



Avifauna Impact Assessment for the proposed Droogfontein D5 Solar Photovoltaic Project: Updates

**Kimberley, Sol Plaatje Local Municipality,
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CLIENT



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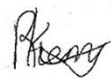



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1 Introduction

1.1 Background

The Biodiversity Company (TBC) was appointed to undertake an avifauna assessment for the proposed Droogfontein D5 Solar Photovoltaic (PV) project. The proposed project involves the development of a solar facility and associated infrastructure, located between the towns of Kimberley and Riverton in the Northern Cape province (Figure 1-2).

The National Web-based Environmental Screening Tool (Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended) indicated that the Animal Species Theme Sensitivity was rated as 'High'. Accordingly, The Biodiversity Company was sub-contracted to undertake an Avifauna Impact Assessment to inform on the impact of the proposed PV to the avifauna community within the receiving environment. The approach was informed by the Environmental Impact Assessment Regulations, 2014 (GNR 326, 7 April 2017) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The approach has taken cognisance of the recently published Government Notices 320 (20 March 2020) in terms of NEMA, dated 20 March and 30 October 2020: "*Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation*" (Reporting Criteria). Based on the size of the PV and the risk associated with it, a Regime 2 assessment was undertaken (BirdLife South Africa, 2017).

This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making, as to the ecological viability of the proposed project.

1.2 Project Description

The following project description is applicable:

- PV Panel Array - To produce up to 200MW direct current and up to 180MW alternating current, the proposed SEF will require numerous linked cells placed behind a protective glass sheet to form a panel. Multiple panels will be required to form the solar PV arrays which will comprise the PV facility. The PV panels will be tilted in order to capture the most sun or using axis tracker structures to follow the sun to increase the Yield;
- Wiring to Inverters - Sections of the PV array will be wired to inverters. The inverter is a pulse width mode inverter that converts direct current (DC) electricity to alternating current (AC) electricity at grid frequency; and
- Connection to the grid - Connecting the array to the electrical grid requires transformation of the voltage from 480V to 33kV to 132kV. The normal components and dimensions of a distribution rated electrical substation will be required. Output voltage from the inverter is approximately 480V and this is fed into step up transformers to 132kV. An onsite facility substation and switching stations will be required on the site to step the voltage up to 132kV, after which the power will be evacuated into the national grid via the proposed new collector substation and power line. The power line route will be assessed within a 300m wide corridor.

As there are five alternative development areas proposed for the placement of the project development footprint, the developer has identified a suitable grid connection corridor for each of the development areas which connects the facility to an existing power line located near to the development area. All grid connection corridors have a width of 300m. The respective grid connection solutions proposed for each of the alternative development areas are considered to be feasible from a technical and capacity perspective and provides an opportunity for limited linear disturbance within the landscape based on the limited power line infrastructure proposed to be developed (i.e. no power lines longer than 2.5km are required). Refer to the below.

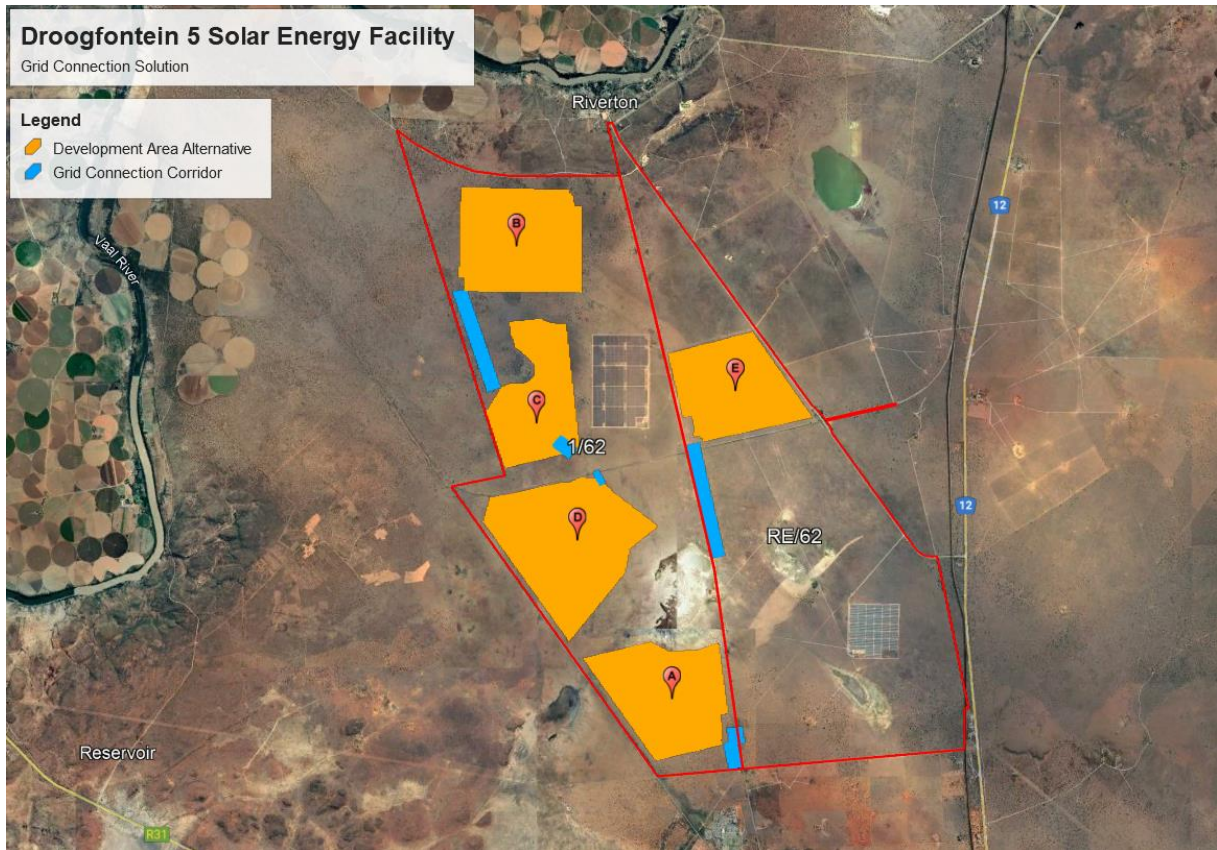


Figure 1-1 *Proposed grid connection corridors (indicated in blue) associated with each of the development area options*

- Electrical reticulation network – An internal electrical reticulation network will be required and will be laid ~2-4m underground as far as practically possible.
- Supporting Infrastructure – The following auxiliary buildings with basic services including water and electricity will be required:
 - Administration Office (~300m²);
 - Switch gear and relay room (~400m²);
 - Staff lockers and changing room (~200m²);
 - Security control (~60m²);
 - Operations & Maintenance (O&M) room; and
 - Warehouse.
- Battery Energy Storage System (BESS) – The battery energy storage system will make use of Lithium-ion as a preferred technology and will have a capacity of up to 40MW. The extent of the system will be 20m long, 23m high, 2.5m wide. The containers may be single stacked only to reduce the footprint. There may be up to a maximum of 40 containers of BESS. The containers will include cells, HVAC, fire, safety and control systems and will comprise of Lithium-Ion technology providing a maximum capacity of 50MW in total
- Roads – Access will be obtained via the tarred Riverton Road and various gravel farm roads within the area and affected properties. An internal site road network will also be required to

provide access to the solar field and associated infrastructure. Roads are expected to be between 8m and 12m wide.

- **Fencing** - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farm. Fencing with a maximum height of 3 meters will be used.

Component	Description / dimensions
Height of PV panels	Up to 3 meters
Area of PV Array	Up to 160 hectares (within the up to 500ha development footprint)
Number of inverters required	To be determined as part of the final facility layout design.
Area occupied by inverter / transformer stations / substations	On-site Facility Substation: up to 3ha Collector Substation: up to 3ha BESS: up to 5ha
Capacity of the on-site substation	33kV / 132kV
Capacity of the collector substation	33kV / 132kV
Capacity of the power line	33kV / 132kV
Area occupied by both permanent and construction laydown areas	Up to 3 hectares
Area occupied by buildings	<ul style="list-style-type: none"> • Administration Office (~300m²); • Switch gear and relay room (~400m²); • Staff lockers and changing room (~200m²); • Security control (~60m²);
Width of internal roads	Between 8 and 12 meters
Grid connection corridor width	300m
Grid connection corridor length – as associated with each development area alternative	<ul style="list-style-type: none"> • Option A: up to 600m • Option B: up to 2km • Option C: up to 140m (two power lines of 140m is required) • Option D: up to 145m • Option E: up to 2.3km
Power line servitude width	Up to 32m
Height of fencing	Approximately 3 meters

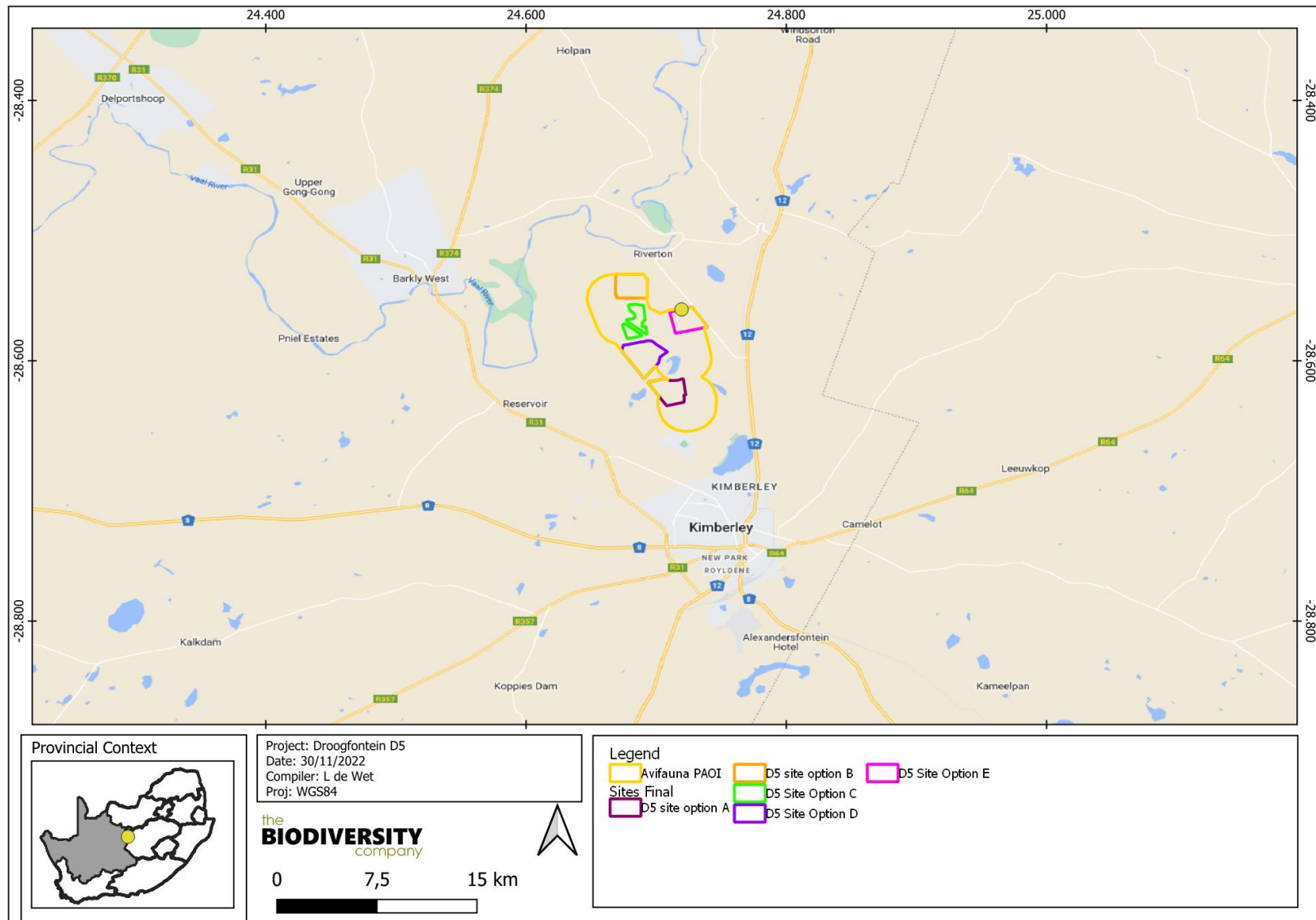


Figure 1-2 Map illustrating the location of the proposed PV Project

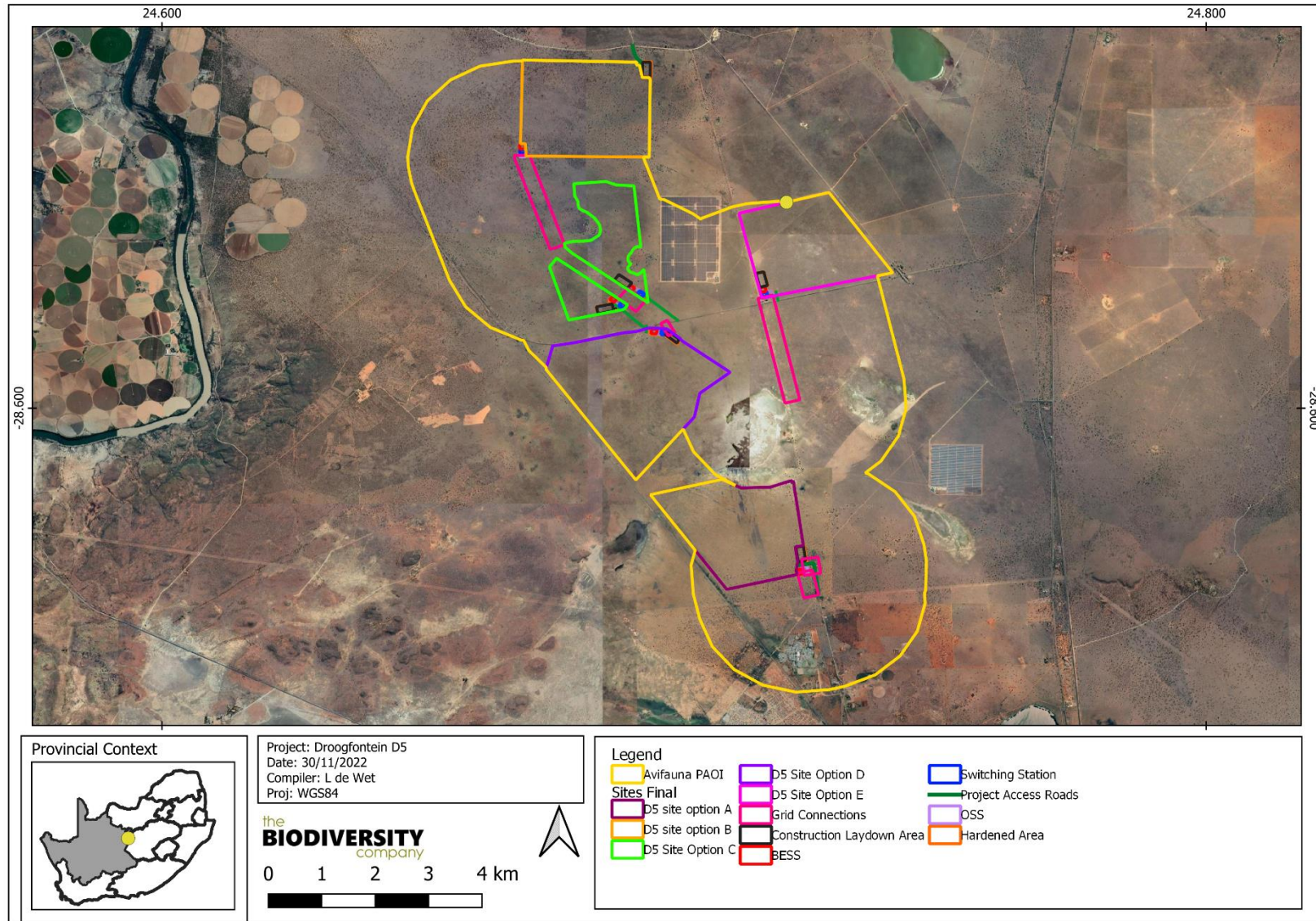


Figure 1-3 Droogfontein 5 Solar Energy Facility infrastructure

1.3 Scope of Work

The assessment was achieved according to the above-mentioned legislation and the best-practice guidelines and principles for Avifaunal Impact Assessments within the context of PVs as outlined by BirdLife South Africa (2017).

The scope of the Avifaunal Impact Assessment included the following:

- Desktop assessment to identify the relevant ecologically important geographical features within the Project Area of Influence (PAOI) and surrounding landscape
- Desktop assessment to compile an expected species list and possible avifauna Species of Conservation Concern (SCC) (Figure 1-4) that potentially occur within the PAOI;
- Description of the baseline avifauna species and Functional Feeding Guild (FFG) composition assemblage within the PAOI;
- Delineate site sensitivity or sensitivities i.e., the Site Ecological Importance (SEI) within the context of the avifauna species assemblage of the PAOI;
- Identify the manner that the proposed development impacts the avifauna community and evaluate the level of risk of these potential impacts; and
- Provide mitigation measures to prevent or reduce the possible impacts.

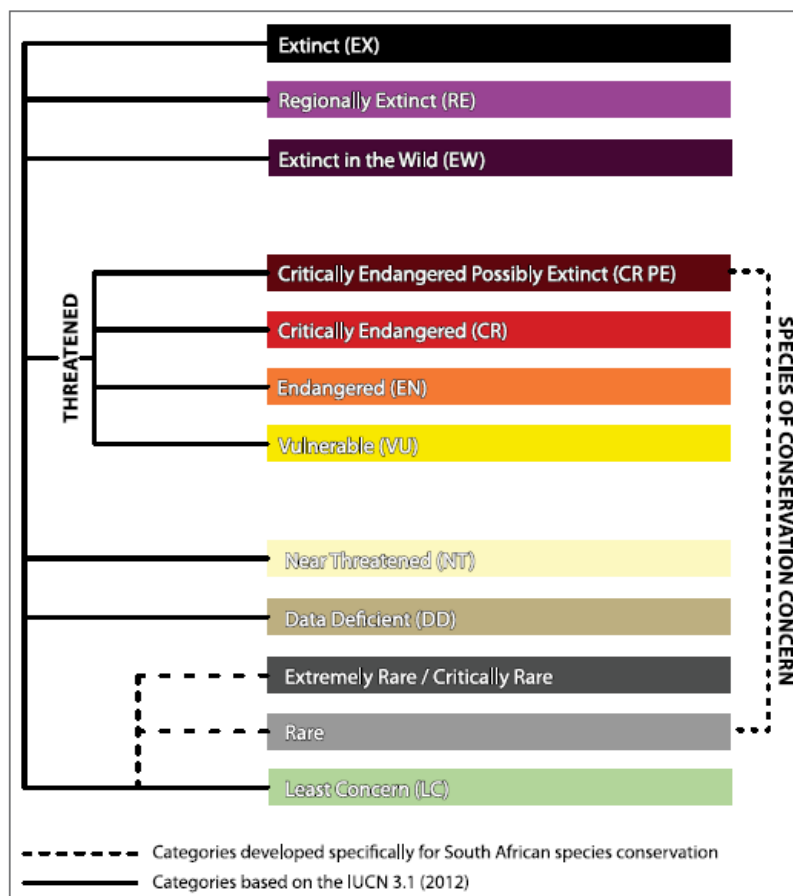


Figure 1-4 The different categories of Species of Conservation Concern modified from the IUCN's extinction risk categories. Source: SANBI (2020)

1.4 Assumptions and Limitations

The following assumptions and limitations should be noted for the assessment:

- The PAOI was based on the project footprint area as provided by the client, as well as a 2 km assessment area around the powerlines. Any alterations to the area and/or missing GIS information pertaining to the assessment area would have affected the area surveyed and hence the results of this assessment;
- Precious avifaunal assessment reports of the existing Droogfontein developments could not be located and therefore has not been included;
- The 2 km assessment area was only included after the first field assessment was completed, due to the recent EGI legislative changes;
- Although the first two site visits were sufficient to record the main avifauna species occurring in the area and affected by the proposed development, a third was undertaken for the purposes of this update to ensure the new sites (C, D and E) were sufficiently covered;
- Whilst every effort was made to cover as much of the PAOI as possible it is possible that some species that are present within the PAOI were not recorded during the field investigations due to their secretive behaviour; and
- The GPS used in the assessment has an accuracy of 5 m and consequently any spatial features delineated may be offset by up to 5 m.

1.5 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 1-1 are applicable to the proposed project. The list below, although extensive, may not be complete and other legislation, policies and guidelines may apply in addition to those listed below.

Table 1-1 *A list of key legislative requirements relevant to biodiversity and conservation in the Northern Cape Province*

Region	Legislation / Guideline
National	Constitution of the Republic of South Africa (Act No. 108 of 1996)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management: Biodiversity Act (Act No. 10 of 2004), Threatened or Protected Species Regulations
	Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 320 of Government Gazette 43310 (March 2020)
	Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 1150 of Government Gazette 43855 (October 2020)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989)
	National Protected Areas Expansion Strategy (NPAES)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Biodiversity Framework (NBF, 2009)
	National Forest Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)

Region	Legislation / Guideline
	National Water Act (NWA) (Act No. 36 of 1998)
	National Spatial Biodiversity Assessment (NSBA)
	World Heritage Convention Act (Act No. 49 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations and, Alien and Invasive Species List 2014/2020, published under NEMBA
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
	White Paper on Biodiversity
Provincial	Northern Cape Biodiversity Sector Plan (2016)
	Northern Cape Planning and Development Act (Act No. 73 of 1998)
	Northern Cape Nature Conservation Act (Act. No. 9 of 2009)

2 Methods

2.1 Project Area

2.1.1 Climate

The climate of the project area is classified as a hot semi-arid climate (BSh) according to the Köppen–Geiger climate classification system (climate-data.org). Hot semi-arid climates (type "BSh") tend to be located in the 20s and 30s latitudes of the tropics and subtropics, typically in proximity to regions with a tropical savanna or a humid subtropical climate. These climates tend to have hot, sometimes extremely hot, summers and warm to cool winters, with some to minimal precipitation. Hot semi-arid climates are most commonly found around the fringes of subtropical deserts.

In Barkley-West (closest monitoring to Kimberley), the average annual temperature is 19.1 °C and precipitation here is about 420 mm per year. Precipitation is the lowest in July, with an average of 4 mm with the highest precipitation in January, with an average of 75 mm (Figure 2-1). January is the hottest month of the year with an average temperature of 25.5 °C and the lowest average temperature occurs in July at 10.7 °C (Figure 2-1).

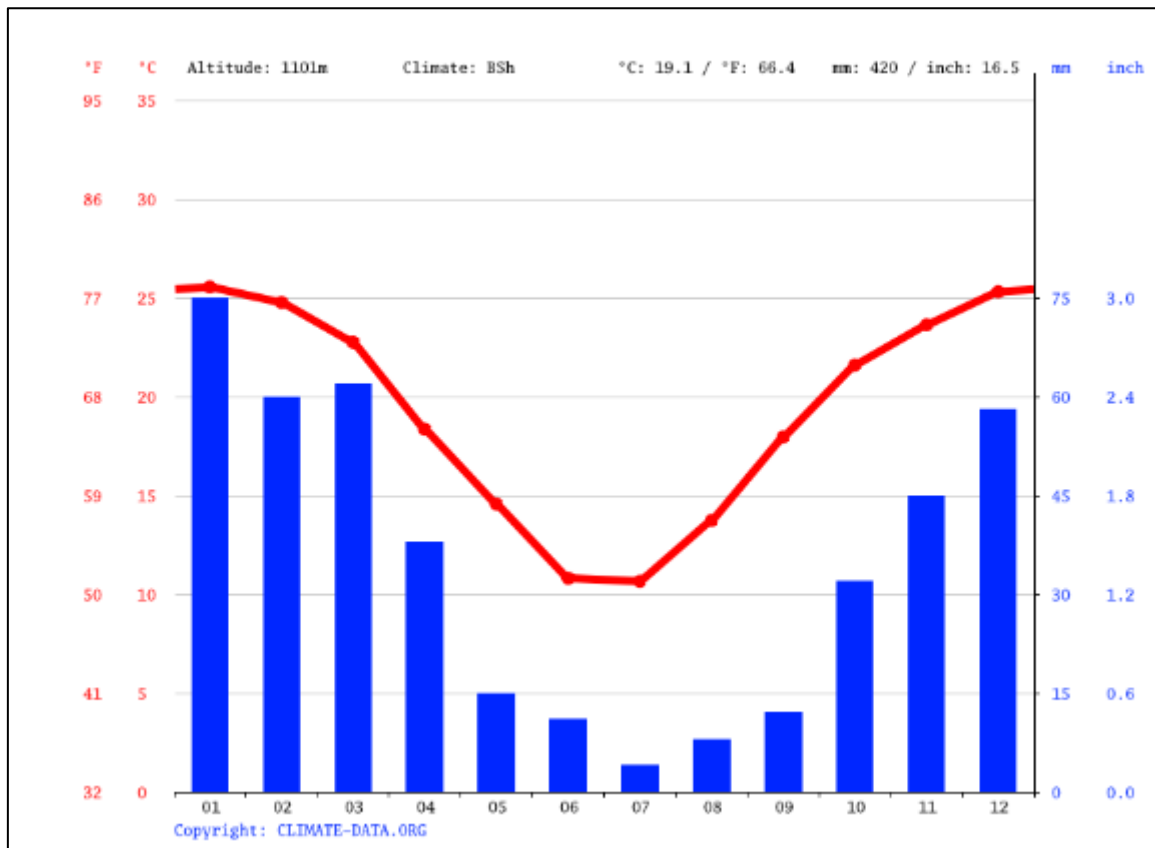


Figure 2-1 Column and line plot illustrating climatic characteristics of Barkley West (source: <https://en.climate-data.org/>)

2.1.2 Biome

The proposed Droogfontein Solar PV project is located within the savanna biome. The savanna vegetation of South Africa represents the southernmost extension of the most widespread biome in Africa (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the Savanna biome include:

- Seasonal precipitation; and
- A (Sub) tropical thermal regime with no or usually a low incidence of frost.

The savanna biome is the largest biome in South Africa, extending throughout the eastern and north-eastern areas of the country. Savannas are characterised by dominant grass layers, over-topped by a discontinuous, but distinct woody plant layer. At a structural level, Africa's savannas can be broadly categorised as either fine-leaved (microphyllous) savannas or broad-leaved savannas. Fine-leaved savannas typically occur on nutrient rich soils and are dominated by microphyllous woody plants of the Mimosaceae family (common genera include *Vachellia* and *Albizia*) and a generally dense herbaceous layer.

2.2 Desktop Assessment

The desktop assessment was principally undertaken using a Geographic Information System (GIS) to access the latest available spatial datasets to develop digital cartographs and species lists. These datasets and their date of publishing are provided below.

2.2.1 Ecologically Important Landscape Features

Existing ecologically relevant data layers were incorporated into a GIS to establish how the proposed development might interact with any ecologically important entities. Emphasis was placed around the following spatial datasets:

- Protected areas:
 - South Africa Protected Areas Database (SAPAD) (DFFE, 2021a) – The South African Protected Areas Database (SAPAD) contains spatial data for the conservation of South Africa. It includes spatial and attribute information for both formally protected areas and areas that have less formal protection. SAPAD is updated on a continuous basis and forms the basis for the Register of Protected Areas which is a legislative requirement under the National Environmental Management: Protected Areas Act, Act 57 of 2003.
 - National Protected Areas Expansion Strategy (NPAES) (DFFE, 2021b) – The National Protected Area Expansion Strategy (NPAES) provides spatial information on areas that are suitable for terrestrial ecosystem protection. These focus areas are large, intact and unfragmented and are therefore, of high importance for biodiversity, climate resilience and freshwater protection.
- Important Bird and Biodiversity Areas (BirdLife South Africa, 2022) – Important Bird and Biodiversity Areas (IBAs) constitute a global network of over 13 500 sites, of which 112 sites are found in South Africa. IBAs are sites of global significance for bird conservation, identified through multi-stakeholder processes using globally standardised, quantitative and scientifically agreed criteria;
- Coordinated Water Bird Counts (CWAC) – The Animal Demography Unit (ADU) launched the Coordinated Waterbird Counts (CWAC) project in 1992 as part South Africa's commitment to international waterbird conservation. The primary aim of CWAC is to act as an effective long-term waterbird monitoring tool. This is being done by means of a programme of regular mid-summer and mid-winter censuses at several wetlands. The database is located at <https://cwac.birdmap.africa/index.php>.
- Coordinated Avifaunal Roadcounts (CAR) – The Coordinated Avifaunal Roadcounts (CAR) were pioneered in July 1993 in a joint Cape Bird Club/ADU project to monitor the populations of two threatened species: *Anthropoides paradiseus* (Blue Crane) and *Neotis denhamii* (Denham's Bustard). Presently it monitors 36 species of large terrestrial birds along 350 fixed routes covering over 19 000 km using a standardised method.
- The Northern Cape Department of Environment and Nature Conservation has developed the Northern Cape CBA Map which identifies biodiversity priority areas for the province, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). These biodiversity priority areas, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape as a whole. The identification of Critical Biodiversity Areas for the Northern Cape was undertaken using a Systematic Conservation Planning approach. Available data on biodiversity features (incorporating both pattern and process, and covering terrestrial and inland aquatic realms), their condition, current Protected Areas and Conservation Areas, and opportunities and constraints for effective conservation were collated. The Northern Cape Critical Biodiversity Area (CBA) Map updates, revises and replaces all older systematic biodiversity plans and associated products for the province. These include the:
 - Namakwa District Biodiversity Sector Plan;

- Cape Fine-Scale Plan (only the extent of the areas in the Northern Cape i.e. Bokkeveld and Nieuwoudtville); and
- Richtersveld Municipality Biodiversity Assessment; and
- Hydrological Context
 - South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (Van Deventer *et al.*, 2018) – A South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was established during the National Biodiversity Assessment of 2018. It is a collection of data layers that represent the extent of river and inland wetland ecosystem types as well as pressures on these systems.
 - National Freshwater Ecosystem Priority Area (NFEPA) (Nel *et al.*, 2011) – The NFEPA database provides strategic spatial priorities for conserving the country's freshwater ecosystems and associated biodiversity as well as supporting sustainable use of water resources.

2.2.2 Desktop Avifauna Assessment

The avifaunal desktop assessment comprised of compiling an expected avifauna list, generated from the South African Bird Atlas Project 2 (SABAP2) dataset using the 2830_2435; 2830_2440; 2830_2445; 2835_2435; 2835_2440; 2835_2445; 2840_2435; 2840_2440 and 2840_2445 pentads.

Species of Conservation Concern were identified by either their regional (Taylor *et al.*, 2015) or global (IUCN) conservation status.

2.3 Field Survey

Two field surveys were undertaken during the 4th – 8th of July 2022 (Winter) (Survey 1) and in 5th -9th of September 2022 (Summer) (Survey 2) and these data are presented in the original avifauna report (TBC 2022). An additional site assessment was conducted from the 4th to the 6th of November 2022 (summer) to sample the new sites (C, D and E) in more detail (Survey 3). Sampling consisted of standardized point counts as well as random diurnal incidental surveys. Standardised point counts (Buckland *et al.*, 1993) were conducted to gather data on the species composition and relative abundance of species within the broad habitat types identified. The standardized point count technique was utilised as it was demonstrated to outperform line routes (Cumming & Henry, 2019). Each point count was run over a 10 min period. The horizontal detection limit was set at 150 m. At each point the observer would document the date, start time, and end time, habitat, numbers of each species, detection method (seen or heard), behaviour (perched or flying) and general notes on habitat and nesting suitability for conservation important species. To supplement the species inventory with cryptic and illusive species that may not be detected during the rigid point count protocol, diurnal and nocturnal incidental searches were conducted. This involved the opportunistic sampling of species between point count periods, random meandering and road cruising. Effort was made to cover all the different habitat types within the limits of time and access (Figure 2-2).

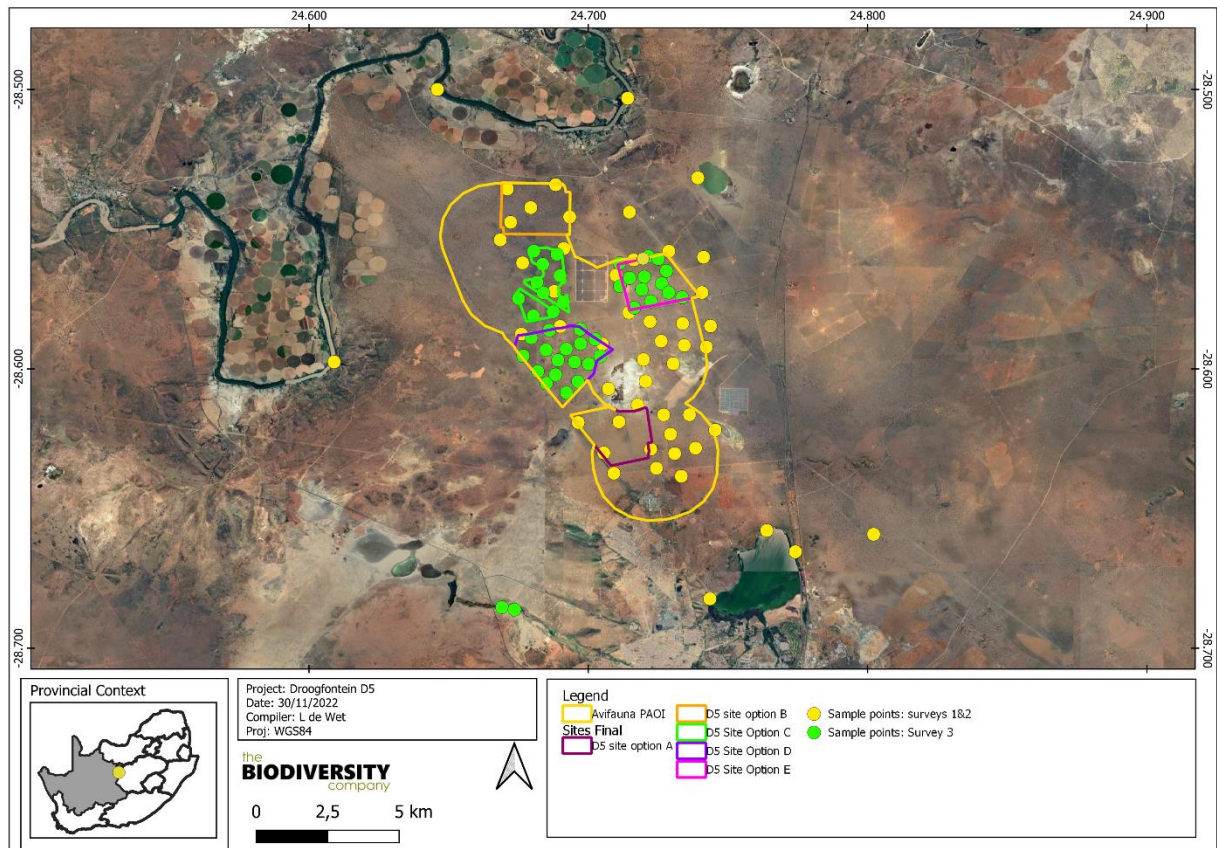


Figure 2-2 Map illustrating the field survey area and locations of standardised point counts for the proposed Solar PV PAOI

2.4 Data Analysis

The analyses described below only used the data collected from the standardised point counts. See Appendix A for the point count raw data for Survey 3.

Point count data was arranged into a matrix with point count samples in rows and species in columns. The table formed the basis of the various subsequent statistical analyses. This data was first used to distinguish similarities / differences in the species composition between the two identified avifaunal habitats, the matrix was converted into a Bray-Curtis dissimilarity matrix. The data was subject to fourth root transformation to downscale the contribution of very abundant species while upscaling the influence of less abundant species. However, the effect was negligible and ultimately the raw data proved more informative. Thirdly, raw count data was converted to relative abundance values and used to establish dominant species and calculate the diversity of each habitat. The Shannon Diversity Index (H') was the metric used to estimate diversity. Lastly, present, and potentially occurring species were assigned to 13 major trophic guilds loosely based on the classification system developed by González-Salazar *et al.* (2014). Species were first classified by their dominant diet (carnivore, herbivore, granivore, frugivore, nectarivore, omnivore), then by the medium upon / within which they most frequently forage (ground, water, foliage, air) and lastly by their activity period (nocturnal or diurnal).

2.5 Site Ecological Importance (SEI)

The different habitat types within the project area were delineated and identified based on observations during the field assessment, and available satellite imagery. These habitat types were assigned Ecological Importance (EI) categories based on their ecological integrity, conservation value, the presence of species of conservation concern and their ecosystem processes.

Site Ecological Importance (SEI) is a function of the Biodiversity Importance (BI) of the receptor (e.g., SCC, the vegetation/fauna community or habitat type present on the site) and Receptor Resilience (RR) (its resilience to impacts) as follows.

BI is a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor as follows. The criteria for the CI and FI ratings are provided in Table 2-1 and Table 2-2, respectively.

Table 2-1 Summary of Conservation Importance (CI) criteria

Conservation Importance	Fulfilling Criteria
Very High	Confirmed or highly likely occurrence of Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Extremely Rare or CR species that have a global extent of occurrence (EOO) of < 10 km ² . Any area of natural habitat of a CR ecosystem type or large area (> 0.1% of the total ecosystem type extent) of natural habitat of an EN ecosystem type. Globally significant populations of congregatory species (> 10% of global population).
High	Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km ² . IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. If listed as threatened only under Criterion A, include if there are less than 10 locations or < 10 000 mature individuals remaining. Small area (> 0.01% but < 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (> 0.1%) of natural habitat of VU ecosystem type. Presence of Rare species. Globally significant populations of congregatory species (> 1% but < 10% of global population).
Medium	Confirmed or highly likely occurrence of populations of Near Threatened (NT) species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. Any area of natural habitat of threatened ecosystem type with status of VU. Presence of range-restricted species. > 50% of receptor contains natural habitat with potential to support SCC.
Low	No confirmed or highly likely populations of SCC. No confirmed or highly likely populations of range-restricted species. < 50% of receptor contains natural habitat with limited potential to support SCC.
Very Low	No confirmed and highly unlikely populations of SCC. No confirmed and highly unlikely populations of range-restricted species. No natural habitat remaining.

Table 2-2 Summary of Functional Integrity (FI) criteria

Functional Integrity	Fulfilling Criteria
Very High	Very large (> 100 ha) intact area for any conservation status of ecosystem type or > 5 ha for CR ecosystem types. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches. No or minimal current negative ecological impacts, with no signs of major past disturbance.
High	Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types. Good habitat connectivity, with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts, with no signs of major past disturbance and good rehabilitation potential.
Medium	Medium (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types. Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. Mostly minor current negative ecological impacts, with some major impacts and a few signs of minor past disturbance. Moderate rehabilitation potential.
Low	Small (> 1 ha but < 5 ha) area. Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential. Several minor and major current negative ecological impacts.
Very Low	Very small (< 1 ha) area. No habitat connectivity except for flying species or flora with wind-dispersed seeds. Several major current negative ecological impacts.

BI can be derived from a simple matrix of CI and FI as provided in Table 2-3.

Table 2-3 *Matrix used to derive Biodiversity Importance (BI) from Functional Integrity (FI) and Conservation Importance (CI)*

Biodiversity Importance (BI)		Conservation Importance (CI)				
		Very high	High	Medium	Low	Very low
Functional Integrity (FI)	Very high	Very high	Very high	High	Medium	Low
	High	Very high	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very low
	Low	Medium	Medium	Low	Low	Very low
	Very low	Medium	Low	Very low	Very low	Very low

The fulfilling criteria to evaluate RR are based on the estimated recovery time required to restore an appreciable portion of functionality to the receptor, as summarised in Table 2-4.

Table 2-4 *Summary of Receptor Resilience (RR) criteria*

Resilience	Fulfilling Criteria
Very High	Habitat that can recover rapidly (~ less than 5 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) returning to a site once the disturbance or impact has been removed.
High	Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) returning to a site once the disturbance or impact has been removed.
Medium	Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) returning to a site once the disturbance or impact has been removed.
Low	Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of: (i) remaining at a site even when a disturbance or impact is occurring, or (ii) returning to a site once the disturbance or impact has been removed.
Very Low	Habitat that is unable to recover from major impacts, or species that are unlikely to: (i) remain at a site even when a disturbance or impact is occurring, or (ii) return to a site once the disturbance or impact has been removed.

Subsequent to the determination of the BI and RR, the SEI can be ascertained using the matrix as provided in Table 2-5.

Table 2-5 *Matrix used to derive Site Ecological Importance from Receptor Resilience (RR) and Biodiversity Importance (BI)*

Site Ecological Importance		Biodiversity Importance (BI)				
		Very high	High	Medium	Low	Very low
Receptor Resilience (RR)	Very Low	Very high	Very high	High	Medium	Low
	Low	Very high	Very high	High	Medium	Very low
	Medium	Very high	High	Medium	Low	Very low
	High	High	Medium	Low	Very low	Very low
	Very High	Medium	Low	Very low	Very low	Very low

Interpretation of the SEI in the context of the proposed project is provided in Table 2-6.

Table 2-6 *Guidelines for interpreting Site Ecological Importance in the context of the proposed development activities*

Site Ecological Importance	Interpretation in relation to proposed development activities
Very High	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e., last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted, limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very Low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

The SEI evaluated for each taxon can be combined into a single multi-taxon evaluation of SEI for the assessment area. Either a combination of the maximum SEI for each receptor should be applied, or the SEI may be evaluated only once per receptor but for all necessary taxa simultaneously. For the latter, justification of the SEI for each receptor is based on the criteria that conforms to the highest CI and FI, and the lowest RR across all taxa. For the purposes of this assessment, only avifauna were considered.

3 Results & Discussion

3.1 Desktop Assessment

3.1.1 Ecologically Important Landscape Features

The GIS analysis pertaining to the relevance of the proposed project to ecologically important landscape features is summarised in Table 3-1.

Table 3-1 *Summary of relevance of the proposed project to ecologically important landscape features*

Desktop Information Considered	Relevance	Section
Protected Areas	Irrelevant – The nearest protected area (Tarentaalrand Safari Lodge) is located 11 km from the project area.	-
National Protected Areas Expansion Strategy	Irrelevant – The project area is located over 6 km from the nearest NPAES Protected Areas.	-
Critical Biodiversity Area	Relevant – the PAOI overlaps with ONA features and borders a CBA1 and a CBA2 area	3.1.1.1
Important Bird and Biodiversity Area	Relevant – There are two IBAs near the PAOI, the Dronfield Nature Reserve IBA located approximately 2.7 km from the PAOI and Kamfers Dam IBA 1.5 km from the PAOI.	3.1.1.2
Coordinated Water Bird Counts	Relevant – Five CWAC sites can be found around the PAOI, Kamfer Dam, Du Toit Pan, Galeshewe Dam, Galeshewe Vlei and Nanwich Saltpan	3.1.1.3
Coordinated Avifaunal Roadcounts	Relevant – The closest CAR route is 37 km away from the PAOI.	3.1.1.4
South African Inventory of Inland Aquatic Ecosystems	Relevant – Wetland systems classified as LC can be found around D5. A CR river, the Vaal river, can be found north of the PAOI	3.1.1.5
National Freshwater Ecosystem Priority Areas	Relevant – the PAOI does overlap wetland systems within the NFEPA database.	3.1.1.5
Strategic Transmission Corridors	Relevant- The PAOI overlaps with the Central EGI corridor	3.1.1.6
Renewable Energy Zones	Relevant -The project area falls within the Kimberly Solar REDZ	3.1.1.7

3.1.1.1 Northern Cape Conservation Plan

The Northern Cape Department of Environment and Nature Conservation has developed the Northern Cape CBA Map which identifies biodiversity priority areas for the province, called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). These biodiversity priority areas, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape as a whole.

The identification of Critical Biodiversity Areas for the Northern Cape was undertaken using a Systematic Conservation Planning approach. Available data on biodiversity features (incorporating both pattern and process, and covering terrestrial and inland aquatic realms), their condition, current Protected Areas and Conservation Areas, and opportunities and constraints for effective conservation were collated.

Figure 3-1 indicates that the PAOI overlaps with ONA features and borders a CBA1 and a CBA2 area.

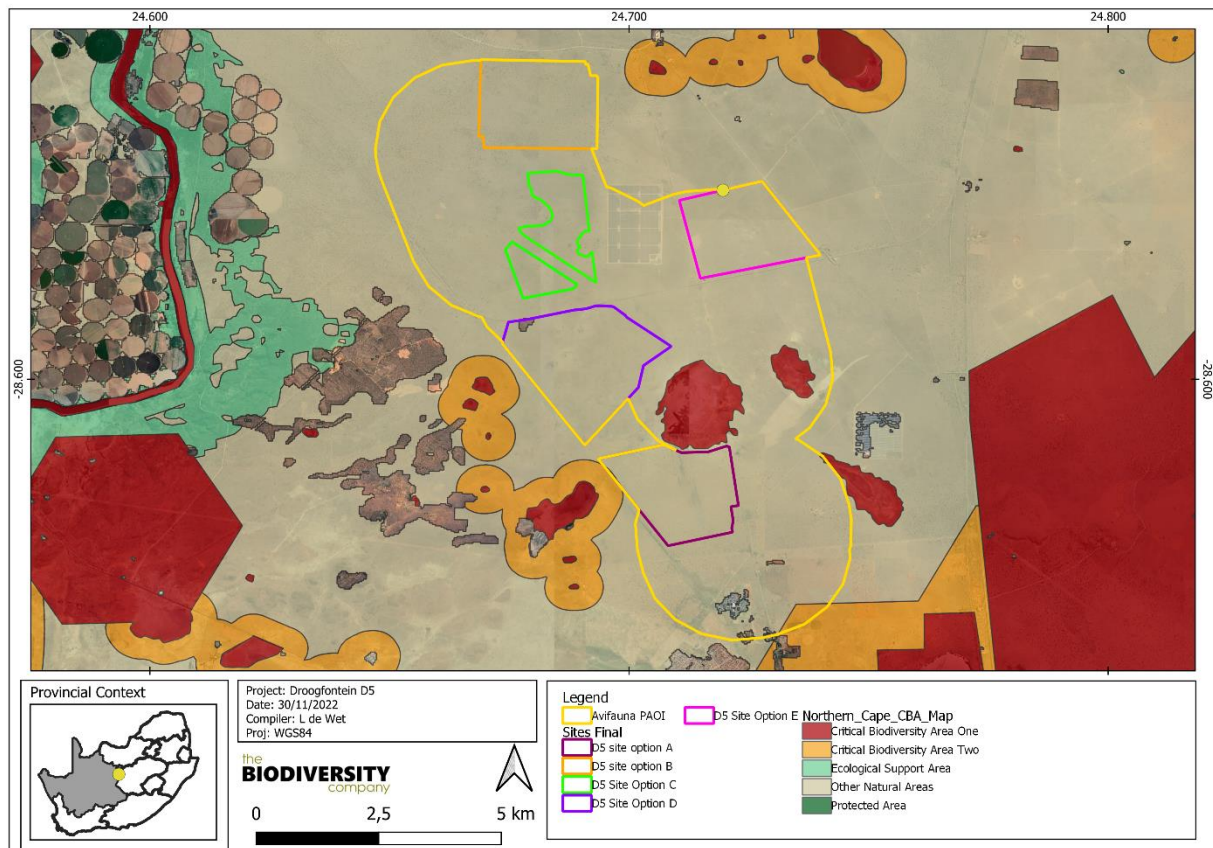


Figure 3-1 Map illustrating Free State Biodiversity Sector Plan features overlapping the proposed Droogfontein PV PAOI

3.1.1.2 Important Bird and Biodiversity Areas

Important Bird & Biodiversity Areas (IBAs) are the sites of international significance for the conservation of the world's birds and other conservation significant species as identified by BirdLife International. These sites are also all Key Biodiversity Areas; sites that contribute significantly to the global persistence of biodiversity.

The selection of IBAs is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations. The criteria ensure that the sites selected as IBAs have true significance for the international conservation of bird populations and provide a common currency that all IBAs adhere to, thus creating consistency among, and enabling comparability between, sites at national, continental and global levels.

Figure 3-2 illustrates that the proposed development does not overlap any IBAs. There are two IBAs near the PAOI, the Dronfield Nature Reserve IBA located approximately 2.7 km from the PAOI and Kamfers Dam IBA 1.5 km from the PAOI. These are described below:

- **Dronfield Nature Reserve** – The reserve is located within the Savanna Biome and is close to the western edge of the Grassland Biome. One vegetation type, Kimberley Thornveld, is present. Globally threatened species are White-backed Vulture (*Gyps africanus*), Lappet-faced Vulture (*Torgos tracheliotos*), Secretarybird (*Sagittarius serpentarius*), Kori Bustard (*Ardeotis kori*) and Lesser Flamingo (*Phoeniconaias minor*). Regionally threatened species comprises of Tawny Eagle (*Aquila rapax*). Dronfield supports large numbers of breeding White-backed Vultures (99 breeding pairs) and colony comprises 41% of the breeding pairs in the Kimberley region. The numbers of this species and its breeding success have largely remained stable over the past 20 years, but the past five years have shown a slight decline in breeding success.
- **Kamfers Dam** – This IBA is located 6 km north of Kimberley in the ecotone of the Kalahari Savanna, Grassland and Nama Karoo biomes. This IBA provides a reliable refuge for waterbirds in a semi-arid area where wetlands are scarce. Kamfers Dam regularly holds more than 20 000 birds. Globally threatened birds are Lesser Flamingo (10 000 to 80 000) and Chestnut-banded Plover (*Charadrius pallidus*). Regionally threatened birds are Greater Flamingo (*Phoenicopterus roseus*) and African Marsh Harrier (*Circus ranivorus*). The most abundant waterbirds in recent years are Lesser Flamingo, Greater Flamingo and Grey-headed Gull (*Chroicocephalus cirrocephalus*). The highest number of waterbirds counted was 84 919 individuals in 2006.

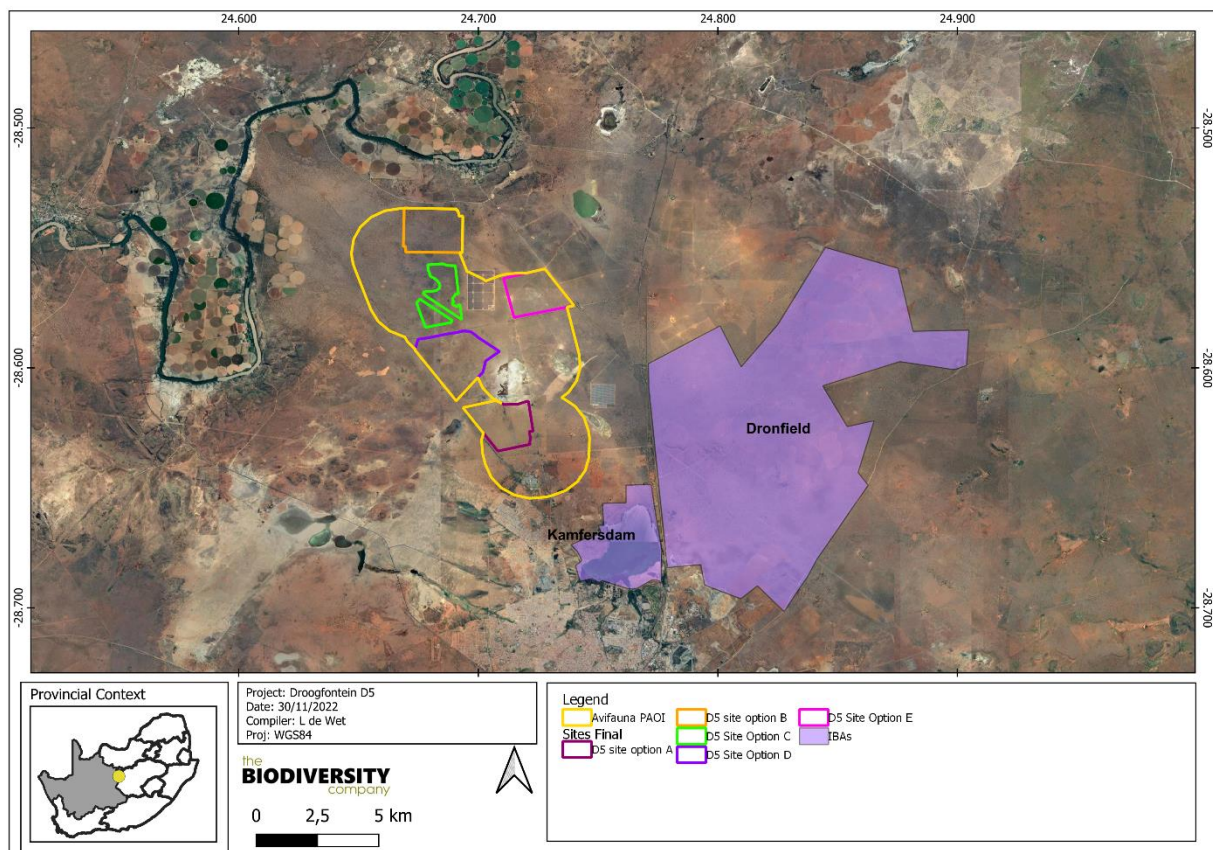


Figure 3-2 Map illustrating Important Bird and Biodiversity Areas in relation to the proposed Droogfontein PV PAOI

3.1.1.3 Coordinated Water Bird Counts (CWAC)

Five CWAC sites can be found around the PAOI, Kamfer Dam, Du Toit Pan, Galeshewe Dam, Galeshewe Vlei and Nanwich Saltpan (Figure 3-3). Collectively 80 water bird species have been found at the various CWAC sites. Table 3-2 list the various species recorded at the individual CWAC sites and their abundance.

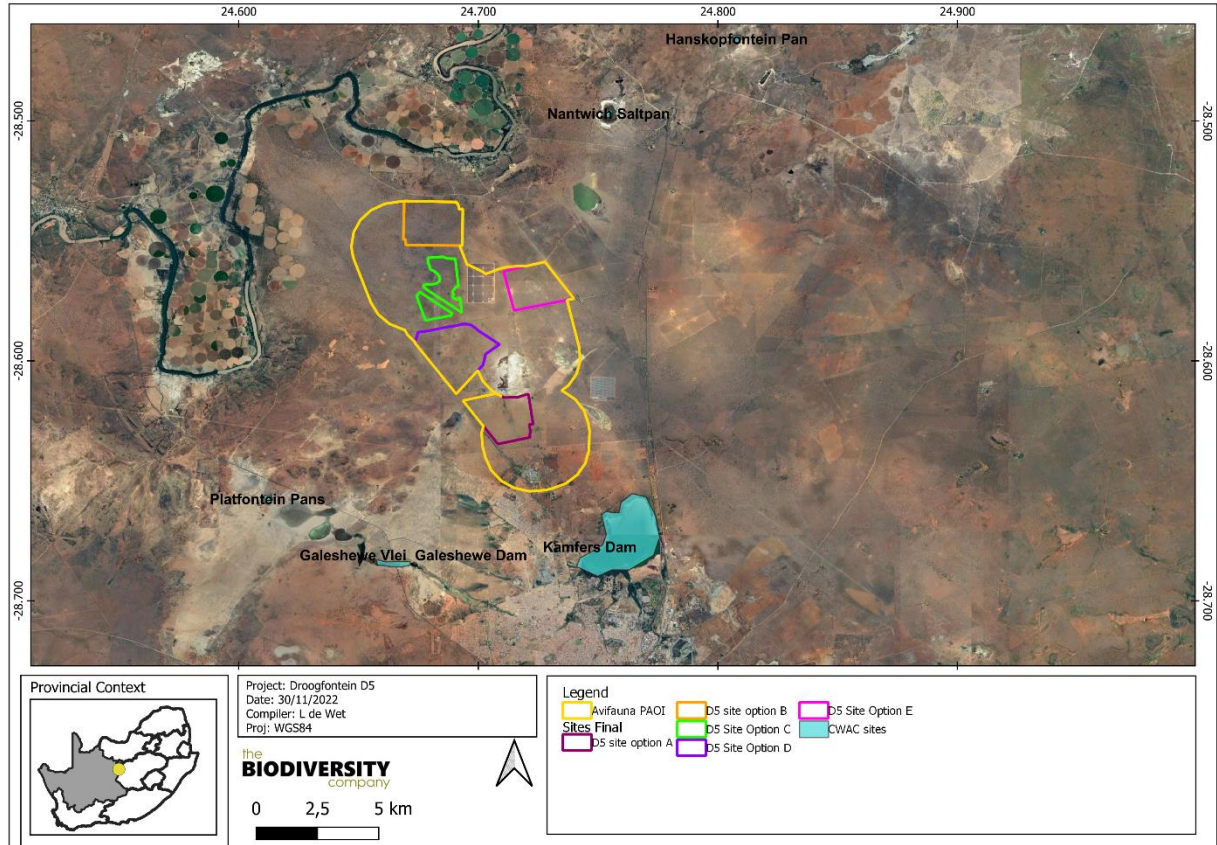


Figure 3-3 Map illustrating Coordinated Water Bird Counts (CWAC) locations in relation to the proposed Droogfontein PV PAOI

Table 3-2 The species recorded at the CWAC sites and their abundance.

Common Name	Scientific Name	Kamfer Dam	Du Toit Pan	Galeshewe Dam	Galeshewe Vlei	Nanwich Saltpan
Goose, Egyptian	<i>Alopochen aegyptiaca</i>	11.38	4.00	2.00	3.00	1.67
Teal, Cape	<i>Anas capensis</i>	125.18	9.60	31.33	33.00	4.10
Teal, Red-billed	<i>Anas erythrorhynchos</i>	31.05	16.33	13.33	2.00	27.50
Duck, Domestic	<i>Anas platyrhynchos</i>	1.00				
Duck, African Black	<i>Anas sparsa</i>		1.00			
Duck, Yellow-billed	<i>Anas undulata</i>	27.00	17.89	3.33	7.67	6.50
Darter, African	<i>Anhinga rufa</i>	1.00	4.29			
Goose, Domestic	<i>Anser</i>	1.00	1.00			
Egret, Great	<i>Ardea alba</i>					3.00
Heron, Grey	<i>Ardea cinerea</i>	2.18		1.50		9.00
Heron, Goliath	<i>Ardea goliath</i>	2.20	1.67			
Heron, Black-headed	<i>Ardea melanocephala</i>	1.79	2.00	1.00		2.00

Heron, Purple	<i>Ardea purpurea</i>	1.50	1.00			1.00
Heron, Squacco	<i>Ardeola ralloides</i>	3.50				
Owl, Marsh	<i>Asio capensis</i>	2.00				
Ibis, Hadada	<i>Bostrychia hagedash</i>	6.00			2.00	
Egret, Western Cattle	<i>Bubulcus ibis</i>	169.15	10.25	26.00	3.50	12.50
Heron, Striated	<i>Butorides striata</i>	1.00				
Knot, Red	<i>Calidris canutus</i>					1.00
Sandpiper, Curlew	<i>Calidris ferruginea</i>	36.08	21.00	25.00		2.00
Stint, Little	<i>Calidris minuta</i>	196.24	31.75	64.00	33.00	17.62
	<i>Calidris pugnax</i>	181.63	270.60	7.00	355.00	10.00
Kingfisher, Pied	<i>Ceryle rudis</i>	1.00				
Plover, Common Ringed	<i>Charadrius hiaticula</i>	7.71				4.00
Plover, Chestnut-banded	<i>Charadrius pallidus</i>	8.00				7.35
Plover, Kittlitz's	<i>Charadrius pecuarius</i>	11.38	11.00			21.80
Plover, Three-banded	<i>Charadrius tricollaris</i>	12.00	3.50	2.00	6.33	3.70
Tern, Whiskered	<i>Chlidonias hybrida</i>	18.00				
Tern, White-winged	<i>Chlidonias leucopterus</i>	230.87	137.00	30.00		12.00
Gull, Grey-headed	<i>Chroicocephalus cirrocephalus</i>	348.04	5.25	55.00		
Stork, White	<i>Ciconia</i>			1.00		
Harrier, African Marsh	<i>Circus ranivorus</i>	1.33				1.00
Kingfisher, Malachite	<i>Corythornis cristatus</i>	2.00				1.00
Swan, Mute	<i>Cygnus olor</i>					2.00
Duck, Fulvous Whistling	<i>Dendrocygna bicolor</i>	8.00				
Duck, White-faced Whistling	<i>Dendrocygna viduata</i>	40.76		41.33	20.00	4.00
Heron, Black	<i>Egretta ardesiaca</i>					1.00
Egret, Little	<i>Egretta garzetta</i>	2.00				54.00
Coot, Red-knobbed	<i>Fulica cristata</i>	231.79	64.13	20.33		5.00
Snipe, African	<i>Gallinago nigripennis</i>	4.00			5.50	
Moorhen, Common	<i>Gallinula chloropus</i>	79.93	7.10		1.50	
Pratincole, Black-winged	<i>Glareola nordmanni</i>					3.00
Eagle, African Fish	<i>Haliaeetus vocifer</i>	1.33	1.33			
Stilt, Black-winged	<i>Himantopus</i>	144.15	13.75	14.67	18.00	22.25
Bittern, Little	<i>Ixobrychus minutus</i>		1.00			
Gull, Lesser Black-backed	<i>Larus fuscus</i>	1.00				
Cormorant, Reed	<i>Microcarbo africanus</i>	4.00	6.29			3.00
Wagtail, Cape	<i>Motacilla capensis</i>	17.00	2.33	2.00	4.00	3.36
Stork, Yellow-billed	<i>Mycteria ibis</i>	4.00				4.00
Pochard, Southern	<i>Netta erythrophthalma</i>	60.26	4.50	15.00		19.50

Heron, Black-crowned Night	<i>Nycticorax</i>	1.00		1.00		
Duck, Maccoa	<i>Oxyura maccoa</i>	40.47				
Pelican, Great White	<i>Pelecanus onocrotalus</i>	1.00				
Cormorant, White-breasted	<i>Phalacrocorax lucidus</i>	1.50	4.50			
Flamingo, Lesser	<i>Phoeniconaias minor</i>	10954.19	289.00	24.50	80.00	1.00
Flamingo, Greater	<i>Phoenicopterus roseus</i>	2022.40		121.67	62.00	
Spoonbill, African	<i>Platalea alba</i>	4.50				
Goose, Spur-winged	<i>Plectropterus gambensis</i>	11.00	2.00	3.00	2.67	1.50
Ibis, Glossy	<i>Plegadis falcinellus</i>	33.84			5.00	52.50
Plover, Grey	<i>Pluvialis squatarola</i>	2.00				
Grebe, Great Crested	<i>Podiceps cristatus</i>	3.00				
Grebe, Black-necked	<i>Podiceps nigricollis</i>	403.18		14.00		1.50
Swamphen, African	<i>Porphyrio madagascariensis</i>	2.85				
Rail, African	<i>Rallus caerulescens</i>	1.33				
Avocet, Pied	<i>Recurvirostra avosetta</i>	45.29	2.25		5.00	16.33
Martin, Brown-throated	<i>Riparia paludicola</i>	1.00	1.00			
Painted-snipe, Greater	<i>Rostratula benghalensis</i>					6.00
Duck, Knob-billed	<i>Sarkidiornis melanotos</i>		3.00			
	<i>Scopus umbretta</i>	1.00				
Teal, Blue-billed	<i>Spatula hottentota</i>	20.95	15.00	1.00	2.00	
Shoveler, Cape	<i>Spatula smithii</i>	40.35	6.20	13.33	8.00	11.00
Grebe, Little	<i>Tachybaptus ruficollis</i>	68.21	15.50	17.00		1.00
Shelduck, South African	<i>Tadorna cana</i>	32.57	3.38	4.00	4.00	2.75
Duck, White-backed	<i>Thalassornis leuconotus</i>	1.50				
Ibis, African Sacred	<i>Threskiornis aethiopicus</i>	13.25		1.00	1.00	4.00
Sandpiper, Wood	<i>Tringa glareola</i>	13.08	1.67		1.50	14.00
Greenshank, Common	<i>Tringa nebularia</i>	6.36		1.00		20.33
Sandpiper, Marsh	<i>Tringa stagnatilis</i>	31.08	19.20			5.50
Lapwing, Blacksmith	<i>Vanellus armatus</i>	46.83	6.43	7.67	5.33	6.50
Crake, Black	<i>Zapornia flavirostra</i>	1.50				

3.1.1.4 Coordinated Avifaunal Roadcounts (CAR)

Figure 3-4 illustrates the location of CAR routes in relation to the PAOI. The closest CAR route is 37 km away from the PAOI. No recent information is available for these routes.

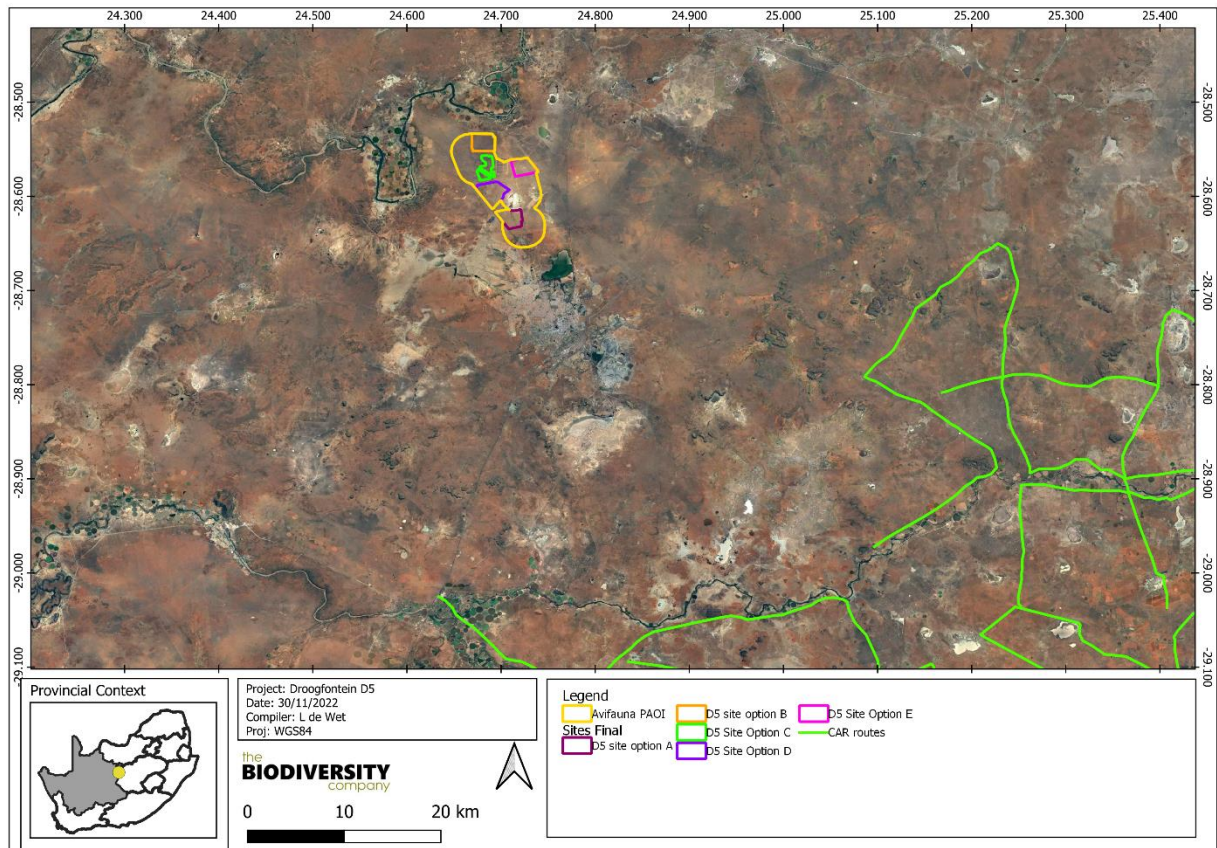


Figure 3-4 Map illustrating Coordinated Avifaunal Roadcounts (CAR) routes in relation to the proposed Droogfontein PV PAOI

3.1.1.5 Hydrological Context

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was released with the National Biodiversity Assessment (NBA) 2018. Ecosystem threat status (ETS) of ecosystem types is based on the extent to which each river ecosystem type had been altered from its natural condition. Ecosystem types are categorised as CR, EN, VU or LT. Critically Endangered, EN and VU ecosystem types collectively referred to as ‘threatened’ (Van Deventer *et al.*, 2019; Skowno *et al.*, 2019). Wetland systems classified as LC can be found around D5A (Figure 3-5). A CR river, the Vaal River, can be found north of the PAOI according to the SAIIAE database and potentially supports aquatic avifauna and waders during the wet season.

In an attempt to better conserve aquatic ecosystems, South Africa has categorised its river systems according to set ecological criteria (i.e., ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs) (Driver *et al.*, 2011). The FEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act’s (NEM:BA) biodiversity goals (Nel *et al.*, 2011).

Figure 3-5 illustrates that the PAOI does overlap wetland systems within the NFEPA database.

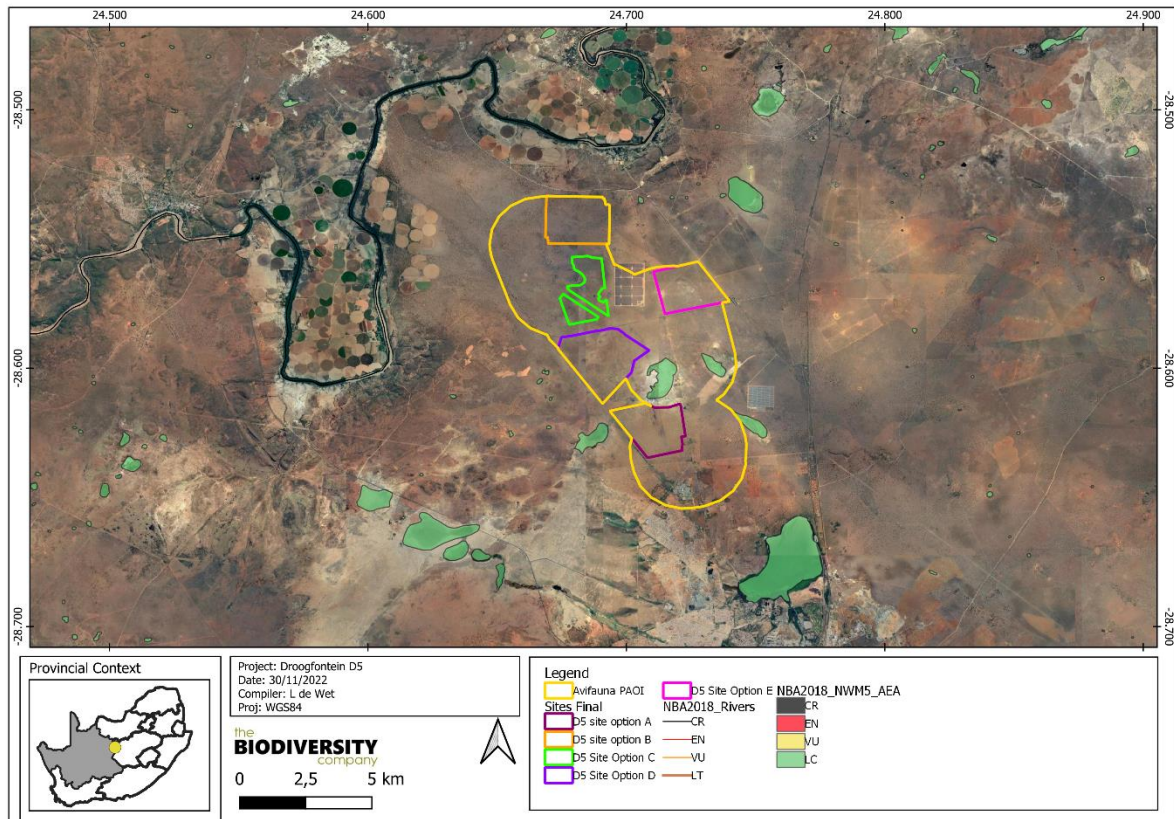


Figure 3-5 Map illustrating hydrological context (SAIIAE) of the proposed Doornfontein PV PAOI

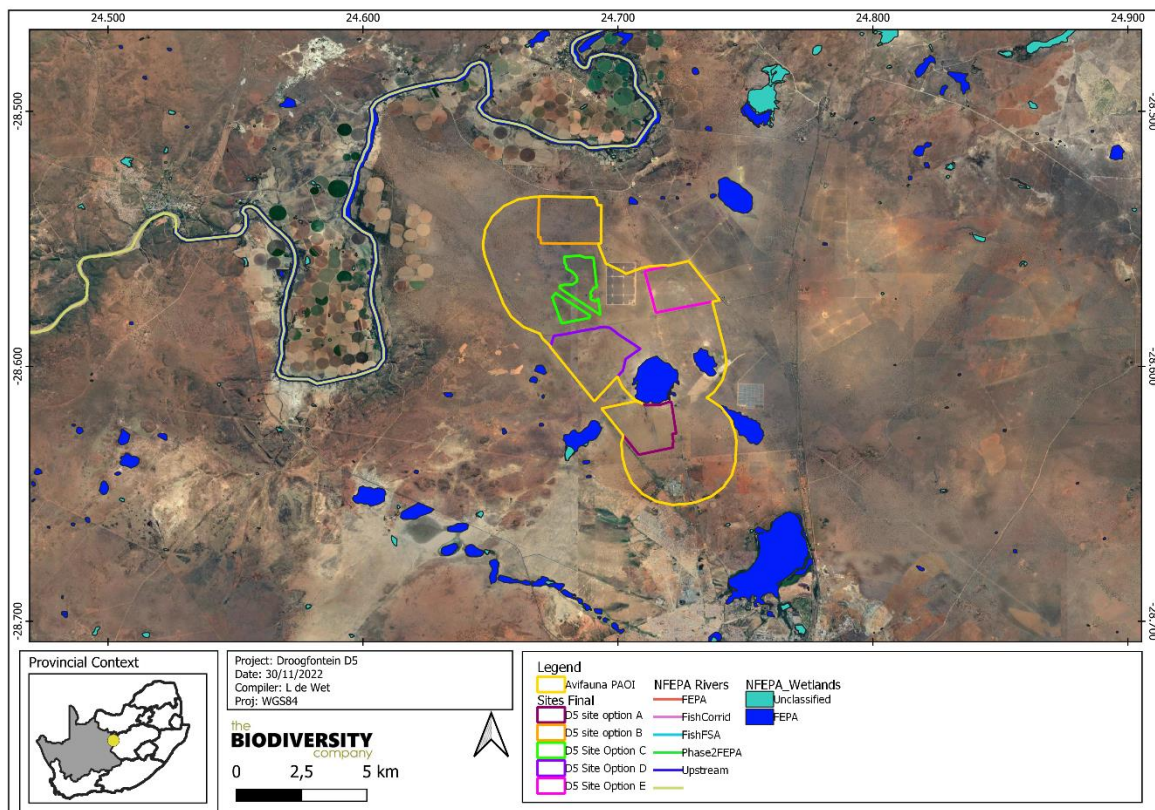


Figure 3-6 Map illustrating hydrological context (NFEPA) of the proposed Doornfontein PV PAOI

3.1.1.6 Strategic Transmission Corridors (EGI)

On the 16 February 2018 minister Edna Molewa published Government Notice No. 113 in Government Gazette No. 41445 which identified 5 strategic transmission corridors important for the planning of electricity transmission and distribution infrastructure as well as procedure to be followed when applying for environmental authorisation for electricity transmission and distribution expansion when occurring in these corridors.

On 29 April 2021, Minister Barbara Dallas Creecy published Government Notice No. 383 in Government Gazette No. 44504, which expanded the eastern and western transmission corridors and gave notice of the applicability of the application procedures identified in Government Notice No. 113, to these expanded corridors. More information on this can be obtained from <https://egis.environment.gov.za/egi>.

Figure 3-7 shows the PAOI overlaps with the Central EGI corridor.

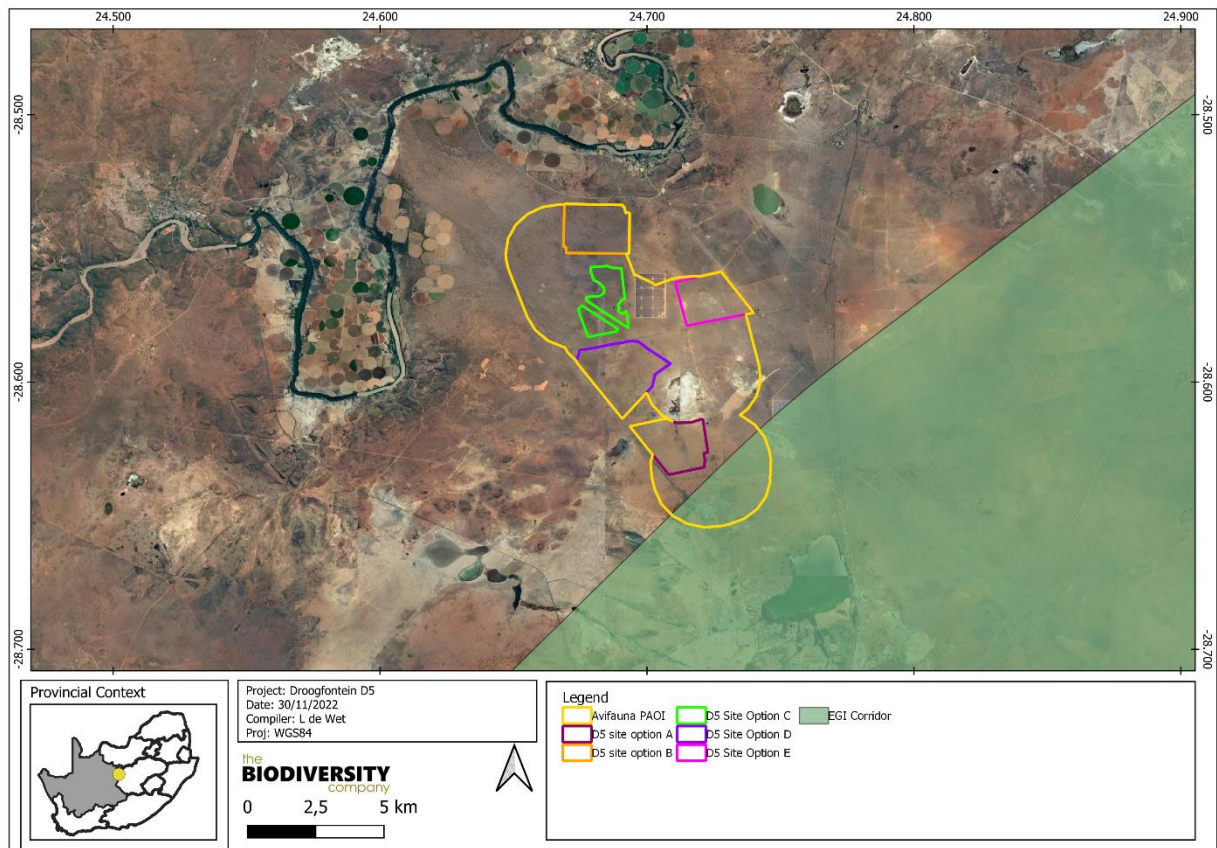


Figure 3-7 The project area in relation to the strategic transmission corridors

3.1.1.7 Renewable Energy Development Zones (REDZ)

In 2018 the Government Notice No. 114 in Government Gazette No. 41445 was published where 8 renewable energy development zones important for the development of large-scale wind and solar photovoltaic facilities were identified. In 2021 an additional 3 sites were included. The REDZs were identified through the undertaking of 2 Strategic Environmental Assessments.

More detailed information can be obtained from <https://egis.environment.gov.za/redz>. Information here includes the Government Notice No. 142, 144 and 145 in Government Gazette No. 44191 that specifies the procedures to be followed when applying for environmental authorisation for electricity transmission or distribution infrastructure or large-scale wind and solar photovoltaic energy facilities in these REDZs.

The project area falls within the Kimberly Solar REDZ (Figure 3-8).

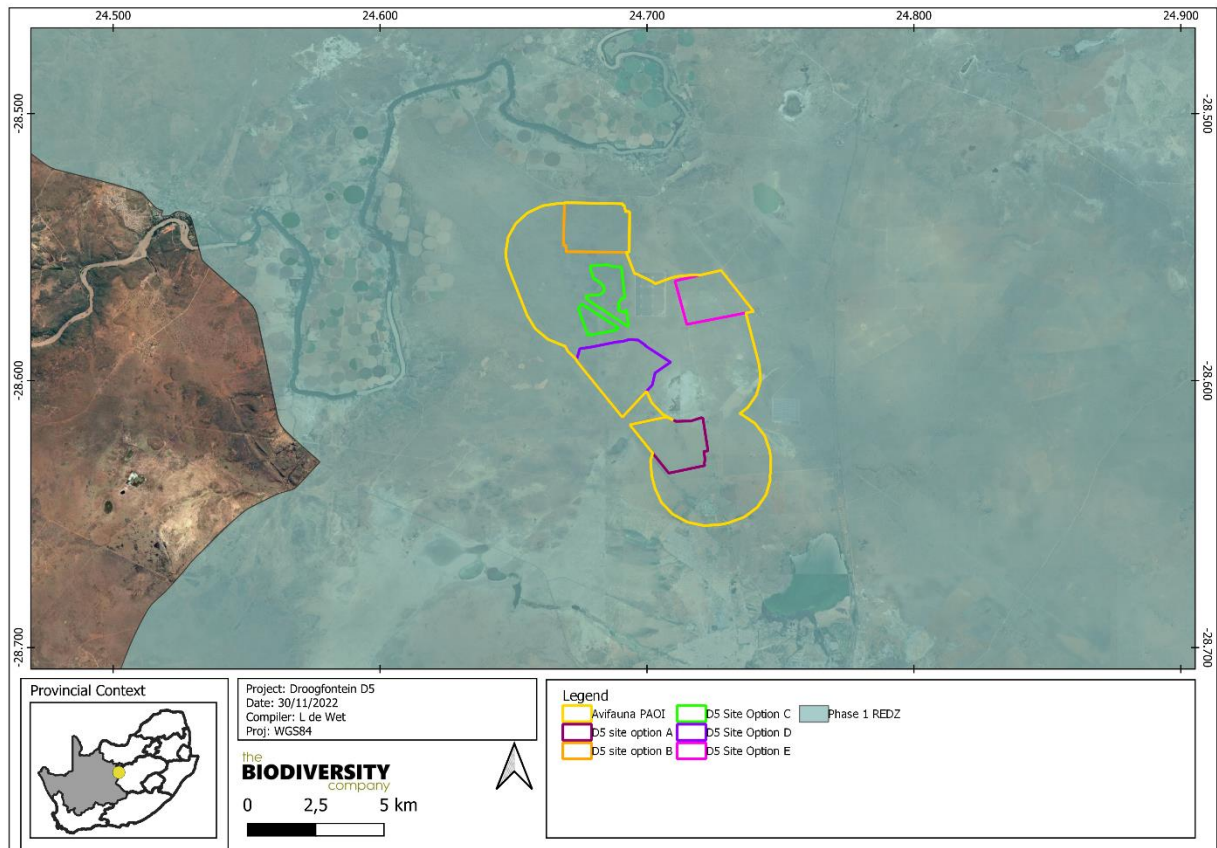


Figure 3-8 The project area in relation to the Renewable Energy Development Zone dataset

3.1.2 Expected Species of Conservation Concern

The SABAP2 Data lists 300 indigenous avifauna species that could be expected to occur within the PAOI and surrounding landscape (Appendix B). Twenty-one (21) of these expected species are regarded as SCC (Table 3-3).

Table 3-3 Threatened avifauna species that are expected to occur within the project area CR = Critically Endangered, EN = Endangered, LC = Least Concern, NT = Near Threatened and VU = Vulnerable

Species	Common Name	SANBI	IUCN	Likelihood of Occurrence
<i>Aquila rapax</i>	Tawny Eagle	EN	VU	High
<i>Ardeotis kori</i>	Kori Bustard	NT	NT	High
<i>Balearica regulorum</i>	Grey Crowned Crane	EN	EN	Moderate
<i>Calidris ferruginea</i>	Curlew Sandpiper	LC	NT	High
<i>Charadrius pallidus</i>	Chestnut-banded Plover	NT	NT	Moderate
<i>Ciconia abdimii</i>	Stork, Abdim's	NT	LC	Moderate
<i>Ciconia nigra</i>	Black Stork	VU	LC	High
<i>Circus ranivorus</i>	African Marsh Harrier	EN	LC	High
<i>Coracias garrulus</i>	European Roller	NT	LC	High
<i>Cursorius rufus</i>	Burchell's Courser	VU	LC	Moderate
<i>Falco biarmicus</i>	Lanner Falcon	VU	LC	High

<i>Gyps africanus</i>	White-backed Vulture	CR	CR	Confirmed
<i>Gyps coprotheres</i>	Cape Vulture	EN	EN	High
<i>Mycteria ibis</i>	Yellow-billed Stork	EN	LC	High
<i>Neotis ludwigii</i>	Ludwig's Bustard	EN	EN	High
<i>Oxyura maccoa</i>	Maccoa Duck	NT	VU	High
<i>Phoeniconaias minor</i>	Lesser Flamingo	NT	NT	Moderate
<i>Phoenicopterus roseus</i>	Greater Flamingo	NT	LC	Confirmed
<i>Polemaetus bellicosus</i>	Martial Eagle	EN	EN	Confirmed
<i>Rostratula benghalensis</i>	Greater Painted-snipe	NT	LC	High
<i>Sagittarius serpentarius</i>	Secretarybird	VU	EN	High
<i>Torgos tracheliotos</i>	Lappet-faced Vulture	EN	EN	Moderate

Aquila rapax (Tawny Eagle) is listed as VU on a global scale (BirdLife International, 2021a) and EN on a regional scale (Taylor *et al.* 2015). This is a widespread raptor occurring over large areas of Sub-Saharan Africa, with isolated populations in North Africa, the Middle East and South Asia, albeit the African population is now becoming increasingly dependent on protected areas (BirdLife International, 2021a). The species occupies dry open from sea level to 3000 m and will occupy both woodland and wooded savannah. *Aquila rapax rapax* predaes on mammals, birds, reptiles, insects, and occasionally fish and amphibians. It will also regularly consume carrion and pirate other raptors' prey. The African population is estimated at 73 860 pairs with a severely declining population at a rate of decline as > 60% over the past 50 years within South Africa, Lesotho and eSwatini. The main threats are secondary poisoning, direct persecution and collisions with powerlines (BirdLife International, 2021a). Based on the available habitat in the project area this species were given a high likelihood of occurrence.

Ardeotis kori (Kori Bustard) is listed as NT on a regional and global scale (BirdLife International, 2016a). This species has a large but disjunct range in sub-Saharan Africa, occurring from Ethiopia and Somalia south to Tanzania, and from southern Angola and Zimbabwe south to South Africa. The species occupies flat, arid, mostly open country such as grassland, karoo, bushveld, thornveld, scrubland and savanna but also including modified habitats such as wheat fields and firebreaks. The diet includes a wide range of plants and animals including insects, reptiles, small rodents, birds, carrion, seeds, berries and roots. It is largely sedentary but does undertake local movements. The global population size has not been quantified, but the population in South Africa has been estimated at 2 000-5 000 birds individuals (BirdLife International, 2016c). A major threat is collision with overhead powerlines but the causes of population declines and range losses in many parts of the distribution are unknown. These have been hypothesised to include persecution, rangeland degradation and bush encroachment. The habitat is very suitable for the species therefore the likelihood of occurrence is high.

Grus regulorum (Grey Crowned Cranes) are EN both regionally and internationally. They are known to make local and season movements, but are not migratory in the true senses. In southern Africa they tend to breed in the wet season (October to March) where they breed on the edges of wetlands (IUCN, 2022a). Their habitat ranges from wetlands such as marshes, pans and dams with tall emergent vegetation (Hockey *et al.* 2005), riverbanks (Meine and Archibald 1996), open riverine woodland, shallowly flooded plains (Urban *et al.* 1986) and temporary pools (del Hoyo *et al.* 1996) with adjacent grasslands to open savannas and croplands (del Hoyo *et al.* 1996) (del Hoyo *et al.* 1996, Meine and Archibald 1996). The species nest in solitary pairs, which might indicate the two found were breeding as it corresponds to the right time of year. Grey Crowned-cranes are territorial in the breeding season, using an average home range of 23.3 km² (2,330 ha) in South Africa (Tarboton, 1992). Outside the breeding season they are found in groups of 20-200 individuals. They forage in short to medium height open grasslands adjacent to wetlands, where they feed on seed heads (e.g., of sedges *Cyperus* spp.), new tips of grasses (del Hoyo *et al.* 1996), agricultural pulses, nuts and grain (Meine and Archibald 1996), insects (Orthoptera,

larval Lepidoptera), frogs, lizards and crabs Potamon spp. (del Hoyo *et al.* 1996). They will roost in trees including the plantation pine and Eucalyptus trees. The wetland areas provide suitable breeding area however the vegetation adjacent to the wetlands are not ideal foraging area therefore the species were given a moderate likelihood of occurrence.

Calidris ferruginea (Curlew Sandpiper) is migratory species which breeds on slightly elevated areas in the lowlands of the high Arctic, and may be seen in parts of South Africa during winter. During winter, the species occurs at the coast, but also inland on the muddy edges of marshes, large rivers and lakes (both saline and freshwater), irrigated land, flooded areas, dams and salt pans (IUCN, 2017). The wetlands, especially the large wetland in the western side of the project area provide suitable habitat for this species.

Ciconia abdimii (Abdim's Stork) is listed as NT on a local and international scale and the species is known to be found in open grassland and savanna woodland often near water but also in semi-arid areas, gathering beside pools and water-holes (IUCN, 2017). Non-breeding visitor to southern Africa, departing from its northern breeding grounds in the period from May-August, eventually arriving in southern Africa at the onset of the rainy season in the period from October-December. It is nomadic in southern Africa, moving in response to food availability. It gathers in large flocks then departs in February, March and early April. It mainly eats large insects, doing most of its foraging on pastures, irrigated land and recently ploughed fields, usually in groups which split up to cover more ground. The habitat might create suitable feeding habitat, however the lack of suitable water sources on site.

Charadrius pallidus (Chestnut-banded Plover) is listed as NT on a regional and a global scale. The species is found in salt lakes and estuaries, they do migrate inland when the coastal waters dry up. It mainly feeds on insects and small crustaceans. They are monogamous, terrestrial solitary nesters on the shoreline on a nest consisting of quartz chips, clay shards, grass, fish bones and small gastropods shells. Even though this species is mostly coastal it does occur inland and based on the number of large wetlands on site and the known occurrence in the area based on SABAP2 data, the species were given a moderate likelihood of occurrence.

Ciconia nigra (Black Stork) is native to South Africa, and inhabits old, undisturbed, open forests. They are known to forage in shallow streams, pools, marshes swampy patches, damp meadows, flood-plains, pools in dry riverbeds and occasionally grasslands, especially where there are stands of reeds or long grass (IUCN, 2017). It is unlikely that this species would breed in the project area due to the lack of forested areas, however some suitable foraging habitat remains in the form of the open grasslands and wetland areas, and as such the likelihood of occurrence is rated as moderate.

Circus ranivorus (African Marsh Harrier) is listed as EN in South Africa (ESKOM, 2014). This species has an extremely large distributional range in sub-equatorial Africa. South African populations of this species are declining due to the degradation of wetland habitats, loss of habitat through over-grazing and human disturbance and possibly, poisoning owing to over-use of pesticides (IUCN, 2017). This species breeds in wetlands and forages primarily over reeds and lake margins. There are some extensive wetlands and marsh areas at the project area therefore the likelihood of occurrence is considered to be high.

Coracias garrulous (European Roller) is a summer migrant with the population from South-central Europe and Asia occurring throughout sub-Saharan Africa. The European Roller has a preference for bushy plains and dry savannah areas. It is globally listed as LC (BirdLife International, 2019a) but NT on a regional scale (Taylor *et al.*, 2015). Threats include persecution on migration in some Mediterranean countries and numerous individuals are killed for food in Oman and India. The loss of suitable breeding habitat due to changing agricultural practices, conversion to monoculture, loss of nest sites, and use of pesticides (reducing food availability) are the main threats to the species in Europe (BirdLife International, 2019a). It is sensitive to loss of hedgerows and riparian forest in Europe which provide essential habitats for perching and nesting. The habitat is very suitable for the species therefore the likelihood of occurrence is high.

Cursorius rufus (Burchell's Courser) is categorised as VU on a regional scale. It inhabits open short-sward grasslands, dry savannas, fallow fields, overgrazed or burnt grasslands and pastures, bare or sparsely vegetated sandy or gravelly deserts, stony areas dotted with small shrubs and salt pans (IUCN, 2017). The

species is threatened in the south of its range by habitat degradation as a result of poor grazing practices and agricultural intensification. The likelihood of occurrence in the project area is rated as moderate.

Falco biarmicus (Lanner Falcon) is native to South Africa and inhabits a wide variety of habitats, from lowland deserts to forested mountains (IUCN, 2017). They may occur in groups up to 20 individuals, but have also been observed solitary. Their diet is mainly composed of small birds such as pigeons and francolins. The likelihood of incidental records of this species in the project area is rated as high due to the natural veld condition and the presence of many bird species on which Lanner Falcons may predate.

Gyps africanus (White-backed Vulture) is listed as CR on a global scale (BirdLife International, 2021c). This species is the most widespread vulture in Africa and occurs from Senegal, Gambia and Mali in the west, throughout the Sahel region to Ethiopia and Somalia in the east, through East Africa into Mozambique, Zimbabwe, Botswana, Namibia and South Africa in the south. *Gyps africanus* is primarily a lowland species of open wooded savanna, particularly areas of thornveld. It requires tall trees for nesting but has also been recorded nesting on electricity pylons in South Africa. It is a gregarious species congregating at carcasses, in thermals and at roost sites and nests in loose colonies. The species' global population was estimated at 270 000 individuals in 1992, but it is likely considerably lower than this due to rapid population declines in recent years. The median estimate of the rate of decline, 4.1% annually (2.5-5.4%), is equivalent to a three-generation reduction of 81% (63-89%) (BirdLife International, 2021c). The species faces similar threats to other African vultures, being susceptible to habitat conversion to agro-pastoral systems, loss of wild ungulates leading to a reduced availability of carrion, hunting for trade, persecution and poisoning. In southern Africa, vultures are caught and consumed for perceived medicinal and psychological benefits, and the decline and possible extirpation in Nigeria has been attributed to the trade in vulture parts for traditional juju practices. One individual of this species were observed on site, a large number of this species were also recorded at the nearby Vulture restaurant.

Gyps coprotheres (Cape Vulture) is listed as EN on both a regional and global scale. Cape Vultures are long-lived carrion-feeders specialising on large carcasses, they fly long distances over open country, although they are usually found near steep terrain, where they breed and roost on cliffs (IUCN, 2017). They are resident and partially nomadic; adults may travel up to about 750 km from their colony in the non-breeding season. Barnes (2000) estimated that the population declined by 10% between 1994-1995, which when expanded over 3 generation lengths (41.7 years [Bird *et al.* 2020]) equates to a decline rate of 58.4%. McKean and Botha (2007) also suggested that between 1992-2007, the populations in eastern South Africa declined by 60-70%, equivalent to a rate of 92-96% over 3 generation lengths, if the trend continued for that period. However, there is now evidence to suggest that the colonies have been increasing post 2007. The species has a high likelihood of occurrence in the project area based on the occurrence of the White-backed Vulture in the project area.

Mycteria ibis (Yellow-billed Stork) is listed as EN on a regional scale and LC on a global scale. This species is migratory and has a large distributional range which includes much of sub-Saharan Africa. It is typically associated with freshwater ecosystems, especially wetlands and the margins of lakes and dams (IUCN, 2017). The presence of extensive water bodies within the project area creates a high possibility that this species may occur there.

Neotis ludwigii (Ludwig's Bustard) is listed as EN on a global scale (BirdLife International, 2018a). The species has a large range centred on the dry biomes of the Karoo and Namib in southern Africa, being found in the extreme south-west of Angola, western Namibia and South Africa. This species inhabits open lowland and upland plains with grass and light thornbush, sandy open shrub-veld and semi-desert in the arid and semi-arid Namib and Karoo biomes. Ludwig's Bustard is nomadic and a partial migrant, moving to the western winter-rainfall part of its range in winter. The diet includes invertebrates, small vertebrates and vegetable matter. The global population is estimated to be 100 000 – 499 999 individuals. The primary threat to the species is collisions with overhead power lines, with potentially thousands of individuals involved in such collisions each. Collision rates on high voltage transmission lines in the Karoo may exceed one Ludwig's Bustard per kilometre per year. Bustards have limited frontal vision so may not see power lines, even if they are marked. The habitat is very suitable for the species therefore the likelihood of occurrence is high.

Oxyura maccoa (Maccoa Duck) has a large range, divided into a northern population occurring in Eritrea, Ethiopia, Kenya and Tanzania, and a southern population found in Angola, Botswana, Namibia, South Africa and Zimbabwe. During the breeding season it inhabits small temporary and permanent inland freshwater lakes, preferring those that are shallow and nutrient-rich with extensive emergent vegetation such as reeds and sedges on which it relies for nesting, although it can breed in anthropogenic systems such as farm dams and sewerage treatment plants (BirdLife International, 2021 d). It exhibits a preference for habitats with a bottom of mud or silt and minimal amounts of floating vegetation, since this provides the best foraging conditions. Outside the breeding season it will wander over larger, deeper lakes and brackish lagoons. Currently the links between population trends and threats facing this species are poorly understood. Pollution is a primary concern, since the species feeds mainly on benthic invertebrates, and is therefore more vulnerable to bio-accumulation of pollutants than other duck species (BirdLife International, 2021d). Hunting and poaching, competition with alien benthic fish and habitat alteration by invasive plants are further threats. The water bodies on site creates the potential for this species occurring on site.

Phoeniconaias minor (Lesser Flamingo) is widely distributed throughout sub-Saharan Africa but mainly breeds in the Rift Valley Lakes in East Africa, with smaller breeding congregations in West Africa and southern Africa. This species is nomadic and makes extensive movements in response to environmental conditions and southern African populations are partially migratory, with many making regular movements from their breeding sites inland to coastal wetlands when not breeding (BirdLife International, 2018a). The species is an obligate filter feeder and feeds during the night and early morning when the surface of the water is calm, primarily by swimming and filtering the algae near the surface. The global population has been estimated at between 2 220 000-3 240 000 individuals, with a declining population trend. The main threat is breeding habitat loss due to mining and hydro-electric power (BirdLife International, 2018a). Further threats include effluents mining, pollution from sewage and heavy metal effluents from industries and collisions with powerlines. The Kamfer dam is one of the areas with the greatest congregations of flamingos in South Africa, the water sources on site is not ideal for flamingos but might be used as a stop over point, therefore this species was given a moderate likelihood of occurrence.

Phoenicopterus roseus (Greater Flamingo) is widely distributed throughout sub-Saharan Africa and inhabits shallow eutrophic waterbodies such as saline lagoons, salt pans and large saline or alkaline lakes (BirdLife International, 2019). Juveniles, and to a lesser extent adults undertake irregular nomadic or partially migratory movements throughout the species' range in response to water-level changes. In sub-Saharan Africa, the species may also join large flocks of non-breeding *Phoeniconaias minor* (Lesser Flamingo). The sub-Saharan African populations between 100 000 and 120 000 mature individuals. The species suffers from low reproductive success if exposed to disturbance at breeding colonies, or if water-levels surrounding nest-sites lower resulting in increased predation from ground predators. Further threats include effluents mining, pollution from sewage and heavy metal effluents from industries and collisions with powerlines (BirdLife International, 2019). Two of these species were recorded at the Kamfers Dam, it is likely that this species would move across the project area.

Polemaetus bellicosus (Martial Eagle) is listed as EN on a regional scale and EN on a global scale. This species has an extensive range across much of sub-Saharan Africa, but populations are declining due to deliberate and incidental poisoning, habitat loss, reduction in available prey, pollution and collisions with power lines (IUCN, 2017). It inhabits open woodland, wooded savanna, bushy grassland, thorn-bush and, in southern Africa, more open country and even sub-desert (IUCN, 2017). This species was recorded in the second survey.

Rostratula benghalensis (Greater Painted-snipe) shows a preference for recently flooded areas in shallow lowland freshwater temporary or permanent wetland, it has a wide range of these freshwater habitats which they occur in, in this case, sewage pools, reservoirs, mudflats overgrown with marsh grass which exist within the project area, thus the likelihood of occurrence is high.

Sagittarius serpentarius (Secretarybird) is listed as EN on a global scale (BirdLife International, 2020). The species has a wide distribution across sub-Saharan Africa but surveyed densities suggest that the

total population size does not exceed a five-figure number. Ad-hoc records, localised surveys and anecdotal observations indicate apparent declines in many parts of the species' range, especially in South Africa where reporting rates decreased by at least 60% of quarter degree grid cells used in Southern African Bird Atlas Projects. Threats include excessive burning of grasslands that may suppress populations of prey species, whilst the intensive grazing of livestock is also probably degrading otherwise suitable habitat. Disturbance by humans is likely to negatively affect breeding. The species is captured and traded; however, it is unknown how many deaths occur in captivity and transit. Direct hunting and nest-raiding for other uses and indiscriminate poisoning at waterholes are also further threats. A proposed conservation action is that landowners of suitable properties should join biodiversity stewardship initiatives and to manage their properties in a sustainable way for the species' populations. The habitat is very suitable for the species therefore the likelihood of occurrence is high.

Torgos tracheliotus (Lappet-faced Vulture) is listed as EN, both on a regional and global level. Only a small, very rapidly declining population remains, owing primarily to poisoning and persecution, as well as ecosystem alterations (IUCN, 2017). The species inhabits dry savanna, arid plains, deserts and open mountain. It ranges widely when foraging and is mainly a scavenger, feeding predominantly on any large carcasses or their remains. The habitat is suitable, however even at the Vulture restaurant this species was not recorded, therefore it was given a moderate likelihood of occurrence.

4 Field Assessment

4.1 Third Field Survey

4.1.1 Species List of Third Field Survey

During the third assessment performed in the summer (4th – 6th of November 2022) 54 species were recorded during the point counts (Appendix B) and 61 during the incidental counts (Appendix C). Some species were observed both as incidental records and during the point counts. The total number of individual species accounts for approximately 31% of the total number of expected species (Table 4-1). Avifauna communities within arid and semi-arid regions exhibit temporal movements in response to shifts in resource availability resulting in changes in species numbers.

Four of the expected SCC as mentioned in section 3.1.2 of this report was recorded within the PAOI during the survey period either within point counts or an incidental sightings i.e., *Calidris ferruginea* (Curlew Sandpiper), *Gyps africanus* (White-backed Vulture), *Sagittarius serpentarius* (Secretarybird), and *Phoeniconaias minor* (Lesser Flamingo) (Figure 4-1). One Secretarybird was recorded perching on site, with one White-backed Vulture recorded circling overhead. Fifty-five Curlew Sandpipers and Eighty Greater Flamingos were observed at a wetland to the south of the site, the proximity of this wetland increases the risk of collisions of this species on site. Table 4-1 lists the species recorded, Figure 4-1 shows photographs of some of the species while Figure 4-2 shows the location of the observed species.

Table 4-1 Summary of the avifauna species of conservation concern recorded within the proposed Droogfontein PV PAOI during the field survey.

Scientific Name	Common Name	Regional Status	International Status
<i>Calidris ferruginea</i>	Curlew Sandpiper	LC	NT
<i>Gyps africanus</i>	White-backed Vulture	CR	CR
<i>Sagittarius serpentarius</i>	Secretarybird	VU	EN
<i>Phoeniconaias minor</i>	Lesser Flamingo	NT	NT



Figure 4-1 *Photograph illustrating a portion of the avifauna recorded within the proposed Droogfontein PV PAOI during the field survey: Pheniconaias minor (Lesser Flamingo).*

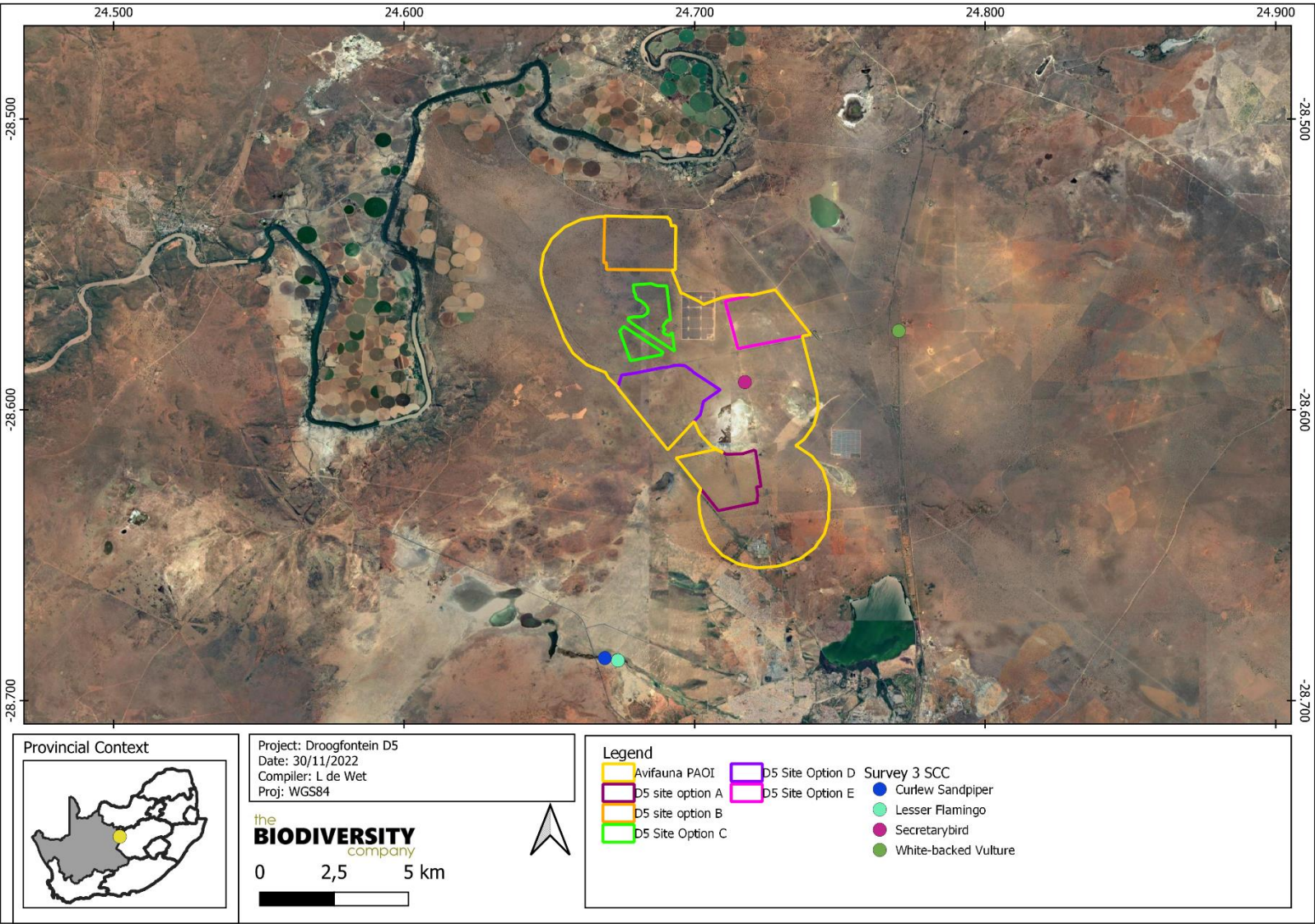


Figure 4-2 Location of the SCC during the first assessment

4.1.2 Priority Species

'Priority Species' are those avifauna that are particularly susceptible to energy developments, and although these priority species were developed for Wind Energy developments (Ralston Paton *et al*, 2017), the type of impact is congruent with SEFs, i.e., collision, electrocution, and habitat loss. Even though the panels may not pose an extensive collision risk for larger avifauna species, powerlines associated with the infrastructure, guidelines (anchor lines) and connection lines do pose a risk. The fence could also pose a collision risk for various species. Twenty-four of the species observed within the PAOI are regarded as priority species (Table 4-2). The location of some of these species within the PAOI are provided in Figure 4-4, while photographs of some of the species are shown in Figure 4-3.

Table 4-2 Summary of Priority Species recorded within and around the proposed Droogfontein Solar PV

Scientific Name	Common Name	Collisions	Electrocutions	Habitats Loss
<i>Afrotis afraoides</i>	Northern Black Korhaan	x		x
<i>Alopochen aegyptiaca</i>	Egyptian Goose	x	x	
<i>Anas capensis</i>	Cape Teal	x		
<i>Anas undulata</i>	Yellow-billed Duck	x		
<i>Bostrychia hagedash</i>	Hadedda Ibis		x	
<i>Bubulcus ibis</i>	Western Cattle Egret	x		
<i>Dendrocygna bicolor</i>	Fulvous Whistling Duck	x		
<i>Falco rupicoloides</i>	Greater Kestrel	x		
<i>Phoeniconaias minor</i>	Lesser Flamingo	x		
<i>Falco naumanni</i>	Lesser Kestrel	x		
<i>Anas erythrorhyncha</i>	Red-billed Teal	x		
<i>Fulica cristata</i>	Red-knobbed Coot	x		
<i>Netta erythrophthalma</i>	Southern Pochard	x		
<i>Dendrocygna viduata</i>	White-faced Whistling Duck	x		
<i>Ardea cinerea</i>	Grey Heron	x	x	
<i>Ardea melanocephala</i>	Black-headed Heron	x	x	
<i>Platalea alba</i>	African Spoonbill	x		
<i>Sagittarius serpentarius</i>	Secretarybird	x		
<i>Corvus albus</i>	Pied Crow		x	
<i>Gyps africanus</i>	White-backed Vulture	x	x	x
<i>Lophotis ruficrista</i>	Red-crested Korhaan	x		x
<i>Numida meleagris</i>	Helmeted Guinea fowl		x	
<i>Plegadis falcinellus</i>	Glossy Ibis	x	x	
<i>Tadorna cana</i>	South African Shelduck	x		



Figure 4-3 Some of the risk species identified; A) African Spoonbill (*Platalea alba*), B) Glossy Ibis (*Plegadis falcinellus*).

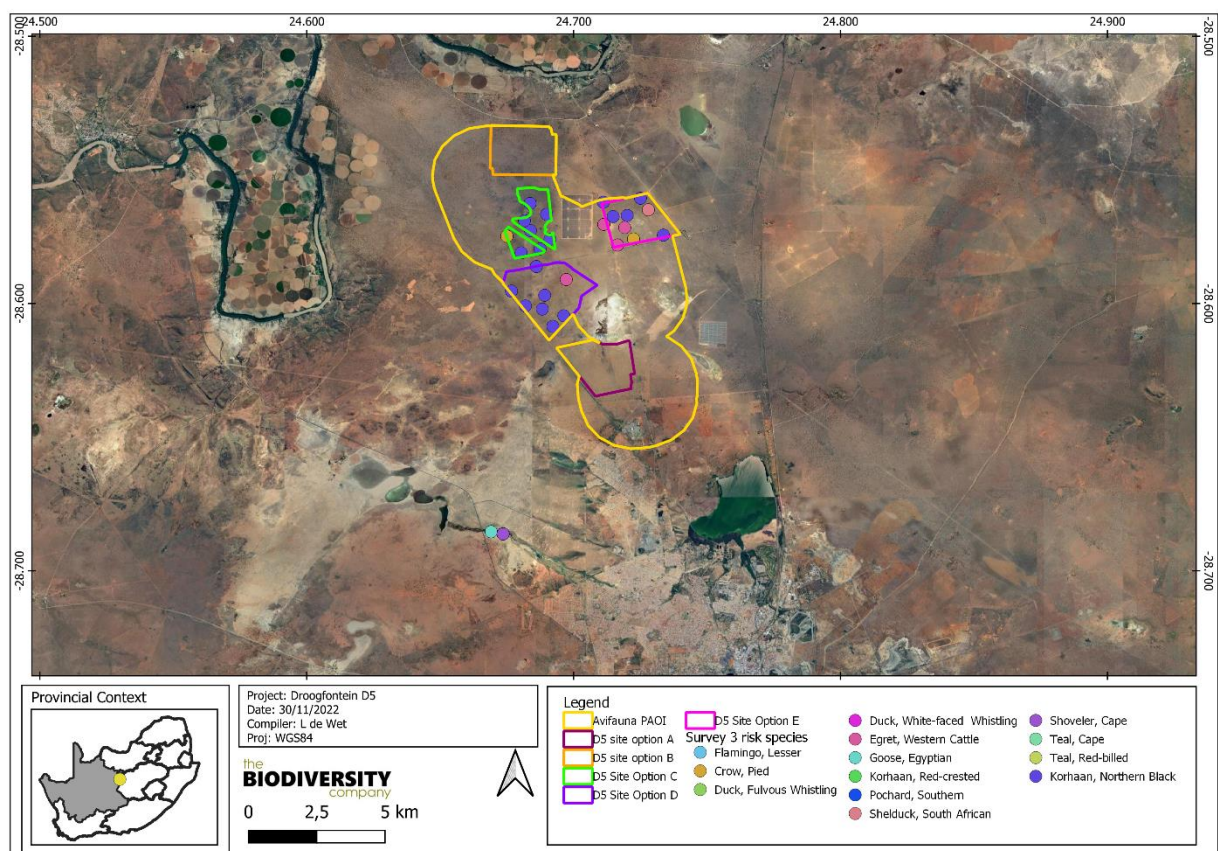


Figure 4-4 Map illustrating the location of some of the priority avifauna species within the proposed Droogfontein PV PAOI

4.1.3 Dominant Species

Table 4-3 provides the relative abundance of the dominant species as well as the frequency with which each species appeared in the point count samples. Twenty of the recorded species accounted for more than 83% of the total number of individuals recorded (Only data from standardized point counts was considered). The most abundant species was the Barn Swallow (*Hirundo rustica*) with a relative abundance of 0.106 and a frequency of occurrence of 39.02%. Additional ubiquitous species comprised of Desert Cisticoolala (*Cisticola aridulus*) and Lesser Flamingo (*Phoeniconaias minor*), with a frequency of occurrence of 92.68% and 2.45%, respectively.

Table 4-3 *Relative abundance and frequency of occurrence of dominant avifauna species recorded within the Droogfontein Solar PV PAOI during the field survey. Dominant species cumulatively account for more than 83% of the overall abundance. Only data from the standardized point counts were considered.*

Scientific Name	Common name	Regional Status (SANBI 2016)	Global Status (IUCN 2017)	Relative abundance	Frequency (%)
<i>Hirundo rustica</i>	Barn Swallow			0,106	39,024
<i>Cisticola aridulus</i>	Desert Cisticola			0,094	92,683
<i>Phoeniconaias minor</i>	Lesser Flamingo	NT	NT	0,092	2,439
<i>Dendrocygna viduata</i>	White-faced Whistling Duck			0,075	4,878
<i>Calidris ferruginea</i>	Curlew Sandpiper	LC	NT	0,063	2,439
<i>Himantopus himantopus</i>	Black-winged Stilt			0,051	2,439
<i>Mirafra fasciolata</i>	Eastern Clapper Lark			0,040	39,024
<i>Afrotis afraoides</i>	Northern Black Korhaan			0,039	56,098
<i>Recurvirostra avosetta</i>	Pied Avocet			0,039	2,439
<i>Falco naumanni</i>	Lesser Kestrel			0,038	9,756
<i>Gallinula chloropus</i>	Common Moorhen			0,038	2,439
<i>Fulica cristata</i>	Red-knobbed Coot			0,031	2,439
<i>Anas erythrorhyncha</i>	Red-billed Teal			0,024	2,439
<i>Tadorna cana</i>	South African Shelduck			0,024	4,878
<i>Alopochen aegyptiaca</i>	Egyptian Goose			0,023	4,878
<i>Anas capensis</i>	Cape Teal			0,020	2,439
<i>Bubulcus ibis</i>	Western Cattle Egret			0,020	9,756
<i>Chersomanes albofasciata</i>	Spike-heeled Lark			0,018	19,512
<i>Dendrocygna bicolor</i>	Fulvous Whistling Duck			0,017	2,439
<i>Vanellus armatus</i>	Blacksmith Lapwing			0,016	2,439



Figure 4-5 Some of the species recorded in the project area; A) White-faced Whistling Duck (*Dendrocygna viduata*), B) Northern Black Korhaan (*Afrotis afraoides*), C) Burchell's Sandgrouse (*Pterocles burchellii*), D) Three-banded Plover (*Charadrius tricollaris*), E) Black-winged Stilt (*Himantopus himantopus*), F) Fulvous Whistling Duck (*Dendrocygna bicolor*).

4.1.4 Trophic Guilds

Trophic guilds are defined as a group of species that exploit the same class of environmental resources in a similar way (González-Salazar *et al*, 2014). The guild classification used in this assessment is as per González-Salazar *et al* (2014); they divided avifauna into 13 major groups based on their diet, habitat, and main area of activity. Although species tend to exhibit varied diet with insectivores consuming fruit and frugivores consuming insects for example, the dominant composition of the diet was considered.

The analysis of the major avifaunal guilds reveals that the species composition during the survey was dominated by insectivorous birds that feed on the ground during the day (IGD). Followed by Granivores (GGD) and Omnivores (OMD) tied with Insectivores (IWD) (Figure 4-6). The species composition is spread throughout the various groups.

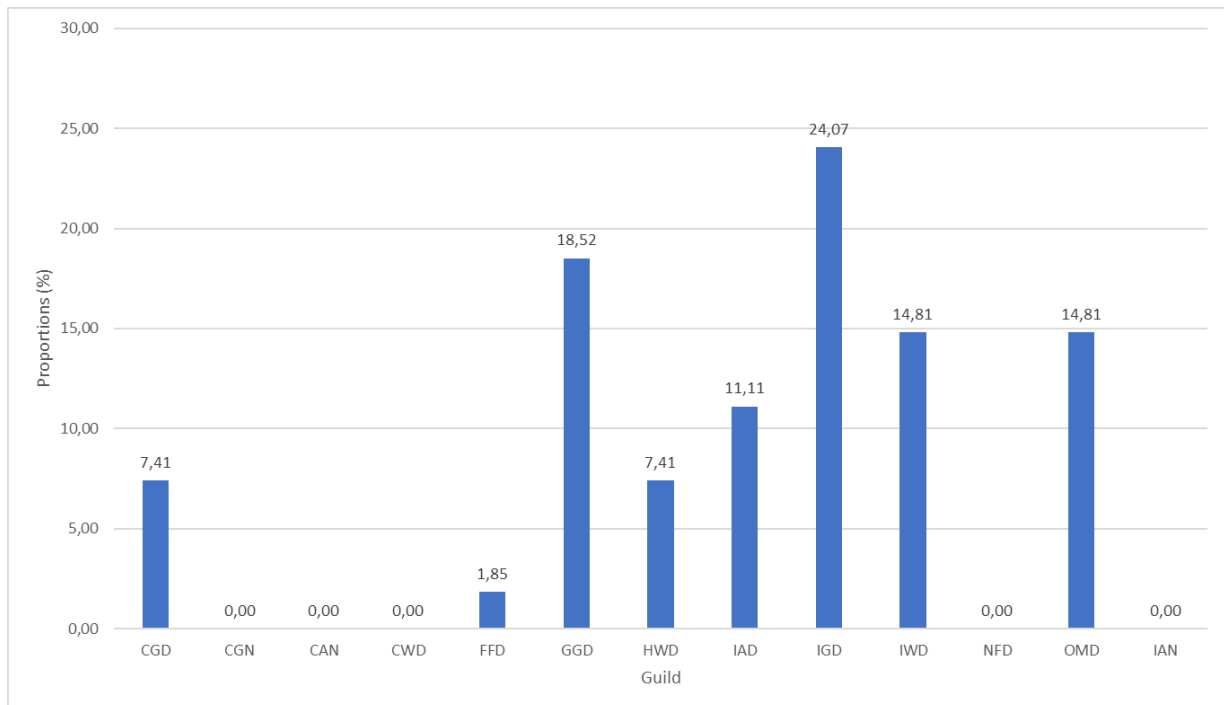


Figure 4-6 Column plot illustrating the proportion of each Functional Feeding Guild to the total abundance (Avifaunal trophic guilds. CGD, carnivore ground diurnal; CGN, carnivore ground nocturnal; CAN, carnivore air nocturnal; CWD, carnivore water diurnal; FFD, frugivore foliage diurnal; GGD, granivore ground diurnal; HWD, herbivore water diurnal; IAD, insectivore air diurnal; IGD, insectivore ground diurnal; IWD, insectivore water diurnal; NFD, nectivore foliage diurnal; OMD, omnivore multiple diurnal; IAN, Insectivore air nocturnal).

4.1.5 Flight and Nest Analysis

Observing and monitoring flight paths and nesting sites of SCC and/or priority species are important in ascertaining habitat sensitivity and evaluating the impact risk significance of any proposed development. Flight analysis is also important for species that exhibit diel movement between roosting and foraging sites to prevent the risk of collision with infrastructure. A very condensed version of flight path analysis were done, the aim of this was to determine if there is a general direction of most birds on site. This section needs to be interpreted with caution based on the limited time spend on this component.

What was observed was that a number of water birds were moving between Kamfer Dam and the Vaal River. The White-backed Vulture observed on site was circling above the project area, it is believed they are drawn to the area as a result of the Vulture restaurant. The flight paths can be seen in Figure 4-7.

No nest sites were recorded during the first assessment, this is mainly attributed to the point count analysis protocol which allows for accurate sampling of the avifauna but does not exhaustively cover the site locating nests.

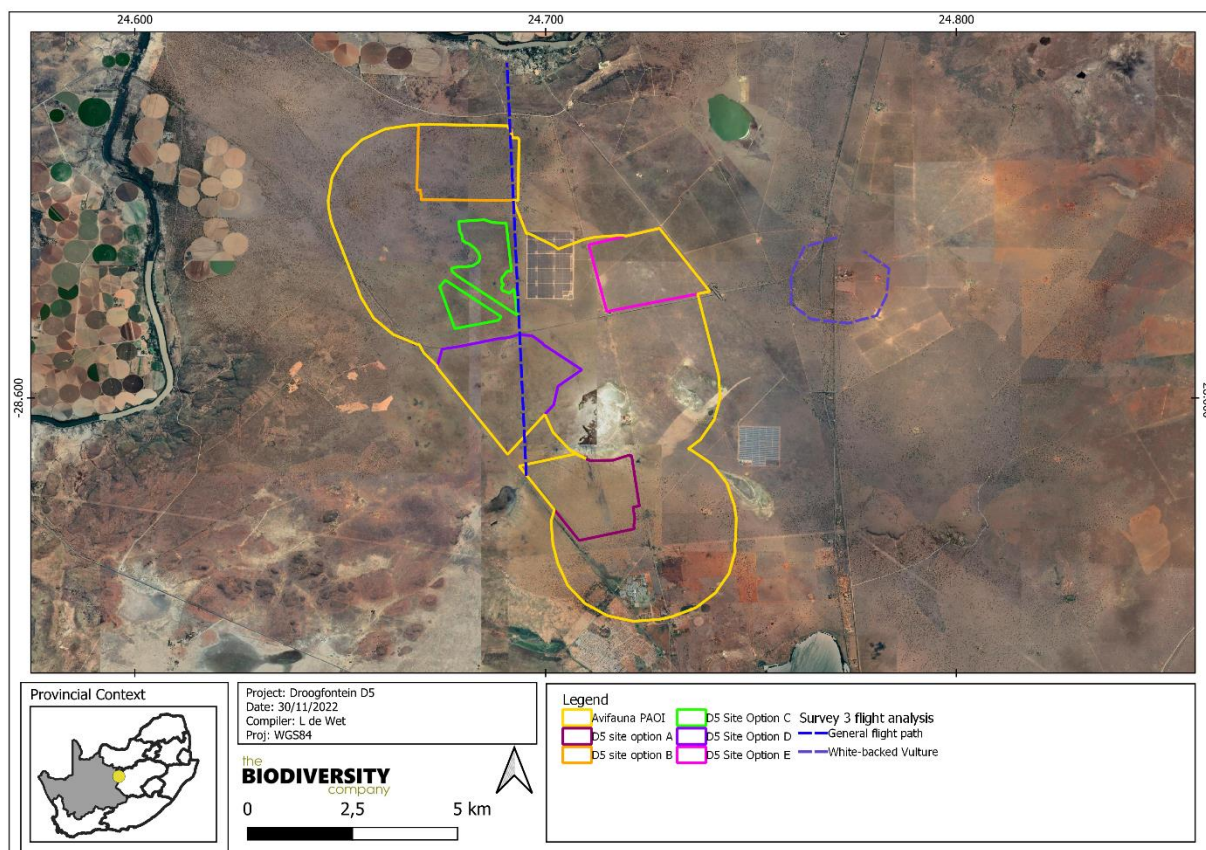


Figure 4-7 Map illustrating the location of the flight direction within the proposed Droogfontein PV PAOI

5 Fine-Scale Habitat Use

Fine-scale habitats within the landscape are important in supporting a diverse avifauna community as they provide differing nesting, foraging and reproductive opportunities. Six different habitat types were delineated within the PAOI, comprising of Woody Thornveld, Modified Thornveld, Critically Modified Thornveld, Koppies, Water Resources and Transformed (Figure 5-5).

Woody Thornveld

This habitat is Thornveld with a distinct woody component comprising of large trees. The habitat has not been disturbed much, except for the historic and current grazing (Figure 5-1). This habitat type is regarded as semi-natural, but slightly disturbed due to the grazing by livestock, mismanagement and also human infringement.

This habitat contributed to a large number of avifauna species recorded. It also provided nesting sites, especially the Camel Thorn trees found in this area were extensively utilised by the avifauna species. Avifauna species observed in this habitat include: Brown-crowned Tchagra (*Tchagra australis*), Crimson-breasted Shrike (*Laniarius atrococcineus*), African Red-eyed Bulbul (*Pycnonotus nigricans*), Marico Flycatcher (*Melaenornis mariquensis*), Karoo Scrub-robin (*Cercotrichas coryphoeus*), Cape-Penduline Tit (*Anthoscopus minutus*), Pritis Batis (*Baris pririt*) and Fork-tailed Drongo (*Dicrurus adsimilis*).



Figure 5-1 **An example of the Woody Thornveld habitat observed in the PAOI**

Modified Thornveld and Critically Modified Thornveld

The Modified Thornveld was dominated by grass species without a distinct woody component present (Figure 5-2). The terrain consists of a low to zero slope with deep soils. Variable in the presence or absence of grass species and shrub density. Semi-natural, but slightly disturbed due to the grazing by livestock and also human infringement. Critically Modified Thornveld comprises no shrub layer and some grasses, but is heavily impacted by grazing and trampling by livestock.

This habitat contributed to lower numbers of avifauna species. Although some species such as Northern Black Korhaan (*Afrotis afraoides*), African Pipit (*Anthus cinnamomeus*), Red-capped Lark (*Calandrella cinerea*), Rattling (*Cisticola chiniana*) and Zitting Cisticola (*Cisticola juncidis*), Namaqua Sandgrouse (*Pterocles Namaqua*) and Burchell's Sandgrouse (*Pterocles burchelli*) were found exclusively in this habitat.



Figure 5-2 **Example of the Modified Thornveld habitat observed in the PAOI**

Koppies

These areas are distinctive rocky hills surrounded by the Thornveld. They are dominated by woody vegetation with some grasses and herbaceous species. These do not form a distinctive avifauna habitat

in and of themselves, and tend to host species similar to the surrounding landscape. However, these areas do provide a unique area for foraging and roosting as well as woody vegetation for nesting.

Avifauna species likely to occur here include Red-billed Firefinch (*Lagonosticta senegala*), Fiscal Flycatcher (*Melaenornis silens*), Black-chested Prinia (*Prinia flavicans*), Green-winged Pytilia (*Pytilia melba*), and Chestnut-vented Warbler (*Curruca subcoerulea*).

Water Resources

The water resources considered in this assessment included the Kamfer Dam, the Vaal river, the offsite depressions and the onsite artificial and natural water resources (Figure 5-3). It is important to note the water source delineations were done from an avifauna perspective and is not representative of the wetlands found on site. For the wetland outlines refer to the Wetland TBC 2022 report.

Some of the water resources in the project area and surrounds were fed by both a leaking sewage and fresh water pipelines, both of these contributing to the constant water and nutrient supply in the PAOI. Based on personal communications with the onsite cattle farmer Johan Hatting some of the leaks are more than 10 years old. The pan on the western side of the PAOI had a high diversity of species.

Avifauna species recorded in this habitat includes: African Jacana (*Actophilornis africanus*), Egyptian Goose (*Alopochen aegyptiaca*), Cape Teal (*Anas capensis*), Black Crake (*Zapornia flavirostra*), South African Shelduck (*Tadorna cana*), Little Grebe (*Tachybaptus ruficollis*), White-faced Whistling Duck (*Dendrocygna viduata*), Red-knobbed Coot (*Fulica cristata*) and Spur-winged Goose (*Plectropterus gambensis*).



Figure 5-3 Some of the water resources assessed in the avifauna assessment

Transformed

The transformed area consisted primarily of urban development and existing solar PV facilities (Figure 5-4). These areas were mostly void of avifauna species, with the only species recorded here being Speckled Pigeons (*Columba guinea*), Common Myna (*Acridotheres tristis*) and Western Cattle Egrets (*Bubulcus ibis*).



Figure 5-4 *An example of the disturbed habitats observed in the PAOI*

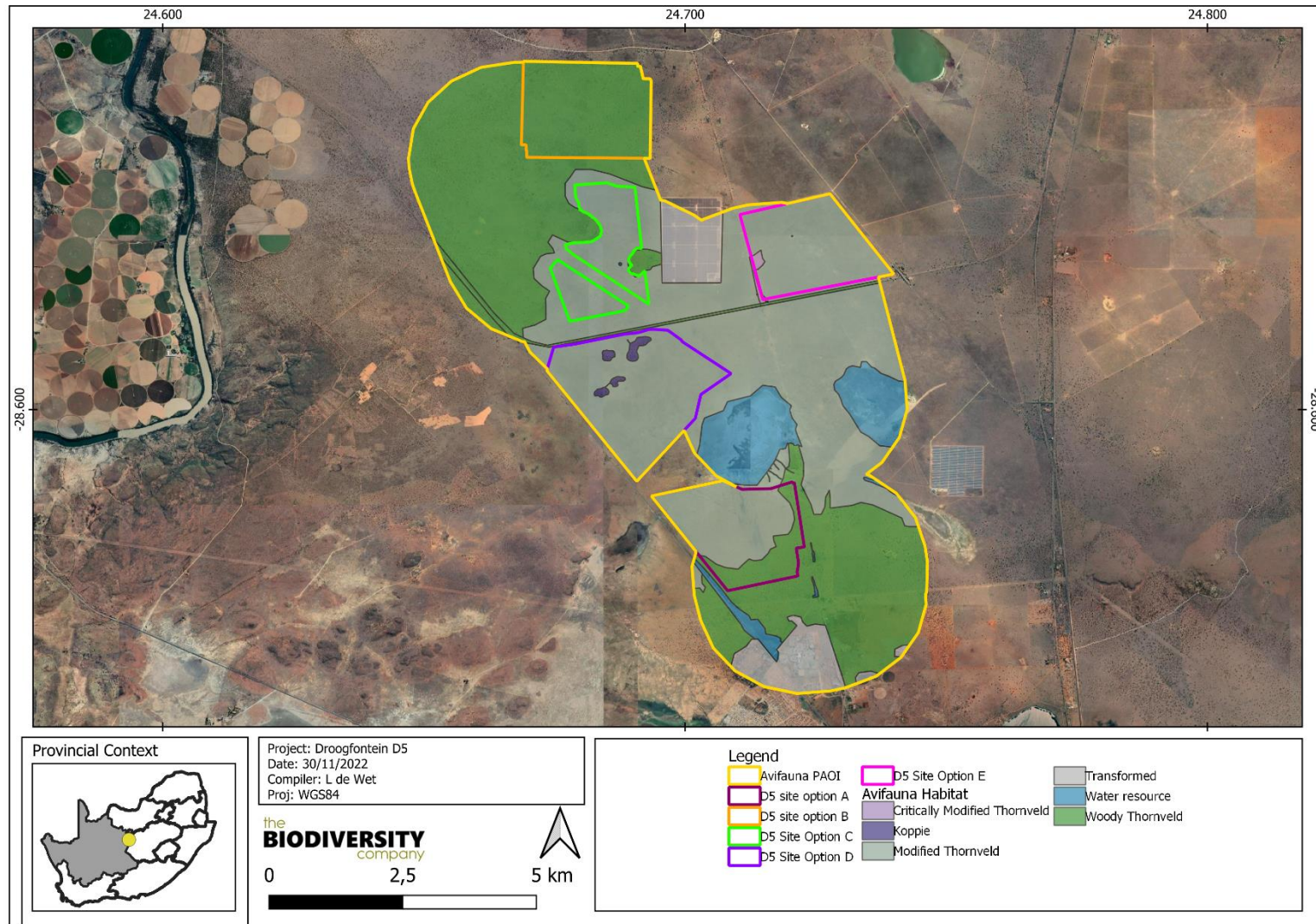


Figure 5-5 Map illustrating the habitat types delineated within the proposed Droogfontein Solar PV PAOI

6 Site Ecological Importance (SEI)

6.1 Environmental Screening Tool

The terrestrial biodiversity theme sensitivity as indicated by the screening tool report for the project area of influence was derived to be 'Very High' for a small area of the site restricted to existing water resources and 'Low' for the remainder of the PAOI (Figure 6-1).

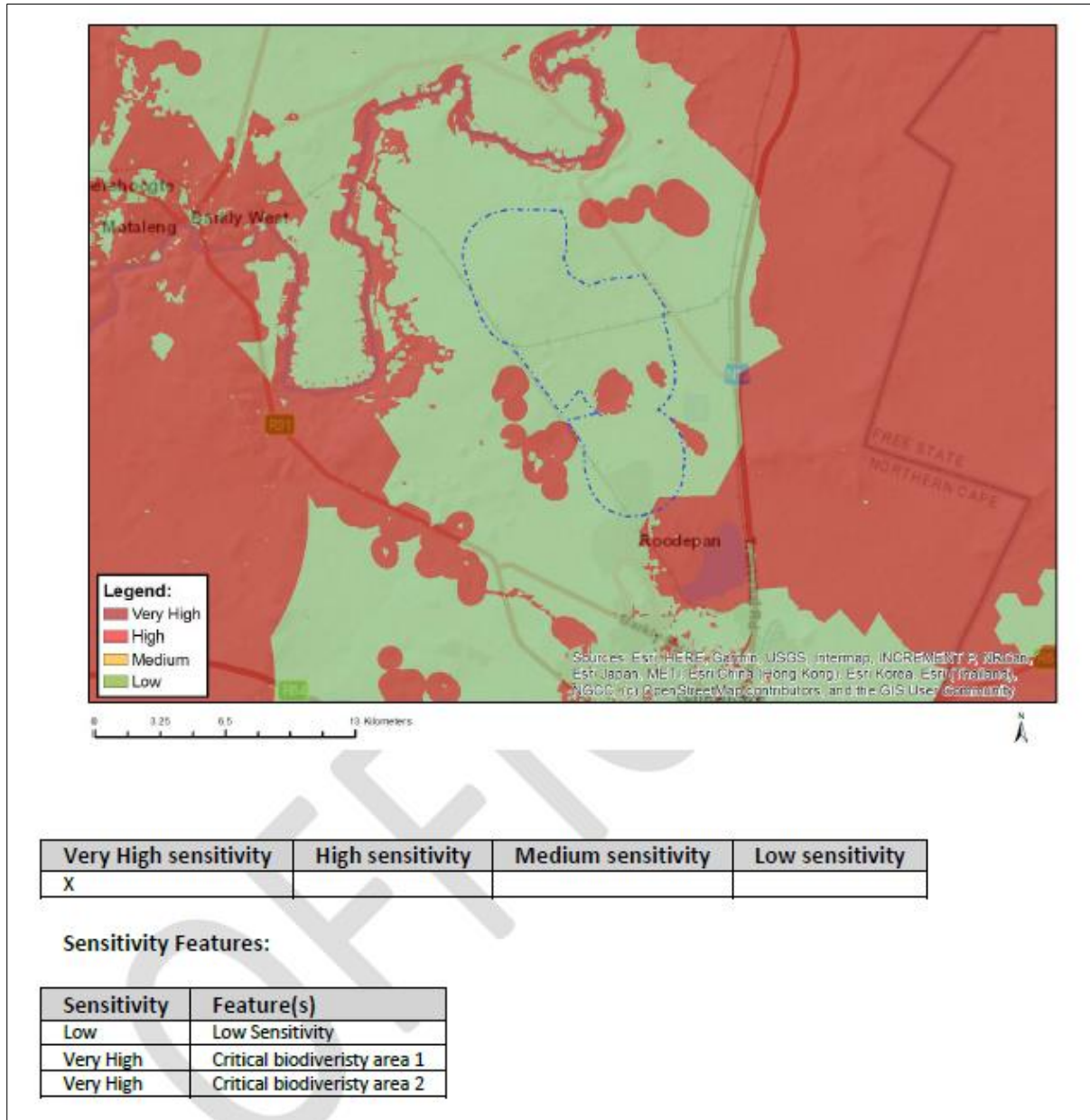


Figure 6-1 Terrestrial Biodiversity Theme Sensitivity for the PAOI, National Web based Environmental Screening Tool

The Animal Species Theme sensitivity, as indicated in the screening report, was derived to be 'High' for the PAOI (Figure 6-2). The High sensitivity was due to the likely presence of the Ludwigs Bustard (*Neotis ludwigii*), Secretarybird (*Sagittarius serpentarius*) and White-backed Vulture (*Gyps africanus*).

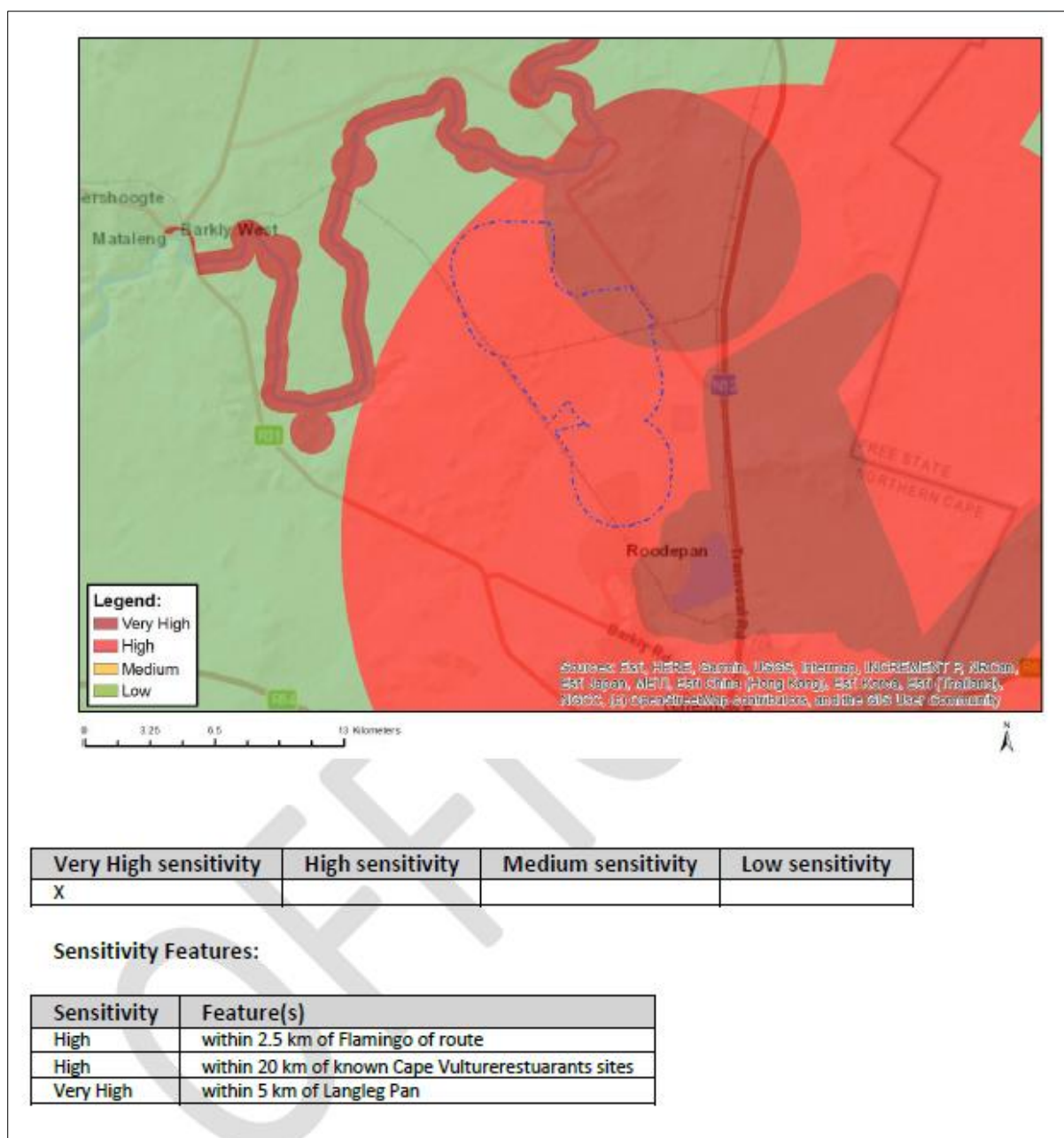


Figure 6-3 Avifauna Theme Sensitivity for the PAOI, National Web based Environmental Screening Tool

6.2 Site Ecological Importance (SEI)

Based on the criteria provided in Section 2.5 of this report, all habitats within the assessment area of the proposed project were allocated a sensitivity or SEI category (Table 6-1). The SEI of the PAOI within an avifauna context was based on both the field results and desktop information. The SEI of the habitat types delineated are illustrated in Figure 6-4. The water resources were given a very high rating based on high likelihood of the water sources supporting SCCs as well as the known occurrence of the flamingos at the nearby Kamfer dam (globally important numbers of Lesser Flamingo (10 000 to 80 000, Birdlife 2022) and regionally important numbers of Greater Flamingo (1 200 to 4 800), along with the high number of risk species recorded in the PAOI. The high number of waterfowl observed during the winter assessment further supports the importance of these areas in the general habitat. No nests of the White-backed Vultures were observed in the project area therefore only a high rating was given to

the Woody Thornveld habitat. This habitat does however still have a high potential of supporting other SCCs such as Ludwigs Bustard (*Neotis ludwigii*) and Secretarybird (*Sagittarius serpentarius*).

Table 6-1 SEI Summary of habitat types delineated within field assessment area of project area

Habitat	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Woody Thornveld	High	Medium	Medium	Low	High
	Confirmed or highly likely occurrence of CR, EN, VU species. Presence of Rare species.	Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity		Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality	
Modified Thornveld	Medium	Medium	Medium	Medium	Medium
	Confirmed or highly likely occurrence of populations of NT species	Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity		Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality	
Critically Modified Thornveld	Low	Low	Low	Medium	Low
	< 50% of receptor contains natural habitat with limited potential to support SCC.	Several minor and major current negative ecological impacts.		Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor	
Koppie	Medium	Medium	Medium	Medium	Medium
	> 50% of receptor contains natural habitat with potential to support SCC.	Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity		Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality	
Water Resources	High	High	High	Low	Very High
	Confirmed or highly likely occurrence of CR, EN, VU species. Presence of Rare species	Only minor current negative ecological impacts with no signs of major past disturbance and good rehabilitation potential.		Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality	
Transformed	Very Low	Very Low	Very Low	Very High	Very Low
	No confirmed and highly unlikely populations of SCC. No confirmed and highly unlikely populations of range-restricted species. No natural habitat remaining.	Several major current negative ecological impacts.		Habitat that can recover rapidly	

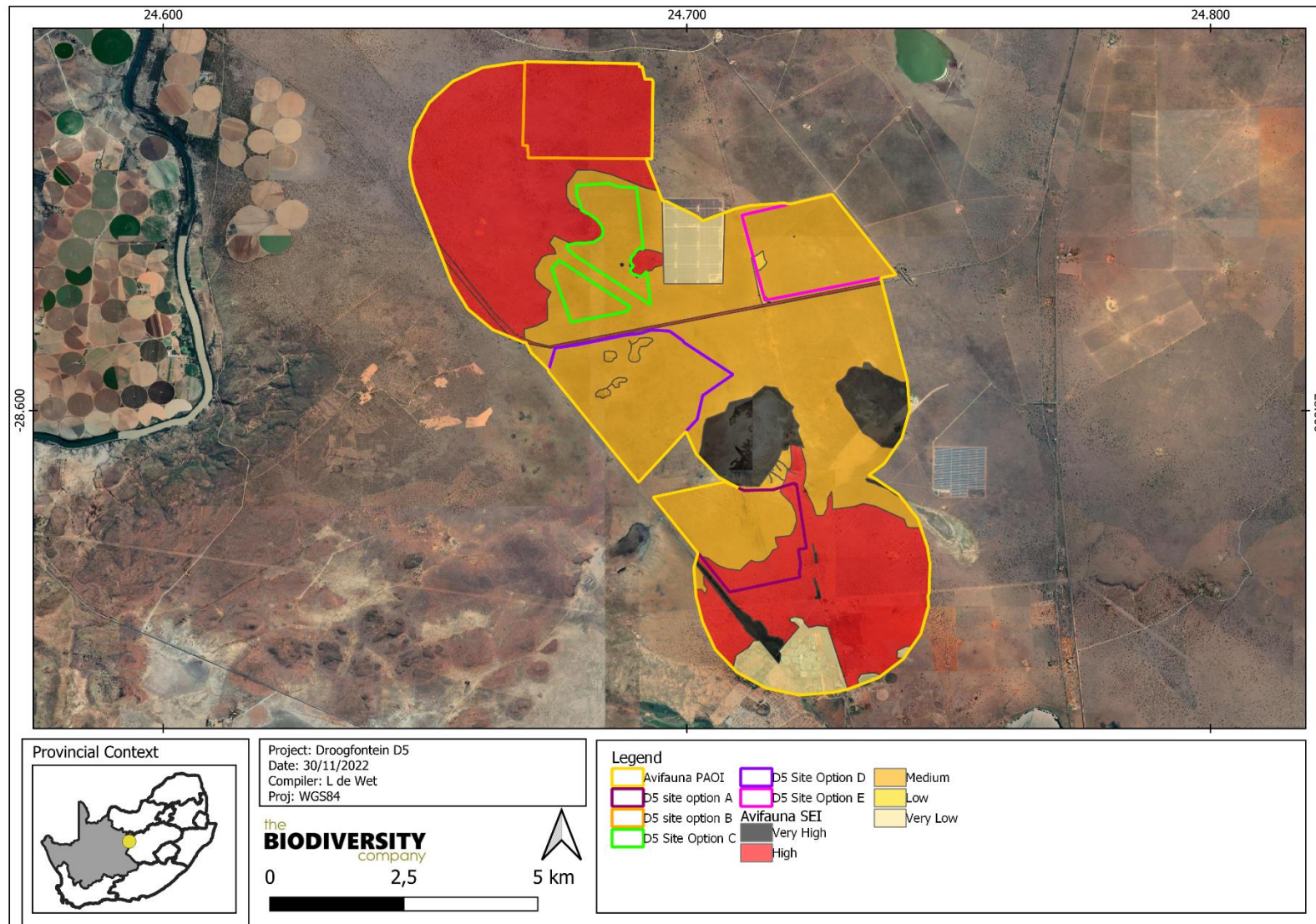


Figure 6-4 Map illustrating the Site Ecological Importance of the proposed Droogfontein Solar PV PAOI within an avifauna context

Interpretation of the SEI in the context of the proposed project is provided in Table 6-2.

Table 6-2 *Guidelines for interpreting Site Ecological Importance in the context of the proposed development activities*

Site Ecological Importance (SEI)	Interpretation in relation to proposed development activities
Very High	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e., last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted, limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very Low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

7 Impact Assessment

Potential impacts were evaluated against the data captured during the fieldwork and from a desktop perspective to identify relevance to the project site, specifically the proposed development footprint area. The assessment of the significance of direct, indirect and cumulative impacts was undertaken using the method as provided by Environamics Environmental Consultants. Bennun *et al* (2021) describes three broad types of impacts associated with solar energy development:

- Direct impacts – Impacts that result from project activities or operational decisions that can be predicted based on planned activities and knowledge of local biodiversity, such as habitat loss under the project footprint, habitat fragmentation as a result of project infrastructure and species disturbance or mortality as a result of project operations.
- Indirect impacts – Impacts induced by, or 'by-products' of, project activities within a project's area of influence.
- Cumulative impacts – Impacts that result from the successive, incremental and/or combined effects of existing, planned and/or reasonably anticipated future human activities in combination with project development impacts.

The assessment of impact significance considers pre-mitigation as well as implemented post-mitigation scenarios. Three phases were considered for the impact assessment:

- Construction Phase;
- Operational Phase; and
- Closure/Rehabilitation Phase.

7.1 Present Impacts to Avifauna

In consideration that there are anthropogenic activities and influences are present within the landscape, there are several negative impacts to biodiversity, including avifauna. These include:

- Existing energy infrastructure;
- Noise pollution especially from the train and transmission lines;
- Minor and major gravel roads and associated vehicle traffic;

- Invasive Alien Plants;
- Livestock agriculture; and
- Fences and associated infrastructure.

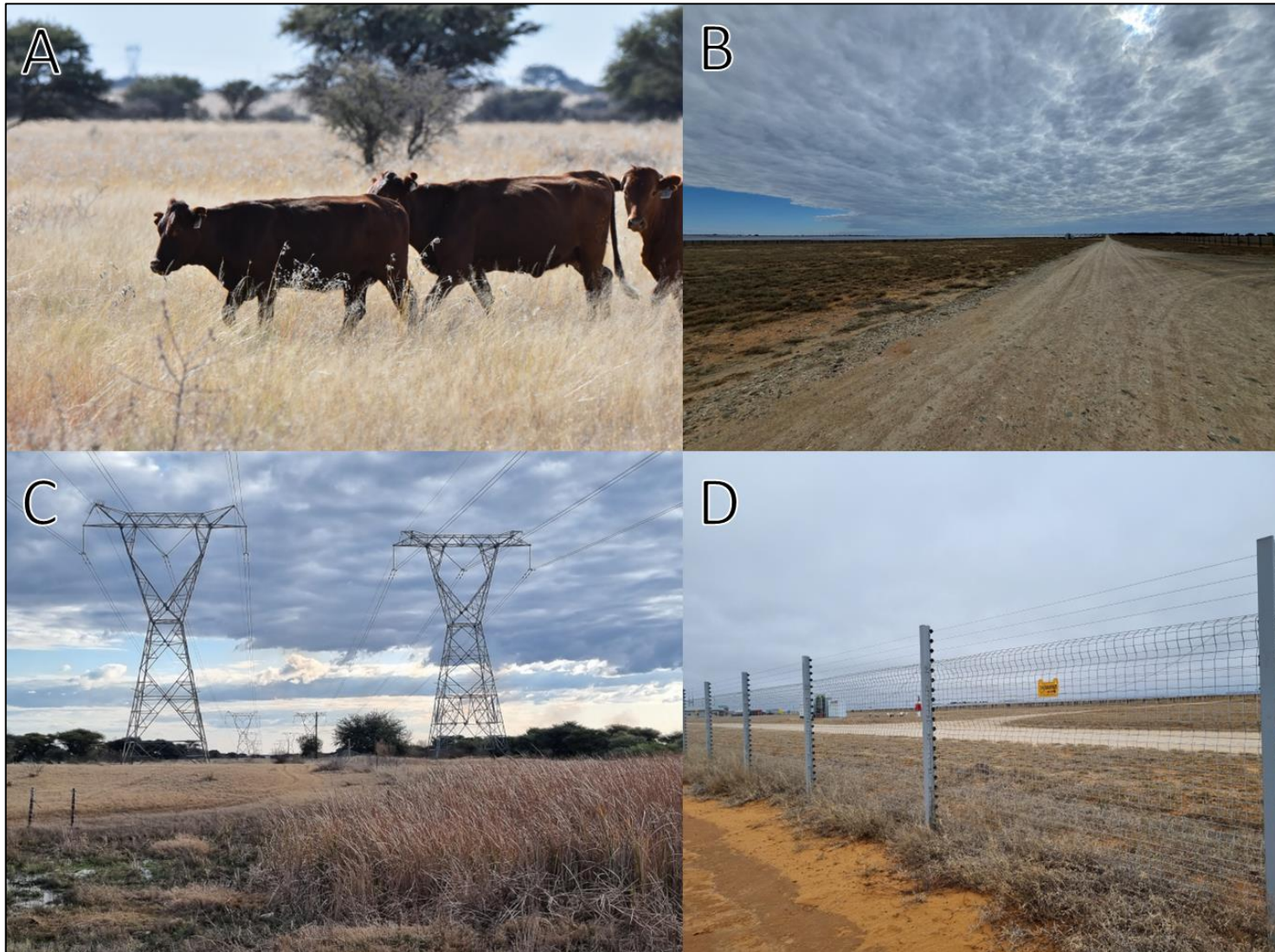


Figure 7-1 *Photographs illustrating examples of impacts observed within the Droogfontein Solar PV PAOI. A) Livestock, B) Existing roads, C) Fences, servitudes and overhead lines and D) Existing energy infrastructure with its associated electric fence*

7.2 Anticipated Impacts

This section describes the potential impacts on avifauna associated with the construction and operational phases of the proposed development and is only relevant to the PV site and associated infrastructure.

During the construction phase vegetation clearing for the associated infrastructure will lead to direct habitat loss. Vegetation clearing will create a disturbance and will therefore potentially lead to the displacement of avifaunal species. The operation of construction machinery on site will generate noise pollution. Increased human presence can lead to poaching and the increase in vehicle traffic and heavy machinery will potentially lead to roadkill.

The principal impacts of the operational phase are electrocution, collisions, fencing, chemical pollution due to chemical cleaning of the PV panels and habitat loss. Solar panels have been implicated as a potential risk for bird collisions. Collisions are thought to arise when birds (particularly waterbirds) mistake the panels for waterbodies, known as the “lake effect” (Lovich & Ennen, 2011), or when migrating or dispersing birds become disorientated by the polarised light reflected by the panels. This “lake-effect” hypothesis has not been substantiated or refuted to date (Visser *et al*, 2019). It can however be said that the combination of powerlines, fencing and large infrastructure will influence avifauna species. Visser *et al* (2019) performed a study at a utility-scale PV SEF in the Northern Cape and found that most of the species affected by the facility were passerine species. This is due to collisions with solar panels from underneath. During a predator attack while foraging under the panels, individuals may alight and then collide with the panel. Larger species were said to be more influenced by the facilities when they were found foraging close by and were disturbed by predators which resulted in collisions with infrastructure.

Large passerines are particularly susceptible to electrocution because owing to their relatively large bodies, they are able to touch conductors and ground/earth wires or earthed devices simultaneously. The chances of electrocution are increased when feathers are wet, during periods of high humidity or during defecation. Prevailing wind direction also influences the rate of electrocution casualties.

Fencing of the PV site can influence birds in six ways (BirdLife South Africa, 2015):

- Snagging – occurs when a body part is impaled on one or more barbs or razor points of a fence;
- Snaring – when a bird’s foot/leg becomes trapped between two overlapping wires;
- Impact injuries – birds flying into a fence, the impact may kill or injure the bird;
- Snarling – when birds try and push through a mesh or wire stands, ultimately becoming trapped (uncommon);
- Electrocution – electrified fence can kill or severely injure birds; and
- Barrier effect – fences may limit flightless birds including moulting waterfowl from resources.

Chemical pollution from PV cleaning, if not environmentally friendly will result in either acute or chronic affects. Should this chemical penetrate into the surrounding environment, it would impact populations on a larger scale and not just species found in and around the PV footprint.

7.3 Alternatives considered

For this assessment the four different location options (Droogfontein D5 A, B, C, D and E) were considered (Figure 7-2). A design alternative that is suggested in this report is to change the overall type of fencing used around the PV sites. It is assumed that the design of the fencing planned is similar to that of the existing Droogfontein site.

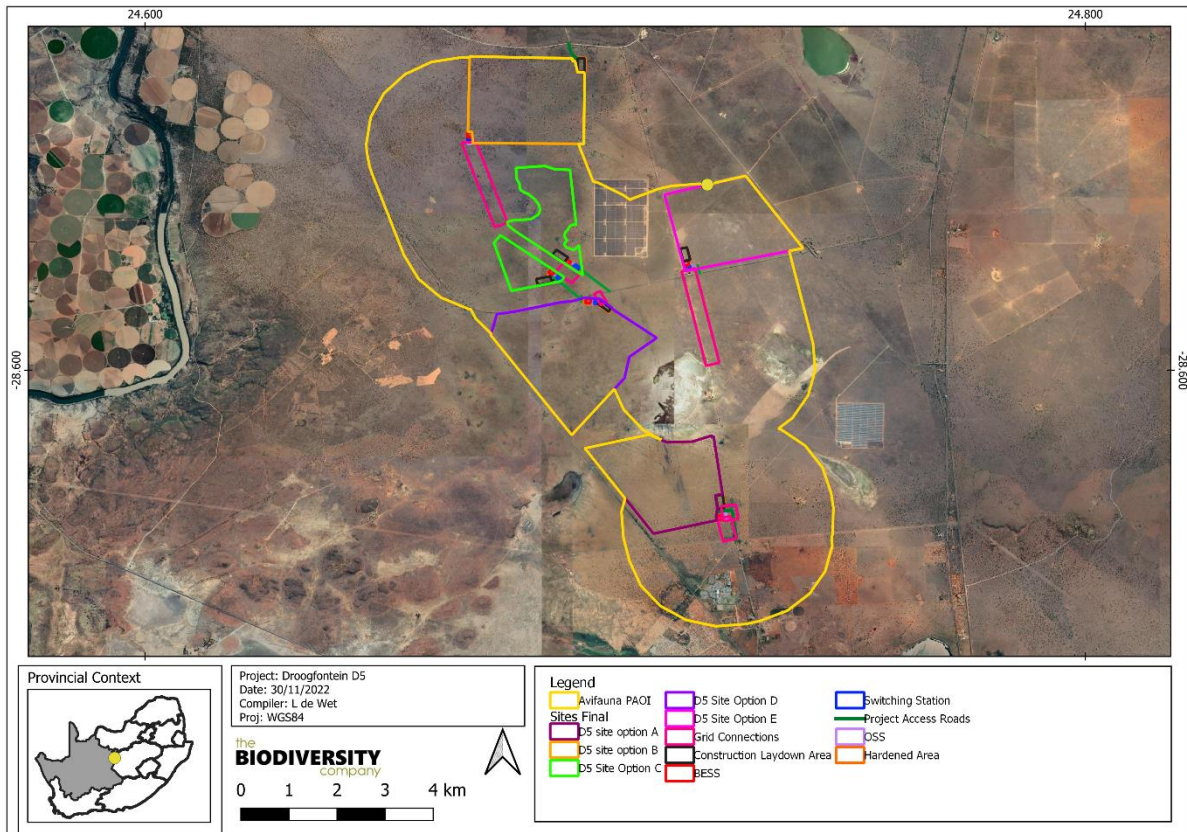


Figure 7-2 The location alternatives of the Droogfontein D5 project

7.1 Loss of Irreplaceable Resources

The proposed development will lead to the loss of the following irreplaceable resources:

- Habitat and possible nesting sites for avifauna SCC.

7.2 Assessment of Impact Significance

The assessment of impact significance considers pre-mitigation as well as implemented of post-mitigation scenarios. Although different species and groups will react differently to the development, the risk assessment was undertaken bearing in mind the potential impacts to the priority species listed in this report.

7.2.1 Impact Assessment Method

Different impacts need to be evaluated in terms of its significance and in doing so highlight the most critical issues to be addressed. Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale i.e., site, local, national or global whereas intensity is defined by the severity of the impact e.g., the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

In assessing the significance of each impact, the following criteria is used:

Geographical Extent		
This is defined as the area over which the impact will be experienced.		
1	Site	The impact will only affect the site.
2	Local/district	Will affect the local area or district.
3	Province/region	Will affect the entire province or region.
4	International and National	Will affect the entire country.

Probability		
This describes the chance of occurrence of an impact.		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).

Duration		
This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.

Intensity/ Magnitude		
Describes the severity of an impact.		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

Reversibility		
This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity.		

1	Completely reversible	The impact is reversible with implementation of minor mitigation measures.
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.

Irreplaceable Loss of Resources

This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.

1	No loss of resource	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.

Cumulative Effect

This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.

1	Negligible cumulative impact	The impact would result in negligible to no cumulative effects.
2	Low cumulative impact	The impact would result in insignificant cumulative effects.
3	Medium cumulative impact	The impact would result in minor cumulative effects.
4	High cumulative impact	The impact would result in significant cumulative effects

Significance

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula: (Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact significance rating	Description
6 to 28	Negative low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive high impact	The anticipated impact will have significant positive effects.
74 to 96	Negative very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".

74 to 96	Positive very high impact	The anticipated impact will have highly significant positive effects.
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7.2.2 Construction Phase

7.2.2.1 Habitat destruction within the project footprint

Habitat destruction of the proposed development is inevitable. The habitat destruction of D5A was rated as a Negative High Impact but with the implementation of mitigation measures can be reduced to a Negative Low Impact. Pre-mitigation the significance of the impact on the D5B option is a Negative Very High Impact but with the implementation of mitigation measures can be reduced to a Negative Medium Impact. The habitat destruction of D5C was rated as a Negative High Impact but with the implementation of mitigation measures can be reduced to a Negative Low Impact. Pre-mitigation the significance of the impact on the D5D option is a Negative Very High Impact but with the implementation of mitigation measures can be reduced to a Negative Medium Impact. The habitat destruction of D5E was rated as a Negative High Impact but with the implementation of mitigation measures can be reduced to a Negative Low Impact. The destruction of trees on D5B would have a higher impact due to the destruction of woody thornveld, as will D5D due to the presence of the Koppies. Habitats in D5A, D5C and D5E is of lower sensitivity and will result in lower impacts.

Pre Mitigation (D5A)							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
1	4	3	2	4	4	3	
Site: The impact will only affect the site.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Complete loss of resources: The impact is result in a complete loss of all resources.	High cumulative impact: The impact would result in significant cumulative effects	High: Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.	Negative High Impact
Post Mitigation (D5A)							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
1	3	2	2	2	3	2	

Site: The impact will only affect the site.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	Negative Low Impact
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Pre Mitigation (D5B)							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
1	4	3	2	4	4	4	
Local/district: Will affect the local area or district.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Complete loss of resources: The impact is result in a complete loss of all resources.	High cumulative impact: The impact would result in significant cumulative effects	Very high: Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.	Negative Very High Impact
Post Mitigation (D5B)							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
1	4	3	2	4	4	2	
Site: The impact will only affect the site.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will	Partly reversible: The impact is partly reversible but more intense mitigation	Complete loss of resources: The impact is result in a complete loss of all resources.	High cumulative impact: The impact would result in significant	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and	Negative Medium Impact

		be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	measures are required.		cumulative effects	maintains general integrity (some impact on integrity).	
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Pre Mitigation (D5C)							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
1	4	3	2	4	4	3	
Site: The impact will only affect the site.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Complete loss of resources: The impact is result in a complete loss of all resources.	High cumulative impact: The impact would result in significant cumulative effects	High: Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.	Negative High Impact
Post Mitigation (D5C)							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
1	3	2	2	2	3	2	
Site: The impact will only affect the site.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	Negative Low Impact

Pre Mitigation (D5D)							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
1	4	3	2	4	4	4	
Local/district: Will affect the local area or district.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Complete loss of resources: The impact is result in a complete loss of all resources.	High cumulative impact: The impact would result in significant cumulative effects	Very high: Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.	Negative Very High Impact
Post Mitigation (D5D)							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
1	4	3	2	4	4	2	
Site: The impact will only affect the site.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Complete loss of resources: The impact is result in a complete loss of all resources.	High cumulative impact: The impact would result in significant cumulative effects	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	Negative Medium Impact

Pre Mitigation (D5E)

Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
1	4	3	2	4	4	3	
Site: The impact will only affect the site.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Complete loss of resources: The impact is result in a complete loss of all resources.	High cumulative impact: The impact would result in significant cumulative effects	High: Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.	Negative High Impact
Post Mitigation (D5E)							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
1	3	2	2	2	3	2	
Site: The impact will only affect the site.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	Negative Low Impact

Mitigation Actions:

- Solar panels must be mounted on pile driven or screw foundations, such as post support spikes, rather than heavy foundations, such as trench-fill or mass concrete foundations, to reduce the negative effects on natural soil functioning, such as its filtering and buffering characteristics, while maintaining habitats for both fossorial and epigeic biodiversity (Bennun *et al*, 2021). If concrete foundations are used that would increase the impact of the project as there would be direct impacts to soil permeability and characteristics, thereby influencing inhabitant fauna. In addition, stormwater runoff and runoff from cleaning the panels would be increased, increasing erosion in the surrounding areas;

- Indigenous vegetation to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion (Beatty et al, 2017; Sinha et al, 2018). The photographs below are sourced from these documents;



- Vegetation clearing to commence only after the necessary permits have been obtained; and
- Environmental Officer (EO) to provide supervision and oversight of vegetation clearing activities.

7.2.2.2 Destruction, degradation and fragmentation of surrounding habitats

Construction activities can lead to destruction of surrounding habitats. Pre-mitigation this impact has a Negative Very High significance, but with the implementation of mitigation measures the significance can be reduced to a Negative Low Impact. This impact matrix is relevant to all five sites.

Pre-Mitigation							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	4	4	4	4	4	4	
Local/district: Will affect the local area or district	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Permanent: The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.	Irreversible: The impact is irreversible and no mitigation measures exist.	Complete loss of resources: The impact is result in a complete loss of all resources.	High cumulative impact: The impact would result in significant cumulative effects	Very high: Impact affects the continued viability of the system/component, and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible, rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.	Negative Very High Impact

Post-Mitigation							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
1	1	1	1	1	1	1	1
Site: The impact will only affect the site.	Unlikely: The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).	Short term: The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).	Completely reversible: The impact is reversible with implementation of minor mitigation measures.	No loss of resource: The impact will not result in the loss of any resources.	Negligible cumulative impact: The impact would result in negligible to no cumulative effects.	Low: Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.	Negative Low Impact

Mitigation Actions:

- Pre-construction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, remaining within demarcated construction areas etc.
- All solid waste must be managed in accordance with the Solid Waste Management Plan. Recycling is encouraged;
- All construction activity and roads to be within the clearly defined and demarcated areas;
- Temporary laydown areas should be clearly demarcated and rehabilitated with indigenous vegetation subsequent to end of use;
- Appropriate dust control measures to be implemented;
- Suitable sanitary facilities to be provided for construction staff as per the guidelines in Health and Safety Act;
- No cement/concrete may be mixed on site and must be brought in off site to ensure the water sources does not get polluted and that successful rehabilitation of the construction areas can take place; and

- All hazardous materials, if any, should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner.

7.2.2.3 Displacement/emigration of avifauna community (including SCC) due to noise pollution

Noise pollution generated from construction activities will lead to the displacement/emigration of the local avifauna community including the proximal surrounding area. This will include SCC that occur or are likely to occur within the area. This impact matrix is relevant to all five sites.

Pre-Mitigation							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	4	2	2	2	4	4	
Local/district: Will affect the local area or district	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	High cumulative impact: The impact would result in significant cumulative effects	Very high: Impact affects the continued viability of the system/component, and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible, rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.	Negative High Impact
Post-Mitigation							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	4	2	2	2	2	2	1
Local/district: Will affect the local area or district.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	Low cumulative impact: The impact would result in insignificant	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	Negative Low Impact

		processes thereafter (2 – 10 years).			cumulative effects.		
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Mitigation Actions:

- Noise pollution is difficult to mitigate against.
- No construction activity is to occur at night, as nocturnal species are highly dependent on sound and/or vocalisations for behavioural processes;
- All vehicles speed must be restricted to 20 km/h, to reduce the noise emitted by them; and
- If generators are to be used these must be soundproofed.

7.2.2.4 Direct mortality from persecution or poaching of avifauna species and collection of eggs

There is the possibility of construction staff poaching avifauna species and collecting eggs from the project footprint and proximal surrounding area. There is also the possibility of persecution of species that are deemed as negative in folklore. This impact was determined to have a Negative Medium Impact significance but can be reduced to a Negative Low Impact significance with the implementation of mitigation actions. This impact matrix is relevant to all five sites.

Pre-Mitigation							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	3	2	1	2	4	3	
Local/district: Will affect the local area or district.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Completely reversible: The impact is reversible with implementation of minor mitigation measures.	Marginal loss of resource: The impact will result in marginal loss of resources.	High cumulative impact: The impact would result in significant cumulative effects	High: Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.	Negative Medium Impact

Post-Mitigation							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	1	1	1	1	1	1	
Local/district: Will affect the local area or district.	Unlikely: The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).	Short term: The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).	Completely reversible: The impact is reversible with implementation of minor mitigation measures.	No loss of resource: The impact will not result in the loss of any resources.	Negligible cumulative impact: The impact would result in negligible to no cumulative effects.	Low: Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.	Negative Low Impact

Mitigation Actions:

- All personnel should undergo environmental awareness training that includes educating on not poaching/persecuting species and collecting eggs;
- Prior to commencing work each day, two individuals should traverse the working area in order to disturb any avifauna and so they have a chance to vacate the area; and
- Any avifauna threatened by the construction activities that does not vacate the area should be removed safely by an appropriately qualified environmental officer or removal specialist.

7.2.2.5 Direct mortality from increased vehicle and heavy machinery traffic

The increased vehicle and heavy machinery traffic associated with construction activities will lead to roadkill. This impact was determined to have a Negative Medium Impact significance but can be reduced to a Negative Low Impact significance with the implementation of mitigation actions. This impact matrix is relevant to all five sites.

Pre-Mitigation							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance

2	3	2	3	3	3	2	
Local/district: Will affect the local area or district.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	Negative Medium Impact
Post-Mitigation							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	2	2	1	2	1	1	
Local/district: Will affect the local area or district.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Completely reversible: The impact is reversible with implementation of minor mitigation measures.	Marginal loss of resource: The impact will result in marginal loss of resources.	Negligible cumulative impact: The impact would result in negligible to no cumulative effects.	Low: Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.	Negative Low Impact

Mitigation Actions:

- All personnel should undergo environmental induction with regards to awareness about speed limits and roadkill.
- All construction vehicles should adhere to a speed limit of maximum 20 km/h to avoid collisions. Appropriate speed control measures and signs must be erected.

7.2.3 Operational Phase

7.2.3.1 Collisions with infrastructure associated with the PV Facility

The proposed PV SEF comprises of components that pose a collision risk to avifauna species. This includes collisions with PV panels, any overhead lines/cables and fences. The D5A, D5D and D5E options have a Negative Very High option that is reduced to Negative High based on its proximity to a water resource, which is host to a large number of risk species and for D5E the proximity to Flamingo routes. The impact of collisions at D5B and D5C are both also Negative High pre-mitigation as it is between the Vaal river and the Kamfer dam as well as between the large water resource and the Vaal river. This impact can be reduced to a Negative Medium significance with the implementation of appropriate mitigation measures.

Pre Mitigation D5A							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	4	4	4	4	4	4	
Local/district: Will affect the local area or district.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Permanent: The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.	Irreversible: The impact is irreversible and no mitigation measures exist.	Complete loss of resources: The impact is result in a complete loss of all resources.	High cumulative impact: The impact would result in significant cumulative effects	Very high: Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.	Negative Very High Impact
Post Mitigation D5A							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	3	3	3	3	3	3	
Local/district: Will affect the local area or district.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	High: Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily	Negative High Impact

		processes thereafter (10 – 30 years).				cease. High costs of rehabilitation and remediation.	
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Pre Mitigation D5B							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	4	4	4	4	4	4	
Local/district: Will affect the local area or district.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Permanent: The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.	Irreversible: The impact is irreversible and no mitigation measures exist.	Complete loss of resources: The impact is result in a complete loss of all resources.	High cumulative impact: The impact would result in significant cumulative effects	Very high: Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.	Negative Very High Impact
Post Mitigation D5B							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	2	3	3	2	2	3	
Local/district: Will affect the local area or district.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Marginal loss of resource: The impact will result in marginal loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	High: Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.	Negative Medium Impact

Pre Mitigation D5C							
Extent	Probability	Duration	Reversibility	Irreplaceability		Magnitude/ Intensity	Significance

					Cumulative Effect		
2	4	4	4	4	4	4	
Local/district: Will affect the local area or district.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Permanent: The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.	Irreversible: The impact is irreversible and no mitigation measures exist.	Complete loss of resources: The impact is result in a complete loss of all resources.	High cumulative impact: The impact would result in significant cumulative effects	Very high: Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.	Negative Very High Impact
Post Mitigation D5C							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	2	3	3	2	2	3	
Local/district: Will affect the local area or district.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Marginal loss of resource: The impact will result in marginal loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	High: Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.	Negative Medium Impact
Pre Mitigation D5D							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	4	4	4	4	4	4	
Local/district: Will affect the	Definite: Impact will certainly occur (Greater	Permanent: The only class of impact that will be non-transitory. Mitigation either	Irreversible: The impact is irreversible and	Complete loss of resources: The impact is result in a	High cumulative impact: The impact would	Very high: Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently	Negative Very High Impact

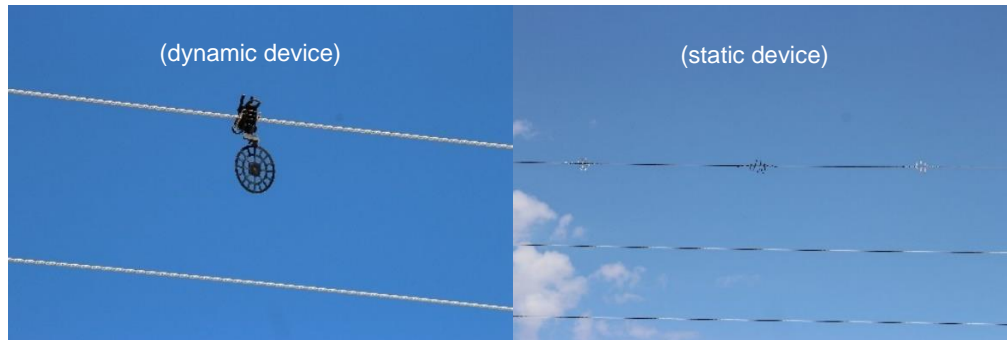
local area or district.	than a 75% chance of occurrence).	by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.	no mitigation measures exist.	complete loss of all resources.	result in significant cumulative effects	ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.	
Post Mitigation D5D							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	3	3	3	3	3	3	
Local/district: Will affect the local area or district.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	High: Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.	Negative High Impact

Pre Mitigation D5E							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	4	4	4	4	4	4	
Local/district: Will affect the local area or district.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Permanent: The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.	Irreversible: The impact is irreversible and no mitigation measures exist.	Complete loss of resources: The impact is result in a complete loss of all resources.	High cumulative impact: The impact would result in significant cumulative effects	Very high: Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.	Negative Very High Impact

Post Mitigation D5E							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	3	3	3	3	3	3	
Local/district: Will affect the local area or district.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	High: Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.	Negative High Impact

Mitigation Actions:

- The design of the proposed solar plant must be of a type or similar structure as endorsed by the Eskom-Endangered Wildlife Trust (EWT) Strategic Partnership on Birds and Energy, considering the mitigation guidelines recommended by Birdlife South Africa;
- Infrastructure should be consolidated where possible in order to minimise the amount of ground and air space used. This would involve using existing/approved pylons and associated infrastructure for different lines;
- The loop in loop out lines must join in at closest point to the existing line as possible;
- Non-polarising white tape can be used around and/or across panels to minimise reflection (Bennun *et al*, 2021). This is especially pertinent to waders and aquatic species that may recognise the panel array as water bodies (lake effect as described above) and collide with the panels, causing mortality;
- Overhead cables/lines must be fitted with industry standard bird flight diverters in order to make the lines as visible as possible to collision-susceptible species. Shaw *et al* (2021) demonstrated that large avifauna species mortality was reduced by 51% (95% CI: 23–68%). Recommended bird diverters such as flapping devices (dynamic device) and thickened wire spirals (static device) that increase the visibility of the lines should be fitted 5 m apart. The Inotec BFD88 bird diverter is highly recommended due to its visibility under low light conditions when most species move from roosting to feeding sites;



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- Fencing mitigations:
- Top 2 strands must be smooth wire;
- Routinely retention loose wires;
- Minimum distance between wires is 300 mm; and
- Place markers on fences.

7.2.3.2 Electrocutation due to infrastructure associated with the PV Facility

Electrocutation with SEF connections and associated pylons pose a risk to avifauna. Several species that occur within the area that exhibit a high probability of electrocution by powerlines. This includes the White-backed Vultures that use the powerlines as perching spots. This impact for D5A, D5D and D5C was determined to have a Negative Very High significance but can be reduced to a Negative Low significance with the implementation of appropriate mitigation measures. The impact for the D5B and D5C Negative High pre-mitigations and Negative Low post-mitigations.

Pre Mitigation D5A							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	3	4	3	3	4	4	
Local/district: Will affect the local area or district.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Permanent: The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	High cumulative impact: The impact would result in significant cumulative effects	Very high: Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.	Negative Very High Impact
Post Mitigation D5A							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
1	2	3	1	2	2	2	
Site: The impact will only affect the site.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Completely reversible: The impact is reversible with implementation of minor mitigation measures.	Marginal loss of resource: The impact will result in marginal loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	Negative Low Impact

Pre-Mitigation D5B							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
1	2	4	3	3	3	4	
Site: The impact will only affect the site.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	High cumulative impact: The impact would result in significant cumulative effects	Negative High Impact
Post-Mitigation D5B							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
1	2	3	1	2	2	2	
Site: The impact will only affect the site.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Completely reversible: The impact is reversible with implementation of minor mitigation measures.	Marginal loss of resource: The impact will result in marginal loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	Negative Low Impact
Pre-Mitigation D5C							
Extent	Probability	Duration	Reversibility	Irreplaceability		Magnitude/ Intensity	Significance

					Cumulative Effect		
1	2	4	3	3	3	4	
Site: The impact will only affect the site.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	High cumulative impact: The impact would result in significant cumulative effects	Negative High Impact
Post-Mitigation D5C							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
1	2	3	1	2	2	2	
Site: The impact will only affect the site.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Completely reversible: The impact is reversible with implementation of minor mitigation measures.	Marginal loss of resource: The impact will result in marginal loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	Negative Low Impact

Pre Mitigation D5D							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	3	4	3	3	4	4	

Local/district: Will affect the local area or district.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Permanent: The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	High cumulative impact: The impact would result in significant cumulative effects	Very high: Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.	Negative Very High Impact
Post Mitigation D5D							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
1	2	3	1	2	2	2	
Site: The impact will only affect the site.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Completely reversible: The impact is reversible with implementation of minor mitigation measures.	Marginal loss of resource: The impact will result in marginal loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	Negative Low Impact

Pre Mitigation D5E							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	3	4	3	3	4	4	
Local/district: Will affect the local area or district.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Permanent: The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	High cumulative impact: The impact would result in significant cumulative effects	Very high: Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often	Negative Very High Impact

						unfeasible due to extremely high costs of rehabilitation and remediation.	
Post Mitigation D5E							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
1	2	3	1	2	2	2	
Site: The impact will only affect the site.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Completely reversible: The impact is reversible with implementation of minor mitigation measures.	Marginal loss of resource: The impact will result in marginal loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	Negative Low Impact

Mitigation Actions:

- The design of the proposed solar plant and grid lines must be of a type or similar structure as endorsed by the Eskom-EWT Strategic Partnership on Birds and Energy, considering the mitigation guidelines recommended by Birdlife South Africa;
- Insulation where energised parts and/or grounded parts are covered with materials appropriate for providing incidental contact protection to birds. It is best to use suspended insulators and vertical disconnectors, if upright insulators or horizontal disconnectors are present, these should be covered; and
- Perch discouragers can be used such as perch guards or spikes. Considerable success achieved by providing artificial bird safe perches, which are placed at a safe distance from the energised parts (Prinsen *et al*, 2012).

7.2.3.3 Direct mortality from persecution or poaching of avifauna species and collection of eggs

There is the possibility of operational staff poaching avifauna species and collecting eggs from the project footprint and proximal surrounding area. There is also the possibility of persecution of species that are deemed as negative in folklore. This impact was determined to have a Negative Medium Impact significance but can be reduced to a Negative Low Impact significance with the implementation of mitigation actions. Relevant to all options.

Pre-Mitigation							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	3	2	1	2	4	3	
Local/district: Will affect the local area or district.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Completely reversible: The impact is reversible with implementation of minor mitigation measures.	Marginal loss of resource: The impact will result in marginal loss of resources.	High cumulative impact: The impact would result in significant cumulative effects	High: Impact affects the continued viability of the system/ component, and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.	Negative Medium Impact
Post-Mitigation							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	1	1	1	1	1	1	
Local/district: Will affect the local area or district.	Unlikely: The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).	Short term: The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).	Completely reversible: The impact is reversible with implementation of minor mitigation measures.	No loss of resource: The impact will not result in the loss of any resources.	Negligible cumulative impact: The impact would result in negligible to no cumulative effects.	Low: Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.	Negative Low Impact

Mitigation Actions:

- All personnel should undergo environmental awareness training that includes educating on not poaching/persecuting avifauna species and collecting eggs; and
- Signs must be put up to enforce this, should someone be caught a R1000 fine must be enforced.

7.2.3.4 Direct mortality by roadkill during maintenance procedures

There is the likelihood that species are likely to be killed by vehicle use during maintenance procedures. This impact was determined to have a Negative Medium Impact significance but can be reduced to a Negative Low Impact significance with the implementation of mitigation actions. Relevant to all options.

Pre-Mitigation							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	3	2	3	3	3	2	
Local/district: Will affect the local area or district.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	Negative Medium Impact
Post-Mitigation							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	2	2	1	2	1	1	
Local/district: Will affect the local area or district.	Possible: The impact may occur (Between a 25% to	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct	Completely reversible: The impact is reversible with implementation of	Marginal loss of resource: The impact will result in marginal loss of resources.	Negligible cumulative impact: The impact would result in negligible	Low: Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.	Negative Low Impact

	50% chance of occurrence).	human action or by natural processes thereafter (2 – 10 years).	minor mitigation measures.		to no cumulative effects.		
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Mitigation Actions:

- All personnel should undergo environmental induction with regards to awareness about speed limits and roadkill.
- All vehicles should adhere to a speed limit of maximum 20 km/h to avoid collisions. Appropriate speed control measures and signs must be erected.

7.2.3.5 Pollution of water sources and surrounding habitat due to cleaning products of the PV panels

Based on the large amount of dust that were observed in the area it is likely that the panels will be cleaned with chemicals in addition to water. This impact was determined to have a Negative High Impact significance but can be reduced to a Negative Low Impact significance with the implementation of mitigation actions. Relevant to all options.

Pre Mitigation							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	3	3	3	3	3	3	
Local/district: Will affect the local area or district.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	High: Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.	Negative High Impact
Post Mitigation							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance

1	1	1	1	1	1	1	
Site: The impact will only affect the site.	Unlikely: The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).	Short term: The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).	Completely reversible: The impact is reversible with implementation of minor mitigation measures.	No loss of resource: The impact will not result in the loss of any resources.	Negligible cumulative impact: The impact would result in negligible to no cumulative effects.	Low: Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.	Negative Low Impact

Mitigation Actions:

- Only environmentally friendly chemicals are to be used for cleaning of the panels.

7.2.3.6 Heat radiation form the BESS and PV panels

Heat radiation form the infrastructure can result in an overall increase in the surrounding area, it can also lead to veld fires. This impact was determined to have a Negative Medium Impact significance but can be reduced to a Negative Low Impact significance with the implementation of mitigation actions. Relevant to all options.

Pre Mitigation							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
1	2	3	3	3	3	3	
Site: The impact will only affect the site.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	High: Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.	Negative Medium Impact
Post Mitigation							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance

1	1	3	2	2	2	2	
Site: The impact will only affect the site.	Unlikely: The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	Negative Low Impact

Mitigation Actions:

- The BESS must be enclosed in a structure with a non-reflective surface;
- A fire management plan needs to be put in place; and
- Grass must be kept under the panels to ensure that additional reflection is not taking place from the surface below the panels.

7.2.3.7 Encroachment of Invasive Alien Plants into disturbed areas

Invasive Alien Plants (IAPs) tend to encroach into disturbed areas and outcompete/displace indigenous vegetation. This will lead to a shift in the vegetation composition and structure, and consequently will cause a negative shift in the wellbeing of the avifauna community. This impact was determined to have a Negative Very High significance but can be reduced to a Negative Low Impact significance with the implementation of mitigation actions. Relevant to all options.

Pre-Mitigation							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	4	4	3	4	4	4	
Local/district: Will affect the local area or district.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Permanent: The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the	Barely reversible: The impact is unlikely to be reversed even with	Complete loss of resources: The impact is result in a complete loss of all resources.	High cumulative impact: The impact would result in significant	Very high: Impact affects the continued viability of the system/component, and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired.	Negative Very High Impact

		impact can be considered indefinite.	intense mitigation measures.		cumulative effects	Rehabilitation and remediation often impossible. If possible, rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.	
Post-Mitigation							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
1	1	1	1	1	1	1	
Site: The impact will only affect the site.	Unlikely: The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).	Short term: The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).	Completely reversible: The impact is reversible with implementation of minor mitigation measures.	No loss of resource: The impact will not result in the loss of any resources.	Negligible cumulative impact: The impact would result in negligible to no cumulative effects.	Low: Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.	Negative Low Impact

Mitigation Actions:

- An IAP Management Plan must be written and implemented for the development. The developer must contract a specialist to develop the plan and the developer is responsible for its implementation;
- Regular monitoring for IAP encroachment during the operation phase to ensure that no alien invasion problems have developed as result of the disturbance. This should be every 3 months during the first two years of the operation phase and every six months for the life of the project; and
- All IAP species must be removed/controlled using the appropriate techniques as indicated in the IAP management plan.

7.2.4 Decommissioning Phase

7.2.4.1 Direct mortality due to earthworks, vehicle collisions and persecution

Decommissioning activity will likely lead to direct mortality of fauna due to earthworks, vehicle collisions and persecution. This impact was determined to have a Negative Medium significance but can be reduced to a Negative Low Impact significance with the implementation of mitigation actions. Relevant to all options.

Pre Mitigation							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	3	2	3	3	3	2	
Local/district: Will affect the local area or district.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	Negative Medium Impact
Post-Mitigation							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
1	2	1	2	1	1	1	
Site: The impact will only affect the site.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Short term: The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	No loss of resource: The impact will not result in the loss of any resources.	Negligible cumulative impact: The impact would result in negligible to no cumulative effects.	Low: Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.	Negative Low Impact

- All personnel should undergo environmental awareness including educating about not harming or collecting species;

- Prior to commencing work each day, two individuals should traverse the working area in order to disturb any fauna and so they have a chance to vacate;
- Any fauna threatened by the construction activities should be removed safely by an appropriately qualified environmental officer or removal specialist;
- All construction vehicles should adhere to a speed limit of maximum 20 km/h to avoid collisions. Appropriate speed control measures and signs must be erected;
- All hazardous materials, if any, should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner;
- Any excavations should not be left open for extended periods of time as fauna may fall in and become trapped in them. Excavations should only be dug when they are required and should be used and filled shortly thereafter;
- All infrastructure including powerlines must be removed if the facility is decommissioned; and
- The project area must be rehabilitated, and a management plan must be in place to ensure that it is done successfully.

7.2.4.2 Continued habitat degradation due to Invasive Alien Plant encroachment and erosion

Disturbance created during decommissioning will leave the development area vulnerable to erosion and alien plant invasion for several years. Relevant to all options.

Pre-Mitigation							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
2	4	4	4	4	4	4	
Local/district: Will affect the local area or district.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Permanent: The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way	Irreversible: The impact is irreversible, and no mitigation measures exist.	Complete loss of resources: The impact is result in a complete loss of all resources.	High cumulative impact: The impact would result in	Very high: Impact affects the continued viability of the system/component, and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and	Negative Very High Impact

		or such a time span that the impact can be considered indefinite.			significant cumulative effects	remediation often impossible. If possible, rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.	
Post-Mitigation							
Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
1	2	2	2	2	2	2	
Site: The impact will only affect the site.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	Negative Low Impact

Mitigation Actions:

- Rehabilitation in accordance with the Rehabilitation Plan for the development must be undertaken in areas disturbed during the decommissioning phase;
- Monitoring of the rehabilitated area must be undertaken at quarterly intervals for 3 years after the decommissioning phase;
- All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques; and
- There should be follow-up rehabilitation and revegetation of any remaining bare areas with indigenous flora.

7.3 Unplanned Events

The planned activities will have anticipated impacts as discussed above; however, unplanned events may occur on any project, and these could lead to potential impacts which will require appropriate management.

Table 7-1 is a summary of the findings of an unplanned event assessment conducted from a terrestrial ecology perspective. Note that not all potential unplanned events may be captured herein, and this process must therefore be managed throughout all phases and according to events that take place or have a high likelihood of taking place.

Table 7-1 Summary of unplanned events, potential impacts and mitigations

Unplanned Event	Potential Impact	Mitigation
Spills into the surrounding environment	Contamination of habitat as well as water resources associated with a spillage.	A spill response kit must be available at all times. The incident must be reported on, and if necessary, a biodiversity specialist must investigate the extent of the impact and provide rehabilitation recommendations.
Fire	Uncontrolled/unmanaged fire that spreads to the surrounding natural savannah.	An appropriate fire management plan needs to be compiled and implemented.
Erosion caused by water runoff from the surface	Erosion on the side of the roads and cleared areas.	A storm water management plan must be compiled and implemented.

7.4 Cumulative Impacts

Cumulative impacts are assessed within the context of the extent of the proposed PAOI other developments and activities in the area (existing and proposed) and general habitat loss and disturbance resulting from any other anthropogenic activities in the area. The impacts of projects are often assessed by comparing the post-project situation to a pre-existing baseline. Where projects can be considered in isolation this provides a good method of assessing a project's impact. However, in areas where baselines have already been affected, or where future development will continue to add to the impacts in an area or region, it is appropriate to consider the cumulative effects of development or disturbance activities. This is similar to the concept of shifting baselines, which describes how the environmental baseline at a specific point in time may actually represent a significant change from the original state of the system. This section describes the potential cumulative impacts of the project on the local and regional avifauna community.

Localised cumulative impacts include those from operations that are close enough to potentially cause additive effects on the local environment or any sensitive receivers (such as nearby large road networks, other solar PV facilities, and power infrastructure). Relevant activities and impacts include dust deposition, noise and vibration, loss of corridors or habitat, disruption of waterways, groundwater drawdown, groundwater and surface water depletion, and transport activities. Long-term cumulative impacts associated with the site development activities can lead to the loss of endemic and threatened species, including natural habitat and vegetation types, and these impacts can even lead to the degradation of conserved areas such as the adjacent game parks and reserves.

The total area within the 30 km buffer around the project area amounts to 303,763.04 ha, but when considering the transformation (34,062.04 ha) that has taken place within this radius, 269,701 ha of intact habitat remains according to the 2018 National Biodiversity Assessment. Therefore, the area within 30 km of the project has experienced approximately 11.21% loss in natural habitat. Considering this context, the project footprint for the options (according to the provided layout), and similar project exists in the 30 km region measuring a maximum of 36,449.32 ha, which includes the project options (as per the latest South African Renewable Energy EIA Application Database). This means that the total amount of remaining habitat lost as a result of solar projects in the region amounts to 22.6% (the sum of all related developments as a percentage of the total remaining habitat). Table 7-2 outlines the calculation procedure for the spatial assessment of cumulative impacts.

Table 7-2 ***Loss of habitat within a 30 km radius of the project***

	Total Habitat (ha)	Total Loss (ha)	Tot. Remaining Habitat (ha) (Remnants)	Total Historical Loss	Cumulative Projects (ha)	Tot. Remaining Habitat (ha)	Cumulative Habitat Lost
Approximate Solar development cumulative effects (Spatial)	303,763.04	34,062.04	269,701.00	11.21%	68,729.11	235,033.9	22.6 %

The overall cumulative impact assessment is presented in Table 7-3 and Table 7-4 below. Note that this also accounts for the relative importance of the habitats within and adjacent to the project area, in the context of the value of the regional habitat. Approximately 10.21% of the habitat has already been lost, and as discussed above the proposed solar developments will result in a cumulative loss of approximately 22.6% from only similar developments (Solar, approved and in process) in the area, as such the cumulative impact from the proposed development is rated as “high”, with overall medium significance (Figure 7-3). This means that the careful spatial management and planning of the entire region must be a priority, and existing large infrastructure projects must be carefully monitored over the long term.

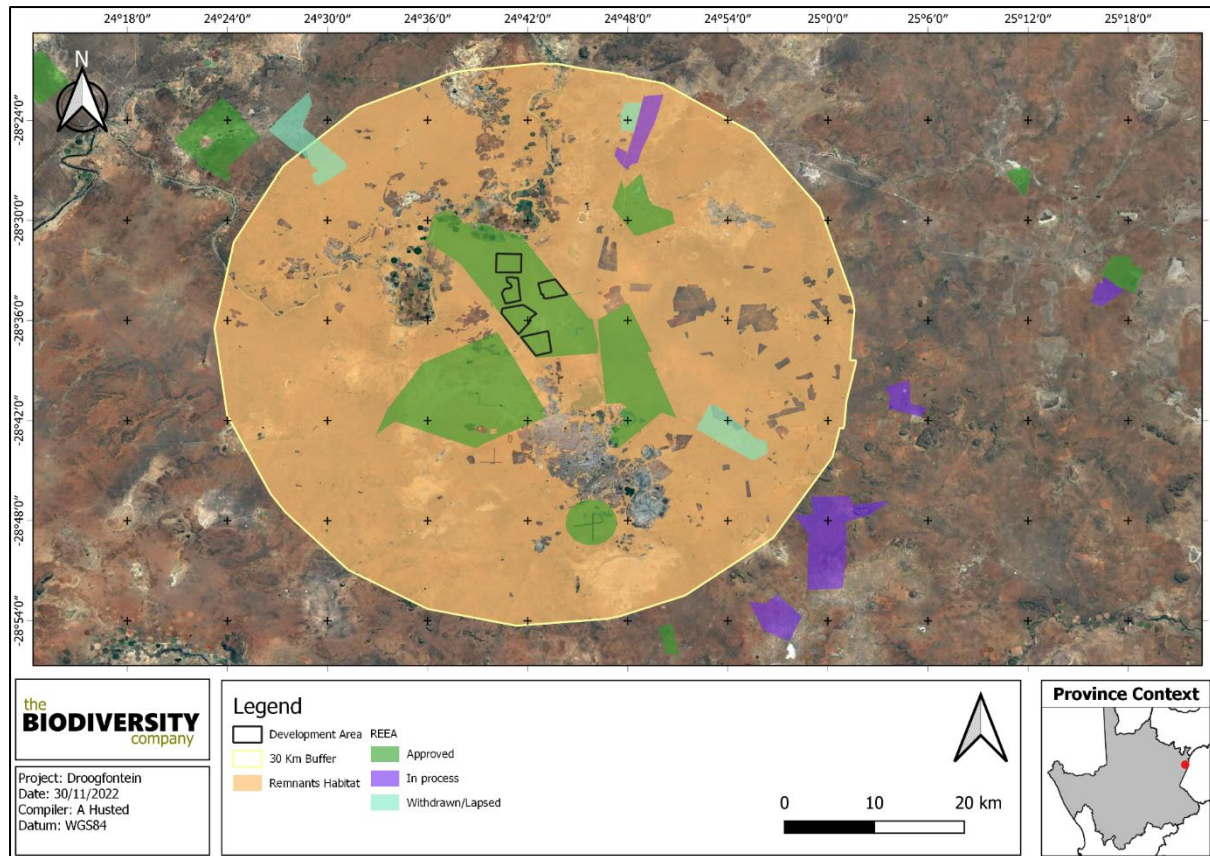


Figure 7-3 Map illustrating the additional renewable energy developments within the landscape overlaid onto the remnant vegetation types

Table 7-3 Cumulative Impacts to avifauna associated with the proposed project – Project in Isolation

Impact	Project in Isolation							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
Loss of habitat	1	4	2	2	3	2	2	
	Site: The impact will only affect the site.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Significant loss of resources: The impact will result in significant loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	Negative Low Impact

Table 7-4 Cumulative Impacts to avifauna associated with the proposed project – Cumulative Effect

Impact	Cumulative Effect							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	Significance
Loss of habitat, and disruption of surrounding ecological corridors.	3	4	3	3	3	4	2	
	Province/region: Will affect the entire province or region.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	High cumulative impact: The impact would result in significant cumulative effects	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	Negative Medium Impact

8 Avifauna Impact Management Actions

The purpose of the Biodiversity Impact Management Actions of is to present the mitigations in such a way that they can be incorporated into the Environmental Management Programme (EMPr), allowing for more successful implementation and auditing of the mitigations and monitoring guidelines.

Table 8-1 presents the recommended mitigation measures and the respective timeframes, targets, and performance indicators pertaining to the avifaunal component.

Table 8-1 *Summary of management outcomes pertaining to impacts to avifauna and their habitats*

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Management outcome: Habitats				
The areas to be developed must be specifically demarcated to prevent movement into surrounding environments.	Life of operation	Project Manager Environmental Officer	Development footprint	Ongoing
The proposed location in the D5B option (not current location) is the preferred location this will allow for the lowest impact on the habitat, as well as a reduced risk in collisions and electrocutions	Life of operation	Project Manager Environmental Officer	Development footprint	Ongoing
Very High sensitivity areas must be declared No-go areas, they must be demarcated to ensure no vehicles or people move into these areas. This is with the exception of the small areas where existing roads can be found.	Life of operation	Project Manager Environmental Officer	Development footprint	Ongoing
Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further.	Life of operation	Project Manager Environmental Officer	Areas of indigenous vegetation	Ongoing
Solar panels must be mounted on pile driven or screw foundations, such as post support spikes, rather than heavy foundations, such as trench-fill or mass concrete foundations, to reduce the negative effects on natural soil functioning, such as its filtering and buffering characteristics, while maintaining habitats for both below and above-ground biodiversity.	Life of operation	Project Manager	Solar panels must be mounted on pile driven or screw foundations, such as post support spikes, rather than heavy foundations, such as trench-fill or mass concrete foundations, to reduce the negative effects on natural soil functioning, such as its filtering and buffering characteristics, while maintaining habitats for both below and above-ground biodiversity	Life of operation
Indigenous vegetation to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion (Beatty et al, 2017; Sinha et al, 2018).	Life of operation	Project Manager	Indigenous vegetation to be maintained under the solar panels to ensure biodiversity is maintained and to prevent soil erosion (Beatty et al, 2017; Sinha et al, 2018).	Life of operation

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion. This will also reduce the likelihood of encroachment by alien invasive plant species. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are indigenous to this vegetation type.	Decommissioning /Rehabilitation	Project Manager	Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion. This will also reduce the likelihood of encroachment by alien invasive plant species. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are indigenous to this vegetation type.	Decommissioning /Rehabilitation
A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment on site unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers. Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them leaking and entering the environment.	Life of operation	Environmental Officer Contractor	Spill events, Vehicles dripping.	Ongoing
No cement/concrete may be mixed on site and must be brought in off site to ensure the water sources does not get polluted and that successful rehabilitation of the construction areas can take place	Planning and Construction	Project Manager Environmental Officer Contractor Engineer	Water pollution and restricted rehabilitation	During phase
Leaking equipment and vehicles must be repaired immediately or be removed from project area to facilitate repair.	Life of operation	Environmental Officer Contractor	Leaks and spills	Ongoing
A fire management plan needs to be compiled to restrict the impact of fire.	Life of operation	Environmental Officer Contractor	Fire Management	During Phase
Management outcome: Avifauna				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
All personnel should undergo environmental induction with regards to avifauna and in particular awareness about not harming, collecting, or hunting terrestrial species, and owls,	Life of operation	Environmental Officer	Evidence of trapping etc	Ongoing

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
which are often persecuted out of superstition. Signs must be put up to enforce this.				
The duration of the construction should be kept to a minimum to avoid disturbing avifauna.	Construction/Operational Phase	Project Manager Environmental Officer	Construction/Closure Phase	Ongoing
Outside lighting should be designed and limited to minimize impacts on fauna. All outside lighting should be directed away from highly sensitive areas. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (red/green) lights should be used wherever possible.	Construction/Operational Phase	Project Manager Environmental Officer Design Engineer	Light pollution and period of light.	Ongoing
All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limit (20 km/h), to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited.	Life of Operation	Health and Safety Officer	Compliance to the training.	Ongoing
All project activities must be undertaken with appropriate noise mitigation measures to avoid disturbance to avifauna population in the region	Construction/Operational Phase	Project Manager Environmental Officer	Noise	Ongoing
All areas to be developed must be walked through prior to any activity to ensure no nests or avifauna species are found in the area. Should any Species of Conservation Concern be found and not move out of the area, or their nest be found in the area a suitably qualified specialist must be consulted to advise on the correct actions to be taken.	Construction	Environmental Officer	Presence of avifauna species and nests	During Phase
The design of the proposed PV and grid lines must be of a type or similar structure as endorsed by the Eskom-EWT Strategic Partnership on Birds and Energy, considering the mitigation guidelines recommended by Birdlife South Africa (Jenkins <i>et al.</i> , 2015).	Planning and Construction	Project Manager Environmental Officer Contractor Engineer	Presence of electrocuted birds or bird strikes	During Phase
Infrastructure should be consolidated where possible in order to minimise the amount of ground and air space used.	Planning and Construction	Project Manager Environmental Officer Contractor Engineer	Presence of bird collisions	During phase
The loop in loop out lines must join in at the closest point to the existing line as possible.	Planning and Construction	Project Manager Environmental Officer Contractor Engineer	Presence of bird collisions	During phase
All the parts of the infrastructure must be nest proofed and anti-perch devices placed on areas that can lead to electrocution	Planning and Construction	Environmental Officer Contractor Engineer	Presence of electrocuted birds	During phase

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Use environmentally friendly cleaning and dust suppressant products	Construction and Operation	Environmental Officer Contractor Engineer	Chemicals used	During phase
Fencing mitigations: <ul style="list-style-type: none"> • Top 2 strands must be smooth wire • Routinely retention loose wires • Minimum 300 mm between wires • Place markers on fences 	Life of Operation	Project Manager Environmental Officer Contractor Design Engineer	Presence of birds stuck /dead in fences Monitor fences for slack wires	During phase
As far as possible power cables within the project site should be thoroughly insulated and preferably buried.	Construction and Operation	Project Manager Environmental Officer Design Engineer	Exposed cables	During phase
Any exposed parts must be covered (insulated) to reduce electrocution risk	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of electrocuted birds	During phase
The BESS must be enclosed in a structure with a non-reflective surface	Construction and Operation	Project Manager Environmental Officer Design Engineer	Reflective surfaces on BESS	During phase
Non-polarising white strips must be fitted along the edges of the panels to reduce reflection and therefore similarity to water and deter birds and insects (Horvath <i>et al</i> , 2010).	Operational	Project Manager Environmental Officer Design Engineer	Presence of dead birds in the project site. Monitoring must be undertaken in accordance with the BirdLife South Africa best practice guidelines for solar energy facilities (BirdLife South Africa, 2017). The precise location of any dead birds found should be recorded and mapped (using GPS). All carcasses should be photographed as found then placed in a plastic bag, labelled as to the location and date, and preserved (refrigerated or frozen) until identified. Feather spots (e.g., a group of feathers attached to skin) and body parts should also be collected.	During phase. The monitoring frequency is based on the collision rate.
Overhead cables/lines must be fitted with bird diverters or flappers.	Operational	Project Manager Environmental Officer Design Engineer	Collisions. Monitoring must be undertaken in accordance with the BirdLife South Africa best practice guidelines for solar energy facilities (BirdLife South Africa, 2017).	During phase. The monitoring frequency is based on the collision rate.

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
There is little to no information on the recovery of the avifauna community subsequent to the closure of SEFs within South Africa. A post-closure monitoring regime is recommended for the proposed project to document any impacts and this data must be used for improving rehabilitation measures	Closure/Rehabilitation	Project Manager Environmental Officer	Avifauna community	Wet-season and dry-season survey for the initial 3-5 years after closure.
All infrastructure including powerlines must be removed if the facility is decommissioned	Closure/Rehabilitation	Project Manager Environmental Officer	Infrastructure removal	During Process

9 Conclusion and Impact Statement

9.1 Conclusion

The aim of this Avifauna Impact Assessment was to provide information to guide the risk of the proposed Droogfontein (D5) Solar PV project to the avifauna community likely affected by its development.

During the first assessment performed in the winter (4th – 8th of July 2022) 115 species were recorded during the point counts. Two of the species recorded were SCC i.e., *Gyps africanus* (White-backed Vulture) and *Phoenicopterus roseus* (Greater Flamingo). During the second assessment performed in the summer (5th -9th of September) 119 species were recorded during the point counts. Three of the species recorded were SCC i.e., *Gyps africanus* (White-backed Vulture), *Phoenicopterus roseus* (Greater Flamingo) and *Polemaetus bellicosus* (Martial Eagle). During the third survey, 54 species were recorded during the point counts. Four of the species recorded (including incidental records) were SCC i.e. *Calidris ferruginea* (Curlew Sandpiper), *Gyps africanus* (White-backed Vulture), *Sagittarius serpentarius* (Secretarybird), and *Phoeniconaias minor* (Lesser Flamingo) Twenty risk species were recorded in the first survey, twenty in the second survey and twenty-four in the third survey. These are species at risk for collisions, electrocutions or highly sensitive to habitat loss.

The sensitivity of the D5A layout was found to be partially high and partially moderate, while the D5B option was high, the D5C option was Moderate, the D5D option was moderate and the D5E option was moderate. The electrocution and collision risk at D5A, D5D and D5E is however higher than at D5B and D5C. Of the three options located within the lowest sensitivity (Medium) Option C is located adjacent to areas of high sensitivity whilst Option D includes the koppies, which may provide niche habitats for avifauna as well as providing novel habitat within a largely homogenous environment. Option E is preferred as it is located furthest from designed Very High and High sensitivity area.

9.2 Impact Statement

The main expected impacts of the proposed PV and associated infrastructure will include the following:

- Habitat loss and fragmentation;
- Electrocutions; and
- Collisions.

Mitigation measures as described in this report can be implemented to reduce the significance of the risk to an acceptable residual risk level. Considering the above-mentioned information and that the facility is located within a REDZ, it is the opinion of the specialist that the project may be favourably considered, on condition that all the mitigation and recommendations provided in this report and other specialist reports are implemented. Option E is preferred as it is located furthest from designed Very High and High sensitivity area.

10 References

- BirdLife International. 2021. The IUCN Red List of Threatened Species 2021: e.T22679820A181759055.
- Birdlife South Africa (2022). Important Bird and Biodiversity Areas. <https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/>
- BirdLife South Africa. 2015. Fences & birds, minimising unintended impacts. <https://www.birdlife.org.za/what-we-do/landscape-conservation/what-we-do/birds-and-fences/>
- BirdLife South Africa. 2017. Birds and Solar Energy Best Practice Guidelines. <https://www.birdlife.org.za/wp-content/uploads/2020/03/BLSA-Guidelines-Solar-and-Energy.pdf>
- Buckland, S., Anderson, D., Burnham, K.P. and Laake, J. 1993. Distance Sampling: Estimating Abundance of Biological Populations. 440 pgs., Chapman and Hall, London
- Coordinated Avifaunal Roadcounts (CAR) (2020). <http://car.birdmap.africa/index.php>
- Cumming, G.S. & Henry, D.A.W. 2019. Point counts outperform line transects when sampling birds along routes in South African protected areas. *African Zoology*, 54(4): 187-198. doi: 10.1080/15627020.2019.1658540.
- Del Hoyo, J., Collar, N.J., Christie, D.A., Elliott, A., Fishpool, L.D.C., Boesman, P. & Kirwan, G.M. (1996). HBW and BirdLife International Illustrated Checklist of the Birds of the World. Volume 2: Passerines. Lynx Editions and BirdLife International, Barcelona, Spain and Cambridge, UK.
- Department of Forestry, Fisheries and the Environment (DFFE). 2021a. SACAD (South Africa Conservation Areas Database) and SAPAD (South Africa Protected Areas Database). <http://egis.environment.gov.za>.
- Department of Forestry, Fisheries and the Environment (DFFE). 2021b. National Protected Areas Expansion Strategy. <http://egis.environment.gov.za>.
- Department of Forestry, Fisheries and the Environment (DFFE). 2021c. Renewable Energy EIA Application Database. <http://egis.environment.gov.za>.
- Taylor, M.R., Peacock, F. & Wanless, R.M. (Eds). 2015. The 2015 Eskom Red Data Book of birds of South Africa, Lesotho and Swaziland. BirdLife South Africa, Johannesburg.
- Hockey, P.A.R., Dean, W.R.J. & Ryan, P.G. (Eds). (2005). Roberts – Birds of Southern Africa, VIIth ed. The Trustees of the John Voelcker Bird Book Fund, Cape Town.
- Horvath, G., Blaho, M., Egri A., Kriska, G., Seres, I. & Robertson, B. 2010. Reducing the Maladaptive Attractiveness of Solar Panels to Polarotactic Insects *Conservation biology* 24 (6) 1644-1653
- IUCN. (2021). The IUCN Red List of Threatened Species. www.iucnredlist.org
- Jenkins, A.R., van Rooyen, C.S., Smallie, J.J., Harrison, J.A., Diamond, M., Smit-Robinson, H.A. & Ralston, S. 2015. Birds and Wind-Energy Best-Practice Guidelines. Birds and Wind-Energy Best-Practice Guidelines.
- Lovich, J.E. & Ennen, J.R. 2011. Wildlife conservation and solar energy development in the desert southwest, United States. *BioScience* 61:982-992.
- Prinsen, H.A.M., Smallie, J.J., Boere, G.C. & Pires, N. (Compilers). 2012. Guidelines on How to Avoid or Mitigate Impact of Electricity Power Grids on Migratory Birds in the African-Eurasian Region. AEWa Conservation Guidelines No. 14, CMS Technical Series No. 29, AEWa Technical Series No. 50, CMS Raptors MOU Technical Series No. 3, Bonn, Germany.

Ralston Paton, S., Smallie J., Pearson A., & Ramalho, R. 2017. Wind energy's impacts on birds in South Africa: A preliminary review of the results of operational monitoring at the first wind farms of the Renewable Energy Independent Power Producer Procurement Programme in South Africa. BirdLife South Africa Occasional Report Series No. 2. BirdLife South Africa, Johannesburg, South Africa

Shaw, J.M., Reid, T.A., Gibbons, B.K., Pretorius, M., Jenkins, A.R., Visagie, R., Michael, M.D. & Ryan, P.G. 2021. A large-scale experiment demonstrates that line marking reduces power line collision mortality for large terrestrial birds, but not bustards, in the Karoo, South Africa. *Ornithological Applications*, 123: 1-10.

Skowno, A.L., Raimondo, D.C., Poole, C.J., Fizzotti, B. & Slingsby, J.A. (eds.). 2019. South African National Biodiversity Assessment 2018 Technical Report Volume 1: Terrestrial Realm. South African National Biodiversity Institute, Pretoria.

South African National Biodiversity Institute (SANBI). 2016. Lexicon of Biodiversity Planning in South Africa. Beta Version, June 2016. South African National Biodiversity Institute, Pretoria. 72 pp.

South African National Biodiversity Institute (SANBI). 2017. Technical guidelines for CBA Maps: Guidelines for developing a map of Critical Biodiversity Areas & Ecological Support Areas using systematic biodiversity planning. Driver, A., Holness, S. & Daniels, F. (Eds). 1st Edition. South African National Biodiversity Institute, Pretoria.

South African National Biodiversity Institute (SANBI). 2020. Species Environmental Assessment Guideline. Guidelines for the implementation of the Terrestrial Fauna and Terrestrial Flora Species Protocols for environmental impact assessments in South Africa. South African National Biodiversity Institute, Pretoria.

Van Deventer, H., Smith-Adao, L., Mbona, N., Petersen, C., Skowno, A., Collins, N.B., Grenfell, M., Job, N., Lötter, M., Ollis, D., Scherman, P., Sieben, E. & Snaddon, K. 2018. South African National Biodiversity Assessment 2018: Technical Report. Volume 2a: South African Inventory of Inland Aquatic Ecosystems (SAIIAE). Version 3, final released on 3 October 2019. Council for Scientific and Industrial Research (CSIR) and South African National Biodiversity Institute (SANBI): Pretoria, South Africa.

Visser, Elke & Perold, V. & Ralston-Paton, S. & Cardenal, A. C. & Ryan, P.G., 2019. "Assessing the impacts of a utility-scale photovoltaic solar energy facility on birds in the Northern Cape, South Africa," *Renewable Energy*, Elsevier, vol. 133(C), pages 1285-1294.

11 Appendix Items

11.1 Appendix A: Summary of Expected species

Common Name	Scientific Name	Conservation Status	
		Regional	Global
<i>Acridotheres tristis</i>	Myna, Common	Unlisted	LC
<i>Acrocephalus arundinaceus</i>	Reed-warbler, Great	Unlisted	LC
<i>Acrocephalus baeticatus</i>	Reed-warbler, African	Unlisted	Unlisted
<i>Acrocephalus gracilirostris</i>	Swamp-warbler, Lesser	Unlisted	LC
<i>Actitis hypoleucos</i>	Sandpiper, Common	Unlisted	LC
<i>Actophilornis africanus</i>	Jacana, African	Unlisted	LC
<i>Afrotis afraoides</i>	Korhaan, Northern Black	Unlisted	LC
<i>Alopochen aegyptiaca</i>	Goose, Egyptian	Unlisted	LC
<i>Amadina erythrocephala</i>	Finch, Red-headed	Unlisted	LC
<i>Anas capensis</i>	Teal, Cape	Unlisted	LC
<i>Anas erythrorhyncha</i>	Teal, Red-billed	Unlisted	LC
<i>Anas sparsa</i>	Duck, African Black	Unlisted	LC
<i>Anas undulata</i>	Duck, Yellow-billed	Unlisted	LC
<i>Anhinga rufa</i>	Darter, African	Unlisted	LC
<i>Anser</i>	Goose, Domestic	Unlisted	LC
<i>Anthoscopus minutus</i>	Penduline-tit, Cape	Unlisted	LC
<i>Anthus cinnamomeus</i>	Pipit, African	Unlisted	LC
<i>Anthus leucophrys</i>	Pipit, Plain-backed	Unlisted	LC
<i>Anthus nicholsoni</i>	Nicholson's pipit	Unlisted	LC
<i>Anthus vaalensis</i>	Pipit, Buffy	Unlisted	LC
<i>Apus affinis</i>	Swift, Little	Unlisted	LC
<i>Apus</i>	Swift, Common	Unlisted	LC
<i>Apus barbatus</i>	Swift, African Black	Unlisted	LC
<i>Apus bradfieldi</i>	Swift, Bradfield's	Unlisted	LC
<i>Apus caffer</i>	Swift, White-rumped	Unlisted	LC
<i>Aquila rapax</i>	Eagle, Tawny	EN	VU
<i>Ardea alba</i>	Egret, Great	Unlisted	LC
<i>Ardea cinerea</i>	Heron, Grey	Unlisted	LC
<i>Ardea goliath</i>	Heron, Goliath	Unlisted	LC
<i>Ardea intermedia</i>	Egret, Yellow-billed (Intermediate)	Unlisted	LC
<i>Ardea melanocephala</i>	Heron, Black-headed	Unlisted	LC
<i>Ardea purpurea</i>	Heron, Purple	Unlisted	LC
<i>Ardeola ralloides</i>	Heron, Squacco	Unlisted	LC
<i>Ardeotis kori</i>	Bustard, Kori	NT	NT
<i>Asio capensis</i>	Owl, Marsh	Unlisted	LC

<i>Balearica regulorum</i>	Crane, Grey Crowned	EN	EN
<i>Batis pririt</i>	Batis, Pirit	Unlisted	LC
<i>Bostrychia hagedash</i>	Ibis, Hadedash	Unlisted	LC
<i>Brunhilda erythronotos</i>	Waxbill, Black Cheeked	Unlisted	LC
<i>Bubo africanus</i>	Eagle-owl, Spotted	Unlisted	LC
<i>Bubo capensis</i>	Eagle-Owl, Cape	Unlisted	LC
<i>Bubo lacteus</i>	Eagle-owl, Verreaux's	Unlisted	LC
<i>Bubulcus ibis</i>	Egret, Cattle	Unlisted	LC
<i>Burhinus capensis</i>	Thick-knee, Spotted	Unlisted	LC
<i>Buteo</i>	Buzzard, Common (Steppe)	Unlisted	LC
<i>Butorides striata</i>	Heron, Green-backed	Unlisted	LC
<i>Calamonastes fasciolatus</i>	Wren-warbler, Barred	Unlisted	LC
<i>Calandrella cinerea</i>	Lark, Red-capped	Unlisted	LC
<i>Calendulauda africanoides</i>	Lark, Fawn-coloured	Unlisted	LC
<i>Calendulauda sabota</i>	Lark, Sabota	Unlisted	LC
<i>Calidris ferruginea</i>	Sandpiper, Curlew	LC	NT
<i>Calidris minuta</i>	Stint, Little	LC	LC
<i>Calidris pugnax</i>	Ruff	Unlisted	LC
<i>Campethera abingoni</i>	Woodpecker, Golden-tailed	Unlisted	LC
<i>Caprimulgus rufigena</i>	Nightjar, Rufous-cheeked	Unlisted	LC
<i>Cecropis cucullata</i>	Swallow, Greater Striped	Unlisted	LC
<i>Cecropis semirufa</i>	Swallow, Red-breasted	Unlisted	LC
<i>Centropus burchellii</i>	Coucal, Burchell's	Unlisted	Unlisted
<i>Cercotrichas coryphoeus</i>	Scrub-robin, Karoo	Unlisted	LC
<i>Cercotrichas paena</i>	Scrub-robin, Kalahari	Unlisted	LC
<i>Ceryle rudis</i>	Kingfisher, Pied	Unlisted	LC
<i>Charadrius hiaticula</i>	Plover, Common Ringed	Unlisted	LC
<i>Charadrius pallidus</i>	Plover, Chestnut-banded	NT	NT
<i>Charadrius pecuarius</i>	Plover, Kittlitz's	Unlisted	LC
<i>Charadrius tricollaris</i>	Plover, Three-banded	Unlisted	LC
<i>Chersomanes albofasciata</i>	Lark, Spike-heeled	Unlisted	LC
<i>Chlidonias hybrida</i>	Tern, Whiskered	Unlisted	LC
<i>Chlidonias leucopterus</i>	Tern, White-winged	Unlisted	LC
<i>Chlidonias niger</i>	Tern, Black	Unlisted	LC
<i>Chroicocephalus cirrocephalus</i>	Gull, Grey-headed	Unlisted	LC
<i>Chrysococcyx caprius</i>	Cuckoo, Diderick	Unlisted	LC
<i>Chrysococcyx klaas</i>	Cuckoo, Klaas's	Unlisted	LC
<i>Ciconia abdimii</i>	Stork, Abdim's	NT	LC
<i>Ciconia ciconia</i>	Stork, White	Unlisted	LC

<i>Ciconia nigra</i>	Stork, Black	VU	LC
<i>Cinnyris fuscus</i>	Sunbird, Dusky	Unlisted	LC
<i>Cinnyris mariquensis</i>	Sunbird, Marico	Unlisted	LC
<i>Cinnyris talatala</i>	Sunbird, White-bellied	Unlisted	LC
<i>Circaetus cinereus</i>	Snake-eagle, Brown	Unlisted	LC
<i>Circaetus pectoralis</i>	Snake-eagle, Black-chested	Unlisted	LC
<i>Circus pygargus</i>	Montagu's Harrier	Unlisted	LC
<i>Circus ranivorus</i>	Marsh-harrier, African	EN	LC
<i>Cisticola aridulus</i>	Cisticola, Desert	Unlisted	LC
<i>Cisticola ayresii</i>	Cisticola, Wing-snapping	Unlisted	LC
<i>Cisticola chiniana</i>	Cisticola, Rattling	Unlisted	LC
<i>Cisticola fulvicapilla</i>	Neddicky, Neddicky	Unlisted	LC
<i>Cisticola juncidis</i>	Cisticola, Zitting	Unlisted	LC
<i>Cisticola subruficapilla</i>	Cisticola, Grey-backed	Unlisted	LC
<i>Cisticola textrix</i>	Cisticola, Cloud	Unlisted	LC
<i>Cisticola tinniens</i>	Cisticola, Levallant's	Unlisted	LC
<i>Clamator glandarius</i>	Cuckoo, Great Spotted	Unlisted	LC
<i>Clamator jacobinus</i>	Cuckoo, Jacobin	Unlisted	LC
<i>Colius colius</i>	Mousebird, White-backed	Unlisted	LC
<i>Colius striatus</i>	Mousebird, Speckled	Unlisted	LC
<i>Columba guinea</i>	Pigeon, Speckled	Unlisted	LC
<i>Columba livia</i>	Dove, Rock	Unlisted	LC
<i>Coracias caudatus</i>	Roller, Lilac-breasted	Unlisted	LC
<i>Coracias garrulus</i>	Roller, European	NT	LC
<i>Corvus albus</i>	Crow, Pied	Unlisted	LC
<i>Corythornis cristatus</i>	Kingfisher, Malachite	Unlisted	Unlisted
<i>Cossypha caffra</i>	Robin-chat, Cape	Unlisted	LC
<i>Cossypha humeralis</i>	Robin-chat, White-throated	Unlisted	LC
<i>Coturnix coturnix</i>	Quail, Common	Unlisted	LC
<i>Coturnix delegorguei</i>	Quail, Harlequin	Unlisted	LC
<i>Creatophora cinerea</i>	Starling, Wattled	Unlisted	LC
<i>Crecopsis egregia</i>	Crake, African	Unlisted	LC
<i>Crinifer concolor</i>	Go-away-bird, Grey	Unlisted	LC
<i>Crithagra albogularis</i>	White-throated Canary	LC	LC
<i>Crithagra atrogularis</i>	Canary, Black-throated	Unlisted	LC
<i>Crithagra flaviventris</i>	Canary, Yellow	Unlisted	LC
<i>Cuculus clamosus</i>	Cuckoo, Black	Unlisted	LC
<i>Cuculus gularis</i>	Cuckoo, African	Unlisted	LC
<i>Curruca layardi</i>	Tit-Babbler, Layard's	Unlisted	LC

<i>Curruca subcoerulea</i>	Tit-babbler, Chestnut-vented	Unlisted	Unlisted
<i>Cursorius rufus</i>	Courser, Burchell's	VU	LC
<i>Cursorius temminckii</i>	Courser, Temminck's	Unlisted	LC
<i>Cypsiurus parvus</i>	Palm-swift, African	Unlisted	LC
<i>Delichon urbicum</i>	House-martin, Common	Unlisted	LC
<i>Dendrocygna bicolor</i>	Duck, Fulvous	Unlisted	LC
<i>Dendrocygna viduata</i>	Duck, White-faced Whistling	Unlisted	LC
<i>Dendropicos fuscescens</i>	Woodpecker, Cardinal	Unlisted	LC
<i>Dicrurus adsimilis</i>	Drongo, Fork-tailed	Unlisted	LC
<i>Egretta garzetta</i>	Egret, Little	Unlisted	LC
<i>Elanus caeruleus</i>	Kite, Black-shouldered	Unlisted	LC
<i>Emarginata sinuata</i>	Chat, Sickle-winged	Unlisted	LC
<i>Emberiza capensis</i>	Bunting, Cape	Unlisted	LC
<i>Emberiza flaviventris</i>	Bunting, Golden-breasted	Unlisted	LC
<i>Emberiza impetruani</i>	Bunting, Lark-like	Unlisted	LC
<i>Emberiza tahapisi</i>	Bunting, Cinnamon-breasted	Unlisted	LC
<i>Eremomela icteropygialis</i>	Eremomela, Yellow-bellied	Unlisted	LC
<i>Eremopterix leucotis</i>	Sparrowlark, Chestnut-backed	Unlisted	LC
<i>Eremopterix verticalis</i>	Sparrowlark, Grey-backed	Unlisted	LC
<i>Estrilda astrild</i>	Waxbill, Common	Unlisted	LC
<i>Euplectes afer</i>	Bishop, Yellow-crowned	Unlisted	LC
<i>Euplectes orix</i>	Bishop, Southern Red	Unlisted	LC
<i>Falco amurensis</i>	Falcon, Amur	Unlisted	LC
<i>Falco biarmicus</i>	Falcon, Lanner	VU	LC
<i>Falco naumanni</i>	Kestrel, Lesser	Unlisted	LC
<i>Falco peregrinus</i>	Falcon, Peregrine	Unlisted	LC
<i>Falco rupicoloides</i>	Kestrel, Greater	Unlisted	LC
<i>Falco rupicolus</i>	Kestrel, Rock	Unlisted	LC
<i>Falco subbuteo</i>	Hobby, Eurasian	Unlisted	LC
<i>Fulica cristata</i>	Coot, Red-knobbed	Unlisted	LC
<i>Galerida magnirostris</i>	Lark, Large-billed	Unlisted	LC
<i>Gallinago nigripennis</i>	Snipe, African	Unlisted	LC
<i>Gallinula chloropus</i>	Moorhen, Common	Unlisted	LC
<i>Glaucidium perlatum</i>	Owlet, Pearl-spotted	Unlisted	LC
<i>Granatina granatina</i>	Waxbill, Violet-eared	Unlisted	LC
<i>Gyps africanus</i>	Vulture, White-backed	CR	CR
<i>Gyps coprotheres</i>	Vulture, Cape	EN	EN
<i>Halcyon albiventris</i>	Kingfisher, Brown-hooded	Unlisted	LC
<i>Halcyon chelicuti</i>	Kingfisher, Striped	Unlisted	LC

<i>Haliaeetus vocifer</i>	Fish-eagle, African	Unlisted	LC
<i>Hieraetus pennatus</i>	Eagle, Booted	Unlisted	LC
<i>Himantopus himantopus</i>	Stilt, Black-winged	Unlisted	LC
<i>Hippolais icterina</i>	Warbler, Icterine	Unlisted	LC
<i>Hirundo albicularis</i>	Swallow, White-throated	Unlisted	LC
<i>Hirundo dimidiata</i>	Swallow, Pearl-breasted	Unlisted	LC
<i>Hirundo rustica</i>	Swallow, Barn	Unlisted	LC
<i>Indicator indicator</i>	Honeyguide, Greater	Unlisted	LC
<i>Indicator minor</i>	Honeyguide, Lesser	Unlisted	LC
<i>Ixobrychus minutus</i>	Bittern, Little	Unlisted	LC
<i>Lagonosticta rhodopareia</i>	Firefinch, Jameson's	Unlisted	LC
<i>Lagonosticta senegala</i>	Firefinch, Red-billed	Unlisted	LC
<i>Lamprotornis bicolor</i>	Starling, Pied	Unlisted	LC
<i>Lamprotornis nitens</i>	Starling, Cape Glossy	Unlisted	LC
<i>Laniarius atrococcineus</i>	Shrike, Crimson-breasted	Unlisted	LC
<i>Lanius collaris</i>	Fiscal, Common (Southern)	Unlisted	LC
<i>Lanius collurio</i>	Shrike, Red-backed	Unlisted	LC
<i>Lanius minor</i>	Shrike, Lesser Grey	Unlisted	LC
<i>Lophoceros nasutus</i>	Hornbill, African Grey	Unlisted	LC
<i>Lophotis ruficrista</i>	Korhaan, Red-crested	Unlisted	LC
<i>Lybius torquatus</i>	Barbet, Black-collared	Unlisted	LC
<i>Macronyx capensis</i>	Longclaw, Cape	Unlisted	LC
<i>Malcorus pectoralis</i>	Warbler, Rufous-eared	Unlisted	LC
<i>Megaceryle maxima</i>	Kingfisher, Giant	Unlisted	Unlisted
<i>Melaenornis infuscatus</i>	Flycatcher, Chat	Unlisted	LC
<i>Melaenornis mariquensis</i>	Flycatcher, Marico	Unlisted	LC
<i>Melaenornis silens</i>	Flycatcher, Fiscal	Unlisted	LC
<i>Melaniparus cinerascens</i>	Tit, Ashy	Unlisted	LC
<i>Melierax canorus</i>	Goshawk, Southern Pale Chanting	Unlisted	LC
<i>Merops apiaster</i>	Bee-eater, European	Unlisted	LC
<i>Merops bullockoides</i>	Bee-eater, White-fronted	Unlisted	LC
<i>Merops hirundineus</i>	Bee-eater, Swallow-tailed	Unlisted	LC
<i>Merops persicus</i>	Bee-eater, Blue-cheeked	Unlisted	LC
<i>Merops pusillus</i>	Bee-eater, Little	Unlisted	LC
<i>Microcarbo africanus</i>	Cormorant, Reed	Unlisted	LC
<i>Micronisus gabar</i>	Goshawk, Gabar	Unlisted	LC
<i>Mirafraga africana</i>	Lark, Rufous-naped	Unlisted	LC
<i>Mirafraga fasciolata</i>	Lark, Eastern Clapper	Unlisted	LC
<i>Mirafraga passerina</i>	Lark, Monotonous	Unlisted	LC

<i>Monticola brevipes</i>	Rock-thrush, Short-toed	Unlisted	LC
<i>Motacilla capensis</i>	Wagtail, Cape	Unlisted	LC
<i>Muscicapa striata</i>	Flycatcher, Spotted	Unlisted	LC
<i>Mycteria ibis</i>	Stork, Yellow-billed	EN	LC
<i>Myrmecocichla formicivora</i>	Chat, Anteater	Unlisted	LC
<i>Myrmecocichla monticola</i>	Wheatear, Mountain	Unlisted	LC
<i>Neotis ludwigii</i>	Bustard, Ludwig's	EN	EN
<i>Netta erythrophthalma</i>	Pochard, Southern	Unlisted	LC
<i>Nilaus afer</i>	Brubru	Unlisted	LC
<i>Numenius phaeopus</i>	Whimbrel, Common	Unlisted	LC
<i>Numida meleagris</i>	Guineafowl, Helmeted	Unlisted	LC
<i>Nycticorax nycticorax</i>	Night-Heron, Black-crowned	Unlisted	LC
<i>Oena capensis</i>	Dove, Namaqua	Unlisted	LC
<i>Oenanthe familiaris</i>	Chat, Familiar	Unlisted	LC
<i>Oenanthe pileata</i>	Wheatear, Capped	Unlisted	LC
<i>Onychognathus nabouroup</i>	Starling, Pale-winged	Unlisted	LC
<i>Ortygospiza atricollis</i>	Quailfinch, African	Unlisted	LC
<i>Oxyura maccoa</i>	Duck, Maccoa	NT	VU
<i>Passer diffusus</i>	Sparrow, Southern Grey-headed	Unlisted	LC
<i>Passer domesticus</i>	Sparrow, House	Unlisted	LC
<i>Passer melanurus</i>	Sparrow, Cape	Unlisted	LC
<i>Passer motitensis</i>	Sparrow, Great	Unlisted	LC
<i>Pavo cristatus</i>	Peacock, Common	Unlisted	LC
<i>Petrochelidon spilodera</i>	Cliff-swallow, South African	Unlisted	LC
<i>Phalacrocorax lucidus</i>	Cormorant, White-breasted	Unlisted	LC
<i>Philetairus socius</i>	Weaver, Sociable	Unlisted	LC
<i>Phoeniconaias minor</i>	Flamingo, Lesser	NT	NT
<i>Phoenicopterus roseus</i>	Flamingo, Greater	NT	LC
<i>Phoeniculus purpureus</i>	Wood-hoopoe, Green	Unlisted	LC
<i>Phylloscopus trochilus</i>	Warbler, Willow	Unlisted	LC
<i>Platalea alba</i>	Spoonbill, African	Unlisted	LC
<i>Plectropterus gambensis</i>	Goose, Spur-winged	Unlisted	LC
<i>Plegadis falcinellus</i>	Ibis, Glossy	Unlisted	LC
<i>Plocepasser mahali</i>	Sparrow-weaver, White-browed	Unlisted	LC
<i>Ploceus capensis</i>	Weaver, Cape	Unlisted	LC
<i>Ploceus velatus</i>	Masked-weaver, Southern	Unlisted	LC
<i>Podiceps cristatus</i>	Grebe, Great Crested	Unlisted	LC
<i>Podiceps nigricollis</i>	Grebe, Black-necked	Unlisted	LC
<i>Polemaetus bellicosus</i>	Eagle, Martial	EN	EN

<i>Polihierax semitorquatus</i>	Falcon, Pygmy	Unlisted	LC
<i>Porphyrio madagascariensis</i>	Swamphen, African Purple	Unlisted	Unlisted
<i>Prinia flavicans</i>	Prinia, Black-chested	Unlisted	LC
<i>Prodotiscus regulus</i>	Honeybird, Brown-backed	Unlisted	LC
<i>Psittacula krameri</i>	Parakeet, Rose-ringed	Unlisted	LC
<i>Pternistis natalensis</i>	Spurfowl, Natal	Unlisted	LC
<i>Pternistis swainsonii</i>	Spurfowl, Swainson's	Unlisted	LC
<i>Pterocles burchelli</i>	Sandgrouse, Burchell's	Unlisted	LC
<i>Pterocles namaqua</i>	Sandgrouse, Namaqua	Unlisted	LC
<i>Ptilopsis granti</i>	Scops-owl, Southern White-faced	Unlisted	Unlisted
<i>Ptyonoprogne fuligula</i>	Martin, Rock	Unlisted	Unlisted
<i>Pycnonotus nigricans</i>	Bulbul, African Red-eyed	Unlisted	LC
<i>Pytilia melba</i>	Pytilia, Green-winged	Unlisted	LC
<i>Quelea quelea</i>	Quelea, Red-billed	Unlisted	LC
<i>Recurvirostra avosetta</i>	Avocet, Pied	Unlisted	LC
<i>Rhinopomastus cyanomelas</i>	Scimitarbill, Common	Unlisted	LC
<i>Rhinoptilus africanus</i>	Courser, Double-banded	Unlisted	LC
<i>Riparia cincta</i>	Martin, Banded	Unlisted	LC
<i>Riparia paludicola</i>	Martin, Brown-throated	Unlisted	LC
<i>Riparia riparia</i>	Martin, Sand	Unlisted	LC
<i>Rostratula benghalensis</i>	Painted-snipe, Greater	NT	LC
<i>Sagittarius serpentarius</i>	Secretarybird	VU	EN
<i>Sarkidiornis melanotos</i>	Duck, Comb	Unlisted	LC
<i>Saxicola torquatus</i>	Stonechat, African	Unlisted	LC
<i>Scleroptila gutturalis</i>	Francolin, Orange River	Unlisted	LC
<i>Scopus umbretta</i>	Hamerkop, Hamerkop	Unlisted	LC
<i>Spatula hottentota</i>	Teal, Hottentot	Unlisted	LC
<i>Spatula smithii</i>	Shoveler, Cape	Unlisted	LC
<i>Spilopelia senegalensis</i>	Dove, Laughing	Unlisted	LC
<i>Spizocorys conirostris</i>	Lark, Pink-billed	Unlisted	LC
<i>Spizocorys starki</i>	Lark, Stark's	Unlisted	LC
<i>Sporopipes squamifrons</i>	Finch, Scaly-feathered	Unlisted	LC
<i>Stenostira scita</i>	Flycatcher, Fairy	Unlisted	LC
<i>Streptopelia capicola</i>	Turtle-dove, Cape	Unlisted	LC
<i>Streptopelia semitorquata</i>	Dove, Red-eyed	Unlisted	LC
<i>Struthio camelus</i>	Ostrich, Common	Unlisted	LC
<i>Sturnus vulgaris</i>	Starling, Common	Unlisted	LC
<i>Sylvietta rufescens</i>	Crombec, Long-billed	Unlisted	LC
<i>Tachybaptus ruficollis</i>	Grebe, Little	Unlisted	LC

<i>Tachymarpis melba</i>	Swift, Alpine	Unlisted	LC
<i>Tadorna cana</i>	Shelduck, South African	Unlisted	LC
<i>Tchagra australis</i>	Tchagra, Brown-crowned	Unlisted	LC
<i>Telophorus zeylonus</i>	Bokmakierie, Bokmakierie	Unlisted	LC
<i>Terpsiphone viridis</i>	Paradise-flycatcher, African	Unlisted	LC
<i>Thalassornis leuconotus</i>	Duck, White-backed	Unlisted	LC
<i>Threskiornis aethiopicus</i>	Ibis, African Sacred	Unlisted	LC
<i>Tockus leucomelas</i>	Hornbill, Southern Yellow-billed	Unlisted	LC
<i>Torgos tracheliotos</i>	Vulture, Lappet-faced	EN	EN
<i>Trachyphonus vaillantii</i>	Barbet, Crested	Unlisted	LC
<i>Tricholaema leucomelas</i>	Barbet, Acacia Pied	Unlisted	LC
<i>Tringa glareola</i>	Sandpiper, Wood	Unlisted	LC
<i>Tringa nebularia</i>	Greenshank, Common	Unlisted	LC
<i>Tringa stagnatilis</i>	Sandpiper, Marsh	Unlisted	LC
<i>Turdus litsitsirupa</i>	Thrush, Groundscraper	Unlisted	Unlisted
<i>Turdus smithi</i>	Thrush, Karoo	Unlisted	LC
<i>Tyto alba</i>	Owl, Barn	Unlisted	LC
<i>Upupa africana</i>	Hoopoe, African	Unlisted	LC
<i>Uraeginthus angolensis</i>	Waxbill, Blue	Unlisted	LC
<i>Urocolius indicus</i>	Mousebird, Red-faced	Unlisted	LC
<i>Urolestes melanoleucus</i>	Shrike, Magpie	Unlisted	LC
<i>Vanellus armatus</i>	Lapwing, Blacksmith	Unlisted	LC
<i>Vanellus coronatus</i>	Lapwing, Crowned	Unlisted	LC
<i>Vidua chalybeata</i>	Indigobird, Village	Unlisted	LC
<i>Vidua macroura</i>	Whydah, Pin-tailed	Unlisted	LC
<i>Vidua paradisaea</i>	Paradise-whydah, Long-tailed	Unlisted	LC
<i>Vidua regia</i>	Whydah, Shaft-tailed	Unlisted	LC
<i>Zapornia flavirostra</i>	Crake, Black	Unlisted	LC
<i>Zosterops pallidus</i>	White-eye, Orange River	Unlisted	LC
<i>Zosterops virens</i>	White-eye, Cape	Unlisted	LC

11.2 Appendix B: Point count data of survey 3

Scientific Name	Alphabetical Name	Regional Status (SANBI 2016)	Global Status (IUCN 2017)	relative abundance	frequency	Guild code
<i>Afrotis afraoides</i>	Korhaan, Northern Black			0,039	56,098	IGD
<i>Alopochen aegyptiaca</i>	Goose, Egyptian			0,023	4,878	HWD
<i>Anas capensis</i>	Teal, Cape			0,020	2,439	OMD
<i>Anas erythrorhynchos</i>	Teal, Red-billed			0,024	2,439	OMD
<i>Apus affinis</i>	Swift, Little			0,002	4,878	IAD
<i>Bubulcus ibis</i>	Egret, Western Cattle			0,020	9,756	IGD
<i>Calandrella cinerea</i>	Lark, Red-capped			0,001	2,439	GGD
<i>Calidris ferruginea</i>	Sandpiper, Curlew	LC	NT	0,063	2,439	IWD
<i>Calidris minuta</i>	Stint, Little			0,014	2,439	IWD
<i>Cecropis cucullata</i>	Swallow, Greater Striped			0,003	4,878	IAD
<i>Charadrius hiaticula</i>	Plover, Common Ringed			0,007	2,439	IWD
<i>Charadrius pecuarius</i>	Plover, Kittlitz's			0,001	2,439	IWD
<i>Chersomanes albofasciata</i>	Lark, Spike-heeled			0,018	19,512	IGD
<i>Cisticola aridulus</i>	Cisticola, Desert			0,094	92,683	IGD
<i>Cisticola juncidis</i>	Cisticola, Zitting			0,001	2,439	IGD
<i>Columba guinea</i>	Pigeon, Speckled			0,002	4,878	FFD
<i>Corvus albus</i>	Crow, Pied			0,005	7,317	OMD
<i>Dendrocygna bicolor</i>	Duck, Fulvous Whistling			0,017	2,439	OMD
<i>Dendrocygna viduata</i>	Duck, White-faced Whistling			0,075	4,878	HWD
<i>Elanus caeruleus</i>	Kite, Black-winged			0,001	2,439	CGD
<i>Euplectes orix</i>	Bishop, Southern Red			0,003	2,439	GGD
<i>Euplectes progne</i>	Widowbird, Long-tailed			0,001	2,439	GGD
<i>Falco naumanni</i>	Kestrel, Lesser			0,038	9,756	CGD
<i>Falco rupicoloides</i>	Kestrel, Greater			0,001	2,439	CGD
<i>Fulica cristata</i>	Coot, Red-knobbed			0,031	2,439	HWD
<i>Gallinula chloropus</i>	Moorhen, Common			0,038	2,439	HWD
<i>Himantopus himantopus</i>	Stilt, Black-winged			0,051	2,439	IWD
<i>Hirundo albigularis</i>	Swallow, White-throated			0,002	4,878	IAD
<i>Hirundo rustica</i>	Swallow, Barn			0,106	39,024	IAD
<i>Lophotis ruficrista</i>	Korhaan, Red-crested			0,001	2,439	IGD
<i>Merops apiaster</i>	Bee-eater, European			0,002	4,878	IAD
<i>Mirafra africana</i>	Lark, Rufous-naped			0,002	2,439	IGD
<i>Mirafra fasciolata</i>	Lark, Eastern Clapper			0,040	39,024	IGD
<i>Motacilla capensis</i>	Wagtail, Cape			0,002	2,439	IGD
<i>Myrmecocichla formicivora</i>	Chat, Ant-eating			0,013	12,195	IGD
<i>Netta erythrophthalma</i>	Pochard, Southern			0,009	2,439	OMD

Scientific Name	Alphabetical Name	Regional Status (SANBI 2016)	Global Status (IUCN 2017)	relative abundance	frequency	Guild code
<i>Oena capensis</i>	Dove, Namaqua			0,001	2,439	GGD
<i>Ortygospiza atricollis</i>	Quailfinch			0,003	2,439	GGD
<i>Passer melanurus</i>	Sparrow, Cape			0,001	2,439	GGD
<i>Petrochelidon spilodera</i>	Swallow, South African Cliff			0,010	2,439	IAD
<i>Phoeniconaias minor</i>	Flamingo, Lesser	NT	NT	0,092	2,439	IWD
<i>Plocepasser mahali</i>	Sparrow-weaver, White-browed			0,003	4,878	OMD
<i>Ploceus velatus</i>	Weaver, Southern Masked			0,001	2,439	GGD
<i>Prinia flavicans</i>	Prinia, Black-chested			0,001	2,439	IGD
<i>Pterocles burchelli</i>	Sandgrouse, Burchell's			0,005	4,878	GGD
<i>Recurvirostra avosetta</i>	Avocet, Pied			0,039	2,439	IWD
<i>Scleroptila gutturalis</i>	Francolin, Orange River			0,002	2,439	GGD
<i>Spatula smithii</i>	Shoveler, Cape			0,007	2,439	OMD
<i>Streptopelia capicola</i>	Dove, Cape Turtle (Ring-necked)			0,002	4,878	GGD
<i>Tadorna cana</i>	Shelduck, South African			0,024	4,878	OMD
<i>Threskiornis aethiopicus</i>	Ibis, African Sacred			0,007	4,878	CGD
<i>Tringa stagnatilis</i>	Sandpiper, Marsh			0,007	2,439	IWD
<i>Vanellus armatus</i>	Lapwing, Blacksmith			0,016	2,439	IGD
<i>Vanellus coronatus</i>	Lapwing, Crowned			0,003	2,439	IGD

11.3 Appendix C: Incidental records during survey 3

Scientific Name	Alphabetical Name	Regional status (SANBI 2016)	Global Status (2017)
<i>Acrocephalus gracilirostris</i>	Warbler, Lesser Swamp		
<i>Afrotis afraoides</i>	Korhaan, Northern Black		
<i>Anas undulata</i>	Duck, Yellow-billed		
<i>Apus affinis</i>	Swift, Little		
<i>Ardea cinerea</i>	Heron, Grey		
<i>Ardea melanocephala</i>	Heron, Black-headed		
<i>Bostrychia hagedash</i>	Ibis, Hadedda (Hadedda)		
<i>Bubulcus ibis</i>	Egret, Western Cattle		
<i>Burhinus capensis</i>	Thick-knee, Spotted		
<i>Calendulauda africanoides</i>	Lark, Fawn-colored		
<i>Calidris pugnax</i>	Ruff		
<i>Cecropis cucullata</i>	Swallow, Greater Striped		
<i>Charadrius tricollaris</i>	Plover, Three-banded		
<i>Chersomanes albofasciata</i>	Lark, Spike-heeled		
<i>Chlidonias leucopterus</i>	Tern, White-winged		
<i>Cinnyris talatala</i>	Sunbird, White-bellied		
<i>Cisticola tinniens</i>	Cisticola, Levallant's		
<i>Columba guinea</i>	Pigeon, Speckled		
<i>Corvus albus</i>	Crow, Pied		
<i>Corythornis cristatus</i>	Kingfisher, Malachite		
<i>Creatophora cinerea</i>	Starling, Wattled		
<i>Curruca subcoerulea</i>	Warbler, Chestnut-vented		
<i>Cypsiurus parvus</i>	Swift, African Palm		
<i>Dendrocygna viduata</i>	Duck, White-faced Whistling		
<i>Dicrurus adsimilis</i>	Drongo, Fork-tailed		
<i>Elanus caeruleus</i>	Kite, Black-winged		
<i>Euplectes orix</i>	Bishop, Southern Red		
<i>Falco rupicolus</i>	Kestrel, Rock		
<i>Fulica cristata</i>	Coot, Red-knobbed		
<i>Gallinula chloropus</i>	Moorhen, Common		
<i>Gyps africanus</i>	Vulture, White-backed	CR	CR
<i>Lagonosticta senegala</i>	Firefinch, Red-billed		
<i>Lanius collaris</i>	Fiscal, Southern		
<i>Lanius collurio</i>	Shrike, Red-backed		
<i>Melaenornis silens</i>	Flycatcher, Fiscal		
<i>Merops bullockoides</i>	Bee-eater, White-fronted		
<i>Mirafr africana</i>	Lark, Rufous-naped		
<i>Mirafr fasciolata</i>	Lark, Eastern Clapper		
<i>Motacilla capensis</i>	Wagtail, Cape		
<i>Myrmecocichla formicivora</i>	Chat, Ant-eating		
<i>Numida meleagris</i>	Guineafowl, Helmeted		
<i>Nycticorax nycticorax</i>	Heron, Black-crowned Night		

Scientific Name	Alphabetical Name	Regional status (SANBI 2016)	Global Status (2017)
<i>Passer diffusus</i>	Sparrow, Southern Grey-headed		
<i>Passer domesticus</i>	Sparrow, House		
<i>Platalea alba</i>	Spoonbill, African		
<i>Plegadis falcinellus</i>	Ibis, Glossy		
<i>Plocepasser mahali</i>	Sparrow-weaver, White-browed		
<i>Prinia flavicans</i>	Prinia, Black-chested		
<i>Pternistis swainsonii</i>	Spurfowl, Swainson's		
<i>Pterocles burchelli</i>	Sandgrouse, Burchell's		
<i>Pycnonotus nigricans</i>	Bulbul, African Red-eyed		
<i>Pytilia melba</i>	Pytilia, Green-winged		
<i>Sagittarius serpentarius</i>	Secretarybird	VU	EN
<i>Scleroptila gutturalis</i>	Francois, Orange River		
<i>Spizocorys conirostris</i>	Lark, Pink-billed		
<i>Sporopipes squamifrons</i>	Weaver, Scaly-feathered		
<i>Tachybaptus ruficollis</i>	Grebe, Little		
<i>Trachyphonus vaillantii</i>	Barbet, Crested		
<i>Turnix sylvaticus</i>	Buttonquail, Common (Kurrichane)		
<i>Vanellus armatus</i>	Lapwing, Blacksmith		
<i>Vanellus coronatus</i>	Lapwing, Crowned		

11.4 Appendix F: Specialist Declaration of Independence

I, Leigh-Ann de Wet, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations, and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan, or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.



Leigh-Ann de Wet

Biodiversity Specialist

The Biodiversity Company

November 2022