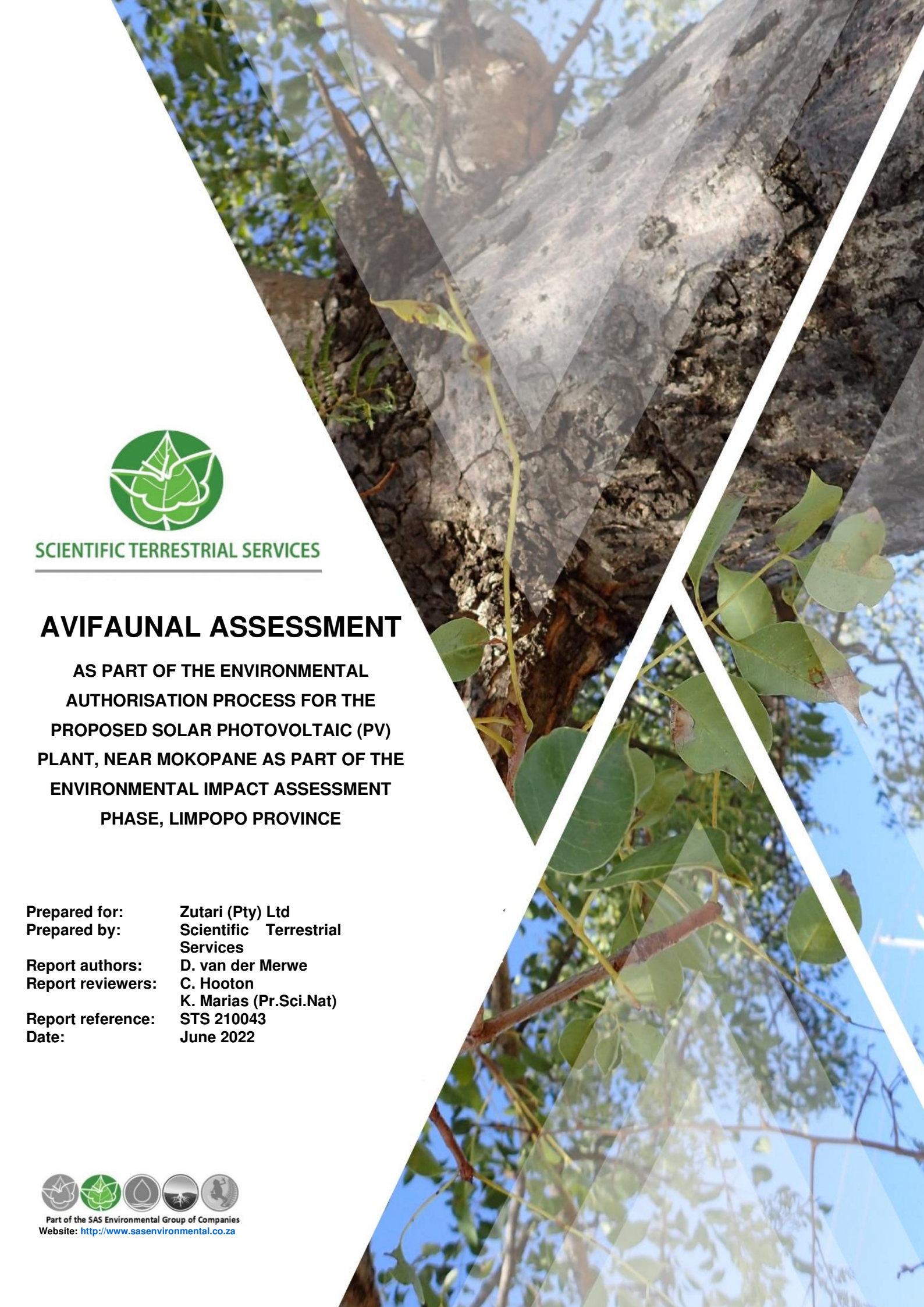


SCIENTIFIC TERRESTRIAL SERVICES

# AVIFAUNAL ASSESSMENT

**AS PART OF THE ENVIRONMENTAL AUTHORISATION PROCESS FOR THE PROPOSED SOLAR PHOTOVOLTAIC (PV) PLANT, NEAR MOKOPANE AS PART OF THE ENVIRONMENTAL IMPACT ASSESSMENT PHASE, LIMPOPO PROVINCE**

| | |
|---|---|
| **Prepared for:** | **Zutari (Pty) Ltd** |
| **Prepared by:** | **Scientific Terrestrial Services** |
| **Report authors:** | **D. van der Merwe** |
| **Report reviewers:** | **C. Hooton**<br>**K. Marias (Pr.Sci.Nat)** |
| **Report reference:** | **STS 210043** |
| **Date:** | **June 2022** |

Part of the SAS Environmental Group of Companies
Website: http://www.sasenvironmental.co.za

# EXECUTIVE SUMMARY

**Based on the findings of the avifaunal assessment, it is the opinion of the ecologists that from an avifaunal perspective, the proposed development will have moderate to minor impacts on the receiving environment prior to the implementation of mitigation measures. With mitigation impacts can be reduced to minor levels in all cases. The most impactful activities are the development within natural portions of *Dischrostachys* Bushveld which will lead to a reduction in avian habitat and the proposed powerlines and PV infrastructure which increase the probability of avian collisions. The proposed developments will lead to a reduction in avian diversity within the study area. The proposed study area provides suitable foraging habitat for two SCC, while several more SCC may temporarily utilize the study area while foraging. All mitigation measures and recommendations presented in this report should be adhered to as to ensure the ecology within the proposed development areas along with the surrounding zone of influence is protected or adequately rehabilitated, where necessary, in order to minimise the deviations in levels of ecosystem functions and processes.**

Scientific Terrestrial Services CC (STS) was appointed by Zutari (Pty) Ltd. to conduct an Avifaunal Assessment as part of the Environmental Impact Assessment (EIA) and Environmental Authorisation (EA) process for the proposed development of a Solar Photovoltaic (PV) Plant outside the town of Mokopane at the Mogalakwena Mine, Limpopo Province.

The proposed solar PV Plant is situated east of the N11 main road, 27 km outside and to the north of the town Mokopane and is located south of the Sekuruwe settlement, southwest of the Ga-Sekhaolelo settlement, and east of the Ga-Molekana informal settlement. For a detailed project description please refer to Section 1.

**Specific outcomes required from this report include the following:**

- To conduct an avifaunal Species of Conservation Concern (SCC) and determine suitable habitat for these species;
- To identify and consider all sensitive landscapes and possible habitat for such species; and
- To determine the environmental impacts that the proposed development may have on the ecology associated with the study area, with emphasis on avifauna SCC and to develop mitigation and management measures in terms of avifaunal SCC for all phases of the development.

**AVIFAUNAL ASSESSMENT**

- During the field investigation 4 broad habitats were identified, they include Bushveld Habitat, Freshwater Habitat, Donga Habitat and Transformed Habitat;
- Habitat for two SCC, *Certhilauda chuana* (Short-clawed Lark) and *Coracias garrulus* (European Roller) was observed within the study area. It is not considered that *Certhilauda chuana* (Short-clawed Lark) breeds within the study area as it is on the far edge of its SABAP 1 distribution and beyond its SABAP 2 distribution. *Coracias garrulus* (European Roller) is a non-breeding migrant anticipated to have marginally suitable habitat within the study area;
- The largely homogeneous nature of the landscape (Dichrostachys Habitat and Degraded Bushveld Habitat) provides intermediate habitat suitability and habitat availability for most common avifauna yet, the monotonous structure and homogenous floral composition limits niche and foraging habitat and thus species diversity;
- During the field assessment no SCC were observed within the study area, however, a greater sampling effort is likely to identify the presence of more avifaunal SCC, particularly wide ranging larger avian species;
- The proposed activities will lead to the transformation of intermediate sensitivity habitat to an extent that it will no longer be suitable for most avifauna. Minor migrations to adjacent habitat will likely occur decreasing species richness within the study area and increasing competition

for resources in the surrounding habitat reducing avian abundances. It is unlikely that avian diversity will return to baseline levels; and

- The proposed development is not deemed likely to pose a threat to avifaunal SCC within the study area, yet regional impacts are anticipated if mitigation measures set out within this report are not adhered to due to the potential for avian SCC collisions with Powerline or PV infrastructure.

**AVIFAUNAL IMPACT ASSESSMENT:**

The tables below summarise the findings of the impact assessment, indicating the significance of the impact before mitigation takes place and the likely impact if effective management and mitigation takes place. In the consideration of mitigation, it is assumed that a high level of mitigation takes place, but which does not lead to prohibitive costs. From the impact tables it is evident that prior to mitigation, the impacts on avifaunal SCC are of minor significance impacts with more impactful activities occurring on habitat and diversity as a result of the establishment of the proposed PV facility and associate infrastructure. This activity will likely result in a decrease in avian richness and abundance within the study area, while SCC diversity may be reduced. If effective mitigation takes place, impacts may be reduced to lower significance impacts. No regional impacts are anticipated to occur as a result of the proposed development

**Table A: Summary of the impact assessment undertaken for Avifauna**

| Potential Impact: | Phase | Without Mitigation | With Mitigation |
|---|---|---|---|
| Loss of avian habitat outside of the development footprint, including a decrease in species diversity and potential loss of avian SCC as a result of uncontrolled bush encroachment and/or AIP proliferation. | **Pre-construction & Construction** | Minor - negative | Negligible - negative |
| Loss of intact avifaunal habitat and diversity within the proposed development footprint | | Moderate - negative | Minor - negative |
| Loss of avian SCC habitat within the development footprint | | Minor - negative | Minor - negative |
| Ongoing loss of avian habitat, diversity and SCC as AIPs proliferate within disturbance areas and adjacent locations, and a higher likelihood of edge effect as a result of the proposed development. | **Operational & Maintenance** | Minor - negative | Minor - negative |
| Loss of SCC habitat | | Minor - negative | Minor - negative |
| Loss of avian SCC, as a result of collisions with powerlines and PV infrastructure. | | Moderate - negative | Minor - negative |

**Sensitivity**

From an avifaunal ecological perspective, the study area is considered to be of an intermediate to moderately low sensitivity, mainly as a result of historic and current agricultural activities which have impacted upon the study areas, while human settlements and a high degree of edge effects and grazing have occurred in much of the remaining habitat. The major habitat units (*Dichrostachys* Habitat and Degraded Bushveld Habitat) are largely homogenous in structure and homogenous in their floral composition providing intermediate habitat for avifauna. The surrounding landscape is a mosaic of agricultural, mining and natural areas and thus expected to retain an intermediate abundance and diversity of birds. The study area is not considered valuable foraging, breeding or roosting habitat for avifaunal SCC. The proposed activities, notably the establishment of PV Panels, will alter the landscape to an extent where it will no longer be suitable for many birds to forage or breed within the study area. Effective mitigation can reduce the potential impacts anticipated to lower levels.

# TABLE OF CONTENTS

# LIST OF FIGURES



# LIST OF TABLES

# GLOSSARY OF TERMS

Most definitions are based on terms and concepts elaborated by Richardson et al. (2011), Hui and Richardson (2017) and Wilson et al. (2017), with consideration to their applicability in the South African context, especially South African legislation [notably the National Environmental Management: Biodiversity Act, 2004 (Act no. 10 of 2004), and the associated Alien and Invasive Species (A&IS) Regulations, 2014].

| | |
|---|---|
| **Biological diversity or Biodiversity (as per the definition in NEMBA)** | The variability among living organisms from all sources including, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part and includes diversity within species, between species, and of ecosystems. |
| **Biome - as per Mucina and Rutherford (2006); after Low and Rebelo (1998).** | A broad ecological spatial unit representing major life zones of large natural areas – defined mainly by vegetation structure, climate, and major large-scale disturbance factors (such as fires). |
| **Bioregion (as per the definition in NEMBA)** | A geographic region which has in terms of section 40(1) been determined as a bioregion for the purposes of this Act; |
| **Corridor** | A dispersal route or a physical connection of suitable habitats linking previously unconnected regions. |
| **Critical Biodiversity Area (CBA)** | A CBA is an area considered important for the survival of threatened species and includes valuable ecosystems such as wetlands, untransformed vegetation, and ridges. |
| **Disturbance** | A temporal change, either regular or irregular (uncertain), in the environmental conditions that can trigger population fluctuations and secondary succession. Disturbance is an important driver of biological invasions. |
| **Ecological Support Area (ESA)** | An ESA provides connectivity and important ecological processes between CBAs and is therefore important in terms of habitat conservation. |
| **Endangered** | Organisms in danger of extinction if causal factors continue to operate. |
| **Endemic species** | Species that are only found within a pre-defined area. There can therefore be sub-continental (e.g. southern Africa), national (South Africa), provincial, regional, or even within a particular mountain range. |
| **Habitat (as per the definition in NEMBA)** | A place where a species or ecological community naturally occurs. |
| **Important Bird and Biodiversity Area (IBA)** | The IBA Programme identifies and works to conserve a network of sites critical for the long-term survival of bird species that: are globally threatened, have a restricted range, are restricted to specific biomes/vegetation types or sites that have significant populations. |
| **Integrity (ecological)** | The integrity of an ecosystem refers to its functional completeness, including its components (species) its patterns (distribution) and its processes. |
| **Invasive species** | Alien species that sustain self-replacing populations over several life cycles, produce reproductive offspring, often in very large numbers at considerable distances from the parent and/or site of introduction, and have the potential to spread over long distances. |
| **Least Threatened** | Least threatened ecosystems are still largely intact. |
| **Red Data Listed (RDL) species** | According to the Red List of South African plants (http://redlist.sanbi.org/) and the International Union for Conservation of Nature (IUCN), organisms that fall into the Extinct in the Wild (EW), critically endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status. |
| **Species of Conservation Concern (SCC)** | The term SCC in the context of this report refers to all RDL (Red Data), The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland and the IUCN (International Union for the Conservation of Nature) listed threatened species as well as protected species of relevance to the project.<br><br>Refer to **Appendix B and F** for further details. |
| **Special Interest** | Species with <5% of their global range falling within South Africa, many of which were recorded in previous assessments. The small regional populations of these species render them susceptible to regional extinction. However, they are not considered conservation priorities |

# LIST OF ACRONYMS

| | |
|---|---|
| **AIP** | Alien Invasive Plant |
| **BGIS** | Biodiversity Geographic Information Systems |
| **CARA** | Conservation of Agricultural Resource Act |
| **CBA** | Critical Biodiversity Area |
| **CR** | Critically Endangered |
| **DFFE** | Department of Forestry, Fisheries and the Environment |
| **EAP** | Environmental Assessment Practitioner |
| **EIA** | Environmental Impact Assessment |
| **EN** | Endangered |
| **ESA** | Ecological Support Area |
| **GIS** | Geographic Information System |
| **GPS** | Global Positioning System |
| **Ha** | Hectares |
| **IBA** | Important Bird Area |
| **IEM** | Integrated Environmental Management |
| **IUCN** | International Union for the Conservation of Nature |
| **MAP** | Mean Annual Precipitation |
| **MAPE** | Mean Annual Potential for Evaporation |
| **MASMS** | Mean Annual Soil Moisture Stress |
| **MAT** | Mean Annual Temperature |
| **MFD** | Mean Frost Days |
| **NBA** | National Biodiversity Assessment (2011) |
| **NEMA** | National Environmental Management Act (Act 107 of 1998) |
| **NEMBA** | National Environmental Management: Biodiversity Act (Act 10 of 2004) |
| **NPAES** | National Protected Areas Expansion Strategy |
| **NT** | Near Threatened |
| **OHPL** | Overhead powerline |
| **PES** | Present Ecological State |
| **POC** | Probability of Occurrence |
| **PV** | Photovoltaic |
| **QDS** | Quarter Degree Square (1:50,000 topographical mapping references) |
| **RDL** | Red Data List |
| **SABAP 1** | Southern African Bird Atlas Project 1 (1987 - 1991) |
| **SABAP 2** | Southern African Bird Atlas Project 2 (2007 - Present) |
| **SACAD** | South Africa Conservation Areas Database |
| **SANBI** | South African National Biodiversity Institute |
| **SAPAD** | South Africa Protected Area Database |
| **SCC** | Species of Conservation Concern |
| **SI** | Special Interest |
| **STS** | Scientific Terrestrial Services CC |
| **TOPS** | Threatened or Protected Species |
| **TSP** | Threatened Species Programme |
| **VU** | Vulnerable |

# 1. INTRODUCTION

Scientific Terrestrial Services CC (STS) was appointed by Zutari (Pty) Ltd. to conduct an Avifaunal Assessment as part of the Environmental Impact Assessment (EIA) and Environmental Authorisation (EA) process for the proposed development of a Solar Photovoltaic (PV) Plant outside the town of Mokopane at the Mogalakwena Mine, Limpopo Province.

Mogalakwena Mine is a wholly owned subsidiary of Anglo-American Platinum Limited and is situated within the Mogalakwena Local Municipality, which forms part of the greater Waterberg District Municipality of the Limpopo Province.

This report, after consideration and the description of the ecological integrity of the study area, must guide the Environmental Assessment Practitioner (EAP), regulatory authorities and developing proponent, by means of the presentation of results and recommendations, as to the ecological viability of the proposed development activities.

## *1.1 Project Background*

The proposed PV Solar Plant is situated east of the N11 main road, 27 km outside and to the north of the town Mokopane (Figure 1). The proposed PV Solar Plant is south of the Sekuruwe settlement, southwest of the Ga-Sekhaolelo settlement, and east of the Ga-Molekana informal settlement.

Previous studies were undertaken for the proposed Solar PV Plant (refer to STS 200051, 2020) with the layout subsequently updated and amended (Figure 1 and 2). This 2022 study is focused on the amended “Study Area” boundary and further includes specific focus areas that was highlighted by the screening tool as potentially sensitive habitat and/or that was not part of the previously assessed area (Figure 3).

## *1.2 Project Scope*

Specific outcomes in terms of this report are outlined below:

- To update the desktop study with all relevant information as presented by South African National Biodiversity Institute’s (SANBI’s) Biodiversity Geographic Information Systems (BGIS) website (http://bgis.sanbi.org), including the National Threatened

Ecosystem Database (2011), the The Limpopo Environmental Management Act, 2003 (Act No.7 of 2003) and the Environmental Geographical Information Systems (E-GIS) databases (https://egis.environment.gov.za/), The National Environmental Management: Biodiversity Act (Act No.10 of 2004) (NEMBA) Threatened or Protected Species (TOPS) list (NEMBA, Notice 389 of 2013), The International Union for Conservation of Nature (IUCN) Red List of Threatened Species; and The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland, to gain background information on the physical habitat and potential floral and faunal ecology associated with the study area;

- To identify and consider all sensitive landscapes and possible habitat for such species; and
- To determine the environmental impacts that the proposed development may have on the ecology associated with the study area, with emphasis on avifauna SCC and to develop mitigation and management measures in terms of avifaunal SCC for all phases of the development.

## *1.3 Assumptions and Limitations*

The following assumptions and limitations are applicable to this report:

- The Avifaunal assessment was limited to the study area only and did not assess in detail the surrounding properties. The surrounding properties were noted on an adhoc basis whilst moving to and from the study area however, with data extrapolated to these areas through the use of satellite imagery as and where necessary. The dams and freshwater systems situated outside of the study area were looked at as these are important ecological features for avifauna;
- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. It is, however, expected that most avifaunal communities have been accurately assessed and considered;
- Due to the nature and habits of most avifaunal species and their often-wide ranging habits or migration patterns, it is unlikely that all species would have been observed during a site assessment of limited duration. Therefore, site observations were compared with literature studies where necessary; and
- The initial field assessment was undertaken during winter (1 – 4 June 2021) (STS 200051, 2020). The 2022 assessment was undertaken in early winter (24 May 2022). The field assessment aimed to determine the ecological status of the habitat associated with the Study Area, and to “ground-truth” the results of the desktop

assessment. Previous field assessments (Digby Wells Environmental, 2022) have also been conducted by STS for the previous scoping (September 2020; STS 200051, 2020) and screening assessments (September 2019, STS 19004, 2019).

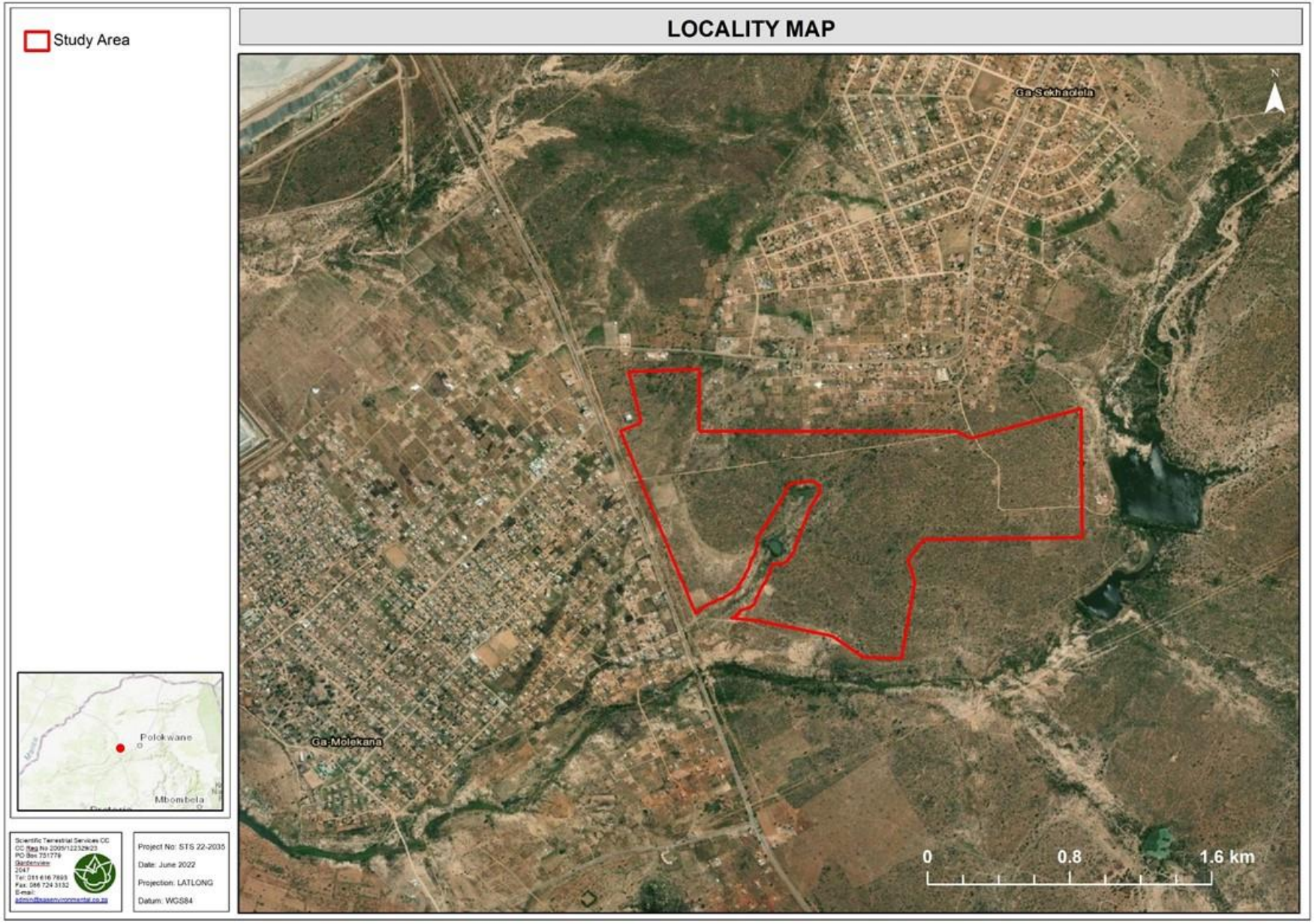



**Figure 1: Digital satellite image depicting the Study Area in relation to surrounding area.**

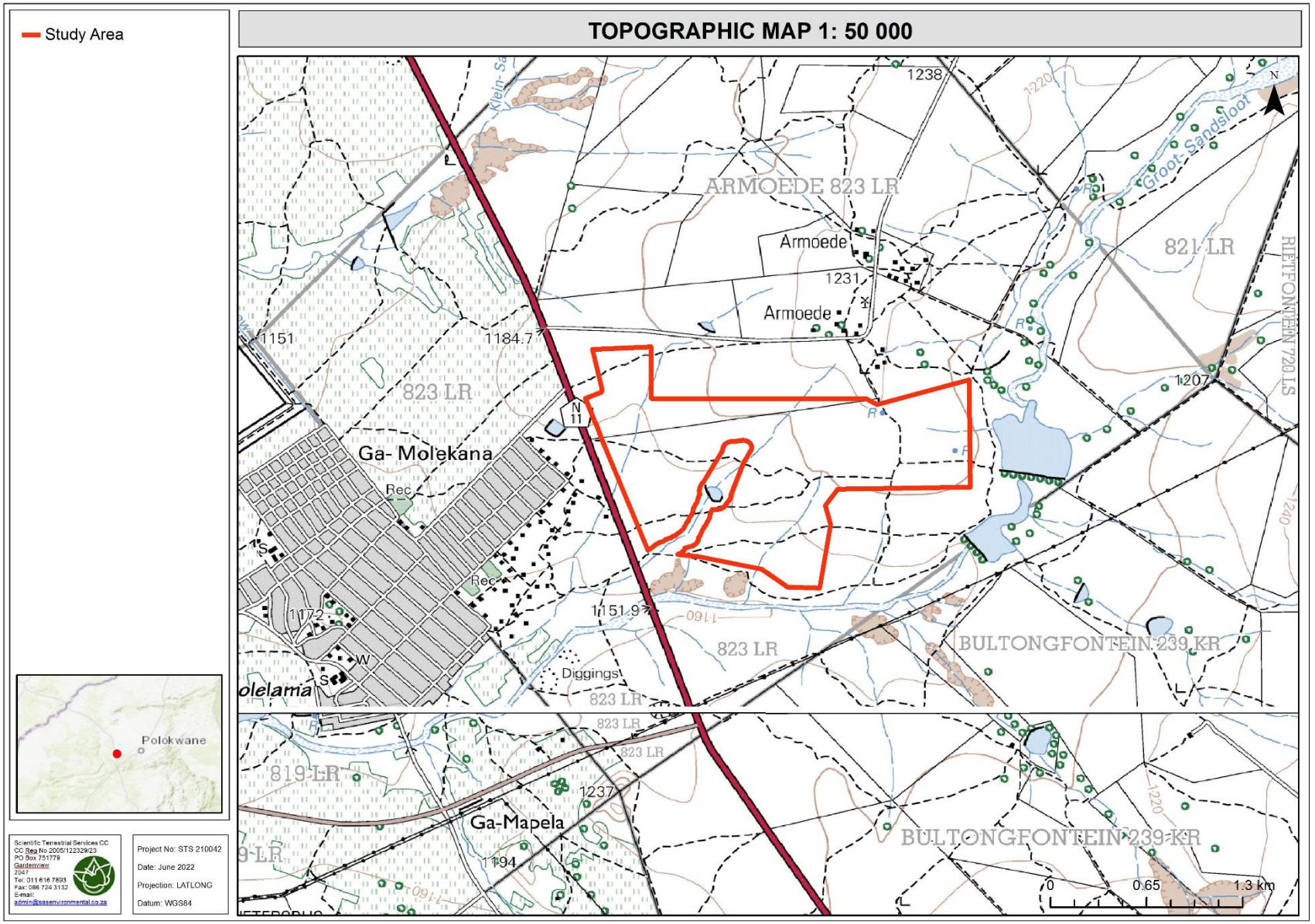



**Figure 2: The study area servitude depicted on a 1:50 000 topographical map in relation to the surrounding area.**

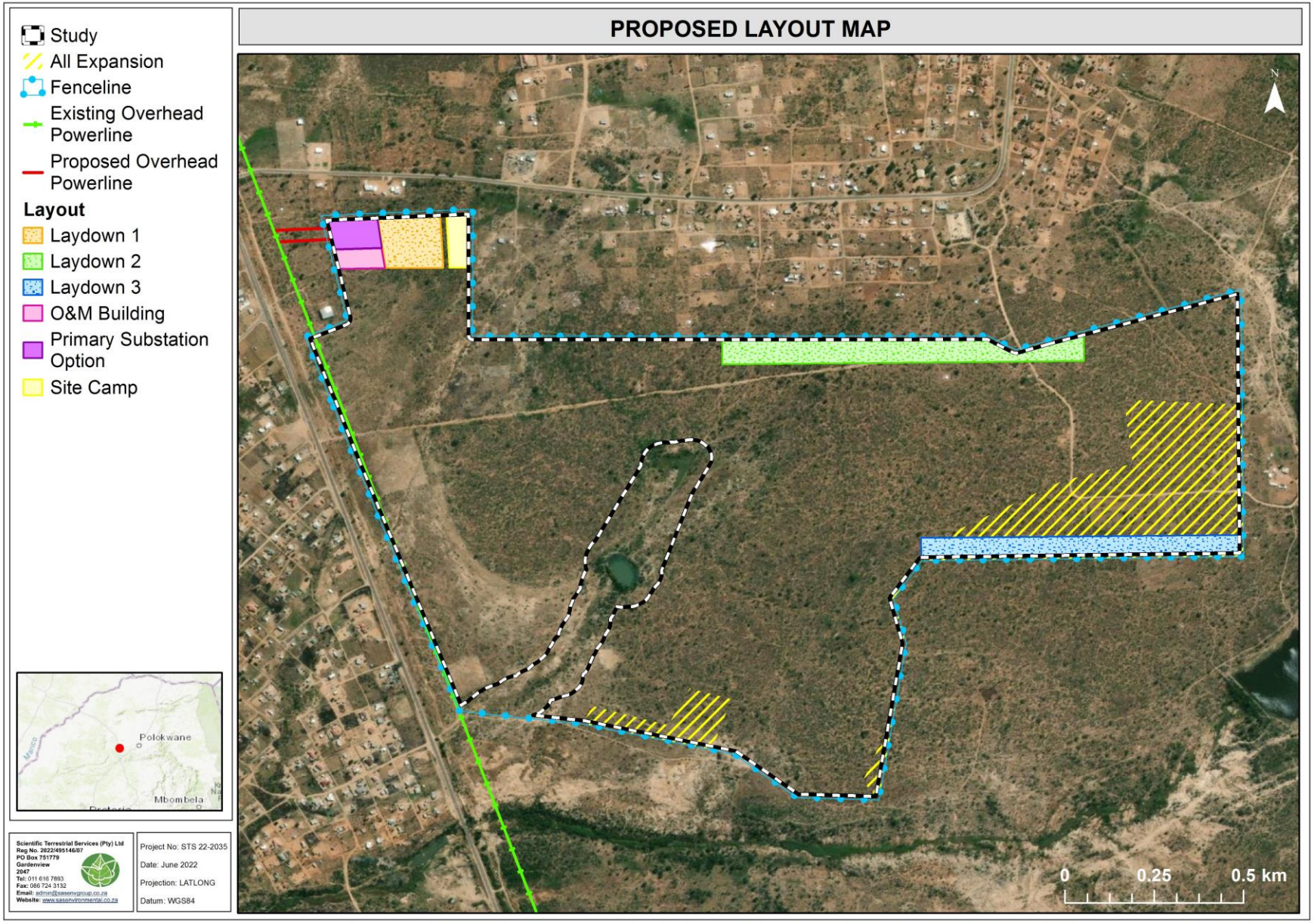



**Figure 3: The proposed infrastructure layout, ie, the study area.**

## 1.4 Indemnity and Terms of use of this Report

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and STS CC and its staff reserve the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

Although STS CC exercises due care and diligence in rendering services and preparing documents, STS CC accepts no liability and the client, by receiving this document, indemnifies STS CC and its directors, managers, agents and employees against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by STS CC and by the use of the information contained in this document.

This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of this report, which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section of the main report.

# 2. ASSESSMENT APPROACH

## 2.1 General Approach

Two field assessments were undertaken during autumn and winter (from the 1st to the 4th of May 2021 and the 24th of May 2022), in order to determine the potential presence of SCC and general habitat characteristics within the study area. It is recommended that a follow up assessment be undertaken during the summer period, to provide temporal information on the native avifaunal assemblage. A reconnaissance 'walkabout' was initially undertaken to determine the general habitat types found throughout the study area, following this, specific study sites that were selected which were considered to be representative of the habitats found within the area, with special emphasis being placed on areas that may potentially support breeding and foraging habitat for SCC. These areas were then walked on foot and all

observed avifauna were recorded. A detailed explanation of the method of assessment is provided in **Appendix B** of this report.

## *2.2 Sensitivity Mapping*

All the ecological features of the study area were considered, and sensitive areas were assessed. In addition, identified locations of protected species were marked by means of Global Positioning System (GPS). A Geographic Information System (GIS) was used to project these features onto aerial photographs and topographic maps. The sensitivity map should guide the design and layout of the proposed construction and operational activities.

# 3. RESULTS OF THE DESKTOP ANALYSIS

## *3.1 Conservation Characteristics of the Study area*

The following table contains data accessed as part of the desktop assessment. It is important to note, that although all data sources used provide useful and often verifiable high-quality data, the various databases do not always provide an entirely accurate indication of the study areas actual biodiversity characteristics.

**Table 1: Summary of the biodiversity characteristics associated with the study area [Quarter Degree Square (QDS) 2328DD].**

| **Details of the Study Area in terms of the national VEGMAP project (SANBI, 2018a)** | | **Description of the vegetation type associated with the Study Area** | |
|---|---|---|---|
| **Biome** | The Study Area is situated within the **Savanna Biome**. | **Vegetation Type** | Makhado Sweet Bushveld (SVcb 20) |
| **Bioregion** | The Study Area is located within the **Central Bushveld Bioregion** | **Climate** | Summer rainfall with very dry winters |
| **Vegetation Type** | The Study Area is located within the **Makhado Sweet Bushveld** (SVcb 20) vegetation type. | **Altitude (m)** | 850 to 1200 |
| | | **MAP* (mm)** | 454 |
| | | **MAT* (°C)** | 18.5 |
| **Conservation details pertaining to the area of interest (various databases)** | | **MFD* (Days)** | 7 |
| **NBA (2018) (Figure 4)** | Most of the study Study Area within the remaining extent of the **Makhado Sweet Bushveld** which is currently **Least Concerned** and **Poorly Protected.**<br><br>Ecosystem types are categorised[1] as "not protected", "poorly protected", "moderately protected" and "well protected" based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act, 2003 (Act No. 57 of 2003), and compared with the biodiversity target for that ecosystem type. | **MAPE* (mm)** | 2174 |
| | | **MASMS* (%)** | 81 |
| | | **Distribution** | Limpopo Province |
| | | **Conservation** | **Vulnerable** in Mucina and Rutherford (2006) but the status of the vegetation type has been updated in the 2018 Final Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018a) to now being of Least Concern (LC).<br><br>Target 19%. About 1% statutorily conserved, mainly in the Bellevue Nature Reserve. Some 27% transformed, mainly by cultivation, with some urban and built-up areas. The southwestern half of the unit has densely populated rural communities. Erosion is low to high. |
| **National Threatened Ecosystems (2011)** | The Study Area is not situated within a threatened ecosystem, according to the National Threatened Ecosystem Database (2011).<br><br>The purpose of listing protected ecosystems is primarily to preserve witness sites of exceptionally high conservation value. The first national list of threatened terrestrial ecosystems for South Africa was gazetted on 9 December 2011 (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GoN 1002), 9 December 2011).<br><br>**Note**: *The National List of Threatened Terrestrial Ecosystems published in terms of the NEMBA in 2011 remains in legal force. The data contained in NBA 2018 represents an update of the assessment of threat status for terrestrial ecosystems, but the National List of Threatened Terrestrial Ecosystems has not yet been revised*. | **Geology and Soils** | The area is underlain by the gneisses and migmatites of the Hout River Gneiss (Randian Erathem) and the potassium-deficient gneisses of the Goudplaats Gneiss (Swazian Erathem). Sandstones and mudstones of the Matlabas Subgroup (Mokolian Waterberg Group) are also found. Soils include deep, greyish sands, eutrophic plinthic catenas, red-yellow apedal freely drained soils with high base status, clayey in bottomlands. Land types mainly Bd, Bc, Ae and Ia. |

[1] The ecosystem protection level status is assigned using the following criteria:

i. If an ecosystem type has more than 100% of its biodiversity target protected in a formal protected area either A or B, it is classified as Well Protected;
ii. When less than 100% of the biodiversity target is met in formal A or B protected areas it is classified it as Moderately Protected;
iii. If less than 50% of the biodiversity target is met, it is classified it as Poorly Protected; and
iv. If less than 5% it is Hardly Protected.

| | | | |
|---|---|---|---|
| **SAPAD (2021)** [2]**; SACAD (2021)** [3]**; NPAES (2009) (Figure 5) and Limpopo C-Plan (Figure 6)** | According to the South Africa Protected Areas Database (SAPAD, 2021_Q4) and the National Protected Areas Expansion Strategy Database (NPAES, 2009) the **Witvinger Nature Reserve** (a formally protected area) is situated approximately 2.7 km southeast of the Study Area, which is managed by the LEDET. This corresponds with the Limpopo C-Plan database which included buffers around protected areas as defined in "Listing Notice 3" (National Environmental Management Act, 1998 (Act No. 107 of 1998).<br><br>The South Africa Conservation Areas Database (SACAD, 2021_Q4) does not indicate the presence of any additional conservation areas within 10 km of the Study Area. | **Vegetation & landscape features** | Slightly to moderately undulating plains sloping generally down to the north, with some hills in the southwest. Short and shrubby bushveld with a poorly developed grass layer.<br><br>**Remark:** This area is transitional between the higher-lying Polokwane Plateau and the lower-lying vegetation units of the Limpopo River Valley. |
| **IBA (2015)** | The Study Area is not located within 10 km of an Important Bird and Biodiversity Area (IBA, 2015). The **Waterberg System IBA** is however located approximately 13.5 km southwest of the proposed OHL Corridor. | | |
| **Detail of the Study Area in terms of the Limpopo Conservation Plan v2 (2018) – Figure 6** | | | |
| **CBA 1** | A small south-eastern portion of the Study Area falls within a **Category 1 Critical Biodiversity Area (CBA)**. These are **Irreplaceable Sites** required to meet biodiversity pattern and / or ecological processes targets. It should be noted that the proposed layout footprint does not fall within the CBA.<br><br>Land Management Recommendations: Obtain formal conservation protection where possible. Implement appropriate zoning to avoid net loss of intact habitat or intensification of land use.<br><br>Incompatible Land-Use: Urban land-uses including Residential (including golf estates, rural residential, resorts), Business, Mining & Industrial; Infrastructure (roads, power lines, pipelines). | | |
| **ESA 1** | The majority of the southern OHL Corridor and the central portion of the project boundary falls within a **Category 1 Ecological Support Area (ESA)**. These are natural, near natural and/or degraded areas that are selected to support CBAs by maintaining ecological processes.<br><br>Land Management Recommendations: Implement appropriate zoning and land management guidelines to avoid impacting on ecological processes. Avoid intensification of land use and fragmentation of natural landscapes.<br><br>Incompatible Land-Use: Urban land-uses including Residential (including golf estates, rural residential, resorts), Business, Mining & Industrial; Infrastructure (roads, power lines, pipelines). | | |

[2] **SACAD (2021):** The types of conservation areas that are currently included in the database are the following: 1. Biosphere reserves, 2. Ramsar sites, 3. Stewardship agreements (other than nature reserves and protected environments), 4. Botanical gardens, 5. Transfrontier conservation areas, 6. Transfrontier parks, 7. Military conservation areas and 8. Conservancies.

[3] **SAPAD (2021):** The definition of protected areas follows the definition of a protected area as defined in the National Environmental Management: Protected Areas Act, (Act 57 of 2003). Chapter 2 of the National Environmental Management: Protected Areas Act, 2003 sets out the "System of Protected Areas", which consists of the following kinds of protected areas - 1. Special nature reserves; 2. National parks; 3. Nature reserves; 4. Protected environments (1-4 declared in terms of the National Environmental Management: Protected Areas Act, 2003); 5. World heritage sites declared in terms of the World Heritage Convention Act; 6. Marine protected areas declared in terms of the Marine Living Resources Act; 7. Specially protected forest areas, forest nature reserves, and forest wilderness areas declared in terms of the National Forests Act, 1998 (Act No. 84 of 1998); and 8. Mountain catchment areas declared in terms of the Mountain Catchment Areas Act, 1970 (Act No. 63 of 1970).

| | |
|---|---|
| | **Note**: Certain elements of these activities could be allowed subject to detailed impact assessment to ensure that developments were designed to maintain the overall ecological functioning of ESAs. |
| **Other Natural Areas** | The remaining northern portion of the project boundary and a portion of the northern OHL Corridor falls within an area considered to be **other natural areas**. These are natural and intact areas but are not required to meet targets, nor have they been identified as Critical Biodiversity Areas or Ecological Support Areas.<br><br>No management objectives, land management recommendations or land-use guidelines are prescribed. These areas are nevertheless subject to all applicable town and regional planning guidelines and policy. Where possible existing "Not Natural" areas should be favoured for development before "Other natural areas". |
| **National Web-based Screening Tool (2020)** | |
| The screening tool is intended to allow for pre-screening of sensitivities in the landscape to be assessed within the EA process. this assists with implementing the mitigation hierarchy by allowing developers to adjust their proposed development footprint to avoid sensitive areas. The different sensitivity ratings pertaining to the Plant [and Animal] Protocols are described below:<br>➢ **Very High:** Habitat for species that are endemic to South Africa, where all the known occurrences of that species are within an area of 10 km$^2$ are considered Critical Habitat, as all remaining habitat is irreplaceable. Typically, these include species that qualify under Critically Endangered (CR), Endangered (EN), or Vulnerable (VU) D criteria of the IUCN or species listed as Critically/ Extremely Rare under South Africa's National Red List Criteria. For each species reliant on a Critical Habitat, all remaining suitable habitat has been manually mapped at a fine scale.<br>➢ **High:** Recent occurrence records for all threatened (CR, EN, VU) and/or rare endemic species are included in the high sensitivity level.<br>➢ **Medium:** Model-derived suitable habitat areas for threatened and/or rare species are included in the medium sensitivity level.<br>➢ **Low:** Areas where no SCC are known or expected to occur. | |
| **Terrestrial Biodiversity Theme (Figure 7)** | For the terrestrial biodiversity theme, the Study Area is considered to have an overall **sensitivity of very high**. The triggered sensitivity features include CBA Category 1 and ESA Category 1. |
| **Animal Species Theme (Figure 8)** | For the animal species theme, the majority of the Study Area is considered to have an overall **sensitivity of medium,** with a small eastern section classified as **high sensitivity**. Species identified by the EIA Screening tool include: *Mycteria ibis* (Yellow Billed Stork; LC), *Dasymys robertsii* (Robert's shaggy rat), *Lycaon pictus* (African Wild Dog: EN) and *Sagittarius serpentarius* (Secretary bird; EN). |
| **Strategic Water Source Areas (SWSA)** | |
| Surface water SWSAs are defined as areas of land that supply a disproportionate (i.e., relatively large) quantity of mean annual surface water runoff in relation to their size. They include transboundary areas that extend into Lesotho and Swaziland. The sub-national Water Source Areas (WSAs) are not nationally strategic as defined in the report but were included to provide a complete coverage. | |
| **Name and Criteria** | The Study Area is not within 10 km of a Strategic Water Source Area. |

**NBA = National Biodiversity Assessment; SAPAD = South African Protected Areas Database; SACAD = South African Conservation Areas Database; NPAES = National Protected Areas Expansion Strategy; IBA = Important Bird Area; MAP = Mean annual precipitation; MAT = Mean annual temperature; MAPE = Mean annual potential evaporation; MFD = Mean Frost Days; MASMS = Mean annual soil moisture stress (% of days when evaporative demand was more than double the soil moisture supply); CBA = Critical Biodiversity Areas; ESA = Ecological Support Area.**

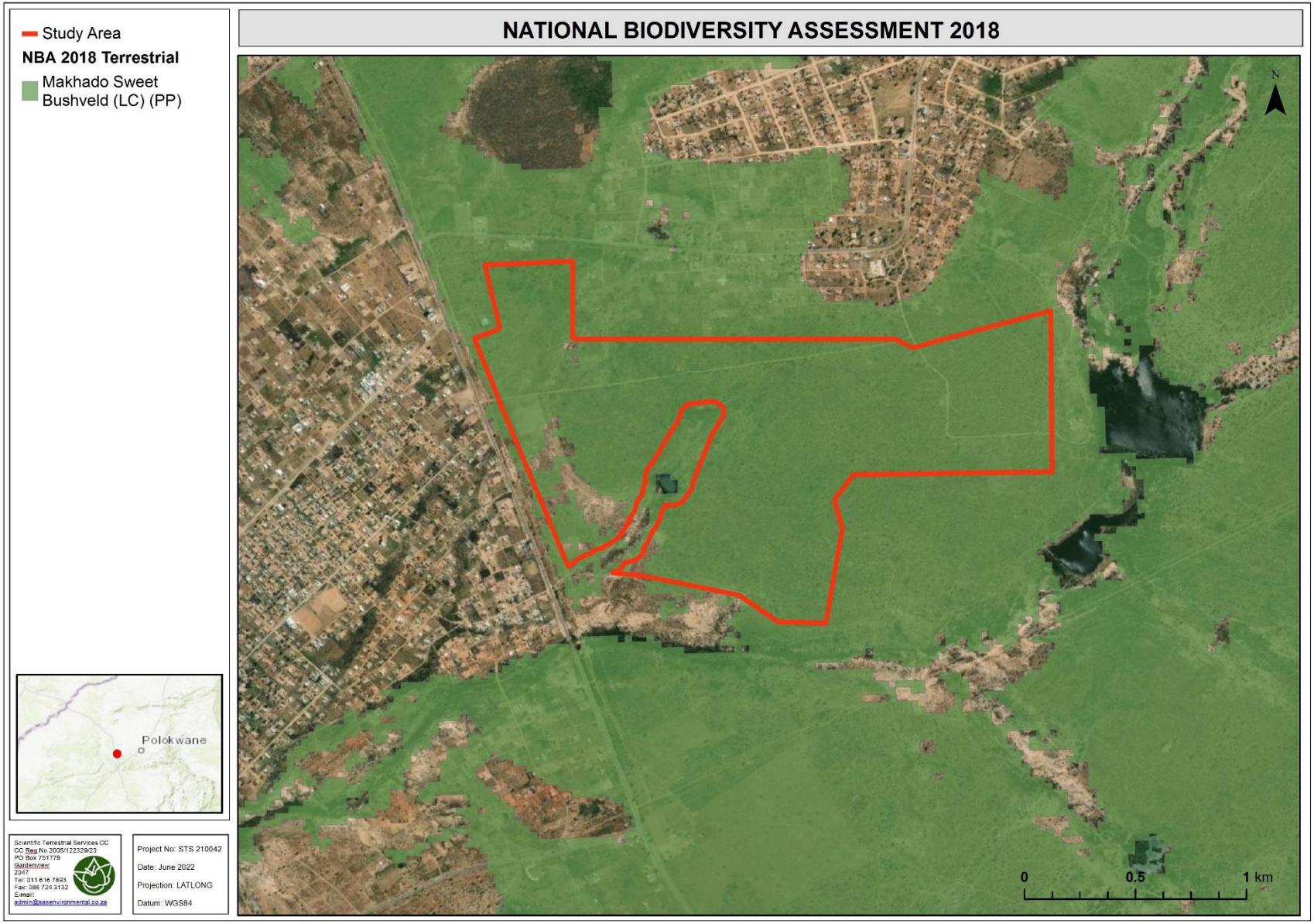



**Figure 4: The proposed layout in relation to the remaining extent of the Eastern Highveld Grassland (VU), according to the National Biodiversity Assessment (NBA, 2018).**

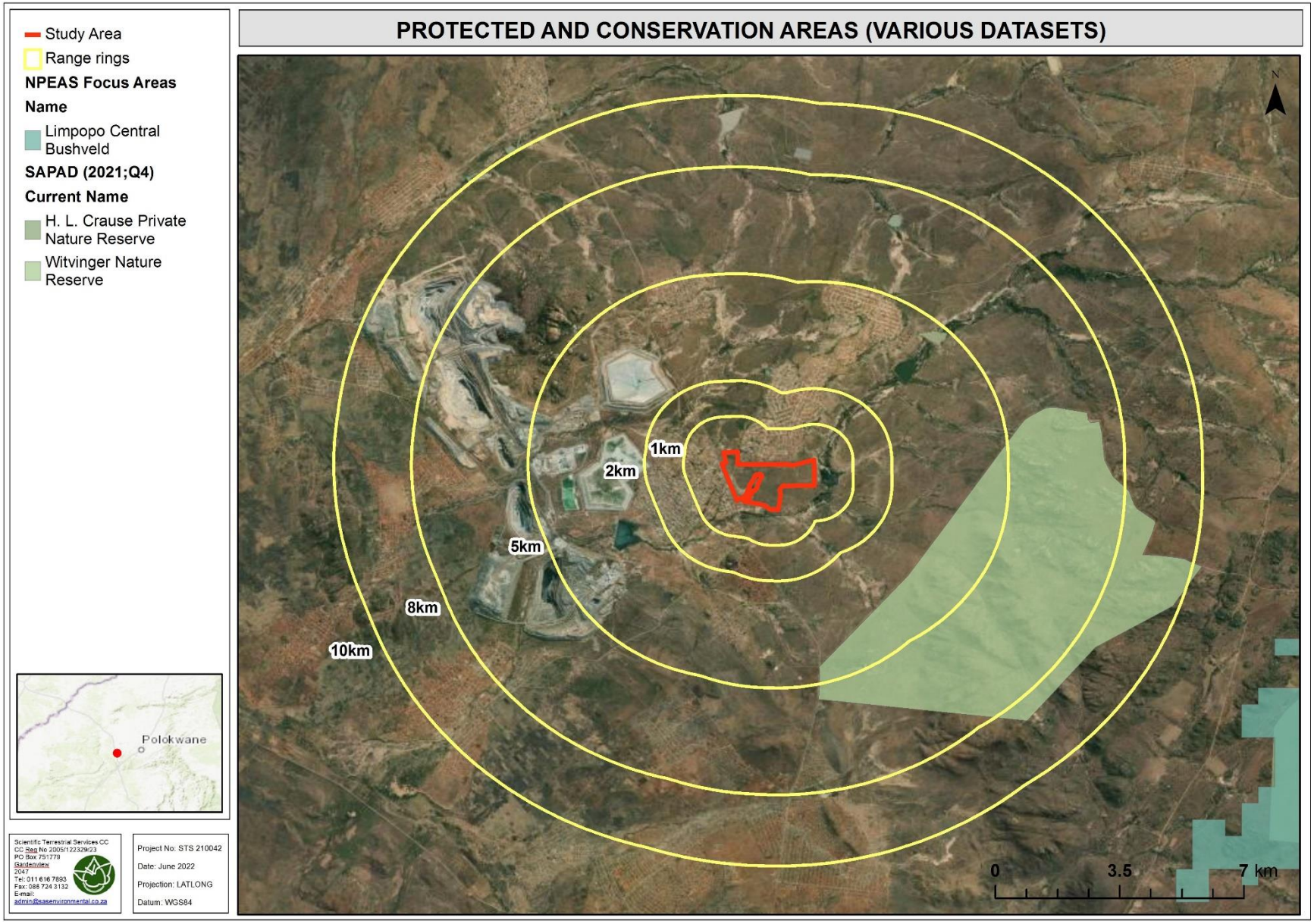



**Figure 5: The protected areas and biodiversity area within a 10km radius of the study area (various datasets).**

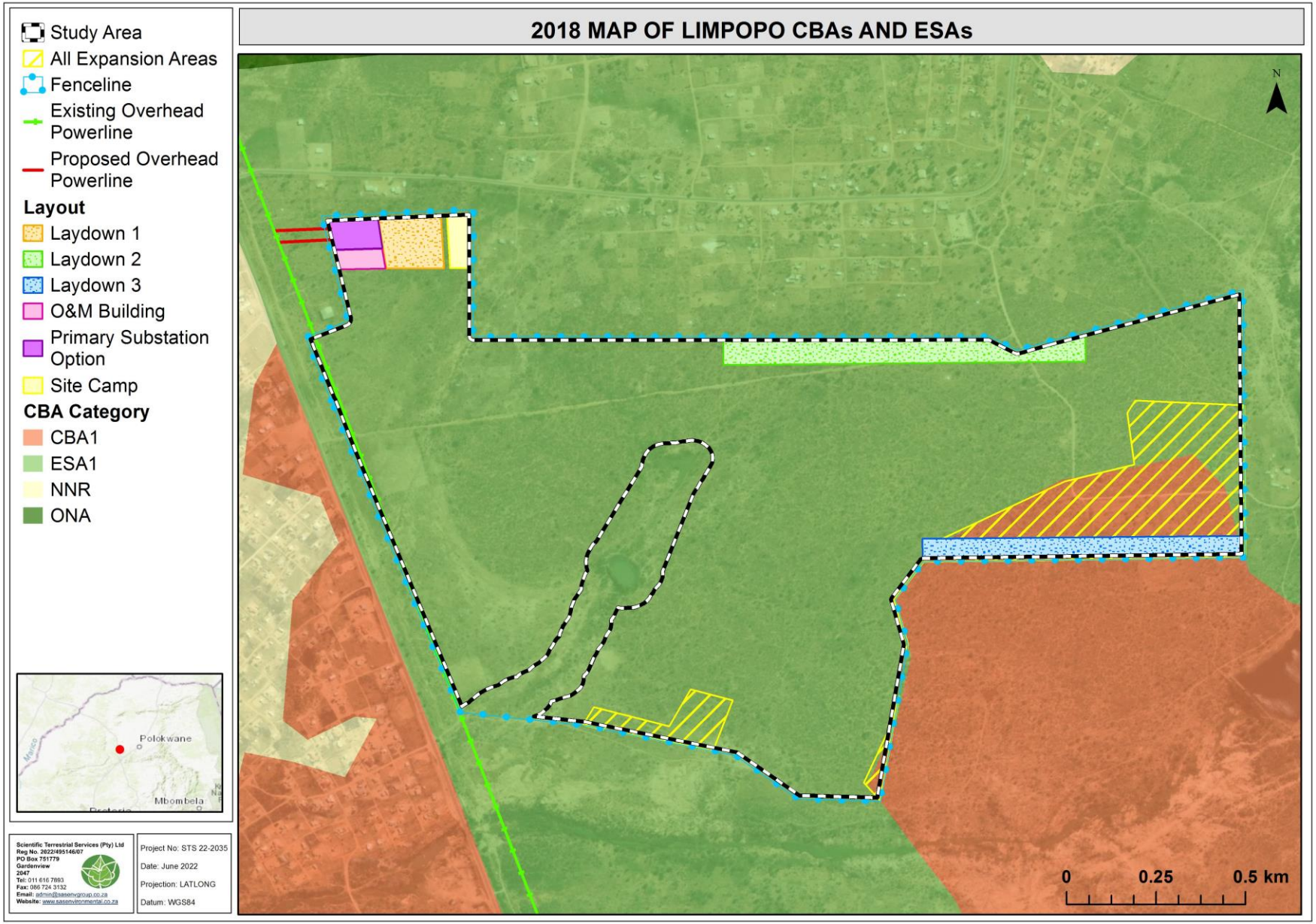



**Figure 6: The study area in relation to the Limpopo Conservation Plan Version 2 (2013) categories.**

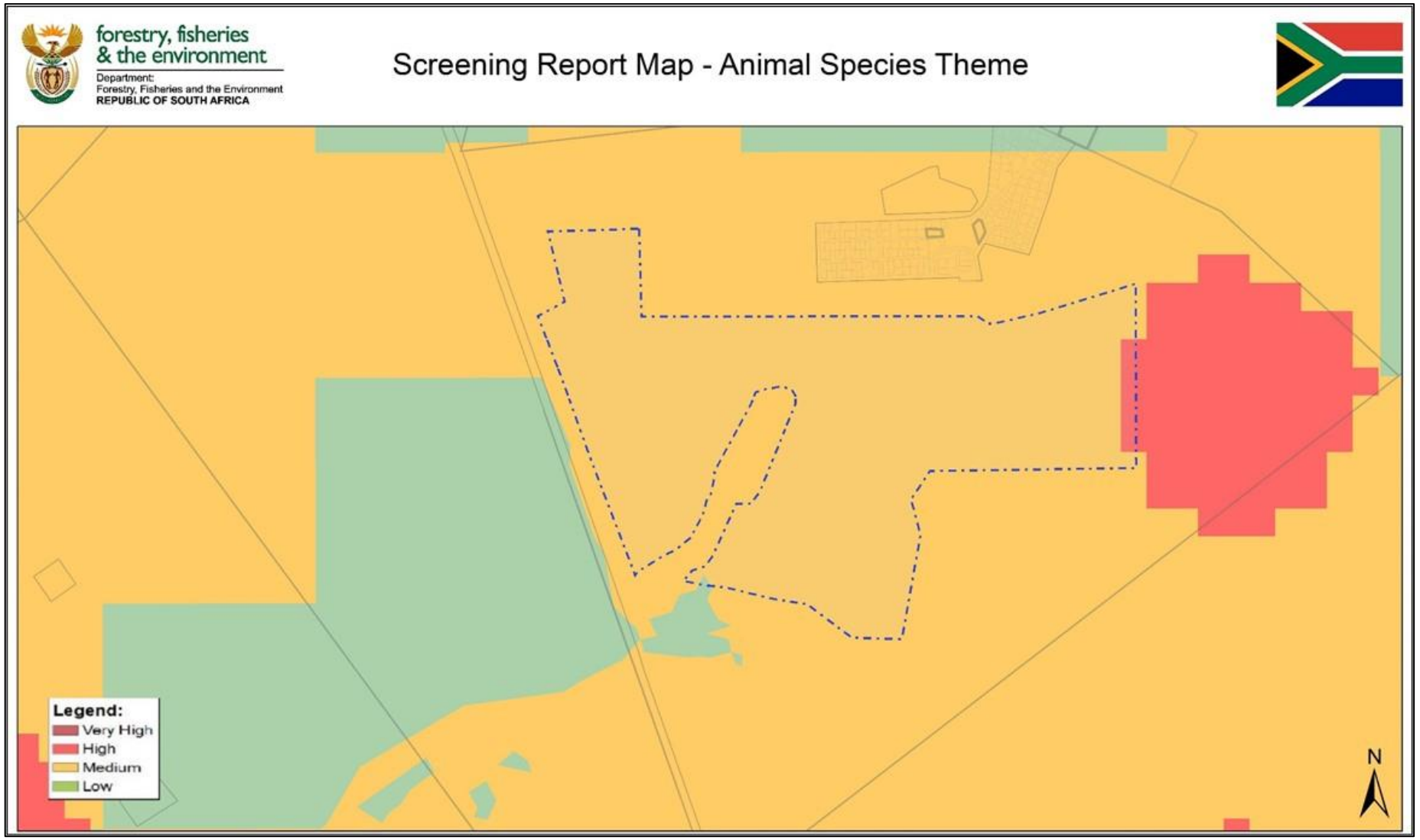



**Figure 7. Animal Species Theme sensitivity map generated by the National Web based Screening Tool.**

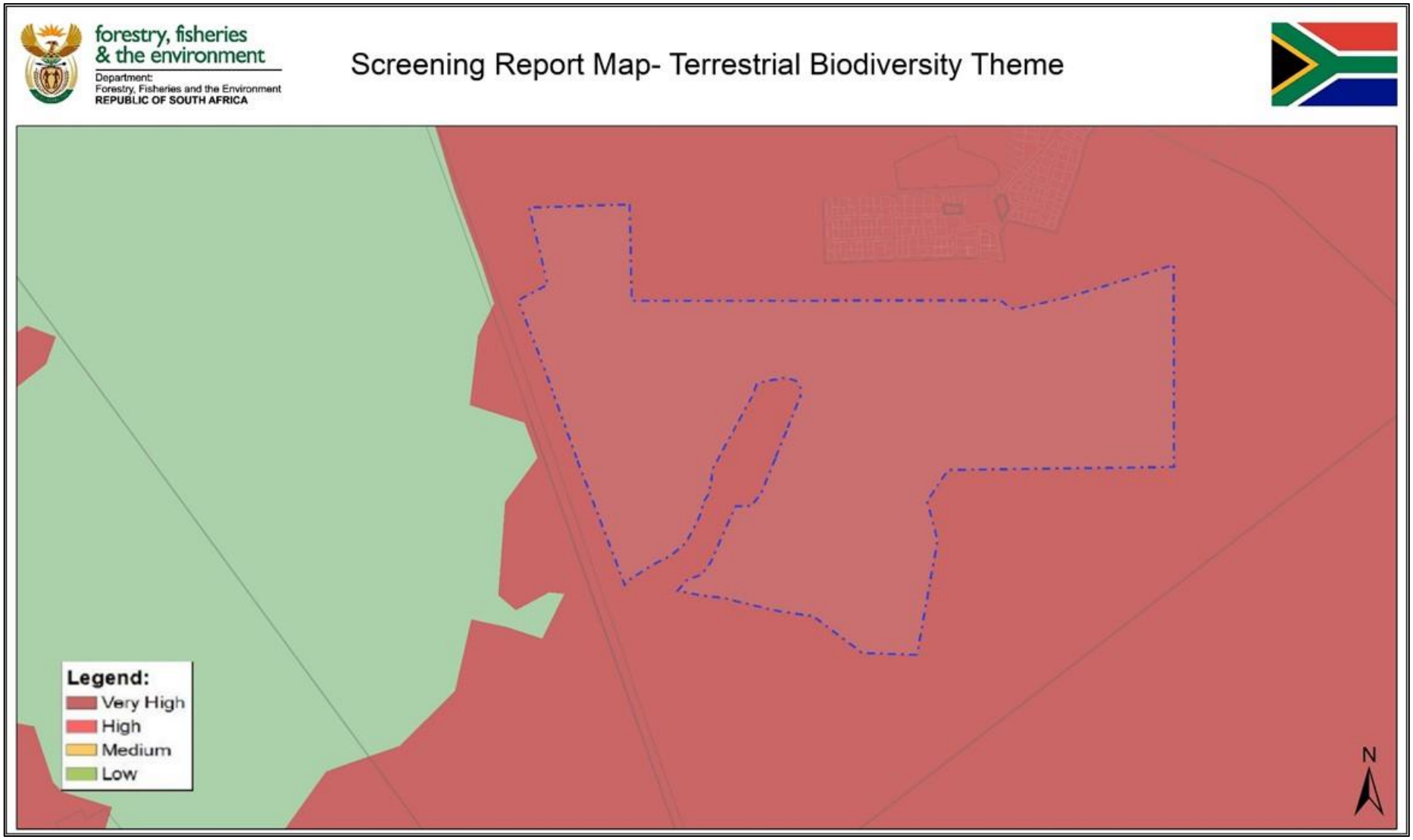



**Figure 8: Terrestrial Biodiversity Theme sensitivity map generated by the National Web based Screening Tool**

## 3.2 Important Bird and Biodiversity Areas (IBA)

The IBA database indicate that no IBA's are within 10 km of the study area. The **Waterberg System IBA** is approximately 16 km south-west of the study area (Figure 5).

IBA trigger species include globally threatened species such as, Cape Vulture (818 active nests were recorded in 2013), Secretarybird (*Sagittarius serpentarius)*, Martial Eagle (*Polemaetus bellicosus)*, Blue Crane (*Anthropoides paradiseus)*, Denham's Bustard (*Neotis denhami)* and Southern Ground-Hornbill (*Bucorvus leadbeateri*). Regionally threatened birds are the White-backed Night Heron (*Gorsachius leuconotus*), Lanner Falcon (*Falco biarmicus*), White-bellied Korhaan (*Eupodotis senegalensis)*, African Grass Owl (*Tyto capensis)*, Tawny Eagle (*Aquila rapax)*, African Finfoot (*Podica senegalensis*) and Half-collared Kingfisher (*Alcedo semitorquata)*.

Biome-restricted species include Kurrichane Thrush (*Turdus libonyanus*), White-bellied Sunbird (*Cinnyris talatala*), Barred Wren-Warbler (*Calamonastes fasciolatus*) and Burchell's Starling (*Lamprotornis australis*). White-throated Robin-Chat (*Cossypha humeralis*) is considered fairly common and Buff-streaked Chat (*Campicoloides bifasciata*), Kalahari Scrub Robin (*Erythropygia paena*) and Gurney's Sugarbird (*Promerops gurney*) are regarded as uncommon.

## 3.3 Results of Desktop Avifaunal SCC Assessment

The following table of avifaunal SCC include species whose distribution ranges at some time have overlayed the study area. Records from SABAP 2 were obtained to determine if these species were recorded in SABAP 2 in the pentads 2355_2855 and 2400_2855 and their relative reporting rate. The table below provides a brief summary of the data.

**Table 2: A summary of historic and current data obtained from SABAP2 pentads 2355_2855 and 2400_2855.**

| Common Name | Scientific Name | Regional Status (Taylor *et al*, 2015) | Reporting Rate (%) | |
|---|---|---|---|---|
| | | | SABAP 2 2355_2855 (2 cards) | SABAP 2 2400_2855 (3 cards) |
| Hooded Vulture | *Necrosyrtes monachus* | CR | - | - |
| White-backed Vulture | *Gyps africanus* | CR | - | - |
| Martial Eagle | *Polemaetus bellicosus* | EN | - | - |
| Tawny Eagle | *Aquila rapax* | EN | - | - |
| Cape Vulture | *Gyps coprotheres* | EN | - | - |
| Lappet-faced Vulture | *Torgos tracheliotus* | EN | - | - |
| Yellow-billed Stork | *Mycteria ibis* | EN | 50 | 33 |

| | | | | |
|---|---|---|---|---|
| Denham's Bustard | *Neotis denhami* | VU | - | - |
| Verreauxs' Eagle | *Aquila verreauxii* | VU | - | - |
| Pygmy Goose | *Nettapus auritus* | VU | - | - |
| White-backed Night Heron | *Gorsachius leuconotus* | VU | - | - |
| White-bellied Korhaan | *Eupodotis senegalensis* | VU | - | - |
| Secretarybird | *Sigattarius serpentarius* | VU | - | - |
| Black Stock | *Cocinia nigra* | VU | - | - |
| Maccoa Duck | *Oxyura maccoa* | NT | - | - |
| Blue Crane | *Anthropoides paradiseus* | NT | - | - |
| Half-collared Kingfisher | *Alcedo semitorquata* | NT | - | - |
| Short-clawed Lark | *Certhilauda chuana* | NT | - | - |
| European Roller | *Coracias garrulus* | NT | - | - |
| Abdim's Stork | *Ciconia abdimii* | NT | - | - |
| Lanner Falcon | *Falco biarmicus* | VU | - | - |
| Marabou Stork | *Leptoptilos crumeniferus* | NT | - | - |

LC= Least Concern, NA= Not Assessed, NT= Near Threatened, VU= Vulnerable, EN= Endangered, CR= Critically Endangered, SI=Species Interest and P=Protected in Provincial or National Legislation

# 4. AVIFAUNAL ASSESSMENT RESULTS

Four broad habitat units were identified during the site assessment of the study area, they are briefly discussed below. The habitat units are depicted in Figure 10 below. For avifauna, vegetation structure as opposed to actual species richness, is widely acknowledged as the primary determinant of bird communities (Skowno & Bond 2003; Wichmann *et al.* 2009; Burgess *et al.* 2011; Smith *et al.* 2017). The habitat is mostly thornveld savanna, comprising of mostly dense almost thicket like stands of homogenous *Dichrostachys cinerea*. Some portions within the Mixed Bushveld habitat reflected more open bushveld with higher broadleaf tree diversity with a taller structure and more diverse flora. Open areas dominated by grasses, with some shrubs and taller trees, occurred within Degraded bushveld Habitat locations which were historically utilised for agriculture resulting in homogenous floral compositions.

Based on the results of the field investigation undertaken in May 2021, four broad habitat units were distinguished for the study area.

The four broad habitat units include:

1. **Bushveld Habitat**: The Bushveld Habitat Unit is the largest habitat within the study area and is largely characterised by sandy soils. Currently, this Habitat Unit is utilised

for grazing purposes by the surrounding communities. As such, areas throughout the Habitat Unit are heavily overgrazed. Different community compositions were supported within the habitat unit and as such, three subunits are recognised:

a. ***Dichrostachys* Bushveld**: this subunit comprised the largest extent (approximately 335 ha) of the Bushveld Habitat Unit and supports dense homogenous thicket like stands of thorny, woody species, particularly *Dichrostachys cinerea*. The subunit is overgrazed, which is favourable to some avifauna, yet severe resource competition reduced forage availability and avian abundance;

b. **Mixed Bushveld:** this subunit comprised the smallest extent (approximately 20 ha) of the Bushveld Habitat Unit and supported a higher diversity of floral species, particularly broad-leaf woody species, than the remaining Bushveld Subunits. Slightly more open than the dense *Dichrostachys* Bushveld this habitat appeared most favourable to bird species and bird parties were often encountered in these areas. Yellow-billed hornbills, Fork-tailed Drongos and Chinspot Batis were noted in these areas. The subunit has also been subjected to grazing pressures and grass species that are indicative of overgrazing, including *Heteropogon contortus* and *Aristida congesta* subsp. *barbicollis* are common within this subunit*;*

c. **Degraded Bushveld:** this subunit comprised the second largest extent (approximately 275 ha) of the Bushveld Habitat Unit and supported a low diversity of floral species. This habitat unit is largely degraded in nature and has historically been subjected to edge effects from dumping, historic agriculture, severe historic and current grazing pressures, AIP infestation, firewood collection, and frequent fires. This subunit is characterised by a high abundance of weedy, pioneer species, most of which are either alien and invasive plants (AIPs) or species that thrive within disturbed conditions. This open unit provides an alternative to the woodier Bushveld habitats and granivores are anticipated to dominate this unit.

2. **Freshwater Habitat**: This habitat comprised the smallest extent of all the Habitat Units within the study area. Different community compositions (SAS 202186, 2021) were supported within the habitat unit and as such, two subunits are recognised:

a. **Seep Wetland**[4]: This Habitat subunit is located within the central section of the study area. The Seep Wetland Habitat supported avifauna species that favour moist wetland habitat, species included Lazy and Zitting Cisticolas and southern red bishops; and
b. **Riverine Habitat**: This habitat subunit comprised the largest extent of the Freshwater Habitat. The species composition within this habitat subunit was riparian[5] in nature but largely mimicking the Mixed Bushveld in avian composition. The of seasonal water flow within the neighbouring drainage lines provides habitat for a higher diversity of floral species which results in greater forage availability for frugivores and insectivores.

3. **Donga Habitat**[6]**:** The Donga Habitat is the second smallest habitat unit within the study area (approximately 4 ha). This habitat unit was characterised by steep-sided erosion gulley's that have formed within the landscape. This habitat, which consisted of lose, sandy, somewhat stony soils is likely to be associated with increased moisture (seasonally). Overall vegetation cover within this habitat was scarce limiting habitat suitability and forage availability for most avifauna.

4. **Transformed Habitat**: This habitat unit includes areas associated with the surrounding settlements (e.g., infrastructure associated with houses and buildings), and associated mining development within the study area. The Transformed Habitat is the second largest habitat unit within the study area (approximately 157 ha). Due to anthropogenic activities this habitat unit has an altered physical environment but does still provide habitat for mostly common, urban adaptor avian species.

For a further breakdown of the floral communities and habitat and conservation sensitivities associated with them, refer to the floral report (STS 210042: Part B).

Section 4.1 summarises the field observations that were made during the site visit in May 2021, with regards to overall avifaunal diversity, food availability, habitat integrity, habitat availability, general comments and business case and conclusion. Figure 9 below provides a visual representation of the above-mentioned habitat units.

[4] A seep wetland is a wetland area located on gently to steeply sloping land and dominated by colluvial (i.e., gravity-driven), unidirectional movement of water and material down-slope (Ollis et al. 2013).
[5] "**riparian habitat**" (as per the National Water Act, 1998 (Act No. 36 of 1998) includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.
[6] A dry gully, with steep sidewalls and a stepped longitudinal profile that is actively eroded. These dongas can be the result of several factors including the eroding action of running water, soil properties, geological features, rainfall, topography, vegetation, and land use (i.e., anthropogenic activities).

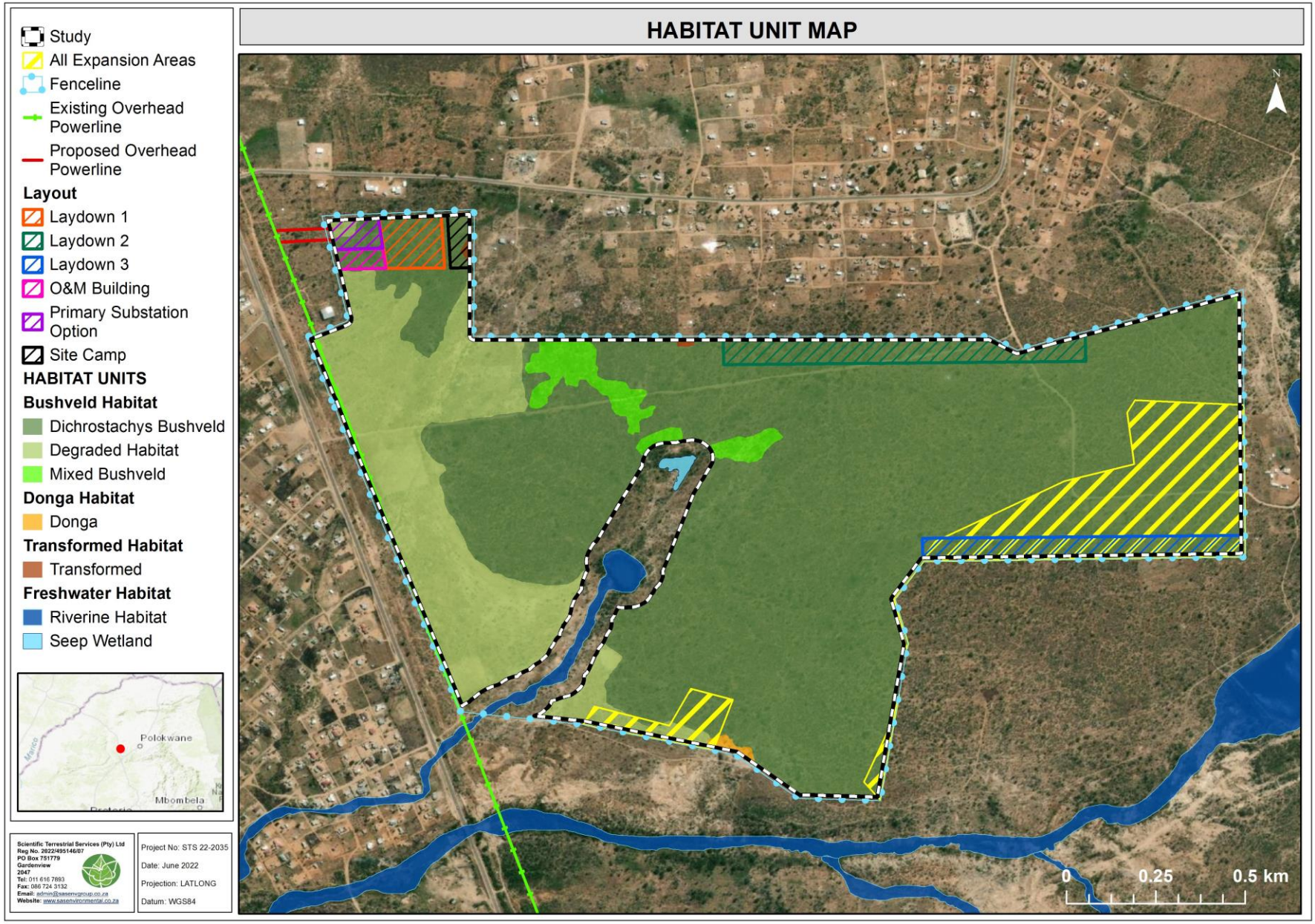


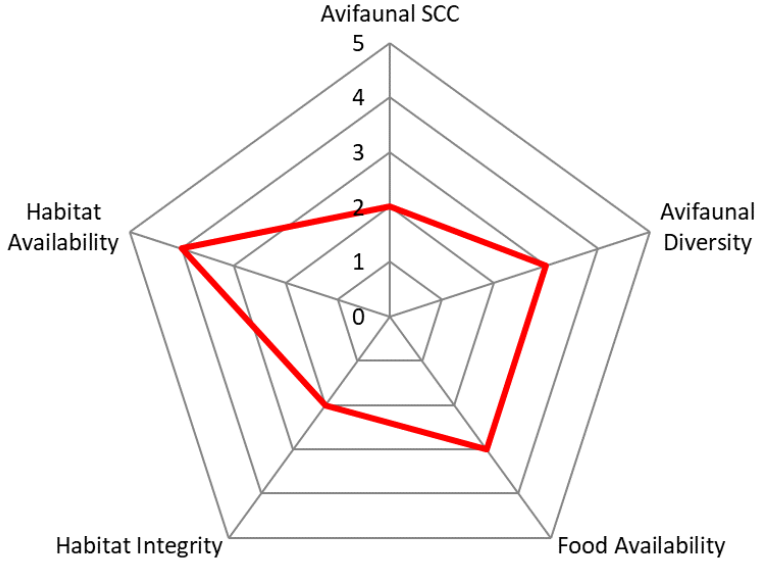

**Figure 9: Habitat units encountered within the study area.**

## 4.1 Summary of results for avifaunal species

| Class: Aves | Habitat Sensitivity: | Intermediate |
|---|---|---|

**Notes on photographs:**
**Top:** General habitat characteristics noted during the field investigation. Left - Open Degraded Bushveld and Dense *Dichrostachys* Bushveld in the foreground and background respectively. Right - Donga and Riverine Habitat. **Middle:** Left to right – *Merops pusilus* (Little Bee-eater), *Estrilda erythronotos* (Black-faced Waxbill) and *Uraeginthus granatinus* (Violet-eared Waxbill). **Bottom**: Left to right – *Bradornis mariquensis* (Marico Flycatcher), *Erythropygia paena* (Kalahari Scrub Robin) and *Bubulcus ibis* (Cattle Egret).

**Avifaunal Sensitivity Graph:**




| | | |
|---|---|---|
| **Faunal SCC/ Endemics/ TOPS/** | No SCC were observed during the field investigation. Several SCC do have distribution ranges which overlay the study area, these include: *Necrosyrtes monachus* (Hooded Vulture), *Gyps africanus* (White-backed Vulture), *Polemaetus bellicosus* (Martial Eagle), *Aquila rapax* (Tawny Eagle), *Gyps coprotheres* (Cape Vulture), *Torgos tracheliotos* (Lappet-faced Vulture), *Mycteria ibis* (Yellow-billed Stork), *Neotis denhami* (Denham's Bustard), *Aquila verreauxii* (Verreauxs' Eagle), *Nettapus auratus* (Pygmy Goose), *Gorsachius leuconotus* (White-backed Night | **Conclusion:**<br>The avifaunal habitat sensitivity for the study area is considered to be intermediate. Although a large contingent of SCC do have ranges which overlap the study area, this area is not known as an important breeding, foraging or roosting location for any of the SCC. Two species are deemed likely to utilise the site for foraging or breeding purposes, *Coracias garrulus* (European Roller) and the eastern population of *Certhilauda chuana* (Short-clawed Lark), known to occur in the Polokwane Plateau. The study area just marginally occurs on the southwestern boundary of the Polokwane Plateau. The habitat in the Degraded Bushveld and margins of Transformed Habitat may be favorable to this species yet the constant presence of humans and domestic cats and dogs is not favorable for these species. *Coracias garrulus* (European Roller), a non-breeding migrant, may utilise the area to forage yet records do not indicate this area as |

| | | |
|---|---|---|
| | Heron), *Eupodotis senegalensis* (White-bellied Korhaan), *Sigattarius serpentarius* (Secretarybird), *Cocinia nigra* (Black Stock), *Oxyura maccoa* (Maccoa Duck), *Anthropoides paradiseus* (Blue Crane), *Alcedo semitorquata* (Half-collared Kingfisher), *Certhilauda chuana* (Short-clawed Lark), *Coracias garrulus* (European Roller), *Falco biarmicus* (Lanner Falcon), *Ciconia abdimii* (Abdim's Stork) and *Leptoptilos crumeniferus* (Marabou Stork). On-site characteristics are considered suitable for *Certhilauda chuana* (Short-clawed Lark) and *Coracias garrulus* (European Roller). | important for the species. The National Web Based Screening Tool indicated that *Sagittarius serpentarius* (Secretary bird) potentially occurs within the study area. The Degraded Bushveld is suitable habitat for the species, yet the constant traffic, human presence and movement of domestic animals reduce the POC of this species occurring here to Low. Most SCC which have ranges that overlay the study area, have wide ranges and often respond to favourable environmental conditions (grazing, fire, rainfall or invertebrate outbreaks) and as such may find suitable habitat within the study area intermittently.<br><br>The proposed activities will increase the risk of birds colliding with or being electrocuted by PV infrastructure, powerlines or when perching or nesting on pylons which can also be a fire risk. Potential impacts arising from the proposed activities are unlikely to impact on SCC diversity or abundance as a reduction in suitable habitat is limited to two species. Provided that mitigation measures stipulated in this report are adhered to the risk of bird collisions with powerlines is low. |
| **Faunal Diversity** | The avifaunal diversity associated with the study area was intermediate and comprised mainly of common avifaunal species. The timing of the survey did restrict the observed species assemblage to resident species, reducing the potential diversity of the species list. Since habitat structure is often considered the primary determinant of bird assemblages it is anticipated that the largely homogenous structure of the study area will be mirrored by a relatively narrow assemblage of birds. Portions of habitat along drainage lines near the study area in the Freshwater Habitat will harbour more rich species assemblages. Species within the study area include: Cape turtledove (*Streptopelia capicola*), *Microcarbo africanus* (Reed Cormorant), *Merops pusilus* (Little Bee-eater), *Estrilda erythronotos* (Black-faced Waxbill), *Uraeginthus granatinus* (Violet-eared Waxbill), *Bradornis mariquensis* (Marico Flycatcher), *Erythropygia paena* (Kalahari Scrub Robin), *Bubulcus ibis* (Cattle Egret), *Euplectes albonotatus* (White-winged Widowbird), *Euplectes orix* (Southern Red Bishop), *Ploceus velatus* (Southern Masked Weaver), *Macronyx capensis* (Cape Longclaw), *Charadrius tricollaris* (Three-banded Plover), *Cisticola tinniens* (Levaillant's Cisticola), *Cisticola aberrans* (Lazy Cisticola), *Cisticola juncidis* (Zitting Cisticola), *Fulica cristata* (Red-knobbed Coot), *Saxicola torquatus* (African Stonechat), *Alopochen aegyptiaca* (Egyption Goose), *Lanius collaris* (Common Fiscal), *Burhinus capensis* (Spotted Thick-knee), *Ardea cinerea* (Grey Heron), *Ardea melanocephala* (Black-headed Heron), *Anas undulata* (Yellow-billed Duck), *Euplectes afer* (Yellow-crowned Bishop) and *Elanus caeruleus* (Black-shouldered Kite). Please refer to Appendix E for the full list of species identified on site. | |
| **Food Availability** | The study area is considered to have an intermediate abundance of forage for avian species. Diverse flora in the drainage lines and Freshwater habitat do provide more variable forage albeit only a small part of the study area. The broad *Dichrostachys* Bushveld habitat unit offers sufficient food for the avian assemblage within the study area, with the interspersed Freshwater habitat promoting year-round access to water and an important niche habitat for numerous invertebrate prey. It is unlikely forage is a limiting factor within the largely natural habitats for smaller passerines. Large raptors will have high competition for food as a result of competing domestic dogs and will have limited opportunity to hunt within the dense *Dichrostachys* Bushveld. Vultures which require mammal carcasses will not find suitable forage due to the absence of carnivores. Where settlements exist or in degraded areas, Transformed Habitat and Degraded Bushveld, different niche opportunities exist for avifauna and urban adaptor species which are common and widely occurring dominated, yet lowered forage abundances and opportunities are expected for more rare species. The route which the proposed powerline will traverse is largely transformed from historic agriculture and as limited clearance of vegetation will occur minimal habitat alterations and impacts to forage are anticipated. Forage suitability and availability here will be patchy and more favourable to granivores. Insect abundances were low at the time of the field investigation reducing forage for many passerines while fruiting also appeared restricted to drainage lines and along the verges of Freshwater habitat. Forage for large perch hunting raptors was noted in low abundances and is expected to have been reduced due to domestic hunting animals (cats and dogs). | |
| **Habitat Integrity** | The study area is comprised of natural habitat which is exposed to heavy grazing and interspersed within rural settlements and mining areas. The study area is surrounded by a mosaic of mining areas, agricultural areas, rural settlements and more natural Bushveld reducing the intactness of the broader area. The high degree of human movement through the study area further reduces the integrity of the study area. | |
| **Habitat Availability** | Habitat availability is considered moderately high within the study area where the PV facility and much of the associate infrastructure is proposed, however, many of these portions are exposed to a high degree of edge effects from neighbouring settlements or from historically cultivated locations. These locations provide suboptimal habitat for more niche specific avifauna representative of the region. The Degraded Bushveld habitat with open more grass dominated habitat offers suitable habitat for bushveld species and those preferring more open grassland habitat. As little human activities are currently occurring here availability of habitat is moderately high. The Transformed Habitat will be of little value yet may increase rodent abundances which are an important component of accipiter diets. The dense sheltered areas with high tree abundance increase habitat availability and shelter for many avifaunal species who require these features for nesting and foraging. The study area offers habitat of similar structure, which is a primary determinant of bird species assemblages, throughout and as such it is not anticipated that a highly diverse assemblage of birds will occur here although abundance is anticipated to be high. | |

## 4.2 International Finance Corporation (IFC) Performance Standard 6 Habitat Description

This section serves to address the application of Performance Standard 6 (Biodiversity Conservation and Sustainable Management of Living Natural Resources) of the International Finance Corporation (IFC) and to categorise the observed habitats as described in Section 4 above into the relevant IFC defined habitat categories (Table 3).

**Table 3: Descriptions of the IFC habitat categories.**

| Description of the IFC habitat categories |
|---|
| ***Modified Habitat***<br>Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands.<br><br>This Performance Standard applies to those areas of modified habitat that include significant biodiversity value, as determined by the risks and impacts identification process required in Performance Standard 1. The client should minimize impacts on such biodiversity and implement mitigation measures as appropriate. |
| ***Natural Habitat***<br>Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.<br>The client will not significantly convert or degrade natural habitats, unless all of the following are demonstrated:<br>• No other viable alternatives within the region exist for development of the project on modified habitat;<br>• Consultation has established the views of stakeholders, including Affected Communities, with respect to the extent of conversion and degradation; and<br>• Any conversion or degradation is mitigated according to the mitigation hierarchy.<br><br>In areas of natural habitat, mitigation measures will be designed to achieve no net loss of biodiversity where feasible. Appropriate actions include:<br>• Avoiding impacts on biodiversity through the identification and protection of set-asides;<br>• Implementing measures to minimize habitat fragmentation, such as biological corridors;<br>• Restoring habitats during operations and/or after operations; and<br>• Implementing biodiversity offsets |
| ***Critical Habitat***<br>Critical habitats are areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes.<br><br>In areas of critical habitat, the client will not implement any project activities unless all of the following are demonstrated:<br>• No other viable alternatives within the region exist for development of the project on modified or natural habitats that are not critical;<br>• The project does not lead to measurable adverse impacts on those biodiversity values for which the critical habitat was designated, and on the ecological processes supporting those biodiversity values;<br>• The project does not lead to a net reduction in the global and/or national/regional population of any Critically Endangered or Endangered species over a reasonable period of time; and<br>• A robust, appropriately designed, and long-term biodiversity monitoring and evaluation program is integrated into the client's management program.<br><br>In such cases where a client is able to meet the requirements defined in paragraph 17, the project's mitigation strategy will be described in a Biodiversity Action Plan and will be designed to achieve net gains of those biodiversity values for which the critical habitat was designated. |

| |
|---|
| In instances where biodiversity offsets are proposed as part of the mitigation strategy, the client must demonstrate through an assessment that the project's significant residual impacts on biodiversity will be adequately mitigated to meet the requirements of paragraph 17. |

GN9. The requirements for the baseline study will vary depending on the nature and scale of the project. For sites with potentially significant impacts on natural and critical habitats and ecosystem services, the baseline should include field surveys over multiple seasons, to be undertaken by competent professionals and with the involvement of external experts, as necessary. Field surveys and assessments should be recent, and data should be acquired for the direct project footprint, including related and associated facilities, the project's area of influence, and potentially beyond.

GN15. The EIA should spell out project-related direct, indirect, and residual impacts on species, ecosystems, and ecosystem services identified in the baseline studies. Direct impacts might include (i) disturbance or reduction in species' populations or their habitats (for example, from wind turbine collisions; roadkill; or results from noise, light, and land or shipping traffic); (ii) effects from emissions and effluents, (iii) alterations of surface hydrology, landforms, and coastal processes; (iv) competition by invasive species, edge effects, and barriers to dispersal; and (v) reduced access to ecosystem services, including loss or degradation. Indirect impacts might include project-induced access by third parties, in-migration and associated impacts on resource use, including land conversion, hunting and wildlife trade, and spread of invasive alien species. Mitigation and management measures should then be defined to address adverse impacts to biodiversity or ecosystem services. As mentioned in Performance Standard 1, residual impacts are those that might remain after measures are taken to avoid and minimize impacts on biodiversity and ecosystem services and/or to restore viability. It should be noted that a reliable determination of residual impacts on biodiversity needs to take into account uncertainties in the effectiveness of proposed mitigation measures. This is especially relevant with respect to the client's ability to ensure adequate restoration of biodiversity and ecosystem services. Where there is significant uncertainty, the client should take a conservative approach in ascertaining the significance of residual impacts. Regarding cumulative impacts, the client is responsible for considering such impacts in line with paragraph 8 of Performance Standard 1 and described in its accompanying Guidance Note.

GN20. Performance Standard 6 uses the term adaptive management to mean a practical approach to managing uncertainty in biodiversity mitigation and management planning. As is often the case in determining the risks to and impacts on biodiversity and ecosystem services, data gaps may exist even after lengthy data collection and completion of the EIA or additional studies. The client's mitigation strategy should be commensurate with the project's risks and impacts to ensure that the requirements of Performance Standard 6 are met and should take a risk-averse approach that explicitly identifies and accommodates uncertainty about outcomes of mitigation measures. Flexibility

should be built into the client's ESMS so that the mitigation and management approach can be adapted according to its performance over time.

GN26. Paragraph 9 of Performance Standard 6 purposely provides a broad definition of habitats as geographical units (that include marine and freshwater aquatic areas as well as airway passages), which is a departure from a classic ecological definition of habitat (i.e., the place or type of site where an organism or population naturally occurs). Modified, natural and critical habitat refers to the biodiversity value of the area as determined by species, ecosystems, and ecological processes. As part of the risks and impacts identification process, the client should develop and present a map of the modified, natural, and/or critical habitats in the landscape of the project's area of influence to inform the applicability of Performance Standard 6.

GN27. In practice, natural and modified habitats exist on a continuum that ranges from largely untouched, pristine natural habitats to intensively managed, modified habitats. Project sites will often be located among a mosaic of habitats with varying levels of anthropogenic and/or natural disturbance. Clients are responsible for delineating the project site as best as possible in terms of modified and natural habitat. This determination is made based on the level of human-induced disturbance (for example, presence of invasive species, level of pollution, extent of habitat fragmentation, viability of existing naturally occurring species assemblages, resemblance of existing ecosystem functionality and structure to historical conditions, degree of other types of habitat degradation) and the biodiversity values of the site (for example, threatened species, ecosystems, and ecological processes necessary for maintaining nearby critical habitats).

GN28. Both natural and modified habitats may contain high biodiversity values, thereby qualifying as critical habitat. Performance Standard 6 does not limit its definition of critical habitat to *critical natural* habitat. An area may just as well be *critical modified* habitat. The extent of human-induced modification of the habitat is therefore not necessarily an indicator of its biodiversity value or the presence of critical habitat.

GN37. Performance Standard 6 requires that projects with significant biodiversity values in modified habitats minimize their impacts and implement mitigation and management measures as needed to conserve those values. Significant biodiversity values that might occur in modified habitat include species of conservation concern (for example, species that are threatened or otherwise identified as important by stakeholders) and remnant ecological features that persist in the modified landscape, especially those that perform important ecological functions. In some cases, significant biodiversity values may cause natural or critical habitat requirements to be applied, in which case they should be treated using the guidelines for those habitat designations.



GN51. Long-term biodiversity monitoring may be required to validate the accuracy of predicted impacts and risks to biodiversity values posed by the project, and the predicted effectiveness of biodiversity management actions. The monitoring and evaluation program should include the following: (i) *baseline*, measures of the status of biodiversity values prior to the project's impacts; (ii) *process*, monitoring of the implementation of mitigation measures and management controls; and (iii) *outcomes*, monitoring of the status of biodiversity values during the life of the project, compared to the baseline.

GN52. Specific thresholds should be set for monitoring results that will trigger a need to adapt the management plan(s) to address any deficiencies in performance. The results of the monitoring program should be reviewed regularly. If they indicate that the actions specified in the management plan(s) are not being implemented as planned, the reasons for failure need to be identified (for example, insufficient staff, insufficient resources, unrealistic timeline, etc.) and rectified. If outcome monitoring results indicate that project impacts to biodiversity values were underestimated or that the benefits to biodiversity from management actions including offsets were overestimated, the impact assessment and management plans should be updated.

GN56. To facilitate decision-making, numerical thresholds have been defined for the first four critical habitat criteria (i.e., CR/EN species; endemic/restricted-range species; migratory/congregatory species; threatened and unique ecosystems). The thresholds presented in this Guidance Note were obtained from globally standardized numerical thresholds published in the IUCN's *A Global Standard for the Identification of Key Biodiversity Areas* and *Red List Categories and Criteria*. The thresholds are indicative and serve as a guideline for decision-making only. There is no universally accepted or automatic formula for making determinations on critical habitat. The involvement of external experts and project-specific assessments is of utmost importance, especially when data are limited (as will often be the case).

GN57. For Criterion 5, there are no numerical thresholds. Best available scientific information and expert opinion should be used to guide decision-making with respect to the relative "criticality" of a habitat in these cases.

GN89. A biodiversity monitoring and evaluation program (BMEP) is a fundamental aspect of demonstrating compliance with paragraphs 7 and 17 of Performance Standard 6, as well as Performance Standard 1. See paragraphs GN51 and GN52 of this note for a description of a suitable BMEP.



GN100. The introduction of any alien species as part of the client's operations should be assessed for compliance with the existing host country regulatory framework for such introductions. The client will not intentionally introduce any new alien species (that is, those that are not currently established in the country or region in which the project is operating) unless this is carried out in accordance with the existing regulatory framework, if such is present. If not, a risk assessment should be conducted on the invasiveness of the species, in coordination with competent professionals with knowledge of the particular species in question. Alien species of known high risk of invasive behaviour shall not be introduced into a project site under any circumstances, even if such an introduction is not forbidden by the host country regulatory framework.

GN102. Preventive and mitigation measures are essential when the project includes a linear infrastructure, such as a pipeline, transmission line, road, or rail development, as the right-of-way will likely traverse and link several habitats through one corridor, providing optimal means for a species to quickly spread through the region. In certain cases, and especially for projects operating in largely undisturbed habitats, clients should also include provisions in suppliers' contracts to prevent alien species from arriving in-country if cargo is transported from outside the country. This may include requirements for inspection and quarantine of containers and heavy equipment. Equipment should arrive "clean as new" to prevent risk of introductions.

GN104. In many cases, invasive species will have already been established in the region in which the project is located. In these cases, the client has the responsibility to take measures to prevent the species from further spread into areas in which it has not already been established. For example, in the case of linear infrastructure, invasive weeds might be spread into forested habitats, especially if the forest canopy is not able to re-establish itself (due to maintenance of the right-of-way for operational purposes). This is exacerbated if opportunistic agricultural or logging activities further widen the right-of-way, thereby facilitating spread. In these cases, the client is expected to determine the severity of the threat and the mode of spread of that species. The situation should be monitored as part of the overall ESMS, and the client should seek effective mitigation measures in coordination with local and national authorities.

GN106. Performance Standard 6 defines ecosystem services as "the benefits that people, including businesses, obtain from ecosystems" (paragraph 2), which is in line with the definition provided by the Millennium Ecosystem Assessment (GN23). As described in paragraph 2 and footnote 1 of Performance Standard 6, ecosystem services are organized into four major categories:

- Provisioning ecosystem services, include, among others, (i) agricultural products, seafood and game, wild foods, and ethnobotanical plants; (ii) water for drinking, irrigation, and industrial

purposes; and (iii) forest areas, which provide the basis for many biopharmaceuticals, construction materials, and biomass for renewable energy;

- Regulating ecosystem services, include, among others, (i) climate regulation and carbon;
- storage and sequestration; (ii) waste decomposition and detoxification; (iii) purification of water and air; (iv) control of pests, disease, and pollination; and (v) natural hazard mitigation;
- Cultural services, include, among others, (i) spiritual and sacred sites; (ii) recreational purposes such as sport, hunting, fishing, and ecotourism; and(iii) scientific exploration and education; and
- Supporting services, are the natural processes that maintain the other services, such as (i) nutrient capture and recycling, (ii) primary production, and (iii) pathways for genetic exchange.

The table below lists the various habitat units as identified in Section 4 with reference to the IFC habitat categories mentioned above.

**Table 4: Habitat Units as they relate to the IFC Habitat Categories and considerations.**

| Habitat Units as per Biodiversity Reports | Applicable IFC Habitat and applicable Criteria (General Notices) | IFC Habitat Unit Discussion |
|---|---|---|
| ***Dichrostachys* and Mixed Bushveld Habitat** | **Natural Habitat**<br>Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.<br><br>**Additional Considerations: Near Threatened** avian species may forage within this habitat, however, the study area and focus areas are not anticipated to be an important foraging, breeding or roosting location for these species. | **Natural Habitat**<br>These units are considered to be in a natural condition with minimal disturbances through landscape altering activities. Although heavily grazed, the overall level of habitat provision as well as species diversity still qualifies this habitat unit as a natural habitat in terms of the IFC descriptions where habitat of suitable structure will be favoured by several bird species. Whilst some areas have been subjected to higher levels of impact than others, on a landscape level the overall ecological functioning has not been impaired to an extent that would classify this habitat as modified.<br><br>**Additional Considerations:**<br>• These units may provide habitat for Near-threatened bird species, however, these species have ranges or at their ranges limit, although they may forage here this area is not considered critical habitat for breeding, roosting or foraging and the impacts to habitat will be limited in extent (minimal landscape altering activities) and as such do not meet the requirements for this habitat unit to be considered Critical Habitat as per the IFC definitions;<br>• Consideration needs to be given to GN37 as it indicates that in some instances "significant biodiversity values may cause natural or critical habitat requirements to be applied, in which case they should be treated using the guidelines for those habitat designations". With this in mind heavily grazed portions of the Bushveld Habitat can be considered as Natural Habitat as per the IFC standards;<br>• GN51 Long-term biodiversity monitoring may be required to validate the accuracy of predicted impacts and risks to biodiversity values, especially for possible collisions of endangered avian species with the powerline;<br>• GN52. Specific thresholds should be set for monitoring results that will trigger a need to adapt the management plan(s) to address any deficiencies in performance. The results of the monitoring program should be reviewed regularly;<br>• GN56. To facilitate decision-making, numerical thresholds have been defined for the first four critical habitat criteria (i.e., CR/EN species; |

| | | |
|---|---|---|
| | | endemic/restricted-range species; migratory/congregatory species; threatened and unique ecosystems). The thresholds presented in this Guidance Note were obtained from globally standardized numerical thresholds published in the IUCN's *A Global Standard for the Identification of Key Biodiversity Areas* and *Red List Categories and Criteria*. The thresholds are indicative and serve as a guideline for decision-making only;<br>• GN57. For Criterion 5, there are no numerical thresholds. Best available scientific information and expert opinion should be used to guide decision-making with respect to the relative "criticality" of a habitat in these cases;<br>• GN89. A biodiversity monitoring and evaluation program (BMEP) is a fundamental aspect of demonstrating compliance;<br>• GN102. Preventive and mitigation measures are essential when the project includes a linear infrastructure, such as a pipeline, transmission line, road, or rail development, as the right-of-way will likely traverse and link several habitats through one corridor, providing optimal means for a species to quickly spread through the region;<br>• GN104 states that all measures must be put in place to ensure the adequate control of alien plant species proliferation, ensuring that natural habitats are not further degraded to such a state that they will be considered modified; and<br>• As per GN106, this habitat unit is considered important in terms of "Provisioning ecosystem services, Regulating ecosystem services and Supporting services". These habitats do offer a suitable movement corridor, habitat for game and wild foods. |
| **Transformed, Donga and Degraded Bushveld Habitat** | **Modified Habitat**<br>Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands. | **Modified Habitat**<br><br>This habitat unit is considered to be modified as per the IFC guidelines due to the increased levels of alien plant proliferation, loss of native species and the continuous ground disturbances associated with agricultural activities. The ecological functions of this habitat unit have been significantly altered from their natural state, providing limited habitat for avifaunal species associated with the region.<br><br>**Additional Considerations:**<br>• The Transformed Habitat may provide habitat for avian SCC, however these habitats are not considered of significant importance to any of these species and do not meet the requirements for this habitat unit to be considered Critical Habitat as per the IFC definitions;<br>• GN51 Long-term biodiversity monitoring may be required to validate the accuracy of predicted impacts and risks to biodiversity values, especially for possible collisions of endangered avian species with the OHPL;<br>• GN52. Specific thresholds should be set for monitoring results that will trigger a need to adapt the management plan(s) to address any deficiencies in performance. The results of the monitoring program should be reviewed regularly;<br>• GN89. A biodiversity monitoring and evaluation program (BMEP) is a fundamental aspect of demonstrating compliance;<br>• GN102. Preventive and mitigation measures are essential when the project includes a linear infrastructure, such as a pipeline, transmission line, road, or rail development, as the right-of-way will likely traverse and link several habitats through one corridor, providing optimal means for a species to quickly spread through the region; and<br>• GN104 states that all measures must be put in place to ensure the adequate control of alien plant species proliferation, ensuring that surrounding natural habitats are not further degraded to such a state that they will in turn be considered modified. |

## 4.3 Avifaunal SCC Assessment

During field assessments, it is not always feasible to identify or observe all species within an area, largely due to the secretive nature of many avian species, possible low population numbers or varying habits of species. As such, and to specifically assess an area for faunal SCC, a Probability of Occurrence (POC) matrix is used, utilising a number of factors to determine the probability of faunal SCC occurrence within the study area. Species listed in Appendix F or other regional listings, whose known distribution ranges and habitat preferences include the study area were taken into consideration. Only species who are anticipated to have a medium or high probability of occurring within the study area are listed.

Several SCC listed in Appendix F, which include: *Necrosyrtes monachus* (Hooded Vulture), *Gyps africanus* (White-backed Vulture), *Polemaetus bellicosus* (Martial Eagle), *Aquila rapax* (Tawny Eagle), *Gyps coprotheres* (Cape Vulture), *Torgos tracheliotos* (Lappet-faced Vulture), *Mycteria ibis* (Yellow-billed Stork), *Neotis denhami* (Denham's Bustard), *Aquila verreauxii* (Verreauxs' Eagle), *Nettapus auratus* (Pygmy Goose), *Gorsachius leuconotus* (White-backed Night Heron), *Eupodotis senegalensis* (White-bellied Korhaan), *Sagittarius serpentarius* (Secretarybird), *Cocinia nigra* (Black Stock), *Oxyura maccoa* (Maccoa Duck), *Anthropoides paradiseus* (Blue Crane), *Alcedo semitorquata* (Half-collared Kingfisher), *Certhilauda chuana* (Short-clawed Lark), *Coracias garrulus* (European Roller), *Falco biarmicus* (Lanner Falcon), *Ciconia abdimii* (Abdim's Stork) and *Leptoptilos crumeniferus* (Marabou Stork) have distribution ranges which encompass the study area. Of these species only *Certhilauda chuana* (Short-clawed Lark) and *Coracias garrulus* (European Roller) may potentially inhabit the study area.

Due to the habitat unit associated with the study area there is a likelihood for avifaunal SCCs to occur within the study area. Should the nests of any avifaunal SCC as listed above and in Appendix F of this report, be encountered during the course of the proposed development activities, all operations must be stopped immediately, and an avifaunal specialist must be consulted in order to advise on the best way forward. For mitigation on how to appropriately manage and treat potential SCC present in the study area refer to Section 6.4.

**Table 5: Avifaunal SCC that may occur within the study area due to suitable habitat.**

| SCIENTIFIC AND COMMON NAME | HABITAT DESCRIPTION | REGIONAL STATUS | POC (%) |
|---|---|---|---|
| *Coracias garrulus* (European Roller) | **Range**: Non-breeding migrant ranging from Morocco to southwestern and central Europe with its non-breeding range within Africa.<br>**Major habitats**: Forest, grassland, shrubland and savanna. May utilise agricultural fields.<br>**Description**: Perch hunter preferring a prominent point from which it can see prey.<br>**Food:** Feeds primarily on invertebrates.<br>**Available habitat with the study area:** Degraded and Mixed Bushveld. | NT | **M** |
| *Certhilauda chuana* (Short-clawed Lark) | **Range**: Endemic to central and northern South Africa and south-central Botswana where it is found at an altitudinal range of between 1000 and 1400 m.<br>**Major habitats**: Savanna.<br>**Description**: The species prefers open, sparsely vegetated habitat with scattered trees or shrubs where overgrazing has occurred. In South Africa it is associated with *Tarchonanthus* Bushveld.<br>**Food:** Insects, especially termites and ants.<br>**Available habitat with the Subject Property:** Degraded Bushveld Habitat. | **NT** | **M** |

**NT=Near Threatened.**

# 5. SENSITIVITY MAPPING

Figure 10 below conceptually illustrate the areas considered to be of increased ecological sensitivity. The areas are depicted according to their sensitivity in terms of the presence or potential for avifaunal SCC, habitat integrity and levels of disturbance, threat status of the habitat type, the presence of unique landscapes and overall levels of diversity. The table below presents the sensitivity of each identified habitat unit along with an associated conservation objective and implications for development.

**Table 6: A summary of sensitivity of each habitat unit and implications for development.**

| Sensitivity | Habitat Unit | Development Implications |
|---|---|---|
| **Low Sensitivity** | **Transformed Habitat and Donga Habitat**<br>Conservation Objective for areas of Low Sensitivity: Optimise development potential. | These habitats are deemed to be of low sensitivity for avifauna due to their altered state, absence of vegetation and lack of heterogeneity. Development within these areas is unlikely to lead to high impacts to avifaunal habitat or species diversity provided mitigation measures are implemented, as discussed in Section 6.4. |
| **Moderately Low** | **Degraded Bushveld**<br>Conservation Objective for areas of Low Sensitivity: Optimise development potential while improving biodiversity intactness of surrounding natural habitat and managing edge effects. | The habitat sensitivity of this unit is considered moderately low as it has been degraded as a result of historic agricultural activities, erosion and as a result of heavy grazing. The unit comprises of homogenous vegetation with limited forging and shelter opportunities for most avifauna. Development within these habitat units is not expected to have a significant negative impact on the local or regional ecology of the area, provided mitigation measures are adhered to. |
| **Intermediate Sensitivity** | ***Dischrostachys* Bushveld and Mixed Bushveld Habitat**<br>Conservation Objective: | Areas of intermediate sensitivity include those that have avoided impacts for agriculture or other landscape transforming factors ensuring natural habitat has persisted, with varying degrees of degradation as a result of encroachment and overgrazing. From an avifaunal perspective |

| Sensitivity | Habitat Unit | Development Implications |
|---|---|---|
| | Preserve and enhance the biodiversity of the habitat unit and the surrounds while optimising development potential | it is likely that mostly common species who have broad habitat requirement are likely to utilize this unit for breeding though most avifauna within the vicinity will forage here. The relatively homogenous structure and composition of the vegetation, broadly ***Dischrostachys* Bushveld** reduces its appeal to SCC who will readily favour less encroached intact habitats where no historic disturbances have occurred.<br><br>Development within these areas are less likely to have significant impacts on avifaunal communities within the study area. It remains important that edge effect impacts on areas outside of the direct footprint be strictly managed to increase/maintain ecological functionality. Mitigation measures included within this report should be adhered to limit ecological impacts. |

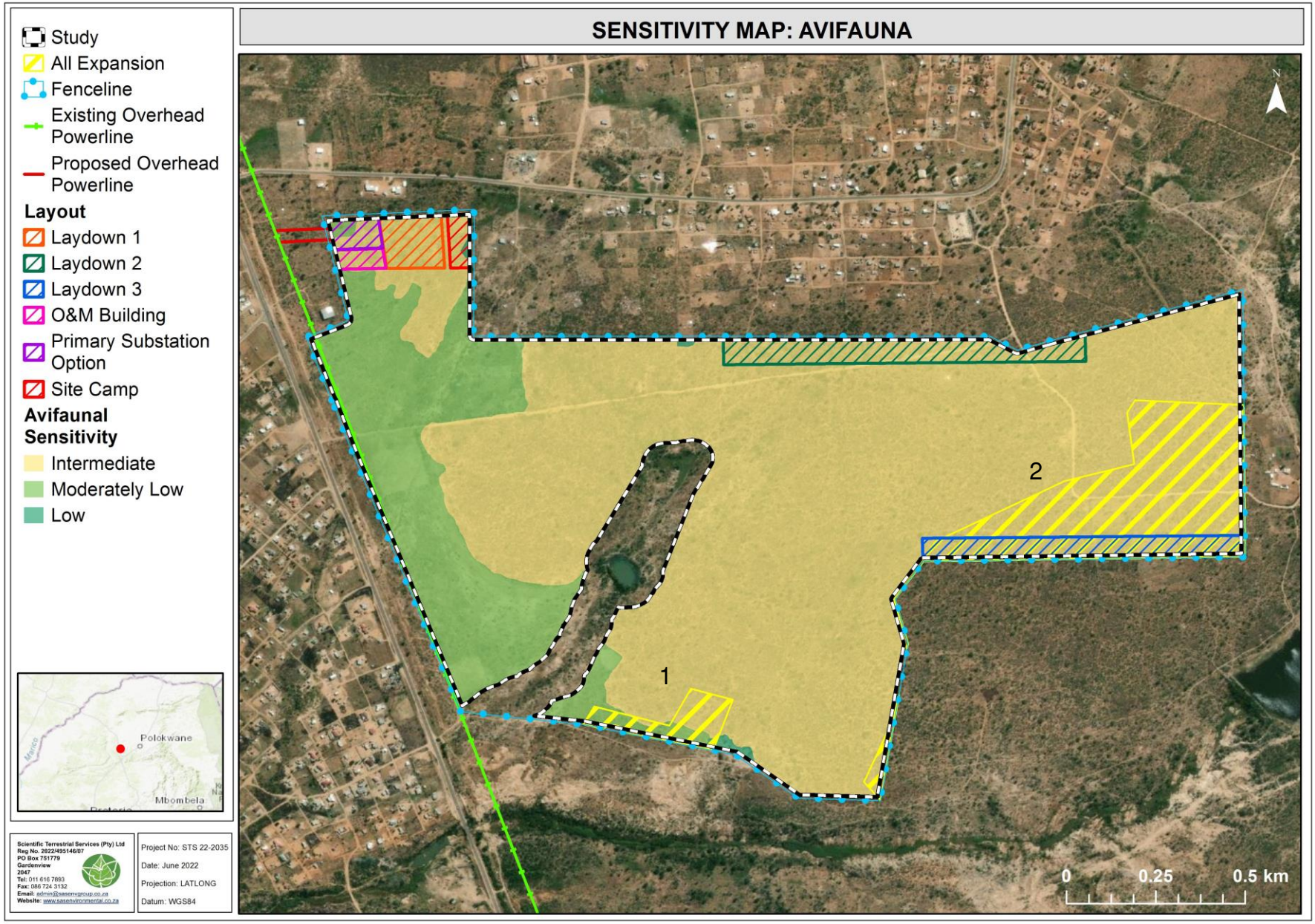



**Figure 10: Avifaunal sensitivity map of the proposed PV Plant section of the study area.**

# 6. IMPACT ASSESSMENT

The sections below provide the significance of perceived impacts arising from the proposed PV facility development for the study area.

An impact discussion and assessment of all potential pre-construction, construction, operational and maintenance phase impacts are provided in Section 6.2 and 6.3. All mitigatory measures required to minimise the perceived impacts are presented in Section 6.4.

Proposed Activity Description**:**

The proposed Mogalakwena Solar PV Plant will comprise the following:

- The majority of the study area will host the solar arrays;
- A substation;
- A laydown areas 1, 2 and 3;
- O&M building and store house;
- Site Camp;
- Internal overhead transmission lines (OHL); and
- Two overhead transmission lines connecting to the existing infrastructure.

For a depiction of the proposed layout, refer to Figure 3.

## *6.1 Activities and Aspect Register*

The table below indicates the perceived risks to avifaunal species associated with the activities pertaining to the proposed infrastructure developments listed in Section 6 above.

**Table 7: Aspects and activities register considering avifaunal resources during all phases of development.**

| ACTIVITIES AND ASPECTS REGISTER |
|---|
| **Planning Phase** |
| - Potential failure to implement the required mitigation measures before and at the commencement of construction activities:<br>  • Potential failure to have a Rehabilitation Plan and anti-collision measures developed before the commencement of the development of the powerline.<br>  • Potential failure to obtain the necessary permits for the removal of protected avifaunal species should they be needed resulting in delays to the construction activities.<br>- **Impact**: Long-term or permanent degradation and modification of the receiving environment, loss of SCC and fauna habitat. |
| - Potential inadequate design of PV infrastructure, electricity pylons and powerlines increasing the possibility of birds being electrocuted or colliding with infrastructure.<br>- **Impact:** Long-term collision and electrocution risks to SCC species leading to a reduction in SCC diversity. |
| **Construction Phase** |

| ACTIVITIES AND ASPECTS REGISTER |
|---|
| - Inadequate layout optimisation, resulting in extensive site clearing and the removal of indigenous vegetation.<br>- **Impact:** Loss of important avifaunal habitat and the potential loss of potential avifaunal SCC. |
| - Uncontrolled and unplanned site clearing and the removal of vegetation and destruction of avifaunal habitat and forage. This is particularly true for the Freshwater Habitat.<br>- **Impact:** Loss of sensitive avifaunal habitat and avifaunal species reliant on this specific habitat for survival. |
| - Proliferation of AIP species that colonise areas of increased disturbances and may outcompete indigenous plant species, including further transformation of adjacent, undeveloped habitat.<br>- **Impact:** Degradation of favourable avifaunal habitat outside of the direct construction footprint, leading to a decrease in avifaunal diversity at a local scale and loss of land to meet biodiversity targets. |
| - Potential dumping of excavated and construction material outside of designated areas, promoting the establishment of AIPs.<br>- **Impact:** Loss of avifaunal habitat, diversity and potential SCC. |
| - Potential failure to implement a rehabilitation and an alien floral control plan after the construction phase.<br>- **Impact:** Potentially leading to permanent transformation of avifaunal habitat and long-term degradation of important avifaunal habitat within the region. |
| - Increased risk of avian collisions with construction vehicles.<br>- **Impact:** Local loss of potential avifaunal SCC abundance and diversity. |
| - Additional pressure on avifaunal habitat as a result of an increased human presence associated with the proposed development, contributing to:<br>• Potential hunting/trapping/removal/collection of avifaunal species or potential SCC; and<br>• Increased human activity will lead to the displacement and/or loss of potential avifaunal SCC.<br>- **Impact:** Loss of sensitive avifaunal habitat and the potential loss of potential avifaunal SCC. |
| - Potential failure to concurrently rehabilitate bare or disturbed sites as soon as the construction activities have occurred will potentially result in loss of viable soils, increasing erosion risk and/or permitting the proliferation of AIPs.<br>- **Impact:** Long-term loss of favourable habitat for historically recorded avifaunal species. Loss of avifaunal diversity and potential SCC which will disperse into the surrounding area in search of favourable habitat. |
| **Operational and Maintenance Phase** |
| - Ineffective rehabilitation of exposed and impacted areas potentially leading to vegetation succession and a possible reduction of avifaunal diversity and occurrence of potential avifaunal SCC over the long-term.<br>- **Impact:** Permanent loss of avifaunal habitat, diversity and potential SCC, and a higher likelihood of edge effect impacts on adjacent and nearby natural avifaunal habitat of increased sensitivity. Further reduction of available habitat in the long-term, compounding the limiting factors to avifaunal assemblages. |
| - Potential poor management and failure to monitor rehabilitation efforts, leading to:<br>• Landscapes being left fragmented, resulting in reduced migration capabilities of avifaunal species, isolation of avifaunal populations and a decrease in avifaunal diversity;<br>• Compacted soils limiting the re-establishment of natural vegetation; and<br>• Increased risk of erosion in areas left disturbed.<br>- **Impact:** Long-term (or permanent) loss of avifaunal habitat, diversity and potential SCC. |
| - Poorly implemented and monitored AIP Management programme leading to the reintroduction and proliferation of AIP species.<br>- **Impact:** Permanent loss of surrounding avifaunal niche habitat, diversity and SCC. |
| - Increased risk of collisions with the project infrastructure and/or electrocution while perching on the pylons or powerlines.<br>- **Impact:** Local loss of potential avifaunal SCC abundance and diversity. |
| - Potential overexploitation through the removal and/or collection of important or sensitive avifaunal SCC on the property.<br>- **Impact:** Local loss of potential avifaunal SCC abundance and diversity. |
| - Potentially poorly managed edge effects:<br>- Ineffective rehabilitation of compacted areas, bare soils, or eroded areas leading to a continual proliferation of AIP species in disturbed areas and subsequent spread to surrounding natural areas altering the avifaunal habitat; and<br>- Potential erosion stemming from soil left bare leading to sedimentation of downslope avifaunal habitat.<br>- **Impact:** Loss of avifaunal habitat, diversity and potential SCC within the direct expansion development footprint of the mine. Loss of surrounding avifaunal diversity and potential avifaunal SCC through the displacement of indigenous flora by AIP species - especially in response to disturbance in natural areas. |

## 6.2 Avifaunal Impact Assessment Results

The below table indicates the perceived risks to the avian ecology associated with all phases of the proposed development within the study area. The table also provides the findings of the impact assessment undertaken with reference to the perceived impacts prior to the implementation of mitigation measures and following the implementation of mitigation measures. The mitigated results of the impact assessment have been calculated on the premise that all mitigation measures as stipulated in this report are adhered to and implemented. Should such actions not be adhered to, it is highly likely that post-mitigation impact scores will increase.

**Table 8: Summary of the Impact Assessment of the Pre-construction and Construction and Operational and Maintenance Phases of the proposed project footprint on avifauna.**

| | Project Phase | Impact | Nature | Duration | Extent | Intensity | Probability | Significance | Nature | Duration | Extent | Intensity | Probability | Significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Pre-construction & Construction | Loss of avian habitat outside of the development footprint, including a decrease in species diversity and potential loss of avian SCC as a result of uncontrolled bush encroachment and/or AIP proliferation. | Negative | Medium term | Municipal | Low | Likely | Minor - negative | Negative | Short term | Local | Low | Unlikely | Negligible - negative |
| 2 | Pre-construction & Construction | Loss of intact avifaunal habitat and diversity within the proposed development footprint. | Negative | Medium term | Municipal | Moderate | Certain | Moderate - negative | Negative | Short term | Local | Low | Almost certain | Minor - negative |
| 3 | Pre-construction & Construction | Loss of avian SCC habitat within the development footprint. | Negative | Medium term | Municipal | Moderate | Almost certain | Minor - negative | Negative | Short term | Local | Low | Likely | Minor - negative |
| 4 | Operational & Maintenance | Ongoing loss of avian habitat, diversity and SCC as AIPs proliferate within disturbance areas and adjacent locations, and a higher likelihood of edge effect as a result of the proposed development. | Negative | On-going | Municipal | Low | Likely | Minor - negative | Negative | Long term | Local | Low | Probable | Minor - negative |

| | Project Phase | Impact | Nature | Duration | Extent | Intensity | Probability | Significance | Nature | Duration | Extent | Intensity | Probability | Significance |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | Operational & Maintenance | Loss of SCC habitat. | Negative | Long term | Municipal | Moderate | Likely | Minor - negative | Negative | Long term | Local | Low | Probable | Minor - negative |
| 6 | Operational & Maintenance | Loss of avian SCC, as a result of collisions with powerlines and PV infrastructure. | Negative | On-going | Municipal | Moderate | Almost certain | Moderate - negative | Negative | Long term | Local | Low | Likely | Minor - negative |

## 6.3 Impact discussion

The perceived impact significance of the proposed development (prior to mitigation) on avifaunal habitat, diversity and SCC range from moderate to minor (negative). The potential for local or regional impacts are unlikely if recommended mitigation measures as stipulated in Section 6.4 below are adhered to. If effective mitigation takes place at all stages of the proposed project, most of the impacts may be reduced to a lower significance ratings, minor to negligible (negative).

Construction phase impacts resulting in the destruction of habitat and operational phase impacts resulting from possible avifaunal collisions with infrastructure are expected to be the highest in their severity with impact that are anticipated to be minor and moderate (negative) without mitigation. Impact mitigation is however expected to reduce the severity of these impacts to lower significance levels. Impacts to SCC will be minor (negative) if mitigations measures are ignored during the construction and operational phases. Mitigation, if implemented correctly, will reduce the impact significance to lower levels for SCC.

### 6.3.1 Impact on avifaunal Diversity and Habitat

The study area has largely avoided any form of large-scale landscape transformation (e.g. extensive agriculture or mining activities or earth works) ensuring that a modest assemblage of avifauna, with a reduced abundance of large raptors, has been conserved. Very little clearing of vegetation is anticipated for the construction of the Powerline and thus little alteration in the local habitat or impacts on SCC habitat are anticipated. However, these proposed infrastructures increase the potential for avifauna (particularly larger birds) to collide with the transmission lines or be electrocuted on them while perching which may reduce their abundances. The major impact will result from the proposed PV facility and the associated infrastructure which will result in the alteration of intact portions of Bushveld Habitat. Impacts from edge effects may occur should proper rehabilitation of the site not be completed which may alter the local environment to a small extent, however these impacts are not anticipated to be high. An increase in vehicle movement during maintenance will increase the likelihood of collisions with avifauna, yet the vehicles are unlikely to be moving fast enough to be a significant risk to avifauna should a strict speed limit be kept. Avifaunal diversity within the study area is considered intermediate, and should the proposed PV facility be established it is likely that a reduction in species diversity will occur within the study area. The impact significance of the loss of avifaunal species diversity based on the proposed layout plans for the construction and operational phases is expected to be between moderate and minor prior

to the implementation of mitigation measures and minor should mitigation be implemented thoroughly. Focus area 2 is considered a CBA within the Limpopo Conservation Plan, however, ground truthing indicated that it did not present more unique or valuable habitat characters from an avifaunal perspective and thus is not considered a CBA.

### 6.3.2 Impact on avifaunal SCC

Twenty-two avifaunal SCC have distribution ranges which overlay the study area and may utilize it for foraging on an intermittent basis. These species include; *Necrosyrtes monachus* (Hooded Vulture), *Gyps africanus* (White-backed Vulture), *Polemaetus bellicosus* (Martial Eagle), *Aquila rapax* (Tawny Eagle), *Gyps coprotheres* (Cape Vulture), *Torgos tracheliotos* (Lappet-faced Vulture), *Mycteria ibis* (Yellow-billed Stork), *Neotis denhami* (Denham's Bustard), *Aquila verreauxii* (Verreauxs' Eagle), *Nettapus auratus* (Pygmy Goose), *Gorsachius leuconotus* (White-backed Night Heron), *Eupodotis senegalensis* (White-bellied Korhaan), *Sagittarius serpentarius* (Secretarybird), *Cocinia nigra* (Black Stock), *Oxyura maccoa* (Maccoa Duck), *Anthropoides paradiseus* (Blue Crane), *Alcedo semitorquata* (Half-collared Kingfisher), *Certhilauda chuana* (Short-clawed Lark), *Coracias garrulus* (European Roller), *Falco biarmicus* (Lanner Falcon), *Ciconia abdimii* (Abdim's Stork) and *Leptoptilos crumeniferus* (Marabou Stork). Of these species only two, *Certhilauda chuana* (Short-clawed Lark) and *Coracias garrulus* (European Roller) are anticipated to have a medium potential of occurring within the study area for sustained periods, and as such may lose habitat should the proposed PV facility be installed. The area, however, is not considered to be a regionally important breeding, roosting or foraging habitat for any of the abovementioned species and thus no impacts on their respective populations breeding productivity are likely to occur.

Based on the habitats observed during the field investigation, two species have suitable habitat on-site. *Coracias garrulus* (European Roller) is a non-breeding migrant which ranges throughout much of the country. Habitat is marginal for this species as a result of the high human abundance and activity and encroached habitat within the study area. *Certhilauda chuana* (Short-clawed Lark) prefers more open habitat as observed within the Degraded Bushveld habitat, yet the species distribution range occurs more northeast and as such habitat is considered marginal.

Local migrations from the development footprint and its direct surroundings will likely occur during the construction, operational and maintenance phase which will lead to higher competition for resources in adjacent habitats and a reduced species richness within the study area. Even with the proposed mitigation measures it is unlikely that diversity levels will return to baseline levels.



The impact associated with the loss of habitat for the above-mentioned SCC is of minor significance during the construction and operational phases, prior to the implementation of mitigation measures. With the implementation of mitigation measures, the impact significance of the loss of important species will reduce, however, not enough to reduce the impact significance levels, as mitigation measures will ensure better protection for these species.

### 6.3.3 Probable Residual Impacts

Even with extensive mitigation, significant residual impacts on the receiving avifaunal ecological environment are deemed highly likely. The following points highlight the key latent impacts that have been identified:

- Continued loss of avifaunal habitat (including portions of CBA within focus area 2);
- Reduction in potential avifaunal SCC presence and in the surrounding habitats through edge effects, collisions and electrocutions;
- Loss of and altered avifaunal species diversity;
- Reduction of avifaunal abundance; and
- Disturbed areas are highly unlikely to be rehabilitated to baseline levels of ecological functioning and loss of avifaunal habitat, species diversity and potential avifaunal SCC may be permanent if mitigations are not implemented.

### 6.3.4 Cumulative Impacts

Based on the number of avifaunal SCC whose distribution overlay the study area the area appears to be important in terms of its avifaunal assemblage, however, habitat characteristics and human disturbances reduce the suitability of habitat for most of these species. Many of these species are, however, wide ranging and it is likely that they will use this area between Witvinger Nature Reserve and the Waterberg IBA as a corridor and as such bird flappers are required to increase the visibility of any OHPL. Only two species have a medium POC within the study area and habitat is considered marginal. Thus, it is unlikely that the location plays an important role in supporting SCC populations. As areas within the study area and its surrounding landscape have been exposed to anthropogenic impacts areas suitable for SCC inhabitation are limited. In most cases the anticipated SCC are not known to have any important foraging, roosting or breeding locations within the study area and thus regional impacts are not anticipated. Both mitigated and unmitigated impacts are anticipated to be minor on SCC due to the reduced habitat suitability and small SCC assemblage anticipated to inhabit the study area.

Based on the general landscape and habitat within the study area the site has the potential to host an intermediate assemblage on avifauna and several potential SCC. Two SCC have

possible habitat within the study area and, as such uncontrolled development should be restricted as it may result in the loss of habitat for these species. The proposed activities will lead to the loss of avifaunal habitat and to a reduction in the abundance of common avifauna and local reductions in SCC presence. The activities will lead to the displacement of avifaunal species currently inhabiting these areas, pushing them out into the surrounding vegetated areas leading to increased competition for territories and breeding sites. Moreover, there is likely to be a knock-on dispersal affect, leading to increased resource competition and possible increased mortality rates, resulting in a decreased species abundance and possible further loss of species diversity. On a municipal scale, portions of CBA (as per the Limpopo Conservation Plan) are proposed to be developed. Although on site characteristics do not support the classification of the area as a CBA, this will still result in the provincial conservation targets being forfeit. Lastly, ineffective control and monitoring of edge effects will result in the spread of AIP species to areas outside of the study area, which will further alter avifaunal habitat and subsequently abundance within the habitats surrounding the study area.

## *6.4 Integrated Impact Mitigation*

The table below highlights the key integrated mitigation measures that are applicable to the proposed study area in order to suitably manage and mitigate the ecological impacts that are associated with the proposed development. Provided that all the management and mitigation measures as stipulated in this report are implemented the overall risk associated with the activities may be minimised, although impacts are still considered unavoidable.

**Table 9: A summary of the mitigatory requirements for avifaunal resources.**

| **Project phase** | *Planning Phase* |
|---|---|
| **Impact Summary** | *Loss of avifaunal habitat, species and avifaunal SCC* |
| **Management Measures** | ***Proposed mitigation and management measures:*** |
| | **Avifaunal Habitat and Diversity** |
| | - At all times, ensure that sound environmental management is in place during the planning phase;<br>- During the site-pegging phase of surface infrastructure, any avifaunal SCC that will be affected by surface infrastructure must be noted and recorded. Should the species (likely its nest) need to be removed the relevant permits must be applied for from the Limpopo Department of Economic Development, Environment and Tourism (LDEDET) or from the Department of Forestry, Fisheries and the Environment (DFFE) prior to construction;<br>- Minimise loss of indigenous vegetation where possible through refining the final development footprint, optimising the design within study area while avoiding sensitive Freshwater Habitat where possible;<br>- If avian SCC nests are located, a qualified avifaunal specialist should be consulted to determine the best management options. If nests are known to have nestlings or eggs within, these should be allowed to fledge prior to the nest removal;<br>- Design of infrastructure should be environmentally sound and all construction equipment to be utilised must be a good working condition, and all possible precautions taken to prevent potential avifaunal collisions or electrocutions, and mechanical spills and/or leaks; and |

| | |
|---|---|
| | - Prior to the commencement of proposed activities on site an alien vegetation management plan should be compiled for implementation throughout all development phases. |
| **Project phase** | *Construction Phase* |
| **Impact Summary** | *Loss of avifaunal habitat, species and avifaunal SCC* |
| **Management Measures** | ***Proposed mitigation and management measures:***<br>**Development footprint**<br>- The development footprint should be demarcated, and it should be ensured that no development related activities take place outside of the demarcated footprint. This final footprint area should be reviewed by an avifaunal specialist to ensure no detrimental impacts to avifaunal assemblages occur;<br>- No development should occur within the Freshwater Habitat or within the relevant zones of regulation around these features;<br>- Any structures which may act as perching sites for birds should be installed with anti-perching spikes;<br>- Should any lights be installed they should face downwards to reduce the abundance of insects attracted to the night lights, this prey source may attract birds to the study area and may increase avian collisions or electrocutions;<br>- Avifaunal habitat beyond the demarcated area should not be cleared or altered;<br>- Avifaunal monitoring within the proposed PV facilities and along the proposed power line should be undertaken and reported monthly to monitor or record avifauna and collect any birds which have collided with or been electrocuted by the proposed infrastructure, these must be reported by the ECO to the department and further mitigation measures should be investigated in how to minimise the mortalities;<br>- Anti-collision devices should be installed along the entire length of the powerline. These must be Eskom approved anti-collision devices that are durable as the area is prone to strong winds. Anti-collision devices must be installed as soon as the wires are strung. The devices must be installed 5m apart and alternate between a light and dark colour in order to increase the visibility of the earth wires;<br>- Construction equipment should be restricted to travelling only on designated roadways to limit the ecological footprint of the development activities;<br>- No dumping of litter, rubble or cleared vegetation on site should be allowed. As such it is advised vegetation cuttings (especially AIP) to be carefully collected and disposed of at a separate waste facility;<br>- If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line and avifaunal recolonization. In the event of a breakdown, maintenance of vehicles must take place with care, and the collection of spillages should be practised preventing the ingress of hydrocarbons into the topsoil; and<br>- No hunting/trapping or collecting of avifaunal species is allowed.<br>**Avifaunal SCC**<br>- No collection of avifaunal SCC within the study area may be allowed by construction personnel;<br>- Edge effect control needs to be implemented to prevent further degradation and potential loss of avifaunal SCC habitat outside of the proposed development footprint;<br>- Should any other avifaunal species protected under the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) or the Limpopo Environmental Management Act, 2003 (Act No. 7 of 2003) be encountered, construction should be halted and authorisation to relocate such species must be obtained from LDEDET or DFFE;<br>- Edge effect control needs to be implemented to ensure no further degradation and potential loss of avifaunal SCC outside of the proposed project footprint area; and<br>- A suitable rescue and relocation plan should be developed and overseen by a suitably qualified specialist should SCC be identified within the study area in order to ensure that species loss during construction activities is kept to a minimum.<br>**Fire**<br>- No illicit fires must be allowed during the construction phase of the proposed development.<br>**Rehabilitation**<br>- A rehabilitation plan should be compiled by a suitable specialist. This rehabilitation plan should consider all development phases of the project indicating rehabilitation actions to be undertaken during, and once construction has been completed as well |

| | |
|---|---|
| | as ongoing rehabilitation during the operational phase of the project to ensure habitat for avifauna is restored; and<br>- Any natural areas beyond the development footprint, that have been affected by the construction activities, must be rehabilitated using indigenous plant species. |
| **Project phase** | *Operational and Maintenance Phase* |
| **Impact Summary** | *Loss of avifaunal habitat, species and SCC* |
| **Management Measures** | **Development footprint**<br>- All vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the development activities;<br>- Bird nests on Powerlines or the PV infrastructure are potential fire hazards and should be removed from structures regularly; and<br>- Continuous monitoring (monthly) should be undertaken, and a record of potential bird electrocutions or collisions should be kept and reported to the to or by the ECO. Mitigation measures should be updated annually depending on monitoring results.<br>**Alien Vegetation**<br>- Ongoing alien and invasive plant monitoring and clearing/control should take place throughout the operational phase, and the project perimeters should be regularly checked for AIP establishment to prevent spread into surrounding natural areas which may alter the suitability of the habitat to avifaunal species; and<br>- Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility, which comply with legal standards.<br>**Avifaunal SCC**<br>- No collection of avifaunal SCC within the study area may be allowed by operational phase personnel unless as part of mortality monitoring activities;<br>**Rehabilitation**<br>- Where bare soils are left exposed as a result of construction activities, they should be immediately rehabilitated. Rehabilitated efforts should continue to be monitored throughout the operational phase, until natural processes will allow the ecological functioning and biodiversity of the area to be re-instated. |

# 7. CONCLUSION AND RECOMMENDATIONS

Scientific Terrestrial Services (STS) was appointed to conduct an Avifauna Assessment as part of the Environmental Assessment and Authorisation process for the proposed development of a Solar Photovoltaic (PV) Plant outside the town of Mokopane at the Mogalakwena Mine, Limpopo Province.

Based on the findings of the avifaunal assessment it is the opinion of the ecologists that from an avifaunal perspective, the proposed components of the development can be considered acceptable. The major impact anticipated to occur is the alteration of areas of natural habitat, reducing avian abundance and diversity within the study area. Impact scores are reduced as no sensitive habitat is proposed to be developed within and existing anthropogenic disturbances reduce habitat suitability. Further impacts that may result from the proposed project are as a result of potential collisions and electrocutions with the proposed PV facilities and powerlines. It is anticipated that should the proposed mitigation measures be implemented the risk of collisions and electrocutions can be drastically reduced. Although several SCC have distribution ranges which overlay the study are, only two have marginal habitat within the study

area and no known important foraging, nesting or roosting sites are located here. Thus, impacts to the priority species are not anticipated to be regionally significant. It is important that all essential mitigation measures and recommendations presented in this report should be adhered to as to ensure the ecology within the proposed construction areas as well as surrounding zone of influence is protected or adequately rehabilitated in order to minimise the deviations from the Present Ecological State as much as possible.

# 8. REFERENCES

Burgess, M.D., Nicoll, M.A.C., Jones, C.G., Norris, K. (2011). Multiple environmental gradients affect spatial variation in the productivity of a bird population. Journal of Animal Ecology **80**:688-695.

Chittendan, H. (2007). *Roberts Bird Guide. A comprehensive field guide to over 950 bird species in southern Africa.* John Voeckler Bird Book Fund. Cape Town.

IBA: 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. Online available: http://bgis.sanbi.org/IBA/project.asp

IUCN (2016). http://www.iucnredlist.org/.

Mucina, L. & Rutherford, M.C. (Eds). (2006). *The Vegetation of South Africa, Lesotho and Swaziland*. Strelitzia 19. South African National Biodiversity Institute, Pretoria, RSA.

SABAP2, 2016. *The South Africa Bird Atlas Project 2 database.* http://sabap2.adu.org.za/index.php

Skowno, A.L. & Bond, W.J. (2003). Bird community composition in an actively managed savanna reserve, important of vegetation structure and vegetation composition. Biodiversity and Conservation **12**:2279-2294.

Smith, S.H., Steenhof, K., McClure, C.J.W., Heath, J.A. (2017). Earlier nesting by generalist predatory bird is associated with human responses to climate change. Journal of Animal Ecology **86**:98-107.

STS 210042. (2021). Terrestrial Biodiversity Assessment as part of the Environmental Authorisation process for the proposed Solar Photovoltaic (PV) associated with the Anglo-Mogalakwena Mine near Mokopane, Limpopo Province. Part B: Floral Assessment.

Tarboton W.R., Kemp M.I., Kemp A.C. (1987). Birds of the Transvaal. Pretoria, South Africa: Transvaal Museum.

Taylor M.R., Peacock F. Wanless R.W. (eds) (2015). The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. Johannesburg, South Africa.

Wichmann, M.C., Dean, W.R.J, Jeltsch, F., Wichmann, M.C, Predicting, F.J. (2009). Predicting the breeding Success of large raptors in arid southern Africa: a first assessment **6525**:589-594.

# APPENDIX A: Legislative Requirements

## National Environmental Management Act, 1998

The National Environmental Management Act (NEMA; Act 107 of 1998) and the associated Environmental Impact Assessment (EIA) Regulations (GN R982 of 2014) and well as listing notices 1, 2 and 3 (GN R983, R984 and R985 of 2014), state that prior to any development taking place which triggers any activity as listed within the abovementioned regulations, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment process or the EIA process depending on the nature of the activity and scale of the impact.

## National Environmental Management Biodiversity Act (NEMBA, Act No. 10 of 2004)

The objectives of this act are (within the framework of NEMA) to provide for:

- The management and conservation of biological diversity within the Republic of South Africa and of the components of such diversity;
- The use of indigenous biological resources in a sustainable manner;
- The fair and equitable sharing among stakeholders of the benefits arising from bio prospecting involving indigenous biological resources;
- To give effect to ratify international agreements relating to biodiversity which are binding to the Republic;
- To provide for cooperative governance in biodiversity management and conservation; and
- To provide for a South African National Biodiversity Institute to assist in achieving the objectives of this Act.

This act alludes to the fact that management of biodiversity must take place to ensure that the biodiversity of the surrounding areas are not negatively impacted upon, by any activity being undertaken, in order to ensure the fair and equitable sharing among stakeholders of the benefits arising from indigenous biological resources.

Furthermore, a person may not carry out a restricted activity involving either:

a) A specimen of a listed threatened or protected species;
b) Specimens of an alien species; or
c) A specimen of a listed invasive species without a permit.

## Conservation of Agricultural Resources Act (CARA, Act 43 of 1983)

Removal of the alien and weed species encountered in the application area must take place in order to comply with existing legislation (amendments to the regulations under the CARA, 1983 and Section 28 of the NEMA, 1998). Removal of species should take place throughout the construction and operation, phases.

# APPENDIX B: Avifaunal Method of Assessment

## *Avifaunal Assessment Methodology*

A reconnaissance 'walk through' on foot was undertaken to determine the general habitat types found throughout the study area. Special emphasis was placed on areas that may potentially support avifaunal SCC. Sites representative of habitat units or unique niche habitats were then marked and point counts were undertaken in order to identify the occurrence of the avifaunal communities, species and habitat diversities. The presence of any avifaunal inhabitants of the study area was assessed through direct visual observation or identifying such species through calls, nests and potentially pellets.

It is important to note that avifaunal species have varied breeding patterns and are subject to seasonal fluctuations. As such, it is unlikely that all avifaunal species will have been recorded during the site assessment. However, even though some avifaunal species may not have been identified during the sight assessment, the habitat units and degree of transformation can be used to establish an accurate understanding of avifaunal species most likely associated with the study area.

### Avifaunal Species of Conservational Concern Assessment

Throughout the fauna assessment, special attention was paid to the identification of any of these SCC as well as the identification of suitable habitat that could potentially support these species. The **Probability of Occurrence (POC)** for each faunal SCC is described as:

- "**Confirmed'**: if observed during the survey.
- "**High**": if within the species' known distribution range and preferable habitat for foraging, roosting or breeding is available.
- "**Medium**": if either within the known distribution range of the species with marginal habitat that does not occur within the core of the species range or within an important foraging, roosting or breeding area; or
- "**Low**": if the habitat is not suitable and falls outside the distribution range of the species.

The accuracy of the POC is based on the available knowledge about the species in question, with many of the species lacking in-depth habitat research.

### Avifaunal Habitat Sensitivity

The sensitivity of the study area for avifauna species was determined by calculating the mean of five different parameters which influence avifaunal species and provide an indication of the overall avifaunal ecological integrity, importance and sensitivity of the study area for each class. Each of the following parameters are subjectively rated on a scale of 1 to 5 (1 = lowest and 5 = highest):

- **Avifaunal SCC:** The confirmed presence or potential for avifaunal SCC or any other significant species, such as endemics, to occur within the habitat unit;
- **Habitat Availability:** The presence of suitable habitat for avifaunal species;
- **Food Availability:** The availability of food within the study area for avifaunal species;
- **Avifaunal Diversity:** The recorded avifaunal diversity compared to a suitable reference condition such as surrounding natural areas or available avifaunal databases; and
- **Habitat Integrity:** The degree to which the habitat is transformed based on observed disturbances which may affect habitat integrity.

Each of these values contribute equally to the mean score, which determines the suitability and sensitivity of the study area for avifaunal species. A conservation and land-use objective is also assigned to each sensitivity class which aims to guide the responsible and sustainable utilization of the study area in relation to avifaunal species. The different classes and land-use objectives are presented in the table below:

**Table B1: Avifaunal habitat sensitivity rankings and associated land-use objectives.**

| SCORE | RATING SIGNIFICANCE | CONSERVATION OBJECTIVE |
|---|---|---|
| 1> and <2 | Low | Optimise development potential. |
| 2> and <3 | Moderately low | Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects. |
| 3> and <4 | Intermediate | Preserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential. |
| 4> and <5 | Moderately high | Preserve and enhance the biodiversity of the habitat unit, limit development and disturbance. |
| 5 | High | Preserve and enhance the biodiversity of the habitat unit, no-go alternative must be considered. |

# APPENDIX C: Impact Assessment Methodology

| CRITERIA | CATEGORY | DESCRIPTION | |
|---|---|---|---|
| Project phase | Construction | | |
| | Operation | | |
| | Decommissioning | | |
| Mitigatability | Low | Mitigation does not exist; or mitigation will slightly reduce the significance of impacts | |
| | Medium | Mitigation exists and will notably reduce significance of impacts | |
| | High | Mitigation exists and will considerably reduce the significance of impacts | |
| Nature | Positive | | 1 |
| | Negative | | -1 |
| Duration | Immediate | Impact will self-remedy immediately | 1 |
| | Brief | Impact will not last longer than 1 year | 2 |
| | Short term | impact will last between 1 and 5 years | 3 |
| | Medium term | Impact will last between 5 and 10 years | 4 |
| | Long term | Impact will last between 10 and 15 years | 5 |
| | On-going | Impact will last between 15 and 20 years | 6 |
| | Permanent | Impact may be permanent, or in excess of 20 years | 7 |
| Extent | Very limited | Limited to specific isolated parts of the site | 1 |
| | Limited | Limited to the site and its immediate surroundings | 2 |
| | Local | Extending across the site and to nearby settlements | 3 |
| | Municipal area | Impacts felt at a municipal level | 4 |
| | Regional | Impacts felt at a regional / provincial level | 5 |
| | National | Impacts felt at a national level | 6 |
| | International | Impacts felt at an international level | 7 |
| Intensity | Negligible | Natural and/ or social functions and/ or processes are negligibly altered | 1 |
| | Very low | Natural and/ or social functions and/ or processes are slightly altered | 2 |
| | Low | Natural and/ or social functions and/ or processes are somewhat altered | 3 |
| | Moderate | Natural and/ or social functions and/ or processes are moderately altered | 4 |
| | High | Natural and/ or social functions and/ or processes are notably altered | 5 |
| | Very high | Natural and/ or social functions and/ or processes are majorly altered | 6 |
| | Extremely high | Natural and/ or social functions and/ or processes are severely altered | 7 |
| Probability | Highly unlikely / none | Expected never to happen | 1 |
| | Rare / improbable | Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere | 2 |
| | Unlikely | Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur | 3 |
| | Probable | The impact has occurred here or elsewhere and could therefore occur | 4 |
| | Likely | The impact may occur | 5 |
| | Almost certain / Highly probable | It is most likely that the impact will occur | 6 |
| | Certain / definite | There are sound scientific reasons to expect that the impact will definitely occur | 7 |
| Confidence | Low | Judgement is based on intuition | |
| | Medium | Determination is based on common sense and general knowledge | |
| | High | Substantive supportive data exists to verify the assessment | |
| Reversibility | Low | The affected environment will not be able to recover from the impact - permanently modified | |
| | Medium | The affected environment will only recover from the impact with significant intervention | |
| | High | The affected environmental will be able to recover from the impact | |
| | Low | The resource is not damaged irreparably or is not scarce | |

| | | | |
|---|---|---|---|
| **Resource irreplaceability** | **Medium** | The resource is damaged irreparably but is represented elsewhere | |
| | **High** | The resource is irreparably damaged and is not represented elsewhere | |
| **Significance** | **Negligible** | | |
| | **Minor** | | |
| | **Moderate** | | |
| | **Major** | | |

| **Significance:** | negative | positive |
|---|---|---|
| Negligible | Negligible - negative | Negligible - positive |
| Minor | Minor - negative | Minor - positive |
| Moderate | Moderate - negative | Moderate - positive |
| Major | Major - negative | Major - positive |

## *Mitigation measure development*

The following points presents the key concepts considered in the development of mitigation measures for the proposed construction:

- Mitigation and performance improvement measures and actions that address the risks and impacts[7] are identified and described in as much detail as possible. Mitigating measures are investigated according to the impact minimisation hierarchy as follows:
  - Avoidance or prevention of impact;
  - Minimisation of impact; and
  - Rehabilitation.
- Measures and actions to address negative impacts will favour avoidance and prevention over minimisation, mitigation or compensation; and
- Desired outcomes are defined and have been developed in such a way as to be measurable events with performance indicators, targets and acceptable criteria that can be tracked over defined periods, wherever possible.

## *Recommendations*

Recommendations were developed to address and mitigate impacts associated with the proposed projects. These recommendations also include general management measures which apply to the proposed projects as a whole. Mitigation measures have been developed to address issues in all phases throughout the life of the projects from planning, through to construction and operation.

[7] Mitigation measures should address both positive and negative impacts.

# APPENDIX D: Vegetation Type

## Makhado Sweet Bushveld (SVcb 20)

**Remarks:** This area is transitional between the higher-lying Polokwane Plateau and the lower-lying vegetation units of the Limpopo River Valley.

**Table D1: Dominant & typical floristic species of the Makhado Sweet Bushveld (Mucina & Rutherford, 2012)**

| Group | Species |
|---|---|
| **Woody Species** | |
| **Small trees** | *Senegalia erubescens* (d), *Vachellia gerrardii* (d), *S. mellifera* subsp. *detinens* (d), *V. rehmanniana* (d), *Boscia albitrunca* (d), *Combretum apiculatum* (d), *V tortilis* subsp. *heteracantha*, *Terminalia sericea* |
| **Tall shrubs** | *Commiphora pyracanthoides*, *Dichrostachys cinerea*, *Grewia flava*, *Hibiscus calyphyllus*, *Lycium shawii*, *Rhigozum obovatum* |
| **Low shrubs** | *Barleria lancifolia*, *Hirpicium bechuanense*, *Indigofera poliotes*, *Melhania rehmannii*, *Pechuel-Loeschea leubnitziae* |
| **Succulents** | |
| **Succulent shrubs** | *Euphorbia bergii, Kalanchoe rotundifolia*, *Lycium cinereum*. |
| **Herbaceous species** | |
| **Herbs** | *Chamaecrista absus*, *Corbichonia decumbens*, *Geigeria acaulis*, *Harpagophytum procumbens* subsp. *transvaalense*, *Heliotropium steudneri*, *Hemizygia elliottii*, *Hermbstaedtia odorata*, *Leucas sexdentata*, *Osteospermum muricatum*, *Tephrosia purpurea* subsp. *leptostachya* |
| **Graminoids** | |
| **Grasses** | *Anthephora pubescens* (d), *Aristida stipitata* subsp. *graciliflora* (d), *Cenchrus ciliaris* (d), *Enneapogon scoparius* (d), *Brachiaria nigropedata*, *Eragrostis trichophora*, *Panicum coloratum*, *P. maximum*, *Schmidtia pappophoroides*, *Urochloa mosambicensis* |

***(d) – Dominant species for the vegetation type**

# APPENDIX E: Species Observation List

**Table E1: Avifaunal species not already listed which were observed during site visit (to be updated).**

| Scientific name | Common name | IUCN Red List Status |
|---|---|---|
| *Acridotheres tristis* | Common Myna | LC |
| *Merops pusilus (* | *Little Bee-eater* | LC |
| *Estrilda erythronotos* | Black-faced Waxbill | LC |
| *Uraeginthus granatinus* | Voilet-eared Waxbill | LC |
| *Bradornis mariquensis* | *Marico Flycatcher* | LC |
| *Euplectes albonotatus* | *White-winged Widowbird* | LC |
| *Cisticola tinniens* | *Levaillant's Cisticola* | LC |
| *Cisticola aberrans* | *Lazy Cisticola* | LC |
| *Cisticola juncidis* | *Zitting Cisticola* | LC |
| *Elanus caeruleus* | *Black-shouldered Kite* | LC |
| *Anas undulata* | Yellow-billed Duck | LC |
| *Ardea cinerea* | Grey Heron | LC |
| *Ardea melanocephala* | Black-headed Heron | LC |
| *Bubulcus ibis* | Cattle Egret | LC |
| *Burhinus capensis* | Spotted Thick-knee | LC |
| *Charadrius tricollaris* | Three-banded Plover | LC |
| *Cinnyris talatala* | White-bellied Sunbird | LC |
| *Cisticola aberrans* | Lazy Cisticola | LC |
| *Cisticola tinniens* | Levaillant's Cisticola | LC |
| *Colius striatus* | Speckled Mousebird | LC |
| *Columba guinea* | Speckled pigeon | LC |
| *Corvus albus* | Pied Crow | LC |
| *Corythaixoides concolor* | Grey Go-away-bird | LC |
| *Crithagra flaviventris* | Yellow Canary | LC |
| *Dicrurus adsimilis* | Fork-tailed Drongo | LC |
| *Erythropygia paena* | Kalahari Scrub Robin | LC |
| *Euplectes orix* | Southern Red Bishop | LC |
| *Fulica cristata* | Red-knobbed Coot | LC |
| *Granatina granatina* | Violet-eared Waxbill | LC |
| *Lanius collaris* | Common Fiscal | LC |
| *Macronyx capensis* | Cape Longclaw | LC |
| *Microcarbo africanus* | Reed Cormorant | LC |
| *Motacilla capensis* | Cape Wagtail | LC |
| *Numida meleagris* | Helmeted Guineafowl | LC |
| *Oena capensis* | Namaqua Dove | LC |
| *Passer domesticus* | House Sparrow | LC |
| *Passer melanurus* | Cape Sparrow | LC |
| *Plocepasser mahali* | White-browed Sparrow-weaver | LC |
| *Ploceus velatus* | Southern masked weaver | LC |
| *Pycnonotus tricolor* | Dark-capped Bulbul | LC |
| *Saxicola torquata* | African Stonechat | LC |

| Scientific name | Common name | IUCN Red List Status |
|---|---|---|
| *Spilopelia senegalensis* | Laughing Dove | LC |
| *Streptopelia capicola* | Cape turtledove | LC |
| *Streptopelia senegalensis* | Laughing Dove | LC |
| *Sylvia subcaerulea* | Chestnut-vented Tit-babbler | LC |
| *Tchagra australis* | Brown-crowned Tchagra | LC |
| *Threskiornis aethiopicus* | Sacred Ibis | LC |
| *Uraeginthus angolensis* | Blue Waxbill | LC |
| *Vanellus armatus* | Blacksmith Lapwing | LC |
| *Vanellus coronatus* | Crowned Lapwing | LC |

LC = Least concerned. NT = Near Threatened, NYBA = Not yet been assessed by the IUCN.
*Species observed on site, LC = Least Concern

# APPENDIX F: Avifaunal SCC

## Faunal Species of Conservation Concern

**Table F1: Red Data Bird species listed in the Limpopo SoER 2004 report including IUCN status.**

| Scientific name | Common Name | Limpopo SoER 2004 Status | IUCN Red List Status | POC |
|---|---|---|---|---|
| *Gyps coprotheres* | Cape Vulture | T | VU | Low |
| *Ciconia nigra* | Black Stork | T | LC | Low |
| *Falco naumanni* | Lesser Kestrel | T | LC | Low |
| *Certhilauda chuana* | Short-clawed Lark | T | LC | Medium |
| *Pterocles gutturalis* | Yellow throated Sandgrouse | T | LC | Low |
| *Anthropoides paradiseus* | Blue Crane | T | VU | Low |
| *Gyps africanus* | White backed Vultures | T | EN | Low |
| *Ardeotis kori* | Kori Bustard | T | LC | Low |
| *Scotopelia peli* | Pel's Fishing Owl | T | LC | Low |
| *Bucorvus leadbeateri* | Southern Ground Hornbill | T | VU | Low |
| *Buphagus erythrorhynchus* | Red-billed Oxpecker | T | LC | Low |
| *Terathopius ecaudatus* | Bateleur | T | NT | Low |
| *Polemaetus bellicosus* | Martial Eagle | T | NT | Low |
| *Aquila rapax* | Tawny Eagle | T | LC | Low |
| *Torgos tracheliotos* | Lappet faced Vulture | T | VU | Low |
| *Trigonoceps occipitalis* | White headed Vulture | T | VU | Low |
| *Buphagus africanus* | Yellow billed Oxpecker | T | LC | Low |
| *Stephanoaetus coronatus* | Crowned hawk Eagle | T | NT | Low |

LC = Least concerned, CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near Threatened. NYBA = Not yet been assessed by the IUCN. T = listed as threatened but with no specific status for the Limpopo Province

### South African Bird Atlas Project 2 list

**Table B6: Avifaunal Species for the pentads 2355_2855, 2355_2850, 2400_2855 within the QDS 2328DD and 2428BB.**

| PENTADS | LINK TO PENTAD SUMMARY ON THE SOUTH AFRICAN BIRD ATLAS PROJECT 2 WEB PAGE |
|---|---|
| **2355_2850** | http://sabap2.adu.org.za/coverage/pentad/2355_2850 |
| **2355_2855** | http://sabap2.adu.org.za/coverage/pentad/2355_2855 |
| **2400_2855** | http://sabap2.adu.org.za/coverage/pentad/2400_2855 |

# APPENDIX G: Declaration and Specialists CV's

**1. (a) (i) Details of the specialist who prepared the report**

| | |
|---|---|
| Daryl van der Merwe | MSc Conservation Biology (University of Cape Town) |
| Christopher Hooton | BTech Nature Conservation (Tshwane University of Technology) |
| Kim Marais | Bsc (Hons) Zoology (University of the Witwatersrand) |

**1. (A). (ii) The expertise of that specialist to compile a specialist report including a curriculum vitae**

| | | | |
|---|---|---|---|
| Company of Specialist: | Scientific Terrestrial Services | | |
| Name / Contact person: | Chris Hooton | | |
| Postal address: | PO. Box 751779, Gardenview | | |
| Postal code: | 2047 | Cell: | 083 342 0639 |
| Telephone: | 011 616 7893 | Fax: | 086 724 3132 |
| E-mail: | Chris@sasenvgroup.co.za | | |
| Qualifications | BTech Nature Conservation (Tshwane University of Technology<br>National Diploma Nature Conservation (Tshwane University of Technology)<br>Certificate – Department of Environmental Science in Legal context of Environmental Management, Compliance and Enforcement (UNISA)<br>Integrated Water Resource Management, the National Water Act, and Water Use Authorisations, focusing on WULAs and IWWMPs | | |

| | | | |
|---|---|---|---|
| Company of Specialist: | Scientific Terrestrial Services | | |
| Name / Contact person: | Daryl van Der Merwe | | |
| Postal address: | PO. Box 751779, Gardenview | | |
| Postal code: | 2047 | Cell: | 0780201 0069 |
| Telephone: | 011 616 7893 | Fax: | 086 724 3132 |
| E-mail: | Daryl@sasenvgroup.co.za | | |
| Qualifications | MSc (Conservation Biology) (University of Cape Town)<br>BSc (Hons) (Plant Science) (University of Pretoria)<br>BSc (Environmental Science) (University of Pretoria) | | |

| | | | |
|---|---|---|---|
| Company of Specialist: | Scientific Terrestrial Services | | |
| Name / Contact person: | Kim Marais | | |
| Postal address: | PO. Box 751779, Gardenview | | |
| Postal code: | 2047 | Cell: | 071 413 2245 |
| Telephone: | 011 616 7893 | Fax: | 086 724 3132 |
| E-mail: | kim@sasenvgroup.co.za | | |
| Qualifications | BSc (Hons) Zoology (University of the Witwatersrand)<br>BSc (Zoology and Conservation) (University of the Witwatersrand) | | |
| Registration / Associations | Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP)<br>Member of South African Wetland Forum | | |

**1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority**

I, Daryl van der Merwe, 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 relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, 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

---

Signature of the Specialist

I, Christopher Hooton, declare that -

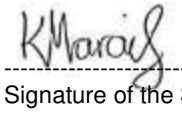
- I act as the **independent specialist (reviewer)** in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, 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.

---

Specialist Signature

I, Kim Marais, 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 relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, 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.



---

Signature of the Specialist

## SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

# CURRICULUM VITAE OF DARYL VAN DER MERWE

### PERSONAL DETAILS

| | |
|---|---|
| Position in Company | Field Biologist, Member Terrestrial Ecology |
| Joined SAS Environmental Group of Companies | 2019 |

### MEMBERSHIP IN PROFESSIONAL SOCIETIES

Member of the South African Environmental Observation Network (SAEON)

### EDUCATION

**Qualifications**

| | |
|---|---|
| MSc (Conservation Biology) (University of Cape Town) | 2019 |
| BSc (Hons) Plant Science (Ecology) (University of Pretoria) | 2014 |
| BSc Environmental Science (University of Pretoria) | 2013 |

### AREAS OF WORK EXPERIENCE

**South Africa** – Gauteng, Mpumalanga, North West, Limpopo, Free State, Western Cape and Northern Cape

### KEY SPECIALIST DISCIPLINES

**Biodiversity Assessments**

- Faunal Assessments
- Invertebrate Assessments
- Invertebrate Monitoring
- Avifaunal Assessments
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Terrestrial Monitoring
- Protected Tree and Floral Marking and Reporting

**Legislative Requirements, Processes and Assessments**

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Environmental and Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions

**SAS ENVIRONMENTAL GROUP OF COMPANIES –**
**SPECIALIST CONSULTANT INFORMATION**

# CURRICULUM VITAE OF CHRISTOPHER HOOTON

## PERSONAL DETAILS

| | |
|---|---|
| Position in Company | Senior Scientist, Member<br>Biodiversity Specialist |
| Joined SAS Environmental Group of Companies | 2013 |

## EDUCATION

**Qualifications**

| | |
|---|---|
| BTech Nature Conservation (Tshwane University of Technology) | 2013 |
| National Diploma Nature Conservation (Tshwane University of Technology) | 2008 |

**Short Courses**

| | |
|---|---|
| Certificate – Department of Environmental Science in Legal context of Environmental Management, Compliance and Enforcement (UNISA) | 2009 |
| Introduction to Project Management - Online course by the University of Adelaide | 2016 |
| Integrated Water Resource Management, the National Water Act, and Water Use Authorisations, focusing on WULAs and IWWMPs | 2017 |

## AREAS OF WORK EXPERIENCE

**South Africa** – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Eastern Cape, Western Cape, Northern Cape, Free State
**Africa** - Zimbabwe, Sierra Leone

## KEY SPECIALIST DISCIPLINES

**Biodiversity Assessments**

- Floral Assessments
- Faunal Assessments
- Biodiversity Actions Plan (BAP)
- Biodiversity Management Plan (BMP)
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Protected Tree and Floral Marking and Reporting
- Biodiversity Offset Plan

**Freshwater Assessments**

- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning

## SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

## CURRICULUM VITAE OF KIM MARAIS

### PERSONAL DETAILS

| | |
|---|---|
| Position in Company | Senior Scientist<br>Water Resource Manager |
| Joined SAS Environmental Group of Companies | 2015 |

### MEMBERSHIP IN PROFESSIONAL SOCIETIES

Professional member of the South African Council for Natural Scientific Professions (SACNASP – Reg No. 117137/17)
Member of the Western Cape Wetland Forum (WCWF)

### EDUCATION

**Qualifications**

| | |
|---|---|
| BSc (Hons) Zoology (University of the Witwatersrand) | 2012 |
| BSc (Zoology and Conservation) (University of the Witwatersrand) | 2011 |

**Short Courses**

| | |
|---|---|
| Aquatic and Wetland Plant Identification (Cripsis Environment) | 2019 |
| Tools for Wetland Assessment (Rhodes University) | 2018 |
| Certificate in Environmental Law for Environmental Managers (CEM) | 2014 |
| Certificate for Introduction to Environmental Management (CEM) | 2013 |

### AREAS OF WORK EXPERIENCE

**South Africa** – Gauteng, Mpumalanga, KwaZulu-Natal, Northern Cape, Eastern Cape,
**Africa** – Uganda

### KEY SPECIALIST DISCIPLINES

**Biodiversity Assessments**

- Biodiversity Action Plans (BAP)
- Alien and Invasive Control Plans (AICP)
- Faunal Eco Scans
- Faunal Impact Assessments

**Freshwater Assessments**

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Watercourse Maintenance and Management Plans
- Freshwater Offset Plan

**Aquatic Ecological Assessment and Water Quality Studies**

- Riparian Vegetation Integrity (VEGRAI)
- Water quality Monitoring
- Riverine Rehabilitation Plans

**Legislative Requirements, Processes and Assessments**

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions
- Public Participation processes

# APPENDIX H: Impact Assessment Results

This section presents the detailed impact assessment table per habitat unit and per impact relating to the impact summary table presented in Section 6.2 (Table 6). Impacts were assessed for the construction and the operational phase of the powerline. Impacts focussed on the loss of faunal habitat and species diversity as well as faunal SCC. The tables which follow detail the individual impacts, the mitigation measure and the cumulative impacts associated with the impact.

**Table H1: Loss of faunal habitat and diversity in the *Dichrostachys* Bushveld, Degraded Bushveld, Transformed and Donga Habitat Units.**

| Ref: | 1 | | | |
|---|---|---|---|---|
| **Project phase** | **Construction** | | | |
| **Impact** | **Loss of avian habitat outside of the development footprint, including a decrease in species diversity and potential loss of avian SCC as a result of uncontrolled bush encroachment and/or AIP proliferation. Bushveld, Transformed and Donga Habitat Units.** | | | |
| **Description of impact** | **Clearance of vegetation beyond the proposed footprint providing encroacher species a competitive advantage and the possible introduction of AIP to these locations. leading to habitat loss, decreased food resources and displacement of avifaunal species from these habitats.** | | | |
| **Mitigatability** | Medium | Mitigation exists and will notably reduce significance of impacts | | |
| **Potential mitigation** | **The development footprint should be demarcated, and it should be ensured that no development related activities take place outside of the demarcated footprint. No dumping of litter, rubble or cleared vegetation on site should be allowed. As such it is advised vegetation cuttings (especially AIP) to be carefully collected and disposed of at a separate waste facility. Edge effect control needs to be implemented to ensure no further degradation and potential loss of faunal habitat outside of the proposed project footprint areas occurs. Disturbed and cleared areas need to be revegetated with indigenous grass species to help stabilise the soil surface. Where bare soils are left exposed because of construction activities, they should be immediately rehabilitated.** | | | |
| **Assessment** | **Without mitigation** | | **With mitigation** | |
| **Nature** | Negative | | Negative | |
| **Duration** | Medium term | Impact will last between 5 and 10 years | Short term | impact will last between 1 and 5 years |
| **Extent** | Municipal area | Impacts felt at a municipal level | Local | Extending across the site and to nearby settlements |
| **Intensity** | Low | Natural and/ or social functions and/ or processes are somewhat altered | Low | Natural and/ or social functions and/ or processes are somewhat altered |
| **Probability** | Likely | The impact may occur | Unlikely | Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur |
| **Confidence** | Medium | Determination is based on common sense and general knowledge | Medium | Determination is based on common sense and general knowledge |
| **Reversibility** | Medium | The affected environment will only recover from the impact with significant intervention | Medium | The affected environment will only recover from the impact with significant intervention |
| **Resource irreplaceability** | Medium | The resource is damaged irreparably but is represented elsewhere | Medium | The resource is damaged irreparably but is represented elsewhere |

| Significance | Minor - negative | Negligible - negative |
|---|---|---|
| **Comment on significance** | Provided all mitigation measures are implemented and construction activities take placed in an environmentally sound manner, impact significance is likely to be remain minor within the study area. | |
| **Cumulative impacts** | The local area has already been subjected to extensive impacts as a result of historic and current livestock farming and agriculture, informal housing and existing mining activities in already degraded habitats.<br>Edge effects, human movement and AIP proliferation are concerning over the long-term especially because this focus area is next to a Watercourse habitat. Further habitat loss will only add to the already high levels of habitat loss in the region. | |

**Table H2: Loss of faunal habitat and diversity in the Mixed Bushveld Habitat unit.**

| Ref: | 2 | | | |
|---|---|---|---|---|
| **Project phase** | **Construction** | | | |
| **Impact** | **Loss of intact avifaunal habitat and diversity within the proposed development footprint** | | | |
| **Description of impact** | **Clearance of vegetation for the PV plant leading to habitat loss, decreased food resources and displacement of faunal species from these habitats.** | | | |
| **Mitigatability** | Medium | Mitigation exists and will notably reduce significance of impacts | | |
| **Potential mitigation** | **The development footprint should be demarcated, and it should be ensured that no development related activities take place outside of the demarcated footprint. No dumping of litter, rubble or cleared vegetation on site should be allowed. As such it is advised vegetation cuttings (especially AIP) to be carefully collected and disposed of at a separate waste facility. Edge effect control needs to be implemented to ensure no further degradation and potential loss of faunal habitat outside of the proposed project footprint areas occurs. Disturbed and cleared areas need to be revegetated with indigenous grass species to help stabilise the soil surface. Where bare soils are left exposed because of construction activities, they should be immediately rehabilitated; and it is recommended that construction activities take place in a phased manner, so as to ensure that as far as possible faunal species can naturally disperse out of the area ahead of sequential construction activities;** | | | |
| **Assessment** | **Without mitigation** | | **With mitigation** | |
| **Nature** | Negative | | Negative | |
| **Duration** | Medium term | Impact will last between 5 and 10 years | Short term | impact will last between 1 and 5 years |
| **Extent** | Municipal area | Impacts felt at a municipal level | Local | Extending across the site and to nearby settlements |
| **Intensity** | Moderate | Natural and/ or social functions and/ or processes are moderately altered | Low | Natural and/ or social functions and/ or processes are somewhat altered |
| **Probability** | Certain / definite | There are sound scientific reasons to expect that the impact will definitely occur | Almost certain / Highly probable | It is most likely that the impact will occur |
| **Confidence** | Medium | Determination is based on common sense and general knowledge | Medium | Determination is based on common sense and general knowledge |
| **Reversibility** | Medium | The affected environment will only recover from the impact with significant intervention | Medium | The affected environment will only recover from the impact with significant intervention |
| **Resource irreplaceability** | Medium | The resource is damaged irreparably but is represented elsewhere | Medium | The resource is damaged irreparably but is represented elsewhere |
| **Significance** | **Moderate - negative** | | **Minor - negative** | |
| **Comment on significance** | Provided all mitigation measures are implemented and construction activities take placed in an environmentally sound manner, impact significance is likely to be remain minor within this focus area for the Mixed Bushveld habitat unit. | | | |

| | |
|---|---|
| **Cumulative impacts** | The local area has already been subjected to extensive impacts as a result of historic and current livestock farming and agriculture, informal housing and existing mining activities in already degraded habitats.<br>Edge effects, increased human movements and AIP proliferation are concerning over the long-term especially because this focus area is next to a Watercourse habitat. Further habitat loss will add to the already high levels of habitat loss in the region. |

**Table H3: Loss of faunal SCC in the *Dichrostachys* Bushveld, Degraded Bushveld, Transformed and Donga Habitat Units.**

| Ref: | 3 | | | |
|---|---|---|---|---|
| **Project phase** | **Construction** | | | |
| **Impact** | **Loss of avian SCC habitat within the development footprint** | | | |
| **Description of impact** | **Avifaunal SCC populations may experience further decline and increased pressure through loss of habitat** | | | |
| **Mitigatability** | Medium | Mitigation exists and will notably reduce significance of impacts | | |
| **Potential mitigation** | **Minimise loss of indigenous vegetation where possible through refining the final development footprint, optimising the design within study area while avoiding sensitive Freshwater Habitat where possible. If avian SCC nests are located, a qualified avifaunal specialist should be consulted to determine the best management options. If nests are known to have nestlings or eggs within, these should be allowed to fledge prior to the nest removal. Should SCC need to be removed that are protected under the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) or the Limpopo Environmental Management Act, 2003 (Act No. 7 of 2003) during construction, construction should be halted and authorisation to relocate such species must be obtained from LDEDET or DFFE Design of infrastructure should be environmentally sound and all construction equipment to be utilised must be a good working condition, and all possible precautions taken to prevent potential avifaunal collisions or electrocutions, and mechanical spills and/or leaks. Any structures which may act as perching sites for birds should be installed with anti-perching spikes. Should any lights be installed they should face downwards to reduce the abundance of insects attracted to the night lights, this prey source may attract birds to the study area and may increase avian collisions or electrocutions It is recommended that construction activities take place in a phased so as to ensure that as far as possible faunal species can naturally disperse out of the area ahead of sequential construction activities.** | | | |
| **Assessment** | **Without mitigation** | | **With mitigation** | |
| **Nature** | Negative | | Negative | |
| **Duration** | Medium term | Impact will last between 5 and 10 years | Short term | impact will last between 1 and 5 years |
| **Extent** | Municipal area | Impacts felt at a municipal level | Local | Extending across the site and to nearby settlements |
| **Intensity** | Moderate | Natural and/ or social functions and/ or processes are moderately altered | Low | Natural and/ or social functions and/ or processes are somewhat altered |
| **Probability** | Almost certain / Highly probable | It is most likely that the impact will occur | Likely | The impact may occur |
| **Confidence** | Medium | Determination is based on common sense and general knowledge | Medium | Determination is based on common sense and general knowledge |
| **Reversibility** | Medium | The affected environment will only recover from the impact with significant intervention | Medium | The affected environment will only recover from the impact with significant intervention |

| | | | | |
|---|---|---|---|---|
| **Resource irreplaceability** | Medium | The resource is damaged irreparably but is represented elsewhere | Medium | The resource is damaged irreparably but is represented elsewhere |
| **Significance** | **Minor - negative** | | **Minor - negative** | |
| **Comment on significance** | It is unlikely that impacts to SCC in the focus area, will be significant, considering the reduced POC of SCC on site, and due to the ability of these SCC to occur elsewhere, although their populations may be placed under further pressure, if no mitigatory measures regarding SCC are undertaken. If mitigatory measures are adhere to the impacts to SCC can be negligible. | | | |
| **Cumulative impacts** | Habitat loss in already degraded habitats can cause further decline of potentially occurring SCC in the area, should a rescue plan not be implemented. Further habitat loss will only add to the already high levels of habitat loss in the region. Further impacts may be incurred should relevant structures to mitigate bird collisions not be implemented. | | | |

**Table H4: Loss of faunal SCC in the Mixed Bushveld**

| Ref: | 4 | | | |
|---|---|---|---|---|
| **Project phase** | **Operation** | | | |
| **Impact** | **Ongoing loss of avian habitat, diversity and SCC as AIPs proliferate within disturbance areas and adjacent locations, and a higher likelihood of edge effect as a result of the proposed development. through changes in the current pattern, flow, and timing of water in the landscape as well as the chemical constituency of the local water resources.** | | | |
| **Description of impact** | **Avifaunal populations utilizing Freshwater habitat outside the study area may experience declines further decline and increased pressure, should an action plan not be compiled or authorised in the event that a SCC be encountered during construction.** | | | |
| **Mitigatability** | Medium | Mitigation exists and will notably reduce significance of impacts | | |
| **Potential mitigation** | **The development footprint should be demarcated, and it should be ensured that no further development outside the footprint occur and that AIP be managed on the footprint boundary. Any structures which may act as perching sites for birds should be installed with anti-perching spikes. Should any lights be installed they should face downwards to reduce the abundance of insects attracted to the night lights, this prey source may attract birds to the study area and may increase avian collisions or electrocutions. Avifaunal monitoring within the proposed PV facilities and along the proposed power line should be undertaken and reported monthly to monitor or record avifauna and collect any birds which have collided with or been electrocuted by the proposed infrastructure, these must be reported by the ECO to the department and further mitigation measures should be investigated in how to minimise the mortalities. Anti-collision devices should be installed along the entire length of the powerline. These must be Eskom approved anti-collision devices that are durable as the area is prone to strong winds. Anti-collision devices must be installed as soon as the wires are strung. The devices must be installed 5m apart and alternate between a light and dark colour in order to increase the visibility of the earth wires. No hunting/trapping or collecting of SCC or avifaunal species is allowed. It is recommended that construction activities take place in a phased so as to ensure that as far as possible faunal species can naturally disperse out of the area ahead of sequential construction activities.** | | | |
| **Assessment** | **Without mitigation** | | **With mitigation** | |
| **Nature** | Negative | | Negative | |
| **Duration** | On-going | Impact will last between 15 and 20 years | Long term | Impact will last between 10 and 15 years |
| **Extent** | Municipal area | Impacts felt at a municipal level | Local | Extending across the site and to nearby settlements |
| **Intensity** | Low | Natural and/ or social functions and/ or processes are somewhat altered | Low | Natural and/ or social functions and/ or processes are somewhat altered |
| **Probability** | Likely | The impact may occur | Probable | The impact has occurred here or elsewhere and could therefore occur |
| **Confidence** | Medium | Determination is based on common sense and general knowledge | Medium | Determination is based on common sense and general knowledge |
| **Reversibility** | Medium | The affected environment will only recover from the impact with significant intervention | Medium | The affected environment will only recover from the impact with |

| | | | | |
|---|---|---|---|---|
| | | | | significant intervention |
| **Resource irreplaceability** | Medium | The resource is damaged irreparably but is represented elsewhere | Medium | The resource is damaged irreparably but is represented elsewhere |
| **Significance** | **Minor - negative** | | **Minor - negative** | |
| **Comment on significance** | It is unlikely that impacts to SCC in the focus area, will be significant, considering the reduced POC of SCC on site, and due to the ability of these SCC to occur elsewhere, although their populations may be placed under further pressure, if no mitigatory measures regarding SCC are undertaken and habitat degradation is not managed in adjacent habitat. If mitigatory measures are adhere to the impacts to SCC can be minor on a local scale. | | | |
| **Cumulative impacts** | Habitat loss in already degraded habitats can cause further decline of potentially occurring SCC in the area, should a rescue plan not be implemented. AIP proliferation into adjacent habitat must be monitored to mitigate further loss of habitat. | | | |

**Table H5: Loss of faunal habitat and diversity in the Mixed Bushveld, *Dichrostachys* Bushveld, Degraded Bushveld, Transformed and Donga Habitat units.**

| Ref: | 5 | | | |
|---|---|---|---|---|
| **Project phase** | **Operation** | | | |
| **Impact** | **Loss of SCC habitat** | | | |
| **Description of impact** | **Maintenance activities and edge effects leading to habitat degradation and decreases avifaunal SCC species diversity and abundance.** | | | |
| **Mitigatability** | Medium | Mitigation exists and will notably reduce significance of impacts | | |
| **Potential mitigation** | **Any structures which may act as perching sites for birds should be installed with anti-perching spikes. Should any lights be installed they should face downwards to reduce the abundance of insects attracted to the night lights, this prey source may attract birds to the study area and may increase avian collisions or electrocutions. Avifaunal monitoring within the proposed PV facilities and along the proposed power line should be undertaken and reported monthly to monitor or record avifauna and collect any birds which have collided with or been electrocuted by the proposed infrastructure, these must be reported by the ECO to the department and further mitigation measures should be investigated in how to minimise the mortalities. Anti-collision devices should be installed along the entire length of the powerline. These must be Eskom approved anti-collision devices that are durable as the area is prone to strong winds. Anti-collision devices must be installed as soon as the wires are strung. The devices must be installed 5m apart and alternate between a light and dark colour in order to increase the visibility of the earth wires. No hunting/trapping or collecting of SCC or avifaunal species is allowed. It is recommended that construction activities take place in a phased so as to ensure that as far as possible faunal species can naturally disperse out of the area ahead of sequential construction activities. All vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the development activities. No hunting/trapping or collecting of any avifauna is allowed. No fires are allowed by construction personnel as this will increase the risk of the surrounding veld catching fire and burning down not only the immediate faunal habitat but also that of the larger local areas.** | | | |
| **Assessment** | **Without mitigation** | | **With mitigation** | |
| **Nature** | Negative | | Negative | |
| **Duration** | Long term | Impact will last between 10 and 15 years | Long term | Impact will last between 10 and 15 years |
| **Extent** | Municipal area | Impacts felt at a municipal level | Local | Extending across the site and to nearby settlements |
| **Intensity** | Moderate | Natural and/ or social functions and/ or processes are moderately altered | Low | Natural and/ or social functions and/ or processes are somewhat altered |
| **Probability** | Likely | The impact may occur | Probable | The impact has occurred here or elsewhere and could therefore occur |
| **Confidence** | Medium | Determination is based on common sense and general knowledge | Medium | Determination is based on common sense and general knowledge |
| **Reversibility** | Medium | The affected environment will only recover from the impact with significant intervention | Medium | The affected environment will only recover from the impact with |

| | | | | |
|---|---|---|---|---|
| | | | | significant intervention |
| **Resource irreplaceability** | Medium | The resource is damaged irreparably but is represented elsewhere | Medium | The resource is damaged irreparably but is represented elsewhere |
| **Significance** | **Minor - negative** | | **Minor - negative** | |
| **Comment on significance** | If left unmanaged, AIP and erosion proliferation from operations may have a minor impact on habitat, as these changes have potential to impact a larger area than that of the focus area and reduce the suitability of the habitat for SCC. With mitigation the scale of the impacts can be reduced significantly. | | | |
| **Cumulative impacts** | On-going disturbance arising from the proposed solar development on avifaunal habitat and diversity pushing avifauna into neighbouring habitat increasing competition for resources during the operational phase. Potentially leading to reduced abundance of avifauna within the study area. | | | |

**Table H6: Loss of faunal SCC in the Mixed Bushveld, *Dichrostachys* Bushveld, Degraded Bushveld, Transformed and Donga Habitat units.**

| Ref: | 6 | | | |
|---|---|---|---|---|
| **Project phase** | **Operation** | | | |
| **Impact** | **Loss of avian SCC, as a result of collisions with powerlines and PV infrastructure.** | | | |
| **Description of impact** | **Potential loss of faunal SCC from the affected areas due to habitat degradation and/or loss as well as risk of direct mortalities resulting from collisions with vehicles.** | | | |
| **Mitigatability** | Medium | Mitigation exists and will notably reduce significance of impacts | | |
| **Potential mitigation** | **Any structures which may act as perching sites for birds should be installed with anti-perching spikes. Should any lights be installed they should face downwards to reduce the abundance of insects attracted to the night lights, this prey source may attract birds to the study area and may increase avian collisions or electrocutions. Avifaunal monitoring within the proposed PV facilities and along the proposed power line should be undertaken and reported monthly to monitor or record avifauna and collect any birds which have collided with or been electrocuted by the proposed infrastructure, these must be reported by the ECO to the department and further mitigation measures should be investigated in how to minimise the mortalities. Anti-collision devices should be installed along the entire length of the powerline. These must be Eskom approved anti-collision devices that are durable as the area is prone to strong winds. Anti-collision devices must be installed as soon as the wires are strung. The devices must be installed 5m apart and alternate between a light and dark colour in order to increase the visibility of the earth wires. Bird nests on Powerlines or the PV infrastructure are potential fire hazards and should be removed from structures regularly. No hunting/trapping or collecting of SCC or avifaunal species is allowed. No collection or persecution of faunal SCC within the study area is allowed; and Any faunal SCC that are observed should be logged (with a GPS position) and uploaded to the iNaturalist site. Such data can also be used as part of the projects long term monitoring programme.** | | | |
| **Assessment** | **Without mitigation** | | **With mitigation** | |
| **Nature** | Negative | | Negative | |
| **Duration** | On-going | Impact will last between 15 and 20 years | Long term | Impact will last between 10 and 15 years |
| **Extent** | Municipal area | Impacts felt at a municipal level | Local | Extending across the site and to nearby settlements |
| **Intensity** | Moderate | Natural and/ or social functions and/ or processes are moderately altered | Low | Natural and/ or social functions and/ or processes are somewhat altered |
| **Probability** | Almost certain / Highly probable | It is most likely that the impact will occur | Likely | The impact may occur |
| **Confidence** | Medium | Determination is based on common sense and general knowledge | Medium | Determination is based on common sense and general knowledge |
| **Reversibility** | Medium | The affected environment will only recover from the impact with significant intervention | Medium | The affected environment will only recover from the impact with significant intervention |

| | | | | |
|---|---|---|---|---|
| **Resource irreplaceability** | Medium | The resource is damaged irreparably but is represented elsewhere | Medium | The resource is damaged irreparably but is represented elsewhere |
| **Significance** | **Moderate - negative** | | **Minor - negative** | |
| **Comment on significance** | Due to the increase in infrastructure and the potential for collisions during the operational phase impacts to avifauna (SCC and common species) may reach moderate levels. However with effective mitigation most impacts can be reduced and the significance level can be lowered to minor. | | | |
| **Cumulative impacts** | Degradation of the habitat through the installation of infrastructure which may be detrimental to avifaunal species and may limit the potential for avifauna to recolonise the focus area. | | | |