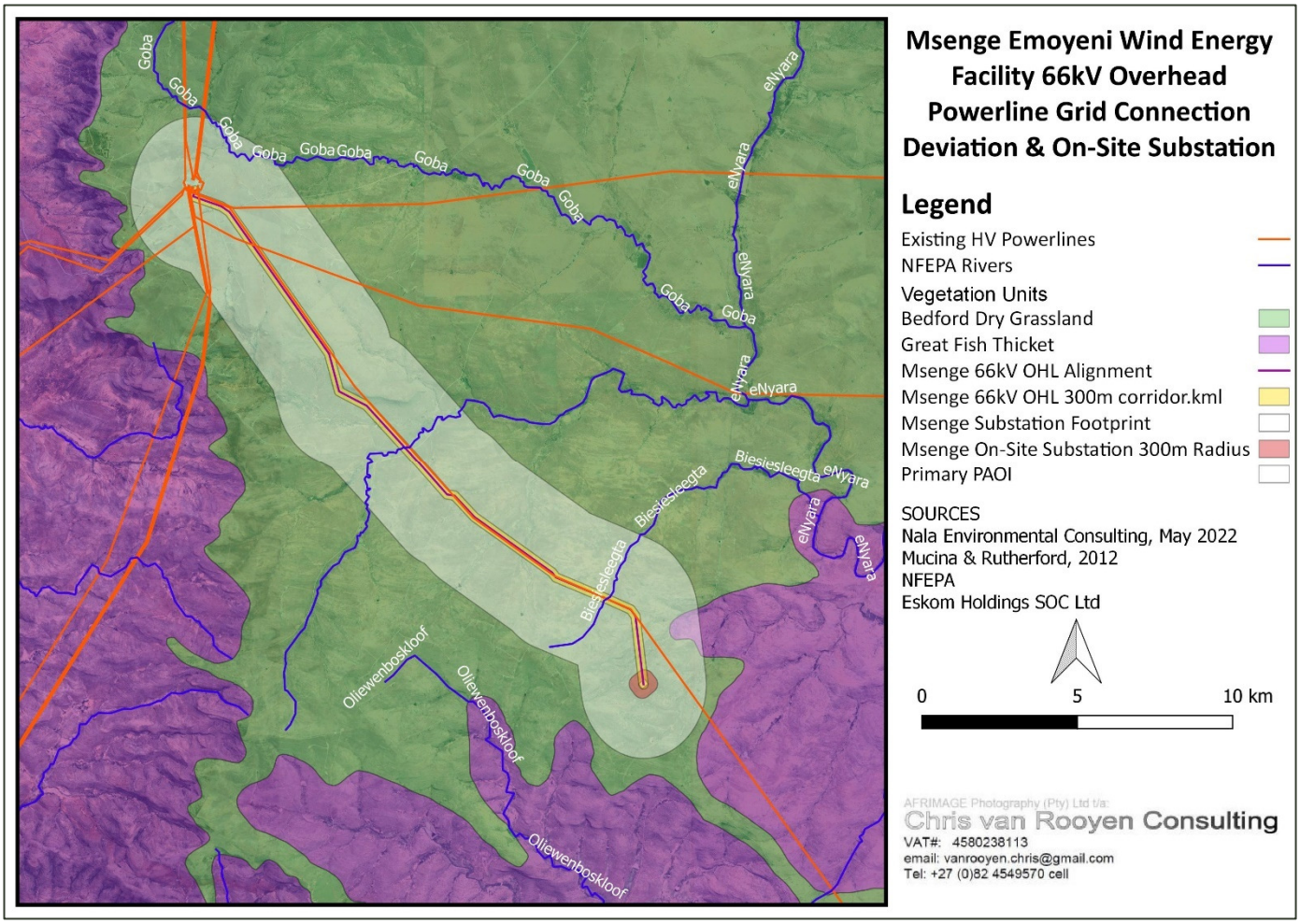


Figure 6: Regional map delineating the vegetation units, river systems and existing high voltage powerlines within the Msenge Emoyeni 66kV OHL grid connection deviation and on-site substation project PAOI

7 AVIFAUNA IN THE PAOI

7.1 South African Bird Atlas Project 2

The SABAP2 data indicates that a total of 213 bird species could potentially occur within the primary PAOI and broader areas of which 14 are regional Red List species (Taylor et al, 2015). Relevant to this grid connection development, 51 species are classified as priority species (see definition of priority species in section 3). Of the priority species, 41 are likely to occur regularly at the primary and broader areas and immediate surrounding area, with the remaining ten occurring sporadically. Appendix 4 provides a comprehensive list of all the species

Table 2 below lists all the priority species and the possible impact on the respective species by the proposed Msenge Emoyeni WEF 66kV OHL grid connection and on-site substation project. The following abbreviations and acronyms are used:

- EN = Endangered
- VU = Vulnerable
- NT = Near Threatened
- LC = Least Concern
- H = High
- M = Medium
- L = Low

Table 2: Priority powerline species potentially occurring within the primary and broader area.

Name		SABAP Reporting Rates		Status						Habitat							Impacts				
Species name	Scientific name	Full protocol	Ad hoc protocol	Red List Global	Red List Regional	Endemic (SA)	Powerline priority	Likelihood of regular occurrence in the PAOI	Recorded during surveys	Grassland	Shrubland/Thicket	Rivers/Drainage Lines	Surface Waterbodies (Dams & Wetlands)	Mountains, Ridges, Rocky Outcrops	Alien Trees	HV Powerlines	On-site Substation - Electrocution	Powerline - Electrocution HV	Powerline - Collision	Displacement: Disturbance	Displacement: Habitat Transformation
African Fish Eagle	Haliaeetus vocifer	0.8	0.0	-	-		x	L				x	x		x				x		x
African Harrier-Hawk	Polyboroides typus	9.3	2.5	-	-		x	M		x	x		x	x	x			x	x		
African Marsh Harrier	Circus ranivorus	0.0	1.3	-	EN		x	L					x						x		x
African Sacred Ibis	Threskiornis aethiopicus	5.9	1.3	-	-		x	M		x		x	x		x			x	x	x	
African Spoonbill	Platalea alba	4.2	1.3	-	-		x	H	x			x	x							x	
Amur Falcon	Falco amurensis	5.1	0.0	-	-		x	M		x					x			x			
Black Stork	Ciconia nigra	0.0	1.3	-	VU		x	L				x	x	x						x	x
Black-headed Heron	Ardea melanocephala	28.8	13.9	-	-		x	H	x									x	x	x	
Black-winged Kite	Elanus caeruleus	26.3	11.4	-	-		x	H		x					x	x		x			
Blue Crane	Grus paradisea	62.7	15.2	VU	NT		x	H	x	x			x							x	x
Booted Eagle	Hieraaetus pennatus	0.8	0.0	-	-		x	L					x	x	x	x		x	x		x
Cape Crow	Corvus capensis	58.5	25.3	-	-		x	H		x	x				x	x		x	x		x
Cape Vulture	Gyps coprotheres	9.3	1.3	EN	EN		x	H	x	x	x		x	x	x	x			x	x	
Common Buzzard	Buteo buteo	17.8	5.1	-	-		x	H	x	x	x		x		x	x		x	x		
Common Moorhen	Gallinula chloropus	0.8	0.0	-	-		x	L				x	x								
Denham's Bustard	Neotis denhami	16.9	2.5	NT	VU		x	H	x	x										x	x
Egyptian Goose	Alopochen aegyptiaca	47.5	12.7	-	-		x	H	x			x	x							x	
Gabar Goshawk	Micronisus gabar	1.7	0.0	-	-		x	L				x	x		x			x			
Greater Kestrel	Falco rupicoloides	2.5	0.0	-	-		x	M		x	x				x	x		x			x
Grey Crowned Crane	Balearica regulorum	0.8	0.0	EN	EN		x	L		x			x						x	x	x
Grey Heron	Ardea cinerea	13.6	5.1	-	-		x	H	x										x	x	
Hadada Ibis	Bostrychia hagedash	55.1	20.3	-	-		x	H	x	x		x	x		x	x		x	x	x	
Hamerkop	Scopus umbretta	1.7	1.3	-	-		x	L				x	x							x	
Helmeted Guineafowl	Numida meleagris	37.3	8.9	-	-		x	H		x	x		x		x	x		x	x	x	x
Jackal Buzzard	Buteo rufofuscus	32.2	6.3	-	-	x	x	H	x	x	x		x	x	x	x		x	x		x
Kori Bustard	Ardeotis kori	0.8	0.0	NT	NT		x	M		x	x									x	x
Lanner Falcon	Falco biarmicus	2.5	2.5	-	VU		x	M		x			x	x	x			x			x

Name		SABAP Reporting Rates		Status						Habitat							Impacts				
Species name	Scientific name	Full protocol	Ad hoc protocol	Red List Global	Red List Regional	Endemic (SA)	Powerline priority	Likelihood of regular occurrence in the PAOI	Recorded during surveys	Grassland	Shrubland/Thicket	Rivers/Drainage Lines	Surface Waterbodies (Dams & Wetlands)	Mountains, Ridges, Rocky Outcrops	Alien Trees	HV Powerlines	On-site Substation - Electrocution	Powerline - Electrocution HV	Powerline - Collision	Displacement: Disturbance	Displacement: Habitat Transformation
Lesser Kestrel	Falco naumanni	1.7	0.0	-	-		x	M		x	x				x	x		x			
Little Grebe	Tachybaptus ruficollis	6.8	3.8	-	-		x	H	x			x	x							x	
Little Sparrowhawk	Accipiter minullus	0.8	0.0	-	-		x	L			x				x			x			x
Ludwig's Bustard	Neotis ludwigii	11.0	2.5	EN	EN		x	H		x										x	x
Martial Eagle	Polemaetus bellicosus	5.1	1.3	EN	EN		x	H	x		x	x	x		x	x		x	x		x
Pale Chanting Goshawk	Melierax canorus	31.4	7.6	-	-		x	H	x	x	x	x	x					x	x		x
Pied Crow	Corvus albus	78.0	39.2	-	-		x	H	x	x	x				x	x		x	x		x
Red-billed Teal	Anas erythrorhyncha	6.8	8.9	-	-		x	M				x	x							x	
Red-knobbed Coot	Fulica cristata	3.4	1.3	-	-		x	M				x	x							x	
Reed Cormorant	Microcarbo africanus	7.6	0.0	-	-		x	M				x	x							x	
Rock Kestrel	Falco rupicolus	50.0	15.2	-	-		x	H	x	x	x			x	x	x		x			x
Secretarybird	Sagittarius serpentarius	16.9	2.5	EN	VU		x	H	x	x	x		x							x	x
South African Shelduck	Tadorna cana	19.5	3.8	-	-		x	H	x			x	x							x	
Southern Black Korhaan	Afrotis afra	13.6	6.3	VU	VU	x	x	H	x	x										x	x
Spotted Eagle-Owl	Bubo africanus	4.2	1.3	-	-		x	H			x			x	x	x		x	x	x	
Spur-winged Goose	Plectropterus gambensis	6.8	1.3	-	-		x	M					x							x	
Verreaux's Eagle	Aquila verreauxii	2.5	0.0	-	VU		x	H	x				x	x	x	x			x	x	x
Western Cattle Egret	Bubulcus ibis	9.3	0.0	-	-		x	H	x	x			x		x					x	x
White-bellied Bustard	Eupodotis senegalensis	16.1	1.3	-	VU		x	H		x	x									x	x
White-breasted Cormorant	Phalacrocorax lucidus	3.4	0.0	-	-		x	H	x			x	x							x	
White-faced Whistling Duck	Dendrocygna viduata	0.0	0.0	-	-		x	H	x			x	x							x	
White-necked Raven	Corvus albicollis	20.3	1.3	-	-		x	H		x	x			x				x	x		x
Yellow-billed Duck	Anas undulata	24.6	7.6	-	-		x	H				x	x							x	
Yellow-billed Kite	Milvus aegyptius	1.7	0.0	-	-		x	L		x	x			x	x			x	x		

7.2 Co-ordinated Avifaunal Roadcount Data

Cranes, bustards, storks and other large birds that spend most of their time on the ground, need wide, open spaces and are certainly not restricted to protected areas. Agricultural habitats are used extensively for feeding, roosting and breeding, often because no natural, pristine habitats are available, and sometimes because the agricultural habitats are especially attractive to birds (Harrison *et al*. 1997). The Coordinated Avifaunal Roadcounts (CAR) project monitors the populations of 36 species of large terrestrial birds in agricultural habitats, in addition to gamebirds, raptors and corvids along 350 fixed routes covering over 19 000km (http://car.adu.org.za/). Although CAR road counts do not give an absolute count of all the individuals in a population, they do provide a measure of relative abundance in a particular area. A single CAR route (EG02) intersects the proposed OHL corridor (Figure 7). Scrutiny of available CAR count data from June 2004 to July 2014 (http://car.adu.org.za/) reveals regular occurrences of Blue Crane *G. paradisea* , Black-headed Heron *Ardea melanocephala*, Southern Black Korhaan *A. afra*, Secretarybird *S. serpentarius*, Denham's Bustard *N. denhami*, Spur-winged Goose *Plectropterus gambensis* and White Stork *C. ciconia*. Ludwig's Bustard *N. ludwigii* was also observed on two occasions. Notable numbers of Blue Crane *G. paradisea* were recorded in July 2012 (n = 65) and January 2013 (n = 32) and significant numbers of White Stork *C. ciconia* in January 2005 (n = 31).

Given the suitable habitat, it is highly likely that large terrestrial birds will regularly occur in areas along the proposed power 66kV OHL grid connection alignment. With the exception of Ludwig's Bustard *N. ludwigii*, Spur-winged Goose *P. gambensis* and White Stork *C. ciconia*, the aforementioned species were observed in the primary PAOI during the field survey in March 2022.

7.3 Co-ordinated Waterbird Count Data

A CWAC site is any body of water, other than the oceans, which supports a significant number (set at approximately 500 individual waterbirds, irrespective of the number of species) of birds which use the site for feeding, and/or breeding and roosting (Harrison *et al*., 2004). This definition includes natural pans, vleis, marshes, lakes, rivers, as well as a range of manmade impoundments (i.e. sewage works). The presence of a CWAC site within the PAOI is an indication of a large number of waterbird species occurring there and the overall sensitivity of the area.

There are no CWAC sites located within the PAOI. Malangskraal is large privately owned dam, situated approximately 1km east of the PAOI (Figure 7). This site is a locally important habitat for wetland birds with at least 50 species recorded regularly (Taylor *et al.* 1999). Red-knobbed Coot, Yellow-billed Duck, Egyptian Goose, Little Grebe and Cape Shoveler have been recorded in significant abundances with the number of individual birds ranging from 109 to 337. While this CWAC site may provide an indication of the waterbird species that could be supported by similar natural and artificial impoundments located in the primary PAOI, this site will not have a significant affect the sensitivity rating of the proposed Msenge Emoyeni WEF 66kV OHL grid connection and on-site substation due to the distance from the PAOI.

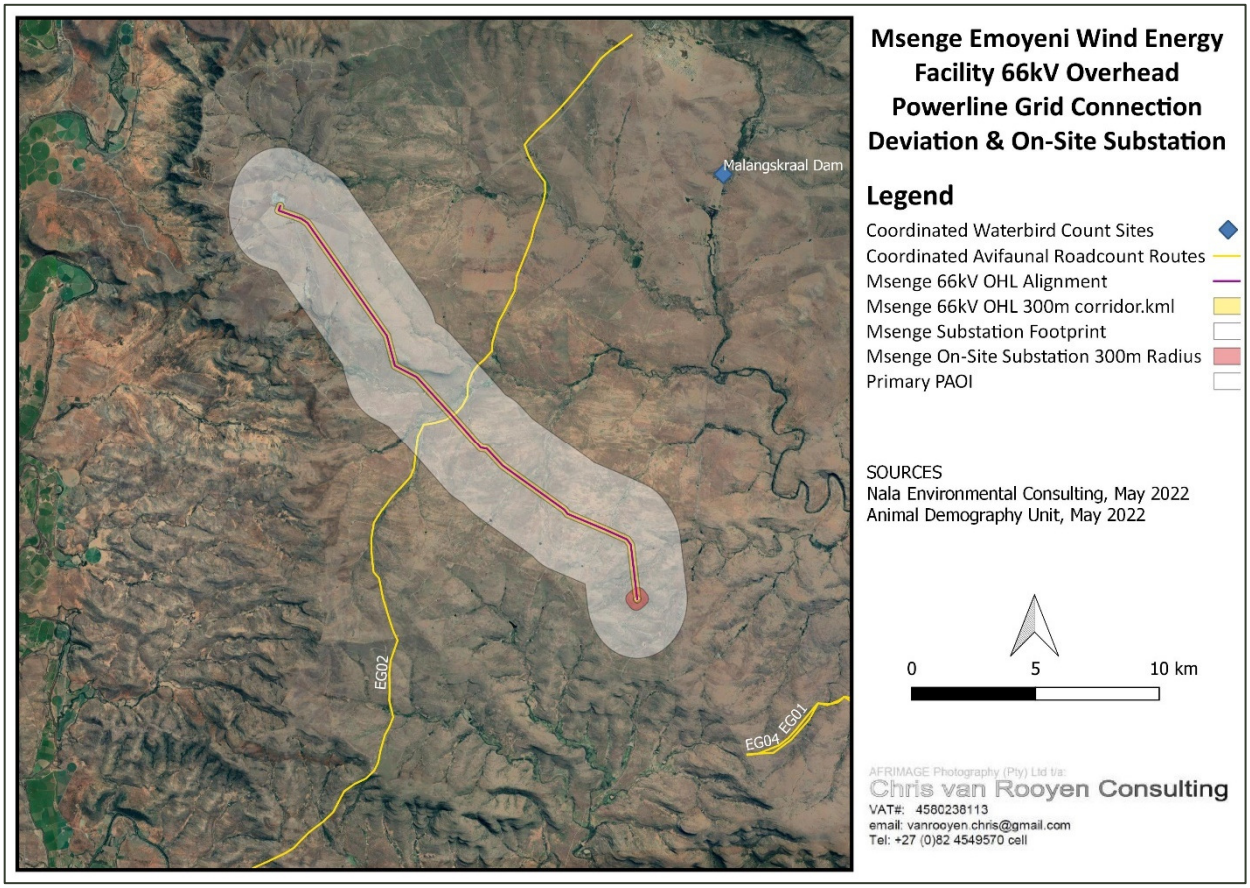


Figure 7: Regional map detailing the location of the primary PAOI in relation to Coordinated Avifaunal Roadcount (CAR) routes and Coordinated Waterbird Count (CWAC) sites

7.4 Vulture Colonies, Nest Locations, Movement & Restaurant Data

Despite being a remarkable part of South Africa's rich and celebrated diversity, vultures are one of a handful of species that are largely ignored and have been saddled with the rather poor reputation of being creatures of the afterlife (Wolter et al, 2013). Their contribution to the environment is enormous - they reduce the spread of diseases such as anthrax and keep rabies in check by minimising contact of the virus with mammalian predators (Sharp, 2001; Mudur, 2001; Hugh-Jones and de Vos, 2002) as well as reduce blow-fly populations. Six of South Africa's vultures are threatened, so their conservation through a variety of mechanisms is an absolute must. The broader area has undergone fairly significant land use changes in recent years, with the establishment of dense human settlement resulting in a loss of habitat, and a reduction in ungulate populations, key threats to this family of birds.

Vultures are a far-ranging species and may forage extensively across the broader area, as carcasses become available (Wolter et al 2010). There is at least one known Cape Vulture *G. coprotheres* colony (Agieskloof) located within a 50km radius north east of the primary PAOI (Figure 8). This is believed to be mainly a summer roost, used by up to 120 birds or even more in the off-season, and much depleted in the winter (from Feb-March to Sept-Oct) when most of these birds move east to breed (Boshoff *et al.* 2009a). Cape Vultures *G. coprotheres* may be attracted to the development area by the combination of (i) open, grassy slopes with good slope soaring conditions, (ii) small stock farming with heavy losses associated with drought and/or lambing and carcasses left where they fall, and (iii) convenient lines of power line pylons to provide safe perch/roost sites.

Cape Vulture *G. coprotheres* are capable of traversing large distances - individuals captured in the Eastern Cape, covered an area of approximately 366 km^2 (Pfeiffer *et al.* 2015) while those captured in the North

West Province and Namibia foraged over much larger areas, approximately 90 845 km^2 and 21 320 km^2 respectively (Bamford *et al.* 2007, Phipps *et al.* 2013b). As a communal cliff-nesting raptor, Cape Vultures *G. coprotheres* form large breeding colonies on suitable rock formations (Benson 2015) and also congregate at overnight roosts (cliffs, on power line poles/towers, or in trees) to sleep (Mundy *et al.* 1992, Dermody *et al.* 2011, Pfeiffer *et al.* 2015). As adult breeding Cape Vulture *G. coprotheres* usually forage within a certain area around a central colony (Boshoff & Minnie 2011), the risk of impact is likely to be greatest closest to these sites. Cape Vulture *G. coprotheres* can be expected to regularly use the air-space within 50km around their roosts and breeding locations, based on fixed kernel density estimates (Venter et al, 2018). Vultures will occur well beyond these zones, but there is a lower probability of them occurring regularly beyond these core foraging ranges. Research suggests that Cape Vulture *G. coprotheres* movement patterns and core foraging ranges are closely associated with the spatial distribution of power lines (Phipps *et al.* 2013). The vultures' ability to traverse vast distances and the high proportion of time they spend foraging outside protected areas and particularly in the vicinity of power lines makes them especially vulnerable to negative interactions (both collision and electrocution) with the expanding power line network across the region and in particular the power line infrastructure that forms part of this project. Continued, unmitigated mortality of adult breeding birds on the power line infrastructure will undoubtedly affect breeding success at breeding locations.

To promote the survival of these high-flying scavengers, the practice of supplemental feeding of vultures in so called vulture restaurants, was initiated and today there are 236 documented vulture restaurants scattered throughout South Africa (Wolter *et al*., 2013). In this system of supplementary feeding, carcasses donated by stock farmers and hunters in the surrounding area are routinely placed out at selected sites, assisting in the continued survival of vultures. Feeding in areas that are traversed by power line infrastructure increases the risk of collision and electrocution. There are no established vulture restaurants within a 50km radius of the project location.

7.4 On-site surveys

A single late summer survey was conducted on 26-30 March 2022 within the PAOI (Figure 3). In order to describe the avifaunal community present, a concerted effort was made to observe the various species in all of the primary habitats that were available within the PAOI.

The site visit produced a combined list of 58 species (Appendix 4 - highlighted in grey), covering both the primary PAOI and to a limited extent, the broader area. Twenty-two priority species were observed along the proposed powerline alignment. SCC recorded during the field survey include, Cape Vulture *G. coprotheres*, Verreaux's Eagle *A. verreauxii*, Martial Eagle *P. bellicosus*, Blue Crane *G. paradisea*, Denham's Bustard *N. denhami* and Secretarybird *S. serpentarius*. All other observations were of small passerine and game bird species that are common to this area. Each of the aforementioned species has the potential to be displaced by the proposed Msenge Emoyeni WEF 66kV grid connection and on-site substation as a result of habitat transformation and disturbance. A single crow's nest was observed within the primary PAOI. An additional eight nests were observed to the south of the broader area, most notably a Secretarybird *S. serpentarius* nest approximately 11km south-west from the proposed on-site substation site (Figure 3). Given the distance, it is unlikely that these birds will be vulnerable to the disturbance impact associated with the construction of the 66kV OHL grid connection and on-site substation.

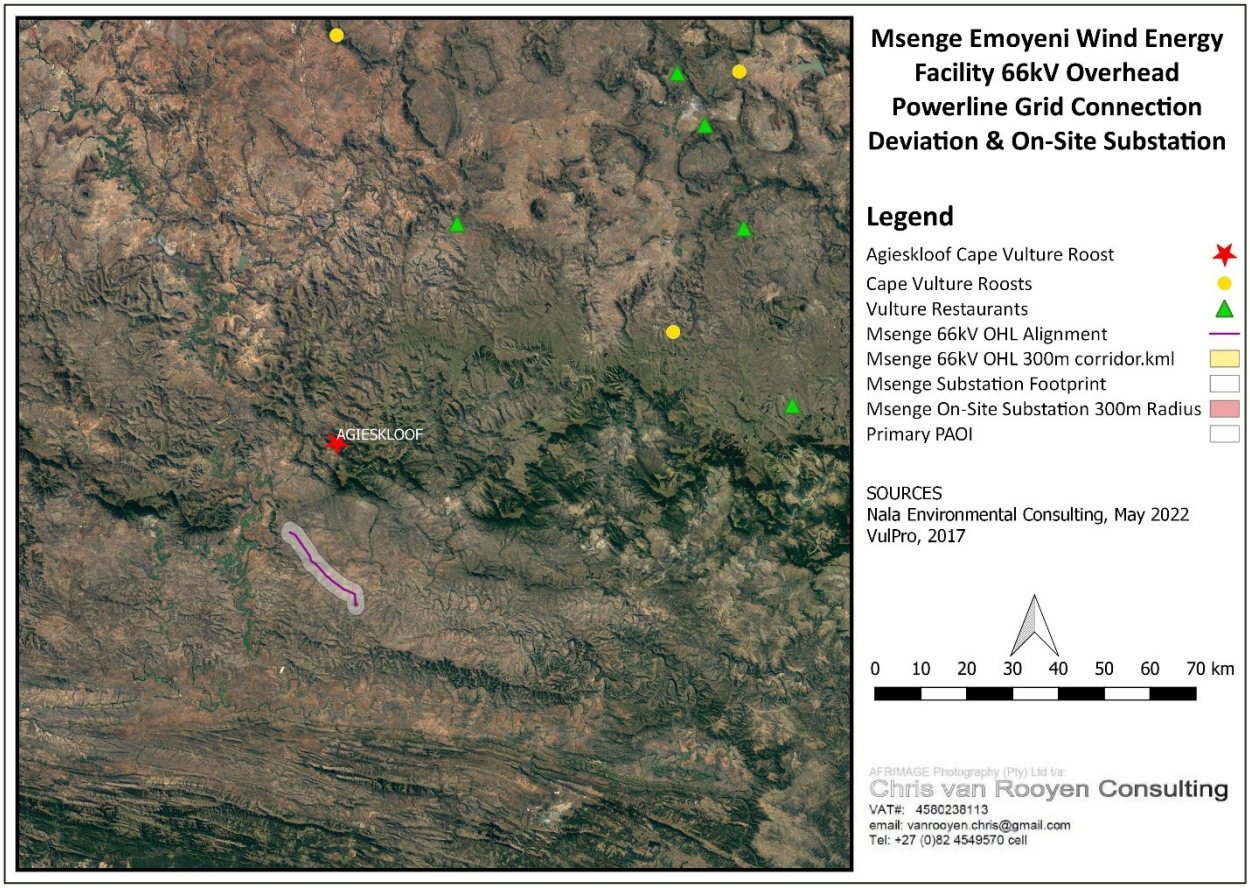


Figure 8: Regional map detailing the location of the proposed Msenge Emoyeni 66kV OHL grid connection deviation and on-site substation project in relation to the Agieskloof Vulture Colony, other Cape Vulture roosts and colonies and Vulture Restaurants

8 IMPACT ASSESSMENT

8.1 General

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

The following potential impacts have been identified:

8.1.1 Construction Phase

- Displacement due to disturbance associated with the construction of the proposed Msenge Emoyeni WEF 66kV OHL and on-site substation; and
- Displacement due to habitat transformation associated with the construction of the proposed Msenge Emoyeni WEF 66kV OHL and on-site substation.

8.1.2 Operational Phase

- Collisions with the proposed Msenge Emoyeni WEF 66kV OHL;

- Electrocution on the proposed 66kV OHL infrastructure; and
- Electrocution of priority species on the electrical infrastructure within the proposed on-site substation.

8.1.3 Decommissioning Phase

- Displacement due to disturbance associated with the decommissioning of the Msenge Emoyeni WEF 66kV OHL and on-site substation.

8.1.4 Cumulative Impacts

- Displacement due to disturbance associated with the construction and decommissioning of the proposed Msenge Emoyeni WEF 66kV OHL and on-site substation;
- Displacement due to habitat transformation associated with the Msenge Emoyeni WEF 66kV OHL and on-site substation;
- Collisions with the proposed Msenge Emoyeni WEF 66kV OHL;
- Electrocution of vultures and large raptors on the proposed Msenge Emoyeni WEF 66kV OHL infrastructure; and
- Electrocution of priority species on the electrical infrastructure within the proposed on-site substation.

8.2 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 voltage size of the proposed powerline and the pole/tower design. Relevant to the proposed Msenge Emoyeni WEF 66kV single circuit OHL, the significance of the electrocution impact on vultures and large raptors is high. The clearance distance between the live and earthed components on a structure of this voltage size cannot accommodate a perching vulture or large-sized raptor. However, should the proposed OHL be constructed using a 132kV tower specification and operated at a voltage of 66kV, the electrocution impact for the majority of priority species will be low. The only priority species capable of bridging the clearance distances of an OHL constructed using this specification is the Cape Vulture recorded in the PAOI, due to their size and gregarious nature.

The final pylon type will be finalized closer to construction, based on detailed design and Geo-technical investigations. The pylon designs must comply with the latest Eskom-EWT "bird-friendly" guidelines/designs and must be finalized in consultation with an avifaunal specialist and the EWT Wildlife and Energy Working Groups.

Electrocutions within the proposed on-site substation are possible, however the likelihood of this impact on the more sensitive Red List priority species is remote, as these species are unlikely to regularly utilise the infrastructure within the onsite substation station for perching or roosting. Species that are more vulnerable to this impact are medium-sized raptors, corvids, owls and certain species of waterbirds. The priority species which are potentially vulnerable to this impact are listed in Table 2, and below:

66kV powerline (depending on tower design):

- Common Buzzard
- Jackal Buzzard

- Grey Crowned Crane
- African Fish Eagle
- Booted Eagle
- Martial Eagle
- Verreaux's Eagle
- Spotted Eagle Owl
- Pale Chanting Goshawk
- Helmeted Guineafowl
- African Marsh Harrier
- African Harrier Hawk
- Black-headed Heron
- African Sacred Ibis
- Hadeda Ibis
- Yellow-billed Kite
- Cape Vulture

On-site substation:

- Common Buzzard
- Jackal Buzzard
- Cape Crow
- Pied Crow
- Booted Eagle
- Martial Eagle
- Spotted Eagle Owl
- Amur Falcon
- Lanner Falcon
- Gabar Goshawk
- Pale Chanting Goshawk
- Helmeted Guineafowl
- African Harrier Hawk
- Black-headed Heron
- African Sacred Ibis
- Hadeda Ibis
- Greater Kestrel
- Lesser Kestrel
- Rock Kestrel
- Black-winged Kite
- Yellow-billed Kite
- White-necked Raven
- Little Sparrowhawk

8.3 Collisions

Collisions are the biggest threat posed by high voltage powerlines 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 high voltage powerlines (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 powerlines is complex and problems are often localised. While any bird flying near a powerline 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 powerlines, 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. Powerlines 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 powerlines that they can see but do not have enough flight control to avoid (Brown et al. 1987, APLIC 2012).

The technical aspects of powerline design and siting also play a big part in collision risk. Grouping similar powerlines 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 powerlines 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 powerline collisions in South Africa (Figure 9).

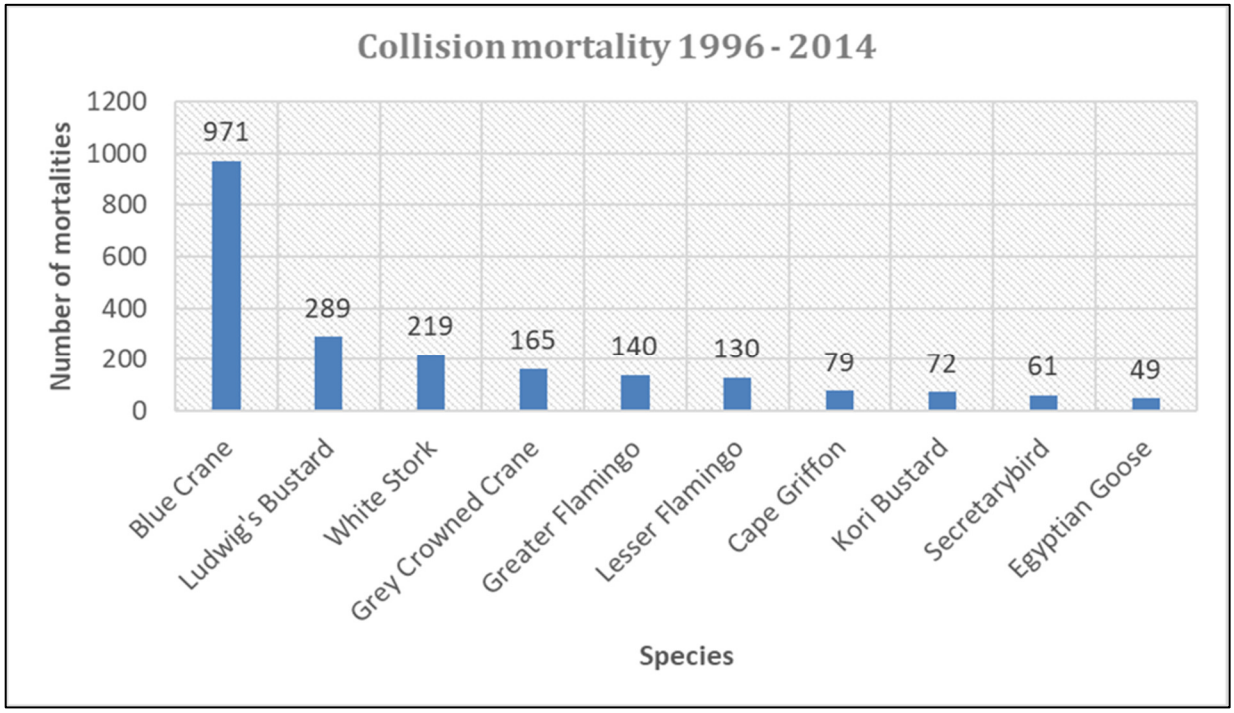


Figure 9: The top ten collision prone bird species in South Africa, in terms of reported incidents contained in the Eskom/Endangered Wildlife Trust Strategic Partnership central incident register 1996 - 2014 (EWT unpublished data)

Powerline 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 powerlines (Shaw 2013).

Several factors are thought to influence avian collisions, including the manoeuvrability of the bird, topography, weather conditions and powerline 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 powerlines, 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 powerlines i.e. Kori Bustard *Ardeotis kori*, Blue Crane and White Stork *Ciconia ciconia*. In all species the frontal visual fields showed narrow and vertically long binocular fields typical of birds that take food items directly in the bill under visual guidance. However, these species differed markedly in the vertical extent of their binocular fields and in the extent of the blind areas which project above and below the binocular fields in the forward-facing hemisphere. The importance of these blind areas is that when in flight, head movements in the vertical plane (pitching the head to look downwards) will render the bird blind in the direction of travel. Such movements may frequently occur when

birds are scanning below them (for foraging or roost sites, or for conspecifics). In bustards and cranes pitch movements of only 25° and 35°, respectively, are sufficient to render the birds blind in the direction of travel; in storks, head movements of 55° are necessary. That flying birds can render themselves blind in the direction of travel has not been previously recognised and has important implications for the effective mitigation of collisions with human artefacts including wind turbines and powerlines. 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 powerline 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 powerline 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:

- Denham's Bustard
- Kori Bustard
- Ludwig's Bustard
- White-bellied Bustard
- Red-knobbed Coot
- Reed Cormorant
- White-breasted Cormorant
- Blue Crane
- Grey Crowned Crane
- Yellow-billed Duck
- White-faced Whistling Duck

- Verreaux's Eagle
- Spotted Eagle-Owl
- Western Cattle Egret
- Egyptian Goose
- Spur-winged Goose
- Little Grebe
- Helmeted Guineafowl
- Hamerkop
- Black-headed Heron
- Grey Heron
- African Sacred Ibis
- Hadeda Ibis
- Southern Black Korhaan
- Secretarybird
- South African Shelduck
- African Spoonbill
- Black Stork
- Red-billed Teal
- Cape Vulture

8.4 Displacement: Habitat Destruction and Disturbance

During the construction of powerlines, service roads (jeep tracks), substations and other associated infrastructure, habitat destruction/transformation inevitably takes place. These activities could impact on birds breeding, foraging and roosting in or in close proximity of the proposed OHL grid connection through the **transformation of habitat**. The construction activities will constitute the following:

- Site clearance and preparation;
- Excavations for infrastructure;
- Construction of the substation and grid connection infrastructure; and
- Transportation of personnel, construction material and equipment to the site, and personnel away from the site.

Relevant to this development, very little mitigation can be applied to reduce the significance of this impact as the total permanent transformation of the natural habitat within the construction footprint of the on-site substation is unavoidable. In the case of the 66kV single circuit OHL, the direct habitat transformation is limited to the on-site substation and pole/tower footprints and the narrow access road/track under the proposed OHL. The habitat in the PAOI is highly uniform from a bird impact perspective. The loss of habitat will be a relatively small percentage of the habitat that regularly supports priority species and the resultant impact is likely to be fairly minimal.

Apart from direct habitat destruction, the above-mentioned 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. Raptors breeding on the existing powerline infrastructure within the PAOI 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:

Displacement: Habitat Loss / Transformation

- Secretarybird
- Denham's Bustard
- Kori Bustard
- Ludwig's Bustard
- White-bellied Bustard
- Common Buzzard
- Jackal Buzzard
- Blue Crane
- Grey Crowned Crane
- Cape Crow
- Pied Crow
- Booted Eagle
- Martial Eagle
- Verreaux's Eagle
- Spotted Eagle-Owl
- Western Cattle Egret
- Amur Falcon
- Lanner Falcon
- Pale Chanting Goshawk
- Helmeted Guineafowl
- African Marsh Harrier
- African Harrier-Hawk
- Black-headed Heron
- Greater Kestrel
- Lesser Kestrel
- Rock Kestrel
- Black-winged Kite
- Yellow-billed Kite
- Southern Black Korhaan
- White-necked Raven
- Little Sparrowhawk
- Black Stork
- Cape Vulture

Displacement: Disturbance

- Denham’s Bustard
- Kori Bustard
- Ludwig’s Bustard
- White-bellied Bustard
- Common Buzzard
- Jackal Buzzard
- Blue Crane
- Grey Crowned Crane
- Cape Crow

- Pied Crow
- African Fish Eagle
- Booted Eagle
- Martial Eagle
- Verreaux's Eagle
- Spotted Eagle-Owl
- Western Cattle Egret
- Lanner Falcon
- Pale Chanting Goshawk
- Helmeted Guineafowl
- African Marsh Harrier
- African Harrier-Hawk
- Greater Kestrel
- Rock Kestrel
- Southern Black Korhaan
- White-necked Raven
- Secretarybird
- Little Sparrowhawk
- Black Stork

9 IMPACT RATING

The Environmental Impact Assessment Methodology assists in evaluating the overall effect of a proposed activity on the environment. The determination of the effect of an environmental impact on an environmental parameter is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the environmental practitioner through the process of the environmental impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts. The impact assessments are summarised in the Tables 3-9 below.

9.1 Determination of Significance of Impacts

Direct, indirect and cumulative impacts associated with the project on priority avifauna is assessed in accordance with the following criteria:

- The nature, which includes a description of what causes the effect, what will be affected and how it will be affected.
- The extent, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5:
  - 1 - site
  - 2 - local
  - 3 - regional
  - 4 - national
  - 5 - international
- The duration, wherein is indicated whether:
  - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1
  - the lifetime of the impact will be of a short duration (2-5 years) – assigned a score of 2
  - medium-term (5–15 years) – assigned a score of 3

- long term (> 15 years) – assigned a score of 4 or
- permanent – assigned a score of 5

- The consequences (magnitude), quantified on a scale from 0-10, where
  - 0 is small and will have no effect on the environment,
  - 2 is minor and will not result in an impact on processes,
  - 4 is low and will cause a slight impact on processes,
  - 6 is moderate and will result in processes continuing but in a modified way,
  - 8 is high (processes are altered to the extent that they temporarily cease), and
  - 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The probability of occurrence, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale of 1–5, where
  - 1 is very improbable (probably will not happen),
  - 2 is improbable (some possibility, but low likelihood),
  - 3 is probable (distinct possibility),
  - 4 is highly probable (most likely) and
  - 5 is definite (impact will occur regardless of any prevention measures).
- The significance, which is determined through a synthesis of the characteristics described above and is assessed as low, medium or high; and
- The status, which is described as either positive, negative or neutral.
- The degree to which the impact can be reversed.
- The degree to which the impact may cause irreplaceable loss of resources.
- The degree to which the impact can be mitigated.

The significance is calculated by combining the criteria in the following formula:

Significance = (Extent + Duration + Magnitude) Probability

The significance weightings for each potential impact are as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

9.1.1 Construction Phase

Table 3: Assessment: Displacement due to disturbance

Nature: Displacement of priority species due to disturbance associated with construction of the 66kV single circuit OHL and on-site substation		
	Without mitigation	**With mitigation**
Extent	2 regional	2 local
Duration	2 short	2 short
Magnitude	8 high	6 moderate
Probability	4 highly probable	3 probable
Significance	**48 medium**	**30 medium**

Status (positive or negative)	negative	negative
Reversibility	low	medium
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	

Mitigation:

- Conduct an inspection (avifaunal walk-through) of the final on-site substation and 66kV single circuit OHL (once pole positions have been finalised) and access road to identify SSC species that may be breeding within the project footprint to ensure that the impacts to breeding species (if any) are adequately managed.
- If an SSC nest is occupied, the avifaunal specialist must consult with the contractor to find ways of minimising the potential disturbance to the breeding birds during the construction period. This could include measures such as delaying some of the activities until after the breeding season.
- 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 use should be made of existing access roads and the construction of new roads should be kept to a minimum.

Residual Risks:

The residual risk of displacement will be reduced to a low level after mitigation, if the proposed mitigation is implemented. The residual risks are also limited by the temporary nature of the impact.

Table 4: Assessment: Displacement due to habitat transformation associated with the on-site substation

Nature: Displacement of priority species due to habitat transformation/loss associated with construction of the on-site substation

	Without mitigation	**With mitigation**
Extent	2 local	2 local
Duration	4 long term	4 long term
Magnitude	6 medium	4 low
Probability	3 probable	improbable
Significance	**36 medium**	**24 low**
Status (positive or negative)	negative	negative
Reversibility	low	medium
Irreplaceable loss of resources?	yes	no
Can impacts be mitigated?	to a limited extent	

Mitigation:

- Vegetation clearance should be limited to what is absolutely necessary.
- The mitigation measures proposed by the vegetation specialist must be strictly enforced.

Residual Risks:

The residual risk of displacement will be reduced after mitigation, but the habitat transformation, and therefore displacement, in the footprint will be permanent.

Table 5: Displacement due to habitat transformation impact assessment associated with the 66kV OHL

Nature: Displacement of priority species due to habitat transformation/loss associated with construction of the 66kV single circuit OHL		
	Without mitigation	**With mitigation**
Extent	1 site	1 site
Duration	2 short term	2 short term
Magnitude	6 moderate	4 low
Probability	3 distinct possibility	2 improbable
Significance	**27 low**	**14 low**
Status (positive or negative)	negative	negative
Reversibility	medium	medium
Irreplaceable loss of resources?	no	no
Can impacts be mitigated?	to a limited extent	
Mitigation: • Vegetation clearance should be limited to what is absolutely necessary. • The mitigation measures proposed by the vegetation specialist must be strictly enforced.		
Residual Risks: The residual risk of displacement is low and is also limited by the temporary nature of the impact as the vegetation in the servitude will regrow afire the construction phase, except in the case of trees that will be permanently removed or trimmed regularly.		

9.1.2 Operational Phase

Table 6: Mortality due to collision impact assessment

Nature: Mortality of priority species due to collisions with the 66kV single circuit OHL		
	Without mitigation	**With mitigation**
Extent	3 regional	3 regional
Duration	4 long term	4 long term
Magnitude	8 high	6 moderate
Probability	4 highly probable	3 probable
Significance	**60 high**	**39 medium**
Status (positive or negative)	negative	negative
Reversibility	low	medium
Irreplaceable loss of resources?	yes	yes
Can impacts be mitigated?	to a limited extent	to a limited extent
Mitigation: Bird Flight Diverters must be fitted to the entire OHL according to the applicable Eskom Engineering Instruction (Eskom Unique Identifier 240 – 93563150: The utilisation of Bird Flight Diverters on Eskom Overhead Lines). These devices must be installed as soon as the conductors and earthwires are strung.		
Residual Risks: There will be an ongoing residual risk of collisions with the 66kV single circuit OHL, but mitigation should make a significant difference, except for bustards.		

Table 7: Mortality due to electrocution impact assessment (66kV single circuit OHL)

Nature: Electrocution of priority species on the Msenge Emoyeni WEF 66kV single circuit OHL infrastructure		
	Without mitigation	**With mitigation**
Extent	3 regional	3 regional
Duration	4 long term	4 long term
Magnitude	8 high	6 moderate
Probability	4 highly probable	2 improbable
Significance	**60 high**	**26 low**
Status (positive or negative)	negative	negative
Reversibility	low	high
Irreplaceable loss of resources?	yes	yes
Can impacts be mitigated?	yes	
Mitigation: The final pylon type will be finalized closer to construction, based on detailed design and Geo-technical investigations. The pylon designs must comply with the latest Eskom-EWT "bird-friendly" guidelines/designs and must be finalized in consultation with an avifaunal specialist and the EWT Wildlife and Energy Working Groups.		
Residual Risks: The residual risk of electrocution will be low once mitigation is implemented.		

Table 8: Mortality due to electrocution impact assessment associated (on-site substation)

Nature: Electrocution of priority species within the on-site substation		
	Without mitigation	**With mitigation**
Extent	3 regional	3 regional
Duration	4 long term	4 long term
Magnitude	6 moderate	4 low
Probability	3 probable	2 improbable
Significance	**39 medium**	**22 low**
Status (positive or negative)	negative	negative
Reversibility	low	high
Irreplaceable loss of resources?	yes	no
Can impacts be mitigated?	yes	
Mitigation: • The hardware within the proposed substation yard is too complex and the risk too low to warrant any mitigation for electrocution at this stage. It is recommended that if on-going impacts are recorded by the maintenance staff once operational, site specific mitigation (insulation) be applied reactively if need be. This is an acceptable approach because Red List priority species are unlikely to frequent the substation, although some more common priority species might well be present more often and exposed to the electrocution risk.		
Residual Risks: The residual risk of electrocution will be low once mitigation is implemented.		

9.1.3 Decommissioning Phase

Table 9: Displacement due to disturbance impact assessment associated with the decommissioning of the on-site substation and 66kV single circuit OHL

Nature: Displacement of priority species due to disturbance associated with decommissioning of the switching station, MTS and overhead power line		
	Without mitigation	**With mitigation**
Extent	2 local	2 local
Duration	1 very short	1 very short
Magnitude	8 high	6 moderate
Probability	4 highly probable	3 probable
Significance	**44 medium**	**27 low**
Status (positive or negative)	negative	negative
Reversibility	low	medium
Irreplaceable loss of resources?	yes	No
Can impacts be mitigated?	yes	
Mitigation: • Conduct an avifaunal inspection of the OHL prior to the commencement of the decommissioning activities. Should any active nests be present, decommissioning activities during the breeding season should be avoided if possible. • 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 use should be made of existing access roads and the construction of new roads should be kept to a minimum.		
Residual Risks: The residual risk of displacement will be reduced to a low level after mitigation, if the proposed mitigation is implemented. The residual risks are also limited by the temporary nature of the impact.		

9.2 Cumulative impacts

"Cumulative Impact", in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities .

The role of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e. whether the addition of the proposed project in the area will increase the impact). This section addresses whether the construction of the proposed development will result in:

- Unacceptable risk
- Unacceptable loss
- Complete or whole-scale changes to the environment
- Unacceptable increase in impact

The proposed Msenge Emoyeni WEF 66kV OHL grid connection deviation project equates to a maximum of 22.7kms. There are approximately 14 existing transmission powerlines and significantly more distribution and reticulation lines totalling hundreds of kilometres of existing medium and high voltage lines within the 30km radius around the Msenge Emoyeni WEF 66kV OHL grid connection PAOI (Figure 10). In

addition, the following operational and/or planned renewable energy facilities are located within a 30km radius around the proposed project:

- Amakhala Emoyeni WEF
- Cookhouse WEF
- Golden Valley Project Phase 2 WEF
- Iziduli Emoyeni WEF
- Nojoli WEF
- Middleton WEF
- Spitskop WEF

The combined length of the grid connections associated with these renewable energy facilities could not be established despite extensive internet searches, but it can be assumed to exceed 100km.

The Msenge Emoyeni WEF 66kV OHL grid connection deviation will increase the total number of existing and planned high voltage lines by a very small percentage. The contribution of the proposed grid connection deviation to the cumulative impact of all the high voltage lines is thus LOW. However, the combined cumulative impact of the existing and proposed powerlines on avifauna within a 30km radius is considered to be MODERATE to HIGH.

The cumulative impact of displacement due to disturbance and habitat transformation at the on-site substation, occupying an area of 250m x 200m is considered to be LOW, due to the small size of the footprint and the availability of similar habitat within the 30km radius. The cumulative impact of potential electrocutions within the on-site substation yard is also likely to be LOW as it is expected to be a rare event.

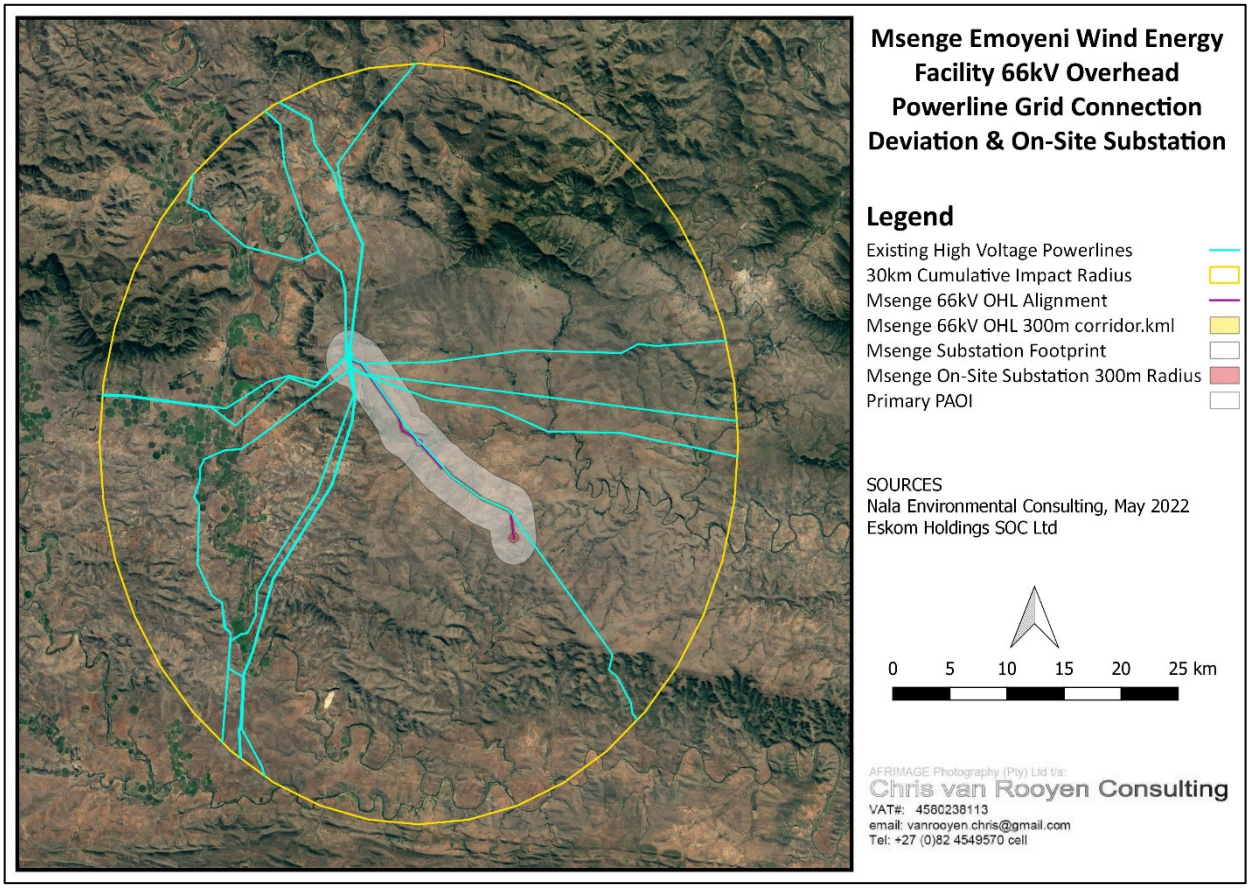


Figure 10: Existing high voltage powerlines within 30km of the proposed Msenge Emoyeni WEF 66kV OHL grid connection and on-site substation project

Table 10: Cumulative Impact Assessment of the powerline collision mortality of priority avifauna due to the construction of the 66kV single circuit OHL

Nature: Powerline collision mortality of priority avifauna due to the construction of the overhead power line.		
	Cumulative impact of the proposed grid connection (post mitigation) within a 30km radius (post mitigation).	**The combined cumulative impact of the proposed grid connection and all the other planned and existing high voltage lines within a 30km radius (post mitigation)**
Extent	1 local	2 regional
Duration	4 long term	4 long term
Magnitude	2 minor	6 moderate
Probability	4 highly probable	4 highly probable
Significance	**28 low**	**48 medium**
Status	negative	negative
Reversibility	medium	medium
Loss of resources?	yes	yes
Can impacts be mitigated?	yes	yes
Confidence in findings: Medium.		

Table 11: Cumulative Impact Assessment of the displacement impact dues to disturbance and habitat transformation of priority avifauna due to the construction of the onsite substation

Nature: Displacement of priority avifauna due to disturbance and habitat transformation of priority avifauna due to the construction of the on-site substation		
	Overall impact of the proposed on-site substation (post mitigation) within a 30km radius (post mitigation).	**Cumulative impact of the proposed on-site substation and other planned and existing substations within a 30km radius (post mitigation)**
Extent	1 local	2 regional
Duration	4 long term	4 long term
Magnitude	2 minor	4 low
Probability	2 improbable	2 improbable
Significance	**14 low**	**20 low**
Status	negative	negative
Reversibility	low	low
Loss of resources?	yes	Yes
Can impacts be mitigated?	yes, but only to some extent	yes, but only to some extent
Confidence in findings: Medium.		

9.3 No-Go Alternative

The no-go alternative will result in the current status quo i.e. natural habitat being maintained at the proposed development site as far as the avifauna is concerned, which would be beneficial to the avifauna currently occurring there.

9.4 Environmental Sensitivities

At a site-specific level, environmentally sensitive features present within the primary PAOI are potential Red List priority species nest locations, and the permanent and ephemeral waterbodies. These areas are deemed to be areas of **HIGH** sensitivity. The construction of the proposed 66kV single circuit OHL across or within close proximity to the waterbodies will necessitate the marking of the powerline with bird flight diverters to mitigate the collision impact.

The remainder of the primary PAOI is considered to be of **MEDIUM - HIGH** sensitivity, given its propensity to support Denham's Bustard, Ludwig's Bustard, Kori Bustard, Blue Crane, Cape Vulture and Secretarybird, and will therefore also require marking of the powerline with bird flight diverters to mitigate the collision impact. In practice this means the entire OHL needs to be marked with bird flight diverters.

Site specific recommendations for the management of any potential disturbance impacts associated with Red List priority species nest locations will be provided following the final avifaunal walk-through (inspection) when the pole positions have been finalised.

10. ENVIRONMENTAL MANAGEMENT PROGRAMME INPUTS

Refer to Appendix 6 for a description of the key mitigation and monitoring recommendations for each applicable mitigation measure identified for all phases of the project.

11. FINAL SPECIALIST STATEMENT AND AUTHORISATION RECOMMENDATION

11.1 Statement and Reasoned Opinion

The expected impacts of the proposed Msenge Emoyeni 66kV OHL grid connection deviation within the 300m corridor and on-site substation project range from MEDIUM to HIGH significance and negative status pre-mitigation. However, with appropriate mitigation, the post-mitigation significance of the identified impacts should be reduced to MEDIUM and LOW negative. No fatal flaws were discovered in the course of the investigation. 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 6) are strictly implemented.

11.2 EA Condition Recommendations

The proposed mitigation measures are detailed in the EMPr (Appendix 6).

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APPENDIX 1: CURRICULUM VITAE

Albert Froneman

Profession/Specialisation	:	Avifaunal Specialist
Highest Qualification	:	MSc (Conservation Biology)
Nationality	:	South African
Years of experience	:	20 years
SACNASP Reg Nr:	:	Registered Professional Natural Scientist (reg. nr 400177/09) – specialist field: Zoological Science

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 Kolkies & 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, Northren 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.

Chris van Rooyen

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

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.

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 Kolkies & Heuweltjies Wind Energy Facilities, Western Cape, 12-month pre-construction monitoring (Mainstream)
60. Great Karoo Wind Energy Facility, Northern Cape, 12-month pre-construction monitoring (African Green Ventures).
61. Mpumalanga & Gauteng Wind and Hybrid Energy Facilities (6x), pre-construction monitoring (Enertrag SA)
62. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (Enertrag SA)
63. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (ACED)
64. Nanibees North & South Wind Energy Facilities, Northern Cape, Screening Report (juwi)
65. Sutherland Wind Energy Facilities, Northern Cape, Screening Report (WKN Windcurrent)
66. Pofadder Wind Energy Facility, Northren Cape, Screening Report (Atlantic Energy)
67. Haga Haga Wind Energy Facility, Eastern Cape, Amendment Report (WKN Windcurrent)
68. Banken Wind Energy Facility, Northern Cape, Screening Report (Atlantic Energy)
69. Hartebeest Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (juwi).
70. Perdekraal East Wind Energy Facility, Touws River, Western Cape, 24 months operational phase monitoring (Mainstream).
71. Great Karoo Wind Energy Facility, Richmond, Northern Cape, 12 months pre-construction monitoring, African Green Ventures.
72. Ezelsjacht Wind Energy Facility, De Doorns, Western Cape, 12-months pre-construction monitoring Mainstream Renewable Power.
73. Canopus Wind Energy Facility, Laingsburg, Western Cape, 12-months pre-construction monitoring WKN Windcurrent.
74. Kangnas Wind Energy Facility, Aggeneys, Northern Cape, 24-months operational monitoring, Mainstream Renewable Power.
75. Taaibosch Wind Energy Facility, Lime Acres, Northern Cape, 12-months pre-construction monitoring, Enertrag SA
76. Mpumalanga & Gauteng Wind and Hybrid Energy Facilities (6x), pre-construction monitoring (Enertrag SA)
77. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (Enertrag SA)
78. Dordrecht Wind Energy Facilities, Eastern Cape, Screening Report (ACED)
79. Nanibees North & South Wind Energy Facilities, Northern Cape, Screening Report (juwi)
80. Kappa Solar PV facility, Touwsrivier, Western Cape, pre-construction monitoring (Veroniva)
81. Sutherland Wind Energy Facilities, Northern Cape, Screening Report (WKN Windcurrent)
82. Pofadder Wind Energy Facility, Northern Cape, Screening Report (Atlantic Energy)
83. Haga Haga Wind Energy Facility, Eastern Cape, Amendment Report (WKN Windcurrent)
84. Banken Wind Energy Facility, Northern Cape, Screening Report (Atlantic Energy)
85. Hartebeest Wind Energy Facility, Western Cape, 12-month pre-construction monitoring (juwi).
86. Iphiko Wind Energy facilities, Laingsburg, Western Cape, screening and pre- construction monitoring (G7 Energies)
87. Kangnas Wind Energy Facility, Northern Cape, Operational Phase 2 years avifaunal monitoring (Mainstream)
88. Perdekraal East Wind Energy Facility, Northern Cape, Operational Phase 2 years avifaunal monitoring (Mainstream)
89. Aberdeen 1, 2 & Aberdeen Kudu (3&4) Wind Energy Facilities, Eastern Cape, 12- month pre-construction monitoring (Atlantic Renewable Energy Partners)
90. Loxton / Beaufort West Wind Energy Facilities, Northern Cape, 12-month pre- construction monitoring (Genesis Eco-Energy Developments)
91. Ermelo & Volksrust Wind Energy Facilities, Northern Cape, Screening Report (WKN Windcurrent)

Bird Impact Assessment Studies for Solar Energy Plants:

1. Concentrated Solar Power Plant, Upington, Northern Cape.
2. Globeleq De Aar and Droogfontein Solar PV Pre- and Post-construction avifaunal monitoring
3. JUWI Kronos PV project, Copperton, Northern Cape
4. Sand Draai CSP project, Groblershoop, Northern Cape
5. Biotherm Helena PV Project, Copperton, Northern Cape
6. Biotherm Letsiao CSP Project, Aggeneys, Northern Cape
7. Biotherm Enamandla PV Project, Aggeneys, Northern Cape
8. Biotherm Sendawo PV Project, Vryburg, North-West
9. Biotherm Tlisitseng PV Project, Lichtenburg, North-West
10. JUWI Hotazel Solar Park Project, Hotazel, Northern Cape
11. Namakwa Solar Project, Aggeneys, Northern Cape

12. Brypaal Solar Power Project, Kakamas, Northern Cape
13. ABO Vryburg 1,2,3 Solar PV Project, Vryburg, North-West
14. NamPower CSP Facility near Arandis, Namibia
15. Dayson Klip PV Facility near Upington, Northern Cape
16. Geelkop PV Facility near Upington, Northern Cape
17. Oya PV Facility, Ceres, Western Cape
18. Vrede and Rondawel PV Facilities, Free State
19. Kolkies & Sadawa PV Facilities, Western Cape
20. Leeuwbosch PV1 and 2 and Wildebeeskuil PV1 and 2 Facilities, North-West
21. Kenhardt PV 3,4 and 5, Northern Cape
22. Wittewal PV, Grootfontein PV and Hoekdoornen PV Facilities, Touws River, Western Cape
23. Aardvark Solar PV facility, Copperton, Northern Cape, 12-month pre-construction monitoring (ABO)
24. Bestwood Solar PV facility, Kathu, Northern Cape, pre-construction monitoring (AMDA)
25. Boundary Solar PV facility, Kimberley, Northern Cape, Site sensitivity verification
26. Rinkhals PV 1 – 6 Solar PV Facility, Kimberley, Northern Cape.

Bird Impact Assessment Studies for the following overhead line projects:

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

56. Endicot 44kV
57. Apollo Lepini 400kV
58. Tarlton-Spring Farms 132kV
59. Kuschke 132kV substation
60. Bendstore 66kV Substation and associated lines
61. Kuiseb 400kV (Namibia)
62. Gyani-Malamulele 132kV
63. Watershed 132kV
64. Bakone 132kV substation
65. Eerstegoud 132kV LILO lines
66. Kumba Iron Ore: SWEP - Relocation of Infrastructure
67. Kudu Gas Power Station: Associated power lines
68. Steenberg Booysendal 132kV
69. Toulon Pumps 33kV
70. Thabatshipi 132kV
71. Witkop-Silica 132kV
72. Bakubung 132kV
73. Nelsriver 132kV
74. Rethabiseng 132kV
75. Tilburg 132kV
76. GaKgapane 66kV
77. Knobel Gilead 132kV
78. Bochum Knobel 132kV
79. Madibeng 132kV
80. Witbank Railway Line and associated infrastructure
81. Spencer NDP phase 2 (5 lines)
82. Akanani 132kV
83. Hermes-Dominion Reefs 132kV
84. Cape Pensinsula Strengthening Project 400kV
85. Magalakwena 132kV
86. Benficosa 132kV
87. Dithabaneng 132kV
88. Taunus Diepkloof 132kV
89. Taunus Doornkop 132kV
90. Tweedracht 132kV
91. Jane Furse 132kV
92. Majeje Sub 132kV
93. Tabor Louis Trichardt 132kV
94. Riversong 88kV
95. Mamatsekele 132kV
96. Kabokweni 132kV
97. MDPP 400kV Botswana
98. Marble Hall NDP 132kV
99. Bokmakiere 132kV Substation and LILO lines
100. Styldrift 132kV
101. Taunus – Diepkloof 132kV
102. Bighorn NDP 132kV
103. Waterkloof 88kV
104. Camden – Theta 765kV
105. Dhuva – Minerva 400kV Diversion
106. Lesedi –Grootpan 132kV
107. Waterberg NDP
108. Bulgerivier – Dorset 132kV
109. Bulgerivier – Toulon 132kV
110. Nokeng-Fluorspar 132kV
111. Mantsole 132kV
112. Tshilamba 132kV
113. Thabamoopo - Tshebela – Nhlovuko 132kV
114. Arthurseat 132kV
115. Borutho 132kV MTS
116. Volspruit - Potgietersrus 132kV
117. Neotel Optic Fibre Cable Installation Project: Western Cape
118. Matla-Glockner 400kV
119. Delmas North 44kV
120. Houwhoek 11kV Refurbishment
121. Clau-Clau 132kV
122. Ngwedi-Silwerkrans 134kV
123. Nieuwehoop 400kV walk-through
124. Booysendal 132kV Switching Station
125. Tarlton 132kV
126. Medupi - Witkop 400kV walk-through
127. Germiston Industries Substation
128. Sekgame 132kV
129. Botswana – South Africa 400kV Transfrontier Interconnector

130. Syferkuil – Rampheri 132kV
131. Queens Substation and associated 132kV 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. Section: Springs To Leandra –"Borrow Pit 12 And Access Road On (Section 9, 6 And 28 Of The Farm Winterhoek N17 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.

APPENDIX 2: DETAILS OF THE SPECIALIST AND EXPERTISE TO COMPILE A SPECIALIST REPORT

Chris van Rooyen (Avifaunal Specialist)

Chris has 26 years' experience in the management of wildlife interactions with electricity infrastructure. He was head of the Eskom-Endangered Wildlife Trust (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 worked in South Africa, Namibia, Botswana, Lesotho, New Zealand, Texas, New Mexico and Florida. Chris also has extensive project management experience and has received several management awards from Eskom for his work in the Eskom-EWT Strategic Partnership. He is the author of 15 academic papers (some with co-authors), co-author of two book chapters and several research reports. He has been involved as ornithological consultant in numerous powerline and wind generation projects. Chris is also co-author of the Best Practice for Avian Monitoring and Impact Mitigation at Wind Development Sites in Southern Africa, which is currently (2016) accepted as the industry standard. Chris also works outside the electricity industry and had done a wide range of bird impact assessment studies associated with various residential and industrial developments.

Albert Froneman (Avifaunal and GIS Specialist) (SACNASP) Prof Natural Scientist (reg. nr 400177/09)

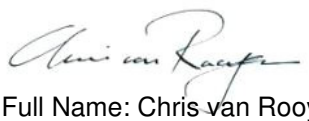
Albert has an M. Sc. In Conservation Biology from the University of Cape Town and started his career in the natural sciences as a Geographic Information Systems (GIS) specialist at Council for Scientific and Industrial Research (CSIR). In 1998, he joined the Endangered Wildlife Trust where he headed up the Airports Company South Africa – EWT Strategic Partnership, a position he held until he resigned in 2008 to work as a private ornithological consultant. Albert's specialist field is the management of wildlife, especially bird related hazards at airports. His expertise is recognized internationally; in 2005 he was elected as Vice Chairman of the International Bird Strike Committee. Since 2010, Albert has worked closely with Chris van Rooyen in developing a protocol for pre-construction monitoring at wind energy facilities, and he is currently jointly coordinating pre-construction monitoring programmes at several wind farm facilities. Albert also works outside the electricity industry and had done a wide range of bird impact assessment studies associated with various residential and industrial developments.

Megan Diamond (Avifaunal Specialist)

Megan completed a Bachelor of Science degree in Environmental Management from the University of South Africa and has been involved in the environmental sector for 20 years. She has 16 years' worth of experience in the field of bird interactions with electrical infrastructure and during this time has completed impact assessments for over 180 projects. Megan currently owns and manages *Feathers Environmental Services* and is tasked with providing guidance to industry through the development of best practice procedures and avifaunal specialist studies for various developments. Megan has attended and presented at several conferences and facilitated workshops, as a subject expert, since 2007. Megan has authored and co-authored several academic papers, research reports and energy industry related guidelines. She chaired the Birds and Wind Energy Specialist Group in South Africa (2011/2012) and the IUCN/SSC Crane Specialist Group's Crane and Powerline Network (2013-2015). She is currently a member of the IUCN Stork, Ibis and Spoonbill Specialist Group and the Eskom-EWT Strategic Partnership Ludwig's Bustard Working Group.

SPECIALIST DECLARATION

I, Chris van Rooyen as duly authorised representative of Chris van Rooyen Consulting, and working under the supervision of and in association with Albert Froneman (SACNASP Zoological Science Registration number 400177/09) as stipulated by the Natural Scientific Professions Act 27 of 2003, hereby confirm my independence (as well as that of Chris van Rooyen Consulting) as a specialist and declare that neither I nor Chris van Rooyen Consulting have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which Nala Environmental (Pty) Ltd was appointed as environmental assessment practitioner in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), other than fair remuneration for worked performed, specifically in connection with the Basic Assessment for the proposed Msenge Emoyeni Wind Energy Facility 66kV Grid Connection Deviation Project.



Full Name: Chris van Rooyen
Position: Director

APPENDIX 3: SITE SENSITIVITY VERIFICATION

1. INTRODUCTION

Msenge Emoyeni Wind Farm (Pty) Ltd is proposing the construction and operation of a 66kV single circuit OHL within a corridor of 300m, that will evacuate power from the proposed 33/132kV Msenge Emoyeni WEF onsite substation to the Poseidon Main Transmission Substation (MTS). The proposed OHL grid connection is routed across nine land portions of the farms: Leeuw Fontein, Normandale, Plat House Poort Kop Leegte, Farm 260, Farm242, Farm 148 and Van Wyks Kraal and includes an OHL that is approximately 22.7km in length, 7m wide access tracks and a 33kV/132kV on-site substation with a footprint occupying an area of 250m x 200m, within a 300m radius to allow movement where possible. The project is located approximately 20km south of the town of Bedford in the Eastern Cape Province. The grid connection infrastructure related to the authorised WEF is located within the Cookhouse Renewable Energy Development Zone ("REDZ") and Eastern Power Corridor (Figure 1).

In terms of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) Environmental Impact Assessment (EIA) Regulations [4 December 2014, Government Notice (GN) R982, R983, R984 and R985, as amended], various aspects of the proposed developments may have an impact on the environment and are considered to be listed activities. These activities require authorisation from the National Competent Authority (CA), namely the Department of Forestry, Fisheries and the Environment (DFFE), prior to the commencement thereof. In accordance with GN 320 and GN 1150 (20 March 2020)[2] of the NEMA EIA Regulations of 2014 (as amended), prior to commencing with a specialist assessment, a site sensitivity verification must be undertaken to confirm the current land use and environmental sensitivity of the proposed project areas as identified by the National Web-Based Environmental Screening Tool (i.e., Screening Tool). Chris van Rooyen, in association with Albert Froneman, as avifaunal specialists, have been commissioned to verify the sensitivity of the project sites under these specialist protocols. The proposed Msenge Emoyeni WEF 66kV OHL grid connection deviation and on-site substation is the subject of this Site Sensitivity Verification report.

[2] GN 320 (20 March 2020): Procedures for The Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(A) and (H) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation

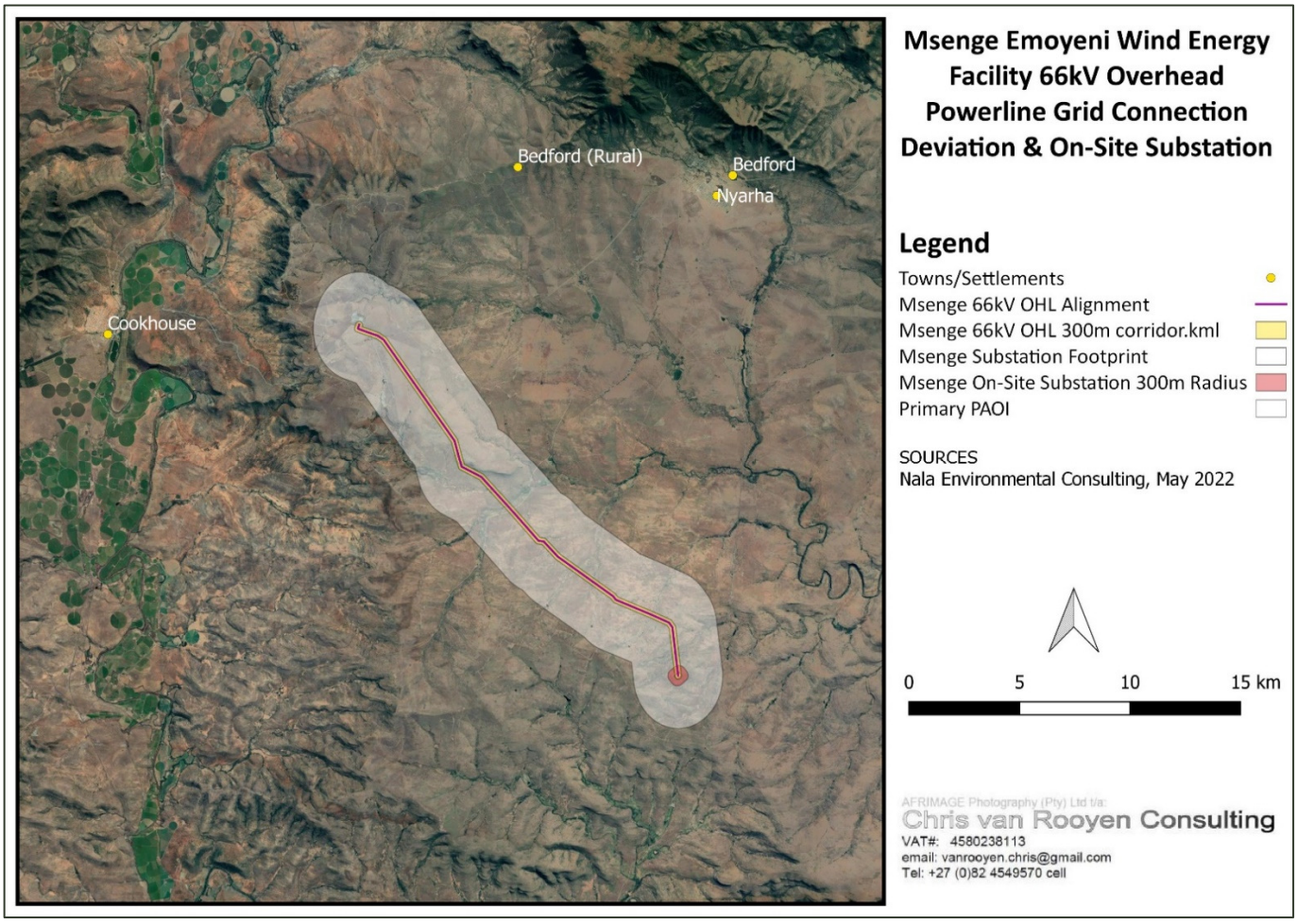


Figure 1: Locality map indicating the location of the Msenge Emoyeni WEF 66kV OHL grid connection and on-site substation within the primary PAOI near Bedford, Eastern Cape Province.

2. SITE SENSITIVITY VERIFICATION METHODOLOGY

The following information sources were consulted to compile this report:

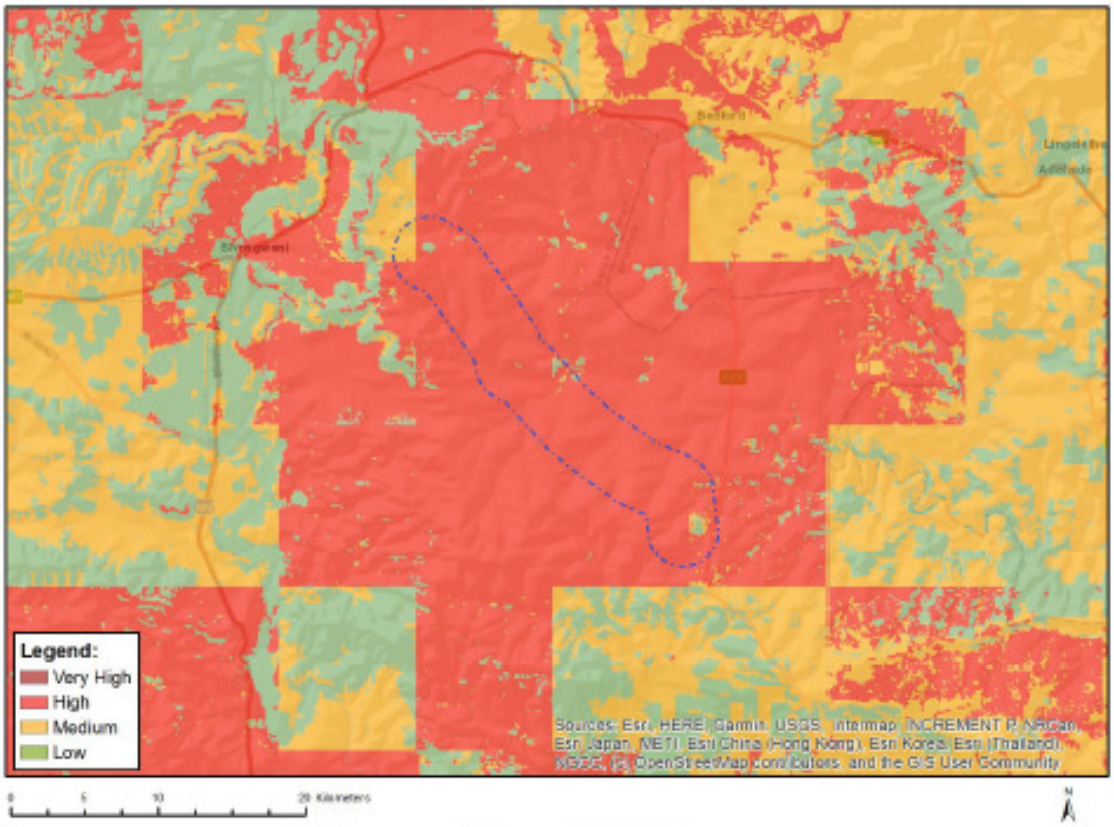
- Bird distribution data from the Southern African Bird Atlas Project 2 (SABAP2) was obtained (http://sabap2.adu.org.za/), in order to ascertain which species occur in the pentads where the proposed development is located. A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'' × 5'). Each pentad is approximately 8 × 7.6 km. To get a more representative impression of the birdlife, a consolidated data set was obtained for a total of six pentads some of which intersect and others that are near the PAOI. The decision to include multiple pentads around the PAOI was influenced by the fact that the pentads within which the proposed development is located have few completed full protocol surveys. The additional pentads and their data augment the bird distribution data. The six pentad grid cells are the following: 3240_2555, 3240_2600, 3245_2555, 3245_2600, 3250_2555 and 3250_2600. A total of 118 full protocol lists (i.e. bird listing surveys lasting a minimum of two hours each) and 79 ad hoc protocol lists (surveys lasting less than two hours but still yielding valuable data) have been completed to date for the six pentads within which the PAOI is located. The SABAP2 data is regarded as a reliable reflection of the avifauna which occurs in the area and is supplemented with data collected during the site visit and extensive general knowledge of the area;
- A classification of the vegetation types in the PAOI was obtained from the Atlas of Southern African Birds 1 (SABAP1) and the National Vegetation Map compiled by the South African National Biodiversity Institute (Mucina & Rutherford 2006);
- 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), and the latest authoritative summary of southern African bird biology (Hockey *et al.* 2005);

- The global threatened status of all priority species was determined by consulting the latest (2021.3) IUCN Red List of Threatened Species (http://www.iucnredlist.org/);
- The Important Bird and Biodiversity Areas of South Africa (Marnewick *et al.* 2015; http://www.birdlife.org.za/conservation/important-bird-areas) was consulted for information on potentially relevant Important Bird Areas (IBAs);
- Satellite imagery (Google Earth © 2022) was used in order to view the broader area on a landscape level and to help identify bird habitat on the ground;
- The South African National Biodiversity BGIS map viewer was used to determine the locality of the PAOI relative to National Protected Areas in the Eastern Cape Province;
- The DFFE National Screening Tool was used to determine the assigned avian sensitivity of the PAOI*: Deviation of the authorised Msenge Emoyeni WEF Powerline and associated infrastructure* dated 8 May, 2022;
- Procedures for the Assessment and Minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of NEMA when applying for Environmental Authorisation (Gazetted October 2020)
- Guidelines for the Implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for EIAs in South Africa produced by the South African National Biodiversity Institute on behalf of the Department of Environment, Forestry and Fisheries (2020);
- *Msenge Emoyeni Wind Energy Facility: Avian Impact Risk Assessment & Mitigation Scheme*, compiled by Dr Andrew Jenkins of Avisense Consulting (2013) and
- Primary avifaunal diversity and abundance data collected during a single season, two-day site visit conducted on 26-30 March 2022. Data was collected by means of incidental counts.

3. DFFE ONLINE SCREENING TOOL

The primary Project Area of Impact PAOI is classified as **MEDIUM and HIGH** (but mostly HIGH) sensitivity for terrestrial animals according to the Terrestrial Animal Species Theme (Figure 2). These classifications are linked to the potential occurrence of Denham's Bustard *Neotis denhami* (Regionally Vulnerable), Ludwig's Bustard *Neotis ludwigii* (Globally and Regionally Endangered), Black Harrier *Circus maurus* (Globally and Regionally Endangered), Burchell's Courser *Cursorius rufus* (Regionally Vulnerable), Martial Eagle *Polemaetus bellicosus* (Globally and Regionally Endangered), Southern Black Korhaan *Afrotis afra* (Globally and Regionally Vulnerable) and White-bellied Bustard *Eupodotis senegalensis* (Regionally Vulnerable).

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



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

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Neotis denhami
High	Aves-Cursorius rufus
High	Aves-Circus maurus
High	Aves-Neotis ludwigii
High	Aves-Polemaetus bellicosus
High	Aves-Afrotis afra
High	Aves-Eupodotis senegalensis
Low	Subject to confirmation
Medium	Aves-Circus maurus
Medium	Aves-Neotis denhami
Medium	Aves-Stephanoaetus coronatus
Medium	Aves-Neotis ludwigii
Medium	Aves-Afrotis afra

Figure 4: The National Web-Based Environmental Screening Tool map of the primary PAOI, indicating sensitivities for the Terrestrial Animal Species theme. The High and Medium sensitivity classifications are linked to Denham's Bustard *Neotis denhami* (Regionally Vulnerable), Ludwig's Bustard *Neotis ludwigii* (Globally and Regionally Endangered), Black Harrier *Circus maurus* (Globally and Regionally Endangered), Burchell's Courser *Cursorius rufus* (Regionally Vulnerable), Martial Eagle *Polemaetus bellicosus* (Globally and Regionally Endangered), Southern Black Korhaan *Afrotis afra* (Globally and Regionally Vulnerable) and White-bellied Korhaan *Eupodotis senegalensis* (Regionally Vulnerable).

12 CONCLUSION

The primary PAOI contains confirmed habitat for the above-mentioned and other SCCs 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). It is important to note that Black Harrier C. maurus has not been recorded during the SABAP2 atlassing period to date, nor during the field survey in March 2022. However, this species was recorded during transect and vantage point monitoring conducted in 2010-2011 at the proposed Msenge Emoyeni WEF. It was identified as a locally resident or visiting raptor, foraging in or moving through the broader area, that will be vulnerable to collision and displacement impacts associated with a development of this kind. Both Ludwig's Bustard *N. ludwigii* and Denham's Bustard *N. denhami* have been recorded during the SABAP2 surveys, the latter also observed during the field survey. Based on these and observations of Blue Crane *Grus paradisea*, Secretarybird *Sagittarius serpentarius*, Cape Vulture *Gyps coprotheres*, Verreaux's Eagle *Aquila verreauxii* and Martial Eagle *Polemaetus bellicosus* made during the March 2022 surveys, the classification of **HIGH** sensitivity for avifauna in the screening tool is therefore confirmed for the primary PAOI (Figure 2).

APPENDIX 4: SABAP 2 SPECIES LIST FOR THE BROADER AREA

Shaded species were recorded during the fieldwork in March 2022

Name		SABAP2 Reporting Rates		Status		
Species name	Scientific name	Full protocol	Ad hoc protocol	Red List Global	Red List Regional	Endemic (SA)
Bokmakierie	*Telophorus zeylonus*	34,7	2,5	-	-	
Hamerkop	*Scopus umbretta*	1,7	1,3	-	-	
Neddicky	*Cisticola fulvicapilla*	54,2	22,8	-	-	
Quailfinch	*Ortygospiza atricollis*	16,9	13,9	-	-	
Secretarybird	*Sagittarius serpentarius*	16,9	2,5	EN	VU	
Bar-throated Apalis	*Apalis thoracica*	29,7	5,1	-	-	
Acacia Pied Barbet	*Tricholaema leucomelas*	52,5	10,1	-	-	
Black-collared Barbet	*Lybius torquatus*	14,4	0,0	-	-	
Cape Batis	*Batis capensis*	5,1	0,0	-	-	
Chinspot Batis	*Batis molitor*	44,9	8,9	-	-	
Pririt Batis	*Batis pririt*	1,7	0,0	-	-	
Southern Red Bishop	*Euplectes orix*	13,6	7,6	-	-	
Yellow Bishop	*Euplectes capensis*	0,8	0,0	-	-	
Southern Boubou	*Laniarius ferrugineus*	10,2	0,0	-	-	
Terrestrial Brownbul	*Phyllastrephus terrestris*	0,8	0,0	-	-	
African Red-eyed Bulbul	*Pycnonotus nigricans*	3,4	0,0	-	-	
Dark-capped Bulbul	*Pycnonotus tricolor*	31,4	10,1	-	-	
Cape Bunting	*Emberiza capensis*	9,3	0,0	-	-	
Cinnamon-breasted Bunting	*Emberiza tahapisi*	11,0	1,3	-	-	
Golden-breasted Bunting	*Emberiza flaviventris*	18,6	2,5	-	-	
Lark-like Bunting	*Emberiza impetuani*	6,8	5,1	-	-	
Olive Bushshrike	*Chlorophoneus olivaceus*	6,8	0,0	-	-	
Orange-breasted Bushshrike	*Chlorophoneus sulfureopectus*	0,8	2,5	-	-	
Denham's Bustard	*Neotis denhami*	16,9	2,5	NT	VU	
Kori Bustard	*Ardeotis kori*	0,8	0,0	NT	NT	
Ludwig's Bustard	*Neotis ludwigii*	11,0	2,5	EN	EN	
White-bellied Bustard	*Eupodotis senegalensis*	16,1	1,3	-	VU	
Common Buttonquail	*Turnix sylvaticus*	1,7	0,0	-	-	
Common Buzzard	*Buteo buteo*	17,8	5,1	-	-	
Jackal Buzzard	*Buteo rufofuscus*	32,2	6,3	-	-	x
Black-headed Canary	*Serinus alario*	2,5	0,0	-	-	x
Black-throated Canary	*Crithagra atrogularis*	1,7	0,0	-	-	
Brimstone Canary	*Crithagra sulphurata*	1,7	0,0	-	-	
Cape Canary	*Serinus canicollis*	6,8	1,3	-	-	
White-throated Canary	*Crithagra albogularis*	1,7	1,3	-	-	
Yellow Canary	*Crithagra flaviventris*	0,8	0,0	-	-	
Yellow-fronted Canary	*Crithagra mozambica*	50,0	26,6	-	-	
Ant-eating Chat	*Myrmecocichla formicivora*	48,3	25,3	-	-	
Familiar Chat	*Oenanthe familiaris*	39,8	5,1	-	-	
Mocking Cliff Chat	*Thamnolaea cinnamomeiventris*	2,5	1,3	-	-	
Sickle-winged Chat	*Emarginata sinuata*	47,5	10,1	-	-	x
Cloud Cisticola	*Cisticola textrix*	45,8	2,5	-	-	x
Desert Cisticola	*Cisticola aridulus*	1,7	0,0	-	-	
Grey-backed Cisticola	*Cisticola subruficapilla*	18,6	0,0	-	-	
Lazy Cisticola	*Cisticola aberrans*	2,5	1,3	-	-	
Wing-snapping Cisticola	*Cisticola ayresii*	3,4	1,3	-	-	
Zitting Cisticola	*Cisticola juncidis*	5,9	0,0	-	-	
Red-knobbed Coot	*Fulica cristata*	3,4	1,3	-	-	
Reed Cormorant	*Microcarbo africanus*	7,6	0,0	-	-	
White-breasted Cormorant	*Phalacrocorax lucidus*	3,4	0,0	-	-	
Burchell's Courser	*Cursorius rufus*	14,4	0,0	-	VU	

Name		SABAP2 Reporting Rates		Status		
Species name	Scientific name	Full protocol	Ad hoc protocol	Red List Global	Red List Regional	Endemic (SA)
Blue Crane	*Grus paradisea*	62,7	15,2	VU	NT	
Grey Crowned Crane	*Balearica regulorum*	0,8	0,0	EN	EN	
Long-billed Crombec	*Sylvietta rufescens*	7,6	1,3	-	-	
Cape Crow	*Corvus capensis*	58,5	25,3	-	-	
Pied Crow	*Corvus albus*	78,0	39,2	-	-	
Black Cuckoo	*Cuculus clamosus*	0,8	0,0	-	-	
Diederik Cuckoo	*Chrysococcyx caprius*	22,0	5,1	-	-	
Great Spotted Cuckoo	*Clamator glandarius*	1,7	0,0	-	-	
Jacobin Cuckoo	*Clamator jacobinus*	3,4	1,3	-	-	
Klaas's Cuckoo	*Chrysococcyx klaas*	5,1	1,3	-	-	
Red-chested Cuckoo	*Cuculus solitarius*	3,4	0,0	-	-	
Cape Turtle Dove	*Streptopelia capicola*	70,3	26,6	-	-	
Laughing Dove	*Spilopelia senegalensis*	18,6	7,6	-	-	
Namaqua Dove	*Oena capensis*	7,6	5,1	-	-	
Red-eyed Dove	*Streptopelia semitorquata*	40,7	12,7	-	-	
Ring-necked Dove	*Streptopelia capicola*					
Rock Dove	*Columba livia*	1,7	1,3	-	-	
Fork-tailed Drongo	*Dicrurus adsimilis*	51,7	0,0	-	-	
Yellow-billed Duck	*Anas undulata*	24,6	7,6	-	-	
White-faced Whistling Duck	*Dendrocygna viduata*			-	-	
African Fish Eagle	*Haliaeetus vocifer*	0,8	0,0	-	-	
Booted Eagle	*Hieraaetus pennatus*	0,8	0,0	-	-	
Martial Eagle	*Polemaetus bellicosus*	5,1	1,3	EN	EN	
Verreaux's Eagle	*Aquila verreauxii*	2,5	0,0	-	VU	
Spotted Eagle-Owl	*Bubo africanus*	4,2	1,3	-	-	
Western Cattle Egret	*Bubulcus ibis*	9,3	0,0	-	-	
Yellow-bellied Eremomela	*Eremomela icteropygialis*	6,8	0,0	-	-	
Amur Falcon	*Falco amurensis*	5,1	0,0	-	-	
Lanner Falcon	*Falco biarmicus*	2,5	2,5	-	VU	
Red-headed Finch	*Amadina erythrocephala*	8,5	5,1	-	-	
African Firefinch	*Lagonosticta rubricata*	5,1	0,0	-	-	
Red-billed Firefinch	*Lagonosticta senegala*	1,7	0,0	-	-	
Southern Fiscal	*Lanius collaris*	51,7	15,2	-	-	
African Dusky Flycatcher	*Muscicapa adusta*	3,4	1,3	-	-	
African Paradise Flycatcher	*Terpsiphone viridis*	3,4	1,3	-	-	
Fiscal Flycatcher	*Melaenornis silens*	19,5	2,5	-	-	x
Southern Black Flycatcher	*Melaenornis pammelaina*	3,4	1,3	-	-	
Grey-winged Francolin	*Scleroptila afra*	4,2	0,0	-	-	x
Egyptian Goose	*Alopochen aegyptiaca*	47,5	12,7	-	-	
Spur-winged Goose	*Plectropterus gambensis*	6,8	1,3	-	-	
Gabar Goshawk	*Micronisus gabar*	1,7	0,0	-	-	
Pale Chanting Goshawk	*Melierax canorus*	31,4	7,6	-	-	
Cape Grassbird	*Sphenoeacus afer*	0,8	0,0	-	-	x
Little Grebe	*Tachybaptus ruficollis*	6,8	3,8	-	-	
Sombre Greenbul	*Andropadus importunus*	19,5	1,3	-	-	
Helmeted Guineafowl	*Numida meleagris*	37,3	8,9	-	-	
African Marsh Harrier	*Circus ranivorus*	0,0	1,3	-	EN	
African Harrier-Hawk	*Polyboroides typus*	9,3	2,5	-	-	
Black-headed Heron	*Ardea melanocephala*	28,8	13,9	-	-	
Grey Heron	*Ardea cinerea*	13,6	5,1	-	-	
Greater Honeyguide	*Indicator indicator*	1,7	0,0	-	-	
Lesser Honeyguide	*Indicator minor*	2,5	0,0	-	-	
African Hoopoe	*Upupa africana*	47,5	17,7	-	-	
Crowned Hornbill	*Lophoceros alboterminatus*	0,8	0,0	-	-	
African Sacred Ibis	*Threskiornis aethiopicus*	5,9	1,3	-	-	

Name		SABAP2 Reporting Rates		Status		
Species name	Scientific name	Full protocol	Ad hoc protocol	Red List Global	Red List Regional	Endemic (SA)
Hadada Ibis	*Bostrychia hagedash*	55,1	20,3	-	-	
Dusky Indigobird	*Vidua funerea*	5,1	1,3	-	-	
Greater Kestrel	*Falco rupicoloides*	2,5	0,0	-	-	
Lesser Kestrel	*Falco naumanni*	1,7	0,0	-	-	
Rock Kestrel	*Falco rupicolus*	50,0	15,2	-	-	
Brown-hooded Kingfisher	*Halcyon albiventris*	20,3	3,8	-	-	
Malachite Kingfisher	*Corythornis cristatus*	0,8	0,0	-	-	
Black-winged Kite	*Elanus caeruleus*	26,3	11,4	-	-	
Yellow-billed Kite	*Milvus aegyptius*	1,7	0,0	-	-	
Southern Black Korhaan	*Afrotis afra*	13,6	6,3	VU	VU	x
Blacksmith Lapwing	*Vanellus armatus*	11,0	8,9	-	-	
Crowned Lapwing	*Vanellus coronatus*	35,6	2,5	-	-	
Eastern Clapper Lark	*Mirafra fasciolata*	33,1	1,3	-	-	
Eastern Long-billed Lark	*Certhilauda semitorquata*	5,1	0,0	-	-	x
Large-billed Lark	*Galerida magnirostris*	49,2	13,9	-	-	x
Melodious Lark	*Mirafra cheniana*	8,5	2,5	-	-	x
Monotonous Lark	*Mirafra passerina*					
Red-capped Lark	*Calandrella cinerea*	41,5	10,1	-	-	
Rufous-naped Lark	*Mirafra africana*	41,5	16,5	-	-	
Sabota Lark	*Calendulauda sabota*	2,5	0,0	-	-	
Spike-heeled Lark	*Chersomanes albofasciata*	45,8	13,9	-	-	
Cape Longclaw	*Macronyx capensis*	37,3	10,1	-	-	
Brown-throated Martin	*Riparia paludicola*	3,4	0,0	-	-	
Common House Martin	*Delichon urbicum*	1,7	0,0	-	-	
Rock Martin	*Ptyonoprogne fuligula*	20,3	2,5	-	-	
Common Moorhen	*Gallinula chloropus*	0,8	0,0	-	-	
Red-faced Mousebird	*Urocolius indicus*	40,7	3,8	-	-	
Speckled Mousebird	*Colius striatus*	23,7	3,8	-	-	
White-backed Mousebird	*Colius colius*	0,8	0,0	-	-	
Fiery-necked Nightjar	*Caprimulgus pectoralis*	22,9	8,9	-	-	
Black-headed Oriole	*Oriolus larvatus*	37,3	1,3	-	-	
African Scops Owl	*Otus senegalensis*	4,2	2,5	-	-	
African Olive Pigeon	*Columba arquatrix*	0,8	0,0	-	-	
Speckled Pigeon	*Columba guinea*	50,0	7,6	-	-	
African Pipit	*Anthus cinnamomeus*	70,3	39,2	-	-	
Long-billed Pipit	*Anthus similis*	0,8	0,0	-	-	
Nicholson's Pipit	*Anthus nicholsoni*	4,2	0,0	-	-	
Plain-backed Pipit	*Anthus leucophrys*	6,8	1,3	-	-	
Three-banded Plover	*Charadrius tricollaris*	9,3	3,8	-	-	
Karoo Prinia	*Prinia maculosa*	16,9	2,5	-	-	x
Black-backed Puffback	*Dryoscopus cubla*	1,7	0,0	-	-	
Common Quail	*Coturnix coturnix*	7,6	3,8	-	-	
Red-billed Quelea	*Quelea quelea*	5,1	2,5	-	-	
White-necked Raven	*Corvus albicollis*	20,3	1,3	-	-	
Cape Robin-Chat	*Cossypha caffra*	38,1	7,6	-	-	
Black Saw-wing	*Psalidoprocne pristoptera*	2,5	0,0	-	-	
Common Scimitarbill	*Rhinopomastus cyanomelas*	0,8	0,0	-	-	
Karoo Scrub Robin	*Cercotrichas coryphoeus*	22,0	7,6	-	-	
White-browed Scrub Robin	*Cercotrichas leucophrys*	11,0	0,0	-	-	
Streaky-headed Seedeater	*Crithagra gularis*	8,5	0,0	-	-	
South African Shelduck	*Tadorna cana*	19,5	3,8	-	-	
Lesser Grey Shrike	*Lanius minor*	0,8	0,0	-	-	
Red-backed Shrike	*Lanius collurio*	1,7	1,3	-	-	
Cape Sparrow	*Passer melanurus*	55,9	16,5	-	-	
House Sparrow	*Passer domesticus*	10,2	6,3	-	-	

Name		SABAP2 Reporting Rates		Status		
Species name	Scientific name	Full protocol	Ad hoc protocol	Red List Global	Red List Regional	Endemic (SA)
Southern Grey-headed Sparrow	*Passer diffusus*	51,7	20,3	-	-	
Yellow-throated Bush Sparrow	*Gymnoris superciliaris*	21,2	6,3	-	-	
Grey-backed Sparrow-Lark	*Eremopterix verticalis*	1,7	0,0	-	-	
Little Sparrowhawk	*Accipiter minullus*	0,8	0,0	-	-	
African Spoonbill	*Platalea alba*	4,2	1,3	-	-	
Red-necked Spurfowl	*Pternistis afer*	0,8	1,3	-	-	
Cape Starling	*Lamprotornis nitens*	42,4	17,7	-	-	
Common Starling	*Sturnus vulgaris*	17,8	8,9	-	-	
Pied Starling	*Lamprotornis bicolor*	50,8	13,9	-	-	x
Red-winged Starling	*Onychognathus morio*	45,8	13,9	-	-	
Wattled Starling	*Creatophora cinerea*	0,8	0,0	-	-	
Black-winged Stilt	*Himantopus himantopus*	3,4	0,0	-	-	
African Stonechat	*Saxicola torquatus*	39,8	27,8	-	-	
Black Stork	*Ciconia nigra*	0,0	1,3	-	VU	
Amethyst Sunbird	*Chalcomitra amethystina*	17,8	1,3	-	-	
Greater Double-collared Sunbird	*Cinnyris afer*	9,3	1,3	-	-	x
Malachite Sunbird	*Nectarinia famosa*	10,2	0,0	-	-	
Southern Double-collared Sunbird	*Cinnyris chalybeus*	5,9	1,3	-	-	x
Barn Swallow	*Hirundo rustica*	33,1	20,3	-	-	
Greater Striped Swallow	*Cecropis cucullata*	37,3	11,4	-	-	
Lesser Striped Swallow	*Cecropis abyssinica*	19,5	1,3	-	-	
Pearl-breasted Swallow	*Hirundo dimidiata*	6,8	0,0	-	-	
White-throated Swallow	*Hirundo albigularis*	17,8	3,8	-	-	
African Black Swift	*Apus barbatus*	5,1	0,0	-	-	
Little Swift	*Apus affinis*	3,4	0,0	-	-	
White-rumped Swift	*Apus caffer*	16,9	2,5	-	-	
Red-billed Teal	*Anas erythrorhyncha*	6,8	8,9	-	-	
Caspian Tern	*Hydroprogne caspia*	0,0	1,3	-	VU	
Spotted Thick-knee	*Burhinus capensis*	28,0	1,3	-	-	
Cape Rock Thrush	*Monticola rupestris*	4,2	0,0	-	-	x
Olive Thrush	*Turdus olivaceus*	5,9	0,0	-	-	
Red-fronted Tinkerbird	*Pogoniulus pusillus*	9,3	0,0	-	-	
Cape Penduline Tit	*Anthoscopus minutus*	3,4	0,0	-	-	
Grey Tit	*Melaniparus afer*	11,0	0,0	-	-	x
Southern Black Tit	*Melaniparus niger*	41,5	5,1	-	-	
Cape Vulture	*Gyps coprotheres*	9,3	1,3	EN	EN	
African Pied Wagtail	*Motacilla aguimp*					
Cape Wagtail	*Motacilla capensis*	45,8	12,7	-	-	
Chestnut-vented Warbler	*Curruca subcoerulea*	33,9	10,1	-	-	
Rufous-eared Warbler	*Malcorus pectoralis*	22,0	2,5	-	-	
Willow Warbler	*Phylloscopus trochilus*	5,1	0,0	-	-	
Common Waxbill	*Estrilda astrild*	8,5	2,5	-	-	
Swee Waxbill	*Coccopygia melanotis*	0,8	0,0	-	-	x
Cape Weaver	*Ploceus capensis*	29,7	5,1	-	-	x
Southern Masked Weaver	*Ploceus velatus*	19,5	2,5	-	-	
Village Weaver	*Ploceus cucullatus*	0,0	2,5	-	-	
Capped Wheatear	*Oenanthe pileata*	7,6	0,0	-	-	
Mountain Wheatear	*Myrmecocichla monticola*	5,9	0,0	-	-	
Cape White-eye	*Zosterops virens*	20,3	1,3	-	-	x
Pin-tailed Whydah	*Vidua macroura*	17,8	16,5	-	-	
Long-tailed Widowbird	*Euplectes progne*	17,8	11,4	-	-	
Red-collared Widowbird	*Euplectes ardens*	0,8	2,5	-	-	
Green Wood Hoopoe	*Phoeniculus purpureus*	16,1	1,3	-	-	
Cardinal Woodpecker	*Dendropicos fuscescens*	5,9	0,0	-	-	
Knysna Woodpecker	*Campethera notata*	1,7	0,0	NT	NT	x

Name		SABAP2 Reporting Rates		Status		
Species name	Scientific name	Full protocol	Ad hoc protocol	Red List Global	Red List Regional	Endemic (SA)
Red-throated Wryneck	*Jynx ruficollis*	1,7	0,0	-	-	

APPENDIX 5: HABITAT WITHIN THE PAOI

Figure 1: Typical grassland habitat which comprises the vast majority of the PAOI.

Figure 2: Shrubby woodland / thicket habitat.

Figure 3: An ephemeral river / drainage line

Figure 4: An example of a large dam within the PAOI

Figure 5: Wetland area

Figure 6: A ridge line within the PAOI

Figure 8: An example of small stands of alien trees

Figure 8: Existing HV powerlines within the PAOI

APPENDIX 6: ENVIRONMENTAL MANAGEMENT PROGRAMME

Management Plan for the Planning and Design Phase

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
66kV Voltage Mortality of avifauna, specifically Cape Vulture and large raptors, due to electrocutions on the overhead powerline poles/towers using steel monopole structures).	Reduction of avian electrocution mortality	The final pylon type will be finalized closer to construction, based on detailed design and Geo-technical investigations. The pylon designs must comply with the latest Eskom-EWT "bird-friendly" guidelines/designs and must be finalized in consultation with an avifaunal specialist and the EWT Wildlife and Energy Working Groups.	1. Construct the powerline using the latest Eskom-EWT "bird-friendly" guidelines/designs.	Once-off	Contractor and ECO

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.)	Conduct an inspection (avifaunal walk-through) when the final pole positions have been determined to identify priority species that may be breeding within the final footprint. If a SSC nest is occupied, the avifaunal specialist must consult with the contractor to find ways of minimising the potential disturbance to the breeding birds during the construction period. This could include measures such as delaying some of the activities until after the breeding season. 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;	1. Walk-through by avifaunal specialist 2. Implementation of the CEMPr. Oversee activities to ensure that the CEMPr is implemented and enforced via site audits and inspections. Report and record any non-compliance. 3. Ensure that construction personnel are made aware of the impacts relating to off-road driving. 4. Construction access roads must be demarcated clearly. Undertake site inspections to verify. 5. Monitor the implementation of noise control mechanisms via site inspections and record and report non-compliance. 6. Ensure that the construction area is demarcated clearly and that construction personnel are made aware of these demarcations. Monitor via	1. Once-off 2. On a daily basis 3. Weekly 4. Weekly 5. Weekly 6. Weekly	1. Avifaunal Specialist 2. Contractor and ECO 3. Contractor and ECO 4. Contractor and ECO 5. Contractor and ECO 6. Contractor and ECO

Impact	Mitigation/Management Objectives and Outcomes	Mitigation/Management Actions	Monitoring		
			Methodology	***Frequency***	***Responsibility***
		3. Measures to control noise and dust according to latest best practice; 4. Restricted access to the rest of the property; 5. Strict application of all recommendations in the biodiversity specialist report pertaining to the limitation of the footprint.	site inspections and report non-compliance.		
Avifauna: Mortality due to collision with the overhead powerline					
Mortality of avifauna due to collisions with the overhead powerline.	Reduction of avian collision mortality	Bird Flight Diverters must be fitted to the entire OHL according to the applicable Eskom Engineering Instruction (Eskom Unique Identifier 240 – 93563150: The utilisation of Bird Flight Diverters on Eskom Overhead Lines). These devices must be installed as soon as the conductors and earthwires are strung.	1. Fit Eskom approved Bird Flight Diverters on the entire length of line	1. Once-off	1. Contractor and ECO

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.	Conduct an avifaunal inspection of the OHL prior to its decommissioning to identify nests on the poles/towers. 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; 5. Strict application of all recommendations in the botanical specialist report pertaining to the limitation of the footprint.	1. Implementation of the DEMPr. Oversee activities to ensure that the DEMPr is implemented and enforced via site audits and inspections. 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. Once-off 2. On a daily basis 3. Weekly 4. Weekly 5. Weekly 6. Weekly	1. Contractor and ECO 2. Contractor and ECO 3. Contractor and ECO 4. Contractor and ECO 5. Contractor and ECO