The Terrestrial Ecology Baseline & Impact Assessment for the proposed Highveld Solar Power Plant Project

Emalahleni, Mpumalanga Province, South Africa

November 2022

CLIENT

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1 Introduction

1.1 Background

The Biodiversity Company was appointed to undertake a terrestrial ecology (fauna and flora) baseline and impact assessment for the proposed Highveld Solar Power Plants (SPP) Photovoltaic (PV) project. The proposed project involves the development of a solar facility and associated infrastructure and is located 12.5 km northwest of Emalahleni in the Mpumalanga province.

The proposed solar facility will produce up to a total of 329 MW and it will include a PV Panel Array, inverters, and connection to the grid, and supportive infrastructure will also be developed which includes roads, fencing and small buildings. This report pertains to the assessment of the PV area and its associated footprint, as well as the supportive grid infrastructure.

To assess the baseline ecological state of the area and to present a detailed description of the receiving environment, both a desktop assessment as well as a field survey were conducted during October 2022. Furthermore, the desktop assessment and field survey both involved the detection, identification and description of any locally relevant sensitive receptors and habitats, and the manner in which these sensitive features may be affected by the proposed development was also investigated.

It is important to note that this assessment considers terrestrial fauna and flora with the exclusion of avifauna, as this aspect is considered as part of a separate assessment.

This assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations, 2014 (No. 326, 7 April 2017) of the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998). The approach has taken cognisance of the recently published Government Notice 320 in terms of NEMA dated 20 March 2020 as well as the Government Notice 1150 in terms of NEMA dated 30 October 2020: “Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation”. The National Web based Environmental Screening Tool has characterised the terrestrial biodiversity theme for the area as ‘Very High’ sensitivity (National Environmental Screening Tool, 2022).

The purpose of conducting the specialist study is to provide relevant input into the overall Environmental Authorisation application process, with a focus on the proposed project activities and their associated impacts. This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Registered Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making as to the ecological viability of the proposed project.

1.2 Technical Information

The following technical information was provided by Environamics:

The term photovoltaic describes a solid-state electronic cell that produces direct current electrical energy from the radiant energy of the sun through a process known as the Photovoltaic Effect. This refers to light energy placing electrons into a higher state of energy to create electricity. Each PV cell is made of silicon (i.e. semiconductors), which is positively and negatively charged on either side, with electrical conductors attached to both sides to form a circuit. This circuit captures the released electrons in the form of an electric current (direct current). The key components of the proposed project are described below:

- PV Panel Array - To produce up to 329MW, the proposed facility will require numerous linked cells placed behind a protective glass sheet to form a panel. Multiple panels will be required to form the solar PV arrays which will comprise the PV facility. The PV panels will be tilted at a northern angle in order to capture the most sun or using one-axis tracker structures to follow the sun to increase the Yield.

- Wiring to Inverters - Sections of the PV array will be wired to inverters. The inverter is a pulse width mode inverter that converts direct current (DC) electricity to alternating current (AC) electricity at grid frequency.

- Connection to the grid - Connecting the array to the electrical grid requires transformation of the voltage from 480V to 33kV to 132kV. The normal components and dimensions of a distribution rated electrical substation will be required. Output voltage from the inverter is 480V and this is fed into step up transformers to 132kV. An onsite substation will be required on the site to step the voltage up to 132kV, after which the power will be evacuated into the national grid via the proposed powerline. It is expected that generation from the facility will link to the Eskom Vulcan 400kV MTS Substation. The connection will be assessed within the 250m wide (up to 690m in some instances) grid connection corridor. Connection will be limited to the grid connection corridor. The Highveld SPP will inject up to 250MW into the National Grid. The installed capacity will be up to 329MW (Figure 1-1).

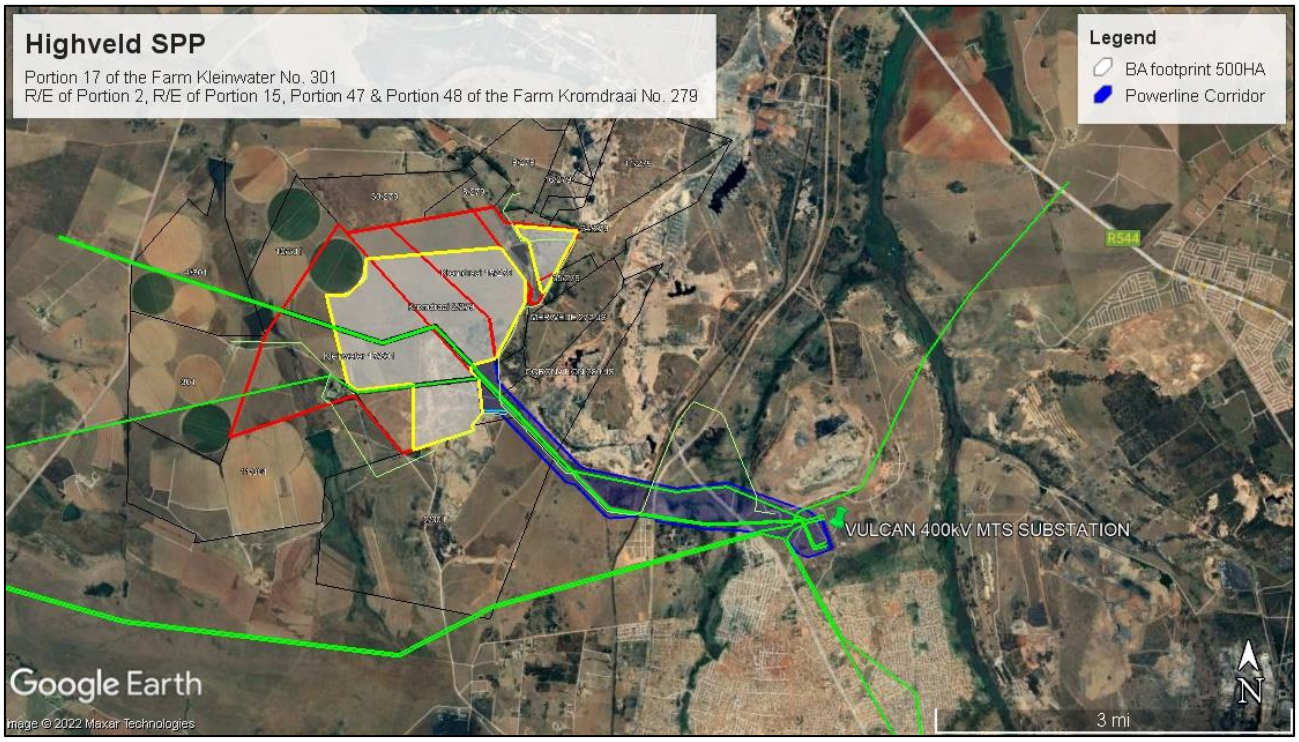


Figure 1-1 Powerline corridor

- Electrical reticulation network – An internal electrical reticulation network will be required and will be lain ~2-4m underground as far as practically possible.

- Supporting Infrastructure – The supporting infrastructure such as the auxiliary buildings will be situated in an area measuring up to 4 ha.

- Battery storage – A Battery Storage Facility with a maximum height of 8m and a maximum volume of 1,740 m3 of batteries and associated operational, safety, and control infrastructure.

- Roads – Access will be obtained via an unnamed road off of the N4 to the south of the site and via another unnamed road to the east of the site. An internal site road network will also be required to provide access to the solar field and associated infrastructure. The access and internal roads will be constructed within a 25- meter corridor. Access Points: coordinates 25°49'14.48"S; 29° 3'4.95"E and 25°48'55.80"S; 29° 3'43.84"E.

Table 1.2 Technical details for the proposed facility

Component	Description / dimensions
Height of PV panels	6 meters
Area of PV Array	500 hectares (Development footprint)
Number of inverters required	Minimum 50
Area occupied by inverter / transformer stations / substations / BESS	Central inverters+ LV/MV trafo: 750 m^2 HV/MV substation with switching station: 15 000 m^2 BESS: 40 000 m^2
Capacity of on-site substation	132kV
Capacity of the powerline	132kV
Area occupied by both permanent and construction laydown areas	Total Footprint Area: 500 hectares Construction laydown area: within ~ 5.74 ha
Area occupied by buildings	Security Room: ~405 m^2 O&M laydown: Within 5.74 ha
Battery storage facility	Maximum height: 8m Maximum volume: 1740 m^3 Capacity: Up to 500 MW
Length of internal roads	Approximately 16.41 km
Width of internal roads	Between 4 and 6 meters
Proximity to grid connection	Approximately 5.3 kilometres
Grid connection corridor width	Between 250 and 690 m
Grid connection corridor length	Approximately 5.3 km
Powerline servitude width	32 m
Height of fencing	Approximately 2.5 meters

1.3 Project Area of Influence

A 2000 ha Project Area of Influence (PAOI) is delineated to incorporate the proposed PV area and the grid routes, and this represents the total area to be assessed. The PAOI is approximately 12.5 km northwest of the city of Emalahleni and the region is characterised by undeveloped agricultural and grazing land, and extensive mining activity and township development – particularly to the east.

A map of the PAOI in relation to the local region is presented in Figure 1-2, and a detailed map of the PAOI and associated PV and grid development footprint is presented in Figure 1-3.

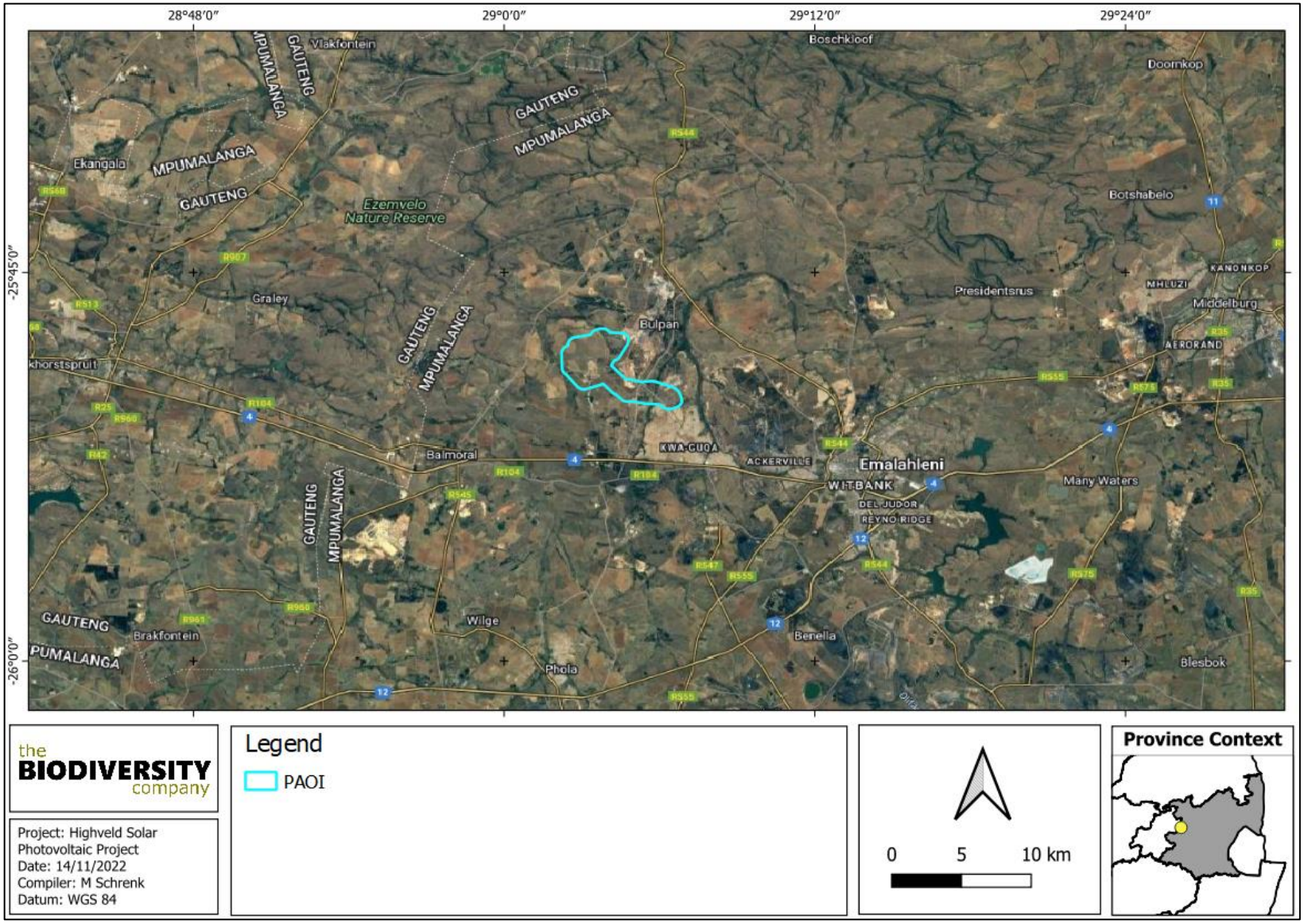


Figure 1-2 Map illustrating the regional context of the PAOI

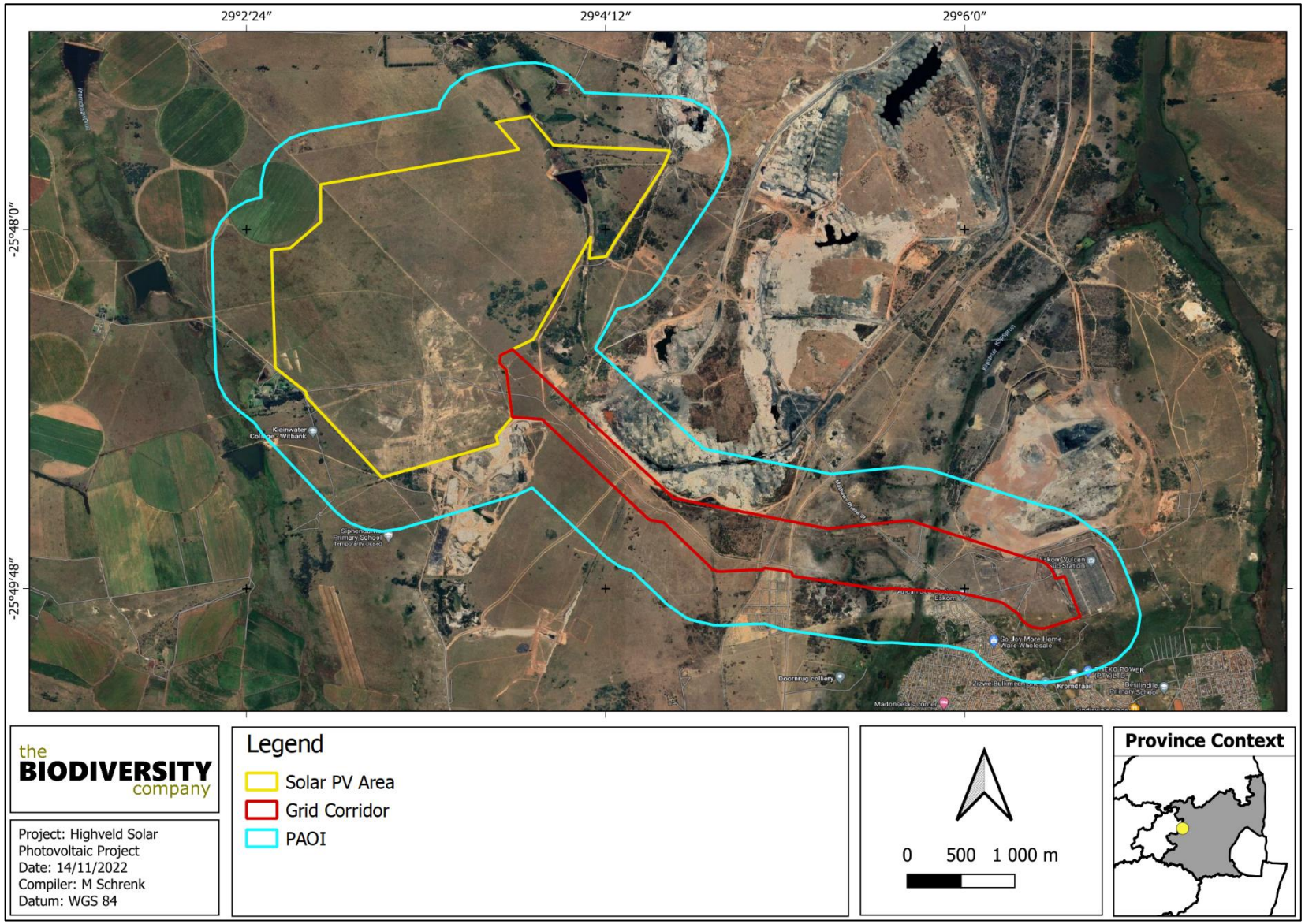


Figure 1-3 Map illustrating the details of the PAOI

1.4 Specialist Details

Report Name	**The Terrestrial Ecology Baseline & Impact Assessment for the proposed Highveld Solar Power Plant Project**
Reference	Highveld Solar Photovoltaic Project
Submitted to / Client	ENVIRONAMICS
Fieldwork & Report Writer	Michael Schrenk 
	Michael completed his professional Civil and Environmental engineering degree at the University of the Witwatersrand in 2016. He has been working in the fields of project management, biodiversity and habitat assessment and ecological restoration for over 4 years.
Reviewer	Andrew Husted 
	Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field.
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.

1.5 Scope of Work

The principle aim of the assessment was to provide information to inform on the risk that the proposed activity has on the terrestrial ecosystems within the PAOI. This was achieved through the following:

- Identification and description of any sensitive receptors that occur in the Project Area of Influence, and the manner in which these sensitive receptors may be affected by the proposed activity;
- Conducting of a desktop assessment to identify the relevant ecologically important geographical features within or nearby to the Project Area of Influence;
- Conducting of a desktop assessment to compile an expected species list and identify flora and fauna Species of Conservation Concern (SCC) that may occur within the Project Area of Influence;
- Conducting of a field survey to ascertain the baseline species composition of the present flora and fauna community within the Project Area of Influence;
- Delineation and mapping of the habitats and their respective sensitivities that occur within the Project Area of Influence;
- Identification of the manners in which the proposed project impacts the flora and fauna communities, and an evaluation of the level of risk that these potential impacts present; and
- The prescription of mitigation measures and associated recommendations for the identified risks.

2 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 2-1 are applicable to the current project. The list below, although extensive, may not be complete and other legislation, policies and guidelines may apply in addition to those listed below.

Table 2-1 A list of key legislative acts and guidelines relevant to biodiversity and conservation in the Mpumalanga Province

Region	Legislation / Guideline
National	Constitution of the Republic of South Africa (Act No. 108 of 1996)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management: Biodiversity Act (NEM:BA) (Act No. 10 of 2004)
	The National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
	Threatened or Protected Species Regulations and lists (No. R. 152 of Government Gazette No. 29657 of 23 February 2007, and No. R. 1187 of Government Gazette No. 30568 of 14 December 2007)
	Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 320 of Government Gazette 43110 (March 2020); and GNR 1150 of Government Gazette 43855 (October 2020)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Forests Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)
	National Water Act (NWA) (Act No. 36 of 1998)
	World Heritage Convention Act (Act No. 49 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations and Alien and Invasive Species List 2014-2020, published under NEM:BA
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)
Provincial	Mpumalanga Nature Conservation Act 10 of 1998
	Mpumalanga Parks Board Act 6 of 1995
	Mpumalanga Tourism and Parks Agency Act 5 of 2005

3 Definitions

3.1 Species of Conservation Concern

In accordance with the National Red List of South African Plants website, managed and maintained by the South African National Biodiversity Institute (SANBI), a Species of Conservation Concern (SCC) is a species that has a high conservation importance in terms of preserving South Africa's rich biodiversity. This classification covers a range of red list categories as illustrated in Figure 3-1 below.

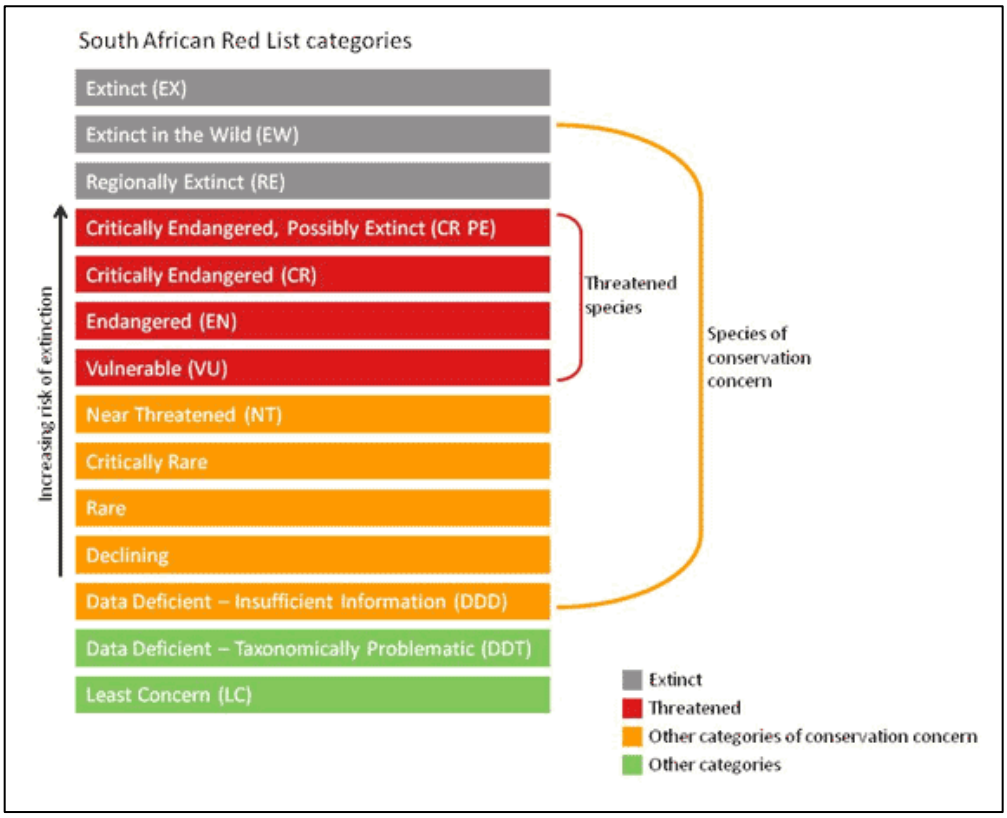


Figure 3-1 Threatened species and Species of Conservation Concern (SANBI, 2016)

South Africa uses the internationally endorsed International Union for Conservation of Nature (IUCN) Red List Categories and Criteria (IUCN, 2012). This scientific system is designed to measure species' risk of extinction and its purpose is to highlight those species that are in need of critical conservation action. As this system has been adopted from the IUCN, the definition of an SCC as described and categorised above is extended to all red list classifications relevant to fauna as well as the IUCN categories, for the purposes of this report.

3.2 Protected Species

Protected species include both flora and fauna species that are protected according to some form of relevant legislation, be it provincial, national, or international. Provincial legislation may include that published in the form of a provincial ordinance, bill, or act, and national legislation includes that which is published in terms of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004) or the National Forests Act (Act No. 84 of 1998). Relevant international legislation includes the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 2021).

4 Methods

4.1 Desktop Assessments

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

4.1.1 Spatially Relevant Legislative Boundaries

Two aspects of legislation apply with regards to the development of certain project types within South Africa, and these have important implications for the EA processes for these project types. These two aspects are briefly discussed below. Where relevant the spatial orientation of the proposed project is referenced with

respect to these important legislative boundaries, as the applicable legislation may be relevant to not only the overall EIA process, but also the specialist assessment process that is to be followed.

- Strategic Transmission Corridors (EGI):

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

On the 29th of April 2021, Minister Barbara Dallas Creecy published Government Notice No. 383 in *Government Gazette* No. 44504, which expanded the eastern and western transmission corridors and gave notice of the applicability of the application procedures identified in Government Notice No. 113, to these expanded corridors.

In June 2022 the Standard for the Development and Expansion of Power Lines and Substations within Identified Geographical Areas Revision 2, Prepared by the CSIR and SANBI, was published. This standard was then adopted as per Government Notice No. 2313 of *Government Gazette* No. 47095 of 27 July 2022. The Standard was prepared to allow a proponent to achieve planning, routing, siting and remediation objectives that will ensure the acceptability of the impacts of the development of EGI (including substations) on the environment, independently from the need for an assessment by the competent authority. The standard enforces the following key environmental principles as part of its application with regards to the planning of powerline routes and substation positions (Note: several additional principles apply as relevant to avifauna assessments, however these are not included below):

- There must be no removal of threatened plant species;
- There must be no impact on Tier 1 plant species (i.e. threatened species reliant on critical habitat) identified through the screening process and site verification process;
- Clear-cutting during construction must be kept to a maximum of 8 m; and
- Wetlands must be avoided or, where wetland crossing is unavoidable, the power line should be routed over the narrowest part of the wetland. For the most part, wetlands and rivers can be traversed by the power line with little to no impact by placing the pylons outside of the wetland.
- Renewable Energy Development Zones (REDZs):

On 16 February 2018, Minister Edna Molewa published Government Notice No. 114 in *Government Gazette* No. 41445 which identified 8 renewable energy development zones important for the development of large scale wind and solar photovoltaic facilities. The Government Notice included the procedure to be followed when applying for environmental authorisation for large scale wind and solar photovoltaic energy facilities when occurring in these REDZs.

On 26 February 2021, Minister Barbara Dallas Creecy, published Government Notice No. 142, 144 and 145 in Government Gazette No. 44191 which identified 3 additional REDZs for implementation as well as the procedures to be followed when applying for environmental authorisation for electricity transmission or distribution infrastructure or large scale wind and solar photovoltaic energy facilities in these REDZs.

4.1.2 Ecologically Important Landscape Features

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

- The Mpumalanga Biodiversity Sector Plan of 2014 (MTPA, 2014);

- 2018 National Biodiversity Assessment (NBA, 2018) (Skowno *et al.,* 2019);
- Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018);
- South Africa Protected and Conservation Areas Databases, 2022 (DFFE, 2022 & DFFE, 2022a);
- National Protected Areas Expansion Strategy, 2016 (DEA, 2016);
- Important Bird and Biodiversity Areas, 2015 (Marnewick *et al.,* 2015);
- South African Inventory of Inland Aquatic Ecosystems (SAIIAE), NBA 2018 Rivers and Wetlands (Awuah, 2018 & Van Deventer et al., 2019);
- National Freshwater Priority Areas, Rivers and Wetlands, 2011 (Nel, 2011); and
- Strategic Water Source Areas, 2021 (Lötter & Le Maitre, 2021).

Descriptions of these datasets, and their associated relevance to terrestrial biodiversity, are provided below.

4.1.2.1 Provincial Conservation Plan

The Mpumalanga Biodiversity Sector Plan classifies areas within the province on the basis of their contributions to reaching the associated conservation targets within the province. These areas are primarily classified as either Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs). These biodiversity priority areas, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species, as well as the long-term ecological functioning of the landscape as a whole.

- **CBAs** are areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and healthy functioning of important species and ecosystems and the delivery of ecosystem services. Thus, if these areas are not maintained in a natural or near natural state then provincial biodiversity targets cannot be met (SANBI, 2017).
- **ESAs** are areas that are not essential for meeting biodiversity representation targets but play an important role in supporting the ecological functioning of ecosystems as well as adjacent Critical Biodiversity Areas, and/or in delivering ecosystem services that support socio-economic development (SANBI, 2017).

Provincial CBAs and ESAs are often further classified into sub-categories, such as CBA1 and CBA2 or ESA1 and ESA2. These present fine scale habitat and biodiversity area baseline requirements and associated land management objectives or outcomes. The highest categorisation level is often referred to as an 'Irreplaceable Critical Biodiversity Area' which usually represents pristine natural habitat that is very important for conservation.

4.1.2.2 National Biodiversity Assessment 2018

The National Biodiversity Assessment (NBA) was completed as a collaboration between the South African National Biodiversity Institute (SANBI), the then Department of Environmental Affairs (DEA), and other stakeholders including scientists and biodiversity management experts throughout the country over a three-year period (Skowno *et al.,* 2019).

The purpose of the NBA is to assess the state of South Africa's biodiversity with a view to understanding trends over time and informing policy and decision-making across a range of sectors. The two headline indicators assessed in the NBA are Ecosystem Threat Status and Ecosystem Protection Level (Skowno et al., 2019).

- **Ecosystem Threat Status (ETS)** outlines the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function, and composition, on which their ability to provide ecosystem services ultimately depends. Ecosystem types are categorised as Critically

Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Concern (LC), based on the proportion of each ecosystem type that remains in a good or healthy ecological condition (Skowno et al., 2019). CR, EN, or VU ecosystem types are collectively referred to as threatened ecosystems.

- **Ecosystem Protection level (EPL)** informs on whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Not Protected (NP), Poorly Protected (PP), Moderately Protected (MP) or Well Protected (WP), based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act (Skowno *et al.,* 2019). NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems.

4.1.2.3 South Africa Protected and Conservation Areas

The South African Protected Areas Database (SAPAD) and the South Africa Conservation Areas Database (SACAD) contains spatial data critical for the conservation of South Africa's natural resources. It includes spatial and attribute information for both formally protected areas and areas that have less formal protection, such as conservation areas. These databases are updated regularly and form the basis for the Register of Protected Areas, which is a legislative requirement under the National Environmental Management: Protected Areas Act (Act 57 of 2003).

Formally protected areas are categorised according to several different types, and each type is subject to specific legislative restrictions and management guidelines, many of which restrict development to some degree. Generally, these areas are assigned a buffer of influence of between 5 and 10 km (the latter pertaining to National Parks and World Heritage Sites), within which certain laws and management actions may apply. Many of the protected area types are further classified into sub-types as well. Formally protected area types include:

- National Parks;
- Nature Reserves;
- Special Nature Reserves;
- Mountain Catchment Areas;
- World Heritage Sites;
- Protected Environments;
- Forest Nature Reserves and Forest Wilderness Areas;
- Specially Protected Forest Areas; and
- Marine Protected Areas.

4.1.2.3.1 National Protected Areas Expansion Strategy

The Department of Environmental Affairs (now the Department of Forestry, Fisheries and the Environment) led the development of the National Protected Areas Expansion Strategy (NPAES) in consultation with the protected area agencies and other key private and public sector stakeholders. The need for the development of the NPAES was established in the National Biodiversity Framework in 2009. The NPAES is a 20-year strategy with 5-year implementation targets aligned with a 5-year revision cycle. (DEA, 2016).

South Africa's protected area network currently falls far short of representing all ecosystems and maintaining healthy functioning ecological processes. In this context, the goal of the NPAES is to achieve cost effective protected area expansion thus enabling better ecosystem representation, ecological sustainability, and resilience to climate change. A comprehensive set of priority areas was compiled based on the priorities identified by provincial and other agencies in their respective protected area expansion

strategies. These focus areas are generally large, intact and unfragmented and are therefore of high importance for biodiversity, climate resilience and freshwater protection (DEA, 2016).

4.1.2.4 Important Bird and Biodiversity Areas

Important Bird & Biodiversity Areas (IBAs) are sites of international significance for the conservation of the world's birds, and other conservation significant species, as identified through multi-stakeholder processes using globally standardised, quantitative, and scientifically agreed criteria. These sites are also Key Biodiversity Areas; sites that contribute significantly to the global persistence and health of biodiversity (Birdlife, 2020).

The selection of IBAs is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge on the sizes and trends of bird populations. The criteria ensures that sites selected as IBAs have true significance for the international conservation of bird populations, and it also ensures classification consistency among sites at all geographic levels.

IBAs constitute a global network of over 13 500 sites, of which 112 sites are found in South Africa. Approximately 60% of the IBA network is unprotected, leaving these sites vulnerable to habitat transformation and mismanagement. Additionally, habitats within many IBAs are poorly managed, leading to habitat degradation, especially in unprotected sites. (BirdLife SA, 2022)

4.1.2.5 Aquatic Habitats

Three inland aquatic habitat datasets are used to identify the ecological sensitivity of the project area with regards to local aquatic habitat, which is critical for the healthy functioning of both aquatic and terrestrial biodiversity. The presence of aquatic ecosystems is often a strong indicator for the presence of unique flora as well as the regular presence of fauna. Many national SCC are only found within or near to aquatic habitat.

- **The South African Inventory of Inland Aquatic Ecosystems (SAIIAE):** Established during the 2018 NBA, the SAIIAE is a collection of spatial data layers that represent the extent of river and inland wetland ecosystem types as well as the pressures on these systems. The same two headline indicators, and their associated categorisations, are applied as with the terrestrial ecosystem NBA, namely Ecosystem Threat Status and Ecosystem Protection Level. The Ecosystem Threat Status of river and wetland ecosystem types are based on the extent to which each ecosystem type had been altered from its natural condition.
- **National Freshwater Ecosystem Priority Areas, Rivers and Wetlands (NFEPA):** In an attempt to better conserve aquatic ecosystems, South Africa has categorised its inland aquatic systems according to set ecological criteria (i.e., ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs). The FEPAs are intended to be conservation support tools and it is envisioned that they will guide the effective implementation of measures to achieve the National Environment Management: Biodiversity Act's biodiversity conservation goals (Nel *et al.,* 2011).
- **Strategic Water Source Areas (SWSAs):** SWSAs are defined as areas of land that supply a disproportionate quantity of mean annual surface water runoff in relation to their size, and therefore contribute considerably to the overall water supply of the country, as well as national aquatic and terrestrial biodiversity resources. These are considered key ecological infrastructure assets and the effective protection of SWSAs is vital for national security because a lack of water security will compromise national security and human wellbeing on all levels.

4.1.3 Desktop Flora Assessment

The desktop flora assessment encompassed an assessment of all the vegetation units and habitat types within the PAOI as well as the identification of expected plant species and any locally occurring flora SCC.

The Vegetation of South Africa, Lesotho, and Swaziland (Mucina & Rutherford, 2006) and the 2018 Terrestrial & Freshwater Assessment by SANBI (2018) was used to identify the vegetation types that would have occurred under natural or pre-anthropogenically altered conditions. Furthermore, the Plants of Southern Africa (POSA, 2019) database was accessed to compile a list of expected flora species within the PAOI (Figure 4-1). The Red List of South African Plants website (SANBI, 2016) was used to provide the most current account of the national conservation status of flora.

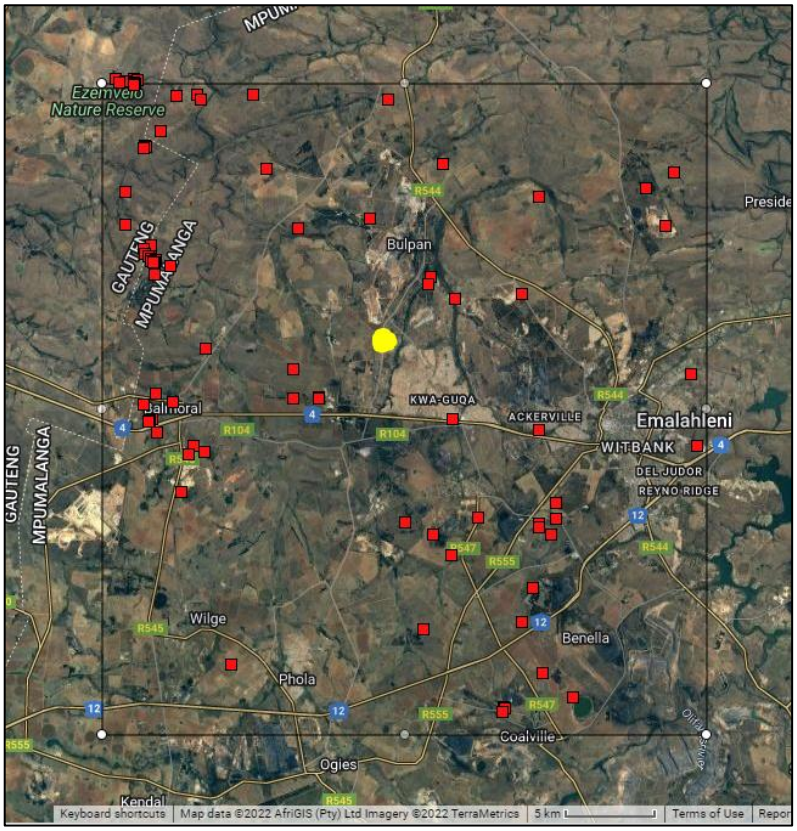


Figure 4-1 Map illustrating the extent of area used to obtain the expected flora species list from the Plants of South Africa (POSA) database. The yellow dot indicates the approximate location of the Project Area of Interest. The red squares are cluster markers of botanical records as per POSA data

The latest information regarding provincially, and nationally protected flora was obtained from the following published legislative sources:

- Provincially Protected Plant Species (Schedules 11 and 12 of the Mpumalanga Nature Conservation Act 10 of 1998); and
- List of Nationally Protected Tree Species (DEFF, 2022).

4.1.4 Desktop Fauna Assessment

The faunal desktop assessment involved the compilation of expected species lists and the identification of any protected and/or SCC fauna potentially occurring in the area. The respective species lists, and international Red-List statuses, were obtained from the IUCN spatial dataset (2017), in addition to the following sources:

- Mammal list: Generated from the ADU MammalMap database using the 2529C Half-Degree Square (ADU, 2020);
- Reptile list: Generated from ADU ReptileMap database using the 2529C Half-Degree Square (ADU, 2020a); and

- Amphibian list: Generated from ADU FrogMap database using the 2529C Half-Degree Square (ADU, 2020b).

For data concerning the expected avifaunal species refer to the project avifaunal assessment.

South Africa's official site for Species Information and National Red Lists (SANBI, 2022) was used to provide the most current national Red-List status of fauna. The latest information regarding provincially, and nationally protected fauna was obtained from the following published legislative lists:

- Provincially Protected Wildlife Species (Schedules 1 to 5 of the Mpumalanga Nature Conservation Act 10 of 1998); and
- Nationally Protected Wildlife species (The 2007 lists of Threatened or Protected Species (TOPS), published in terms of Section 56(1) of the NEM:BA, Act No. 10 of 2004).

4.2 Biodiversity Field Survey

A single season field survey was undertaken from the 18th to the 20th of October 2022, which constitutes a wet season survey, to determine the presence of any local SCC and to achieve the delineation of local habitat types and their associated sensitivities. Effort was made to cover all the different habitat types within the PAOI, within the limits of time and access.

4.2.1 Flora Survey

The wet season fieldwork and sample sites were placed within targeted areas (i.e., target sites) perceived as ecologically sensitive based on the preliminary interpretation of satellite imagery (Google Corporation) and GIS analysis (which included the latest applicable biodiversity datasets) available prior to the fieldwork. The focus of the fieldwork was therefore to maximise coverage and navigate to each target site in the field in order to perform a rapid vegetation and ecological assessment at each sample site.

Homogenous vegetation units were subjectively identified using satellite imagery and existing land cover maps (confirmed during the field survey). The floristic diversity and search for protected plants and flora SCC were conducted through timed meanders within representative habitat units. Emphasis was placed on sensitive habitats, especially those overlapping with the PAOI.

The timed random meander method is a highly efficient method for conducting floristic analysis, specifically in detecting protected plants and flora SCC and maximising floristic coverage. In addition, the method is time and cost effective and highly suited for compiling observed flora species lists and therefore gives a rapid indication of flora diversity. The timed meander search was performed based on the original technique described by Goff *et al*. (1982). Suitable habitat for SCC were identified according to Raimondo *et al.* (2009) and targeted as part of the timed meanders.

At each sample site notes were made regarding current impacts (e.g., roads, erosion etc.), and this included the subjective recording of dominant vegetation species and any sensitive features (e.g., wetlands, rock outcrops etc.). In addition, opportunistic observations were made while navigating through the area.

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

- A field guide to Wild flowers (Pooley, 1998), and Field Guide to the Wild Flowers of the Highveld (van Wyk & Malan, 1998);
- Orchids of South Africa (Johnson & Bytebier, 2015);
- Guide to the Aloes of South Africa (Van Wyk & Smith, 2014);
- Medicinal Plants of South Africa (Van Wyk *et al*., 2013);

- Freshwater Life: A field guide to the plants and animals of southern Africa (Griffiths & Day, 2016), and Aquatic and Wetland Plants of Southern Africa (van Ginkel & Cilliers, 2020);
- Identification guide to southern African grasses (Fish et al., 2015);
- Field guide to trees of Southern Africa, Struik Publishers (Van Wyk & Van Wyk, 1997); and
- Problem Plants and Alien Weeds of Southern Africa (Bromilow, 2018).

4.2.2 Fauna Survey

The faunal component of this report pertains only to mammals and herpetofauna (reptiles and amphibians). The faunal field survey utilised a variety of sampling techniques, including but not limited to:

- Visual and auditory searches: This involves strategic meandering and the use of binoculars and specialist camera equipment to view species from a distance without them being disturbed;
- Active hand-searches: Used for species that shelter in or under particular micro-habitats (typically rocks, exfoliating rock outcrops, fallen trees, leaf litter, bark etc.);
- The identification of tracks and signs, and listening to species calls; and
- The utilization of local knowledge.

The relevant field guides and texts consulted for identification purposes included the following:

- Roberts Bird Guide, Second Edition (Chittenden *et al*., 2016);
- The Mammals of the Southern African Subregion (Skinner & Chimimba, 2005);
- Bats of Southern and Central Africa (Monadjem *et al*., 2010);
- Spiders of Southern Africa (Leroy & Leroy, 2003);
- A Guide to the Reptiles of Southern Africa (Alexander & Marais, 2007), and Field Guide to Snakes and other Reptiles of Southern Africa (Branch, 1998);
- Tortoises, Terrapins, and Turtles of Africa (Branch, 2008);
- A Complete Guide to the Frogs of Southern Africa (du Preez & Carruthers, 2009); and
- A Field Guide to the Tracks and Signs of Southern and East African Wildlife (Stuart & Stuart, 2000).

4.3 Terrestrial Site Ecological Importance

The different habitat types within the PAOI were delineated and identified based on observations made during the field survey, and information from available satellite imagery. These habitat types were assigned Ecological Importance (EI) categories based on their ecological integrity, conservation value, the presence of SCC and their ecosystem processes.

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

BI is a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor. The criteria for the CI and FI ratings are provided in Table 4-1 and Table 4-2 respectively.

Table 4-1 Summary of Conservation Importance (CI) criteria

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

Table 4-2 Summary of Functional Integrity (FI) criteria

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

BI can be derived from a simple matrix of CI and FI as provided in Table 4-3.

Table 4-3 Matrix used to derive Biodiversity Importance (BI) from Functional Integrity (FI) and Conservation Importance (CI)

Biodiversity Importance		Conservation Importance				
		Very high	High	Medium	Low	Very low
Functional Integrity	Very high	Very high	Very high	High	Medium	Low
	High	Very high	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very low
	Low	Medium	Medium	Low	Low	Very low
	Very low	Medium	Low	Very low	Very low	Very low

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

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

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

After the determination of BI and RR, the SEI can be ascertained using the matrix as provided in Table 4-5.

Table 4-5 Matrix used to derive Site Ecological Importance from Receptor Resilience (RR) and Biodiversity Importance (BI)

Site Ecological Importance		Biodiversity Importance				
		Very high	High	Medium	Low	Very low
Receptor Resilience	Very Low	Very high	Very high	High	Medium	Low
	Low	Very high	Very high	High	Medium	Very low
	Medium	Very high	High	Medium	Low	Very low
	High	High	Medium	Low	Very low	Very low
	Very High	Medium	Low	Very low	Very low	Very low

Interpretation of the SEI in the context of the proposed project is provided in Table 4-6.

Table 4-6 Guideline for interpreting Site Ecological Importance in the context of proposed activities

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

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

4.4 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- It is assumed that all information received from the client and landowner is accurate;
- The specialist was not provided with an architectural plan or any engineering drawings with regards to the planned development activities and as such the potential impacts arising from these activities may only be assumed based on descriptive information received from the client and the landowner/developer;
- All datasets accessed and utilised for this assessment are considered to be representative of the most recent and suitable data for the intended purposes;
- The assessment area (PAOI) was based on the footprint areas as provided by the client, and any alterations to the area and/or missing GIS information pertaining to the assessment area would have affected the area surveyed and hence the results of this assessment;
- The area was only surveyed during a single site visit and therefore this assessment does not consider temporal trends (note: data collected is considered sufficient for a meaningful baseline);
- A large number of provincially protected plants were observed during the survey (over 100), the GPS logging of this many species was not within the scope of this assessment and as such a plant search and rescue procedure is recommended – whereby an accurate count and extensive location tagging may be obtained;
- Whilst every effort was made to cover as much of the PAOI as possible, representative sampling is completed, and by its nature it is possible that some plant and animal species that are present within the PAOI were not recorded during the field investigations; and

- The GPS used in the assessment has an accuracy of 5 m and consequently any spatial features may be offset by up to 5 m.

5 Results & Discussion

5.1 Desktop Assessments

5.1.1 Spatially Relevent Legislative Boundaries

Due to the scope of planned infrastructure, the proposed project is relevant to both the Strategic Transmission Corridors (EGI) and Renewable Energy Development Zones (REDZs) legislation. As presented in Figure 5-1 and Figure 5-2 below, the PAOI overlaps completely with both the 'international' EGI corridor, as well as the phase 2 Emalahleni solar REDZ.

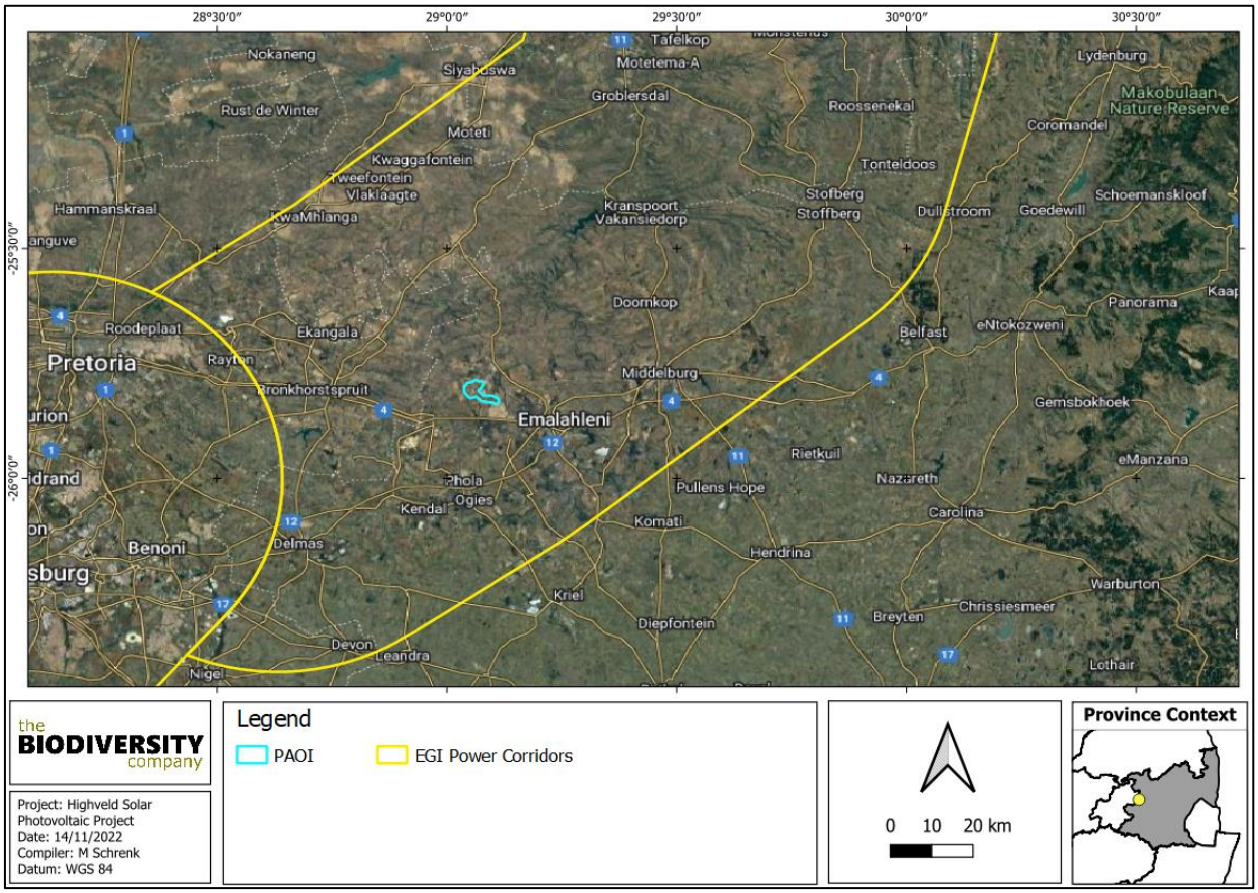


Figure 5-1 Map illustrating the Strategic Transmission Corridors (EGI) dataset relevance

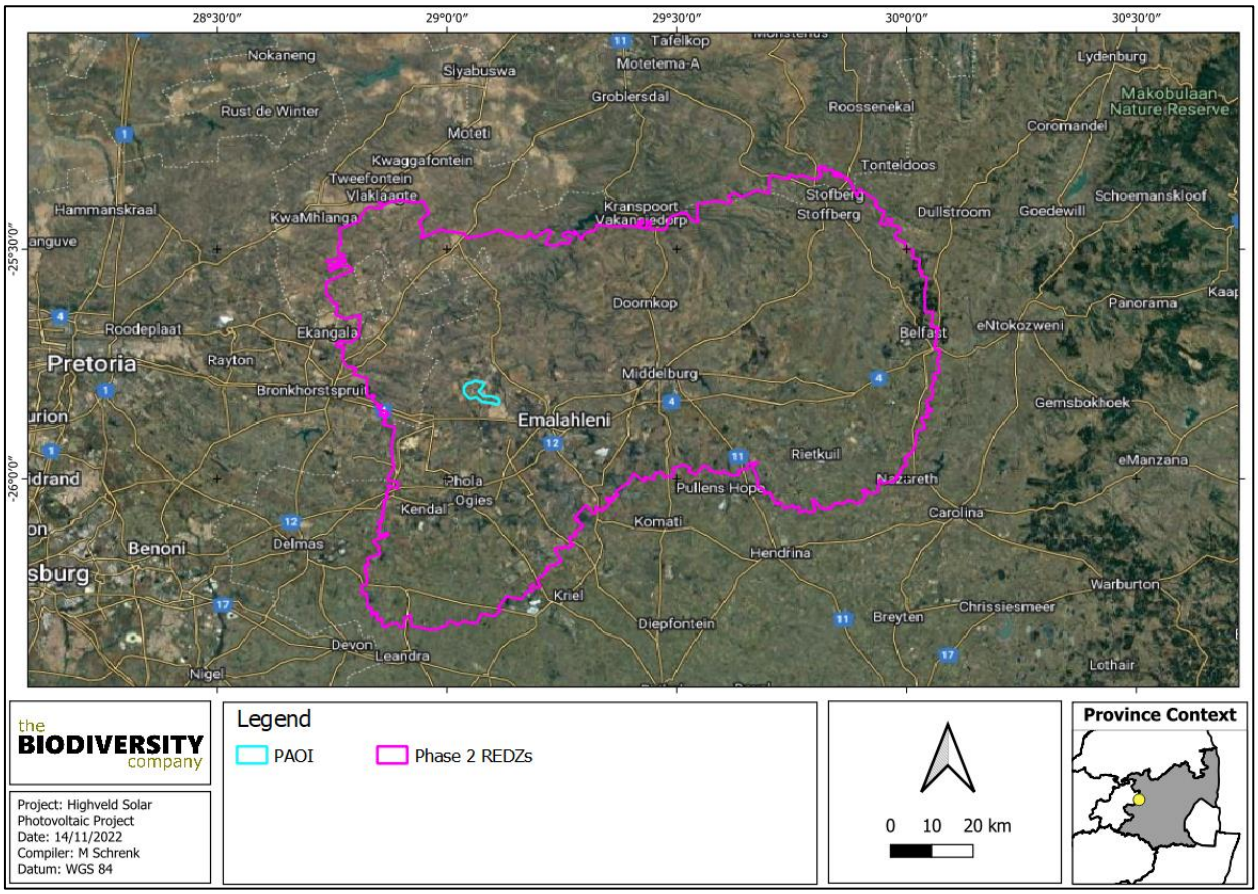


Figure 5-2 Map showing the Renewable Energy Development Zones (REDZs) dataset relevance

5.1.2 Ecologically Important Landscape Features

Table 5-1 below has been produced as a result of the spatial data collected and analysed (as provided by various sources such as the national and provincial environmental authorities and SANBI). It presents a summative breakdown of the ecological boundaries considered and the associated relevance that each has to the region or PAOI. Where a feature is regarded as relevant it is considered an ecologically important landscape feature and discussed further as part of the sub-sections that follow.

Table 5-1 Summary of the spatial relevance of the PAOI to local ecologically important landscape features

Desktop Information Considered	Relevant?	Reasoning	Section
Provincial Conservation Plan	Yes	The PAOI intercepts with terrestrial CBA and ESA areas, and Freshwater ESA areas	5.1.2.1
NBA 2018: Ecosystem Threat Status	Yes	The PAOI overlaps with 'Vulnerable' ecosystems	5.1.2.2
NBA 2018: Ecosystem Protection Level	Yes	The PAOI overlaps with 'Poorly Protected' ecosystems	5.1.2.2
National Protected Areas Expansion Strategy (NPAES)	Yes	Large priority areas for protected area expansion overlap with the PAOI	5.1.2.3
South African Inventory of Inland Aquatic Ecosystems (SAIIAE)	Yes	The PAOI intercepts multiple 'Critically Endangered' wetlands	5.1.2.4
National Freshwater Ecosystem Priority Areas	Yes	The NFEPA database lists one FEPA wetland that intercepts the PAOI	5.1.2.4
Protected and Conservation Areas (SAPAD & SACAD)	No	According to the latest datasets no SAPAD or SACAD areas occur within 10 km of the PAOI	-
Strategic Water Source Areas	No	No Strategic Water Source Areas occur nearby, according to the 2021 dataset	-
Important Bird and Biodiversity Areas (IBA)	No	No IBA areas occur nearby	-

5.1.2.1 Provincial Conservation Plan

According to the 2014 Mpumalanga terrestrial CBA and ESA map dataset the PAOI overlaps mostly with areas classified as 'Heavily Modified' and 'Other Natural Areas', smaller portions of CBA: Irreplaceable and CBA: Optimal are also triggered (Figure 5-3). The freshwater dataset also shows that the PAOI is mostly characterised by 'Heavily Modified' and 'Other Natural Areas', with three sections of ESA: Wetlands crossing portions of the PAOI (Figure 5-4). According to MTPA (2014):

- CBA areas are areas that are required to meet biodiversity targets, for species, ecosystems or ecological processes and these must be kept in a natural state, with no further loss of habitat. Only low-impact, biodiversity-sensitive land-uses are appropriate;
- ESA areas are areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of protected areas or CBAs and for delivering ecosystem services. These must be maintained in a functional, near-natural state, but some habitat loss is acceptable. A greater range of land-uses over wider areas is appropriate, subject to an authorisation process that ensures the underlying biodiversity objectives are not compromised;
- 'Other Natural Areas' have not been identified as a priority in the current systematic biodiversity plan, but retain most of their natural character and perform a range of biodiversity and ecological infrastructural functions. Although they have not been prioritised for biodiversity, they are still an important part of the natural ecosystem; and
- 'Heavily or Moderately Modified Areas' have been modified by human activity to the extent that they are no longer natural, and do not contribute to biodiversity targets.

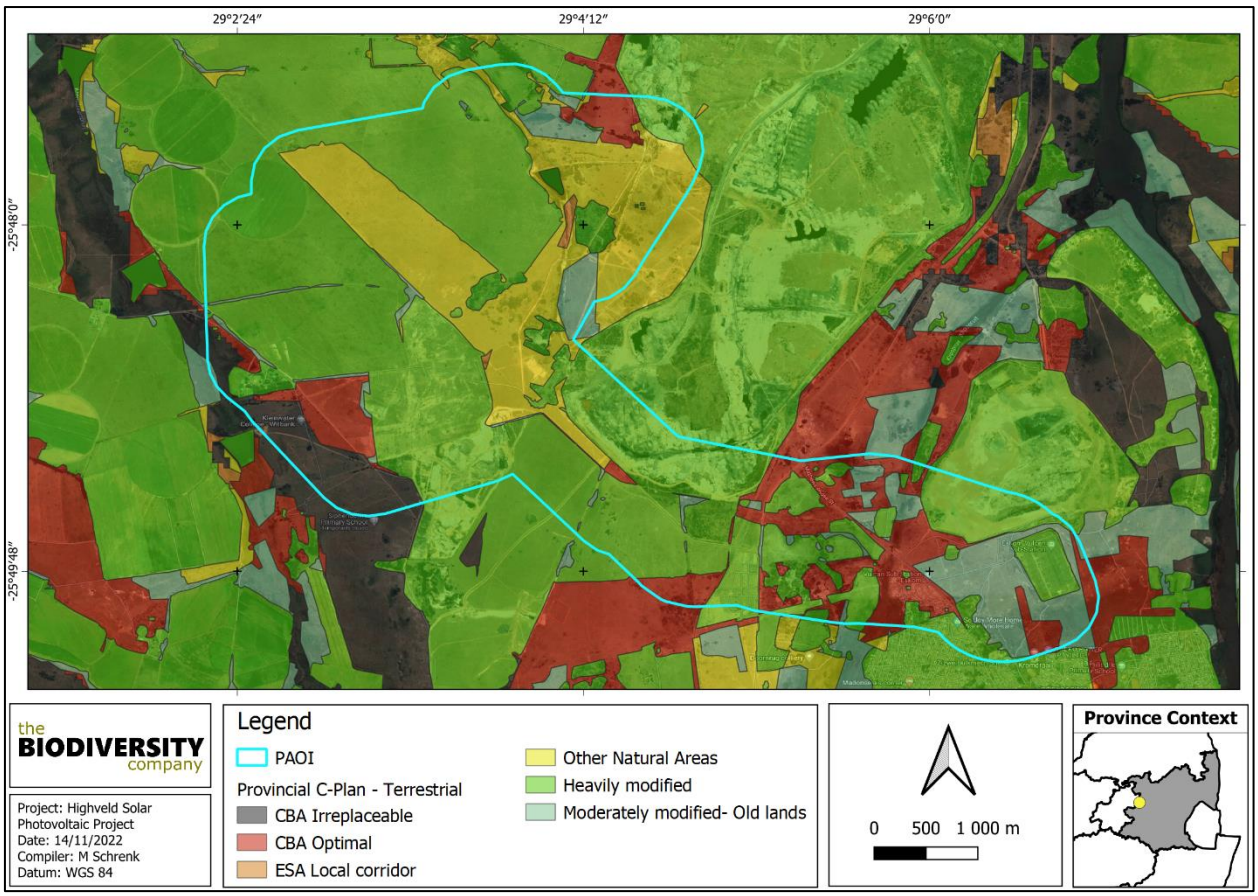


Figure 5-3 Map illustrating the Mpumalanga Terrestrial CBA and ESA map dataset relevance

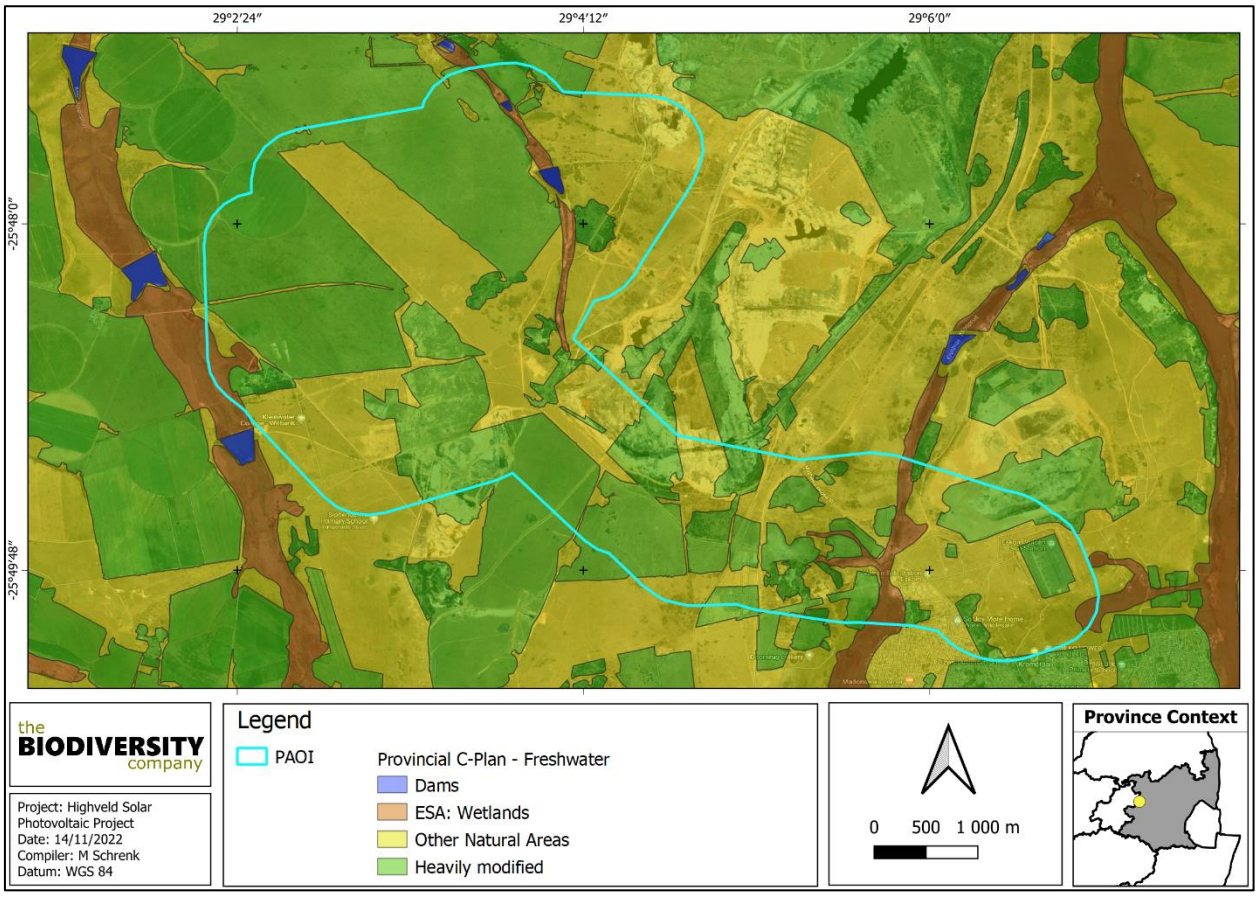


Figure 5-4 Map illustrating the Mpumalanga Freshwater CBA and ESA map dataset relevance

5.1.2.2 National Biodiversity Assessment

According to the 2018 NBA spatial dataset the PAOI overlaps with 'Vulnerable' and 'Poorly Protected' ecosystems (Figure 5-5 and Figure 5-6).

A 'Vulnerable' ecosystem type is one which is considered to be at a high risk of collapse, and 'Poorly Protected' ecosystems are those which have between five per cent and 50% of their biodiversity target included in one or more protected areas (SANBI, 2019).

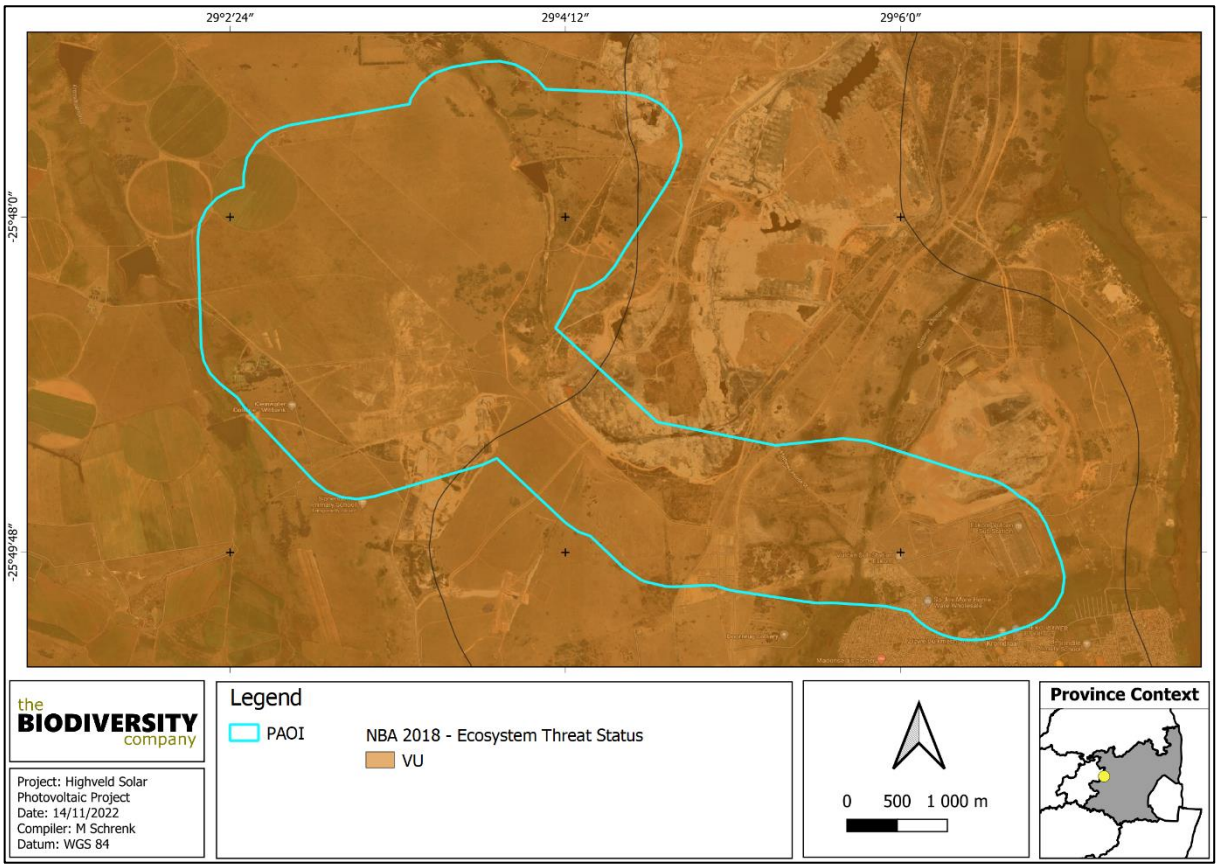


Figure 5-5 Map illustrating the Ecosystem Threat Status associated with the PAOI

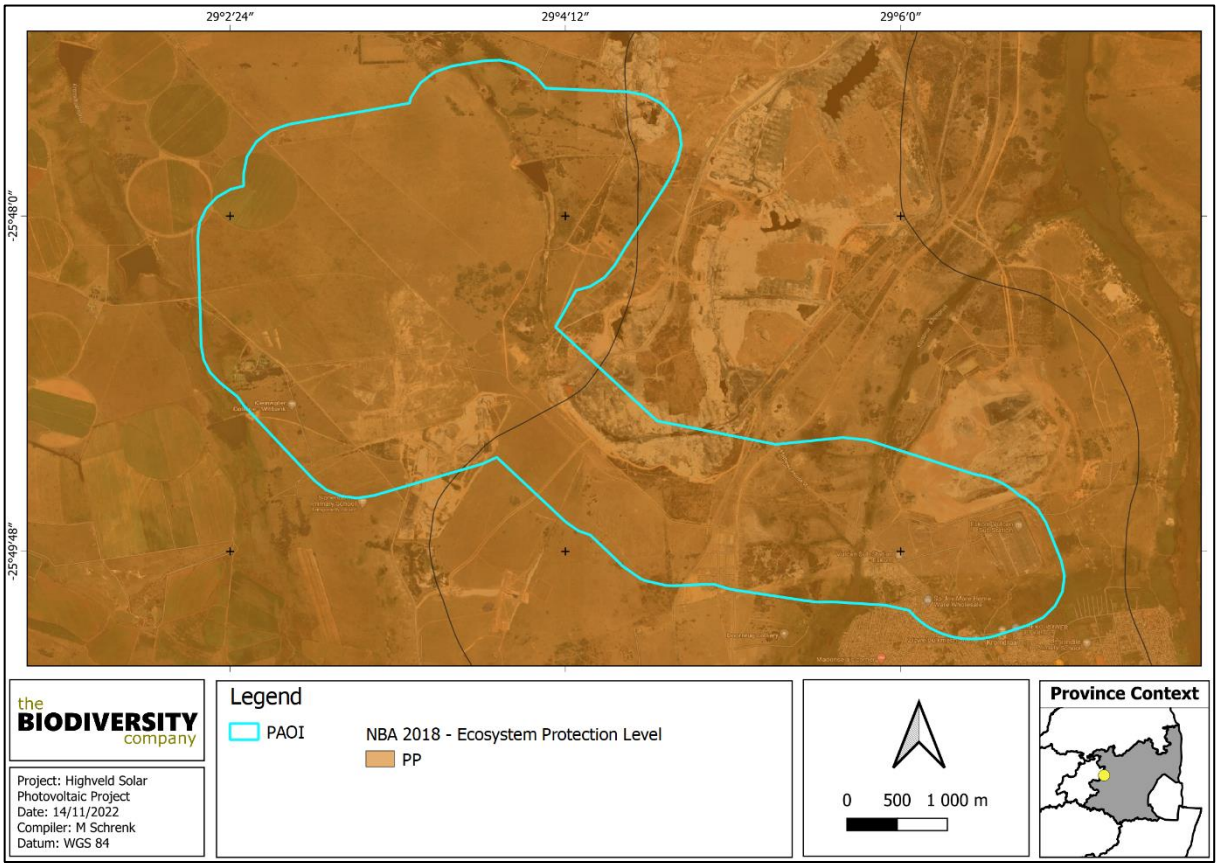


Figure 5-6 Map illustrating the Ecosystem Protection Level associated with the PAOI

5.1.2.3 National Protected Areas Expansion Strategy

Large portions of the PAOI overlap with NPAES priority areas for protected area expansion, as illustrated in Figure 5-7. These areas are typically important for regional conservation due to their status as important habitat or biodiversity areas and their proximity to formally protected areas or CBA's. Priority focus areas are often large portions of undeveloped natural land occurring within important ecosystem types.

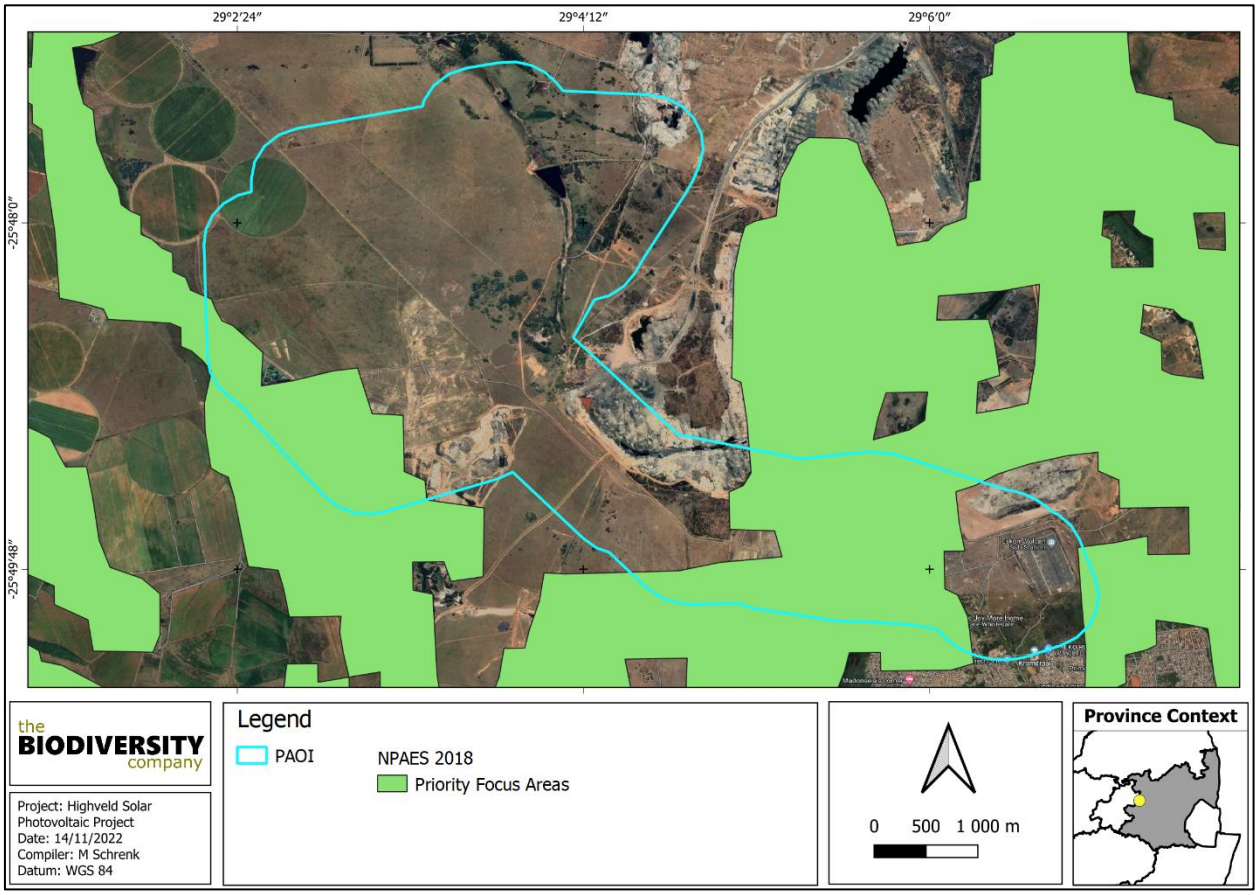


Figure 5-7 Map illustrating the PAOI location in relation to the NPAES dataset

5.1.2.4 Aquatic Habitats

According to the SAIIAE database, three 'Critically Endangered' wetlands intercept with the PAOI (Figure 5-8). The NFEPA database lists one FEPA wetland system that intercepts with the south western portion of the PAOI (Figure 5-9).

'Critically Endangered' systems are considered to be at an extremely high risk of collapse. Most of the ecosystem type has been severely or moderately modified from its natural state and the ecosystem type is likely to have lost much of its natural structure and functioning, and species associated with the ecosystem may have been lost (SANBI, 2019).

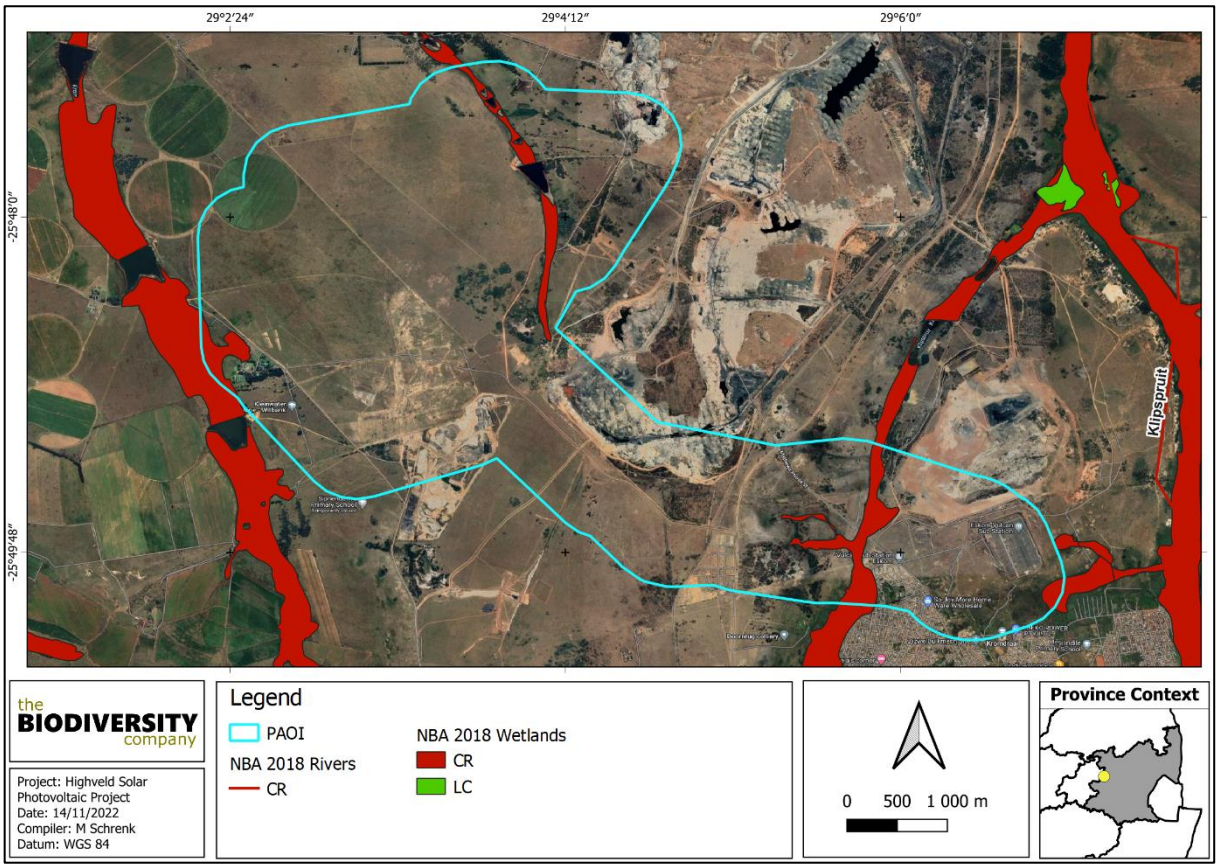


Figure 5-8 Map illustrating the PAOI location in relation to the SAIIAE dataset

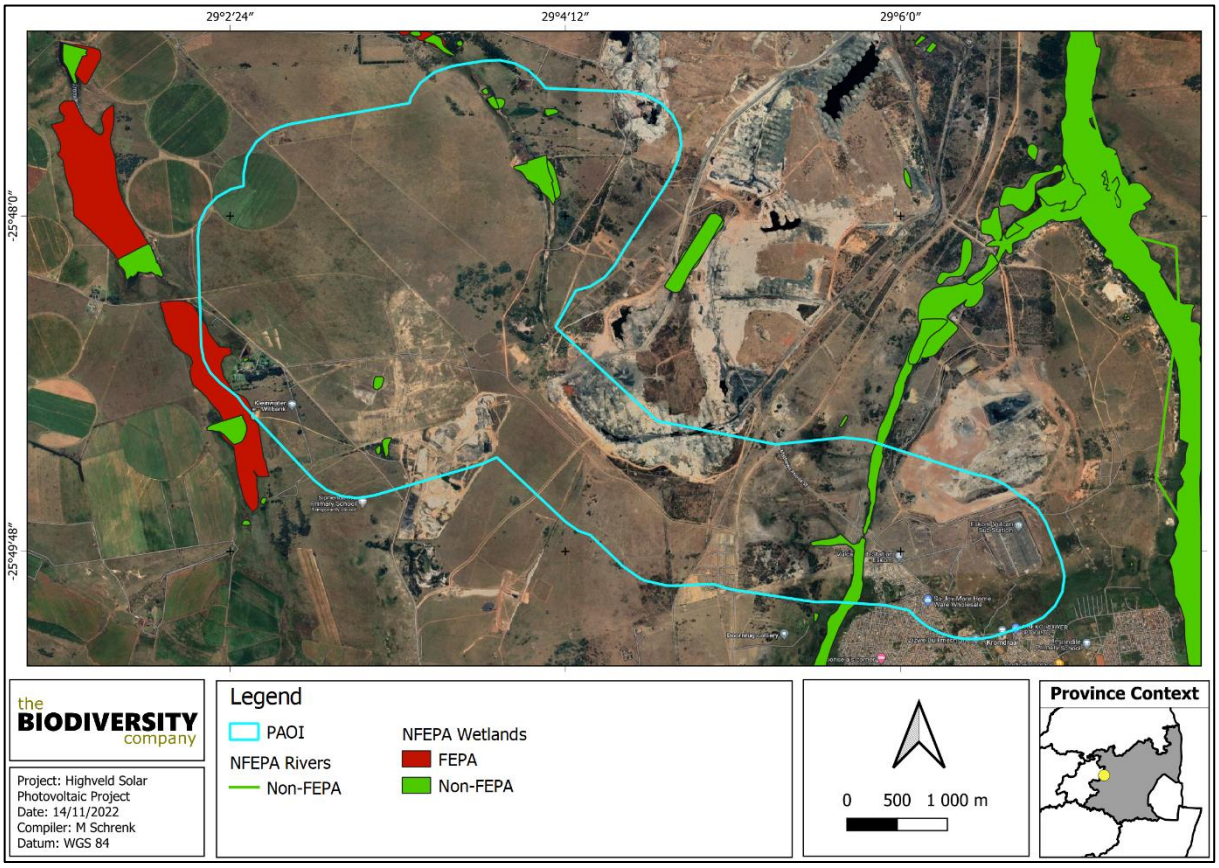


Figure 5-9 Map illustrating the PAOI location in relation to the NFEPA dataset

5.1.3 Flora Assessment

This section is divided into a description of the local vegetation type that would be expected under natural conditions, and the expected flora species.

5.1.3.1 Vegetation Type

The PAOI is situated within the Grassland Biome. The Grassland Biome in South Africa occurs mainly on the Highveld, the inland areas of the eastern seaboard, the mountainous areas of KwaZulu-Natal and the central parts of the Eastern Cape. The topography is mainly flat to rolling, but also includes mountainous regions and the Escarpment (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the Grassland Biome include:

- Summer to strong summer rainfall and winter drought; and
- Frost is common, and fog is found on the upper slopes of the Great Escarpment and seaward scarps (Mucina & Rutherford, 2006).

Grasslands characteristically contain herbaceous vegetation of a relatively short and simple structure that is dominated by graminoids, usually of the family Poaceae. Woody plants are rare (usually made up of low or medium-sized shrubs), absent, or confined to specific habitats such as smaller escarpments or koppies. Core grassland areas usually have deep, fertile soils although a wide spectrum of soil types do occur (Mucina & Rutherford, 2006).

The Grassland Biome is comprised of 4 parent bioregions and a total of 72 different vegetation types. The PAOI is situated within both the Eastern Highveld Grassland and the Rand Highveld Grassland of the Mesic Highveld Grassland Bioregion (Figure 5-10).

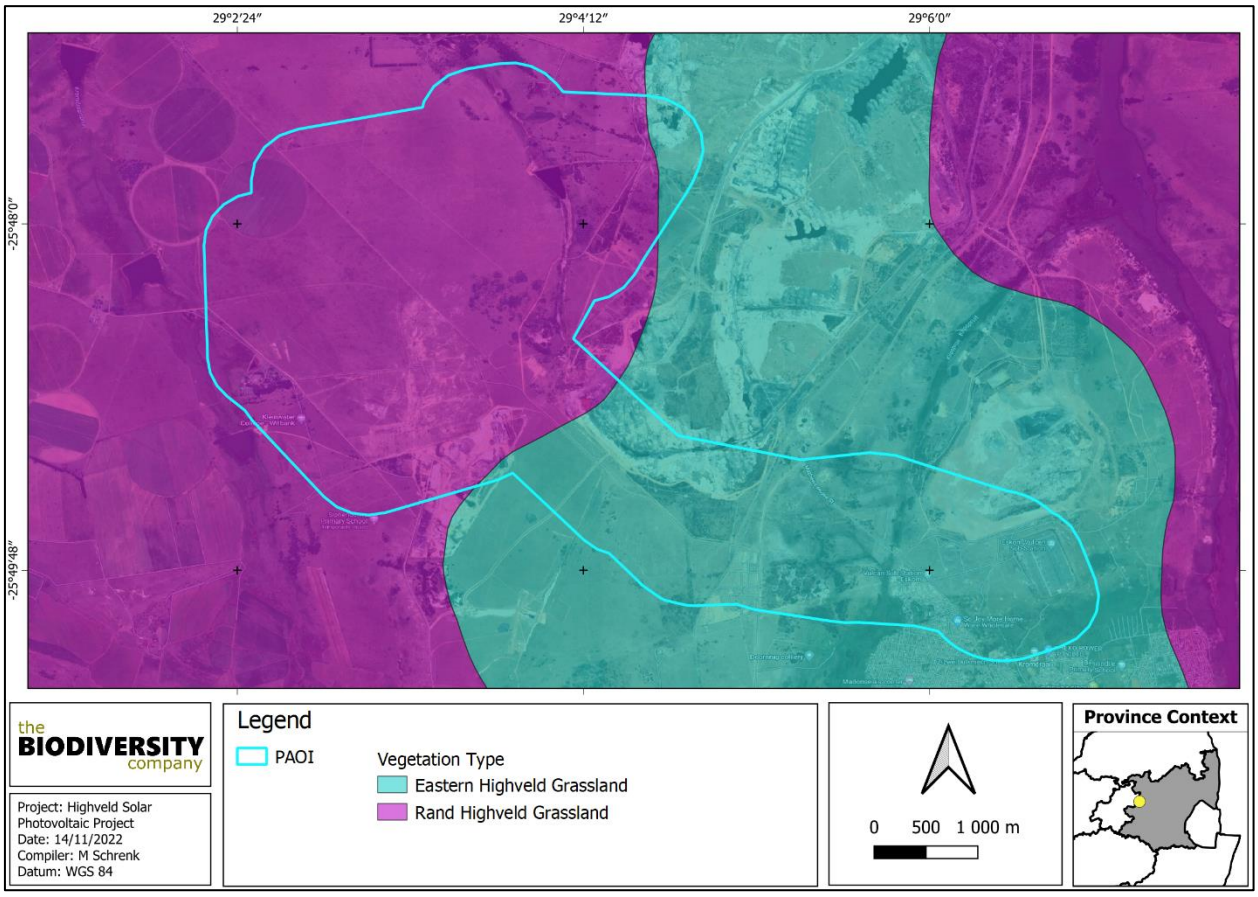


Figure 5-10 Map illustrating the vegetation types associated with the area

5.1.3.1.1 Eastern Highveld Grassland

This vegetation is characterised by slightly to moderately undulating plains, including some low hills and pan depressions. The flora is dominated by short dense grassland populated by the usual highveld grass composition (*Aristida, Digitaria, Eragrostis, Themeda, Tristachya* etc.) with small, scattered rocky outcrops with wiry, sour grasses and some woody species (*Acacia caffra, Celtis africana, Diospyros lycioides subsp lycioides, Parinari capensis, Protea caffra, P. welwitschii and Rhus magalismontanum*) (Mucina & Rutherford, 2006).

Important Plant Taxa

Important plant taxa are those species that have a high abundance, a frequent occurrence, or are prominent in the landscape within a particular vegetation type (Mucina & Rutherford, 2006). The following species are considered important in the Eastern Highveld Grassland vegetation type (d = dominant):

Graminoids: *Aristida aequiglumis (d), A. congesta (d), A. junciformis subsp. galpinii (d), Brachiaria serrata (d), Cynodon dactylon (d), Digitaria monodactyla (d), D. tricholaenoides (d), Elionurus muticus (d), Eragrostis chloromelas (d), E. curvula (d), E. plana (d), E. racemosa (d), E. sclerantha (d), Heteropogon contortus (d), Loudetia simplex (d), Microchloa caffra (d), Monocymbium ceresiiforme (d), Setaria sphacelata (d), Sporobolus africanus (d), S. pectinatus (d), Themeda triandra (d), Trachypogon spicatus (d), Tristachya leucothrix (d), T. rehmannii (d), Alloteropsis semialata subsp. eckloniana, Andropogon appendiculatus, A. schirensis, Bewsia biflora, Ctenium concinnum, Diheteropogon amplectens, Eragrostis capensis, E. gummiflua, E. patentissima, Harpochloa falx, Panicum natalense, Rendlia altera, Schizachyrium sanguineum, Setaria nigrirostris, Urelytrum agropyroides.*

Herbs: *Berkheya setifera (d), Haplocarpha scaposa (d), Justicia anagalloides (d), Pelargonium luridum (d), Acalypha angustata, Chamaecrista mimosoides, Dicoma anomala, Euryops gilfillanii, E. transvaalensis subsp. setilobus, Helichrysum aureonitens, H. caespititium, H. callicomum, H. oreophilum, H. rugulosum, Ipomoea crassipes, Pentanisia prunelloides subsp. latifolia, Selago densiflora, Senecio coronatus, Vernonia oligocephala, Wahlenbergia undulata.*

Geophytic Herbs: *Gladiolus crassifolius, Haemanthus humilis subsp. hirsutus, Hypoxis rigidula var. pilosissima, Ledebouria ovatifolia.*

Succulent Herb: *Aloe ecklonis.*

Low Shrubs: *Anthospermum rigidum subsp. pumilum, Stoebe plumosa.*

Conservation Status of the Vegetation Type

According to Mucina and Rutherford (2006) this vegetation type is classified as ‘Endangered’, with the national target for conservation protection being 24%.

Only very small areas are conserved in statutory reserves (Nooitgedacht Dam and Jericho Dam Nature Reserves) and in private reserves (Holkranse, Kransbank, Morgenstond). Some 44% is transformed primarily by cultivation, plantations, mines, urbanisation and by building of dams (Mucina and Rutherford, 2006).

5.1.3.1.2 Rand Highveld Grassland

Characterised by a highly variable landscape with extensive sloping plains and a series of ridges slightly elevated over undulating surrounding plains. The vegetation is species-rich, wiry, sour grassland alternating with low, sour shrubland on rocky outcrops and steeper slopes. Most common grasses on the plains belong to the genera *Themeda, Eragrostis, Heteropogon* and *Elionurus*. High diversity of herbs, many of which belong to the Asteraceae family, is also a typical feature. Rocky hills and ridges carry sparse (savannoid) woodlands with *Protea caffra subsp. caffra, P. welwitschii, Acacia caffra* and *Celtis africana*, accompanied by a rich suite of shrubs among which the genus *Rhus* (especially *R. magalismonata*) is most prominent. (Mucina & Rutherford, 2006)

Important Plant Taxa

Graminoids: *Ctenium concinnum (d), Cynodon dactylon (d), Digitaria monodactyla (d), Diheteropogon amplec-tens (d), Eragrostis chloromelas (d), Heteropogon contortus (d), Loudetia simplex (d), Monocymbium ceresiiforme (d), Panicum natalense (d), Schizachyrium sanguineum (d), Setaria sphacelata (d), Themeda triandra (d), Trachypogon spicatus (d), Tristachya biseriata (d), T. rehmannii (d), Andropogon schirensis, Aristida aequiglumis, A. congesta, A. junciformis subsp. galpinii, Bewsia biflora, Brachiaria nigropedata, B. serrata, Bulbostylis burchellii, Cymbopogon caesius, Digitaria tricholaenoides, Elionurus muticus, Eragrostis capensis, E. curvula, E. gummiflua, E. plana, E. racemosa, Hyparrhenia hirta, Melinis nerviglumis, M. repens subsp. repens, Microchloa caffra, Setaria nigrirostris, Sporobolus pectinatus, Trichoneura grandiglumis, Urelytrum agropyroides.*

Herbs: *Acanthospermum australe (d), Justicia anagalloides (d), Pollichia campestris (d), Acalypha angustata, Chamaecrista mimosoides, Dicoma anomala, Helichrysum caespititium, H. nudifolium var. nudifolium, H. rugulosum, Ipomoea crassipes, Kohautia amatymbica, Lactuca inermis, Macledium zeyheri subsp. argyrophylum, Nidorella hottentotica, Oldenlandia herbacea, Rotheca hirsuta, Selago densiflora, Senecio coronatus, Sonchus dregeanus, Vernonia oligocephala, Xerophyta retinervis.*

Geophytic Herbs: *Boophone disticha, Cheilanthes hirta, Haemanthus humilis subsp. humilis, Hypoxis rigidula var. pilosissima, Ledebouria ovatifolia, Oxalis corniculata.*

Succulent Herb: *Aloe greatheadii var. davyana.*

Low Shrubs: *Anthospermum rigidum subsp. pumilum, Indigofera comosa, Rhus magalismontana, Stoebe plumosa.*

Succulent Shrub: *Lopholaena coriifolia (d).*

Geoxylic Suffrutex: *Elephantorrhiza elephantina.*

Biogeographically Important Taxa

Geophytic Herbs: *Agapanthus inapertus subsp. pendulus, Eucomis vandermerwei.*

Succulent Herb: *Huernia insigniflora.*

Low Shrub: *Melhania randii.*

Endemic Taxa

Herbs: *Melanospermum rudolfii, Polygala spicata.*

Succulent Herbs: *Anacampseros subnuda subsp. lubbersii, Frithia humilis.*

Succulent Shrubs: *Crassula arborescens subsp. undulatifolia, Delosperma purpureum.*

Small Trees: *Encephalartos lanatus, E. middelburgensis.*

Conservation Status of the Vegetation Type

According to Mucina and Rutherford (2006) this vegetation type is classified as ‘Endangered’, with the national target for conservation protection being 24%.

The vegetation unit is poorly conserved (only 1%). Small patches are protected in statutory reserves (Kwaggavoetpad, Van Riebeeck Park, Bronkhorstspruit, Boskop Dam Nature Reserves) and in private conservation areas (e.g. Doornkop, Zemvelo, Rhenosterpoort and Mpopomeni). Almost half of the vegetation area has been transformed mostly by cultivation, plantations, urbanisation or dam-building (Mucina and Rutherford, 2006).

5.1.3.2 Expected Flora Species

The POSA database indicates that over 870 species of plants could be expected to occur within and around the PAOI. Six (6) of the expected species are classified as SCC, based on their conservation statuses (Table 5-2).

Table 5-2 SCC flora species that may occur within the Project Area of Influence

Family	Species	Author	SANBI Red-List Status	Ecology
Anacampserotaceae	*Anacampseros subnuda subsp. lubbersii*	Poelln.	VU	Indigenous; Endemic
Fabaceae	*Argyrolobium megarrhizum*	Bolus	NT	Indigenous; Endemic
Apocynaceae	*Aspidoglossum validum*	Kupicha	DDD	Indigenous
Iridaceae	*Gladiolus paludosus*	Baker	VU	Indigenous
Aizoaceae	*Khadia carolinensis*	(L.Bolus) L.Bolus	VU	Indigenous; Endemic
Hyacinthaceae	*Merwilla plumbea*	(Lindl.) Speta	NT	Indigenous

5.1.4 Fauna Assessment

This section of the report details the lists of expected SCC fauna species that may occur within the PAOI, where the fauna species considered include mammals, reptiles, and amphibians. Where the likelihood of a particular species occurring within the Project Area of Influence is rated by the specialist as being either moderate or high, based on the known habitat and prey/forage preferences of a particular species (linked with the field survey data obtained), the relevant species is then further discussed below a given table.

5.1.4.1 Mammals

The IUCN Red List spatial database, in addition to the MammalMap database, lists over 90 mammal species that could be expected to occur within and around the PAOI. Five (5) of these expected species are regarded as SCC (Table 5-3), and of these SCC four (4) have a moderate-high likelihood of occurrence based on the presence of suitable habitat and food sources in the area. Mammals that are typically limited to formally protected areas are not included in the SCC count.

Table 5-3 SCC mammal species that may occur within the Project Area of Influence

Species	Common Name	Conservation Status		Likelihood of Occurrence
		SANBI (2022)	IUCN (2021)	
Atelerix frontalis	Southern African Hedgehog	NT	LC	High
Crocidura maquassiensis	Makwassie Musk Shrew	VU	LC	Moderate
Crocidura mariquensis	Swamp Musk Shrew	NT	LC	Moderate
Leptailurus serval	Serval	NT	LC	Low
Parahyaena brunnea	Brown Hyena	NT	NT	Moderate

Atelerix frontalis (South African Hedgehog) has a tolerance of a degree of habitat modification and occurs in a wide variety of semi-arid and sub-temperate habitats (IUCN, 2017). Based on the Red List of Mammals of South Africa, Lesotho and Swaziland (2016), *A. frontalis* populations are decreasing due to the threats of electrocution, veld fires, road collisions, predation from domestic pets and illegal harvesting. Although the species is cryptic and therefore not often seen, there is suitable habitat in the project area and therefore the likelihood of occurrence is rated as high.

Crocidura maquassiensis (Maquassie Musk Shrew) is listed as Vulnerable (VU) on a regional basis and is known to be found in rocky, mountain habitats. Although it may tolerate a wider range of habitats and individuals have been collected in Kwa-Zulu Natal from a garden, and in mixed bracken and grassland

alongside a river at 1,500 m (IUCN, 2017). There is some suitable habitat for this species in the area and therefore the likelihood of occurrence is rated as moderate.

Crocidura mariquensis (Swamp Musk Shrew) has very specific habitat requirements. It occurs in close proximity to open water with a distinct preference for marshy ponds, and riverine and semi-aquatic vegetation such as reed beds (IUCN, 2017). It is considered to be common in suitable habitats. Due to the presence of some of this habitat type in the area (although disturbed), the likelihood of occurrence of this species was rated as moderate.

Parahyaena brunnea (Brown Hyaena) is endemic to southern Africa. This species occurs in dry areas, generally with annual rainfall less than 100 mm, particularly along the coast, semi-desert, open scrub and open woodland savanna. Given its known ability to persist outside of formally protected areas the likelihood of occurrence of this species in the project area is moderate. The presence of common small and medium herbivores nearby and on adjacent farms increases the likelihood of occurrence of this species.

5.1.4.2 Reptiles

Based on the IUCN Red List spatial database and the ReptileMap database, over 50 reptile species may be expected to occur within and nearby to the PAOI. Five (5) of these species are regarded as SCC, and three (3) are assigned a moderate likelihood of occurence (Table 5-4).

Table 5-4 SCC reptile species that may occur within the Project Area of Influence

Species	Common Name	Conservation Status		Likelihood of Occurrence
		SANBI (2022)	IUCN (2021)	
Chamaesaura aenea	Coppery Grass Lizard	LC	NT	Moderate
Chamaesaura macrolepis	Large-scaled Grass Lizard	NT	LC	Moderate
Homoroselaps dorsalis	Striped Harlequin Snake	LC	NT	Moderate
Kinixys lobatsiana	Lobatse Hinged Tortoise	VU	VU	Low
Psammophis leightoni	Cape Sand Snake	VU	LC	Low

Chamaesaura aenea (Coppery Grass Lizard) is listed as near threatened (NT) globally (IUCN, 2017). The species is found in Southern Africa, in the grassland biome. Their decline is mainly linked to habitat loss as well as a decline in habitat quality. The likelihood of occurrence is rated as moderate due to the availability of some suitable grassland and rocky habitat.

Chamaesaura macrolepis (Large-scaled Grass Lizard) is endemic to South Africa (KwaZulu-Natal, Mpumalanga and Limpopo), Swaziland and Zimbabwe. They occur in the Savanna, Indian Ocean Coastal Belt and Grassland biomes where they are found in the grassland, especially on rocky, grassy hillsides. The species is threatened by transformation of land for crop farming and plantations, overgrazing by livestock, infrastructural development, frequent anthropogenic fires and the use of pesticides. The likelihood of occurrence in the area is rated as moderate as some suitable grassland and rocky habitat is present.

Homoroselaps dorsalis (Striped Harlequin Snake) is partially fossorial and known to inhabit old termitaria in grassland habitat (IUCN, 2017). Most of its range is at moderately high altitudes, reaching 1,800 m in Mpumalanga and Swaziland, but it is also found at elevations as low as about 100 m in KwaZulu-Natal. The likelihood of occurrence was rated as moderate as some rocky outcrops were observed across the area where the species may hunt and sunbathe.

5.1.4.3 Amphibians

Based on the IUCN Red List spatial database and FrogMap, over 20 amphibian species may be expected to occur within and nearby to the PAOI. One (1) of these is regarded as an SCC and it is assigned a moderate likelihood of occurrence due to the presence of some suitable wetland habitat (Table 5-5).

Table 5-5 SCC amphibian species that may occur within the Project Area of Influence

Species	Common Name	Conservation Status		Likelihood of Occurrence
		SANBI (2022)	IUCN (2021)	
Pyxicephalus adspersus	Giant Bull Frog	NT	LC	Moderate

Pyxicephalus adspersus (Giant Bullfrog) is a species that inhabits drier savannahs where it is fossorial for most of the year, remaining buried in cocoons. They emerge at the start of the rain season and breed in shallow, temporary waters in pools, pans and ditches (IUCN, 2017). The presence of some suitable aquatic habitat within the PAOI means that this species has a moderate likelihood of occurrence.

5.2 Biodiversity Field Survey

The following sections discuss the results from the field survey that was conducted for the proposed project, which was undertaken in October 2022. These results pertain to the findings as relevant to the entire PAOI.

5.2.1 Flora Survey

This section is divided into two subsections: Indigenous flora; and Invasive Alien Plants (IAPs) of the PAOI.

5.2.1.1 Indigenous Flora

The PAOI was generally found to be rich in flora diversity, despite the extensive disturbances present across the landscape. The most dominant flora was that of grass, herb, and low shrub species, with the most prolific species being *Geigeria aspera* var. *aspera, Hypoxis obtusa, Parinari capensis* subsp. *capensis, Ledebouria marginata*, and the grasses *Hyparrhenia hirta* and *Cynodon dactylon*. Forty-seven (47) species of plant were noted as being prominent in the landscape (Table 5-6) – including thirty-nine (39) indigenous species and eight (8) exotics (of which six (6) are listed invasives, highlighted in brown below). This list is by no means comprehensive, and it is only presented in order to depict an overview of some of the most important and/or notable flora species observed within the vegetation landscape.

No SCC flora were recorded; however, three (3) provincially protected plant species were observed (highlighted in blue below). The plants are protected as per Schedule 11 of the Mpumalanga nature Conservation act. Note: Over one hundred (100) individual *Boophone disticha* plants were recorded, and more are expected to occur within the PAOI, additionally, at least ten (10) *Protea welwitschia* individuals are expected to be found within the PAOI. For this reason, it is recommended that a plant search and rescue plan be developed and implemented prior to the commencement of site clearing – and this must include an application for the appropriate permit.

Figure 5-11 and Figure 5-12 presents photographs of some of the species observed within the PAOI, including the protected plants.

Table 5-6 Notable flora species recorded within the Project Area of Influence

Family	Species	Author	SANBI Red-List Status	Ecology
Fabaceae	*Acacia dealbata*	Link		Invasive, Category 2
Papaveraceae	*Argemone ochroleuca*	Sweet		Invasive, Category 1b
Apocynaceae	*Asclepias stellifera*	Schltr.	LC	Indigenous
Amaryllidaceae	*Boophone disticha*	(L.f.) Herb.	LC	Indigenous, Protected
Fabaceae	*Burkea Africana*	Hook.	LC	Indigenous
Amaryllidaceae	*Crinum graminicola*	I.Verd.	LC	Indigenous, Protected
Poaceae	*Cynodon dactylon*	(L.) Pers.	LC	Indigenous
Solanaceae	*Datura stramonium*	L.		Invasive, Category 1b

Caryophyllaceae	*Dianthus mooiensis*	F.N.Williams	LC	Indigenous
Iridaceae	*Dierama mossii*	(N.E.Br.) Hilliard	LC	Indigenous
Fabaceae	*Elephantorrhiza elephantina*	(Burch.) Skeels	LC	Indigenous
Myrtaceae	***Eucalyptus camaldulensis***	**Dehnh.**		**Invasive, Category 1b/ 2**
Rubiaceae	*Fadogia homblei*	De Wild.	LC	Indigenous
Asteraceae	*Geigeria aspera var. aspera*	Harv.	LC	Indigenous
Apocynaceae	*Gomphocarpus physocarpus*	E.Mey.	LC	Indigenous
Asteraceae	*Hilliardiella elaeagnoides*	(DC.) Swelank.	LC	Indigenous
Poaceae	*Hyparrhenia hirta*	(L.) Stapf	LC	Indigenous
Hypoxidaceae	*Hypoxis obtuse*	Burch. ex Ker Gawl.	LC	Indigenous
Poaceae	*Imperata cylindrica*	(L.) P.Beauv.	LC	Indigenous
Fabaceae	*Indigofera oxytropis*	Benth. ex Harv.	LC	Indigenous
Acanthaceae	*Justicia anagalloides*	(Nees) T.Anderson	LC	Indigenous
Thymelaeaceae	*Lasiosiphon kraussianus*	(Meisn.) Meisn.	LC	Indigenous
Hyacinthaceae	*Ledebouria marginata*	(Baker) Jessop	LC	Indigenous
Hyacinthaceae	*Ledebouria ovatifolia*	(Baker) Jessop	LC	Indigenous
Fabaceae	*Leobordea foliosa*	(Bolus) B.-E.van Wyk	LC	Indigenous
Asteraceae	*Lopholaena coriifolia*	(Sond.) E.Phillips	LC	Indigenous
Poaceae	*Melinis repens*	(Willd.) Zizka	LC	Indigenous
Fabaceae	*Mundulea sericea subsp. sericea*	(Willd.) A.Chev.	LC	Indigenous
Myrothamnaceae	*Myrothamnus flabellifolius*	Welw.	DDT	Indigenous
Asteraceae	*Nidorella hottentotica*	DC.	LC	Indigenous
Lamiaceae	*Ocimum obovatum*	E.Mey. ex Benth.	LC	Indigenous
Onagraceae	*Oenothera stricta*	Ledeb. ex Link		Exotic weed
Polygonaceae	*Oxygonum dregeanum*	Meisn.	LC	Indigenous
Chrysobalanaceae	*Parinari capensis subsp. capensis*	Harv.	LC	Indigenous
Pteridaceae	*Pellaea calomelanos*	(Sw.) Link	LC	Indigenous
Polygalaceae	*Polygala hottentotta*	C.Presl	LC	Indigenous
Proteaceae	***Protea welwitschia***	**Engl.**	**LC**	**Indigenous, Protected**
Asteraceae	*Pseudopegolettia tenella*	(DC.) H.Rob., Skvarla	LC	Indigenous
Dennstaedtiaceae	*Pteridium aquilinum*	(L.) Kuhn	LC	Indigenous
Apocynaceae	*Raphionacme hirsute*	(E.Mey.) R.A.Dyer	LC	Indigenous
Asteraceae	*Senecio coronatus*	(Thunb.) Harv.	LC	Indigenous
Asteraceae	*Seriphium plumosum*	L.	LC	Indigenous
Solanaceae	***Solanum mauritianum***	**Scop.**		**Invasive, Category 1b**
Solanaceae	***Solanum sisymbriifolium***	**Lam.**		**Invasive, Category 1b**
Fabaceae	*Sphenostylis angustifolia*	Sond.	LC	Indigenous
Asteraceae	*Tagetes minuta*	L.		Exotic weed
Velloziaceae	*Xerophyta retinervis*	Baker	LC	Indigenous

Figure 5-11 ***Photographs illustrating some of the indigenous flora species recorded – A) Boophone disticha (protected); B) Protea welwitschii (protected); C) Crinum graminicola (protected); and D) Ledebouria ovatifolia***

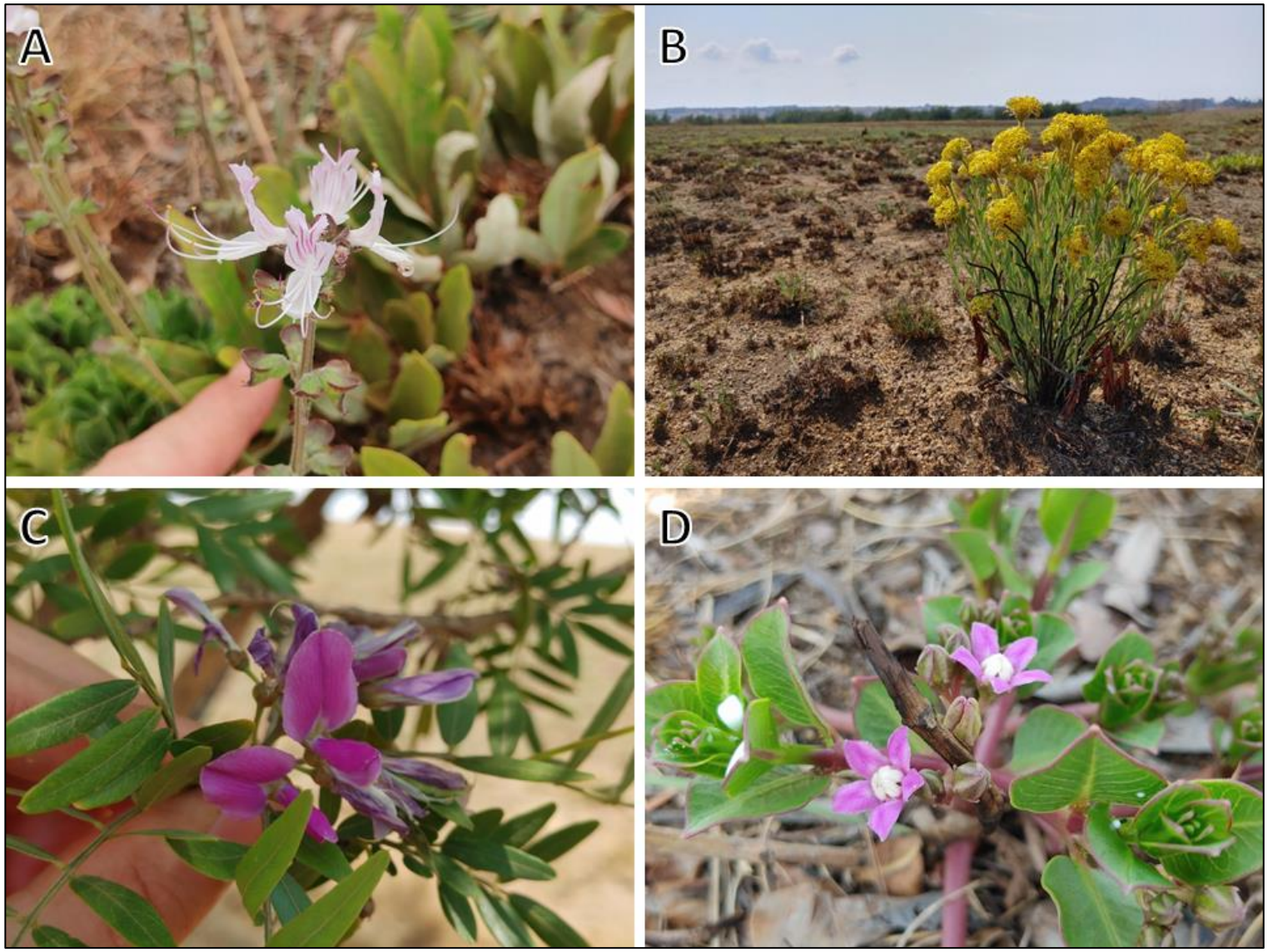


Figure 5-12 ***Photographs illustrating some of the additional indigenous flora species recorded – A) Ocimum obovatum; B) Lasiosiphon kraussianus; C) Mundulea sericea; and D) Raphionacme hirsuta***

5.2.1.2 Invasive Alien Plants

The National Environmental Management: Biodiversity Act, Act No. 10 of 2004, (NEM:BA) is the national legislation that incorporates the mandatory regulation of Invasive Alien Plant (IAP) species, and in September 2020 the most current lists of IAP Species were published in terms of NEM:BA (in Government Gazette No. 43726 of 18 September 2020). The Alien and Invasive Species Regulations serve to define and regulate the various categories of Alien and Invasive Species and were recently updated and published in terms of NEM:BA in the Government Gazette No. 43735 of 25 September 2020. The 2020 Alien and Invasive Species Regulations and Lists were recently extended as published in the Government Gazette No. 44182, 24th of February 2021.

The legislation calls for the removal and/or control of IAP species (Category 1 species). In addition, unless authorised thereto in terms of the National Water Act, no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse. Below is a brief explanation of the three categories in terms of the NEM:BA:

- **Category 1a:** Invasive species requiring compulsory eradication. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
- **Category 1b:** Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
- **Category 2:** Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones. Species existing outside of a regulated area shall be classified as category 1b.
- **Category 3:** Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities: import, possess, grow, breed, move, sell, buy or accept as a gift - involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones as these will be classified as category 1b species.

Note that according to the regulations, any person who has under his or her control a category 1b listed invasive species must immediately:

- Notify the competent authority in writing;
- Take steps to manage the listed invasive species in compliance with:
    - Section 75 of the NEM:BA;
    - The relevant local invasive species management programme developed in terms of regulation 4; and
    - Any directive issued in terms of section 73(3) of the NEMBA.

Six (6) IAP species were recorded during the field survey, four (4) of which are Category 1b species which must be controlled through the implementation of an IAP Management Programme. The common weed *Tagetes minuta* was also observed invading certain sections. Most of the IAP invasion was confined to the proposed grid area, with only some minor invasion of *Solanum sisymbriifolium* noted within the proposed PV footprint. Dense and extensive stands of *Acacia dealbata* were observed in numerous sections. Photographs of some the observed IAP species are presented in Figure 5-13.

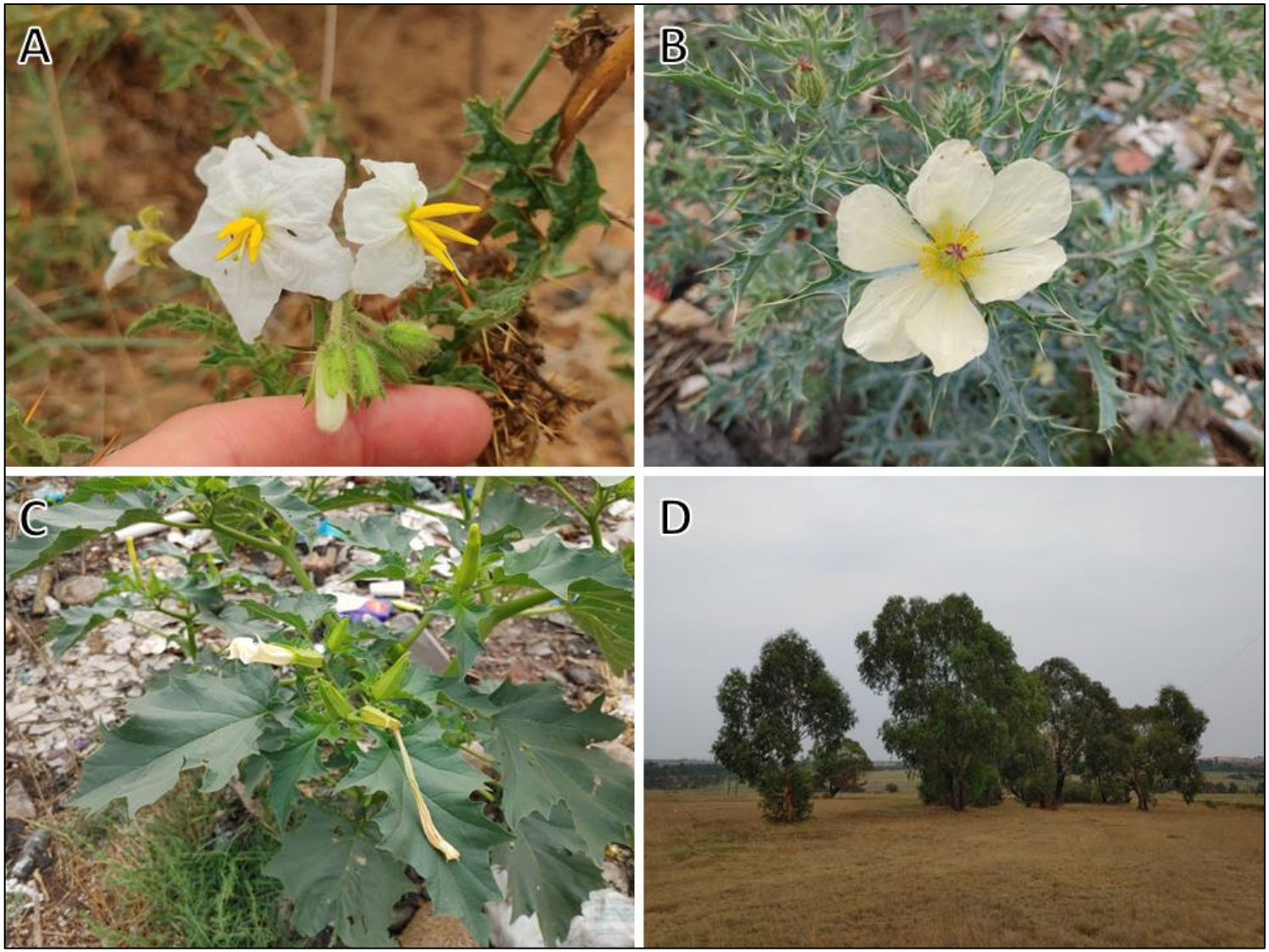


Figure 5-13 ***Photographs illustrating some of the listed IAP flora species recorded within the Project Area of Influence – A) Solanum sisymbriifolium; B) Argemone ochroleuca; C) Datura stramonium; and D) Eucalyptus camaldulensis***

5.2.2 Fauna Survey

Mammal activity during the survey was good, particularly within the proposed PV area as this section is managed as an informal reserve. Ten (10) mammal species were recorded (Table 5-7), and one (1) herpetofauna species was observed during the survey (Table 5-8).

One fauna SCC was recorded, the internationally 'Near Threatened' *Equus quagga* (Plains Zebra), this species is however relatively abundant in Southern Africa and its presence is of little concern to the proposed project.

A larger number of mammal and herpetofauna species are expected to occur in the area, and longer-term multi-season surveys would be required in order to ensure sufficient sampling.

Refer to Figure 5-14 for photographs of some of the recorded fauna species.

Table 5-7 The mammal species recorded during the field survey

Species	Common Name	Conservation Status	
		SANBI (2022)	IUCN (2021)
Antidorcas marsupialis	Springbok	LC	LC
Cynictis penicillata	Yellow Mongoose	LC	LC
Damaliscus pygargus phillipsi	Blesbok	LC	LC
Equus quagga	Plains Zebra	LC	NT
Geosciurus inauris	South African ground squirrel	LC	LC
Lepus saxatilis	Scrub Hare	LC	LC
Phacochoerus africanus	Common Warthog	LC	LC
Raphicerus campestris	Steenbok	LC	LC
Redunca arundinum	Southern Reedbuck	LC	LC
Tragelaphus oryx	Common Eland	LC	LC

Table 5-8 The herpetofauna species recorded during the field survey

Species	Common Name	Conservation Status	
		SANBI (2022)	IUCN (2021)
Schismaderma carens	Red Toad	LC	LC

Note: For results pertaining to the avifaunal species of the area refer to the avifaunal specialist assessment report.

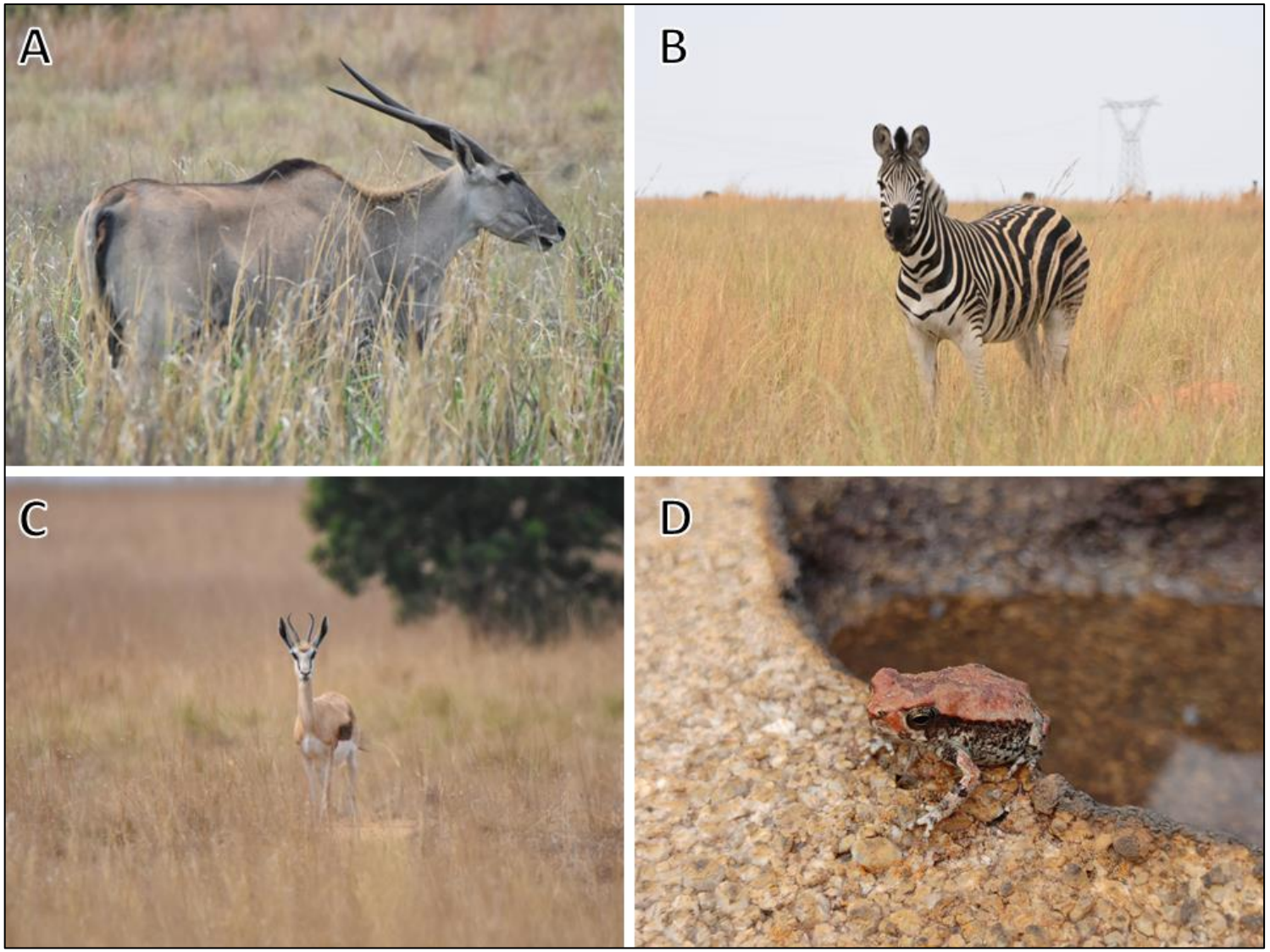


Figure 5-14 ***Photographs: Fauna species recorded during the survey – A) Tragelaphus oryx (Common Eland); B) Equus quagga (Plains Zebra); C) Antidorcas marsupialis (Springbok); and D) Schismaderma carens (Red Toad)***

5.3 Habitat Assessment

The main habitat types identified across the Project Area of Influence were initially delineated largely based on aerial imagery, and these main habitat types were then refined based on the field coverage and data collected during the survey. Six (6) habitats were delineated in total, and these are mapped over the entire PAOI in Figure 5-15 below.

Emphasis was placed on limiting timed meander searches to within the most functional habitats, and therefore habitats with a higher potential of hosting SCC. It is noted that the Modified Grassland habitat closely coincides with the regional historical vegetation types as described by Mucina & Rutherford (2006).

The six habitats are briefly discussed in the sub-sections that follow, and a summary of the habitat types delineated within the Project Area of Influence can be seen in Table 5-9.

Table 5-9 Summary of habitat types delineated within the Project Area of Influence

Habitat Type	Description	Dominant Flora	Habitat Sensitivity
Transformed	Portions of land with very little to no indigenous vegetation remaining, such as roads and township development.	Exotic weeds and invasives such as *Solanum spp.* and *Tagetes minuta*.	Very Low
Critically Modified Grassland	Gently undulating open grassland habitat of a low functionality, impacted by overgrazing and the edge effects of development activities.	*Hyparrhenia hirta* and *Cynodon dactylon grasses* with some dominant populations of several indigenous herbs.	Low
Modified Grassland	Gently undulating open grassland habitat with some functionality and a higher diversity and density of flora species than the Critically Modified Grassland areas.	Diversity of grasses. Diversity of herbs and low shrubs such as *Elephantorrhiza elephantina, Geigeria aspera* var. *aspera, and Hypoxis obtusa.*	Medium
Secondary Water Resource	Significantly impacted permanently to seasonally wet portions of land as delineated by the wetland specialist.	Low diversity of sedge species, and some reeds typical of wet areas.	Medium
Primary Water Resource	Interconnected and important permanently to seasonally wet portions of land as delineated by the wetland specialist. Important foraging resource for local fauna.	Diversity of sedge and reed species, and some habitat specialist flora such as *Dierama mossii*.	High
Rocky Outcrops	Isolated sections of rocky outcrops that serve as important micro-habitat for unique flora and fauna.	Species found in the Modified Grassland habitat, as well as some habitat specialists such as *Pellaea calomelanos*.	High

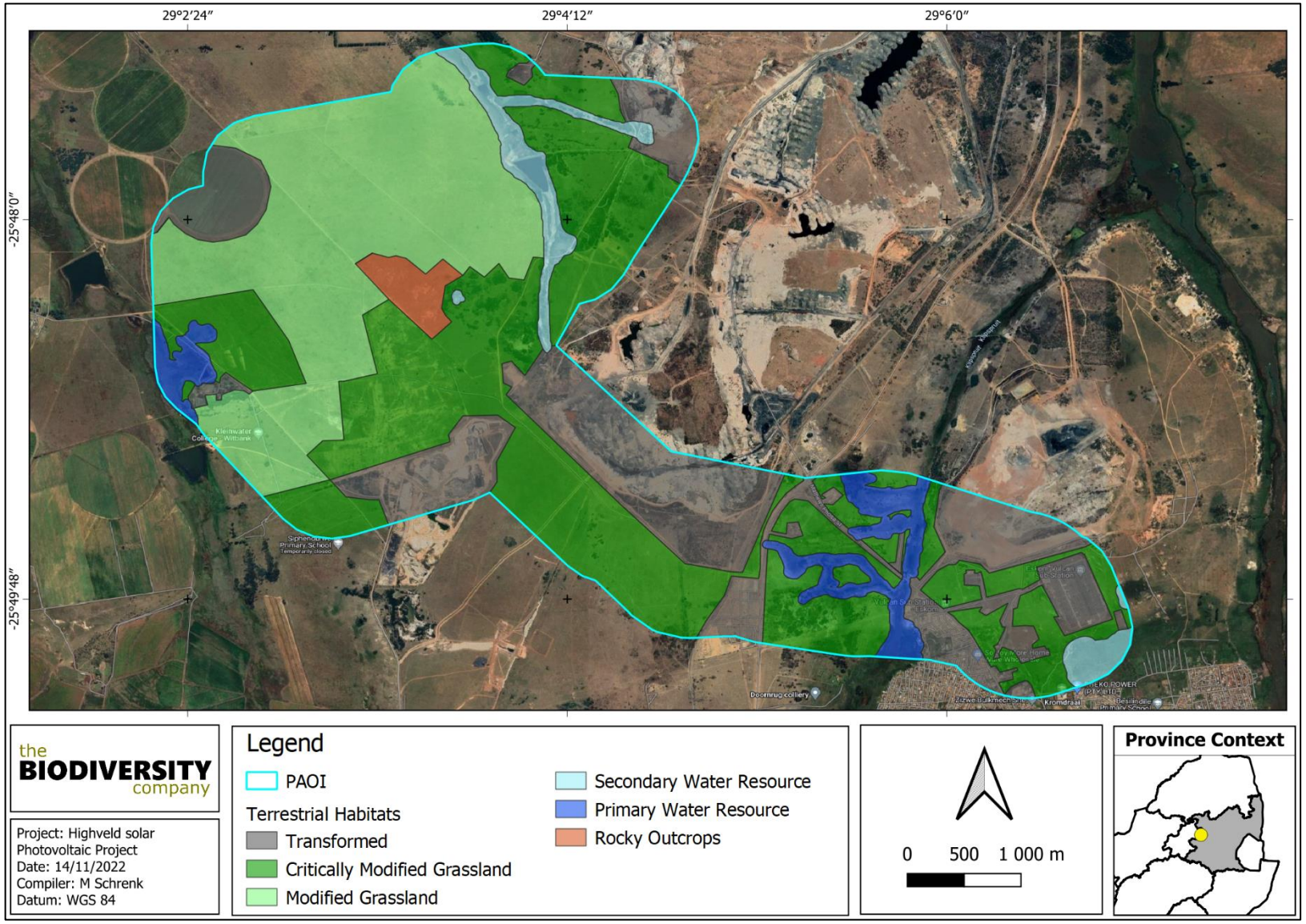


Figure 5-15 Map illustrating the habitats identified in the Project Area of Influence

5.3.1 Transformed Habitat

This habitat unit represents those areas of the PAOI that are considered to have practically no functionality from a terrestrial ecology perspective. Vegetation is almost entirely limited to exotic flora and IAPs, and no SCC fauna are likely to nest or regularly forage in these areas. The most common features include powerline infrastructure, housing developments, roads, and cleared land.

The ecological services provided by this habitat are limited due to the extensive cover of impermeable surfaces and the large amount of bare land. Locally common bird species will forage and nest in the larger trees, and parts of the area may be considered a movement corridor.

Figure 5-16 presents a representative photograph of this habitat type.

Figure 5-16 A representative photograph of the Transformed habitat

5.3.2 Critically Modified Grassland Habitat

Critically Modified Grassland is characterised by open grassland impacted by weed populations, low pioneer grasses, and IAPs. Historical imagery reveals that much of these areas were previously utilised for agricultural land and/or were recently cleared. The habitat has a low level of functionality in its current state and is unlikely to support the regular presence of regional SCC fauna species. Some protected flora species are however found here.

As with the Transformed habitat, ecological services provided by the Critically Modified Grassland are limited. Some erosion protection is provided, and locally common bird species will forage and nest in the larger trees. Parts of the area may be considered a movement corridor, particularly for small mammals. In some instances, these areas provide a buffer zone between the Transformed habitat and the more sensitive Modified Grassland and Water Resources. Figure 5-17 presents a representative photograph of this habitat type.

Figure 5-17 Photograph: Critically Modified Grassland habitat

5.3.3 Modified Grassland Habitat

The north western portions of the PAOI were found to be representative of Modified Grassland habitat, which encompasses open grassland areas with a higher diversity of herbaceous indigenous species and a greater density of grasses and low shrubs. This habitat unit has a higher level of functionality than the Critically Modified Grassland and local SCC fauna species may occasionally forage in these areas. A significant number of protected plants were recorded here.

This habitat provides important ecological services to the surrounding region, including runoff and erosion control enabling rainwater percolation, nutrient cycling within the topsoil layers supporting the healthy functioning of indigenous flora and re-seeding processes, carbon sequestration, and foraging and nesting resources for livestock and local indigenous fauna species (including occasional SCC). The Modified Grassland is also considered an important movement corridor for all types of fauna. Figure 5-18 presents a photograph of the Modified Grassland habitat type.

Figure 5-18 A representative photograph of the Modified Grassland habitat

5.3.4 Water Resource Habitat

The Water Resource areas include those portions of land which have been confirmed as at least seasonally or temporarily wet, such as channelled valley bottom wetlands, by the most recent wetland study. In both the wet and dry seasons these areas are likely to serve as unique foraging resources for local fauna. It is also possible that unique flora, including SCC and protected species, may be found in some of these areas. For specific details pertaining to these areas, including ecological services provided, refer to the most recent wetland assessment – conducted by The Biodiversity Company. Figure 5-19 presents a representative photograph of this habitat unit.

Figure 5-19 A representative photograph of the water resource habitat

5.3.5 Rocky Outcrop Habitat

A small portion of land towards the north west contains a collection of flat, natural rocky outcrops which serve as a unique microhabitat feature that is likely to be supportive of reptile and small mammal species native to the area (Figure 5-20). The feature is also likely to be supportive of habitat specialist flora, such as geophytes and micro succulents. SCC may be found to occur here.

Figure 5-20 A representative photograph of the rocky outcrop habitat

5.4 Site Ecological Importance

Based on the criteria provided in section 4.3 of this report, the six delineated habitat types have each been allocated a sensitivity category, or SEI, and this breakdown is presented in Table 5-10 below. In order to identify and spatially present sensitive features in terms of the relevant specialist discipline, the sensitivities of each of the habitat types delineated within the PAOI are mapped in Figure 5-21 below.

It is important to note that this map does not replace any local, provincial, or national government legislation relating to these areas or the land use capabilities or sensitivities of these environments.

Table 5-10 Sensitivity summary of the habitat types delineated within the Project Area of Influence

Habitat	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Transformed	Low	Low	**Low**	High	**Very Low**
Critically Modified Grassland	Low	Medium	**Low**	Medium	**Low**
Modified Grassland	Medium	Medium	**Medium**	Medium	**Medium**
Secondary Water Resource	Medium	Low	**Low**	Low	**Medium**
Primary Water Resource	High	Medium	**Medium**	Low	**High**
Rocky Outcrop	Medium	Medium	**Medium**	Low	**High**

Consider the following guidelines when interpreting SEI in the context of any proposed development or disturbance activities (noted in conjunction with provincial guidelines pertaining to ESA and CBA areas):

- Very Low: Minimisation mitigation – Development activities of medium to high impact acceptable and restoration activities may not be required.
- Low: Minimisation and restoration mitigation – Development activities of medium to high impact acceptable followed by appropriate restoration activities.
- Medium: Minimisation and restoration mitigation – Development activities of medium impact acceptable followed by appropriate restoration activities.
- High: Avoidance mitigation wherever possible.
    - Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted, limited development activities of low impact acceptable.
    - Offset mitigation may be required for high impact activities.

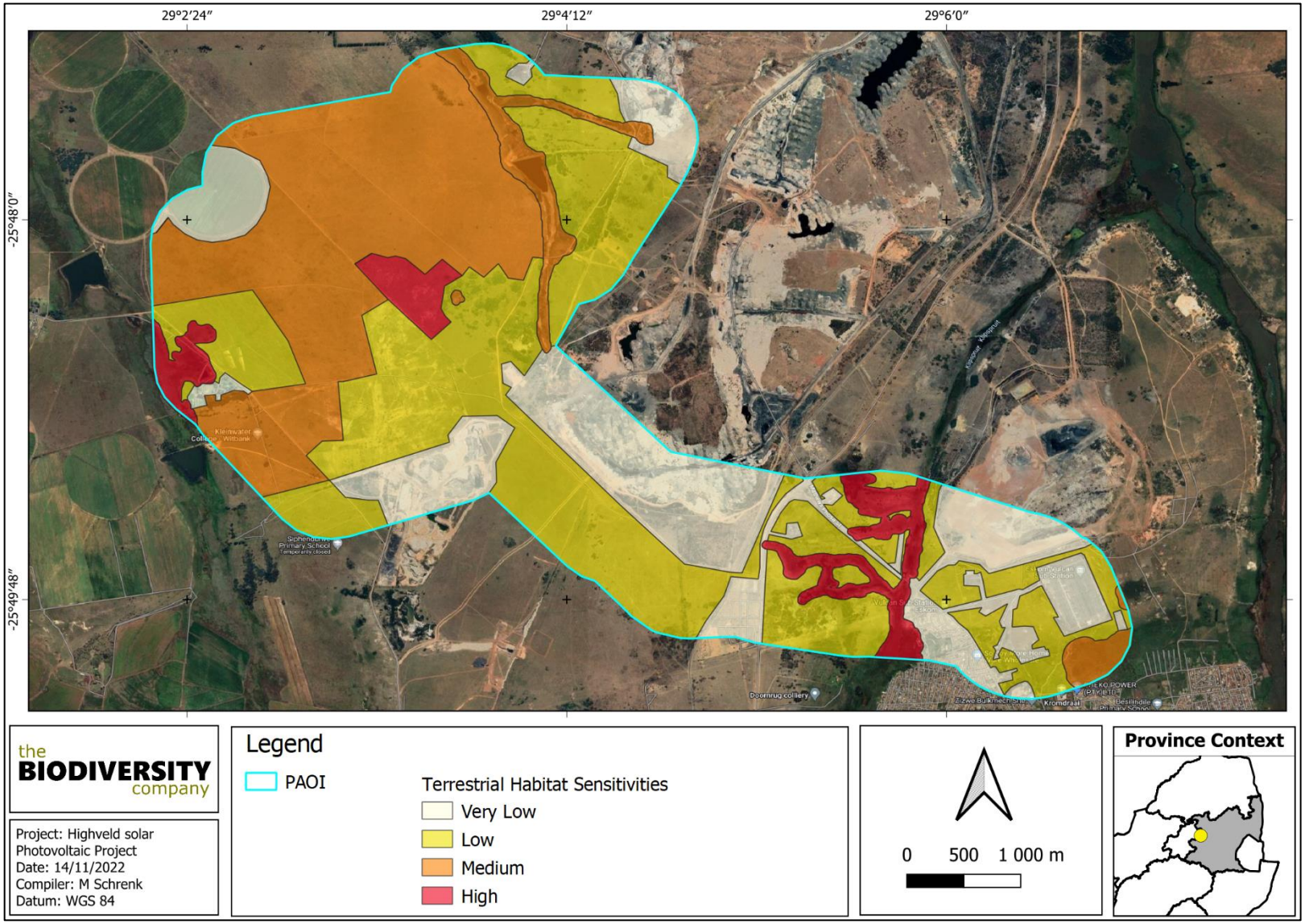
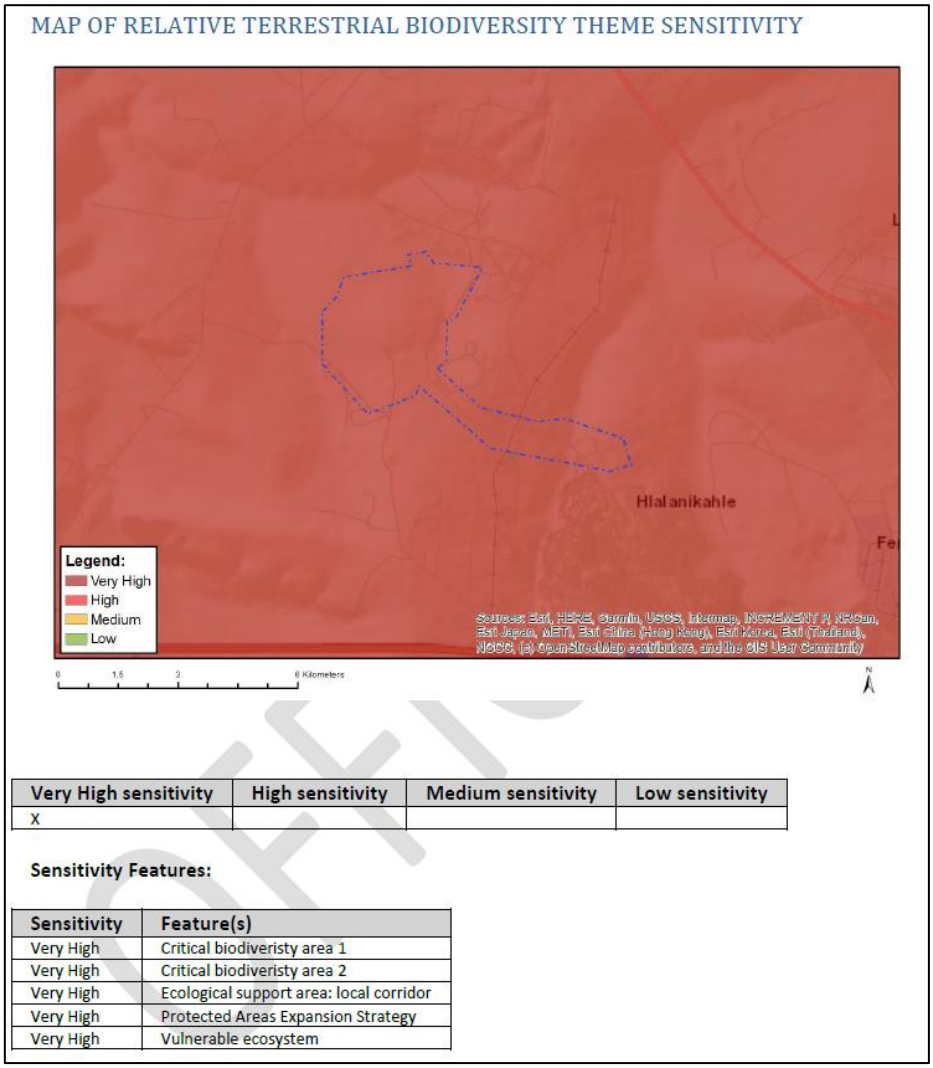


Figure 5-21 Map illustrating the sensitivities of the habitats delineated within the overall Project Area of Influence

5.4.1 Screening Tool Comparison

The relative terrestrial biodiversity theme sensitivity as indicated by the screening tool report for the overall PAOI was derived to be 'Very High' (Figure 5-22), due to the presence of CBA, ESA, NPAES, and threatened ecosystem areas.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	Critical biodiveristy area 1
Very High	Critical biodiveristy area 2
Very High	Ecological support area: local corridor
Very High	Protected Areas Expansion Strategy
Very High	Vulnerable ecosystem

Figure 5-22 Relative Terrestrial Biodiversity Theme Sensitivity for the Project Area of Influence (National Environmental Screening Tool, 2022)

The allocated sensitivities for each of the relevant themes are either disputed or validated for the overall PAOI in Table 5-11 below. A summative explanation for each result is provided as relevant. The specialist-assigned sensitivity ratings are based largely on the SEI process followed in the previous section, and consideration is given to any observed or likely presence of SCC or protected species. Note: Avifauna are not considered, as this is treated as part of a separate specialist assessment.

Table 5-11 Summary of the screening tool vs specialist assigned sensitivities

Screening Tool Theme	Screening Tool	Specialist	Tool Validated or Disputed by Specialist - Reasoning
Animal Theme	**High**	**Medium**	Disputed – Habitat is generally disturbed and adjacent to roads and development, thus the regular presence of SCC is unlikely. SCC may forage in specific areas.
Plant Theme	**Medium**	**Medium**	Validated - The presence of many protected plants means that a relocation and/or destruction permit needs to be issued. A total of up to 200 individuals may occur.
Terrestrial Theme	**Very High**	**Medium**	Disputed – Much of the area is historically disturbed, however some functionality and important connectivity remains. Some high sensitivity habitat is present.

6 Impact Assessment and Management Plan

The sections below serve to outline and quantify the types of perceived impacts from the proposed activities on the terrestrial biodiversity and ecology of the Project Area of Influence. The associated significance of each impact is evaluated as relevant to the local biodiversity and the likely project activities.

6.1 Biodiversity Risk Assessment

6.1.1 Impact Assessment Considerations and Procedure

The project activities will have a negative effect on the natural environment of the area. Anthropogenic activities drive habitat destruction leading to the displacement of fauna and flora and possibly causing direct mortality. Land clearing destroys local wildlife habitat and can lead to the loss of local breeding grounds, foraging and nesting sites, and wildlife movement corridors such as rivers, streams and drainage lines, or other locally important features. The removal of natural vegetation is likely to reduce the habitat available for all types of fauna species and hence reduce animal populations and species compositions within the area.

Potential impacts were evaluated against the data captured during the desktop assessment and field survey to identify associated relevance to the habitats within the PAOI. The impacts associated with the proposed activities were then subjected to a prescribed impact assessment methodology as provided by the client, which is available on request. The planning, decommissioning and/or rehabilitation phases were not considered based on the nature of the likely activities and the associated negatable impacts expected during these phases. Refer to section 6.2 below for the full impact assessment.

6.1.2 Present Impacts to Biodiversity

Considering the fact that anthropogenic activities have historically taken place throughout most of the region, and continue to do so, several significantly negative impacts to biodiversity were observed within and adjacent to the PAOI. These include:

- Historic land modification largely in the form of housing development, and road and powerline infrastructure, and the associated land clearing and edge effects;
- Domestic animal grazing, including herds of sheep, cattle and horses;
- Small to large scale informal dumping, including the dumping of hazardous scrap metal;
- Air, dust and noise pollution;
- Minor and major gravel roads;
- Invasive Alien Plants and exotic weeds;
- Recent and extensive veld fires;
- Bare land and the corresponding high erosion potential; and
- Fences and the associated infrastructure.

As illustrated in Figure 6-1, powerline infrastructure, extensive dumping, major roadways, and domestic animal grazing pose some of the major ongoing impacts to the biodiversity of the PAOI. These impacts are pre-existing and are currently degrading the ecological functionality of the area.

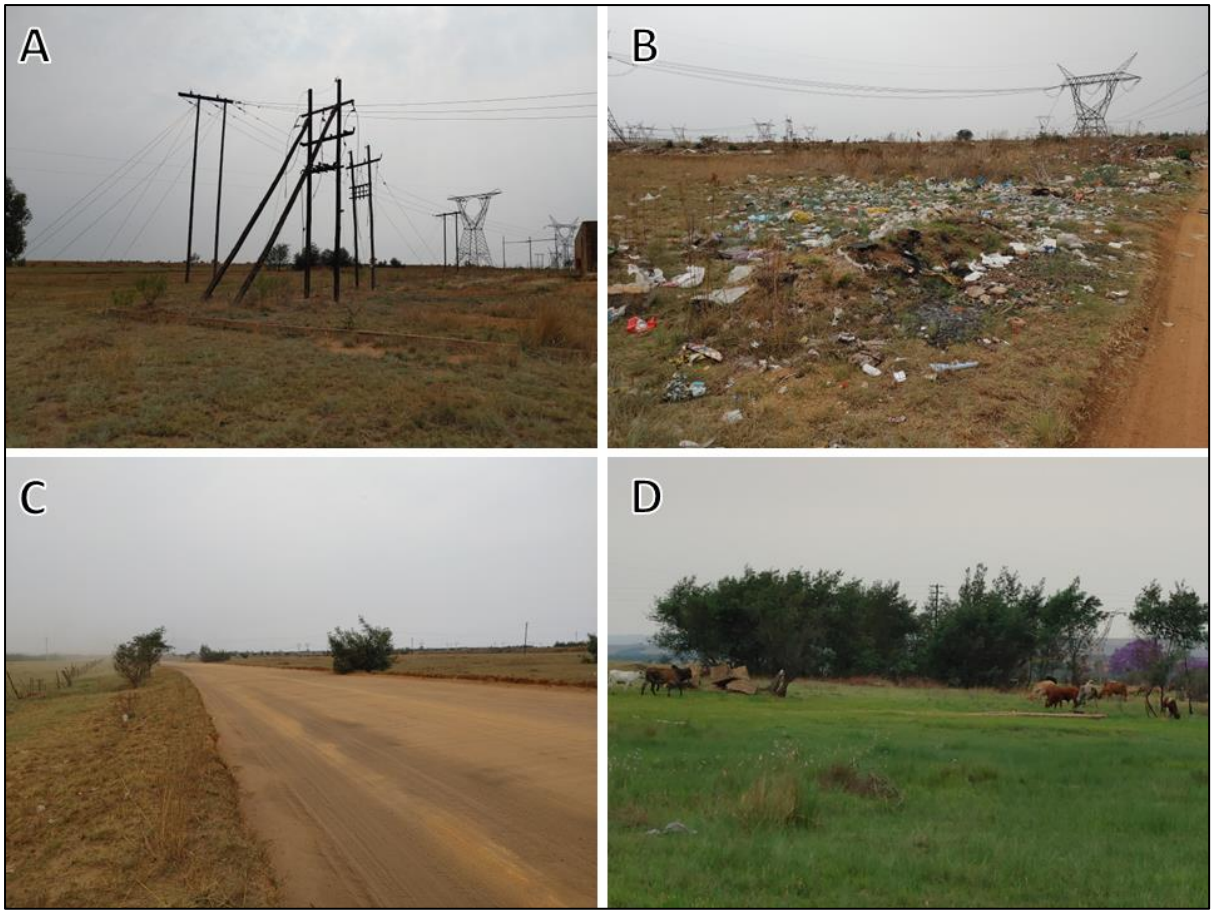


Figure 6-1 ***Photographs of current impacts: A) Extensive and large powerline infrastructure deteriorates the landscape; B) Dumping of waste is a major concern; C) Large roadways create noise and dust pollution; and D) Overgrazing promotes the spreading of annual weeds and the dominance of pioneer species***

6.1.3 Loss of Irreplaceable Resources

The proposed activities are likely to be of a high impact and large footprint, and the careful placement of certain developments is therefore important so as to minimise the damage to natural resources.

The proposed activities will be conducted over 'Vulnerable' Grassland habitat, and within parts of the functional Modified Grassland vegetation unit. It is therefore important to note that any irresponsible and/or overly expansive high impact activities will likely result in the loss of the following notable resources:

- Sensitive rocky outcrops and sensitive 'Critically Endangered' wetland areas;
- Irreplaceable and Optimal CBA areas, and functional ESA portions of land;
- Local fauna species, including possible SCC, (through direct mortality during clearing/construction activities, or indirectly via the inappropriate control of waste material); and
- Foraging and traversing routes, and/or nesting sites, relevant to the SCC fauna that may occasionally make use of the areas.

As some areas are in a functional state, the loss of these resources may be considered significant. Therefore, mitigations must be put in place and implemented to prevent the total and widespread destruction of valuable natural resources. See section 6.4 below for a full overview of the project-specific mitigation measures that must be implemented in order to reduce the impact significance levels.

6.1.4 Anticipated Impacts

The project activities will lead to several significant impacts to terrestrial biodiversity, which are presented as an overview in Table 6-1 below. It is important to predict and quantify these impacts so as to assess the magnitude and effect that each may have on the local terrestrial biodiversity and ecology.

The impacts described are to be used as a guideline for the main impact assessment procedure that is to be followed.

Table 6-1 Anticipated impacts for the proposed activities on terrestrial biodiversity

Main Impact	Project activities that are likely to cause the impact	Secondary impacts anticipated
Destruction, fragmentation and degradation of habitats and ecosystems	Physical removal of vegetation, including protected species Development of access roads and servitudes Soil dust precipitation Dumping of waste products Random events such as fire (cooking fires or cigarettes) Walking and driving outside of demarcated routes (roads and paths)	• Displacement/loss of flora & fauna (including possible SCC); • Loss of protected species; • Increased potential for soil erosion; • Habitat fragmentation; • Increased potential for the establishment of IAP vegetation; and • Erosion
Spread and/or establishment of Invasive Alien Plants	The removal of indigenous vegetation Vehicles and people spreading seed Unsanitary conditions surrounding infrastructure, promoting the establishment of alien and/or invasive rodents Creation of infrastructure suitable for breeding activities of alien and/or invasive birds	• Habitat loss for native flora & fauna (including SCC); • Spreading of potentially dangerous diseases due to invasive and pest species; • Alteration of fauna assemblages due to habitat modification; and • Displacement of indigenous bird species
Direct mortality of fauna	Clearing of vegetation and/or the mass dumping of earth or construction waste Roadkill due to vehicle collision (non-compliance with speed limits etc.) Pollution of water resources due to dust effects, chemical spills, etc. Intentional killing of fauna for food or sale	• Loss of habitat; • Loss of ecosystem services; • Increase in rodent populations and associated disease risk; and • Deterioration of local ecology
Reduced dispersal/migration of fauna	Activities causing significant noise (heavy machinery) Construction of linear infrastructure (large roads and powerlines) Compacted roads Removal of vegetation	• Loss of landscape used as a corridor; • Reduced dispersal/migration of fauna; • Loss of ecosystem services; and • Reduced plant seed dispersal
Environmental pollution due to water runoff, spills from vehicles and erosion	Chemical (organic/inorganic) spills Erosion Poor maintenance and control of vehicles and machinery Pipe leaks (poor maintenance)	• Faunal mortality (direct and indirect – such as through poisoning); • Groundwater pollution; • Pollution of watercourses and the surrounding environment; and • Loss of ecosystem services

Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise, dust, and light pollution	Operation of machinery (Large earth moving machinery, vehicles)	• Disruption/alteration of ecological life cycles due to noise; • Loss of ecosystem services; and • Loss of local faunal community
	Vehicle traffic	
	Large, intense fluorescent and mercury vapor lighting	
Loss of SCCs and/or protected species	All unregulated/unsupervised activities outdoors	• Loss of SCCs; and • Harm to people (dangerous fauna)
	Poaching and trapping	
	Staff and others interacting directly with fauna (potentially dangerous), or flora	

6.1.5 Unplanned Events

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

Table 6-2 is a summary of the findings of an unplanned event assessment conducted from a terrestrial ecology perspective. Note that not all potential unplanned events may be captured herein, and this process must therefore be managed throughout all phases and according to new events that take place or other events that have a high likelihood of taking place.

Table 6-2 Summary of unplanned events, potential impacts and mitigations

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

6.1.6 Alternatives considered

No alternative footprint layout options were provided by the client and thus it is anticipated that most of the PAOI will be developed. Layouts must avoid the 'High' sensitivity areas as far as possible.

6.2 Quantitative Biodiversity Impact Assessment

6.2.1 Overview: Assessment of Impact Significance

The assessment of impact significance considers both pre-mitigation as well as post-mitigation scenarios as relevant to each potential impact. Construction phase, operational phase, and cumulative impacts are discussed and assessed below, and the project specific mitigation actions required to lower the risks of the impacts are provided in section 6.4 of this report. No planning or decommissioning/rehabilitation phases were considered based on the nature of the activities.

Certain details have been provided by the client with regards to the nature of the intended development activities, and these have been used as part of the assessment process to aid in the estimation of the likely significance ratings for each predicted impact type.

6.2.2 Construction Phase Impacts

Three main impacts on the terrestrial biodiversity of the PAOI were considered for the construction phase of the proposed activities (based on the framework discussed above). This phase refers to the period during site preparation, clearing and construction and is considered to have the largest short-term and direct impact on biodiversity - partly as a result of the high levels of regular activity, and the extensive clearing that usually takes place. The following potential impacts to terrestrial biodiversity were considered, and these are each assessed for their significance in Table 6-3 and

Table 6-4 that follows:

- Destruction, loss and fragmentation of habitats (including wetlands and rocky outcrop habitats in certain areas), ecosystems and the vegetation community (including protected plants);
- Introduction of IAP species and invasive fauna;
- Displacement of the indigenous faunal community (including SCC) due to habitat loss, direct mortalities, and disturbance (road collisions, noise, dust, light, vibration, and poaching).

All likely impacts are rated as Medium-Highly negative pre-mitigation but may be reduced to Low significance through the proper implementation of effective mitigation measures. The most important mitigation measures for this phase are as follows:

- Ensure that the site footprint is as small as possible and responsibly positioned, the development area must be properly and safely fenced off during construction;
- All laydown activities must be restricted to the 'Very Low' and 'Low' sensitivity areas as far as possible. Clearing and construction activities should avoid 'High' sensitivity wetland and rocky outcrop areas;
- Land clearing must be done over at least three days and conducted linearly and successively – always towards an open area and away from the centre of the PAOI (allowing animals a safe evacuation route) – clearing towards the north and west is preferable;
- Protected plants must be avoided where possible, if activities will result in the disturbing of these species, then a plant rescue and protection plan must be developed and implemented such that as many individuals as possible may be relocated; and
- No trapping, killing, or poisoning of any wildlife is to be allowed and signs must be put up to enforce this. Monitoring must take place in this regard.

Table 6-3 Construction phase Impact Assessment – Pre Mitigation

Impact	Pre Mitigation							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
Destruction, loss and fragmentation of habitats (including wetlands and rocky outcrop habitats in certain areas), ecosystems and the vegetation community (including protected plants).	2	4	3	3	3	3	3	
	Local/district: Will affect the local area or district.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	High: Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.	**Negative High Impact**
Introduction of IAP species and invasive fauna.	2	4	3	2	3	3	3	
	Local/district: Will affect the local area or district.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Significant loss of resources: The impact will result in significant loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	High: Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.	**Negative High Impact**
Displacement of the indigenous faunal community (including SCC) due to habitat loss, direct mortalities, and disturbance (road collisions, noise, dust, light, vibration, and poaching).	2	3	3	3	3	3	2	
	Local/district: Will affect the local area or district.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Medium Impact**

Table 6-4 Construction phase Impact Assessment – Post Mitigation

Impact	Post Mitigation							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
Destruction, loss and fragmentation of habitats (including wetlands and rocky outcrop habitats in certain areas), ecosystems and the vegetation community (including protected plants).	2	3	2	2	2	2	2	
	Local/district: Will affect the local area or district.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Low Impact**
Introduction of IAP species and invasive fauna.	1	2	2	2	2	2	1	
	Site: The impact will only affect the site.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	Low: Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.	**Negative Low Impact**
Displacement of the indigenous faunal community (including SCC) due to habitat loss, direct mortalities, and disturbance (road collisions, noise, dust, light, vibration, and poaching).	2	2	2	2	2	2	2	
	Local/district: Will affect the local area or district.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Low Impact**

6.2.3 Operational Phase Impacts

The impacts of daily activities associated with the operational phase of the project are anticipated to further spread the IAP species, and lead to the further deterioration of habitats due to the continuing presence of dust and other edge effect impacts. Dust inhibits the ability of plants to photosynthesize and thus leads to the degradation of surrounding natural areas. Additionally, moving maintenance vehicles do not only cause sensory disturbances to fauna, affecting their life cycles and movement, but will also lead to displacement and direct faunal mortalities due to collisions.

The operational phase is often the longest phase of a project and as such the effects from impacts have the opportunity to cumulate over long periods of time and cause significant cumulative damage to the environment. It is important to actively and continuously implement and update the relevant mitigation measures for this phase so as to effectively reduce this compounding effect.

The following potential impacts were considered for this phase of the project, and these are each assessed for their significance in Table 6-5 and Table 6-6 below:

- Continued fragmentation and degradation of natural habitats and ecosystems (including sensitive wetland and rocky areas, and protected plants);
- Continuing spread of IAP and weed species; and
- Ongoing displacement and direct mortalities of the faunal community (including SCC) due to continued disturbance (road collisions, noise, light, dust, vibration, poaching, etc.).

All potential impacts may be reduced from a significance rating of High to Low with the proper implementation of ongoing mitigation measures. The most important mitigation measures to implement during this phase include:

- The continual usage of the same roadways, parking areas and walkways, and the following of speed limits;
- The monitoring of, and enforcement against, any illegal hunting, poaching, and/or trapping activities;
- The responsible management of all waste. No waste must be dumped or stored in any ‘High’ sensitivity areas; and
- An IAP management and habitat rehabilitation plan must be implemented and updated annually.

Table 6-5 Operational phase Impact Assessment – Pre-Mitigation

Impact	Pre Mitigation							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
Continued fragmentation and degradation of natural habitats and ecosystems (including sensitive wetland and rocky areas, and protected plants).	2	3	3	3	3	3	3	
	Local/district: Will affect the local area or district.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	High: Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.	**Negative High Impact**
Continuing spread of IAP and weed species.	3	4	3	2	2	3	3	
	Province/region: Will affect the entire province or region.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	High: Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.	**Negative High Impact**
Ongoing displacement and direct mortalities of the faunal community (including SCC) due to continued disturbance (road collisions, noise, light, dust, vibration, poaching, etc.)	3	3	3	3	3	3	3	
	Province/region: Will affect the entire province or region.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	High: Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.	**Negative High Impact**

Table 6-6 Operational phase Impact Assessment – Post Mitigation

Impact	Post Mitigation							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
Continued fragmentation and degradation of natural habitats and ecosystems (including sensitive wetland and rocky areas, and protected plants).	2	2	2	2	2	2	2	
	Local/district: Will affect the local area or district.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Low Impact**
Continuing spread of IAP and weed species.	1	2	2	2	2	2	2	
	Site: The impact will only affect the site.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Low Impact**
Ongoing displacement and direct mortalities of the faunal community (including SCC) due to continued disturbance (road collisions, noise, light, dust, vibration, poaching, etc.)	2	2	2	2	2	2	2	
	Local/district: Will affect the local area or district.	Possible: The impact may occur (Between a 25% to 50% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Low Impact**

6.2.4 Cumulative Impacts

The impacts of projects are often assessed by comparing the post-project situation to a pre-existing baseline. Where projects can be considered in isolation this provides a good method of assessing a project's impact. However, in areas where baselines have already been affected, or where future development will continue to add to the impacts pre-existing in an area or region, it is appropriate to consider the cumulative effects of development or disturbance activities. This is similar to the concept of shifting baselines, which describes how the environmental baseline at a specific point in time may actually represent a significant change from the original state of the system. This section describes the potential cumulative impacts of the project on local fauna and flora specifically.

Cumulative impacts are assessed within the context of the extent of the proposed PAOI, other similar developments and activities in the area (existing and in-process), and general habitat loss and transformation resulting from any other activities in the area. Localised cumulative impacts include those from operations that are close enough (within 30 km) to potentially cause additive effects on the local environment or any sensitive receptors (relevant operations include nearby large road networks, other solar PV facilities, mining activities, dense urban development, and power infrastructure). Relevant impacts include the overall reduction of foraging and nesting habitat, dust deposition, noise and vibration, disruption of functional corridors of habitat important for movement and migration, disruption of waterways, groundwater drawdown, and groundwater and surface water quality depletion.

Long-term cumulative impacts associated with the site development activities can lead to the loss of endemic and threatened species, including natural habitat and vegetation types, and these impacts can even lead to the degradation of conserved areas such as regional game parks and reserves.

6.2.4.1 Cumulative Impact Assessment

In order to spatially quantify the cumulative effects of the proposed development, the project footprint is compared with the overall effects of surrounding development (including total transformation, and transformation as a result of new and proposed developments of a similar type, i.e., solar). Note that this spatial assessment is only conducted for the proposed solar development footprint area, the powerline area is omitted.

According to the 2018 National Biodiversity Assessment, the total amount of Rand Highveld Grassland habitat within 30 km of the PAOI amounts to 175 612 ha, but when considering the transformation that has taken place within this radius – only 89 290 ha remains. Therefore, the area within 30 km of the project has experienced approximately 49.2% loss in natural highveld grassland habitat.

The PV project footprint is 500 ha, and there are no other existing or approved PV projects that lie within the 30 km region that will remove intact Rand Highveld Grassland (as per the latest South African Renewable Energy EIA Application Database).

This means that the total amount of remaining habitat lost as a result of all existing and/or approved solar projects in the region, including the proposed Highveld PV development, amounts to 0.5% (the sum of all related developments as a percentage of the total remaining habitat). Table 6-7 outlines the calculation procedure for the spatial assessment of cumulative impacts.

Table 6-7 Loss of Rand Highveld Grassland habitat within a 30 km radius

	Total Habitat (ha)	Tot. Remaining Habitat (ha)	Total Historical Loss	Footprint (ha)	Similar Projects (ha)	Cumulative Habitat Lost
Project cumulative effects (Spatial)	175 612	89 290	**49.2%**	500	0	**0.6%**

The overall cumulative impact assessment is presented in Table 6-8 and Table 6-9 below. Note that this assessment also accounts for the relative importance of the habitats within and adjacent to the PAOI, in the context of the value of the regional habitat. Refer to Figure 6-2 for a map illustrating the amount of remaining natural habitat within a 30 km radius of the proposed project, in addition to all 'approved' PV projects in the region.

Although a significant amount of the local vegetation type has already been lost, the proposed development is the only one of its kind within 30 km, and no key habitat corridors would be lost. Thus, the overall cumulative impact of the proposed project is rated as 'Low'.

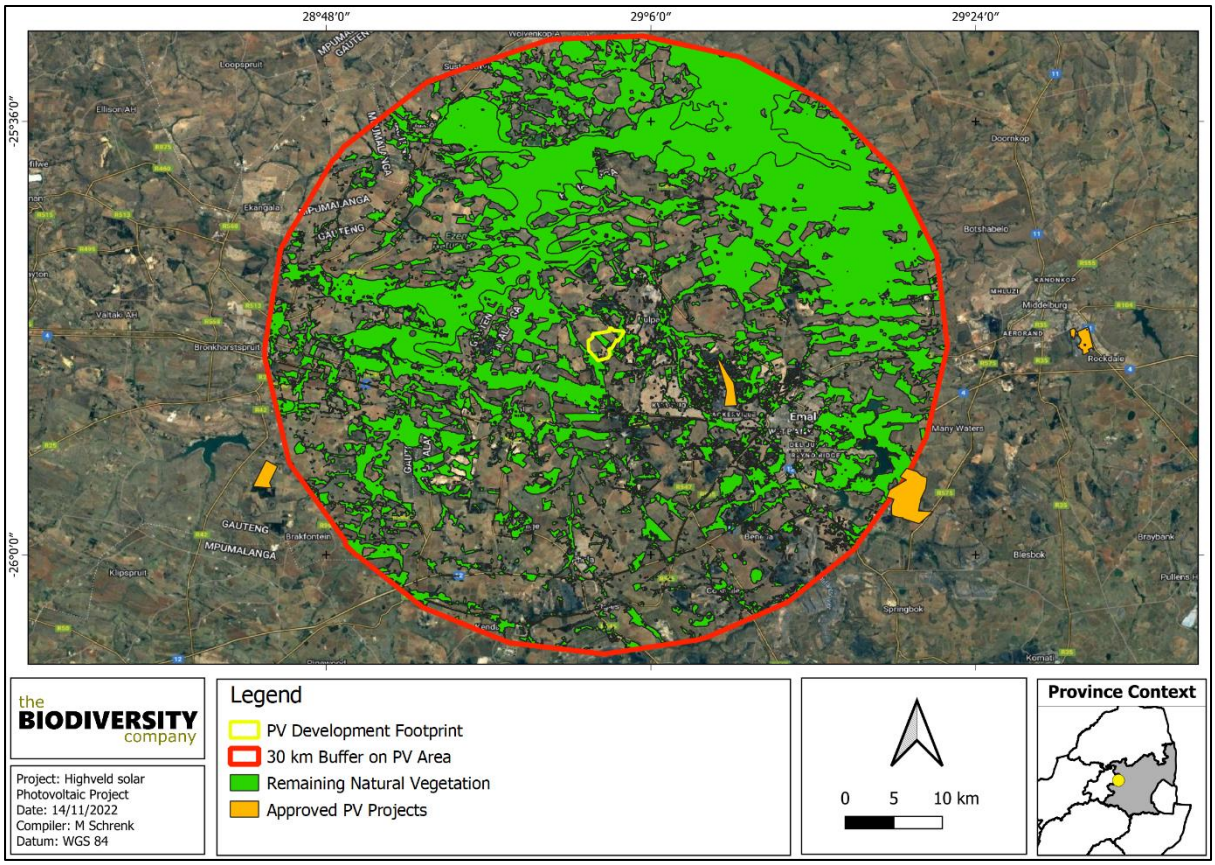


Figure 6-2 Map of the remaining natural vegetation and approved PV projects within the PAOI region

Table 6-8 Cumulative Impacts to biodiversity associated with the proposed project – project in Isolation

Impact	Project in Isolation							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
Loss of habitat, and disruption of surrounding ecological corridors. As well as the influences of pollution (water, noise, air, etc.).	2	3	2	2	2	2	2	
	Local/district: Will affect the local area or district.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Low Impact**

Table 6-9 Cumulative Impacts to biodiversity associated with the proposed project – Cumulative Effects

Impact	Cumulative Effect							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
Loss of habitat, and disruption of surrounding ecological corridors. As well as the influences of pollution (water, noise, air, etc.).	2	3	2	2	2	3	2	
	Local/district: Will affect the local area or district.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Marginal loss of resource: The impact will result in marginal loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Low Impact**

6.3 No-Go Scenario

The current land use is predominantly grazing and foraging for domestic cattle, sheep, and horses – as well as some local wildlife, and the associated impacts of this on the local terrestrial ecology is considered to be relatively low. It is also noted that the overall functionality of the land is moderate. Given the current land use and associated functionality of the area, the overall 'no-go' alternative is considered to represent a low negative long-term impact on the environment. Note: This specifically pertains to the proposed PV area, as the powerline routes occur over portions of land that mostly exist in a much more disturbed state.

Should the project be approved, it would be preferable for the 'High' sensitivity areas to be avoided, and for only light rotational grazing to be permitted within the 'Medium' sensitivity portions post-development (maximum twice per year).

6.4 Impact Management and Mitigation Plan

The aim of the management outcomes is to present mitigation actions in such a way that they can be incorporated into the Environmental Management Programme (EMPr), and possible biodiversity management programme, for the project, which should in turn allow for a more successful implementation and auditing of the mitigations and monitoring guidelines. Table 6-10 presents the recommended mitigation measures and the respective timeframes, targets, and performance indicators relative to the terrestrial assessment.

The focus of mitigation measures is to reduce the significance of the likely impacts associated with the development, and thereby to:

- Prevent the significant loss and fragmentation of vegetation communities (including CBA and ESA areas, and protected flora) within the PAOI;
- Reduce the negative fragmentation effects of the development and enable the safe movement of fauna species;
- Prevent the direct and indirect loss and disturbance of fauna species and communities, including SCC and protected species; and
- Adequately follow the guidelines for interpreting the Site Ecological Importance ratings assigned to the Project Area of Influence (see Table 4-6).

Special attention must be paid to the 'Vegetation and Habitats' and 'Fauna' sections below as these sections provide recommended and important mitigation measures pertaining to the presence of protected species, and the possible occasional presence of SCC fauna.

Table 6-10 Project specific mitigation measures including requirements for timeframes, roles and responsibilities

Management outcome: Vegetation and Habitats				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
All 'High' sensitivity areas should be avoided, and these areas should be clearly demarcated by non-hazardous/dangerous fencing. Brush cutting should be implemented beneath the panels, no vegetation clearing should be permitted.	Construction Phase	Project manager & Environmental Officer	Development footprint	Ongoing
Laydown and construction preparation activities (such as cement mixing, temporary toilets, etc.) must be limited to the 'Very Low' and 'Low' sensitivity areas.	Construction Phase	Project manager, Environmental Officer	Development footprint	Ongoing
The clearing of vegetation must be minimized where possible. All activities must be restricted to within the authorised areas. It is recommended that areas to be developed be specifically and responsibly demarcated so that during the construction phase only the demarcated areas be impacted upon.	Life of operation	Project manager, Environmental Officer	Areas of indigenous vegetation	Ongoing
Any observed SCC flora or protected plants must be clearly demarcated prior to the commencement of site clearing. If construction activities are likely to affect any SCC or protected plants these individuals must be relocated as part of a plant rescue and protection plan, and a permit may need to be obtained before doing so.	Planning Phase	Environmental Officer	Protected plants and SCC	During phase
Existing access routes, especially roads, must be made use of.	Construction/Operational Phase	Environmental Officer & Design Engineer	Roads and paths used	Ongoing
Any materials may not be stored for extended periods of time and must be removed from the PAOI once the construction phase has been concluded. No permanent construction phase structures should be permitted. Construction buildings should preferably be prefabricated or constructed of re-usable/recyclable materials. No storage of vehicles or equipment will be allowed outside of the designated laydown areas.	Construction and Operational Phase	Environmental Officer, Design Engineer, and Contractor	Laydown areas	Ongoing
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation according to a habitat rehabilitation plan, to prevent erosion during flood and wind events and to promote the regeneration of functional habitat. This will also reduce the likelihood of encroachment by invasive alien plant species. All grazing mammals must be kept out of the areas that have recently been re-planted.	Operational phase	Environmental Officer & Contractor	Assess the state of rehabilitation and encroachment of alien vegetation	Quarterly for up to two years after the closure

A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. • **Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use.** • **No servicing of equipment on site unless necessary.** • **All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers.** • **Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them from leaking and entering the environment.** • **Construction activities and vehicles could cause spillages of lubricants, fuels and waste material negatively affecting the functioning of the ecosystem.** • **All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas outside of the project area.**	Life of operation	Environmental Officer & Contractor	Spill events, Vehicles dripping.	Ongoing
It must be made an offence for any staff to take/ bring any plant species into/out of any portion of the project area. No plant species whether indigenous or exotic should be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.	Life of operation	Project manager, Environmental Officer	Any instances	Ongoing
A fire management plan needs to be complied and implemented to restrict the impact fire would have on the surrounding areas.	Life of operation	Environmental Officer & Contractor	Fire Management	During Phase
All construction waste must be removed from site at the closure of the construction phase.	Construction phase	Environmental Officer & Contractor	Construction waste	During Phase
Management outcome: Fauna				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency

A qualified environmental control officer must be on site when activities begin. A site walk through is recommended by a suitably qualified ecologist prior to any activities taking place and any SSC or protected species should be noted. In situations where these species are observed and must be removed, the proponent may only do so after the required permission/permits have been obtained in accordance with national and provincial legislation. In the abovementioned situation the development and implementation of a search, rescue and recovery program is suggested for the protection of these species. Should animals not move out of the area on their own relevant specialists must be contacted to advise on how the species can be relocated.	Construction Phase	Environmental Officer, Contractor	Presence of any floral or faunal SCC	During phase
Clearing and disturbance activities must be conducted in a progressive linear manner, always outwards and away from the centre of the PAOI and over several days, so as to provide an easy escape route for all small mammals and herpetofauna.	Construction Phase	Environmental Officer & Contractor	Progressive land clearing operations and the movement of fauna	Ongoing
The areas to be disturbed must be specifically and responsibly demarcated to prevent the movement of staff or any individual into the surrounding environments, signs must be put up to enforce this.	Construction/Operational Phase	Project manager, Environmental Officer	Infringement into these areas	Ongoing
The duration of the activities should be minimized to as short a term as possible, to reduce the period of disturbance on fauna.	Construction	Project manager, Environmental Officer & Design Engineer	Construction/Closure Phase	Ongoing
Noise must be kept to an absolute minimum during the evenings and at night to minimize all possible disturbances to reptile species and nocturnal mammals.	Construction/Operational Phase	Environmental Officer	Noise levels	Ongoing
No trapping, killing, or poisoning of any wildlife is to be allowed and Signs must be put up to enforce this. Monitoring must take place in this regard.	Life of operation	Environmental Officer	Evidence of trapping etc	Ongoing
Outside lighting should be designed and limited to minimize impacts on fauna. All outside lighting should be directed away from any sensitive areas. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (green/red) lights should be used wherever possible.	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Light pollution and period of light	Ongoing
All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must be enforced to ensure that road killings and erosion is limited.	Life of operation	Health and Safety Officer	Compliance to the training	Ongoing

Schedule activities and operations during least sensitive periods, to avoid migration, nesting, and breeding seasons.	Life of operation	Project manager, Environmental Officer & Design Engineer	Activities should take place during the day	Ongoing
Any holes/deep excavations must be dug in a progressive manner and shouldn't be left open overnight. Should any holes remain open overnight they must be properly covered temporarily to ensure that no small fauna species fall in. Holes must be subsequently inspected for fauna prior to backfilling.	Planning and Construction	Environmental Officer & Contractor, Engineer	Presence of trapped animals and open holes	Ongoing
Fencing mitigations: • **Top 2 strands must be smooth wire** • **Routinely re-tension loose wires** • **Minimum 30cm between wires** **Place markers on fences.**	Planning, construction, and operation	Environmental Officer & Contractor, Engineer	Fence construction. Limiting risk to large bird species and mammals	Ongoing
Wildlife-permeable fencing with holes large enough for mongoose and other smaller mammals should be installed, the holes must not be placed in the fence where it is next to a major road as this will increase road killings in the area.	Planning and construction	Environmental Officer & Contractor, Engineer	Fauna movement corridor	Ongoing
Use environmentally friendly cleaning and dust suppressant products.	Construction and operation	Environmental Officer & Contractor, Engineer	Presence of chemicals in and around the project area	Ongoing
Once the development layout has been confirmed, the footprint area must be fenced off appropriately in segments pre-construction to allow animals to move or be moved out of these areas before breaking ground activities occur. Construction activities must take place systemically and the perimeter fence should not be completed (i.e., leaving sections unfenced to allow fauna to escape) until systematic clearing is completed. Drilling etc. should start one side of the site and progress towards the section of the site where fences are incomplete (away from the center of the PAOI).	Planning/Construction Phase	Environmental Officer & Design Engineer	Areas not to be developed and construction direction	Ongoing

Management outcome: Alien species				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
An Invasive Alien Plant Management Plan must be compiled and implemented. This should regularly be updated to reflect the annual changed in IAP composition.	Life of operation	Project manager, Environmental Officer & Contractor	Manage and assess presence and encroachment of alien vegetation	Twice a year
The footprint area of the construction should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas. Footprints of the roads must be kept to prescribed widths.	Construction/Operational Phase	Project manager, Environmental Officer & Contractor	Footprint Area	Life of operation

Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site. A location specific waste management plan must be put in place to limit the presence of rodents and pests and waste must not be allowed to enter surrounding areas.	Life of operation	Environmental Officer & Health and Safety Officer	Presence of waste	Life of operation
A pest control plan must be put in place and implemented; it is imperative that poisons not be used to control pests due to the likely occasional presence of SCC.	Life of operation	Environmental Officer & Health and Safety Officer	Evidence or presence of pests	Life of operation
Management outcome: Dust				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
Dust-reducing mitigation measures must be put in place and must be strictly adhered to. This includes the wetting of exposed soft soil surfaces. **No non-environmentally friendly suppressants may be used as this could result in the pollution of water sources.**	Construction phase	Contractor	Dustfall	Dust monitoring program.
Management outcome: Waste management				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
Waste management must be a priority and all waste must be collected and stored effectively and responsibly according to a site-specific waste management plan. Dangerous waste such as metal wires and glass must only be stored in fully sealed and secure containers, before being moved off site as soon as possible.	Life of operation	Environmental Officer & Contractor	Waste Removal	Weekly
Litter, spills, fuels, chemical and human waste in and around the project area must be minimised and controlled according to the waste management plan.	Construction/Closure Phase	Environmental Officer & Health and Safety Officer	Presence of Waste	Daily
Cement mixing may not be performed on the ground. It is recommended that only closed side drum or pan type concrete mixers be utilised. Any spills must be immediately contained and isolated from the natural environment, before being removed from site.	Construction Phase	Environmental Officer & Contractor	Cement mixing and spills	Every occurrence

A minimum of one toilet must be provided per 10 persons. Portable toilets must be pumped dry to ensure the system does not degrade over time and spill into the surrounding area.	Life of operation	Environmental Officer & Health and Safety Officer	Number of toilets per staff member. Waste levels	Daily
The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility within every 10 days at least.	Life of operation	Environmental Officer & Health and Safety Officer	Availability of bins and the collection of the waste	Ongoing
Where a registered disposal facility is not available close to the project area, the Contractor shall provide a method statement with regards to waste management. Under no circumstances may domestic waste be burned on site or buried on open pits.	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Collection/handling of the waste	Ongoing
Refuse bins will be responsibly emptied and secured. Temporary storage of domestic waste shall be in covered and secured waste skips. Maximum domestic waste storage period will be 10 days.	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Management of bins and collection of waste	Ongoing, every 10 days

Management outcome: Environmental awareness training				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
All personnel and contractors are to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. **Discussions are required on sensitive environmental receptors within the PAOI to inform contractors and site staff of the presence of protected species and sensitive habitat, their identification, conservation status and importance, biology, habitat requirements and management requirements in line with the Environmental Authorisation and within the EMPr.** **Contractors and employees must all undergo the induction and must be made aware of any sensitive areas to be avoided.**	Pre-construction phase	Health and Safety Officer, Environmental Officer	Compliance to the training	Ongoing

Management outcome: Erosion				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency

Speed limits must be put in place to reduce erosion. Soil surfaces must be wetted as necessary to reduce the dust generated by the project activities. Speed bumps and signs must be erected to enforce slow speeds.	Life of operation	Project manager, Environmental Officer	Water Runoff from road surfaces	Ongoing
Only existing access routes and walking paths may be made use of.	Life of operation	Project manager, Environmental Officer	Routes used within the area	Ongoing
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events etc.	Life of operation	Project manager, Environmental Officer	Re-establishment of indigenous vegetation	Progressively
A stormwater management plan must be compiled and implemented.	Life of operation	Project manager, Environmental Officer	Management plan	Before construction phase: Ongoing

7 Conclusion and Impact Statement

The PAOI overlaps with impacted CBA and ESA areas, as well as functional portions of land that are provincially classified as 'Other Natural Areas' and 'Heavily Modified Areas' - which are in a state of recovery. Parts of the PAOI also intercept with 'Critically Endangered' wetland systems and rocky features. For these reasons it is important that the management outcomes presented above be adhered to, in order to properly mitigate the negative environmental impacts that will stem from the project activities.

No flora SCC were recorded during the survey; however, it is noted that some of these may be found to occur in the 'High' sensitivity areas. One fauna SCC was recorded, *Equus quagga* (plains zebra), and certain additional local fauna SCC may occasionally be found foraging within the PAOI, specifically within the Rocky Outcrop and Primary Water Resource areas. No protected tree species are likely to occur, although a significant number (>100) of provincially protected plants were recorded.

Completion of the terrestrial biodiversity assessment led to a disputing of the 'Very High' classification for the terrestrial biodiversity theme sensitivity as allocated by the National Environmental Screening Tool. The PAOI is instead assigned an overall sensitivity of 'Medium', because of the high diversity of flora species recorded in addition to the fact that the ecosystem currently exists in a reasonably functional state, and portions of sensitive wetland and rocky outcrop features were recorded.

7.1 Impact Statement

The main impacts that may be expected to occur, as a result of the proposed activities, include the following:

- Direct habitat loss and fragmentation (including the loss of functional grassland areas);
- Degradation of surrounding habitat;
- Disturbance and displacement of fauna (including direct mortality); and
- Introduction and further spreading of IAP and weed species.

All mitigation measures as described in this report must be implemented so as to reduce the significance of all anticipated impacts to an acceptable level (from 'Medium' – 'High' to 'Low'). The cumulative impact of the overall project, taking into account the transformation of surrounding land, is rated as 'Low'. This is because the proposed development does not result in the loss of any important habitat corridors and the overall project footprint is regarded as relatively small, especially considering the fact that no other significant solar projects are approved in the region (within a 30 km radius).

Considering the assessment findings, no fatal flaws are evident for the proposed project. It is the opinion of the specialists that the project may be favourably considered, on condition that all prescribed mitigation measures are implemented.

7.2 Specialist Recommendations

It is recommended that a plant rescue and protection plan be developed for the proposed project, and implemented prior to the start of the construction phase and during the wet season. This is to limit the loss of a large number of provincially protected plant species that were confirmed to occur within the PAOI.

All 'High' sensitivity habitat features should be avoided where possible, and this includes the primary Water Resource and Rocky Outcrop habitat units. These areas represent important and unique biodiversity resources within a degraded landscape and as such serve a critical supportive role to the ecology of the region. These features do not however represent fatal flaws.

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9 Appendix Items

9.1 Appendix A – Specialist Declarations

DECLARATION

I, Michael Schrenk, declare that:

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

Michael Schrenk

Environmental Consultant

The Biodiversity Company

November 2022

DECLARATION

I, Andrew Husted, declare that:

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

Andrew Husted

Terrestrial Ecologist

The Biodiversity Company

November 2022