AVIFAUNAL SPECIALIST ASSESSMENT FOR THE PROPOSED BRAKPAN 1 SOLAR ENERGY FACILITY NEAR NELSPOORT, WESTERN CAPE

FOR

Savannah Environmental (Pty) Ltd

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Prepared By:

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1 INTRODUCTION

Brakpan 1 Solar Energy Facility (Pty) Ltd (the 'Independent Power Producer') proposes to develop the Brakpan 1 Solar Energy Facility and its associated electrical infrastructure (the 'Project/Facility') approximately 15 km north-west of Nelspoort and 60km south-west of Beaufort West within the Central Karoo District Municipality in the Western Cape Province (Figure 1). The Project site is located within the Beaufort West Renewable Energy Development Zone ('REDZ 11') and the Central Transmission Corridor. The facility is to be developed with a maximum installed capacity of 220 MW and will have a generating capacity of 190 MW.

The Project is earmarked for submission into the South African Government's Renewable Independent Power Producer Procurement Programme ('REIPPPP') or for a Private Off-take.

The Project (Brakpan 1 Solar Energy Facility) is part of a cluster known as the Poortjie Wes Cluster (the 'Cluster'). The Cluster entails the development of six (6) solar energy facilities. All six solar energy facilities ('SEFs') will connect to the proposed 132 kV Belvedere Collector Switching Station (the 'Collector Switching Station') via 132 kV Overhead Lines ('OHLs'). The proposed Collector Switching Station will connect to the new Poortjie Wes 400/132 kV LILO MTS ('Poortjie Wes LILO MTS') via a 132 kV OHL.

A technically suitable project site of ~450 ha has been identified by Brakpan 1 Solar Energy Facility (Pty) Ltd for the establishment of the PV facility. The project site is located on the following property:

- The Farm Poortje No. 76, in the Kamdeboo Municipality, division of Murraysburg, Western Cape Province.

The development footprint for the facility allowing the facility to generate 190 MWac will be approximately 395 ha and will contain the following infrastructure:

Solar Facility

- PV modules (mono or bifacial);
- Single or dual axis tracking structures, Fixed Axis Tracking, or Fixed Panels;
- Fixed tilt mounting structure (to be considered during the design phase of the facility);
- Galvanised steel and/or aluminium solar module mounting structures;
- Solar module substructure foundations. These will likely be drilled into the ground, filled with concrete and then have posts fixed inside them. Alternately, ramming may be used; and
- 60 to 65 Central Inverter stations.

Building Infrastructure

- Offices;
- Operational and maintenance control centre;
- Warehouse/workshop;
- Panel maintenance and cleaning area;
- Ablution facilities;
- A conservancy tank for storage of sewage underground with a capacity of up to 35m^3; and
- Guard Houses.

Associated Infrastructure

- On-site substation building - IPP owned (including lightening conductor poles);
- Eskom switching station, to be handed over to Eskom at Commercial Operation Date ("COD") (this forms part of a separate BA);

- Battery storage (up to 500 MW/500 MWh);
- Internal distribution lines of up to 33 kV;
- Underground low voltage cables or cable trays;
- Internal gravel roads;
- Fencing;
- Stormwater channels;
- Temporary work area during the construction phase; and
- Access road to site from the existing District gravel road between Nelspoort and Murraysburg No. MR 587.

Part of the grid infrastructure to be built by the IPP will be owned and operated by Eskom Holdings (SOC) Ltd. ("Eskom") and forms part of a separate Basic Assessment Process. This includes:

- An onsite Switching Station;
- a 132kV OHL from each facility's onsite Switching Station to the Collector Switching Station or a 132 kV OHL from the onsite Switching Station to the new Poortjie Wes 400/132 kV LILO MTS; and
- Gravel service road beneath the 132 kV power line.

1.1 Terms of Reference

As no specific avifaunal protocol exists for a development of this nature, this report was developed following Government Gazette 43855 (GN. 1150) "*Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Animal Species*" dated 30 October 2020 ('The Protocol'), the Species Environmental Assessment Guideline[1] and the Birds and Solar Energy Best-Practice Guidelines[2] and the requirements prescribed therein.

The aims of the study were to:

- Determine the proposed Project Area of Influence ('PAOI') in relation to avifauna;
- Determine the avifaunal habitats present across the PAOI;
- Determine the potential avifaunal species that could occur across the PAOI;
- Determine the potential avifaunal Species of Conservation Concern ('SCCs') relevant to the proposed development activities;
- Determine the baseline avifaunal community present across the PAOI and summarise the results of the avifaunal monitoring programme;
- Determine the Site Ecological Importance ('SEI') of the PAOI in relation to the development activity proposed and relevant avifaunal SCCs;
- Produce an avifaunal sensitivity map to inform potential layout designs;
- Assess the potential impacts of the proposed development to the avifaunal community;
- Identify relevant mitigation measures (if any) to reduce the potential impact to the avifaunal community.

2 METHODS

The Protocol indicates that prior to commencing with a specialist assessment, the current use of the land and the potential environmental sensitivity of the site under consideration be confirmed by undertaking a site sensitivity verification ('SSV') that includes:

- A desktop analysis;

[1] 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. Version 2.1 2021.

[2] Jenkins, A.R., S. Ralston-Paton and Smit-Robinson, H.A. 2017. Birds & Solar Energy Best Practice Guidelines: Guidelines for assessing and monitoring the impact of solar power generating facilities on birds in southern Africa. BirdLife South Africa.

- A preliminary on-site inspection; and
- Any other available and relevant information.

This initial process aligns with the Birds and Solar Energy Best-Practice Guidelines which recommend that a Preliminary Avifaunal Assessment be undertaken to provide an initial assessment of the likely avifauna in the area to inform the likely assessment regime and data collection applicable.

2.1.1 Desktop Study

The desktop study included data obtained from the following sources:

- Broad vegetation types present on the project site were obtained from the updated National Vegetation Map 2018 (NVM 2018) database[3] and the vegetation descriptions were obtained from Mucina & Rutherford (2006)[4];
- Bird distribution data of the Southern African Bird Atlas Project 2 (SABAP2) obtained from the Avian Demography Unit of the University of Cape Town[5];
- Co-ordinated Avifaunal Road Count (CAR) project[6];
- Co-ordinated Water-bird Count (CWAC) project[7];
- The Important Bird Areas of southern Africa (IBA) project[8];
- Output from the National Web-based Screening Tool ('Screening Tool');
- Habitat suitability maps compiled by BirdLife South Africa;
- Publically available satellite imagery; and
- The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland[9].

2.1.2 Site Visits

A preliminary avifaunal assessment was conducted during an initial site visit used to inform the appropriate survey protocol applicable to determine the baseline avifaunal community of the proposed development site and included a nest survey.

The baseline avifaunal surveys included two site visits timed to record the maximum variation in climatic conditions and included the likely peak in avifaunal abundance. Rainfall is generally unpredictable in the area with sporadic events occurring throughout the year and not restricted to any particular season. Therefore, the timing of the avifaunal baseline monitoring was determined to align with the predicted breeding and display and breeding period of Ludwig's Bustard and Southern Black Korhaan (spring) and the peak presence of summer migratory species (summer).

A total of nine 200 m walk transects were conducted to determine the density and abundance of birds in and around the proposed facility. This included three transects within the development footprint area and six transects radiating outward from the proposed site boundary, parallel to the site boundary at 200 m, 500 m, 1 000 m, 1 500 m, 2 000 m and 2 500m perpendicular distance. Walk transects were conducted once per site visit.

[3] South African National Biodiversity Institute (2006-2018). The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors), Online, http://bgis.sanbi.org/Projects/Detail/186, Version 2018 accessed January 20 2020.

[4] Mucina, L. and Rutherford, M.C. (eds) 2006. The vegetation of South Africa, Lesotho and Swaziland, in Strelitzia 19. South African National Biodiversity Institute, Pretoria.

[5] http://sabap2.birdmap.africa/

[6] Young, D.J., Harrison, J.A, Navarro, R.A., Anderson, M.A., & Colahan, B.D. (Eds). 2003. Big birds on farms: Mazda CAR Report 1993-2001. Avian Demography Unit: Cape Town.

[7] Taylor, P.B., Navarro, R.A., Wren-Sargent, M., Harrison, J.A. & Kieswetter, S.L. 1999. Coordinated waterbird Counts in South Africa, 1992-1997. Avian Demography Unit, Cape Town.

[8] Marnewick, M.D., Retief, E.F., Theron, N.T., Wright, D.R., Anderson, T.A. 2015. Important Bird and Biodiversity Areas of South Africa. Johannesburg: BirdLife South Africa.

[9] Taylor, M.R., Peacock, F., and Wanless, R.M. 2015. Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland.

All components of the cluster were surveyed concurrently and therefore data obtained from additional walk transects, drive transects and vantage points associated with a proposed wind energy facility were also considered for the assessment.

2.1.2.1 Preliminary Avifaunal Assessment

- Date: 2020-11-09 to 2020-11-14
- Duration: 6 Days
- Season: Spring
- Season Relevance: The timing of the initial site inspection coincided with an outbreak of Brown Locust *(Locustana pardalina)* in the area and an influx of migratory and other bird species taking advantage of the food resource.

2.1.2.2 Baseline Avifaunal Survey 1

- Date: 2021-10-26 to 2021-10-31 and 2021-11-12 to 2021-11-18
- Duration: 11 Days
- Season: Spring (dry season)
- Season Relevance: The timing of the first baseline avifaunal survey coincided with the breeding and display season of many karoo species and prior to the arrival of many summer migratory species.

2.1.2.3 Baseline Avifaunal Survey 2

- Date: 2022-01-19 to 2022-01-26
- Duration: 7 Days
- Season: Summer (wet season)
- Season Relevance: The timing of the second baseline avifaunal survey coincided with a wet period and another outbreak of Brown Locust *(Locustana pardalina)* in the area and an influx of migratory and other bird species taking advantage of the food resource.

2.1.3 Site Ecological Importance (SEI)

SEI is considered to be a function of the biodiversity importance (BI) of the receiving environment (e.g. species of conservation concern and the habitat type present on the site) and its resilience to impacts (i.e. receptor resilience [RR]). The BI of the receiving environment is in turn a function of the conservation importance (CI) and the functional integrity (FI) of the receiving environment.

Conservation importance is defined as: '*The importance of a site for supporting biodiversity features of conservation concern present, e.g. populations of IUCN threatened and Near Threatened species (CR, EN, VU and NT), rare species, range-restricted species, globally significant populations of congregatory species, and areas of threatened ecosystem types, through predominantly natural processes.*'

Functional integrity (FI) of the receiving environment/habitats is defined as its current ability to maintain the structure and functions that define it, compared to its known or predicted state under ideal conditions, i.e. a measure of the ecological condition of the receiving environment as determined by its remaining intact and functional area, its connectivity to other natural areas and the degree of current persistent ecological impacts. The degree of connectivity between habitat patches varies greatly with the dispersal ability of the taxa in question and similarly, existing impacts will have differential effects on each species.

As biodiversity importance (BI) is a function of conservation importance (CI) and the functional integrity (FI), the biodiversity importance can be determined.

Receptor resilience (RR) is the intrinsic capacity of the receptor to resist major damage from an impact and/or to recover to its original state with limited or no human intervention. Resilience can be linked to a particular disturbance/impact or time of year; e.g. large birds of prey have different levels of resilience to noise disturbance depending on whether they are breeding or not. The avifaunal sensitivity map was informed by the calculated SEI in the context of the species attributes and the characteristics of the site.

2.1.4 Impact Assessment Rating System

Significance ratings of the potential impacts were determined using the methodology provided and outlined in Appendix B.

3 RESULTS

3.1 Assumptions and Limitations

The following assumptions and limitations were identified for this study:

- The likely potential impacts on species identified in this survey are based on the experience of these and similar species in different parts of South Africa. Bird behaviour may vary across geographical locations;
- The pentads in and around the project site have not been thoroughly assessed by the Southern African Bird Atlas Project 2 (SABAP2), with only a single card having been submitted for some of the pentads examined. While reporting rates for each species were therefore not considered to be a useful reflection of density these data were useful for the generation of a species list of the area, to overcome this limitation a wider search (of 20 pentads) was conducted and data was supplemented by interrogating additional studies in the area; and
- Co-ordinated Avifaunal Road counts (CAR) and Co-ordinated Waterbird Counts (CWAC) sites are counted irregularly and this information is potentially out-dated.

3.2 Desktop Study

3.2.1 Project Area of Influence (PAOI)

The PAOI for the purposes of the mapping generated for this report was considered to be approximately 10 km from the main focus of the activity. Nevertheless, the potential impacts on local and regional populations of species have been considered during the assessment process as well as habitats in the surrounding area through the incorporation of avifaunal data from multiple sources.

3.2.2 Regional Context

The site is situated in the south-central portion of Nama-Karoo biome, amongst the dolerite ridges and outcrops on the southern edge of the Nuweveld Escarpment between Beaufort West and Murraysburg. This part of the region includes an altitudinal transition between the lower plains (dominated by grassy scrub) of the Lower Karoo Bioregion found between the Great Escarpment in the north and the Cape Fold Mountains in the south and the harsher vegetation associated with the Upper Karoo Bioregion of the higher altitude plateau where frost frequency increases and vegetation becomes less succulent. Belts of riverine thicket line the mostly dry riverbeds, creating a network of wooded thorn trees between dwarf scrubland. The Karoo National Park Important Bird Area (IBA SA102) is located approximately 65 km to the west of the proposed project site and contains a similar mix of microhabitats associated with an altitudinal transition between lower and upper karoo vegetation, but with a steeper gradient. A total of 231 species have been recorded in the park, which is particularly important for Namib-Karoo biome-restricted species and supports several globally threatened species such as Blue Crane, Martial Eagle, Black Harrier,

Secretarybird, Kori Bustard and Ludwig's Bustard as well as regionally threatened species including Verreauxs' Eagle, Lanner Falcon, Black Stork, Karoo Korhaan and African Rock Pipit.

3.2.3 Local Context

The site is positioned wholly within Gamka Karoo vegetation in a flat lowland plain located in a natural bowl between the dolerite dominated Rooiberg Mountain in the west and a lower portion of Vaalkoppe in the north and east (Figure 2).

Figure 2: View looking south towards the proposed project site (Rooiberg on the right).

The area is primarily used for livestock production despite the relatively low carrying capacity of the natural veld type. This vegetation represents one of the most arid units of the Nama-Karoo Biome comprising dwarf spiny shrubland dominated by Karoo dwarf shrubs with rare low trees (e.g. *Euclea undulata*). Dense stands of drought-resistant grasses (*Stipagrostis*, *Aristida*) cover (especially after abundant rains) broad sandy bottomlands. The flat nature of the landscape has resulted in the broad wash areas that experience sheet runoff, exposing bare patches of ground lacking ground cover, particularly in areas with elevated grazing pressure from livestock farming (Figure 3).

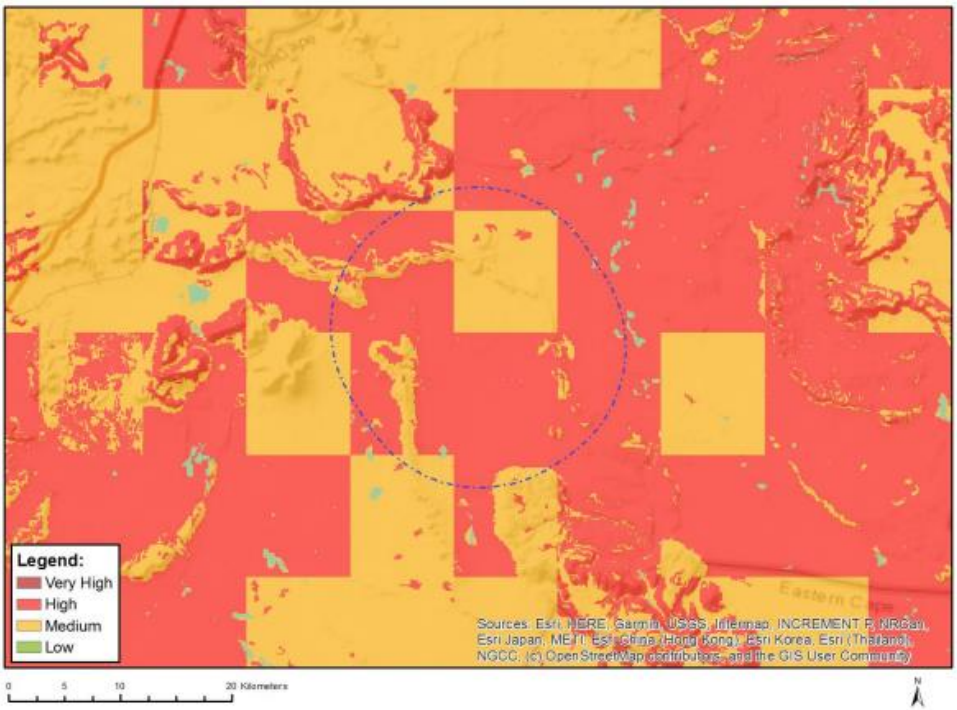
Figure 3: A and B) Sheet runoff and grazing pressure result in bare patches between drought resistant grassy shrubland scattered across the proposed site.

Scattered thorn trees are present in the area with increasing density towards larger drainage lines and surrounding depressions. A moderately sized farm dam is located approximately 1.5 km to the north-east of the proposed project site (Figure 4) and collects water during good rainy seasons, attracting species such as Greater and Lesser Flamingo, as well Blue Crane that roost overnight.

3.2.4 Screening Tool

The output from the Screening Tool (as of 2022-05-27) indicated that the majority of area site was of high sensitivity in the Animal Species Theme, with patches of high sensitivity due to the potential presence of several avifaunal species of conservation concern (SCCs), namely Black Harrier (*Circus maurus*), Ludwig's Bustard (*Neotis ludwigii*), Lanner Falcon (*Falco biarmicus*), Martial Eagle (*Polemaetus bellicosus*) and Verreaux's Eagle (*Aquila verreauxii*) (Figure 5) and medium sensitivity for possible presence of Black Stork (*Ciconia nigra*) and Southern Black Korhaan (*Afrotis afra*, Figure 5).

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Circus maurus
High	Aves-Neotis ludwigii
High	Aves-Falco biarmicus
High	Aves-Polemaetus bellicosus
High	Aves-Aquila verreauxii
High	Mammalia-Felis nigripes
Low	Subject to confirmation
Medium	Aves-Circus maurus
Medium	Aves-Ciconia nigra
Medium	Aves-Neotis ludwigii
Medium	Aves-Afrotis afra
Medium	Aves-Aquila verreauxii

Figure 5: Output from the National Web-based Screening Tool.

The broader project area was determined by the Screening Tool to be outside of sensitivities in the Avian (Wind) Theme as it did not intersect with any sensitivity layers contained in the database at the time of reporting.

3.2.5 South African Bird Atlas Project 2 (SABAP2)

The Southern African Bird Atlas Project 2 is part of an on-going study by the Animal Demography Unit, a research unit based at the University of Cape Town. SABAP2 data were examined for 20 pentads (which are approximately 8 km x 8 km squares) located within the study area (Appendix C). A total of 17 species classified as Endangered, Vulnerable or Near-Threatened were recovered and 5 endemic or near-endemic species.

3.2.6 Co-ordinated Avifaunal Roadcounts Project (CAR)

The nearest CAR route (WB03) is adjacent to the proposed development area and is a circular route 60km in length. Blue Crane, Secretarybird, Black Stork, Ludwig's Bustard and Karoo Korhaan have been recorded on this route.

3.2.7 Co-ordinated Waterbird Counts Project (CWAC)

Two CWAC sites (Springfontein Dam and Beaufort West Bird Sanctuary) are located near the town of Beaufort West and are approximately 60 km southwest of the proposed development area respectively. Springfontein Dam is adjacent to Beaufort West town and moderate numbers of Marsh Sandpiper, Little Stint, Ruff, Avocet and Black-winged Stilt, Kittlitz's Plover Three-banded Plover, Blacksmith Lapwing, South African Shelduck and Cape Teal have been recorded. Beaufort West Bird Sanctuary comprises a sewage works, where Sacred Ibis, Yellow-billed Duck, Red-billed Teal, Cape Teal, Cape Shoveler, Black-winged Stilt and Grey-headed Gull have been recorded in good numbers.

3.3 Observed Species

The diversity and abundance of birds observed during the walk transects was low, with eleven positively identified species recorded during Season 1 and 19 species during Season 2. The abundance of birds recorded during Season 1 (64 individuals) was lower than during Season 2 (143 individuals) as expected (Table 1). The only avifaunal SCC recorded during either season was Ludwig's Bustard, and while this species was recorded on multiple occasions this may represent the same individual.

Table 1: Diversity and abundance of avifaunal species recorded in and around the proposed facility.

Season 1	**Transect**									
Species	**WTA 1.1**	**WTA1.2**	**WTA1.3**	**WTA1.4**	**WTA1.5**	**WTA1.6**	**WTA IA**	**WTA IB**	**WTA IC**	**Grand Total**
African Pipit		1								**1**
Cape Sparrow				1						**1**
Eastern Clapper Lark					1		1			**2**
Grey-backed Sparrow-Lark		18								**18**
Karoo Korhaan			1							**1**
Large-billed Lark							4			**4**
Ludwig's Bustard							1			**1**
Namaqua Sandgrouse					1			1	2	**4**
Red-capped Lark				2	2					**4**
Spike-heeled Lark		1			1	1	3			**6**
Spotted Thick-knee		1								**1**
Unidentified	2	2	2	2	3	2	2	4	2	**18**
Grand Total	**2**	**23**	**3**	**5**	**8**	**3**	**11**	**5**	**4**	**64**

Season 2	**Transect**									
Species	**WTA 1.1**	**WTA 1.2**	**WTA1.3**	**WTA1.4**	**WTA1.5**	**WTA1.6**	**WTA IA**	**WTA IB**	**WTA IC**	**Grand Total**
African Black Swift	10									**10**
African Pipit	5	3					3	3	1	**15**

Barn Swallow	2			1	8				1	**12**
Common Buzzard						1				**1**
Desert Cisticola	5	5	2	2	2	2	2	2		**22**
Eastern Clapper Lark	3	3			2	2			1	**11**
Egyptian Goose	2				3					**5**
Grey-backed Sparrow-Lark	2	2					2	5	4	**15**
Karoo Long-billed Lark						1				**1**
Karoo Prinia				1		1				**2**
Large-billed Lark		2			2				2	**6**
Lark-like Bunting							3			**3**
Ludwig's Bustard	1		1						1	**3**
Neddicky					1					**1**
Red-billed Quelea							16			**16**
Red-capped Lark	3	1			2	7				**13**
Rufous-eared Warbler	2									**2**
Sabota Lark				1			1			**2**
Spur-winged Goose							1			**1**
Unidentified				1		1				**2**
Grand Total	**35**	**16**	**3**	**6**	**20**	**15**	**28**	**10**	**10**	**143**

Avifaunal SCCs observed in the broader area include Martial Eagle, Lanner Falcon, Secretarybird, Blue Crane, Karoo Korhaan, Southern Black Korhaan and Verreaux's Eagle.

3.4 Avifaunal Species of Conservation Concern

Data obtained from the desk-top study and recorded across the site were used to formulate a list of potential avifaunal SCCs likely to be the most relevant impact receptors of the avifaunal community of the receiving environment (Table 2).

Table 2: List of potential avifaunal Species of Conservation Concern most likely to be impact receptors of the avifaunal community of the receiving environment.

Common Name	Scientific Name	Regional	Global	Atlas Data	Screening Tool	Observed
Black Stork	*Ciconia nigra*	**Vulnerable A2c; D1**	Least Concern	x	x	x
Secretarybird	*Sagittarius serpentarius*	Vulnerable A4acd; C1	**Endangered A2acde+3cde+4acde**	x	x	x
Black Harrier	*Circus maurus*	**Endangered C1+2a(ii)**	Endangered C2a(ii)	x	x	x
Martial Eagle	*Polemaetus bellicosus*	**Endangered A2cde ; C1**	Endangered A2acde+3cde+4acde	x	x	x
Ground Woodpecker	*Geocolaptes olivaceus*	Least Concern	**Near Threatened A2bc+3bc+4bc**	x		
Greater Flamingo	*Phoenicopterus roseus*	**Near Threatened A2bd**	Least Concern	x		
Blue Crane	*Anthropoides paradiseus*	Near Threatened A2acde	**Vulnerable A3cde+4cde**	x		x

Common Name	Scientific Name	Regional	Global	Atlas Data	Screening Tool	Observed
Lanner Falcon	*Falco biarmicus*	**Vulnerable A2bc; C1**	Least Concern	x	x	x
Verreaux's Eagle	*Aquila verreauxii*	**Vulnerable A2c; C1**	Least Concern	x	x	x
Karoo Korhaan	*Eupodotis vigorsii*	**Near Threatened A2c**	Least Concern	x		x
Southern Black Korhaan	*Afrotis afra*	**Vulnerable A2bc+4bc**	Vulnerable A4bc	x	x	x

3.5 Sensitivity Mapping

3.5.1 Current Impacts

Several current impacts exist in the broader area, including overhead transmission infrastructure and varying degrees of grazing pressure associated with livestock production.

3.5.2 Site Ecological Importance (SEI)

The SEI has been calculated for each species through the combination of various attributes (Table 4) through the consideration of site-specific factors (e.g. land-use, habitat functionality etc.) in combination with the nature of the potential impacts associated with the proposed development. The highest SEI corresponding with each habitat/land-use category that represented the preferred habitats used by each species was mapped for the PAOI (Figure 6).

The interpretation of the SEI classifications in relation to proposed development activities as outlined in the guidelines is presented in Table 3 below.

Table 3: Interpretation of Site Ecological Importance Classifications

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.

Table 4: Site Ecological Importance evaluated for each potential Species of Conservation Concern that may occur in the area.

SCC	Habitat	EOO (km^2)	Status Used	CI	FI	BI	RR	SEI
Black Harrier	Scrublands	> 10	EN (C1+2)	High	High	High	Very High	**Low**
Black Stork	Wetlands, Rivers	> 10	VU (A2, D1)	Low	Very High	Medium	Very High	**Very Low**
Blue Crane	Scrublands , Wetlands, Dams	> 10	VU (A3, 4)	Medium	Very High	High	Very High	**Low**
Greater Flamingo	Dams		NT (A2)	Medium	High	Medium	Very High	**Very Low**
Ground Woodpecker	Scrublands		NT (A2, 3, 4)	Medium	Very High	High	Very High	**Low**
Lanner Falcon	Scrublands	> 10	VU (A2: C1)	High	Very High	Very High	Very High	**Medium**
Ludwig's Bustard	Scrublands	> 10	EN (A4)	High	Very High	Very High	Very High	**Medium**
Martial Eagle	Scrublands	> 10	EN (A2; C1)	High	Very High	Very High	Very High	**Medium**
Secretarybird	Scrublands	> 10	EN (A2 , 3, 4)	Medium	Very High	High	Very High	**Low**
Verreaux's Eagle	Rocky Slopes	> 10	VU (A2; C1)	High	Very High	Very High	Very High	**Medium**
Ground Woodpecker	Scrublands		NT (A2)	Medium	Very High	High	Very High	**Low**
Southern Black Korhaan	Scrublands	> 10	VU (A2, 4)	High	Very High	Very High	Very High	**Medium**

4 IDENTIFICATION OF IMPACTS

The following key potential impacts on avifauna, arising from the proposed development have been identified for assessment:

- Construction Phase:
  - Direct Habitat Destruction – modification, removal and clearing of vegetation for development of infrastructure such as temporary laydown areas, site buildings, Solar PV arrays, access roads and servitudes;
  - Disturbance/Displacement – indirect habitat loss and/or reduced breeding success due to displacement by noise and activity associated with machinery and construction activity; and
  - Direct Mortality – fatalities of avifauna due to vehicle collision, entrapment, entanglement or collision with temporary infrastructure (e.g. fencing), entrapment in uncovered excavations and increased predation pressure.
- Operational Phase:
  - Direct Habitat Destruction – Contamination of habitats due to routine operational maintenance activity (e.g. cleaning of Solar PV arrays), increased erosion;
  - Disturbance/Displacement – indirect habitat loss, reduced breeding success, obstruction of movement corridors due to displacement by infrastructure and noise/activity associated with ongoing, routine operational tasks/maintenance activity; and
  - Direct Mortality – fatalities of avifauna due to collision with Solar PV arrays, collision or entrapment with perimeter fencing, collision with overhead power lines, and electrocution from electrical components.
- Decommissioning Phase:
  - As per construction phase.

4.1 Construction Phase

4.1.1 Direct Habitat Destruction

The removal and/or destruction and/or alteration of habitat during the construction phase is potentially the most significant impact associated with solar PV developments as the vegetation within the development footprint is cleared for the installation of the solar PV arrays. This could result in the exclusion of several species from the development footprint for the duration of the operation of the facility. Increased water runoff from hard surfaces (e.g. solar PV arrays) could result in increased erosion and degradation of habitat if appropriate flow-control measures are not implemented. Contamination of the immediate and local downstream environment could occur through leaks or spills of hazardous material. Direct habitat destruction associated with construction is largely unavoidable, resulting in some birds being displaced from the project site.

The habitats present across the proposed development site are already modified from existing grazing pressure from livestock production and are widespread and contiguous in the area. The site does not represent unique avifaunal habitat and as the proposed development site is small relative to the available habitat in the broader area, proposed development is unlikely to have a significant negative impact on the long-term viability or persistence of species across the landscape.

Impact phase: Construction		
Nature: Habitat destruction due to clearing of vegetation in the development footprint for the construction of infrastructure such as solar PV arrays, temporary laydown areas, site buildings, servitudes and access roads. This results in loss of area available to avifaunal species for foraging and breeding.		
	Without mitigation	With mitigation
Extent	Local (2)	Footprint (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (1)	Small (0)
Probability	Definite (5)	Definite (5)
Significance	**Medium (35)**	**Low (25)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Partially	
Mitigation: • Laydown and other temporary infrastructure to be placed within very low sensitivity areas, preferably previously transformed areas, wherever possible; • Appropriate run-off and erosion control measures are to be implemented where required; • A site specific environmental management programme (EMPr) must be implemented, which gives appropriate and detailed description of how construction activities must be conducted to reduce unnecessary destruction of habitat (e.g. no open fires outside of designated areas); • All contractors are to adhere to the EMPr and should apply good environmental practice during construction; • All hazardous materials should be stored in the appropriate manner to prevent contamination of the site and downstream environments. Any accidental chemical, fuel and oil spills that occur at the site should be cleared as appropriate for the nature of the spill; • Existing roads and farm tracks should be used where possible;		

• The minimum footprint areas of infrastructure should be used wherever possible, including road widths and lengths; • No off-road driving should be permitted in areas not identified for clearing; • An Environmental Site Officer (ESO) must form part of the on-site team to ensure that the EMPr is implemented and enforced and an Environmental Control Officer (ECO) must be appointed to oversee the implementation activities and monitor compliance for the duration of the construction phase; and • Following construction, rehabilitation of areas disturbed by temporary laydown areas and facilities must be undertaken.
Residual Impacts: Habitat cleared for the construction of permanent facilities will not be available for use by avifaunal species during the operational lifespan of the development. No long-term residual impacts are likely to negatively influence the viability or persistence of the avifaunal community of the receiving environment.

4.1.2 Disturbance and Displacement

Indirect loss of habitat from disturbance during the construction phase is temporary in nature and is expected to result largely from the presence of heavy machinery and increased activity of construction personnel.

The habitats present in vicinity of the proposed development are not unique to the site and are relatively widespread in the area so any displacement from the immediate vicinity that may occur will not likely incur a high energetic cost as suitable habitat is widely available nearby. The proximity of nearby suitable habitat makes it likely that species will return to areas that have not been physically altered by the proposed development once construction activity ceases.

There are no known active nest locations in proximity to the proposed development site at this stage where breeding success is likely to be negatively impacted upon through disturbance or displacement during the construction phase.

Impact phase: Construction		
Nature: Disturbance or displacement of birds due to increased noise and activity levels associated with construction machinery and personnel resulting in an indirect loss of habitat available for foraging and breeding. Project area already experiences relatively high levels of regular disturbance from commercial crop production activities.		
	Without mitigation	With mitigation
Extent	Local (2)	Local (2)
Duration	Very Short-term (1)	Very Short-term (1)
Magnitude	Minor (2)	Minor (2)
Probability	Low Likelihood (2)	Low Likelihood (2)
Significance	**Low (10)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	Unlikely	Unlikely
Can impacts be mitigated?	Yes	
Mitigation: • A site specific EMPr must be implemented, which gives appropriate and detailed description of how construction activities must be conducted; • All contractors are to adhere to the EMPr and should apply good environmental practice during construction; • Environmental Officer to oversee activities and ensure that the site specific EMPr is implemented and enforced;		

• Maximum use of existing access road and servitudes; • Existing and novel access roads are to be suitably upgraded or constructed to prevent damage and erosion resulting from increased vehicular traffic and construction vehicles; • No off-road driving in undesignated areas; • Speed limits (30 km/h) should be strictly enforced on site to reduce unnecessary noise; • Construction camps should be lit with as little light as practically possible, with the lights directed downwards where appropriate; • The movement of construction personnel should be restricted to the construction areas on the project site; • No dogs or cats other than those of the landowners should be allowed on site; • The appointed Environmental Officer must be trained to identify the potential Red Data species as well as the signs that indicate possible breeding by these species; • The Environmental Officer must then, during audits/site visits, make a concerted effort to look out for such breeding activities of SCCs (e.g. cranes, Secretarybird), and such efforts may include the training of construction staff (e.g. in Toolbox talks) to identify Red Data species, followed by regular questioning of staff as to the regular whereabouts on site of these species; • If any avifaunal SCCs are confirmed to be breeding (e.g. if a nest site is found), construction activities within 500 m of the breeding site must cease, and an avifaunal specialist is to be contacted immediately for further assessment of the situation and instruction on how to proceed; • Prior to construction, an avifaunal specialist should conduct a site walkthrough, covering the final road and power line routes as well as temporary laydown areas and facilities, to identify any nests/breeding/roosting activity of sensitive species; • The results of which may inform the final construction schedule in close proximity to that specific area, including abbreviating construction time, scheduling activities around breeding activity, and lowering levels of associated noise.
Residual Impacts: None.

4.1.3 Direct Mortality

Fatalities of avifaunal species can occur through collision with vehicles as traffic in the area increases due to construction activity. Large-bodied and ground dwelling species (e.g. korhaans and bustards) are at increased risk, but this impact can be effectively mitigated against. Temporary fencing can result in collisions, entrapment or entanglement if not suitably installed. Similarly ground dwelling avifauna (particularly chicks) can fall into uncovered excavations and become entrapped.

Impact phase: Construction		
Nature: Avifaunal fatalities caused by construction activity including vehicle collision (i.e. roadkill), entrapment within security fencing or uncovered excavations.		
	Without mitigation	With mitigation
Extent	Local (2)	Local (2)
Duration	Very Short-term (1)	Very Short-term (1)
Magnitude	Minor (2)	Minor (2)
Probability	Distinct Possibility (3)	Low Likelihood (2)
Significance	**Low (15)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No

Can impacts be mitigated?	Yes
Mitigation: • Maximum use of existing access road and servitudes; • No off-road driving in undesignated areas; • Speed limits (30 km/h) should be strictly enforced on site to reduce probability of vehicle collisions; • The movement of construction personnel should be restricted to the construction areas on the project site; • No dogs or cats other than those of the landowners should be allowed on site; • Any holes dug e.g. for foundations of pylons should not be left open for extended periods of time to prevent entrapment by ground dwelling avifauna or their young and only be dug when required and filled in soon thereafter; • Temporary fencing must be suitably constructed, e.g. if double layers of fencing are required for security purposes they should be positioned at least 2 m apart to reduce the probability of entrapment by larger bodied species that may find themselves between the two fences; • Roadkill is to be reported to the ECO and removed as soon as possible.	
Residual Impacts: None.	

4.2 Operational Phase

4.2.1 Direct Habitat Destruction

The utilisation of dust suppression or cleaning chemicals used on solar PV arrays could impose a risk of contamination of pollution of water resources. However, this potential impact can be easily mitigated. The production of wastewater is to be appropriately collected and not released into the receiving environment prior to appropriate treatment to reduce the likelihood of downstream habitat contamination.

Increased runoff from hard surfaces during the operational phase (e.g. solar PV arrays, has the potential to increase the risk of habitat destruction through erosion. This potential impacts are also easy to mitigate through the appropriate use of flow and erosion control measures.

Impact phase: Operational		
Nature: Habitat destruction due to contamination or altered flow regimes impacting downstream environments.		
	Without mitigation	With mitigation
Extent	Local (2)	Footprint (1)
Duration	Long-term (4)	Long-term (2)
Magnitude	Minor (1)	Minor (2)
Probability	Definite (5)	Improbable (2)
Significance	**Medium (35)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	Difficult	Yes
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Very Effectively.	
Mitigation:		

• Flow- and erosion control measures are to be implemented where appropriate to reduce uncontrolled runoff from hard surfaces; • All cleaning products used on the site should be environmentally friendly and bio-degradable; and • The operational environmental management programme must include site specific measures for the effective management and treatment of any wastewater to be produced.
Residual Impacts: None.

4.2.2 Disturbance and Displacement

Indirect loss of habitat from disturbance during the operational phase is associated with ongoing operational activity as well as more discrete periods of routine maintenance tasks.

As per the construction phase, the habitats present in vicinity of the proposed development are not unique to the site and are relatively widespread in the area so any displacement from the immediate vicinity that may occur will not likely incur a high energetic cost as suitable habitat is widely available nearby.

There are no known active nest locations in proximity to the proposed development site at this stage where breeding success is likely to be negatively impacted upon through disturbance or displacement during the operational phase.

Impact phase: Operational		
Nature: Disturbance or displacement of birds due to increased noise and activity levels associated with operational activities resulting in an indirect loss of habitat available for foraging and breeding.		
	Without mitigation	With mitigation
Extent	Local (2)	Local (2)
Duration	Very Short-term (1)	Very Short-term (1)
Magnitude	Minor (2)	Minor (2)
Probability	Low Likelihood (2)	Low Likelihood (2)
Significance	**Low (10)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	Unlikely	Unlikely
Can impacts be mitigated?	Yes	
Mitigation: • A site specific operational EMPr must be implemented, which gives appropriate and detailed description of how operational and maintenance activities must be conducted to reduce unnecessary disturbance; • All contractors are to adhere to the environmental management programme and should apply good environmental practice during all operations; and • Operational phase bird monitoring, in line with the latest available guidelines, must be implemented.		
Residual Impacts: None.		

4.2.3 Direct Mortality

Smaller passerine (songbird) species seem to account for the majority records of fatality due to collision with Solar PV arrays[10]. Fatalities of avifaunal species can occur through collision with vehicles as traffic in the area increases due to operational activity. Large-bodied and ground dwelling species (e.g. korhaans and bustards) are at increased risk, but this impact can be effectively mitigated against. Perimeter fencing can result in collisions, entrapment or entanglement if not suitably installed. Similarly ground dwelling avifauna (particularly chicks) can fall into cattle grids if not adequately modified to allow for their escape.

Impact phase: Operational		
Nature: Bird fatalities due to collision entrapment.		
	Without mitigation	With mitigation
Extent	Local (3)	Local (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Low Likelihood (2)	Low Likelihood (2)
Significance	**Low (22)**	**Low (22)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	Unlikely	Unlikely
Can impacts be mitigated?	Partially	
Mitigation: • Internal power lines should be buried wherever possible; • Novel above-ground overhead power lines to be constructed adjacent to existing transmission infrastructure where possible and pylons to be staggered (where possible) relative to existing pylon positions to increase the overall visibility of transmission infrastructure to avifauna such as bustards; • Appropriate (approved) Bird flight diverters (BFDs) to be affixed to the entire length of novel above-ground overhead power lines; • If one or more avifaunal SCC carcasses are located and determined likely to have resulted from collisions with infrastructure in any sensitivity area over the lifespan of the facility the fatality is to be appropriately recorded and reported to an avifaunal specialist to determine the most appropriate action; • If double layers of fencing are required for security purposes they should be positioned at least 2 m apart to reduce the probability of entrapment by larger bodied species that may find themselves between the two fences; • Develop and implement a carcass search and bird activity monitoring programme in-line with the latest applicable guidelines; • Regular reviews of operational phase monitoring data (activity and carcass) and results to be conducted by an avifaunal specialist; • Lighting should be kept to a minimum to avoid attracting insects and birds and light • sensors/switches should be utilised to keep lights off when not required; • Lighting fixtures should be hooded and directed downward where possible, to minimize the skyward and horizontal illumination, lighting should be motion activated where possible; • Cattle grids should be modified to allow for any chicks that fall in to escape (e.g. by placing a ramp inside the structure);		

[10] Visser, E., Perlod, 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. 2019; 133: 1285–1294. https://doi.org/10.1016/j.renene.2018.08.106

• If unacceptable impacts are observed (in the opinion of the bird specialist and independent review), the specialist should conduct a literature review specific to the impact and provide updated and relevant mitigation options to be implemented.
Residual Impacts: Current mitigation measures, while effective, are not capable of completely preventing collisions and some residual impact will remain. Nevertheless given the species most commonly at risk from solar PV developments it is unlikely that the proposed development will have a significant negative impact on the long-term viability and persistence of SCCs in the area.

4.3 Decommissioning Phase

The impacts of the decommissioning phase are similar to those of the construction phase, with the exception of a reduced impact of habitat destruction. Temporary disassembly and storage areas associated with the decommission phase are to be positioned on the same sites as those used for temporary laydown areas during the construction phase where possible to reduce the incidence of novel habitat destruction.

4.4 Cumulative Impact

The cumulative impact assessment includes the position and number of existing transmission infrastructure and impacts present across the receiving environment considering the scenario where all the renewable energy components proposed in the cluster are approved and constructed following appropriate mitigation measures.

For solar energy developments the highest potential cumulative impacts following the implementation of mitigation measures relate to the direct destruction of habitat (primarily during the construction phase). Collisions with the solar PV array pose a lower risk to large-bodied SCC than overhead transmission lines and the grid connection infrastructure associated with the proposed development will be separately assessed and the impacts appropriately mitigated against to reduce the likelihood of collisions occurring. The position of the proposed infrastructure in close proximity to existing transmission lines reduces the length of grid connection required and is therefore unlikely to increase the risk associated with overhead power lines in the area beyond that already present across the landscape.

It is unlikely that the proposed development will result in a significant contribution to the cumulative impact or negatively influence the long-term viability or persistence of avifaunal populations in the area given the high availability of suitable habitat for SCCs surrounding the site.

Nature:
The primary impact associated with solar PV facilities on the avifaunal community of the receiving environment is the loss of available habitat associated with the clearing of vegetation for the solar arrays and the indirect loss of habitat due to disturbance and displacement associated with ongoing activity. Habitat cleared for the construction of permanent facilities will not be available for use by avifaunal species during the operational lifespan of the development. This impact is unavoidable, however, it is unlikely to contribute to a significant reduction in the long-term persistence or viability of avifaunal SCCs in the area either individually or cumulatively.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low (1)	Low (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (1)	Minor (1)
Probability	Definite (5)	Definite (5)
Significance	**Medium (30)**	**Medium (30)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High

Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Confidence in findings: High.		
Mitigation: As listed above.		

4.5 'No-Go' Alternative

The 'No-Go' alternative considers that the proposed development is not constructed. Most of the potential impacts associated with the development itself and assessed above would therefore not be imposed on the avifaunal community of the receiving environment.

The 'No-Go' alternative reduces the opportunity to progress the de-carbonisation transition of the economy and achieve various climate change mitigation targets outlined by the South Africa's Low Emission Development Strategy, The National Development Plan, The National Climate Change Response Policy, Integrated Resource Plan, the National Climate Change Adaptation Strategy (amongst others) and ultimately South Africa's commitment to the Paris Agreement.

5 CONCLUSION

The proposed development site appears to be well suited for the development of renewable energy facilities as proposed. The proposed development site is outside of major avifaunal sensitivities and does not represent unique avifaunal habitat in the context of the broader area. The available habitat across the site is already modified through grazing pressure and is located relatively close to existing overhead transmission lines, this translates into a reduced length of novel overhead powerline required for the grid connection, reducing the potential impact on species susceptible to collisions with transmission lines such as bustards, cranes and storks in the area.

6 AVIFAUNAL IMPACT STATEMENT

The proposed development is unlikely to have a significant negative impact on the long-term viability or persistence of avifaunal species in the area and therefore can be approved from an avifaunal perspective.

APPENDIX A: CONSTRUCTION AND POST-CONSTRUCTION MONITORING PLAN

Aims

The avifaunal post construction monitoring aims to assess the impact of the SEF by comparing pre- and post- construction monitoring data and to measure the extent of bird fatalities caused by the SEF and should take the recommendations of the most recent applicable monitoring guidelines into consideration at the time of commencement of the activity. It is recommended that the following considerations be included.

Post-construction monitoring is to:

- Determine as far as possible the realised impacts of the SEF are on the avifaunal community of the receiving environment, particularly avifaunal SCCs; and
- Determine what mitigation is required if need be (adaptive management).

The proposed post-construction monitoring can be divided into three categories:

- Habitat availability;
- Quantification of avifaunal numbers and movements for comparative analyses (replicating baseline pre-construction monitoring); and
- Quantification of avifaunal mortalities.

Post-construction monitoring should aim to answer the following questions:

- How has the habitat available to birds in and around the SEF changed?
- How has the number of birds and species composition changed?
- How has the SEF affected priority species' breeding success?
- How many birds collide with the turbines? And are there any discernible patterns to collisions?
- What mitigation is necessary to reduce the impacts on avifauna?

Timing

Post-construction monitoring should commence as soon as possible during the commencement of the construction phase to ensure that the immediate effects of the facility on resident and passing birds are recorded, before they have time to adjust or habituate to the development. However, it should be borne in mind that it is also important to obtain an understanding of the impacts of the facility as they would be over the lifespan of the facility. Over time the habitat in the area may change, birds may become habituated to, or learn to avoid the facility. It is therefore necessary to monitor over a longer period than just an initial one year.

Duration

Monitoring should take place in Year 1 and 2 of the operational phase, and then repeated in Year 5 and every five years after that. After the first year of monitoring, the programme should be reviewed in order to incorporate significant findings that have emerged. This may entail the revision of the search protocol, and the size of the search plots, depending on the outcome of the first year of monitoring. If significant impacts are observed and mitigation is required, the matter should be taken up with the operator to discuss potential mitigation. In such instances the scope of monitoring could be reduced to focus only on the impacts of concern.

Habitat Classification

Any observed changes in bird numbers and movements in and around a SEF may be linked to changes in the available habitat. The avian habitats available must be mapped at least

once a year (at the same time every year), using the same methods which were used during pre-construction.

Bird Numbers and Movements

In order to determine if there are any impacts relating to displacement and/or disturbance, all methods used to estimate bird numbers and movements during baseline monitoring must be applied as far as is practically possible in the same way to construction and post-construction work in order to ensure maximum comparability of these data sets. This includes sample counts of small terrestrial species, counts of large terrestrial species and raptors and focal site surveys according to the current best practice.

Collisions

The collision monitoring must have three components:

- Experimental assessment of search efficiency and scavenging rates of bird carcasses on the site;
- Regular searches in the immediate vicinity of the facility for collision casualties; and
- Estimation of fatality rates.

Searcher Efficiency and Scavenger Removal Rates

The value of surveying the area for collision victims is only valid if some measure of the accuracy of the survey method is developed. The probability of a carcass being detected and the rate of removal/decay of the carcass must be accounted for when estimating fatality rates and when designing the monitoring protocol. This must be done in the form of searcher and scavenger trails once per season where possible but a minimum of twice per year.

Collision Fatality Surveys

Carcass searches must begin as early in the mornings as possible to reduce carcass removal by scavengers. The searchers must have a vehicle available for transport per site. The supervisor must assist with the collation of the data at each site and to provide the data to the specialist in electronic format on a weekly basis. The specialists must ensure that the supervisor is completely familiar with all the procedures concerning the management of the data.

The following must be sent to the specialist on a weekly basis:

- Carcass fatality data (hardcopy and scans as well as data entered into Excel spreadsheets);
- Pictures of any carcasses, properly labelled;
- GPS tracks of the search plots walked; and
- Search interval spreadsheets.

When a carcass is found, it must be bagged, labelled and kept refrigerated for species confirmation when the specialist visits the site.

Estimation of collision rates

Observed mortality rates need to be adjusted to account for searcher efficiency and scavenger removal. There have been many different formulas proposed to estimate mortality rates. The available methodologies must be investigated, and an appropriate method will be applied.

Deliverables

Concise quarterly reports must be provided with basic statistics and any issues that need to be red flagged.

An operational monitoring report must be completed at the end of each year of operational monitoring. As a minimum, the report must attempt to answer the following questions:

- How has the habitat available to birds in and around the SEF changed?
- How has the number birds and species composition changed?
- How have the movements of priority species changed?
- How has the SEF affected priority species' breeding success?
- What are the likely drivers of any changes observed?
- How many, and which species of birds collided with the turbines and associated infrastructure? And are there any patterns to this?
- What is the significance of any impacts observed?
- What mitigation measures are required to reduce the impacts?

APPENDIX B: IMPACT ASSESSMENT SCORING METHODOLOGY

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected;
- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high);
- The **duration**, wherein it will be indicated whether:
  - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
  - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
  - medium-term (5 – 15 years) – assigned a score of 3;
  - long term (> 15 years) - assigned a score of 4; or
  - permanent - assigned a score of 5.
- The **magnitude**, quantified on a scale from 0-10, where:
  - 0 is small and will have no effect on the environment,
  - 2 is minor and will not result in an impact on processes,
  - 4 is low and will cause a slight impact on processes,
  - 6 is moderate and will result in processes continuing but in a modified way,
  - 8 is high (processes are altered to the extent that they temporarily cease), and
  - 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where:
  - 1 is very improbable (probably will not happen);
  - 2 is improbable (some possibility, but low likelihood);
  - 3 is probable (distinct possibility);
  - 4 is highly probable (most likely); and
  - 5 is definite (impact will occur regardless of any prevention measures).
- The **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high (as per the calculation below;
- The **status**, which will be described as either positive, negative or neutral;
- The degree to which the impact can be reversed;
- The degree to which the impact may cause irreplaceable loss of resources; and
- The degree to which the impact can be mitigated.

The **significance** is calculated by combining the criteria in the following formula:

$S = (E + D + M) * P$

where:

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The **significance weightings** for each potential impact are as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area);

- 30 – 60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated); and
- > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

APPENDIX C: SABAP2 RECORDS FROM PENTADS IN AND AROUND THE PROJECT SITE

Table A1: SABAP 2 RECORDS FROM FIRST HALF OF PENTADS

Species	Red Data Status	Endemic or near-endemic	Priority Species Score	Reporting Rate (%)									
				3200_2300	3200_2305	3200_2310	3200_2315	3205_2255	3205_2300	3205_2305	3205_2310	3205_2320	3205_2325
Cape Vulture	EN, EN		405	85.7	20	100			13.3				
Verreaux's Eagle	VU, LC		360				8.7					3.4	
Martial Eagle	EN, EN		350										
Black Harrier	EN, EN	NE	345	28.6					13.3			3.4	
Black Stork	VU, LC		330	14.3			47.8			50	25	69	50
Blue Crane	NT, VU		320				8.7			25	25	34.5	
Secretarybird	VU, EN		320				26.1			25	25	10.3	50
Ludwig's Bustard	EN, EN		320		20		4.3						
Lanner Falcon	VU, LC		300										
Bateleur	EN, EN		300										
Lesser Flamingo	NT, NT		290										
Greater Flamingo	NT, LC		290										
African Fish Eagle			290										
Tawny Eagle	EN, VU		290	28.6	60		65.2	33.3	13.3	50	75	41.4	100
Karoo Korhaan	NT, LC		270										
Southern Black Korhaan	VU, VU	E	270				13					20.7	50
Kori Bustard	NT, NT		260				4.3	50	13.3	25		17.2	
Jackal Buzzard		NE	250										
Cape Eagle-Owl			250	28.6	60		4.3		6.7		25	3.4	
Nicholson's Pipit			230									6.9	
Booted Eagle			230										
Black-chested Snake Eagle			230				4.3					10.3	

Species	Red Data Status	Endemic or near-endemic	Priority Species Score	Reporting Rate (%)									
				3200_2300	3200_2305	3200_2310	3200_2315	3205_2255	3205_2300	3205_2305	3205_2310	3205_2320	3205_2325
White Stork			220										
Lesser Kestrel			214	14.3			26.1	16.7	26.7			27.6	
Common Buzzard			210										
Amur Falcon			210				4.3					3.4	
Double-banded Courser			204	71.4	20	100	52.2	66.7	53.3	75	100	79.3	
Pale Chanting Goshawk			200	14.3	20				6.7				
African Rock Pipit	NT, LC	SLS	200										
African Harrier-Hawk			190										
Grey-winged Francolin		SLS	190									3.4	
Brown Snake Eagle			180									3.4	
Northern Black Korhaan			180	14.3	20		4.3					6.9	
Black-winged Kite			174				13	16.7				10.3	
Greater Kestrel			174				13			25	25	24.1	
Spotted Eagle-Owl			170										
Rufous-breasted Sparrowhawk			170										
Black Sparrowhawk			170	14.3			4.3		6.7				
Little Grebe				42.9			8.7		6.7			3.4	
Reed Cormorant				42.9									
African Darter				28.6				16.7	26.7			13.8	
Grey Heron				14.3			4.3		13.3		25	6.9	
Hamerkop				42.9	20	100	43.5	33.3	40			10.3	
Hadada Ibis				14.3									
Spur-winged Goose				28.6			26.1	33.3	33.3			37.9	
Egyptian Goose				28.6		100	17.4		46.7		25	17.2	
South African Shelduck				28.6			8.7		6.7				

Species	Red Data Status	Endemic or near-endemic	Priority Species Score	Reporting Rate (%)									
				3200_2300	3200_2305	3200_2310	3200_2315	3205_2255	3205_2300	3205_2305	3205_2310	3205_2320	3205_2325
African Black Duck				14.3			13		13.3			6.9	
Yellow-billed Duck				42.9	40		17.4	50	46.7	25	50	6.9	
Rock Kestrel				14.3			13						
Gabar Goshawk				28.6	40		30.4		26.7		25	37.9	
Helmeted Guineafowl				57.1			26.1		13.3				
Common Moorhen				28.6					13.3				
Red-knobbed Coot				14.3	20		26.1		26.7			24.1	
Three-banded Plover				14.3	40		30.4	33.3	73.3			17.2	
Blacksmith Lapwing				14.3	60		8.7		6.7			13.8	
Namaqua Sandgrouse				71.4	40		60.9	50	66.7			10.3	
Speckled Pigeon				14.3	20		30.4	33.3	13.3				
Red-eyed Dove				85.7	80	100	52.2	100	86.7		75	69	50
Cape Turtle Dove				14.3	40	100	34.8	66.7	60		25	24.1	50
Laughing Dove				14.3			4.3		6.7			3.4	
Diederik Cuckoo				57.1	20		34.8	33.3	40		25	20.7	
Little Swift				57.1	20		43.5	66.7	60		50	17.2	
White-backed Mousebird				14.3	40			33.3	26.7		25	3.4	
Red-faced Mousebird				14.3					20				
Pied Kingfisher				28.6			4.3		6.7			10.3	
Malachite Kingfisher				14.3					6.7				
European Bee-eater				14.3									
White-fronted Bee-eater				42.9			34.8	33.3	46.7		25	13.8	
African Hoopoe				100	20	100	39.1	83.3	46.7		100	55.2	50
Acacia Pied Barbet				42.9	20	100	4.3		33.3				
Cardinal Woodpecker				71.4	60	100	69.6	66.7	26.7	75	75	31	50

Species	Red Data Status	Endemic or near-endemic	Priority Species Score	Reporting Rate (%)									
				3200_2300	3200_2305	3200_2310	3200_2315	3205_2255	3205_2300	3205_2305	3205_2310	3205_2320	3205_2325
Sabota Lark				14.3	40		34.8	33.3	26.7	50		48.3	
Barn Swallow				42.9	40		13		33.3				
White-throated Swallow				28.6	60		34.8	66.7	46.7	25	25	31	
Greater Striped Swallow				14.3	60		52.2	83.3	80		75	20.7	
Rock Martin				71.4	20		21.7		46.7			17.2	
Brown-throated Martin				42.9	20	100	52.2	33.3	60			13.8	
Fork-tailed Drongo				71.4	100	100	65.2	83.3	60	50	100	51.7	100
Pied Crow				14.3	80		95.7	66.7	40	25	75	86.2	50
Cape Crow				57.1		100	4.3		6.7		50	24.1	
Cape Penduline Tit				85.7	60	100	60.9	83.3	80		75	51.7	50
African Red-eyed Bulbul				14.3			4.3	16.7	13.3			3.4	
Short-toed Rock Thrush				14.3	40		4.3	83.3	46.7		25		
Mountain Wheatear				100	80	100	34.8	100	80	25	25	24.1	50
Familiar Chat				14.3	80		56.5	33.3	33.3	25		13.8	50
Ant-eating Chat				14.3					6.7			27.6	
African Stonechat				71.4	40	100	4.3	33.3	46.7			20.7	
Cape Robin-Chat				71.4	80	100	47.8	100	66.7	50	100	41.4	100
Karoo Scrub Robin				71.4	20		26.1	33.3	13.3		25	44.8	100
Yellow-bellied Eremomela				71.4			8.7		26.7				
Lesser Swamp Warbler				28.6					33.3			3.4	
African Reed Warbler				57.1	80	100	91.3	83.3	40	75	100	89.7	100
Rufous-eared Warbler				71.4	20		8.7		20			13.8	
Long-billed Crombec				42.9			21.7					37.9	
Neddicky				28.6	60	100	39.1	50	53.3			41.4	
Grey-backed Cisticola				85.7	20	100	26.1	16.7	73.3			51.7	

Species	Red Data Status	Endemic or near-endemic	Priority Species Score	Reporting Rate (%)									
				3200_2300	3200_2305	3200_2310	3200_2315	3205_2255	3205_2300	3205_2305	3205_2310	3205_2320	3205_2325
Namaqua Warbler		NE		85.7	80	100	52.2	83.3	80		75	86.2	100
Chestnut-vented Warbler				14.3	20			16.7	20	25	50		
Layard's Warbler		NE		14.3			60.9	66.7	13.3		50	48.3	
Chat Flycatcher				71.4	20	100	26.1	83.3	80		50	31	
Fiscal Flycatcher		NE		71.4	20	100	13	16.7	33.3			34.5	
Pririt Batis				85.7	20	100	26.1	16.7	46.7	25	50	17.2	
Fairy Flycatcher		NE		71.4	60	100	78.3	66.7	93.3	25	25	41.4	
Cape Wagtail				14.3	40		56.5	16.7	46.7	25		65.5	50
African Pipit				28.6	80		26.1	83.3	60		75	55.2	50
Southern Fiscal				14.3									
Southern Tchagra		NE		42.9	100		4.3	83.3	60		50	51.7	
Bokmakierie				42.9	20		4.3	33.3	93.3	50	25		
Pale-winged Starling				14.3	40	100	17.4	16.7	60		25		
Red-winged Starling				100	60	100	65.2	66.7	93.3		50	20.7	
Pied Starling		SLS		42.9	20		4.3	16.7	26.7		25	3.4	
Malachite Sunbird				42.9	20		4.3	16.7	26.7			13.8	
Southern Double-collared Sunbird		NE		100	20	100	26.1	16.7	6.7	25	25	3.4	
Dusky Sunbird				71.4	80	100	73.9	83.3	80	25	75	44.8	100
Cape Sparrow				14.3	40		13		6.7		25	65.5	
Scaly-feathered Weaver				85.7	40	100	56.5	66.7	73.3		50	34.5	
Southern Masked Weaver				71.4	20		34.8		66.7			3.4	
Southern Red Bishop				28.6			4.3		6.7				
Red-billed Firefinch				71.4		100	8.7		46.7		25	20.7	
Common Waxbill				42.9	20	100	52.2		60			27.6	50
Black-throated Canary				14.3	20		17.4	16.7	6.7	25		13.8	

Species	Red Data Status	Endemic or near-endemic	Priority Species Score	Reporting Rate (%)									
				3200_2300	3200_2305	3200_2310	3200_2315	3205_2255	3205_2300	3205_2305	3205_2310	3205_2320	3205_2325
Black-headed Canary		NE		85.7	60	100	34.8	50	53.3	50	50	31	100
White-throated Canary				14.3	80		39.1	66.7	53.3	50	25	62.1	100
Lark-like Bunting				14.3					6.7				
Cinnamon-breasted Bunting				57.1	40	100		66.7	40	50	50	10.3	50
Cape Bunting				42.9	20	100	21.7	33.3	73.3		25	10.3	
Karoo Thrush		NE		28.6	40	100	30.4	16.7	80			17.2	
Cape White-eye		NE		28.6	60		26.1	50	20	75	75	13.8	
Karoo Long-billed Lark				100	80	100	52.2	83.3	80	25	75	75.9	50
Karoo Prinia		NE		42.9	20	100	43.5		40		25	10.3	
Southern Grey-headed Sparrow					20		8.7					31	
Black-headed Heron					20		4.3		13.3			3.4	
Crowned Lapwing					20		13	66.7	40		25	37.9	50
Namaqua Dove					20		13	50	20		25	3.4	
White-rumped Swift					20		8.7	33.3	20	25		6.9	50
Alpine Swift					40		26.1	16.7	13.3	50		3.4	50
Large-billed Lark		NE			60		17.4	66.7	13.3		50	34.5	
Spike-heeled Lark					60		47.8	33.3	20	25	50	55.2	
Grey-backed Sparrow-Lark					20							3.4	
Black-eared Sparrow-Lark		NE			20		8.7					20.7	50
Red-capped Lark					40		13	33.3	26.7	25		10.3	
White-necked Raven					60	100	26.1	66.7	40	50	75	37.9	100
Karoo Chat					40		13		6.7	50	25	27.6	
Desert Cisticola					60		8.7	50	66.7		25	3.4	
House Sparrow					20		17.4		6.7			6.9	
Red-headed Finch					20		4.3					6.9	

Species	Red Data Status	Endemic or near-endemic	Priority Species Score	Reporting Rate (%)									
				3200_2300	3200_2305	3200_2310	3200_2315	3205_2255	3205_2300	3205_2305	3205_2310	3205_2320	3205_2325
Quailfinch					40		17.4		26.7			3.4	
Eastern Clapper Lark						100	13					3.4	
Pied Avocet						100	17.4					6.9	
Black-winged Stilt						100	13		20			27.6	
Red-billed Quelea							17.4		20			13.8	
African Sacred Ibis							13		13.3			10.3	
African Spoonbill							4.3						
Cape Shoveler							13					10.3	
Spotted Thick-knee							4.3		6.7				
Rufous-cheeked Nightjar							4.3		13.3			13.8	
African Black Swift							8.7		13.3			3.4	
Brown-hooded Kingfisher							8.7					10.3	
Capped Wheatear							4.3					10.3	
Tractrac Chat							13					34.5	50
Sickle-winged Chat		NE					4.3		20			3.4	
Levaillant's Cisticola							4.3						
Long-billed Pipit								16.7					
Plain-backed Pipit								16.7					
Rock Dove									6.7				
White-breasted Cormorant									6.7				
Little Bittern									13.3			3.4	
Red-billed Teal									20				
Cape Teal									6.7	25			
Karoo Lark		NE							13.3			3.4	
Spotted Flycatcher									6.7				

Species	Red Data Status	Endemic or near-endemic	Priority Species Score	Reporting Rate (%)									
				3200_2300	3200_2305	3200_2310	3200_2315	3205_2255	3205_2300	3205_2305	3205_2310	3205_2320	3205_2325
Common Starling									6.7			6.9	
Pin-tailed Whydah									26.7				
Cape Canary									6.7			6.9	
Yellow Canary												3.4	
Common Quail												3.4	
Wood Sandpiper												3.4	
Common Swift												3.4	
Greater Honeyguide												3.4	
Pink-billed Lark												10.3	
Pearl-breasted Swallow												3.4	
Sand Martin												3.4	
Grey Tit		NE										3.4	
Zitting Cisticola												3.4	

Table A2: SABAP2 RECORDS FROM SECOND HALF OF PENTADS

Species	Red Data Status	Endemic or near-endemic	Priority Species Score	Reporting Rate (%)									
				3205_2330	3210_2250	3210_2255	3210_2300	3210_2305	3210_2310	3210_2315	3210_2320	3210_2325	3210_2330
Cape Vulture	EN, EN		405										0.3
Verreaux's Eagle	VU, LC		360	38.5	5.6			100	33.3				51.9
Martial Eagle	EN, EN		350	2.9	2.8					12.5			7.3
Black Harrier	EN, EN	NE	345	1						25			2.4

Species	Red Data Status	Endemic or near-endemic	Priority Species Score	Reporting Rate (%)									
				3205_2330	3210_2250	3210_2255	3210_2300	3210_2305	3210_2310	3210_2315	3210_2320	3210_2325	3210_2330
Black Stork	VU, LC		330	1			33.3						7.7
Blue Crane	NT, VU		320	26.9	5.6			100	100	75	37.5	50	84.3
Ludwig's Bustard	EN, EN		320	15.4	5.6		33.3	100	33.3	62.5	12.5		50.9
Secretarybird	VU, EN		320	14.4						37.5	12.5	25	24.7
Lanner Falcon	VU, LC		300	3.8	11.1		16.7	100	33.3	12.5			11.1
Bateleur	EN, EN		300	1									0.3
African Fish Eagle			290									25	0.3
Tawny Eagle	EN, VU		290										0.3
Lesser Flamingo	NT, NT		290		2.8								
Greater Flamingo	NT, LC		290							12.5		25	
Karoo Korhaan	NT, LC		270	58.7	19.4	100	66.7	100	66.7	87.5	62.5	25	94.1
Southern Black Korhaan	VU, VU	E	270			100	16.7						13.6
Kori Bustard	NT, NT		260	1.9			33.3				12.5	25	14.3
Jackal Buzzard		NE	250	19.2	5.6		33.3			37.5			90.9
Cape Eagle-Owl			250										39.4
Nicholson's Pipit			230	51	8.3	100	33.3		33.3	12.5	37.5		81.2
Booted Eagle			230	5.8	8.3		33.3						11.5
Black-chested Snake Eagle			230										0.7
White Stork			220	1.9			16.7						2.4
Lesser Kestrel			214							12.5			0.7
Common Buzzard			210	6.7	13.9		33.3			12.5	37.5		15.7
Amur Falcon			210				16.7						0.3
Double-banded Courser			204	13.5			16.7			37.5			16
African Rock Pipit	NT, LC	SLS	200	31.7	5.6	100	16.7						82.6
Pale Chanting Goshawk			200	41.3	58.3	100	66.7	100	33.3	87.5	50	100	69.7

Species	Red Data Status	Endemic or near-endemic	Priority Species Score	Reporting Rate (%)									
				3205_2330	3210_2250	3210_2255	3210_2300	3210_2305	3210_2310	3210_2315	3210_2320	3210_2325	3210_2330
African Harrier-Hawk			190	1									13.9
Grey-winged Francolin		SLS	190	5.8	2.8								7
Northern Black Korhaan			180										1
Brown Snake Eagle			180										
Black-winged Kite			174		2.8					12.5	12.5	25	2.4
Greater Kestrel			174		5.6					37.5	12.5		1.4
Spotted Eagle-Owl			170	19.2	2.8					12.5	12.5		52.3
Rufous-breasted Sparrowhawk			170										0.7
Black Sparrowhawk			170										0.7
African Red-eyed Bulbul				76.9	88.9	100	100	100	100	87.5	100	50	100
Karoo Prinia		NE		69.2	88.9	100	83.3	100	100	100	87.5	75	100
Cape Turtle Dove				59.6	63.9	100	83.3	100	66.7	87.5	75	75	99.7
Acacia Pied Barbet				77.9	94.4	100	66.7	100	66.7	75	100		99.7
Rock Martin				27.9	69.4	100	83.3	100	66.7	62.5	87.5	50	99.7
Familiar Chat				59.6	61.1	100	100	100	66.7	50	87.5	75	99.7
Chestnut-vented Warbler				64.4	83.3	100	83.3	100	33.3	75	87.5	75	99.7
Southern Masked Weaver				47.1	91.7		83.3		33.3	75	100	25	99.7
Laughing Dove				42.3	86.1		100		100	62.5	87.5	50	99.3
Karoo Scrub Robin				76.9	97.2	100	100	100	33.3	75	87.5	50	99.3
Fairy Flycatcher		NE		61.5	69.4	100	66.7	100	33.3	75	50		99.3
Cape Sparrow				47.1	91.7	100	83.3	100		75	100	75	99.3
White-throated Canary				69.2	80.6	100	50	100	66.7	75	75		99.3
Cape Robin-Chat				26	66.7		100		33.3	75	87.5		99
Layard's Warbler		NE		73.1	5.6		33.3	100	33.3	12.5			99
Cape Wagtail				40.4	77.8	100	100	100	66.7	87.5	87.5	25	99

Species	Red Data Status	Endemic or near-endemic	Priority Species Score	Reporting Rate (%)									
				3205_2330	3210_2250	3210_2255	3210_2300	3210_2305	3210_2310	3210_2315	3210_2320	3210_2325	3210_2330
Karoo Thrush		NE		21.2	52.8		66.7			75	75		98.3
White-backed Mousebird				33.7	72.2	100	50	100	33.3	87.5	87.5	25	97.9
Pririt Batis				66.3	61.1	100	50	100	66.7	12.5	12.5	25	97.9
African Pipit				21.2	41.7		66.7	100	66.7	87.5	50	75	97.6
Lark-like Bunting				84.6	55.6	100	66.7	100	100	75	75	75	97.6
Three-banded Plover				26.9	36.1	100	66.7	100	33.3	50	37.5	25	97.2
Pied Crow				80.8	77.8	100	66.7	100	66.7	62.5	12.5	50	97.2
Cape Bunting				57.7	44.4	100	50	100	66.7	87.5	50	25	97.2
Long-billed Crombec				39.4	41.7	100	33.3	100		12.5	25		96.9
Dusky Sunbird				58.7	58.3	100	16.7		100	50	25		96.9
Neddicky				57.7	16.7	100	33.3					75	96.5
Common Waxbill				14.4	25		16.7	100		87.5	37.5		96.5
Namaqua Warbler		NE			25		66.7			50	75		96.2
Black-throated Canary				27.9	44.4	100	50	100	100	50	75		96.2
Fiscal Flycatcher		NE		23.1	63.9		83.3		33.3	62.5	75		95.8
Cape White-eye		NE		30.8	50	100	50		66.7	62.5	87.5	25	95.8
Hadada Ibis				11.5	38.9		66.7	100	33.3	62.5	75		95.5
Southern Grey-headed Sparrow				15.4	36.1	100	16.7		66.7		12.5	25	95.5
Pale-winged Starling				27.9	5.6		66.7	100		12.5	12.5		94.8
Speckled Pigeon				8.7	63.9	100	50		66.7	50	75	25	94.4
Southern Fiscal				48.1	77.8		100	100	33.3	87.5	75	50	94.1
Red-headed Finch				8.7	55.6	100	16.7		66.7	50	25		93
House Sparrow				9.6	72.2		83.3		100	50	100	25	92.7
Malachite Sunbird				30.8	13.9		50		66.7	37.5	12.5	25	92.3
Rufous-eared Warbler				81.7	86.1	100	66.7	100	66.7	87.5	75	75	91.6

Species	Red Data Status	Endemic or near-endemic	Priority Species Score	Reporting Rate (%)									
				3205_2330	3210_2250	3210_2255	3210_2300	3210_2305	3210_2310	3210_2315	3210_2320	3210_2325	3210_2330
Southern Double-collared Sunbird		NE		22.1	25		16.7		33.3	50	50		90.6
Pied Starling		SLS		31.7	52.8	100	16.7			50	75	25	90.2
Mountain Wheatear				45.2	27.8		50	100	33.3	62.5	50	25	89.9
Yellow-bellied Eremomela				48.1	36.1		50	100	33.3	37.5	25	50	89.5
Helmeted Guineafowl				32.7	19.4	100	66.7		33.3	37.5	75	25	89.2
Bar-throated Apalis				4.8									88.9
Sabota Lark				75	52.8	100	83.3	100	100	62.5	62.5	25	87.8
African Hoopoe				8.7	30.6		83.3		33.3	25	50		84
Scaly-feathered Weaver				42.3	16.7		16.7	100	33.3	25	37.5		82.9
Karoo Long-billed Lark				59.6	61.1	100	66.7	100	66.7	87.5	62.5	25	82.9
Red-winged Starling				9.6	36.1	100	66.7		33.3	12.5	12.5		81.5
Red-faced Mousebird				39.4	41.7		50		33.3	12.5	37.5	25	80.8
Little Swift				19.2	44.4	100	50			50	62.5	25	79.8
Grey-backed Cisticola				51.9	36.1	100	33.3			50	62.5		79.4
Red-billed Quelea				11.5	22.2		33.3		33.3	37.5	37.5	25	79.4
Pin-tailed Whydah				17.3	25								79.4
Ant-eating Chat				76	55.6	100	83.3	100	33.3	62.5	62.5	25	78.4
White-necked Raven				50	27.8		33.3	100	66.7	12.5			77.7
Egyptian Goose				27.9	38.9	100	100	100	33.3	50	62.5	50	77.4
Red-billed Firefinch				36.5	19.4		16.7		66.7	25	25		75.6
Black-headed Canary		NE		26	19.4	100	50	100	33.3		12.5	25	75.6
Spike-heeled Lark				24	30.6	100	50	100	33.3	75	75		74.2
Brown-hooded Kingfisher				1	2.8						25		72.1
Grey Tit		NE		19.2	2.8								69.3
Bokmakierie				40.4	72.2		83.3	100		75	75	25	69

Species	Red Data Status	Endemic or near-endemic	Priority Species Score	Reporting Rate (%)									
				3205_2330	3210_2250	3210_2255	3210_2300	3210_2305	3210_2310	3210_2315	3210_2320	3210_2325	3210_2330
Greater Striped Swallow				47.1	66.7	100	83.3	100	33.3	50	62.5	50	68.3
Blacksmith Lapwing				3.8	50		50	100	33.3	50	75		67.2
Southern Red Bishop				1	16.7		16.7		33.3	87.5	50		66.6
Spotted Thick-knee				8.7	16.7					12.5	12.5		65.2
Sickle-winged Chat		NE		25	5.6	100	16.7			25	37.5		64.1
Grey-backed Sparrow-Lark				25	47.2	100	50	100	100	75	50	50	63.1
Cape Crow				42.3	22.2	100	83.3	100	33.3	87.5	50	75	62
Cape Penduline Tit				37.5	8.3		16.7		33.3		25		62
Namaqua Dove				16.3	52.8		66.7		33.3	87.5	37.5	50	62
Namaqua Sandgrouse				14.4	38.9		16.7		66.7	50	50		61.3
Cardinal Woodpecker				2.9	8.3		33.3			12.5			60.6
White-throated Swallow				12.5	22.2		33.3		33.3	12.5	37.5	25	60.3
South African Shelduck				11.5	38.9		50	100	33.3	50	50	25	59.9
Cinnamon-breasted Warbler		NE		8.7									58.2
Eastern Clapper Lark				30.8	38.9	100	16.7			62.5	62.5		56.1
Karoo Chat				58.7	27.8		83.3	100		62.5	87.5	50	55.7
Yellow-billed Duck				7.7	11.1		16.7		33.3	37.5	12.5	25	53
African Reed Warbler					22.2		33.3			37.5	37.5		52.6
Desert Cisticola				12.5	19.4					62.5	37.5	50	50.2
Barn Swallow				42.3	36.1		33.3			37.5	37.5	50	49.8
Ground Woodpecker	LC, NT	SLS		6.7									49.1
Black-headed Heron				1.9			33.3			12.5	25	50	45.3
Chat Flycatcher				22.1	13.9		66.7		33.3	37.5	25	25	44.3
White-rumped Swift				6.7	27.8		33.3			37.5	37.5	50	42.9
African Black Duck				1			16.7	100	33.3				41.8

Species	Red Data Status	Endemic or near-endemic	Priority Species Score	Reporting Rate (%)									
				3205_2330	3210_2250	3210_2255	3210_2300	3210_2305	3210_2310	3210_2315	3210_2320	3210_2325	3210_2330
Rufous-cheeked Nightjar				13.5	2.8								41.5
Malachite Kingfisher											12.5		41.1
Diederik Cuckoo				6.7	5.6		16.7			12.5	25		36.9
Pearl-breasted Swallow				11.5	22.2		16.7					25	36.9
Cinnamon-breasted Bunting				5.8	5.6						12.5		36.6
Alpine Swift				8.7	13.9		33.3						36.2
Hamerkop				4.8	5.6		16.7		33.3				35.2
Large-billed Lark		NE		3.8	8.3		50		33.3	62.5	25	50	32.8
Rock Kestrel				19.2	22.2		100		33.3	37.5	62.5		30.7
African Sacred Ibis				1	8.3	100	16.7			37.5	62.5	25	28.2
Gabar Goshawk				2.9	2.8		16.7						27.2
Wattled Starling				7.7	16.7						25		26.5
Grey Heron				1	8.3		50			37.5	37.5	25	25.1
Greater Honeyguide													25.1
Horus Swift				9.6									24.7
European Bee-eater				1.9			33.3					25	22.6
Lesser Swamp Warbler							16.7			25	12.5		22.6
Quailfinch				1	11.1		16.7	100	33.3	12.5		25	22.3
Brown-throated Martin							50		33.3	25	25		22
African Spoonbill					19.4		16.7				12.5	25	21.3
African Black Swift				8.7			16.7						21.3
Capped Wheatear				3.8	5.6		16.7			12.5		25	21.3
Plain-backed Pipit				5.8	2.8		16.7	100			12.5		19.9
Levaillant's Cisticola							16.7			50	37.5		19.5
Village Indigobird				3.8	2.8								18.5

Species	Red Data Status	Endemic or near-endemic	Priority Species Score	Reporting Rate (%)									
				3205_2330	3210_2250	3210_2255	3210_2300	3210_2305	3210_2310	3210_2315	3210_2320	3210_2325	3210_2330
African Paradise Flycatcher													17.4
Lesser Honeyguide					2.8								15
Short-toed Rock Thrush				5.8		100							12.9
African Firefinch													12.9
Golden-breasted Bunting				1			16.7						11.5
Red-capped Lark					25		33.3	100		50	12.5	25	10.8
Spotted Flycatcher				1	8.3								10.8
Pink-billed Lark										12.5			10.8
Fiery-necked Nightjar				1.9									10.1
Common Greenshank				1	5.6					12.5		25	9.8
Red-backed Shrike				2.9	5.6								9.4
Streaky-headed Seedeater				1.9									9.4
Red-billed Teal					8.3					25	12.5		8.7
Western Barn Owl													8.7
Common Quail				3.8					33.3	12.5			8.4
Little Rush Warbler													8
Yellow-throated Bush Sparrow				1			16.7					25	7.7
Spur-winged Goose					5.6								7.3
Common House Martin				1									7.3
Common Swift					2.8		16.7				12.5		6.6
Willow Warbler					2.8		16.7						6.3
Zitting Cisticola					2.8					12.5	12.5		5.2
Common Moorhen										12.5	12.5		4.5
Crowned Lapwing					5.6		50						4.5
Black-eared Sparrow-Lark		NE								62.5	25		4.5

Species	Red Data Status	Endemic or near-endemic	Priority Species Score	Reporting Rate (%)									
				3205_2330	3210_2250	3210_2255	3210_2300	3210_2305	3210_2310	3210_2315	3210_2320	3210_2325	3210_2330
Speckled Mousebird													4.5
African Stonechat													3.8
Cape Canary				1	2.8								3.1
Cape Weaver		NE		1									2.8
Common Buttonquail													2.4
Red-eyed Dove					8.3		66.7			25	62.5		2.1
Black-winged Stilt					13.9					25			2.1
Yellow-crowned Bishop													2.1
African Dusky Flycatcher													2.1
Jacobin Cuckoo				1									1.7
Western Cattle Egret							16.7						1.7
Buffy Pipit													1.7
Little Grebe					5.6					12.5			1.4
White-fronted Bee-eater													1.4
Fork-tailed Drongo				1			66.7			37.5	25		1.4
Reed Cormorant				1						12.5	12.5		1
White-breasted Cormorant													1
Yellow Canary										25	12.5		1
Red-knobbed Coot					2.8					37.5	12.5		0.7
Little Bittern													0.7
Lesser Grey Shrike				1						12.5			0.7
Orange River White-eye													0.7
Pied Kingfisher							16.7				12.5		0.3
Pied Avocet					13.9					37.5		25	0.3
Cape Shoveler					8.3					25			0.3

Species	Red Data Status	Endemic or near-endemic	Priority Species Score	Reporting Rate (%)									
				3205_2330	3210_2250	3210_2255	3210_2300	3210_2305	3210_2310	3210_2315	3210_2320	3210_2325	3210_2330
Rock Dove													0.3
African Palm Swift				1									0.3
Dwarf Bittern													0.3
Southern Pochard													0.3
Eurasian Hobby													0.3
Great Spotted Cuckoo													0.3
European Nightjar													0.3
Giant Kingfisher													0.3
South African Cliff Swallow		BNE											0.3
Black Cuckooshrike													0.3
Black-chested Prinia													0.3
Cape Longclaw													0.3
Swee Waxbill		NE											0.3
Long-tailed Paradise Whydah													0.3
African Darter											12.5		
Tractrac Chat				6.7							12.5		
Karoo Lark		NE		1	5.6		16.7					25	
Common Starling							16.7						
Common Ostrich				8.7				100	33.3				
Karoo Eremomela		NE		1.9									
Great Egret					2.8								
Kittlitz's Plover					5.6					25			
Little Stint					2.8					12.5			
European Roller	NT, LC						16.7						
Marsh Sandpiper										12.5			

Species	Red Data Status	Endemic or near-endemic	Priority Species Score	Reporting Rate (%)									
				3205_2330	3210_2250	3210_2255	3210_2300	3210_2305	3210_2310	3210_2315	3210_2320	3210_2325	3210_2330
Little Egret											12.5		