Proposed Dalmanutha Wind Energy Facility

Avifaunal Impact Assessment – Scoping phase

July 2022 (update to turbine layout Nov 2022)

Submitted to:

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Executive summary

ENERTRAG South Africa (hereafter the "Developer") is proposing the development of the Dalmanutha Wind Energy Facility and the Dalmanutha West Wind Energy Facility (hereafter referred to as the "Projects"), including associated and grid connection infrastructure for each facility. The Projects will be operated under two Special Purpose Vehicles, namely, Dalmanutha Wind (RF) Pty Ltd and Dalmanutha West Wind (RF) Pty Ltd. These Projects are being developed in the context of the Department of Mineral Resources and Energy (DMRE) Integrated Resource Plan and the Country's plan for a Just Transition.

The following Projects are being proposed as separate applications:

1. Dalmanutha Wind Energy Facility (up to 300MW);
2. Dalmanutha Wind Energy Facility Grid infrastructure (up to 132kV);
3. Dalmanutha West Wind Facility (up to, but not including, 20MW);
4. Dalmanutha West Grid infrastructure (up to 132kV); and
5. Common Collection Substation and Powerline (up to 132kV)

The proposed site is located in an area of the country which provides a mosaic of land uses or micro habitats. As a result, a rich diversity of birds occur here, many of which are regionally Red Listed. The most important of these are: Wattled Crane (regionally Critically Endangered); White-backed Vulture (regionally Critically Endangered); Cape Vulture (regionally Endangered); Martial Eagle (regionally Endangered); Grey-crowned Crane (regionally Endangered); Black-rumped Buttonquail (regionally Endangered); Denham's Bustard (regionally Vulnerable); White-bellied Bustard (regionally Vulnerable); Secretarybird (regionally Vulnerable; Southern Bald Ibis (regionally Vulnerable); Lanner Falcon (regionally Vulnerable); and Blue Crane (regionally Near-threatened) (Taylor *et al,* 2015).

All bird species will to some extent be susceptible to habitat destruction and disturbance if the wind farm is built. However, it is the direct mortality risk through collision with turbines, and collision and electrocution on overhead power lines which is of most concern. The larger species are particularly at risk of these impacts. We have made the following assessments of the significance of the potential impacts of the proposed project on avifauna (using methods and criteria supplied by WSP):

Phase	**Impact**	**Significance Pre-mitigation**
Construction	Habitat destruction	Medium
	Disturbance	Medium
Operation	Disturbance	Very low
	Displacement	Very low

	Collision of birds with turbines	High
	Collision & electrocution of birds on overhead power lines	High
Decommissioning	Disturbance of birds	Very low

These impacts will require mitigation measures which will be designed in the EIA Phase. The impact of 'Collision and electrocution on overhead power lines' can be relatively easily mitigated to Low significance through correct design. However, the impact of 'Collision of birds with turbines' is more challenging as most potential mitigation measures are currently relatively unproven in South Africa and for our bird species.

At a landscape level, we would categorise the site as High sensitivity for avifauna, based on the cited sources in this report. The northern parts of the site certainly appear to be more sensitive and constrained than the southern parts.

A number of avifaunal features have been identified on site which require spatial protection in the form of no-go buffers. Several current turbine positions infringe on these areas and will require micro siting.

Plan of study for EIA

The following sections of this report will be expanded upon in the EIA Phase:

- The second year of pre-construction bird monitoring will be completed. This will provide additional data on bird abundance and movement on site. in particular, regular counts of the number of Cape Vultures roosting on the power lines on site have been conducted. These data will be presented in the EIA phase report.
- Pre-construction bird monitoring data will be analysed and used in more detail.
- Sensitivity mapping will be refined. If necessary, wetland mapping will be compared with a wetland specialists', and buffers determined.
- Mitigation measures will be designed for each identified impact. This will include the consideration of all priority species identified by this study and future work on site.
- The cumulative impact assessment will be completed.
- The opportunity for technology alternatives at the site, and for the reduction of turbine numbers will be investigated further.
- Comments on the scoping phase assessment were received from three organisations: BirdLife South Africa (BLSA); Mpumalanga Department of Agriculture, Rural Development, land and Environmental Affairs; and Mpumalanga Tourism and Parks Agency. Comment was also received from Ms Annatjie Burke of the farm Vogelstruispoort 384 JT portion. We will consult with the project proponent and these stakeholders during the EIA phase to ensure that we deal appropriately with the aspects that have been raised.

- The above organisations have also submitted relevant avifaunal data collected on an *ad hoc* basis in the area. This will be cross checked against our systematically collected monitoring data (over 24 months). We are aware of one inaccuracy in the data submitted by stakeholders, where a Blue Crane nest location is cited, but our own observation is that the nest area has been ploughed by the landowner in 2021/2022.

Note that In November, seven turbines were dropped from the layout due to avifaunal concerns. An update to this report was therefore conducted in November 2022, to consider an updated turbine layout. No other changes were made to the report and no new information that has become available since the first version of this report (July 2022) was written. Any such information will be considered in the EIA phase.

NEMA requirements for specialists reports – check list

NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) AND ENVIRONMENTAL IMPACT REGULATIONS, 2014 (AS AMENDED) - REQUIREMENTS FOR SPECIALIST REPORTS (APPENDIX 6)

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	Section of Report
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Page 4-5, Appendix 1
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page 4-5. Appendix 1
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 2
(cA) an indication of the quality and age of base data used for the specialist report;	Section 2
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 9.3
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 2
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 2
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 8
g) an identification of any areas to be avoided, including buffers;	Section 7
h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 7
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.5
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, (including identified alternatives on the environment) or activities;	Section 8
k) any mitigation measures for inclusion in the EMPr;	Section 9
l) any conditions for inclusion in the environmental authorisation;	Section 9
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 9
n) a reasoned opinion-	Section 9

i. (as to) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	n/a
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	n/a
q) any other information requested by the competent authority.	n/a
2) Where a government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	

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Glossary of terms & abbreviations

The following terms are used in this study:

Red Listed – regionally	The latest regional conservation status for the species as per Taylor *et al,* 2015
Red Listed – globally	The latest global conservation status for the species as per IUCN (2022)
Priority Species	Priority species are those that this study focuses on in more detail
Endemic/near	Occurring only here, southern African endemics as taken from BirdLife South Africa Checklist 2018
kV	Kilovolt (1000 volts)
EN	Endangered
VU	Vulnerable
NT	Near-threatened
LC	Least concern
Rec	Number of records

1. Introduction

ENERTRAG South Africa (hereafter the "Developer") is proposing the development of the Dalmanutha Wind Energy Facility and Dalmanutha West Wind Energy Facility, including (hereafter referred to as the "Projects") associated and grid connection infrastructure. The Projects will be operated under two Special Purpose Vehicles, namely, Dalmanutha Wind (RF) Pty Ltd and Dalmanutha West Wind (RF) Pty Ltd. These Projects are being developed in the context of the Department of Mineral Resources and Energy (DMRE) Integrated Resource Plan and the Country's plan for a Just Transition.

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5. Common Collection Substation and Powerline (up to 132kV)

In terms of the EIA Regulations various aspects of the proposed development 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. Specialist studies have been commissioned to verify the sensitivity and assess the impacts of the wind farms under the Gazetted specialist protocols (GN R 320 and GN R 1150 of 2020).

WildSkies Ecological Services (Pty) Ltd has been appointed by ENERTRAG to conduct the pre-construction bird monitoring and impact assessment studies at the site.

2. Assessment methodology

2.1. Specialist Credentials

See Appendix 1 for the avifaunal specialists full *curriculum vitae*.

2.2. Terms of Reference

Specialists shall undertake all necessary data collection and fieldwork to assess the project and meet the requirements of Appendix 6 to the EIA Regulations (as amended) including, but not limited to:

- Providing a detailed project specific description
- A detailed baseline description of the receiving environment in and surrounding the site, including a description of key no go areas or features or other sensitive areas to be avoided.
- A description of all methodology and processes used to source information, collect baseline data, generate models and the age or season when the data was collected. A description of any assumptions made and any uncertainties or gaps in knowledge.
- A description of relevant legal matters, policies, standards and guidelines.
- A list of potentially significant environmental impacts that may arise in the construction, operation and decommissioning phases of the project, including cumulative impacts
- A preliminary impact assessment of each impact
- Any other information the specialist believes to be important, including recommendations that should be included as conditions in the Environmental Authorisation.

2.3. General approach

The general approach to this study was as follows:

- Pre-construction bird monitoring was initiated in 2021. The study design and setup were conducted during April 2021, as was the first seasonal site visit (autumn). The second site visit was conducted in July (winter) and the third in November 2021 (spring). The fourth site visit was completed in February 2022 (summer). Each site visit consisted of approximately 14 consecutive days on site by a team of two skilled observers, to record data on bird species and abundance on and near site. These site visits covered summer (when summer migrants are present); winter (when raptors breed and Blue Cranes *Grus paradisea* flock); spring (when summer migrants are arriving on site and many species start to breed); and autumn (when summer migrants are leaving and many raptors are preparing to breed). We believe this sampling is sufficient to capture data representative of conditions on site. Pre-construction bird monitoring complied with the general birds and wind energy best practice guidelines (Jenkins et al, 2015, 2021). The detailed methods employed by this pre-construction monitoring are described in Section 2.7.
- Since a high risk to Cape Vulture *Gyps coprotheres* was identified during the first year of pre-construction bird monitoring, a second year of monitoring was initiated, in compliance with the Cape Vulture and wind energy guidelines (BirdLife South Africa, 2018). The first of 6 planned site visits for Year 2 monitoring was completed in May 2022.
- Additional specialist site visits were conducted during April 2022.

Note that pre-construction bird monitoring and all specialist field assessments have been designed to assess the full Dalmanutha Wind Energy Facility site. This is an advantage when it comes to the

assessment of each project component on its own, as data has been collected for a larger area. Since birds are mobile this presents a far stronger assessment than would otherwise be the case.

2.4. Information sources used

Various existing data sources have been used in the design and implementation of this study, including the following:

- The pre-construction bird monitoring raw data and progress reports (WildSkies, 2021, 2022).
- The data captured by specialist site visits.
- The Southern African Bird Atlas Project data (SABAP1 - Harrison *et al*, 1997) for the relevant quarter degree squares covering the site, and the Southern African Bird Atlas Project 2 data, available at the pentad level (http://sabap2.adu.org.za/v1/index.php)(accessed at www.mybirdpatch.adu.org.za)
- The conservation status of all relevant bird species was determined using Taylor *et al* (2015) & IUCN 2022. The endemism of species was determined using the BirdLife South Africa Checklist.
- The vegetation classification of South Africa (Mucina & Rutherford, 2018) was consulted in order to determine which vegetation types occur on site.
- Aerial photography from the Surveyor General was used for planning purposes.
- The 'Avian Wind Farm Sensitivity Map: Criteria and procedures used (Retief *et al*, 2011, update 2014).
- The Important Bird & Biodiversity Areas programme was consulted (Marnewick *et al*, 2015).
- A review report entitled "Wind energy's impacts on birds in South Africa: a preliminary review of the results of operational monitoring at the first wind farms of the Renewable Energy Independent Power Producer Procurement Programme Wind Farms in South Africa" (Ralston-Paton, Smallie, Pearson, & Ramalho, 2017) was consulted extensively.
- A more recent review of the species affected by turbine collisions at south African wind farms was conducted by Perold *et al* (2020) and consulted for this study.
- Coordinated Avifaunal Road count data for the area (accessed at www.car.adu.org.za) was consulted.
- Coordinated Wetland bird count data (CWAC) was consulted to obtain information on waterbird abundance in the area.
- The "Best practice guidelines for assessing and monitoring the impact of wind energy facilities on birds in southern Africa" Unpublished guidelines by BirdLife South Africa & Endangered Wildlife Trust (Jenkins *et al*, 2015, 2021).
- Available published literature on wind energy – bird interactions.
- The Cape Vulture and wind energy best practice guidelines (BirdLife South Africa, 2018).

- Priority bird species records made in the site area over the last 12 years was received from a stakeholder/neighbouring landowner (Mr Geoff Lockwood) (Appendix 5).

2.5. Assumptions and Limitations

Certain biases and challenges are inherent in the methods that have been employed to collect data in this programme. It is not possible to discuss all of them here, and some will only become evident with time and operational phase data, but the following are some of the key points:

The presence of the observers on site is certain to have an effect on the birds itself. For example, during walked transects, certain bird species will flush more easily than others (and therefore be detected), certain species may sit undetected, certain species may flee, and yet others may be inquisitive and approach the observers. Likewise, with the vantage point counts, it is extremely unlikely that two observers sitting in position for hours at a time will have no effect on bird flight. Some species may avoid the vantage point position because there are people present, and others may approach out of curiosity.

In almost all data collection methods large bird species will be more easily detected, and their position in the landscape more easily estimated. This is particularly relevant at the vantage points where a large eagle may be visible several kilometres away, but a smaller kestrel perhaps only within 800 metres. A particularly important challenge is that of estimating the height at which birds fly above the ground. With no reference points against which to judge, it is exceptionally difficult and subjective. It is for this reason that the flight height data has been treated cautiously by this report, and much of the analysis conducted using flights of all height.

The questions that one can ask of the data collected by this programme are almost endless. Most of these questions however become far more informative once post construction data has been collected and effects can be observed. For this reason, some of the analysis in this report is relatively crude. The raw data has however been collected and will be stored until such time as more detailed analysis is possible and necessary.

Spotting and identifying birds whilst walking is a significant challenge, particularly when only fleeting glimpses of birds are obtained. As such, there is variability between observers' ability and hence the data obtained. The above data is therefore by necessity subjective to some extent. To control for this subjectivity, the same pairs of observers have been used for the full duration of the project, and it is hoped this can be maintained for the post construction phase. Despite this subjectivity, and a number of assumptions that line transects rely on (for more details see Bibby *et al*, 2000), this field method returns the greatest amount of data per unit effort (Bibby *et al*, 2000) and was therefore deemed appropriate for the purposes of this programme. Further, to maximise the returns from available

resources, the walked transects were located close to each Vantage Point. This systematic selection may result in some as yet unknown bias in the data, but it has numerous logistical benefits.

No thresholds for fatality rates for priority species have been established in South Africa to date. This means that impact assessments such as this one need to make subjective judgements on the acceptability of the estimated predicted fatalities for each species.

2.6. Site sensitivity verification report

Government Notice No. 320, dated 20 March 2020, includes the requirement that an Initial Site Sensitivity Verification Report must be produced for a development footprint. As per Part 1, Section 2.3, the outcome of the Initial Site Verification must be recorded in the form of a report that - Confirms or disputes the current use of the land and environmental sensitivity as identified by the national web based environmental screening tool; Contains a motivation and evidence of either the verified or different use of the land and environmental sensitivity; is submitted together with the relevant reports prepared in accordance with the requirements of the Environmental Impact Assessment Regulations. The required report has been produced specifically to consider the avian and animal themes and addresses the content requirements of (a) and (b) above. This report can be viewed in Appendix 3.

2.7. Pre-construction bird monitoring methodology

Data was collected on site through five primary data collection techniques, described in detail below.

2.7.1. Sample counts of small terrestrial species

Although not traditionally the focus of wind farm bird studies and literature, small terrestrial birds are an important component of this programme. Due to the rarity of many of our threatened bird species, it is anticipated that statistically significant trends in abundance and density may be difficult to observe for these species. More common, similar species could provide early evidence for trends and point towards the need for more detailed future study. Given the large spatial scale of most wind farms, these smaller species may also be particularly vulnerable to displacement and habitat level effects. Sampling these species is aimed at establishing indices of abundance for small terrestrial birds in the study area. These counts should be done when conditions are optimal. In this case, this means the times when birds are most active and vocal, i.e., early mornings. Twelve walked transects (WT) of approximately 1 kilometre each were established on the site. These were each counted once per site visit.

2.7.2. Counts of large terrestrial species & raptors

This is a very similar data collection technique to the above, the aim being to establish indices of abundance for large terrestrial species and raptors. These species are relatively easily detected from a vehicle, hence driven transects (DTs) are conducted in order to determine the number of birds of relevant species in the study area. Detection of these large species is less dependent on their activity levels and calls, so these counts can be done later in the day. Four DTs were established on suitable roads in the area, ranging between 8 and 11 km in length, and totalling 39km (Figure 5). These transects were each counted once per site visit.

2.7.3. Focal site surveys

Four Focal Sites were identified for the site: Focal Sites 1 and 3 are man-made dams; and Focal Sites 2 and 4 are natural pans. These sites are important open water sources in the landscape and were surveyed each season.

2.7.4. Incidental observations

This monitoring programme comprises a significant amount of field time on site by the observers, much of it spent driving between the above activities. As such, it is important to record any other relevant information whilst on site. All other incidental sightings of priority species (and particularly those suggestive of breeding or important feeding or roosting sites or flight paths) within the broader study area were carefully recorded.

2.7.5. Direct observation of bird movements

The aim of direct observation is to record bird flight activity on site. An understanding of this flight behaviour will help explain any future interactions between birds and the wind farm. Spatial patterns in bird flight movement may also be detected, which will allow for input into turbine placement. Direct observation was conducted through counts at 7 fixed Vantage Points (VPs) in the study area (Figure 5). These VP's provide coverage of a reasonable and representative proportion of the entire study area. VPs were identified using GIS (Geographic Information Systems), and then fine-tuned during the project setup, based on access and other information. Since these VP's aim at capturing both usage and behavioural data, they were positioned mostly on high ground to maximise visibility. The survey radius for VP counts is 2 kilometres (although large birds are sometimes recorded further). Vantage Point counts are conducted by four teams of two observers each. Birds are recorded 360° around the observers. Data should be collected during representative conditions, so the sessions are spread throughout the day, with each VP being counted over 'early to mid-morning', 'mid-morning to early afternoon', and 'mid-afternoon to evening'. Each VP session is 4 hours long, which is believed to be towards the upper limit of observer concentration span, whilst also maximising duration of data capture relative to travel time required in order to get to the Vantage Points. A total of 12 hours of observation was collected per Vantage Point on each Site Visit (x 6). A maximum of two VP sessions

were conducted per day, to avoid observer fatigue compromising data quality. As far as logistically possible, two different Vantage Points were visited per day per team of observers.

One of the most important attributes of any bird flight event is its height above ground, since this will determine its risk of collision with turbine blades. Since it is possible that the turbine model (and hence the exact height of the rotor swept zone) could still change on this project, actual flight height was estimated rather than assigning flight height to broad bands (such as proposed by Jenkins *et al*. 2015). This 'raw' data will allow flexibility in assigning to classes later on, depending on final turbine specifications.

During each VP session, flight paths of priority species in conjunction with their corresponding heights, flight modes and flight times were drawn onto printed 1:50 000 maps which were later digitised using QGIS software for further analysis.

The layout of the Vantage Points is shown in Figure 4.

2.7.6. Control site

A control or reference site was established to the south of the Dalmanutha site and was monitored as part of this programme (Jenkins *et al.* 2015). At this site, 2 vantage points, 1 drive transect and 3 walked transects were monitored (Figure 5). These data will not be reported on in the EIA phase of this study.

3. Legislative context

The legislation and guidelines relevant to this specialist field and development include the following:

The *Convention on Biological Diversity (CBD):* dedicated to promoting sustainable development. The Convention recognizes that biological diversity is about more than plants, animals and micro-organisms and their ecosystems – it is about people and our need for food security, medicines, fresh air and water, shelter, and a clean and healthy environment in which to live. It is an international convention signed by 150 leaders at the Rio 1992 Earth Summit. South Africa is a signatory to this convention and should therefore abide by its' principles.

An important principle encompassed by the CBD is the *precautionary principle* which essentially states that where serious threats to the environment exist, lack of full scientific certainty should not be used a reason for delaying management of these risks. The burden of proof that the impact will not occur lies with the proponent of the activity posing the threat.

The *Convention on the Conservation of Migratory Species of Wild Animals* (also known as CMS or Bonn Convention): aims to conserve terrestrial, aquatic and avian migratory species throughout their range. It is an intergovernmental treaty, concluded under the aegis of the United Nations Environment Programme, concerned with the conservation of wildlife and habitats on a global scale. Since the Convention's entry into force, its membership has grown steadily to include 117 (as of 1 June 2012) Parties from Africa, Central and South America, Asia, Europe and Oceania. South Africa is a signatory to this convention.

The *Agreement on the Conservation of African-Eurasian Migratory Water birds (AEWA):* is the largest of its kind developed so far under the CMS. The AEWA covers 255 species of birds ecologically dependent on wetlands for at least part of their annual cycle, including many species of divers, grebes, pelicans, cormorants, herons, storks, rails, ibises, spoonbills, flamingos, ducks, swans, geese, cranes, waders, gulls, terns, tropic birds, auks, frigate birds and even the South African penguin. The agreement covers 119 countries and the European Union (EU) from Europe, parts of Asia and Canada, the Middle East and Africa.

The *National Environmental Management – Biodiversity Act - Threatened or Protected Species* list (TOPS). Those TOPS species occurring in this study are described in this report.

The *Mpumalanga Nature Conservation Act (MNCA; Act 10 of 1998).* This Act makes provision with respect to nature conservation in Mpumalanga Province. It provides for, among other things, protection of wildlife, hunting, fisheries, protection of endangered fauna and flora as listed in the CITES, the control of harmful animals, freshwater pollution and enforcement. This act lists the following bird species as 'Protected Game': any wild bird excluding 'ordinary game birds' and the following: White-breasted Cormorant; Reed Cormorant; Red-eyed Turtle Dove; Cape Turtle Dove; Laughing Dove; all mousebirds; Pied Crow; Black Crow; Red-eyed and Black-eyed Bulbul; Red-winged Starling; Cape Sparrow; Spotted-backed Weaver; Cape Weaver; Masked Weaver; Red-billed Quelea; and Red Bishop.

The *Civil Aviation Authority* has certain requirements regarding the visibility of wind turbines to aircraft. It is our understanding that these may preclude certain mitigation measures for bird collisions, such as the painting of turbine blades in different colours.

The *National Environmental Management Act, No. 107 of 1998* (NEMA as amended): An Environmental Authorisation is required for Listed Activities in Regulations pursuant to NEMA. The avifaunal assessment feeds into the Environmental Authorisation process to inform whether the project can proceed or not.

The “Best practice guidelines for assessing and monitoring the impact of wind energy facilities on birds in southern Africa” Unpublished guidelines by BirdLife South Africa & Endangered Wildlife Trust (Jenkins et al, 2015, 2021).

The South African *Important Bird and Biodiversity Area (IBA*) data was consulted. Important Bird and Biodiversity Areas are spatial areas identified around the country as important for the conservation of birds. Development within or close to these areas is generally discouraged. The Karoo National Park is an IBA.

The *Species Environmental Assessment Guideline (SANBI, 2020)* is applicable, this report adheres to the guideline.

4. Project description

The Dalmanutha Wind Energy Facility (WEF) (“Dalmanutha WEF”) is located approximately 7km southeast of the Belfast town within Emakhazeni Local Municipality, Mpumalanga Province. Site access is via the N4, which is approximately 220 meters from the Dalmanutha WEF. The Dalmanutha WEF will be located over eighteen farm portions covering approximately 4 370 ha. These portions are highlighted in Table 1 and the site outline depicted in Figure 2.

To connect the Dalmanutha WEF to the Eskom grid, the applicant proposes collecting the various turbine underground cables to an up to 132kV onsite substation, comprising and IPP portion and an Eskom portion, the latter of which will form part of a separate Basic Assessment Report (BAR). The onsite substation is proposed to occupy an area of up to 4ha. This onsite substation will be located adjacent to the Common Grid Infrastructure.

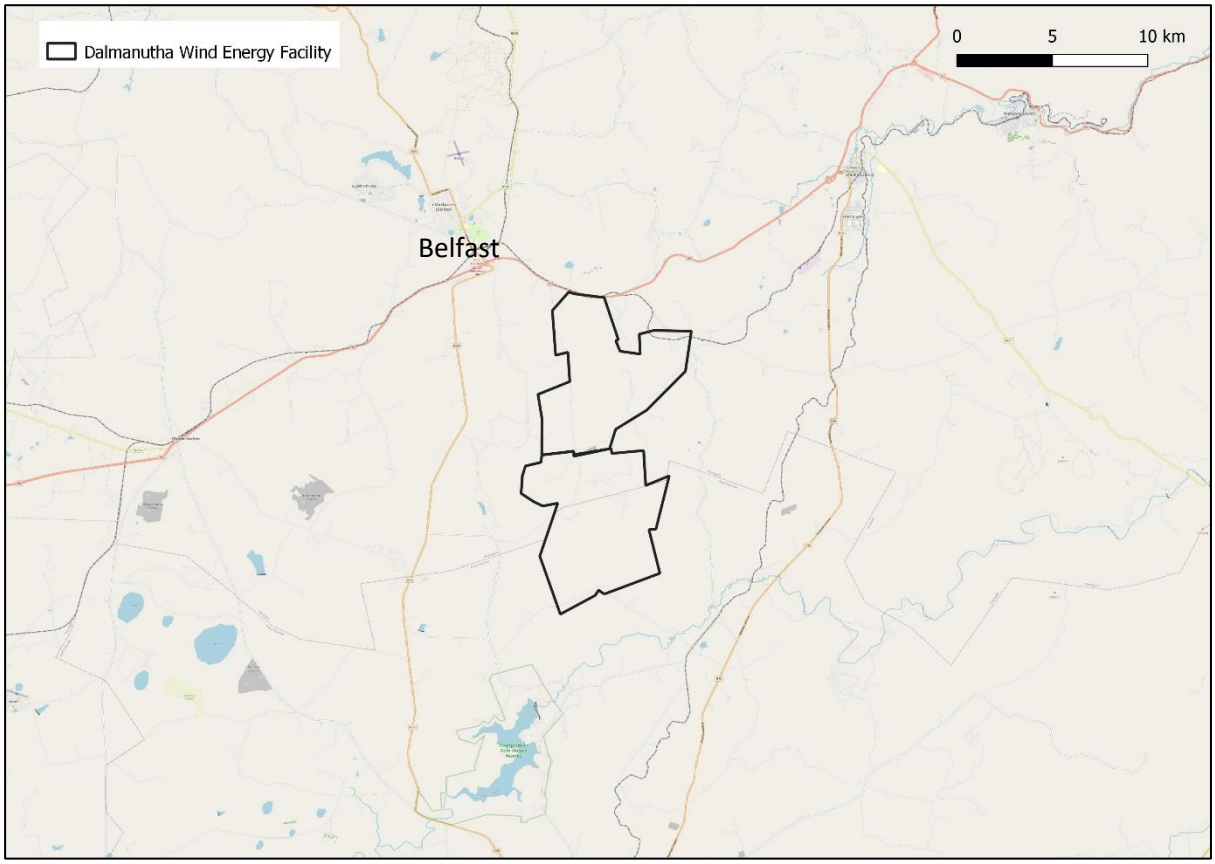

Figure 1. Project location.

Table 1. Project components.

Extent	9 400ha
Buildable area	Approximately 400 ha
Capacity	Up to 300MW
Number of turbines	Up to 70
Turbine hub height:	Up to 200m
Rotor Diameter:	Up to 200m
Foundation	Approximately 25m² diameter x 3m deep – 500 – 650m³ concrete. Excavation approximately 1 000m², in sandy soils due to access requirements and safe slope stability requirements.
Operations and Maintenance (O&M) building footprint:	Located near the substation. Septic tanks with portable toilets Typical areas include: - Operations building – 20m x 10m = 200m² - Workshop – 15m x 10m = 150m² Stores - 15m x 10m = 150m²
Construction camp laydown	Typical area 100m x 50m = 5000m². Sewage: Conservancy tanks and portable toilets
Temporary laydown or staging area:	Typical area 220m x 100m = 22 000m². Laydown area could increase to 30 000m² for concrete towers, should they be required.
Cement batching plant (temporary):	Gravel and sand will be stored in separate heaps whilst the cement will be contained in a silo. The footprint will be around 0.5ha. The maximum height of the silo will be 20m.

Internal Roads:	Width of the internal road – Between 8m and 10m, this can be increased to 12m on bends. Length of the internal road – Approximately 60km.
Cables:	The medium voltage collector system will comprise of cables up to and include 33kV that run underground, except where a technical assessment suggests that overhead lines are required, connecting the turbines to the onsite IPP substation.
Independent Power Producer (IPP) onsite substation and battery energy storage system (BESS):	The total footprint will be up to 4ha in extent. The substation will consist of a high voltage substation yard to allow for multiple (up to) 132kV feeder bays and transformers, control building, telecommunication infrastructure, access roads, etc. The associated BESS storage capacity will be up to 300MW/1200MWh with up to four hours of storage. It is proposed that Lithium Battery Technologies, or Vanadium Redox flow technologies will be considered as the preferred battery technology. The main components of the BESS include the batteries, power conversion system, and transformer which will all be stored in various rows of containers.

The detailed project layout is shown in Figure 2 below.

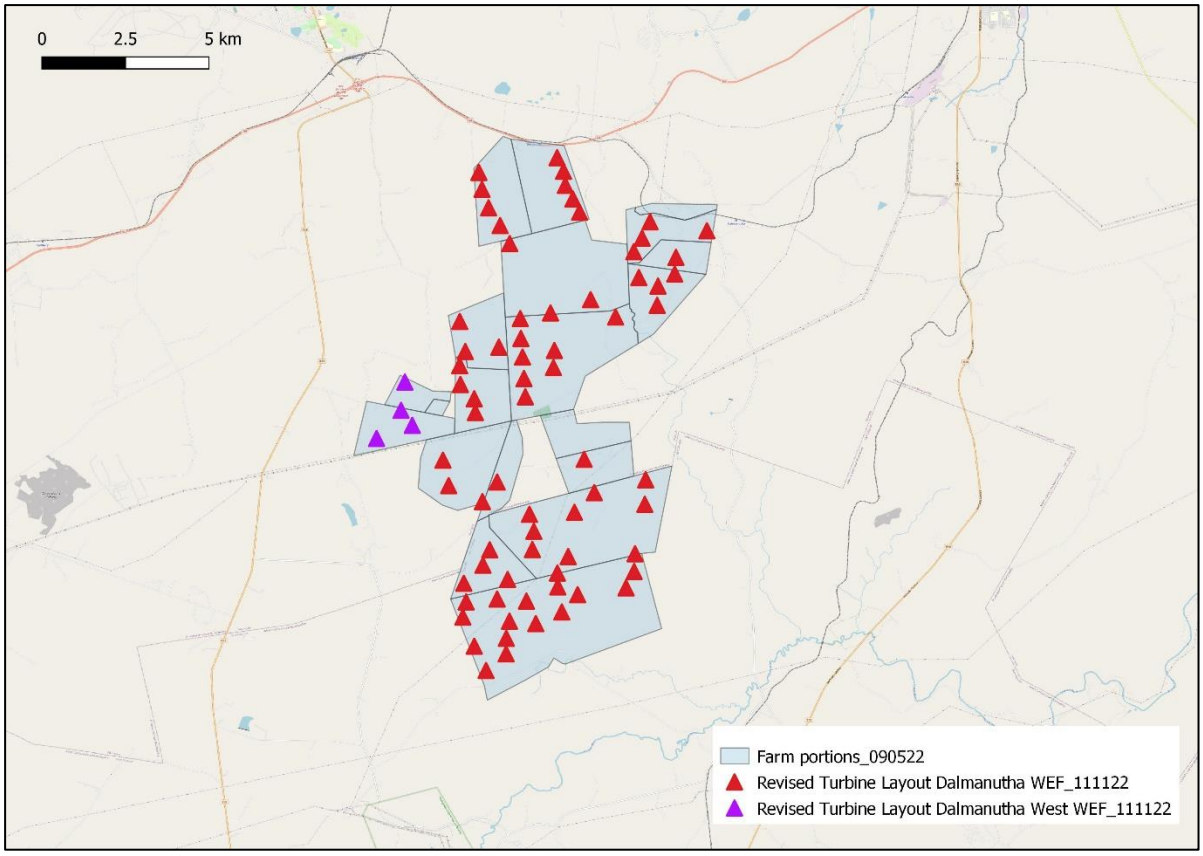

Figure 2. Detailed project layout.

Based on the extensive in-house scoping study done in the province, the Project has been selected based on several factors namely: location to Eskom power station, wind resources, environmental constraints, grid connection, topography, site access, existing competition, and land availability.

5. Background to wind farms & birds

The first documented interaction between birds and wind farms was that of birds killed through collisions with turbines, dating back to the 1970s. Certain sites, such as Altamont Pass – California, and Tarifa – Spain, killed many birds and focused attention on the issue. However, as the research developed it appears that sites such as these are the exception rather than the rule, with most facilities causing much lower fatality rates (Kingsley & Whittam, 2005; Rydell *et al* 2012; Rydell *et al*, 2017; Ralston-Paton *et al* 2017). Impacts have so far proven to differ significantly between sites (Bose *et al.* 2018; Ralston-Paton *et al.* 2017; Thaxter *et al*. 2017).

With time it became apparent that there are actually four ways in which birds can be affected by wind farms: 1) collisions – which is a direct mortality factor; 2) habitat alteration or destruction (less direct); 3) disturbance – particularly whilst breeding; and 4) displacement/barrier effects (various authors including Rydell *et al* 2012; Rydell *et al*, 2017). Whilst the impacts of habitat alteration and disturbance are probably fairly similar to that associated with other forms of development, collision and displacement/barrier effects are unique to wind energy.

Associated infrastructure such as overhead power lines also have the potential to impact on birds. For example, they pose a collision and possibly electrocution threat to certain bird species.

5.1. Collision of birds with turbine blades

Without doubt the impact of bird collision with turbines has received the most attention to date amongst researchers, operators, conservationists, and the public (Dwyer *et al.* 2018; Bose *et al.* 2018; Thaxter *et al.* 2017; Vasiliakis *et al.* 2017, Ralston Paton *et al*. 2017; Perold *et al*, 2020).

It is important to understand that not all birds that fly through a wind farm at rotor height collide with blades. In fact, avoidance rates for certain species have proven to be extremely high internationally. Avoidance rates have not been determined for South African species.

The two most common measures for collision fatality data used to date are, the number of birds killed per turbine per year, and number of birds killed per megawatt installed per year. Rydell *et al* (2012) reviewed studies from 31 wind farms in Europe and 28 in North America and found a range between 0 and 60 birds killed per turbine per year, with a median of 2.3. European average bird fatality rates

were much higher at 6.5 birds per turbine per year compared to the 1.6 for North America. These figures include an adjustment for detection (the efficiency with which monitors detect carcasses in different conditions) and scavenger bias (the rate at which birds are removed by scavengers between searches). These are important biases which must be accounted for in any study of mortality.

Eagle turbine collision fatalities are particularly relevant to the proposed site as described later in this report. Internationally, fatalities at wind farms have been reported for Golden Eagle (e.g. Smallwood 2013), White-tailed Sea Eagle (e.g. Hötker *et al.* 2006), Bald Eagle (Pagel *et al.* 2013) and White-bellied Sea Eagle (Smales & Muir 2005).

In South Africa, Ralston-Paton, Smallie, Pearson & Ramalho (2017) reviewed the results of operational phase bird monitoring at 8 wind farms ranging in size from 9 to 66 turbines and totalling 294 turbines (or 625MW). Hub height ranged from 80 to 115m (mean of 87.8m) and rotor diameter from 88 to 113m (mean of 102.4m). The estimated fatality rate at the wind farms (adjusted for detection rates and scavenger removal) ranged from 2.06 to 8.95 birds per turbine per year. The mean fatality rate was 4.1 birds per turbine per year. This places South Africa within the range of fatality rates that have been reported for North America and Europe (Rydell *et al*, 2012).

The composition of the South African bird turbine collision fatalities by family group was as follows: Unknown 5%; Waterfowl 3%; Water birds other 2%; Cormorants & Darters 1%; Shorebirds, Lapwings and gulls 2%; Large terrestrial birds 2%; Gamebirds 4%; Flufftails & coots 2%; Songbirds 26%; Swifts, swallows & martins 12%; Pigeons & doves 2%; Barbets, mousebirds & cuckoo's 1%; Ravens & crows 1%; Owls 1%; and Diurnal raptors 36%.

Threatened species killed by turbine collision to date at these operational sites included Verreaux's Eagle *Aquila verreauxii* (5 - Vulnerable), Martial Eagle *Polemaetus bellicosus* (2 - Endangered), Black Harrier *Circus maurus* (5 - Endangered), and Blue Crane (3 – Near-threatened). Although not Red Listed, a large number of Jackal Buzzard *Buteo rufofuscus* fatalities (24) were also reported.

Ralston-Paton *et al's* review included the first year of operational monitoring at the first 8 facilities. At least one more year has elapsed at each of these facilities and additional facilities have come online. Ralston-Paton (2019) presented an update of the findings in October 2019 at the Birds and Renewable Energy Forum. We have used these findings for this study where relevant, supplemented with our own knowledge of fatality findings at sites we have worked at.

A more recent review was conducted by Perold *et al* (2020) of the bird fatality data across 20 operational wind farms in SA between 2014 and 2018. The overall adjusted fatality rate was 4.6 birds/turbine/year. Thirty families and 130 bird species were affected. Diurnal raptors were killed most often (36% of carcasses, 23 species) followed by passerines (30%, 49 species), waterbirds (11%, 24 species), swifts (9%, six species), large terrestrial birds (5%, 10 species), pigeons (4%, six species) and

other near passerines (1%, seven species). The species of most conservation concern killed include endangered Cape Vultures and Black Harriers, both of which are endemic to southern Africa.

5.2. Loss or alteration of habitat during construction

During the construction of wind farms and associated infrastructure, some habitat destruction and alteration will take place. This happens with the construction of access roads, the clearing of servitudes and areas for turbine hardstands and laydown areas, and the levelling of substation yards (including associated battery storage facility). This removal of vegetation which provides habitat for avifauna and food sources may have an impact on birds breeding, foraging and roosting (Dwyer *et al.* 2018; Tarr *et al.* 2016). The area of land directly affected by a wind farm and associated infrastructure is often relatively small when compared with the extent of the site. Typically, actual habitat loss is between 2 and 5 % of the total development area (Drewitt & Langston 2006). As a result, in most cases habitat destruction or alteration in its simplest form (removal of natural vegetation) is unlikely to be of great significance for many bird species. However, fragmentation of habitat can be an important factor for some smaller bird species. Construction and operation of a wind farm results in an influx of human activity to areas often previously relatively uninhabited (Kuvlesky *et al* 2007), which is certainly the case at the proposed site. This disturbance could cause certain birds to avoid the entire site, thereby losing a significant amount of habitat (Langston & Pullan, 2003). In addition to this, birds are aerial species, spending much of their time above the ground. It is therefore simplistic to view the amount of habitat destroyed as the terrestrial land area only.

Ralston-Paton *et al* (2017) did not review habitat destruction or alteration. From our own work to date, we have recorded a range of habitat destruction on 6 wind farms from 0.6 to 4% (mean of 2.4%) of the total site area (defined by a polygon drawn around the outermost turbines and other infrastructure) and 6.9 to 48.1ha (mean of 27.8ha) of aerial space. The surface area impacted on by this proposed project is described later in this report.

5.3. Disturbance of birds

Activities associated with construction of wind farms (including heavy machinery, earth moving, vehicle and staff traffic) can disturb birds in the receiving environment (Dwyer *et al*, 2018; Tarr *et al*. 2016; Ledec *et al.* 2011). Disturbance effects can occur at differing levels and have variable levels of effect on bird species, depending on their sensitivity to disturbance and whether they are breeding or not. For smaller bird species, with smaller territories, disturbance may be absolute, and the birds may be forced to move away and find alternative territories, with secondary impacts such as increased competition. For larger bird species, many of which are typically the subject of concern for wind farms, larger territories mean that they are less likely to be entirely displaced from their territory. For these birds, disturbance is probably likely to be significant only when breeding (seasonal). Effects of

disturbance during breeding could include loss of breeding productivity; temporary (within that particular season) or permanent (never to breed again) abandonment of breeding; or even abandonment of a nest site.

Ralston-Paton *et al* (2017) found no conclusive evidence of disturbance of birds at the sites reviewed. It may be premature to draw this conclusion after only one year as effects are likely to vary with time (Stewart *et al*, 2007) and statistical analysis was not as in depth as desired. At this stage in the industry, a simplistic view of disturbance has been applied whereby the presence or absence of active breeding at breeding sites of key species is used as the basis for findings.

5.4. Associated infrastructure

Infrastructure associated with wind energy facilities also has the potential to impact on birds, in some cases more than the turbines themselves. Overhead power lines pose a collision and possible electrocution threat to certain bird species (depending on the pole top configuration). Furthermore, the construction and maintenance of the power lines will result in some disturbance and habitat destruction. New access roads, substations (including associated battery storage facility) and offices constructed will also have a disturbance and habitat destruction impact.

Collision with power lines is one of the biggest single threats facing birds in southern Africa (van Rooyen 2004). Most heavily impacted upon are bustards, storks, cranes, and various species of water birds (many of which occur in the study area). 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 power lines (van Rooyen 2004, Anderson 2001). Unfortunately, many of the collision sensitive species are also considered threatened in southern Africa. The Red List species vulnerable to power line collisions are generally long living, slow reproducing species under natural conditions.

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 larger bird species (such as eagles) are most affected since they are most capable of bridging critical clearances on hardware.

Ralston-Paton *et al* (2017) did not review power line impacts at the 8 sites.

5.5. Displacement & barrier effects

A barrier effect occurs when a wind energy facility acts as a barrier for birds in flight, which then avoid the obstacle and fly around it. This can reduce the collision risk but will also increase the distance that the bird must fly. This has consequences for the birds' energy balance. Obviously, the scale of this

effect can vary hugely and depends on the scale of the facility, the species territory and movement patterns and the species reaction. Displacement occurs when birds leave an area due to the disturbance or habitat destruction that has taken place there (Dwyer *et al*, 2018).

Ralston-Paton *et al* (2017) reported that little conclusive evidence for displacement of any species was reported for the 8 wind farms in South Africa, although once again this is an early and possibly simplistic conclusion.

5.6. Mitigation

Possible mitigation measures for bird turbine collision include: increasing turbine visibility (for example through painting turbine blades; restriction of turbine operation during high risk periods; automated turbine shutdown on demand; human based turbine shutdown on demand; bird deterrents – both audible and visual; habitat management; and offsets). Most of these suggested mitigation measures are largely untested. In South Africa, observer led Shutdown on Demand has recently shown initial promise at an operational wind farm in the Western Cape. It is likely that by the time of construction of the proposed project more experience on this mitigation will be available in country. Likewise, with blade painting, a paper out of Norway recently showed significant promise for the effectiveness of this measure. Trials of this method are likely to take place in SA in the near future and results should be available in time for the operation of the proposed project.

For any mitigation to be undertaken during operation, budget will need to be available. We strongly recommend that the Developer make provision for a mitigation contingency budget so that if issues are encountered during operation, the best-suited and proven mitigation at that point in time can be implemented.

Mitigation for habitat destruction consists typically of avoiding sensitive habitats during layout planning. A certain amount of habitat destruction is unavoidable.

For disturbance, mitigation takes the form of allowing sufficient spatial and temporal protection for breeding sites of sensitive species.

Mitigation of power line impacts is relatively well understood and effective and is described in more detail later in this report.

The primary means of mitigating bird impacts therefore remains as correct siting, both of the entire facility, and of the individual turbines themselves. This has already been done in detail with the proposed project during the screening phase in which detailed no go areas for avifauna were used in developing the layout being assessed. Whichever mitigation measures are identified as necessary, this should be informed by a thorough pre and post construction bird monitoring programme.

5.7. Contextualising wind energy impacts on birds

Several authors have compared causes of mortality of birds (American Bird Conservancy, 2012; Sibley Guides, 2012; National Shooting Sports Foundation 2012; Drewitt & Langston 2008) in order to contextualise possible mortality at wind farms. In most of these studies, apart from habitat destruction which is the number one threat to birds (although not a direct mortality factor) the top killers are collision with building windows and cats. Overhead power lines rank fairly high up, and wind turbines only far lower down the ranking. These studies typically cite absolute number of deaths and rarely acknowledge the numerous biases in this data. For example, a bird that collides with a high-rise building window falls to a pavement and is found by a passer-by, whereas a bird colliding with a wind turbine falls to the ground which is covered in vegetation and seldom passed by anyone. Other biases include: the number of windows; kilometres of power line; or cats which are available to cause the demise of a bird, compared to the number of wind turbines. Biases aside the most important shortcoming of these studies is a failure to recognise the difference in species affected by the different infrastructure. Species such as those of concern at wind farms, and particularly Red List species in South Africa are unlikely to frequent tall buildings or to be caught by cats. Since many of these bird species are already struggling to maintain sustainable populations, we should be striving to avoid all additional, new and preventable impacts on these species, and not permitting these impacts simply because they are smaller than those anthropogenic impacts already in existence.

6. Baseline description of receiving environment

6.1. Vegetation & habitat

The Dalmanutha Wind Energy Facility site is comprised mostly of two vegetation types. In the west is ‘Eastern Highveld Grassland’ (Mucina & Rutherford, 2018). This is an ‘Endangered’ and ‘Hardly protected’ vegetation type. In the east is ‘Lydenburg Montane Grassland’, which is a ‘Vulnerable’ and ‘Poorly protected’ vegetation type. A small portion of the site in the south is classified as ‘KaNgwane Montane Grassland’ which is ‘Vulnerable’ and ‘Hardly protected’. The vegetation on site and potential impacts will no doubt be described in more detail by the biodiversity specialist.

Effectively, a number of bird micro habitats are available to birds in the area including: man-made dams; pans; drainage lines; wetlands; rocky ridges and cliffs; exotic trees; and arable lands. Examples of these are shown in Figure 3.

Figure 3. Typical micro-habitats available to birds in the study area.

6.2. Southern African Bird Atlas Project (SABAP2) data

The first and second South African Bird Atlas Projects (SABAP1 – Harrison *et al* 1997; SABAP2 – www.sabap2.birdmap.africa) have recorded a combined total of approximately 297 bird species in the broader study area (Appendix 2). These 297 species include a number of regionally Red Listed species. Almost all of these have been recorded by our own monitoring on site as described in Section 6.6. Exceptions include: Verreaux's Eagle (low report rate of 0.9%); Lesser Flamingo *Phoeniconaias minor* (low report rate of 0.5%); Red-billed Oxpecker *Buphagus erythrorynchus* (low report rate of 1.5%); Yellow-breasted Pipit *Anthus chloris* (low report rate of 0.5%); and European Roller *Coracias garrulus* (low report rate of 0.5%).

6.3. Important Bird & Biodiversity Area (IBA) data

The proposed wind farm partially overlaps the Steenkampsberg Important Bird and Biodiversity Area (IBA - Marnewick *et al*, 2015)(Figure 4). The following description draws heavily from Marnewick *et al* (2015).

This IBA consists primarily of rolling high-altitude (1 700–2 100 m a.s.l.) grassland interspersed with rocky outcrops. The area receives an average rainfall of 1 025 mm p.a. Annual average minimum and maximum temperatures are 5 °C and 20 °C respectively, with a range from -8 °C to 39 °C. Two wetland systems are particularly important in the Steenkampsberg area. The first is Lakensvleispruit, which lies 8 km north-east of Belfast. The second is Verloren Valei. Lying approximately 9 km north of Dullstroom.

The proposed wind farm is not in close proximity to either of these systems (although smaller wetlands exist on site).

The core area of the IBA, especially along Steenkampsberg towards Dullstroom, is covered by Endangered Dullstroom Plateau Grassland. Globally threatened species found in this IBA include: Southern Bald Ibis *Geronticus calvus*, Wattled Crane *Grus carunculata*, Blue Crane, Grey Crowned Crane *Balearica regulorum*, White-winged Flufftail *Sarothrura ayresi*, Rudd's Lark *Heteromirafra ruddi*, Yellow-breasted Pipit, Denham's Bustard *Neotis denhami*, Blue Korhaan *Eupodotis caerulescens* and Secretarybird *Sagittarius serpentarius*. Regionally threatened species are African Marsh Harrier *Circus ranivorus*, Black-rumped Buttonquail *Turnix nanus*, Striped Flufftail *Sarothrura affinis*, White-bellied Korhaan *Eupodotis senegalensis*, African Grass Owl *Tyto capensis*, Black Stork *Ciconia nigra* and Lanner Falcon *Falco biarmicus*. Restricted-range and biome-restricted species are Kurrichane Thrush *Turdus libonyanus* and Buff-streaked Chat *Campicoloides bifasciatus*, both of which are common. Rudd's Lark, Yellow-breasted Pipit and Gurney's Sugarbird *Promerops gurneyi* are uncommon, while White-bellied Sunbird *Cinnyris talatala* is fairly common.

Mining in the form of open-cast coal mining, and to a lesser extent sand and diamond mining, is one of the biggest threats to the area, and there has recently been a flood of prospecting and mining applications. According to the Environmental Management Framework developed for the Emakazheni local municipality in 2009, mining is not considered a suitable land use in this region. General threats include afforestation of the grasslands with pines *Pinus* species and blue gums *Eucalyptus* species, wetland degradation, and increased acid rain and sulphur emissions from local power stations. Afforestation also has a harmful impact on wetlands, and they face several other significant threats. The construction of dams is disrupting ecosystem processes downstream, with the effect of turning wetlands into sterile stretches of open water. Overgrazing and the frequent burning of marshy areas in winter leads to accelerated run-off, soil erosion and the formation of dongas. Several threatened species are dramatically affected by this wetland degradation. The habitat of the White-winged Flufftail is continually being degraded and reduced by damming, draining, grazing, burning and afforestation.

6.4. Co-ordinated Avifaunal Roadcount (CAR) data

CAR counts are a census of birds (focussed on large terrestrial species) performed twice annually (in winter and summer) by volunteer birdwatchers. The purpose is to provide population data for use in science, especially conservation biology, by determining findings about the natural habitats and the birds that use them. Two CAR routes bisect the proposed site, MS08 and MS09 (Figure 4). Relevant species recorded on these two routes regularly include: Blue Crane; White Stork; Secretarybird; and Southern Bald Ibis. Grey Crowned Crane is also recorded occasionally.

6.5. Co-ordinated Waterbird Count (CWAC) data

There are several Coordinated Waterbird Count (CWAC) sites within approximately 15km of the proposed site (Figure 4). The data from these sites was not deemed relevant to this assessment.

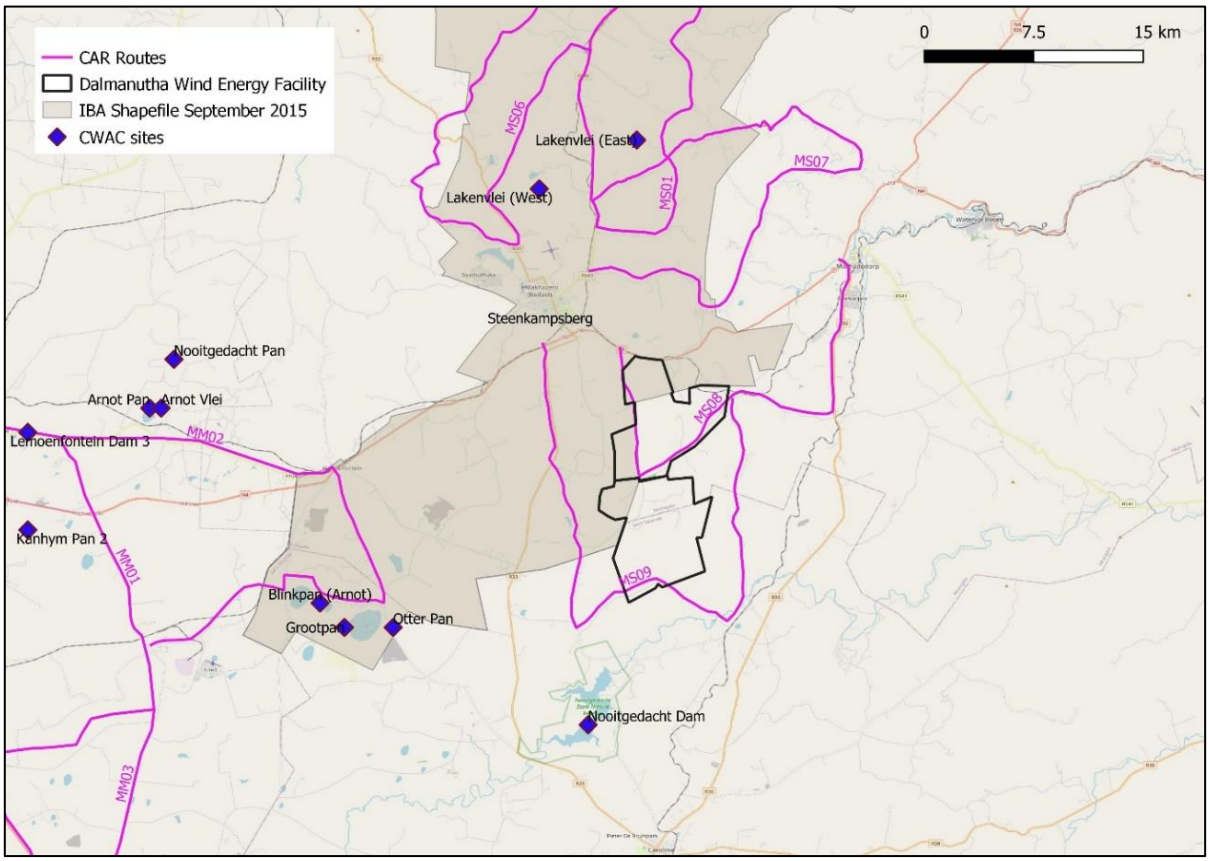

Figure 4. The Important Bird Area, Coordinated Roadcount & Coordinated Waterbird Count locations.

6.6. Pre-construction bird monitoring data

The layout of the various pre-construction bird monitoring activities is shown in Figure 5.

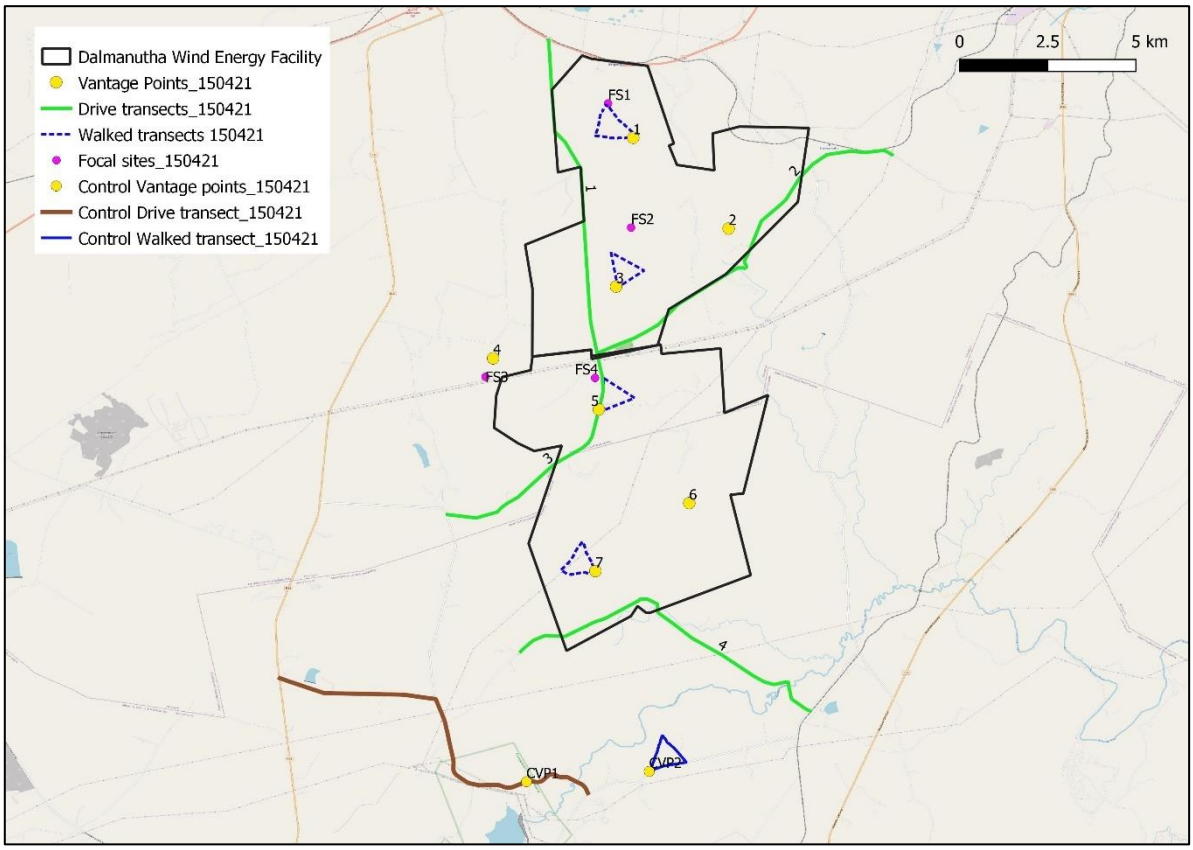

Figure 5. Layout of pre-construction bird monitoring activities.

A total of 220 bird species have been recorded on site to date by our work, across all data collection methods (143, 129, 155, 177 in Seasons 1 to 4 respectively). Twelve of these species are regionally Red Listed as described below (2 Critically Endangered, 4 Endangered, 5 Vulnerable, 2 Near-threatened). One further species is regionally Least Concern but Globally Near-threatened – the Blue Korhaan. The most important findings on site to date are described below. The EIA phase study will elaborate on the detailed data on these species.

Wattled Crane *Grus carunculata*. Wattled Crane is regionally Critically Endangered (Taylor *et al,* 2015). A single bird appears to be resident on site and has been recorded in all seasons, always in the same wetland (see Section 7.2). The wetland was surveyed for a nest, but no such nest was identified. At a second wetland the farmer has advised that Wattled Crane normally breed, however this has not been confirmed. Lockwood (pers comm – Appendix 5) reports up to 4 cranes being seen together over the last 12 years. This species is anticipated to be highly susceptible to wind turbine collision. The spatial avoidance of risk through a buffer around the wetland (Section 7.2) is not anticipated to be sufficient, and the collision risk will also need to be mitigated.

White-backed Vulture *Gyps africanus*. White-backed Vulture is regionally Critically Endangered (Taylor *et al,* 2015). Several records of small numbers (<5) of birds flying on site were made in Season 1 but not again in subsequent seasons. We consider the species to be an occasional visitor to the area.

Cape Vulture *Gyps coprotheres*. Cape Vulture is regionally Endangered (Taylor *et al,* 2015). Multiple records of up to a maximum of 26 birds (in S4) flying on site have been made in all seasons. Birds have been found roosting at night on Eskom transmission lines on site. One of the landowners of the farm Leeuwkloof, has a vulture restaurant. He reports seeing up to 100 vultures on and around his property. This requires further investigation to confirm, and would need to be closed if the project proceeds. The risk of attracting vultures onto site would be too high. During S4 we recorded between 54 and 70 vultures feeding on a dead calf on site. Lockwood (pers comm0 reports up to 43 vultures being seen in the area over the last 12 years. We consider the species to forage and roost regularly on the site.

Martial Eagle *Polemaetus bellicosus*. Martial Eagle is regionally Endangered (Taylor *et al,* 2015). Single records of single birds of this species were made in S1 and S2. We conclude that the proposed site falls marginally within the home range of a pair of this species and that the eagles forage occasionally on the site.

Grey Crowned Crane *Balearica regulorum*. Grey Crowned Crane is regionally Endangered (Taylor *et al,* 2015). A pair has been seen foraging at a pan at Leeukloof several times, and in May two adults were seen with a juvenile, indicating breeding probably took place in this area.

Black-rumped Buttonquail *Turnix nanus*. Black-rumped Buttonquail is regionally Endangered (Taylor *et al,* 2015). Several records of pairs of birds flushed from the side of the road in S1 and S4. Lockwood (pers comm) reports 'fairly regular' records in the area.

Denham's Bustard *Neotis denhami*. Denham's Bustard is regionally Vulnerable (Taylor *et al,* 2015). The species was recorded in low numbers in S1 and S2 but not again later in the programme. This is probably an occasional visitor to the site.

White-bellied Bustard *Eupodotis senegalensis*. White-bellied Korhaan is regionally Vulnerable (Taylor *et al,* 2015). Several records of up to four birds together have been made in all seasons. Lockwood (pers comm) reports 'fairly regular' records in the area. A small population is probably more or less resident on site.

Secretarybird *Sagittarius serpentarius*. Secretarybird is regionally Vulnerable (Taylor *et al,* 2015). Single record of single birds have been made in all seasons, and one record of a pair in S3. A nest

has been found several kilometres off site to the east. This will be investigated further when the grid connection corridor is assessed. Lockwood (pers comm) reports 'fairly regular' records in the area.

Southern Bald Ibis *Geronticus calvus*. Southern Bald Ibis is regionally Vulnerable (Taylor *et al,* 2015). Several records of small groups have been made across all seasons. During S4 a roost site was identified on site, where up to 10 birds roost at night. Lockwood (pers comm) reports that up to 18 birds and 5 active nests have been recorded here. This is described more in Section 7.2.

Lanner Falcon *Falco biarmicus*. Lanner Falcon is regionally Vulnerable (Taylor *et al,* 2015). Records of single birds have been in each season, including a pair in S3.

Blue Crane *Grus paradisea*. Blue Crane is regionally Near-threatened (Taylor *et al,* 2015). The species has been recorded in S3 and S4 on site. A group of three birds was recorded on site in S3. Landowners have anecdotally reported to our field team that Blue Cranes breed on site but this remains unconfirmed. Lockwood (pers comm) has several records for the species, including a nest site (Section 7.2).

Although we have not recorded the species, Lockwood (pers comm) reports three records over 12 years of Yellow-breasted Pipit (regionally Vulnerable).

This is a high diversity of Red Listed species, collectively utilising almost the full component of micro habitats on site: wetlands; grasslands; dams; arable lands; pans. The only micro habitat not considered useful is the exotic tree stands (wattle and eucalyptus).

Of particular concern is the Critically Endangered Wattled Crane & Endangered Cape Vulture. For both of these species, spatial avoidance of turbine collision risk is not considered sufficient. If the significance of the impact of turbine collision on these species is to be reduced to acceptable levels extensive and effective mitigation measures will need to be implemented for the full project lifespan. These will likely include Shutdown on Demand, on site vulture food management, and blade painting. Also of concern is the sheer diversity of regionally Red listed birds on this site. Whilst the risk to most of them can be managed in various ways, the 'whole risk' to avifauna is almost certainly greater than the 'sum of the parts'.

Spatially, we have identified a number of sensitive areas or constraints on site, described more in Section 7.

7. Sensitivity mapping

7.1. Landscape level sensitivity

The "Avian Wind Farm Sensitivity map for South Africa (Retief *et al,* 2011) and the Important Bird & Biodiversity Areas programme data (IBBA - Marnewick *et al*, 2015) were consulted to determine the sensitivity of the site in national terms. Figure 6 shows that the northern part of the site falls in the highest sensitivity categories in terms of avifauna (darker colours indicate higher risk). For a full discussion on the methods used in producing this map see Retief *et al* (2011, 2014). The site falls partially within an IBA (Marnewick *et al*, 2015). This IBA has already been described in Section 6.3.

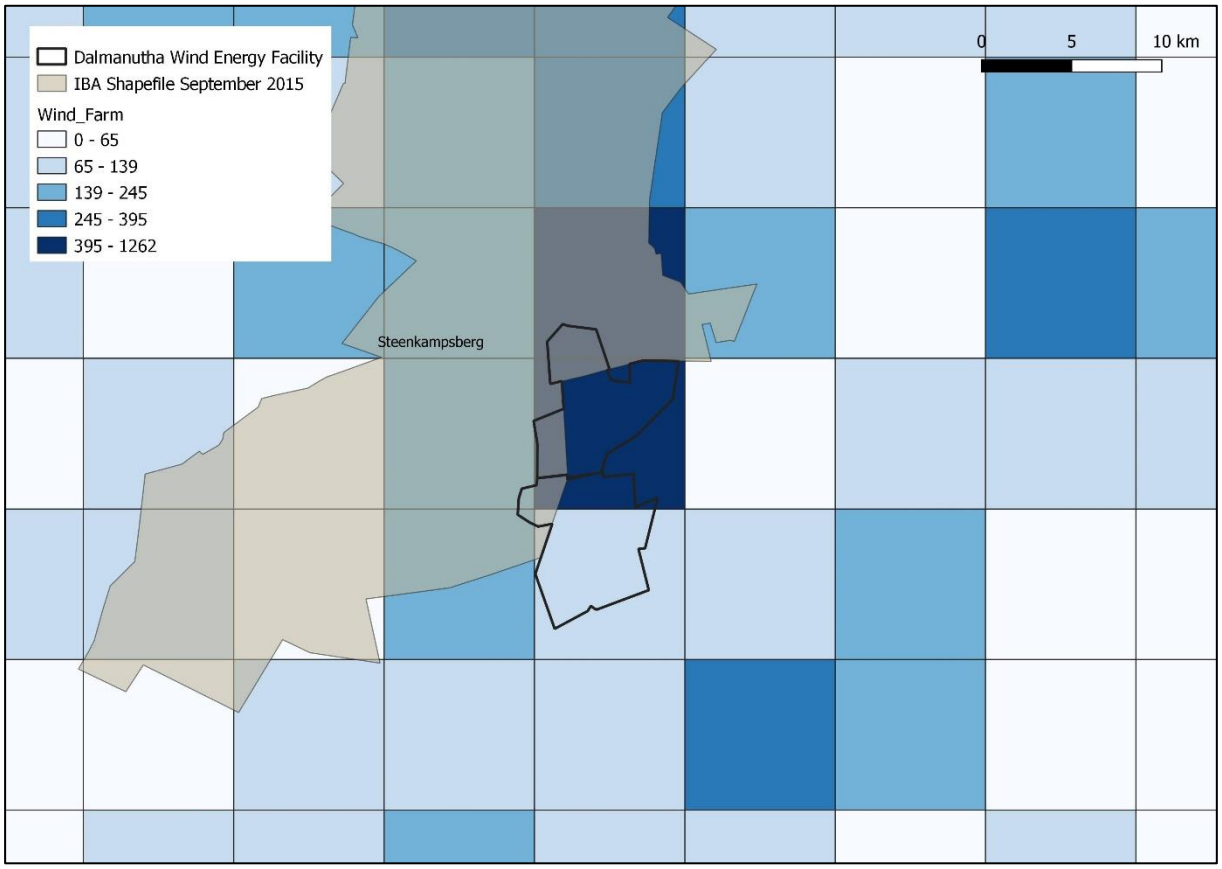

Figure 6. The position of the site relative to the Avian wind farm sensitivity map (Retief et al, 2011) & Important Bird Areas (Marnewick et al 2015).

(Darker colours indicate higher avifaunal sensitivity)

We note that the proposed site falls outside of the Renewable Energy Development Zones (Strategic Environmental Assessment for Wind Energy – www.redz.csir.co.za), and the Transmission Grid corridors identified. The REDZ are areas that are being strategically identified for potential wind energy development in future.

At a landscape level we would categorise the site as High sensitivity for avifauna, based on the above sources. The northern parts of the site certainly appear to be more sensitive and constrained than the southern parts.

7.2. On site sensitivity

Our work on site to date has identified the following sensitive areas:

1. All wetlands. These have been identified using the NBA2018 shape file. At this stage these areas have not been buffered, as we will likely need to ensure consistency with the wetland specialist buffer sizes. This will be described more in the EIA Phase.

2. Berg en Dal Main wetland body: The main body of this wetland has proven to be of high value with a rich diversity of birdlife including 2 pairs of Marsh Owl and a resident Wattled Crane. Although no second Wattled Crane has been recorded and no nest found, breeding at this site remains a possibility in the future. We have buffered the main body by 1km to provide protection. If however a Wattled Crane breeding site is found here in the future this would need to be increased to at least 2km.

3. Leeuwkloof Pan: A round, medium sized permanent pan covered in short emergent vegetation. This is ideal habitat for many waterfowl and wetland species. We have buffered this pan by 500m.

4. Leeuwkloof Pan 2 (Figure 7): A round, medium sized permanent pan covered in short emergent vegetation. This is ideal habitat for many waterfowl and wetland species. Based on two separate reports from farmers living in the immediate area, this pan of water is a regular seasonal breeding site for both Blue and Wattled Cranes. Our own work has however not confirmed breeding here. We have buffered this pan by 750m.

Figure 7. The Leeuwkloof 2 Pan.

5. Cape Vulture Roosts: Cape Vultures have been recorded roosting on three stretches of existing Eskom powerlines in the evenings. Up to a maximum of approximately 40 vultures have been recorded roosting. The large pylons running through this broader area appear to be a regular overnight roost for Cape Vultures. Two of these roosts are on site and have been mapped and buffered by 500m. The third is 1.6km off site to the south and has not been mapped at this stage. This size buffer is not sufficient for this species (mitigating risk would require many kilometres) but assumes that other forms of mitigation would be used to manage this risk and to be detailed in the EIA phase. For such a wide-ranging species any buffer would have to be very big and would probably eliminate the entire project. Also – although certain areas have been identified as being used as roosts to date, all the pylons along these power lines are exactly the same from a roosting point of view and the birds could just as easily roost anywhere along the line.

6. Southern Bald Ibis roost/breeding colony (Figure 8). A small gorge with cliffs has been identified as being used as a roost by this species. Up to 10 birds have been recorded roosting here by our own surveys. Our survey of the cliffs revealed no evidence of breeding, although it cannot be ruled out in the future, and Lockwood (pers comm) reports 5 active nests at this location. It appears that the roost may not be used every evening and it is conceivable that it is used for breeding in some years and not others. This location site has been buffered by 1km to provide protection for these birds flying in and out of the roost.

Figure 8. The gorge where Southern Bald Ibis roost.

7. Blue Crane nest. Lockwood (pers comm) has reported a nest location on site. We have included this location in the sensitivity mapping and buffered the nest by 1km. However we have noted that landowners have recently ploughed up most of the grassland surrounding this nest location. Although the nest location itself was likely in or close to the seep area and probably left intact, time will tell whether this pair of cranes choose to nest here in the future given that their foraging grasslands around the nest no longer remain. We will monitor this in the 2022 breeding season (Oct to Mar).

8. Grey Crowned Crane breeding area: A pair of adult cranes have been recorded in the area several times, and most recently with two juveniles. This indicates that breeding took place somewhere in this vicinity. We have identified and delineated the wetland area within which we assume these birds have bred. Without having a nest location itself it is difficult to impose a buffer on this area, but we do caution against planning any turbines closer to this area than the current positions.

The identified constraints are presented in Figure 9 below.

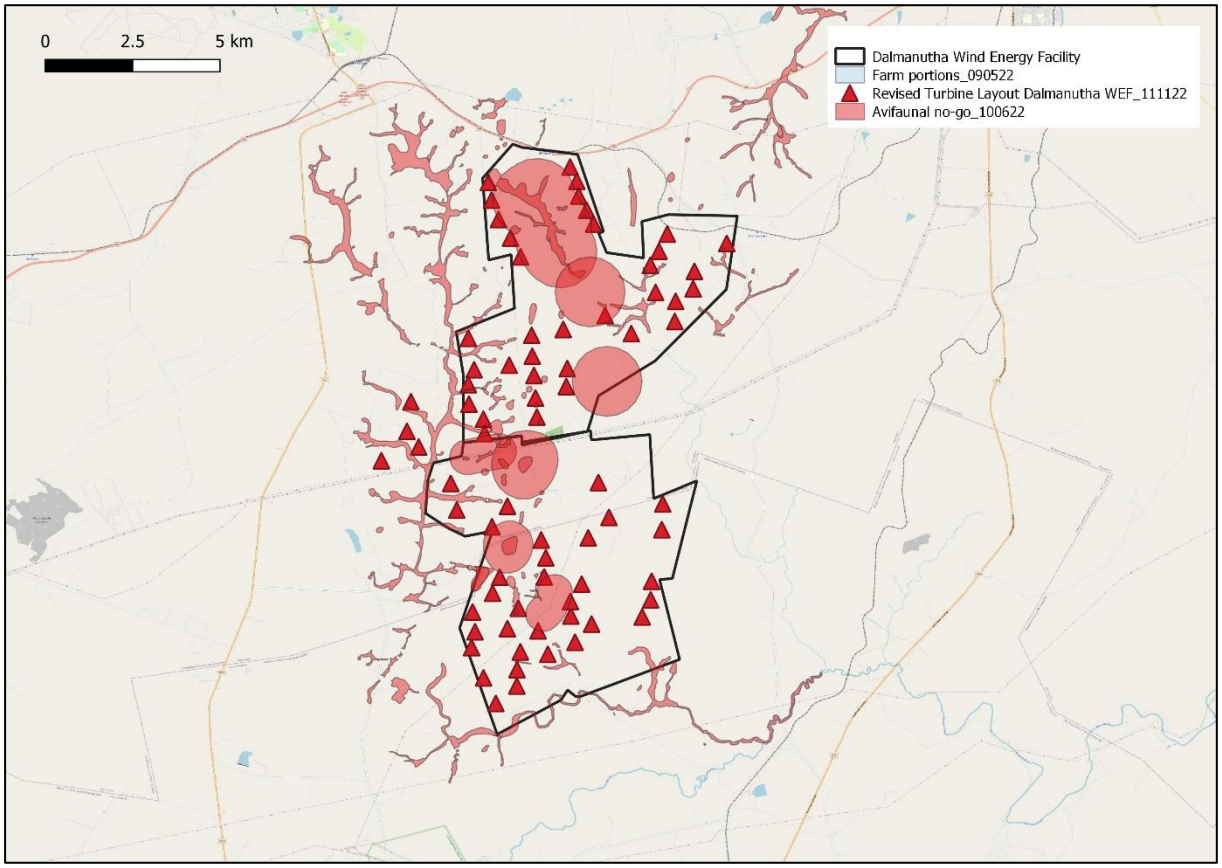

Figure 9. Summary of avifaunal constraints identified to date on the site.

8. Assessment of impacts

Appendix 2 of GNR 982, as amended, requires the identification of the significance of potential impacts during scoping. To this end, an impact screening tool has been used in the scoping phase. The screening tool is based on two criteria, namely probability; and, consequence, where the latter is based on general consideration to the intensity, extent, and duration (Table 2). Mitigation measures for each impact will be designed in the EIA phase.

The scales and descriptors used for scoring probability and consequence are detailed in Table 3 and 4.

Table 2. Significance Screening Tool

	CONSEQUENCE SCALE				
PROBABILITY SCALE		**1**	**2**	**3**	**4**
	1	**Very Low**	**Very Low**	**Low**	**Medium**
	2	**Very Low**	**Low**	**Medium**	**Medium**

	3	**Low**	**Medium**	**Medium**	**High**
	4	**Medium**	**Medium**	**High**	**High**

Table 3. Probability Scores and Descriptors

SCORE	DESCRIPTOR
4	**Definite**: The impact will occur regardless of any prevention measures
3	**Highly Probable**: It is most likely that the impact will occur
2	**Probable**: There is a good possibility that the impact will occur
1	**Improbable:** The possibility of the impact occurring is very low

Table 4. Consequence Score Descriptions

SCORE	NEGATIVE	POSITIVE
4	Very severe: An irreversible and permanent change to the affected system(s) or party(ies) which cannot be mitigated.	Very beneficial: A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit.
3	Severe: A long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming or some combination of these.	Beneficial: A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these.
2	Moderately severe: A medium to long term impacts on the affected system(s) or party (ies) that could be mitigated.	Moderately beneficial: A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time consuming (or some combination of these), as achieving them in this way.
1	Negligible: A short to medium term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary.	Negligible: A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.

The nature of the impact must be characterised as to whether the impact is deemed to be positive (+ve) (i.e., beneficial) or negative (-ve) (i.e., harmful) to the receiving environment/receptor. For ease of reference, a colour reference system (Table 5) has been applied according to the nature and significance of the identified impacts.

Table 5. Impact Significance Colour Reference System to Indicate the Nature of the Impact

Negative Impacts (-ve)	Positive Impacts (+ve)
Negligible	Negligible
Very Low	Very Low
Low	Low
Medium	Medium
High	High

8.1. Construction Phase

8.1.1. Habitat destruction

Destruction and alteration of bird habitat during construction is a negative impact, which will definitely occur as a certain amount of habitat transformation is inevitable, in spite of any mitigation. Turbine hard stands, roads and other infrastructure need to be built and will transform habitat. The probability of this impact is therefore 'Definite (4)'. We judge the consequence to be 'Moderately severe (2)'. This means that the significance is rated as Medium pre-mitigation.

8.1.2. Disturbance of birds

Disturbance of birds during construction is a negative impact, which will definitely occur similarly to the above. The probability of this impact is 'Definite (4)'. The consequence depends on the sensitivity of the avifaunal receptors on site. For breeding sensitive species the consequence could be 'Severe (3)' if unmitigated. This would mean that the significance is High. However, for the general avifaunal community, the consequence will likely be much lower, probably 'Moderately severe (2)', resulting in a Medium significance. The extent to which this impact on sensitive breeding species can be avoided or mitigated will be investigated in the EIA phase.

8.2. Operational Phase

8.2.1. Disturbance of birds

Provided that the risk to sensitive bird breeding sites has been adequately mitigated or avoided in the earlier phases, the probability of disturbance of birds in the operational phase will be 'Probable (2)' and consequence will be 'Negligible (1)' resulting in a 'Very low' significance.

8.2.2. *Displacement of birds*

Similarly to the above, provided that the risk to sensitive bird breeding sites has been adequately mitigated or avoided in the earlier phases, the probability of displacement of birds in the operational phase will be 'Probable (2)' and consequence will be 'Negligible (1)' resulting in a 'Very low' significance.

8.2.3. *Collision of birds with turbines*

Collision of birds with the turbines once operating (a negative impact since birds are killed) is rated as 'Definite (4)' and with 'Severe (3)' consequence for regionally Red Listed bird species. This results in the significance being rated as High significance before mitigation.

8.2.4. *Collision & electrocution of birds on overhead power lines*

Collision of birds with overhead power lines, and electrocution of birds perched on pylons (a negative impact since birds are killed) is rated as 'Definite (4)' and with 'Severe (3)' consequence for regionally Red Listed bird species. This results in the significance being rated as High significance before mitigation.

8.3. Decommissioning Phase

8.3.1. *Disturbance of birds*

Provided that the risk to sensitive bird breeding sites has been adequately mitigated or avoided in the earlier phases, the probability of disturbance of birds in the decommissioning phase will be 'Probable (2)' and consequence will be 'Negligible (1)' resulting in a 'Very low' significance.

8.4. Alternatives

No alternatives have been provided for assessment. It is noted that most of the proposed site has mining rights on it. Also, significant areas of grassland have been transformed into arable land during the course of our monitoring on site. It cannot be assumed that the status quo in terms of land use will persist indefinitely if the proposed wind farm does not go ahead.

8.5. Cumulative Impacts

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

The cumulative impacts of wind energy on avifauna in the proposed area will be assessed in the EIA phase according to the guidance in the DEA (DEAT (2004) Cumulative Effects Assessment, Integrated Environmental Management, Information Series 7, Department of Environmental Affairs and Tourism (DEAT), Pretoria); and the IFC guidelines (Good Practice Handbook - Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets).

Specifically, the steps to be undertaken in the cumulative impact assessment section of the study will be as follows:

- Define and assess the impacts of the proposed project.
- Identify and obtain details for all operational and authorised overhead power lines and wind farms (within 30km radius of the proposed project).
- Identify impacts of the proposed project which are also likely or already exist at the other projects.
- Obtain reports and data for other projects (if possible).
- As far as possible quantify the effect of all projects on key bird species local populations (will need to be defined and estimated).
- Express the likely impacts associated with the proposed project as a proportion of the overall impacts on key species.
- A reasoned overall opinion will be expressed on the suitability of the proposed development against the above background (i.e. whether the receiving environment can afford to accommodate additional similar impacts). This will include a cumulative impact assessment statement.

The impacts identified and screened by this scoping phase are summarised in Table 6. It is noted that a mining prospecting rights application for coal has recently been made on the farm Berg en Dal in the north of the proposed wind farm. This will need to be considered in the EIA phase cumulative impact assessment.

Table 6. Summary of impacts.

Phase	**Impact**	**Significance Pre-mitigation**
Construction	Habitat destruction	Medium
	Disturbance	Medium
Operation	Disturbance	Very low
	Displacement	Very low
	Collision of birds with turbines	High
	Collision & electrocution of birds on overhead power lines	High
Decommissioning	Disturbance of birds	Very low

9. Conclusion

The proposed site is located in an area of the country which provides a mosaic of land uses or micro habitats. As a result, a rich diversity of birds occur here, many of which are regionally Red Listed. The most important of these are: Wattled Crane (regionally Critically Endangered); White-backed Vulture (regionally Critically Endangered); Cape Vulture (regionally Endangered); Martial Eagle (regionally Endangered); Grey-crowned Crane (regionally Endangered); Black-rumped Buttonquail (regionally Endangered); Denham's Bustard (regionally Vulnerable); White-bellied Bustard (regionally Vulnerable); Secretarybird (regionally Vulnerable; Southern Bald Ibis (regionally Vulnerable); Lanner Falcon (regionally Vulnerable); and Blue Crane (regionally Near-threatened) (Taylor *et al,* 2015).

All bird species will to some extent be susceptible to habitat destruction and disturbance if the wind farm is built. However, it is the direct mortality risk through collision with turbines, and collision and electrocution on overhead power lines which is of most concern. The larger species are particularly at risk of these impacts. We have made the following assessments of the significance of the potential impacts of the proposed project on avifauna (using methods and criteria supplied by WSP):

Phase	**Impact**	**Significance Pre-mitigation**
Construction	Habitat destruction	Medium
	Disturbance	Medium
Operation	Disturbance	Very low
	Displacement	Very low
	Collision of birds with turbines	High
	Collision & electrocution of birds on overhead power lines	High
Decommissioning	Disturbance of birds	Very low

These impacts will require mitigation measures which will be designed in the EIA Phase. The impact of 'Collision and electrocution on overhead power lines' can be relatively easily mitigated to Low significance through correct design. However, the impact of 'Collision of birds with turbines' is more challenging as most potential mitigation measures are currently relatively unproven in South Africa and for our bird species.

At a landscape level, we would categorise the site as High sensitivity for avifauna, based on the cited sources in this report. The northern parts of the site certainly appear to be more sensitive and constrained than the southern parts.

A number of avifaunal features have been identified on site which require spatial protection in the form of no-go buffers. Several current turbine positions infringe on these areas and will require micro siting.

Plan of study for EIA

The following sections of this report will be expanded upon in the EIA Phase:

- The second year of pre-construction bird monitoring will be completed. This will provide additional data on bird abundance and movement on site. in particular, regular counts of the number of Cape Vultures roosting on the power lines on site have been conducted. These data will be presented in the EIA phase report.
- Pre-construction bird monitoring data will be analysed and used in more detail.
- Sensitivity mapping will be refined. If necessary, wetland mapping will be compared with a wetland specialists', and buffers determined.
- Mitigation measures will be designed for each identified impact. This will include the consideration of all priority species identified by this study and future work on site.
- The cumulative impact assessment will be completed.
- The opportunity for technology alternatives at the site, and for the reduction of turbine numbers will be investigated further.
- Comments on the scoping phase assessment were received from three organisations: BirdLife South Africa (BLSA); Mpumalanga Department of Agriculture, Rural Development, land and Environmental Affairs; and Mpumalanga Tourism and Parks Agency. Comment was also received from Ms Annatjie Burke of the farm Vogelstruispoort 384 JT portion. We will consult with the project proponent and these stakeholders during the EIA phase to ensure that we deal appropriately with the aspects that have been raised.
- The above organisations have also submitted relevant avifaunal data collected on an *ad hoc* basis in the area. This will be cross checked against our systematically collected monitoring data (over 24 months). We are aware of one inaccuracy in the data submitted by stakeholders, where a Blue Crane nest location is cited, but our own observation is that the nest area has been ploughed by the landowner in 2021/2022.

Note that In November, seven turbines were dropped from the layout due to avifaunal concerns. An update to this report was therefore conducted in November 2022, to consider an updated turbine layout. No other changes were made to the report and no new information that has become available since the first version of this report (July 2022) was written. Any such information will be considered in the EIA phase.

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Appendix 1. Specialist CV

JONATHAN JAMES SMALLIE
WildSkies Ecological Services (2011/131435/07)
Curriculum Vitae

Background
Date of birth: 20 October 1975
Qualifications: BSC – Agriculture (Hons) (completed 1998)
University of Natal – Pietermaritzburg
MSC – Environmental Science (completed 2011)
University of Witwaterstrand
Occupation: Specialist avifaunal consultant
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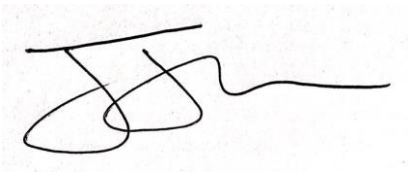


Professional experience
IFC PS6 experience:
Amakhala Emoyeni Wind Farm – in collaboration with Simon Hulka (IFC) designed and implemented an operational phase monitoring programme and Biodiversity Monitoring & Mitigation Plan; Golden Valley Wind Farm – in collaboration with Leon Bennun (The Biodiversity Consultancy - TBC) compiled a Critical Habitat Assessment and Biodiversity Action Plan for the wind farm; Jeffrey's Bay Wind Farm – in collaboration with TBC compiled a Biodiversity Management Plan for the wind farm.

Renewable energy:

Post construction bird monitoring for wind energy facilities:
Dassieklip (Caledon) –initiated in April 2014 (2yrs); Dorper Wind Farm (Molteno) – initiated in July 2014 (5yrs); Jeffreys Bay Wind Farm – initiated in August 2014 (4yrs); Kouga Wind Farm – started Feb 2015 (2yrs); Cookhouse Wind Farm – started March 2015 (1yr); Grassridge Wind Farm – initiated in April 2015 (2yrs); Chaba Wind Farm – initiated December 2015 (1yr); Amakhala Emoyeni 01 Wind Farm initiated August 2016 (5yrs) – IFC funded project; Gibson Bay Wind Farm – initiated March 2017 (4yrs); Nojoli Wind Farm initiated March 2017 (4yrs); Sere Wind Farm (2yrs); Golden Valley Wind Farm (started Sep 2021 – 1 yr).

Pre-construction bird monitoring & EIA for wind energy facilities:
Golden Valley 1; Middleton; Dorper; Qumbu; Ncora; Nqamakhwe; Ndakana; Thomas River; Peddie; Mossel Bay; Hluhluwe; Richards Bay; Garob; Outeniqua; Castle; Wolf; Inyanda-Roodeplaat; Dassiesridge; Great Kei; Bayview; Grahamstown; Bakenskop; Umsobomvu; Stormberg; Zingesele; Oasis; Gunstfontein; Naumanii; Golden Valley Phase 2; Ngxwabangu; Hlobo; Woodstock; Scarlet Ibis; Albany; Golden Valley 1 2nd monitoring; Umtathi Emoyeni; Serenje Zambia; Unika 1 Zambia; Impofu East, West, and North; Nuweveld East, West and North; Elands Wind Farm; Ingwe Wind Farm; Hoogland Wind Farm; Cradock Wind Farm Cluster; Canyon Springs Wind Farm; Loxton Wind Farm; Taaibos Wind Farm; Aberdeen Wind Farm.

Screening studies for wind energy facilities:
Tarkastad Wind Farm; Quanti Wind Farm; Ruitjies Wind Farm; Beaufort West Wind Farm; Success Wind Farm; Cradock Wind Farm; Britstown Wind Farm; Clanwilliam Wind Farm; Ebenhezer Wind Farm.

Avifaunal walk through for wind energy facilities:
Garob Wind Farm; Golden Valley 1 wind farm; Nxuba Wind Farm.

Pre-construction bird monitoring and EIA for Solar energy facilities:
Bonnievale Solar Energy Facility; Dealesville Solar Energy Facility; Rooipunt Solar Energy Facility; De Aar Solar Energy Facility; Noupoort Solar Energy Facility, Aggeneys Solar Energy Facility; Eskom Concentrated Solar Power Plant; Bronkhorstspruit Solar Photovoltaic Plant; De Aar Solar Energy Facility; Paulputs Solar Energy Facility; Kenhardt Solar Energy Facility; Wheatlands Solar Energy Facility; Nampower CSP project; Dwaalboom PV; Slurry PV; De Hoek PV; Suikerbekkie PV; Springhaas PV.

Other Electricity Generation:
Port of Nqura Power Barge EIA; Tugela Hydro-Electric Scheme; Mmamabula West Coal Power Station (Botswana).

Electricity transmission & distribution:
Overhead transmission power lines (>132 000 kilovolts):

Oranjemund Gromis 220kv; Perseus Gamma 765kv; Aries Kronos 765kv; Aries Helios 765kv; Perseus Kronos 765kv; Helios Juno 765kv; Borutho Nzelele 400kv; Foskor Merensky 275kv; Kimberley Strengthening; Mercury Perseus 400kV; Eros Neptune Grassridge 400kV; Kudu Juno 400kV; Garona Aries 400kV; Perseus Hydra 765Kv; Tabor Witkop 275kV; Tabor Spencer 400kV; Moropule Orapa 220kV (Botswana); Coega Electrification; Majuba Venus 765kV; Gamma Grassridge 765kV; Gourikwa Proteus 400KV; Koeberg Strengthening 400kV; Ariadne Eros 400kV; Hydra Gamma 765kV; Zizabona transmission – Botswana; Maphutha Witkop 400kv; Makala B 400kv; Aggeneis Paulputs 400kv; Northern Alignment 765kv; Kappa Omega 765kv; Isundu 400kv and Substation; Senakangwedi B Integration; Oranjemund Gromis;

Overhead distribution power lines (<132 000 kilovolts):
Kanoneiland 22KV; Hydra Gamma 765kV; Komani Manzana 132kV; Rockdale Middelburg 132kV; Irenedale 132 kV; Zandfontein 132kV; Venulu Makonde 132 kV; Spencer Makonde 132 kV; Dalkeith Jackal Creek 132Kv; Glen Austin 88kV; Bulgerivier 132kV; Ottawa Tongaat 132kV; Disselfontein 132kV; Voorspoed Mine 132kV; Wonderfontein 132kV; Kabokweni Hlau Hlau 132kV; Hazyview Kiepersol 132kV; Mayfern Delta 132kV; VAAL Vresap 88kV; Arthursview Modderkuil 88kV; Orapa, AK6, Lethakane substations and 66kV lines (Botswana); Dagbreek Hermon 66kV; Uitkoms Majuba 88kV; Pilanesberg Spitskop 132kV; Qumbu PG Bison 132kV; Louis Trichardt Venetia 132kV; Rockdale Middelburg Ferrochrome 132kV; New Continental Cement 132KV; Hillside 88kV; Marathon Delta 132kV; Malelane Boulder 132kV; Nondela Strengthening 132kV; Spitskop Northern Plats 132kV; West Acres Mataffin 132kV; Westgate Tarlton Kromdraai 132kV; Sappi Elliot Ugie 132kV; Melkhout Thyspunt 132kV; St Francis Bay 66kv; Etna Ennerdale 88kv; Kroonstad 66kv; Firham Platrand; Paradise Fondwe 132kv; Kraal Mafube 132kv; Loeriesfontein 132kv; Albany Mimosa 66kv; Zimanga 132kv; Grootpan Brakfontein; Mandini Mangethe; Valkfontein Substation; Sishen Saldanha; Corinth Mzongwana 132kv; Franklin Vlei 22kv; Simmerpan Strengthening; Ilanga Lethemba 132kv; Cuprum Burchell Mooidraai 132; Oliphantskop Grassridge 132;

Risk Assessments on existing power lines:
Hydra-Droerivier 1,2 & 3 400kV; Hydra-Poseidon 1,2 400kV; Butterworth Ncora 66kV; Nieu-Bethesda 22kV; Maclear 22kV (Joelshoek Valley Project); Wodehouse 22kV (Dordrecht district); Burgersdorp Aliwal North Jamestown 22kV; Cradock 22kV; Colesberg area 22kV; Loxton self build 11kV; Kanoneiland 22kV; Stutterheim Municipality 22kV; Majuba-Venus 400kV; Chivelston-Mersey 400kV; Marathon-Prairie 275kV; Delphi-Neptune 400kV; Ingagane – Bloukrans 275kV; Ingagane – Danskraal 275kV; Danskraal – Bloukrans 275kV

Avifaunal “walk through” (EMP’s):
Kappa Omega 765kv; Rockdale Marble Hall 400kv; Beta Delphi 400kV; Mercury Perseus 765kV; Perseus 765kV Substation; Beta Turn 765kV in lines; Spencer Tabor 400kV line; Kabokweni Hlau Hlau 132kV; Mayfern Delta 132Kv; Eros Mtata 400kV; Cennergi Grid connect 132kV; Melkhout Thyspunt 132kv; Imvubu Theta 400kv; Outeniqua Oudshoorn 132kv; Clocolan Ficksburg 88kv.

Strategic Environmental Assessments for Master Electrification Plans:
Northern Johannesburg area; Southern KZN and Northern Eastern Cape; Northern Pretoria; Western Cape Peninsula

Other electrical infrastructure work
Investigation into rotating Bird Flapper saga – Aberdeen 22Kv; Special investigation into faulting on Ariadne-Eros 132kV; Special investigation into Bald Ibis faulting on Tutuka Pegasus 275kV; Special investigation into bird related faulting on 22kV Geluk Hendrina line; Special investigation into bird related faulting on Camden Chivelston 400kV line

Water sector:
Umkhomazi Dam and associated tunnel and pipelines; Rosedale Waste Water Treatment Works; Lanseria Outfall Sewer; Lanseria Wastewater Treatment Works;

Wildlife airport hazards:
Kigali International Airport – Rwanda; Port Elizabeth Airport – specialist study as part of the EIA for the proposed Madiba Bay Leisure Park; Manzini International Airport (Swaziland); Polokwane International Airport; Mafekeng International Airport; Lanseria Airport. Namibia Airports Company – wildlife hazard management plans for three airports.

Conservation planning:
East Cape Biodiversity Strategy & Action Plan – avifaunal input; City of Ekurhuleni Biodiversity Plan – avifaunal input.

Other sectors:
Submarine telecommunications cables project; Lizzard Point Golf Estate – Vaaldam; Lever Creek Estates housing development; East Cape Biodiversity Strategy and Action Plan 2017; Cathedral Peak Road diversion; Dube Tradeport; East London Transnet Ports Authority Biodiversity Management Plan; Leazonia Feedlot; Carisbrooke Quarry; Senekal Sugar Development; Frankfort Paper Mill;

Employment positions held to date:

- August 1999 to May 2004: Eastern Cape field officer for the South African Crane Working Group of the Endangered Wildlife Trust
- May 2004 to November 2007: National Field officer for Eskom-EWT Strategic Partnership and Airports Company SA – EWT Strategic Partnership (both programmes of Endangered Wildlife Trust)
- November 2007 to August 2011: Programme Manager – Wildlife & Energy Programme – Endangered Wildlife Trust

- August 2011 to present: Independent avifaunal specialist – Director at WildSkies Ecological Sevices (Pty) Ltd

Relevant achievements:

- Recipient of BirdLife South Africa's Giant Eagle Owl in 2011 for outstanding contribution to bird conservation in SA
- Founded and chaired for first two years – the Birds and Wind Energy Specialist Group (BAWESG) of the Endangered Wildlife Trust & BirdLife South Africa.

Conferences attended & presented at:

- 2021. African Conference on Linear Infrastructure and Environment
- 2018. Raptor Research Foundation conference, Kruger National Park.
- 2019. Conference on Wind Energy and Wildlife, Stirling, Scotland.
- 2017. Conference on Wind Energy and Wildlife, Estoril, Portugal.
- 2012-2020. Windaba Conference. Various attendance.
- May 2011. Conference of Wind Energy and Wildlife, Trondheim, Norway.
- March 2011. Chair and facilitator at Endangered Wildlife Trust – Wildlife & Energy Programme – "2011 Wildlife & Energy Symposium", Howick, SA
- September 2010 – Raptor Research Foundation conference, Fort Collins, Colorado. Presented on the use of camera traps to investigate Cape Vulture roosting behaviour on transmission lines
- May 2010 - Wind Power Africa 2010. Presented on wind energy and birds
- October 2008. Session chair at Pan-African Ornithological Conference, Cape Town, South Africa
- March 27 – 30 2006: International Conference on Overhead Lines, Design, Construction, Inspection & Maintenance, Fort Collins Colorado USA. Presented a paper entitled "Assessing the power line network in the Kwa-Zulu Natal Province of South Africa from a vulture interaction perspective".
- June 2005: IASTED Conference at Benalmadena, Spain – presented a paper entitled "Impact of bird streamers on quality of supply on transmission lines: a case study"
- May 2005: International Bird Strike Committee 27th meeting – Athens, Greece. Presented a paper entitled Bird Strike Data analysis at SA airports 1999 to 2004.
- 2003: Presented a talk on "Birds & Power lines" at the 2003 AGM of the Amalgamated Municipal Electrical Unions – in Stutterheim - Eastern Cape
- September 2000: 5th World Conference on Birds of Prey in Seville, Spain.

Papers & publications:

- Jenkins, A.R., Van Rooyen, C.S., Smallie, J., Harrison, J.A., Diamond, M., Smit-Robbinson, H.A. & Ralston, S. 2015. "Best practice guidelines for assessing and monitoring the impact of wind energy facilities on birds in southern Africa" Unpublished guidelines

- Ralston-Paton, S., Smallie, J., Pearson, A., & Ramalho, R. 2017. Wind energy's impacts on birds in South Africa: a preliminary review of the results of operational monitoring at the first wind farms of the Renewable Energy Independent Power Producer Procurement Programme Wind Farms in South Africa. BirdLife South Africa Occasional Report Series No. 2. BirdLife South Africa, Johannesburg, South Africa.
- Prinsen, H.A.M., J.J. Smallie, G.C. Boere, & N. Pires. (compilers), 2011. Guidelines on how to avoid or mitigate impacts of electricity power grids on migratory birds in the African-Eurasian Region. CMS Technical Series Number XX. Bonn, Germany.
- Prinsen, H.A.M., J.J. Smallie, G.C. Boere, & N. Pires. (compilers), 2011. Review of the conflict between migratory birds and electricity power grids in the African-Eurasian region. CMS Technical Series Number XX, Bonn, Germany.
- Jenkins, A.R., van Rooyen, C.S, Smallie, J.J, Harrison, J.A., Diamond, M.D., Smit-Robinson, H.A & Ralston, S. 2014. Best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa
- Jenkins, A.R., Shaw, J.M., Smallie, J.J., Gibbons, B., Visagie, R. & Ryan, P.G. 2011. Estimating the impacts of power line collisions on Ludwig's Bustards *Neotis ludwigii*. Bird Conservation International.
- Jordan, M., & Smallie, J. 2010. A briefing document on best practice for pre-construction assessment of the impacts of onshore wind farms on birds. Endangered Wildlife Trust , Unpublished report
- Smallie, J., & Virani, M.Z. 2010. A preliminary assessment of the potential risks from electrical infrastructure to large birds in Kenya. Scopus 30: p32-39
- Shaw, J.M., Jenkins, A.R., Ryan, P.G., & Smallie, J.J. 2010. A preliminary survey of avian mortality on power lines in the Overberg, South Africa. Ostrich 2010. 81 (2) p109-113
- Jenkins, A.R., Smallie, J.J., & Diamond, M. 2010. Avian collisions with power lines: a global review of causes and mitigation with a South African perspective. Bird Conservation International 2010. 20: 263-278.
- Shaw, J.M., Jenkins, A.R., Ryan, P.G., & Smallie, J.J. 2010. Modelling power line collision risk for the Blue Crane *Anthropoides paradiseus* in South Africa. Ibis 2010 (152) p590-599.
- Jenkins, A.R., Allan, D.G., & Smallie, J.J. 2009. Does electrification of the Lesotho Highlands pose a threat to that countries unique montane raptor fauna? Dubious evidence from surveys of three existing power lines. Gabar 20 (2).
- Smallie, J.J., Diamond, M., & Jenkins, A.R. 2008. Lighting up the African continent – what does this mean for our birds? Pp 38-43. In Harebottle, D.M., Craig, A.J.F.K., Anderson, M.D., Rakotomanana, H., & Muchai. (eds). Proceedings of the 12th Pan-african Ornithological Congress. 2008. Cape Town. Animal Demography Unit. ISBN (978-0-7992-2361-3)
- Van Rooyen, C., & Smallie, J.J. 2006. The Eskom –EWT Strategic Partnership in South Africa: a brief summary. Nature & Faunae Vol 21: Issue 2, p25

- Smallie, J. & Froneman, A. 2005. Bird Strike data analysis at South African Airports 1999 to 2004. Proceedings of the 27th Conference of the International Bird Strike Committee, Athens Greece.
- Smallie, J. & Van Rooyen, C. 2005. Impact of bird streamers on quality of supply on transmission lines: a case study. Proceedings of the Fifth IASTED International Conference on Power and Energy Systems, Benalmadena, Spain.
- Smallie, J. & Van Rooyen, C. 2003. Risk assessment of bird interaction on the Hydra-Droërivier 1 and 2 400kV. Unpublished report to Eskom Transmission Group. Endangered Wildlife Trust. Johannesburg. South Africa
- Van Rooyen, C. Jenkins, A. De Goede, J. & Smallie J. 2003. Environmentally acceptable ways to minimise the incidence of power outages associated with large raptor nests on Eskom pylons in the Karoo: Lessons learnt to date. Project number 9RE-00005 / R1127 Technology Services International. Johannesburg. South Africa
- Smallie, J. J. & O'Connor, T. G. (2000) Elephant utilization of *Colophospermum mopane*: possible benefits of hedging. African Journal of Ecology 38 (4), 352-359.

Courses & training:

- Successfully completed a 5 day course in High Voltage Regulations (modules 1 to 10) conducted by Eskom – Southern Region
- Successfully completed training on, and obtained authorization for, live line installation of Bird Flappers

Appendix 2. Bird species data for the site

'*1*' denotes presence, not abundance

Status = Red Data (Regional, Global) Regional Red List – Taylor *et al*. 2015; Global Red List – IUCN 2021

Endemism – E = Endemic, NE = Near-endemic, SLS = Endemic to South Africa Lesotho & Swaziland, BSLS = Botswana South Africa Lesotho Swaziland.

CR - Critically Endangered; EN – Endangered; VU – Vulnerable; NT – Near-Threatened; LC - Least Concern

Common name	***Taxonomic name***	**Status (Regional, Global, Endemic)**	**S1**	**S2**	**S3**	**S4**
Wattled Crane	*Grus carunculata*	CR, VU	1	1	1	1
White-backed Vulture	*Gyps africanus*	CR, CR	1			
Martial Eagle	*Polemaetus bellicosus*	EN, VU	1	1		1
Black-rumped Buttonquail	*Turnix nanus*	EN, LC	1			1
Cape Vulture	*Gyps coprotheres*	EN, EN	1	1	1	1
Grey Crowned Crane	*Balearica regulorum*	EN, EN			1	1
Southern Bald Ibis	*Geronticus calvus*	VU, VU, SLS	1	1	1	1
Secretarybird	*Sagittarius serpentarius*	VU, VU	1	1	1	1
Crowned Eagle	*Stephanoaetus coronatus*	VU, NT				1
Denham's Bustard	*Neotis denhami*	VU, NT	1	1		
Lanner Falcon	*Falco biarmicus*	VU, LC	1	1	1	1
White-bellied Korhaan (Bustard)	*Eupodotis senegalensis*	VU, LC	1	1	1	
Blue Crane	*Grus paradisea*	NT, VU			1	1
Greater Flamingo	*Phoenicopterus roseus*	NT, LC				1
Blue Korhaan	*Eupodotis caerulescens*	LC, NT, SLS				1
Cape Grassbird	*Sphenoeacus afer*	NE	1	1	1	1
Cape Weaver	*Ploceus capensis*	NE	1	1	1	1
Cape White-eye	*Zosterops virens*	NE	1	1	1	
Cloud Cisticola	*Cisticola textrix*	NE			1	1
Fiscal Flycatcher	*Melaenornis silens*	NE	1	1	1	1
Jackal Buzzard	*Buteo rufofuscus*	NE	1	1	1	1
Southern Double-collared Sunbird	*Cinnyris chalybeus*	NE		1		
Buff-streaked Chat	*Campicoloides bifasciatus*	SLS	1	1	1	1
Drakensberg Prinia	*Prinia hypoxantha*	SLS	1	1	1	1
Eastern Long-billed Lark	*Certhilauda semitorquata*	SLS	1	1	1	1
Greater Double-collared Sunbird	*Cinnyris afer*	SLS				1
Pied Starling	*Lamprotornis bicolor*	SLS	1	1	1	1
South African Cliff Swallow	*Petrochelidon spilodera*	BSLS	1	1	1	1
African (Purple) Swamphen	*Porphyrio madagascariensis*		1	1	1	1
African Black Duck	*Anas sparsa*					1
African Black Swift	*Apus barbatus*		1		1	1
African Darter	*Anhinga rufa*		1			1
African Dusky Flycatcher	*Muscicapa adusta*		1			

African Firefinch	*Lagonosticta rubricata*		1			
African Fish Eagle	*Haliaeetus vocifer*		1	1	1	1
African Goshawk	*Accipiter tachiro*		1	1	1	
African Harrier-Hawk	*Polyboroides typus*		1	1	1	1
African Hoopoe	*Upupa africana*		1	1	1	1
African Olive Pigeon	*Columba arquatrix*				1	
African Palm Swift	*Cypsiurus parvus*				1	1
African Paradise Flycatcher	*Terpsiphone viridis*				1	1
African Pipit	*Anthus cinnamomeus*		1	1	1	1
African Quail-finch	*Ortygospiza atricollis*		1	1	1	
African Rail	*Rallus caerulescens*		1		1	1
African Reed Warbler	*Acrocephalus baeticatus*					1
African Sacred Ibis	*Threskiornis aethiopicus*		1	1	1	1
African Snipe	*Gallinago nigripennis*		1	1	1	1
African Spoonbill	*Platalea alba*				1	
African Stonechat	*Saxicola torquatus*		1	1	1	1
African Wattled Lapwing	*Vanellus senegallus*		1		1	1
Alpine Swift	*Tachymarptis melba*		1		1	1
Amethyst Sunbird	*Chalcomitra amethystina*				1	1
Amur Falcon	*Falco amurensis*					1
Ant-eating Chat	*Myrmecocichla formicivora*		1	1	1	1
Baillon's Crake	*Porzana pusilla*		1			
Banded Martin	*Riparia cincta*		1			1
Barn Swallow	*Hirundo rustica*		1		1	1
Bar-throated Apalis	*Apalis thoracica*		1	1	1	1
Black Crake	*Amaurornis flavirostra*		1	1	1	1
Black Cuckoo	*Cuculus clamosus*				1	
Black Saw-wing	*Psalidoprocne pristoptera*					1
Black Sparrowhawk	*Accipiter melanoleucus*		1	1	1	
Black-chested Prinia	*Prinia flavicans*					1
Black-chested Snake Eagle	*Circaetus pectoralis*		1	1	1	1
Black-collared Barbet	*Lybius torquatus*		1	1	1	1
Black-headed Heron	*Ardea melanocephala*		1	1	1	1
Black-headed Oriole	*Oriolus larvatus*		1	1	1	1
Blacksmith Lapwing	*Vanellus armatus*		1	1	1	1
Black-throated Canary	*Crithagra atrogularis*				1	1
Black-winged Kite	*Elanus caeruleus*		1	1	1	1
Black-winged Lapwing	*Vanellus melanopterus*		1	1	1	1
Black-winged Stilt	*Himantopus himantopus*			1		
Blue Quail	*Excalfactoria adansonii*					1
Bokmakierie	*Telophorus zeylonus*		1	1	1	1
Brimstone Canary	*Crithagra sulphurata*			1		
Brown Snake Eagle	*Circaetus cinereus*		1	1	1	1
Brown-backed Honeybird	*Prodotiscus regulus*		1	1	1	
Brown-throated Martin	*Riparia paludicola*		1		1	1
Buffy Pipit	*Anthus vaalensis*		1	1	1	1
Cape Bunting	*Emberiza capensis*		1	1		1

Cape Canary	*Serinus canicollis*		1	1	1	1
Cape Crow	*Corvus capensis*		1	1	1	1
Cape Longclaw	*Macronyx capensis*		1	1	1	1
Cape Robin-chat	*Cossypha caffra*		1	1	1	
Cape Sparrow	*Passer melanurus*		1	1	1	
Cape Turtle (Ring-necked) Dove	*Streptopelia capicola*		1	1	1	1
Cape Wagtail	*Motacilla capensis*		1	1	1	1
Capped Wheatear	*Oenanthe pileata*		1	1	1	
Cardinal Woodpecker	*Dendropicos fuscescens*				1	
Chinspot Batis	*Batis molitor*					1
Cinnamon-breasted Bunting	*Emberiza tahapisi*					1
Common (Kurrichane) Buttonquail	*Turnix sylvaticus*		1		1	
Common (Steppe) Buzzard	*Buteo buteo*				1	1
Common House Martin	*Delichon urbicum*					1
Common Moorhen	*Gallinula chloropus*		1	1	1	1
Common Myna	*Acridotheres tristis*		1	1		1
Common Quail	*Coturnix coturnix*		1	1	1	
Common Sandpiper	*Actitis hypoleucos*			1	1	
Common Square-tailed Drongo	*Dicrurus ludwigii*					1
Common Swift	*Apus apus*				1	
Common Waxbill	*Estrilda astrild*		1	1	1	1
Crested Barbet	*Trachyphonus vaillantii*			1	1	1
Crowned Lapwing	*Vanellus coronatus*		1	1	1	1
Dark-capped (African) Yellow Warbler	*Iduna natalensis*					1
Dark-capped Bulbul	*Pycnonotus tricolor*		1	1	1	1
Diederik Cuckoo	*Chrysococcyx caprius*				1	1
Eastern Clapper Lark	*Mirafra fasciolata*		1	1	1	1
Egyptian Goose	*Alopochen aegyptiaca*		1	1	1	1
European Bee-eater	*Merops apiaster*				1	
European Honey Buzzard	*Pernis apivorus*					1
Familiar Chat	*Oenathe familiaris*			1		
Fan-tailed Widowbird	*Euplectes axillaris*				1	1
Fiery-necked Nightjar	*Caprimulgus pectoralis*		1			1
Fork-tailed Drongo	*Dicrurus adsimilis*		1	1	1	
Giant Kingfisher	*Megaceryle maxima*			1	1	1
Glossy Ibis	*Plegadis falcinellus*			1	1	1
Golden-breasted Bunting	*Emberiza flaviventris*				1	1
Goliath Heron	*Ardea goliath*					1
Great Egret	*Ardea alba*		1		1	
Great Sparrow	*Passer motitensis*					1
Greater Honeyguide	*Indicator indicator*		1	1	1	
Greater Kestrel	*Falco rupicoloides*			1		
Greater Striped Swallow	*Cecropis cucullata*		1		1	1
Grey Heron	*Ardea cinerea*		1	1	1	1
Groundscraper Thrush	*Turdus litsitsirupa*		1	1		1
Hadeda (Hadada) Ibis	*Bostrychia hagedash*		1	1	1	1
Hamerkop	*Scopus umbretta*		1	1	1	1

Harlequin Quail	*Coturnix delegorguei*					1
Helmeted Guineafowl	*Numida meleagris*		1	1	1	1
Horus Swift	*Apus horus*					1
House Sparrow	*Passer domesticus*		1	1	1	1
Karoo Scrub Robin	*Cercotrichas coryphoeus*					1
Laughing Dove	*Spilopelia senegalensis*		1	1		1
Lazy Cisticola	*Cisticola aberrans*		1		1	1
Lesser Striped Swallow	*Cecropis abyssinica*				1	1
Lesser Swamp Warbler	*Acrocephalus gracilirostris*		1	1	1	1
Levaillant's Cisticola	*Cisticola tinniens*		1	1	1	1
Little Egret	*Egretta garzetta*			1	1	
Little Grebe	*Tachybaptus ruficollis*		1	1	1	1
Little Rush Warbler	*Bradypterus baboecala*		1		1	1
Little Swift	*Apus affinis*		1	1	1	1
Long-crested Eagle	*Lophaetus occipitalis*				1	1
Long-tailed Widowbird	*Euplectes progne*		1	1	1	1
Malachite Kingfisher	*Corythornis cristatus*		1			1
Malachite Sunbird	*Nectarinia famosa*		1	1	1	1
Marsh Owl	*Asio capensis*		1			1
Mocking Cliff Chat	*Thamnolaea cinnamomeiventris*					1
Mountain Wheatear	*Myrmecocichla monticola*		1	1	1	1
Namaqua Dove	*Oena capensis*		1		1	
Natal Spurfowl	*Pternistis natalensis*		1	1	1	1
Neddicky	*Cisticola fulvicapilla*		1	1	1	1
Nicholson's Pipit	*Anthus similis*		1	1	1	
Olive Thrush	*Turdus olivaceus*		1		1	1
Olive Woodpecker	*Dendropicos griseocephalus*					1
Pale-crowned Cisticola	*Cisticola cinnamomeus*				1	1
Pearl-breasted Swallow	*Hirundo dimidiata*			1		
Peregrine Falcon	*Falco peregrinus*			1	1	
Pied Crow	*Corvus albus*			1	1	1
Pied Kingfisher	*Ceryle rudis*					1
Pin-tailed Whydah	*Vidua macroura*		1	1	1	1
Plain-backed Pipit	*Anthus leucophrys*			1		
Purple Heron	*Ardea purpurea*		1		1	1
Red-billed Oxpecker	*Buphagus erythrorynchus*				1	1
Red-billed Quelea	*Quelea quelea*		1	1	1	1
Red-billed Teal	*Anas erythrorhyncha*		1			1
Red-capped Lark	*Calandrella cinerea*		1	1	1	1
Red-chested Cuckoo	*Cuculus solitarius*				1	
Red-chested Flufftail	*Sarothrura rufa*		1	1	1	1
Red-collared Widowbird	*Euplectes ardens*		1		1	1
Red-eyed Dove	*Streptopelia semitorquata*		1	1	1	1
Red-faced Mousebird	*Urocolius indicus*		1			
Red-knobbed coot	*Fulica cristata*		1	1	1	1
Red-throated Wryneck	*Jynx ruficollis*		1		1	1
Red-winged Francolin	*Scleroptila levaillantii*		1	1	1	1

Red-winged Starling	*Onychognathus morio*		1	1	1	1
Reed Cormorant	*Microcarbo africanus*		1	1	1	1
Rock Dove	*Columba livia*		1	1		
Rock Kestrel	*Falco rupicolus*			1	1	1
Rock Martin	*Ptyonoprogne fuligula*		1	1		1
Rufous-naped Lark	*Mirafra africana*		1	1		1
Sedge Warbler	*Acrocephalus schoenobaenus*					1
South African Shelduck	*Tadorna cana*		1	1		
Southern (Common) Fiscal	*Lanius collaris*		1	1	1	1
Southern Black flycatcher	*Melaenornis pammelaina*					1
Southern Boubou	*Laniarius ferrugineus*		1	1	1	1
Southern Grey-headed Sparrow	*Passer diffusus*		1	1	1	1
Southern Masked Weaver	*Ploceus velatus*		1	1	1	1
Southern Red Bishop	*Euplectes orix*		1	1	1	1
Southern Yellow White-eye	*Zosterops senegalensis*					1
Speckled Mousebird	*Colius striatus*		1	1	1	1
Speckled Pigeon	*Columba guinea*		1	1	1	1
Spike-heeled Lark	*Chersomanes albofasciata*		1	1	1	1
Spotted Eagle-Owl	*Bubo africanus*		1			1
Spotted flycatcher	*Muscicapa striata*					1
Spotted Thick-knee	*Burhinus capensis*				1	1
Spur-winged Goose	*Plectropterus gambensis*		1	1	1	1
Streaky-headed Seedeater	*Crithagra gularis*		1	1	1	1
Swainson’s Spurfowl	*Pternistis swainsonii*		1	1	1	1
Temminck's Courser	*Cursorius temminckii*		1		1	
Three-banded Plover	*Charadrius tricollaris*		1	1		1
Wailing Cisticola	*Cisticola lais*			1	1	1
Western Cattle Egret	*Bubulcus ibis*		1		1	1
Whiskered Tern	*Chlidonias hybrida*		1		1	1
White Stork	*Ciconia ciconia*					1
White-breasted Cormorant	*Phalacrocorax lucidus*			1	1	
White-browed Sparrow-Weaver	*Plocepasser mahali*					1
White-fronted Bee-eater	*Merops bullockoides*		1	1	1	1
White-rumped Swift	*Apus caffer*		1	1	1	1
White-throated Swallow	*Hirundo albigularis*		1		1	1
White-winged Tern	*Chlidonias leucopterus*					1
White-winged Widowbird	*Euplectes albonotatus*				1	1
Willow Warbler	*Phylloscopus trochilus*				1	1
Wing-snapping Cisticola	*Cisticola ayresii*		1	1	1	1
Wood Sandpiper	*Tringa glareola*					1
Yellow-billed (Intermediate) Egret	*Ardea intermedia*			1	1	1
Yellow-billed Duck	*Anas undulata*		1	1	1	1
Yellow-billed Kite	*Milvus aegyptius*					1
Yellow-crowned Bishop	*Euplectes afer*			1		1
Yellow-fronted Canary	*Crithagra mozambica*		1	1	1	1
Zitting Cisticola	*Cisticola juncidis*		1	1	1	1

Appendix 3. Site sensitivity verification report.

Government Notice No. 320, dated 20 March 2020, includes the requirement that an Initial Site Sensitivity Verification Report must be produced for a development footprint. As per Part 1, Section 2.3, the outcome of the Initial Site 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 national web based environmental screening tool;

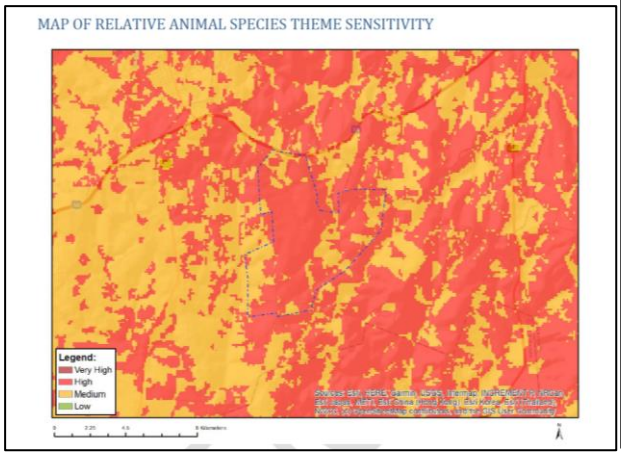
(b) Contains a motivation and evidence of either the verified or different use of the land and environmental sensitivity;

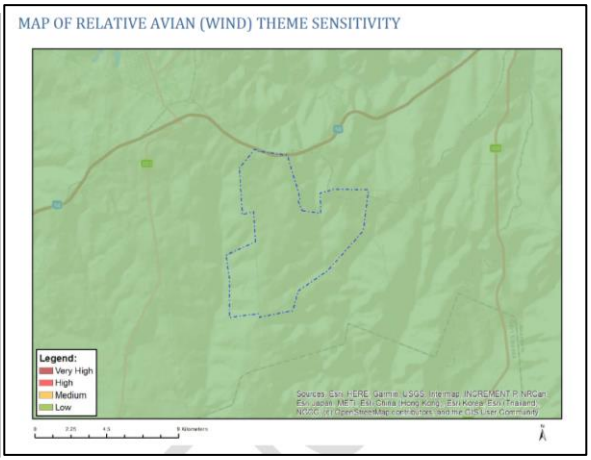
(c) Is submitted together with the relevant reports prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

This report has been produced specifically to consider the avian theme and addresses the content requirements of (a) and (b) above.

The DFFE Screening Tool – classifies the site as follows:

- Dalmanutha North
    a. Animal theme – High. Mostly bird species are listed, including: Black-rumped Buttonquail; Southern Bald Ibis; Secretarybird; Wattled Crane; Denham's Bustard; Yellow-breasted Pipit; African Marsh-Harrier; and White-winged Flufftail.
    b. Avian Theme – Low.
    c. Terrestrial Biodiversity theme – Very high. Based on CBA1 and CBA2 and ESA areas.





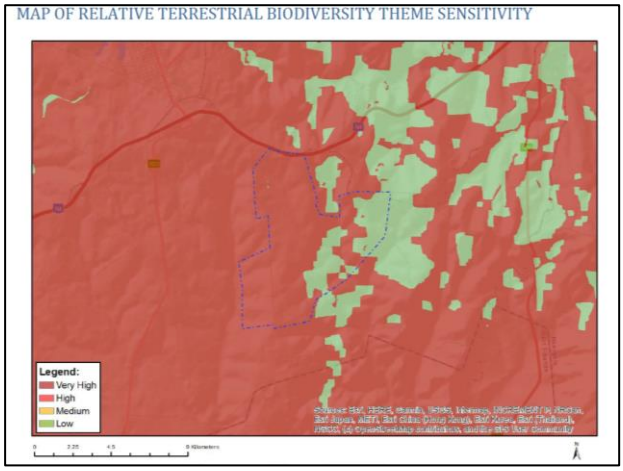


Figure 1. DFFE Screening Tool outcome for the three themes.

- Dalmanutha South
    a. Animal theme – High. Mostly bird species are listed, including: Bush Blackcap; Southern Bald Ibis; Black-rumped Buttonquail;; Denham's Bustard; Wattled Crane; Yellow-breasted Pipit; African Marsh-Harrier; and Secretarybird.
    b. Avian Theme – Low.
    c. Terrestrial Biodiversity theme – Very high. Based on CBA1 and CBA2 and ESA areas.

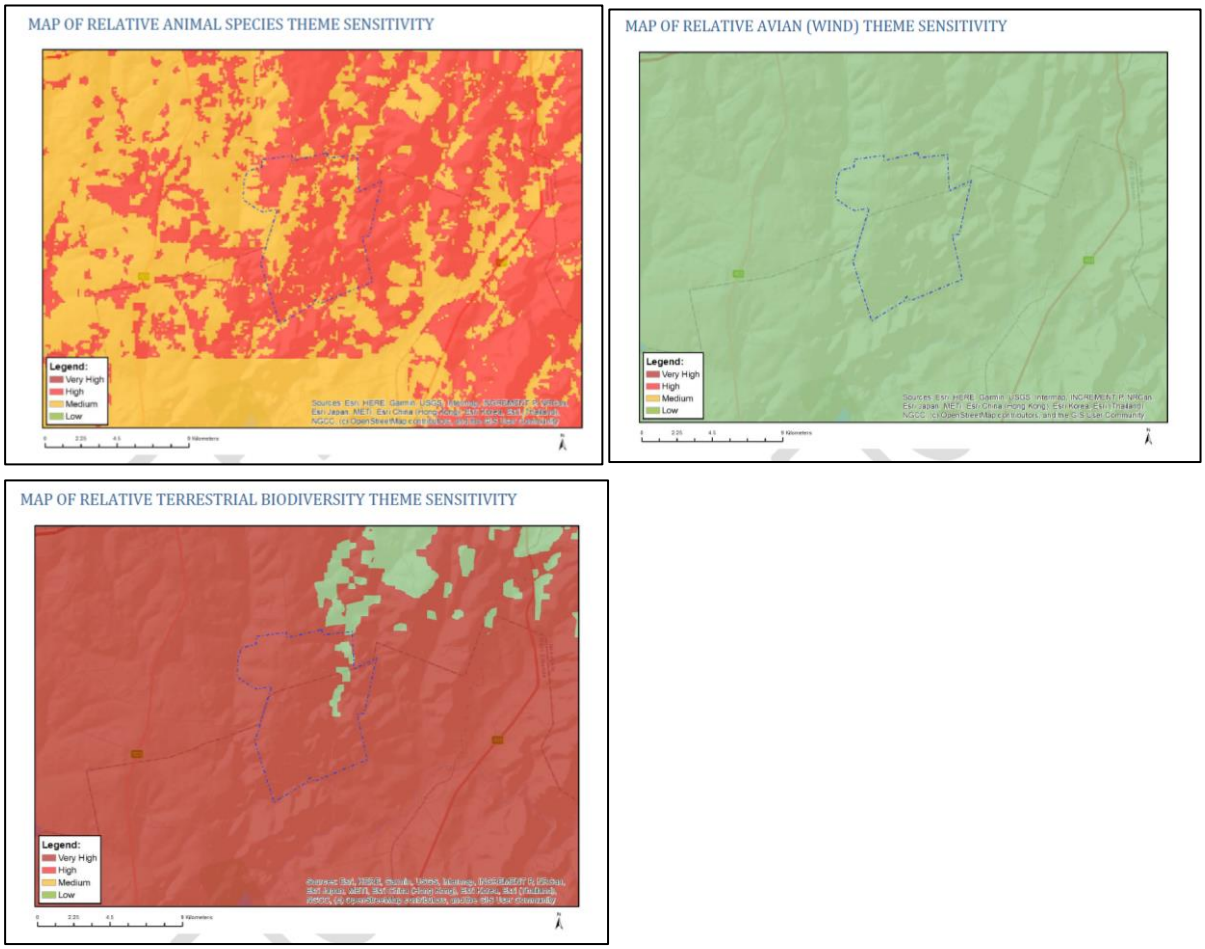
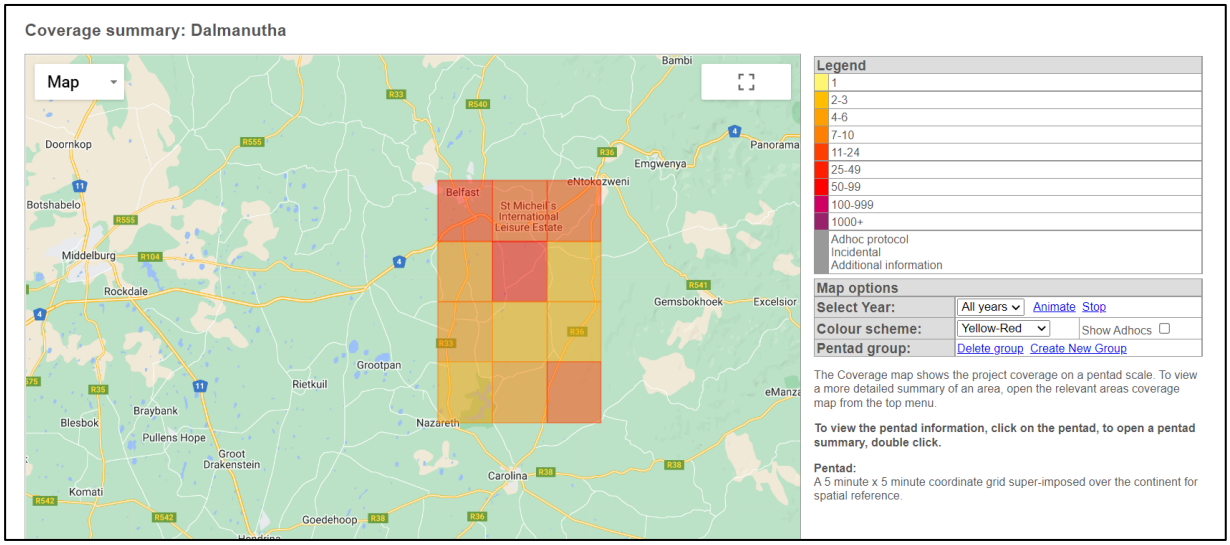


Figure 2. DFFE Screening Tool outcome for the three themes.

Our work on site confirms that the site is of Medium to High sensitivity for avifauna. We have confirmed the presence of most of the above listed bird species on site, exceptions being African Marsh-Harrier and White-winged Flufftail.

Appendix 4. Southern African Bird Atlas Project data.



Common name	Taxonomic name	Report rate
Bokmakierie	*Telophorus zeylonus*	84.5
Brubru	*Nilaus afer*	0.5
Hamerkop	*Scopus umbretta*	31.9
Neddicky	*Cisticola fulvicapilla*	31.5
Quailfinch	*Ortygospiza atricollis*	37.6
Ruff	*Calidris pugnax*	1.4
Secretarybird	*Sagittarius serpentarius*	11.3
Bar-throated Apalis	*Apalis thoracica*	31.9
Arrow-marked Babbler	*Turdoides jardineii*	0.5
Black-collared Barbet	*Lybius torquatus*	26.8
Crested Barbet	*Trachyphonus vaillantii*	5.2
Cape Batis	*Batis capensis*	0.5
European Bee-eater	*Merops apiaster*	2.8
Little Bee-eater	*Merops pusillus*	0.9
White-fronted Bee-eater	*Merops bullockoides*	10.3
Southern Red Bishop	*Euplectes orix*	85
Yellow Bishop	*Euplectes capensis*	0.5
Yellow-crowned Bishop	*Euplectes afer*	24.9
Little Bittern	*Ixobrychus minutus*	24.9
Bush Blackcap	*Sylvia nigricapillus*	15
Southern Boubou	*Laniarius ferrugineus*	50.7
Dark-capped Bulbul	*Pycnonotus tricolor*	83.1
Cape Bunting	*Emberiza capensis*	9.9
Cinnamon-breasted Bunting	*Emberiza tahapisi*	19.7
Golden-breasted Bunting	*Emberiza flaviventris*	19.2
Olive Bushshrike	*Chlorophoneus olivaceus*	1.4
Orange-breasted Bushshrike	*Chlorophoneus sulfureopectus*	0.9
Denham's Bustard	*Neotis denhami*	2.3

White-bellied Bustard	*Eupodotis senegalensis*	23
Black-rumped Buttonquail	*Turnix nanus*	5.6
Common Buttonquail	*Turnix sylvaticus*	1.9
Common Buzzard	*Buteo buteo*	43.7
Jackal Buzzard	*Buteo rufofuscus*	14.6
Black-throated Canary	*Crithagra atrogularis*	18.8
Cape Canary	*Serinus canicollis*	70
Yellow-fronted Canary	*Crithagra mozambica*	28.6
Ant-eating Chat	*Myrmecocichla formicivora*	68.1
Buff-streaked Chat	*Campicoloides bifasciatus*	36.6
Familiar Chat	*Oenanthe familiaris*	9.9
Mocking Cliff Chat	*Thamnolaea cinnamomeiventris*	25.8
Cloud Cisticola	*Cisticola textrix*	17.8
Croaking Cisticola	*Cisticola natalensis*	1.4
Lazy Cisticola	*Cisticola aberrans*	24.4
Levaillant's Cisticola	*Cisticola tinniens*	84.5
Pale-crowned Cisticola	*Cisticola cinnamomeus*	21.1
Rattling Cisticola	*Cisticola chiniana*	0.5
Wailing Cisticola	*Cisticola lais*	16.4
Wing-snapping Cisticola	*Cisticola ayresii*	51.6
Zitting Cisticola	*Cisticola juncidis*	61.5
Red-knobbed Coot	*Fulica cristata*	67.1
Reed Cormorant	*Microcarbo africanus*	75.6
White-breasted Cormorant	*Phalacrocorax lucidus*	23
Burchell's Coucal	*Centropus burchellii*	0.5
Temminck's Courser	*Cursorius temminckii*	0.5
Black Crake	*Zapornia flavirostra*	34.3
Corn Crake	*Crex crex*	0.5
Blue Crane	*Grus paradisea*	9.9
Grey Crowned Crane	*Balearica regulorum*	3.8
Wattled Crane	*Grus carunculata*	15
Cape Crow	*Corvus capensis*	27.2
Pied Crow	*Corvus albus*	13.1
Black Cuckoo	*Cuculus clamosus*	17.8
Diederik Cuckoo	*Chrysococcyx caprius*	40.4
Klaas's Cuckoo	*Chrysococcyx klaas*	3.3
Red-chested Cuckoo	*Cuculus solitarius*	32.9
African Cuckoo-Hawk	*Aviceda cuculoides*	0.9
Black Cuckooshrike	*Campephaga flava*	0.9
African Darter	*Anhinga rufa*	18.3
Cape Turtle Dove	*Streptopelia capicola*	87.8
Emerald-spotted Wood Dove	*Turtur chalcospilos*	0.5
Laughing Dove	*Spilopelia senegalensis*	46
Namaqua Dove	*Oena capensis*	2.8
Red-eyed Dove	*Streptopelia semitorquata*	65.3
Rock Dove	*Columba livia*	5.6
Fork-tailed Drongo	*Dicrurus adsimilis*	42.7

African Black Duck	*Anas sparsa*	14.1
Fulvous Whistling Duck	*Dendrocygna bicolor*	0.9
Maccoa Duck	*Oxyura maccoa*	0
White-backed Duck	*Thalassornis leuconotus*	2.8
White-faced Whistling Duck	*Dendrocygna viduata*	2.8
Yellow-billed Duck	*Anas undulata*	73.2
African Fish Eagle	*Haliaeetus vocifer*	17.8
Black-chested Snake Eagle	*Circaetus pectoralis*	3.8
Brown Snake Eagle	*Circaetus cinereus*	4.2
Crowned Eagle	*Stephanoaetus coronatus*	0.5
Long-crested Eagle	*Lophaetus occipitalis*	4.7
Martial Eagle	*Polemaetus bellicosus*	1.9
Verreaux's Eagle	*Aquila verreauxii*	0.9
Spotted Eagle-Owl	*Bubo africanus*	8
Great Egret	*Ardea alba*	5.2
Intermediate Egret	*Ardea intermedia*	16.9
Little Egret	*Egretta garzetta*	4.7
Western Cattle Egret	*Bubulcus ibis*	63.8
Amur Falcon	*Falco amurensis*	25.4
Lanner Falcon	*Falco biarmicus*	6.6
Peregrine Falcon	*Falco peregrinus*	2.8
Red-footed Falcon	*Falco vespertinus*	1.4
Cuckoo Finch	*Anomalospiza imberbis*	0.9
African Firefinch	*Lagonosticta rubricata*	7.5
Southern Fiscal	*Lanius collaris*	95.3
Lesser Flamingo	*Phoeniconaias minor*	0.5
Red-chested Flufftail	*Sarothrura rufa*	14.1
African Dusky Flycatcher	*Muscicapa adusta*	5.6
African Paradise Flycatcher	*Terpsiphone viridis*	31
Ashy Flycatcher	*Muscicapa caerulescens*	0.5
Fairy Flycatcher	*Stenostira scita*	0.9
Fiscal Flycatcher	*Melaenornis silens*	18.3
Southern Black Flycatcher	*Melaenornis pammelaina*	0.5
Spotted Flycatcher	*Muscicapa striata*	10.3
Coqui Francolin	*Peliperdix coqui*	0.9
Grey-winged Francolin	*Scleroptila afra*	4.2
Red-winged Francolin	*Scleroptila levaillantii*	34.7
African Pygmy Goose	*Nettapus auritus*	0.9
Egyptian Goose	*Alopochen aegyptiaca*	65.3
Spur-winged Goose	*Plectropterus gambensis*	25.8
African Goshawk	*Accipiter tachiro*	0.9
Cape Grassbird	*Sphenoeacus afer*	47.9
Great Crested Grebe	*Podiceps cristatus*	1.9
Little Grebe	*Tachybaptus ruficollis*	70.4
Common Greenshank	*Tringa nebularia*	2.8
Helmeted Guineafowl	*Numida meleagris*	39.4
Grey-headed Gull	*Chroicocephalus cirrocephalus*	1.4

African Marsh Harrier	*Circus ranivorus*	0.5
Montagu's Harrier	*Circus pygargus*	0.9
Pallid Harrier	*Circus macrourus*	0.5
African Harrier-Hawk	*Polyboroides typus*	10.3
Black-crowned Night Heron	*Nycticorax nycticorax*	1.9
Black-headed Heron	*Ardea melanocephala*	35.7
Goliath Heron	*Ardea goliath*	0
Grey Heron	*Ardea cinerea*	18.3
Purple Heron	*Ardea purpurea*	31.5
Squacco Heron	*Ardeola ralloides*	1.9
European Honey-buzzard	*Pernis apivorus*	0.9
Brown-backed Honeybird	*Prodotiscus regulus*	11.3
Greater Honeyguide	*Indicator indicator*	13.6
Lesser Honeyguide	*Indicator minor*	1.9
African Hoopoe	*Upupa africana*	21.6
African Sacred Ibis	*Threskiornis aethiopicus*	17.4
Glossy Ibis	*Plegadis falcinellus*	9.9
Hadada Ibis	*Bostrychia hagedash*	85.4
Southern Bald Ibis	*Geronticus calvus*	31.9
African Jacana	*Actophilornis africanus*	3.8
Lesser Kestrel	*Falco naumanni*	0
Rock Kestrel	*Falco rupicolus*	2.8
African Pygmy Kingfisher	*Ispidina picta*	0.5
Brown-hooded Kingfisher	*Halcyon albiventris*	4.2
Giant Kingfisher	*Megaceryle maxima*	26.3
Half-collared Kingfisher	*Alcedo semitorquata*	10.8
Malachite Kingfisher	*Corythornis cristatus*	23.5
Pied Kingfisher	*Ceryle rudis*	20.7
Black-winged Kite	*Elanus caeruleus*	50.2
Yellow-billed Kite	*Milvus aegyptius*	2.3
Blue Korhaan	*Eupodotis caerulescens*	4.2
African Wattled Lapwing	*Vanellus senegallus*	29.1
Black-winged Lapwing	*Vanellus melanopterus*	4.2
Blacksmith Lapwing	*Vanellus armatus*	46.5
Crowned Lapwing	*Vanellus coronatus*	31.9
Eastern Clapper Lark	*Mirafra fasciolata*	7
Eastern Long-billed Lark	*Certhilauda semitorquata*	33.3
Red-capped Lark	*Calandrella cinerea*	18.8
Rufous-naped Lark	*Mirafra africana*	39.9
Spike-heeled Lark	*Chersomanes albofasciata*	24.4
Cape Longclaw	*Macronyx capensis*	86.4
Bronze Mannikin	*Spermestes cucullata*	0.5
Banded Martin	*Riparia cincta*	54
Brown-throated Martin	*Riparia paludicola*	40.8
Common House Martin	*Delichon urbicum*	10.3
Rock Martin	*Ptyonoprogne fuligula*	40.4
Sand Martin	*Riparia riparia*	1.4

Common Moorhen	*Gallinula chloropus*	57.3
Red-faced Mousebird	*Urocolius indicus*	0.9
Speckled Mousebird	*Colius striatus*	55.4
Common Myna	*Acridotheres tristis*	26.8
European Nightjar	*Caprimulgus europaeus*	1.9
Fiery-necked Nightjar	*Caprimulgus pectoralis*	11.3
Black-headed Oriole	*Oriolus larvatus*	41.8
Western Osprey	*Pandion haliaetus*	0.5
Common Ostrich	*Struthio camelus*	3.3
Marsh Owl	*Asio capensis*	2.8
Western Barn Owl	*Tyto alba*	0.9
Red-billed Oxpecker	*Buphagus erythrorynchus*	1.4
African Olive Pigeon	*Columba arquatrix*	13.6
Speckled Pigeon	*Columba guinea*	62.4
African Pipit	*Anthus cinnamomeus*	64.3
Buffy Pipit	*Anthus vaalensis*	3.8
Nicholson's Pipit	*Anthus nicholsoni*	34.7
Plain-backed Pipit	*Anthus leucophrys*	5.6
Short-tailed Pipit	*Anthus brachyurus*	0.9
Striped Pipit	*Anthus lineiventris*	1.9
Yellow-breasted Pipit	*Anthus chloris*	0.5
Kittlitz's Plover	*Charadrius pecuarius*	0.5
Three-banded Plover	*Charadrius tricollaris*	15
Southern Pochard	*Netta erythrophthalma*	12.2
Black-chested Prinia	*Prinia flavicans*	10.8
Drakensberg Prinia	*Prinia hypoxantha*	51.2
Tawny-flanked Prinia	*Prinia subflava*	8
Black-backed Puffback	*Dryoscopus cubla*	0.9
Common Quail	*Coturnix coturnix*	21.1
Red-billed Quelea	*Quelea quelea*	21.6
African Rail	*Rallus caerulescens*	21.6
White-necked Raven	*Corvus albicollis*	0.9
Cape Robin-Chat	*Cossypha caffra*	73.7
Chorister Robin-Chat Robin-Chat	*Cossypha dichroa*	1.4
European Roller	*Coracias garrulus*	0.5
Lilac-breasted Roller	*Coracias caudatus*	0.5
Common Sandpiper	*Actitis hypoleucos*	0.5
Curlew Sandpiper	*Calidris ferruginea*	0.5
Wood Sandpiper	*Tringa glareola*	6.6
Black (Southern Africa) Saw-wing	*Psalidoprocne pristoptera holomelas*	27.2
Streaky-headed Seedeater	*Crithagra gularis*	63.8
South African Shelduck	*Tadorna cana*	4.2
Cape Shoveler	*Spatula smithii*	4.7
Lesser Grey Shrike	*Lanius minor*	0.9
Red-backed Shrike	*Lanius collurio*	1.9
African Snipe	*Gallinago nigripennis*	14.6
Cape Sparrow	*Passer melanurus*	51.2

House Sparrow	*Passer domesticus*	30
Southern Grey-headed Sparrow	*Passer diffusus*	46.9
Yellow-throated Bush Sparrow	*Gymnoris superciliaris*	9.4
Black Sparrowhawk	*Accipiter melanoleucus*	14.1
Rufous-breasted Sparrowhawk	*Accipiter rufiventris*	3.8
African Spoonbill	*Platalea alba*	6.6
Natal Spurfowl	*Pternistis natalensis*	25.4
Swainson's Spurfowl	*Pternistis swainsonii*	41.8
Cape Starling	*Lamprotornis nitens*	1.9
Pied Starling	*Lamprotornis bicolor*	63.4
Red-winged Starling	*Onychognathus morio*	43.7
Violet-backed Starling	*Cinnyricinclus leucogaster*	3.3
Wattled Starling	*Creatophora cinerea*	1.9
Black-winged Stilt	*Himantopus himantopus*	3.8
Little Stint	*Calidris minuta*	0.5
African Stonechat	*Saxicola torquatus*	78.4
Abdim's Stork	*Ciconia abdimii*	0.5
White Stork	*Ciconia ciconia*	12.7
Amethyst Sunbird	*Chalcomitra amethystina*	47.4
Greater Double-collared Sunbird	*Cinnyris afer*	33.3
Malachite Sunbird	*Nectarinia famosa*	33.8
Barn Swallow	*Hirundo rustica*	64.8
Greater Striped Swallow	*Cecropis cucullata*	72.3
Lesser Striped Swallow	*Cecropis abyssinica*	2.8
Red-breasted Swallow	*Cecropis semirufa*	0.5
South African Cliff Swallow	*Petrochelidon spilodera*	6.6
White-throated Swallow	*Hirundo albigularis*	63.8
Wire-tailed Swallow	*Hirundo smithii*	0.5
African Swamphen	*Porphyrio madagascariensis*	13.1
African Black Swift	*Apus barbatus*	14.6
African Palm Swift	*Cypsiurus parvus*	9.4
Alpine Swift	*Tachymarptis melba*	10.8
Common Swift	*Apus apus*	2.8
Horus Swift	*Apus horus*	1.9
Little Swift	*Apus affinis*	14.6
White-rumped Swift	*Apus caffer*	46.5
Blue-billed Teal	*Spatula hottentota*	1.9
Cape Teal	*Anas capensis*	0.5
Red-billed Teal	*Anas erythrorhyncha*	9.4
Whiskered Tern	*Chlidonias hybrida*	38
White-winged Tern	*Chlidonias leucopterus*	1.4
Spotted Thick-knee	*Burhinus capensis*	8
Cape Rock Thrush	*Monticola rupestris*	20.7
Groundscraper Thrush	*Turdus litsitsirupa*	29.1
Karoo Thrush	*Turdus smithi*	6.6
Kurrichane Thrush	*Turdus libonyana*	24.9
Olive Thrush	*Turdus olivaceus*	11.7

Southern Black Tit	*Melaniparus niger*	0.9
Cape Vulture	*Gyps coprotheres*	18.8
African Pied Wagtail	*Motacilla aguimp*	2.8
Cape Wagtail	*Motacilla capensis*	76.5
Mountain Wagtail	*Motacilla clara*	0.5
African Reed Warbler	*Acrocephalus baeticatus*	9.4
African Yellow Warbler	*Iduna natalensis*	16.4
Great Reed Warbler	*Acrocephalus arundinaceus*	0.5
Lesser Swamp Warbler	*Acrocephalus gracilirostris*	54.9
Little Rush Warbler	*Bradypterus baboecala*	15.5
Marsh Warbler	*Acrocephalus palustris*	3.3
Willow Warbler	*Phylloscopus trochilus*	15.5
Blue Waxbill	*Uraeginthus angolensis*	0.5
Common Waxbill	*Estrilda astrild*	63.8
Orange-breasted Waxbill	*Amandava subflava*	2.3
Cape Weaver	*Ploceus capensis*	71.4
Golden Weaver	*Ploceus xanthops*	0.5
Southern Masked Weaver	*Ploceus velatus*	84.5
Spectacled Weaver	*Ploceus ocularis*	0.5
Thick-billed Weaver	*Amblyospiza albifrons*	5.6
Village Weaver	*Ploceus cucullatus*	12.7
Capped Wheatear	*Oenanthe pileata*	5.2
Mountain Wheatear	*Myrmecocichla monticola*	32.9
Cape White-eye	*Zosterops virens*	58.2
Pin-tailed Whydah	*Vidua macroura*	44.1
Fan-tailed Widowbird	*Euplectes axillaris*	47.4
Long-tailed Widowbird	*Euplectes progne*	77
Red-collared Widowbird	*Euplectes ardens*	26.3
White-winged Widowbird	*Euplectes albonotatus*	7
Green Wood Hoopoe	*Phoeniculus purpureus*	1.9
Cardinal Woodpecker	*Dendropicos fuscescens*	6.6
Golden-tailed Woodpecker	*Campethera abingoni*	1.4
Olive Woodpecker	*Dendropicos griseocephalus*	2.3
Red-throated Wryneck	*Jynx ruficollis*	53.1

Appendix 5. Stakeholder input

From: Geoff Lockwood <geofflockwood609@gmail.com>
Sent: Friday, March 25, 2022 3:33:57 PM
To: Michael Barnes <Michael.Barnes@enertrag.co.za>
Subject: Re: Dalmanutha - ecology site visits

Good afternoon Michael

My apologies for taking so long to get back to you. I've been neck-deep in renovations! You are more than welcome to pass my contact details on to the specialists.

We were at the farm over New Year, and again in mid-February and had a number of Red Data bird sightings - including a Wattled Crane and a pair of White-bellied Bustards on the February visit. I have prepared a map of all sightings of the relevant species over the past 12 years for your information. We have tended to concentrate on the valley to the south of the Bergendal War Memorial and most of the sightings are from this area.

As you will see, there are four significant concerns:

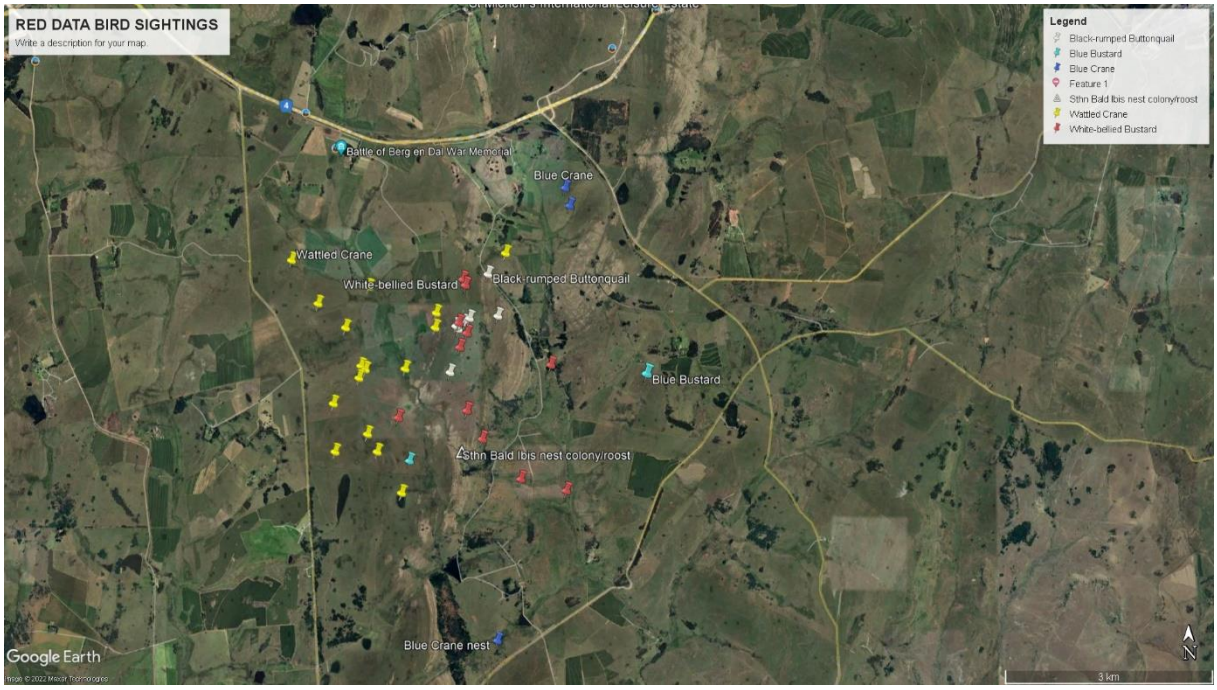
1. Over the past 8 years we have been regularly recording Wattled Cranes (up to 4 birds on one occasion) in the valley. At least some of the sightings are almost certainly of the birds from Lakenvlei but they have been joined by birds of unknown origin on several occasions. **THE VALLEY IS CLEARLY AN IMPORTANT FEEDING AREA FOR THESE BIRDS**
2. There is a small Southern Bald Ibis nesting colony at the site indicated. The highest number of roosting birds recorded has been 18, with up to 5 active nests.
3. We have recorded Yellow-breasted Pipit on three occasions
4. We have had fairly regular sightings of Black-rumped Buttonquail, Secretarybirds and White-bellied Bustard in the area

Added to this is the fact that sightings of Cape Vultures overhead have increased significantly in the last 15 years, with at least 43 birds roosting on the Dalmanutha power pylons and then heading north up the valley six or seven years ago.

Taken together, I would class the valley as extremely sensitive from an avifaunal perspective!

I am busy with a similar map showing the distribution of a number of orchid species on the site and will share this with you and the specialists when this is complete.

Kind regards
Geoff Lockwood - Resident Manager, Delta Environmental Centre


RED DATA BIRD SIGHTINGS
Write a description for your map
Legend
Black-rumped Buttonquail
Blue Bustard
Blue Crane
Feature 1
Sthn Bald Ibis nest colony/roost
Wattled Crane
White-bellied Bustard
Battle of Berg en Dal War Memorial
Blue Crane
Wattled Crane
White-bellied Bustard
Black-rumped Buttonquail
Blue Bustard
Sthn Bald Ibis nest colony/roost
Blue Crane nest
Google Earth
3 km
N