Avifauna Scoping Assessment for the proposed Limestone PV1 and Limestone PV2 Solar Energy Facilities

Z F Mgcawu District Municipality, Northern Cape

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CLIENT

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Submitted to	savannah environmental
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Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.

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1 Introduction

1.1 Background

The Biodiversity Company was appointed to undertake an avifauna scoping assessment for the proposed Limestone PV1 and Limestone PV2 solar energy facilites near Danielskuil (Figure 1-1). The focus areas are approximately 14 km south of the town Danielskuil in the Z F Mgcawu District Municipality, Northern Cape.

The Danielskuil Focus Areas has been identified by the development for the construction and operation of a solar farm affecting the following property:

- Portion 4 of the Farm Engeland 300 (Figure 1-2).

Each project will have a contracted capacity of between 75MWp to 150MWp. A project site of 1842 ha and a preferred development area with an extent of 300-400ha have been identified by AGV Projects (Pty) Ltd as technically suitable for the development of the PV facilities. Each facility is proposed to include the following infrastructure:

» PV modules mounted on either a single axis tracking & fixed structure, dependent on optimisation, technology available and cost.

» Inverters and transformers.

» Low voltage cabling between the PV modules to the inverters.

» Fence around the project development area with security and access control.

» Camera surveillance.

» Internet connection.

» 33kV cabling between the project components and the facility substation.

» 33/132kV onsite facility substation.

» Battery Energy Storage System (BESS) with a footprint of 3-5ha.

» Site offices and maintenance buildings, including workshop areas for maintenance and storage as well as parking for staff and visitors.

» Laydown/staging area on-site in front of mounting structures during installation. Temporary store area close to site entrance (Less than 2ha).

» Access roads (up to 6m wide) and internal distribution roads (up to 5m wide).

» Temporary concrete batching facility.

» Stormwater management infrastructure as required.

The approach to this scoping study 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). The National Web based Environmental Screening Tool has characterised the terrestrial sensitivity of the project area as "Very High" and the fauna as 'High'.

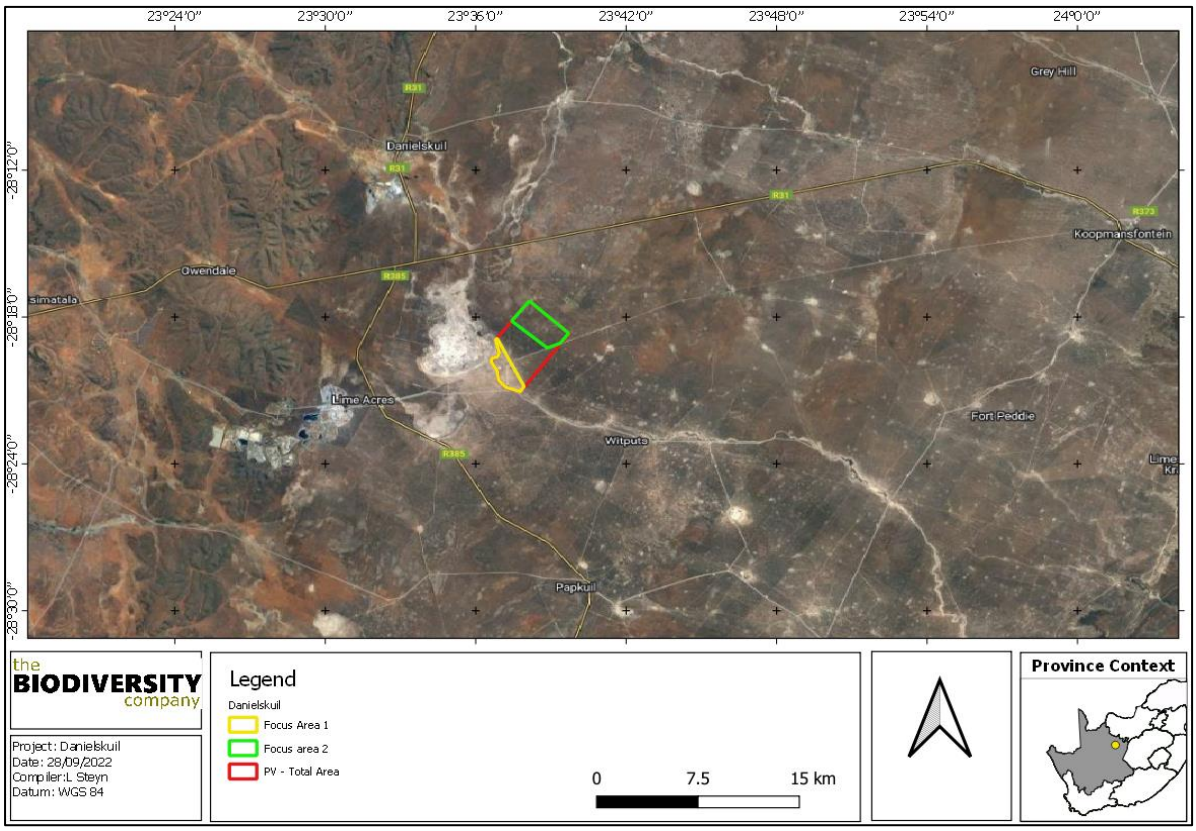


Figure 1-1 Proposed location of the project area in relation to the nearby towns

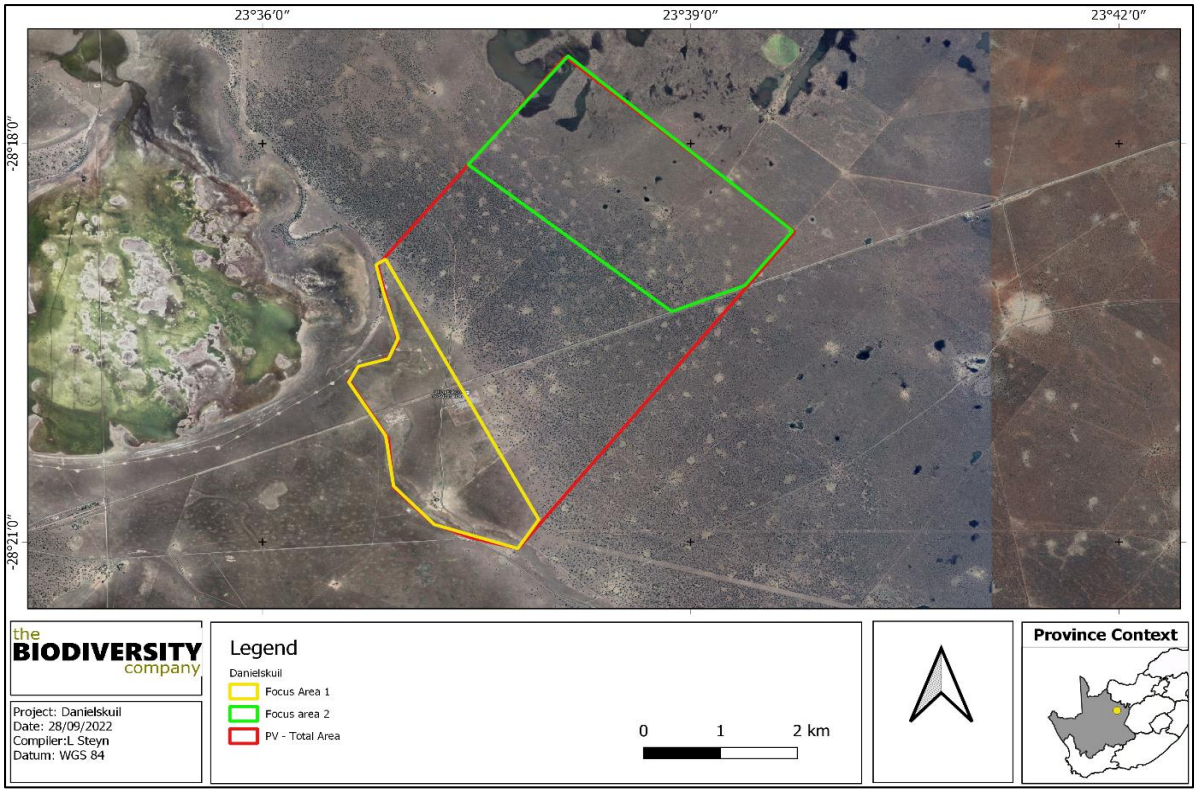


Figure 1-2 The focus areas inside the total project area

1.2 Scope of Work

The principle aim of the assessment was to provide information to guide the risk of the proposed activity to the avifauna communities of the associated ecosystems within the project area. This was achieved through the following:

- Desktop assessment to identify the relevant ecologically important geographical features within the project area;
- Desktop assessment to compile an expected species list and identify possible threatened avifauna species that occur within the project area;
- Identify the manner that the proposed project impacts based on the scoping assessment information and the desktop information and evaluate the level of risk of these potential impacts.

1.3 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- The assessment area was based on the area provided by the client and any alterations to the footprint and/or missing GIS information pertaining to the assessment area would have affected the area surveyed;
- The species likelihood of occurrence is based on desktop information and might be changed after the two assessments;

- The impact assessment included is for scoping purposes alone and is based on desktop information, data from a first site visit, as well as the information from the screening assessment; and
- The SEI included in the field summary section is pre-liminary and may change after the second survey.

1.4 Key Legislative Requirements

1.4.1 Terrestrial Ecology

The legislation, policies and guidelines listed below in Table 1-1 are applicable to the current project in terms of biodiversity and ecological support systems. 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 Northern Cape

Region	Legislation
International	Convention on Biological Diversity (CBD, 1993)
	The Convention on Wetlands (RAMSAR Convention, 1971)
	The United Nations Framework Convention on Climate Change (UNFCC,1994)
	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)
	The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)
National	Constitution of the Republic of South Africa (Act No. 108 of 2006)
	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)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24 , No 42946 (January 2020)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24 , No 43110 (March 2020)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989) and associated EIA Regulations
	National Protected Areas Expansion Strategy (NPAES)
	Environmental Conservation Act (Act No. 73 of 1983)
	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)
	National Spatial Biodiversity Assessment (NSBA)
	World Heritage Convention Act (Act No. 49 of 1999)
	National Heritage Resources Act, 1999 (Act 25 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations, 2014

	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
	White Paper on Biodiversity
Provincial	Northern Cape Planning and Development Act no. 7 of 1998
	Northern Cape Critical Biodiversity Area 2017
	Northern Cape Planning and Development Act no. 7 of 1998

2 Methods

2.1 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.

2.1.1 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:

- National Biodiversity Assessment 2018 (Skowno *et al*, 2019) - The purpose of the National Biodiversity Assessment (NBA) is to assess the state of South Africa's biodiversity based on best available science, with a view to understanding trends over time and informing policy and decision-making across a range of sectors. The NBA deals with all three components of biodiversity: genes, species and ecosystems; and assesses biodiversity and ecosystems across terrestrial, freshwater, estuarine and marine environments. The two headline indicators assessed in the NBA are:
    - Ecosystem Threat Status – indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition.
    - Ecosystem Protection Level – indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. Not Protected, Poorly Protected or Moderately Protected ecosystem types are collectively referred to as under-protected ecosystems.
- Protected areas:

- South Africa Protected Areas Database (SAPAD) (DEA, 2020) – 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) (SANBI, 2010) – 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.

- Critical Biodiversity Areas (Northern Cape Department of Environment and Nature Conservation, 2016) – Critical Biodiversity Areas (CBAs) are natural or near-natural features, habitats or landscapes that include terrestrial, aquatic and marine areas that are considered critical for:

  - meeting national and provincial biodiversity targets and thresholds;

  - safeguarding areas required to ensure the persistence and functioning of species and ecosystems, including the delivery of ecosystem services; and/or

  - conserving important locations for biodiversity features or rare species.

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. Priorities from existing plans such as the Namakwa District Biodiversity Plan, the Succulent Karoo Ecosystem Plan, National Estuary Priorities, and the National Freshwater Ecosystem Priority Areas were incorporated.

- Important Bird and Biodiversity Areas (BirdLife South Africa, 2015) – 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; and

- 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.

2.1.2 Desktop avifaunal Assessment

The avifaunal desktop assessment comprised of the following:

- Compiling an expected avifauna list from the South African Bird Atlas Project (SABP2) website using the 2820_2325; 2820_2340; 2820_2335; 2820_2330; 2815_2335; 2815_2330; 2810_2340; 2810_2335 and 2810_2330 pentads; and
- Compilation of a Coordinated Water Bird Count (CWAC) species list if the project area was found to be in a vicinity of a CWAC site.

2.2 Field Survey

The avifaunal field survey will be comprised of the following techniques:

- Visual and auditory searches - This typically comprises of meandering and using binoculars to view species from a distance without them being disturbed; and listening to species calls;
- Point counts for the avifauna; and
- Utilization of local knowledge.

Relevant field guides and texts that will be consulted for identification purposes included the following:

- Book of birds of South Africa, Lesotho and Swaziland (Taylor *et al.,* 2015); and
- Roberts – Birds of Southern Africa (Hockey *et al.,* 2005).

A first field survey was conducted during 12-16 September 2022.

2.3 Terrestrial Site Ecological Importance

The different habitat types within the project area will be delineated and identified based on observations during the field assessment, and available satellite imagery. These habitat types will be 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).
	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.
High	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).
	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.
Medium	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.
	No confirmed or highly likely populations of SCC.
Low	No confirmed or highly likely populations of range-restricted species.
	< 50% of receptor contains natural habitat with limited potential to support SCC.
	No confirmed and highly unlikely populations of SCC.
Very Low	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 large (> 100 ha) intact area for any conservation status of ecosystem type or > 5 ha for CR ecosystem types.
Very High	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.
	Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types.
High	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 (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types.
Medium	Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches.

Low	Mostly minor current negative ecological impacts, with some major impacts and a few signs of minor past disturbance. Moderate rehabilitation potential. 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.
Very Low	Several minor and major current negative ecological impacts. 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.

3 Results & Discussion

3.1 Desktop Assessment

3.1.1 Ecologically Important Landscape Features

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

Table 3-1 Summary of relevance of the proposed Limestone PV1 and Limestone PV2 project area to ecologically important landscape features.

Desktop Information Considered	Relevant/Irrelevant	Section
Ecosystem Threat Status	Irrelevant – Located within Least Concern ecosystems	3.1.1.1
Ecosystem Protection Level	Relevant – The focus area 1 overlaps with NP and MP ecosystems, while the rest of the project area only overlaps with a NP ecosystem	3.1.1.2
Protected Areas	Irrelevant – Does not overlap NPAES focus areas, protected areas and their buffers	3.1.1.3
Critical Biodiversity Area	Relevant – Intersects CBA1 and CBA2	3.1.1.4
Important Bird and Biodiversity Areas	Irrelevant – Approximately 83 km to the closest IBA	3.1.1.5
South African Inventory of Inland Aquatic Ecosystems	Relevant – The project area overlaps with a river classified as CR, as well as numerous LC wetlands	3.1.1.6
National Freshwater Ecosystem Priority Areas	Relevant – The project area overlaps with a FEPA river, and numerous FEPA wetlands.	3.1.1.6
Coordinated Road Count	Irrelevant – 150 km from the project area	-
Coordinated Waterbird Count	Relevant -The project area is 13 km from the Danielskuil CWAC and 11 km from the Soutpan CWAC	3.3
Renewable Energy Development Zones	Irrelevant – 63 km from the Kimberley Solar REDZ	-
Strategic Transmission Corridors (EGI)	Irrelevant – 14 km from the Northern Corridor	-

3.1.1.1 Critical Biodiversity Areas (CBA)

Conservation of CBAs is crucial, in that if these areas are not maintained in a natural or near-natural state, biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (SANBI-BGIS, 2017).

The provincial CBA spatial data indicates that the Limestone PV1 and Limestone PV2project area overlaps with CBA1 features and CBA2 features (Figure 2-1).

CBA1 and CBA2 are areas “that must be maintained in a good ecological condition (natural or near-natural state) in order to meet biodiversity targets. CBAs collectively meet biodiversity targets for all ecosystem types as well as for species and ecological processes that depend on natural or near-natural habitat, that have not already been met in the protected area network.” (SANBI, 2016).

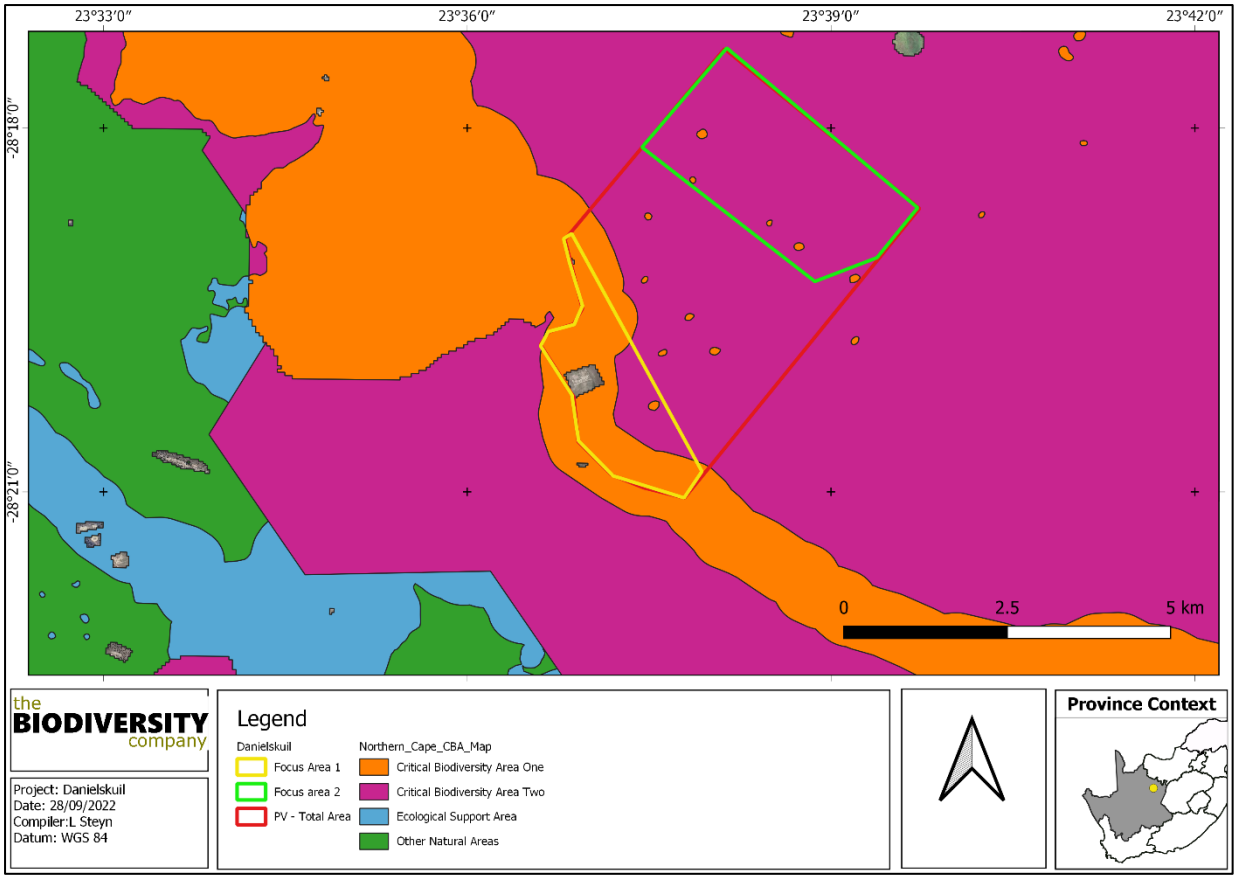


Figure 3-1 ***Map illustrating the locations of Critical Biodiversity Area features in relation to the Limestone PV1 and Limestone PV2 project area***

3.1.1.2 Ecosystem Threat Status

The Ecosystem Threat Status is an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition. According to the spatial dataset the project area overlaps LC ecosystems (Figure 3-1).

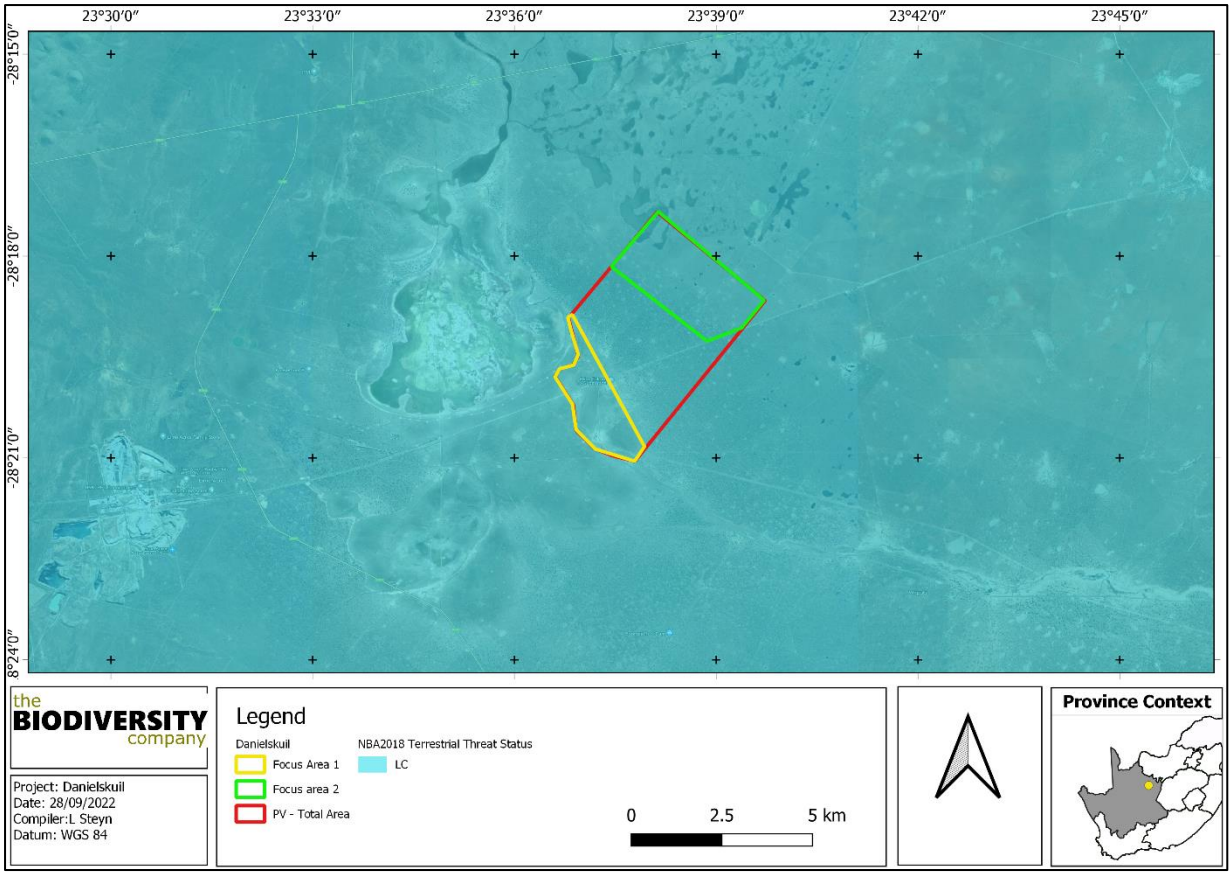


Figure 3-2 Map illustrating the ecosystem threat status associated with the Limestone PV1 and Limestone PV2 project area

3.1.1.3 Ecosystem Protection Level

Indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. Not Protected, Poorly Protected or Moderately Protected ecosystem types are collectively referred to as under-protected ecosystems. The focus area 1 overlaps with NP and MP ecosystems, while the rest of the project area only overlaps with a NP ecosystem (Figure 3-2).

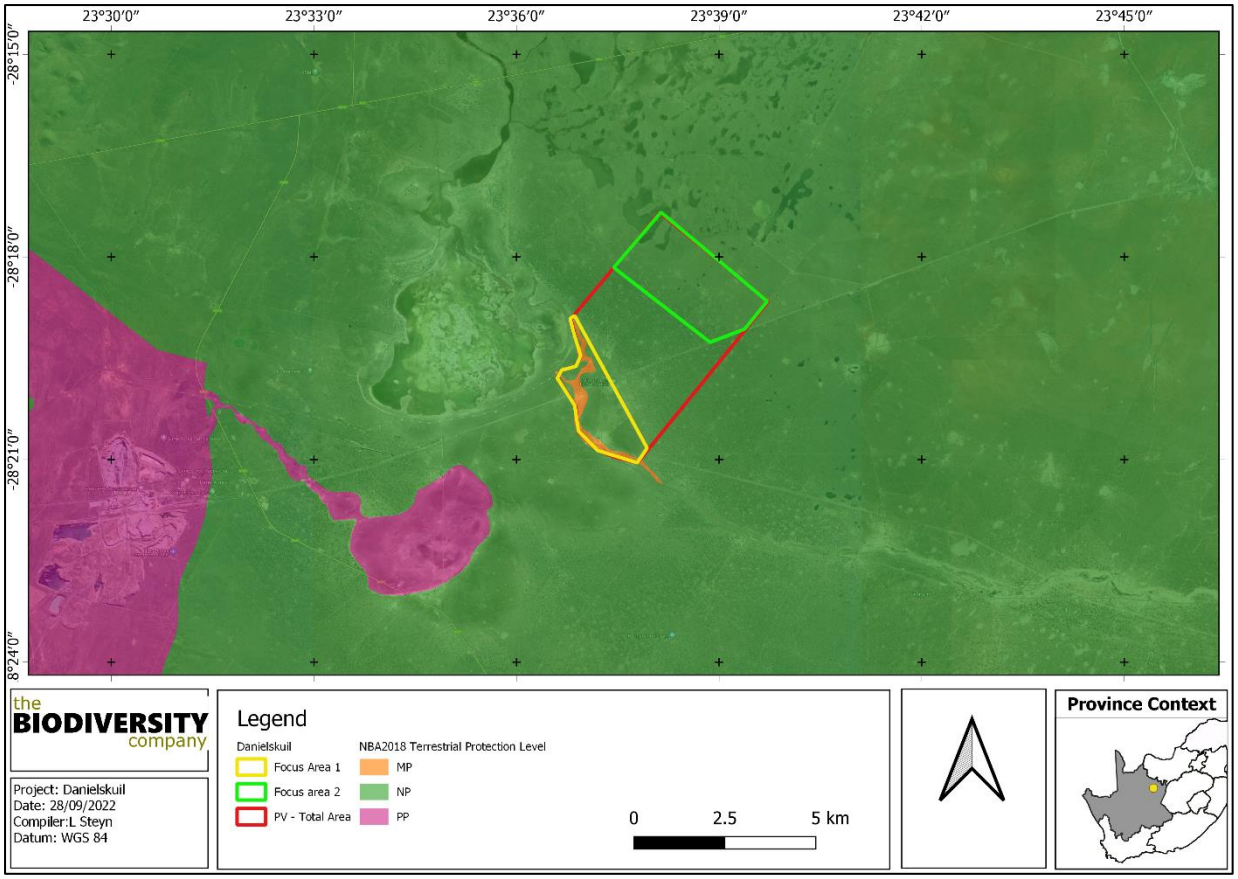


Figure 3-3 ***Map illustrating the ecosystem protection level associated with the Limestone PV1 and Limestone PV2 project area***

3.1.1.4 Protected Areas

According to the protected area spatial datasets from SAPAD (2019), the proposed development does not occur within any protected area (Figure 3-3). The Rockwood Nature Reserve is located approximately 27 km to the south of the project area.

The Focus Area is not located within any focus area for the National Protected Area Expansion Strategy (NPAES). The Eastern Kalahari Bushveld Focus Area is located approximately 2.2km to the north-west of the project area (Figure 3-3).

Focus areas for land-based protected area expansion are large, intact and unfragmented areas of high importance, suitable for the creation or expansion of large, protected areas. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES. This suggests that development may occur within a portion of these areas, taking into consideration the nature of the development and the level of impact to the receiving environment.

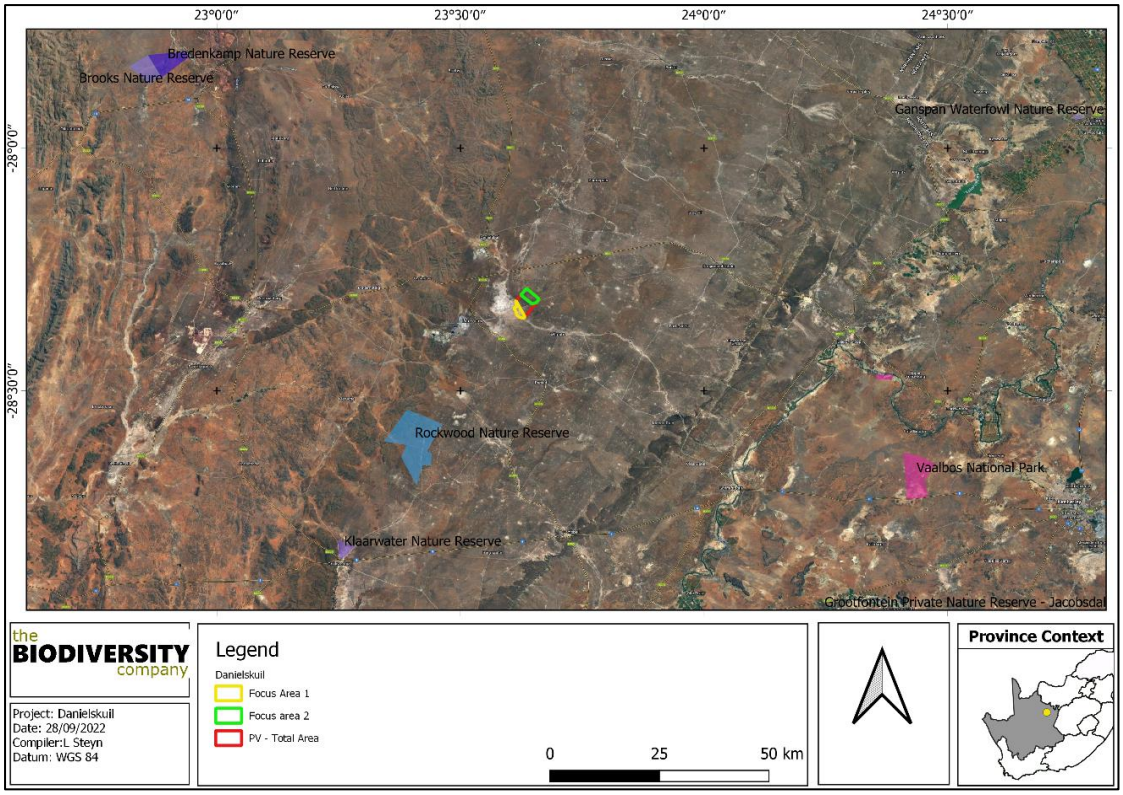


Figure 3-4 ***Map illustrating the location of protected areas proximal to the Limestone PV1 and Limestone PV2 project area***

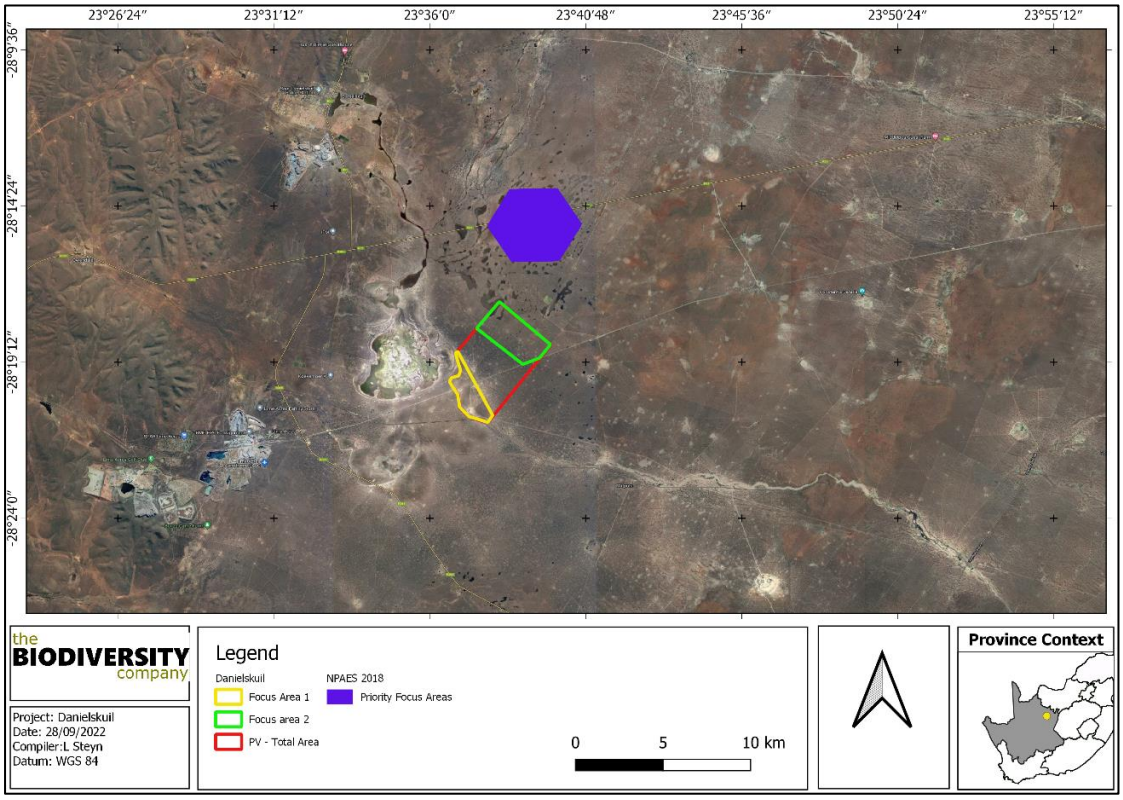


Figure 3-5 ***Map illustrating the location of National Protected Area Expansion Strategy proximal to the Limestone PV1 and Limestone PV2 project area***

3.1.1.5 Important Bird & Biodiversity Areas

The proposed development is not located within an IBA. The Spitskop Dam is located approximately 83 km to the north-east of the project area (Figure 3-5).

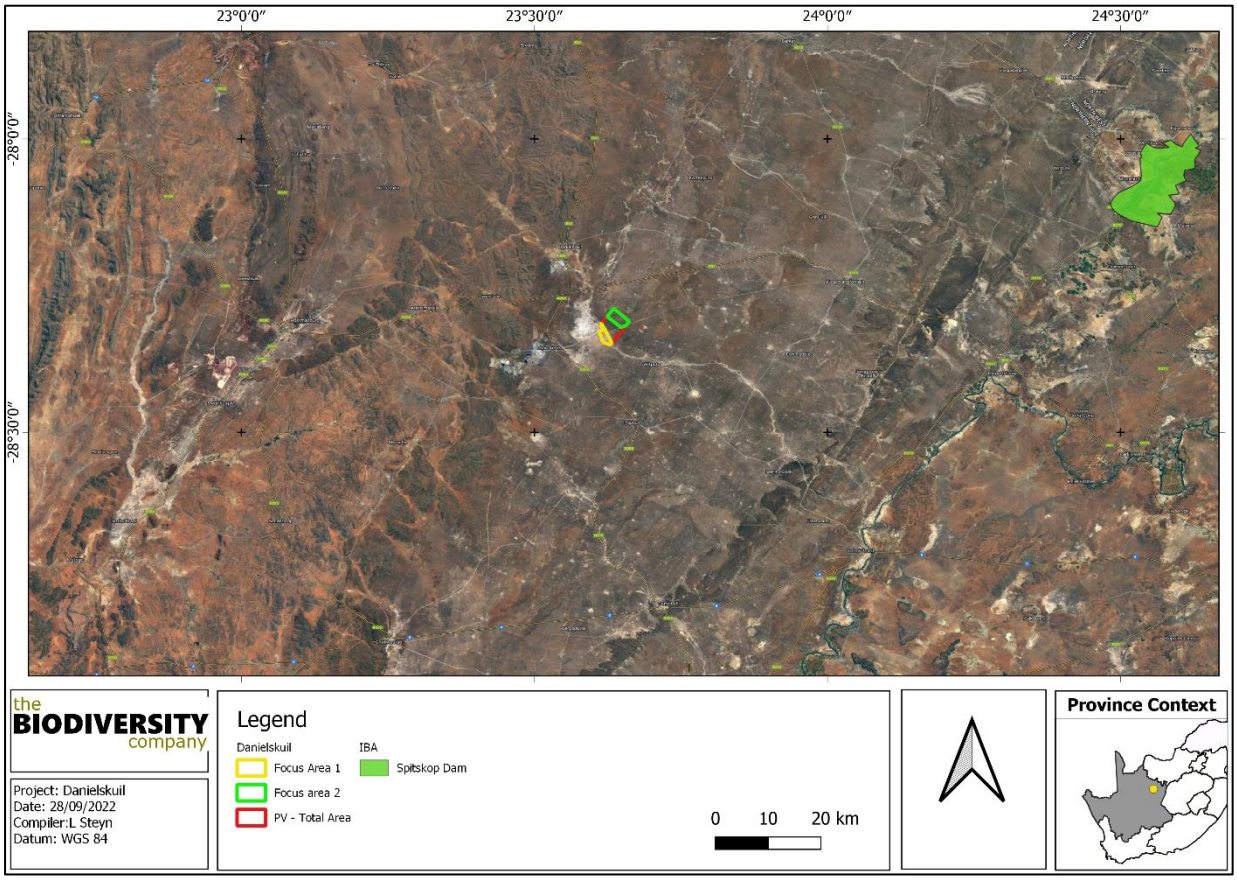


Figure 3-6 Map illustrating the location of the nearest Important Bird & Biodiversity Areas to the Limestone PV1 and Limestone PV2 project area

3.1.1.6 Hydrological Setting

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was released with the National Biodiversity Assessment (NBA) 2018. Ecosystem threat status (ETS) of river 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 Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Threatened (LT), with CR, EN and VU ecosystem types collectively referred to as 'threatened' (Van Deventer *et al.,* 2019; Skowno *et al.,* 2019). The project area overlaps with a river classified as CR, as well as numerous LC wetlands (Figure 3-6).

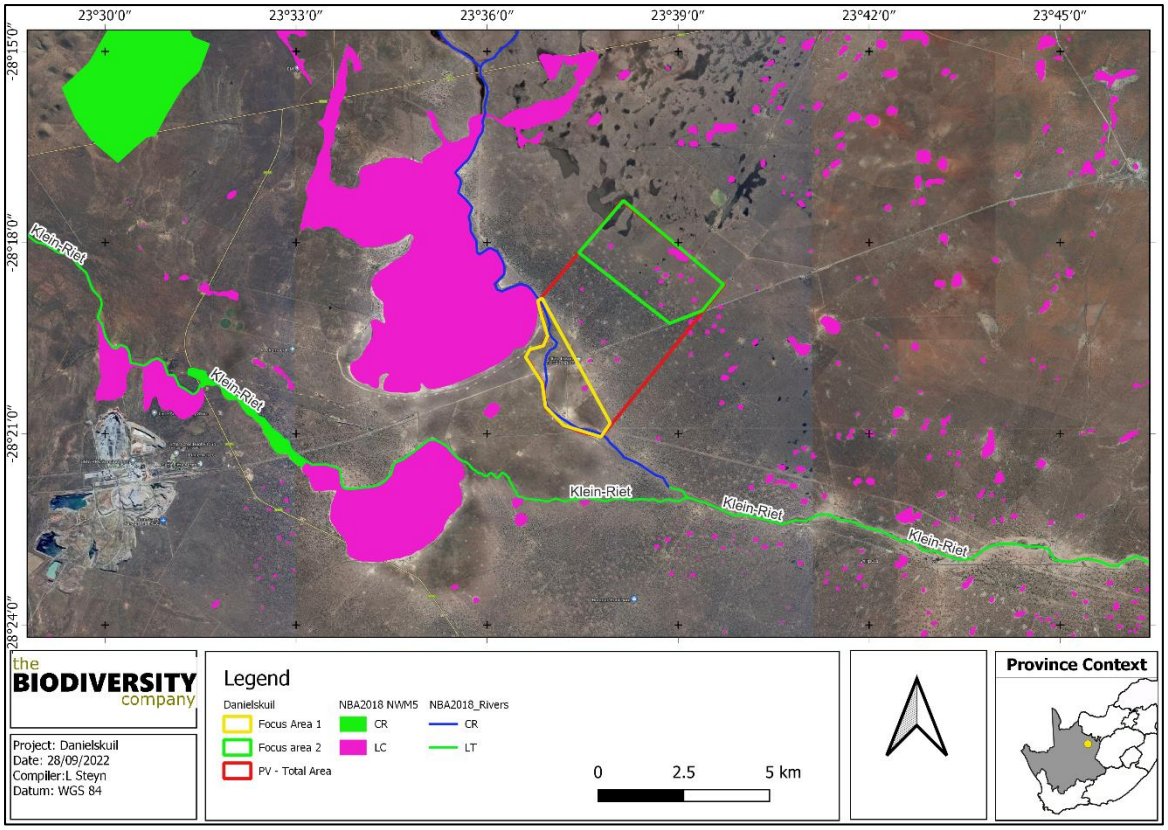


Figure 3-7 Map illustrating the hydrological setting of the Limestone PV1 and Limestone PV2 project area

The National Freshwater Ecosystem Priority Areas (NFEPA) spatial data has been incorporated in the above mentioned SAIIAE spatial data set. However, to ensure that this data sets are considered we included it as the Freshwater Ecosystem Priority Areas (FEPAs) (Driver *et al*., 2011) are intended to be conservation support tools and are envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act (NEM:BA) biodiversity goals (Nel *et al.,* 2011). The project area overlaps with a FEPA river (Figure 3-7), and numerous FEPA wetlands.

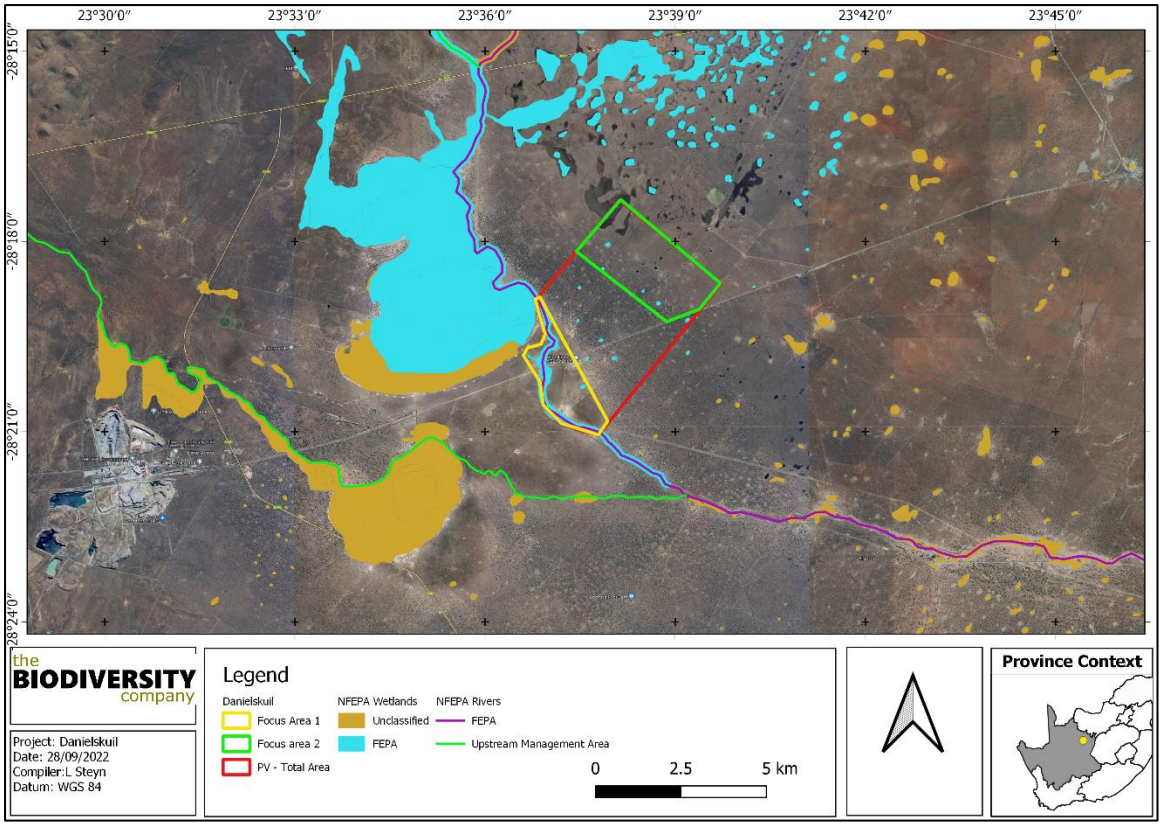


Figure 3-8 Map illustrating the project area in relation to the NFEPA spatial data

3.2 Expected Avifauna Species of Conservation Concern

Based on the SABAP 2 data 202 species are expected in the project area (Appendix A) of which 12 species are threatened species (Table 3-2).

Table 3-2 Threatened avifauna species that are expected to occur within the Danielskuil project area. EN = Endangered, NT = Near Threatened, LC = Least Concern, and VU = Vulnerable.

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	**IUCN (2021)**	
Aquila rapax	Eagle, Tawny	EN	VU	Moderate
Aquila verreauxii	Eagle, Verreaux's	VU	LC	Moderate
Ciconia nigra	Stork, Black	VU	LC	Moderate
Cursorius rufus	Courser, Burchell's	VU	LC	High
Falco biarmicus	Falcon, Lanner	VU	LC	High
Neotis ludwigii	Bustard, Ludwig's	EN	EN	High
Oxyura maccoa	Duck, Maccoa	NT	VU	Moderate
Phoeniconaias minor	Flamingo, Lesser	NT	NT	High
Phoenicopterus roseus	Flamingo, Greater	NT	LC	High
Polemaetus bellicosus	Eagle, Martial	EN	EN	Moderate

Rostratula benghalensis	Painted-snipe, Greater	NT	LC	Moderate
Sagittarius serpentarius	Secretarybird	VU	EN	High

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* predates 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). This species has a moderate likelihood of occurring.

Aquila verreauxii (Verreaux's Eagle) is listed as VU on a regional scale and LC on a global scale. This species is locally persecuted in southern Africa where it coincides with livestock farms, but because the species does not take carrion, is little threatened by poisoned carcasses. Where hyraxes are hunted for food and skins, eagle populations have declined (IUCN, 2017). Based on the expected habitat, the likelihood of occurrence of this species at the project area is rated as moderate.

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 wetland areas, and as such the likelihood of occurrence is rated as moderate.

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 saltpans (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 high.

Falco biarmicus (Lanner Falcon) is listed as LC on a global scale but VU on a regional scale (Taylor, 2015). They may occur in groups up to 20 individuals or individually. Their diet is mainly composed of small birds such as pigeons and francolins. Threats include trapping, persecution, pesticide use and habitat loss. Suitable habitat and prey species is present in the project area.

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, irrespective of size, with potentially thousands of individuals involved in such collisions each year (Jenkins et al. 2011). 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 (Martin and Shaw 2010). The likelihood of occurrence is rated as high based on the suitable habitat present.

Oxyura maccoa (Maccoa Duck) has a large northern and southern range, South Africa is part of its southern distribution. During the species' 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 (*Phragmites spp*.) and cattails (*Typha spp*.) on which it relies for nesting (IUCN, 2017). The likelihood of occurrence of this species in the project area was rated as moderate as they might occur at the nearby pan.

Phoeniconaias minor (Lesser Flamingo) is listed as NT on a global and regional scale whereas *Phoenicopterus roseus* (Greater Flamingo) is listed as NT on a regional scale only. Both species have similar habitat requirements and the species breed on large undisturbed alkaline and saline lakes, salt pans or coastal lagoons, usually far out from the shore after seasonal rains have provided the flooding necessary to isolate remote breeding sites from terrestrial predators and the soft muddy material for nest building (IUCN, 2017). The pan adjacent to the project area provide highly suitable habitat for both of these species.

Polemaetus bellicosus (Martial Eagle) is widely distributed throughout sub-Saharan Africa. The global population has not been quantified but the population in South Africa, Lesotho and Eswatini is believed to be around 800 pairs (Taylor, 2015). Declines have taken place across much of this species's range owing to habitat loss, deliberate and incidental poisoning, collisions with power lines, and pollution (BirdLife International, 2020). Direct persecution (shooting and trapping) by farmers and indirect poisoning are by far the most important causes of losses. In some areas, birds may be taken for use in traditional medicine, and parts have been found in muthi markets in Johannesburg. In South Africa, the highest declines were observed in areas with the greatest increase in temperature and areas with high densities of power lines, probably due to collisions and electrocutions. The habitat is somewhat suitable for this species as such a moderate likelihood of occurrence were given to this species.

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 may possibly exist within the project area or adjacent to the project area, thus the likelihood of occurrence is moderate.

Sagittarius serpentarius (Secretarybird) occurs in sub-Saharan Africa and inhabits grasslands, open plains, and lightly wooded savanna. It is also found in agricultural areas and sub-desert (IUCN, 2017). The likelihood of occurrence is rated as high due to the highly suitable habitat for this species in the project area.

The field survey recorded 88 bird species, of which three were SCCs. Refer to section 5.2 for more details.

3.3 Coordinated Water Bird Count

The Animal demographic unit launched the Coordinated Waterbird Counts (CWAC) project in 1992 as part South Africa's commitment to International waterbird conservation. Regular mid-summer and mid-winter censuses are done to determine the various features of water birds including population size, how waterbirds utilise water sources and determining the heath of wetlands. For a full description of CWAC please refer to http://cwac.birdmap.africa/about.php.

The project area is 13 km from the Danielskuil CWAC and 11 km from the Soutpan CWAC (Figure 3-8).

Danielskuil Pan (28112333) was first registered in 1996 and is counted irregularly. This site consist of two dams and a dam/pan with open shoreline, some shorebird habitat, and almost no fringing vegetation, adjacent to Danielskuil. Formerly, the dam/pan received water from local sewage works. Counts are available for 1996 and 1997, when mainly small numbers of 17 species were recorded, 16 species in summer (only South African Shelduck being missing) and only 3 in winter (SA Shelduck, Three-banded Plover and Cape Wagtail). The most numerous birds in summer were White-faced Duck, Blacksmith Plover (a good count of 47 birds in 1997), Curlew Sandpiper and Little Stint. Pollution by sewage and domestic refuse is an important threat; mild threats are fishing, and overhead powerlines.

Soutpan (28262347) was also first registered in 1996 and is counted irregularly. It is found on a private owners farm and 25 species has been recorded here during the assessments (Table 3-3).

Figure 3-9 The CWAC sites in the vicinity of the project area

Table 3-3 Water bird species recorded at the two CWAC sites and their average reporting rates

Common name	Taxonomic name	Soutpan	Danielskuil
Avocet, Pied	*Recurvirostra avosetta*	28.00	
Coot, Red-knobbed	*Fulica cristata*	3.80	7.00
Duck, Knob-billed	*Sarkidiornis melanotos*		1.00

Duck, White-faced Whistling	*Dendrocygna viduata*		15.00
Duck, Yellow-billed	*Anas undulata*	1.00	3.50
Egret, Intermediate	*Ardea intermedia*	1.00	
Egret, Western Cattle	*Bubulcus ibis*		10.50
Flamingo, Greater	*Phoenicopterus roseus*	13.00	
Goose, Egyptian	*Alopochen aegyptiaca*	1.60	2.00
Grebe, Little	*Tachybaptus ruficollis*		4.50
Greenshank, Common	*Tringa nebularia*	183.00	
Heron, Black-headed	*Ardea melanocephala*	1.00	
Heron, Grey	*Ardea cinerea*	3.00	
Heron, Grey	*Ardea cinerea*		2.50
Ibis, Glossy	*Plegadis falcinellus*		2.00
Ibis, Hadada	*Bostrychia hagedash*	1.00	1.00
Lapwing, Blacksmith	*Vanellus armatus*	8.00	18.20
Painted-snipe, Greater	*Rostratula benghalensis*	1.00	
Plover, Common Ringed	*Charadrius hiaticula*		2.00
Plover, Kittlitz's	*Charadrius pecuarius*	20.50	2.00
Plover, Three-banded	*Charadrius tricollaris*	4.25	
Plover, Three-banded	*Charadrius tricollaris*		3.25
Sandpiper, Common	*Actitis hypoleucos*		1.50
Sandpiper, Curlew	*Calidris ferruginea*	20.00	39.00
Sandpiper, Marsh	*Tringa stagnatilis*	7.00	6.00
Sandpiper, Wood	*Tringa glareola*	1.00	1.00
Shelduck, South African	*Tadorna cana*	3.75	1.50
Stilt, Black-winged	*Himantopus himantopus*	38.50	1.00
Stint, Little	*Calidris minuta*	48.00	22.50
Teal, Cape	*Anas capensis*	2.00	1.00
Teal, Red-billed	*Anas erythrorhyncha*	2.00	
Wagtail, Cape	*Motacilla capensis*	4.60	4.50
Ruff	*Calidris pugnax*	8.50	

4 First Field Assessment and Screening Assessment Summary

4.1 Review of screening assessment information

The following concerns are associated with the Limestone PV1 and Limestone PV2 project area:

- *Eupodotis afraoides afraoides* (South African Black Korhaan) was observed occupying the plains habitat within, and adjacent to, the project area.
- During this scoping survey, *Falco rupicolus* (Rock Kestrel) was the only raptor observed to use the cliff habitats.
- Personal communication with landowners had indicated that *Gyps africanus* (White-backed Vulture) occur within the area and are particularly prevalent during drought periods. They are likely to use the plains for feeding and cliff habitats for roosting. The development of solar PV impacts these species mainly through the construction of powerline infrastructure, which presents significant collision and electrocution risks to vultures. The PV panels will result in the loss of foraging and potential nesting habitat for the species.
- Although not recorded within the project area, *Ardeotis kori* (Kori Bustard) were recorded between Danielskuil and Groblershoop with an OHL collision mortality recorded (Figure 4-1). The development of solar PV impacts these species mainly through the construction of powerline infrastructure, which presents significant collision risks to bustards. The PV panels will result in the loss of foraging and potential nesting habitat for the species.

Figure 4-1 Kori bustard recoded under a powerline during the screening assessment

4.2 First Field Assessment

A field assessment was conducted 12-16 September 2022, during this survey the 88 bird species were recorded of which three were SCCs. The SCCs recorded were Lanner Falcon (*Falco biarmicus*) (VU- regionally), Burchell's Courser (*Cursorius rufus*) (VU-regionally) and Greater Flamingo (*Phoenicopterus roseus*) (NT- regionally). Lanner Falcon and Burchell's Courser were both recorded once during the assessment, one and two individuals respectively were found. The Greater Flamingos were recorded on two occasions and a total of 569 birds were recorded (Figure 4-2).

Figure 4-2 The SCCs recorded during the first assessment, A) Greater Flamingos, B) Burchell's Courser and C) Lanner Falcon

Of the 88 species 15 species were identified that would be at risk for collisions, electrocutions or habitat loss due to the development. These species are listed in Table 4-1.

Table 4-1 Species at risk for collisions, electrocutions and habitat loss

Common Name	Scientific Name	RD (Regional, Global)	Collisions	Electrocution	Habitat Loss
Burchell's Courser	*Cursorius rufus*	VU, LC			x
Egyptian Goose	*Alopochen aegyptiaca*		x	x	
Glossy Ibis	*Plegadis falcinellus*		x	x	
Greater Flamingo	*Phoenicopterus roseus*	NT, LC		x	

Hadeda (Hadada) Ibis	*Bostrychia hagedash*		x	x	
Helmeted Guineafowl	*Numida meleagris*			x	
Lanner Falcon	*Falco biarmicus*	VU, LC	x		x
Northern Black Korhaan	*Afrotis afraoides*		x	x	x
Pale Chanting Goshawk	*Melierax canorus*			x	
Red-crested Korhaan	*Lophotis ruficrista*		x	x	x
South African Shelduck	*Tadorna cana*		x		
Spotted Eagle-Owl	*Bubo africanus*		x	x	
Western Cattle Egret	*Bubulcus ibis*		x	x	
White-faced Whistling Duck	*Dendrocygna viduata*		x	x	
Yellow-billed Duck	*Anas undulata*		x	x	

The biodiversity theme sensitivity, as indicated in the screening report, was derived to be Very High, (Figure 4-3) while the fauna sensitivity was rated as 'High (Figure 4-4).

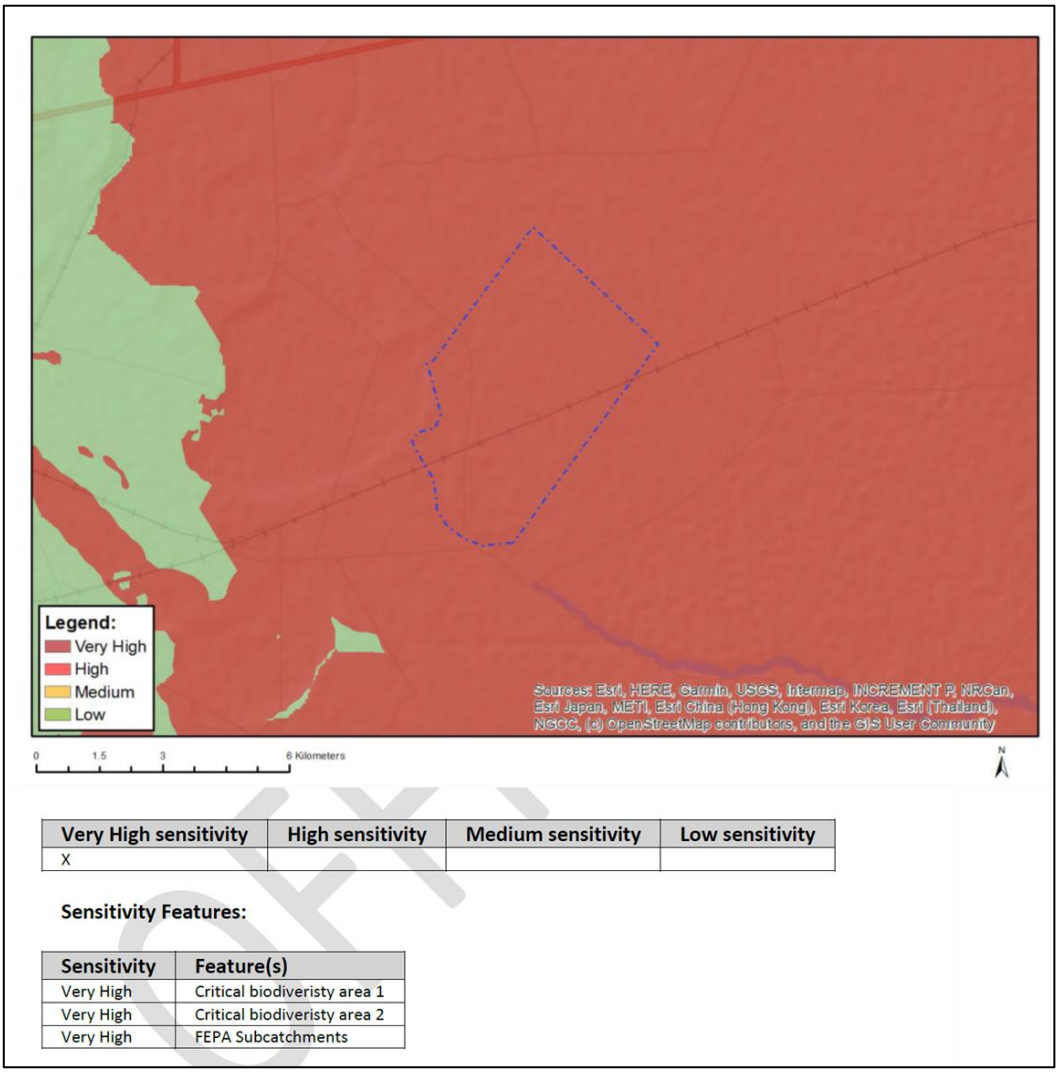
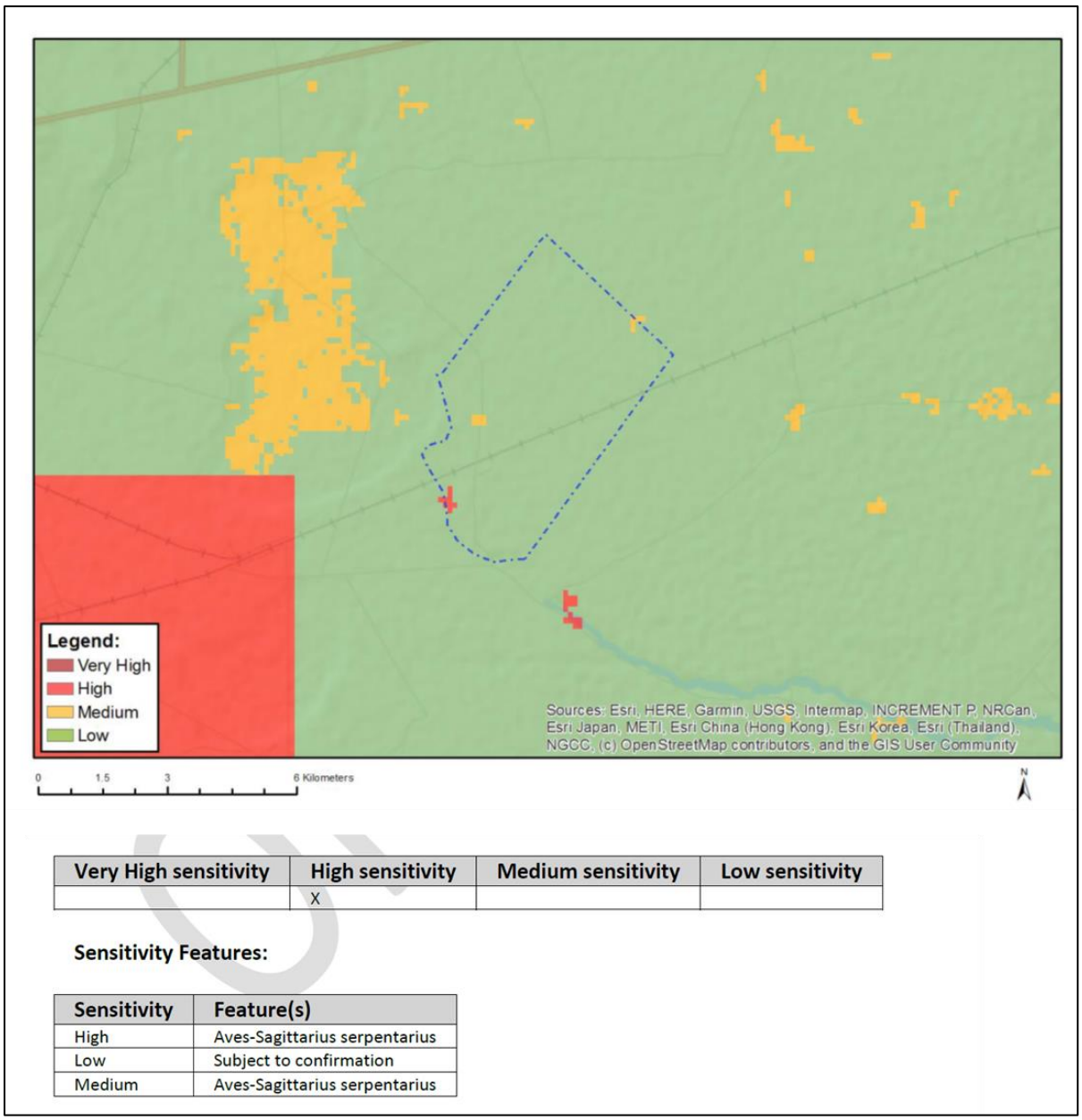


Figure 4-3 Terrestrial Biodiversity Theme Sensitivity, National Web based Environmental Screening Tool.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
	X		

Sensitivity Features:

Sensitivity	Feature(s)
High	Aves-Sagittarius serpentarius
Low	Subject to confirmation
Medium	Aves-Sagittarius serpentarius

Figure 4-4 Fauna Theme Sensitivity, National Web based Environmental Screening Tool.

The screening tool sensitivity for the fauna theme is mostly of a low sensitivity, with only small sections of high sensitivity noted. This is likely due to historical data that proves confirmed sightings and regular foraging locations for the threatened Secretary Bird (*Sagittarius serpentarius*). The data is not up-to-date with the confirmed presence of large colonies of threatened Flamingo populations (*Phoenicopterus roseus*) that utilise the local water resources.

Pre-liminary sensitivities were compiled for the avifauna study based on only the first survey. Based on the criteria provided in Section 2.3 of this report, all habitats (full description of the habitats to be provided after the second survey) within the assessment area of the proposed project were allocated a sensitivity category (Table 4-2). The sensitivities of the habitat types delineated are illustrated in Figure 4-5.

Table 4-2 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
Water Resources (and buffer)	High	High	High	Very Low	Very High
Grassland	High	High	High	Medium	High
Transformed	Very Low	Low	Very Low	High	Very Low
Vaalbos veld	High	High	High	Medium	High
Shrubland	High	High	High	Medium	High

The 'Very High' ratings are ultimately based on the five SCCs found in the area along with the extensive congregations of the Greater Flamingos in the adjacent water bodies.

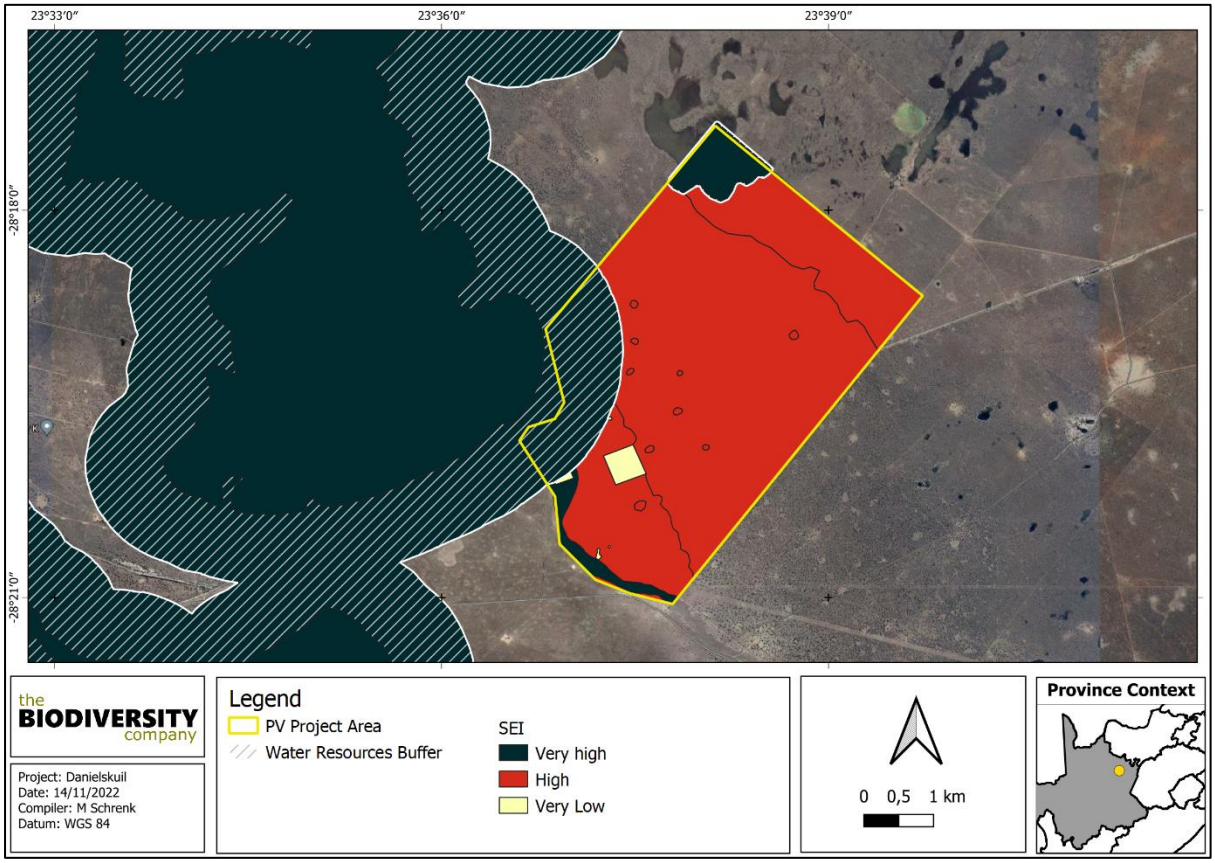


Figure 4-5 Pre-liminary sensitivities based on the first avifauna assessment

Interpretation of the SEI in the context of the proposed project is provided in Table 4-3.

Table 4-3 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.
Very Low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

5 Impact Risk Assessment

5.1 Avifauna Impact Assessment

Anthropogenic activities drive habitat destruction causing displacement of avifauna and possibly direct mortality. Land clearing destroys habitat and can lead to the loss of local breeding grounds, nesting sites and movement corridors such as rivers, streams and drainage lines, or other locally important features. The removal of natural vegetation may reduce the habitat available for avifauna species and may reduce animal populations and species compositions within the area.

Portions of the project area are classified as CBA1 and CBA2 also overlaps with CR rivers and FEPA wetlands and rivers. The importance of these areas are highlighted by the number of avifauna SCCs expected. A total of ten avifauna SCCs were given a high likelihood of occurrence, while a further two were given a moderate likelihood of occurrence. During the screening assessment two SCCs were recorded and during the first assessment an additional three SCCs were recorded (see section 4). Based on the desktop and initial assessments information it can be said that majority of the project area will have a very high sensitivity rating. Refer to section 6 for more details.

Table 5-1 Scoping evaluation table summarising the impacts identified to terrestrial biodiversity

Impact			
Biodiversity loss/disturbance			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Destruction, fragmentation and degradation of habitats and ecosystems	<u>Direct impacts:</u> » Disturbance / degradation / loss to vegetation and habitats » Ecological corridors are disrupted » Habitat fragmentation <u>Indirect impacts:</u> » Erosion risk increases » Fire risk increases » Increase in invasive alien species	Local	Water resources and buffer area
Spread and/or establishment of alien and/or invasive species	<u>Direct impacts:</u> » Loss of vegetation and habitat due to increase in alien species <u>Indirect impacts:</u> » Creation of infrastructure suitable for breeding activities of alien and/or invasive species	Local	None identified at this stage

	» Spreading of potentially dangerous diseases due to invasive and pest species		
Direct mortality of avifauna	Direct impacts: » Loss of SCC species » Loss of avifauna diversity Indirect impacts: » Loss of diversity and species composition in the area. » Possible impact on the food chain	Regional	The whole of the project area footprint because of the large amount of Greater flamingos found at the wetland adjacent to the project area, combined with the presence of Lanner Falcon, Burchell's Courser, Kori Bustard and Southern Black Korhaan.
Reduced dispersal/migration of fauna	Direct impacts: » Loss of genetic diversity » Isolation of species and groups leading to inbreeding Indirect impacts: » Reduced seed dispersal » Loss of ecosystem services	Regional	None identified at this stage
Environmental pollution due to water runoff, spills from vehicles and erosion	Direct impacts: » Pollution in watercourses and the surrounding environment » Avifaunal mortality (direct and indirectly) Indirect impacts: » Ground water pollution » Loss of ecosystem services	Local	None identified at this stage
Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise, dust, heat radiation and light pollution.	Direct impacts: » Disruption/alteration of ecological life cycles due to noise » Reduced pollination and growth of vegetation due to dust leading to reduced habitat	Local	None identified at this stage

	» Avifaunal mortality due to light pollution (nocturnal species becoming more visible to predators) » Heat radiation could lead to the displacement of species Indirect impacts: » Loss of ecosystem services Direct impacts: » Loss of SCCs or TOPS species		
Staff and others interacting directly with fauna (potentially dangerous) or poaching of animals	Indirect impacts: » Loss of ecosystem service » Loss of genetic diversity	Local	None identified at this stage

Description of expected significance of impact

The development of the area could result in the loss or degradation of the habitat and vegetation, most of which is still in a natural condition and supports a number of avifauna species. The construction of the solar facility could also lead to the displacement/mortalities of the avifauna and more specifically SCC avifauna species. The operation of the facility could result in the disruption of ecological life cycles. This could be as a result of a number of things, but mainly due to dust, noise, light pollution and heat radiation. Leaks, spillages or breakages from any of these could result in contamination of the receiving water resources. Contaminated water resources are likely to have an effect on the associated biota.

Gaps in knowledge & recommendations for further study

- This is completed at a desktop level only.
- Identification and descriptions of habitats.
- Identification of the Site Ecological Importance after dual season surveys.
- Location and identification of SCCs as well as in the case of avifauna their location of the nests.
- Determine a suitable buffer width for the identified features.

Recommendations with regards to general field surveys

- Field surveys to prioritise the development areas, but also consider the 500 m PAOI.
- Fieldwork to be undertaken during the wet season period.
- Avifauna assessment field work to be conducted over two seasons to ensure migratory species are considered.
- Breeding survey to be conducted in late spring– early summer.

5.1.1 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 protected areas. As per Table 5-2 the project in isolation has a moderate impact but cumulatively it has a high impact (based on a preliminary assessment).

Table 5-2 Preliminary Cumulative impact assessment for the solar plant

The development of the proposed infrastructure will contribute to cumulative habitat loss within CBAs and will result in the loss of SCCs including SCC breeding areas.

	Overall impact of the proposed development considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Moderate (3)	High (4)
Duration	Long term (4)	Long term (4)
Magnitude	Moderate (6)	High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (52)**	**High (64)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes to some extent, but habitat loss and displacement of avifauna SCCs cannot be mitigated.	

Mitigation:

• This impact cannot be mitigated as the loss of vegetation is unavoidable.

Residual Impacts:

Will result in the loss of:

- CBA1 and CBA2
- Endemic species;
- SCC avifauna species (including large congregations of SCCs); and
- Niche habitats.

6 Conclusion

Portions of the project area are classified as both CBA1 and CBA2, also overlapping a CR river and FEPA water resources. The ecological importance of the project area is highlighted by the number of avifauna SCCs expected for the area. A total of six avifauna SCCs were assigned a high likelihood of occurrence, while a further six were assigned a moderate likelihood of occurrence. During the screening assessment two SCCs were recorded and during the first assessment an additional three SCCs were recorded for the area. During the screening assessment *Eupodotis afraoides afraoides* (South African Black Korhaan) and *Ardeotis kori* (Kori Bustard) were observed. During the first assessment SCCs recorded species included Lanner Falcon (*Falco biarmicus*) (VU- regionally), Burchell's Courser (*Cursorius rufus*) (VU-regionally) and Greater Flamingo (*Phoenicopterus roseus*) (NT-regionally) – all species were found within the projects area of influence, which means that over the course of time they will forage and possibly nest within the proposed development areas. Whilst only one and two individuals of Lanner Falcon and Burchell's Courser respectively were recorded, a total of 569 Greater Flamingos were recorded during the first assessment. The main impact of the proposed development on all species will be the loss of habitat, while the construction of powerlines associated with the PV plant present significant collision risk to the large congregations of Flamingo species.

Based on the number of Greater Flamingos found in the pan adjacent to the project area it is likely the system serves as a breeding area for these birds, a breeding survey (late spring-early summer) will confirm this. This is relevant to the proposed development as the colonies will fly past and over the area to get to the pan – thus raising collision risks with powerlines and any relevant infrastructure. Based on the five SCCs found in the area along with the congregations of the Greater Flamingos, currently the 'wet' portions of the project area have been assigned a Very High avifauna sensitivity. A 1 km buffer been assigned to the pan system due to the large colonies of Flamingo observed, however this buffer is preliminary and may be adjusted based on input from BirdLife South Africa (buffer considerations taken from van Rooyen, 2019). The high sensitivity areas may be considered for development, pending input from BirdLife South Africa and if the appropriate mitigation measures are put into place.

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8 Appendix Items

8.1 Appendix A – Expected Avifauna species

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	**IUCN (2021)**
Acridotheres tristis	Myna, Common	Unlisted	LC
Acrocephalus baeticatus	Reed-warbler, African	Unlisted	Unlisted
Acrocephalus gracilirostris	Swamp-warbler, Lesser	Unlisted	LC
Actitis hypoleucos	Sandpiper, Common	Unlisted	LC
Afrotis afraoides	Korhaan, Northern Black	Unlisted	LC
Alopochen aegyptiaca	Goose, Egyptian	Unlisted	LC
Amadina erythrocephala	Finch, Red-headed	Unlisted	LC
Anas capensis	Teal, Cape	Unlisted	LC
Anas erythrorhyncha	Teal, Red-billed	Unlisted	LC
Anas undulata	Duck, Yellow-billed	Unlisted	LC
Anthoscopus minutus	Penduline-tit, Cape	Unlisted	LC
Anthus cinnamomeus	Pipit, African	Unlisted	LC
Anthus leucophrys	Pipit, Plain-backed	Unlisted	LC
Anthus vaalensis	Pipit, Buffy	Unlisted	LC
Apus affinis	Swift, Little	Unlisted	LC
Apus apus	Swift, Common	Unlisted	LC
Apus caffer	Swift, White-rumped	Unlisted	LC
Aquila rapax	Eagle, Tawny	EN	VU
Aquila verreauxii	Eagle, Verreaux's	VU	LC
Ardea cinerea	Heron, Grey	Unlisted	LC
Ardea melanocephala	Heron, Black-headed	Unlisted	LC
Batis pririt	Batis, Pririt	Unlisted	LC
Bostrychia hagedash	Ibis, Hadeda	Unlisted	LC
Brunhilda erythronotos	Waxbill, Black Cheecked	Unlisted	LC
Bubo africanus	Eagle-owl, Spotted	Unlisted	LC
Bubulcus ibis	Egret, Cattle	Unlisted	LC
Burhinus capensis	Thick-knee, Spotted	Unlisted	LC
Buteo buteo	Buzzard, Common (Steppe)	Unlisted	LC
Calandrella cinerea	Lark, Red-capped	Unlisted	LC
Calendulauda africanoides	Lark, Fawn-coloured	Unlisted	LC
Calendulauda sabota	Lark, Sabota	Unlisted	LC

Calidris minuta	Stint, Little	LC	LC
Calidris pugnax	Ruff	Unlisted	LC
Campethera abingoni	Woodpecker, Golden-tailed	Unlisted	LC
Caprimulgus rufigena	Nightjar, Rufous-cheeked	Unlisted	LC
Cecropis cucullata	Swallow, Greater Striped	Unlisted	LC
Cecropis semirufa	Swallow, Red-breasted	Unlisted	LC
Cercotrichas coryphoeus	Scrub-robin, Karoo	Unlisted	LC
Cercotrichas paena	Scrub-robin, Kalahari	Unlisted	LC
Certhilauda subcoronata	Lark, Karoo Long-billed	Unlisted	LC
Ceryle rudis	Kingfisher, Pied	Unlisted	LC
Charadrius tricollaris	Plover, Three-banded	Unlisted	LC
Chersomanes albofasciata	Lark, Spike-heeled	Unlisted	LC
Chlidonias hybrida	Tern, Whiskered	Unlisted	LC
Chroicocephalus cirrocephalus	Gull, Grey-headed	Unlisted	LC
Chrysococcyx caprius	Cuckoo, Diderick	Unlisted	LC
Ciconia ciconia	Stork, White	Unlisted	LC
Ciconia nigra	Stork, Black	VU	LC
Cinnyris fuscus	Sunbird, Dusky	Unlisted	LC
Cinnyris mariquensis	Sunbird, Marico	Unlisted	LC
Cinnyris talatala	Sunbird, White-bellied	Unlisted	LC
Circaetus pectoralis	Snake-eagle, Black-chested	Unlisted	LC
Cisticola aridulus	Cisticola, Desert	Unlisted	LC
Cisticola fulvicapilla	Neddicky, Neddicky	Unlisted	LC
Cisticola juncidis	Cisticola, Zitting	Unlisted	LC
Cisticola subruficapilla	Cisticola, Grey-backed	Unlisted	LC
Cisticola tinniens	Cisticola, Levaillant's	Unlisted	LC
Clamator jacobinus	Cuckoo, Jacobin	Unlisted	LC
Colius colius	Mousebird, White-backed	Unlisted	LC
Columba guinea	Pigeon, Speckled	Unlisted	LC
Coracias caudatus	Roller, Lilac-breasted	Unlisted	LC
Corvus albus	Crow, Pied	Unlisted	LC
Corvus capensis	Crow, Cape	Unlisted	LC
Corythornis cristatus	Kingfisher, Malachite	Unlisted	Unlisted
Cossypha caffra	Robin-chat, Cape	Unlisted	LC
Coturnix coturnix	Quail, Common	Unlisted	LC
Creatophora cinerea	Starling, Wattled	Unlisted	LC
Crithagra albogularis	White-throated Canary	LC	LC

Crithagra atrogularis	Canary, Black-throated	Unlisted	LC
Crithagra flaviventris	Canary, Yellow	Unlisted	LC
Curruca layardi	Tit-Babbler, Layard's	Unlisted	LC
Curruca subcoerulea	Tit-babbler, Chestnut-vented	Unlisted	Unlisted
Cursorius rufus	Courser, Burchell's	VU	LC
Cypsiurus parvus	Palm-swift, African	Unlisted	LC
Delichon urbicum	House-martin, Common	Unlisted	LC
Dendrocygna viduata	Duck, White-faced Whistling	Unlisted	LC
Dendropicos fuscescens	Woodpecker, Cardinal	Unlisted	LC
Egretta garzetta	Egret, Little	Unlisted	LC
Elanus caeruleus	Kite, Black-shouldered	Unlisted	LC
Emberiza capensis	Bunting, Cape	Unlisted	LC
Emberiza flaviventris	Bunting, Golden-breasted	Unlisted	LC
Emberiza impetuani	Bunting, Lark-like	Unlisted	LC
Emberiza tahapisi	Bunting, Cinnamon-breasted	Unlisted	LC
Eremomela icteropygialis	Eremomela, Yellow-bellied	Unlisted	LC
Eremopterix verticalis	Sparrowlark, Grey-backed	Unlisted	LC
Estrilda astrild	Waxbill, Common	Unlisted	LC
Euplectes afer	Bishop, Yellow-crowned	Unlisted	LC
Euplectes orix	Bishop, Southern Red	Unlisted	LC
Falco biarmicus	Falcon, Lanner	VU	LC
Falco naumanni	Kestrel, Lesser	Unlisted	LC
Falco rupicoloides	Kestrel, Greater	Unlisted	LC
Falco rupicolus	Kestrel, Rock	Unlisted	LC
Fulica cristata	Coot, Red-knobbed	Unlisted	LC
Gallinula chloropus	Moorhen, Common	Unlisted	LC
Glaucidium perlatum	Owlet, Pearl-spotted	Unlisted	LC
Granatina granatina	Waxbill, Violet-eared	Unlisted	LC
Haliaeetus vocifer	Fish-eagle, African	Unlisted	LC
Himantopus himantopus	Stilt, Black-winged	Unlisted	LC
Hippolais icterina	Warbler, Icterine	Unlisted	LC
Hirundo albigularis	Swallow, White-throated	Unlisted	LC
Hirundo rustica	Swallow, Barn	Unlisted	LC
Indicator indicator	Honeyguide, Greater	Unlisted	LC
Indicator minor	Honeyguide, Lesser	Unlisted	LC
Lagonosticta senegala	Firefinch, Red-billed	Unlisted	LC
Lamprotornis bicolor	Starling, Pied	Unlisted	LC

Lamprotornis nitens	Starling, Cape Glossy	Unlisted	LC
Laniarius atrococcineus	Shrike, Crimson-breasted	Unlisted	LC
Lanius collaris	Fiscal, Common (Southern)	Unlisted	LC
Lanius collurio	Shrike, Red-backed	Unlisted	LC
Lanius minor	Shrike, Lesser Grey	Unlisted	LC
Lophoceros nasutus	Hornbill, African Grey	Unlisted	LC
Lophotis ruficrista	Korhaan, Red-crested	Unlisted	LC
Lybius torquatus	Barbet, Black-collared	Unlisted	LC
Malcorus pectoralis	Warbler, Rufous-eared	Unlisted	LC
Melaenornis infuscatus	Flycatcher, Chat	Unlisted	LC
Melaenornis silens	Flycatcher, Fiscal	Unlisted	LC
Melaniparus cinerascens	Tit, Ashy	Unlisted	LC
Melierax canorus	Goshawk, Southern Pale Chanting	Unlisted	LC
Merops apiaster	Bee-eater, European	Unlisted	LC
Merops bullockoides	Bee-eater, White-fronted	Unlisted	LC
Merops hirundineus	Bee-eater, Swallow-tailed	Unlisted	LC
Microcarbo africanus	Cormorant, Reed	Unlisted	LC
Micronisus gabar	Goshawk, Gabar	Unlisted	LC
Mirafra fasciolata	Lark, Eastern Clapper	Unlisted	LC
Monticola brevipes	Rock-thrush, Short-toed	Unlisted	LC
Motacilla capensis	Wagtail, Cape	Unlisted	LC
Muscicapa striata	Flycatcher, Spotted	Unlisted	LC
Myrmecocichla formicivora	Chat, Anteating	Unlisted	LC
Myrmecocichla monticola	Wheatear, Mountain	Unlisted	LC
Neotis ludwigii	Bustard, Ludwig's	EN	EN
Netta erythrophthalma	Pochard, Southern	Unlisted	LC
Numida meleagris	Guineafowl, Helmeted	Unlisted	LC
Nycticorax nycticorax	Night-Heron, Black-crowned	Unlisted	LC
Oena capensis	Dove, Namaqua	Unlisted	LC
Oenanthe familiaris	Chat, Familiar	Unlisted	LC
Oenanthe pileata	Wheatear, Capped	Unlisted	LC
Onychognathus nabouroup	Starling, Pale-winged	Unlisted	LC
Ortygospiza atricollis	Quailfinch, African	Unlisted	LC
Oxyura maccoa	Duck, Maccoa	NT	VU
Passer diffusus	Sparrow, Southern Grey-headed	Unlisted	LC
Passer domesticus	Sparrow, House	Unlisted	LC
Passer melanurus	Sparrow, Cape	Unlisted	LC

Phalacrocorax lucidus	Cormorant, White-breasted	Unlisted	LC
Philetairus socius	Weaver, Sociable	Unlisted	LC
Phoeniconaias minor	Flamingo, Lesser	NT	NT
Phoenicopterus roseus	Flamingo, Greater	NT	LC
Phoeniculus purpureus	Wood-hoopoe, Green	Unlisted	LC
Phylloscopus trochilus	Warbler, Willow	Unlisted	LC
Platalea alba	Spoonbill, African	Unlisted	LC
Plectropterus gambensis	Goose, Spur-winged	Unlisted	LC
Plegadis falcinellus	Ibis, Glossy	Unlisted	LC
Plocepasser mahali	Sparrow-weaver, White-browed	Unlisted	LC
Ploceus velatus	Masked-weaver, Southern	Unlisted	LC
Polemaetus bellicosus	Eagle, Martial	EN	EN
Prinia flavicans	Prinia, Black-chested	Unlisted	LC
Pterocles namaqua	Sandgrouse, Namaqua	Unlisted	LC
Ptyonoprogne fuligula	Martin, Rock	Unlisted	Unlisted
Pycnonotus nigricans	Bulbul, African Red-eyed	Unlisted	LC
Pytilia melba	Pytilia, Green-winged	Unlisted	LC
Quelea quelea	Quelea, Red-billed	Unlisted	LC
Recurvirostra avosetta	Avocet, Pied	Unlisted	LC
Rhinopomastus cyanomelas	Scimitarbill, Common	Unlisted	LC
Rhinoptilus africanus	Courser, Double-banded	Unlisted	LC
Riparia cincta	Martin, Banded	Unlisted	LC
Riparia paludicola	Martin, Brown-throated	Unlisted	LC
Rostratula benghalensis	Painted-snipe, Greater	NT	LC
Sagittarius serpentarius	Secretarybird	VU	EN
Saxicola torquatus	Stonechat, African	Unlisted	LC
Scleroptila gutturalis	Francolin, Orange River	Unlisted	LC
Scopus umbretta	Hamerkop, Hamerkop	Unlisted	LC
Spatula smithii	Shoveler, Cape	Unlisted	LC
Spilopelia senegalensis	Dove, Laughing	Unlisted	LC
Spizocorys conirostris	Lark, Pink-billed	Unlisted	LC
Spizocorys starki	Lark, Stark's	Unlisted	LC
Sporopipes squamifrons	Finch, Scaly-feathered	Unlisted	LC
Stenostira scita	Flycatcher, Fairy	Unlisted	LC
Streptopelia capicola	Turtle-dove, Cape	Unlisted	LC
Streptopelia semitorquata	Dove, Red-eyed	Unlisted	LC
Struthio camelus	Ostrich, Common	Unlisted	LC

Sylvietta rufescens	Crombec, Long-billed	Unlisted	LC
Tachybaptus ruficollis	Grebe, Little	Unlisted	LC
Tachymarptis melba	Swift, Alpine	Unlisted	LC
Tadorna cana	Shelduck, South African	Unlisted	LC
Tchagra australis	Tchagra, Brown-crowned	Unlisted	LC
Telophorus zeylonus	Bokmakierie, Bokmakierie	Unlisted	LC
Thalassornis leuconotus	Duck, White-backed	Unlisted	LC
Threskiornis aethiopicus	Ibis, African Sacred	Unlisted	LC
Tockus leucomelas	Hornbill, Southern Yellow-billed	Unlisted	LC
Trachyphonus vaillantii	Barbet, Crested	Unlisted	LC
Tricholaema leucomelas	Barbet, Acacia Pied	Unlisted	LC
Tringa glareola	Sandpiper, Wood	Unlisted	LC
Tringa nebularia	Greenshank, Common	Unlisted	LC
Turdus litsitsirupa	Thrush, Groundscraper	Unlisted	Unlisted
Turdus smithi	Thrush, Karoo	Unlisted	LC
Tyto alba	Owl, Barn	Unlisted	LC
Upupa africana	Hoopoe, African	Unlisted	LC
Urocolius indicus	Mousebird, Red-faced	Unlisted	LC
Vanellus armatus	Lapwing, Blacksmith	Unlisted	LC
Vanellus coronatus	Lapwing, Crowned	Unlisted	LC
Vidua macroura	Whydah, Pin-tailed	Unlisted	LC
Vidua regia	Whydah, Shaft-tailed	Unlisted	LC
Zosterops pallidus	White-eye, Orange River	Unlisted	LC

8.2 Appendix B – Specialist Declarations of Independence

I, Lindi Steyn, 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.

Lindi Steyn

Biodiversity Specialist

The Biodiversity Company

September 2022

I, Andrew Husted, 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.

Andrew Husted

Biodiversity Specialist

The Biodiversity Company

September 2022

I, Michael Schrenk, 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.

Michael Schrenk

Biodiversity Specialist

The Biodiversity Company

September 2022