ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED HYPERION SOLAR DEVELOPMENT 2 AND ASSOCIATED INFRASTRUCTURE, KATHU, NORTHERN CAPE:

AVIFAUNAL SPECIALIST SCOPING REPORT

savannah environmental

PRODUCED FOR SAVANNAH ENVIRONMENTAL

BY

3Foxes Biodiversity Solutions

Simon.Todd@3foxes.co.za

October 2018

EXECUTIVE SUMMARY

Cyraguard (Pty) Ltd is proposing the establishment of a 75MW commercial Photovoltaic (PV) solar energy facility (SEF) and associated infrastructure, called Hyperion Solar Development 2 (proposed development), on the Remainder of the Farm Lyndoch 432, situated north of Kathu in the Gamagara Local Municipality, Northern Cape Province. Three additional 75MW SEFs and associated infrastructure are proposed within the same property (project site) and will be submitted as separate projects. This report has been compiled specifically for the Hyperion Solar Development 2 including associated infrastructure. The proposed development is currently in the Scoping Phase and Cyraguard (Pty) Ltd has appointed 3Foxes Biodiversity Solutions to provide a specialist avifaunal scoping study of the project site as part of the Scoping and Environmental Impact Assessment (EIA) process.

A full field assessment as well as a desktop review of the available avifaunal information for the area was conducted in order to identify and characterise the avifaunal features of the project site. The avifauna is considered typical of the Kalahari bioregion. An approximate total of 219 bird species have been recorded within the project site and surrounds, of which 75 species were observed during a three-day field survey in August 2018. Very few of the species are listed as endemic (one species) and near-endemic (five species) or biome-restricted (five species). There are no known Important Bird Areas (IBAs) within the vicinity of the project site, while there are also no known wetlands of significant avifaunal importance.

Fourteen (14) red-listed species are known to occur in the broader area or are likely to occur at the project site. Of these, ten (10) species are listed as threatened, while four (4) others are considered Near-Threatened. However, none of these were recorded during the site visit while none have also been reported during recent atlas surveys. For the majority of these species their populations are considered to be marginal to the area and of low local significance. The Critically Endangered White-backed Vulture *Gyps africanus*, the Endangered Martial Eagle *Polemaetus bellicosus*, the Vulnerable Lanner Falcon and the Near-Threatened Kori Bustard *Ardeotis kori* are considered the most important priority species in the area, although they are not known to breed nor are observed in the area on a regular basis. Further, no sensitive breeding or roosting sites of any red-listed species were observed at the site during the field survey.

The expected impacts of the proposed solar development within the project site include 1) habitat loss and fragmentation associated with the Kathu Bushveld habitat, 2) disturbance caused during the construction and maintenance phases, and 3) direct mortality of avifauna colliding with solar panels or getting trapped in electric fences. The species that will be the most negatively impacted by the proposed development include mostly small passerines, ground-dwelling non-passerines and large raptors and terrestrial birds that occasionally use the area for foraging. The impacts on the avifauna would normally be expected to be of

medium importance, but due to the low frequency of occurrence of priority species, the impacts are likely to be low and no high post-mitigation impacts are expected.

The primary mitigation measures required to reduce the potential impacts on priority species include 1) restrict habitat destruction and disturbance to within the footprint of the proposed development, 2) exclusion of dense *Acacia erioloba* savanna and the dry riverbed of the Vlermuisleegte River from any development, 3) ensure that perimeter fencing along the boundaries of the development are bird (especially ground-dwelling species) friendly.

Cumulative impacts associated with the development area (approximately 200ha in extent) are a concern due to the increasing number of solar facility developments proposed for the broader Kathu area. Considering that vegetation and avifauna that occur on the property are typical of the Kalahari bioregion, the overall cumulative avifaunal impact of the development is still considered likely to be relatively low, provided that suitable ecological corridors within the broader area are identified and maintained. This is to ensure that ecological connectivity between areas of higher conservation value is preserved.

Considering that the project site supports a typical bioregional avifaunal assemblage, and that there are no known breeding or roosting sites of red-listed priority species, there are no impacts associated with the development that are considered to be of high significance and which cannot be mitigated to a low level. Therefore, based on the results of this avifaunal assessment, there are no reasons to indicate that the development should not proceed to the EIA phase. A proposed plan of study for the EIA phase is provided.

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COMPLIANCE WITH APPENDIX 6 OF THE 2014 EIA REGULATIONS, AS AMENDED

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b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	9
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(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	27-33
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g) an identification of any areas to be avoided, including buffers;	25-27
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i) a description of any assumptions made and any uncertainties or gaps in knowledge;	16-17
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n) a reasoned opinion- i. 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;	33-34
o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	See Main Report
p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	See Main Report
q) any other information requested by the competent authority.	
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

SHORT CV/SUMMARY OF EXPERTISE

Simon Todd Pr.Sci.Nat
Director & Principle Scientist
C: 082 3326502
O: 021 782 0377
Simon.Todd@3foxes.co.za
60 Forrest Way
Glencairn
7975

Ecological Solutions for People & the Environment

Simon Todd

Simon Todd is Director and principal scientist at 3Foxes Biodiversity Solutions and has over 20 years of experience in biodiversity measurement, management and assessment. He has provided specialist ecological input on more than 200 different developments distributed widely across the country. This includes input on the Wind and Solar SEA (REDZ) as well as the Eskom Grid Infrastructure (EGI) SEA and Karoo Shale Gas SEA. He is on the National Vegetation Map Committee as representative of the Nama and Succulent Karoo Biomes. Simon Todd is a recognised ecological expert and is a past chairman and current deputy chair of the Arid-Zone Ecology Forum. He is registered with the South African Council for Natural Scientific Professions (No. 400425/11).

Skills & Primary Competencies

- Research & description of ecological patterns & processes in Nama Karoo, Succulent Karoo, Thicket, Arid Grassland, Fynbos and Savannah Ecosystems.
- Ecological Impacts of land use on biodiversity
- Vegetation surveys & degradation assessment & mapping
- Long-term vegetation monitoring
- Faunal surveys & assessment.
- GIS & remote sensing

Tertiary Education:

- 1992-1994 – BSc (Botany & Zoology), University of Cape Town
- 1995 – BSc Hons, Cum Laude (Zoology) University of Natal
- 1996-1997- MSc, Cum Laude (Conservation Biology) University of Cape Town

Employment History

- 2009 – Present – Sole Proprietor of Simon Todd Consulting, providing specialist ecological services for development and research.
- 2007 Present – Senior Scientist (Associate) – Plant Conservation Unit, Department of Botany, University of Cape Town.

- 2004-2007 – Senior Scientist (Contract) – Plant Conservation Unit, Department of Botany, University of Cape Town
- 2000-2004 – Specialist Scientist (Contract) - South African National Biodiversity Institute
- 1997 – 1999 – Research Scientist (Contract) – South African National Biodiversity Institute

A selection of recent work is as follows:

Strategic Environmental Assessments

Co-Author. Chapter 7 - Biodiversity & Ecosystems - Shale Gas SEA. CSIR 2016.

Co-Author. Chapter 1 Scenarios and Activities – Shale Gas SEA. CSIR 2016.

Co-Author – Ecological Chapter – Wind and Solar SEA. CSIR 2014.

Co-Author – Ecological Chapter – Eskom Grid Infrastructure SEA. CSIR 2015.

Contributor – Ecological & Conservation components to SKA SEA. CSIR 2017.

Recent Specialist Ecological Studies in the Vicinity of the Current Site

- Kathu Solar PV Facility. Fauna and Flora EIA Process. Cape EAPrac 2015.
- Mogobe Solar PV Facility. Fauna and Flora EIA Process. Cape EAPrac 2015.
- Legoko Solar PV Facility. Fauna and Flora EIA Process. Cape EAPrac 2015.
- RE Capital 10 Solar Power Plant, Postmasburg. Fauna and Flora EIA Proces. Cape EAPrac 2015.
- Walk-through study of Kumba Iron Ore expansion area at Dingleton, Northern Cape. MSA Group. 2017.
- Adams PV Project – EIA process and follow-up vegetation survey. Aurora Power Solutions. 2016.
- Mamatwane Compilation Yard. Fauna and Flora EIA process. ERM. 2013.
- Olifantshoek-Emil 132kV power line. Fauna and Flora BA process. Savannah Environmental 2017.
- Gaetsewe Solar PV Facility. Fauna and Flora EIA Process. Cape EAPrac 2018.
- Mogara Solar PV Facility. Fauna and Flora EIA Process. Cape EAPrac 2018.
- Hotazel Solar PV Facility. Fauna and Flora EIA Process. Cape EAPrac 2018.

Eric Herrmann

Eric Herrmann is an avifaunal specialist with over 15 years of experience in biodiversity research and conservation in the Northern Cape. He completed a B.Tech Degree (Cum Laude) in Nature Conservation (1999) at the Cape Technikon, followed by a Masters (Cum Laude) in Conservation Ecology at the University of Stellenbosch (2004). He has worked as a research assistant for the Endangered Wildlife Trust (1999-2001) in the Kgalagadi Transfrontier Park, and then for the Percy FitzPatrick Institute of African Ornithology (University of Cape Town) as project manager of a field research centre near Kimberley (2003 to 2006). In 2006 he joined the provincial Department of Environment and Nature

Conservation (DENC) in Kimberley as a faunal scientist until 2012. Since 2016 he has been working independently as an avifaunal specialist largely on wind and solar energy projects in the Western and Northern Cape.

Tertiary Education:

- 1994 - 1997 – National Diploma: Nature Conservation (cum laude), Cape Technikon
- 1998 - 1999 – B.Tech Degree: Nature Conservation (cum laude), Cape Technikon
- 2000 - 2004 – MFor: Conservation Ecology (cum Laude), University of Stellenbosch

Employment History

- 2016 - Present – Independent contractor, avifaunal specialist for renewable energy projects.
- 2006 - 2012 – Senior Conservation Scientist, Department of Environment and Nature Conservation, Kimberley.
- 2003 - 2006 – Research Assistant and Field Projects Manager, Percy Fitzpatrick Institute of African Ornithology, Cape Town
- 2001 - 2002 – Field Researcher, Deciduous Fruit Producers Trust, Stellenbosch.
- 1999 - 2001 – Research Assistant, Endangered Wildlife Trust, Johannesburg.

Recent Specialist Avifaunal projects related to Solar and Wind energy or transmission infrastructure:

- Excelsior Wind Facility. Avifaunal pre-construction monitoring. BTE Wind Pty (Ltd). 2018.
- Mamre Wind Facility. Avifaunal pre-construction monitoring. Mulilo Renewable Project Developments. 2017.
- Soventix Solar PV Facility (De Aar). Avifaunal Specialist Scoping and EIA Reports. Ecoleges. 2017.
- Olifantshoek-Emil 132kV power line. Ecological Basic Assessment Report. Savannah Environmental. 2016.
- Klondike (Vryburg) Solar PV Facility. Ecological Specialist Report for EIA. Cape EAPrac 2016.
- Olifantshoek-Emil 132kV power line. Fauna and Flora BA process. Savannah Environmental 2017.
- Gaetsewe Solar PV Facility. Avifaunal Scoping Report. Cape EAPrac 2018.
- Mogara Solar PV Facility. Avifaunal Scoping Report. Cape EAPrac 2018.
- Hotazel Solar PV Facility. Fauna and Flora EIA Process. Cape EAPrac 2018.

SPECIALIST DECLARATION

I, ..Simon Todd....., as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- I act as the independent specialist in this application;
- I 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;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- 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 have no vested interest in the proposed activity proceeding;
- 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;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study 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: 

Name of Specialist: ____Simon Todd_____

Date: ____08 October 2018_____

SPECIALIST DECLARATION

I, ..Eric Herrmann....., as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- I act as the independent specialist in this application;
- I 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;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
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- 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: _____

Name of Specialist: ____Eric Herrmann_____

Date: ____08 October 2018_____

1 INTRODUCTION

Cyraguard (Pty) Ltd is proposing the establishment of a 75MW commercial Photovoltaic (PV) solar energy facility (SEF) and associated infrastructure, called Hyperion Solar Development 2 (proposed development), on the Remainder of the Farm Lyndoch 432, situated north of Kathu in the Gamagara Local Municipality, Northern Cape Province. Three additional 75MW SEFs and associated infrastructure are proposed within the same property (project site) and will be submitted as separate projects. This report has been compiled specifically for the Hyperion Solar Development 2 including associated infrastructure. The proposed development is currently in the Scoping Phase and Cyraguard (Pty) Ltd has appointed 3Foxes Biodiversity Solutions to provide a specialist avifaunal scoping study of the development site as part of the EIA process.

The purpose of the Hyperion 2 Solar Avifaunal Scoping Report is to 1) describe the avian ecological features of the proposed PV project site, 2) to provide a preliminary assessment of the avian ecological sensitivity of the project site and development area, and 3) identify and assess the significance of the likely impacts on the avifauna associated with the development of the site as a solar PV facility, and 4) to provide measures to avoid, minimize and mitigate project related impacts to the avifauna. A site visit (13 to 16 August 2018) as well as a desktop review of the available literature for the area was conducted in order to identify and characterise the local avifauna at the site.

This information is used to derive a draft avifaunal sensitivity map that presents the ecological constraints and opportunities for development at the project site. The information and sensitivity map presented here provides an avifaunal baseline that should be used in the planning phase of the development to ensure that the potential negative avifaunal impacts associated with the development can be minimised. Furthermore, the study defines the terms of reference for the EIA phase of the project and outlines a plan of study for the EIA which will follow the Scoping Study. The full scope of study is detailed below.

1.1 SCOPE OF STUDY

The assessment is conducted according to the 2014 EIA Regulations (Government Notice Regulation 982, as amended) in terms of the National Environmental Management Act (Act 107 of 1998) as amended (NEMA), as well as best-practice guidelines and principles for avifaunal assessment within solar energy facilities as outlined by Birdlife South Africa (Jenkins *et al.*, 2017).

The scope of the study includes the following activities:

- a description of the avifauna that may be affected by the activity and the manner in

which the avifauna may be affected by the proposed project

- a description and evaluation of environmental issues and potential impacts on the avifauna (including using direct, indirect and cumulative impacts) that have been identified
- a statement regarding the potential significance of the identified issues based on the evaluation of the issues/impacts
- an indication of the methodology used in determining the significance of potential impacts on the avifauna
- an assessment of the significance of direct indirect and cumulative impacts in terms of the following criteria:
    - the nature of the impact, which shall include a description of what causes the effect, what will be affected, and how it will be affected
    - the extent of the impact, indicating whether the impact will be local (limited to the immediate area or site of development), regional, national or international
    - the duration of the impact, indicating whether the lifetime of the impact will be of a short-term duration (0-5 years), medium-term (5-15 years), long-term (> 15 years, where the impact will cease after the operational life of the activity), or permanent
    - the probability of the impact, describing the likelihood of the impact actually occurring, indicated as improbable (low likelihood) probable (distinct possibility), highly probable (most likely), or definite (Impact will occur regardless of any preventable measures)
    - the severity/beneficial scale indicating whether the impact will be very severe/beneficial (a permanent change which cannot be mitigated/permanent and significant benefit with no real alternative to achieving this benefit), severe/beneficial (long-term impact that could be mitigated/long-term benefit), moderately severe/beneficial (medium- to long-term impact that could be mitigated/ medium- to long-term benefit), slight, or have no effect
    - the significance which shall be determined through a synthesis of the characteristics described above and can be assessed as low medium or high
    - the status which will be described as either positive, negative or neutral
    - the degree to which the impact can be reversed
    - the degree to which the impact may cause irreplaceable loss of resources
    - the degree to which the impact can be mitigated

- a description and comparative assessment of all alternatives
- recommendations regarding practical mitigation measures for potentially significant impacts, for inclusion in the Environmental Management Programme (EMPr)
- an indication of the extent to which the issue could be addressed by the adoption of mitigation measures

- a description of any assumptions uncertainties and gaps in knowledge
- an environmental impact statement which contains:
    - a summary of the key findings of the environmental impact assessment;
    - an assessment of positive and negative implications of the proposed activity;
    - a comparative assessment of the positive and negative implications of identified alternatives.

General Considerations:

- Disclose any gaps in information or assumptions made.
- Identify recommendations for mitigation measures to minimise impacts.
- Outline additional management guidelines.
- Provide monitoring requirements, mitigation measures and recommendations in a table format as input into the Environmental Management Plan (EMP) for avifaunal related issues.

A description of the potential impacts of the development and recommended mitigation measures are to be provided, which will be separated into the following project phases:

- Preconstruction
- Construction
- Operational Phase

1.2 RELEVANT ASPECTS OF THE DEVELOPMENT

The proposed development is located on the Remainder of the Farm Lyndoch 432, situated north of Kathu in the Gamagara Local Municipality, Northern Cape Province. (**Error! Reference source not found.**). Hyperion Solar Development 2 is to consist of solar photovoltaic (PV) technology with fixed, single and double axis tracking mounting structures, with a net generation (contracted) capacity of 75 MW_{AC}, as well as associated infrastructure, which will include:

- Several arrays of photovoltaic solar panels;
- Mounting structures to support the PV panels;
- Cabling between the project components, to be laid underground where practical;
- On-site inverters to convert the power from a direct current to an alternating current;
- An on-site substation to facilitate the connection between the solar energy facility and the Eskom electricity grid;

- A new 132kV power line between the on-site substation and the existing Ferrum Substation[1];
- Battery storage facilities;
- Water purification plant;
- Site Offices and Maintenance Buildings, including workshop areas for maintenance and storage;
- Batching plant;
- Temporary laydown areas;
- Internal access roads and fencing around the development area;
- Access road from the project site to the N14. Two access road alternatives will be considered:
    - Upgrade approximately 3,6km of the T26 gravel road between the project site and the N14 (Alternative 1); and
    - The construction of a new access road and the formalisation of an informal access road between the project site and the T25 gravel road, approximately 5km in length (Alternative 2).

[1] The construction of the 132kV overhead power line will be assessed as part of a separate Basic Assessment process and do not form part of this assessment.

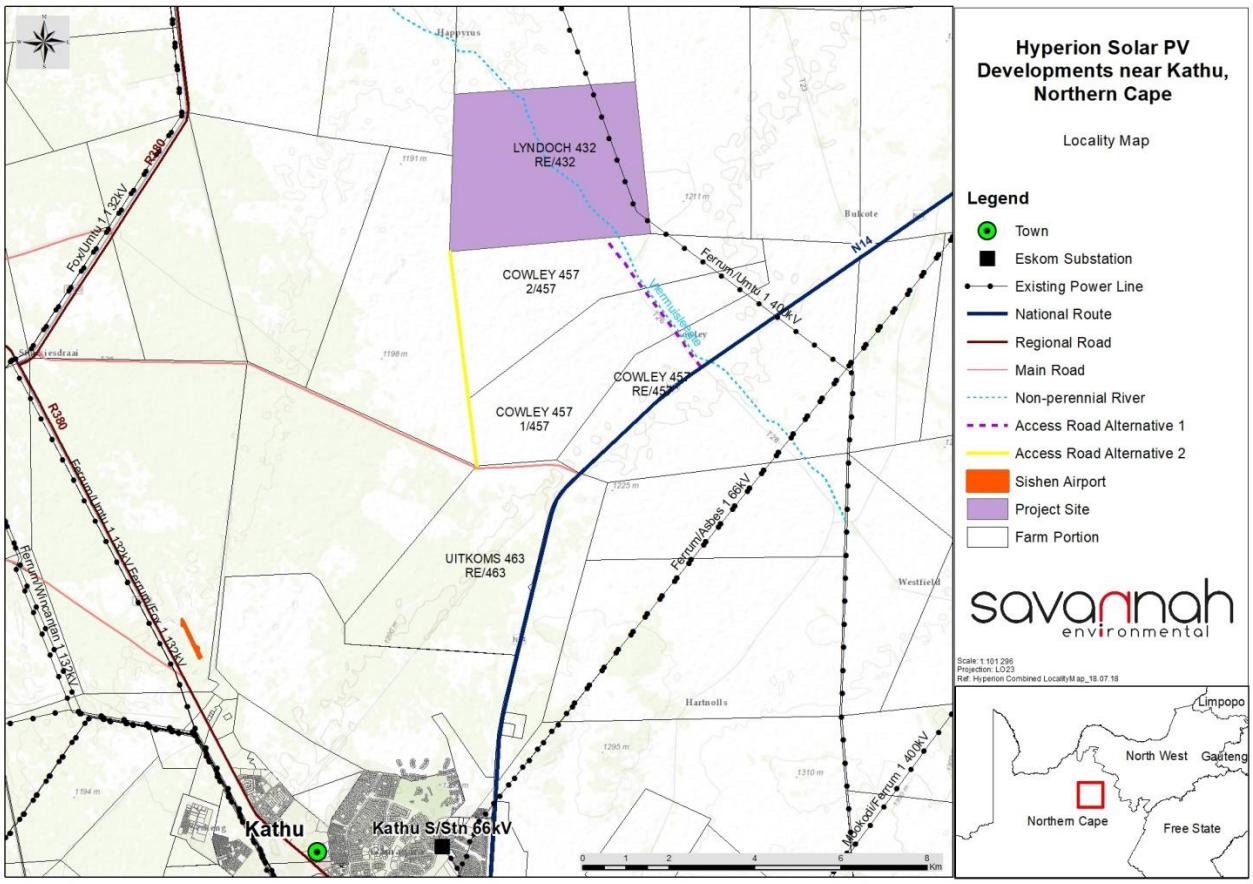

Figure 1. Map showing the location of the Hyperion Solar PV development site in relation to Kathu and the two access road alternatives (courtesy of Savannah Environmental).

2 METHODOLOGY

2.1 DATA SOURCING AND REVIEW

Data sources from the literature consulted and used where necessary in the study include the following:

- The Southern African Bird Atlas Project 1 (SABAP 1; Harrison *et al*., 1997), which obtained bird distribution data between 1987 and 1992, was consulted to determine the bird species likely to occur within the project site. The relevant quarter-degree grid cell (QDGC) that covers the study area is 2723CA (51 cards, 211 species). More recent bird distribution data were also obtained from the second bird atlas project, which has been on-going since its inception in 2007 (SABAP 2; http://sabap2.adu.org.za/). SABAP2 employs a finer resolution using the pentad scale (5' latitude x 5' longitude), with the relevant pentad codes for the study area being 2730_2300 (2 cards, 51 species) and 2730_2305 (2 cards, 67 species). These

were consulted to determine the bird species likely to occur within the project site and the broader impact zone of the development.

- The Important Bird Areas of South Africa (IBA; Marnewick *et al*., 2015) was consulted to determine the location of the nearest IBAs to the project site.
- The data from the Coordinated Avifaunal Roadcounts (CAR; Young *et al*., 2003) were consulted to determine the location of the nearest CAR routes to the project site.
- The data from the Coordinated Waterbird Counts (CWAC; Taylor *et al*., 1999) were consulted to determine the location of the nearest CWAC sites to the project site.
- The conservation status, endemism and biology of all species considered likely to occur within the study area were determined from Hockey *et al.* (2005) and Taylor *et al.* (2015).
- The South African National Vegetation Map (Mucina & Rutherford, 2006) was consulted in order to determine the vegetation types and their conservation status that occur within the project site.

The literature review revealed that there are no Important Bird Areas (IBAs), Coordinated Avifaunal Roadcounts (CAR) routes, or Coordinated Waterbird Counts (CWAC) wetlands in the vicinity of the project site.

2.2 SITE VISIT & FIELD METHODOLOGY

A site visit of three full days was made to the project site in winter (13 to 16 August 2018) following a relatively wet summer to determine the *in situ* local avifauna and avian habitats present on site. In terms of timing, the field assessment is considered to correspond to a dry-season assessment. The field approach is informed by the *Birds and Solar Energy*

Best Practice Guidelines (Jenkins *et al*., 2017) issued by Birdlife South Africa. In terms of these guidelines, the project is seen to fall within the Regime 2 assessment protocol in terms of the extent of the site and the avifaunal sensitivity.

The current field assessment consisted of point counts (n = 51) and 1km linear transects (n = 16), distributed throughout the study area to obtain preliminary data on presence/absence of species. All birds detected by sight or sound were recorded over a 10-minute period at each point count, while only large non-passerine species were recorded along the 1km line transects, lasting between 30 to 40 minutes. The number of birds and their distance from the observer was recorded for all detections made at point counts and along line transects. These surveys served to:

- Quantify aspects of the local avifauna (such as species diversity and abundance);
- Identify important avian features present on site (such as nesting and roosting sites);

- Confirm the presence, abundance, habitat preference and movements of priority species;
- Identify important flyways across the site; and
- Delineate any obvious, highly sensitive, no-go areas to be avoided by the development.

A list was compiled of all the avifaunal species likely to occur within the project site and the broader impact zone of the development, based on a combination of existing distributional data (SABAP 1 and SABAP 2) and species seen during the site visit. A short-list of priority bird species (including nationally and/or globally threatened, rare, endemic or range-restricted bird species) which could be affected by the proposed development was also compiled. These species will subsequently be considered as adequate surrogates for the local avifauna in general, and mitigation of impacts on these species will be considered likely to accommodate other bird populations that may be affected.

2.3 SENSITIVITY MAPPING & ASSESSMENT

An avifaunal sensitivity map of the site was produced by integrating the available ecological and biodiversity information available in the literature and various spatial databases with mapping based on the satellite imagery of the site as well as personal knowledge of the site. This includes delineating different habitat units identified on the satellite imagery and assigning likely sensitivity values to the units based on their ecological properties, conservation value and the potential presence of avifaunal species of conservation concern. The ecological sensitivity of the different units identified in the mapping procedure was rated according to the following scale:

- **Low** – Areas of natural or transformed habitat with a low sensitivity where there is likely to be a negligible impact on ecological processes and avifaunal biodiversity. Most types of development can proceed within these areas with little ecological impact.
- **Medium**- Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impact such as erosion low. These areas usually comprise the bulk of habitats within an area. Development within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken.
- **High** – Areas of natural or transformed land where a high impact is anticipated due to the high biodiversity value, sensitivity or important ecological role of the area. These areas may contain or be important habitat for avifaunal species or provide important ecological services such as water flow regulation or forage provision. Development within these areas is undesirable and should only proceed with caution as it may not be possible to mitigate all impacts appropriately.

- **Very High** – Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles. These areas are essentially no-go areas from a developmental perspective and should be avoided as much as possible.

2.4 SAMPLING LIMITATIONS AND ASSUMPTIONS

The current study consisted of a detailed field assessment as well as a desktop study, which serves to significantly reduce the limitations and assumptions required for the study. However, it must be noted that there are limiting factors, and these could detract from the accuracy of the predicted results:

- There is a scarcity of published, scientifically assessed information regarding the avifaunal impacts at existing SEFs. Recent studies at SEFs (all using different solar technologies) in southern California have revealed that a wide range of bird species are susceptible to morbidity and mortality at SEFs, regardless of the type of technology employed. It must however be noted, that facility related factors could influence impacts and mortality rates and as such, each SEF must be assessed individually, taking all variables into account.
- Assessment of the impacts associated with bird-SEF interactions is problematic due to: (i) limitations on the quality of information available describing the composition, abundance and movements of the local avifauna, and (ii) the lack of local, empirical data describing the known impacts of existing SEFs on birds (Jenkins, 2011). A more recent study (Venter, 2016), however, provides some preliminary data within the South African context.
- The SABAP 1 data for the relevant quarter degree squares covering the proposed development area are now >21 years old (Harrison *et al*., 1997), while there are presently only four (4) SABAP 2 atlas cards recorded for the two relevant pentads combined. No more reliable and/or more recent formal data on bird species distribution in the study area are available. In an attempt to reduce this limitation, and ensure a conservative approach, the species list derived from the literature was obtained from an area somewhat larger than the study site, and thus likely includes a much wider array of species than what actually occurs at the site. Aquatic species that were included on the original SABAP1 list for the area, but are largely restricted to permanent water bodies, were excluded from the final list compiled (Appendix 1).
- Limited time in the field and seasonal spread means that important components of the local avifauna (i.e. nest sites or localised areas of key habitats for rare or threatened species) could have been missed. However, the extent of the project site is not that large and thus it is highly unlikely that there are any significant nesting sites of larger species present within the affected area that would not have been detected.

- During point counts and walking transects many birds were heard but not seen, which made it difficult to estimate the number of individuals present per detection. However, considering that the same observer was responsible for recording all detections, it is assumed that sampling error would be distributed evenly across all samples.

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT- BASELINE

3.1 AVIFAUNAL MICROHABITATS

Broad-scale vegetation patterns influence the distribution and abundance of bird species holistically, while vegetation structure, rather than plant species composition, has a greater influence on local avifauna populations and species assemblages (Harrison *et al*., 1997). The project site lies within one vegetation type, the Kathu Bushveld, and supports four avifaunal microhabitats, namely 1) *Tarchonanthus camphoratus* dominated scrubland, 2) *Acacia erioloba* woodland, 3) dense *Acacia mellifera* savanna, and 4) arid riparian grassland associated with the Vlermuisleegte River that traverses the project site. A few dense stands of *Terminalia sericea* trees also occur and are generally associated with the *Acacia erioloba* woodland. The *Tarchonanthus camphoratus* scrubland (Figure 2) dominates the western half of the project site and is the result of a devastating veld fire in 2009 that transformed an open *Acacia erioloba* woodland to a scrubland. The remaining *Acacia erioloba* woodland occurs on the eastern half of the study area (Figure 3), together with extensive *Acacia mellifera* dominated savanna. The ephemeral Vlermuisleegte River (Figure 4), traverses the centre of the project site, separating the *Tarchonanthus* scrubland to the west from the *Acacia* savannas to the east. The *Tarchonanthus camphoratus* scrubland is considered to be of Medium Sensitivity, as the area does support a low density of *Acacia erioloba* trees and a high density of *Acacia haematoxylon* trees. The *Acacia erioloba* woodland has a markedly higher density of large *Acacia erioloba* trees interspersed with patches of *Acacia mellifera*, giving rise to higher structural diversity, with a combined High Sensitivity. The drainage line supports an almost pan-like habitat that may support a different assemblage of bird species compared to the scrub and woodland, and hence is considered to be of Very High Sensitivity.

Figure 2. *Tarchonanthus camphoratus* scrubland within the western half of the project site. The habitat does support some large *Acacia erioloba* trees, but these occur at a much lower density compared to the eastern half of the project site.

Figure 3. *Acacia erioloba* woodland in the eastern half of the project site. The habitat is interspersed with patches of *Acacia mellifera* and *Terminalia sericea,* hence supporting a higher structural diversity with respect to vegetation.

Figure 4. Open grassland associated with the dry bed of the Vlermuisleegte River that bisects the project site. This habitat is considered highly sensitive as it represents a 'pan-like' habitat that may support a unique assemblage of bird species not found in the surrounding habitats.

3.2 General Avifauna

Approximately 219 bird species are known to occur in the project site and surrounds (Annexure 1), of which 75 species were recorded on site during the field survey. Fourteen (14) red-listed species have been recorded in the broader area since SABAP1, and may possibly occur at the study site. Of these, ten (10) species are listed as threatened, while four (4) others are considered Near-Threatened. Several other species are listed as endemic (one (1) species), near-endemic (five (5) species) or biome-restricted (five (5) species).

The bird assemblage recorded within the project site is typical of the Kalahari bioregion. Of the 75 species recorded on site, 46 species were detected during point counts and line transects. An average of 4.9 species were recorded per point count, with an average of 8.9 individual birds. Small passerines species made up the majority (34 species, 74%) of the species detected, compared to non-passerines (12 species, 26%). The five near-endemic species reported for the broader study area include Fiscal Flycatcher *Sigelus silens,* Karoo Thrush *Turdus smithi*, Fairy Flycatcher *Stenostira scita,* Black-headed Canary *Serinus alario* and Black Harrier *Circus maurus*, of which only the former two widespread species are relatively common in the broader area. The endemic Pied Starling *Lamprotornis bicolor* is considered an uncommon species in the area, occurring more regularly to the east near Kuruman. The two biome-restricted species that occur in the area, namely, the Kalahari

Scrub-robin *Cercotrichas paena*, and Burchell's Sandgrouse *Pterocles burchelli,* are common and have widespread distributions through the bioregion.

The most abundant species recorded during point counts at the site was the Scaly-feathered Finch *Sporopipes squamifrons*, with a relative abundance of 2.0 birds/point count (Table 1). Other common species which occurred at significantly lower abundances included Black-chested Prinia *Prinia flavicans* (0.8 birds/point count), Kalahari Scrub-robin (0.8 birds/point count), and Chestnut-vented Warbler *Sylvia subcaeruleum* (0.5 birds/point count). These four species had the highest encounter rates of all detected species (between 20 and 40 detections each for the 51-point counts). The remaining species had significantly lower encounter rates, with the most common of these being Violet-eared Waxbill *Granatina granatina*, Ant-eating Chat *Myrmecocichla formicivora*, Fork-tailed Drongo *Dicrurus adsimilis*, Yellow Canary *Crithagra flaviventris*, and Burchell's Sandgrouse (mostly seen flying overhead).

Table 1. The most commonly detected bird species during point counts (n = 51) across the Hyperion Solar Development 2 project site, with the number of birds seen per point count as a measure of relative abundance.

Species	Number of detections	Number of birds	Birds/point count
Scaly-feathered Finch	46	102	2.00
Black-chested Prinia	35	43	0.84
Kalahari Scrub Robin	35	39	0.76
Chestnut-vented Warbler	24	26	0.51
Violet-eared Waxbill	8	21	0.41
Ant-eating Chat	11	17	0.33
Fork-tailed Drongo	14	17	0.33
Burchell's Sandgrouse	7	14	0.27
Yellow Canary	7	14	0.27
African Red-eyed Bulbul	6	13	0.25
Cape Glossy Starling	4	12	0.24
Cape Turtle-dove	9	11	0.22
Brown-crowned Tchagra	5	7	0.14
Golden-breasted Bunting	6	7	0.14
Crimson-breasted Shrike	6	6	0.12
Tinkling Cisticola	4	6	0.12

Very few species and individuals were recorded along the walked line transects, and included the following (with the number of detections in parenthesis), Burchell's Sandgrouse (four), Red-crested Korhaan *Lophotis ruficrista* (two), Orange River Francolin *Scleroptila gutturalis* (one) and Gabar Goshawk *Micronisus gabar* (one). Other medium to large non-passerines that were detected incidentally include Verreaux's Eagle-Owl *Bubo lacteus* (one), Pale Chanting Goshawk *Melierax canorus* (two) and Southern Yellow-billed Hornbill *Tockus leucomelas* (two).

Some species showed rather clear preferences for parts of the project site. Fawn-coloured Lark *Calendulauda africanoides,* Ant-eating Chat *Myrmecocichla formicivora* and Tinkling Cisticola *Cisticola rufilatus* were found more commonly in the western half of the project site, which is dominated by *Tarchonanthus* scrub with a very low density of *Acacia erioloba* trees. Species that were only recorded in the eastern half of the study area, with a higher density of *Acacia erioloba* trees, include Crimson-breasted Shrike *Laniarius atrococcineus*, Neddicky *Cisticola fulvicapilla* and Pearl-spotted Owlet *Glaucidium perlatum*. However, the number of detections for these species were low, thereby precluding any reliable inferences regarding their distributions within the study area.

3.3 RED-LISTED SPECIES

Red-listed species are considered fundamental to this study, because of their susceptibility to the various threats posed by solar facilities and associated infrastructures. A total of 10 species that have been recorded in the broader area are threatened, while four (4) other species are considered Near-Threatened (Table 2). However, none of these species have been reported from the area during the current atlas period (SABAP2), most likely due to poor coverage. Only two (2) cards had been submitted for the two (2) relevant pentads combined prior to the field survey. The most important of all these species is the Critically Endangered White-backed Vulture *Gyps africanus*, which is presumably uncommon in the area based on atlas records dating back to SABAP1. The species' low reporting rate (14%) during SABAP1 and absence during SABAP2 seems to be corroborated by local knowledge, claiming that the species is only occasionally seen flying over the project site. White-backed Vultures therefore do not appear to use the study area to any appreciable extent, whether for roosting, breeding or foraging.

For the majority of the red-listed species it appears that their populations are marginal to the area, and therefore of low local significance. Besides White-backed Vulture, the Endangered Martial Eagle *Polemaetus bellicosus*, the Vulnerable Lanner Falcon and the Near-Threatened Kori Bustard *Ardeotis kori* are considered the most important priority species in the area, although they are not known to breed nor be frequently observed in the area on a regular bases based on atlas records. Further, no sensitive breeding or roosting sites of any red-listed species were observed at the site during the field survey.

Other species that may occur at the project site include the European Roller *Coracias garrulus* (Near-Threatened), which favours savannah habitat, and the Burchell's Courser *Cursorius rufus* (Vulnerable), which may occupy the drainage line that traverses the centre of the project site. Similarly, the Secretarybird *Sagittarius serpentarius* (Vulnerable) may also prefer to forage with the grassland habitat of the drainage line compared to the scrub and dense woodlands. Red-listed species which may occur with negligible frequency and therefore are of less concern include the Ludwig's Bustard *Neotis ludwigii* (Endangered), Black Stork *Ciconia nigra* (Vulnerable), Abdim's Stork *Ciconia abdimii*, (Near-Threatened), and Maccoa Duck *Oxyura maccoa* (Near-Threatened). The lack of suitable microhabitats will in all likelihood exclude these species from the site. With the exception of the Maccoa Duck, these species may occupy the grassland habitat in the drainage line when conditions are favourable, but probably only in very low numbers.

During the walking transects regular scans were made to detect any large flying birds to establish the presence of flight paths across the project site. No large terrestrial birds or raptors were seen, other than the most common birds of prey, namely Pale Chanting Goshawk and Gabar Goshawk. No nest or communal nesting sites of red-listed species were found in the project site during the site visit, which could be due to the absence of suitably

large trees in the area. These observations seem to suggest that red-listed or large communal species are not currently using the project site or parts thereof for roosting or nesting.

In essence, much of the avifauna within the study area appears similar to that found across the Kalahari bioregion of the Northern Cape. The apparent lack of red-listed species in the area could be attributed to their naturally low densities and large ranges, the absence of suitable habitat (Black Stork, Abdim's Stork, Maccoa Duck) and nesting/roosting trees (White-backed Vulture). However, certain species may use the project site on occasion, such as Martial Eagle, Lanner Falcon, and European Roller and possibly Secretarybird. However, since the study area appears not to directly support large and healthy populations of red-listed species, the sensitivity of the study area in general can be considered to be of medium significance with respect to avifauna.

Table 2. Red-listed species recorded in the study area during SABAP1 (1987-1991), ranked according to their red-list status. No species have been reported during SABAP2 (2007 on-going), most likely due to poor coverage in the area, nor during the field survey (13 to 16 August 2018)

English name	Taxonomic name	Red-list status	Regional endemism	Estimated importance of local population	Preferred habitat	Probability of occurrence	Threats
Vulture, White-backed	*Gyps africanus*	Critically Endangered	-	Low	Savanna	Moderate	Habitat loss/Disturbance Collisions/Electrocution
Bateleur	*Terathopius ecaudatus*	Endangered	-	Low	Savanna	Low	Habitat loss/Disturbance Collisions/Electrocution
Bustard, Ludwig's	*Neotis ludwigii*	Endangered	-	Low	Semi-arid shrublands	Low	Habitat loss/Disturbance Collisions
Eagle, Martial	*Polemaetus bellicosus*	Endangered	-	Low	Savanna & shrublands	Moderate	Habitat loss/Disturbance Collisions/Electrocution
Harrier, Black	*Circus maurus*	Endangered	Near-endemic	Low	Fynbos, Karoo & grassland	Low	Habitat loss/Disturbance/Collisions
Courser, Burchell's	*Cursorius rufus*	Vulnerable	-	Low	Shrubland plains	Moderate	Habitat loss/Disturbance
Eagle, Verreaux's	*Aquila verreauxii*	Vulnerable	-	Low	Mountainous and rocky areas	Low	Habitat loss/Disturbance Collisions/Electrocution
Falcon, Lanner	*Falco biarmicus*	Vulnerable	-	Moderate	Widespread	High	Habitat loss/Disturbance Collisions/Electrocution
Secretarybird	*Sagittarius serpentarius*	Vulnerable	-	Low	Open savanna & grassland	Low	Habitat loss/Disturbance Collisions
Stork, Black	*Ciconia nigra*	Vulnerable	-	Low	Water bodies	Low	Collisions
Bustard, Kori	*Ardeotis kori*	Near-threatened	-	Moderate	Open savanna	Moderate	Habitat loss/Disturbance Collisions
Duck, Maccoa	*Oxyura maccoa*	Near-Threatened	-	Low	Water bodies	Low	Habitat loss/Disturbance
Roller, European	*Coracias garrulus*	Near-Threatened	-	Low	Open savanna	Moderate	Habitat loss/Disturbance
Stork, Abdim's	*Ciconia abdimii*	Near-threatened	-	Low	Grassland & savanna	Low	Collisions

3.4 AVIAN SENSITIVITY ASSESSMENT

Important avian microhabitats in the project site play an integral role within the landscape, providing nesting, foraging and reproductive benefits to the local avifauna. In order to ensure that the development does not have a long-term negative impact on the local avifauna, it is important to delineate these avian microhabitats within the project site. To this end an avian sensitivity map (Figure 5) was generated by integrating avian microhabitats present on the site and avifaunal information collected during the site visit.

Much of the study area to the west of the Vlermuisleegte River consists of *Tarchonanthus camphoratus* scrub, considered to be of Medium Sensitivity. It is host to the typical avifauna of the Kalahari bioregion. This is the lowest sensitivity part of the site and the development should preferably be restricted to this habitat type. It is however important to recognise the long-term temporal aspect of vegetation dynamics at the site. This area experienced a devastating fire in 2009, which destroyed many of the large *Acacia* trees as now only found to the east of the Vlermuisleegte River. Hence, with time (several decades), large *Acacia erioloba* trees may again become prominent across the *Tarchonanthus* scrub. As such the sensitivity is reflection of the current vegetation composition and not the long-term potential.

The *Acacia erioloba* woodland to the east of the Vlermuisleegte is considered to be of High Sensitivity with respect to avifauna, as it supports large *Acacia* trees interspersed with patches of *Acacia mellifera* and *Terminalia sericea*, which contribute towards higher habitat heterogeneity and wider array of nesting sites resulting in an overall greater diversity of avifauna. Data obtained from the current field study is insufficient to conclusively demonstrate differences in avifaunal assemblages between the *Acacia* woodland to the east, and the *Tarchonanthus* scrub to the west of the drainage line. However, indications from the site visit suggest that it is likely to more diverse and this is a reasonable assumption as there is a known relationship between habitat heterogeneity and species richness (Harrison *et al*., 1997). The area to the east of the Vlermuisleegte is considered High Sensitivity and largely unsuitable for development.

The open grassland that occupies the bed of the dry Vlermuisleegte River is considered to be of Very High Sensitivity, as this is a restricted habitat that has elements similar to that of pans, which are generally regarded as very high sensitivity areas due to their high use and specialised avifauna that is usually associated with these features. This drainage line may therefore support a very different assemblage of birds compared to the scrub and woodland habitat and may even support red-listed species under favourable conditions, such as Burchell's Courser and Ludwig's Bustard. No additional development or transformation within this area is recommended. The continued use of the current access road is considered acceptable provided that no large raptor nests of species of concern are found in the trees near the road. Although no such nests were seen during the current survey, this

would be confirmed during the follow-up wet season survey. Provided that this condition can be met, then the existing access road would be the preferred access route to the site. The alternative access route is not recommended as it would open up a new disturbance path through habitat that is currently little disturbed.

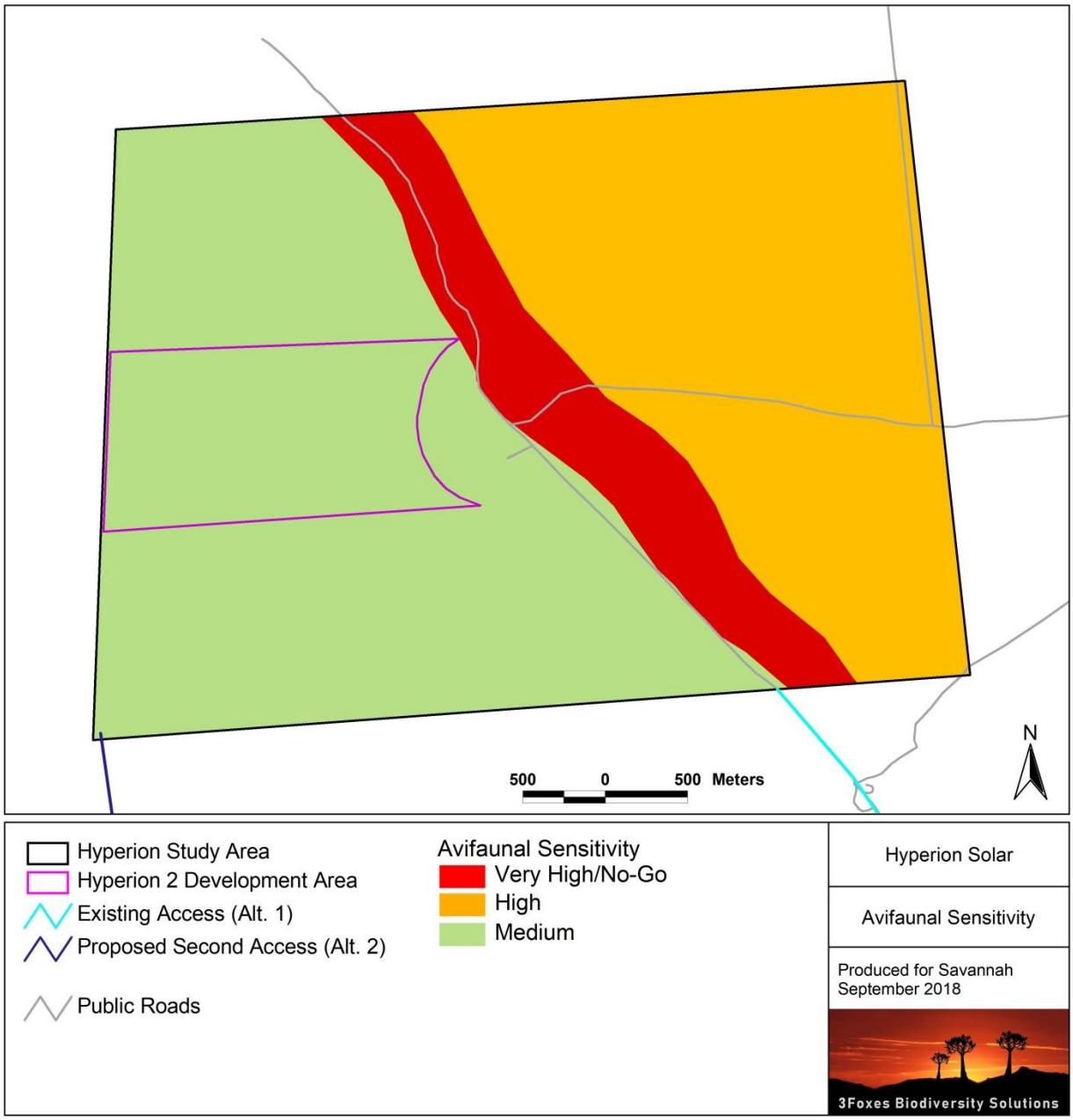

Figure 5. Avifaunal Sensitivity map for the Hyperion Solar Development 2 development area and the wider project site. There is High Sensitivity *Acacia erioloba* woodland to the east of the Vlermuiseleegte which is considered to be Very High sensitivity, and Medium Sensitivity *Tarchonanthus* scrubland to the west.

In terms of the two proposed access road alternatives, the existing access which runs adjacent to the dry bed of the Vlermuisleegte River, is in a potentially sensitive area. However, the use of this road must be weighed up against the likely avifaunal habitat loss and disturbance generated by the construction and use of the alternative access route. As the existing road is currently used to access the site and is a large road that would require minimal additional work, this is seen as preferred alternative from an avifaunal perspective.

4 IDENTIFICATION & NATURE OF IMPACTS

In this section, the potential impacts and associated risk factors that may be generated by the development are identified. In order to ensure that the impacts identified are broadly applicable and inclusive, all the likely or potential impacts that may be associated with the development are listed below. The relevance and applicability of each potential impact to the current situation are then examined in more detail in the next section.

According to a position statement by Birdlife South Africa, the main concerns with PV facilities are the following:

- Displacement or the exclusion of nationally and/or globally threatened, rare, endemic, or range-restricted bird species from important habitats.
- Loss of habitat and disturbance of resident bird species caused by construction, operation and maintenance activities.
- Collision with the solar panels, which may be mistaken for water bodies.
- Collision and electrocution caused when perching on or flying into associated power line infrastructure.
- Habitat destruction and disturbance/exclusion of avifauna through construction (short-term) and maintenance (long-term) of new power line infrastructure.
- Habitat destruction and disturbance of birds caused by the construction and maintenance of new roads and other infrastructure.

Each 75MW facility of the proposed Hyperion Solar development will cover an area of approximately 180ha, located within Kathu Bushveld and should all 4 plants be constructed, this would result in more than 700ha of habitat loss. This habitat represents the typical vegetation of the broader area, but supports a homogenous scrubland dominated by *Tarchonanthus camphoratus* in the western half, and a more heterogeneous *Acacia* woodland in the eastern half of the property. None of the 14 red-listed species that are known to occur in the broader area were recorded during the field survey, while only two (2) near-endemic species and two (2) biome-restricted species occur regularly in the area. While the development may have an insignificant impact on these species, it will nevertheless impact on common local bird assemblages primarily through direct habitat loss and displacement. Species are expected to be impacted to varying degrees based on their

life-history strategies, abundance and general susceptibility to the threats posed by PV facilities. While habitat loss can be quantified by extent of the development footprint, there are other impacts such as direct mortalities caused by collisions with solar panels, which are still poorly understood.

Data on estimates of birds killed at solar facilities as a direct result of collisions with associated infrastructure are limited, especially in South Africa. A recent study at a large solar facility in the Northern Cape (Visser, 2016) provides the first estimates of the potential impact on birds within the region, with direct mortalities amounting to 4.5 birds/MW/year. This short-term study also concluded, however, that there was no significant association with collision-related mortality at that study site, and that further studies were required. Most injuries that were recorded were related to species such as francolin colliding with the underside of PV panels when startled, and korhaans becoming entrapped along the perimeter fencing, between the mesh and electrical strands (Visser, 2016). A PV solar facility in the United States is reported to result in the deaths of 0.5 birds/MW/year as a direct result of the collisions with infrastructure (Walston *et al*., 2016).

4.1 Identification of Potential Impacts and Damaging Activities

In this section each of the potential impacts on avifauna, associated with the development is explored in more detail with reference to the features and characteristics of the site and the likelihood that each impact would occur given the characteristics of the site and the extent and nature of the development. While renewable energy sources, such as solar energy, are important to the future development of power generation and hold great potential to alleviate the dependence on fossil fuels, they are not without their environmental risks and negative impacts. Poorly sited or designed SEFs can have negative impacts on not only vulnerable species and habitats, but also on entire ecosystem functioning. These impacts are extremely variable, differing from site to site, and are dependent on numerous contributing factors which include the design and specifications of the development, the importance and sensitivity of avian microhabitats present on site and the diversity and abundance of the local avifauna.

Potential avifaunal impacts resulting from the development of the Hyperion Solar Development 2 would stem from a variety of different activities and risk factors associated with the preconstruction, construction and operational phases of the project including the following:

Habitat loss and disturbance of small passerines

For the smaller passerine species, the most important impacts will include displacement from the area encompassed by the development footprint as a result of habitat destruction. The loss of habitat will be permanent while disturbance may be continuous during the operational phase of the solar facility. Other impacts such as disturbances caused by

reflective panels are not likely to have any appreciable impact on these small species. The impacts in general can be expected to be minimal as the populations of these smaller species are far less susceptible to the associated impacts than larger species.

Habitat loss, disturbance and collision risk of medium terrestrial birds and raptors

Small to medium-sized non-passerines that may be impacted to some extent due to habitat loss and displacement include resident raptors such as Gabar Goshawk, Pale Chanting Goshawk, and the ground-dwelling Burchell's Sandgrouse, Orange River Francolin and Red-crested Korhaan. These species may also be susceptible to collisions with associated infrastructure such as the PV panels and site fencing, but this is not expected to have a major impact on most of these species. Red-crested Korhaan and Orange River Francolin may, however, be at more risk based on the recent research (Visser, 2016).

Habitat loss and disturbance of large terrestrial birds and raptors

The group of primary concern is the medium to large non-passerines, which include the large terrestrial birds and diurnal raptors. Many of these are also red-listed, such as White-backed Vulture, Martial eagle, Verreaux's Eagle, Kori Bustard, and Secretarybird. Besides the loss of potential habitat that these species will experience, disturbances during construction and maintenance of the facility is also expected to have a negative impact.

5 SCOPING PHASE ASSESSMENT OF IMPACTS

The various identified impacts are assessed below for the different phases of the development. It is important to note that this is a scoping-phase assessment and subject to change based on any changes to the layout or project description that might occur before the EIA Phase.

The following is an assessment of the Hyperion Solar Development 2, for the planning, construction and operational phase of the development.

5.1 PLANNING & CONSTRUCTION PHASE

Impact Avifaunal habitat loss due to SEF construction			
Sensitivity Analysis			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Loss of intact habitat due to transformation	Vegetation clearing will potentially lead	Local	The bed of the Vlermuisleegte River

for the SEF and associated infrastructure	to the loss of avifaunal species, habitats and ecosystems as birds are displaced from their habitat		should be considered to be a no-go area for infrastructure apart from where there are already existing access roads through this area which can be used for access. The areas of high tree density east of the Vlermuisleegte River are also considered unsuitable for development.
Description of expected significance of impact: Since habitat loss is an unavoidable outcome of the development, this impact cannot be fully mitigated and the impacts on the local avifauna after mitigation are likely to be Low Negative for a single SEF phase, but could become of medium significance if four SEF phases are constructed on the site.			
Gaps in Knowledge and recommendations for further study: • The use and presence of larger raptors and other similar species of conservation concern at the site should be better quantified with a summer-season survey. This information should be used to inform the sensitivity mapping at the site as well as the final layout of the development footprint.			

Impact Avifaunal Disturbance During Construction			
Sensitivity Analysis			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Construction of the SEF will generate a frequent and high noise volumes, and disturbances which have a negative impact on local avifauna.	Construction will involve the use of heavy machinery on-site as well as other associated construction activities which will displace and deter sensitive	Local	The bed of the Vlermuisleegte River should be considered to be a no-go area apart from where there are already existing access roads through this area

	species from the area or from their nesting sites.		which can be used for access.

Description of expected significance of impact:
The noise, activity and disturbance generated during construction is unavoidable and cannot be fully mitigated. This impact is however transient and restricted to the construction period. The impacts on the local avifauna after mitigation are likely to be Low Negative.

Gaps in Knowledge and recommendations for further study:

- The use and presence of larger raptors and other similar species of conservation concern at the site should be better quantified with a summer-season survey. This information should be used to inform the sensitivity mapping at the site as well as the final layout of the development footprint.
- The fence around the facility should be designed with potential impacts on avifauna in mind. This includes the location and positioning of the electrified strands in relation to the fence as it has been shown that avifauna may become trapped in the gap between these two components of the fence.

5.2 Operational Phase Impacts

Impact
Avifaunal Impacts During Operation –disturbance and collisions with PV panels, security fences and other site infrastructure.

Sensitivity Analysis			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Disturbance due to general operational activities and mortality of avifauna from collisions with plant infrastructure	Mortality among the local avifauna may result due to direct collisions with solar panels or entrapment along the fenced boundaries of the facility. The operation of the facility will also generate noise and	Local	The bed of the Vlermuisleegte River should be considered to be a no-go area apart from where there are already existing access roads through this area which can be used for

	disturbance which may deter some avifauna from the area, especially red-listed avifaunal species which are less tolerant of disturbances.		access.

Description of expected significance of impact:

Specific areas that will require mitigation include design of night-lighting and ensuring that the fence around the facility is constructed according to a bird-friendly design as well as management of bird interactions will the infrastructure of the facility. With mitigation, the operational phase impact on avifauna can be reduced to a low significance.

Gaps in Knowledge and recommendations for further study:

- The presence and distribution of species with are considered potentially more vulnerable to impact at PV facilities, should be better quantified with a follow-up summer season survey.

Impact

Avifaunal Impacts During Operation – attraction of birds to the site for nesting, roosting or other interactions.

Sensitivity Analysis			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
It is common for birds to be attracted to SEFs for nesting sites on the infrastructure.	Avifauna are frequently attracted to SEFs and use the facility infrastructure for nesting sites, particularly the panel support structures. This use is not always tolerated or may cause unsafe operating conditions with the result that nests may be destroyed and birds impacted.	Local	The bed of the Vlermuisleegte River should be considered to be a no-go area apart from where there are already existing access roads through this area which can be used for access.

Description of expected significance of impact: This impact appears to be a particular problem where there is little other suitable structure in the environment that birds can use for nesting purposes. At the Hyperion site, the density of large trees in the area is high with the result that this impact is not likely to be of high magnitude. With mitigation, the impact of the SEF on avifauna due to nesting and other interaction can be reduced to a low significance.
Gaps in Knowledge and recommendations for further study: • The presence and distribution of species with are considered potentially more vulnerable to impact at PV facilities, should be better quantified with a follow-up summer season survey.

6 CONCLUSION & RECOMMENDATIONS

Although the Hyperion Solar Development 2 is in the Scoping Phase, the current study is based on a detailed field assessment of the proposed development area. Consequently, the scoping impact assessment and sensitivity map presented herein are based on detailed on-site information and as such have a high degree of confidence. Consequently, there is little uncertainty with regards to the results of the current study and the conclusions reached are based on actual information collected at the site.

The project site lies within the Kalahari bioregion and supports the typical avifaunal assemblage expected for the area. Although ten (10) threatened and four (4) Near-Threatened species are known to occur within the broader study area, most of these appear to be uncommon in the area and probably occur in low numbers. Further, the vegetation of the project site to the west of the drainage line supports few species or features of concern, such as nesting of roosting sites of red-listed species. Provided development is restricted to the western half of the site dominated by *Tarchonanthus* scrub, impacts on avifauna with the development on this site are likely to be medium to low and no high post-mitigation impacts are likely.

The expected impacts of the proposed solar development area will include the following, 1) habitat loss and fragmentation associated with the loss of the *Tarchonanthus scrub* habitat to the SEF, 2) disturbance and displacement caused during the construction and maintenance phases, and 3) possible direct mortality of avifauna colliding with solar panels and associated structures, and 4) a cumulative habitat loss at a broader scale from renewable energy developments in the broader area. Habitat loss and disturbance during the construction phase of the development will impact mostly small passerine species and medium-sized non-passerines, with consequences restricted to the local area only. Impacts

related to collisions with PV panels and associated infrastructure (such as fencing) will impact mostly medium-sized non-passerines (e.g. korhaans, francolin and thick-knees). Red-listed species will be impacted by the loss of foraging habitat and disturbances, and potentially by collisions and electrocutions with power line infrastructure. However, given the extensive national ranges of these species and their apparently infrequent use of the project site the impact of the development on habitat loss for these species would be minimal and a long-term impact unlikely.

The most important mitigation measure that can be implemented at the current stage to ensure that impacts on avifauna are minimised is to ensure that the development is restricted to the lower sensitivity parts of the site. Identified sensitive habitats, such as the *Acacia erioloba woodland to the east of the Vlermuisleegte, and the drainage line itself,* should be excluded from the development footprint apart from the main access road which could potentially still be used to access the site. With the implementation of the suggested mitigation measures, the impact of the development can be reduced to an acceptable level and as such there are no fatal flaws associated with the development that should prevent it from proceeding.

Cumulative impacts in the area are a concern due to the proliferation of solar energy development in the Kathu area. In terms of habitat loss, the affected Kathu Bushveld vegetation type is still approximately 90% intact, and while this is not a very extensive vegetation type, the loss of 180ha of habitat per 75MW facility is not considered highly significant as there are still fairly extensive tracts of undisturbed similar habitat available in the area. In terms of potential losses to landscape connectivity, the ecological context of the site indicates that it does not seem likely to lie within an area that is an important avifaunal movement corridor or along an important ecological gradient. As such, the overall cumulative impact of the development is considered likely to be low for each 75MW plant individually, but moderate overall for all four (4) plants, but further investigation in this regard during the EIA phase is recommended.

The development area is therefore largely favourable and there are no likely impacts associated with the development that are considered to be of high significance and which cannot be mitigated to a low level. Therefore, based on the results of this assessment, there are no reasons to indicate that the development should not move into the EIA phase. A proposed plan of study for the EIA phase is detailed below.

7 PLAN OF STUDY FOR THE EIA PHASE

The current study is based on three-day site visit during which intense avifaunal surveys were undertaken. The winter/dry season field-assessment component of the study is therefore considered complete. Additional summer-season surveys are however

recommended to confirm the preliminary findings. As such, the major tasks remaining prior to the EIA phase include the wet/summer season survey followed by an assessment of the final layout and the cumulative impacts associated with the development in more detail and making the appropriate recommendations with regards to the most appropriate mitigation and avoidance measures to be included in the EMPr for the development.

Based on the results of the current study and the features of the site, the following activities and outputs are planned to inform the EIA phase of the development:

- Conduct a wet/summer-season avifaunal survey within the development footprint to confirm the preliminary findings from the winter-season survey. Include the results of the summer-season survey into the report and assess the implications of these results for the preliminary impact assessment as contained herein.

- Provide a more detailed assessment of cumulative impacts associated with the development of the site. Including an assessment of the extent of habitat lost to solar energy development in the area to date and the likely future potential loss from the current as well as other proposed developments in the area. The potential for there to be disruption of broad-scale ecological processes in the area will be examined by evaluating the extent of habitat loss to date and the distribution of this impact in relation to the gradients, corridors and associated processes operating in the area.

- Evaluate, based on the site attributes and final layout of the development, what the most applicable mitigation measures to reduce the impact of the development on the site would be and if there are any areas where specific precautions or mitigation measures should be implemented. Particular attention will be paid to potential impacts on important landscape features in the vicinity of the site such as the dense *Acacia erioloba* woodland where sensitive avifaunal species may nest or roost.

- Assess the impacts identified above in light of the site-specific findings and the final layout for assessment in the EIA Phase to be provided by the developer.

- Address any comments received on the scoping study from IAPs and commenting authorities and ensure that that study complies with best practice and the requirements of the 2014 EIA regulations as amended.

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9 ANNEX 1. LIST OF AVIFAUNA

A consolidated avifaunal list for the Kathu Hyperion project site and surrounds, including records from SABAP1, SABAP2 and the site visit, and includes red-list status (Taylor *et al.*, 2015), regional endemism (Taylor *et al.*, 2015), and SABAP2 reporting rates (based on four cards submitted for the two relevant pentads). Species with a zero reporting rate were only recorded during SABAP1 and not SABAP2. Species highlighted in bold text were recorded during the site visit (13 to 16 August 2018).

Species name	Taxonomic name	Red-list Status	Regional Endemism	Reporting rate (%)
Avocet, Pied	*Recurvirostra avosetta*			0
Babbler, Southern Pied	***Turdoides bicolor***			**75**
Barbet, Acacia Pied	***Tricholaema leucomelas***			**100**
Barbet, Crested	***Trachyphonus vaillantii***			**25**
Bateleur	*Terathopius ecaudatus*	Endangered		0
Batis, Pririt	***Batis pririt***			**75**
Bee-eater, European	*Merops apiaster*			25
Bee-eater, Swallow-tailed	***Merops hirundineus***			**75**
Bishop, Southern Red	*Euplectes orix*			0
Bishop, Yellow-crowned	*Euplectes afer*			0
Bittern, Little	*Ixobrychus minutus*			0
Bokmakierie	***Telophorus zeylonus***			**25**
Brubru	***Nilaus afer***			**50**
Buffalo-weaver, Red-billed	***Bubalornis niger***			**25**
Bulbul, African Red-eyed	***Pycnonotus nigricans***			**75**
Bunting, Cape	*Emberiza capensis*			0
Bunting, Golden-breasted	***Emberiza flaviventris***			**75**
Bunting, Lark-like	*Emberiza impetuani*			0
Bustard, Kori	*Ardeotis kori*	Near-Threatened		0
Bustard, Ludwig's	*Neotis ludwigii*	Endangered		0
Buttonquail, Kurrichane	*Turnix sylvaticus*			0
Buzzard, Steppe	*Buteo vulpinus*			0
Canary, Black-headed	*Serinus alario*		Near-endemic	0
Canary, Black-throated	***Crithagra atrogularis***			**0**
Canary, Yellow	***Crithagra flaviventris***			**100**
Chat, Anteating	***Myrmecocichla formicivora***			**25**
Chat, Familiar	***Cercomela familiaris***			**25**
Cisticola, Desert	***Cisticola aridulus***			**25**
Cisticola, Levaillant's	*Cisticola tinniens*			0
Cisticola, Tinkling	***Cisticola rufilatus***			**50**

Cisticola, Zitting	*Cisticola juncidis*			0
Courser, Burchell's	*Cursorius rufus*	Vulnerable		0
Courser, Double-banded	*Rhinoptilus africanus*			0
Crombec, Long-billed	***Sylvietta rufescens***			**50**
Crow, Cape	*Corvus capensis*			0
Crow, Pied	***Corvus albus***			**0**
Cuckoo, African	*Cuculus gularis*			0
Cuckoo, Black	*Cuculus clamosus*			0
Cuckoo, Diderick	*Chrysococcyx caprius*			0
Cuckoo, Great Spotted	*Clamator glandarius*			0
Cuckoo, Jacobin	*Clamator jacobinus*			0
Dove, Laughing	***Streptopelia senegalensis***			**75**
Dove, Namaqua	***Oena capensis***			**100**
Dove, Red-eyed	*Streptopelia semitorquata*			0
Dove, Rock	*Columba livia*			0
Drongo, Fork-tailed	***Dicrurus adsimilis***			**75**
Duck, Maccoa	*Oxyura maccoa*	Near-Threatened		0
Eagle, Martial	*Polemaetus bellicosus*	Endangered		0
Eagle, Verreaux's	*Aquila verreauxii*	Vulnerable		0
Eagle-owl, Spotted	*Bubo africanus*			0
Eagle-owl, Verreaux's	***Bubo lacteus***			**25**
Egret, Western Cattle	*Bubulcus ibis*			0
Egret, Little	*Egretta garzetta*			0
Eremomela, Yellow-bellied	***Eremomela icteropygialis***			**75**
Falcon, Lanner	*Falco biarmicus*	Vulnerable		0
Finch, Red-headed	***Amadina erythrocephala***			**25**
Finch, Scaly-feathered	***Sporopipes squamifrons***			**75**
Firefinch, Red-billed	*Lagonosticta senegala*			0
Fiscal, Southern	***Lanius collaris***			**25**
Flycatcher, Chat	*Bradornis infuscatus*			0
Flycatcher, Fairy	*Stenostira scita*		Near-endemic	0
Flycatcher, Fiscal	***Sigelus silens***		**Near-endemic**	**50**
Flycatcher, Marico	***Bradornis mariquensis***			**100**
Flycatcher, Spotted	*Muscicapa striata*			0
Francolin, Orange River	***Scleroptila levaillantoides***			**25**
Goose, Egyptian	*Alopochen aegyptiacus*			0
Goose, Spur-winged	*Plectropterus gambensis*			0
Goshawk, Gabar	***Melierax gabar***			**75**
Goshawk, Pale Chanting	***Melierax canorus***			**50**
Grebe, Little	*Tachybaptus ruficollis*			0
Greenshank, Common	*Tringa nebularia*			0

Guineafowl, Helmeted	***Numida meleagris***			**50**
Harrier, Black	*Circus maurus*	Endangered	Near-endemic	0
Heron, Black-headed	*Ardea melanocephala*			0
Honeyguide, Greater	*Indicator indicator*			0
Hoopoe, African	***Upupa africana***			**75**
Hornbill, African Grey	*Tockus nasutus*			25
Hornbill, Southern Yellow-billed	***Tockus leucomelas***			**75**
Ibis, Hadeda	*Bostrychia hagedash*			0
Kestrel, Greater	*Falco rupicoloides*			0
Kestrel, Lesser	*Falco naumanni*			0
Kestrel, Rock	*Falco rupicolus*			0
Kite, Black	*Milvus migrans*			0
Kite, Black-shouldered	*Elanus caeruleus*			0
Kite, Yellow-billed	*Milvus aegyptius*			0
Korhaan, Northern Black	*Afrotis afraoides*			0
Korhaan, Red-crested	***Lophotis ruficrista***			**50**
Lapwing, Blacksmith	*Vanellus armatus*			0
Lapwing, Crowned	***Vanellus coronatus***			**75**
Lark, Eastern Clapper	***Mirafra fasciolata***			**50**
Lark, Fawn-coloured	***Calendulauda africanoides***			**75**
Lark, Grey-backed Sparrow-	*Eremopterix verticalis*			0
Lark, Red-capped	*Calandrella cinerea*			0
Lark, Sabota	*Calendulauda sabota*			0
Lark, Spike-heeled	*Chersomanes albofasciata*			0
Martin, Brown-throated	*Riparia paludicola*			0
Martin, Rock	***Hirundo fuligula***			**25**
Mousebird, Red-faced	***Urocolius indicus***			**100**
Mousebird, White-backed	***Colius colius***			**75**
Neddicky	***Cisticola fulvicapilla***			**25**
Nightjar, European	*Caprimulgus europaeus*			0
Nightjar, Rufous-cheeked	*Caprimulgus rufigena*			0
Oriole, Eurasian Golden	*Oriolus oriolus*			0
Ostrich, Common	*Struthio camelus*			0
Owl, Barn	*Tyto alba*			0
Owlet, Pearl-spotted	***Glaucidium perlatum***			**25**
Penduline-tit, Cape	***Anthoscopus minutus***			**25**
Pigeon, Speckled	***Columba guinea***			**25**
Pipit, African	***Anthus cinnamomeus***			**25**
Pipit, Buffy	***Anthus vaalensis***			**25**
Plover, Three-banded	*Charadrius tricollaris*			0
Prinia, Black-chested	***Prinia flavicans***			**100**

Pytilia, Green-winged	***Pytilia melba***			**50**
Quail, Common	*Coturnix coturnix*			0
Quailfinch, African	*Ortygospiza atricollis*			0
Quelea, Red-billed	***Quelea quelea***			**50**
Robin, Kalahari Scrub	***Cercotrichas paena***			**100**
Robin, Karoo Scrub	*Cercotrichas coryphoeus*			0
Robin-chat, Cape	*Cossypha caffra*			0
Rock-thrush, Short-toed	*Monticola brevipes*			0
Roller, European	*Coracias garrulus*	Near-Threatened		0
Roller, Lilac-breasted	***Coracias caudatus***			**25**
Roller, Purple	***Coracias naevius***			**50**
Sandgrouse, Burchell's	***Pterocles burchelli***			**50**
Sandgrouse, Namaqua	*Pterocles namaqua*			25
Scimitarbill, Common	***Rhinopomastus cyanomelas***			**50**
Scops-owl, Southern White-faced	*Ptilopsus granti*			0
Secretarybird	*Sagittarius serpentarius*	Vulnerable		0
Shelduck, South African	*Tadorna cana*			0
Shoveler, Cape	*Anas smithii*			0
Shrike, Crimson-breasted	***Laniarius atrococcineus***			**75**
Shrike, Lesser Grey	*Lanius minor*			0
Shrike, Red-backed	*Lanius collurio*			0
Snake-eagle, Brown	*Circaetus cinereus*			0
Sparrow, Cape	***Passer melanurus***			**25**
Sparrow, Great	*Passer motitensis*			0
Sparrow, House	*Passer domesticus*			0
Sparrow, Southern Grey-headed	***Passer diffusus***			**50**
Sparrow-weaver, White-browed	***Plocepasser mahali***			**75**
Spoonbill, African	*Platalea alba*			0
Spurfowl, Red-billed	*Pternistis adspersus*			0
Starling, Cape Glossy	***Lamprotornis nitens***			**100**
Starling, Pale-winged	*Onychognathus nabouroup*			0
Starling, Pied	*Lamprotornis bicolor*		Endemic	0
Starling, Wattled	***Creatophora cinerea***			**25**
Stonechat, African	*Saxicola torquatus*			0
Stork, Abdim's	*Ciconia abdimii*	Near-Threatened		0
Stork, Black	*Ciconia nigra*	Vulnerable		0
Sunbird, Dusky	*Cinnyris fuscus*			0
Sunbird, Marico	***Cinnyris mariquensis***			**50**
Sunbird, White-bellied	*Cinnyris talatala*			0
Swallow, Barn	*Hirundo rustica*			0
Swallow, Greater Striped	*Cecropis cucullata*			25

Swallow, Red-breasted	*Hirundo semirufa*			0
Swallow, White-throated	***Hirundo albigularis***			**25**
Swift, Alpine	*Tachymarptis melba*			0
Swift, Bradfield's	*Apus bradfieldi*			0
Swift, Common	*Apus apus*			0
Swift, Little	*Apus affinis*			0
Swift, White-rumped	*Apus caffer*			0
Tchagra, Brown-crowned	***Tchagra australis***			**75**
Thick-knee, Spotted	***Burhinus capensis***			**50**
Thrush, Groundscraper	***Psophocichla litsipsirupa***			**50**
Thrush, Karoo	*Turdus smithi*		Near-endemic	0
Tit, Ashy	***Parus cinerascens***			**75**
Turtle-dove, Cape	***Streptopelia capicola***			**100**
Vulture, White-backed	*Gyps africanus*	Critically Endangered		0
Wagtail, Cape	***Motacilla capensis***			**25**
Warbler, African Reed	*Acrocephalus baeticatus*			0
Warbler, Chestnut-vented	***Sylvia subcaeruleum***			**100**
Warbler, Lesser Swamp	*Acrocephalus gracilirostris*			0
Warbler, Rufous-eared	*Malcorus pectoralis*			0
Warbler, Willow	*Phylloscopus trochilus*			0
Waxbill, Black-faced	***Estrilda erythronotos***			**50**
Waxbill, Common	*Estrilda astrild*			0
Waxbill, Violet-eared	***Granatina granatina***			**100**
Weaver, Sociable	*Philetairus socius*			0
Weaver, Southern Masked	***Ploceus velatus***			**50**
Wheatear, Capped	*Oenanthe pileata*			0
Wheatear, Mountain	*Oenanthe monticola*			0
White-eye, Orange River	*Zosterops pallidus*			0
Whydah, Pin-tailed	*Vidua macroura*			0
Whydah, Shaft-tailed	***Vidua regia***			**75**
Woodpecker, Cardinal	*Dendropicos fuscescens*			0
Woodpecker, Golden-tailed	***Campethera abingoni***			**25**