JULY 2021

MIER RIETFONTEIN SOLAR PHOTOVOLTAIC & BATTERY STORAGE PROJECT

AVIFAUNAL IMPACT ASSESSMENT REPORT

DRAFTED BY:

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PROFESSIONAL EXPERIENCE

Ms. Megan Diamond completed a Bachelor of Science degree in Environmental Management from the University of South Africa and has been involved in conservation for 20 years. She has 15 years' worth of experience in the field of bird interactions with electrical infrastructure and during this time has completed impact assessments for over 140 projects. During her tenure at the Endangered Wildlife Trust's Wildlife & Energy Programme and the Programme's primary project (i.e., the Eskom-EWT Strategic Partnership) from 2006 to 2013, Megan was responsible for assisting the energy industry and the national utility in minimising the negative impacts, associated with the construction and operation of electrical infrastructure, on wildlife through the provision of strategic guidance, risk and impact assessments, training and research. Megan (SACNASP Environmental Science Registration number 300022/14) currently owns and manages *Feathers Environmental Services* and is tasked with providing guidance to industry through the development of best practice procedures and avifaunal specialist studies for various developments including renewable energy facilities, power lines, power stations and substation infrastructure in addition to railway infrastructure and residential properties within South Africa and elsewhere within Africa. Megan has attended and presented at several conferences and facilitated workshops, as a subject expert, since 2007. Megan has authored and co-authored several academic papers, research reports and energy industry related guidelines, including the *BirdLife South Africa/ Endangered Wildlife Trust best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa* and the *Avian Wind Farm Sensitivity Map for South Africa* (2015), and played an instrumental role in facilitating the endorsement of these two products by the South African Wind Energy Association (SAWEA), IAIAsa (International Association for Impact Assessment South Africa) and Eskom. She chaired the Birds and Wind Energy Specialist Group in South Africa (2011/2012) and the IUCN/SSC Crane Specialist Group's Crane and Powerline Network (2013-2015), a working group comprised of subject matter experts from across the world, working in partnership to share lessons, develop capacity, pool resources, and accelerate collective learning towards finding innovative solutions to mitigate this impact on threatened crane populations. She is currently a member of the IUCN Stork, Ibis and Spoonbill Specialist Group and the Eskom-EWT Strategic Partnership Ludwig's Bustard Working Group.

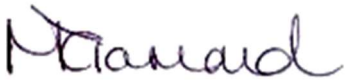
DECLARATION OF INDEPENDENCE

I, **Megan Diamond**, in my capacity as a specialist consultant, hereby declare that I:

- Act as an independent specialist to Golder Associates Africa (Pty) Ltd for this project.
- Do not have any personal or financial interest in the project except for financial compensation for specialist investigations completed in a professional capacity as specified by the Amendment to Environmental Impact Assessment Regulations, 2017.
- Will not be affected by the outcome of the environmental process, of which this report forms part of.
- Do not have any influence over the decisions made by the governing authorities.
- Do not object to or endorse the proposed development, but aim to present facts and our best scientific and professional opinion with regard to the impacts of the development.
- Undertake to disclose to the relevant authorities any information that has or may have the potential to influence its decision or the objectivity of any report, plan, or document required in terms of the Amendment to Environmental Impact Assessment Regulations, 2017.

INDEMNITY

- This avifaunal impact assessment report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken.
- This report is based on a desktop investigation using the available information and data related to the site to be affected and a three-day, single season site visit to the study area from 12-15 April 2021. No long-term investigation or monitoring has been conducted.
- The Precautionary Principle has been applied throughout this investigation.
- The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information at the time of study.
- Additional information may become known or available during a later stage of the process for which no allowance could have been made at the time of this report.
- The specialist investigator reserves the right to modify this report, recommendations and conclusions at any stage should additional information become available.
- Information, recommendations and conclusions in this report cannot be applied to any other area without proper investigation.
- This report, in its entirety or any portion thereof, may not be altered in any manner or form or for any purpose without the specific and written consent of the specialist investigator as specified above.
- Acceptance of this report, in any physical or digital form, serves to confirm acknowledgment of these terms and liabilities.



24 June 2021

EXECUTIVE SUMMARY

Eskom Holdings SOC Ltd is investigating the installation of a Solar Photovoltaic (PV) and Battery Energy Storage System (BESS) located near the town of Rietfontein in the ZF Mgcawu District Municipality, Northern Cape Province in order to address existing capacity constraints and support future electricity demands. The proposed Solar PV and BESS Project will consist of 12 independent PV blocks, 11 independent battery storage systems, inverters, transformers, underground cabling to connect the proposed BESS to the existing Mier substation, an administration block, control & storeroom, workshop & storeroom, access and services roads. A reliable telecommunication network to connect the BESS to the existing network is also required.

The proposed Solar PV, BESS Project and telecommunication tower study areas are considered to have a low Animal Species and Terrestrial Biodiversity Theme Sensitivity. A site sensitivity verification was conducted through the use of both a desktop analysis and an on-site inspection, conducted on 12-15 April 2021 of the Solar PV and BESS Project study area. The desktop analysis and on-site inspection confirmed and concur with the low sensitivity rating assigned to the study area, based on the largely homogenous nature of the natural habitat present within the Solar PV and BESS Project and telecommunication tower study areas, the low avifaunal diversity particularly with regards to Red List species as well as the levels of existing disturbance present with the study area as a result of pastoral activities and vehicle traffic associated with the R31 road that borders the study areas.

A total of 118 bird species have been recorded within the relevant pentads during the SABAP2 atlassing period to date. The presence of these species in the broader area provides an indication of the diversity of species that could potentially occur within the areas earmarked for the proposed BESS Project and its associated telecommunication tower. Of the 118 species, five of these are considered to be of regional conservation concern. An additional nine species are endemic to Southern Africa.

It is important to note that with the exception of Karoo Korhaan (n=18), the remaining Red List species have been recorded in very low numbers, with only 1-3 individual birds being recorded over the fourteen-year survey period. Karoo Korhaan and Lappet-faced Vulture were the only Red List species previously recorded by SABAP 2 that were also observed during the field survey. It is important to note that Martial Eagle and Tawny Eagle, not recorded by SABAP2, were also observed as incidental sightings within the broader study area.

The site visit produced a combined list of 40 species, covering both the Solar PV and BESS Project study area and to a limited extent, the surrounding area. Point counts 8, 10, 11 and 13, located within the drainage lines recorded the highest diversity of species each. Points 1, 6, 7 and 9 recorded the lowest density of species largely due to their proximity to the road. The most notable record was that of a pair of Karoo Korhaan (NT) utilising the areas at Points 9, 10, 11 and 13. Martial Eagle, Kori Bustard and Lappet-faced Vulture were observed within

the broader study area. Most observations were of small passerine species that are common to this area. Each of these species has the potential to be displaced by the proposed Solar PV and BESS Project and its ancillary infrastructure as a result of habitat transformation and disturbance. However, these species have persisted despite existing disturbance within the Solar PV and BESS Project study area. This resilience, coupled with the fact that similar habitat is available throughout the broader area, means that the displacement impact will not be of regional or national significance. In addition, no raptor nests or other possible breeding sites were noted during the site survey.

The Solar PV and BESS Project study area is located within the Nama Karoo Biome and is comprised entirely of the Kalahari Karroid Shrubland vegetation type. This biome supports a particularly high diversity of species endemic or near-endemic to southern Africa. Avifauna characteristically comprises ground dwelling species of open habitats such as the Kori Bustard, Martial Eagle and Tawny Eagle; the latter two species likely to forage across this microhabitat but unlikely to breed within the proposed Solar PV and BESS Project site. Several species are almost entirely confined to the Nama Karoo such as the Karoo Korhaan and Ludwig's Bustard. Investigation of the proposed study area and its immediate surrounds revealed the presence of ephemeral drainage lines, dams, pans and built-up areas.

The proposed telecommunication tower sites are located within the Savanna Biome, specifically the Gordonia Plains Shrubland and Gordonia Duneveld vegetation units (South African National Biodiversity Institute, 2012 and Mucina & Rutherford, 2006). The savanna biome contains a large variety of bird species (it is the most species-rich community in southern Africa) but very few bird species are restricted to this biome. Savanna is particularly rich in raptors and forms the stronghold for priority species (recorded in the broader project area by SABAP2) such as Martial Eagle, Tawny Eagle, Lanner Falcon, Red-footed Falcon, Lappet-faced Vulture and African White-backed Vulture. Several non-Red Listed raptor species could also potentially occur such as the Booted Eagle, Black-chested Snake-Eagle *Circaetus pectoralis* and a multitude of medium-sized raptors, for example Southern Pale Chanting Goshawk and Spotted Eagle-Owl. Apart from raptors, open areas within this biome could also attract other Red Listed species, i.e. Kori Bustard, and Karoo Korhaan.

The study area and the 10ha preferred site alternative that have been proposed for the Solar PV and BESS Project occur within the same pentad. They are comprised of identical vegetation units and are subjected to similar land use practices and therefore likely to be identical in terms of species diversity and density too. With this in mind, the selection of a preferred site alternative has been determined using observations of available micro habitat (specifically drainage lines), species composition and the location of the site alternative in relation to existing infrastructure. The southern portion of the study area contains a series of ephemeral drainage lines, a habitat type that supports a diversity of passerine species, as well as the Karoo Korhaan that were observed each morning during the field survey at this location. The preferred site also contains three drainage lines but these are less defined and likely to be less sensitive. The field survey observations, both in terms of avifaunal

species and habitat, confirm that the identified the preferred site is likely to pose the least impact to the resident avifaunal community.

Two site alternatives are proposed for the establishment of the telecommunication tower. The Preferred Site and the Alternative Site occur within the same pentad. They are comprised of relatively identical vegetation units and are subjected to similar land use practices and therefore likely to be identical in terms of species diversity and density too. With this in mind, the selection of a preferred telecommunication tower site alternative has been determined using the location of the proposed site alternatives in relation to existing infrastructure. The preferred site is considered to be the least sensitive from an avifaunal perspective owing to its location relative to the R31 district road which is a source of existing disturbance. In addition its proximity to the road will also facilitate the construction of the telecommunication tower without the need for additional road infrastructure thereby reducing the displacement impacts associated with habitat loss and disturbance.

In conclusion, the habitat within which the proposed study area is located is low to moderately sensitive from a potential bird impact perspective. The construction of the proposed Solar PV and BESS Project will result in impacts of moderate significance to birds occurring in the vicinity of the new infrastructure, which can be reduced to through the application of mitigation measures. The construction of the proposed telecommunication tower will result in impacts of low significance to birds occurring in the vicinity of the tower. It is anticipated that the proposed Solar PV, BESS Project and telecommunication tower can be constructed within the study area with acceptable levels of impact on the resident avifauna, subject to the following recommendations:

* Conduct a pre-construction inspection (avifaunal walk-through) of the final Solar PV and BESS layout, road and power line routes and telecommunication tower site to identify Red List species that may be breeding within footprint of the Solar PV, BESS Project and telecommunication tower sites and the road and power line servitudes to ensure that the impacts to breeding species (if any) are adequately managed.
* Construction activities (i.e., all staff, vehicle and machinery) should be restricted to the immediate footprint of the infrastructure.
* Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of avifaunal species.
* The 33kV power line must be constructed using a bird friendly structure (i.e., Inverted Delta-T Structure - the same structure used for the existing Rietfontein feeder).
* Additional mitigation in the form of insulating sleeves on *jumpers* present on strain poles, terminal poles and box transformers should also be considered.
* Mitigation is complex at electrical generation structures since there are many factors that contribute to collisions with the PV panels. It is therefore recommended that mitigation be applied reactively once the BESS is operational. Monitoring of this infrastructure for bird fatalities should be built into the operational environmental management plan for the facility.

* If collision or electrocution impacts are recorded once the 33kV power line is operational It is recommended that an avifaunal specialist investigate the mortalities and provide recommendations for site-specific mitigation to be applied reactively.
* Post construction monitoring to be conducted by Eskom-Endangered Wildlife Trust Strategic Partnership for a minimum two years of operation to evaluate mortalities and assess the efficacy of mitigation measures. Additional monitoring requirements will be determined following an assessment of the data collected over the two-year period. The resultant data to be made available to the avifaunal specialist community in order to better inform future solar facility assessment and recommendations.
* A carefully considered operational surface water/drainage management plan must be developed for the site including attention to the use of environmentally friendly cleaning chemicals on the solar panels.
* Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.
* In addition to this, the normal suite of environmental good practices should be applied, such as ensuring strict control of staff, vehicles and machinery on site and limiting the creation of new roads as far as possible.

TABLE OF CONTENTS

1. INTRODUCTION

In order to demonstrate commitment to sustainable development and a pledge to implementing clean energy projects, *Eskom Holdings SOC Ltd (Eskom)* is investigating the installation of Battery Energy Storage System (BESS) projects totalling approximately 1440MWh, at various locations across the country. Existing capacity constraints and the need to support future electricity demands, *Eskom's Northern Cape Operating Unit (NCOU)* has identified the Rietfontein-Rietfontein 33kV Overhead Power Line as being suitable for the installation of a BESS. A reliable telecommunication network to connect the BESS to the existing network is also required.

The National Environmental Management Act (NEMA) (Act 107 of 1998) requires that an impact assessment be conducted for any development which could have a significant effect on the environment, with the objective to identify, predict and evaluate the actual and potential impacts of these activities on ecological systems; identify alternatives; and provide recommendations for mitigation to minimize the negative impacts. In order to meet the Basic Assessment requirements as outlined in the 2014 National Environmental Management Act (No 107 of 1998) Regulations GNR 983 and GNR 985, as amended in 2017, *Eskom* require detailed specialist studies that will document any potential fatal flaws, the impacts of the project and recommend measures to manage (maximise positive and minimise negative) and monitor those impacts. *Eskom* has appointed *Golder Associates Africa (Pty) Ltd (Golder)* as independent environmental assessment practitioners to manage the Basic Assessment process for the proposed Mier Rietfontein Solar PV and Battery Storage Project and the required telecommunication tower to connect the Mier Project to the existing network.

2. THIS REPORT

2.1 Scope of Work

Feathers Environmental Services CC (Feathers) was appointed by *Golder* to compile a specialist avifaunal assessment report for the proposed Solar PV and BESS Project. This report is based on a desktop review and a site visit conducted over a three-day period of both the BESS and telecommunication tower sites, which uses a set methodology and various data sets to determine which avian species regularly occur within the BESS study area, the availability of bird micro habitats (i.e. avifaunal sensitive areas), the possible impacts of the proposed Solar PV, BESS Project and its associated telecommunication tower and their significance and the provision of recommendations for the mitigation of the anticipated impacts.

Feathers has conducted this avifaunal impact assessment according to the following terms of reference:

* Conduct a site sensitivity verification through the use of a desk top analysis, using satellite imagery and other available and relevant information, in addition to an on-site inspection;

- Assess various avifaunal datasets, including but not limited to Important Bird Areas (IBAs) and describe the avifaunal communities (particularly with reference to Red List species) most likely to impacted on by the proposed Solar PV, BESS Project and the associated telecommunication tower;
- Identify and confirm avifaunal microhabitats within the proposed Solar PV and BESS study area and assess these for their suitability to support Red List and non-Red List priority species, in terms of breeding, roosting and foraging;
- Describe the avifaunal communities (both Red List and non-Red List priority species) most likely to be impacted, based on data collected as part of a systematic and quantified data collection process;
- Provide a detailed description of the impacts associated with the construction, operation and decommissioning of the proposed Solar PV, BESS Project and the associated telecommunication tower;
- Assess the significance (rated according to a pre-determined set of criteria, as supplied by *Golder* of the identified direct, indirect and cumulative impacts, during the construction, operation and decommissioning phases of the proposed Solar PV, BESS Project and the associated telecommunication tower, based on data collected in-field;
- Consider layout plans for both the Solar PV, BESS Project and the associated telecommunication tower and advise possible changes to the layouts;
- Recommend practical mitigation measures for the management of the identified impacts, at each stage of the development process, for inclusion in the draft Environmental Management Programme (EMPr);
- Propose a monitoring programme for the sensitive areas, species or receptors (if necessary); and
- Describe the gaps in baseline data and an indication of the confidence levels. The best available data sources will be used to predict the impacts.

2.2 Structure of this report

In terms of the NEMA 2014 EIA Regulations contained in GN R982 of 04 December 2014 (as amended) all specialist studies must comply with Appendix 6 of the NEMA 2014 EIA Regulations (GN R982 of 04 December 2014).

Table 1: Information to be included in specialist reports

Legal Requirement		Relevant Section in Specialist study
(1)	A specialist report prepared in terms of these Regulations must contain-	
(a)	details of-	
	(i) the specialist who prepared the report; and	Professional Experience and Appendix 4

Legal Requirement		Relevant Section in Specialist study
	(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae	Professional Experience and Appendix 4
(b)	a declaration that the specialist is independent in a form as may be specified by the competent authority;	Declaration of Independence
(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 5
(cB)	a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 7
(d)	the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 5
(e)	a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 5
(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 8
(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 8
(i)	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 12
(j)	a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 7
(k)	any mitigation measures for inclusion in the EMPr;	Section 9
(l)	any conditions for inclusion in the environmental authorisation;	Section 10 Section 11
(m)	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 10

Legal Requirement		Relevant Section in Specialist study
(n)	a reasoned opinion	Section 11
	whether the proposed activity, activities or portions thereof should be authorised;	Section 11
	regarding the acceptability of the proposed activity or activities; and	Section 11
	if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 9 Section 10 Section 11
(o)	a description of any consultation process that was undertaken during the course of preparing the specialist report;	Not Applicable
(p)	a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Not Applicable
(q)	any other information requested by the competent authority.	Not Applicable
(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.	Not Applicable

3. PROJECT LOCATION

The study area for the proposed Solar PV and BESS Project and the 10ha preferred site alternative (positioned within the study area) are located near the town of Rietfontein, in the Dawid Kruiper Local Municipality, in the ZF Mgcawu District Municipality, in the Northern Cape Province (FIGURE 1).

The preferred site for the telecommunication tower (and an identified alternative) is located on a single property portion of privately owned land, approximately 35km west of the Town of Rietfontein in the Dawid Kruiper Local Municipality, in the ZF Mgcawu District Municipality, in the Northern Cape Province (FIGURE 2). Two site alternatives have been proposed for the telecommunications tower, with the preferred option being closer to the R31 road and an existing alternating current (AC) power line. This preferred site is 0.0225ha in extent.

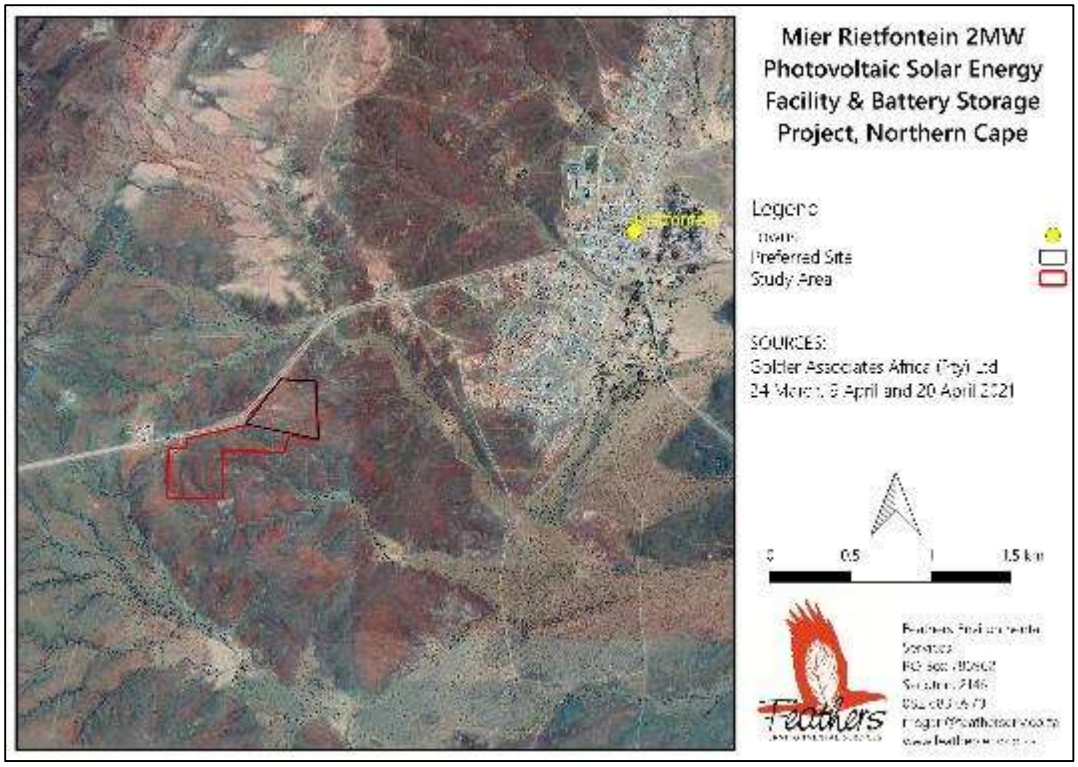


FIGURE 1: Regional map detailing the location of the proposed 2MW BESS Project located within the Dawid Kruiper Local Municipality, Northern Cape Province.

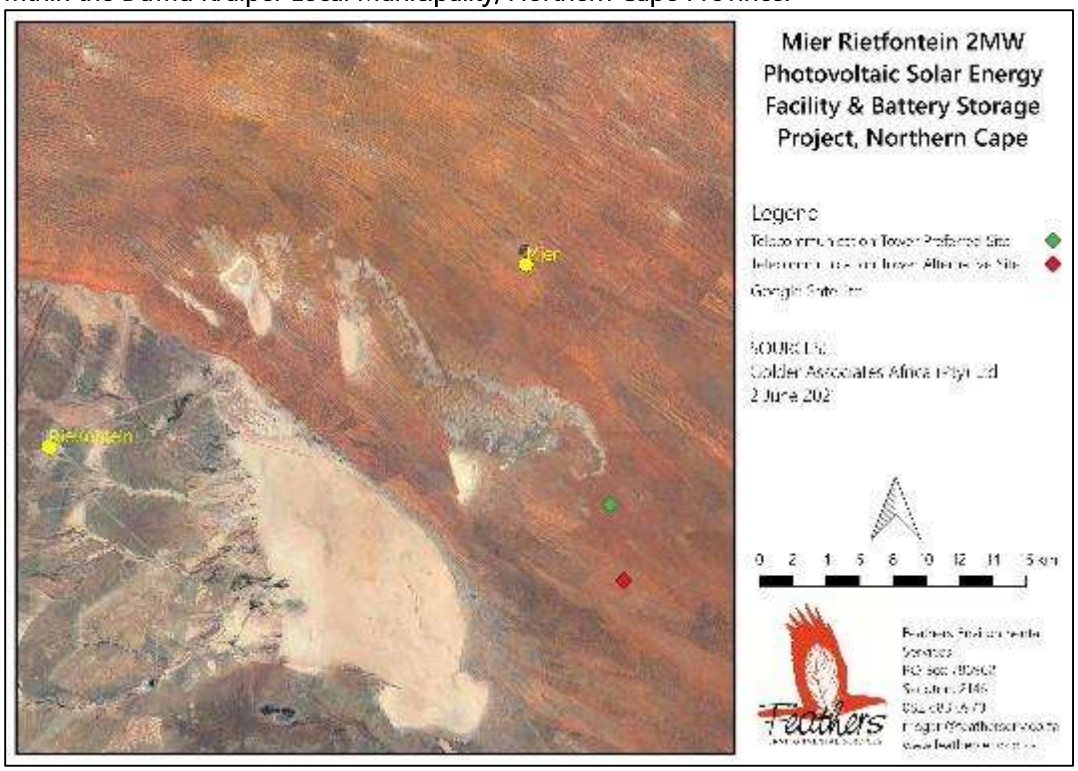


FIGURE 2: Regional map detailing the location of the proposed telecommunication tower sites located within the Dawid Kruiper Local Municipality, Northern Cape Province.

4. PROJECT OVERVIEW

The proposed Solar PV and BESS Project will consist of 12 independent PV blocks of 170kW each, with a total installed capacity of 2 040kW (or 2.04MW). The proposed Solar PV and BESS Project will also consist of 11 independent battery storage systems of 140 kW (560 kWh) each, with a total installed capacity of 1 540 kW (or 1.54 MW) and 6 160 kWh (or 6.16 MWh).

The installation of these PV blocks and BESS will be staggered according to the expected growth in electrical demand:

* Initial installation of 5 x 170 kW PV blocks and 4 x 140 kW BESS for the electrification scenario
* Installation of an additional 3 x 170 kW PV blocks and 3 x 140 kW BESS for the LPUs scenario
* Installation of an additional 4 x PV blocks and 4 x 140 kW for the unforeseen demand scenario

In addition to the PV blocks and BESS, the proposed project will also include the following main ancillary infrastructure:

* 12 x 200 kW inverters to convert the direct current electricity from the PV modules to the alternating current electricity at grid frequency
* 12 x LV/MV step-up transformers to step up the voltage from low voltage at the output of the inverter to the required medium voltage at the point of connection
* Transmission Yard and underground AC cables to connect the proposed PV and BESS to the Mier switching station, and above ground cables connecting to the Rietfontein 33KV feeder.
* Admin block, control & storeroom, workshop & storeroom, and parking area
* Access road, service road, and internal roads (all gravel)

The preferred layout of the proposed project within the preferred site is presented in FIGURE 3 below.

The proposed 50m lattice telecommunication tower will be constructed on a footprint size of 15m x 15m. No guy wires will be used to support the tower. A 3m x 4m equipment container and cable tray will be constructed adjacent to the telecommunication tower. Additional ancillary infrastructure will include a sliding gate for access control.

The preferred layout of the proposed telecommunication tower at the Preferred Site is presented in FIGURE 4 below.

FIGURE 3: Preferred layout of the proposed BESS Project within the preferred site

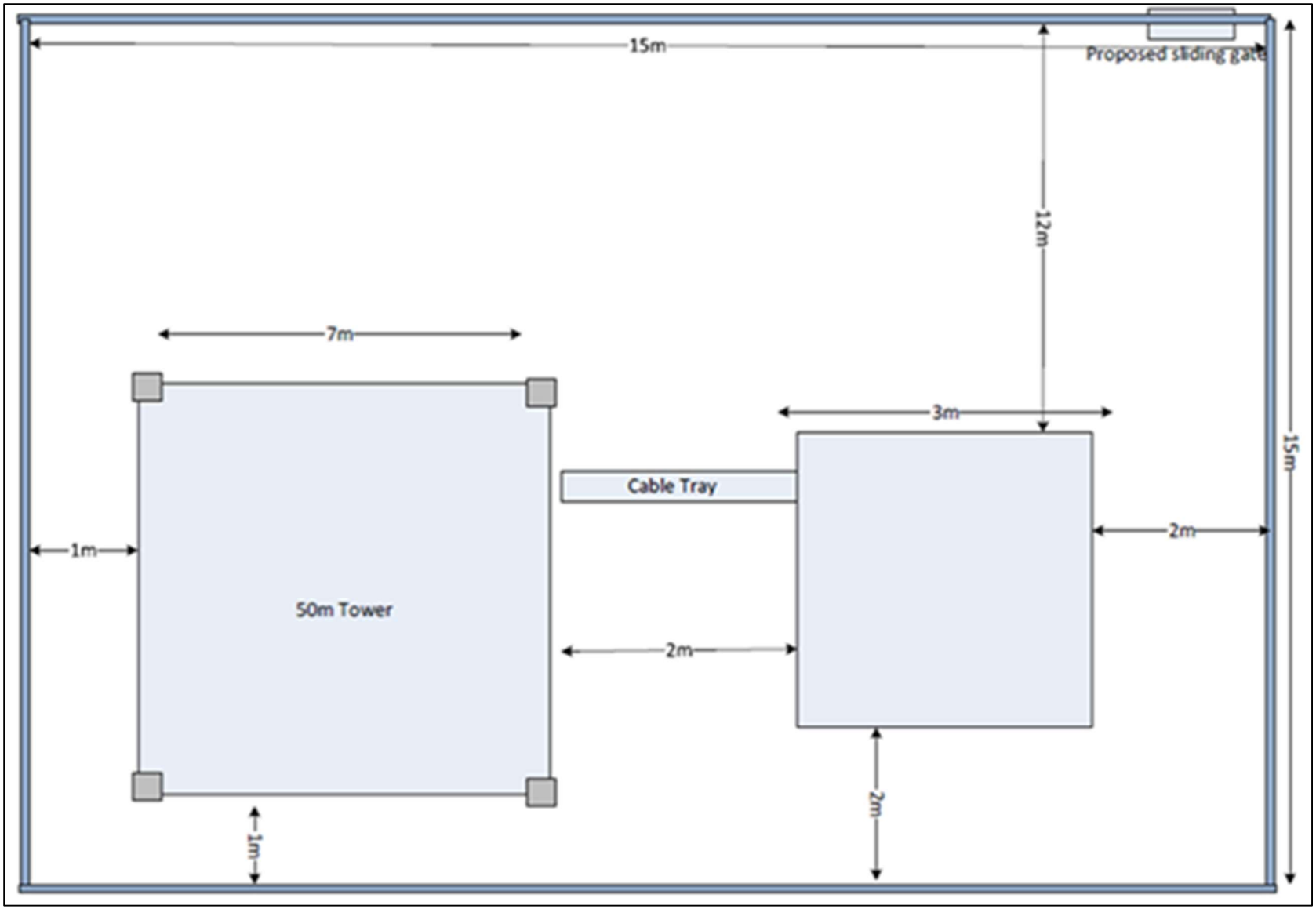


FIGURE 4: Preferred layout of the proposed telecommunication tower and its ancillary infrastructure at the Preferred Site

5. APPROACH AND METHODOLOGY

5.1 Methodology

The following methodology was employed to compile this avifaunal impact assessment report:

- Collect and examine various avifaunal data sets (detailed in section 5.2) at a desktop level to determine the presence of sensitive Red List, as well as non-Red List priority species, that may be vulnerable to the impacts associated with the proposed Solar PV, BESS Project and the associated telecommunication tower;
- Suitable avifaunal habitats and potential sensitive areas within the immediate surrounds of the proposed Solar PV, BESS Project and the associated telecommunication tower, where impacts are likely to occur, were identified using various Geographic Information System (GIS) layers and Google Earth imagery and confirmed based on personal observations made during the site visit on 12-15 April 2021 (FIGURE 5);
- Primary bird data was collected by means of three survey methods during the site visit to the Solar PV and BESS Project study area. These methods included point-count surveys at predetermined survey locations, a single driven transect and incidental observations. These survey methods were employed to determine the bird community structure both at the project site and its immediate surrounds.
- The potential impacts, associated with the construction and operation of the proposed Solar PV, BESS Project and the associated telecommunication tower on the avifaunal community, and the significance were predicted and assessed according to quantitative criteria provided by *Golder* on 20 April 2021 (APPENDIX 3); and
- Practical recommendations for the management and mitigation of potentially significant impacts, related to the construction and operation of the proposed Solar PV, BESS Project and the associated telecommunication tower, are provided in Section 9 for inclusion in the draft EMPr.

5.2 Data sources used

The following data sources and reports were used in varying levels of detail for this study:

- Screening Report for an Environmental Authorisation or for an Environmental Authorisation as required by the 2014 EIA Regulations - Proposed Site Environmental Sensitivity: Mier Substation Site, BESS Project compiled by L Nzimande on 12 June 2020;
- Bird distribution data of the South African Bird Atlas 2 (SABAP 2) was obtained from the Animal Demography Unit of the University of Cape Town on 9 April 2021 as a means to ascertain which species occur within the **broader area**, based on six pentad grid cells surrounding the proposed Solar PV and BESS Project study area. Each pentad is approximately 8 × 7.6 km. Between 2007 and 2021, a total of 27 full protocol cards (i.e., 27 bird surveys lasting a minimum of two hours each) have been completed across five pentads 2640_2000,

2640_2005, 2645_2000, 2645_2005, 2650_2000 and 2650_2005. No surveys have been conducted within the 2650_2000 pentad (FIGURE 6);

* Bird distribution data of the South African Bird Atlas 2 (SABAP 2) was obtained from the Animal Demography Unit of the University of Cape Town on 17 Junel 2021 as a means to ascertain which species occur within the telecommunication tower site alternatives area, based on nine pentad grid cells surrounding the proposed telecommunication tower site alternatives area. Between 2007 and 2021, a total of 20 full protocol cards (i.e., 20 bird surveys lasting a minimum of two hours each) have been completed across five pentads 2650_2025, 2645_2015, 2645_2020, 2645_2025 and 2650_2025. No surveys have been conducted within the 2640_2020, 2640_2025, 2650_2015 and 2650_2020 pentads (FIGURE 7);
* The Important Bird Areas (IBAs) report (Marnewick et al. 2015) was consulted to determine the location of the nearest IBAs and their importance for this study. The study area is not located within an IBA. The closest IBA Kalahari Gemsbok National Park (SA027) is located approximately 60 north east and 45km north of the proposed Solar PV and BESS study area and the associated telecommunication tower site alternatives respectively;
* Co-ordinated Waterbird Count Database (CWAC – Taylor et al. 1999) was consulted determine if large concentrations of water birds, associated with South African wetlands, may occur within the study area. The study area does not contain CWAC sites, however the Klipkolk Farm Dam is located approximately 14km south-east of the proposed Solar PV and BESS study area and may have relevance to this study;
* Coordinated Avifaunal Roadcount project database (CAR – Young et al, 2003) - was consulted to obtain relevant data on large terrestrial bird report rates in the area. The proposed Solar PV, BESS Project and the associated telecommunication tower study areas do not contain CAR routes;
* The conservation status and endemism information of all bird species occurring in the aforementioned pentads was then determined with the use of the Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor et al. 2015) and the IUCN Red List of Threatened Species Version 2021-1 (http://www.iucnredlist.org) and the most recent and comprehensive summary of southern African bird biology (Hockey et al. 2005);
* The latest vegetation classification described in the Vegetation Map of South Africa (South African National Biodiversity Institute, 2012 and Mucina & Rutherford, 2006) was consulted in order to determine which vegetation types occur within the proposed study areas;
* High-resolution Google Earth ©2021 imagery was used to examine the microhabitats within the proposed study area;
* KMZ. shapefiles detailing the location of the proposed Solar PV and BESS Project study area & preferred site, provided by *Golder* on 24 March, 9 April and 20 April 2021;
* Co-ordinates detailing the location of the proposed telecommunication tower site alternatives, provided by *Golder* on 2 June 2021;

* A three-day field visit to the Solar PV and BESS Project study area was conducted on 12-15 April 2021 (autumn survey) to form a first-hand impression of avifaunal species presence and micro-habitat occurring within the larger study area surrounding the Solar PV and BESS Project (FIGURE 5). This information, together with the SABAP2 data was used to compile a comprehensive list of species that could occur in the study area;
* Personal observations made during the aforementioned site visit to the Solar PV and BESS Project study area coupled with the author's experience gained from assessing various electrical infrastructure development projects in the Northern Cape region have been used to formulate a professional opinion of the species likely to occur in the study area and the likely impacts that the proposed BESS Project may have on the resident avifaunal community; and
* The BirdLife South Africa position statement on solar energy and birds (BirdLife South Africa, 2012) and the *Birds and Solar Energy: Guidelines for assessing and monitoring the impact of solar power generating facilities on birds in southern* (Jenkins et al, 2017) was used for evaluating the potential impacts and to inform the site visit requirements for this assessment.

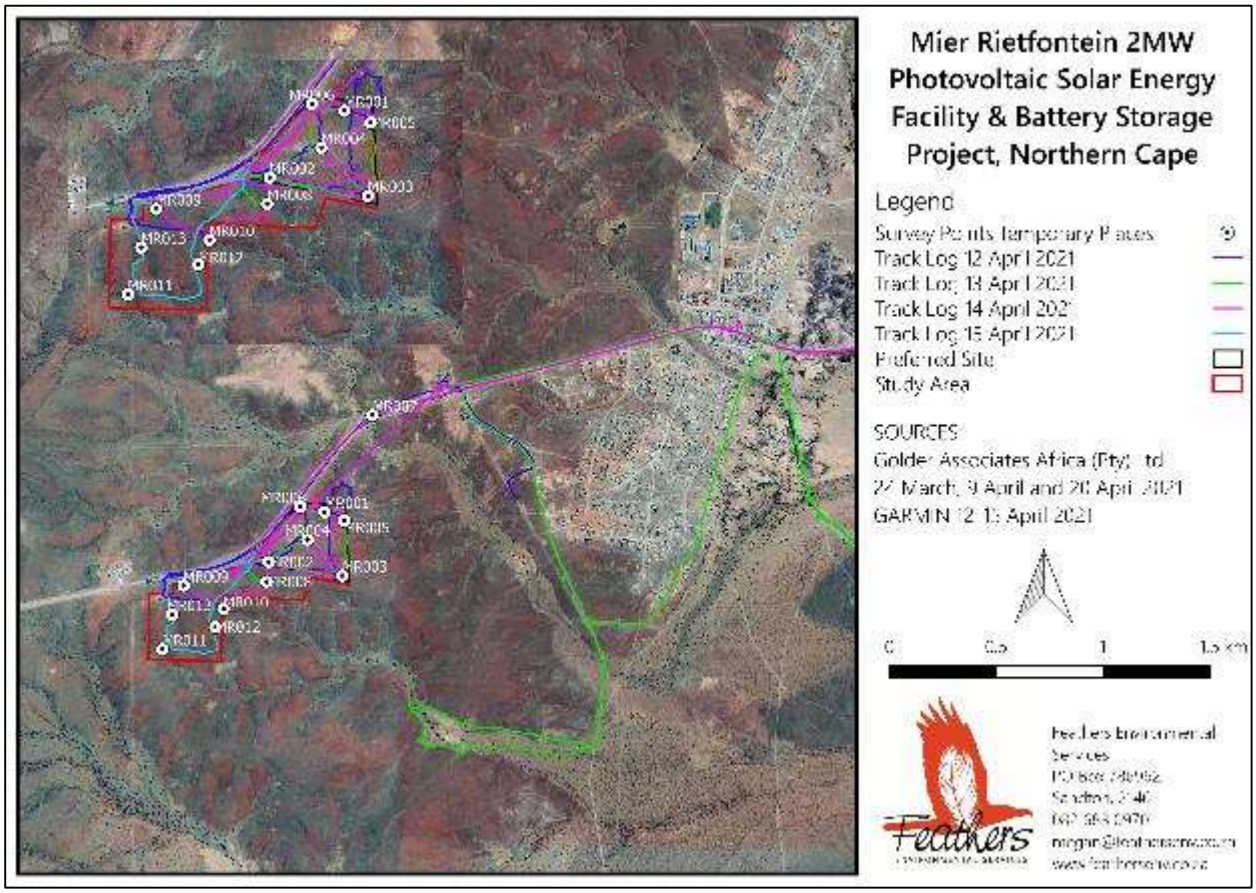


FIGURE 5: Regional map detailing the point count survey locations and routes surveyed during the field survey to the study area conducted on 12-15 April 2021.

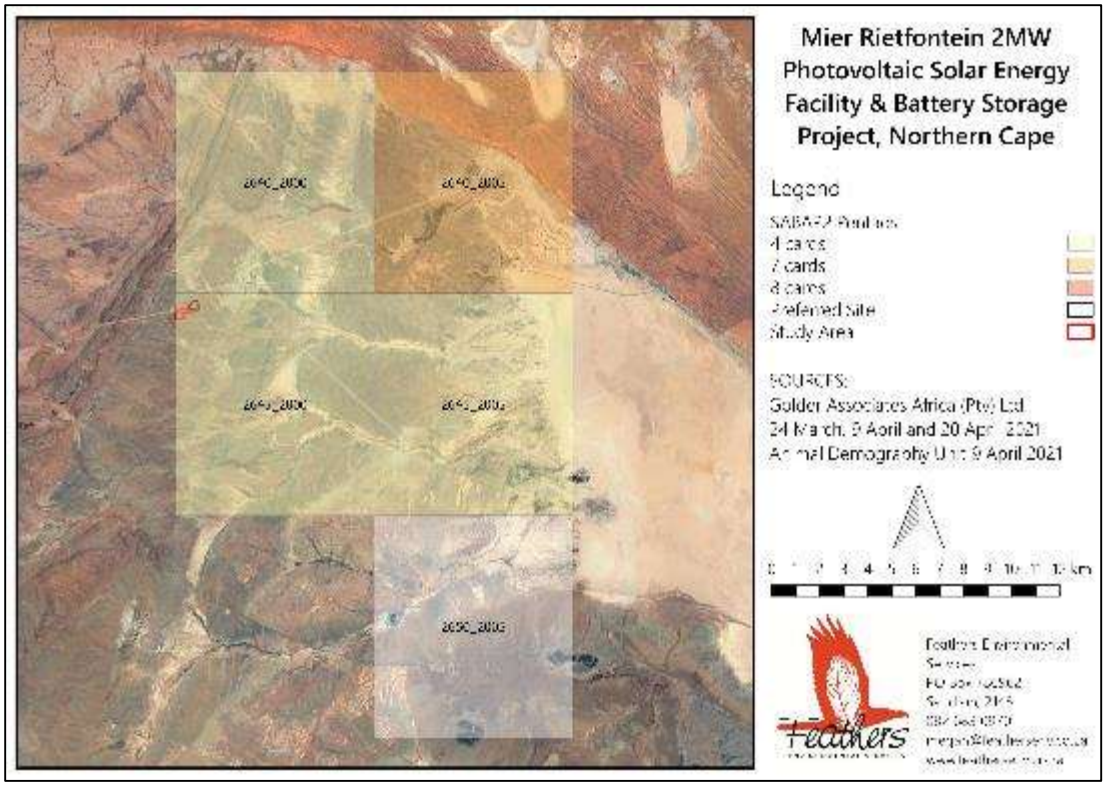


FIGURE 6: Location of the five South African Bird Atlas Project 2 (SABAP2) pentad grid cells that were considered for the proposed BESS Project.

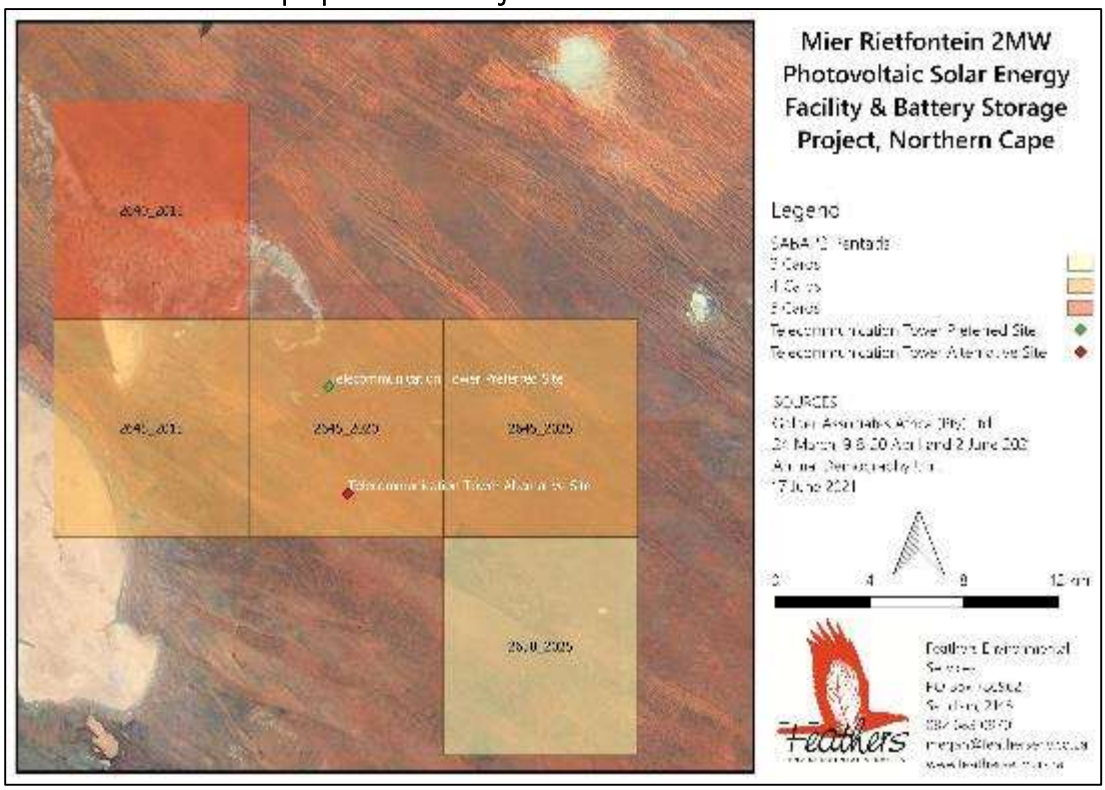


FIGURE 7: Location of the five South African Bird Atlas Project 2 (SABAP2) pentad grid cells that were considered for the proposed telecommunication tower.

6. APPLICABLE LEGISLATION, POLICIES AND GUIDELINES

The following pieces of legislation are applicable to this assessment:

6.1 The Convention on Biological Diversity

The Convention on Biological Diversity (CBD) is an international convention (to which South Africa is a signatory) and represents a commitment to sustainable development. The Convention has three main objectives: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources (http://www.cbd.int/convention/guide/). The convention makes provision (in a general policy guideline) for keeping and restoring biodiversity. In addition to this the CBD is an ardent supporter of thorough assessment procedures (Strategic Environmental Assessments (SEAs) and Environmental Impact Assessments (EIAs)) and requires that Parties apply these processes when planning activities that will have a biodiversity impact. 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 as 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. In addition, the Aichi Biodiversity Targets (CBD 2011) address several priority issues i.e. the loss of biodiversity and its causes; reducing direct pressure on biodiversity; safeguarding ecosystems, species and genetic diversity and participatory planning to enhance implementation of biodiversity conservation. Each of these is relevant in the case of energy infrastructure and bird conservation through all project phases from planning to the implementation of mitigation measures for existing developments.

6.2 The Convention on the Conservation of Migratory Species of Wild Animals

The Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or the Bonn Convention) is an intergovernmental treaty and is the most appropriate instrument to deal with the conservation of terrestrial, aquatic and avian migratory species. The convention includes policy and guidelines with regards to the impacts associated with man-made infrastructure. CMS requires that Parties (South Africa is a signatory) take measures to avoid migratory species from becoming endangered (Art II, par. 1 and 2) and to make every effort to prevent the adverse effects of activities and obstacles that seriously impede or prevent the migration of migratory species (Art III, par. 4b and 4c). At CMS/CoP7 (2002) Res. 7.2 on Impact Assessment and Migratory Species was accepted, requesting Parties to apply appropriate SEA and EIA procedures for all proposed developments. An agreement developed in the framework of CMS, in force since November 1999, brings the 119 Range States of the Africa Eurasian Waterbird Agreement (AEWA) region together in a common policy to protect migratory waterbirds that use the flyway from the Arctic to southern Africa. The agreement contains a number of obligations that are relevant to migratory waterbirds and energy infrastructure. AEWA has also published a series of practical guidelines that enable Parties to effectively address conservation issues influencing the status of migratory waterbirds. The most relevant guideline for migratory birds and energy

infrastructure is the *Guideline on how to avoid, minimise or mitigate impact of infrastructural developments and related disturbance affecting waterbirds* (Tucker & Treweek, 2008).

6.3 The Agreement on the Conservation of African-Eurasian Migratory Water Birds

The Agreement on the Conservation of African-Eurasian Migratory Water birds (AEWA) is an intergovernmental treaty dedicated to the conservation of migratory waterbirds and their habitats across Africa, Europe, the Middle East, Central Asia, Greenland and the Canadian Archipelago. 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 core activities carried out under AEWA are described in its Action Plan, which is legally binding for all countries that have joined the Agreement. The AEWA Action Plan details the various measures to be undertaken by Contracting Parties (South Africa included) to guarantee the conservation of migratory waterbirds within their national boundaries. These include species and habitat protection, and the management of human activities, as well as legal and emergency measures.

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

The National Environmental Management Act 107 of 1998 (NEMA) creates the legislative framework for environmental protection in South Africa and is aimed at giving effect to the environmental right in the Constitution. It sets out a number of guiding principles that apply to the actions of all organs of state that may significantly affect the environment. Sustainable development (socially, environmentally and economically) is one of the key principles, and internationally accepted principles of environmental management, such as the precautionary principle and the polluter pays principle, are also incorporated. NEMA also provides that a wide variety of listed developmental activities, which may significantly affect the environment, may be performed only after an environmental impact assessment has been done and authorization has been obtained from the relevant authority. Many of these listed activities can potentially have negative impacts on bird populations in a variety of ways. The clearance of natural vegetation, for instance, can lead to a loss of habitat and may depress prey populations, while erecting structures needed for generating and distributing energy, communication, and so forth can cause mortalities by collision or electrocution.

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

The National Environmental Management: Biodiversity Act (No. 10 of 2004), (NEMBA) regulations on Threatened and Protected Species (TOPS) provides for the consolidation of biodiversity legislation through establishing national norms and standards for the management of biodiversity across all sectors and by different management authorities. The national Act provides for among other things, the management and

conservation of South Africa's biodiversity; protection of species and ecosystems that necessitate national protection and the sustainable use of indigenous biological resources.

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

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

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

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

6.8 Best Practice Guidelines: Birds and Solar Energy

The most important guidance document from an avifaunal impact perspective that is currently applicable (but not legally binding) to solar energy development in South Africa is the *Birds and Solar Energy: Guidelines for assessing and monitoring the impact of solar power generating facilities on birds in southern* (Jenkins et al, 2017). A gradient of survey and monitoring requirements for avian studies is recommended in the guidelines and is dependent on the proposed technology, size of footprint, the amount of available data, and the estimated sensitivity of the receiving environment. Based on these criteria, the proposed 10MW PV Solar Energy Facility

has been assessed based on Regime 1, where structured and repeated baseline data collection is not required due to the lower-risk nature of the proposed development. Such projects require that the consulting specialist visit the site at least once, during peak period of avian abundance and activity. Sufficient time must be spent on site in order to obtain first-hand knowledge of the avian habitats present, and to predict the affected avifauna, the nature and scale of impacts and the best mitigation options available.

7. DESCRIPTION OF THE BASELINE CONDITIONS

7.1 Site Sensitivity Verification

A screening report for the proposed Solar PV and BESS Project study area was generated on 12 June 2020. The proposed study area occurs within the Siyanda District Municipality Environmental Management Framework (The Siyanda District Municipality has since been renamed the ZF Mgcawu District Municipality). The proposed study area is considered to have a **LOW** Animal Species and Terrestrial Biodiversity Theme Sensitivity. A site sensitivity verification was conducted through the use of both a desktop analysis and an on-site inspection, conducted on 12-15 April 2021 (FIGURE 5). The desktop analysis and on-site inspection confirmed and concur with the LOW sensitivity rating assigned to the study area, based on the largely homogenous nature of the natural habitat present within the study area, preferred site and within the broader area, the low avifaunal diversity particularly with regards to Red List species as well as the levels of existing disturbance present with the study area as a result of pastoral activities and vehicle traffic associated with the R31 road that borders the study area.

A screening report for the proposed telecommunication tower study area was generated on 24 June 2021. The proposed study area occurs within the Siyanda District Municipality Environmental Management Framework (The Siyanda District Municipality has since been renamed the ZF Mgcawu District Municipality). The proposed study area is considered to have a **LOW** Animal Species and Terrestrial Biodiversity Theme Sensitivity. A site sensitivity verification was conducted through the use of a desktop analysis which confirmed and concurs with the LOW sensitivity rating assigned to the study area, based on the largely homogenous nature of the natural habitat present at the two site alternatives and within the broader area, the low avifaunal diversity particularly with regards to Red List species as well as the levels of existing disturbance present with the study area as a result of pastoral activities and vehicle traffic associated with the R31 road that borders the preferred site alternative.

7.2 Relevant Bird Populations

7.2.1. Important Bird Areas

Some sites are exceptionally important for maintaining the taxa dependent upon the habitats and ecosystems in which they occur. Vigorous protection of the most critical sites is one important approach to conservation. Many species may be effectively conserved by this means. Patterns of bird distribution are such that, in most cases, it is possible to select sites that support many species. These sites, carefully identified on the basis of the bird numbers and species complements they hold (i.e., globally threatened, range restricted and or migratory or congregatory species) are termed Important Bird Areas (IBAs). IBAs are selected such that, taken together, they form a network throughout the species' biogeographic distributions. IBAs are key sites for conservation – small enough to be conserved in their entirety and often already part of a protected-area network.

The proposed Solar PV, BESS Project and associated telecommunication tower are not located within the confines of an IBA. The closest IBA to the proposed study areas is the Kalahari Gemsbok National Park IBA (SA027) with its most southern boundary located approximately 60km north-east and 45km north of the proposed BESS Project site and telecommunication tower site alternatives respectively (FIGURE 8). Approximately 280 species are supported by this IBA, most notably White-backed Vulture *Gyps africanus*, Lappet-faced Vulture *Torgos tracheliotos*, White-headed Vulture *Aegypius occipitalis*, Secretarybird *Sagittarius serpentarius*, Martial Eagle *Polemaetus bellicosus*, Kori Bustard *Ardeotis kori*, Ludwig's Bustard *Neotis ludwigii*, Lanner Falcon *Falco biarmicus* , Tawny Eagle *Aquila rapax*, Karoo Korhaan *Eupodotis vigorsii*, Stark's Lark *Spizocorys starki* , Kalahari Scrub Robin *Erythropygia paena*, Sociable Weaver *Philetairus socius*, Burchell's Sandgrouse *Pterocles burchelli*, Barred Wren-Warbler *Calamonastes fasciolatus*, Pale-winged Starling *Onychognathus nabourou* and Burchell's Starling *Lamprotornis australis*.

Although six of the aforementioned species (some of which are far-ranging) were observed both within the proposed sites alternatives and the broader study area, the construction and operation activities associated with the proposed Solar PV, BESS Project and the associated telecommunication tower will not have a negative impact on the IBA and the species it supports.

7.2.2. Coordinated Avifaunal Roadcount (CAR) Routes

Cranes, bustards, storks and other large birds that spend most of their time on the ground, need wide, open spaces and are certainly not restricted to protected areas. Agricultural habitats are used extensively for feeding, roosting and breeding, often because no natural, pristine habitats are available, and sometimes because the agricultural habitats are especially attractive to birds. Because of their size and conspicuous nature, these birds can be monitored using a relatively simple technique i.e. the road count. The Coordinated Avifaunal Roadcounts (CAR) project monitors the populations of 36 species of large terrestrial birds in agricultural habitats, in addition to gamebirds, raptors and corvids along 350 fixed routes covering over

19 000km (http://car.adu.org.za/). Although CAR road counts do not give an absolute count of all the individuals in a population, they do provide a measure of relative abundance in a particular area. There are no CAR routes within the close proximity to the proposed Solar PV, BESS Project and associated telecommunications tower. Karoo Korhaan and Helmeted Guineafowl *Numida meleagris* were the only species, monitored by the CAR project, that were recorded during the site visit to the Solar PV and BESS Project study area.

7.2.3. Coordinated Waterbird Count (CWAC) Sites

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

There are no CWAC sites within the study area. The closest CWAC site (Klipkolk Farm Dam) is located approximately 14km south-east of the proposed Solar PV and BESS Project study area (FIGURE 8). Thirty-nine species have been recorded at this seasonal farm dam over eight surveys, four of which are Red List species i.e. Greater Flamingo *Phoenicopterus ruber*, Maccoa Duck *Oxyura maccoa*, Greater Painted-snipe *Rostratula benghalensis* and Chestnut-banded Plover *Charadrius pallidus*.

While this CWAC may provide an indication of the waterbird species that are likely to be supported by similar impoundments within the study area, this site will not have a significant impact on the sensitivity rating for the proposed Solar PV and BESS Project. Of the species mentioned above, Black-winged Stilt *Himantopus*, Common Moorhen *Gallinula chloropus*, Egyptian Goose *Alopochen aegyptiacus*, African Sacred Ibis *Threskiornis aethiopicus* and Cattle Egret *Bubulcus ibis* were recorded at the waterbody areas within the Solar PV and BESS Project study area during the site visit. None of these species are of conservation concern and are commonly found in *wetland* habitats.

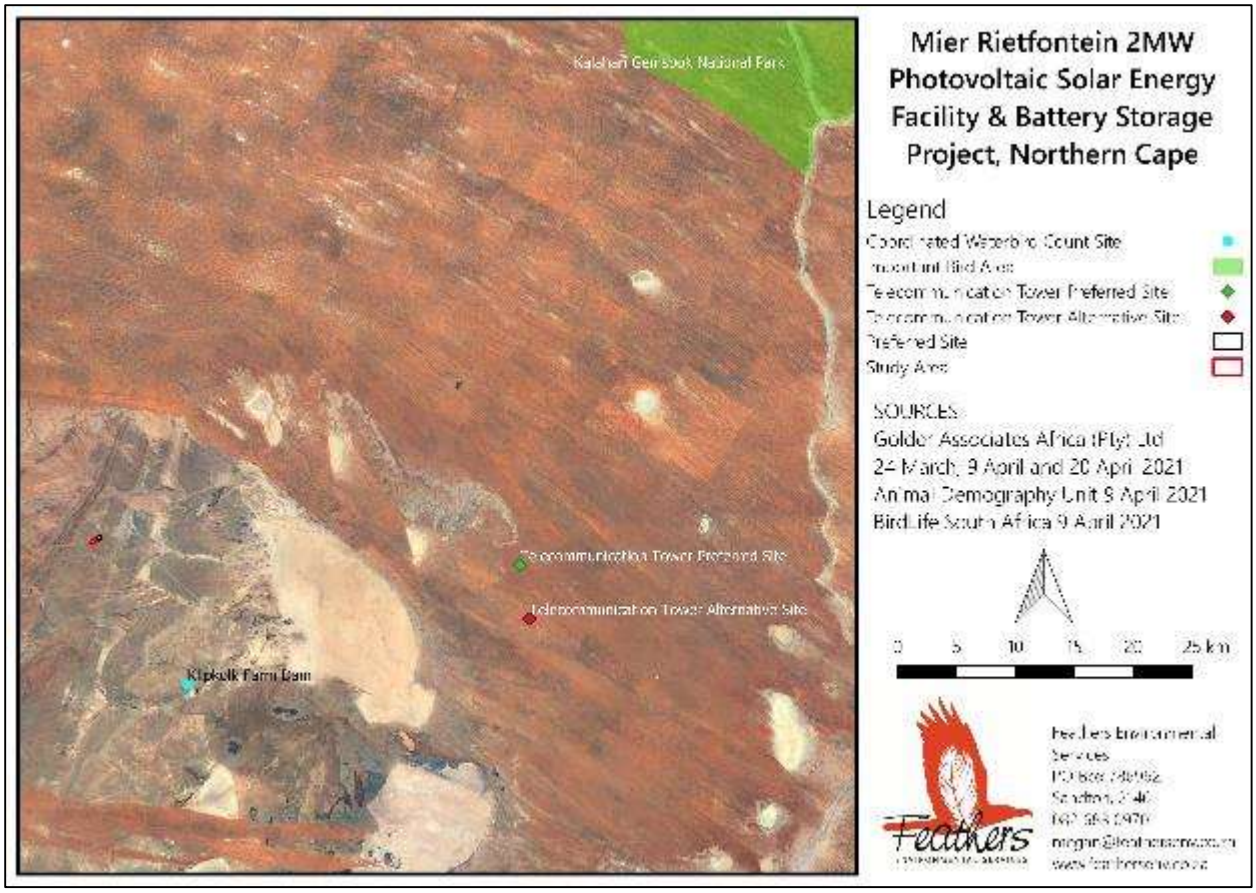


FIGURE 8: Regional map detailing the location of the proposed Solar PV and BESS Project and Telecommunication Tower in relation to Important Bird Areas (IBAs) and Coordinated Waterbird Count Sites.

7.2.4. South African Bird Atlas Project 2 Data (SABAP2)

A total of 106 and 80 bird species have been recorded within the relevant Solar PV and BESS Project and telecommunication tower site alternatives pentads respectively during the SABAP2 atlassing period to date (APPENDIX 1). The presence of these species in the broader area provides an indication of the diversity of species that could potentially occur within the areas earmarked for the proposed Solar PV, BESS Project and associated telecommunications tower. Of the combined pentad (both Solar PV, BESS and telecommunication tower pentads) total of 118 species, five of these are considered to be of regional conservation concern i.e. regional Red List species (Taylor et al, 2015) and nine are endemic to southern Africa.

It is important to note that with the exception of Karoo Korhaan (n=18), the remaining Red List species have been recorded in very low numbers, with only 1-3 individual birds being recorded over the fourteen-year survey period. Karoo Korhaan and Lappet-faced Vulture were the only Red List species previously recorded by SABAP 2 that were also observed during the Solar PV and BESS field survey. It is important to note that both Martial Eagle and Tawny Eagle were observed as incidental sightings within the broader study area.

Although this report focuses on Red List species, since the impacts associated with the construction and operation of the proposed Solar PV, BESS Project and telecommunication tower are likely to be more biologically significant for these species, the impact on non-Red List species is also assessed, albeit in less detail. Furthermore, Red List species can often be used as surrogate species for the others in terms of impacts and the necessary mitigation. The non-Red List priority species that have been considered for this assessment include korhaan, buzzards, kestrels, falcons, herons, geese, ibis and water dependent species. Each Red List species' potential for occurring in a specific habitat class is indicated in TABLE 1, in addition to the type of impact that could potentially affect each species, specific to the location of this Project.

TABLE 1: Annotated list of regional Red List, southern African Endemic species that have been recorded in the relevant pentads surrounding the proposed Solar PV and BESS Project study area

COMMON NAME	CONS. STATUS	AV. REPORT RATE (NO. OF BIRDS)	SHRUBLAND	DRAINAGE LINES	DAMS / PANS (BROADER STUDY AREA)	HABITAT LOSS	DISTURBANCE	COLLISION PV PANELS
Bustard, Kori *Ardeotis kori*	NT	3.7 (1)	x	x	-	x	x	-
Chat, Ant-eating *Myrmecocichla formicivora*	Endemic	3.7 (1)	x	x	-	x	x	x
Falcon, Lanner *Falco biarmicus*	VU	7.4 (2)	x	foraging	-	x	x	x
Korhaan, Karoo *Eupodotis vigorsii*	NT Endemic	66.7 (18)	x	x	-	x	x	-
Korhaan, Northern Black *Afrotis afraoides*	Endemic	37.0 (10)	x	x	-	x	x	-
Lark, Karoo Long-billed *Certhilauda subcoronata*	Endemic	37.0 (10)	x	x	-	x	x	x
Mousebird, White-backed *Colius*	Endemic	25.9 (7)	x	x	-	x	x	x
Scrub-robin, Karoo *Cercotrichas coryphoeus*	Endemic	29.6 (8)	x	x	-	x	x	x
Shelduck, South African *Tadorna cana*	Endemic	29.6 (8)	-	-	x	-	-	x
Vulture, Lappet-faced *Torgos tracheliotus*	EN	3.7 (1)	foraging	-	-	x	-	-
Vulture, White-backed *Gyps africanus*	CR	7.4 (2)	x	-	-	x	-	-
Warbler, Rufous-eared *Malcorus pectoralis*	Endemic	74.1 (20)	x	x	-	x	x	-
Weaver, Sociable *Philetairus socius*	Endemic	3.7 (1)	x	x	-	x	x	-
CR = Critically Endangered EN = Endangered; VU = Vulnerable; NT = Near-threatened								

7.2.5. Primary Data Collection

A single autumn survey was conducted on 12-15 April 2021 within the area earmarked for Solar PV and BESS Project development. In order to describe the avifaunal community present, a concerted effort was made to sample the avifauna in all of the primary habitats that were available at the proposed Solar PV and BESS Project site and within the larger study area by applying the following techniques:

a. Fixed Point Count Survey

A total of 12 fixed-point count survey points were established across the Study Area, sampling the dominant Nama Karoo shrubland and ephemeral drainage line habitats within the proposed study area (FIGURE 3) with an additional point count survey point established within the large drainage line to the north of the Study Area. Three surveys were completed in the early mornings (sunrise) on 13, 14 and 15 April 2021 respectively and an additional three surveys were conducted in the late afternoon (sunset) on 12, 13 and 14 April 2021 at each point count survey location, avoiding the warmer period in the middle of the day when birds are less active and vocal, and hence less conspicuous (Bibby et al. 2000). At each survey point, the birds observed or heard (within 25m of the observer) over a period of five minutes (i.e. long enough to detect all the birds within the survey area, but short enough to avoid including birds that were not present in the area at the start and double counts) were recorded. A detailed description of the methods of conducting fixed-point count surveys is available in Jenkins et al. 2017. The data emanating from the fixed-point count surveys is presented in TABLE 2. Species diversity was comparatively uniform across the 13 point counts with a slightly higher diversity within the drainage lines present at Alternatives Sites 1 and 3.

Point counts 8, 10, 11 and 13, located within the drainage lines recorded the highest diversity of species each. Points 1, 6, 7 and 9 recorded the lowest density of species largely due to their proximity to the road. The most notable record was that of a pair of Karoo Korhaan (NT) at Points 9, 10, 11 and 13.

b. Vehicle Transect Survey

This data collection aims to establish the presence of large terrestrial species and raptors. Two Vehicle Transect (VT) counts were conducted on suitable roads surrounding the Solar PV and BESS Project study area, totalling approximately 67 kilometres (9km conducted 13 April 2021 and 58km on 14 April 2021 all large terrestrial species, raptors, waterbirds and conspicuous passerines encountered along these routes were recorded and presented in TABLE 3 Eighteen species were recorded along the transect.

c. Incidental Observations

In an effort to maximise the benefit from the time spent on site travelling to and from survey points, all birds observed during this time were recorded using an incidental data collection technique. Additional

species that were not observed at point count locations or during the vehicle transect surveys include: Kori Bustard, Helmeted Guineafowl, Blacksmith Lapwing, Crowned Lapwing, Common Moorhen, Black-winged Stilt, Little Swift and Rock Martin.

The site visit produced a combined list of 40 species (APPENDIX 1 - highlighted in grey), covering both the study area and to a limited extent, the surrounding area. Karoo Korhaan, was the only Red List species observed within the study area. Martial Eagle, Kori Bustard and Lappet-faced Vulture were observed within the broader study area. All other observations were of small passerine species that are common to this area. Each of these species has the potential to be displaced by the proposed Solar PV and BESS Project as a result of habitat transformation and disturbance. However, these species have persisted despite existing disturbance (i.e., pastoral and residential activities and vehicle disturbance within the study area. This resilience, coupled with the fact that similar habitat is available throughout the broader area, means that the displacement impact will not be of regional or national significance. In addition, no raptor nests or other possible breeding sites were noted during the site survey.

TABLE 2: Fixed Point Count - Species presence across survey points

SPECIES	TAXONOMIC NAME	POINT 1	POINT 2	POINT 3	POINT 4	POINT 5	POINT 6	POINT 7	POINT 8	POINT 9	POINT 10	POINT 11	POINT 12	POINT 13
Bunting, Lark-like	*Emberiza impetuani*							x	x		x			
Chat, Karoo	*Cercomela schlegelii*			x	x						x		x	x
Dove, Laughing	*Streptopelia senegalensis*				x	x		x	x	x			x	x
Flycatcher, Chat	*Bradornis infuscatus*	x			x				x		x	x	x	
Heron, Black-headed	*Ardea melanocephala*		x											
Korhaan, Karoo (NT)	*Eupodotis vigorsii*		x							x	x	x		x
Korhaan, Northern Black (Endemic)	*Afrotis afraoides*			x		x					x			x
Lark, Fawn-coloured	*Calendulauda africanoides*	x	x	x	x	x		x	x	x	x	x	x	x
Lark, Karoo Long-billed (Endemic)	*Certhilauda subcoronata*	x	x	x	x				x	x	x	x		
Lark, Sabota	*Calendulauda sabota*		x	x					x			x		x
Lark, Spike-heeled	*Chersomanes albofasciata*		x				x		x		x		x	
Prinia, Black-chested	*Prinia flavicans*	x			x	x			x			x		x
Sandgrouse, Namaqua	*Pterocles namaqua*				x									
Sparrowlark, Grey-backed	*Eremopterix verticalis*		x	x		x	x		x	x	x	x		x
Sparrow-Weaver, White-browed	*Plocepasser mahali*		x			x		x	x		x	x	x	x
Turtle-Dove, Cape	*Streptopelia capicola*	x					x							
Warbler, Rufous-eared (Endemic)	*Malcorus pectoralis*							x	x		x	x		x
Weaver, Sociable (Endemic)	*Philetairus socius*			x	x				x					

TABLE 3: Vehicle Transect Summary Data

SPECIES	TAXONOMIC NAME	VT 1	VT2
Bulbul, African Red-eyed	*Pycnonotus nigricans*		x
Buzzard, Steppe	*Buteo*		x
Canary, Yellow	*Crithagra flaviventris*		x
Coot, Red-knobbed	*Fulica cristata*		x
Dove, Namaqua	*Oena capensis*	x	x
Eagle, Tawny (EN)	*Aquila rapax*		x
Finch, Red-headed	*Amadina erythrocephala*	x	
Fiscal, Common	*Lanius collaris*		x
Goose, Egyptian	*Alopochen aegyptiaca*		x
Goshawk, Southern Pale Chanting	*Melierax canorus*		x
Ibis, African Sacred	*Threskiornis aethiopicus*		x
Lark, Fawn-coloured	*Calendulauda africanoides*	x	
Lark, Sabota	*Calendulauda sabota*	x	
Masked-weaver, Southern	*Ploceus velatus*		x
Sparrow, Cape	*Passer melanurus*		x
Sparrow-Lark, Grey-backed	*Eremopterix verticalis*	x	
Turtle-Dove, Cape	*Streptopelia capicola*	x	
Vulture, Lappet-faced, (EN)	*Torgos tracheliotos*		x

7.3 Avifaunal Habitats

Vegetation is one of the primary factors determining bird species distribution and abundance in an area. It is widely accepted within ornithological circles that vegetation structure is more important in determining which bird species will occur there. The classification of vegetation types is from Mucina & Rutherford (2006 and 2012), while from an avifaunal perspective, the Atlas of southern African Birds (SABAP1) recognises six primary vegetation divisions or biomes within South Africa, namely (1) Fynbos (2) Succulent Karoo (3) Nama Karoo (4) Grassland (5) Savanna and (6) Forest (Harrison et al. 1997). Whilst much of the distribution and abundance of bird species can be attributed to the broad vegetation types present in an area, it is the smaller spatial scale habitats (micro habitats) that support the requirements of a particular bird species that need to be examined in greater detail. Micro habitats are shaped by factors other than vegetation, such as topography, land use, food availability, and various anthropogenic factors all of which will either attract or deter birds and are critically important in mapping the site in terms of avifaunal sensitivity and ultimately informing mitigation requirements. Investigation of the proposed Solar PV and BESS Project site and its immediate surrounds revealed at four broadly described avifaunal micro habitats i.e. shrubland, surface waterbodies (i.e. dams and pans) drainage lines and urban/rural areas with APPENDIX 2 providing a photographic record of the bird habitats.

7.3.1. Nama Karoo Shrubland

The proposed Solar PV and BESS Project site and surrounding study area are located within a single primary vegetation division namely the Nama Karoo Biome (FIGURE 9 and APPENDIX 2 FIGURE 1), specifically the Kalahari Karroid Shrubland vegetation unit (South African National Biodiversity Institute, 2012 and Mucina & Rutherford, 2006). The Nama Karoo Biome comprises mainly low shrubs and grasses, trees such as *Acacia karoo* and exotic species such as *Prosopis glandulosa* are restricted to watercourses. Compared to the Succulent Karoo, Nama Karoo has a much higher proportion of grass and tree cover. This biome supports a particularly high diversity of species endemic or near-endemic to southern Africa. Avifauna characteristically comprises ground dwelling species of open habitats such as the Kori Bustard, Martial Eagle and Tawny Eagle; the latter two species likely to forage across this microhabitat but unlikely to breed within the proposed Solar PV and BESS Project sites. Several species are almost entirely confined to the Nama Karoo such as the Karoo Korhaan and Ludwig's Bustard.

7.3.2. Gordonia Plains Shrubland

The proposed telecommunication tower preferred site is located within the Savanna Biome (FIGURE 9), specifically the Gordonia Plains Shrubland vegetation unit (South African National Biodiversity Institute, 2012 and Mucina & Rutherford, 2006). Gordonia Plains Shrubland are open grassland plains with occasional shrubs which include *Rhigozum trichotomum* and *Grewia flava*, sometimes including *Acacia haematoxylon* and scattered individuals of *Acacia erioloba*. Other species that are likely to be encountered includes the small tree *Acacia mellifera*. Low shrubs include *Jatropha erythropoda, Plinthus sericeus* and *Requienia sphaerosperma* as well as the herbaceous climber *Merremia tridentata* and a diversity of grass species. The savanna biome contains a large variety of bird species (it is the most species-rich community in southern Africa) but very few bird species are restricted to this biome. Savanna is particularly rich in raptors and forms the stronghold for priority species (recorded in the broader project area by SABAP2) such as Martial Eagle, Tawny Eagle, Lanner Falcon, Red-footed Falcon, Lappet-faced Vulture and African White-backed Vulture. Several non-Red Listed raptor species could also potentially occur such as the Booted Eagle, Black-chested Snake-Eagle *Circaetus pectoralis* and a multitude of medium-sized raptors, for example Southern Pale Chanting Goshawk and Spotted Eagle-Owl. Apart from raptors, open areas within this biome could also attract other Red Listed species, i.e. Kori Bustard, and Karoo Korhaan.

7.3.3. Gordonia Duneveld

Mucina and Rutherford (2006) describe Gordonia Duneveld (FIGURE 9) as open shrubland with ridges of grassland dominated by *Stipagrostis amabilis* on the dune crests and *Acacia haematoxylon* on the dune slopes, also with *Acacia mellifera* on lower slopes and *Rhigozum trichotomum* in the interdune straaten, occurring on parallel dunes 3-8 m above the plains. The small tree *Acacia mellifera* is likely to occur, while tall shrubs like *Grewia flava* and *Rhigozum trichotomum* are common. Low shrubs like *Aptosimum albomarginatum,*

Monechma incanum and *Requienia sphaerosperma* are frequent together with succulent shrubs which may include *Lycium bosciifolium, Lycium pumilum* and *Talinum caffrum*. Grasses are dominant and is likely to include *Schmidtia kalahariensis, Brachiaria glomerata, Bulbostylis hispidula, Centropodia glauca* (Kalahari-Gha Grass), *Eragrostis lehmanniana, Stipagrostis ciliata*, *Stipagrostis* obtusa and *Stipagrostis* uniplumis. As a vegetation unit within the Savanna biome, we can expect to find a similar suite of bird species as those described above, inhabiting the Gordonia Plains Shrubland habitat .

7.3.4. Ephemeral Drainage Lines

The study area contains a series of ephemeral drainage lines (APPENDIX 2: FIGURE 3 and 4) which drain into the Hakskeen Pan (FIGURE 6). These watercourses usually hold water briefly after good rains. The drainage lines are important for a large terrestrial and the smaller passerine species that are inclined to forage in them. After good rains, the standing water in the river bed may attract Namaqua Sandgrouse *Pterocles Namaqua*.

7.3.5. Surface Waterbodies: Dams and Pans

Many thousands of earthen and other dams exist in the southern African landscape. Whilst dams have altered flow patterns of streams and rivers, and affected many bird species detrimentally, a number of species have benefited from their construction. The construction of these dams has probably resulted in a range expansion for many water bird species that were formerly restricted to areas of higher rainfall. Man-made impoundments, although artificial in nature, can be very important for a variety of birds, particularly water birds. Apart from the water quality, the structure of the dam, and specifically the margins and the associated shoreline and vegetation, plays a big role in determining the species that will be attracted to the dam. The broader study area contains dams (APPENDIX 2: FIGURE 2 and 6) and support a diversity of the more common species i.e. Red-knobbed Coot *Fulica cristata,* Common Moorhen, Black-winged Stilt, African Sacred Ibis *Threskiornis aethiopicus*, Egyptian Goose *Alopochen aegyptiacus and* Crowned Lapwing *Vanellus coronatus*.

Pans are endorheic wetlands having closed drainage systems; water usually flows in from small catchments but with no outflow from the pan basins themselves. They are typical of poorly drained, relatively flat and dry regions. Water loss is mainly through evaporation, sometimes resulting in saline conditions, especially in the most arid regions. Water depth is shallow (<3m) with flooding characteristically ephemeral (Harrison *et al*. 1997). When these pans hold water (which is only likely after exceptional rainfall events), they attract waterbirds, while large raptors and vultures could use them for bathing and drinking. When the pans are dry, they may be covered with grass, which is attractive to several large terrestrial species for foraging, roosting and breeding. Species recorded in the study area that may utilise the pans include Comb Duck *Sarkidiornis melanotos*, Yellow-billed Duck *Anas undulata*, Common Greenshank *Tringa nebularia*, Egyptian Goose *Alopochen aegyptiacus*, Ruff *Philomachus pugnax*, Blacksmith Lapwing *Vanellus armatus,* Crowned Lapwing *Vanellus coronatus*, African Sacred Ibis *Threskiornis aethiopicus* and Hadeda Ibis *Bostrychia hagedash*.

Given the location of the pans and dams outside of the proposed Solar PV and BESS Project, construction and operational activities associated with the proposed BESS Project are unlikely to have a permanent negative impact on the Hakskeen Pan and/or the dams and the bird communities that these may support. Similarly, for the more common species that are fairly resilient to disturbance, the potential displacement impacts are unlikely to be permanent and of regional or national significance.

7.3.6. Built-up Areas

These areas include surface infrastructure such as residential buildings, roads and buildings (APPENDIX 2: FIGURE 8). Built-up areas generally are of little value to sensitive Red List bird species due to their degraded nature and the associated disturbance factor. They do however play an important role in providing safe refuge and foraging opportunities for small passerine species that have become common in urban environments.

TABLE 1 details the micro habitats that each of the Red List bird species (recorded by SABAP2) will typically frequent in the study area. It must be stressed that birds can and will, by virtue of their mobility, utilise almost any areas in a landscape from time to time. However, the analysis in TABLE 1 represents each species' most preferred or normal habitats. These locations are where most of the birds of that species will spend most of their time which in turn provides an indication of where impacts on those species will be most significant.

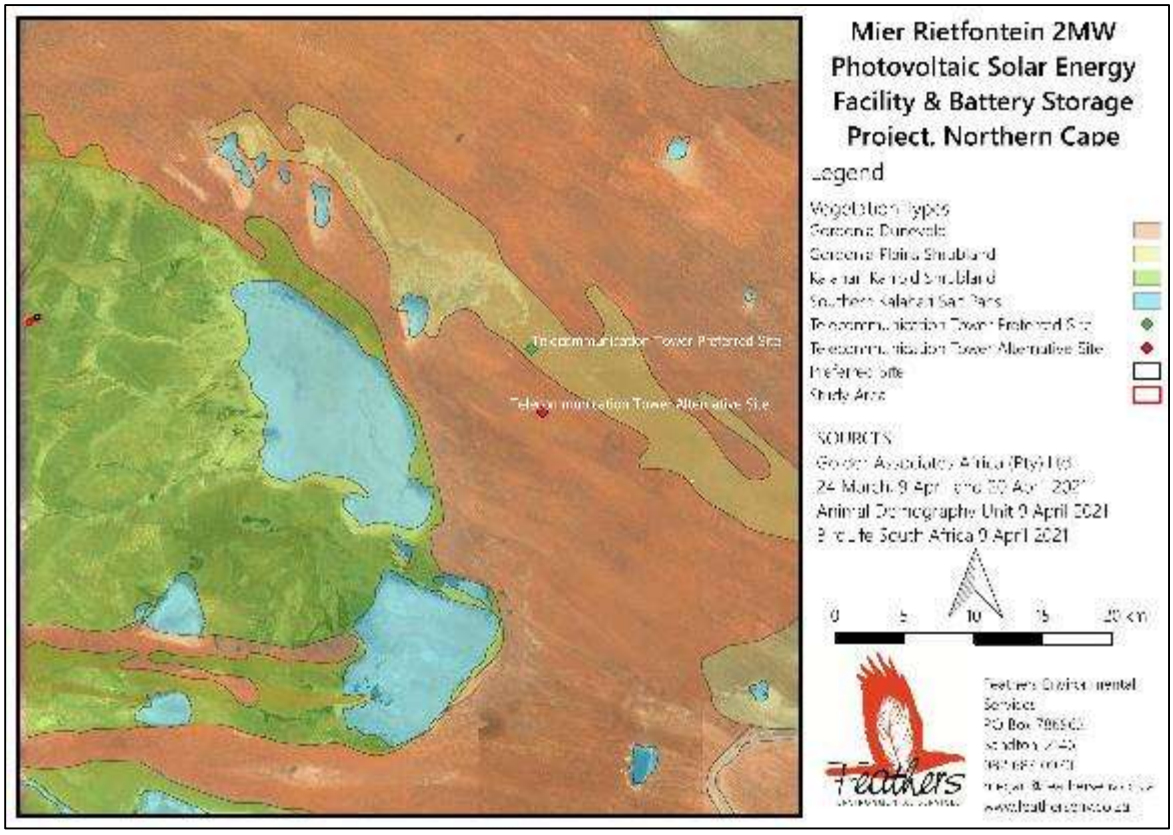


FIGURE 9: Regional map detailing the various vegetation types occurring at the proposed Solar PV and BESS Project & Telecommunication Tower study areas

8. IMPACT ASSESSMENT

The effects of any development on birds are highly variable and depend on a wide range of factors including the specification of the development, the topography of the surrounding land, the habitats affected and the number and diversity of species present. The principal areas of concern for Red List and non-Red List priority species related to the proposed Solar PV and BESS with telecommunications tower Project are listed include:

8.1 Construction Phase

8.1.1. Displacement as a result of habitat loss or transformation

This impact is dependent on various factors i.e., the location and the scale of the facility, the amount of habitat affected; the uniqueness of the habitat; and the sensitivity and conservation status of the bird species utilizing that habitat. Approximately 10ha of habitat will be cleared to accommodate the infrastructure required, reducing the amount of habitat available to birds for foraging, roosting and breeding (Smallie, 2013). This impact may be significant for the smaller bird species with small home ranges as entire territories could be removed during construction activities.

A local case study aimed at identifying the functional and structural changes in bird communities in and around the development footprint of the 180ha Jasper PV solar facility in the Northern Cape (Visser, 2016), revealed that bird density and diversity per unit area was higher in the boundary and untransformed landscape. However, the extent was not considered to be statistically significant and therefore suggests that the PV facility matrix is pervious to most species. A key finding of this study was that the distribution of birds in the landscape changed, in response to changes in the distribution and abundance of habitat resources such as food, water and nesting sites. These changes in resource availability were detrimental to shrubland specialists, but in contrast, open country, grassland and generalist species, were favoured by the changes brought about by the development (Visser 2016).

The transformation of the site surface from natural vegetation to infrastructure alters the manner in which water moves on the site after rainfall and cleaning of infrastructure. If this is not carefully managed this could cause soil erosion reducing the remaining bird habitat further by affecting off site areas. Increased runoff could also create moister conditions on or near the site thereby attracting more birds to the area and increasing the likelihood of other interactions with the facility. In addition, Jenkins *et al,* 2017 suggests that pollution could occur if hazardous chemicals are used to clean PV panels once operational. This could have secondary effects on vegetation, invertebrate populations and in turn food availability and habitat for birds.

In order to facilitate the construction of the telecommunication tower, some habitat loss and transformation will inevitably take place. These activities may have an impact on birds breeding, foraging and roosting in or in close proximity of the site through transformation of habitat, which could result in temporary or permanent

displacement. The effect of the vegetation clearing is always more marked in woodland areas, where construction necessitates the removal of woody plants, and especially large trees. The area that the telecommunication tower will occupy is less than 1ha, resulting in minimal natural vegetation loss or transformation, particularly is the removal of trees is prohibited.

8.1.2. Displacement as a result of disturbance

Construction of energy generation facilities requires a significant amount of machinery and labour to be present on site for a period of time. For most bird species, construction activities are likely to be a cause of temporary disturbance and will impact on foraging, breeding and roosting behaviors. However, for shy, sensitive species or ground nesting birds, construction activities in close proximity to breeding locations, could be a source of disturbance resulting in temporary breeding failure or even permanent abandonment of nests and displacement from the site entirely. In addition, species commuting around the area may become disorientated, avoid the site and fly longer distances than usual as a result, and for some species this may have critical energy implications (Smallie, 2013).

The broader Solar PV and BESS Project study area is already subjected to a degree of disturbance associated with pastoral activities, rural activities with the town of Rietfontein, vehicle traffic on the R31 district road and the Rietfontein Border Control point in the immediate vicinity of the proposed Solar PV and BESS Project site. In addition, no nests or species exhibiting breeding behavior were observed during the field survey. While development in this area will undoubtedly displace some species, based on the proposed Solar PV and BESS Project footprint, the bird species likely to occupy this area, and the fact that similar habitat is available within the broader study area, displacement as a result of habitat transformation is unlikely to be permanent and of national significance.

The area surrounding the preferred telecommunication tower site alternative is already subjected to a fairly significant degree of disturbance as a result of the proximity of the R31 district road . Avifaunal species that have persisted within this area are accustomed to the existing disturbance and are likely to be only temporarily displaced from the area during the construction of the proposed telecommunication tower at this location.

8.2 Operational Phase

8.2.1. Mortality due to collisions with the PV panels (impact trauma)

This impact refers to collision-related fatality i.e., fatality resulting from the direct contact of the bird with a project structure(s). This type of fatality has been occasionally documented at solar projects of all technology types (McCrary *et al*. 1986; Hernandez *et al*. 2014; Kagan *et al*. 2014). In some instances, the bird is not killed outright by the collision impact, but succumbs to predation later, as it cannot avoid predators due to its injuries.

Sheet glass used in commercial and residential buildings has been well established as a hazard for birds. When the sky is reflected in the sheet glass, birds fail to see the building as an obstacle and attempt to fly through the glass, mistaking it for empty space. Although very few cases have been reported it is possible that the reflective surfaces of solar panels could constitute a similar risk to avifauna. An extremely rare but potentially related problem is the so-called "lake effect" where reflections from solar facilities' infrastructure, particularly large sheets of dark blue PV panels, may attract birds in flight, who mistake the broad reflective surfaces for water (Kagan et al. 2014).

The results of mortality searches at various solar facilities in the USA (all technology types), suggest that impact trauma ranks as the highest identifiable cause of avian mortality (Harvey & Associates 2014a and 2014b, Kagan et al. 2014 and Walston *et al*. 2015). The unusually high percentage of waterbird mortalities at the Desert Sunlight PV facility (44%) may support the "lake effect" hypothesis (West 2014). Although in the case of Desert Sunlight, the proximity of evaporation ponds may act as an additional risk increasing factor, in that birds are both attracted to the water feature and habituated to the presence of an accessible aquatic environment in the area. This may translate into the misinterpretation of diffusely reflected sky or horizontal polarised light source as a body of water. However, due to limited data it would be premature to make any general conclusions about the influence of the lake effect or other factors that contribute to fatality of water-dependent birds. The activity and abundance of water-dependent species near solar facilities may depend on other site-specific or regional factors, such as the surrounding landscape (Walston *et al*. 2015). However, until such time as enough scientific evidence has been collected to discount the "lake effect" hypothesis, it must be considered as a potential source of impact.

The only scientific investigation of potential avifaunal impacts that has been performed at a South African PV facility was conducted at the Jasper PV solar facility in the Northern Cape Province (Visser 2016). The Jasper PV facility contains 325 360 solar panels over a footprint of 180ha. Mortality surveys were conducted over a three-month period, with a total of seven mortalities recorded among the solar panels which gives an average rate of 0.003 birds per hectare surveyed per month. All fatalities were inferred from feather spots. The study concluded inter alia that the short study period, and lack of comparable results from other sources made it difficult to provide a meaningful assessment of avian mortality at PV facilities. It further stated that despite these limitations, the few bird fatalities that were recorded might suggest that there is no significant collision-related mortality at the study site (Visser 2016).

It is important to understand that bird abundance and flight activity levels differ according to habitat availability, and other natural features. Therefore, the impact on birds through direct fatality is very site specific. The priority species that may occur in the study area which could potentially be exposed to collision risk are listed in TABLE 1. In addition, the so-called "lake effect" could act as a potential attraction to the waterbird species recorded in the broader study area. It is also important to note, that in order to increase solar panel

efficiency and power output, most solar panels are treated with an anti-reflective coating which may mitigate this impact. Given the number of variables, it is not possible to determine whether this impact will occur until operational monitoring reveals actual mortalities at the proposed Solar PV and BESS Project.

8.2.2. Mortality due to electrocutions on the 33kV power line infrastructure

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). Electrocution risk is strongly influenced by the power line voltage and design of the tower/pole structure and mainly affects larger, perching species that are capable of spanning the spaces between energized components. This is particularly likely when more than one bird attempts to sit on the same pole, a behaviour that is typical of gregarious species when perching or roosting. Relevant to this development, eagles, vultures, ibis and herons may be susceptible to this impact.

8.2.3. Mortality due to collisions with the 33kV power line conductors

Collisions are the biggest single threat posed by power lines to birds in southern Africa (van Rooyen 2004). Most heavily impacted upon are bustards, storks, cranes and various species of waterbirds. These species are mostly heavy-bodied birds with limited maneuverability, 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 considered threatened in southern Africa. A potential impact of the proposed 33kV power line is collisions with the overhead conductors. Quantifying this impact in terms of the likely number of birds that will be impacted, is very difficult because a number of variables play a role in determining the risk, for example weather, rainfall, wind, age, flocking behaviour, power line height, light conditions, topography, population density and so forth. However, from incidental record keeping by the Endangered Wildlife Trust: Wildlife & Energy Programme it is possible to give a measure of what species are likely to be impacted upon (see FIGURE 10 below - Jenkins et al. 2010). This only gives a measure of the general susceptibility of the species to power line collisions, and not an absolute measurement for any specific line.

Relevant to this development, collisions are likely to be linked to specific habitat types and/or specific sets of circumstances potentially involving Karoo Korhaan, Northern Black Korhaan, ibis and heron species that utilise the study area.

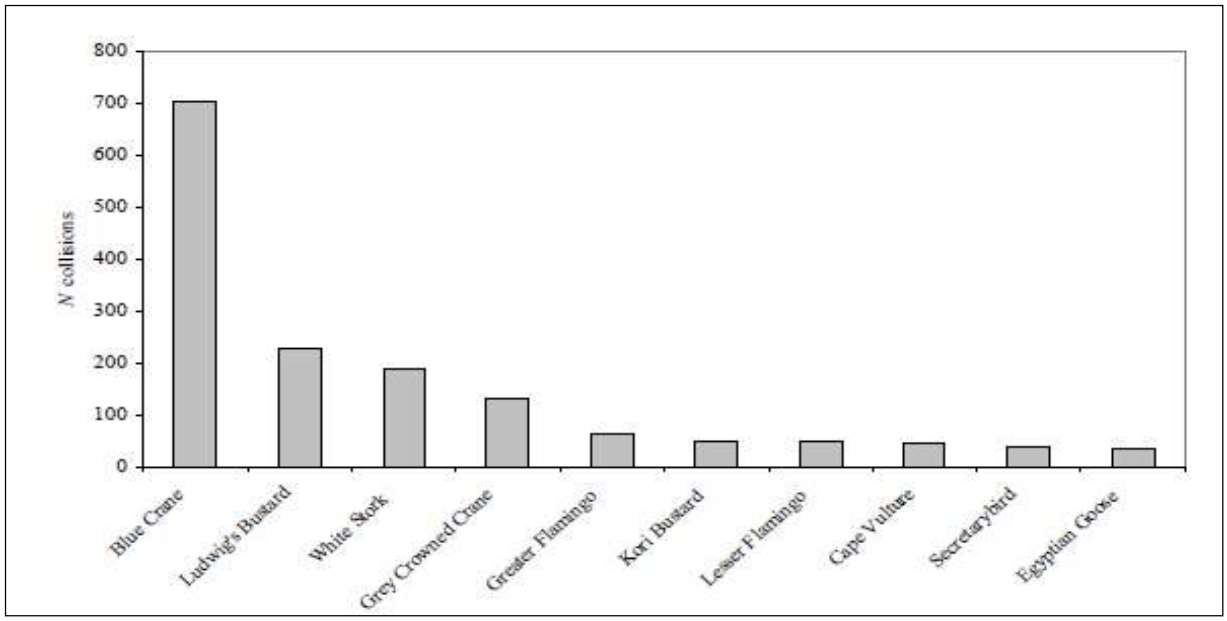


FIGURE 10: The top ten collision prone bird species in South Africa, in terms of reported incidents contained in the Eskom/EWT Strategic Partnership central incident register 1996 - 2007 (Jenkins et al. 2010)

8.2.4. Mortality due to collision with the telecommunication tower

Collisions with man-made structures are a significant and well-documented cause of avian mortality (Erickson et al, 2001). The proliferation of communication towers across the United States of America (USA) have been responsible for mass nocturnal mortality events of migrant birds, with up to 10 000 birds killed in a single night at three communication towers at a natural gas pumping facility (Evans 1998). Another study yielded very similar results, where 12 000 birds were reported to have collided with a television tower in a single event (Kemper, 1996). The Foote Creek Rim, Wyoming wind farm also recorded high bird mortalities at five guyed meteorological (met) masts compared to the total number of birds killed at all 69 wind turbines (Young et al. 2003). With the advent of cellular phones and digital television, between 5000 to 10 000 communication towers are being constructed each year in the USA, culminating in a potentially catastrophic impact on avian migrants (Manville, 2000). The single biggest attractant seems to be the lighting on the towers, with taller, better lit towers responsible for more fatalities. It is speculated that the birds are attracted to the lighted towers, become disoriented and fly around them in a spiral, colliding with the tower, the guy wires, other birds, or falling to the ground in exhaustion (Erickson *et al* 2001). Unfortunately, there is a paucity of research and published literature documenting communication tower collision mortalities in South Africa. However, fatalities are known to have occurred, i.e. Cape Vultures mortalities at a large communication tower on top of Kransberg in the Marekele National Park, which is situated directly above a large Cape Vulture breeding colony (Smallie, 2007), bird mortalities on a similar radio tower at Twee Rivieren in the Kgalagadi Transfrontier Park and a flamingo mortality on a bat monitoring mast at a Northern Cape wind farm (C. van Rooyen pers. comm. 2019).

Relevant to this assessment, the proposed telecommunication tower is likely to be constructed substantially different from those in the USA. The telecommunication tower is likely to be shorter in length, with minimal lighting and perhaps more importantly, the tower infrastructure does not contain guy wires, thereby significantly reducing the potential collision impact with the tower.

8.2.5. Nesting

Various bird species are quick to seize a new opportunity for perching, roosting or nesting, including on man-made structures (van Rooyen & Ledger 1999, de Goede 2011 and de Goede & Jenkins 2001). Relevant to the proposed Solar PV, BESS Project and telecommunication tower, passerine and corvid species are likely to use certain parts of the proposed facility and the tower once commissioned. Whilst nesting could be viewed as a positive impact for birds, it can result in operational problems for the facility and the tower infrastructure. An increase in the number of birds roosting, nesting and feeding at the facility could lead to increased defecation on the solar infrastructure causing panel obstruction requiring management actions such as nest management in order to ensure that the nests don't interfere with operations or increase fire risk. Nest relocation or removal should be done under permit from the provincial authority. It is also likely that some small species will use the PV panels for shade and this will create a new microhabitat on the site. This should not adversely affect the operation of the equipment however and should also not lead to direct mortalities of these small species.

8.3 Decommissioning & Closure Phases

8.3.1. Displacement as a result of disturbance

The broader Solar PV and BESS Project study area is already subjected to a degree of disturbance associated with pastoral activities, rural activities with the town of Rietfontein, vehicle traffic on the R31 district road and the Rietfontein Border Control point in the immediate vicinity of the Solar PV and BESS Project. While the decommissioning of the Solar PV and BESS Project in this area will undoubtedly displace some species, the bird species likely to occupy this area, and the fact that similar habitat is available within the broader study area, displacement as a result of disturbance is unlikely to be permanent and of national significance. Similarly, the displacement as a result of the disturbance caused by the decommissioning of the telecommunication tower will also be permanent or of national significance.

8.4 Sensitivity Mapping

At a landscape, the avifaunal sensitivity of the proposed Solar PV, BESS Project and telecommunication tower sites are considered to be low. At a site-specific level sensitive features present within the proposed Solar PV and BESS Project study area include ephemeral drainage lines, with dams and pans being key features in the broader study area. The well-defined drainage lines have been delineated as areas of HIGH sensitivity, owing to the presence of Karoo Korhaan and a diversity of passerine species. Construction in these areas must be precluded. Three less defined drainage lines within the preferred site are classified as being of medium

sensitivity. The remainder of the study area is considered to be of low sensitivity. A map delineating these areas is provided below (FIGURE 11). At a site-specific level, the habitat present at both the preferred and alternative telecommunication tower sites are homogenous with no key avifaunal habitat features and are considered to be of low sensitivity.

FIGURE 11: Avifaunal sensitivity map. High sensitivity areas are denoted in red, medium sensitivity areas in orange and Low sensitivity areas are represented in green.

8.5 Identification of a Preferred Alternative

One of the objectives of this study is to determine the siting of the Solar PV and BESS Project within the proposed study area that poses the least impact to the avifaunal community, particularly the sensitive Red List avifauna present within the study area.

The study area and the preferred site occur within the same pentad. They are comprised of identical vegetation units and are subjected to similar land use practices and therefore likely to be identical in terms of species diversity and density too. With this in mind, the selection of a preferred site location has been determined

using observations of available micro habitat (specifically drainage lines), species composition and the location of the study area in relation to existing infrastructure.

The study area contains a series of ephemeral drainage lines, a habitat type that supports a diversity of passerine species, as well as the Karoo Korhaan that were observed each morning during the field survey in the southern portion of the study area. The preferred site also contains three drainage lines but these are less defined and likely to be less sensitive. The field survey observations, both in terms of avifaunal species and habitat, confirm that the identified **the preferred site** is likely to pose the least impact to the resident avifaunal community (FIGURE 11).

Two site alternatives are proposed for the establishment of the telecommunication tower. The preferred site and the Alternative Site occur within the same pentad. They are comprised of relatively identical vegetation units and are subjected to similar land use practices and therefore likely to be identical in terms of species diversity and density too. With this in mind, the selection of a preferred telecommunication tower site alternative has been determined using the location of the proposed site alternatives in relation to existing infrastructure. The preferred site is considered to be the least sensitive from an avifaunal perspective owing to its location relative to the R31 district road which is a source of existing disturbance. In addition its proximity to the road will also facilitate the construction of the telecommunication tower without the need for additional road infrastructure thereby reducing the displacement impacts associated with habitat loss and disturbance.

8.6 Impact Assessment

A quantitative methodology was used to describe, evaluate and rate the significance of the aforementioned impacts associated with the construction, operation and decommissioning of the proposed Solar PV, BESS Project and telecommunication tower. This assessment is presented in tabular format below (TABLE 4 - 14) for both pre- and post-mitigation according to set criteria described in APPENDIX 3.

TABLE 4: Assessment of the habitat loss and/or transformation caused by the construction of the Solar PV and BESS Project and its ancillary infrastructure

Activity:	Construction of the Solar PV and BESS Project and its ancillary infrastructure				
Impact:	Displacement of Red List species as a result of habitat loss & transformation				
Significance rating:	Magnitude	Duration	Scale	Probability	Significance
Pre-Mitigation	8	4	2	4	MODERATE
Post-Mitigation	6	4	2	3	MODERATE
Is the Impact Reversible?	• Low reversibility - The construction of the infrastructure will require the complete eradication of the vegetation within the project footprint				
Residual impacts:	• Smaller passerine species may return once the construction activity is completed and the site rehabilitated.				

TABLE 5: Assessment of the habitat loss and/or transformation caused by the construction of the telecommunication tower

Activity:	Construction of the telecommunication tower				
Impact:	Displacement of Red List species as a result of habitat loss & transformation				
Significance rating:	Magnitude	Duration	Scale	Probability	Significance
Pre-Mitigation	4	4	1	3	LOW
Post-Mitigation	2	4	1	3	LOW
Is the Impact Reversible?	• Medium reversibility - The construction of the infrastructure will require the eradication of the vegetation within the project footprint but can be mitigated by not removing trees				
Residual impacts:	• Smaller passerine species will return once the construction activity is completed.				

TABLE 6 Assessment of the disturbance impact caused by the construction of the Solar PV and BESS Project and its ancillary infrastructure

Activity:	Construction of the Solar PV and BESS Project and its ancillary infrastructure				
Impact:	Displacement of Red List species as a result of disturbance				
Significance rating:	Magnitude	Duration	Scale	Probability	Significance
Pre-Mitigation	8	2	2	4	MODERATE
Post-Mitigation	6	2	2	3	LOW
Is the Impact Reversible?	• High reversibility - After the construction activities, have ceased, the source of displacement will cease.				
Residual impacts:	• The majority of species observed in the study area may return once the construction activity is completed				

TABLE 7 Assessment of the disturbance impact caused by the construction of the telecommunication tower

Activity:	Construction of the telecommunication tower				
Impact:	Displacement of Red List species as a result of disturbance				
Significance rating:	Magnitude	Duration	Scale	Probability	Significance
Pre-Mitigation	4	2	1	3	LOW
Post-Mitigation	2	2	1	3	LOW
Is the Impact Reversible?	• High reversibility - After the construction activities, have ceased, the source of displacement will cease.				
Residual impacts:	• The majority of species observed in the study area may return once the construction activity is completed				

TABLE 8 Assessment of mortality due to collision with the PV panels

Activity:	Operation of the Solar PV and BESS Project				
Impact:	Mortality at PV facility (impact trauma on PV panels)				
Significance rating:	Magnitude	Duration	Scale	Probability	Significance
Pre-Mitigation	6	4	3	3	MODERATE
Post-Mitigation	4	4	2	3	LOW
Is the Impact Reversible?	• High reversibility - If the Solar PV and BESS Project is de-commissioned the collision risk ceases				
Residual impacts:	• It is envisaged that mitigation, if required, will reduce but not eliminate collision mortality.				

TABLE 9 Assessment of mortality due to electrocution on the 33kV power line infrastructure

Activity:	Operation of the 33kV power line connecting the Solar PV and BESS Project to the Mier Substation				
Impact:	Mortality as a result of electrocution on the 33kV power line infrastructure				
Significance rating:	Magnitude	Duration	Scale	Probability	Significance
Pre-Mitigation	8	4	2	4	MODERATE
Post-Mitigation	4	4	2	2	LOW
Is the Impact Reversible?	• High reversibility - If the 33kV power line is mitigated and/or de-commissioned the electrocution risk will disappear				
Residual impacts:	• Mitigation will reduce electrocution mortality to negligible levels.				

TABLE 10 Assessment of mortality due to collision with the 33kV power line infrastructure

Activity:	Operation of the 33kV power line connecting the Solar PV and BESS Project to the Mier Substation				
Impact:	Mortality due to collision with the 33kV power line infrastructure				
Significance rating:	Magnitude	Duration	Scale	Probability	Significance
Pre-Mitigation	8	4	2	4	MODERATE
Post-Mitigation	6	4	2	2	LOW
Is the Impact Reversible?	• High reversibility - If the 33kV power line is mitigated and/or de-commissioned the collision risk will disappear				
Residual impacts:	• It is envisaged that mitigation, if required, will reduce but not eliminate collision mortality.				

TABLE 11 Assessment of mortality due to collision with the telecommunication tower

Activity:	Operation of the telecommunication tower				
Impact:	Mortality due to collision with the telecommunication tower				
Significance rating:	Magnitude	Duration	Scale	Probability	Significance
Pre-Mitigation	4	4	2	2	LOW
Post-Mitigation	2	4	2	1	LOW
Is the Impact Reversible?	• High reversibility - If the 33kV power line is mitigated and/or de-commissioned the collision risk will disappear				
Residual impacts:	• It is envisaged that mitigation, if required, will reduce but not eliminate collision mortality.				

TABLE 12: Assessment of nesting on the BESS PV panels and ancillary infrastructure

Activity:	Operation of the Solar PV and BESS Project				
Impact:	Nesting on the PV panels and ancillary infrastructure **(POSITIVE)**				
Significance rating:	Magnitude	Duration	Scale	Probability	Significance
Pre-Mitigation	6	4	2	3	POSITIVE
Post-Mitigation	4	4	2	3	POSITIVE
Is the Impact Reversible?	• N/A				
Residual impacts:	• N/A				

TABLE 13: Assessment of the disturbance impact caused by the decommissioning of the Solar PV and BESS Project and its ancillary infrastructure

Activity:	Decommissioning and closure of the BESS Project				
Impact:	Displacement of Red List species as a result of disturbance				
Significance rating:	Magnitude	Duration	Scale	Probability	Significance
Pre-Mitigation	8	2	2	4	MODERATE
Post-Mitigation	6	2	2	3	LOW
Is the Impact Reversible?	• High reversibility - After the decommissioning and closure activities, have ceased, the source of displacement will cease.				
Residual impacts:	• The majority of species observed in the study area may return once the decommissioning and closure activities are completed.				

TABLE 14: Assessment of the disturbance impact caused by the decommissioning of the telecommunication tower

Activity:	Decommissioning of the telecommunication tower				
Impact:	Displacement of Red List species as a result of disturbance				
Significance rating:	Magnitude	Duration	Scale	Probability	Significance
Pre-Mitigation	4	2	1	3	LOW
Post-Mitigation	2	2	1	3	LOW
Is the Impact Reversible?	• High reversibility - After the decommissioning and closure activities, have ceased, the source of displacement will cease.				
Residual impacts:	• The majority of species observed in the study area will return once the decommissioning and closure activities are completed.				

9. PROPOSED IMPACT MITIGATION ACTIONS

Based on the anticipated impacts described above the following recommendations are provided regarding practical mitigation measures for potentially significant impacts to be included in the Environmental Management Programme (EMPr).

OBJECTIVE: Mitigate the displacement and direct mortality impacts caused by the construction, operation and decommissioning of the Solar PV and BESS Project and its ancillary infrastructure	
Project component/s	BESS including PV panels, battery storage facilities and ancillary infrastructure including the telecommunication tower.
Potential Impact	Permanent displacement and mortality of local populations of Red List and non-Red List species caused by habitat loss, disturbance, collisions with the PV panels.
Activity/risk source	• Construction of the Solar PV and BESS Project and its associated infrastructure including the telecommunication tower within sensitive avifaunal habitat. • Unmitigated construction and operational activities.
Mitigation: Target/Objective	Limit avifaunal mortality and displacement as far as practically possible for the duration of the operational life span of the Solar PV, BESS Project and its associated telecommunication tower infrastructure.

Mitigation: Action/control	Responsibility	Timeframe
CONSTRUCTION PHASE		
Displacement as a result of habitat loss: * No development within the areas delineated as HIGH sensitivity. * Construction activity should be restricted to the immediate footprint of the infrastructure. * All construction activities should be strictly managed according to generally accepted environmental best practice standards, so as to avoid any unnecessary impact on the receiving environment. * All temporary disturbed areas should be rehabilitated according to the site's rehabilitation plan, following construction. * A carefully considered operational surface water/drainage management plan for the site must be developed. * The operational surface water management plan must stipulate the use of environmentally friendly and acceptable cleaning products.	Construction Manager, Environmental Control Officer and Avifaunal Specialist.	From the commencement of construction (inclusive of all project components to the completion of construction. Water management strategies to be developed prior to commissioning and implemented during the operational life span of the Solar PV and BESS Project and its associated infrastructure.
Displacement as a result of disturbance: * Conduct a pre-construction inspection (avifaunal walk-through) of the final Solar PV and BESS layout, road and power line routes and telecommunication tower site to identify Red List species that may be breeding within footprint of the Solar PV, BESS Project and telecommunication tower sites and the road and power line servitudes to ensure that the impacts to breeding species (if any) are adequately managed. * Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. * Measures to control noise should be applied according to current best practice in the industry.	Construction Manager, Environmental Control Officer and Avifaunal Specialist.	From the commencement of construction (inclusive of all project components to the completion of construction.
OPERATIONAL PHASE		
Collision Mortality (PV arrays): * An operational monitoring programme, that includes carcass searches to provide an indication of fatality rates as a result of	PV Solar and BESS Environmental Manager,	Post construction monitoring should be conducted for a minimum two years of operation. Additional

collisions, and if there are any spatial, temporal or conditional patterns to the frequency of collisions. * Most importantly, operational monitoring should highlight if mitigation (i.e. modifications to the panel design to reduce the illusionary characteristics of the panels) is required to reduce impacts to acceptable levels.	Environmental Control Officer	monitoring requirements will be determined following an assessment of the data collected over the two-year period.
Mortality as a result of electrocutions on the 33kV power line infrastructure * The 33kV power line must be constructed using a bird friendly structure (i.e. Inverted Delta-T Structure - the same structure used for the existing Rietfontein feeder) * Additional mitigation in the form of insulating sleeves on *jumpers* present on strain poles, terminal poles and box transformers should also be considered. * Annual CNC maintenance monitoring to include power line surveys to evaluate electrocution mortality (if any) and assess the efficacy of mitigation measures.	PV Solar and BESS Environmental Manager, Environmental Control Officer	Post construction monitoring should be conducted for a minimum five years of operation. Additional monitoring requirements will be determined following an assessment of the data collected over the five-year period..
Collision Mortality (33kV Power Line): * If collision impacts are recorded once the 33kV power line is operational It is recommended that the Eskom-Endangered Wildlife Trust Strategic Partnership investigate the mortalities and provide recommendations for site-specific mitigation to be applied reactively. * Annual CNC maintenance monitoring to include power line surveys to evaluate collision mortality (if any) and assess the efficacy of mitigation measures.	PV Solar and BESS Environmental Manager, Environmental Control Officer Eskom-Endangered Wildlife Trust Strategic Partnership	Post construction monitoring should be conducted for a minimum five years of operation. Additional monitoring requirements will be determined following an assessment of the data collected over the five-year period.
Nest building on PV infrastructure: * If on-going impacts are recorded once the Solar PV, BESS Project and telecommunication tower are operational, it is recommended that these impacts be assessed by the Eskom-Endangered Wildlife Trust Strategic Partnership and site-specific mitigation be applied reactively.	PV Solar and BESS Environmental Manager, Environmental Control Officer Eskom-Endangered Wildlife Trust Strategic Partnership	Nest management strategies to be identified and implemented reactively, if required.

DECOMMISSIONING PHASE		
Displacement as a result of disturbance: * Where possible decommissioning to occur outside of the Karoo Korhaan breeding season (September - February) to ensure minimal disturbance to the pairs that are resident both on site and in the immediate surrounds. * Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of priority species. * Measures to control noise should be applied according to current best practice in the industry.	PV Solar and BESS Environmental Manager, Environmental Control Officer and Avifaunal Specialist	From the commencement of the decommissioning phase until completion.
Performance Indicator	* Habitat loss is confined to the Solar PV, BESS Project and telecommunication tower footprints and rehabilitation results in the size and extent of habitat present at the start of construction remains intact at end of decommissioning phase. * Sustainable levels of mortalities are reported on a monthly basis and the necessary mitigation measures are implemented.	

10. PROPOSED MONITORING ACTIONS

It is recommended that quarterly surveys be conducted at the Solar PV and BESS Project for a minimum of two years post construction in an effort to collect a robust dataset of solar panel collision mortalities. The programme will also enable the review mitigation measures according to their efficacy and develop alternative specific mitigation measures for species that are continually affected. In addition, annual CNC maintenance monitoring will enable the assessment of collision and electrocution mortalities that may occur on the 33kV power line and the identification of nests on the PV panels or ancillary infrastructure (including the telecommunication tower) and should these pose a significant risk to the quality of the supply, appropriate mitigation can be applied reactively.

11. ENVIRONMENTAL IMPACT STATEMENT

11.1 Conditions to be included in the EA

In conclusion, the habitat within which the proposed study area is located is low to moderately sensitive from a potential bird impact perspective. The construction of the proposed Solar PV and BESS Project will result in

impacts of moderate significance to birds occurring in the vicinity of the new infrastructure, which can be reduced to through the application of mitigation measures. The construction of the proposed telecommunication tower will result in impacts of low significance to birds occurring in the vicinity of the tower. It is anticipated that the proposed Solar PV, BESS Project and telecommunication tower can be constructed within the study area with acceptable levels of impact on the resident avifauna, subject to the following recommendations:

- Conduct a pre-construction inspection (avifaunal walk-through) of the final Solar PV and BESS layout, road and power line routes and telecommunication tower site to identify Red List species that may be breeding within footprint of the Solar PV, BESS Project and telecommunication tower sites and the road and power line servitudes to ensure that the impacts to breeding species (if any) are adequately managed.
- Construction activities (i.e. all staff, vehicle and machinery) should be restricted to the immediate footprint of the infrastructure.
- Access to the remainder of the site should be strictly controlled to prevent unnecessary disturbance of avifaunal species.
- The 33kV power line must be constructed using a bird friendly structure (i.e. Inverted Delta-T Structure - the same structure used for the existing Rietfontein feeder).
- Additional mitigation in the form of insulating sleeves on *jumpers* present on strain poles, terminal poles and box transformers should also be considered.
- Mitigation is complex at electrical generation structures since there are many factors that contribute to collisions with the PV panels. It is therefore recommended that mitigation be applied reactively once the BESS is operational. Monitoring of this infrastructure for bird fatalities should be built into the operational environmental management plan for the facility.
- If collision or electrocution impacts are recorded once the 33kV power line is operational It is recommended that the Eskom-Endangered Wildlife Trust Strategic Partnership investigate the mortalities and provide recommendations for site-specific mitigation to be applied reactively.
- Post construction monitoring to be conducted by Eskom-Endangered Wildlife Trust Strategic Partnership for a minimum two years of operation to evaluate mortalities and assess the efficacy of mitigation measures. Additional monitoring requirements will be determined following an assessment of the data collected over the two-year period. The resultant data to be made available to the avifaunal specialist community in order to better inform future solar facility assessment and recommendations.
- A carefully considered operational surface water/drainage management plan must be developed for the site including attention to the use of environmentally friendly cleaning chemicals on the solar panels.
- Maximum use should be made of existing access roads and the construction of new roads should be kept to a minimum.
- In addition to this, the normal suite of environmental good practices should be applied, such as ensuring strict control of staff, vehicles and machinery on site and limiting the creation of new roads as far as possible.

11.2 Specialist Opinion

In accordance with the outcomes of the impact assessment detailed in Section 8, in conjunction with the baseline conditions as presented in Section 7 and the impact management measures in Section 9, the proposed Mier Rietfontein Solar PV, Battery Storage Project and telecommunication tower are not deemed to present significant negative environmental issues or impacts. It is this specialist's opinion that the proposed Solar PV, BESS Project and telecommunication tower can be constructed at the preferred sites with acceptable levels of impact on the resident avifauna subject to the aforementioned mitigation and management measures.

12. ASSUMPTIONS, UNCERTAINTIES & GAPS IN KNOWLEDGE

The avifaunal specialist assumed that the sources of information used for this assessment are reliable. However, it must be noted that there are limiting factors and these may potentially detract from the accuracy of the predicted results.

- The report is the result of a short-term study and is based on a three-day site visit to the proposed study area. No long-term, seasonal monitoring was conducted by the avifaunal specialist. This assessment relies upon secondary data sources with regards to bird occurrence and abundance such as the SABAP2 and IBA projects. These comprehensive datasets provide a valuable baseline against which any changes in species presence, abundance, and distribution can be monitored. However, primary information on bird habitat and avifaunal species occurrence collected during the site visit and together with professional judgement, based on extensive field experience since 2006, was used directly in determining which species of conservation importance are likely to occur within suitable avifaunal habitat types within the proposed study area. Based on these findings, the specialist was able to identify and assess the anticipated impacts and provide recommendations for mitigation;
- The site visit to the Solar PV and BESS Project study area and the resultant observations were made in a single season (austral autumn), during which time migrant species may not have been present;
- The telecommunication tower site alternatives were evaluated based on a desktop assessment of the proposed sites.
- Although the proposed Solar PV, BESS Project and telecommunication tower are located within single pentad grid cell (2645_2000 and 2645_2020 respectively), a larger area is necessary to obtain a dataset that is large enough (encompassing six and five pentad grid cells respectively) to ensure that reasonable conclusions about species diversity and densities, in a particular habitat type, can be drawn. The SABAP2 data is regarded as a fairly rudimentary record of the avifauna occurring within the study area, due to the low number of full protocol data cards (n = 27 and n=20 respectively) which have

been completed to date across the relevant pentads (FIGURE 4). These surveys provide an adequate snapshot of the avifauna in the study area.

* The focus of this assessment is primarily on the potential impacts on regional Red List and priority species i.e., species that are vulnerable to the displacement and collision impacts associated with the construction and operation of the proposed Solar PV, BESS Project and telecommunication tower. The impact on non-Red List species is also assessed, albeit in less detail. Furthermore, much of the mitigation recommended for Red List species will also protect non-Red List species in the study area.
* Predictions in this study are based on experience of these and similar species in different parts of South Africa, through the authors' experience working in the avifaunal specialist field since 2006. However, bird behaviour can't be reduced to formulas that will hold true under all circumstances. It must also be noted that, it is often not possible to entirely eliminate the risk of the disturbance and displacement impacts associated with the construction and operational activities. Our best possible efforts can probably not ensure zero impact on birds. Assessments such as this attempt to minimise the risk as far as possible, and although the impacts associated with the proposed Solar PV, BESS Project and telecommunication tower will be unavoidable, they are likely to be temporary and of medium to low significance.

The above limitations need to be stated as part of this assessment so that the reader fully understands the complexities. However, they do not detract from the confidence that this author has in the findings of this impact assessment report and subsequent recommendations for this project.

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APPENDIX 1: SOUTH AFRICAN BIRD ATLAS PROJECT DATA (SABAP2) FOR THE PROPOSED SOLAR PV, BESS PROJECT AND TELECOMMUNICAITON TOWER

Family Name	Scientific Name	Red Data Global	Red Data Regional	Endemicity South Africa	Endemicity Southern Africa	Average Report Rate	No. of Records
Avocet, Pied	*Recurvirostra avosetta*					11.1	3
Barbet, Acacia Pied	*Tricholaema leucomelas*				Near-endemic	63.0	17
Batis, Pririt	*Batis pririt*				Near-endemic	51.9	14
Bee-eater, European	*Merops apiaster*					7.4	2
Bee-eater, Swallow-tailed	*Merops hirundineus*					7.4	2
Bokmakierie	*Telophorus zeylonus*				Near-endemic	63.0	17
Brubru	*Nilaus afer*					29.6	8
Bulbul, African Red-eyed	*Pycnonotus nigricans*				Near-endemic	40.7	11
Bunting, Lark-like	*Emberiza impetuani*				Near-endemic	70.4	19
Bustard, Kori	*Ardeotis kori*	NT	NT			3.7	1
Canary, Black-throated	*Crithagra atrogularis*					11.1	3
Canary, White-throated	*Crithagra albogularis*				Near-endemic	7.4	2
Canary, Yellow	*Crithagra flaviventris*				Near-endemic	55.6	15
Chat, Anteating	*Myrmecocichla formicivora*				Endemic	3.7	1
Chat, Familiar	*Cercomela familiaris*					14.8	4
Chat, Karoo	*Cercomela schlegelii*				Near-endemic	0.0	0
Cisticola, Desert	*Cisticola aridulus*					25.9	7
Cisticola, Zitting	*Cisticola juncidis*					3.7	1
Coot, Red-knobbed	*Fulica cristata*					7.4	2
Courser, Double-banded	*Rhinoptilus africanus*					14.8	4
Crombec, Long-billed	*Sylvietta rufescens*					25.9	7
Cuckoo, Diderick	*Chrysococcyx caprius*					7.4	2
Cuckoo, Jacobin	*Clamator jacobinus*					3.7	1
Dove, Laughing	*Streptopelia senegalensis*					74.1	20
Dove, Namaqua	*Oena capensis*					81.5	22
Duck, African Black	*Anas sparsa*					3.7	1

Family Name	Scientific Name	Red Data Global	Red Data Regional	Endemicity South Africa	Endemicity Southern Africa	Average Report Rate	No. of Records
Eagle, Booted	*Hieraaetus pennatus*					11.1	3
Eagle-owl, Spotted	*Bubo africanus*					11.1	3
Eremomela, Yellow-bellied	*Eremomela icteropygialis*					29.6	8
Falcon, Lanner	*Falco biarmicus*	LC	VU			7.4	2
Finch, Red-headed	*Amadina erythrocephala*				Near-endemic	40.7	11
Finch, Scaly-feathered	*Sporopipes squamifrons*				Near-endemic	48.1	13
Fiscal, Common	*Lanius collaris*					51.9	14
Flycatcher, Chat	*Bradornis infuscatus*				Near-endemic	25.9	7
Flycatcher, Spotted	*Muscicapa striata*					7.4	2
Goose, Egyptian	*Alopochen aegyptiaca*					44.4	12
Goshawk, Southern Pale Chanting	*Melierax canorus*				Near-endemic	33.3	9
Grebe, Little	*Tachybaptus ruficollis*					18.5	5
Greenshank, Common	*Tringa nebularia*					11.1	3
Heron, Black-headed	*Ardea melanocephala*					3.7	1
Ibis, African Sacred	*Threskiornis aethiopicus*					14.8	4
Jacana, African	*Actophilornis africanus*					3.7	1
Kestrel, Greater	*Falco rupicoloides*					3.7	1
Kestrel, Rock	*Falco rupicolus*					7.4	2
Kingfisher, Malachite	*Alcedo cristata*					3.7	1
Korhaan, Karoo	*Eupodotis vigorsii*	LC	NT		Endemic	66.7	18
Korhaan, Northern Black	*Afrotis afraoides*				Endemic	37.0	10
Lapwing, Blacksmith	*Vanellus armatus*					37.0	10
Lapwing, Crowned	*Vanellus coronatus*					14.8	4
Lark, Fawn-coloured	*Calendulauda africanoides*					18.5	5
Lark, Karoo Long-billed	*Certhilauda subcoronata*				Endemic	37.0	10
Lark, Pink-billed	*Spizocorys conirostris*				Near-endemic	3.7	1
Lark, Red-capped	*Calandrella cinerea*					3.7	1
Lark, Sabota	*Calendulauda sabota*				Near-endemic	66.7	18

Family Name	Scientific Name	Red Data Global	Red Data Regional	Endemicity South Africa	Endemicity Southern Africa	Average Report Rate	No. of Records
Lark, Spike-heeled	*Chersomanes albofasciata*				Near-endemic	37.0	10
Lark, Stark's	*Spizocorys starki*				Near-endemic	11.1	3
Martin, Rock	*Hirundo fuligula*					22.2	6
Masked-weaver, Southern	*Ploceus velatus*					55.6	15
Moorhen, Common	*Gallinula chloropus*					3.7	1
Mousebird, Red-faced	*Urocolius indicus*					18.5	5
Mousebird, White-backed	*Colius*				Endemic	25.9	7
Nightjar, Rufous-cheeked	*Caprimulgus rufigena*					18.5	5
Ostrich, Common	*Struthio camelus*					3.7	1
Palm-swift, African	*Cypsiurus parvus*					3.7	1
Pigeon, Speckled	*Columba guinea*					18.5	5
Pipit, African	*Anthus cinnamomeus*					3.7	1
Plover, Kittlitz's	*Charadrius pecuarius*					7.4	2
Plover, Three-banded	*Charadrius tricollaris*					40.7	11
Prinia, Black-chested	*Prinia flavicans*				Near-endemic	92.6	25
Pytilia, Green-winged	*Pytilia melba*					3.7	1
Quelea, Red-billed	*Quelea*					11.1	3
Sandgrouse, Namaqua	*Pterocles namaqua*				Near-endemic	81.5	22
Sandpiper, Wood	*Tringa glareola*					7.4	2
Scimitarbill, Common	*Rhinopomastus cyanomelas*					7.4	2
Scrub-robin, Kalahari	*Erythropygia paena*				Near-endemic	14.8	4
Scrub-robin, Karoo	*Erythropygia coryphoeus*				Endemic	29.6	8
Shelduck, South African	*Tadorna cana*				Endemic	29.6	8
Shoveler, Cape	*Anas smithii*				Near-endemic	3.7	1
Shrike, Lesser Grey	*Lanius minor*					3.7	1
Snake-eagle, Black-chested	*Circaetus pectoralis*					3.7	1
Sparrow, Cape	*Passer melanurus*				Near-endemic	96.3	26
Sparrow, House	*Passer domesticus*					25.9	7

Family Name	Scientific Name	Red Data Global	Red Data Regional	Endemicity South Africa	Endemicity Southern Africa	Average Report Rate	No. of Records
Sparrow, Southern Grey-headed	*Passer diffusus*					3.7	1
Sparrow-weaver, White-browed	*Plocepasser mahali*					18.5	5
Sparrowlark, Grey-backed	*Eremopterix verticalis*				Near-endemic	55.6	15
Stilt, Black-winged	*Himantopus*					33.3	9
Sunbird, Dusky	*Cinnyris fuscus*				Near-endemic	70.4	19
Swallow, Greater Striped	*Cecropis cucullata*					18.5	5
Swift, Common	*Apus*					14.8	4
Swift, Little	*Apus affinis*					44.4	12
Teal, Cape	*Anas capensis*					14.8	4
Teal, Red-billed	*Anas erythrorhyncha*					7.4	2
Thick-knee, Spotted	*Burhinus capensis*					11.1	3
Tit, Ashy	*Parus cinerascens*				Near-endemic	3.7	1
Tit-babbler, Chestnut-vented	*Sylvia subcaerulea*				Near-endemic	63.0	17
Turtle-dove, Cape	*Streptopelia capicola*					88.9	24
Vulture, Lappet-faced	*Torgos tracheliotos*	EN	EN			3.7	1
Vulture, White-backed	*Gyps africanus*	CR	CR			7.4	2
Wagtail, Cape	*Motacilla capensis*					18.5	5
Warbler, Rufous-eared	*Malcorus pectoralis*				Endemic	74.1	20
Waxbill, Common	*Estrilda astrild*					11.1	3
Waxbill, Violet-eared	*Uraeginthus granatinus*					3.7	1
Weaver, Sociable	*Philetairus socius*				Endemic	3.7	1
Wheatear, Capped	*Oenanthe pileata*					59.3	16
Wheatear, Mountain	*Oenanthe monticola*				Near-endemic	14.8	4
Whydah, Pin-tailed	*Vidua macroura*					3.7	1
Whydah, Shaft-tailed	*Vidua regia*				Near-endemic	3.7	1

APPENDIX 2: AVIFAUNAL HABITAT OBSERVED WITHIN THE SOLAR PV AND BESS PROJECT STUDY AREA

FIGURE 1: Shrubland habitat dominates the proposed Solar PV and BESS Project sites

FIGURE 2: A typical farm dam found within the broader study area

FIGURE 3: Drainage line to the northeast of the study area

FIGURE 4: Ephemeral drainage line within the study area

FIGURE 5: Old sewage or water treatment works located to the east of the proposed project area

FIGURE 6: Hakskeen Pan

FIGURE 7: Pastoral activities feature prominently in the study area

FIGURE 8: Rietfontein

APPENDIX 3: METHOD OF ASSESSING THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS

The impact assessment was undertaken using a matrix selection process, the most used methodology, for determining the significance of potential environmental impacts/risks. This methodology is based on the minimum requirements as outlined in Appendix 3 of the EIA Regulations of 2014. The methodology incorporates four aspects for assessing the potential significance of impacts, namely direction, severity, probability of occurrence, and reversibility, which are further sub-divided as follows.

Table 1: Impact assessment factors

Direction	Severity			Probability	Reversibility
Positive/ negative	Magnitude	Duration	Scale/extent	Probability of occurrence	Reversible/ irreversible

To determine the significance of each potential impact/risk, the following four ranking scales are used

Table 2: Impact assessment scoring methodology

Value	Description
Magnitude	
10	Very high/unknown (of the highest order possible within the bounds of impacts that could occur. In the case of adverse impacts, there is no possible mitigation that could offset the impact, or mitigation is difficult, expensive, time-consuming or some combination of these. Social, cultural, and economic activities of communities are disrupted to such an extent that these come to a halt).
8	High
6	Moderate (impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. In the case of adverse impacts, mitigation is both feasible and easily possible. Social, cultural, and economic activities of communities are changed, but can be continued (albeit in a different form). Modification of the project design or alternative action may be required).
4	Low (impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts, mitigation is either easily achieved or little will be required, or both. Social, cultural, and economic activities of communities can continue unchanged.)
2	Minor
Duration	
5	Permanent (Permanent or beyond closure)
4	Long term (more than 15 years)
3	Medium-term (5 to 15 years)
2	Short-term (1 to 5 years)

Value	Description
1	Immediate (less than 1 year)
Scale	
5	International
4	National
3	Regional
2	Local
1	Site only
0	None
Probability	
5	Definite/unknown (impact will definitely occur)
4	Highly probable (most likely, 60% to 90% chance)
3	Medium probability (40% to 60% chance)
2	Low probability (5% to 40% chance)
1	Improbable (less than 5% chance)
0	None

Significance = (Magnitude + Duration + Scale) x Probability

Table 3: Significance of impact based on point allocation

Points	Significance	Description
SP>75	High environmental significance	An impact which could influence the decision about whether or not to proceed with the project regardless of any possible mitigation.
SP 30 - 75	Moderate environmental significance	An impact or benefit which is sufficiently important to require management, and which could have an influence on the decision unless it is mitigated.
SP<30	Low environmental significance	Impacts with little real effect and which will not have an influence on or require modification of the project design.
+	Positive impact	An impact that is likely to result in positive consequences/effects.

For the methodology outlined above 2), the following definitions were used:

- **Direction** of an impact may be positive, neutral, or negative with respect to the impact
- **Magnitude** is a measure of the degree of change in a measurement or analysis (e.g., the severity of an impact on human health, well-being, and the environment), and is classified as none/negligible, low, moderate, high, or very high/unknown
- **Scale/geographic extent** refers to the area that could be affected by the impact and is classified as site, local, regional, national, or international
- **Duration** refers to the length of time over which an environmental impact may occur i.e., immediate/transient, short-term, medium term, long-term, or permanent
- **Probability** of occurrence is a description of the probability of the impact occurring as improbable, low probability, medium probability, highly probable or definite
- **Reversibility** of an impact, which may be described as reversible or irreversible

APPENDIX 4: CURRICULUM VITAE

MEGAN DIAMOND

PERSONAL DETAILS

Date of Birth | *7 December 1978*

Driver's License | *Code A and B*

Home Language | *English*

Other Languages | *Afrikaans*

EDUCATION

BSc Environmental Management | *University of South Africa (UNISA)* 2002 – 2009

ACCREDITATION

South African Council for Natural Scientific Professions | *Environmental Science*

Registration Number: 300022/14

EXPERIENCE

Owner & Avifaunal Specialist | *Feathers Environmental Services*

July 2013 – Present

- Perform specialist avifaunal assessment studies to minimise the impact of industrial infrastructure on birds and their habitats;
- Provide strategic guidance to industry through the development of best practice procedures and guidelines;
- Review and comment on methodologies, specialist studies and EIA reports for Renewable Energy projects;
- Provide input into renewable energy and power line developments elsewhere in Africa and across the globe;
- Manage the collection and collation of relevant and complete desktop and/or field datasets;
- Manage pre- and post-construction avifaunal monitoring data collected at wind and solar energy facilities;
- Site assessments, either as part of the project team or independently;
- Preparation of reports according to project deadlines, including the use of Geographic Information Systems (GIS) to portray data;
- Attendance of specialist integration meetings; and
- Liaison with stakeholders where necessary.

Wildlife & Energy Programme Manager | *Endangered Wildlife Trust*

October 2006 – June 2013

Programme management

- Annually review the programme's conservation and research strategic objectives and update in accordance with the EWT's and programme's vision and mission including work plans for staff etc.;
- Ensure timeous, professional delivery on all aspects of Wildlife & Energy Programme activities;
- Formulate, prioritise and approve relevant research and conservation projects;
- Ensure acceptable quality of all research projects and their outputs;
- Participate in international network liaison as and when required;
- Produce regular popular articles & media releases on the Wildlife & Energy Programme projects and outputs & contribute to the EWT publications;
- Establish & maintain a network with relevant national & international stakeholders;
- Deliver presentations at relevant meetings, functions, workshops & conferences on behalf of the programme;
- Assist with compilation of newsletters, updating of webpage, compilation of press articles, any advocacy issues;
- Identify & establish partnerships to achieve Wildlife & Energy Programme conservation goals.

Eskom –EWT Strategic Partnership

- Ensure that this partnership is managed effectively and sustainably against its goals. Manage staff in this division;
- Develop and maintain relationships with Eskom;
- Negotiate the terms of reference for the annual service level agreements between EWT and Eskom, to ensure the sustainability of the relationship;
- Compile annual report to Eskom Corporate Environment and Sustainability;
- Produce monthly reports to Eskom's regional grids on the status of incident follow-up;
- Attend applicable forums to interact with Eskom stakeholders;
- Participate in international network liaison as and when required;
- Maintain a network with all relevant local and regional level stakeholders (meetings, forums, workshops, etc.);
- Identify research needs relating to the management of wildlife interaction with power lines;
- Conduct research projects on wildlife and power line interaction and present the results at national and international conferences and workshops;
- Development and implementation of training for Eskom field services staff (at various levels) in the management of wildlife interactions; and
- Conduct special investigations on power lines relating to wildlife induced faulting.

Environmental Impact Assessment Division

- Ensure that this division operates effectively and efficiently at all times and manage staff in this division; and

- Conduct specialist avifaunal studies for new power lines developments including: tendering/quoting for the projects, conducting field work, preparing reports, presenting results & negotiating the acceptance of recommendations, final "walk through" as part of Environmental Management Plans; general project management, all liaison with clients, Eskom, authorities, Interested and Affected Parties etc.

Management and administration

- Ensure all programme staff have relevant terms of reference;
- Ensure that all programme staff are performance appraised against their terms of reference;
- Compile and manage programme budgets, monthly reports, work plans and strategy;
- Monitor expenditure and take corrective action if necessary; and
- Ensure timely delivery on all projects to all stakeholders.

CONFERENCE ATTENDANCE

- *Society for Conservation Biology 21st Annual Meeting (1-5 July 2007)*
- *The 6th TAWIRI Scientific Conference (3 – 6 December 2007)* ***Presented a paper titled*** **"Co-operative management of wildlife and power line conflicts: an African solution"**
- Pan-African Ornithological Congress (7-12 September 2008)
- International Conference on Overhead Lines, Design, Construction, Inspection & Maintenance, Fort Collins Colorado USA. (29 March – 1 April 2010) **Presented a paper titled "Bird's eye view: how birds see is key to avoiding power line collision"**
- Windaba 2011 – Implementing South African Wind Energy (27-29 September 2011)
- Pan African Vulture Summit (16-20 April 2012) **Presented a paper titled "Electrification in Africa – Are our vultures being strung along"**
- 4th Wind Power Africa Conference & Renewable Energy Exhibition (28-30 May 2012) **Presented a paper titled "Wind Energy in Africa – what does this really mean for our continent's birds"**
- 13th Pan-African Ornithological Congress (14-21 October 2012) **Presented a paper titled "Stringing South Africa's Terrestrial Birds Along - Monitoring of Bird Interactions with Power Line and Experimental Testing of Bird Collision Mitigation at the Karoo Long Term Monitoring Site"**
- AEWA Single Species Action-Planning Workshop for the Conservation of the Grey Crowned Crane (10-13 September 2013) **Presented and participated in the workshop as a subject expert (energy and bird interactions)**

AUTHORED & CO-AUTHORED PAPERS

Jenkins, A.R., Smallie, J. & **Diamond, M.** 2009. Balls, flashers, flappers and coils: South African perspectives on a global search for ways to prevent avian collisions with overhead lines. In: Harebottle, D.M., Craig, A.J.F.K., Anderson, M.D., Rakatomonana, H. & Muchai, M. (eds). Proceedings of the 12th Pan-African Ornithological Congress, 2008. Cape Town, Animal Demography Unit.

Smallie, J., Diamond, M. & Jenkins, A. 2009. Lighting up the African continent – what does it 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.

Jenkins, A. R., Smallie, J.J and Diamond, M. 2010 Avian collisions with power lines: a global review of causes and mitigation with a South African perspective. Bird Conservation International, page1 of16.

Retief, E.F., Diamond, M., Anderson, M.D., Smit, H.A., Jenkins, A.R., Brooks, M. 2011. Avian Wind Farm Sensitivity Map for South Africa.

Jenkins, A.R., Van Rooyen, C.S., Smallie, J.J., Harrison, J.A., Diamond, M. And Smit, H.A. 2012. BirdLife South Africa / Endangered Wildlife Trust best practice guidelines for avian monitoring and impact mitigation at proposed wind energy development sites in southern Africa.

Jenkins, A.R., De Goede, K.H., Sebele, L. and Diamond, M. 2013. Brokering a settlement between eagles and industry: sustainable management of large raptors nesting on power infrastructure. Bird Conservation International (2013) 23:232 – 246.

Diamond, M., Harris, J., Mirande, C. and Austin, J. 2014. People of a feather flock together: A global initiative to address crane and power line interactions. 13th North American Crane Workshop Summary. Lafayette, Louisiana.

Page-Nicholson, S., Tate, G., Hoogstad, C., Murison, M., Diamond, M., Blofield, A., Pretorius, M., Michael, M.D. 2018. Mitigating the Impact of Large Mammals on Wooden Electrical Distribution Poles in the Kruger National Park, South Africa. African Journal of Wildlife Research.

Diamond, M. and Hoogstad, C. (in press) Collisions and habitat loss associated with utility lines and wind turbines. IUCN SSC Crane Specialist Group – Crane Conservation Strategy.

forestry, fisheries & the environment

Department:
Forestry, Fisheries and the Environment
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Mier Rietfontein Solar PV and Battery Storage Project

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of April 2021. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Online Submission:
EIAapplications@environment.gov.za or https://sfiler.environment.gov.za:8443/.

Please read the process for uploading files to determine how files are to submitted to this Department.
Postal address:
Department of Forestry, Fisheries and the Environment
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Forestry, Fisheries and the Environment
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	Feathers Environmental Services			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100%
Specialist name:	Megan Diamond			
Specialist Qualifications:	BSc Environmental Management			
Professional affiliation/registration:	SACNASP 300022/14			
Physical address:	26 Ixia Creek, Girdwood Avenue, Boskruin, Johannesburg, 2188			
Postal address:	PO Box 786962 Sandton			
Postal code:	2146	Cell:	082 683 0970	
Telephone:	082 683 0970	Fax:	N/A	
E-mail:	megan@feathersenv.co.za			

2. DECLARATION BY THE SPECIALIST

I, _____ MEGAN DIAMOND _____, declare that –

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

Signature of the Specialist

FEATHERS ENVIRONMENTAL SERVICES

Name of Company:

9 JULY 2021

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, _____ MEGAN DIAMOND _____, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

FEATHERS ENVIRONMENTAL SERVICES

Name of Company

9 JULY 2021

Date

Signature of the Commissioner of Oaths

9 July 2021

Date

COMMISSIONER OF OATHS
Theresa Achada
Practising Attorney
Le Val, Westcliff
First Floor, North Block
45 Westcliff, 2122
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