SiVEST (PTY) LTD

PROPOSED CONSTRUCTION OF THE 132KV POWER LINE BETWEEN THE AUTHORISED LOERIESFONTEIN 3 PV SOLAR ENERGY FACILITY AND THE AUTHORISED DWARSRUG WIND ENERGY FACILITY AND FROM THE DWARSRUG WIND ENERGY FACILITY TO THE AUTHORISED NAROSIES SUBSTATION, NEAR LOERIESFONTEIN, NORTHERN CAPE PROVINCE

Avifaunal Impact Assessment

DEA Reference: TBA
Report Prepared by: Chris van Rooyen Consulting
Issue Date: 9 December 2020
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PROPOSED CONSTRUCTION OF THE 132KV POWER LINE BETWEEN THE AUTHORISED LOERIESFONTEIN 3 PV SOLAR ENERGY FACILITY AND THE AUTHORISED DWARSRUG WIND ENERGY FACILITY AND FROM THE DWARSRUG WIND ENERGY FACILITY TO THE AUTHORISED NAROSIES SUBSTATION, NEAR LOERIESFONTEIN, NORTHERN CAPE PROVINCE

AVIFAUNAL IMPACT ASSESSMENT

EXECUTIVE SUMMARY

The proposed Loeriesfontein PV 3 - Dwarsrug 132kV OHL will have several impacts on priority avifauna. The impacts can be summarised as follows:

- Displacement of priority species due to disturbance associated with the construction and decommissioning activities of the 132kV OHLs.
- Mortality of priority species due to electrocutions on the 132kV OHLs.
- Mortality of priority species due to collisions with the 132kV OHLs.

CONSTRUCTION PHASE

- **Displacement of priority species due to disturbance associated with the construction activities of the 132kV OHLs**

Construction activities in close proximity to breeding locations could be a source of disturbance and could lead to temporary breeding failure or even permanent abandonment of nests. Large terrestrial species namely Ludwig's Bustard, and Karoo Korhaan could be affected by displacement due to disturbance. The biggest potential impact will be on the pair of Martial Eagles that breed on the Aries – Helios 400kV line. The proposed Loeriesfontein – Dwarsrug 132kV OHL will pass underneath the Aries – Helios 400kV line very close to Tower 455, which contains one of the two nests that the birds are using. A potential mitigation measure is the timing of the construction activities to avoid disturbance

during a critical phase of the breeding cycle, should this specific nest be utilised at the time, although it is likely that the birds will not use this specific nest if there is a lot of activity near the nesting tower, but rather the alternative nest on Tower 452, which is 2.4 km away from the proposed alignment.

The priority species which are potentially vulnerable to this impact are listed in Table 2, and below. Species with a high likelihood of regular occurrence in the study area are in bold:

- Ludwig's Bustard
- Karoo Korhaan
- Martial Eagle

This impact is assessed to be medium and can be reduced to low through mitigation.

OPERATIONAL PHASE

- **Mortality of priority species due to electrocutions on the 132kV OHLs.**

Clearance between phases on the same side of the DT 7611 pole structure is approximately 2.2m, and the clearance on strain structures is 1.8m. This clearance should be sufficient to reduce the risk of phase – phase electrocutions of most birds on the towers to negligible. The length of the stand-off insulators is approximately 1.6m. If a very large species attempts to perch on the stand-off insulators, they are potentially able to touch both the conductor and the earthed pole simultaneously potentially resulting in a phase – earth electrocution. This is particularly likely when more than one bird attempts to sit on the same pole, which is an unlikely occurrence, except occasionally with vultures. Vultures are not likely to regularly occur within the study area, and due to the presence of other perch-friendly transmission lines in the broader area, the chances of the birds perching on the steel monopoles of the new line are relatively low. However, it cannot be entirely ruled out, because Lappet-faced Vulture has been recorded. It would be preferable if a 100% vulture friendly structure is used. To eliminate the risk of vulture electrocutions, the 7649 steel monopole structure is proposed with suspended insulators and diagonal supporting cross arms, which would make perching uncomfortable while ensuring that birds are clear of the live phases.

This impact is assessed to be low and can be further reduced through mitigation.

- **Mortality of priority species due to collisions with the 132kV OHLs.**

Collisions are the biggest threat posed by transmission lines to birds in southern Africa (Van Rooyen 2004). Most heavily impacted upon are bustards, storks, cranes and various species of waterbirds, and to a lesser extent, vultures. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with transmission lines (Van Rooyen 2004, Anderson 2001). In this instance, the OHLs will pose the biggest risk to large

terrestrial species (bustards and korhaans), followed by waterbirds and vultures. The priority species which are potentially vulnerable to this impact are listed in Table 2, and below. Species with a high likelihood of regular occurrence in the study area are in bold:

- Lappet-faced Vulture
- Black-headed Heron
- Kori Bustard
- African Black Duck
- Lesser Flamingo
- Spur-winged Goose
- South African Shelduck
- **Ludwig's Bustard**
- **Karoo Korhaan**

This impact is assessed to be medium and can be reduced through mitigation, but it will remain at medium level after mitigation.

DECOMMISSIONING PHASE

Decommissioning activities in close proximity to breeding locations could be a source of disturbance and could lead to temporary breeding failure or even permanent abandonment of nests. Large terrestrial species namely Ludwig's Bustard, and Karoo Korhaan could be affected by displacement due to disturbance. The biggest potential impact could be on the Martial Eagles that breed on the Aries – Helios 400kV line. The proposed Loeriesfontein – Dwarsrug 132kV OHL will pass underneath the Aries – Helios 400kV line very close to Tower 455, which contains one of the two nests that the birds are currently using.

The priority species which are potentially vulnerable to this impact are listed in Table 2, and below. Species with a high likelihood of regular occurrence in the study area are in bold:

- **Ludwig's Bustard**
- **Karoo Korhaan**
- **Martial Eagle**

This impact is assessed to be medium and can be reduced to low through mitigation.

PREFERRED CORRIDOR OPTION FOR AVIFAUNA

Both alternatives are routed through similar habitat and will therefore result in similar impacts. However, none of the other route alternatives were deemed to be fatally flawed.

ENVIRONMENTAL SENSITIVITIES

The entire study area is rated as High sensitivity due to the presence of collision-prone species. It would therefore be advisable to mitigate the whole OHL with Bird Flight Diverters (BFDs) if possible.

OVERALL SIGNIFICANCE RATING

The table below provides a summary of the respective significance ratings, and an average overall rating before and after mitigation.

Impact	Rating pre-mitigation	Rating post-mitigation
Displacement due to disturbance (Construction)	Medium (30)	Low (14)
Electrocution on the 132kV OHLs	Low (22)	Low (12)
Collisions with 132kV OHLs	Medium (26)	Medium (24)
Displacement due to disturbance (De-commissioning)	Medium (30)	Low (14)
Cumulative impacts	Medium (23)	Low (16)
Average:	**Medium (26)**	**Low (16)**

CONCLUSION AND IMPACT STATEMENT

The proposed Loeriesfontein PV - Dwarsrug 132kV OHL, and the 132 kV powerline to link these two facilities to the National grid at the Narosies substation, are expected to have a medium impact on priority species. This impact could be reduced to low through the application of appropriate mitigation measures. No fatal flaws were discovered in the course of the investigations. Based on the outcome of the investigations into the impact of the proposed 132kV OHLs on avifauna, the authorisation of the OHLs is supported, provided the mitigation measures contained in this specialist report are strictly implemented.

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

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	**Section of Report**
1. (1) A specialist report prepared in terms of these Regulations must contain- a) details of- i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Page 8-10 Appendix 2
b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page 7
c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1
(cA) an indication of the quality and age of base data used for the specialist report;	Section 1
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 6
d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 2
e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 2
f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 6
g) an identification of any areas to be avoided, including buffers;	Section 6
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;	N/A
i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 2
j) a description of the findings and potential implications of such findings on the impact of the proposed activity, (including identified alternatives on the environment) or activities;	Section 6

k) any mitigation measures for inclusion in the EMPr;	Section 6
l) any conditions for inclusion in the environmental authorisation;	Section 6
m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	N/A
n) a reasoned opinion- i. (as to) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 8
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
q) any other information requested by the competent authority.	N/A
2) Where a government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	N/A

environmental affairs
Department:
Environmental Affairs
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

PROPOSED CONSTRUCTION OF 132 KV POWERLINE BETWEEN THE APPROVED SUBSTATION AT THE AUTHORISED LOERIESFONTEIN 3 PV SOLAR ENERGY FACILITY (12/12/20/2321/2/AM4) AND THE APPROVED SUBSTATION AT THE AUTHORISED DWARSRUG WIND ENERGY FACILITY (14/12/16/3/3/2/690/AM4), LOCATED NEAR LOERIESFONTEIN IN THE HANTAM LOCAL MUNICIPALITY, NAMAKWA DISTRICT IN THE NORTHERN CAPE PROVINCE OF SOUTH AFRICA.

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 01 September 2018. 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

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
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

Mainstream Renewable Power
Bird Impact Assessment Study
Version No. 1

Prepared by: Chris van Rooyen Consulting

Date: 09 December 2020

SPECIALIST INFORMATION

Specialist Company Name:	Afrimage Photography (Pty) Ltd t/a Chris van Rooyen Consulting			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	Level 4	Percentage Procurement recognition	0
Specialist name:	Chris van Rooyen			
Specialist Qualifications:	BA LLB			
Professional affiliation/registration:	I work under the supervision of and in association with Albert Froneman (MSc Conservation Biology) (SACNASP Zoological Science Registration number 400177/09) as stipulated by the Natural Scientific Professions Act 27 of 2003			
Physical address:	6 Pladda Drive Plettenberg Bay			
Postal address:	P O Box 2676, Fourways			
Postal code:	2055			
Telephone:	0824549570			
E-mail:	Vanrooyen.chris@gmail.com			

DECLARATION BY THE SPECIALIST

I, Chris van Rooyen, 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

Afrimage Photography (Pty) Ltd

Name of Company:

9 December 2020

Date:

UNDERTAKING UNDER OATH/ AFFIRMATION

I, Chris van Rooyen, 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

Chris van Rooyen Consulting
Name of Company

10 December 2020
Date

Signature of the Commissioner of Oaths

2020-12-10
Date

SOUTH AFRICAN POLICE SERVICE
PLETTENBERG BAY
2020 -12- 10
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SOUTH AFRICAN POLICE SERVICE

AVIFAUNAL IMPACT ASSESSMENT

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Glossary of Terms

- Broader area: The area encompassed by the 6 pentads where the project is located.
- Cumulative impact: Impacts from different projects that combine to result in significant change, which could be larger than the sum of all the individual impacts.
- Pentad: A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 7.6 km.
- Priority species: Species which could potentially be impacted by powerline collisions or electrocutions, based on specific morphological and/or behavioural characteristics.
- Study area: The area covered by a 2km buffer around the proposed alignment alternatives.

List of Abbreviations

- BFD: Bird Flight Diverter
- DEFF: Department of Environment, Forestry and Fisheries
- EA: Environmental Authorisation
- EMPr: Environmental Management Programme
- GN: Government Notice
- HV: High voltage
- IBA: Important Bird Area
- IUCN: International Union for the Conservation of Nature
- kV: Kilovolt
- MW: Megawatt
- NPEAS: National Protected Areas Expansion Strategy
- OHL: Overhead Powerline
- SABAP2: South African Bird Atlas Project 2
- SANBI: South African National Biodiversity Institute
- SEF: Solar Energy Facility
- WEF: Wind Energy Facility

SiVEST (PTY) LTD

AVIFAUNAL IMPACT ASSESSMENT

1. INTRODUCTION

Chris van Rooyen Consulting has been appointed by SiVEST (PTY) Ltd, on behalf of South Africa Mainstream Renewable Power Developments (Pty) Ltd (hereafter referred to as "Mainstream") to undertake a Basic Assessment (BA) Process for the proposed construction of a 132 kV powerline between the approved substation at the authorised 100MW Loeriesfontein 3 Photovoltaic (PV) Solar Energy Facility (SEF) (12/12/20/2321/2/AM4) and the approved substation at the authorised 140MW Dwarsrug Wind Energy Facility (WEF) (14/12/16/3/3/2/690/AM4), located near Loeriesfontein in the Northern Cape Province of South Africa. In addition, single 132 kV powerline corridor route is proposed to link these two (2) facilities to the National grid at the Narosies substation from the Dwarsrug WEF.

The grid connection is required to link the authorised 100MW Loeriesfontein 3 PV SEF to the authorised 140MW Dwarsrug WEF in order to create a hybrid energy facility. The hybrid energy facility will ensure that electricity is constantly supplied to the national grid by at least one (1) or both technologies (namely solar PV and wind) at any given time. Separate BA processes to add battery energy storage systems (BESS) to both renewable energy facilities (Loeriesfontein 3 BESS DEFF Reference number: 14/12/16/3/3/1/2263 and Dwarsrug BESS DEFF Reference number: 14/12/16/3/3/1/2262) are currently underway. The BESS will contribute to the hybrid renewable energy facility by storing and providing electricity for the national grid.

In terms of the Environmental Impact Assessment (EIA) Regulations, which were published on 04 December 2014 [GNR 982, 983, 984 and 985) and amended on 07 April 2017 [promulgated in Government Gazette 40772 and Government Notice (GN) R326, R327, R325 and R324 on 7 April 2017], various aspects of the proposed development are considered listed activities under GNR 327 and GNR 324 which may have an impact on the environment and therefore require authorisation from the National Competent Authority (CA), namely the Department of Environment, Forestry and Fisheries (DEFF), prior to the commencement of such activities. Specialist studies have been commissioned to assess and verify the power line under the new Gazetted specialist protocols.

1.1 Scope and Objectives

Assess the impacts associated with the proposed power line required to link the authorised 100MW Loeriesfontein 3 PV SEF to the authorised 140MW Dwarsrug WEF in order to create a hybrid energy facility,

as well as the single 132 kV powerline corridor route is proposed to link these two (2) facilities to the National grid at the Narosies substation from the Dwarsrug WEF.

1.2 Terms of Reference

Please see Appendix 1

1.3 Specialist Credentials

Please see Appendix 2 Specialist CVs

1.4 Assessment Methodology

The following information sources were consulted in order to conduct this study:

- Bird distribution data from the Southern African Bird Atlas Project 2 (SABAP2) was obtained (http://sabap2.adu.org.za/), in order to ascertain which species occur in the pentads where the proposed development area is located. A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 7.6 km. In order to get a more representative impression of the birdlife, a consolidated data set was obtained for a total of 6 pentads which intersect with the development, henceforth called the broader area. The SABAP2 data covers the period 2007 to 2020. The relevant pentads are 3020_1930, 3020_1935, 3025_1930, 3025_1935, 3030_1930, 3030_1935.
- A classification of the vegetation types in the development area was obtained from the Atlas of Southern African Birds 1 (SABAP1) and the National Vegetation Map (2018) accessed via the South African National Biodiversity BGIS map viewer (SANBI 2020).
- The national threatened status of all priority species was determined with the use of the most recent edition of the Red Data Book of Birds of South Africa, Lesotho and Swaziland (Taylor et al. 2015), and the latest authoritative summary of southern African bird biology (Hockey et al. 2005).
- The global threatened status of all priority species was determined by consulting the latest (2020.2) IUCN Red List of Threatened Species.
- The Important Bird and Biodiversity Areas of South Africa (Marnewick et al. 2015) was consulted for information on potentially relevant Important Bird Areas (IBAs).
- The South African National Biodiversity BGIS map viewer was used to determine the locality of the study area relative to National Protected Areas.
- The DEFF National Screening Tool was consulted to determine the assigned avian sensitivity of the study area.
- Satellite imagery was used to view the broader area on a landscape level and to help identify bird habitat on the ground.

- Information collected during the 24 months of operational monitoring at the Loeriesfontein 2 Wind Energy Facility (WEF) from June 2018 to March 2020 was used to supplement the SABAP2 data.

2. ASSUMPTIONS AND LIMITATIONS

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

- A total of 59 SABAP2 full protocol lists had been completed for the broader area where the proposed project is located (i.e. bird listing surveys lasting a minimum of two hours each). In addition, 59 ad hoc protocol lists (i.e. bird listing surveys lasting less than two hours but still giving useful data) were also recorded. The SABAP2 data was therefore regarded as an adequate indicator of the avifauna which could occur at the proposed development area, and it was further supplemented by data collected during the operational monitoring conducted at the Loeriesfontein 2 WEF.
- The focus of the study was primarily on the potential impacts of the proposed OHLs on priority species. Priority species were defined as species which could potentially be impacted by power line collisions or electrocutions, based on specific morphological and/or behavioural characteristics[1]. Priority species were further subdivided into raptors, waterbirds, terrestrial birds and corvids.
- The assessment of impacts is based on the baseline environment as it existed at the time of the operational monitoring at the Loeriesfontein 2 WEF.
- Cumulative impacts include all proposed and existing renewable energy projects within a 35km radius around the proposed development areas.
- Conclusions drawn in this study are based on experience of the specialist on the species found on site and similar species in different parts of South Africa. However, bird behaviour can never be entirely reduced to formulas that will be valid under all circumstances.
- The **broader area** was defined as the area encompassed by the 6 pentads where the project is located. The **study area** was defined as the area covered by a 2km buffer around the proposed alignments options.

3. TECHNICAL DESCRIPTION

3.1 Project Location

The proposed powerline alternatives are located near Loeriesfontein in the Hantam Local Municipality, Namakwa District Municipality, in the Northern Cape Province of South Africa.

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

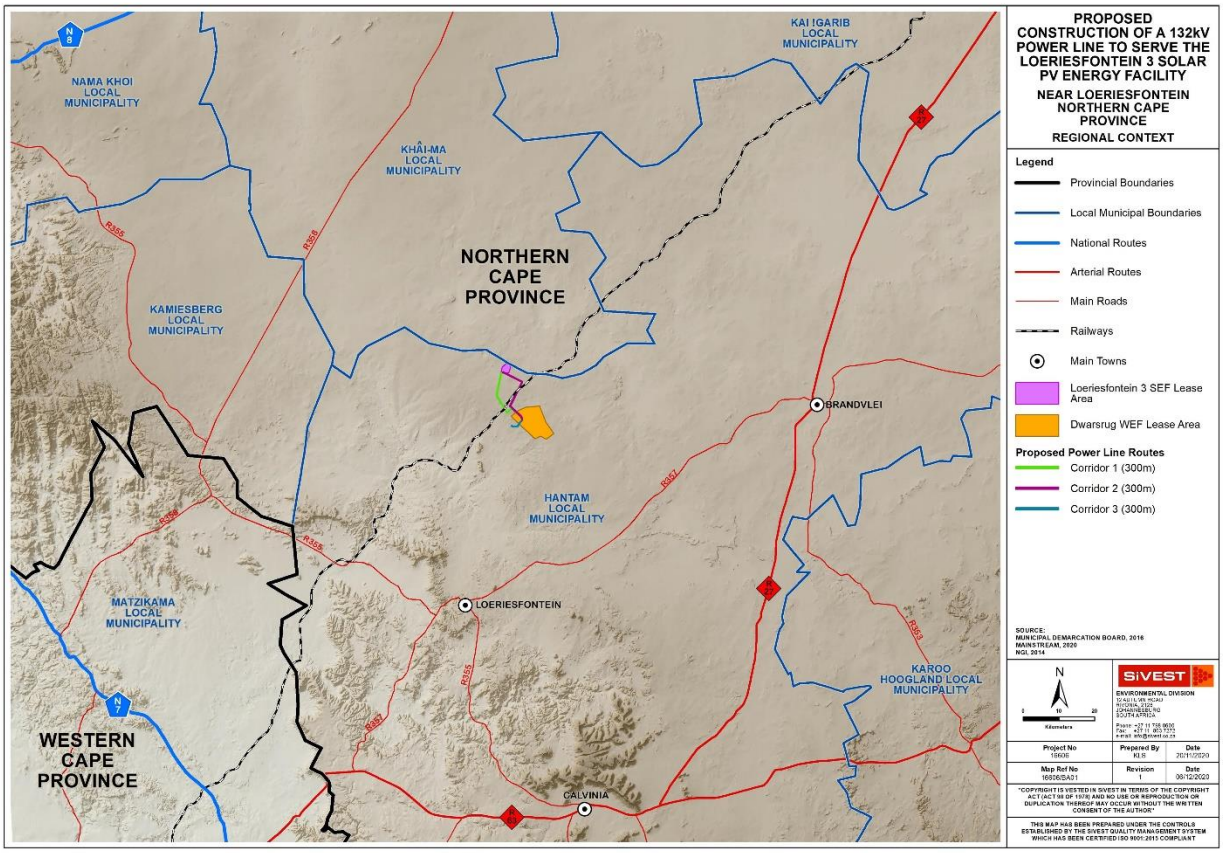


Figure 1: Regional Context Map

3.2 Project Description

Mainstream are proposing the construction of a 132 kV grid connection between the approved substation at the authorised 100MW Loeriesfontein 3 PV SEF (12/12/20/2321/2/AM4) and approved substation at the authorised 140MW Dwarsrug WEF (14/12/16/3/3/2/690/AM4), located near Loeriesfontein in the Hantam Local Municipality, Namakwa District in the Northern Cape Province of South Africa. In addition, a single 132 kV powerline corridor route is proposed to link these two (2) facilities to the National grid at the Narosies substation from the Dwarsrug WEF.

The grid connection is required to link the authorised 100MW Loeriesfontein 3 PV SEF to the authorised 140MW Dwarsrug WEF in order to create a hybrid energy facility. The hybrid energy facility will ensure that electricity is constantly supplied to the national grid by at least one (1) or both technologies (namely solar PV and wind) at any given time. Separate BA processes to add battery energy storage systems (BESS) to both renewable energy facilities (Loeriesfontein 3 BESS DEFF Reference number: 14/12/16/3/3/1/2263 and Dwarsrug BESS DEFF Reference number: 14/12/16/3/3/1/2262) are currently underway. The BESS will contribute to the hybrid renewable energy facility by storing and providing electricity for the national grid.

3.3 Layout alternatives

Two (2) Power line alternatives are proposed to link the authorised Loeriesfontein 3 PV SEF to the authorised Dwarsrug WEF. These alternatives provide for two (2) different power line route alignments contained within an assessment corridor (each 300m wide, 150m on either side of power line). The Power line alternatives which are being proposed and assessed are shown in **Figure 2** below.

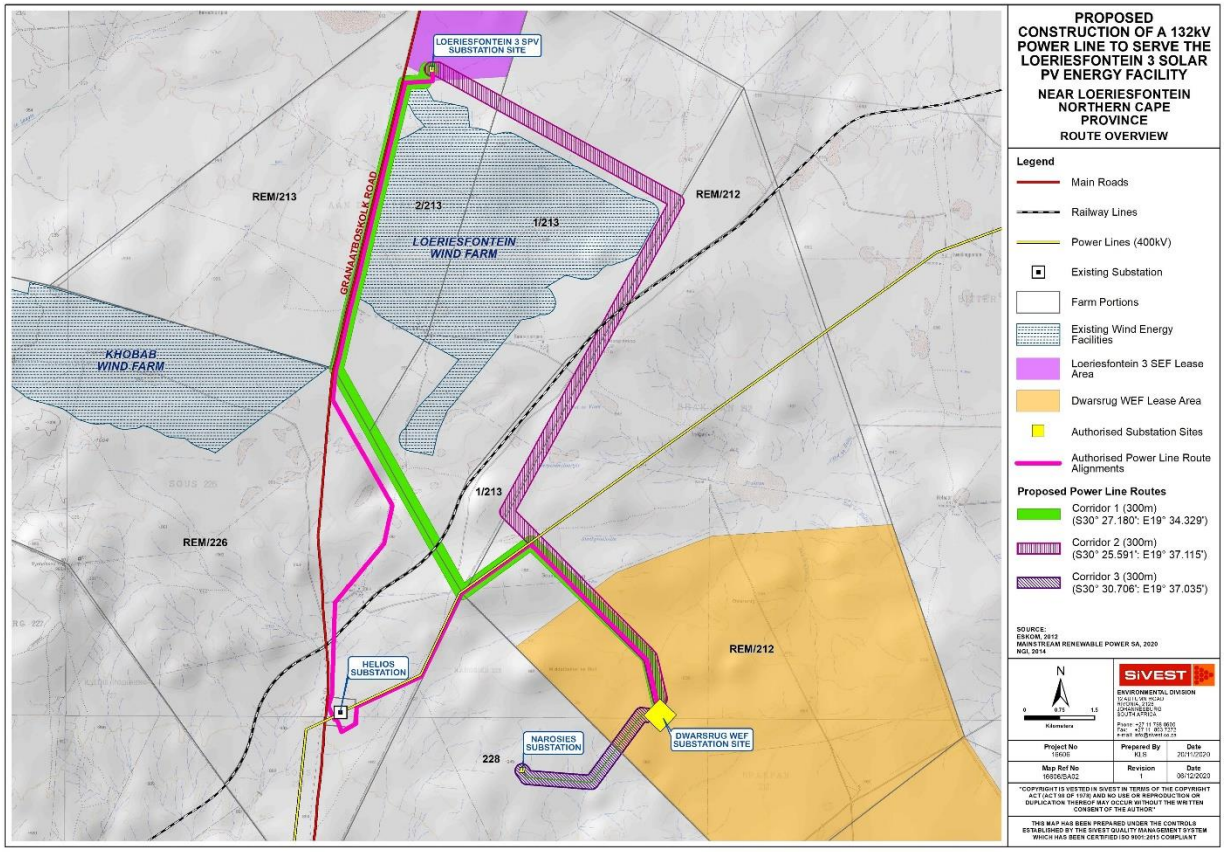


Figure 2: Power line alternatives proposed to link Loeriesfontein 3 PV SEF to Dwarsrug WEF

The 'no-go' alternative is the option of not constructing the powerline project, which would prevent the realization of the hybrid facility and thus prevent electricity generated from renewable sources being fed into the national grid. This alternative would result in no additional environmental impact other than that assessed during the BA for the Renewable Energy (RE) facilities.

The 'no-go' option is a feasible option; however, this would prevent the hybrid facility from contributing to the environmental, social and economic benefits associated with the development of the renewables sector.

4. LEGAL REQUIREMENT AND GUIDELINES

4.1 National Legislation

4.1.1 Constitution of the Republic of South Africa, 1996

The Constitution of the Republic of South Africa provides in the Bill of Rights that: Everyone has the right –

(a) to an environment that is not harmful to their health or well-being; and

(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that –

  (i) prevent pollution and ecological degradation;

  (ii) promote conservation; and

  (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

4.1.2 The National Environmental Management Act (Act No. 107 of 1998) (NEMA)

The National Environmental Management Act (Act No. 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 several 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.

The 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.

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

The most prominent statute containing provisions directly aimed at the conservation of birds is the National Environmental Management: Biodiversity Act 10 of 2004 read with the Threatened or Protected Species

Regulations, February 2007 (TOPS Regulations). Chapter 1 sets out the objectives of the Act, and they are aligned with the objectives of the Convention on Biological Diversity, which are the conservation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of the benefits of the use of genetic resources. The Act also gives effect to CITES, the Ramsar Convention, and the Bonn Convention on Migratory Species of Wild Animals. The State is endowed with the trusteeship of biodiversity and has the responsibility to manage, conserve and sustain the biodiversity of South Africa.

4.2 Provincial Legislation

4.2.1 Northern Cape Nature Conservation Act No. 9 Of 2009

The statute provides for the sustainable utilisation of wild animals, aquatic biota and plants; to provide for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; to provide for offences and penalties for contravention of the Act; to provide for the appointment of nature conservators to implement the provisions of the Act; to provide for the issuing of permits and other authorisations; and to provide for matters connected therewith.

4.3 Agreements and Conventions

Table 1 below lists agreements and conventions which South Africa is party to and which is directly relevant to the conservation of avifauna (BirdLife International 2020).

Table 1: Agreements and conventions which South Africa is party to and which is relevant to the conservation of avifauna.

Convention name	Description	Geographic scope
African-Eurasian Waterbird Agreement (AEWA)	The Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) is an intergovernmental treaty dedicated to the conservation of migratory waterbirds and their habitats across Africa, Europe, the Middle East, Central Asia, Greenland and the Canadian Archipelago. Developed under the framework of the Convention on Migratory Species (CMS) and administered by the United Nations Environment Programme (UNEP), AEWA brings together countries and the wider international conservation community in an effort to establish coordinated conservation and management of migratory waterbirds throughout their entire migratory range.	Regional
Convention on Biological Diversity (CBD), Nairobi, 1992	The Convention on Biological Diversity (CBD) entered into force on 29 December 1993. It has 3 main objectives: The conservation of biological diversity The sustainable use of the components of biological diversity The fair and equitable sharing of the benefits arising out of the utilization of genetic resources.	Global
Convention on the Conservation of Migratory Species of Wild Animals, (CMS), Bonn, 1979	As an environmental treaty under the aegis of the United Nations Environment Programme, CMS provides a global platform for the conservation and sustainable use of migratory animals and their habitats. CMS brings together the States through which migratory animals pass, the Range States, and lays the legal foundation for internationally coordinated conservation measures throughout a migratory range.	Global
Convention on the International Trade in Endangered Species of Wild Flora and Fauna, (CITES), Washington DC, 1973	CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.	Global
Ramsar Convention on Wetlands of International Importance, Ramsar, 1971	The Convention on Wetlands, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.	Global
Memorandum of Understanding on the Conservation of Migratory Birds of Prey in Africa and Eurasia	The Signatories will aim to take co-ordinated measures to achieve and maintain the favourable conservation status of birds of prey throughout their range and to reverse their decline when and where appropriate.	Regional

5. DESCRIPTION OF THE RECEIVING ENVIRONMENT

5.1 Important Bird Areas (IBAs)

The Bitterputs Conservation Area Important Bird Area (IBA) SA036 is the closest IBA and is located approximately 90km north-west of the study area at its closest point. The development is not expected to have any impact on the avifauna in this IBA.

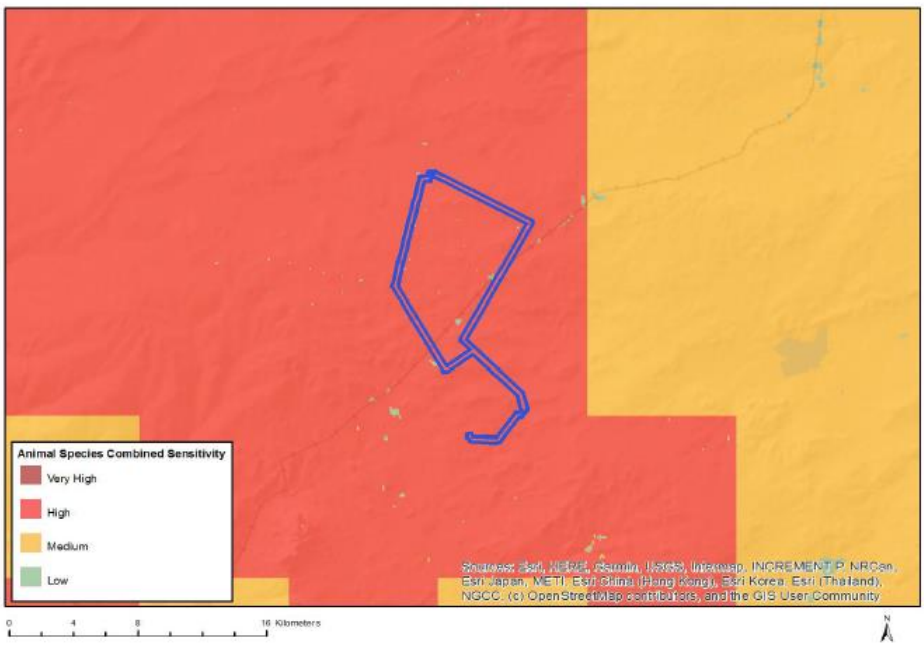
5.2 Protected Areas

The study area does not form part of a formally protected area. The closest protected area is the Kalkgat Private Nature Reserve which is located approximately 90km south-west from the Helios Substation at its closest point. The OHLs are not expected to impact on avifauna in the reserve.

5.3 DEFF National Online Screening Tool

No specific protocol for avifauna were promulgated in GN 320 on 20 March 2020 as far as specialist studies for power lines are concerned. In such an instance, the specialist is required to undertake a site sensitivity verification process, to determine if the site sensitivity allocated by the screening tool is accurate from an avifaunal perspective. See Figure 2 below for the outcome of the screening process (Animal Species Theme).

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Neotis ludwigii
High	Aves-Calendulauda burra
Low	Low sensitivity
Medium	Aves-Sagittarius serpentarius

Figure 3: The outcome of the screening process for the proposed development: Animal Species Theme Sensitivity

The screening tool classifies the study area as High sensitivity due to the potential presence of Ludwig's Bustard, Red Lark *Calendulauda burra* and Secretarybird. The sensitivity ratings of the screening tool were confirmed during the operational monitoring at the Loeriesfontein 2 WEF from June 2018 – March 2020. The study area contains suitable habitat for all of the above species, with Ludwig's Bustard and Red Lark probably breeding. In the case of Secretarybird, the habitat is however marginal. More details on the avifauna and bird habitats are provided in Section 5 below.

5.4 Description of Study Area

5.4.1 Natural environment

- Karoo

The habitat in the study consists of a mixture of sandy and gravelly plains covered with low shrub and grass. The dominant vegetation type is Bushmanland Basin Shrubland (National Vegetation Map SANBI 2012). This vegetation type occurs on slightly irregular plains with dwarf shrubland dominated by a mixture of low sturdy and spiny (and sometimes also succulent) shrubs, 'white' grasses (Stipagrostis) and in years of high rainfall also by abundant annuals such as species of Gazania and Leysera (Mucina & Rutherford 2006). Rainfall occurs in late summer and early autumn but is vary variable between years. The area is extremely arid, with mean annual precipitation ranging from about 100–200 mm. Mean maximum and minimum monthly temperatures ranges from about 39°C and –2°C for January and July, respectively (Mucina & Rutherford 2006).

The study area is situated in an ecological transitional zone between the Nama Karoo and Succulent Karoo biomes (Harrison *et.al.* 1997). Both Karoo biomes support a particularly high diversity of species endemic to southern Africa. The Karoo avifauna characteristically comprises ground-dwelling species of open habitats (Harrison *et.al.* 1997). In comparison with Succulent Karoo, the Nama Karoo has higher proportions of grass and tree cover. The ecotonal nature of the study area is apparent from the presence of typical avifauna of both Succulent and Nama Karoo at the study area e.g. Karoo Eremomela *Eremomela gregalis* and Red Lark.

The priority species which could potentially utilise the Karoo habitat in the study area listed in Table 2, and below. Species with a high likelihood of regular occurrence in the study area are in bold:

- Kori Bustard
- **Ludwig's Bustard**
- Jackal Buzzard
- Cape Crow
- **Pied Crow**

- **Booted Eagle**
- **Martial Eagle**
- **Spotted Eagle-owl**
- Lanner Falcon
- **Pale Chanting Goshawk**
- **Greater Kestrel**
- Yellow-billed Kite
- **Karoo Korhaan**
- Black-chested Snake-eagle
- Lappet-faced Vulture

- Pans

An important feature of the arid landscape where the study area is located is the presence of pans. Pans are endorheic wetlands having closed drainage systems; water usually flows in from small catchments but with no outflow from the pan basins themselves. They are features of poorly drained, relatively flat and dry regions. Water loss is mainly through evaporation, sometimes resulting in saline conditions, especially in the most arid regions. Water depth is shallow (<3m) and flooding characteristically ephemeral (Harrison et al. 1997). The study itself intersects with one sizable pan, and there are three large pans situated about 20km north of the study area. When pans hold water, they may temporarily attract waterbirds, while raptors will also use them as sources of surface water to drink and bath.

The priority species which could potentially utilise the flooded pans in the study area listed in Table 2, and below. Species with a high likelihood of regular occurrence in the study area are in bold:

- Kori Bustard
- Jackal Buzzard
- **Booted Eagle**
- **Martial Eagle**
- Lanner Falcon
- **Pale Chanting Goshawk**
- Yellow-billed Kite
- Black-chested Snake-eagle
- Lappet-faced Vulture
- Lesser Flamingo
- Spur-winged Goose
- Black-headed Heron
- **South African Shelduck**

5.4.2 Modified environment

Whilst most of the distribution and abundance of the bird species in the study area is associated with natural vegetation, as this comprises the vast majority of habitat, it is also necessary to examine the modified environment available to birds.

In addition to the natural vegetation, the following avifaunal relevant modifications to the habitat were recorded at the study area:

- Transmission lines

The Aries-Helios 400kV transmission line bisects the study area. Transmission lines are important anthropogenic habitat modifications, especially in an arid environment, as they constitute important perching and nesting substrate for raptors and crows. There is one Martial Eagle territory associated with this transmission line, which overlaps with the study area, containing two nests, on towers 452 and 455 respectively (see Figure 4). Both nests are used as alternative nests by one pair of eagles, e.g. the nest on tower 455 was used in 2016, and the nest on tower 452 in 2019.

The priority species which could potentially utilise high voltage power lines in the study area listed in Table 2, and below. Species with a high likelihood of regular occurrence in the study area are in bold:

- Jackal Buzzard
- **Booted Eagle**
- **Martial Eagle**
- Lanner Falcon
- **Pale Chanting Goshawk**
- Black-chested Snake-eagle
- Lappet-faced Vulture
- Black-headed Heron
- **Cape Crow**
- **Pied Crow**
- Spotted Eagle-owl
- Greater Kestrel

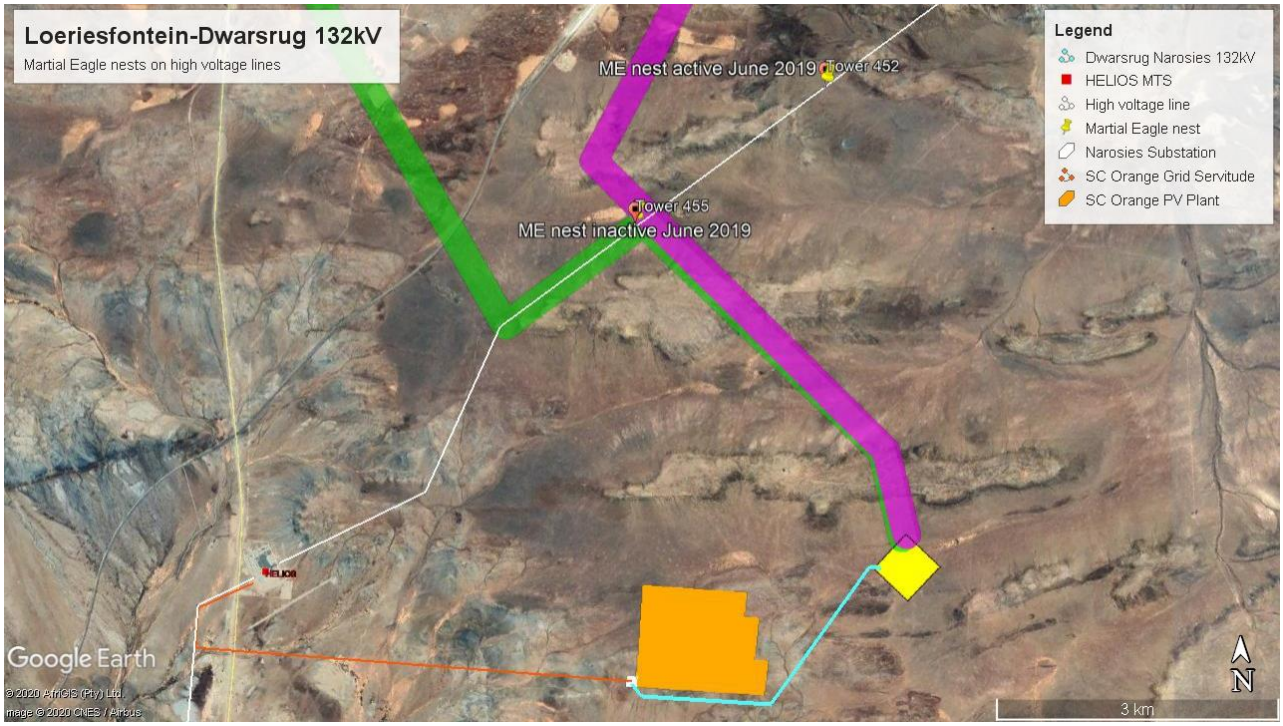


Figure 4: Martial Eagle nests on the existing high voltage lines. Alternative 1 is the green corridor and Alternative 2 is the purple corridor.

- Artificial water points

The study area contains several water troughs. In this highly arid environment, surface water attracts birds like a magnet. A water trough is a source of surface water that regularly attracts several priority species of raptors.

The priority species which could potentially utilise artificial water points in the study area are listed in Table 2, and below. Species with a high likelihood of regular occurrence in the study area are in bold:

- **Booted Eagle**
- **Martial Eagle**
- Lanner Falcon
- **Pale Chanting Goshawk**
- Black-chested Snake-eagle
- Lappet-faced Vulture
- Black-headed Heron
- **Spotted Eagle-owl**
- Greater Kestrel
- Kori Bustard
- Yellow-billed Kite

- Jackal Buzzard

5.5 AVIFAUNA

5.5.1 Southern African Bird Atlas 2

It is estimated that a total of 93 bird species could potentially occur in the broader area. Please refer to Appendix 3 which provides a comprehensive list of all the species, including those recorded during the site investigations. Of these, 20 species are classified as priority species.

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

Key

- EN = Endangered
- VU = Vulnerable
- NT = Near threatened
- H = High
- M = Medium
- L = Low

Table 2: Priority species occurring in the broader area

		SABAP2			Status		Class						Habitat				Impact		
Species	**Taxonomic name**	**Full protocol reporting rate**	**Ad hoc reporting rate**	**Priority species**	**Red Data status: International**	**Red Data status: Regional**	**Raptor**	**Waterbird**	**Terrestrial**	**Corvid**	**Possibility of regular occurrence**	**Recorded during surveys**	**Karoo**	**Pans**	**Water points**	**HV pylons**	**Displacement: Disturbance and habitat transformation**	**Electrocution**	**Collisions**
Booted Eagle	*Aquila pennatus*	3.39	0.00	x			x				M	x	x	x	x	x			
Martial Eagle	*Polemaetus bellicosus*	32.20	18.64	x	VU	EN	x				H	x	x	x	x	x	x		
Lanner Falcon	*Falco biarmicus*	13.56	0.00	x	LC	VU	x				M		x	x	x	x			
Pale Chanting Goshawk	*Melierax canorus*	84.75	27.12	x			x				H	x	x	x	x	x			
Black-chested Snake-eagle	*Circaetus pectoralis*	6.78	1.69	x			x				M		x	x	x	x			
Lappet-faced Vulture	*Torgos tracheliotus*	1.69	0.00	x	EN	EN	x				L		x	x	x	x		x	x
Black-headed Heron	*Ardea melanocephala*	1.69	1.69	x				x			L	x		x	x	x			x
Spotted Eagle-owl	*Bubo africanus*	22.03	0.00	x			x				H	x	x		x	x			
Greater Kestrel	*Falco rupicoloides*	77.97	13.56	x			x				H	x	x		x	x			
Kori Bustard	*Ardeotis kori*	1.69	0.00	x	NT	NT			x		L		x	x	x				x
Yellow-billed Kite	*Milvus aegyptius*	1.69	0.00	x			x				L	x	x	x	x				
Jackal Buzzard	*Buteo rufofuscus*	6.78	5.08	x			x				L	x	x	x		x			
Cape Crow	*Corvus capensis*	28.81	11.86	x						x	M	x	x			x			
Pied Crow	*Corvus albus*	91.53	37.29	x						x	H	x	x			x			
African Black Duck	*Anas sparsa*	1.69	0.00	x				x			L								x
Lesser Flamingo	*Phoenicopterus minor*	1.69	0.00	x	NT	NT		x			L			x					x
Spur-winged Goose	*Plectropterus gambensis*	1.69	0.00	x				x			L			x					x
South African Shelduck	*Tadorna cana*	6.78	0.00	x				x			M			x					x
Ludwig's Bustard	*Neotis ludwigii*	54.24	6.78	x	EN	EN			x		H	x	x				x		x
Karoo Korhaan	*Eupodotis vigorsii*	89.83	33.90	x	LC	NT			x		H	x	x				x		x

6. SPECIALIST FINDINGS / IDENTIFICATION AND ASSESSMENT OF IMPACTS

6.1 General

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

6.2 Electrocutions

Electrocution refers to the scenario where a bird is perched or attempts to perch on the electrical structure and causes an electrical short circuit by physically bridging the air gap between live components and/or live and earthed components (van Rooyen 2004). The electrocution risk is largely determined by the pole/tower design. The tower design that that is commonly used for 132kV sub-transmission lines is DT 7611 steel monopole.

Clearance between phases on the same side of the DT 7611 pole structure is approximately 2.2m, and the clearance on strain structures is 1.8m. This clearance should be sufficient to reduce the risk of phase – phase electrocutions of most birds on the towers to negligible. The length of the stand-off insulators is approximately 1.6m. If a very large species attempts to perch on the stand-off insulators, they are potentially able to touch both the conductor and the earthed pole simultaneously potentially resulting in a phase – earth electrocution. This is particularly likely when more than one bird attempts to sit on the same pole, which is an unlikely occurrence, except occasionally with vultures. Vultures are not likely to regularly occur within the study area, and due to the presence of other perch-friendly transmission lines in the broader area, the chances of the birds perching on the steel monopoles of the new line are relatively low. However, it cannot be entirely ruled out, because Lappet-faced Vulture has been recorded. It would be preferable if a 100% vulture friendly structure is used. To eliminate the risk of vulture electrocutions, the 7649 steel monopole structure is proposed with suspended insulators and diagonal supporting cross arms, which would make perching uncomfortable while ensuring that birds are clear of the live phases (see Appendix 4).

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

6.3 Collisions

Collisions are the biggest threat posed by transmission lines to birds in southern Africa (Van Rooyen 2004). Most heavily impacted upon are bustards, storks, cranes and various species of waterbirds, and to a lesser extent, vultures. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with transmission lines (Van Rooyen 2004, Anderson 2001). In a PhD study, Shaw (2013) provides a concise summary of the phenomenon of avian collisions with transmission lines:

"The collision risk posed by power lines is complex and problems are often localised. While any bird flying near a power line is at risk of collision, this risk varies greatly between different groups of birds, and depends on the interplay of a wide range of factors (APLIC 1994). Bevanger (1994) described these factors in four main groups – biological, topographical, meteorological and technical. Birds at highest risk are those that are both susceptible to collisions and frequently exposed to power lines, with waterbirds, gamebirds, rails, cranes and bustards usually the most numerous reported victims (Bevanger 1998, Rubolini et al. 2005, Jenkins et al. 2010).

The proliferation of man-made structures in the landscape is relatively recent, and birds are not evolved to avoid them. Body size and morphology are key predictive factors of collision risk, with large-bodied birds with high wing loadings (the ratio of body weight to wing area) most at risk (Bevanger 1998, Janss 2000). These birds must fly fast to remain airborne, and do not have sufficient manoeuvrability to avoid unexpected obstacles. Vision is another key biological factor, with many collision-prone birds principally using lateral vision to navigate in flight, when it is the lower-resolution, and often restricted, forward vision that is useful to detect obstacles (Martin & Shaw 2010, Martin 2011, Martin et al. 2012). Behaviour is important, with birds flying in flocks, at low levels and in crepuscular or nocturnal conditions at higher risk of collision (Bevanger 1994). Experience affects risk, with migratory and nomadic species that spend much of their time in unfamiliar locations also expected to collide more often (Anderson 1978, Anderson 2002). Juvenile birds have often been reported as being more collision-prone than adults (e.g. Brown et al. 1987, Henderson et al. 1996).

Topography and weather conditions affect how birds use the landscape. Power lines in sensitive bird areas (e.g. those that separate feeding and roosting areas, or cross flyways) can be very dangerous (APLIC 1994, Bevanger 1994). Lines crossing the prevailing wind conditions can pose a problem for large birds that use the wind to aid take-off and landing (Bevanger 1994). Inclement weather can disorient birds and reduce their flight altitude, and strong winds can result in birds colliding with power lines that they can see but do not have enough flight control to avoid (Brown et al. 1987, APLIC 2012).

The technical aspects of power line design and siting also play a big part in collision risk. Grouping similar power lines on a common servitude, or locating them along other features such as tree lines, are both approaches thought to reduce risk (Bevanger 1994). In general, low lines with short span lengths (i.e. the

distance between two adjacent pylons) and flat conductor configurations are thought to be the least dangerous (Bevanger 1994, Jenkins et al. 2010). On many higher voltage lines, there is a thin earth (or ground) wire above the conductors, protecting the system from lightning strikes. Earth wires are widely accepted to cause the majority of collisions on power lines with this configuration because they are difficult to see, and birds flaring to avoid hitting the conductors often put themselves directly in the path of these wires (Brown et al. 1987, Faanes 1987, Alonso et al. 1994a, Bevanger 1994)."

From incidental record keeping by the Endangered Wildlife Trust, it is possible to give a measure of what species are generally susceptible to power line collisions in South Africa (see Figure 5 below).

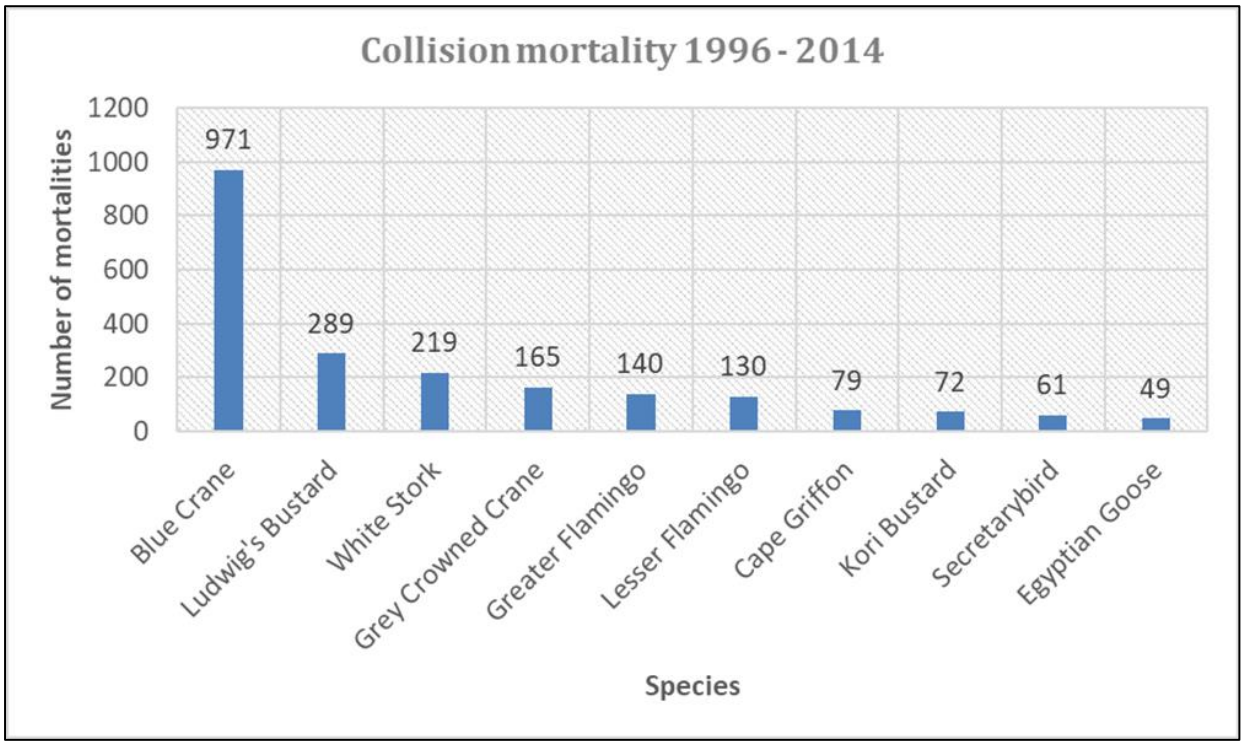


Figure 5: The top 10 collision prone bird species in South Africa, in terms of reported incidents contained in the Eskom/Endangered Wildlife Trust Strategic Partnership central incident register 1996 - 2014 (EWT unpublished data)

Power line collisions are generally accepted as a key threat to bustards (Raab *et al*. 2009; Raab *et al*. 2010; Jenkins & Smallie 2009; Barrientos *et al*. 2012, Shaw 2013). In a recent study, carcass surveys were performed under high voltage transmission lines in the Karoo for two years, and low voltage distribution lines for one year (Shaw 2013). Ludwig's Bustard was the most common collision victim (69% of carcasses), with bustards generally comprising 87% of mortalities recovered. Total annual mortality was estimated at 41% of the Ludwig's Bustard population, with Kori Bustards also dying in large numbers (estimated at least 14% of the South African population killed in the Karoo alone). Karoo Korhaan was also recorded, but to a much lesser extent than Ludwig's Bustard. The reasons for the relatively low collision risk of this species probably include their smaller size (and hence greater agility in flight) as well as their more sedentary lifestyles, as local birds are familiar with their territory and are less likely to collide with power lines (Shaw 2013).

Several factors are thought to influence avian collisions, including the manoeuvrability of the bird, topography, weather conditions and power line configuration. An important additional factor that previously has received little attention is the visual capacity of birds; i.e. whether they are able to see obstacles such as power lines, and whether they are looking ahead to see obstacles with enough time to avoid a collision. In addition to helping explain the susceptibility of some species to collision, this factor is key to planning effective mitigation measures. Recent research provides the first evidence that birds can render themselves blind in the direction of travel during flight through voluntary head movements (Martin & Shaw 2010). Visual fields were determined in three bird species representative of families known to be subject to high levels of mortality associated with power lines i.e. Kori Bustards, Blue Cranes *Anthropoides paradiseus* and White Storks *Ciconia ciconia*. In all species the frontal visual fields showed narrow and vertically long binocular fields typical of birds that take food items directly in the bill under visual guidance. However, these species differed markedly in the vertical extent of their binocular fields and in the extent of the blind areas which project above and below the binocular fields in the forward-facing hemisphere. The importance of these blind areas is that when in flight, head movements in the vertical plane (pitching the head to look downwards) will render the bird blind in the direction of travel. Such movements may frequently occur when birds are scanning below them (for foraging or roost sites, or for conspecifics). In bustards and cranes pitch movements of only 25° and 35°, respectively, are sufficient to render the birds blind in the direction of travel; in storks, head movements of 55° are necessary. That flying birds can render themselves blind in the direction of travel has not been previously recognised and has important implications for the effective mitigation of collisions with human artefacts including wind turbines and power lines. These findings have applicability to species outside of these families especially raptors (A*ccipitridae*) which are known to have small binocular fields and large blind areas similar to those of bustards and cranes, and are also known to be vulnerable to power line collisions.

Despite doubts about the efficacy of line marking to reduce the collision risk for bustards (Jenkins *et al*. 2010; Martin *et al.* 2010), there are numerous studies which prove that marking a line with PVC spiral type Bird Flight Diverters (BFDs) generally reduce mortality rates (e.g. Bernardino *et al.* 2018; Sporer *et al.* 2013, Barrientos *et al*. 2011; Jenkins *et al*. 2010; Alonso & Alonso 1999; Koops & De Jong 1982), including to some extent for bustards (Barrientos *et al*. 2012; Hoogstad 2015 pers.comm). Beaulaurier (1981) summarised the results of 17 studies that involved the marking of earth wires and found an average reduction in mortality of 45%. Barrientos *et al.* (2011) reviewed the results of 15 wire marking experiments in which transmission or distribution wires were marked to examine the effectiveness of flight diverters in reducing bird mortality. The presence of flight diverters was associated with a decrease of 55–94% in bird mortalities. Koops and De Jong (1982) found that the spacing of the BFDs was critical in reducing the mortality rates - mortality rates are reduced up to 86% with a spacing of 5m, whereas using the same devices at 10m intervals only reduces the mortality by 57%. Barrientos *et al*. (2012) found that larger BFDs were more effective in reducing Great Bustard collisions than smaller ones. Line markers should be as large as possible, and highly contrasting with the background. Colour is probably less important as during the day the background will be brighter than the obstacle with the reverse true at lower light levels (e.g. at twilight, or during overcast conditions). Black and white interspersed patterns are likely to maximise the probability of detection (Martin *et al*. 2010).

Using a controlled experiment spanning a period of nearly eight years (2008 to 2016), the Endangered Wildlife Trust (EWT) and Eskom tested the effectiveness of two types of line markers in reducing power line collision mortalities of large birds on three 400kV transmission lines near Hydra substation in the Karoo. Marking was highly effective for Blue Cranes, with a 92% reduction in mortality, and large birds in general with a 56% reduction in mortality, but not for bustards, including the endangered Ludwig's Bustard. The two different marking devices were approximately equally effective, namely spirals and bird flappers, they found no evidence supporting the preferential use of one type of marker over the other (Shaw *et al*. 2017).

In this instance, the OHLs will pose the biggest risk to large terrestrial species (bustards and korhaans), followed by waterbirds and vultures. The priority species which are potentially vulnerable to this impact are listed in Table 2, and below. Species with a high likelihood of regular occurrence in the study area are in bold:

- Lappet-faced Vulture
- Black-headed Heron
- Kori Bustard
- African Black Duck
- Lesser Flamingo
- Spur-winged Goose
- South African Shelduck
- **Ludwig's Bustard**
- **Karoo Korhaan**

6.4 Displacement due to habitat destruction and disturbance

During the construction of power lines and service roads (jeep tracks), habitat destruction/transformation inevitably takes place. The construction activities normally constitute the following:

- Site clearance and preparation;
- Construction of the infrastructure (i.e. the OHLs and service roads);
- Transportation of personnel, construction material and equipment to the site, and personnel away from the site;
- Excavations for infrastructure;

These activities could potentially impact on birds breeding, foraging and roosting in or in close proximity of the proposed OHLs through **transformation of habitat**, which could result in temporary or permanent displacement. Fortunately, due to the nature of the vegetation, and judged by the existing power lines, very little if any vegetation clearing will be required in the power line servitudes, therefore the loss of habitat for priority species due to direct habitat transformation associated with the construction of the OHLs, is likely to be minimal.

Apart from direct habitat destruction, the above-mentioned activities also impact on birds through **disturbance**; this could lead to breeding failure if the disturbance happens during a critical part of the breeding cycle. Construction activities in close proximity to breeding locations could be a source of disturbance and could lead to temporary breeding failure or even permanent abandonment of nests. Large terrestrial species namely Ludwig's Bustard, Karoo Korhaan could be affected by displacement due to disturbance. The biggest potential impact will be on the pair of Martial Eagles that breed on the Aries – Helios 400kV line. The proposed Loeriesfontein – Dwarsrug 132kV OHL will pass underneath the Aries – Helios 400kV line very close to Tower 455, which contains one of the two nests that the birds are using. A potential mitigation measure is the timing of the construction activities to avoid disturbance during a critical phase of the breeding cycle, should this specific nest be utilised at the time, although it is likely that the birds will not use this specific nest if there is a lot of activity near the nesting tower, but rather the alternative nest on Tower 452, which is 2.4 km away from the proposed alignment.

The priority species which are potentially vulnerable to this impact are listed in Table 2, and below. Species with a high likelihood of regular occurrence in the study area are in bold:

- **Ludwig's Bustard**
- **Karoo Korhaan**
- **Martial Eagle**

6.5 Identification of environmental sensitivities

The entire study area is rated as High sensitivity due to the presence of collision-prone species. It would therefore be advisable to mitigate the whole OHL with Bird Flight Diverters (BFDs) if possible.

6.6 Planning / Pre construction

No impacts are expected to be associate with this phase.

6.7 Construction

- Displacement of priority species due to disturbance associated with the construction activities

Table 3: Rating of impacts: Construction Phase

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Construction																				
Avifauna	Displacement of priority species due to disturbance associated with the construction activities of the OHLs	1	3	2	3	1	3	30	_	Medium	▪ No off-road driving; ▪ Maximum use of existing roads; ▪ Measures to control noise; ▪ Restricted access to the rest of the property; ▪ The avifaunal specialist should conduct an inspection to see if the Martial Eagle nest on Tower 455 of the Aries-Helios 400kV transmission line is active. If the nest is not active, the construction activities can proceed without delay. If the nest is occupied, the avifaunal specialist must consult with the contractor to find ways of minimising the	1	2	2	1	1	2	14	_	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Construction																				
											potential disturbance to the breeding pair of eagles during the construction period. This could include measures such as subscribing a 2km temporary buffer around the nest during breeding season where no construction takes place. Construction can continue outside of a 2km buffer so as to avoid delaying construction.									

6.8 Operation

- Mortality of priority species due to electrocutions on the 132kV OHLs
- Mortality of priority species due to collisions with the 132kV OHLs

Table 4: Rating of impacts: Operational Phase

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Operation																				
Direct Impacts																				
Avifauna	Mortality of priority species due to electrocutions on the 132kV OHLs	1	1	2	4	3	2	22	_	Low	▪ The 7649 vulture friendly pole design should be used (see Appendix 4).	1	2	2	4	3	1	12	_	Low
Avifauna	Mortality of priority species due to collisions with the 132kV OHL	1	3	2	4	3	2	26	_	Medium	▪ The entire 132kV OHL should be marked with Bird flight diverters, on the full span length, on the earthwire	1	2	2	4	3	2	24	_	Medium

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Operation																				
											(according to Eskom guidelines - five metres apart). Light and dark colour devices must be alternated so as to provide contrast against both dark and light backgrounds respectively. These devices must be installed as soon as the conductors are strung.									

6.9 De-commissioning

- Displacement of priority species due to disturbance associated with the decommissioning activities

Table 5: Rating of impacts: Decommissioning Phase

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Decommissioning																				
Direct Impacts																				
Avifauna	Displacement of priority species due to disturbance associated with the decommissioning activities	1	3	2	3	1	3	30	_	Medium	• No off-road driving; • Maximum use of existing roads; • Measures to control noise; • Restricted access to the rest of the property; • The avifaunal specialist should conduct an inspection to see if the Martial Eagle nest on Tower 452 of the Aries-Helios 400kV transmission line is active. If the nest is not active, the decommissioning activities can proceed without delay. If the nest is occupied, the avifaunal specialist must consult with the contractor to find ways of minimising the potential disturbance	1	2	2	1	1	2	14	_	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Decommissioning																				
											to the breeding pair of eagles during the decommissioning period. This could include measures such as subscribing a 2km temporary buffer around the nest during breeding season where no construction takes place. Construction can continue outside of a 2km buffer so as to avoid delaying construction.								

6.10 No-go

No additional impacts are expected as the status quo as it currently stands will be maintained.

6.11 Cumulative Impacts

Although it is important to assess the potential avifaunal impacts of the proposed power lines specifically, it is equally important to assess the potential avifaunal impact that could materialise if other renewable energy facilities (both wind and solar facilities) with associated power line infrastructure projects are developed in the broader area. Cumulative impacts occur where existing or planned developments, in conjunction with the proposed development, result in significant incremental changes in the broader study area. In this instance, such developments would include renewable energy facilities with associated power line infrastructure development.

Ten (10) renewable energy projects were identified within a 35 km radius of the proposed development as shown in Figure 6 and Table 6 below. These projects were identified using the DEFF's Renewable Energy EIA Application Database for SA in conjunction with information provided by Independent Power Producers (IPPs) operating in the broader region. It is assumed that all of these renewable energy developments include grid connection infrastructure, although few details of this infrastructure were available at the time of writing this report. It should be noted that this list is based on information available at the time of writing this report and as such there may be other renewable energy projects proposed within the broader area.

Table 6: Renewable energy developments proposed within a 35km radius of the proposed Loeriesfontein – Dwarsrug 132kV OHL.

Development	Current status of EIA/development	Proponent	Technology	Capacity	Farm details
Dwarsrug Wind Farm	EA issued	Mainstream Renewable Power	Wind	140MW	Remainder of the Farm Brak Pan No 212
Khobab Wind Farm	Operational	Mainstream Renewable Power	Wind	140MW	Portion 2 of the Farm Sous No 226
Loeriesfontein 2 Wind Farm	Operational	Mainstream Renewable Power	Wind	140MW	Portions 1 & 2 of the Farm Aan de Karree Doorn Pan No 213
Graskoppies Wind Farm	EA Issued	Mainstream Renewable Power	Wind	235MW	• Portion 2 of the Farm Graskoppies No. 176; and • Portion 1 of the Farm Hartebeest Leegte No. 216.

Development	Current status of EIA/development	Proponent	Technology	Capacity	Farm details
Loeriesfontein PV3 Solar Energy Facility	EA issued	Mainstream Renewable Power	Solar	100MW	Portion 2 of the Farm Aan de Karree Doorn Pan No 213
Hantam PV Solar Energy Facility	EA issued	Solar Capital (Pty) Ltd	Solar	Up to 525MW	Remainder of the Farm Narosies No 228
PV Solar Power Plant	EA issued	BioTherm Energy	Solar	70MW	Portion 5 of the Farm Kleine Rooiberg No 227
Kokerboom 1 Wind Farm	Environmental Impact Assessment (EIA) underway	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	Wind	240MW	• Remainder of the Farm Leeuwbergrivier No. 1163; and • Remainder of the Farm Kleine Rooiberg No. 227.
Kokerboom 2 Wind Farm	Environmental Impact Assessment (EIA) underway	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	Wind	240MW	• Remainder of the Farm Leeuwbergrivier No. 1163; and • Remainder of the Farm Kleine Rooiberg No. 227.
Kokerboom 3 Wind Farm	Environmental Impact Assessment (EIA) underway	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	Wind	240MW	• Remainder of the Farm Aan De Karree Doorn Pan No. 213; • Portion 1 of the Farm Karree Doorn Pan No. 214; and • Portion 2 of the Farm Karree Doorn Pan No. 214.

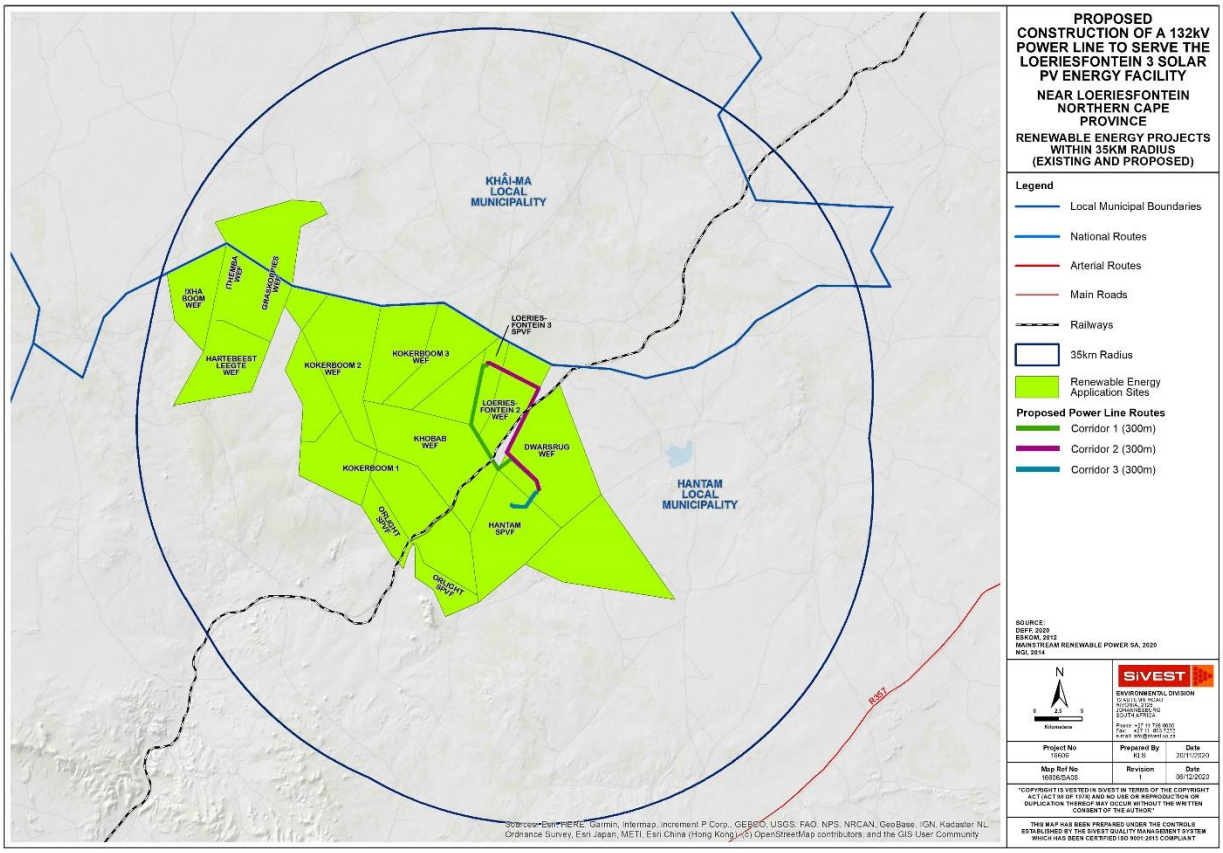


Figure 6: Renewable energy developments identified within a 35km radius of the proposed development

The following cumulative impacts are envisaged:

- Displacement of priority species due to disturbance associated with the construction activities of the 132kV OHLs
- Mortality of priority species due to electrocutions on the 132kV OHLs
- Mortality of priority species due to collisions with the 132kV OHLs
- Displacement of priority species due to disturbance associated with the decommissioning activities

The most significant impact of the proposed OHLs and all the other grid connections associated with the renewable energy facilities within the 35km radius around the current project, is the potential for priority species mortality through collisions. The impacts of electrocution and displacement associated with the proposed grid connections are relatively minor compared to the envisaged collision impacts. This is especially relevant for large terrestrial species, particularly Ludwig's Bustard, which is highly susceptible to power line collisions. The proposed Loeriesfontein – Dwarsrug 132kV OHL will add approximately 19km of HV line to the existing HV network in the area. In addition, the single 132 kV powerline to link these two facilities to the National grid at the Narosies substation from the Dwarsrug WEF will add another 3km. Several hundred kilometres of HV line already exists within this area, and several more are planned, should the renewable

energy projects all be built. The overall cumulative impact of the proposed development, when viewed with the impacts of existing HV lines on avifauna, and the potential impacts of the grid connections and substations of the planned renewable energy facilities (taking into account the mitigation measures proposed for those grid connections by the avifaunal specialists), is assessed to be of medium significance. It could be reduced to some extent with mitigation but will remain at a medium level, specifically as far as power line collisions are concerned.

Table 7: Rating of cumulative impacts

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Cumulative																				
Avifauna	Displacement of priority species due to disturbance associated with the construction activities of the 132kV overhead lines	1	3	2	3	1	3	30	_	Medium	▪ No off-road driving; ▪ Maximum use of existing roads; ▪ Measures to control noise; ▪ Restricted access to the rest of the property; ▪ The avifaunal specialist must consult with the contractor to find ways of minimising the potential disturbance to breeding eagles on existing HV lines during the construction period. This could include measures such as subscribing a 2km temporary buffer around the nest during breeding season	1	2	2	1	1	2	14	_	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Cumulative																				
											where no construction takes place. Construction can continue outside of a 2km buffer so as to avoid delaying construction.									
Avifauna	Mortality of priority species due to electrocutions on the 132kV OHLs	1	1	2	4	3	2	22	_	Low	▪ The 7649 vulture friendly pole design should be used (see Appendix 4).	1	2	2	4	3	1	12	_	Low
Avifauna	Mortality of priority species due to collisions with the 132kV OHL	1	3	2	4	3	2	26	_	Medium	▪ All the 132kV grid connections should be marked with BFDs for their entire lengths.	1	2	2	4	3	2	24	_	Medium

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Cumulative																				
Avifauna	Displacement of priority species due to disturbance associated with the decommisioning activities	1	1	3	4	3	1	12	_	Low	▪ No off-road driving ▪ Maximum use of existing roads ▪ Measures to control noise ▪ Restricte ▪ d access to the rest of the property ▪ The avifaunal specialist must consult with the contractor to find ways of minimising the potential disturbance to breeding eagles on existing HV lines during the de-commissioning period. This could include measures such as subscribing a 2km temporary buffer around the nest during breeding season	1	1	3	4	3	1	12	_	Low

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S		E	P	R	L	D	I / M	TOTAL	STATUS (+ OR -)	S
Cumulative																				
											where no construction takes place. Construction can continue outside of a 2km buffer so as to avoid delaying construction.									

6.12 Overall Impact Rating

Table 8 below provides a summary of the respective significance ratings, and an average overall rating before and after mitigation.

Table 8: Overall impact significance rating

Impact	Rating pre-mitigation	Rating post-mitigation
Displacement due to disturbance (Construction)	Medium (30)	Low (14)
Electrocution on the 132kV OHLs	Low (22)	Low (12)
Collisions with 132kV OHLs	Medium (26)	Medium (24)
Displacement due to disturbance (De-commissioning)	Medium (30)	Low (14)
Cumulative impacts	Medium (23)	Low (16)
Average:	**Medium (26)**	**Low (16)**

7. COMPARATIVE ASSESSMENT OF ALTERNATIVES

Table 9 below sets out an assessment of the two alternatives for the Loeriesfontein – Dwarsrug 132kV OHL from an avifaunal perspective.

Table 9: Comparative assessment of alternatives

PREFERRED	The alternative will result in a low impact / reduce the impact / result in a positive impact
FAVOURABLE	The impact will be relatively insignificant
LEAST PREFERRED	The alternative will result in a high impact / increase the impact
NO PREFERENCE	The alternative will result in equal impacts

Alternative	Preference	Reasons (incl. potential issues)
POWER LINE CORRIDOR ROUTE ALTERNATIVES: LOERIESFONTEIN 3 PV SEF TO DWARSRUG WEF		
Power Line Corridor Alternative 1 (Loeriesfontein 3 PV SEF to Dwarsrug WEF)	**NO PREFERENCE**	Both alternatives are routed through similar habitat and will therefore result in similar impacts
Power Line Corridor Alternative 2 (Loeriesfontein 3 PV SEF to Dwarsrug WEF)	**NO PREFERENCE**	Both alternatives are routed through similar habitat and will therefore result in similar impacts

7.1 No-Go Alternative

The “no-go” option assumes that the site remains in its current state, i.e. there is no construction of the power line and associated infrastructure in the proposed project area and the status quo would be maintained. The No-Go option would be beneficial for the birds in the long term because it will result in no additional impacts on birds.

8. CONCLUSION AND SUMMARY

8.1 Summary of Findings

The proposed Loeriesfontein PV 3 - Dwarsrug 132kV OHL will have several impacts on priority avifauna. The impacts can be summarised as follows:

- Displacement of priority species due to disturbance associated with the construction and decommissioning activities of the 132kV OHLs.
- Mortality of priority species due to electrocutions on the 132kV OHLs.
- Mortality of priority species due to collisions with the 132kV OHLs.

8.1.1 Construction phase

- **Displacement of priority species due to disturbance associated with the construction activities of the 132kV OHLs**

Construction activities in close proximity to breeding locations could be a source of disturbance and could lead to temporary breeding failure or even permanent abandonment of nests. Large terrestrial species namely Ludwig's Bustard, and Karoo Korhaan could be affected by displacement due to disturbance. The biggest potential impact will be on the pair of Martial Eagles that breed on the Aries – Helios 400kV line. The proposed Loeriesfontein – Dwarsrug 132kV OHL will pass underneath the Aries – Helios 400kV line very close to Tower 455, which contains one of the two nests that the birds are using. A potential mitigation measure is the timing of the construction activities to avoid disturbance during a critical phase of the breeding cycle, should this specific nest be utlised at the time, although it is likely that the birds will not use this specific nest if there is a lot of activity near the nesting tower, but rather the alternative nest on Tower 452, which is 2.4 km away from the proposed alignment.

The priority species which are potentially vulnerable to this impact are listed in Table 2, and below. Species with a high likelihood of regular occurrence in the study area are in bold:

- Ludwig's Bustard
- Karoo Korhaan
- Martial Eagle

This impact is assessed to be medium and can be reduced to low through mitigation.

8.1.2 Operational phase

- **Mortality of priority species due to electrocutions on the 132kV OHLs.**

Clearance between phases on the same side of the DT 7611 pole structure is approximately 2.2m, and the clearance on strain structures is 1.8m. This clearance should be sufficient to reduce the risk of phase – phase electrocutions of most birds on the towers to negligible. The length of the stand-off insulators is approximately 1.6m. If a very large species attempts to perch on the stand-off insulators, they are potentially able to touch both the conductor and the earthed pole simultaneously potentially resulting in a phase – earth electrocution. This is particularly likely when more than one bird attempts to sit on the same pole, which is an unlikely occurrence, except occasionally with vultures. Vultures are not likely to regularly occur within the study area, and due to the presence of other perch-friendly transmission lines in the broader area, the chances of the birds perching on the steel monopoles of the new line are relatively low. However, it cannot be entirely ruled out, because Lappet-faced Vulture has been recorded. It would be preferable if a 100% vulture friendly structure is used. To eliminate the risk of vulture electrocutions, the 7649 steel monopole structure is proposed with suspended insulators and diagonal supporting cross arms, which would make perching uncomfortable while ensuring that birds are clear of the live phases.

This impact is assessed to be low and can be further reduced through mitigation.

- **Mortality of priority species due to collisions with the 132kV OHLs.**

Collisions are the biggest threat posed by transmission lines to birds in southern Africa (Van Rooyen 2004). Most heavily impacted upon are bustards, storks, cranes and various species of waterbirds, and to a lesser extent, vultures. These species are mostly heavy-bodied birds with limited manoeuvrability, which makes it difficult for them to take the necessary evasive action to avoid colliding with transmission lines (Van Rooyen 2004, Anderson 2001). In this instance, the OHLs will pose the biggest risk to large terrestrial species (bustards and korhaans), followed by waterbirds and vultures. The priority species which are potentially vulnerable to this impact are listed in Table 2, and below. Species with a high likelihood of regular occurrence in the study area are in bold:

- Lappet-faced Vulture
- Black-headed Heron
- Kori Bustard
- African Black Duck
- Lesser Flamingo
- Spur-winged Goose
- South African Shelduck
- **Ludwig's Bustard**
- **Karoo Korhaan**

This impact is assessed to be medium and can be reduced through mitigation, but it will remain at medium level after mitigation.

8.1.3 Decommissioning phase

Decommissioning activities in close proximity to breeding locations could be a source of disturbance and could lead to temporary breeding failure or even permanent abandonment of nests. Large terrestrial species namely Ludwig's Bustard, Karoo Korhaan could be affected by displacement due to disturbance. The biggest potential impact could be on the Martial Eagles that breed on the Aries – Helios 400kV line. The proposed Loeriesfontein – Dwarsrug 132kV OHL will pass underneath the Aries – Helios 400kV line very close to Tower 455, which contains one of the two nests that the birds are currently using.

The priority species which are potentially vulnerable to this impact are listed in Table 2, and below. Species with a high likelihood of regular occurrence in the study area are in bold:

- **Ludwig's Bustard**
- **Karoo Korhaan**
- **Martial Eagle**

This impact is assessed to be medium and can be reduced to low through mitigation.

8.1.4 Preferred corridor option for avifauna

Both alternatives are routed through similar habitat and will therefore result in similar impacts. However, none of the other route alternatives were deemed to be fatally flawed.

8.1.5 Environmental sensitivities

The entire study area is rated as High sensitivity due to the presence of collision-prone species. It would therefore be advisable to mitigate the whole OHL with Bird Flight Diverters (BFDs) if possible.

8.1.6 Overall significance rating

The table below provides a summary of the respective significance ratings, and an average overall rating before and after mitigation.

Impact	Rating pre-mitigation	Rating post-mitigation
Displacement due to disturbance (Construction)	Medium (30)	Low (14)
Electrocution on the 132kV OHLs	Low (22)	Low (12)
Collisions with 132kV OHLs	Medium (26)	Medium (24)
Displacement due to disturbance (De-commissioning)	Medium (30)	Low (14)
Cumulative impacts	Medium (23)	Low (16)

Average:	**Medium (26)**	**Low (16)**

8.2 Conclusion and Impact Statement

The proposed Loeriesfontein PV - Dwarsrug 132kV OHL, and the 132 kV powerline to link these two facilities to the National grid at the Narosies substation, are expected to have a medium impact on priority species. This impact could be reduced to low through the application of appropriate mitigation measures. No fatal flaws were discovered in the course of the investigations. Based on the outcome of the investigations into the impact of the proposed 132kV OHLs on avifauna, the authorization of the OHLs is supported, provided the mitigation measures contained in this specialist report are strictly implemented.

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PROPOSED CONSTRUCTION OF 132 KV POWERLINES BETWEEN THE AUTHORISED LOERIESFONTEIN 3 PV SOLAR ENERGY FACILITY (12/12/20/2321/2/AM4) AND THE AUTHORISED DWARSRUG WIND ENERGY FACILITY (14/12/16/3/3/2/690/AM4), AND FROM THE DWARSRUG WIND ENERGY FACILITY TO THE AUTHORISED NAROSIES SUBSTATION (12/12/20/2049/3), LOCATED NEAR LOERIESFONTEIN IN THE HANTAM LOCAL MUNICIPALITY, NAMAKWA DISTRICT IN THE NORTHERN CAPE PROVINCE OF SOUTH AFRICA.

TERMS OF REFERENCE (ToR) FOR SPECIALIST STUDIES

1 INTRODUCTION

The purpose of the Terms of Reference (ToR) is to provide the specialist team with a consistent approach to the specialist studies that are required as part of the Basic Assessment (BA) process being conducted in respect of the proposed construction of the 132 kV powerlines. This will enable comparison of environmental impacts, efficient review, and collation of the specialist studies into the BA report, in accordance with the latest requirements of the EIA Regulations, 2014 (as amended).

2 PROCESS

In terms of the Environmental Impact Assessment (EIA) Regulations, which were published on 04 December 2014 [GNR 982, 983, 984 and 985) and amended on 07 April 2017 [promulgated in Government Gazette 40772 and Government Notice (GN) R326, R327, R325 and R324 on 7 April 2017], various aspects of the proposed development are considered listed activities under GNR 327 and GNR 324 which may have an impact on the environment and therefore require authorisation from the National Competent Authority (CA), namely the Department of Environment, Forestry and Fisheries (DEFF), prior to the commencement of such activities. Specialist studies have been commissioned to assess and verify the power line under the new Gazetted specialist protocols.

3 PROJECT BACKGROUND

South Africa Mainstream Renewable Power Developments (Pty) Ltd. (herein after referred to as “Mainstream”) has appointed SiVEST SA (Pty) Ltd (hereafter referred to as “SiVEST”) to undertake a Basic Assessment (BA) Process for the proposed construction of 132 kV overhead powerlines between the proposed (and authorised) 100MW Loeriesfontein 3 Photovoltaic (PV) Solar Energy Facility (SEF) (12/12/20/2321/2/AM4) and proposed (and authorised) 140MW Dwarsrug Wind Energy Facility (WEF) (14/12/16/3/3/2/690/AM4); and between the Dwarsrug WEF and the proposed (and authorised) Narosies Substation (12/12/20/2049/3) located near Loeriesfontein in the Northern Cape Province of South Africa.

4 PROJECT DESCRIPTION

Mainstream are proposing the construction of a 132 kV overhead powerlines between the proposed (and authorised) 100MW Loeriesfontein 3 PV SEF (12/12/20/2321/2/AM4) and proposed (and authorised) 140MW Dwarsrug WEF (14/12/16/3/3/2/690/AM4); and between the Dwarsrug WEF and the proposed (and authorised) Narosies Substation (12/12/20/2049/3) located near Loeriesfontein in the Northern Cape Province of South Africa.

The powerline from the Loeriesfontein 3 PV SEF to the Dwarsrug WEF is proposed to link the SEF to the WEF in order to create a hybrid renewable energy facility, which will ensure that electricity is constantly supplied to the national grid by at least one or both technologies (namely solar PV and wind), at any given time. The powerline from the Dwarsrug WEF is proposed to tie the, above mentioned, hybrid renewable energy facility into the approved Narosies substation to feed the National grid.

5 BA ALTERNATIVES

5.1 Route alternatives

Two (2) powerline alternatives will be assessed to link the Loeriesfontein 3 PV SEF to the Dwarsrug WEF and a single powerline is proposed to link these two (2) facilities to the National grid from the Dwarsrug WEF. All three (3) powerline route alignments will be assessed within a 300m wide assessment corridor (150m on either side of powerline). The powerline alternatives which are being proposed and assessed are shown in **Figure 2** below.

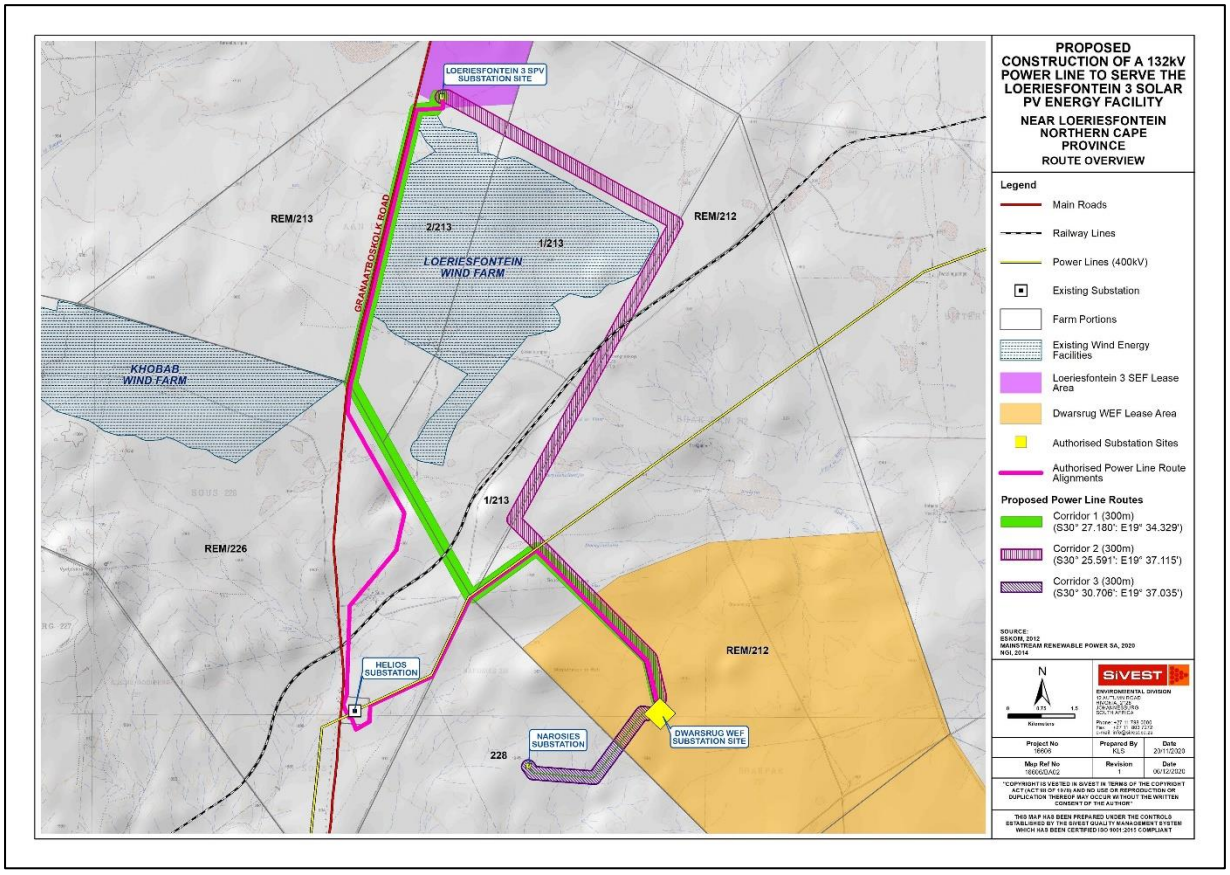

Figure 1: Powerline alternatives proposed to link Loeriesfontein 3 PV SEF to Dwarsrug WEF as well single power line proposed to link two (2) facilities to National grid from Dwarsrug WEF

The layout alternatives are being considered and assessed as part of the BA process and will be refined to avoid identified environmental sensitivities.

5.2 'No-go' alternative

The 'no-go' alternative is the option of not constructing the powerline project, which would prevent the realization of the hybrid facility and thus prevent electricity generated from renewable sources being fed into the national grid. This alternative would result in no additional environmental impact other than that assessed during the BA for the Renewable Energy (RE) facilities.

The 'no-go' option is a feasible option; however, this would prevent the hybrid facility from contributing to the environmental, social and economic benefits associated with the development of the renewables sector.

6 SPECIALIST STATEMENT / REPORT REQUIREMENTS

The specialist assessments should include the following sections:

6.1 Project Description

The specialist report must include the project description as provided above.

6.2 Terms of Reference (ToR)

The terms of reference for the appointment has two elements (1), Site Verification Report and (2) a specialist study / compliance statement as per Government Notice 320 of 20 March 2020 and Government Notice 1150 of 30 October 2020. The specialist report must include an explanation of the Terms of Reference (ToR) applicable to the specialist study. In addition, if the report is written as per Appendix 6 of the EIA Regulations, 2014 (as amended), a table must be provided at the beginning of the specialist report listing the requirements for specialist reports in accordance with and cross referencing these requirements with the relevant sections in the report. An MS Word version of this table will be provided by SiVEST.

6.3 Legal Requirements and Guidelines

The specialist report must include a thorough overview of all applicable best practice guidelines, relevant legislation and authority requirements.

6.4 Methodology

The report must include a description of the methodology applied in carrying out the specialist assessment.

6.5 Specialist Findings / Identification of Impacts

The report must present the findings of the specialist studies and explain the implications of these findings for the proposed development (e.g. permits, licenses etc.). This section of the report should also identify any sensitive and/or 'no-go' areas on the development site which should be avoided.

The reports should be accompanied with spatial datasets (shapefiles, KML) and accompanying text documents if required.

6.6 Impact Rating Methodology

The impacts of the proposed development (during the Construction, Operation and Decommissioning phases) are to be assessed and rated according to the methodology developed by SiVEST. Specialists will be required to make use of the impact rating matrix provided (in Excel format) for this purpose. ***Please note that the significance of Cumulative Impacts should also be rated in this section***. Both the methodology and the rating matrix will be provided by SiVEST.

Please be advised that this section must include mitigation measures aimed at minimising the impact of the proposed development.

6.7 Input to The Environmental Management Program (EMPr)

The report must include a description of the key monitoring recommendations for each applicable mitigation measure identified for each phase of the proposed development for inclusion in the Environmental Management Program (EMPr) or Environmental Authorisation (EA).

Please make use the Impact Rating Table (in Excel format) provided for each of the phases (i.e. Design, Construction, Operation and Decommissioning).

6.8 Cumulative Impact Assessment

A cumulative impact assessment must be undertaken for the proposed development in order to determine the cumulative impact that will materialise should other Renewable Energy Facilities (REFs) with their associated power lines and substations (i.e. powerline infrastructure) and large-scale industrial developments be constructed within 35km of the proposed development.

The cumulative impact assessment must contain the following:

- A cumulative environmental impact statement noting whether the overall impact is acceptable; and
- A review of the specialist reports undertaken for other REFs and powerline infrastructure developments, including an indication of how the recommendations, mitigation measures and conclusion of the studies have been considered.

In order to assist the specialists in this regard, SiVEST will provide the following documentation / data:

- A summary table listing all REFs and associated powerline infrastructure developments identified within 35km of the proposed development;
- A map showing the location of the identified REFs and their associated powerlines; and
- Relevant KML files.

It should be noted that it is the specialist's responsibility to source the relevant EIA / BA reports that are available in the public domain. SiVEST will assist, where possible.

The list of renewable energy facilities that must be assessed as part of the cumulative impact will be provided.

6.9 'No Go' Alternative

Consideration must be given to the 'no-go' option in the BA process. The 'no-go' option assumes that the site remains in its current state, i.e. there is no construction of a power line in the proposed project area and the *status quo* would proceed.

6.10 Comparative Assessment of Alternatives

As mentioned, two (2) powerline alternatives are proposed to link the Loeriesfontein 3 PV SEF to the Dwarsrug WEF and a single powerline is proposed to link these two (2) facilities to the National grid from the Dwarsrug WEF. All three (3) powerline route alignments will be assessed within a 300m wide assessment corridor (150m on either side of powerline).

As such, specialists are required to undertake a comparative assessment of the powerline routes (including alternatives) mentioned above as per the latest table provided by SiVEST.

6.11 Conclusion / Impact Statement

The conclusion section of the specialist reports must include an Impact Statement, indicating whether any fatal flaws have been identified and ultimately whether one or both of the proposed powerlines can be authorised or not (i.e. whether EA should be granted for one or both/ issued or not).

6.12 Executive Summary

Specialists must provide an Executive Summary which summarises the findings of their report to allow for easy inclusion in the BA reports (Draft and Final BA Reports).

7 DELIVERABLES

All specialists will need to submit the following deliverables:

- 1 x Site Verification Report and Specialist Report / Compliance statement no later than the 09th December 2020;
- A copy of the specialist's Curriculum Vitae (CV);
- A copy of the Specialist Declaration of Interest (DoI) form, containing original signatures. This form will be provided to the specialists. ***Please note that the undertaking / affirmation under oath section of the report must be signed by a Commissioner of Oaths***; and
- All data relating to the studies, such as shape files, photos and maps (see **Section 8** below).

8 GENERAL SUBMISSION REQUIREMENTS

Please ensure that your specialist report includes the following:

- The Site Verification Report and Compliance Statement / Specialist Report must in line with the DEFF Screening Tool Specialist Theme Protocols (As gazetted on 20 March 2020 and 30 October 2020), should they apply. Should they not apply, the report must be written in accordance with Appendix 6 of the EIA Regulations, 2014 (as amended);
- A table cross referencing how the requirements for specialist reports have been adhered to according to Appendix 6 of the EIA Regulations, 2014 (as amended) must be provided at the beginning of your report. An MS Word version will be provided by SiVEST;
- A thorough overview of all applicable legislation, policies, guidelines. etc.;
- Identification of sensitive and/or 'no-go' areas to be avoided;
- Recommend mitigation measures in order to minimise the impact of the proposed development;
- Provide implications of specialist findings for the proposed development (e.g. permits, licenses etc.);
- Specify if any further assessment will be required;
- Include an Impact Statement, concluding whether one or both of the the proposed powerlines development can be authorised or not (i.e. whether EA should be granted for one or both/ issued or not); and
- A copy of the specialist's Curriculum Vitae (CV);
- A copy of the Specialist Declaration of Interest (DoI) form, containing original signatures, must be appended to all Draft and Final Reports. This form will be provided to the specialists. ***Please note that the undertaking / affirmation under oath section of the report must be signed by a Commissioner of Oaths.***

9 DEADLINES AND REPORT SUBMISSION

- Site Verification Report and Compliance Statement / Specialist Report no later than 09 December 2020.
- Any changes arising based on stakeholder engagement no later than 12 January 2020

10 REPORT / DATA FORMATS

- All specialist reports must be provided in MS Word format;
- Where maps have been inserted into the report, SiVEST will require a separate map set in PDF format for inclusion in our submission;
- Where figures and/or photos have been inserted into the report, SiVEST will require the original graphic in .jpg format for inclusion in our submission; and
- Delineated areas of sensitivity must be provided in either ESRI shape file format or Google Earth KML format. ***Sensitivity classes must be included in the attribute tables with a clear indication of which areas are 'No-Go' areas.***

APPENDIX 2: SPECIALIST CREDENTIALS

Chris van Rooyen

Profession/Specialisation	:	Avifaunal Specialist
Highest Qualification	:	BA LLB
Nationality	:	South African
Years of experience	:	22 years

Chris van Rooyen has twenty-two years' experience in the assessment of avifaunal interactions with industrial infrastructure. He was employed by the Endangered Wildlife Trust as head of the Eskom-EWT Strategic Partnership from 1996 to 2007, which has received international acclaim as a model of co-operative management between industry and natural resource conservation. He is an acknowledged global expert in this field and has consulted in South Africa, Namibia, Botswana, Lesotho, New Zealand, Texas, New Mexico and Florida. He also has extensive project management experience, and he has received several management awards from Eskom for his work in the Eskom-EWT Strategic Partnership. He is the author and/or co-author of 17 conference papers, co-author of two book chapters, several research reports and the current best practice guidelines for avifaunal monitoring at wind farm sites. He has completed around 130 power line assessments; and has to date been employed as specialist avifaunal consultant on more than 50 renewable energy generation projects. He has also conducted numerous risk assessments on existing power lines infrastructure. He also works outside the electricity industry and he has done a wide range of bird impact assessment studies associated with various residential and industrial developments. He serves on the Birds and Wind Energy Specialist Group which was formed in 2011 to serve as a liaison body between the ornithological community and the wind industry. Chris works under the supervision of and in association with Albert Froneman (MSc Conservation Biology) (SACNASP Zoological Science Registration number 400177/09) as stipulated by the Natural Scientific Professions Act 27 of 2003.

Albert Froneman

Profession/Specialisation	:	Avifaunal Specialist
Highest Qualification	:	MSc (Conservation Biology)
Nationality	:	South African
Years of experience	:	18 years

Albert Froneman (Pr.Sci.Nat) has more than 18 years' experience in the management of avifaunal interactions with industrial infrastructure. He holds a M.Sc. degree in Conservation Biology from the University of Cape Town. He managed the Airports Company South Africa (ACSA) – Endangered Wildlife Trust Strategic Partnership from 1999 to 2008 which has been internationally recognized for its achievements in addressing airport wildlife hazards in an environmentally sensitive manner at ACSA's airports across South Africa. Albert is recognized worldwide as an expert in the field of bird hazard management on airports and has worked in South Africa, Swaziland, Botswana, Namibia, Kenya, Israel, and the USA. He has served as the vice chairman of the International Bird Strike Committee and has presented various papers at international conferences and workshops. At present he is consulting to ACSA with wildlife hazard management on all their airports. He also an accomplished specialist ornithological consultant outside the aviation industry and has completed a wide range of bird impact assessment studies. He has co-authored many avifaunal specialist studies and pre-construction monitoring reports for proposed renewable energy developments across South Africa. He also has vast experience in using Geographic Information Systems to analyse and interpret avifaunal data spatially and derive meaningful conclusions. Since 2009 Albert has been a registered Professional Natural Scientist (reg. nr 400177/09) with The South African Council for Natural Scientific Professions, specialising in Zoological Science.

APPENDIX 3: SPECIES LIST

Species	Taxonomic name	Full protocol reporting rate	Ad hoc reporting rate	Priority species	Red Data status: International	Red Data status: Regional
Acacia Pied Barbet	*Tricholaema leucomelas*	15.25	0.00			
African Black Duck	*Anas sparsa*	1.69	0.00	x		
African Pipit	*Anthus cinnamomeus*	5.08	1.69			
African Red-eyed Bulbul	*Pycnonotus nigricans*	3.39	0.00			
Anteating Chat	*Myrmecocichla formicivora*	32.20	3.39			
Barn Swallow	*Hirundo rustica*	22.03	5.08			
Black-chested Prinia	*Prinia flavicans*	1.69	0.00			
Black-chested Snake-eagle	*Circaetus pectoralis*	6.78	1.69	x		
Black-eared Sparrowlark	*Eremopterix australis*	45.76	8.47			
Black-headed Canary	*Serinus alario*	11.86	5.08			
Black-headed Heron	*Ardea melanocephala*	1.69	1.69	x		
Blacksmith Lapwing	*Vanellus armatus*	1.69	0.00			
Black-winged Stilt	*Himantopus himantopus*	3.39	1.69			
Bokmakierie	*Telophorus zeylonus*	72.88	6.78			
Booted Eagle	*Aquila pennatus*	3.39	0.00	x		
Burchell's Courser	*Cursorius rufus*	6.78	0.00		LC	VU
Cape Bunting	*Emberiza capensis*	30.51	6.78			
Cape Crow	*Corvus capensis*	28.81	11.86	x		
Cape Penduline-tit	*Anthoscopus minutus*	40.68	1.69			
Cape Sparrow	*Passer melanurus*	98.31	49.15			
Cape Turtle-dove	*Streptopelia capicola*	59.32	0.00			
Cape Wagtail	*Motacilla capensis*	27.12	0.00			
Capped Wheatear	*Oenanthe pileata*	40.68	5.08			
Chat Flycatcher	*Bradornis infuscatus*	79.66	27.12			
Chestnut-vented Tit-babbler	*Parisoma subcaeruleum*	5.08	0.00			
Common (Southern) Fiscal	*Lanius collaris*	72.88	1.69			
Common Quail	*Coturnix coturnix*	1.69	0.00			
Common Swift	*Apus apus*	11.86	0.00			
Crowned Lapwing	*Vanellus coronatus*	5.08	1.69			
Double-banded Courser	*Rhinoptilus africanus*	20.34	1.69			
Dusky Sunbird	*Cinnyris fuscus*	10.17	0.00			
European Bee-eater	*Merops apiaster*	10.17	0.00			
Fairy Flycatcher	*Stenostira scita*	1.69	0.00			
Familiar Chat	*Cercomela familiaris*	42.37	8.47			
Greater Kestrel	*Falco rupicoloides*	77.97	13.56	x		
Greater Striped Swallow	*Hirundo cucullata*	3.39	0.00			
Grey Tit	*Parus afer*	25.42	1.69			
Grey-backed Cisticola	*Cisticola subruficapilla*	32.20	1.69			
Grey-backed Sparrowlark	*Eremopterix verticalis*	44.07	13.56			
House Sparrow	*Passer domesticus*	30.51	3.39			
Jackal Buzzard	*Buteo rufofuscus*	6.78	5.08	x		
Karoo Chat	*Cercomela schlegelii*	89.83	61.02			
Karoo Eremomela	*Eremomela gregalis*	71.19	15.25			
Karoo Korhaan	*Eupodotis vigorsii*	89.83	33.90	x	LC	NT

Species	Taxonomic name	Full protocol reporting rate	Ad hoc reporting rate	Priority species	Red Data status: International	Red Data status: Regional
Karoo Long-billed Lark	*Certhilauda subcoronata*	88.14	28.81			
Karoo Prinia	*Prinia maculosa*	22.03	3.39			
Karoo Scrub-robin	*Cercotrichas coryphoeus*	84.75	6.78			
Kori Bustard	*Ardeotis kori*	1.69	0.00	x	NT	NT
Lanner Falcon	*Falco biarmicus*	13.56	0.00	x	LC	VU
Lappet-faced Vulture	*Torgos tracheliotus*	1.69	0.00	x	EN	EN
Large-billed Lark	*Galerida magnirostris*	89.83	37.29			
Lark-like Bunting	*Emberiza impetuani*	83.05	20.34			
Laughing Dove	*Streptopelia senegalensis*	40.68	0.00			
Layard's Tit-babbler	*Parisoma layardi*	5.08	0.00			
Lesser Flamingo	*Phoenicopterus minor*	1.69	0.00	x	NT	NT
Little Swift	*Apus affinis*	13.56	0.00			
Ludwig's Bustard	*Neotis ludwigii*	54.24	6.78	x	EN	EN
Malachite Sunbird	*Nectarinia famosa*	1.69	1.69			
Martial Eagle	*Polemaetus bellicosus*	32.20	18.64	x	VU	EN
Mountain Wheatear	*Oenanthe monticola*	1.69	0.00			
Namaqua Dove	*Oena capensis*	32.20	1.69			
Namaqua Sandgrouse	*Pterocles namaqua*	86.44	22.03			
Nicholson's Pipit	*Anthus nicholsoni*	5.08	0.00			
Pale Chanting Goshawk	*Melierax canorus*	84.75	27.12	x		
Pied Crow	*Corvus albus*	91.53	37.29	x		
Pied Starling	*Spreo bicolor*	1.69	0.00			
Red Lark	*Calendulauda burra*	69.49	18.64		VU	VU
Red-capped Lark	*Calandrella cinerea*	79.66	16.95			
Red-headed Finch	*Amadina erythrocephala*	1.69	0.00			
Rock Kestrel	*Falco rupicolus*	13.56	15.25			
Rock Martin	*Hirundo fuligula*	52.54	6.78			
Rufous-cheeked Nightjar	*Caprimulgus rufigena*	3.39	0.00			
Rufous-eared Warbler	*Malcorus pectoralis*	88.14	37.29			
Sclater's Lark	*Spizocorys sclateri*	32.20	0.00		NT	NT
Sickle-winged Chat	*Cercomela sinuata*	3.39	15.25			
South African Shelduck	*Tadorna cana*	6.78	0.00	x		
Southern Double-collared Sunbird	*Cinnyris chalybeus*	1.69	0.00			
Southern Masked-weaver	*Ploceus velatus*	42.37	1.69			
Speckled Pigeon	*Columba guinea*	74.58	10.17			
Spike-heeled Lark	*Chersomanes albofasciata*	96.61	38.98			
Spotted Eagle-owl	*Bubo africanus*	22.03	0.00	x		
Spotted Flycatcher	*Muscicapa striata*	1.69	0.00			
Spotted Thick-knee	*Burhinus capensis*	18.64	3.39			
Spur-winged Goose	*Plectropterus gambensis*	1.69	0.00	x		
Stark's Lark	*Spizocorys starki*	5.08	5.08			
Three-banded Plover	*Charadrius tricollaris*	8.47	1.69			
Tractrac Chat	*Cercomela tractrac*	93.22	45.76			
White-backed Mousebird	*Colius colius*	5.08	0.00			
White-rumped Swift	*Apus caffer*	6.78	0.00			

Species	Taxonomic name	Full protocol reporting rate	Ad hoc reporting rate	Priority species	Red Data status: International	Red Data status: Regional
White-throated Canary	*Crithagra albogularis*	59.32	13.56			
Yellow Canary	*Crithagra flaviventris*	98.31	52.54			
Yellow-bellied Eremomela	*Eremomela icteropygialis*	44.07	1.69			
Yellow-billed Kite	*Milvus aegyptius*	1.69	0.00	x		

APPENDIX 4: RECOMMENDED STRUCTURE TYPE 7649