AVIFAUNAL IMPACT ASSESSMENT

Castle Wind Energy Facility to Hydra Main Transmission Substation Grid Connection, located near De Aar in the Northern Cape Province

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EXECUTIVE SUMMARY

Chris van Rooyen Consulting has been appointed by EnviroAgri (Pty) Ltd, on behalf of African Clean Energy Developments (Pty) Ltd to undertake an Avifaunal Specialist Study for the proposed construction and operation of a powerline grid connection. Since the issuing of these EAs several Renewable Energy (RE) developments and their respective grid connections surrounding De Aar, specifically Hydra Main Transmission Substation ('MTS"), has increased significantly. This bottleneck has rendered the currently authorised OHL corridor unfeasible. An alternative power line route alignment has been identified and is comprised of a new OHL, an upgrade to an existing OHL and small section that could feed into the authorised De Aar South WEF substation.

The proposed OHL grid connection is approximately 25km in length and is routed across various portions of the farms: Vendussie Kuil, Wagt en Bittje, Hydra, Carolus Poort and Slingers Hoek. The project is located within 10km of De Aar, in the Pixley Ka Seme District Municipality in the Northern Cape Province of South Africa.

1 PROJECT ALTERNATIVES

A single OHL grid connection alignment is proposed, within a 300m wide corridor for each alternative (i.e. 150m either side of the proposed centreline of the OHL) allowing for minor alignment adjustments based on sensitive features. Powerline voltage and tower structure (i.e. technology) alternatives are proposed in the form of voltages between 132kV and 400kV, single circuit or double circuit configurations and steel monopole or steel lattice (self-supporting and/or guyed) structures respectively. The displacement and collision impact assessment are equal for all proposed technology alternatives. However, the electrocution impact is assessed separately, as this impact is directly related to the voltage size and pole/tower type and configuration.

2 AVIFAUNA

The SABAP2 data indicates that a total of 189 bird species could potentially occur within the Project Areas of Impact (PAOI) and immediate surroundings – Appendix 4 provides a comprehensive list of all the species. Of these, 57 species are classified as priority species (see definition of priority species in section 4) and 11 are South African Red List species. Of the priority species, 37 are likely to occur regularly at the PAOI and immediate surrounding area, with the remaining 20 occurring sporadically.

The site visit produced a combined list of 31 species (Appendix 4 - highlighted in grey), covering both the PAOI and to a limited extent, the surrounding area. Eight priority species were observed along the proposed powerline alignment, with Verreaux's Eagle *A. verreauxii* being the only SCC observed. 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 Castle OHL to Hydra MTS grid connection; and
- Displacement due to habitat transformation associated with the construction of the proposed Castle OHL to Hydra MTS grid connection;

3.2 Operational Phase

- Collisions with the proposed Castle OHL to Hydra MTS grid connection; and
- Electrocution of vultures on the proposed infrastructure, in the event that the OHL is constructed at a voltage of 132kV using either a single or double circuit steel monopole structure.

3.3 Decommissioning Phase

- Displacement due to disturbance associated with the decommissioning of the Castle OHL to Hydra MTS grid connection.

3.4 Cumulative Impacts

- Displacement due to disturbance associated with the construction and decommissioning of the proposed Castle OHL to Hydra MTS grid connection;
- Displacement due to habitat transformation associated with the Castle OHL to Hydra MTS grid connection;
- Collisions with the proposed Castle OHL to Hydra MTS grid connection;
- Electrocution of vultures on the proposed infrastructure, in the event that the OHL is constructed at a voltage of 132kV using either a single or double circuit steel monopole structure

4 ENVIRONMENTAL SENSITIVITIES

4.1 High Sensitivity

At a site-specific level, environmentally most sensitive features present within the proposed PAOI are 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 powerline across or within close proximity to the waterbodies and nests will necessitate the marking of the powerline with bird flight diverters to mitigate the collision impact. Site specific recommendations for the management of the disturbance impacts associated with these **HIGH** sensitivity areas will be provided following the pre-construction avifaunal walk-through (inspection).

4.2 Medium to High Sensitivity

The remainder of the PAOI is considered to be of **MEDIUM to HIGH** sensitivity, given its propensity to regularly support Ludwig's Bustard, Secretarybird and Blue Crane. It will therefore also require marking of the powerline with bird flight diverters to mitigate the collision impact, which in effect comes down to marking the entire powerline.

5 MANAGEMENT ACTIONS

The following management actions have been proposed in this assessment:

5.1 Planning & Design phase

- If the grid connection is constructed using a single circuit configuration, the only mitigation option is the construction of the powerline using the approved vulture friendly pole/tower design D-DT-7649 in accordance with the Distribution Technical Bulletin - *Reference Number 240-170000467*. Additional mitigation in the form of insulating sleeves on *jumpers* present on strain poles and terminal poles is also recommended (if suitable insulation material is readily available), alternatively all *jumpers* must be suspended below the crossarms.

- If the grid connection is constructed using a double circuit configuration, it is imperative that there is a minimum clearance of 1.8m between the *jumpers* and/or insulators and the horizontal earthed component on the lattice structure. Additional mitigation in the form of insulating sleeves on *jumpers* present on strain poles and terminal poles is also recommended (if suitable insulation material is readily available), alternatively all *jumpers* must be suspended below the crossarms.

5.2 Construction phase

- Conduct a pre-construction inspection (avifaunal walk-through) as soon as the 132kV powerline route alignment, together with its associated pole positions, have been approved 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 (BFDs) should be installed on the entire line, on the full span length, on the earthwire (according to Eskom guidelines - five - ten metres apart). Light and dark colour devices must be alternated to provide contrast against both dark and light backgrounds respectively. These devices must be installed as soon as the conductors 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*	MAJOR	MODERATE
*Displacement of priority species due to **habitat transformation** associated with construction of the OHL powerline*	MINOR	MINOR
*Mortality of priority species due to **collisions** with the OHL powerline*	MAJOR	MODERATE
*Mortality of priority species due to **electrocution** if constructed as a 132kV powerline*	MODERATE	MINOR
*Displacement of priority species due to **disturbance** associated with decommissioning of the OHL powerline*	MINOR	MINOR

7 CUMULATIVE IMPACTS

According to the official database of DFFE, there are at least 103 applications and/or amendments of renewable energy projects, approximately 1368km² in area, within a 30km radius around the proposed development as at the fourth quarter (Q4) of 2021.The proposed Castle OHL to Hydra MTS grid connection project equates to a maximum of 25km. There are approximately 24 high voltage powerlines totalling hundreds of kilometres of existing powerlines within the 30km radius around the Castle OHL to Hydra MTS grid connection project area. An intensive internet search was conducted to source information on the grid connections of the abovementioned projects available within the public domain, but in some instances no information could be obtained. The Castle OHL to Hydra MTS grid connection project will thus increase the total number of existing high voltage lines by a very small percentage. The contribution of the proposed Castle OHL to Hydra MTS grid connection 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.

8 NO-GO ALTERNATIVE

The no-go alternative will result in the current status quo being maintained within the proposed development area as far as the avifauna is concerned. The PAOI itself consists mostly of natural Karoo shrub and surface waterbodies. The no-go option would maintain the natural habitat which would be beneficial to the avifauna currently occurring there.

9 CONCLUDING STATEMENT

The expected impacts of the proposed Castle OHL to Hydra MTS grid connection range from **MINOR to MAJOR** significance and negative status pre-mitigation. However, with appropriate mitigation, the post-mitigation significance of the identified impacts should be reduced to **MODERATE and MINOR** 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.	Page 8
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;	Page 8 & Appendix 6
A signed statement of independence by the specialist;	Page 8
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 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 6
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 4
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 Castle Wind Energy Facility (WEF) and its associated infrastructure was granted by the Department of Environmental Affairs (DEA) now Department of Forestry, Fisheries and the Environment (DFFE) on 8 May 2015 (DEA Reference: 14/12/16/3/3/2/278). In addition, an EA for the proposed Overhead Line (OHL) from Castle WEF's onsite substation to Hydra Main Transmission Substation (MTS) was obtained on 5 October 2018 (DEA Reference:14/12/16/3/3/1/1351). Since the issuing of these EAs several Renewable Energy (RE) developments and their respective grid connections surrounding De Aar, specifically Hydra MTS, has increased significantly. This bottleneck has rendered the currently authorised OHL corridor infeasible. An alternative power line route alignment has been identified by the Proponent, African Clean Energy Developments (Pty) Ltd (ACED). This alternative is comprised of a new OHL, an upgrade to an existing OHL and small section that could feed into the authorised De Aar South WEF substation.

The proposed OHL grid connection is approximately 25km in length and is routed across various portions of the farms: Vendussie Kuil, Wagt en Bittje, Hydra, Carolus Poort and Slingers Hoek. The project is located within 10km of De Aar, in the Pixley Ka Seme District Municipality in the Northern Cape Province of South Africa (Figure 1). The proposed Castle WEF grid connection is the subject of this impact assessment report.

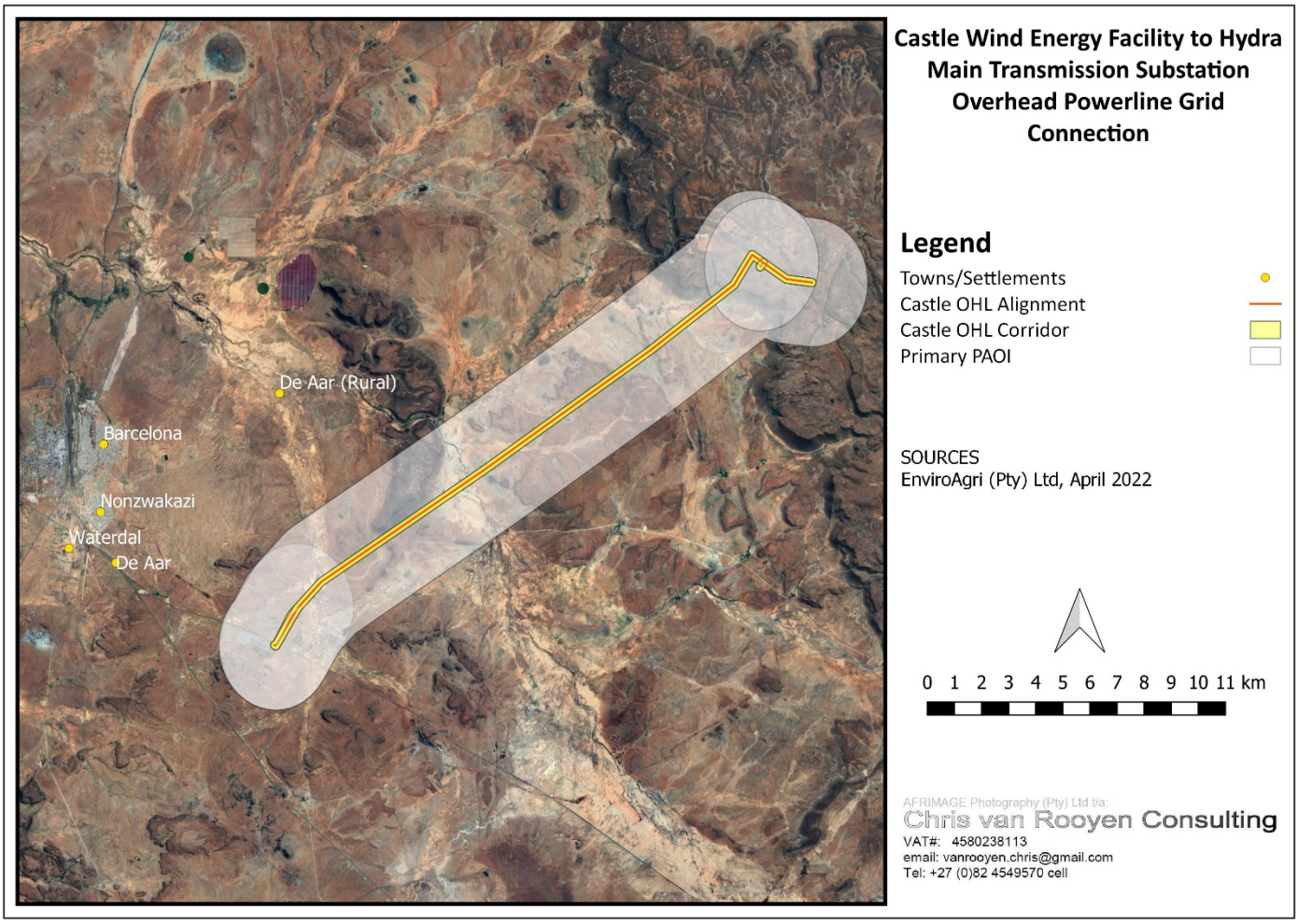


Figure 1: Locality map indicating the location of the Castle OHL to Hydra MTS grid connection within the primary Project Area of Impact (PAOI) near De Aar, Northern Cape Province.

1.2 Project Alternatives

A single OHL grid connection alignment is proposed, within a 300m wide corridor for each alternative (i.e. 150m either side of the proposed centreline of the OHL) allowing for minor alignment adjustments based on sensitive features. Powerline voltage and tower structure (i.e. technology) alternatives are proposed in the form of voltages between 132kV and 400kV, single circuit or double circuit configurations and steel monopole or steel lattice (self-supporting and/or guyed) structures respectively. The displacement and collision impact assessment are equal for all proposed technology alternatives. However, the electrocution impact is assessed separately, as this impact is directly related to the voltage size and pole/tower type and configuration.

2 PROJECT SCOPE

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

- Conduct a site sensitivity verification to the Project Area of Impact (PAOI) (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 Castle WEF to Hydra MTS 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 in the course of the study:

- The focus of this assessment is primarily on the potential impacts of the Castle OHL to Hydra MTS grid connection on priority species. 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.
- 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 ten pentads (secondary PAOI) 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 ten pentad grid cells are the following: 3035_2400, 3035_2405, 3035_2410, 3035_2415, 3035_2420, 3040_2400, 3040_2405, 3040_2410, 3040_2415 and 3040_2420 (Figure 2). A total of 33 full protocol lists (i.e. bird listing surveys lasting a minimum of two hours each) and 70 ad hoc protocol lists (surveys lasting less than two hours but still yielding valuable data) have been completed to date for the secondary PAOI. The

SABAP2 data is regarded as a reliable reflection of the avifauna which could potentially occur in the PAOI 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 PAOI 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 Northern Cape Province .
- The DFFE National Screening Tool was used to determine the assigned avian sensitivity of the PAOI (April, 2022).
- The Procedures for the Assessment and Minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of NEMA when applying for Environmental Authorisation (Gazetted October 2020) were consulted to determine the relevant theme and protocol to be followed.
- The 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 assist with the interpretation of the protocol.
- Primary avifaunal diversity and abundance data collected during a single season, two-day site visit to the PAOI conducted on 19 and 20 April 2022. Data was collected by means of incidental counts (Figure 3).

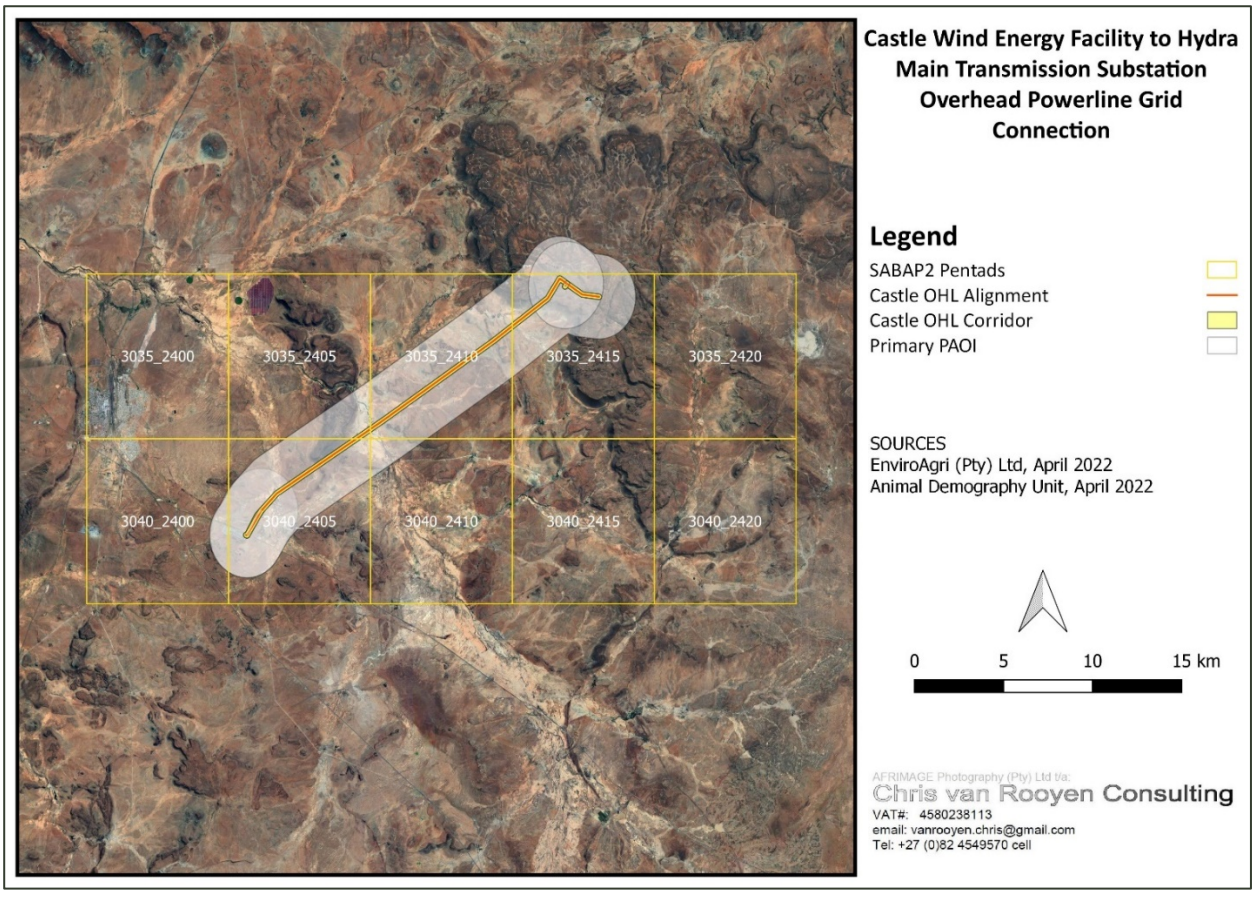


Figure 2: Location of the ten South African Bird Atlas Project 2 (SABAP2) pentad grid cells (secondary PAOI) that were considered for the proposed Castle WEF to Hydra MTS grid connection project.

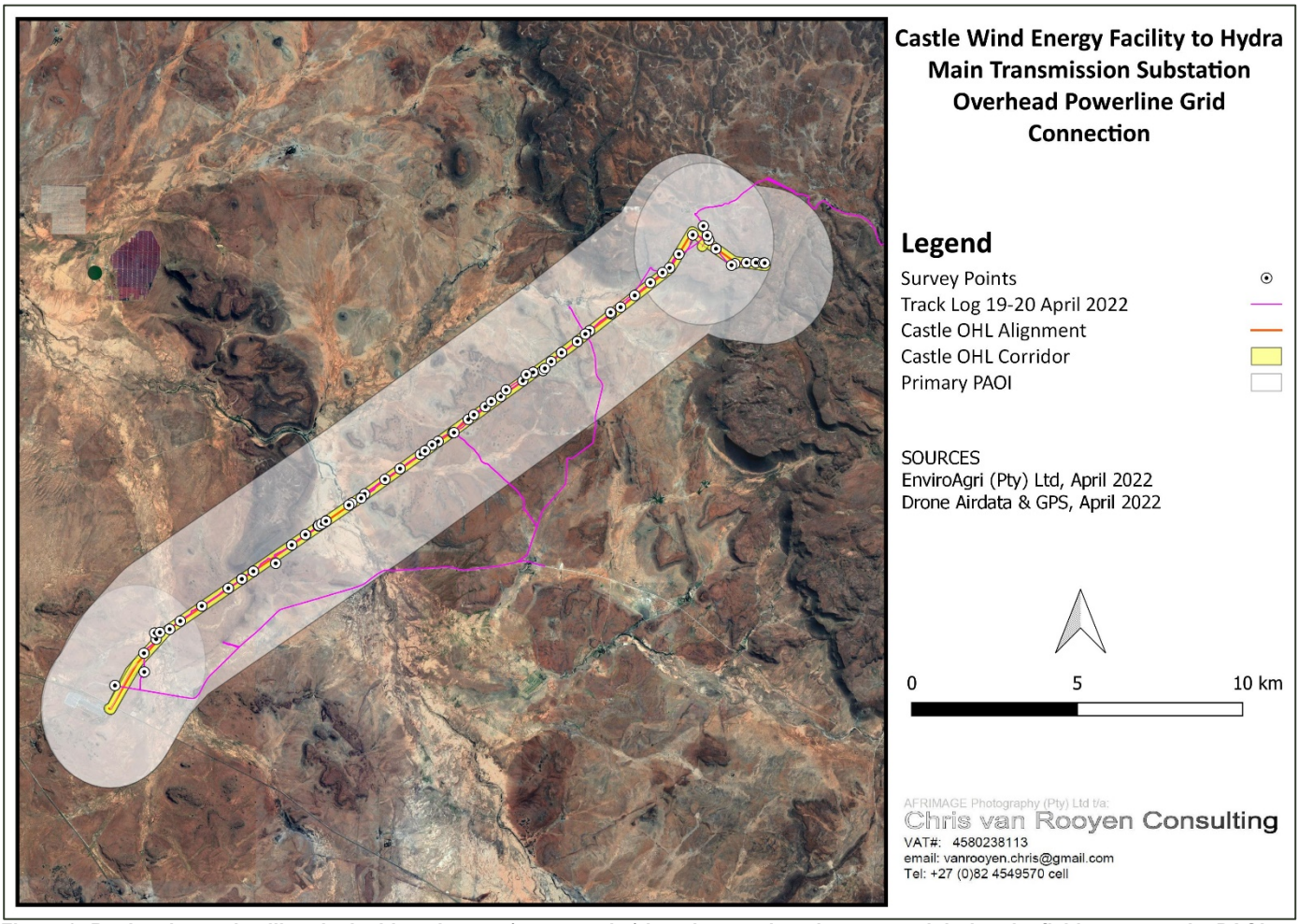


Figure 3: Regional map detailing the incidental count (survey point) locations and tracks surveyed during the field survey to the PAOI conducted on 19-20 April 2022.

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 assessment of impacts is based on the baseline environment as it currently exists in the PAOI.
- Cumulative impacts include all wind energy facility (WEF) and Solar Energy Facilities (PV) projects, grid connections and existing transmission and distribution powerline 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.
- The primary PAOI is defined as a 2km zone around the proposed grid connection corridor.

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 Northern Cape is the Northern Cape Nature Conservation Act No 9 of 2009. It provides for the sustainable utilisation of wild animals, aquatic biota and plants; the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; describes offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; provides for the issuing of permits and other authorisations; and provides for matters connected therewith.

5.4 Species Assessment Guidelines

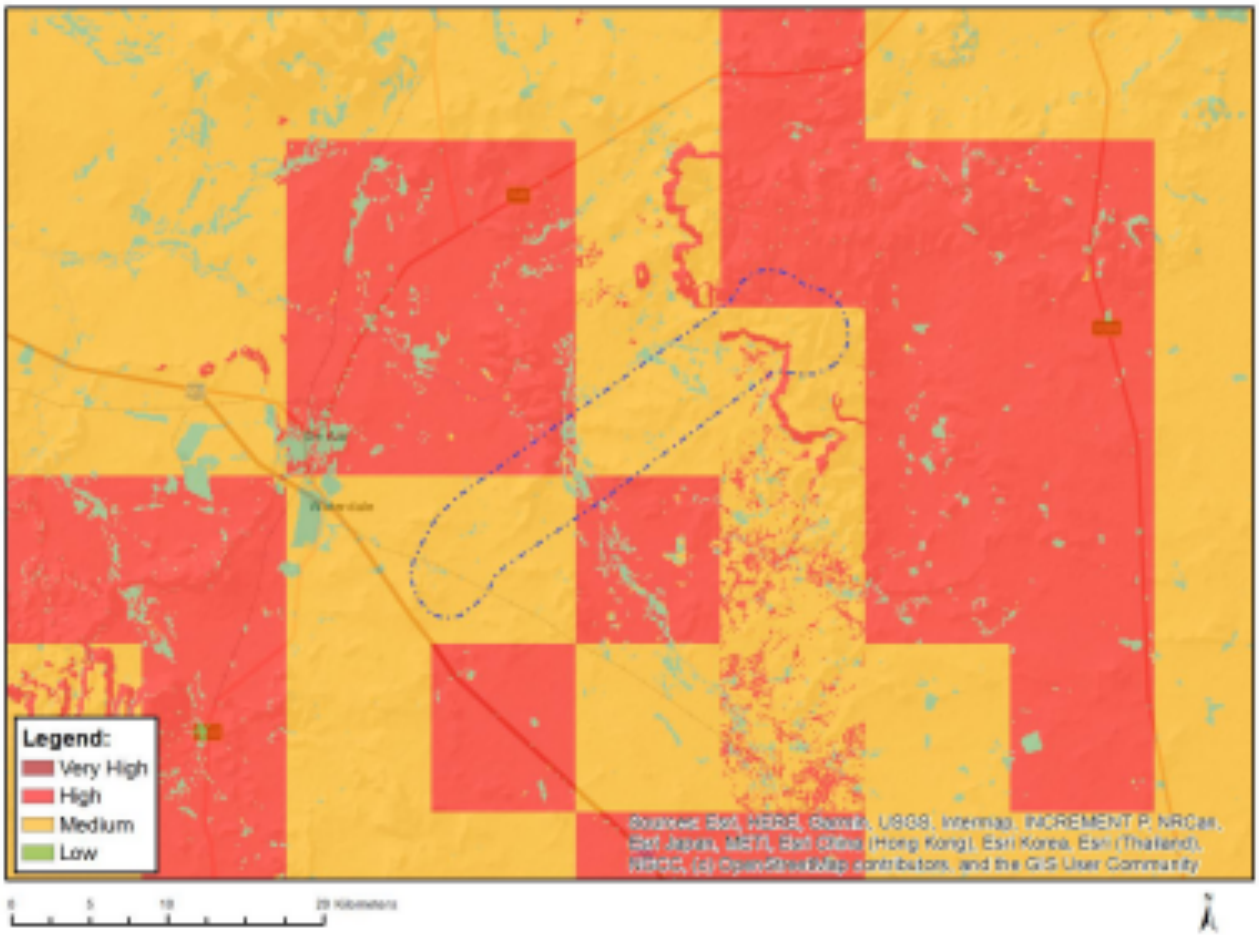
The *Species Environmental Assessment Guideline* provides background and context to the assessment and minimum reporting criteria contained within the Terrestrial Animal and Plant Species Protocols; as well as to provide guidance on sampling and data collection methodologies for the different taxonomic 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 primary and secondary PAOI is classified as **MEDIUM to HIGH** sensitivity for terrestrial animals according to the Terrestrial Animal Species Theme. These classifications are linked to the potential occurrence of Ludwig's Bustard *Neotis ludwigii* (Globally and Regionally Endangered), Tawny Eagle *Aquila rapax* (Globally Vulnerable and Regionally Endangered), Verreaux's Eagle *Aquila verreauxii* (Regionally Vulnerable), Lanner Falcon *Falco biarmicus* (Regionally Vulnerable), Black Stork *Ciconia nigra* (Regionally Vulnerable) and Caspian Tern *Hydroprogne caspia* (Regionally Vulnerable). In addition, the PAOI contains confirmed habitat for SCC as defined in the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020). Although Verreaux's Eagle *A. verreauxii* was the only SCC observed during the site visit, the authors have conducted several assessments and research projects in the secondary PAOI and immediate environment and have previously observed Ludwig's Bustard *N. ludwigii,* Martial Eagle *Polemaetus bellicosus*, Tawny Eagle *A. rapax*, Lanner Falcon *F. biarmicus* and Black Stork C. *nigra* in identical habitats. Based on these observations, the classification of **MEDIUM to HIGH** sensitivity for avifauna in the screening tool is therefore confirmed (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 ludwigii
High	Aves-Aquila rapax
High	Aves-Aquila verreauxii
High	Aves-Falco biarmicus
Low	Subject to confirmation
Medium	Aves-Ciconia nigra
Medium	Aves-Hydroprogne caspia
Medium	Aves-Neotis ludwigii
Medium	Aves-Aquila rapax
Medium	Aves-Aquila verreauxii

Figure 4: The National Web-Based Environmental Screening Tool map of the three PV project sites, indicating sensitivities for the Terrestrial Animal Species theme. The High and Medium sensitivity classifications are linked to Ludwig's Bustard *Neotis ludwigii,* Verreaux's Eagle *Aquila verreauxii,* Lanner Falcon *Falco biarmicus*, Black Stork *Ciconia nigra* and Caspian Tern *Hydroprogne caspia*

6.1 Protected Areas

The De Aar Nature Reserve is located 10km north west of the PAOI (Figure 5). No information could be obtained on the De Aar Nature Reserve, but it is assumed that the composition and abundance of avifauna in the reserve will be similar to the surrounding area.

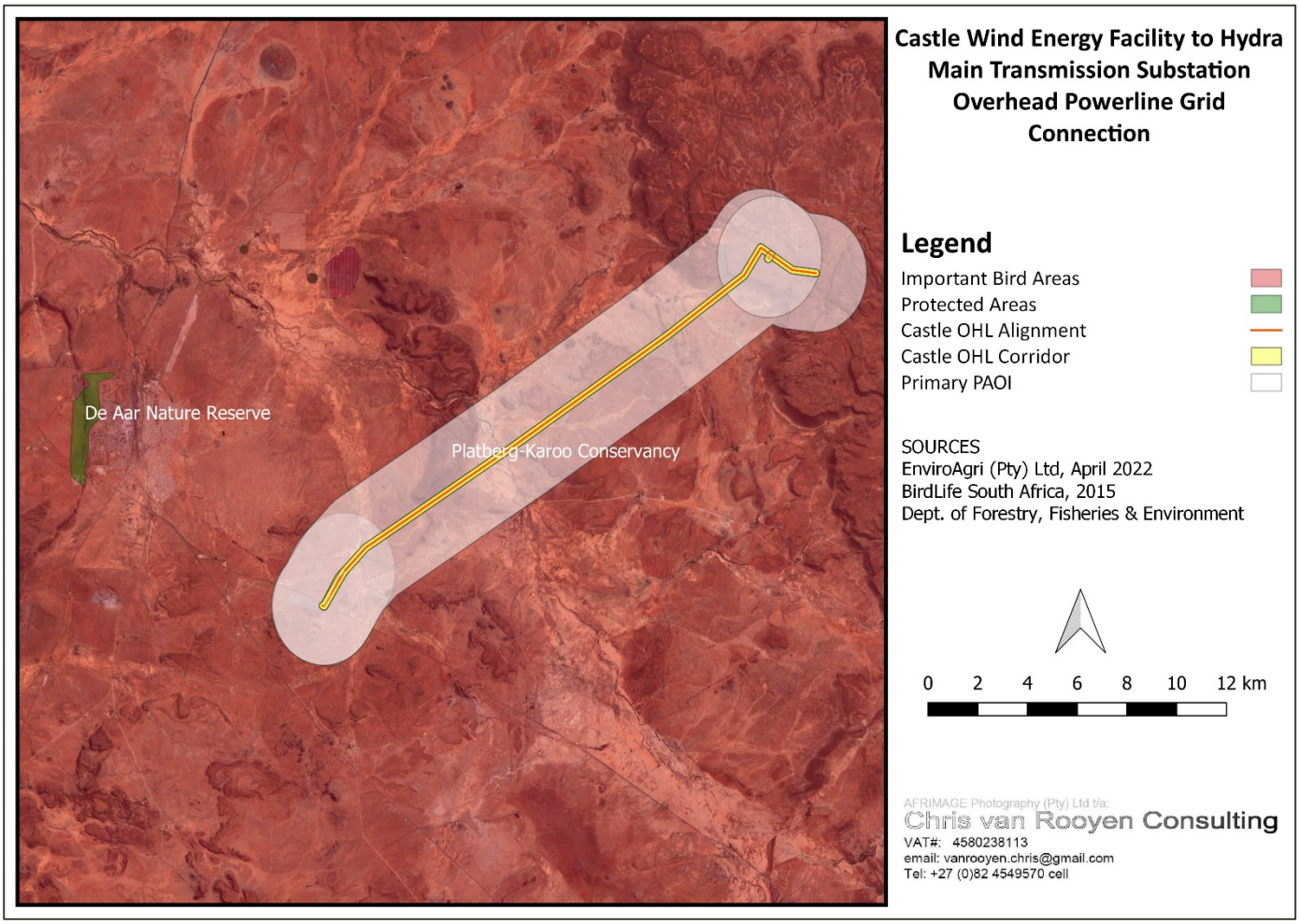


Figure 5: Regional map detailing the location of the proposed Castle WEF to Hydra MTS grid connection project in relation to Important Bird Areas (IBAs) and Protected Areas.

6.2 Important Bird Areas

The PAOI falls within the Platberg-Karoo Conservancy IBA SA037 (Figure 5). The landscape consists of extensive flat to gently undulating plains that are broken by dolerite hills and flat-topped inselbergs. The ephemeral Brak River flows in an arc from south-east to north-west, eventually feeding into the Orange River basin. Other ephemeral rivers include the Hondeblaf, Seekoei, Elandsfontein and Ongers rivers with a network of tributaries. This IBA contributes significantly to the conservation of large terrestrial birds and raptors. These include Blue Crane *Anthropoides paradiseus*, Ludwig's Bustard *N. ludwigii*, Kori Bustard *Ardeotis kori,* Blue *Korhaan Eupodotis caerulescens*, Black Stork *Ciconia nigra*, Secretarybird *Sagittarius serpentarius*, Martial Eagle *P. bellicosus*, Verreauxs' Eagle *A. verreauxii* and Tawny Eagle *A. rapax* (Marnewick *et al*. 2015).

A total of 289 bird species are known to occur here. In summer, close to 10% of the global population of Lesser Kestrel *Falco naumanni* congregate and roost in this IBA. Amur Falcons *Falco amurensis* are also abundant and forage and roost with Lesser Kestrels *F. naumanni* . This IBA is seasonally important for White Stork *Ciconia ciconia*, and Coordinated Avifaunal Roadcounts indicate high numbers of this species during outbreaks of brown locusts *Locustana pardalina* and armoured ground crickets *Acanthoplus discoidalis*. The IBA also supports the following biome-restricted species: Karoo Lark *Calendulauda albescens*, Karoo Long-billed Lark *Certhilauda subcoronata,* Karoo Chat *Cercomela schlegelii*, Tractrac Chat *Cercomela tractrac*, Sickle-winged Chat *Cercomela*

sinuata, Namaqua Warbler *Phragmacia substriata*, Layard's Tit-Babbler *Sylvia layardi*, Pale-winged Starling *Onychognathus nabouroup* and Black-headed Canary *Serinus alario* (Marnewick *et al*. 2015).

All of the aforementioned species have been recorded by SABAP2 in the PAOI. It is therefore likely that the impacts, associated with the construction and operation of the proposed Castle WEF to Hydra MTS OHL grid connection, could negatively affect these species if the necessary avoidance and mitigation measures are not implemented.

6.3 Biomes and Vegetation Types

Temperatures at De Aar range between a mean daily maximum of 31˚C in January (summer) and 15.1˚C in July (winter), and rainfall happens mostly between October and April and averages about 211mm per year, which makes for a fairly arid climate (meteoblue.com). Winters are very dry. The land is used for sheep and game farming.

The proposed Castle OHL to Hydra MTS grid connection is located within the Nama Karoo and Grassland biomes (Mucina & Rutherford 2006), comprised of two vegetation units i.e. Northern Upper Karoo, dominating the plains and the Besemkaree Koppies Shrubland (Figure 6) occurring on the slopes of the ridges and mountains respectively (Mucina & Rutherford 2006). The Northern Upper Karoo unit is found on floristic and ecological gradients between the Nama Karoo, arid Kalahari savanna and highveld grassland. This vegetation unit is comprised of dwarf *mycrophyllus* shrubs, with white grasses of the genera *Aristida* and *Eragrostis*. The Besemkaree Koppies Shrubland occurs on the slopes of koppies, butts and tafelbergs and consists of a two-layered karroid shrubland. The lower layer of the vegetation is dominated by dwarf small-leaved shrubs and the upper layer is dominated by tall shrubs (Mucina & Rutherford 2006). The main relevance of this classification to avifauna is that the site is composed of short Karoo type veld, with grassy components. This affects the species likely to occur on site with most of the SCC recorded in the PAOI favouring the short open vegetation types described above.

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.

6.4 Bird Habitats

6.4.1 Nama Karoo

The vegetation at the development area consists of Karoo shrub vegetation, punctuated by rugged relief. Although not remarkably rich in species or endemism, the flora and fauna of the region are remarkably adapted to the region's climatic extremes. The major threats to biodiversity are posed by pastoralism, exotic plants, mining and agriculture. Trees and taller woody shrubs are restricted mostly to watercourses and include *Acacia karroo, Diospyros lycioides, Grewia robusta, Rhus lancea,* and *Tamarix usneoides* (Palmer and Hoffman 1997). This habitat type will typically support Secretarybird *S. serpentarius*, Ludwig's Bustard *N. ludwigii*, Common Buzzard *Buteo buteo*, Jackal Buzzard *Buteo rufofuscus*, Blue Crane *A. paradiseus*, Booted Eagle *Hieraaetus pennatus*, Martial Eagle *P. bellicosus*, Tawny Eagle *A. rapax*, Amur Falcon *F. amurensis*, Lanner Falcon *F. biarmicus*, Pale Chanting Goshawk *Melierax canorus*, African Harrier-Hawk *Polyboroides typus*, Greater Kestrel *F. rupicoloides*, Lesser Kestrel *F. naumanni*, Blue Korhaan *Eupodotis caerulescens*, Northern Black Korhaan *Afrotis afraoides*, White Stork *C.ciconia* and Cape Vulture *Gyps coprotheres.*

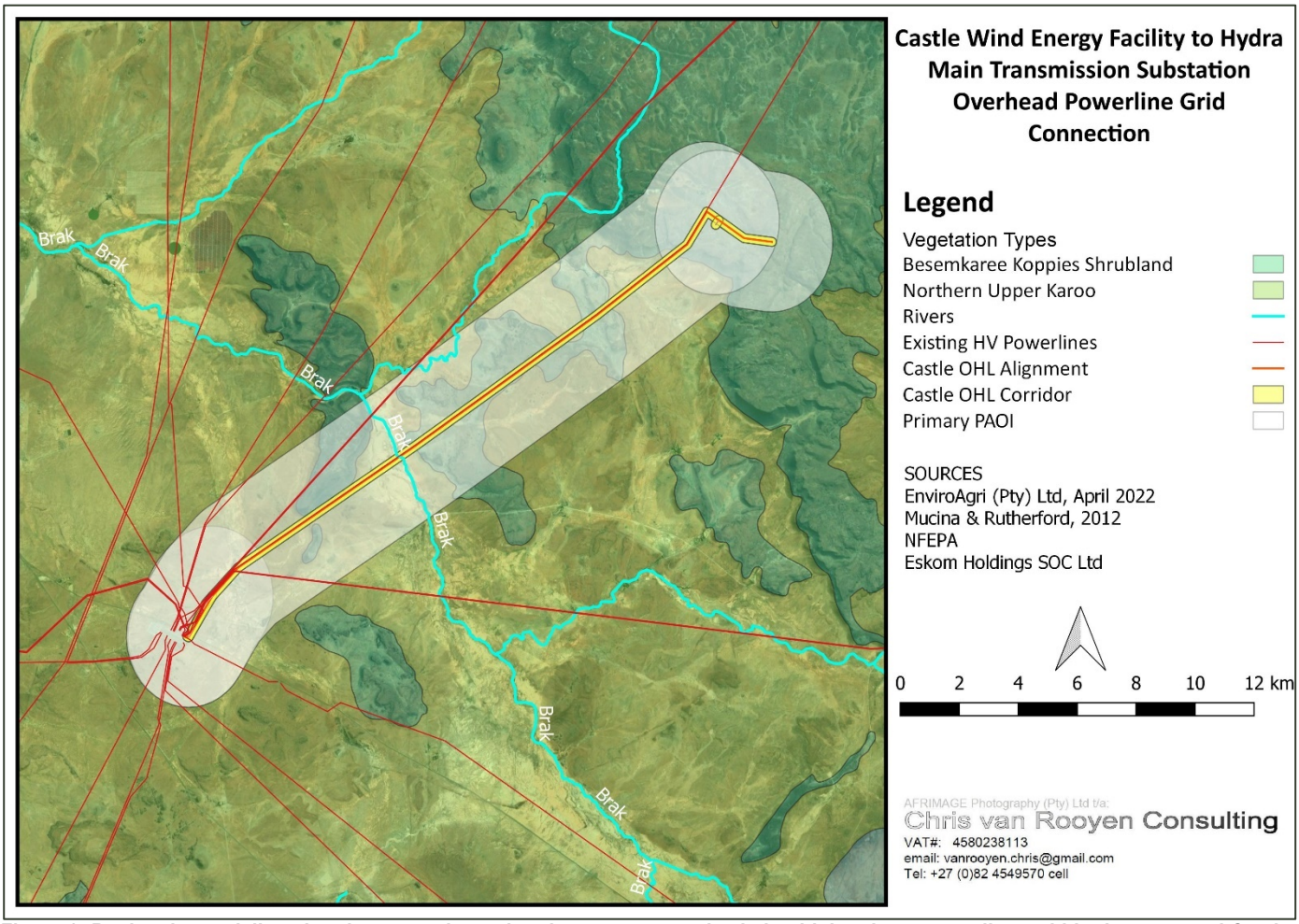


Figure 6: Regional map delineating the vegetation units, river systems and existing high voltage powerlines within the proposed Castle WEF to Hydra MTS grid connection project PAOI

6.4.2 Rivers

The ephemeral Brak River bisects the PAOI (Figure 6) and together with its associated drainage lines, are of specific importance to a variety of priority species in this arid PAOI. Occasionally, after good rains when pools form in the channels, this habitat will become an attractive draw card for a diversity of waterbirds and raptors. During such times, small birds are attracted to the water, which in turn may attract Lanner Falcon *F. biarmicus* and other raptors.

6.4.3 Trees and Woody Shrubs

Several ephemeral drainage lines, associated with the Brak River, bisect the PAOI. These areas are typically covered with broken Karoo veld, typically more shrubby than grassy. Whilst these areas 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 and woody shrubs occur. In an environment that is largely devoid of trees, these areas are attractive to tree nesters like Secretarybird *S. serpentarius.*

6.4.4 Surface water (excluding rivers)

The PAOI contains sources of both permanent (i.e. boreholes with water troughs) and ephemeral surface waterbodies (i.e. dams and pans). Pans are endorheic wetlands having closed drainage systems; water usually flows in from small catchments but with no outflow from the pan basins themselves. They are characteristic of poorly drained, relatively flat and dry regions. Water loss is mainly through evaporation, sometimes resulting in saline conditions, especially in the most arid regions. Water depth is shallow (<3m), and flooding characteristically ephemeral (Harrison *et al*. 1997). When filled with water, the waterbodies typically attract Blue Crane *A. paradiseus* and Greater Flamingo *Phoenicopterus roseus,* Secretarybird *S. serpentarius*, Booted Eagle *H. pennatus*, Martial Eagle *P. bellicosus*, Tawny Eagle *A. rapax*, Verreaux's Eagle *A. verreauxii* , Lanner Falcon *F. biarmicus*, Gabar Goshawk *Micronisus gabar*, Pale Chanting Goshawk *M. canorus*, Helmeted Guineafowl *Numida meleagris*, African Harrier-Hawk *P. typus*, Black Stork *Ciconia nigra*, White Stork *C.ciconia*, Cape Vulture *G. coprotheres*, various waterfowl, ibis, heron and goose species that utilise this habitat type in which to roost, forage, drink and bathe.

6.4.5 Wetlands

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 contained within the PAOI are associated with the Brak River and are likely to attract Blue Crane *A. paradiseus*, Black Stork *C. nigra* and White Stork *C.ciconia* (Young 2003). Various common species i.e. ibis, herons, ducks and geese are also likely to utilise this wetland for their foraging needs.

6.4.6 Mountains, ridges and rocky outcrops

The PAOI contains exposed rocky ridges and a major escarpment in the northeast. . Large ridges and cliff lines 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 feature prominently in this habitat type. This premise was confirmed with the observation of two Verreaux's Eagle *A. verreauxii* nests in this habitat type. Black Stork *C. nigra* and Lanner Falcon *F. biarmicus* may also breed on these cliffs.

6.4.7 Agricultural lands

Relevant to this project, cultivation is limited to pockets of subsistence dryland agricultural lands, and a small irrigated field located in the north east reaches of the primary PAOI, surrounding the proposed grid connection alignment. Arable or cultivated land represents a significant feeding area for many bird species in any landscape, but perhaps more so in arid environments. The opening up of the soil surface, and land preparation makes many insects, seeds, bulbs and other food sources suddenly accessible to birds and other predators; the crop or pasture plants cultivated are often eaten by birds, or attract insects which are in turn eaten by birds. Ludwig's Bustard *N. ludwigii*, Common Buzzard *B. buteo*, Blue Crane *A. paradiseus*, Amur Falcon *F. amurensis*, Lanner Falcon *F. biarmicus*, Lesser Kestrel *F. naumanni*, Rock Kestrel *Falco rupicolus*, Egyptian Goose *Alopochen aegyptiaca*, Spur-winged Goose *Plectropterus gambensis*, Helmeted Guineafowl *N. meleagris* and Hadeda Ibis *Bostrychia hagedash* are likely to frequent this microhabitat. Although the cultivated lands are not located within the proposed powerline corridor, we must account for the potential movement birds across the powerline alignment, as and when food resources become available within the cultivated areas, thereby increasing the risk of collision with the overhead powerline conductors and/or earthwires.

6.4.8 *Alien trees*

The development area is largely devoid of trees, except for alien trees which have been planted in homestead areas. Although stands of *Eucalyptus* are strictly speaking invader species, they have become important refuges for certain species of raptors, particularly Amur Falcon, 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*, Tawny Eagle *A. rapax* and Martial Eagle *P. bellicosus* may utilise this habitat type occasionally.

6.4.9 *High voltage lines*

Twelve existing high voltage transmission powerlines are operational within primary PAOI, one of which runs parallel to the proposed Castle WEF to Hydra MTS OHL grid connection alignment, within the 300m Castle WEF to Hydra MTS OHL grid connection corridor (Figure 6). Transmission lines are an important breeding substrate for raptors in the Karoo, due to the lack of large trees – see 7.1 for a list of nests recorded on the existing HV lines (Jenkins *et al.* 2013).

See Appendix 5 for photographic record of habitat features in the PAOI and the immediate surroundings.

7 AVIFAUNA IN THE STUDY AREA

7.1 South African Bird Atlas Project 2

The SABAP2 data indicates that a total of 189 bird species could potentially occur within the primary and secondary PAOIs – Appendix 4 provides a comprehensive list of all the species. Of these, 57 species are classified as priority species (see definition of priority species in section 4) and 11 are South African Red List species. Of the priority species, 37 are likely to occur regularly at the PAOI and immediate surrounding area, with the remaining 20 occurring sporadically.

Table 2 below lists all the priority species and the possible impact on the respective species by the proposed Castle OHL to Hydra MTS grid connection 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 secondary PAOIs.

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 occurrence in the PAOI	Recorded during surveys	Karoo	Rivers	Surface Waterbodies (pans, dams & boreholes)	Wetlands	Trees & Woody Shrubs (confined to watercourses)	Mountains, Ridges & Rocky Outcrops	Agriculture	Alien Vegetation	HV Power Lines	Powerline - Electrocution HV	Powerline - Collision	Displacement: Disturbance	Displacement: Habitat Transformation
Hamerkop	*Scopus umbretta*	15.1515	0.0000	-	-		x	M			x	x	x							x		
Secretarybird	*Sagittarius serpentarius*	6.0606	7.1429	EN	VU		x	M		x		x		x						x	x	x
Ludwig's Bustard	*Neotis ludwigii*	30.3030	7.1429	EN	EN		x	H		x						x				x	x	x
Common Buzzard	*Buteo buteo*	15.1515	1.4286	-	-		x	M		x		x				x	x	x				x
Jackal Buzzard	*Buteo rufofuscus*	27.2727	32.8571	-	-	x	x	H		x		x					x	x				x
Red-knobbed Coot	*Fulica cristata*	9.0909	0.0000	-	-		x	M			x	x	x							x	x	x
Reed Cormorant	*Microcarbo africanus*	3.0303	0.0000	-	-		x	L			x	x								x		
White-breasted Cormorant	*Phalacrocorax lucidus*	6.0606	0.0000	-	-		x	L			x	x								x		
Blue Crane	*Grus paradisea*	42.4242	11.4286	VU	NT		x	H		x			x			x				x	x	x
Cape Crow	*Corvus capensis*	9.0909	0.0000	-	-		x	L		x							x	x			x	x
Pied Crow	*Corvus albus*	90.9091	40.0000	-	-		x	H	x	x							x	x			x	x
African Black Duck	*Anas sparsa*	6.0606	0.0000	-	-		x	L			x	x	x							x		
White-faced Whistling Duck	*Dendrocygna viduata*	3.0303	0.0000	-	-		x	L			x	x	x							x		
Yellow-billed Duck	*Anas undulata*	21.2121	2.8571	-	-		x	M			x	x	x							x		x
African Fish Eagle	*Haliaeetus vocifer*	3.0303	0.0000	-	-		x	L			x	x					x					
Black-chested Snake Eagle	*Circaetus pectoralis*	3.0303	0.0000	-	-		x	L		x		x		x			x					
Booted Eagle	*Hieraaetus pennatus*	18.1818	5.7143	-	-		x	M		x		x			x		x	x				x
Martial Eagle	*Polemaetus bellicosus*	6.0606	1.4286	EN	EN		x	L		x		x		x			x	x			x	x
Tawny Eagle	*Aquila rapax*	15.1515	11.4286	VU	EN		x	M		x		x					x	x			x	x
Verreaux's Eagle	*Aquila verreauxii*	12.1212	17.1429	-	VU		x	H	x			x			x		x	x		x	x	
Spotted Eagle-Owl	*Bubo africanus*	18.1818	0.0000	-	-		x	M		x				x	x		x	x		x		x
Little Egret	*Egretta garzetta*	3.0303	0.0000	-	-		x	L			x	x	x							x		
Western Cattle Egret	*Bubulcus ibis*	3.0303	0.0000	-	-		x	L				x	x			x	x			x		
Amur Falcon	*Falco amurensis*	12.1212	2.8571	-	-		x	M		x						x	x					x
Lanner Falcon	*Falco biarmicus*	9.0909	2.8571	-	VU		x	M		x		x			x	x	x				x	x
Greater Flamingo	*Phoenicopterus roseus*	15.1515	0.0000	-	NT		x	L				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 occurrence in the PAOI	Recorded during surveys	Karoo	Rivers	Surface Waterbodies (pans, dams & boreholes)	Wetlands	Trees & Woody Shrubs (confined to watercourses)	Mountains, Ridges & Rocky Outcrops	Agriculture	Alien Vegetation	HV Power Lines	Powerline - Electrocution HV	Powerline - Collision	Displacement: Disturbance	Displacement: Habitat Transformation
Egyptian Goose	*Alopochen aegyptiaca*	63.6364	17.1429	-	-		x	H			x	x	x			x				x		x
Spur-winged Goose	*Plectropterus gambensis*	30.3030	2.8571	-	-		x	H				x	x			x				x		
Gabar Goshawk	*Micronisus gabar*	3.0303	0.0000	-	-		x	L				x		x			x					
Pale Chanting Goshawk	*Melierax canorus*	69.6970	25.7143	-	-		x	H	x	x		x		x			x	x			x	x
Little Grebe	*Tachybaptus ruficollis*	6.0606	0.0000	-	-		x	L			x	x	x							x		
Helmeted Guineafowl	*Numida meleagris*	66.6667	8.5714	-	-		x	H		x		x				x	x	x		x		x
African Harrier-Hawk	*Polyboroides typus*	6.0606	1.4286	-	-		x	L		x		x		x	x		x					x
Black-headed Heron	*Ardea melanocephala*	21.2121	0.0000	-	-		x	M		x		x	x				x	x		x		x
Grey Heron	*Ardea cinerea*	21.2121	0.0000	-	-		x	M			x	x	x				x			x		x
African Sacred Ibis	*Threskiornis aethiopicus*	42.4242	1.4286	-	-		x	H				x	x				x			x		
Glossy Ibis	*Plegadis falcinellus*	18.1818	0.0000	-	-		x	M				x	x			x				x		
Hadada Ibis	*Bostrychia hagedash*	75.7576	2.8571	-	-		x	H				x	x			x	x	x		x		
Greater Kestrel	*Falco rupicoloides*	18.1818	15.7143	-	-		x	H	x	x							x	x			x	x
Lesser Kestrel	*Falco naumanni*	42.4242	4.2857	-	-		x	H		x						x	x	x				x
Rock Kestrel	*Falco rupicolus*	18.1818	2.8571	-	-		x	H	x	x					x	x	x	x			x	x
Black-winged Kite	*Elanus caeruleus*	6.0606	1.4286	-	-		x	M		x							x	x				x
Yellow-billed Kite	*Milvus aegyptius*	6.0606	0.0000	-	-		x	L						x	x		x					
Blue Korhaan	*Eupodotis caerulescens*	9.0909	0.0000	NT	LC	x	x	M		x										x	x	x
Karoo Korhaan	*Eupodotis vigorsii*	30.3030	8.5714	-	NT		x	H	x	x										x	x	x
Northern Black Korhaan	*Afrotis afraoides*	87.8788	25.7143	-	-		x	H		x										x	x	x
Common Moorhen	*Gallinula chloropus*	18.1818	0.0000	-	-		x	M			x	x	x									
White-necked Raven	*Corvus albicollis*	12.1212	11.4286	-	-		x	M		x					x		x	x				x
South African Shelduck	*Tadorna cana*	36.3636	2.8571	-	-		x	H			x	x	x							x		
Cape Shoveler	*Spatula smithii*	6.0606	0.0000	-	-		x	L			x	x	x							x		
Rufous-breasted Sparrowhawk	*Accipiter rufiventris*	3.0303	0.0000	-	-		x	L		x							x					
African Spoonbill	*Platalea alba*	3.0303	0.0000	-	-		x	L			x	x	x							x		
Black Stork	*Ciconia nigra*	9.0909	0.0000	-	VU		x	M			x	x	x		x					x	x	x
White Stork	*Ciconia ciconia*	3.0303	0.0000	-	-		x	L		x		x	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 occurrence in the PAOI	Recorded during surveys	Karoo	Rivers	Surface Waterbodies (pans, dams & boreholes)	Wetlands	Trees & Woody Shrubs (confined to watercourses)	Mountains, Ridges & Rocky Outcrops	Agriculture	Alien Vegetation	HV Power Lines	Powerline - Electrocution HV	Powerline - Collision	Displacement: Disturbance	Displacement: Habitat Transformation
Cape Teal	*Anas capensis*	9.0909	0.0000	-	-		x	M			x	x	x							x		
Red-billed Teal	*Anas erythrorhyncha*	6.0606	1.4286	-	-		x	M			x	x	x							x		
Cape Vulture	*Gyps coprotheres*	3.0303	0.0000	EN	EN		x	L		x		x			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. 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 (NK041) intersects the proposed OHL corridor (Figure 7). The four surveys conducted along this route between 2013 and 2015, yielded observations of Kori Bustard *A. kori*,, Karoo Korhaan *Eupodotis vigorsii,* Northern Black Korhaan *Afrotis afraoides*, Spur-winged Goose *P. gambensis* and Pied Crow *Corvus albus*.

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. The closest CWAC site (De Aar Sewage Works) is located 5km north west of Hydra MTS (Figure 7). Greater Flamingo (n=4) is the only Red List species that has been recorded at this CWAC location. Species recorded in relatively larger numbers include Red-knobbed Coot *Fulica cristata*, Yellow-billed Duck *Anas undulata*, Spur-winged Goose *P. gambensis*, Hadeda Ibis *B. hagedash*, Blacksmith Lapwing *Vanellus armatus*, Black-winged Stilt *Himantopus himantopus* and Cape Teal *Anas capensis*.

While this CWAC site may provide an indication of the waterbird species that could be supported by similar natural and artificial impoundments located along the proposed Castle WEF to Hydra MTS OHL grid connection, this site will not have a significant impact on the sensitivity rating for the proposed Castle WEF to Hydra MTS OHL grid connection. However, it is important to note that with the exception of Blacksmith Lapwing, the remaining species are considered priority species that are susceptible to collisions with powerline infrastructure.

7.4 On-site surveys

A single autumn survey was conducted on 19 and 20 April 2022 within the PAOI. 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 proposed Castle OHL to Hydra MTS grid connection PAOI.

The site visit produced a combined list of 31 species (Appendix 4 - highlighted in grey), covering both the primary PAOI and to a limited extent, the secondary PAOI. Eight priority species were observed along the proposed powerline alignment, with Verreaux's Eagle *A. verreauxii* being the only SCC observed. 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 Castle OHL to Hydra MTS

grid connection as a result of habitat transformation and disturbance. Of particular importance are the six raptor nests that were observed, three of which are on the existing transmission structures within the proposed OHL corridor belonging to Verreaux's Eagle *A. verreauxii*, Martial Eagle *P. bellicosus* and Jackal Buzzard *B. rufofuscus* respectively. The other three nests occur with the primary POIA - two Verreaux's Eagle nests on the cliffs in the north-eastern reaches of the PAOI and a Jackal Buzzard *B. rufofuscus* nest on an existing transmission structure. These birds will be especially vulnerable to the disturbance impact, particularly during construction of the OHL grid connection.

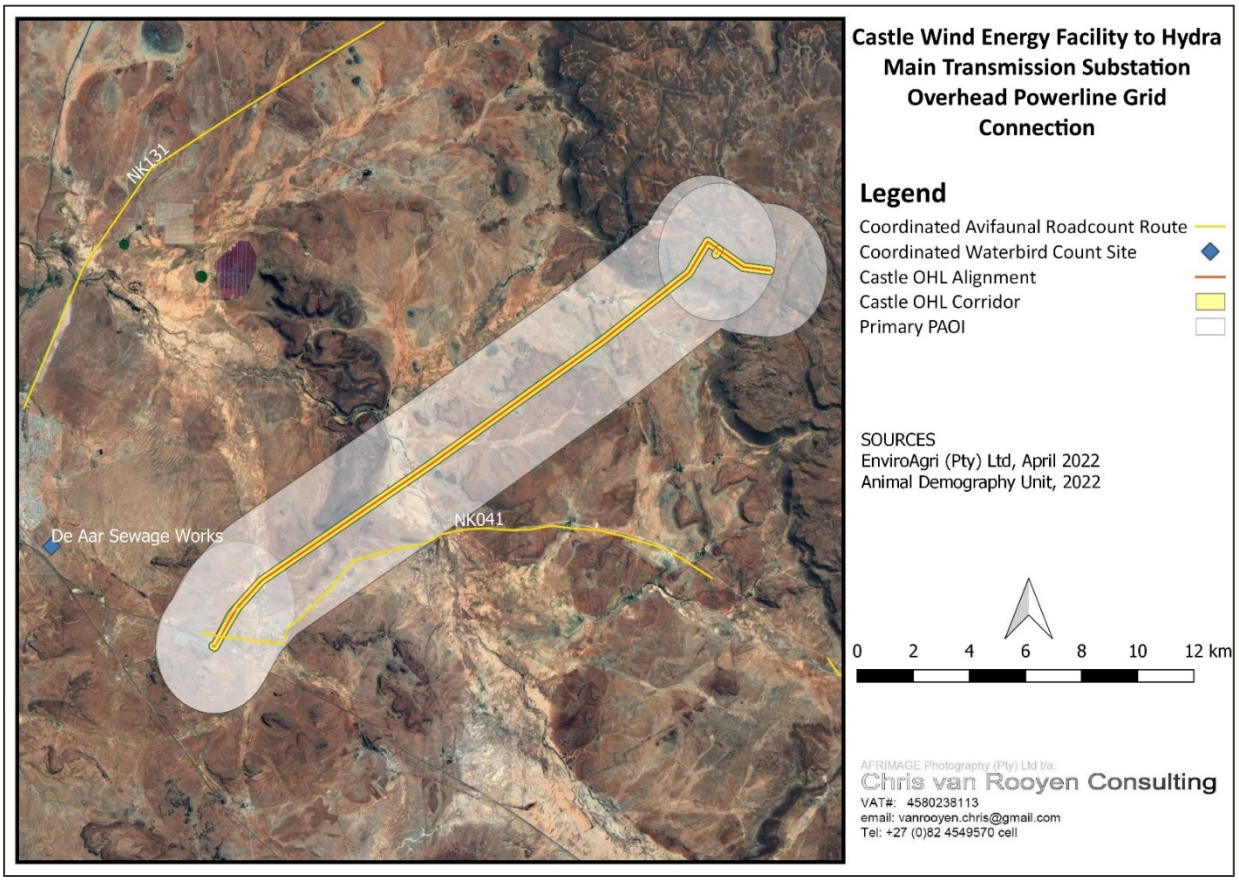


Figure 7: Regional map detailing the location of the proposed Castle OHL to Hydra MTS grid connection project in relation to Coordinated Avifaunal Roadcount (CAR) routes and Coordinated Waterbird Count (CWAC) sites

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 destruction 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 Castle OHL to Hydra MTS grid connection; and
- Displacement due to habitat transformation associated with the construction of the proposed Castle OHL to Hydra MTSL grid connection;

8.1.2 Operational Phase

- Collisions with the proposed Castle OHL to Hydra MTS grid connection; and
- Electrocution of vultures on the proposed infrastructure, in the event that the OHL is constructed at a voltage of 132kV using either a single or double circuit steel monopole structure.

8.1.3 Decommissioning Phase

- Displacement due to disturbance associated with the decommissioning of the Castle OHL to Hydra MTS grid connection.

8.1.4 Cumulative Impacts

- Displacement due to disturbance associated with the construction and decommissioning of the proposed Castle WEF to Hydra MTS OHL grid connection;
- Displacement due to habitat transformation associated with the Castle OHL to Hydra MTS grid connection;
- Collisions with the proposed Castle OHL to Hydra MTS OHL grid connection;
- Electrocution of vultures on the proposed infrastructure, in the event that the OHL is constructed at a voltage of 132kV using either a single or double circuit steel monopole structure

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 Castle OHL to Hydra MTS grid connection, the voltage size and the pole/tower design have not been determined as yet.

If the proposed OHL is constructed at a voltage of 132kV, using the steel lattice or standard steel monopole structure, the significance of the electrocution impact on the majority of priority species will be low. The only priority species capable of bridging the clearance distances of the proposed powerline infrastructure at the voltage is the Cape Vulture, due to their size and gregarious nature. The low reporting rate of the species in the SABAP data suggests that the species is unlikely to occur regularly in the PAOI, a premise that is supported by the lack of observations during the site visit to the PAOI. However, pastoral activities feature prevalently, so their sporadic occurrence cannot be ruled out. They have also been sporadically recorded at the De Aar 2 North wind farm (C van Rooyen pers. obs.). The only envisaged high risk scenario would be when a carcass becomes available within a few hundred metres of the proposed powerline, attracting vultures which may cluster on a few towers. Both technological alternatives i.e. the steel lattice and standard steel monopole tower structures pose an electrocution risk to this SCC at this voltage.

- If the grid connection is constructed using a single circuit configuration, the only mitigation option is the construction of the powerline using the approved vulture friendly pole/tower design D-DT-7649 (Appendix 7) in accordance with the Distribution Technical Bulletin titled *Refurbishment of 66/88kV line kite type frames with D-DT-7649 type top configuration - Reference Number 240-170000467*. The configuration of the insulators and the clearance distances between the live and earthed components on this structure can comfortably accommodate a perching vulture thereby eliminating the electrocution risk. Additional mitigation in the form of insulating sleeves on *jumpers* present on strain poles and terminal poles is also recommended (if suitable insulation material is readily available), alternatively all *jumpers* must be suspended below the crossarms.
- If the grid connection is constructed using a double circuit configuration, it is imperative that there is a minimum clearance of 1.8m between the *jumpers* and/or insulators and the horizontal earthed component on the lattice structure (pers.comm. Lourens Leeuwner - Eskom-EWT Strategic Partnership Manager). Additional mitigation in the form of insulating sleeves on *jumpers* present on strain poles and terminal poles is also recommended (if suitable insulation material is readily available), alternatively all *jumpers* must be suspended below the crossarms.
- Electrocutions on the proposed Castle OHL to Hydra MTS grid connection at a voltage of higher than 132kV (e.g. 275kV or 400kV) is physically not possible due to the large clearances between potentially lethal components.

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 8).

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).

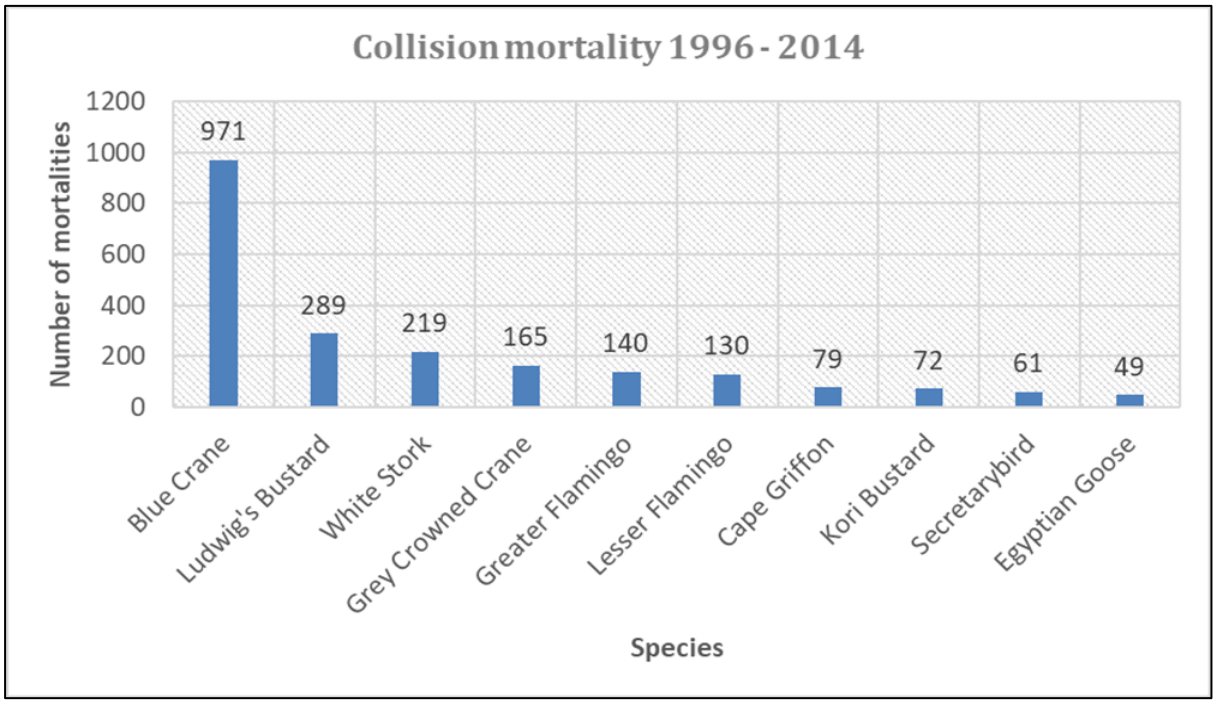


Figure 8: The top ten collision prone bird species in South Africa, in terms of reported incidents contained in the Eskom/Endangered Wildlife Trust Strategic Partnership central incident register 1996 - 2014 (EWT unpublished data)

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:

- African Black Duck
- African Sacred Ibis
- African Spoonbill
- Black Stork
- Black-headed Heron
- Blue Crane
- Blue Korhaan
- Cape Shoveler
- Cape Teal
- Cape Vulture
- Egyptian Goose
- Glossy Ibis
- Greater Flamingo
- Grey Heron
- Hadeda Ibis
- Hamerkop
- Helmeted Guineafowl
- Karoo Korhaan
- Little Egret
- Little Grebe
- Ludwig's Bustard
- Northern Black Korhaan
- Red-billed Teal

- Red-knobbed Coot
- Reed Cormorant
- Secretarybird
- South African Shelduck
- Spotted Eagle-Owl
- Spur-winged Goose
- Verreaux's Eagle
- Western Cattle Egret
- White-breasted Cormorant
- White-faced Whistling Duck
- White Stork
- Yellow-billed Duck

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 **transformation of habitat**. The construction activities will constitute the following:

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

Relevant to this development, the direct habitat transformation is limited to the pole/tower footprints and the narrow access road/track under the powerline. The habitat in the PAOI is relatively 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

- African Harrier-Hawk
- Amur Falcon
- Black-headed Heron
- Black-winged Kite
- Black Stork
- Blue Crane

- Blue Korhaan
- Booted Eagle
- Cape Crow
- Cape Vulture
- Common Buzzard
- Greater Kestrel
- Grey Heron
- Helmeted Guineafowl
- Jackal Buzzard
- Karoo Korhaan
- Lanner Falcon
- Lesser Kestrel
- Ludwig's Bustard
- Martial Eagle
- Northern Black Korhaan
- Pale Chanting Goshawk
- Pied Crow
- Red-knobbed Coot
- Rock Kestrel
- Secretarybird
- Spotted Eagle-Owl
- Tawny Eagle
- White-necked Raven
- White Stork
- Yellow-billed Duck

Displacement: Disturbance

- Black Stork
- Blue Crane
- Blue Korhaan
- Cape Crow
- Greater Kestrel
- Helmeted Guineafowl
- Jackal Buzzard
- Karoo Korhaan
- Lanner Falcon
- Ludwig's Bustard
- Martial Eagle
- Northern Black Korhaan
- Pale Chanting Goshawk
- Pied Crow
- Rock Kestrel
- Secretarybird
- Tawny Eagle
- Verreaux's Eagle
- White-necked Raven

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.

9.1 Determination of Significance of Impacts

For each impact, the **nature** (positive/negative), **extent** (spatial scale), **duration** (time scale), **intensity** (intensity scale) and resultant **magnitude**, and **probability** of occurrence. These criteria are used to ascertain the **significance** and **consequence** of the impact, firstly in the case of no mitigation and then with the most effective mitigation measure(s) in place. The impact assessments are summarised in the Tables 3-7 below.

9.1.1 Construction Phase

Table 3: Displacement due to disturbance impact assessment

No.	**1**	**Alternative**		
Project phase	**Construction**			
Impact title	Displacement: Disturbance			
Impact description	Displacement of priority species due to disturbance associated with construction of the OHL			
Impact Assessment	**Impact not mitigated**		**Impact mitigated**	
Nature	**Negative**		**Negative**	
Extent	**Regional**	Impacts manifest at a regional / municipal level.	**Local**	Extending across the site and to nearby settlements.
Duration	**Medium term**	Impact will last between 1 and 5 years.	**Medium term**	Impact will last between 1 and 5 years.
Intensity	**High**	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes will temporarily or permanently cease.	**Medium**	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are moderately altered.
Magnitude	**High - negative**		**Moderate - negative**	
Probability	**Very likely (>90%)**	There are sound reasons that the impact will occur.	**Likely (>66%)**	The impact may occur, but not necessarily proof that it will.
Significance	**Major - negative**		**Moderate - negative**	
Importance	**High**	High	**Moderate**	Moderate
Consequence	**Highly-detrimental**		**Slightly-detrimental**	
Confidence	**Well established**		**Well established**	
Reversibility	**Medium**	The affected environment may only recover from the impact with significant intervention or over long time period.		
Mitigatability	**Medium**	Mitigation exists and may notably reduce significance of impacts.		
Potential mitigation	Conduct a pre-construction inspection (avifaunal walk-through) of the final powerline alignment 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 pair of eagles/birds during the construction period. This could include measures such as delaying some of the activities until after the breeding season.			

Comment on ratings	The rating of Major Negative significance prior to mitigation is agreed with. Six priority nests have been identified in the primary POAI. Construction activities in close proximity to breeding locations will be a source of disturbance and could lead to temporary breeding failure or even permanent abandonment of nests. The timeous identification of nests and the timing of the construction activities to avoid disturbance during a critical phase of the breeding cycle will reduce the significance of this impact to moderate levels.

Table 4: Displacement due to habitat transformation impact assessment

No.	**2**	**Alternative**		
Project phase	**Construction**			
Impact title	Displacement: Habitat Loss or Transformation			
Impact description	Displacement of priority species due to habitat loss or transformation associated with construction of the OHL			
Impact Assessment	**Impact not mitigated**		**Impact mitigated**	
Nature	**Negative**		**Negative**	
Extent	**Limited**	Limited to the site and its immediate surroundings.	**Limited**	Limited to the site and its immediate surroundings.
Duration	**Medium term**	Impact will last between 1 and 5 years.	**Medium term**	Impact will last between 1 and 5 years.
Intensity	**Low**	Impacts affect the environmental in such a way that natural, cultural and/or social functions and processes are slightly affected.	**Low**	Impacts affect the environmental in such a way that natural, cultural and/or social functions and processes are slightly affected.
Magnitude	**Low - negative**		**Low - negative**	
Probability	**Likely (>66%)**	The impact may occur, but not necessarily proof that it will.	**About as likely as not (33-66%)**	The impact has occurred before and could occur in the lifetime of the project.
Significance	**Minor - negative**		**Minor - negative**	
Importance	**Low**	Low	**Very low**	Very low
Consequence	**Very slightly-detrimental**		**Very slightly-detrimental**	
Confidence	**Established, but incomplete**		**Established, but incomplete**	
Reversibility	**High**	The affected environment may be able to recover from the impact.		
Mitigatability	**Medium**	Mitigation exists and may notably reduce significance of impacts.		
Potential mitigation	Prevent unnecessary displacement of avifauna by ensuring that the rehabilitation of transformed areas is implemented where possible by an appropriately qualified rehabilitation specialist, according to the recommendations of the biodiversity specialist study.			
Comment on ratings	The rating of Minor Negative significance prior to mitigation is agreed with. The direct habitat transformation is limited to the pole/tower footprints and the narrow access road/track under the powerline. The habitat in the PAOI is relatively 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.			

9.2.2 *Operational Phase*

Table 5: Mortality due to collision impact assessment

No.	3	Alternative		
Project phase	**Operation**			
Impact title	Collision			
Impact description	Mortality of priority species due to collisions with the OHL (regardless of voltage size and technology alternatives)			
Impact Assessment	**Impact not mitigated**		**Impact mitigated**	
Nature	**Negative**		**Negative**	
Extent	**Regional**	Impacts manifest at a regional / municipal level.	**Regional**	Impacts manifest at a regional / municipal level.
Duration	**Long term**	Impact will last between 6 and 25 years.	**Medium term**	Impact will last between 1 and 5 years.
Intensity	**High**	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes will temporarily or permanently cease.	**Medium**	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are moderately altered.
Magnitude	**High - negative**		**Moderate - negative**	
Probability	**Very likely (>90%)**	There are sound reasons that the impact will occur.	**Likely (>66%)**	The impact may occur, but not necessarily proof that it will.
Significance	**Major - negative**		**Moderate - negative**	
Importance	**Very high**	Very high	**High**	High
Consequence	**Highly-detrimental**		**Moderately-detrimental**	
Confidence	**Virtually certain**		**Well established**	
Reversibility	**Medium**	The affected environment may only recover from the impact with significant intervention or over long time period.		
Mitigatability	**Medium**	Mitigation exists and may notably reduce significance of impacts.		
Potential mitigation	The entire length of powerline must be marked with Eskom approved bird flight diverters (BFDs). The bird flight diverters should be installed on the full span length on the earthwire (according to Eskom guidelines - five metres apart). Light and dark colour devices must be alternated to provide contrast against both dark and light backgrounds respectively. These devices must be installed as soon as the conductors and earthwire s are strung.			
Comment on ratings	The rating of Major Negative significance prior to mitigation is agreed with. Collisions are the biggest threat posed by high voltage powerlines to birds in southern Africa. Most heavily impacted upon are bustards, storks, cranes and various species of waterbirds, and to a lesser extent, vultures. Several large terrestrial birds occur within the primary POAI. The installation of Bird Flight Diverters on the earthwires that traverse key habitats will reduce the significance of this impact to moderate levels.			

Table 6: Mortality due to electrocution impact assessment (132kV powerline only)

No.	4	Alternative		
Project phase	**Operation**			
Impact title	Electrocution			
Impact description	Mortality of priority species due to electrocution on **132kV powerline infrastructure** using the single circuit, double circuit, steel lattice or standard steel monopole tower structures alternatives			
Impact Assessment	**Impact not mitigated**		**Impact mitigated**	
Nature	**Negative**		**Negative**	
Extent	**Regional**	Impacts manifest at a regional / municipal level.	**Regional**	Impacts manifest at a regional / municipal level.
Duration	**Long term**	Impact will last between 6 and 25 years.	**Long term**	Impact will last between 6 and 25 years.
Intensity	**High**	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes will temporarily or permanently cease.	**High**	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes will temporarily or permanently cease.
Magnitude	**High - negative**		**High - negative**	
Probability	**Likely (>66%)**	The impact may occur, but not necessarily proof that it will.	**Unlikely (>33%)**	The impacts occurrence is rare but has happened before.
Significance	**Moderate - negative**		**Minor - negative**	
Importance	**High**	High	**Low**	Low
Consequence	**Moderately-detrimental**		**Very slightly-detrimental**	
Confidence	**Well established**		**Well established**	
Reversibility	**High**	The affected environment may be able to recover from the impact.		
Mitigatability	**High**	Mitigation exists and will considerably reduce the significance of impacts.		
Potential mitigation	If the grid connection is constructed using a single circuit configuration, the only mitigation option is the construction of the powerline using the approved vulture friendly pole/tower design D-DT-7649 (Appendix 7) in accordance with the Distribution Technical Bulletin Reference Number 240-170000467. If the grid connection is constructed using a double circuit configuration, it is imperative that there is a minimum clearance of 1.8m between the jumpers and/or insulators and the horizontal earthed component on the lattice structure. Additional mitigation in the form of insulating sleeves on jumpers present on strain poles and terminal poles is also required (if possible), alternatively all jumpers must be suspended below the crossarms.			
Comment on ratings	The rating of Moderate Negative significance prior to mitigation is agreed with. The only priority species capable of bridging the clearance distances of 132kV OHL infrastructure is the Cape Vulture, due to their size and gregarious nature. The low reporting rate for the species in the SABAP data suggests that the species is unlikely to occur regularly in the PAOI. However, pastoral activities feature prominently, so their sporadic occurrence cannot be ruled out. The construction of the powerline at a voltage >132kV or using the appropriate vulture friendly structure will reduce the significance of this impact.			

9.2.3 *Decommissioning Phase*

Table 7: Displacement due to disturbance impact assessment

No.	5	Alternative		
Project phase	**Decommissioning**			
Impact title	Displacement: Disturbance			
Impact description	Displacement of priority species due to disturbance associated with decommissioning of the OHL			
Impact Assessment	**Impact not mitigated**		**Impact mitigated**	
Nature	**Negative**		**Negative**	
Extent	**Local**	Extending across the site and to nearby settlements.	**Local**	Extending across the site and to nearby settlements.
Duration	**Short term**	Impact will last less than 1 year.	**Short term**	Impact will last less than 1 year.
Intensity	**Medium**	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are moderately altered.	**Low**	Impacts affect the environmental in such a way that natural, cultural and/or social functions and processes are slightly affected.
Magnitude	**Moderate - negative**		**Low - negative**	
Probability	**Likely (>66%)**	The impact may occur, but not necessarily proof that it will.	**About as likely as not (33-66%)**	The impact has occurred before and could occur in the lifetime of the project.
Significance	**Minor - negative**		**Minor - negative**	
Importance	**High**	High	**Moderate**	Moderate
Consequence	**Slightly-detrimental**		**Slightly-detrimental**	
Confidence	**Well established**		**Well established**	
Reversibility	**High**	The affected environment may be able to recover from the impact.		
Mitigatability	**High**	Mitigation exists and will considerably reduce the significance of impacts.		
Potential mitigation	Conduct a 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.			
Comment on ratings	The rating of Moderate Negative significance prior to mitigation is agreed with. Decommissioning activities in close proximity to breeding locations will be a source of disturbance and could lead to temporary breeding failure or even permanent abandonment of nests. The timeous identification of nests and the timing of the decommissioning activities to avoid disturbance during a critical phase of the breeding cycle will reduce the significance of this impact to moderate levels.			

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

According to the official database of DFFE, there are at least 103 renewable energy projects, approximately 1368km^2 in area, within a 30km radius around the proposed development as at the fourth quarter (Q4) of 2021 (Figure 9).

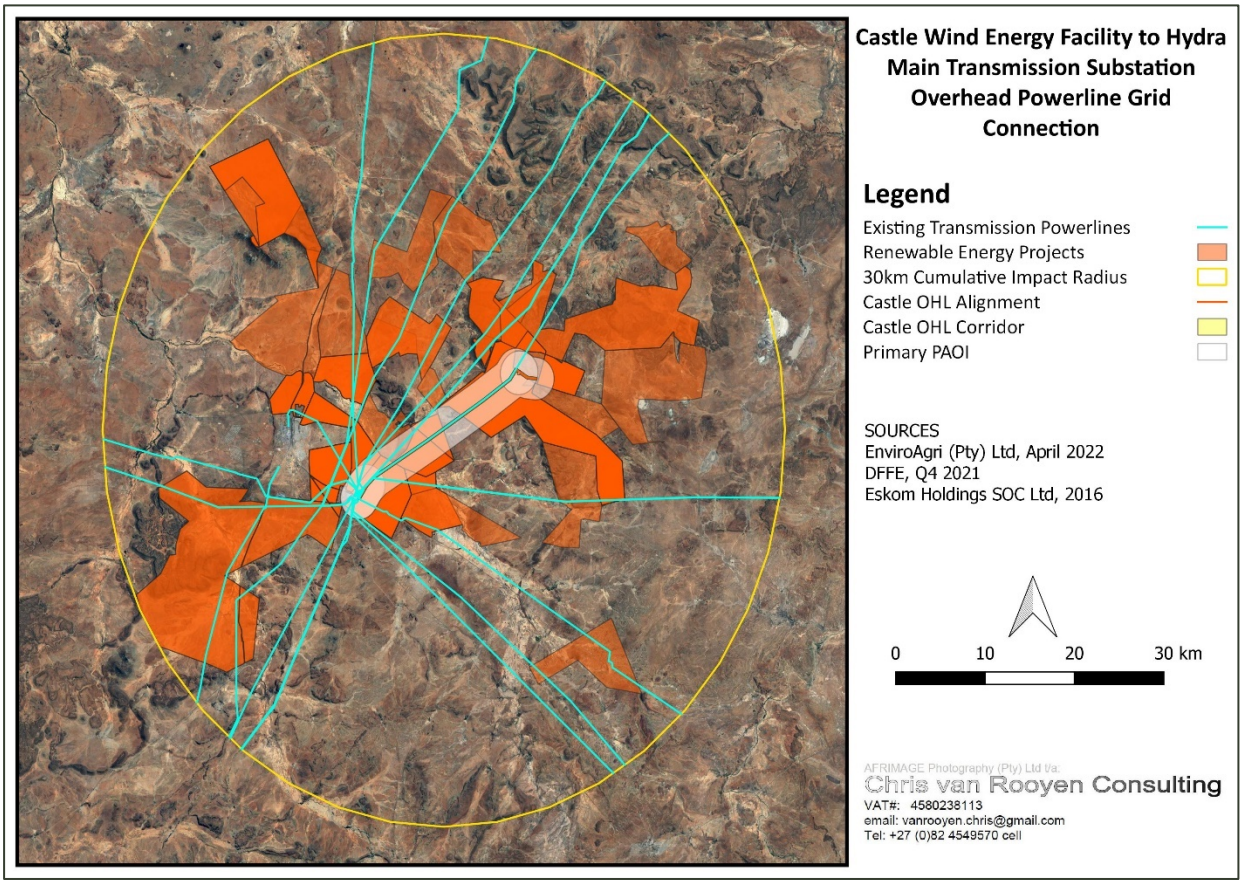


Figure 9: Renewable energy applications and existing high voltage powerlines within 30km of the proposed Castle OHL to Hydra MTS grid connection project

The proposed Castle OHL to Hydra MTS grid connection project equates to a maximum of 25km. There are approximately 24 high voltage powerlines totalling hundreds of kilometres of existing powerlines within the 30km radius around the Castle OHL to Hydra MTS grid connection project area. An intensive internet search was conducted to source information on the grid connections of the abovementioned projects available within the public domain, but in some instances no information could be obtained. The Castle OHL to Hydra MTS grid connection project will thus increase the total number of existing high voltage lines by a very small percentage. The contribution of the proposed Castle OHL to Hydra MTS grid connection 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.

9.3 Environmental Sensitivities

9.3.1 High Sensitivity

At a site-specific level, environmentally most sensitive features present within the proposed PAOI are 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 powerline across or within close proximity to the waterbodies and nests will necessitate the marking of the powerline with bird flight diverters to

mitigate the collision impact. Site specific recommendations for the management of the disturbance impacts associated with these **HIGH** sensitivity areas will be provided following the pre-construction avifaunal walk-through (inspection).

9.3.2 Medium to High Sensitivity

The remainder of the PAOI is considered to be of **MEDIUM to HIGH** sensitivity, given its propensity to regularly support Ludwig's Bustard, Secretarybird and Blue Crane. It will therefore also require marking of the powerline with bird flight diverters to mitigate the collision impact, which in effect comes down to marking the entire powerline.

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 Castle OHL to Hydra MTS grid connection range from **MINOR to MAJOR** significance and negative status pre-mitigation. However, with appropriate mitigation, the post-mitigation significance of the identified impacts should be reduced to **MODERATE and MINOR** 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, BeaufortWest, 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 EnviroAgri (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 Castle Wind Energy Facility Grid Connection Project.

Full Name: Chris van Rooyen
Position: Director

APPENDIX 3: SITE SENSITIVITY VERIFICATION

CONTENTS

1. INTRODUCTION

Environmental Authorisation (EA) for the construction of the Castle Wind Energy Facility (WEF) and its associated infrastructure was granted by the Department of Environmental Affairs (DEA) now Department of Forestry, Fisheries and the Environment (DFFE) on 8 May 2015 (DEA Reference: 14/12/16/3/3/2/278). In addition, an EA for the proposed Overhead Line (OHL) from Castle WEF to Hydra Main Transmission Substation (MTS) was obtained on 5 October 2018 (DEA Reference:14/12/16/3/3/1/1351). Since the issuing of these EAs several Renewable Energy (RE) developments and their respective grid connections surrounding De Aar, specifically Hydra MTS, has increased significantly. This bottleneck has rendered the currently authorised OHL corridor infeasible. An alternative power line route alignment has been identified by the Proponent, African Clean Energy Developments (Pty) Ltd (ACED). This alternative is comprised of a new OHL, an upgrade to an existing OHL and small section that could feed into the authorised De Aar South WEF substation.

The proposed OHL grid connection is approximately 25km in length and is routed across various portions of the farms: Vendussie Kuil, Wagt en Bittje, Hydra, Carolus Poort and Slingers Hoek. The project is located within 10km of De Aar, in the Pixley Ka Seme District Municipality in the Northern Cape Province of South Africa (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 Castle WEF grid connection is the subject of this impact assessment 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

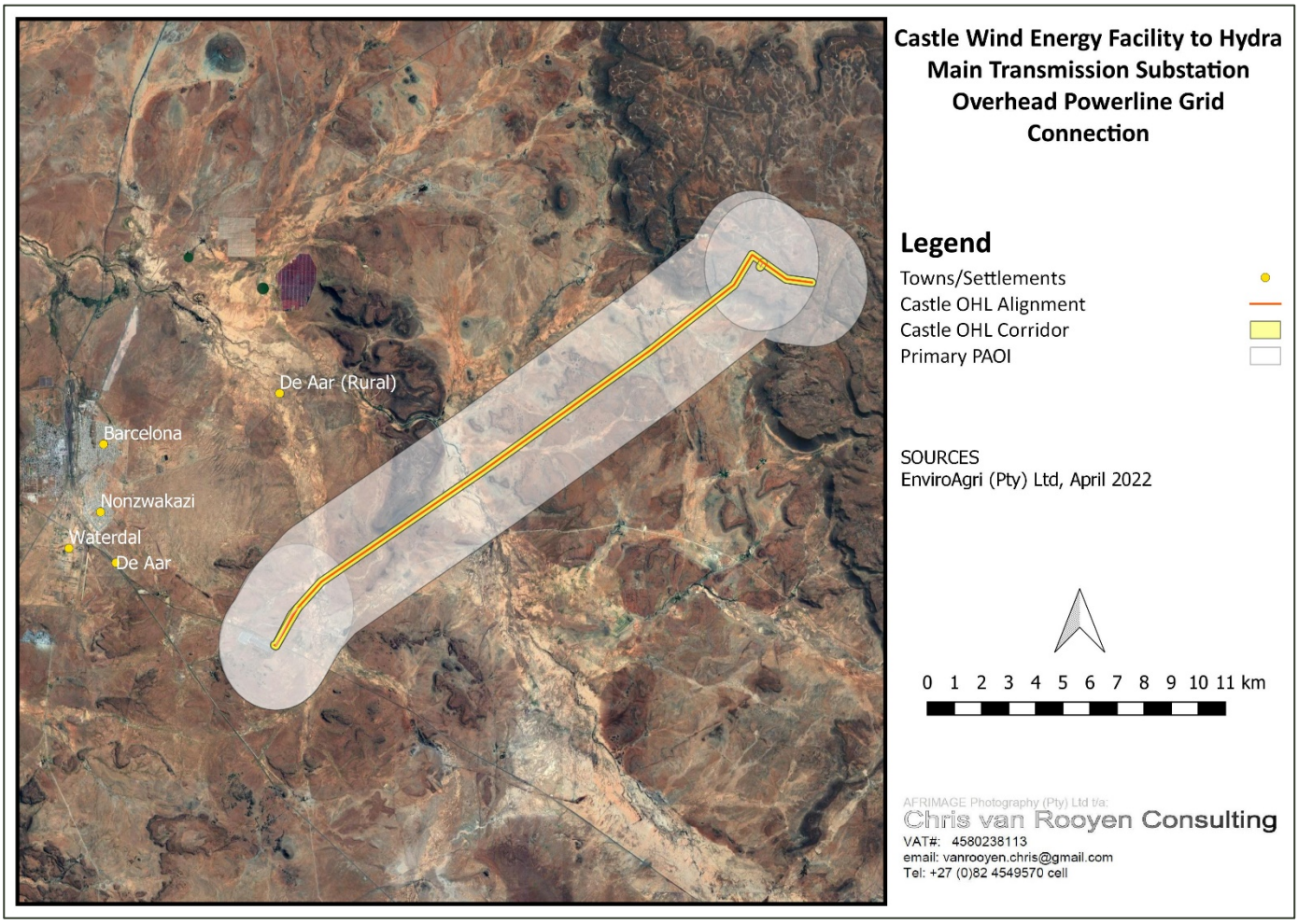

Figure 1: Locality map indicating the location of the Castle WEF to Hydra MTS grid connection within the primary PAOI near De Aar, Northern Cape Province.

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 ten 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 ten pentad grid cells are the following: 3035_2400, 3035_2405, 3035_2410, 3035_2415, 3035_2420, 3040_2400, 3040_2405, 3040_2410, 3040_2415 and 3040_2420. A total of 33 full protocol lists (i.e. bird listing surveys lasting a minimum of two hours each) and 70 ad hoc protocol lists (surveys lasting less than two hours but still yielding valuable data) have been completed to date for the ten 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 Northern Cape Province .
- The DFFE National Screening Tool was used to determine the assigned avian sensitivity of the PAOI (April, 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).
- Primary avifaunal diversity and abundance data collected during a single season, two-day site visit conducted on 19 and 20 April 2022. Data was collected by means of incidental counts.

3. OUTCOME OF SITE SENSITIVITY VERIFICATION

The project site and immediate environment is classified as **MEDIUM and HIGH** sensitivity for terrestrial animals according to the Terrestrial Animal Species Theme (Figure 2). These classifications are linked to the potential occurrence of Ludwig's Bustard *Neotis ludwigii* (Globally and Regionally Endangered), Tawny Eagle *Aquila rapax* (Globally Vulnerable and Regionally Endangered), Verreaux's Eagle *Aquila verreauxii* (Regionally Vulnerable), Lanner Falcon *Falco biarmicus* (Regionally Near Threatened), Black Stork *Ciconia nigra* (Regionally Vulnerable) and Caspian Tern *Hydroprogne caspia* (Regionally Vulnerable). In addition, the PAOI contains confirmed habitat for SCC as defined in the Protocol for the specialist assessment and minimum report content requirements for environmental impacts on terrestrial animal species (Government Gazette No 43855, 30 October 2020).

4. CONCLUSION

Although Verreaux's Eagle *A. verreauxii* was the only SCC observed during the site visit, the authors have conducted several assessments and research projects in the secondary PAOI and have previously observed Ludwig's Bustard *N. ludwigii,* Martial Eagle *Polemaetus bellicosus*, Tawny Eagle *A. rapax*, Lanner Falcon *F. biarmicus* and Black Stork C. *nigra* in identical habitats. Based on these observations, the classification of **HIGH** sensitivity for avifauna in the screening tool is therefore confirmed.

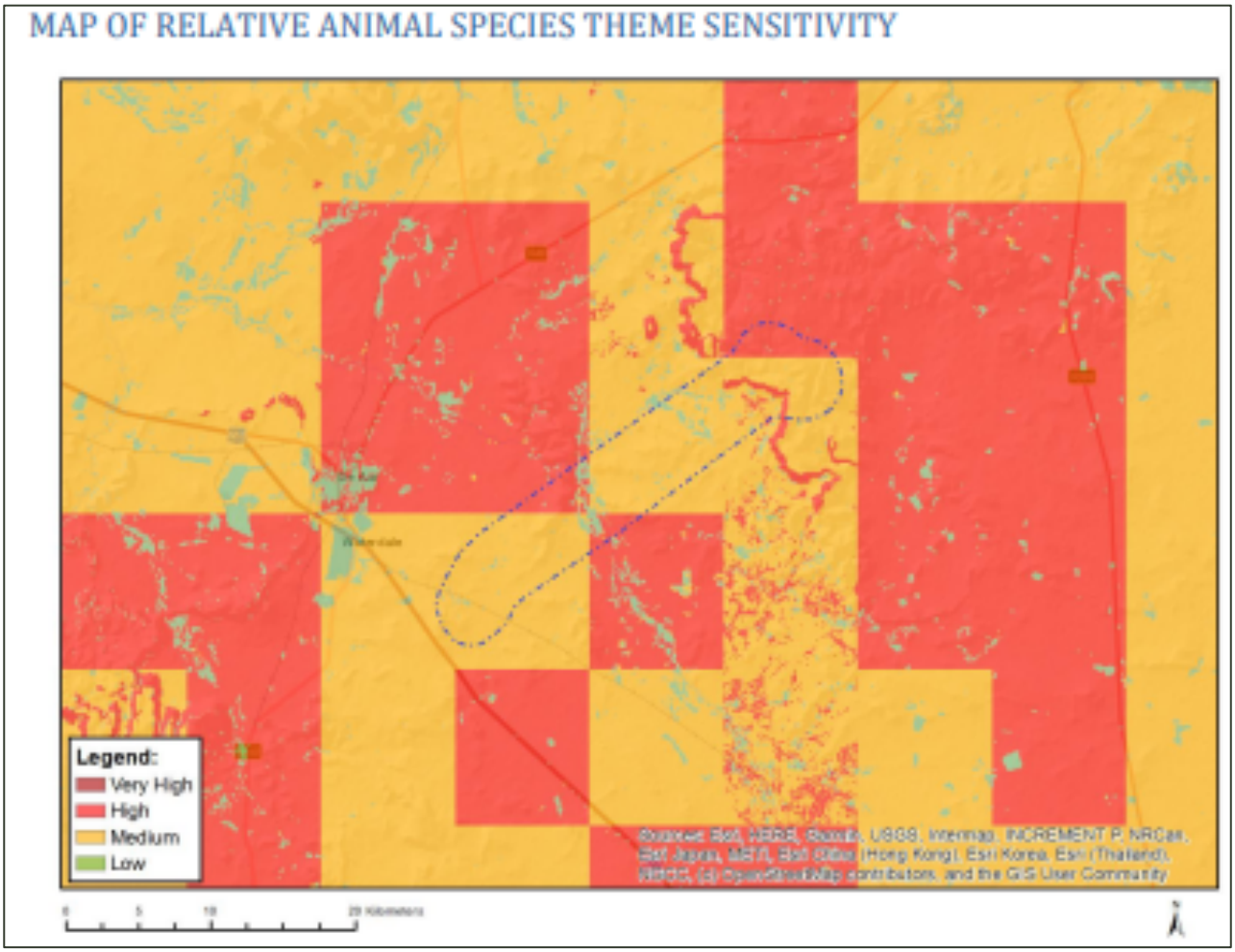

Figure 2: The classification of the PAOI in the DFFE online screening tool.

APPENDIX 4: SABAP 2 SPECIES LIST FOR THE PAOI AND SURROUNDINGS

Name		SABAP Reporting Rates		Status		
Species name	Scientific name	Full protocol	Ad hoc protocol	Red List Global	Red List Regional	Endemic (SA)
Bokmakierie	Telophorus zeylonus	75.7576	17.1429	-	-	
Hamerkop	Scopus umbretta	15.1515	0.0000	-	-	
Neddicky	Cisticola fulvicapilla	3.0303	4.2857	-	-	
Quailfinch	Ortygospiza atricollis	0.0000	2.8571	-	-	
Ruff	Calidris pugnax	9.0909	0.0000	-	-	
Secretarybird	Sagittarius serpentarius	6.0606	7.1429	EN	VU	
Pied Avocet	Recurvirostra avosetta	15.1515	0.0000	-	-	
Acacia Pied Barbet	Tricholaema leucomelas	69.6970	5.7143	-	-	
Crested Barbet	Trachyphonus vaillantii	3.0303	0.0000	-	-	
Pririt Batis	Batis pririt	6.0606	1.4286	-	-	
European Bee-eater	Merops apiaster	36.3636	14.2857	-	-	
Southern Red Bishop	Euplectes orix	60.6061	11.4286	-	-	
African Red-eyed Bulbul	Pycnonotus nigricans	69.6970	15.7143	-	-	
Cape Bunting	Emberiza capensis	27.2727	7.1429	-	-	
Cinnamon-breasted Bunting	Emberiza tahapisi	3.0303	2.8571	-	-	
Lark-like Bunting	Emberiza impetuani	45.4545	38.5714	-	-	
Ludwig's Bustard	Neotis ludwigii	30.3030	7.1429	EN	EN	
Common Buzzard	Buteo buteo	15.1515	1.4286	-	-	
Jackal Buzzard	Buteo rufofuscus	27.2727	32.8571	-	-	x
Black-headed Canary	Serinus alario	12.1212	4.2857	-	-	x
Black-throated Canary	Crithagra atrogularis	36.3636	4.2857	-	-	
White-throated Canary	Crithagra albogularis	57.5758	11.4286	-	-	
Yellow Canary	Crithagra flaviventris	39.3939	15.7143	-	-	
Ant-eating Chat	Myrmecocichla formicivora	81.8182	47.1429	-	-	
Familiar Chat	Oenanthe familiaris	69.6970	10.0000	-	-	
Karoo Chat	Emarginata schlegelii	18.1818	5.7143	-	-	
Sickle-winged Chat	Emarginata sinuata	36.3636	11.4286	-	-	x
Tractrac Chat	Emarginata tractrac	0.0000	1.4286	-	-	
Desert Cisticola	Cisticola aridulus	51.5152	7.1429	-	-	
Grey-backed Cisticola	Cisticola subruficapilla	51.5152	7.1429	-	-	
Levaillant's Cisticola	Cisticola tinniens	15.1515	1.4286	-	-	
Zitting Cisticola	Cisticola juncidis	39.3939	1.4286	-	-	
Red-knobbed Coot	Fulica cristata	9.0909	0.0000	-	-	
Reed Cormorant	Microcarbo africanus	3.0303	0.0000	-	-	
White-breasted Cormorant	Phalacrocorax lucidus	6.0606	0.0000	-	-	
Double-banded Courser	Rhinoptilus africanus	0.0000	1.4286	-	-	
Black Crake	Zapornia flavirostra	3.0303	0.0000	-	-	
Blue Crane	Grus paradisea	42.4242	11.4286	VU	NT	
Long-billed Crombec	Sylvietta rufescens	6.0606	1.4286	-	-	
Cape Crow	Corvus capensis	9.0909	0.0000	-	-	
Pied Crow	Corvus albus	90.9091	40.0000	-	-	
Diederik Cuckoo	Chrysococcyx caprius	21.2121	1.4286	-	-	
Cape Turtle Dove	Streptopelia capicola	78.7879	12.8571	-	-	
Laughing Dove	Spilopelia senegalensis	72.7273	21.4286	-	-	
Namaqua Dove	Oena capensis	30.3030	8.5714	-	-	
Red-eyed Dove	Streptopelia semitorquata	39.3939	1.4286	-	-	
Rock Dove	Columba livia	9.0909	0.0000	-	-	
African Black Duck	Anas sparsa	6.0606	0.0000	-	-	
White-faced Whistling Duck	Dendrocygna viduata	3.0303	0.0000	-	-	
Yellow-billed Duck	Anas undulata	21.2121	2.8571	-	-	
African Fish Eagle	Haliaeetus vocifer	3.0303	0.0000	-	-	

Name		SABAP Reporting Rates		Status		
Species name	Scientific name	Full protocol	Ad hoc protocol	Red List Global	Red List Regional	Endemic (SA)
Black-chested Snake Eagle	Circaetus pectoralis	3.0303	0.0000	-	-	
Booted Eagle	Hieraaetus pennatus	18.1818	5.7143	-	-	
Martial Eagle	Polemaetus bellicosus	6.0606	1.4286	EN	EN	
Tawny Eagle	Aquila rapax	15.1515	11.4286	VU	EN	
Verreaux's Eagle	Aquila verreauxii	12.1212	17.1429	-	VU	
Spotted Eagle-Owl	Bubo africanus	18.1818	0.0000	-	-	
Little Egret	Egretta garzetta	3.0303	0.0000	-	-	
Western Cattle Egret	Bubulcus ibis	3.0303	0.0000	-	-	
Karoo Eremomela	Eremomela gregalis	3.0303	0.0000	-	-	x
Yellow-bellied Eremomela	Eremomela icteropygialis	33.3333	2.8571	-	-	
Amur Falcon	Falco amurensis	12.1212	2.8571	-	-	
Lanner Falcon	Falco biarmicus	9.0909	2.8571	-	VU	
Red-headed Finch	Amadina erythrocephala	15.1515	2.8571	-	-	
Red-billed Firefinch	Lagonosticta senegala	3.0303	0.0000	-	-	
Southern Fiscal	Lanius collaris	81.8182	18.5714	-	-	
Greater Flamingo	Phoenicopterus roseus	15.1515	0.0000	-	NT	
Chat Flycatcher	Melaenornis infuscatus	42.4242	12.8571	-	-	
Fairy Flycatcher	Stenostira scita	15.1515	2.8571	-	-	x
Fiscal Flycatcher	Melaenornis silens	36.3636	11.4286	-	-	x
Spotted Flycatcher	Muscicapa striata	9.0909	0.0000	-	-	
Grey-winged Francolin	Scleroptila afra	6.0606	4.2857	-	-	x
Egyptian Goose	Alopochen aegyptiaca	63.6364	17.1429	-	-	
Spur-winged Goose	Plectropterus gambensis	30.3030	2.8571	-	-	
Gabar Goshawk	Micronisus gabar	3.0303	0.0000	-	-	
Pale Chanting Goshawk	Melierax canorus	69.6970	25.7143	-	-	
Little Grebe	Tachybaptus ruficollis	6.0606	0.0000	-	-	
Common Greenshank	Tringa nebularia	18.1818	0.0000	-	-	
Helmeted Guineafowl	Numida meleagris	66.6667	8.5714	-	-	
Grey-headed Gull	Chroicocephalus cirrocephalus	3.0303	0.0000	-	-	
African Harrier-Hawk	Polyboroides typus	6.0606	1.4286	-	-	
Black-headed Heron	Ardea melanocephala	21.2121	0.0000	-	-	
Grey Heron	Ardea cinerea	21.2121	0.0000	-	-	
Greater Honeyguide	Indicator indicator	6.0606	0.0000	-	-	
African Hoopoe	Upupa africana	24.2424	1.4286	-	-	
African Sacred Ibis	Threskiornis aethiopicus	42.4242	1.4286	-	-	
Glossy Ibis	Plegadis falcinellus	18.1818	0.0000	-	-	
Hadada Ibis	Bostrychia hagedash	75.7576	2.8571	-	-	
Greater Kestrel	Falco rupicoloides	18.1818	15.7143	-	-	
Lesser Kestrel	Falco naumanni	42.4242	4.2857	-	-	
Rock Kestrel	Falco rupicolus	18.1818	2.8571	-	-	
Malachite Kingfisher	Corythornis cristatus	3.0303	0.0000	-	-	
Black-winged Kite	Elanus caeruleus	6.0606	1.4286	-	-	
Yellow-billed Kite	Milvus aegyptius	6.0606	0.0000	-	-	
Blue Korhaan	Eupodotis caerulescens	9.0909	0.0000	NT	LC	x
Karoo Korhaan	Eupodotis vigorsii	30.3030	8.5714	-	NT	
Northern Black Korhaan	Afrotis afraoides	87.8788	25.7143	-	-	
Blacksmith Lapwing	Vanellus armatus	63.6364	1.4286	-	-	
Crowned Lapwing	Vanellus coronatus	21.2121	4.2857	-	-	
Eastern Clapper Lark	Mirafra fasciolata	72.7273	34.2857	-	-	
Karoo Lark	Calendulauda albescens	9.0909	0.0000	-	-	x
Karoo Long-billed Lark	Certhilauda subcoronata	36.3636	5.7143	-	-	
Large-billed Lark	Galerida magnirostris	45.4545	24.2857	-	-	x
Melodious Lark	Mirafra cheniana	6.0606	0.0000	-	-	x

Name		SABAP Reporting Rates		Status		
Species name	Scientific name	Full protocol	Ad hoc protocol	Red List Global	Red List Regional	Endemic (SA)
Red-capped Lark	Calandrella cinerea	9.0909	0.0000	-	-	
Sabota Lark	Calendulauda sabota	48.4848	5.7143	-	-	
Spike-heeled Lark	Chersomanes albofasciata	75.7576	31.4286	-	-	
Brown-throated Martin	Riparia paludicola	12.1212	0.0000	-	-	
Rock Martin	Ptyonoprogne fuligula	60.6061	11.4286	-	-	
Common Moorhen	Gallinula chloropus	18.1818	0.0000	-	-	
Red-faced Mousebird	Urocolius indicus	33.3333	1.4286	-	-	
Speckled Mousebird	Colius striatus	0.0000	1.4286	-	-	
White-backed Mousebird	Colius colius	69.6970	17.1429	-	-	
Rufous-cheeked Nightjar	Caprimulgus rufigena	3.0303	0.0000	-	-	
Common Ostrich	Struthio camelus	6.0606	0.0000	-	-	
Speckled Pigeon	Columba guinea	60.6061	21.4286	-	-	
African Pipit	Anthus cinnamomeus	72.7273	18.5714	-	-	
African Rock Pipit	Anthus crenatus	21.2121	8.5714	NT	NT	x
Long-billed Pipit	Anthus similis	6.0606	0.0000	-	-	
Nicholson's Pipit	Anthus nicholsoni	9.0909	0.0000	-	-	
Plain-backed Pipit	Anthus leucophrys	6.0606	0.0000	-	-	
Kittlitz's Plover	Charadrius pecuarius	9.0909	0.0000	-	-	
Three-banded Plover	Charadrius tricollaris	42.4242	2.8571	-	-	
Black-chested Prinia	Prinia flavicans	12.1212	2.8571	-	-	
Karoo Prinia	Prinia maculosa	30.3030	10.0000	-	-	x
Common Quail	Coturnix coturnix	0.0000	1.4286	-	-	
Red-billed Quelea	Quelea quelea	27.2727	12.8571	-	-	
White-necked Raven	Corvus albicollis	12.1212	11.4286	-	-	
Cape Robin-Chat	Cossypha caffra	57.5758	4.2857	-	-	
Namaqua Sandgrouse	Pterocles namaqua	24.2424	0.0000	-	-	
Common Sandpiper	Actitis hypoleucos	0.0000	1.4286	-	-	
Curlew Sandpiper	Calidris ferruginea	3.0303	0.0000	NT	LC	
Wood Sandpiper	Tringa glareola	6.0606	1.4286	-	-	
Kalahari Scrub Robin	Cercotrichas paena	9.0909	1.4286	-	-	
Karoo Scrub Robin	Cercotrichas coryphoeus	81.8182	34.2857	-	-	
South African Shelduck	Tadorna cana	36.3636	2.8571	-	-	
Cape Shoveler	Spatula smithii	6.0606	0.0000	-	-	
Cape Sparrow	Passer melanurus	93.9394	24.2857	-	-	
House Sparrow	Passer domesticus	42.4242	7.1429	-	-	
Southern Grey-headed Sparrow	Passer diffusus	12.1212	1.4286	-	-	
Black-eared Sparrow-Lark	Eremopterix australis	3.0303	1.4286	-	-	x
Grey-backed Sparrow-Lark	Eremopterix verticalis	24.2424	2.8571	-	-	
White-browed Sparrow-Weaver	Plocepasser mahali	12.1212	0.0000	-	-	
Rufous-breasted Sparrowhawk	Accipiter rufiventris	3.0303	0.0000	-	-	
African Spoonbill	Platalea alba	3.0303	0.0000	-	-	
Cape Starling	Lamprotornis nitens	27.2727	5.7143	-	-	
Common Starling	Sturnus vulgaris	15.1515	0.0000	-	-	
Pale-winged Starling	Onychognathus nabouroup	30.3030	0.0000	-	-	
Pied Starling	Lamprotornis bicolor	60.6061	21.4286	-	-	x
Wattled Starling	Creatophora cinerea	9.0909	5.7143	-	-	
Black-winged Stilt	Himantopus himantopus	24.2424	4.2857	-	-	
Little Stint	Calidris minuta	6.0606	0.0000	-	-	
African Stonechat	Saxicola torquatus	36.3636	2.8571	-	-	
Black Stork	Ciconia nigra	9.0909	0.0000	-	VU	
White Stork	Ciconia ciconia	3.0303	0.0000	-	-	
Dusky Sunbird	Cinnyris fuscus	21.2121	1.4286	-	-	
Malachite Sunbird	Nectarinia famosa	0.0000	1.4286	-	-	

Name		SABAP Reporting Rates		Status		
Species name	Scientific name	Full protocol	Ad hoc protocol	Red List Global	Red List Regional	Endemic (SA)
Barn Swallow	Hirundo rustica	60.6061	20.0000	-	-	
Greater Striped Swallow	Cecropis cucullata	57.5758	5.7143	-	-	
South African Cliff Swallow	Petrochelidon spilodera	21.2121	1.4286	-	-	x
White-throated Swallow	Hirundo albigularis	24.2424	1.4286	-	-	
Alpine Swift	Tachymarptis melba	9.0909	0.0000	-	-	
Common Swift	Apus apus	12.1212	5.7143	-	-	
Little Swift	Apus affinis	51.5152	4.2857	-	-	
White-rumped Swift	Apus caffer	39.3939	1.4286	-	-	
Cape Teal	Anas capensis	9.0909	0.0000	-	-	
Red-billed Teal	Anas erythrorhyncha	6.0606	1.4286	-	-	
Spotted Thick-knee	Burhinus capensis	27.2727	1.4286	-	-	
Karoo Thrush	Turdus smithi	51.5152	1.4286	-	-	x
Short-toed Rock Thrush	Monticola brevipes	3.0303	4.2857	-	-	
Cape Penduline Tit	Anthoscopus minutus	6.0606	10.0000	-	-	
Grey Tit	Melaniparus afer	9.0909	2.8571	-	-	x
Cape Vulture	Gyps coprotheres	3.0303	0.0000	EN	EN	
Cape Wagtail	Motacilla capensis	69.6970	4.2857	-	-	
African Reed Warbler	Acrocephalus baeticatus	18.1818	1.4286	-	-	
Chestnut-vented Warbler	Curruca subcoerulea	27.2727	0.0000	-	-	
Layard's Warbler	Curruca layardi	24.2424	12.8571	-	-	x
Lesser Swamp Warbler	Acrocephalus gracilirostris	9.0909	0.0000	-	-	
Namaqua Warbler	Phragmacia substriata	3.0303	0.0000	-	-	x
Rufous-eared Warbler	Malcorus pectoralis	90.9091	37.1429	-	-	
Common Waxbill	Estrilda astrild	27.2727	0.0000	-	-	
Cape Weaver	Ploceus capensis	0.0000	1.4286	-	-	x
Scaly-feathered Weaver	Sporopipes squamifrons	0.0000	2.8571	-	-	
Southern Masked Weaver	Ploceus velatus	87.8788	17.1429	-	-	
Capped Wheatear	Oenanthe pileata	48.4848	12.8571	-	-	
Mountain Wheatear	Myrmecocichla monticola	39.3939	12.8571	-	-	
Cape White-eye	Zosterops virens	12.1212	0.0000	-	-	x
Orange River White-eye	Zosterops pallidus	21.2121	1.4286	-	-	
Pin-tailed Whydah	Vidua macroura	18.1818	0.0000	-	-	

APPENDIX 5: HABITAT WITHIN THE PAOI

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

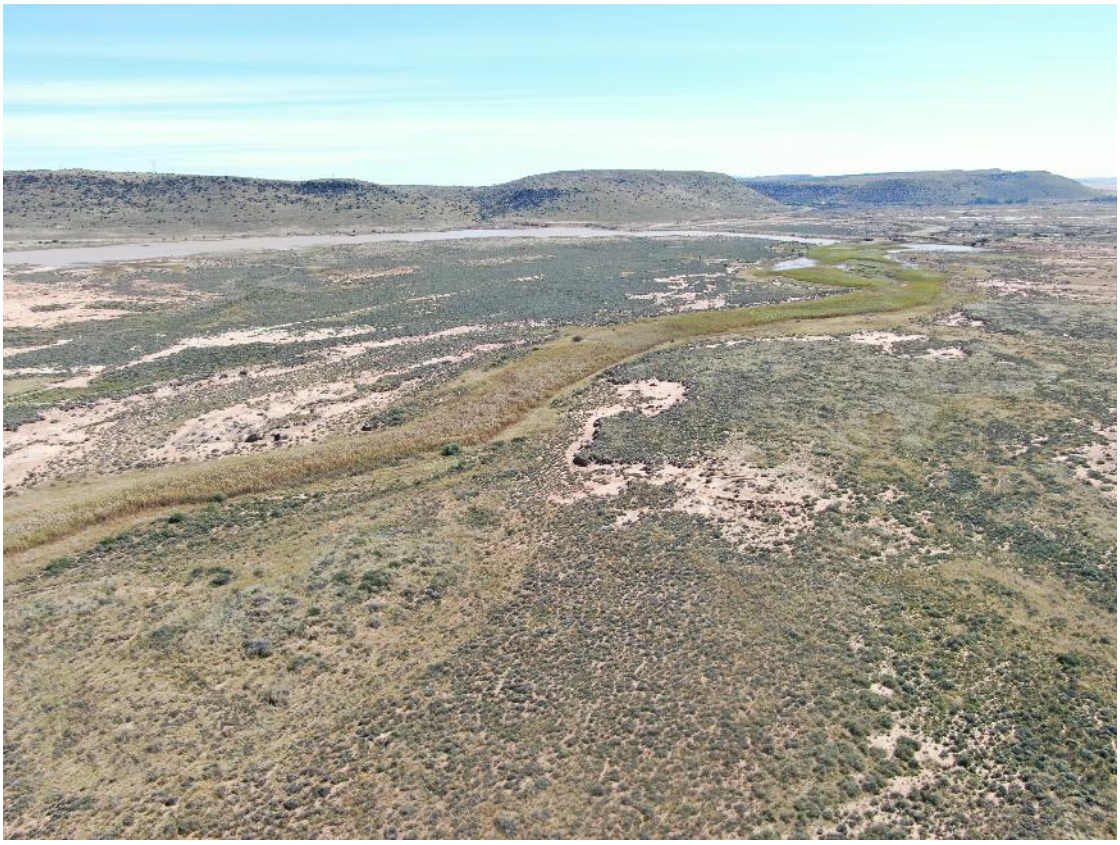

Figure 2: The ephemeral Brak River

Figure 3: An example of a large dam within the broader 2km PAOI

Figure 4: A borehole with a water reservoir within the broader 2km PAOI

Figure 5: Wetland area associated with a drainage line of the Brak River

Figure 6: The mountainous area in the north-eastern reaches of the PAOI

Figure 7: Dryland cultivation in the PAOI

Figure 8: An example of small stands of alien trees associated with homesteads observed within the PAOI

Figure 9: 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***
132kV Voltage Mortality of avifauna, specifically Cape Vulture, due to electrocutions on the overhead powerline poles/towers using either technology alternative (i.e. steel lattice or steel monopole tower structures).	Reduction of avian electrocution mortality	If the grid connection is constructed using a single circuit configuration, the only mitigation option is the construction of the powerline using the approved vulture friendly pole/tower design D-DT-7649 in accordance with the Distribution Technical Bulletin - *Reference Number 240-170000467*. Additional mitigation in the form of insulating sleeves on *jumpers* present on strain poles and terminal poles is also recommended (if suitable insulation material is readily available), alternatively all *jumpers* must be suspended below the crossarms. If the grid connection is constructed using a double circuit configuration, it is imperative that there is a minimum clearance of 1.8m between the *jumpers* and/or insulators and the horizontal earthed component on the lattice structure. Additional mitigation in the form of insulating sleeves on *jumpers* present on strain poles and terminal poles is also recommended (if suitable insulation material is readily available), alternatively all *jumpers* must be suspended below the crossarms.	1. Construct the powerline using an approved vulture friendly pole/tower (D-DT-7649) 2. If possible, insulate *jumpers* that may be present on strain and terminal poles/towers. Alternatively suspend all *jumpers* below the crossarms	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 a pre-construction inspection (avifaunal walk-through) of the final powerline alignment 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	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.	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***
		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; 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.	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 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	The entire length of powerline must be marked with Eskom approved bird flight diverters (BFDs). The bird flight diverters should be installed on the full span length on the earthwire (according to Eskom guidelines - five metres apart). Light and dark colour devices must be alternated to provide contrast against both dark and light backgrounds respectively. These devices must be installed as soon as the conductors and earthwires are strung.	1. Fit Eskom approved Bird Flight Diverters on the earthwire at the demarcated sections of the OHL.	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.	1. Conduct a an avifaunal inspection of the OHL prior to its decommissioning to identify nests on the poles/towers 2. 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

APPENDIX 7: RECOMMENDED 132kV STRUCTURE TYPE (D-DT-7649)