Mobile: Sam - 072 437 1742
Mobile: Luke - 083 784 1997
Email: info@enviro-insight.co.za
Website: www.enviro-insight.co.za

Avifauna Scoping Report and Plan of Study for the development of a 400 MW Solar Photovoltaic (PV) facility on the Remainder of Farm Goede Hoop 26C and Portion 3 of Farm Goede Hoop 26C, between De Aar & Hanover, Emthanjeni Local Municipality, Pixley Ka Seme District Municipality, Northern Cape Province, South Africa

May 2022

APPLICANT:

Soventix SA Pty Ltd

Enviro-Insight CC:

Sam Laurence (*Pr. Sci. Nat.*)

A.E. van Wyk (*Cand. Sci. Nat.*)

info@enviro-insight.co.za

Specialist Declaration

I, Sam Laurence *Pr. Sci. Nat.,* declare that the work presented in this report is our own and has not been influenced in any way by the developer or the EAP. At no point has the developer asked us as specialists to manipulate the results in order to make it more favourable for the proposed development. We consider ourselves bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP) and the EIA Regulations (2014, as amended). We have the necessary qualifications and expertise (*Pr. Sci. Nat. Zoological Science)* in conducting this specialist report.

Sam Laurence Pr. Sci. Nat

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

GLOSSARY

Critical Biodiversity Area (CBA)	An area that must be maintained in a good ecological condition (natural or semi-natural state) in order to meet biodiversity targets. CBAs collectively meet biodiversity targets for all ecosystem types, as well as for species and ecological processes that depend on natural or semi-natural habitat that have not already been met in the protected area network. CBAs are identified through a systematic biodiversity planning process in a configuration that is complementary, efficient and avoids conflict with other land uses where possible.
Cumulative impact	Impacts on a species, ecosystem or resource as a result of the sum of actions in the past, present and foreseeable future, from multiple renewable energy projects or a renewable energy project in combination with other developments.
Ecological Support Area (ESA)	The ESA are supporting zones or areas which must be safeguarded as they are needed to prevent degradation of Critical Biodiversity Areas and formal Protected Areas.
Endemic	A species that is naturally restricted to a particular, well-defined region. This is not the same as the medical definition, which is 'occurring naturally in a region.
Environmental Impact Assessment (EIA)	The process of identifying environmental impacts due to activities and assessing and reporting these impacts
IBA	Important Bird and Biodiversity Area. Part of a global network of sites that are critical for the long-term viability of bird populations. Now known as Important Bird and Biodiversity Areas.
IUCN Red Listed Categories and Criteria	International Union for Conservation of Nature.
Preconstruction Phase	The period prior to the construction of a solar energy facility
Priority species	Threatened or rare birds (in particular those unique to the region and especially those which are possibly susceptible to solar energy impacts), which occur in the given development area at relatively high densities or have high levels of activity in the area. These species should be the primary (but not the sole) focus of all subsequent monitoring and assessment.
SABAP	The Southern African Bird Atlas Project. A project in which data on bird distribution and relative abundance are collected by volunteers. There have been two SABAP projects; i.e. SABAP1 (completed

in 1991) and SABAP2 (started in 2007 and on-going). See http://sabap2.adu.org.za for more information.

SACNASP South African Council for Natural Scientific Professions

SANBI South African National Biodiversity Institute

1 INTRODUCTION AND PROJECT BACKGROUND

Soventix SA (Pty) Ltd ('the Applicant') is proposing to develop the Soventix Solar Farm and associated infrastructure approximately 25 km north of the town Hanover in the Northern Cape Province.

In 2016 ecoleges undertook a S&EIA for the development of a 225 MW Solar PV facility between Hanover and De Aar in the Northern Cape. Three alternative footprints (PV01, PV02, PV03) were investigated during the assessment process. The central footprint (PV02) was identified as the preferred option because of its lower environmental impact and proximity to an existing 400kV Eskom powerline when compared with PV01 and PV03. The National Department of Environmental Affairs granted an environmental authorisation (DEA Reference: 14/12/16/3/3/2/998) on 16th April 2018. The activity must commence on the PV02 footprint within a period of five years from the date of issue.

An amendment to increase the capacity (not the footprint) of the facility to 300 MW due to technological advancements in solar photovoltaic efficiency and electrical output was granted on 24th November 2020. A second amendment was granted in 2021 for the inclusion of containerised lithium-ion battery Storage and dual-fuel backup generators with associated fuel storage.

The competent authority was the National Department of Environmental Affairs because the application was part of the REIPPP or RMIPPP BID rounds, which formed part of a Strategic Infrastructure Project (SIP) as described in the National Development Plan, 2011. Soventix SA (Pty) Ltd was an unsuccessful bidder. However, the applicant has since partnered with another company, Solar Africa, with 1.5 GW in private renewable energy offtake agreements, making it economically feasible to develop two more 300 and 400 MW facilities (Phases 2 and 3, respectively).

Soventix will therefore apply for an environmental authorisation to develop an additional 300MW on the PV03 footprint (Phase 2) that was considered during the initial S&EIA. It is proposed to connect this second phase to the substation that forms part of the authorised facility on PV02.

Enviro-Insight CC was appointed to undertake the requisite avifauna assessment associated with the proposed Soventix Solar Farm. The aim of this report is to undertake a desktop analysis and compile a high-level Scoping Report (Plan of Study), which includes a reconnaissance study.

1.1 STUDY AREA

The extent of the study area is approximately 600 ha and is located on the Remainder of Farm Goede Hoop 26C and Portion 3 of Farm Goede Hoop 26C, between De Aar & Hanover, Emthanjeni Local Municipality, Pixley Ka Seme District Municipality, Northern Cape Province. The proposed study area is situated on the following coordinates, Latitude: 30°50'10.12"S, and Longitude: 24°21'25.37"E (Figure 1).

1.2 PROJECT DESCRIPTION

The project (known as Phase 3) is for the development of a 400 MW Solar Photovoltaic (PV) facility which includes four interconnected 100 MW solar PV plants (150 ha each), with associated infrastructure. The PV system will be connected via distribution lines to the authorised substation on Phase 1. The substation ties into the existing ESKOM 400kV overhead

powerlines. Existing roads will be used for main access, which may need to be enlarged to allow large equipment to access the site during construction.

Given the size of the area required relative to the Site Area (both properties), only one (preferred) Alternative can be considered. The Site Area is bisected by a sensitive watercourse. Consequently, two parts (Part 1 ±333 ha and Part 2 ±543ha) that make up the preferred alternative have been identified. Phase 3 will be connected to a previous Phase 2 and Phase 1 via an overhead powerline.

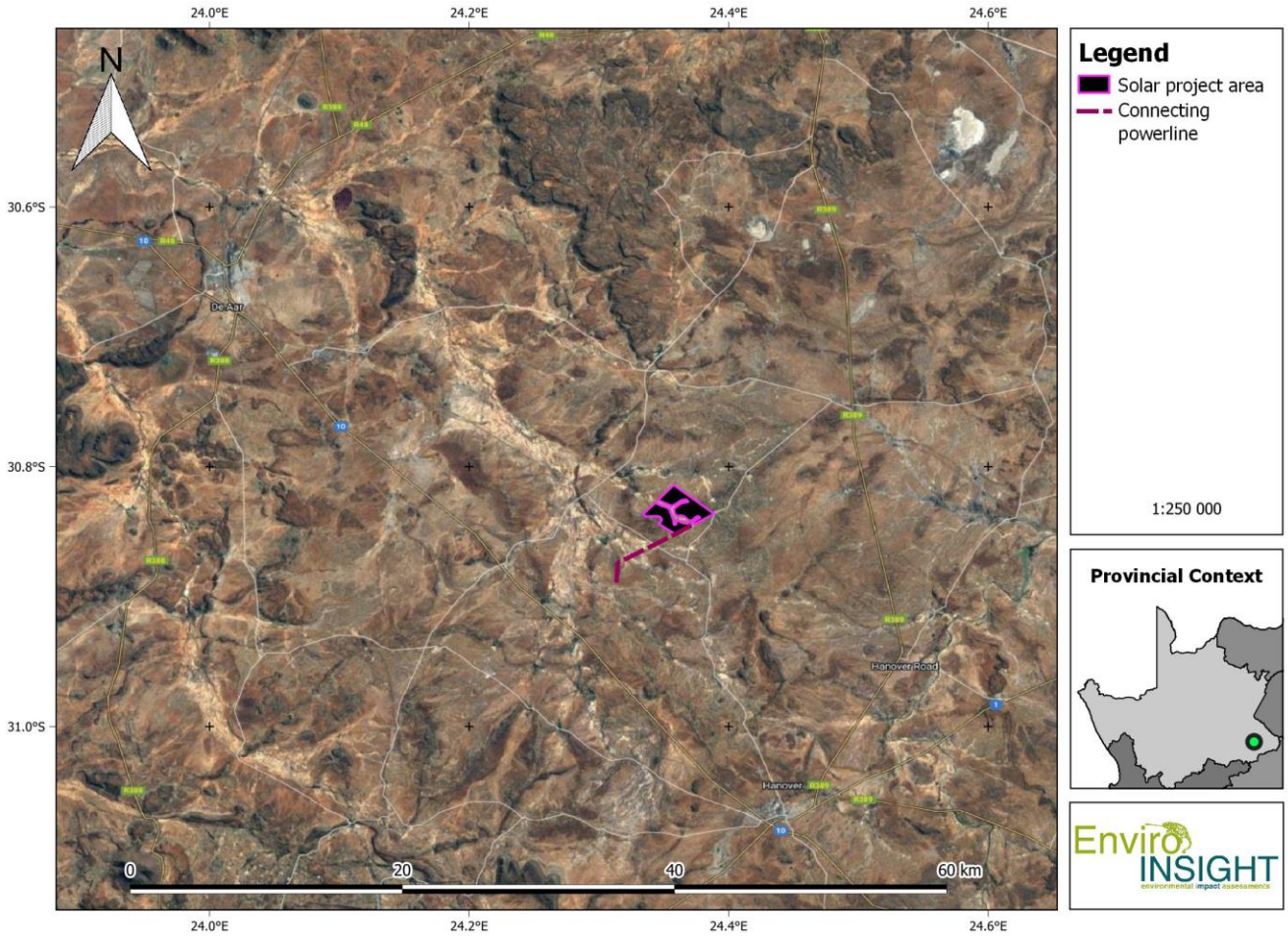

Figure 1: Locality map of the proposed study area.

1.3 OBJECTIVES

The principal aim of the avifaunal assessment will be to determine how this development (and its separate elements) will impact on the terrestrial ecological integrity of the area (as it pertains to avifauna) and if necessary, demarcate appropriate ecological buffers around sensitive communities or receptors.

The main objectives are as follows:

- Provide quantitative information on the abundance, distribution, and risk to key avifaunal species or groups of species and serve to inform and improve mitigation measures.
- Determine how this development (and its separate elements) will impact on avifauna, particularly relating to habitat loss/fragmentation, alteration of habitat quality, species assemblage changes, microclimate disturbance and reduced connectivity between populations in some species.
- Include a corridor analysis for the migration of avifauna across the landscape, taking the cumulative impact of all three facilities (phases) into account.
- Identify actual and potential species of conservation concern/importance (protected – NEMBA, endemic, threatened). GPS the position of all sensitive receptors (protected, endemic and/or red data species) - the co-ordinates should be in degrees and decimal minutes. The minutes should have at least three decimals to ensure adequate accuracy. The projection that must be used in all cases is the WGS84 spheroid in a national or local projection.
- Demarcate appropriate ecological buffers around sensitive communities or receptors.
- Compile a search and rescue plan for relevant species to be adopted prior to construction.
- Identify and quantify the perceived impacts and propose mitigations to be included in the Environmental Management Programme (EMPr). The potential impacts and recommended mitigations must be identified for the planning and design, pre-construction, construction, and post-construction (e.g., monitoring rehabilitation of the construction site) only.
- The impacts must be assessed and evaluated according to the EIA Regulations, 2014 as amended (https://cer.org.za/wp-content/uploads/1999/01/EIA-Regulations.pdf) or the Impact Assessment Criteria and Matrix to be supplied by the client.
- Undertake a cumulative impact assessment of all three phases. Then, in addition to the development site, also take into consideration other similar facilities within a 30 km radius of the proposed development site. Information on the location of renewable energy developments can be accessed from https://egis.environment.gov.za/renewable_energy.

1.4 AVIFAUNA SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS

- Perform the Avifaunal Specialist Assessment according to the criteria provided by the Terrestrial Animal Species protocol published on 30 October 2020 in Government Gazette No. 43855.
- Write up the findings of the specialist assessment in an Avifaunal Specialist Assessment Report that contains the minimum report content requirements prescribed in the same protocol, and the applicable guidelines for soalr developments.
- According to Regulation 13(1)(b) and 13(1)(e) read together with Regulation 18 of the amended EIA Regulations, 2014, Specialists must have knowledge of any guidelines that have relevance to the proposed activity and have regard to the need for and desirability of the undertaking of the proposed activity. BirdLife SA's Best Practice Guidelines on Birds and Solar Energy (Jenkins et al., 2017) was consulted when compiling the Plan of Study.

- Ensure that the avifauna assessment and reporting meet all the requirements of the relevant protocol.

1.5 STUDY LIMITATIONS

- It is assumed that all third-party information acquired is correct (e.g. GIS data and scope of work); and
- Owing to the heavy rain occurring during the reconnaissance site visit in March 2022, certain areas of the property was not accessible.

2 LEGISLATIVE FRAMEWORK

2.1 NATIONAL ENVIRONMENTAL SCREENING TOOL AND ENVIRONMENTAL THEME PROTOCOLS

2.1.1 Screening Report

The Minister of Environment, Forestry and Fisheries, gave notice that the submission of a report generated from the national web-based environmental screening tool[1], as contemplated in Regulation 16(1)(b)(v) of the Environmental Impact Assessment Regulations, 2014, published under Government Notice No. R982 in Government Gazette No. 38282 of 4 December 2014, as amended, will be compulsory from 4 October 2019 when submitting an application for environmental authorisation in terms of regulation 19 and regulation 21 of the Environmental Impact Assessment Regulations, 2014.

In addition, a set of protocols that an applicant needs to adhere to in the Environmental Authorisation (EA) process were developed and on 20 March 2020 the Minister of Forestry, Fisheries and the Environment gazetted the Protocols for national implementation purposes. The gazette '*Procedures to be followed for the Assessment and Minimum Criteria for Reporting of Identified Environmental Themes in terms of Section 24(5)(a) and (h) of the National Environmental Management Act (1998) when Applying for Environmental Authorisation*', has protocols that have been developed for environmental themes which include agriculture, avifauna, biodiversity (Terrestrial and Aquatic Biodiversity), noise, defence and civil aviation.

The protocols set requirements for the assessment and reporting of environmental impacts of activities requiring EA. The higher the sensitivity rating of the features on the proposed site as identified by the screening tool report, the more rigorous the assessment and reporting requirements.

Based on the generated screening report, the avifauna theme was indicated as "medium" sensitivity, due to the probability of Ludwig Bustard (*Neotis ludwigii*) occurring within or around the study area (Figure 2). The Ludwig's Bustard is listed globally and regionally as Endangered.

[1] https://screening.environment.gov.za/screeningtool/#/pages/welcome

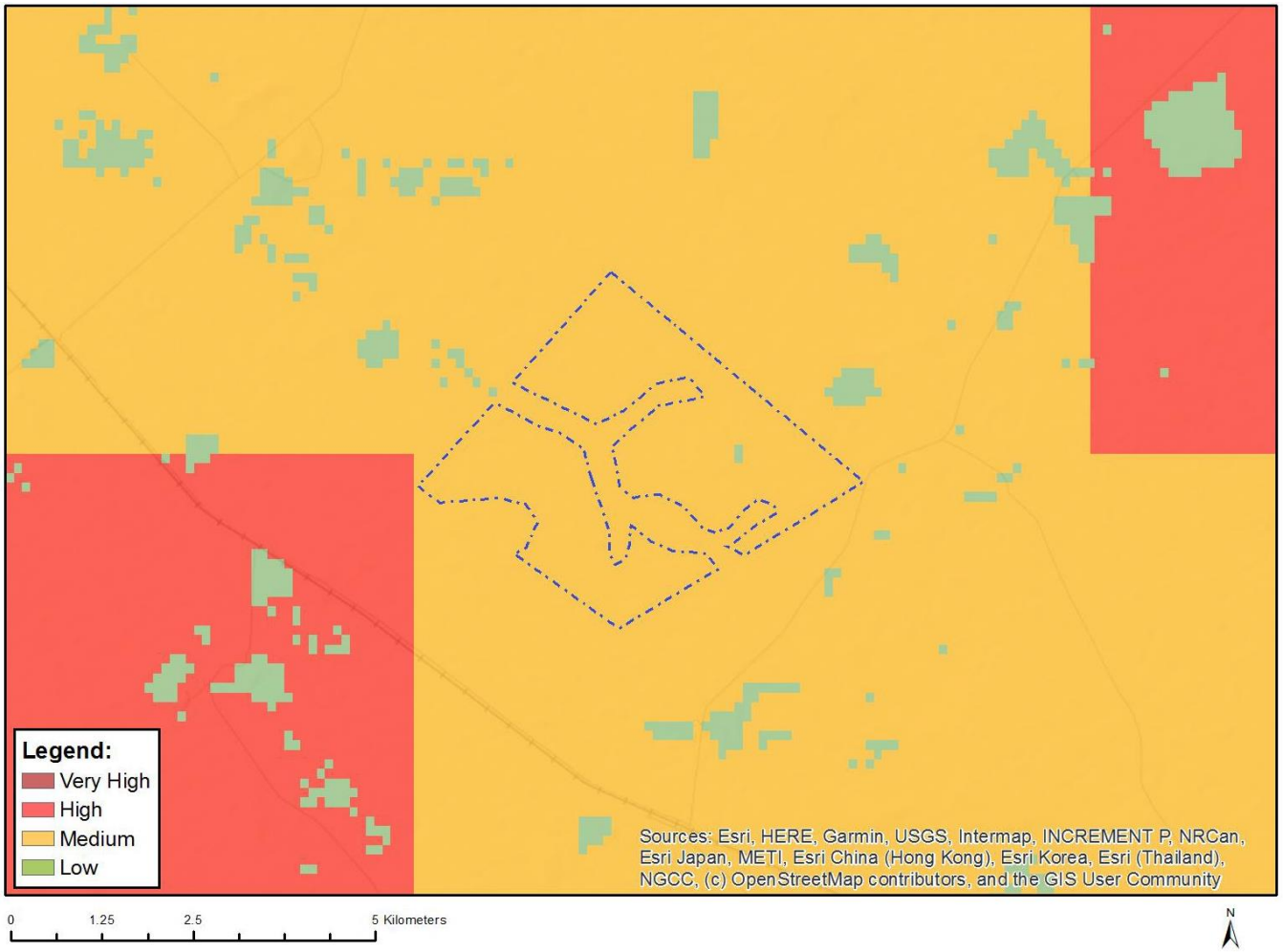

Figure 2: Screening Tool map of relative animal species theme sensitivity.

2.2 RENEWABLE ENERGY DEVELOPMENT ZONE

On 17 February 2016, Cabinet approved the Renewable Energy Development Zones (REDZs) for large scale wind and solar photovoltaic development and associated Strategic Transmission Corridors (STC) which support areas where long term electricity grid will be developed.

The procedure to be followed in applying for EA for a large-scale project in a REDZ or in a Power Corridor was formally gazetted on 16 February 2018 in GN113 and GN114. On 17 July 2020, Minister Barbara Dallas Creecy, published Government Gazette 43528, Notice 786 for consultation with the intention to identify three additional Renewable Energy Development Zones to the eight Renewable Energy Development Zones published under Government Notice No. 114 in Government Gazette No. 41445 of 16 February 2018. REDZs are also aligned with the powerline corridors that were

identified in the Electricity Grid Infrastructure SEA completed in 2016 and gazetted as powerline corridors in February 2018. In this way, the combination of the REDZs and power corridors provides strategic guidance to Eskom on where to prioritise investment in grid infrastructure.

New renewable energy projects located within one of the 11 REDZ areas, and new electricity grid expansion within the 5 Strategic Transmission Corridors are subject to a Basic Assessment and not a full EIA process, as well as a shortened timeframe of 147 days (90-day BA process and 57 decision-making process).

The proposed Soventix Solar Farm is not located in a REDZ but is located in the Central Strategic Transmission Corridor.

2.3 BIRDS AND SOLAR ENERGY BEST-PRACTICE GUIDELINES (2017)

The "*Best-Practice Guidelines for assessing and monitoring the impact of solar energy facilities on birds in southern Africa"* (Jenkins *et al*., 2017) are followed in order to fulfil the outlined requirements.

As per Appendix 2 - *Minimum requirements for avifaunal impact assessment*, an avifaunal impact assessment for a SEF should follow a two-tier process:

1. **Scoping report**- process to identify issues that are likely to be important in the impact assessment process and to define the scope of work required in the assessment (e.g. timing, spatial extent and data collection methodologies). Largely based on desktop analysis of available data, but preferably also informed by a brief site visit.
2. **Preliminary assessment** – This is part of the planning for the EIA application, giving an overview on the biological context, likely impacts and potential red flags to the development, identifying alternatives and determining the appropriate assessment regime.
3. **In-depth Study** – Could including structured and repeated data collection on which to base the impact assessment report and provide a baseline against which post-construction monitoring can be compared.
4. **Impact assessment** - Informed by the data collected during the preliminary assessment.

3 METHODS

3.1 GIS

Existing data layers were incorporated into a GIS to establish how the proposed SEF layout and associated activities interact with important terrestrial entities. Emphasis was placed on the following spatial datasets:

- Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018);
- Important Bird and Protected Areas (Marnewick *et al*., 2015);
- South African Protected Areas Database (SAPAD); and
- GIS layers of proposed layout provided by the client.

All mapping was performed using open-source GIS software (QGIS[2]).

3.2 DESKTOP AND LITERATURE SURVEY

A desktop survey is conducted to consider the best information available, in order to provide a better evaluation of all conditions present within the study area. An initial literature review will be undertaken to assess which bird species could potentially occur in the vicinity of the Soventix SEF using data from the second South African Bird Atlas Project (SABAP 2[3]; [SABAP2, 2020]). SABAP 2 records were developed based on records per pentad (i.e., 5' X 5'). A list of species potentially occurring was developed from SABAP 2 data for the pentads within which the study area falls (3045_2415, 3045_2420, 3050_2415 and 3050_2420) (Figure 3). The expected species list is therefore based on an area much larger than the actual study area and was therefore subsequently refined. This approach was adopted to ensure that all species potentially occurring within the study area, whether resident, nomadic, or migratory, are identified.

Species were considered sensitive based on their abundance, flight characteristics, ecological role, population trend and conservation status.

The following main literature sources have been consulted for the avifauna study:

- The existing avifaunal impact assessments for the area (Simon Tod Consulting, 2017);
- Information relating to avifauna species of conservation concern (SCC) was obtained from Taylor *et al.* (2015) and the IUCN Red List of threatened species (IUCN, 2022);
- del Hoyo *et al.* (1992) and Hockey *et al.* (2005) were consulted for general information on the life history attributes of relevant bird species;
- Distributional data was sourced from the Southern Africa Bird Atlas Project (SABAP 2, 2021), del Hoyo *et al.* (1992) and Sinclair & Ryan (2010);
- INaturalist and Virtual Museum (ADU) was used to source the distribution bird data in the area; and
- Nomenclature and taxonomy followed the IOC World Bird Names unless otherwise specified (see www.worldbirdnames.org; Gill & Donsker, 2012).

[2] http://qgis.osgeo.org/en/site/
[3] http://sabap2.birdmap.africa/

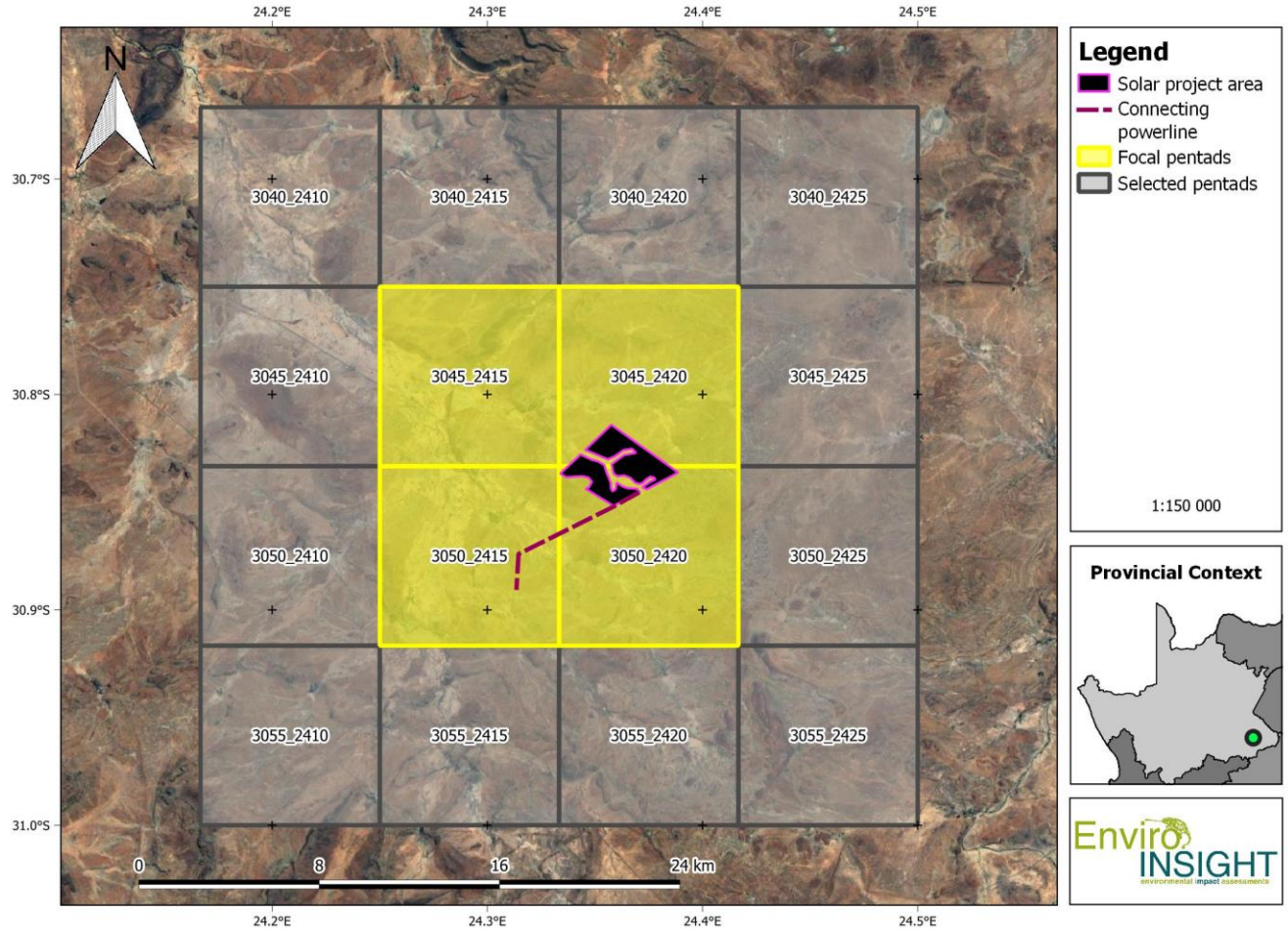

Figure 3: The proposed Soventix SEF in relation to the SABAP2 pentads.

3.3 PRECONSTRUCTION BIRD MONITORING SURVEY DESIGN

They proposed study area is classified as a Regime 2 based on the size of the study area (>150 ha), moderate avifaunal sensitivity and type of technology that will be used for the proposed project. The avifaunal sensitivity was determined based on the number of priority species occurring, or potentially present, within or around the study area, the regional or globally threat status of these species, avifaunal habitat found in the area, population of priority species, bird movement corridor and Important Bird and Biodiversity Area.

The duration, in terms of data collection, for this study will be 6 months consisting of a minimum of 2-3 visits of 3-5 days each, ideally to cover both the peak wet and dry seasons of the year. This complies with the requirements of the Best Practice Guidelines available at the time (Jenkins *et al*., 2017). It is important to take note that this period may be extended should there be a high risk of impact on the priority bird species observed in or around the study area, such as active nests.

The first site visit was a site reconnaissance and verification survey conducted to identify site characteristic found within the study area such as habitats, important bird species and site sensitivities including sensitive habitats with their associated

sensitive bird species and observation of nests of sensitive bird species. The site visit was conducted in March 2022, during optimal conditions where the area receives the most rainfall. During the site visit, sampling was done by means of walking and driving in and around the study area. Waterbodies in- and outside of the study area were identified and powerlines and pylons were scanned for any possible nests from sensitive bird species.

The site visits that will be conducted during the three additional seasons, will form part of the data sampling methods used as per the Best Practice Guidelines (Jenkins et al., 2017). Walking transects (WT) and driving transects (DT) will be determined after the first site visit (Table 1). Additional methods that will commence during the first site visit includes nesting sites and Coordinated Waterbird Counts, (CWAC).

Table 1: Avifauna monitoring sampling period for Soventix SEF and Control Site.

Date	Season	Methodology applied*
March 2022 (wet season) - scoping phase	Early Autumn	WT, DT, NE, WB
Scheduled for late June 2022 (date to be confirmed)	Winter	WT, DT, NE, WB
Scheduled for early September 2022 (date to be confirmed)	Spring	WT, DT, NE, WB
Scheduled for early November 2022 (date to be confirmed and only in circumstances based on the completion of the other surveys)	Summer	WT, DT, NE, WB

*** WT – Walked transects; DT – Drive transects; NE – Nest searches, inspection, and monitoring; WB – Water body inspections.**

3.3.1 Walking Transects and Fixed-Point Counts

These methods are utilised to monitor small bird species within the major habitat types within a study area. Based on the variety of habitat types, transects and sample points will be positioned at varying distances away from the proposed solar farm in order to maximize the comparative value of the data which will be compared with the surveys from the post-construction phase results.

Linear transects are determined based upon habitat characteristics and are approximately 500 m each, conducted to characterize the passerine and small bird communities and will end with a fixed sample point. These transects will be representative of the biotopes present within the study area. The survey locations are selected based on the representation of the different habitats covering the proposed study area, in proportion to their availability. All of them will be positioned at varying distances from the central development area (Jenkins *et al*., 2017). Each linear transect will be conducted by one expert bird observer at a time (more than one observer for all transects will be used), who records all bird contacts (both seen and heard) by walking slowly along the predetermined transect. Observations are made on both the left and right side of the predetermined transect and 360 degrees at the final fixed sample point. As a guideline. birds will be only recorded (seen or heard) within an estimated fixed maximum width of 200 m on either side of the transect line. The same transects are repeated

in every season. Surveys will commence mostly after sunrise and will be performed throughout the day to account for temporal variation in activity. As a general rule, transects will not be walked in adverse conditions, such as heavy rain, strong winds or thick mist.

3.3.2 Driven Transects

Large terrestrial birds (e.g. cranes, bustards, storks, and most raptors) cannot be adequately surveyed using walked transects. Populations of such birds should be estimated on each visit to the project area by means of road counts (vehicle-based sampling; best applied for relatively large, proposed SEFs, especially those with good networks of roads and tracks).

Road counts of large terrestrial birds and raptors require that one or a few driven transects be executed (depending on site size, terrain and infrastructure), comprising one or a number of set routes, limited by the existing roadways but as far as possible directed to include a representative cross section of habitats within the project area of influence.

These transects will be driven at a constant and slow speed (± 20km/h), and all sightings of large terrestrial birds and raptors will be recorded in terms of the same data-capture protocols used for walked transects (above), and in general compliance with the road-count protocols described for large terrestrial species (Young et al., 2003) and raptors (Malan, 2009).

One observer will be travelling slowly in a vehicle recording all species on both sides of the drive transect. The observer will stop at regular intervals (every 300 m) to scan the environment with binoculars. The number, distance and locations of each driving transects will be determined during the first site visit in Autumn.

3.3.3 Nesting sites

Any habitats within the broader impact zone of the proposed SEF, or an equivalent area around the site, deemed likely to support nest sites of key raptor and other species of conservation concern, including power lines, stands of large trees, marshes and drainage lines, will be search for, monitored and surveyed. All potential breeding sites, once identified fully, will be mapped, and checked during each survey to confirm occupancy, and all evidence of breeding and the outcomes of such activity, where possible, will be recorded.

3.3.4 Waterbodies

Prior to the initiation of the preconstruction monitoring campaign, the main water bodies (including wetlands) present within the study area were identified during the site visit in March 2022 and will be mapped on a Geographical Information System (GIS) by using 1:50 000 topographic maps and aerial photos. All identified water bodies continue to be surveyed to determine their level of utilisation by water birds.

Water birds, including potential roosting sites, will be recorded by the observers during all the surveys. The observers will be aided by a pair of binoculars and a spotting scope. Additional sites will be added to the monitoring programme, as and when they are discovered.

3.3.5 Incidental Observations

All other sightings of priority species (and particularly those suggestive of breeding or important feeding or roosting sites or

flight paths) on the SEF and control site as well as within the broader study area will be recorded, along with additional relevant information such as habitat type, abundance, habit and weather data. These observations will be used as complementary data to characterise the bird community and its utilisation of the site, as recommended by the Best Practice Guidelines (Jenkins *et al*., 2017).

3.4 SPECIES OF CONSERVATION CONCERN

The Red List of threatened species generated by the IUCN (http://www.iucnredlist.org/) provided the global conservation status of avifauna. However, Taylor *et al*. (2015) produced a regional conservation status assessment following the IUCN criteria which was used for this assessment. The first three categories i.e. Critically Endangered, Endangered and Vulnerable, are collectively called 'threatened' species.

The conservation status categories defined by the IUCN, which are considered here to represent species of conservation concern (SCC), are defined as follows:

- **Critically Endangered (CR)** - Critically Endangered refers to species facing immediate threat of extinction in the wild.
- **Endangered (EN)** - Endangered species are those facing a very high risk of extinction in the wild within the foreseeable future.
- **Vulnerable (VU)** - Vulnerable species are those facing a high risk of extinction in the wild in the medium-term.
- **Near Threatened (NT)** - any indigenous species which does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. NEMBA also deals with endangered, threatened and otherwise controlled species, under the Threatened or Protected Species Regulations (ToPS). A ToPS permit is required for any activities involving the removal or destruction of any ToPS-listed species.

Protected species: any species which is of such high conservation value or national importance that it requires national protection. Species listed in this category include, among others, species listed in terms of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

4 RESULTS

4.1 REGIONAL CONTEXT

The study area is located in the Nama-Karoo Biome and falls within the Northern Upper Karoo vegetation type (Mucina & Rutherford, 2006 – as amended), listed as Least threatened (Table 2; Figure 4).

Table 2: Attributes of the Northern Upper Karoo vegetation type (Mucina & Rutherford, 2006, as amended).

Name of vegetation type	Northern Upper Karoo
Code as used in the Book	Northern Upper Karoo
Conservation Target (percent of area) from NSBA	NKu3
Protected (percent of area) from NSBA	21%
Remaining (percent of area) from NSBA	0%
Description of conservation status from NSBA	96.6%
Description of the Protection Status from NSBA	Least threatened
Area (km^2) of the full extent of the Vegetation Type	Hardly protected
Name of the Biome	41829.17
Name of Group and Bioregion	Nama-Karoo Biome

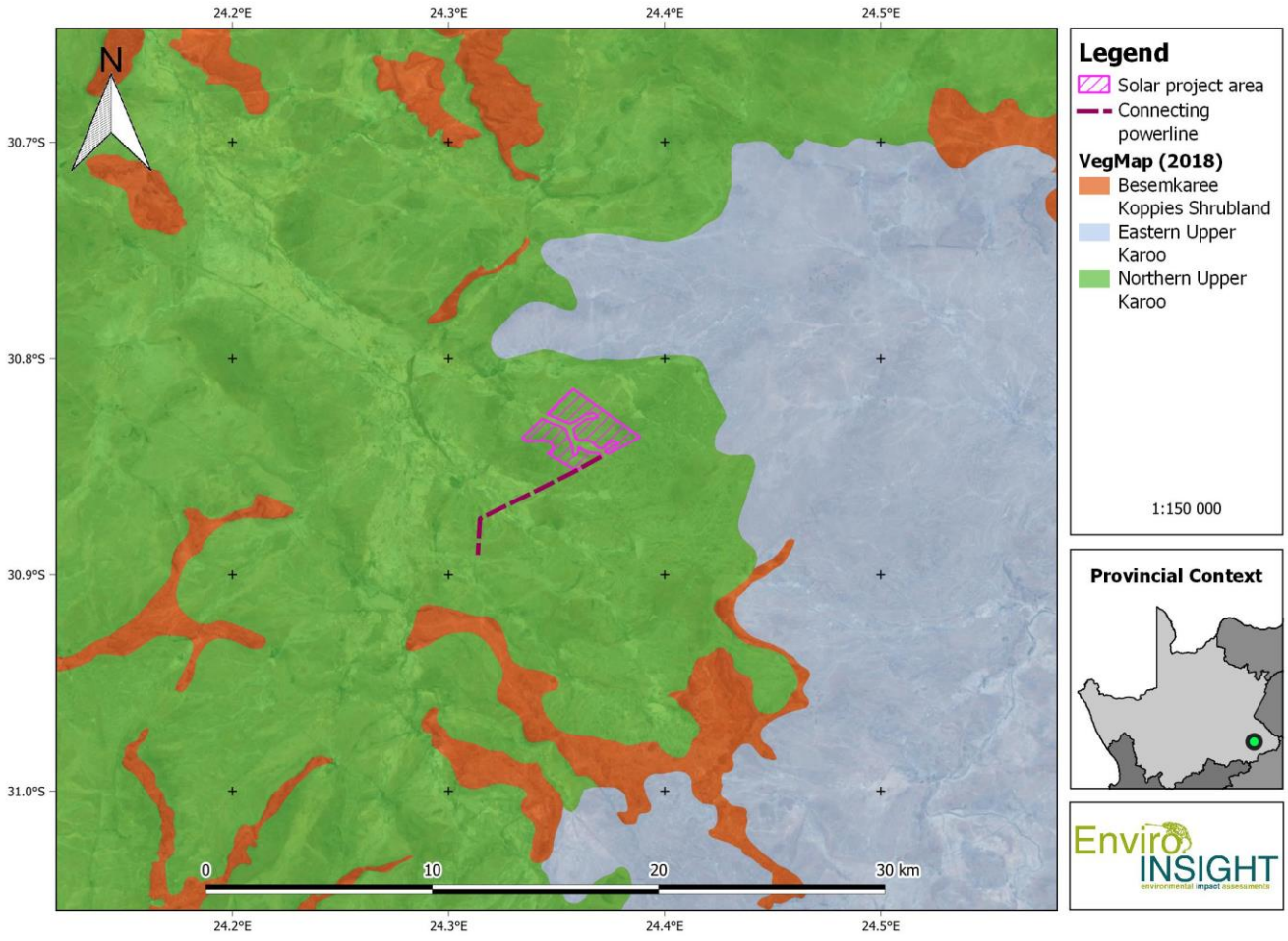

Figure 4: The proposed Soventix SEF in relation to regional vegetation types.

4.2 DESCRIPTION OF THE MAJOR BIRD HABITATS

4.2.1 Open Scrubland

The open scrubland supports a mix of drought-tolerant grass species such as *Aristida sp*., *Eragrostis sp*. and *Stipagrostis sp*. with dwarf shrubs known as the Northern Upper Karoo vegetation (*Mucina and Rutherford, 2006*). The vegetation type is the most dominant type for the proposed project. Due to the vegetation type being the most dominant type of habitat for the proposed study area, it is of medium sensitivity. This type of vegetation also supports most red listed avifauna species expected and observed within the study area such as large terrestrial bird species (Blue Cranes, Ludwig's Bustard and Karoo Korhaan) including raptor species such as Martial Eagle, Pale Chanting Goshawk and Black-chested Snake Eagle.

Figure 5: Open Scrublands.

4.2.2 Rocky ridges "koppies"

The rocky ridges found in and around the study area, differs in size and height. A pair of Verreaux's Eagle, with nest, was observed on one of the "koppies", which is also one of the higher ones in the area, close to the southern point of the connecting powerline. There are some relatively lower ridges in the eastern and western parts of the proposed study area. Although, no nests were found within the "koppies" west and east of the study area, this vegetation type is of high sensitivity it supports great habitat for different fauna and flora species found within the study area. These areas also support scattered large thorn bushes which could be ideal nesting habitat for raptors species such as Secretarybird. Although, no nests where found, it is important to protect these areas.

Figure 6: Rocky ridges "koppies"

4.2.3 Waterbodies

All the waterbodies found within the study area are man-made and mostly fills up after heavy rains. The waterbodies situated within the study area are relatively small compared to the one larger waterbody situated about 1km northwest of the study area. The smaller dams observed within the study area, did not support any waterbird. However, the larger one towards the northwest of the study area, included species such as Egyptian Goose, South African Shelduck, Cape Shoveler, Three-banded Plover and palaearctic migrants such as Little Stint. All the smaller dams may be completely dry during the dry months, as all of the contained water due to the good rains during the summer. These waterbodies will be observed during the dry seasons as well, so that the bird activity can be compared to the other months.

Figure 7: Waterbodies

4.3 CIRTICAL BIODIVERSITY AREAS (CBA'S) OF THE NORTHERN CAPE

Critical biodiversity areas (CBA's) are terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services. The primary purpose of CBA's is to inform land-use planning in order to promote sustainable development and protection of important natural habitat and landscapes. Biodiversity priority areas are described as follows:

- Critical biodiversity areas (CBA's) are areas of the landscape that need to be maintained in a natural or near- natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses. For CBA's the impact on biodiversity of a change in land-use that results in a change from the desired ecological state is most significant locally at the point of impact through the direct loss of a biodiversity feature (e.g. loss of a population or habitat). All FEPA prioritised wetlands and rivers have minimum category of CBA 1, while all FEPA prioritised wetland clusters have minimum category of CBA 2.
- Ecological support areas (ESA's) are areas that are not essential for meeting biodiversity representation targets/thresholds but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and/or delivery ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree of restriction on land use and resources use in this specific ESA is most significant elsewhere in the landscape through the indirect loss of biodiversity due to a breakdown, interruption or loss of an ecological process pathway (e.g. removing a corridor results in a population going extinct elsewhere or a new plantation locally results in a reduction in stream flow at the exit to the catchment which affects downstream biodiversity). All natural non-FEPA wetlands and larger rivers have minimum category of ESA.

A map of the study in relation to the 2016 Northern Cape CBA's is presented in Figure 8, indicating that the study area is located in an ESA.

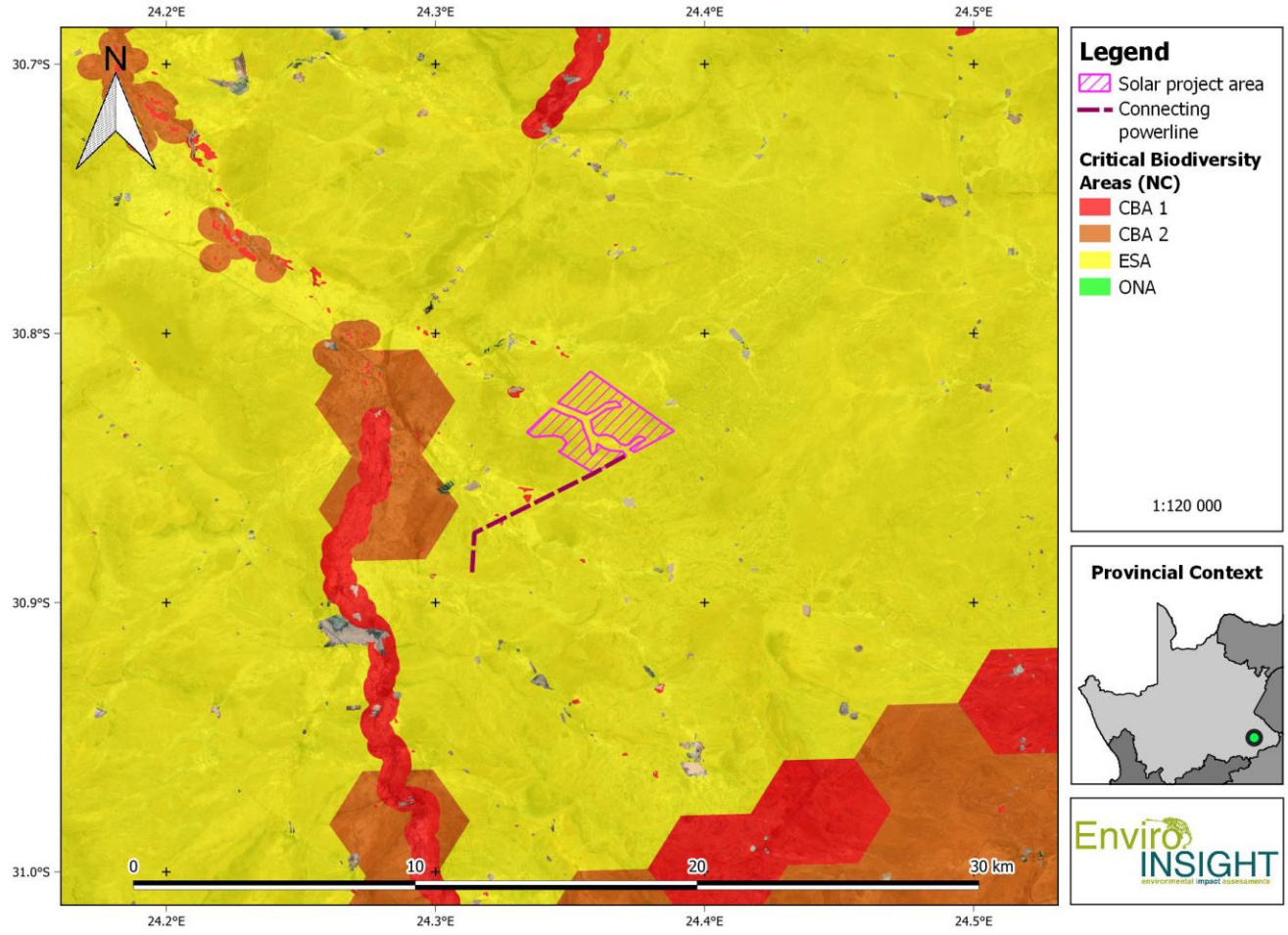

Figure 8: Northern Cape CBA's Map.

4.4 PROTECTED AREAS AND IMPORTANT BIRD AND BIODIVERSITY AREAS

The proposed solar farm occurs in the Platberg-Karoo Conservancy (SA037) Important Bird and Biodiversity Area (IBA) (Figure 9).

The Platberg-Karoo Conservancy IBA covers c. 1240 000 ha and is located in the Northern Cape Province with a protected status of "Unprotected". The folding process has forged several large peaks and plateaus in this area. The IBA encompasses a continuous chain of mountains and includes several State forests, mountain catchment areas and provincial nature reserves. A total of 289 bird species have been recorded in the IBA during SABAP2. With regards to the conservation, the IBA contributes greatly to the large terrestrial bird and raptor species. The priority species includes Blue Crane (*Anthropoides paradiseus)*, Ludwig's Bustard (*Neotis ludwigii)*, Kori Bustard (*Ardeotis kori)*, Blue Korhaan (*Eupodotis caerulescens)*, Black Stork (*Ciconia nigra)*, Secretarybird (*Sagittarius serpentarius)*, Martial Eagle (*Polemaetus bellicosus)*, Verreauxs' Eagle (*Aquila verreauxii)* and Tawny Eagle (*Aquila rapax).*

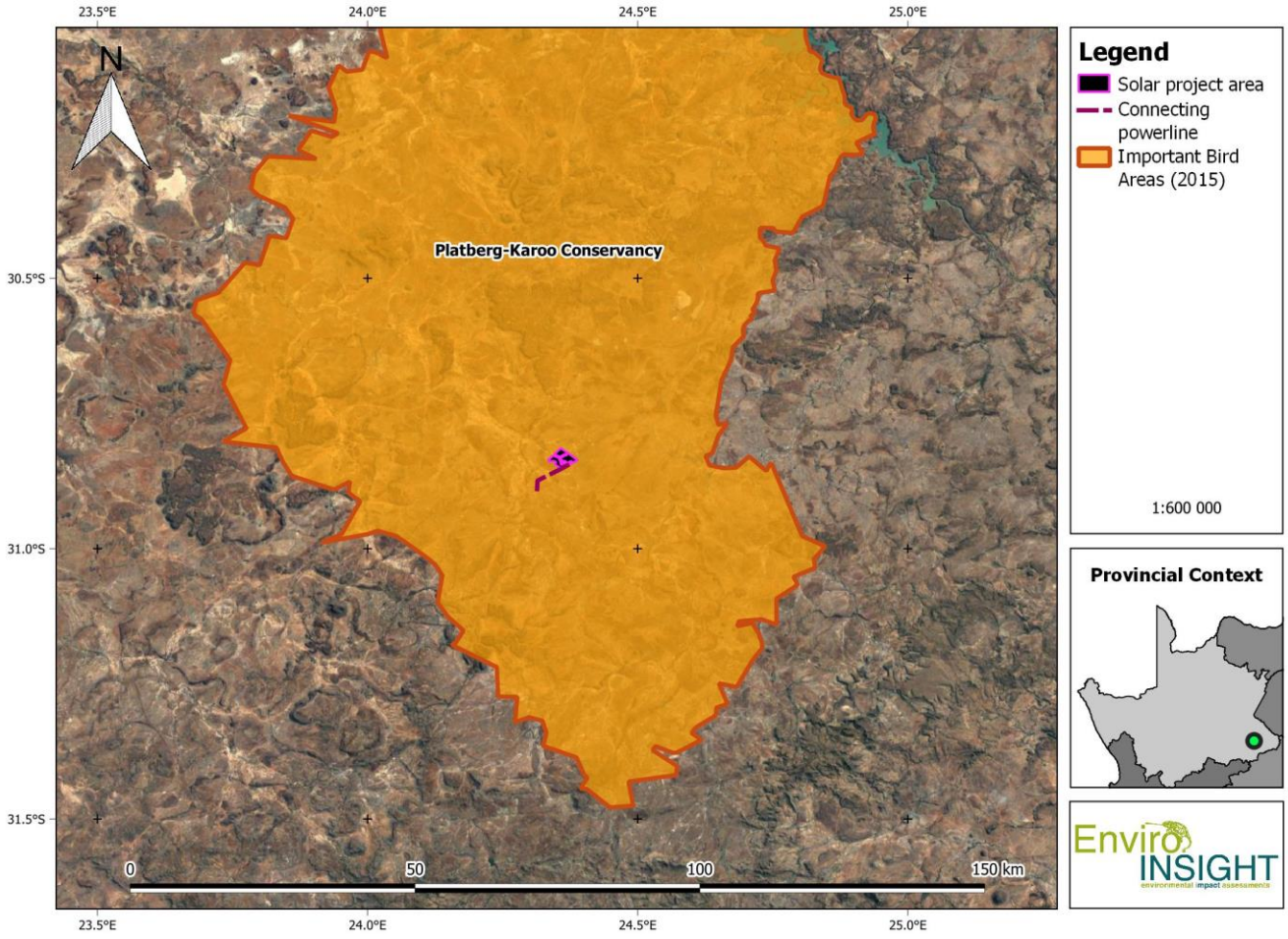

Figure 9: Important Bird Areas in the region

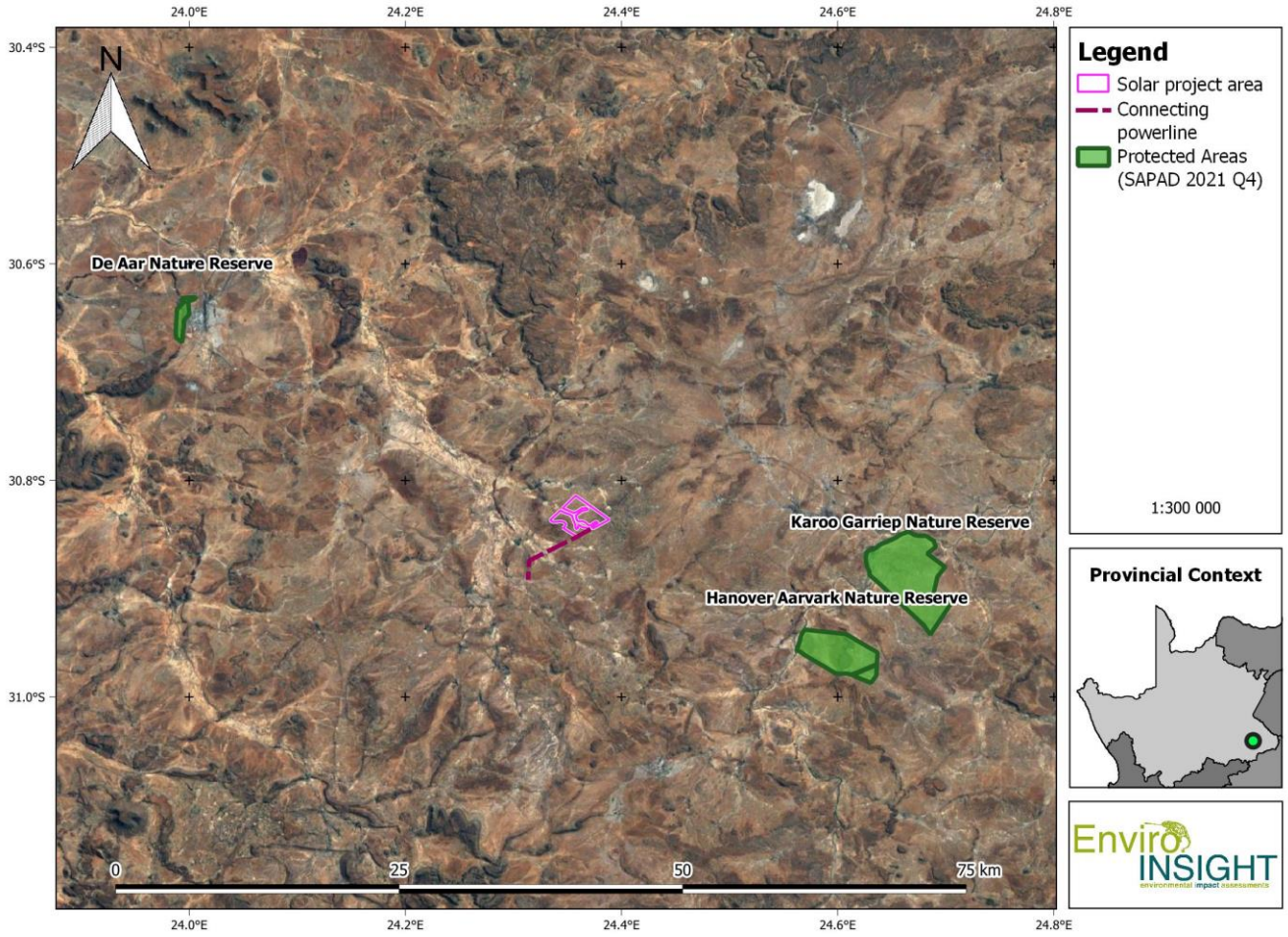

Figure 10: Protected Areas Map.

4.5 EXPECTED & OBSERVED AVIFAUNA

4.5.1 Total species composition and abundance

A relatively high diversity of 128 bird species for the area have been recorded within the four SABAP pentads in which the study area is situated. A total of 159 bird species was recorded in the greater area (16 pentads), as shown in APPENDIX 1: Expected & Observed Avifauna Species List. During the March 2022 site visit, a total of 69 species were recorded.

4.5.2 Sensitive avifauna species list

A list of expected priority species in the project area is provided in Table 3. A total of 16 priority species are expected to occur within and surrounding the study area, of which 13 species are listed as threatened and near threatened. Seven (7) of these regionally/globally threatened and near-threatened species were observed during the site visit.

Thirteen (13) of the sixteen (16) expected sensitive avifauna species have medium to high probability of occurrence (POC) on the site.

The priority species list in Table 3 includes the following data:

- Threatened and Near-Threatened species recorded as per the SABAP pentad data;
- Observed threatened species recorded during the monitoring phase done by Simon Tod Consulting (2017); and
- Priority species with a medium or higher probability of occurrence.

Consequently, every effort will be taken to capture all aspects of priority species observed within the field survey to allow for careful evaluation of potential impacts and application of suitable mitigation measures to reduce these impacts where possible.

Table 3: Priority avifauna species list expected and observed in the study area.

Common name	Taxonomic name	Observed	Status (RG/GB)	Southern African Endemic	POC
Bustard, Ludwig's	*Neotis ludwigii*	Yes	EN, EN		Medium
Buzzard, Jackal	*Buteo rufofuscus*	Yes	LC	Yes	Medium
Crane, Blue	*Anthropoides paradiseus*	Yes	NT, VU		High
Eagle, Booted	*Hieraaetus pennatus*	No	LC		Low
Eagle, Martial	*Polemaetus bellicosus*	Yes	EN, EN		Medium
Eagle, Tawny	*Aquila rapax*	No	EN, VU		Low
Eagle, Verreaux's	*Aquila verreauxii*	Yes	VU, LC		Medium
Falcon, Lanner	*Falco biarmicus*	Yes	VU, LC		Medium
Goshawk, Pale Chanting	*Melierax canorus*	Yes	LC	Yes	Medium
Kestrel, Greater	*Falco rupicoloides*	Yes	LC		Medium
Kestrel, Lesser	*Falco naumanni*	Yes	LC		Medium
Korhaan, Blue	*Eupodotis caerulescens*	No	LC, NT		Medium
Korhaan, Karoo	Eupodotis vigorsii	Yes	NT, LC	Yes	High
Korhaan, Northern Black	*Afrotis afraoides*	Yes	LC	Yes	High
Secretarybird	*Sagittarius serpentarius*	Yes	VU		Medium
Stork. Black	*Ciconia nigra*	No	VU, LC		Low

* These species were observed and recorded to date by SABAP1 or SABAP2.

5 IMPACT ASSESSMENT

5.1 BACKGROUND TO INTERACTIONS BETWEEN SOLAR ENERGY FACILITIES, POWER LINES AND BIRDS

The effects of a solar farm on birds are highly variable and depend on a wide range of factors including the design and specification of the development, the topography of the surrounding land, the habitats affected and the number and species of birds present.

Typical potential impacts include (but are not necessarily limited to):

- Habitat loss (including foraging and breeding) and fragmentation due to displacement (avoidance of disturbance). Habitat loss has the tendency to not only destroy existing habitat but also displace bird species from large areas of natural habitat. This specifically has a greater impact on bird species restricted to a specific habitat and its requirements.
- Collision and electrocution with above-ground power transmission lines (to be assessed in separate application). In some cases, collision can be associated with polarised light pollution and waterbird species mistaking large PV panels areas as wetlands or other waterbodies, a case known as the "lake effect" (as per Jenkins *et al*. 2017). The mitigation of these impacts will be addressed in the final EIA report with operational phase monitoring to be designed in the EMPr.
- Disturbance due to noise such as, machinery movements and maintenance operations during the construction and operational phase of the proposed PV solar farm.
- The attraction of some novel bird species due to the development of a solar farm with associated infrastructure such as perches, nest and shade opportunities
- Chemical pollution: Chemicals being used to keep the PV panels clean from dust (suppressants) etc.

6 PRELIMINARY SENSITIVITY

The study area mostly consists of scrubland and grassland with some ridge found in the southern and eastern parts of the proposed study area. The grassland and scrubland vegetation covers most of the study area and provides nesting habitat for bird species such as Larks, Pipits, Cisticola's and korhaan and sensitive species such as Karoo Korhaan and Ludwig's Bustard, including hunting/foraging habitat for species such as Martial Eagle, Lanner Falcon, Secretary bird and Blue Crane. The ridge areas found within the study area consist of large thorn bushes which might provide possible nesting and foraging habitat for species such as Chats and Prinia's, including sensitivity species such as the Secretarybird.

The site visit in March 2022 took place during the rainy season, which means some small manmade dams found within the study area, were filled with water. However, these small dams did show very low signs in terms of waterbird activities. The bigger dam found about 1.3km west outside of the study area, had the higher density of birds in terms of waterbodies, with species such as ducks, geese, stilts, stints, and plovers. The wetland area is found in the middle of the two proposed study areas, were water eventually flows into the big dam after heavy rains. The wetland area did not have any water in during the study area. However, it provides foraging habitat for sensitive species with a possibility to occur on site such as Blue Cranes

and Black Storks. Accordingly, all watercourses are mapped as sensitive (Figure 11).

There is an existing powerline running along the border of the southern section of the study area. The powerline did not have any signs of priority bird species nests, but could lead to possible nesting in the future for species such as Martial Eagle or Verreaux's Eagle. The species abundance would be at its highest during and after the rainy season, as food resources increase more birds will fly in, including water associated bird species which will mostly be found at the larger dam west of the study area.

During the site visit, one Verreaux's Eagle nest was observed, with two active adults circling the nesting area. This is also the area where one Verreaux's Eagle mortality was found. The nesting site is at this stage the highest sensitivity found within proximately of the study area. The nest is found just over 6km from the proposed study area. However, the proposed connecting powerline as per the layout of the study area falls within 1.9km of the nest. The farmer in the area, mentioned that the nest has been there for several years.

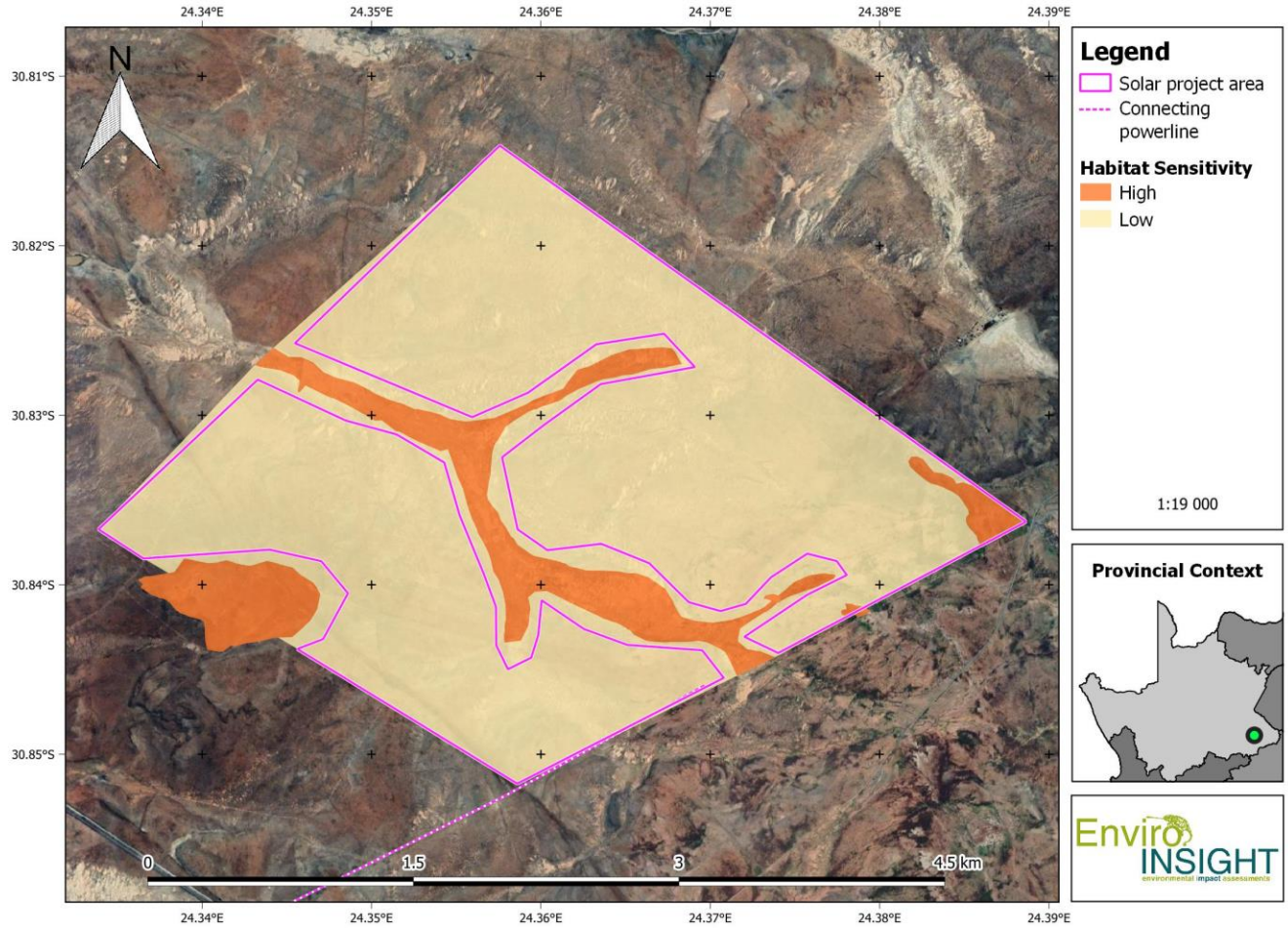

Figure 11: Preliminary avifauna sensitivity map.

7 CONCLUSIONS

The study area is situated within the Nama Karoo Biome and the Northern Upper Karoo vegetation type, nearly meeting the Grassland Biome to the east of the study area. The study area supports several large terrestrial bird species such as cranes, bustards and korhaans, including large raptor species. Therefore, considering the study area is important in terms of conservation of these type of bird species.

The CBAs of the Northern Cape (2016) designated that majority of the site falls within an ecological support area (ESA). Avoidance mitigation could be applied wherever possible to project infrastructure design and limit the amount of habitat impacted.

The study area is classified as a Regime 2 assessment (Jenkins *et al.* 2017) and will follow the appropriate sampling method, which consists of 2-3 surveys of 3-5 days each over a 6-month period. Samling methods to be used will include walking and driving transects, bird species abundance at waterbodies and monitoring of new and previously observed nests on existing and constructed pylons.

A total of sixteen (16) priority species has the possibility of occurring within and around the study area, including Blue Crane, Jackal Buzzard, Martial Eagle, Booted Eagle, Verreaux's Eagle, and Ludwig's Bustard. Special attention will be placed on these species, especially on the Verreaux's Eagle nest site that has been identified during the site visit.

The proposed solar project has the potential to be of medium to high sensitivity from an avifaunal point of view. Some of the priority bird species are habitat bound to the area for nesting and/or foraging purposes and is therefore important to focus on the some of the most significant impacts for the proposed solar project. Possible primary impacts of the proposed study area on avifauna include:

1. Potential habitat loss through the establishment of solar panel infrastructure.
2. The inclusion of crops as part of a Agrivoltaic system might attract more avifauna species to the area.
3. Collision with solar panel infrastructure is possible albeit less likely than secondary collision risk.
4. Secondary collision risks are represented by supporting powerline infrastructure which are connected to solar panel infrastructure. Several species such as IUCN Endangered Ludwig's Bustard and Secretary Birds are highly susceptible to collision impacts.

The study area is surrounded with existing renewable energy developments, both wind and solar developments, which could have the possibility of cumulative impacts at the proposed site. The surrounding wind and solar developments include Mulilo WEF and De Aar Solar Power. However, the study area is also surrounded by natural and undeveloped areas, which has the likelihood of low sensitivity, especially being large areas. This will be discussed in more detail during the EIA phase.

Sensitive bird species found within the study area include Blue Crane, Ludwig's Bustard, Martial Eagle, Karoo Korhaan, and Lanner Falcon. Other species that were observed outside of the study area but will also have a high occurrence probability within the study area are Secretarybird and Kori Bustard. No nests of sensitive species were observed or identified within the study area. Only the one Verreaux's Eagle nest was recorded outside of the PV area, with two active adults circling the nesting area. This is also the area where one Verreaux's Eagle mortality was found. The nest is found just over 6km south

from the proposed study area. However, the proposed connecting powerline as per the layout of the study area falls within 1.9 km of the nest. The farmer in the area, mentioned that the nest has been there for several years. This would be a nest that will be monitored during the future study surveys.

Consequently, every effort will be taken to capture all aspects of priority species observed within the field survey to allow for careful evaluation of potential impacts and application of suitable mitigation measures to reduce these impacts where possible.

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9 APPENDIX

9.1 APPENDIX 1: EXPECTED & OBSERVED AVIFAUNA SPECIES LIST

Avifauna recorded by SABAP1 and SABAP2 for the sixteen pentads, which includes the study area and surrounding area, is situated (see Figure 3).

Table 4: Avifauna species expected (medium probability and higher) in the study area.

Common Name	Scientific Name	Latest FP	Status (RG/GB)	SABAP Pentad	Todd, S	ADU	Observed on Site	POC
Acacia Pied Barbet	*Tricholaema leucomelas*	2020/11/14	LC				Yes	Medium
African Black Swift	*Apus barbatus*	2022/03/04					Yes	Medium
African Pipit	*Anthus cinnamomeus*	2020/12/09		X	X		Yes	High
African Red-eyed Bulbul	*Pycnonotus nigricans*	2021/05/04		X				High
African Sacred Ibis	*Threskiornis aethiopicus*	2017/11/05			X	X	Yes	Medium
African Stonechat	*Saxicola torquatus*	2021/05/22		X				High
Amur Falcon	*Falco amurensis*	2022/02/03		X		X	Yes	Medium
Ant-eating Chat	*Myrmecocichla formicivora*	2022/02/03		X		X	Yes	High
Pied Avocet	*Recurvirostra avosetta*	2017/11/05		X		X	Yes	Medium
Barn Swallow	*Hirundo rustica*	2022/02/03		X			Yes	High
Black-chested Snake Eagle	*Circaetus pectoralis*	2022/03/03					Yes	Medium
Black-headed Heron	*Ardea melanocephala*	2020/10/12		X				Medium
Blacksmith Lapwing	*Vanellus armatus*	2021/01/15		X	X	X	Yes	High
Black-throated Canary	*Crithagra atrogularis*	2017/03/01		X				Medium
Black-winged Stilt	*Himantopus himantopus*	2017/11/05		X	X	X		Medium
Blue Crane	*Grus paradisea*	2022/02/03	NT, VU	X	X	X	Yes	High
Blue Korhaan	*Eupodotis caerulescens*	2017/11/05	LC, NT	X	X			Medium
Bokmakierie	*Telophorus zeylonus*	2022/02/03		X			Yes	High
Booted Eagle	*Hieraaetus pennatus*	2017/03/01		X				Medium
Brown-throated Martin	*Riparia paludicola*	2017/10/19		X				Medium
Cape Robin-Chat	*Cossypha caffra*	2020/12/09		X			Yes	Medium
Cape Shoveler	*Spatula smithii*	2017/10/12		X	X	X	Yes	Medium
Cape Sparrow	*Passer melanurus*	2022/02/03		X			Yes	High
Cape Turtle Dove	*Streptopelia capicola*	2022/02/03		X		X	Yes	Medium
Cape Wagtail	*Motacilla capensis*	2020/12/09		X			Yes	High
Capped Wheatear	*Oenanthe pileata*	2021/05/22		X			Yes	Medium
Chat Flycatcher	*Melaenornis infuscatus*	2020/11/13		X			Yes	Medium
Chestnut-vented Warbler	*Curruca subcoerulea*	2017/10/07		X				Medium

Cloud Cisticola	*Cisticola textrix*	2017/10/07		X			Yes	Medium
Common Greenshank	*Tringa nebularia*	2017/11/05		X				Medium
Desert Cisticola	*Cisticola aridulus*	2017/03/01		X	X	X	Yes	Medium
Eastern Clapper Lark	*Mirafra fasciolata*	2022/02/03		X	X		Yes	High
Egyptian Goose	*Alopochen aegyptiaca*	2022/02/03		X		X	Yes	High
European Bee-eater	*Merops apiaster*	2020/12/09		X				Medium
Familiar Chat	*Oenanthe familiaris*	2020/12/09		X			Yes	High
Fiscal Flycatcher	*Melaenornis silens*	2022/02/03		X				Medium
Greater Kestrel	*Falco rupicoloides*	2021/05/22		X		X	Yes	Medium
Greater Striped Swallow	*Cecropis cucullata*	2022/02/03		X			Yes	High
Grey Heron	*Ardea cinerea*	2021/01/15		X			Yes	Medium
Grey-backed Cisticola	*Cisticola subruficapilla*	2020/12/09		X				Medium
Grey-backed Sparrow-Lark	*Eremopterix verticalis*	2021/11/03		X				Medium
Hadada Ibis	*Bostrychia hagedash*	2021/08/13		X		X		Medium
Helmeted Guineafowl	*Numida meleagris*	2022/02/03				X		Medium
House Sparrow	*Passer domesticus*	2020/02/07						Medium
Jackal Buzzard	*Buteo rufofuscus*	2021/10/10				X	Yes	Medium
Karoo Korhaan	*Eupodotis vigorsii*	2022/02/03	NT, LC	X			Yes	Medium
Karoo Long-billed Lark	*Certhilauda subcoronata*	2019/07/29			X			Medium
Karoo Prinia	*Prinia maculosa*	2020/11/13		X				Medium
Karoo Scrub Robin	*Cercotrichas coryphoeus*	2021/05/22		X	X		Yes	High
Karoo Thrush	*Turdus smithi*	2020/11/14		X				Medium
Kittlitz's Plover	*Charadrius pecuarius*	2017/10/19		X		X	Yes	Medium
Kori Bustard	*Ardeotis kori*	2022/03/06					Yes	Medium
Large-billed Lark	*Galerida magnirostris*	2022/02/03		X	X	X	Yes	High
Lark-like Bunting	*Emberiza impetuani*	2021/11/03		X		X	Yes	High
Laughing Dove	*Spilopelia senegalensis*	2021/05/04		X				High
Lesser Kestrel	*Falco naumanni*	2022/02/03		X	X		Yes	Medium
Little Stint	*Calidris minuta*	2017/10/19		X	X	X	Yes	Medium
Little Swift	*Apus affinis*	2021/11/03		X			Yes	Medium
Ludwig's Bustard	*Neotis ludwigii*	2022/02/03	EN, EN	X	X		Yes	Medium
Martial Eagle	*Polemaetus bellicosus*	2019/07/29	EN, EN	X			Yes	Medium
Mountain Wheatear	*Myrmecocichla monticola*	2020/12/09		X	X		Yes	High
Namaqua Sandgrouse	*Pterocles namaqua*	2020/10/12		X	X	X		Medium
Neddicky	*Cisticola fulvicapilla*	2022/03/07					Yes	Medium
Northern Black Korhaan	*Afrotis afraoides*	2021/10/10		X	X		Yes	Medium
Pale Chanting	*Melierax canorus*	2021/10/10		X	X		Yes	Medium

Goshawk								
Pied Crow	*Corvus albus*	2022/02/03		X		X	Yes	High
Pied Starling	*Lamprotornis bicolor*	2021/05/22		X				High
Red-billed Quelea	*Quelea quelea*	2021/05/04		X				Medium
Red-capped Lark	*Calandrella cinerea*	2017/10/19		X				Medium
Red-eyed Dove	*Streptopelia semitorquata*	2017/10/07		X			Yes	High
Red-headed Finch	*Amadina erythrocephala*	2022/02/03		X			Yes	Medium
Red-knobbed Coot	*Fulica cristata*	2015/11/09		X				Medium
Rock Kestrel	*Falco rupicolus*	2019/05/31		X				Medium
Rock Martin	*Ptyonoprogne fuligula*	2021/08/13		X				Medium
Rufous-eared Warbler	*Malcorus pectoralis*	2021/05/22		X	X	X	Yes	High
Sabota Lark	*Calendulauda sabota*	2017/08/07		X	X		Yes	High
Secretarybird	*Sagittarius serpentarius*	2022/02/03	VU, EN		X		Yes	Medium
Sickle-winged Chat	*Emarginata sinuata*	2021/05/22		X			Yes	High
South African Cliff Swallow	*Petrochelidon spilodera*	2017/10/19		X		X		Medium
South African Shelduck	*Tadorna cana*	2020/05/26		X	X	X	Yes	High
Southern Fiscal	*Lanius collaris*	2022/02/03		X			Yes	High
Southern Grey-headed Sparrow	*Passer diffusus*	2017/08/05		X			Yes	Medium
Southern Masked Weaver	*Ploceus velatus*	2022/02/03		X			Yes	High
Southern Red Bishop	*Euplectes orix*	2021/05/22		X		X		Medium
Speckled Pigeon	*Columba guinea*	2022/02/03		X			Yes	Medium
Spike-heeled Lark	*Chersomanes albofasciata*	2021/05/22		X	X		Yes	High
Spotted Thick-knee	*Burhinus capensis*	2022/02/03		X			Yes	Medium
Spur-winged Goose	*Plectropterus gambensis*	2022/02/03		X		X		Medium
Tawny Eagle	*Aquila rapax*	2021/05/22	EN, VU	X	X			Medium
Three-banded Plover	*Charadrius tricollaris*	2022/02/03		X			Yes	Medium
Verreaux's Eagle	*Aquila verreauxii*	2022/02/03	VU, LC	X	X		Yes	Medium
Western Cattle Egret	*Bubulcus ibis*	2017/03/01		X				Medium
White-backed Mousebird	*Colius colius*	2021/05/19		X			Yes	Medium
White-rumped Swift	*Apus caffer*	2020/12/09		X			Yes	Medium
White-throated Canary	*Crithagra albogularis*	2020/12/09		X				Medium
White-throated Swallow	*Hirundo albigularis*	2017/10/19		X			Yes	Medium
Yellow-crowned Bishop	*Euplectus afer*	2022/03/03					Yes	Medium
Yellow Canary	*Crithagra flaviventris*	2021/05/22		X				Medium
Yellow-bellied Eremomela	*Eremomela icteropygialis*	2017/08/05		X				Medium

Yellow-billed Duck	*Anas undulata*	2020/05/26		X			Yes	Medium
Zitting Cisticola	*Cisticola juncidis*	2012/11/10					Yes	Medium