Bushveld Vametco Solar Facility

Terrestrial Biodiversity Specialist Assessment

Prepared for:

Nsovo Environmental Consulting

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Report Type:	**Terrestrial Biodiversity Specialist Assessment**
Project Name:	**Bushveld Vametco Biodiversity Impact Assessment**
Report Compiler:	**Rudolph Greffrath (Pr. Sci. Nat. 400018/17)**

DECLARATION

I, Rudolph Greffrath, in my capacity as a specialist consultant, hereby declare that I –

- 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 favorable 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.

Rudolph Greffrath *Pr.Sci.Nat* (400018/17, Conservation Science)

October 2023

EXECUTIVE SUMMARY

AES Environmental Services was appointed by Nsovo Environmental Consulting (Nsovo) to undertake a terrestrial (fauna and flora) biodiversity assessment for the proposed Bushveld Vametco Solar facility near Brits, Northwest Province.

The assessment was completed as per the Terrestrial Plant and Animal protocols which provided the criteria for this assessment and its reporting of impacts on terrestrial biodiversity for activities requiring environmental authorization.

The site falls within the regional vegetation type Marikana Thornveld, of which is listed as a Endangered ecosystem (EN) by the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004 (NEMBA).

According to the North-West Biodiversity Sector Plan NWBSP (2015), the Vametco project area is not classified from a terrestrial perspective but is partially an ESA from aquatic perspective. All demarcations were considered during the field work studies planning and execution, as the Sector Plan's delineations were refined where applicable.

The field investigation indicated that most of the project area was dominated by Open Bushveld and Riparian areas. A total of 56 plant species were officially recorded on site of the 543 recorded for the region.

No Species of Conservation Concern (SCC) according to the National Screening report or NEWPOSA were encountered. A total of 4 mammal species were recorded on site, none of which are SCC.

The primary impact of the proposed development is a loss of flora and fauna habitat in the form of Open Bushveld and Riparian areas due to infrastructure development. No Red Data plant or animal species were present within the PAOI however. Due to the majority extent and the moderate sensitivity assigned to these habitats after mitigation, the impacts identified were rated as Low, after mitigation. Alien plant invasion is expected due to surface disturbance due to infrastructure and this should be managed by implementing an alien plant management plan for quarterly monitoring that should take place for at least two years after construction and an additional two years after decommissioning.

The direct impacts on fauna are expected to be low. The impact of habitat destruction will not affect fauna SCC as these species were not recorded and if possibly present, they will move away from the area of construction and settle on other areas, probably within or adjacent to the project area.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

List of Abbreviations

ADU	Animal Demography Unit
CARA	Conservation of Agricultural Resources Act, 1993 (Act 43 of 1983)
CC	Closed Corporation
CBA	Critical Biodiversity Area
C-Plan	Conservation Plan
CR	Critically Endangered
DD	Data Deficient
DEA	Department of Environmental Affairs
DM	District Municipality
DMR	Department of Mineral Rights
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EBA	Endemic Bird Area
ESA	Ecological Support Areas
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMP	Environmental Management Plan
EN	Endangered
EW	Extinct in the Wild
EX	Extinct
Ha	Hectares
HL	Habitat linkage
HR	Habitat requirements
HS	Habitat status
IBA	Important Birding Area
IFC	International Finance Corporation
IUCN	International Union for the Conservation of Nature
IPP	Independent Power Plant
km	Kilometres
km^2	Square kilometres
LC	Least Concern
m	Meters
mm	Millimetres
MRA	Mining Right Application

NBSAP	National Biodiversity Strategy and Acton Plan
NWBSP	Northwest Biodiversity Sector Plan
NE	Not Evaluated
NEMA	National Environmental Management Act,1998 (Act 107 of 1998)
NEMBA	National Environmental Biodiversity Act, 2004 (Act 10 of 2014)
NFEPA	National Freshwater Ecosystem Priority Areas
No	Number
NPAES	National Protected Areas Expansion Strategy
NT	Near Threatened
ONA	Other Natural Areas
PAOI	Project Area of Influence
PES	Present Ecological Status
PRECIS	Pretoria Computerised Information System
PS	Performance Standard
TMS	Timed Meander Searches
QDS	Quarter Degree Square
RE	Remainder Extend
SABAP	South African Bird Atlas Project
SACNASP	South African Council for Natural Scientific Professions
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern
SEI	Site Ecological Importance
VU	Vulnerable

1 Introduction

1.1 Background

AES Environmental Services was appointed by Nsovo Environmental Consulting (Nsovo) to undertake a terrestrial (fauna and flora) biodiversity assessment for the proposed Bushveld Vametco Solar facility near Brits, Northwest Province.

The Vametco Phase 2 Renewable Energy Facility builds upon the foundational concepts established in Phase 1 of the project, which encompasses a 3.5 MW solar photovoltaic (PV) plant and a 1 MW / 4 MWh Vanadium Redox Flow Battery (VRFB). Phase 2 of the project is dedicated to the development of a solar PV plant with a potential capacity of up to 400 MWp and a battery energy storage system (BESS) facility with a capacity of up to 200 MW / 800 MWh. To accommodate this expansion, a 400-hectare land parcel located to the north of the Vametco mine was carefully selected. The choice of this location was primarily influenced by the availability of land, in consideration of future mining expansion plans, and the advantageous fact that the land is situated within the mining rights leased area.

The National Web based Environmental Screening Tool has characterised the Terrestrial Biodiversity Combined Sensitivity of the project area as “Very High”. Accordingly, this assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations. 2014 (GNR 326, 7 April 2017) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The approach has taken cognisance of the recently published Government Notices (GN) 320 (20 March 2020) and GN 1150 (30 October 2020): “Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation” (Reporting Criteria). See Appendix A for the protocol checklist and where they can be found within the report.

1.1.1 Environmental Considerations

The site is bisected by a non-perennial river, dividing it into northern and southern sections. In Figure 1-1 below, marked by a green block, illustrates the site's location, flood lines, and wetland areas.

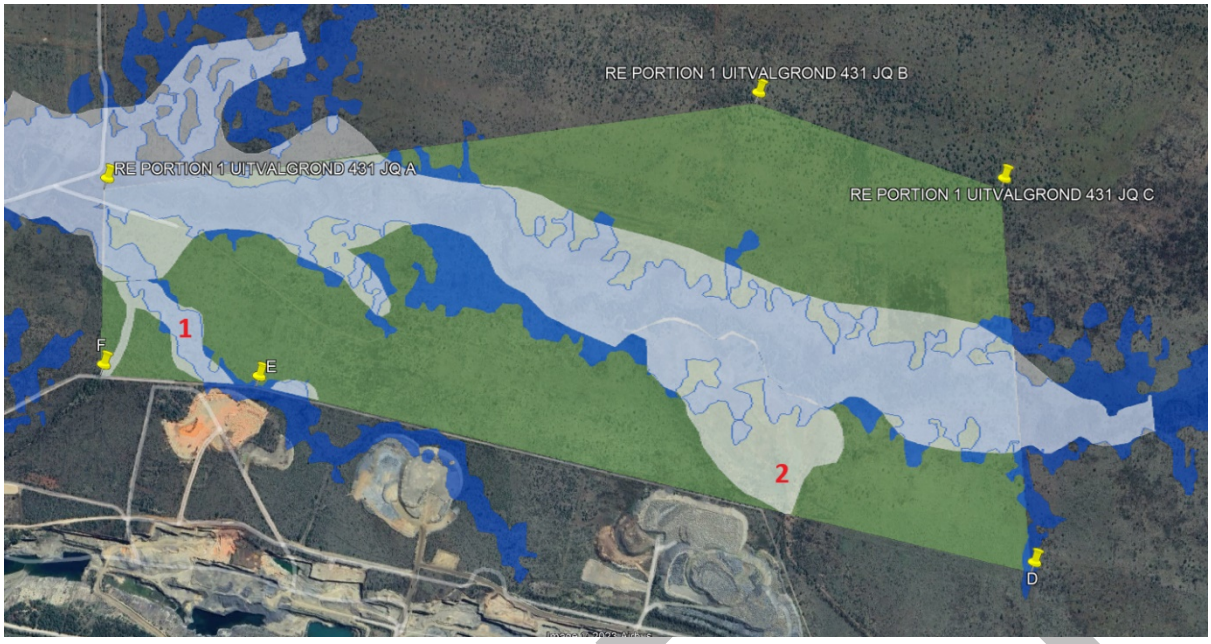


Figure 1-1: Delineated Wetlands illustrating the Northern and Southern sections

The southern portion of the site poses unique challenges, characterized by two wetland areas identified as '1' and '2' on the above figure. Wetland 1 originates in the southern region and flows northward, while Wetland 2 is linked to a sewerage treatment facility.

1.1.2 Proposed Activities

Proposed activities and infrastructure options, associated with the construction and operation of the Solar PV facility is listed below.

- Inverters and Transformers
- Up to 132 kV Transmission Lines and Transmission Towers
- BESS up to 800 MWh (note electrolyte and height requirements)
- Cabling Between Project Components
- Access and Internal Roads
- On-Site Facility Substation
- Borehole for Water Supply
- Telecommunications Mast
- O&M Buildings
- Car Park
- Security, Perimeter Fencing, and Access Control
- Temporary Offices and Construction Yard
- Water and Sewage Pipelines
- Temporary Laydown Area.

1.1.3 Site Layout Considerations

a) Option 1 (Low Feasibility)

The viability of the project is notably impacted by the limited size of the site, which is further complicated by its division into three sub-areas. This division necessitates the establishment of multiple substations, connections between sites, and the construction of additional roadways and bridges (Figure 1-2).

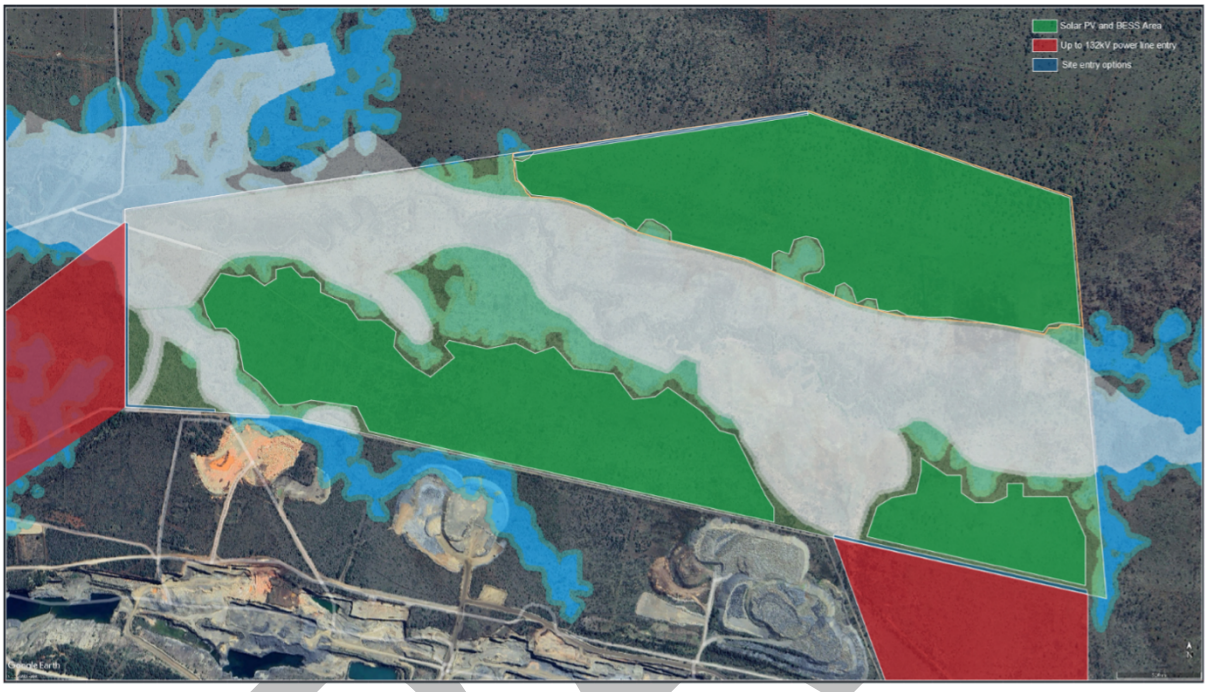


Figure 1-2: Option 1

b) Option 2 (Obstructive)

The figure below illustrates Option 2, which strategically avoids the primary wetland/river area. The site is divided into two main sections, north and south, with access to the northern section facilitated by a bridge from the south. The green areas denote the locations designated for the two solar PV and BESS installations, while the red areas mark potential entry points for the transmission line. The corridor to the south measures 925 meters at its widest point, while the western corridor spans 660 meters at its widest. Small blue blocks on the figure indicate the potential site entry points. It's important to note that this option introduces its own set of challenges, including the construction of a bridge and the need to navigate areas designated as wetlands (Figure 1-3).

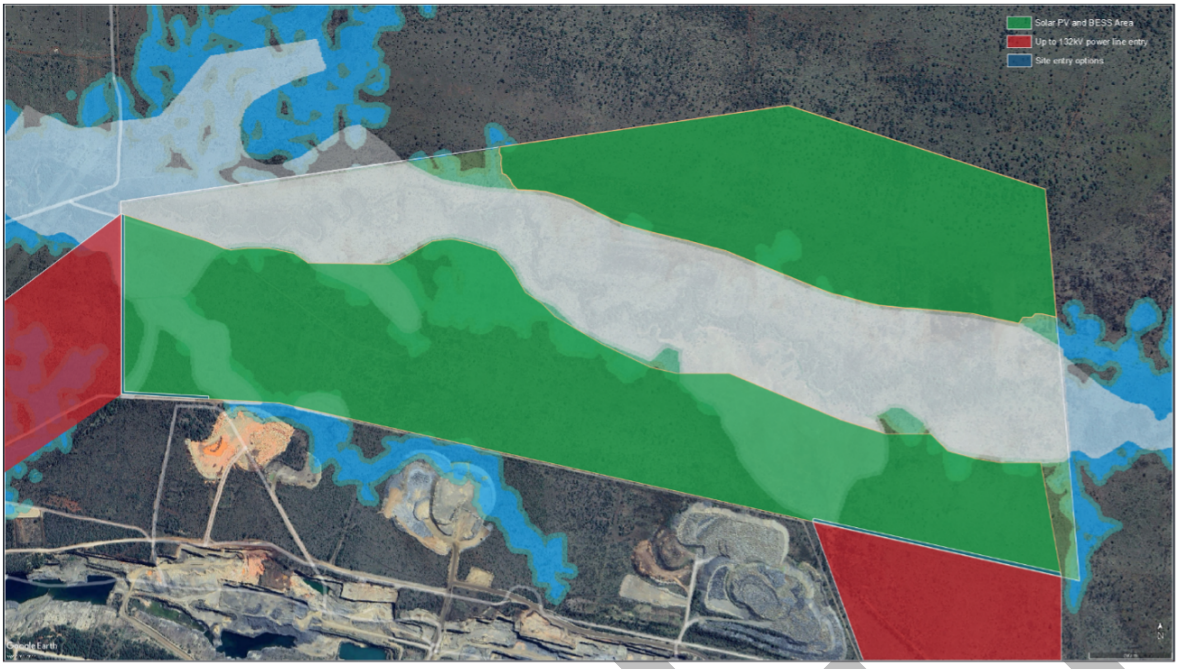


Figure 1-3: Option 2

c) Option 3 (Proposed Option)

Option 3, as illustrated in the figure below, includes the diversion of the sewerage spillway to the south of the site and redirects a smaller stream to the west. Additionally, this option excludes a smaller portion of the wetland area in the central-western region, effectively minimizing the environmental impact on crucial wetland areas. Access to the site will be facilitated by a road to the north, leveraging existing road infrastructure and eliminating the need for a bridge (Figure 1-4), this is the preferred option from the terrestrial ecology perspective.

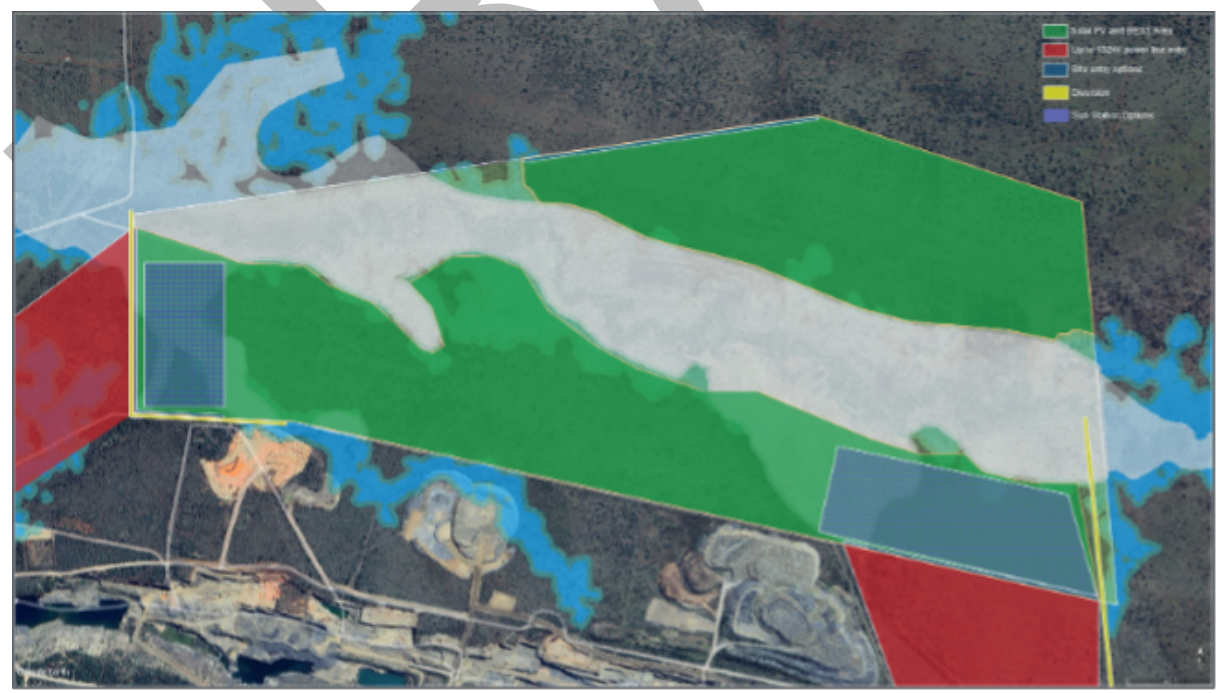


Figure 1-4: Option 3

The decision to propose a river diversion within the scope of the Vametco Hybrid Mini Grid project is driven by the imperative to ensure project viability and effectiveness. While alternatives were indeed considered, the fundamental need arises from the project's requirement for a continuous and uninterrupted expanse of land within the project site. This continuity is essential for the efficient placement and integration of critical infrastructure, including solar photovoltaic (PV) arrays and battery energy storage systems (BESS). The alternatives examined revealed that any division of the project site due to the anthropogenic water features would significantly limit the available area for renewable energy installations. To maximize the project's energy generation capacity and uphold its economic feasibility, the river diversion becomes a strategic and necessary solution.

1.2 Project Location

Bushveld Vametco Holdings (Pty) Ltd (hereafter referred to as Vametco) is an open-cast mine situated approximately 5km west of Ga-Rankuwa and 10km northeast from Brits town within the jurisdiction of Madibeng Local Municipality in the Northwest Province and has been operational since 1967. The mine is approximately 3.5 km long in an east-west direction and its Mining Right Area (MRA) is approximately 1507.7 hectares (ha) in size. Vametco is regarded as a low-cost primary vanadium mining and processing company with a 186.7 metric tonnes (Mt) Joint Ore Reserves Committee (JORC) compliant resource averaging 1.98% vanadium pentoxide (V2O5) in magnetite grades (including 48.4 Mt in reserves). It utilises a well-established salt roast processing method to produce refined vanadium in the form of Nitrovan and Vanadium Oxide (NVO).

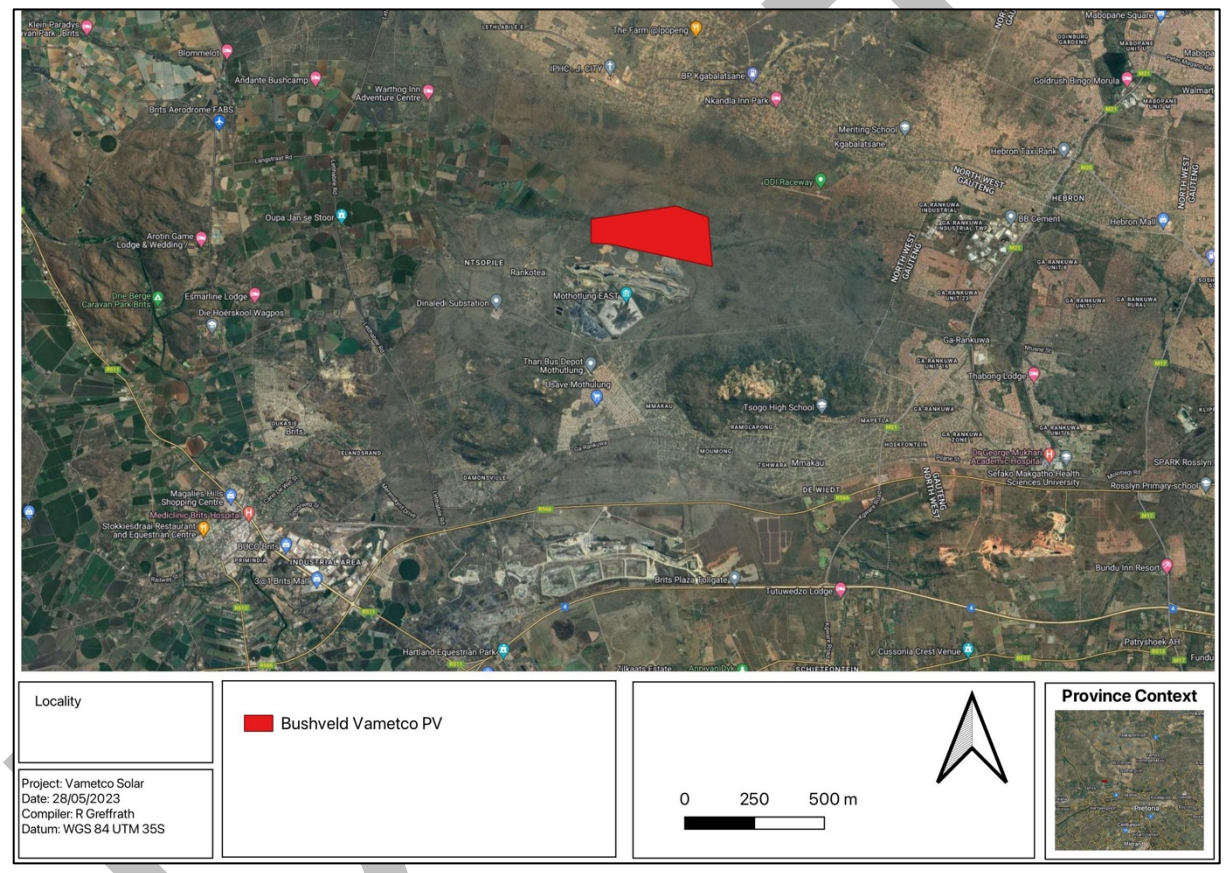


Figure 1-5: Locality

1.3 Project Area of Influence

The IFC PS section 8 states: Where the project involves specifically identified physical elements, aspects, and facilities that are likely to generate impacts, environmental and social risks and impacts will be identified in the context of the project's area of influence. This area of influence encompasses, as appropriate:

The area likely to be affected by:

(i) the project and the client's activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project;

(ii) impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or

(iii) indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent.

The PAOI consists of the Vametco PV Area, no current terrestrial CBA areas are influenced. The proposed infrastructure layout can be viewed in Figure 1-6. Aquatic CBA areas are present in the form of streams within the project infrastructure. Specific management measures would be contained in the Wetland Specialist report.

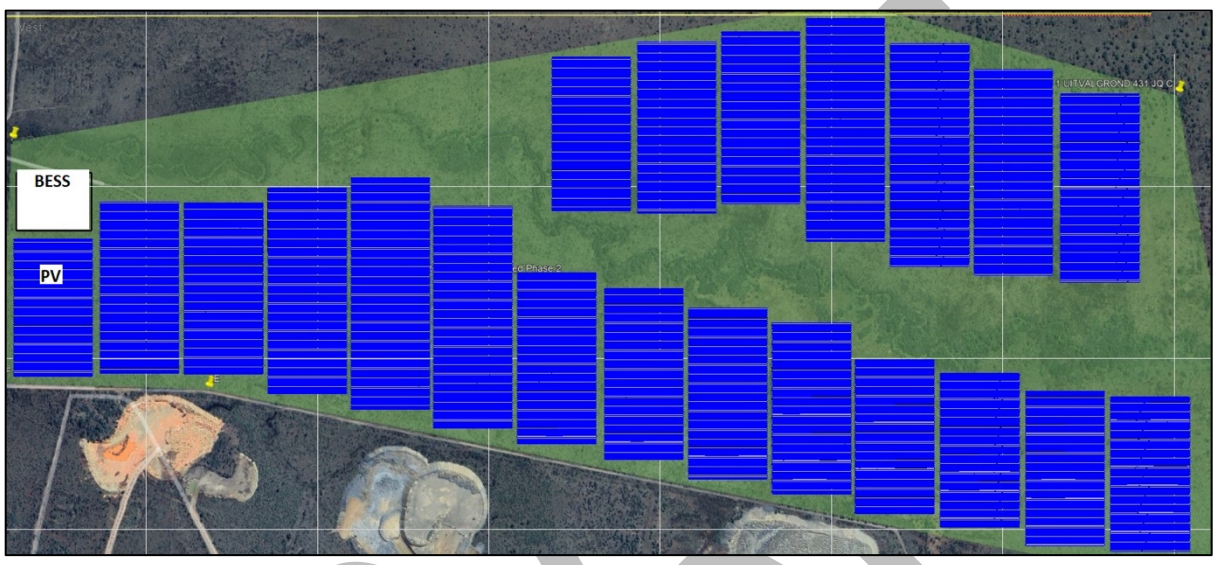


Figure 1-6: Proposed infrastructure layout

1.4 Terms of Reference

The terms of reference include the following deliverables for this Terrestrial Plants and Animals and Biodiversity Assessment include the following:

- Record representative samples of the plant species that occur within the study area based on seasonal field surveys;
- Record representative samples the animal species (mammals, and herpetafuana that occur within the study area based on field surveys;
- Identify which of these species are SCC based on the following lists:
  - International Union for the Conservation of Nature (IUCN) red data list,
  - The South African National Biodiversity Institute (SANBI) red data list,
  - The South African Red Data lists for mammals, amphibians and reptiles,
  - The National Environmental Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA), and
  - The Convention on International Trade in Endangered Species of Flora and Fauna (CITES) list.
- Determine if any of the recorded species are alien invasive species or problem species in terms of NEMBA alien invasive species classification;

- Using data gathered from the field, determine the vegetation communities occurring within the study area and map these;
- Map important habitats for fauna within the study area;
- Determine the biodiversity value of the study area using information gathered on both flora and fauna and map this; and
- Assess the identified impact of the proposed project and recommend mitigation measures to avoid or mitigate negative impacts.

1.5 Assumptions and Limitations

Whilst every effort is made to cover as much of the site as possible, representative sampling was completed as per the nature of this type of investigation. It is therefore possible that some plant and animal species that are present on site were not recorded during the field investigations. An in-depth Avifauna investigation does not form part of this report.

Every effort is made to identify all plant species present on site during field investigations, this being the wet season, any winter flowering species would have been omitted from field data.

This report lists the findings of an on-site baseline evaluation within the area selected by Vametco for the construction and operation activities of the PV facility and related activities. Where necessary, recommendations for the most appropriate mitigation measures have been included.

To obtain a comprehensive understanding of the dynamics of the biota on a site, including SCC, studies should include investigations through the different seasons of the year, over several years, and extensive sampling of the area. Due to the EIA process time constraints, such long-term research was not feasible, and information contained within this report is based on a late wet season field survey.

In terms of limitations relevant to this study, it must be noted that field investigations did not include a nocturnal survey for safety reasons, therefore nocturnal species were not recorded by this means.

1.6 Report Conditions

Findings, recommendations, and conclusions provided in this report are based on the authors' best scientific and professional knowledge as well as information available at the time of compilation. The author, however, accepts no liability for any actions, claims, demands, losses, liabilities, costs, damages, and expenses arising from or in connection with services rendered, and using the information contained in this document.

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

No form of this report may be amended or extended *without the prior written consent of the author*. Any recommendations, statements or conclusions drawn from or based on this report must clearly cite or refer to this report. Whenever such recommendations, statements or

conclusions form part of a main report relating to the current investigation, this report must be included in its entirety.

The author reserves the right to modify aspects pertaining to the present investigation should additional information become available through ongoing research and/or further work in this field.

1.7 Regulatory and Institutional Framework

The Terrestrial plant and Animal studies were completed strictly according to the recently published Government Notice 320 (dated 20 March 2020) and Government Notice 1150 (dated 30 October 2020) in terms of NEMA: "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".

This report is based on the Species Environmental Assessment Guideline: Guidelines for the implementation of the Terrestrial Flora (3c) & Terrestrial Fauna (3d) Species Protocols for environmental impact assessments in South Africa. This guideline provides details for implementing relevant species protocols as they have been identified through the screening tool.

In terms of the NEMA and other applicable laws as listed below, it is required that the environmental and social impacts associated with mining activities be assessed to identify any potential negative and/or positive consequences as a result thereof. Following which, measures must be proposed to avoid or minimise these impacts.

The following legislative requirements were considered during this assessment:

- Section 24 of the Constitution – Environment, 1996 (Act No. 108 of 1996);
- The Minerals and Petroleum Resources Development Act, (Act No. 28 of 2002) (MPRDA) and it's Regulations;
- National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2014) (NEM: BA);
- Section 5 of the National Environmental Management Act, 1998 (Act No. 7 of 1998) (NEMA);
- National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) (NEM: PAA) as amended;
- National Forest Act,1998, (Act No. 84 of 1998) (NFA) and
- Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA).

1.8 Details of Specialist

The Author is a terrestrial ecology specialist with 16 years of experience in biodiversity baseline assessments, biodiversity action planning design and development, biodiversity off-set design and implementation, biodiversity strategy design, conservation management planning and implementation, IFC performance standards best practice, ecological

restoration, ecosystems services and environmental impact assessments, across Africa. He is *Pr. Sci Nat* registered (400018/17) in Conservation Science field of practice.

2 Methodology

2.1 Species Protocols and Associated Species Environmental Assessment Guidelines

The purpose of the Species Environmental Assessment Guideline is to provide background and context to the assessment and minimum reporting criteria contained within the Terrestrial Animal and Plant Species Protocols; as well as to provide guidance on sampling and data collection methodologies for the different taxonomic groups that are represented in the respective protocols. This guideline is intended for specialist studies undertaken for activities that have triggered a listed and specified activity in terms of the National Environmental Management Act, 1998 (No. 107 of 1998) (NEMA), as identified by the EIA Regulations, 2014 (as amended) and Listing Notices 1-3.6.

The screening tool report indicated the environmental sensitivities that intersect with the proposed development footprint as defined by the Vametco, as well as the relevant protocols that the applicant would need to adhere to (Terrestrial Plant and Animal and Biodiversity).

Based on the selected classification, and the environmental sensitivities of the proposed development footprint, the screening tool report indicated that the Vametco project area must incorporate the Terrestrial Plant and Animal Protocols as well as the Biodiversity Protocol for inclusion in this assessment report.

The screening tool report provided a list of all confirmed occurring and potentially occurring animals (medium sensitivity) and flora (medium sensitivity) SCC within the proposed development footprint/PAOI.

2.2 Terrestrial Site Ecological Importance (SEI)

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

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

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

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

Conservation Importance	Fulfilling Criteria
Very High	Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global 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 NT species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. Any area of natural habitat of threatened ecosystem type with status of VU. Presence of range-restricted species. > 50% of receptor contains natural habitat with potential to support SCC.
Low	No confirmed or highly likely populations of SCC. No confirmed or highly likely populations of range-restricted species. < 50% of receptor contains natural habitat with limited potential to support SCC.
Very Low	No confirmed and highly unlikely populations of SCC. No confirmed and highly unlikely populations of range-restricted species. No natural habitat remaining.

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

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

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

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

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

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

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

Table 2-4: Summary of Resource 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 remaining at a site even when a disturbance or impact is occurring, or species that have a very high likelihood of 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 remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of 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 remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of 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 remaining at a site even when a disturbance or impact is occurring, or species that have a low likelihood of 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 remain at a site even when a disturbance or impact is occurring, or species that are unlikely to return to a site once the disturbance or impact has been removed.

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

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

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

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

Table 2-6: Guidelines for interpreting Site Ecological Importance (SEI) in the context of the proposed development activities

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

2.3 Literature Review and Desktop Study

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

2.3.1 Desktop Flora Assessment

The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2012) and SANBI (2019) was used to identify the vegetation type that would have occurred under natural or pre-anthropogenically altered conditions. Furthermore, the Plants of Southern Africa (POSA) database was accessed to compile a list of expected flora species within the project area (Figure 2-1). The Red List of South African Plants (Raimondo et al., 2009; SANBI, 2020) was utilized to provide the most current national conservation status of flora species.

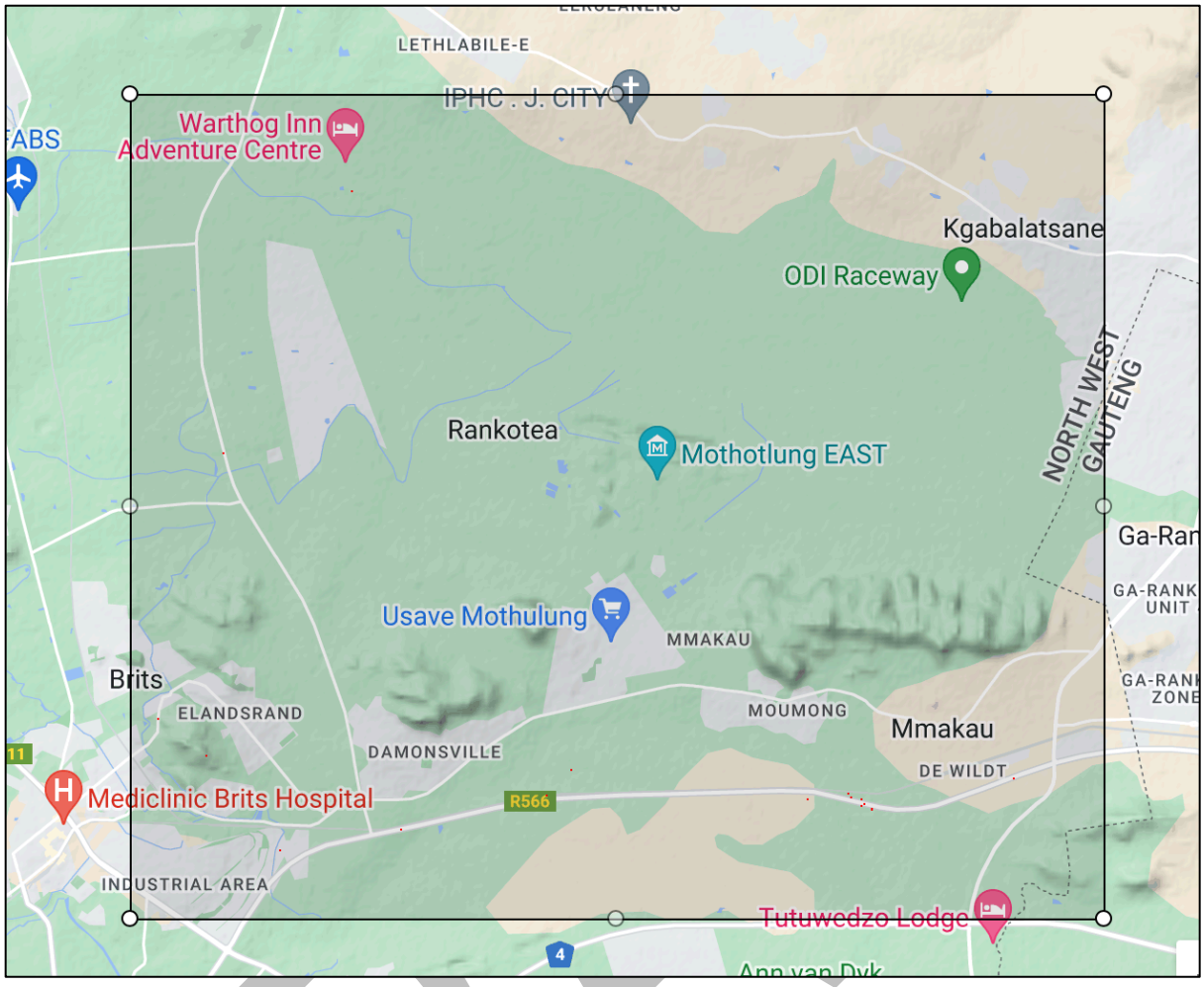


Figure 2-1: Map illustrating extent of area used to obtain the expected flora species list from the Plants of South Africa (POSA) database.

2.3.2 Desktop Faunal Assessment

The faunal desktop assessment comprised of the following, compiling an expected:

- Amphibian list, generated from the IUCN spatial dataset (2017) and ReptileMap database (Fitzpatrick Institute of African Ornithology, 2021a), using the 2527CB quarter degree square;
- Reptile list, generated from the IUCN spatial dataset (2017) and AmphibianMap database (Fitzpatrick Institute of African Ornithology, 2021b), using the 2527CB quarter degree square; and
- Mammal list from the IUCN spatial dataset (2017).

2.4 Field Investigation

The site visit and detailed infield flora and fauna assessments took place from the 11th and 12th of May 2023. Representations of the project area is indicated in Figure 2-2 representing the entire project area footprint.

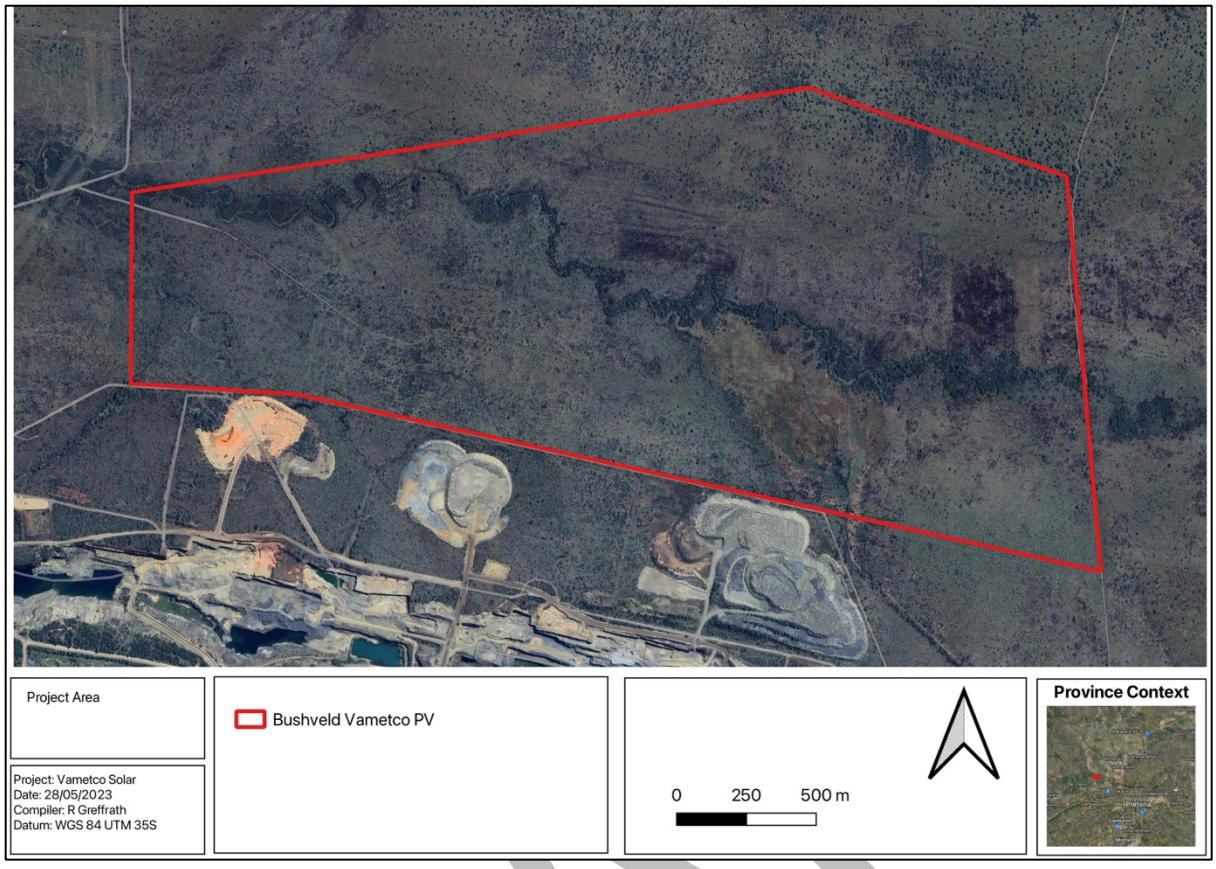


Figure 2-2: Project Area

2.4.1 Flora Survey

The 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, to perform a rapid vegetation and ecological assessment at each sample site. Emphasis was placed on sensitive habitats, especially those overlapping with the proposed project area.

Homogenous vegetation units were subjectively identified using satellite imagery and existing land cover maps. The floristic diversity and search for flora SCC were conducted through timed meanders within representative habitat units delineated during the scoping fieldwork. Emphasis was placed mostly on sensitive habitats overlapping with the proposed project areas.

The timed random meander method is highly efficient for conducting floristic analysis, specifically in detecting flora SCC and maximising floristic coverage. In addition, the method is time and cost effective and highly suited for compiling 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., livestock grazing, erosion etc.), subjective recording of dominant vegetation species and any sensitive features (e.g. wetlands, outcrops etc.). In addition, opportunistic observations were made while navigating through the project area.

2.4.2 Fauna Survey

The faunal assessment within this report pertains to herpetofauna (amphibians and reptiles), avifauna and mammals. The faunal field survey comprised of the following techniques:

- Visual and auditory searches - This typically comprised of meandering and using binoculars to view species from a distance without them being disturbed; and listening to species calls;
- Small Mammal Trapping – where Sherman traps were baited and placed infield for the duration of the study;
- Camera trapping – where stationary motion sensor cameras where left infield for the duration of the study;
- Active hand-searches - are used for species that shelter in or under particular micro-habitats (typically rocks, exfoliating rock outcrops, fallen trees, leaf litter, bark etc.); and
- Utilization of local knowledge, informal but extensive interviews with land owners were completed.

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

- Field Guide to Snakes and other Reptiles of Southern Africa (Branch, 1998);
- A Complete Guide to the Snakes of Southern Africa (Marais, 2004);
- Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland (Bates et al, 2014);
- A Complete Guide to the Frogs of Southern Africa (du Preez and Carruthers, 2009);
- Smithers' Mammals of Southern Africa (Apps, 2000);
- A Field Guide to the Tracks and Signs of Southern and East African Wildlife (Stuart and Stuart, 2000).

2.5 Species of Conservation Concern (SCC)

From the overall species list compiled through field work, a list of SCC is compiled. The comprehensive SCC species list was compiled by taking the following Red Data Lists into consideration:

- International Union for the Conservation of Nature (IUCN) Red Data List (2019);
- The South African National Biodiversity Institute (SANBI) Red Data list version 2019.1;
- The South African Red Data lists for mammals (2004), birds (2016), and Herpetafauna;
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) Threatened or Protected Species Regulations, and

- The Convention on International Trade in Endangered Species of Flora and Fauna (CITES) list (2019).

The South African Red Data List uses the same criteria as that defined by the IUCN. According to the IUCN all species are classified in nine groups, set through criteria such as rate of decline, population size, area of geographic distribution, and degree of population and distribution fragmentation (IUCN, 2021). The categories are described in Table 2-7 below.

Table 2-7: Red Data Categories (taken from SANBI 2018)

CATEGORY		DESCRIPTION
Extinct	(EX)	No known individuals remaining.
Extinct in the Wild	(EW)	Known only to survive in captivity.
Critically Endangered	(CR)	Extremely high risk of extinction in the wild.
Endangered	(EN)	High risk of extinction in the wild..
Vulnerable	(VU)	High risk of endangerment in the wild.
Near Threatened	(NT)	Likely to become endangered in the near future.
Least Concern	(LC)	Lowest risk. Does not qualify for a more at risk category. Widespread and abundant taxa are included in this category.
Data Deficient	(DD)	Not enough data to make an assessment of its risk of extinction.
Not Evaluated	(NE)	Has not yet been evaluated against the criteria.
	Extinct	Threatened species are species that are facing a high risk of extinction. Any species classified in the IUCN categories CR, EN or VU is a threatened species. Species of conservation concern are species that have a high conservation importance in terms of preserving South Africa's high floristic diversity and include not only threatened species, but also those classified in the categories**, NT, LC** and **DD**
	Threatened	
	Other categories of conservation concern	
	Other categories	

2.6 Alien Invasive Species

Alien plant species in South Africa are categorised according to the Alien and Invasive Species Lists, 2014 (GN R864 in GG 40166 of 29 July 2016) of the NEMBA (Act 10 of 2004). The national list of invasive plant species listed in NEMBA represents the following categories:

- Category 1a: Species requiring compulsory control;
- Category 1b: Invasive species controlled by an invasive species management programme;

- Category 2: Invasive species controlled by area, and
- Category 3: Invasive species controlled by activity.

The species recorded on site are categorised according to NEMBA, and management measures designed according to requirements of the act.

3 Study Area

3.1 Locality

The study area is situated approximately 5km west of Ga-Rankuwa and 10km northeast of Brits town which is located within the in Municipal Ward number 35 of Madibeng Local Municipality (hereafter referred to as Madibeng) within the jurisdiction of the Bojanala Platinum District Municipality in the Northwest Province.

3.2 Climate and Surface Hydrology

The study area is in the Highveld climatic region, which is a summer rainfall area. The temperature classifications for the region are hot in summer and mild to warm in winter, with significant diurnal fluctuations. The local climate can be described as semi-arid high-veld conditions with hot summers and moderate dry winters (en.climate-data.org; worldweatheronline.com, Mucina and Rutherford (2012).

3.3 Geology and Soils

The study area is situated within the Bushveld Complex, more specifically, within the Rustenburg Layered Suite with intrusive rocks comprising of Bierkraal Magnetite Gabbro and the Pyramid Gabbro-norite dominating the study area and surroundings. The Gabbro's weather to form well-structured soils such as the Vertics found within the study area.

3.4 Regional Vegetation (Reference State)

3.4.1 Marikana Thornveld

In terms of recent vegetation classifications, the assessed area occurs within the Marikana Thornveld vegetation type (Mucina & Rutherford, 2012). This vegetation occurs as open *Vachellia karoo* woodland, in valleys and slightly undulating plains and some lowland hills. Shrubs are denser along drainage lines, on termitaria and rocky outcrops or in other habitats protected from fire.

Key indicator species of this vegetation type include:

- Tall tree: *Senegalia burkei*;
- Small trees: *Senegalia caffra (d), Vachellia gerrardii, Vachellia karroo (d), Vachellia nilotica, Vachellia tortilis subsp.heteracantha, Combretum molle (d), Searsia lancea (d), Ziziphus mucronata (d), Pappea capensis, Dombeya rotundifolia, Peltophorum africanum, Celtis africana, Terminalia sericea*;

- Tall shrubs: *Euclea crispa subsp. crispa (d), Olea europaea subsp. africana (d), Searsia pyroides var. pyroides (d), Diospyros lycoides subsp. guerkei, Ehretia rigida subsp.rigida, Euclea undulata, Grewia flava, Pavetta gardeniifolia*;

Low shrubs: *Asparagus cooperi (d), Rhynchosia nitens (d), Indigofera zeyheri, Justicia flava*;

- Woody climbers: *Clematis brachiata (d), Helinus integrifolius*;
- Herbaceous climber: *Cyphostemma cirrhosum, Pentarrihum insipidum* (d);
- Graminoids: *Elionurus muticus (d), Eragrostis lehmanniana (d), Setaria sphacelata (d),*
- *Themeda triandra (d), Aristida scabrivalvis subsp. scabrivalvis, Fingerhuthia africana, Heteropogon contortus, Hyperthelia dissoluta, Melinis nerviglumis, Pogonarthria squarrosa*;
- Herb: *Hermannia depressa (d), Ipomoea obscura (d), Vernonia oligocephala*;
- Geophytic herbs: *Ledebouria revoluta, Ornithogalum tenuifolium, Sansevieria aethiopica*. *d = dominant species

3.4.1.1 Conservation

The Marikana Thornveld Ecosystem is described by the National List of Threatened Terrestrial Ecosystems (2021) as being “Vulnerable”. The conservation target for the area is 19% and less than 1% is statutorily conserved in for example, Magaliesberg Nature Area. More of the vegetation type is conserved in other reserves such as De Onderstepoort Nature Reserve. The vegetation type is considerably impacted. With 48% transformed, mainly by cultivation and urban or built-up areas. Most agricultural development of this area is in the western regions towards Rustenburg, while in the east industrial development is a greater threat. Erosion is very low to moderate. Alien invasive floral species occur localised in high densities, especially along drainage lines (Mucina & Rutherford, 2012).

4 Regional Sensitivity Analysis and No-go Areas

There are several assessments for South Africa as a whole, as well as on provincial levels that allow for detailed conservation planning as well as meeting biodiversity targets for the country’s variety of ecosystems. These guides are essential to consult for development projects and will form an important part of the sensitivity analysis.

Areas earmarked for conservation in the future, or that are essential to meet biodiversity and conservation targets should not be developed and have a high sensitivity as they are necessary for overall ecological functioning. Further to this, details of the field investigation are used to inform and determine the site-specific sensitivity, as per Site Ecological Importance (SEI) criteria.

4.1 North-West Biodiversity Sector Plan (NWBSP) (2015)

The main purpose of a biodiversity sector plan is to ensure that the most recent and best quality spatial biodiversity information can be accessed and used to inform land-use and development planning, environmental assessments and authorisations, and natural resource management. A biodiversity sector plan achieves this by providing a map (or maps) of

terrestrial and freshwater areas that are important for conserving biodiversity pattern and ecological processes – these areas are called Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). The maps are provided together with contextual information on biodiversity, and land-use guidelines that can be incorporated into the policies and decisions of a wide range of sectors.

The sector plan is a living document that is constantly reviewed and updated and documents the distribution of conservation important areas for biodiversity. According to the North-West Sector Plan, the Vametco project area contains no terrestrial CBA and ESA areas (Figure 4-1). All demarcations were considered during the field work studies planning and execution, as the Sector Plan's delineations were refined where applicable. The 2008 North West Biodiversity Conservation Assessment (BCA) identified the area as CBA type 2.

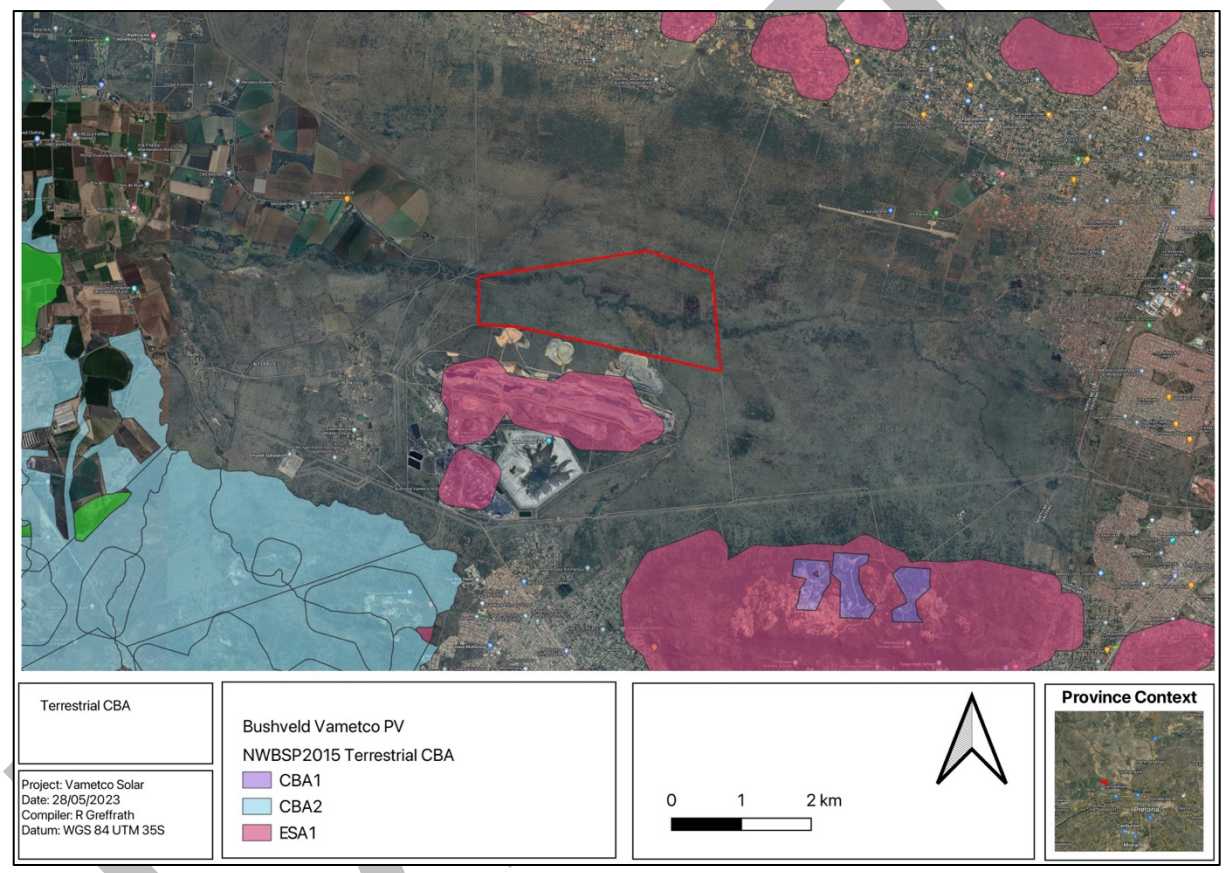


Figure 4-1: The NWBSP in relation to the project site

4.1.1 The National Biodiversity Assessment

The National Biodiversity Assessment (NBA) was completed as a collaboration between the SANBI, the 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 (Skowno et al., 2019).

The two headline indicators assessed in the NBA are ecosystem threat status and ecosystem protection level (Skowno et al., 2019).

4.1.1.1 Ecosystem Threat Status

Ecosystem threat status 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 (Skowno et al., 2019).

Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Concerned (LC), based on the proportion of each ecosystem type that remains in good ecological condition (Skowno et al., 2019).

The list of nationally threatened ecosystems has been gazetted (NEM:BA, Act 10 of 2004: National list of ecosystems that are threatened and in need of protection) and results in several implications in terms of development within these areas. Four basic principles were established for the identification of threatened ecosystems.

Areas were delineated based on as fine a scale as possible and are defined by one of several assessments:

- The South African Vegetation Map (Mucina and Rutherford 2006);
- National forest types recognised by the Department of Water Affairs and Forestry (DWAF), now Department of Water and Sanitation (DWS);
- Priority areas identified in a provincial systematic biodiversity plan; and
- High irreplaceability forest patches or clusters identified by DWAF (DWS).

The criteria for identifying threatened terrestrial ecosystems include six criteria overall, two of which are dormant due to lack of data (criteria B and E). The criteria are presented indicates that the Marikana Thornveld is listed as an Endangered ecosystem. Cumulative loss of these areas should be avoided.

Table 4-1: Criteria for the Listing of National Threatened Ecosystems

Criterion	Details
A1	Irreversible loss of natural habitat
A2	Ecosystem degradation and loss of integrity
B	Rate of loss of natural habitat
C	Limited extent and imminent threat
D1	Threatened plant species associations
D2	Threatened animal species associations
E	Fragmentation
F	Priority areas for meeting explicit biodiversity targets as defined in a systematic biodiversity plan

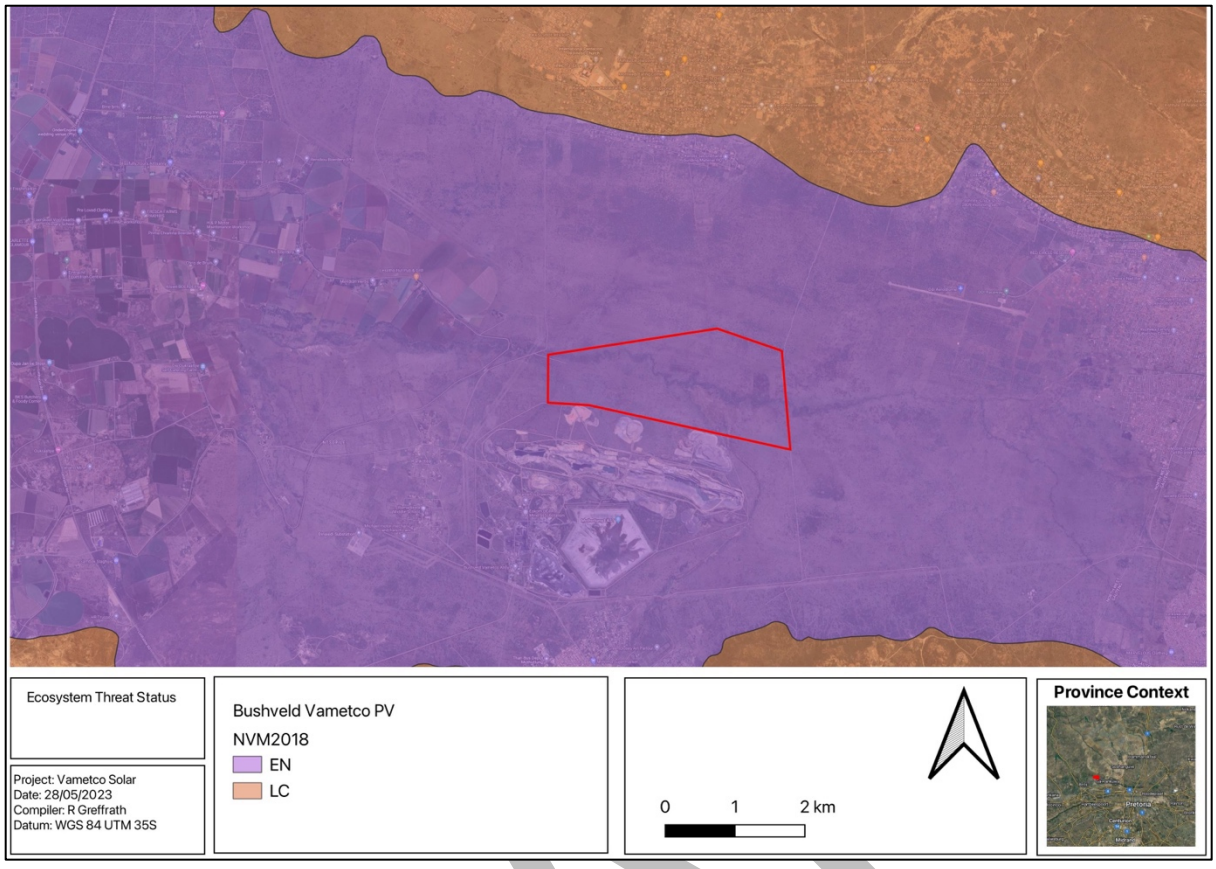


Figure 4-2: Ecosystem Threat Status

4.1.1.2 *Ecosystem Protection Level*

Ecosystem protection level tells us whether ecosystems are adequately protected or under-protected. Ecosystem types are categorised as not protected, poorly protected, moderately protected or well protected, based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act (Skowno et al., 2019).

The project area was superimposed on the ecosystem protection level map to assess the protection status of terrestrial ecosystems associated with the development. Based on this the terrestrial ecosystems associated with the project area is rated as Poorly Protected. This means that these ecosystems are considered not to be adequately protected in areas such as national parks or other formally protected areas.

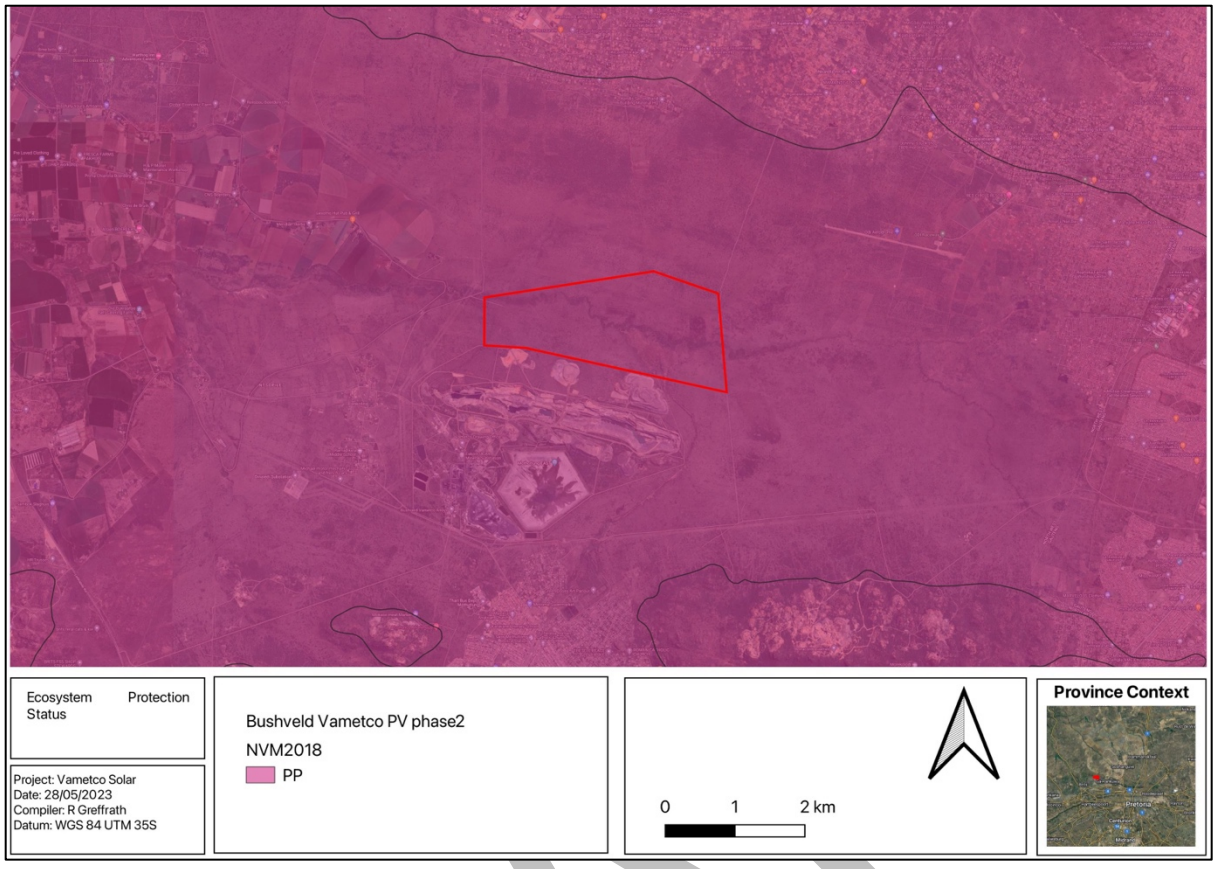


Figure 4-3: Ecosystem Protection Status

4.1.2 Protected Areas

The Department of Environmental Affairs maintains a spatial database on Protected Areas and Conservation Areas. Protected Areas and Conservation Areas (PACA) Database scheme that used for classifying protected areas (South Africa Protected Areas Database-SAPAD) and conservation areas (South Africa Conservation Areas Database-SACAD) into types and sub-types in South Africa.

The definition of protected areas used in these documents follows the definition of a protected area as defined in the National Environmental Management: Protected Areas Act, (Act 57 of 2003). Chapter 2 of the National Environmental Management: Protected Areas Act, 2003 sets out the "System of Protected Areas", which consists of the following kinds of protected areas:

- Special nature reserves:
- National parks:
- Nature reserves and
- Protected environments (1-4 declared in terms of the National Environmental Management: Protected Areas Act, 2003);
- World heritage sites declared in terms of the World Heritage Convention Act;
- Marine protected areas declared in terms of the Marine Living Resources Act;

- Specially protected forest areas, forest nature reserves, and forest wilderness areas declared in terms of the National Forests Act, 1998 (Act No. 84 of 1998); and
- Mountain catchment areas declared in terms of the Mountain Catchment Areas Act, 1970 (Act No. 63 of 1970).

The types of conservation areas that are currently included in the database are the following:

- Biosphere reserves;
- Ramsar sites;
- Stewardship agreements (other than nature reserves and protected environments);
- Botanical gardens;
- Trans frontier conservation areas;
- Trans frontier parks;
- Military conservation areas and
- Conservancies.

Officially protected areas, either provincially or nationally, that occur within proximity to the project site could have consequences as far as impact on these areas are concerned. For the project area however, there are no protected areas in proximity. The closest protected is the Magaliesburg Protected Natural Environment situated 14km to the South, and the Tswaing Meteorite Crater Reserve, 21km Northeast.

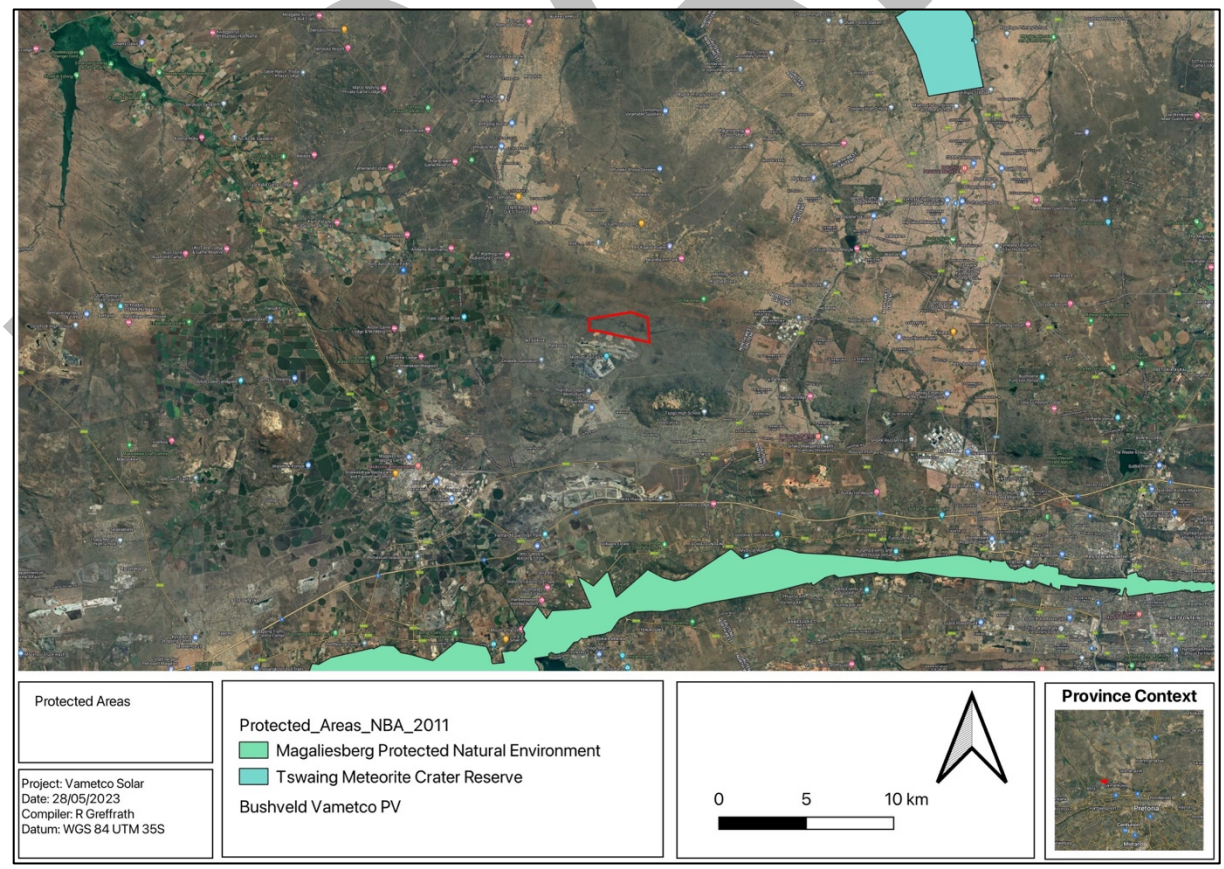


Figure 4-4: Protected Areas in relation the to the project area

4.2 Important Bird Areas (Birdlife SA, 2013)

An Important Bird Area (IBA) is an area recognised as being a globally important habitat for the conservation of bird populations. Currently there are about 10,000 IBAs worldwide. At present, South Africa has 124 IBA's, covering over 14 million hectares of habitat for threatened, endemic and congregatory birds. Yet only one million hectares of the total land surface covered by our IBA's are legally protected. BirdLife South Africa continues an IBA programme of stewardship which will ultimately achieve formal protection (BirdlifeSA, 2013).

The study area falls within the Magaliesberg IBA. Previously known as the Magaliesberg and Witwatersberg IBA, this IBA consists mainly of the Magaliesberg range, which extends in an arc from just north-west of Rustenburg in the west to the N1 in the east near Pretoria. To the south, the Witwatersberg range runs parallel to the Magaliesberg, extending from the town of Magaliesburg in the west to Hartbeespoort Dam in the east.

Cape Vulture (*Gyps coprotheres*) breeds at Nooitgedacht and at Skeerpoort, the larger of the two colonies. No breeding activity was recorded at a third colony, Roberts' Farm, in 2014.

Many raptor species occur in the Magaliesberg IBA, including White-backed Vulture (*Gyps africanus*) and Lappet-faced Vulture (*Torgos tracheliotus*), although most records are of individuals. Verreauxs' Eagle (*Aquila verreauxii*) breeds in the Magaliesberg, and African Grass Owl (*Tyto capensis*) and Secretarybird (*Sagittarius serpentarius*) are regularly recorded. Long-crested Eagle (*Lophaetus occipitalis*) is a more recent coloniser of the range. White-bellied Korhaan (*Eupodotis senegalensis*) is found in grassland at the top of the Magaliesberg, as well on the Witwatersberg.

One pair of Black Stork (*Ciconia nigra)* also breeds at Skeerpoort, and there is a possibility that more birds occur in the area. The densely wooded valleys along overgrown, slow-flowing streams hold Half-collared Kingfisher (*Alcedo semitorquata*). African Finfoot (*Podica senegalensis*) is recorded regularly along rivers in the IBA, such as the Hennops and Magalies.

The surrounding woodland holds Striped Kingfisher (*Halcyon chelicuti),* Burnt-necked Eremomela (*Eremomela usticollis),* Barred Wren-Warbler (*Calamonastes fasciolatus*), Marico Flycatcher (*Bradornis mariquensis*), Crimson-breasted Shrike (*Laniarius atrococcineus*), Scaly-feathered Finch (*Sporopipes squamifrons*), Violet-eared Waxbill (*Uraeginthus granatinus*), Black-faced Waxbill (*Estrilda erythronotos*), Striped Pipit *(Anthus lineiventris*) and Short-toed Rock Thrush (*Monticola brevipes*).

Some Afromontane affinities appear along the range and there are patches of Northern Afro-temperate Forest in the kloofs, where Mountain Wagtail (*Motacilla clara*) has been recorded.

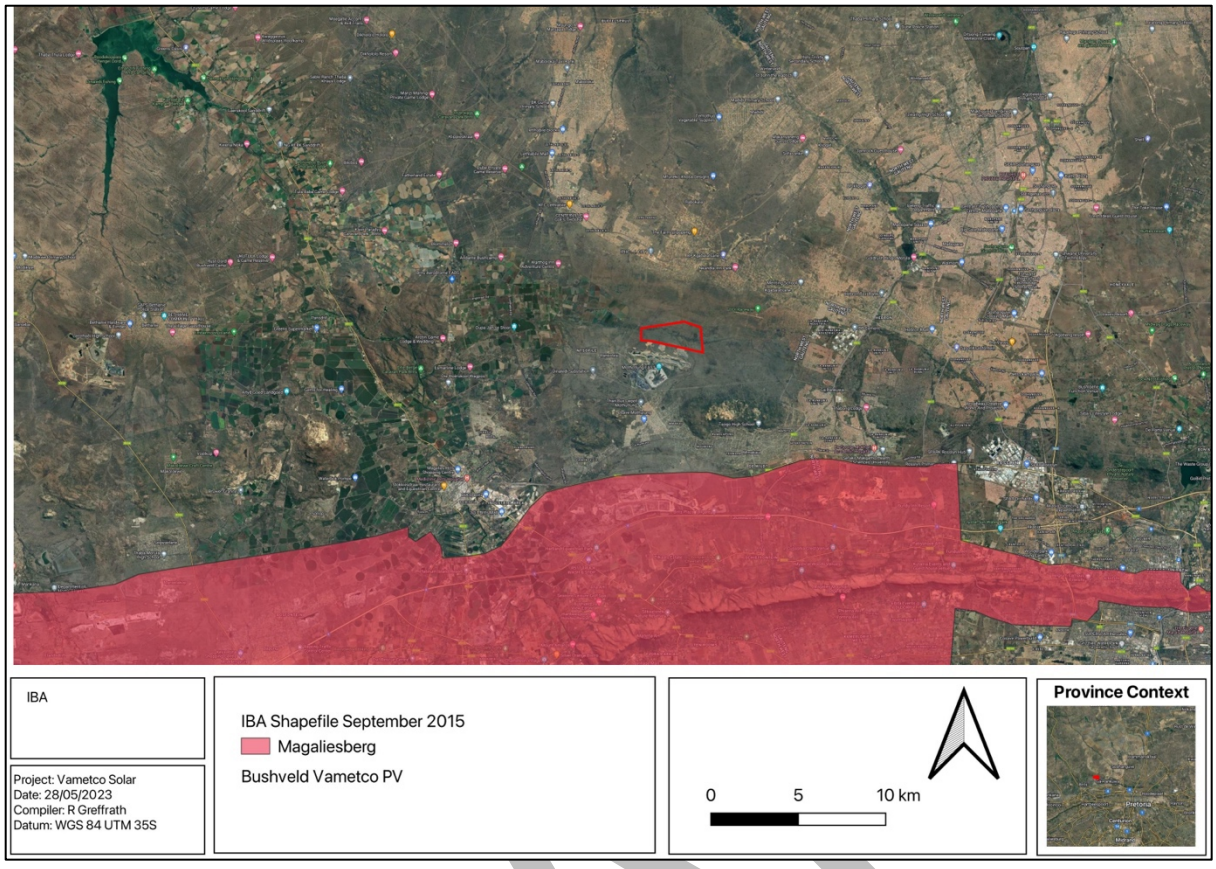


Figure 4-5: IBA

4.3 Nationally Protected Areas Expansion Strategy

The National Protected Areas Expansion Strategy (NPAES) shows areas designated for future incorporation into existing protected areas (both national and informal protected areas). These areas are large, mostly intact areas required to meet biodiversity targets, and suitable for protection. They may not necessarily be proclaimed as protected areas in the future and are a broad scale planning tool allowing for better development and conservation planning. The closest area is the NW/Gauteng Bushveld.

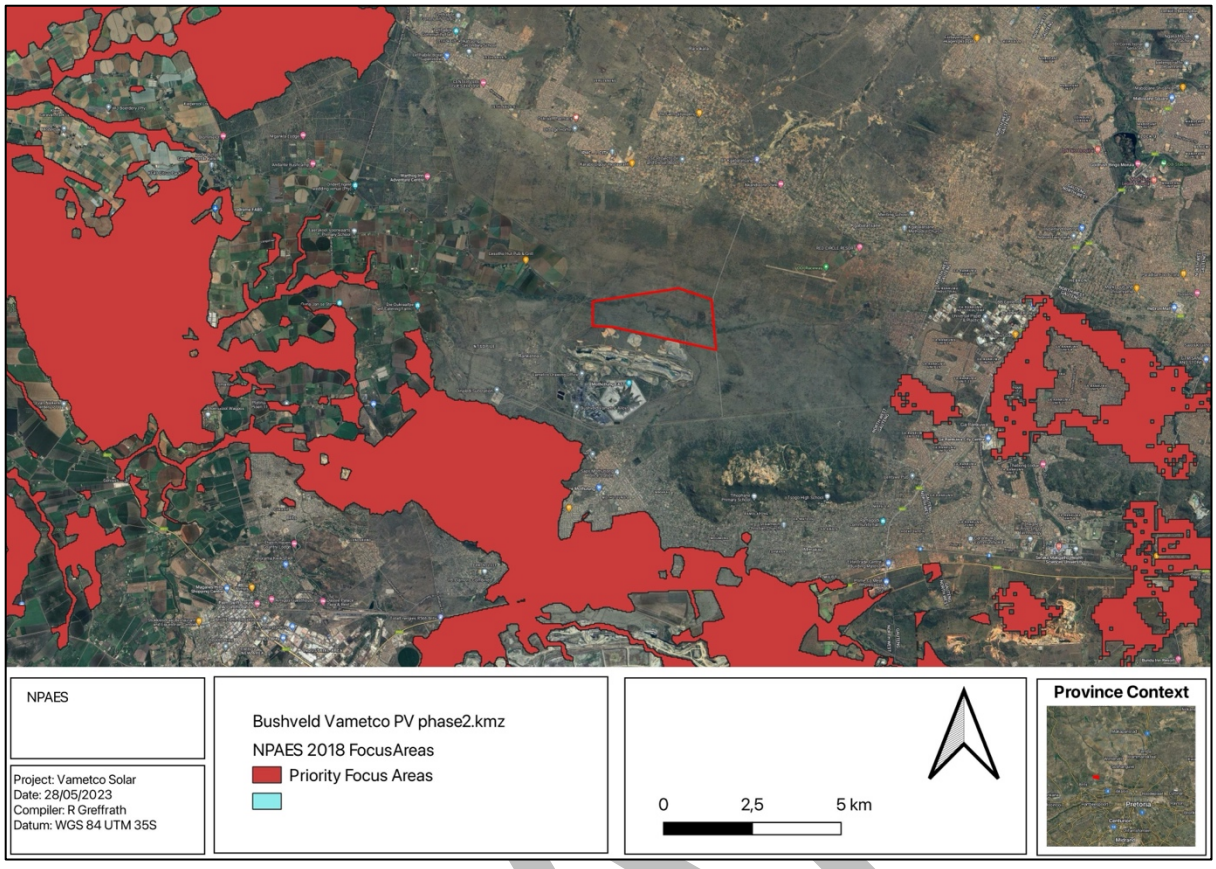


Figure 4-6: NPAES

4.4 Power Corridors

Power Corridors are geographical areas where wind and solar photovoltaic technologies can be incentivized and where grid expansion can be directed and where regulatory processes will be streamlined.

The REDZs act as energy generation hubs and provide anchor points for grid expansion, thereby allowing for strategic and proactive expansion of grid into these areas.

This will ensure that the grid expansion does not hamper the progress of the renewable energy power purchase agreement process. The Vametco project occurs within 3.5km from the central corridor.

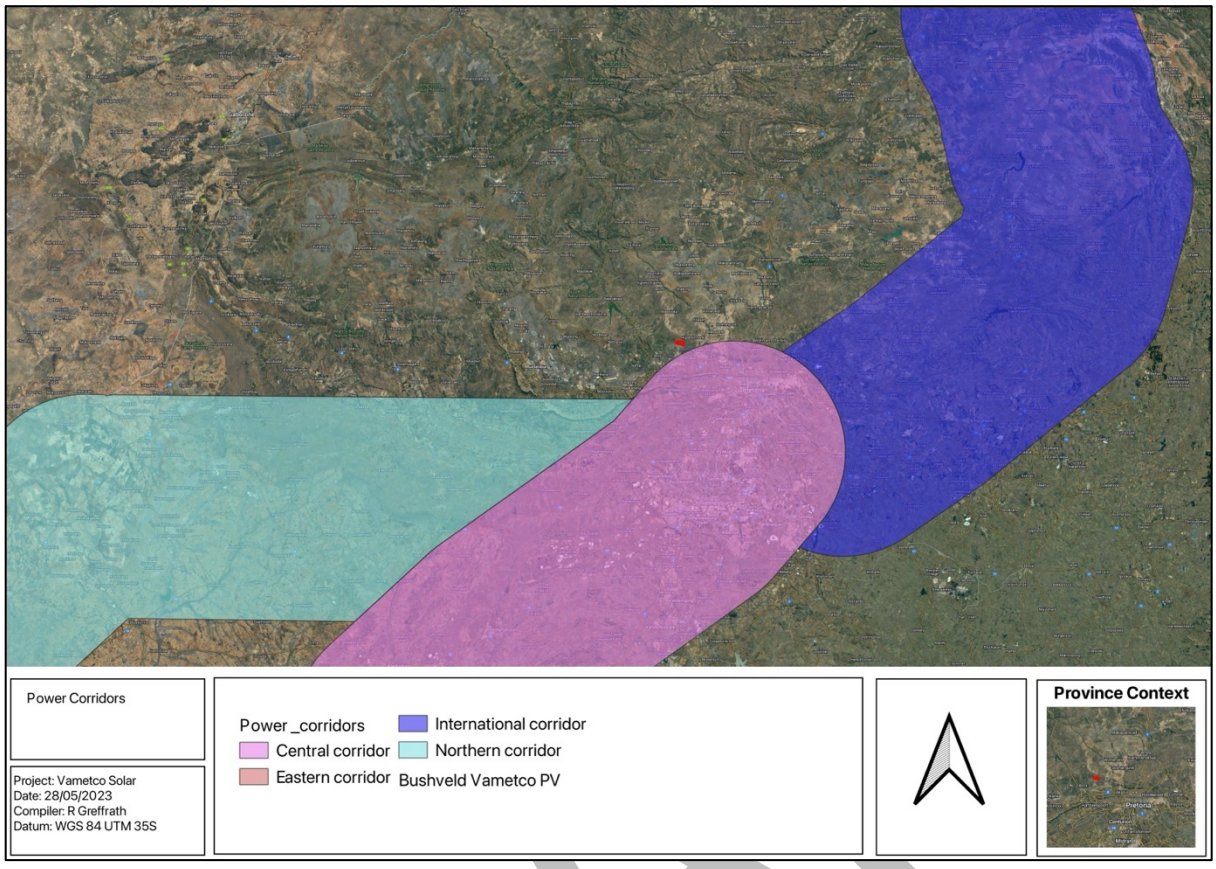


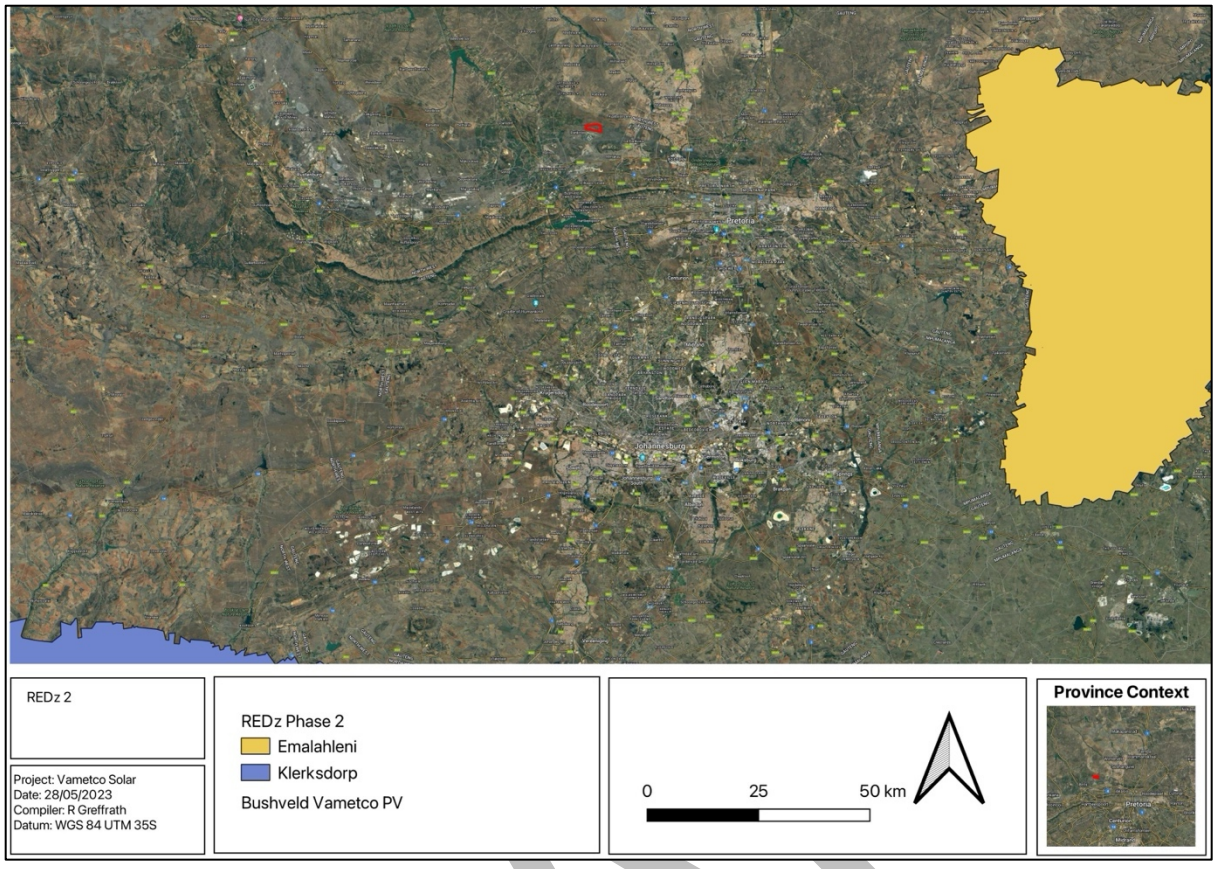
Figure 4-7: Project site in relation to Power Corridors

4.5 Renewable Energy Development Zones

Renewable Energy Development Zones are geographical areas where wind and solar photovoltaic technologies can be incentivized and where grid expansion can be directed and where regulatory processes will be streamlined.

The REDZs act as energy generation hubs and provide anchor points for grid expansion, thereby allowing for strategic and proactive expansion of grid into these areas.

This will ensure that the grid expansion does not hamper the progress of the renewable energy power purchase agreement process. The closest REDz phase 2 area is the Emalahleni area.



5 Results

5.1 Flora Expected Species

The POSA database indicates that 91 species are expected to occur within the PAOI but not the surrounding landscape due its transformed nature. However, based on the opinion of the specialist few of these species are expected, due to the disturbed and transformed nature of the project area and surrounds. Appendix C provides the list of species and their respective conservation status.

5.2 Flora

The Savanna Biome is the largest Biome in southern Africa, occupying 46% of its area, and over one-third the area of South Africa. It is well developed over the lowveld and Kalahari region of South Africa and is also the dominant vegetation in Botswana, Namibia and Zimbabwe.

It is characterized by a grassy ground layer and a distinct upper layer of woody plants. Where this upper layer is near the ground the vegetation may be referred to as Shrubveld, where it is dense as Woodland, and the intermediate stages are locally known as Bushveld.

The study area itself falls within the Marikana thornveld vegetation type according to Mucina and Rutherford (2012). The study site can be divided into three main sections being moist bushveld, rocky bushveld, and riparian areas.

A total of 56 plant species were recorded on site (Appendix B), of 543 listed (recorded by SANBI in the relevant grid in the past in the regional list (Appendix B), however more may occur that was not recorded and identified by SANBI and therefore not on the PRECIS List. The delineated vegetation types associated with the project area are discussed in more detail in the sections to follow and is depicted in Figure 5-1. The primary land use and vegetation habitats identified as well as their respective sizes within the project area are listed in Table 5-1. Vegetation associated with the Vametco project area comprises three broad habitat units, namely the Open Bushveld comprising of moist bushveld, rocky bushveld, and low-lying riparian areas.

The Open Bushveld Habitat Unit includes patches of less impacted bushveld habitat containing a higher abundance of indigenous species. This habitat unit occurs throughout the subject property and is sub divided into moist bushveld and rocky bushveld, depending on elevation and location within the topography.

The Rocky bushveld Habitat Unit comprises several small rocky outcrops, with largely intact vegetation composition and structure, a high diversity of floral species and an increased diversity and abundance of faunal species.

Riparian areas are located at the lowest point in the landscape where water runoff collects and forms small river systems.

Table 5-1: Vegetation Habitats (and other land use) and Approximate Areas

Vegetation/Land Use Unit	Area (ha)
Rocky Bushveld	69.8
Moist Bushveld	241.6
Riparian	84,2
Total	395.6

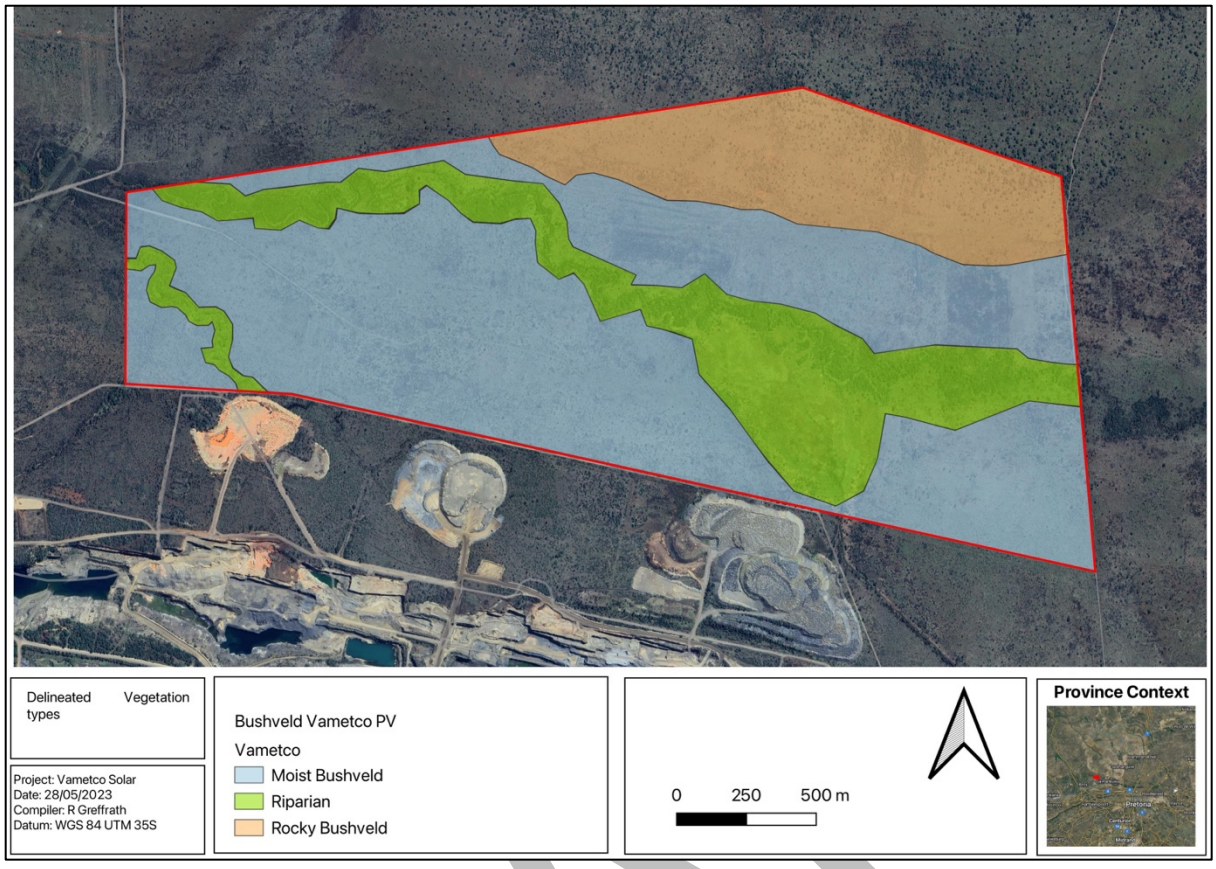


Figure 5-1: Delineated Vegetation types encountered within the Vametco project area.

5.2.1 Open Bushveld

This vegetation type occurs on the level areas of the study site, with few rocks and a high erodibility. Areas of this vegetation type tend to be dominated by short shrubs (up to 1.5m tall) with others supporting larger trees (up to 2.5m tall). Although this vegetation type can be patchy and dominated by different species, it is considered one community type.

5.2.1.1 Moist Bushveld

Extensive areas of short open bushveld dominated by *Peltophorum africanum, Searsia lancea, Heteropogon contortus, Chloris virgata* and *Urochloa mosambicensis* occur throughout the project area. Most of the flat areas within the study site are dominated by a shrubland comprising mainly *Dichrostachys cinerea, Grewia flavescens* and *Setaria sphacelata var. sphacelate* on black turf soils. This vegetation type is easily discerned by its occurrence on comparatively flat areas, and the presence of the diagnostic *Dichrostachys cinerea, Acacia karoo, Asparagus africanus, Gymnosporia heterophylla* and *Heteropogon contortus* all of which do not occur (or occur very rarely) on the rocky outcrops.

The tree and shrub layers are well developed with *Dichrostachys cinerea, Vachellia tortilis, Aloe greatheadii, Vachellia karroo, Ziziphus mucronata, Asparagus africanus, Gymnosporia heterophylla, Vachellia nilotica, Aloe marlothii* and *Vachellia caffra* the dominant trees and shrubs. The cover abundance of the tree and shrub layer was estimated at approximately 15 and 25% respectively. The dominant grass species of this sub-community are *Themeda triandra, Eragrostis rigidior, Eragrostis heteromera, Eragrostis superba, Cynodon dactylon,*

Eragrostis chloromela and *Aristida congesta subsp congesta*. The herb (forb) layer was poorly developed at the time of the survey with a cover abundance of approximately 8-10%. Identification to species level was difficult due to the absence of flowers, leaves (dead) and fruit/seeds. The dominant herbs/forbs recorded at the time of the survey include *Kalanchoe rotundifolia, Solanum incanum, Solanum panduriforme, Verbena bonariesnis, Lippia javanica, Hibiscus trionum, Felicia muricata* and *Vernonia oligocephala*.

5.2.1.2 Rocky Bushveld

The Rocky Outcrop Habitat Unit comprises a number of rocky areas of limited extent and occurrence The floral species occurring within this habitat unit are typical of the rocky outcrops and rocky ridges of the area, hosting an indigenous species assemblage of high biodiversity. Dominant floral species include tree species *Combretum molle, Peltophorum africanum, Croton gratissimusa* and *Vitex zeyherii*, amongst others.

Shrubs and forbs associated with the Rocky Outcrop Habitat Unit include *Rhoicissus tridentata, Commelina erecta, Cyanotis speciosa* and *Cyphostemma cirrhosum* while the grass layer is dominated by species such as *Themeda triandra, Heteropogon contortus, Anthephora pubescens, Loudetia simplex, Elionurus muticus, Melenis repens* and *Panicum maximum*. Alien species are limited but do occur around the boundaries of the rocky outcrops where impacts occurred.

The high ecological functionality, relatively high biodiversity and mostly intact habitat integrity, combine to increase the ecological sensitivity and conservation value of this habitat unit. The Rocky Outcrop Habitat Unit provides habitat for a diversity of faunal species and contribute to providing faunal migratory habitat within the area.

Figure 5-2: Open Bushveld encountered within the Vametco project area.

5.2.2 Riparian Vegetation

A central drainage line runs from east to west through the project area, in and around which vegetation typical for at least seasonally inundated soils could be found. The larger portion of riparian vegetation within the project area was mapped as CBA areas according to the NWBSP aquatic. It had uniquely adapted plant species, but also was suitable habitat for several faunal species, mostly mammals and amphibians. This habitat had a high density of geophytes on its banks, and more unique species could emerge during more favourable rainfall years.

Riparian vegetation around streambanks was found to still have a low presence of alien invasive species.

Figure 5-3: Typical view of Riparian Vegetation.

5.2.3 Plant Species of Conservation Concern

The project area lies within QDS 2527CB. After uploading the project area onto the Screening Tool, a list of potential and confirmed SCC was produced. In addition, the NEWPOSA database was also consulted.

According to the NEWPOSA, two SCC are expected to occur for the QDS's for the project area. The Screening tool results indicated one SCC could be present in the PAOI, Sensitive species 1248.

Table 5-2: Expected Plant SCC

Family	Genus	Sp1	IUCN	Ecology
Crassulaceae	*Adromischus*	*umbraticola*	NT	Indigenous; Endemic
Apocynaceae	*Stenostelma*	*umbelluliferum*	NT	Indigenous; Endemic

5.2.4 Alien Plant Species

Alien plant species have also been classified according to National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA), as published in August 2014 (GN R599 in *GG* 37886 of 1 August 2014) into the following categories:

- Category 1a: Species requiring compulsory control;

- Category 1b: Invasive species controlled by an invasive species management programme;
- Category 2: Invasive species controlled by area, and;
- Category 3: Invasive species controlled by activity.

A total of 8 alien plant species (AIP) were recorded on site (Table 5-3); three of these have been assigned alien plant categories according to CARA and NEMBA. These species have established due to disturbance of the soil primarily due to trampling by livestock.

Table 5-3: Alien Plant Species recorded on site.

Species	Category
Pennisetum clandestinum	1b in wetlands
Persicaria lapathifolia	Exotic
Plantago major	Exotic
Pseudognaphalium luteo-album	Exotic
Schkuhria pinnata	Exotic
Solanum sisymbriifolium	1b
Tagetes minuta	Exotic
Verbena bonariensis	1b

5.3 Fauna

5.3.1 Mammals

Actual sightings, spoor, calls, dung and nesting sites, as well as active sampling by means of motion detection cameras and Sherman traps, were used to establish the presence of mammals on the proposed project site. The evidence of dung and spoor suggests that animals were present in the area although relatively few were recorded during the surveys. Table 5-4 lists mammals that were recorded in the Vametco project area. Expected species are listed in Table 5-5.

Table 5-4: Mammal Species Recorded

Scientific Name	English Name	IUCN (2021.1)	NEMBA TOPS List (2007)
Cynictis penicillata	Yellow Mongoose	LC	Not Listed
Rhabdomys pumilio	Striped Mouse	LC	Not Listed
Sylvicapra grimmia	Common Duiker	LC	Not Listed
Tatera leucogaster	Bushveld Gerbil	LC	Not Listed

Table 5-5: Expected Mammal Species

Scientific Name	English Name	IUCN (2021.1)
Alcelaphus buselaphus caama	Red Hartebeest	LC
Scotophilus dinganii	Yellow-bellied House Bat	LC
Kobus ellipsiprymnus	Waterbuck	LC
Ourebia ourebi	Oribi	EN
Procavia capensis	Cape Rock Hyrax	LC
Potamochoerus larvatus	Bush-pig	LC
Chlorocebus pygerythrus	Vervet Monkey	LC
Papio ursinus	Chacma Baboon	LC
Tragelaphus scriptus	Bushbuck	LC
Sylvicapra grimmia	Common Duiker	LC
Paraxerus cepapi	Smith's Bush Squirrel	LC
Redunca fulvorufula	Mountain Reedbuck	EN
Elephantulus myurus	Eastern Rock Elephant Shrew	LC

5.3.2 Herpetofauna

According to the Southern African Frog Atlas Project (SAFAP), five amphibian species have been confirmed to occur within QDGC 2527CB. None of these species are expected on site due to a lack of suitable habitat. None of these species are of conservation concern (i.e. listed as Least Concern), primarily due to the timing of the survey and the lack of suitable habitat.

According to the Southern African Reptile Conservation Assessment (SARCA), 12 reptile species have been confirmed to occur within 2527CB and 2527CA (Table 5-6). None of the expected species are regarded as red data listed, none of the expected species were recorded, primarily due to the timing of the survey and the lack of suitable habitat.

Table 5-6: Expected Herpetofauna Species

Species Name	Common Name	Red Data status
Trachylepis capensis	Cape Skink	LC
Acanthocercus atricollis	Southern Tree Agama	LC
Stigmochelys pardalis	Leopard Tortoise	LC

Causus rhombeatus	Rhombic Night Adder	LC
Acanthocercus atricollis	Southern Tree Agama	LC
Lygodactylus capensis	Common Dwarf Gecko	LC
Trachylepis punctatissima	Speckled Rock Skink	LC
Trachylepis varia sensu lato	Common Variable Skink	LC
Pachydactylus affinis	Transvaal Thick Toed Gecko	LC
Boaedon capensis	Brown House Snake	LC
Psammophis angolensis	Dwarf Sand Snake	LC
Meroles squamulosus	Common Rough-scaled Lizard	LC
Sclerophrys gutturalis	Guttural Toad	LC
Schismaderma carens	Red Toad	LC
Amietia delalandii	Delalande's River Frog	LC
Cacosternum boettgeri	Common Caco	LC
Ptychadena anchietae	Plain Grass Frog	LC

5.3.3 Avifauna

Please refer to the separate Avifauna specialist study, that has been completed for this project.

5.3.4 Animal Species of Conservation Concern according to the Screening Report

The animal species theme retrieved the sensitivity data for Mammals, Herpetofauna and Avifauna, therefore these three themes were the focus from a terrestrial fauna perspective. The themes are discussed below according to the sensitivity rating assigned to them.

5.3.4.1 Medium Sensitivity

Mammalia-*Crocidura maquassiensis*

Little is known about the habitats and ecology of this species. The type specimen was collected in a house and the Motlateng specimen from a grassy mountainside beneath a rock at 1,580 m asl (Skinner & Chimimba 2005). Other specimens have also been found on rocky or montane grassland, such as recently in the Soutpansberg Mountains (Taylor et al. 2015). The Chase Valley Heights specimen was brought in by a cat from the garden (P. Taylor pers. comm. 2016), which demonstrates the importance of cataloguing what the cat brings in. The Royal Natal specimen was collected in mixed bracken and grasslands along the Tugela River and a single specimen has been collected from coastal forest (Taylor 1998). Thus, it may

tolerate a wide range of habitats, including urban and rural landscapes. This species was not recorded during the field work investigation.

5.3.5 Terrestrial Biodiversity Theme

The combined terrestrial biodiversity theme sensitivity was derived to be High as indicated in the National Environmental Screening Tool (Figure 5-4), it can be downloaded at (https://screening.environment.gov.za/screeningtool/#/pages/welcome).

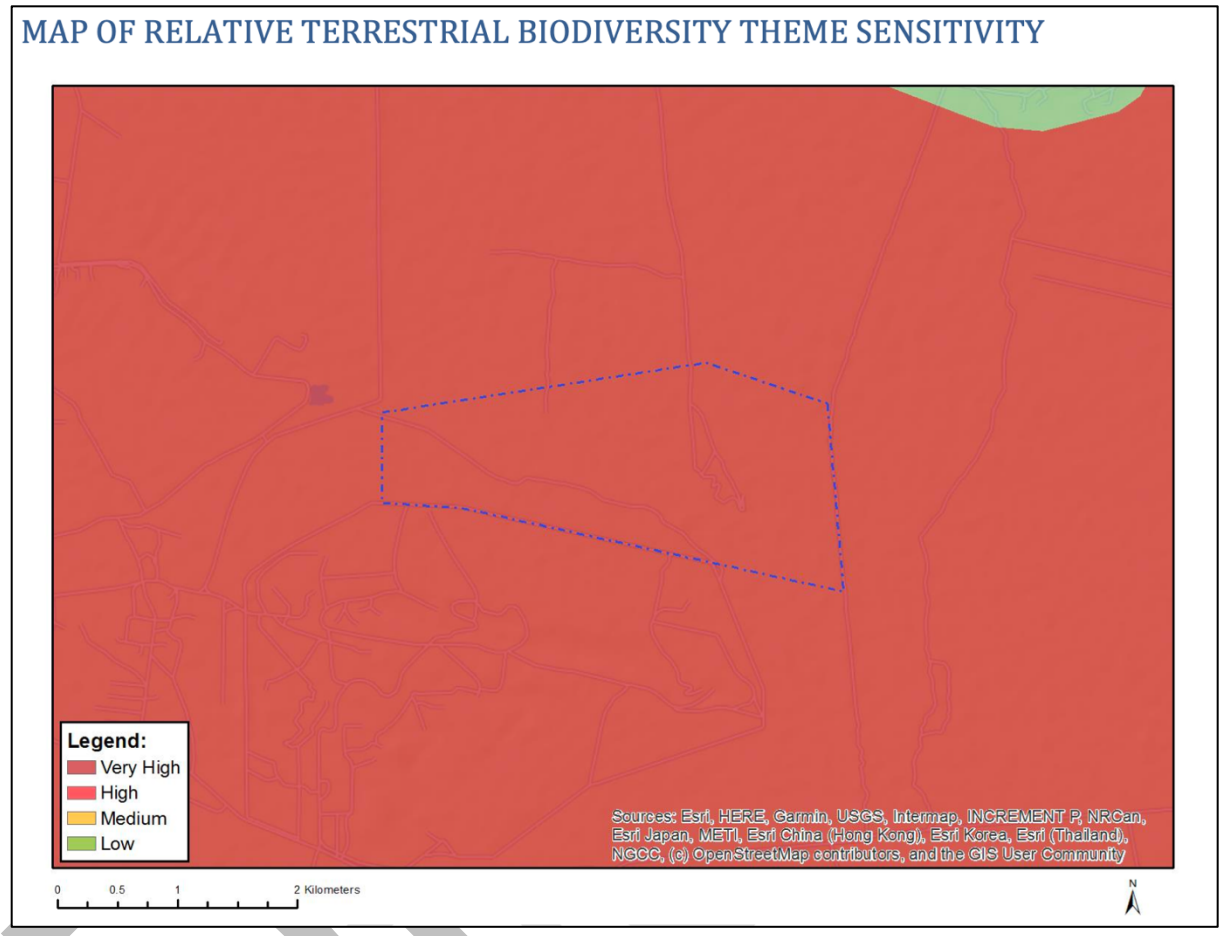


Figure 5-4: Relative Terrestrial Biodiversity Theme Sensitivity

From Figure 5-4, with the refinement of this infield assessment the sensitive features namely CBA 1 and NPAES features can be discounted, with the Vulnerable ecosystem feature only being represented in the project area.

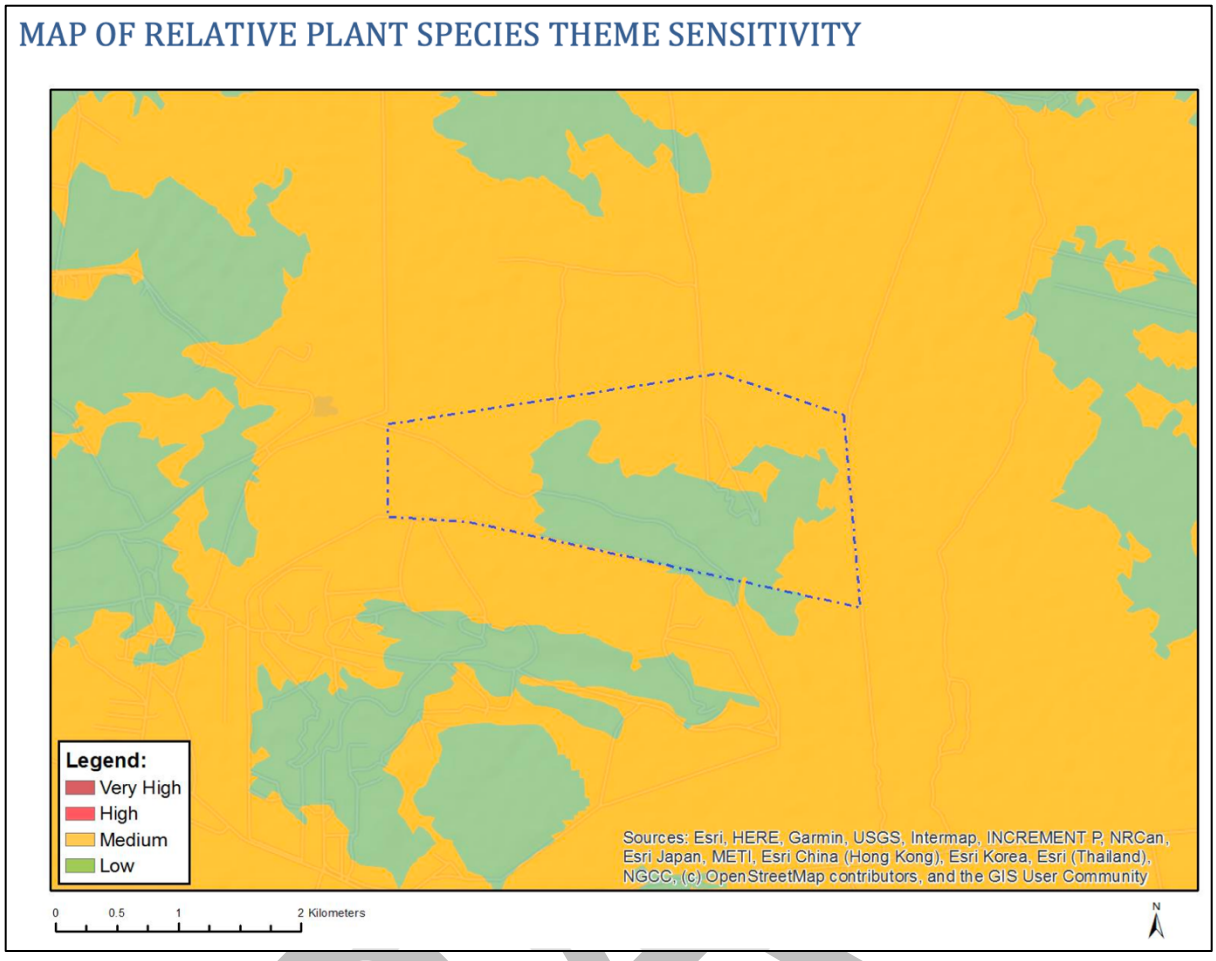


Figure 5-5: Relative Plant species sensitivity

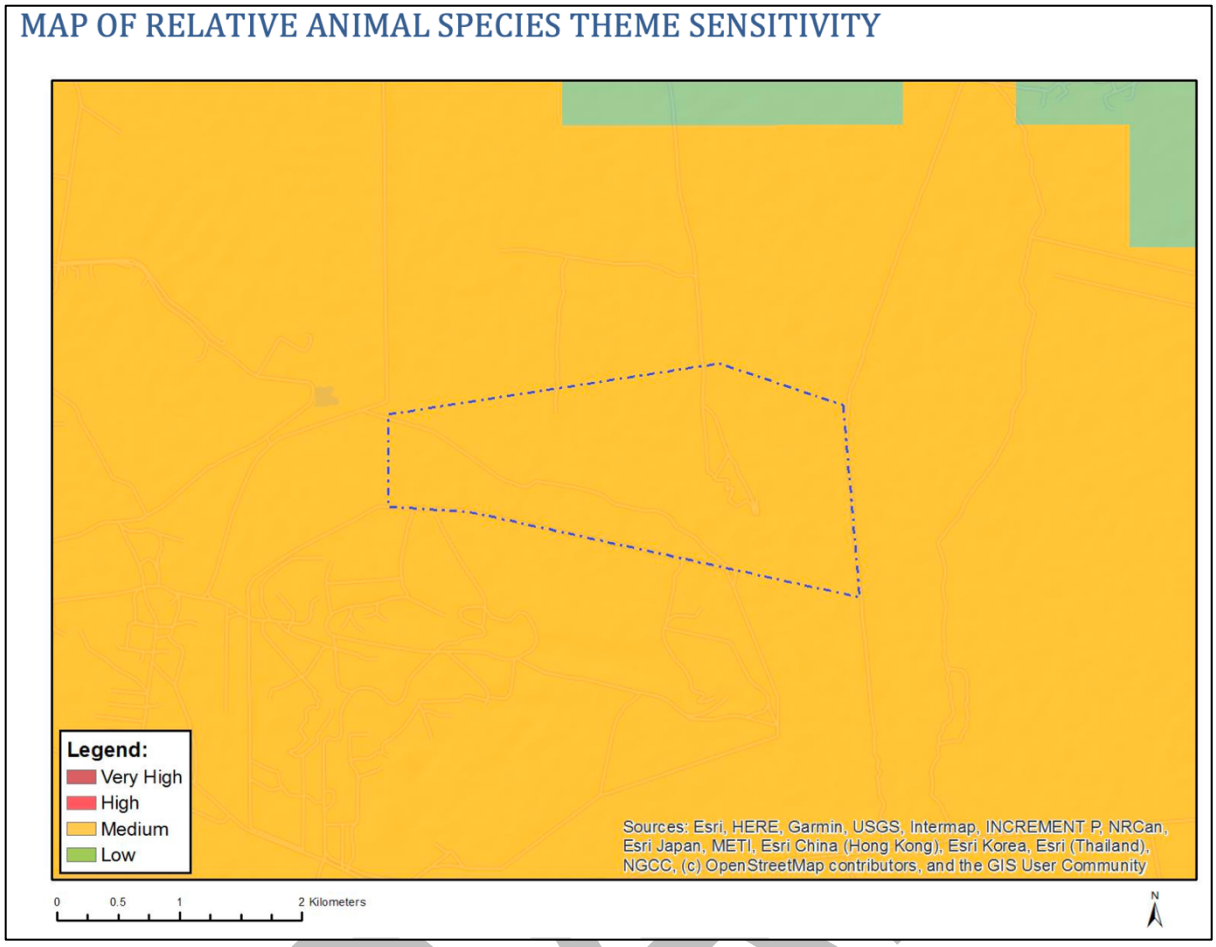


Figure 5-6: Relative Animal species sensitivity

6 Site Ecological Importance

The ecological sensitivity map for the site is represented in Figure 6-1 for the entire project area. The moist bushveld and rocky bushveld vegetation units were allocated a medium sensitivity since these are regarded as an important habitat that should be conserved due to the likely presence of plant SCC and habitat diversity and functionality. Furthermore, the riparian delineations were assigned high ecological sensitivity due to the suitable habitat for SCC and species diversity. SCC are likely to occur in the natural areas of the project area, and provincially protected plant species were previously recorded in similar vegetation types within the greater area (Table 6-1).

Table 6-1: Evaluation of SEI of vegetation communities and habitats in the project footprint (PAOI).

Habitat Type	Description	Ecosystem Processes and Services	Conservation Importance (CI)	Functional Integrity (FI)	Biodiversity Importance (BI)	Receptor Resilience (RR)	Site Ecological Importance (SEI) Guidelines for interpreting SEI in the context of the proposed development activities
Riparian	Valley Bottom wetlands and channel clay soils predominates, moist conditions create microclimate suitable to certain species. The current ecological condition of this habitat regarding the main driving forces, are intact, only being slightly disturbed by edge effect and infringement.	Provides unique habitat for numerous fauna and flora species. Provides greater heterogeneity in regional habitat and microclimate. and an important habitat for various fauna and flora, including the SCC.	**Medium**	**High** Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts with no signs of major past disturbance and good rehabilitation potential.	**Medium**	**Very Low** Habitat that is unable to recover from major impacts, or species that are unlikely to remain at a site even when a disturbance or impact is occurring.	**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.
Moist Bushveld	Impacted seasonally wet portions of land. Even though somewhat disturbed, the ecological integrity, importance and functioning of these areas play a crucial role as a water resource system locally and regionally and an important habitat for various fauna and flora, including the SCC recorded.	Provides refuge and grazing areas. Aids in trapping sediment and nutrients derived from land runoff. Provides grazing and foraging resources for indigenous fauna and livestock. Important corridor for fauna dispersion within the landscape. The preservation of this system is the most important aspect to consider for the proposed project. This habitat needs to be protected and improved due to the role of this habitat as a water resource.	**High** CR systems	Medium Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. Mostly minor current negative ecological impacts, with some major impacts and a few signs of minor past disturbance.	**Medium**	**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	**Medium** 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.

Habitat Type	Description	Ecosystem Processes and Services	Conservation Importance (CI)	Functional Integrity (FI)	Biodiversity Importance (BI)	Receptor Resilience (RR)	Site Ecological Importance (SEI) Guidelines for interpreting SEI in the context of the proposed development activities
						disturbance or impact has been removed.	
Rocky Bushveld	Moderately steep slopes with exposed rocky areas. This habitat includes areas that are rocky outcrops, stony and rocky hills with varying slopes, bedrock protruding from the soil layer with the associated boulders and large rocks. The current ecological condition of this habitat regarding the main driving forces, are intact, only being slightly disturbed by edge effect and infringement.	Provides refuge and grazing areas. Aids in trapping sediment and nutrients derived from land runoff. Provides grazing and foraging resources for indigenous fauna and livestock. Important corridor for fauna dispersion within the landscape. The preservation of this system is the most important aspect to consider for the proposed project. This habitat needs to be protected and improved due to the role of this habitat as a water resource.	**High** CR systems	Medium Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. Mostly minor current negative ecological impacts, with some major impacts and a few signs of minor past disturbance.	**Medium**	**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.	**Medium** 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.

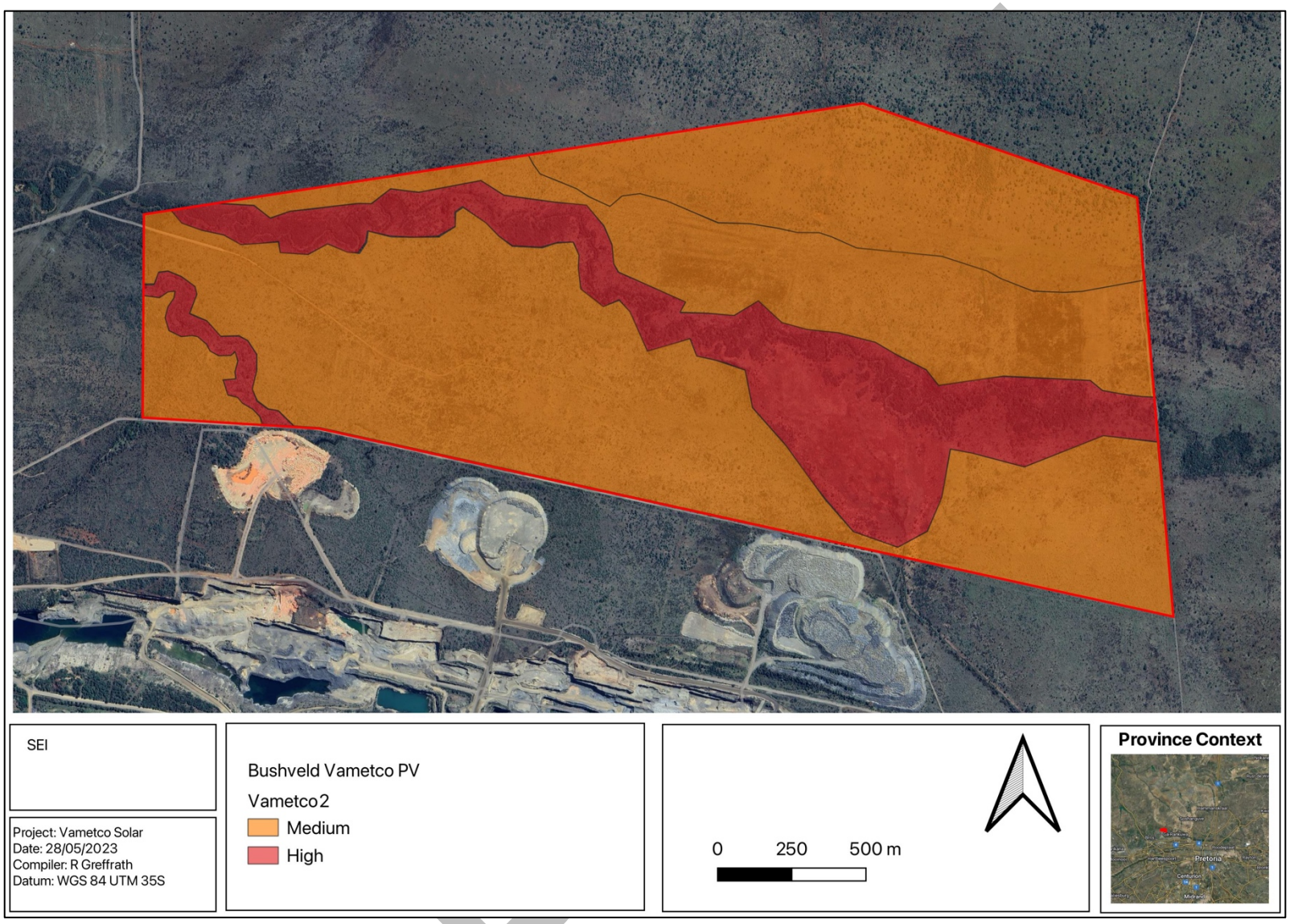


Figure 6-1: SEI for Vametco

7 Impact Assessment

The Methodology used in determining and ranking impacts and risks identified including the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks

The assessment of impacts is largely based on the Department of Environmental Affairs and Tourism's (1998) Guideline Document: Environmental Impact Assessment Regulations. The assessment will consider the impacts arising from the proposed activities of the project both before and after the implementation of appropriate mitigation measures.

The impacts are assessed according to the criteria outlined in this section. The identified issues are ranked according to the extent, duration, magnitude (intensity), and probability. From these criteria, a significance rating is obtained, the method and formula are described below. Where possible, mitigation recommendations have been made and are presented in tabular form.

To spatially identify the different areas of importance for a species for the proposed development site and to facilitate transparent and comparable reporting of the potential impacts of development, a standardized metric for identifying site-based ecological importance for species, in relation to a proposed project with a specific footprint/PAOI and suite of anticipated activities, is used in this section, as per guidelines. It allows for rapid spatial inspection and evaluation of impacts of the project within the context of on-site habitats and SCC, and facilitates integration of inputs from different specialist studies.

This Impact Assessment aims to identify and rate all potential direct (primary) influence and areas of potential indirect (secondary and tertiary) influences, as these relate to the PAOI.

7.1 Present Impacts to Biodiversity

Considering the anthropogenic activities and influences within the landscape, several negative impacts to biodiversity were observed within the project area. These include:

- Historic and current land modification;
- Domestic animals;
- Farm roads and main roads (and associated traffic and wildlife road mortalities);
- Grazing and trampling of natural vegetation by livestock in certain areas;
- Alien and/or Invasive Plants (AIP);
- Unregulated Fire and Erosion; and
- Fences and associated maintenance.

7.2 Terrestrial Impact Assessment

Potential impacts were evaluated against the data captured during the desktop and field assessments to identify relevance to the project area. The relevant impacts associated with the proposed PV area were then subjected to a prescribed impact assessment methodology which is available on request.

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

7.2.1 Alternatives considered

No alternatives were provided for the development.

7.2.2 Loss of Irreplaceable Resources

- Modified areas and Other Natural Areas will be lost, High SEI habitat will be lost,
- The likelihood of losing SCC exists.

7.2.3 Anticipated Impacts

The impacts anticipated for the proposed activities are considered to predict and quantify these impacts and assess & evaluate the magnitude on the identified terrestrial biodiversity (Table 7-1).

Table 7-1: Anticipated impacts for the proposed activities on terrestrial biodiversity

Main Impact	Project Activities	Secondary Impacts Anticipated
Loss of vegetation within development footprint	☐ Physical removal of vegetation for infrastructure construction	☐ Loss of flora (including possible SCC) ☐ Increased potential for soil erosion ☐ Habitat fragmentation ☐ Increased potential for establishment of invasive alien vegetation
Degradation of surrounding habitats	☐ Dust precipitation ☐ Spilling of hazardous waste ☐ Water and wastewater leakages ☐ Dumping of waste products ☐ Random events such as fire (cooking fires or cigarettes)	☐ Loss of flora including possible SCC ☐ Increased potential for soil erosion ☐ Habitat fragmentation ☐ Increased potential for establishment of invasive alien vegetation
Direct mortality of avifauna	☐ Full discussion in separate report	☐ Loss of biodiversity including possible SCC ☐ Loss of ecosystem services provide by avifauna species.
Spread and/or establishment of invasive alien species	☐ Vegetation removal ☐ Vehicles potentially spreading seed ☐ Unsanitary conditions surrounding infrastructure promoting the establishment of alien and/or invasive rodents ☐ Vehicles potentially spreading seed ☐ Unsanitary conditions surrounding infrastructure	☐ Habitat loss for native flora & fauna (including possible SCC) ☐ Spreading of potentially dangerous diseases due to pest species ☐ Alteration of fauna assemblages due to habitat modification

Displacement or Direct mortality of fauna	☐ Clearing of vegetation ☐ Roadkill due to vehicle collision ☐ Pollution of water resources due to dust effects, chemical spills, etc. ☐ Intentional killing of fauna for food (hunting) or persecution (especially with regards to herpetofauna)	☐ Loss of ecosystem services
Disruption/alteration of species activities (breeding, migration, feeding) due to noise and vibration	☐ Operation of machinery (Earth moving machinery	☐ Loss of recruitment ☐ Loss of ecosystem services
Disruption/alteration of species activities (breeding, migration, feeding) due to dust	☐ Vehicles ☐ Exposed stockpiles and/or dumps	☐ Loss of recruitment ☐ Loss of ecosystem services

7.2.4 Unplanned Events

The planned activities will have anticipated impacts as discussed; however, unplanned events may occur on any project and may have potential impacts which will need management.

Table 7-2 is a summary of the findings of an unplanned event assessment from a terrestrial ecology perspective. Note, not all potential unplanned events may be captured herein, and this must therefore be managed throughout all phases according to recorded events.

Table 7-2: Summary of unplanned events for terrestrial biodiversity

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 always available. The incident must be reported on and if necessary, a biodiversity specialist must investigate the extent of the impact and provide rehabilitation recommendations.
Fire	Uncontrolled/unmanaged fire that spreads to the surrounding natural Bushveld and ridge.	Appropriate/Adequate fire management plan need to be implemented.
Erosion caused by water runoff from the surface	Erosion on the side of the road	Storm water management plan must be compiled and implemented.

7.3 Construction Phase

The construction phase activities that will have an impact on the fauna and flora are summarised below. The impacts are rated according to the effect they will have on the SEI ratings of the vegetation/habitat types. The SCC listed by the screening tool were not encountered on site and therefore a separate impact assessment is not completed for each of these taxa.

7.3.1 Impact Description

The proposed infrastructure plan for the preferred site coincides with open bushveld and Riparian areas. No animal or plant SCC were recorded within the PAOI.

During this phase the infrastructure will be constructed, this includes roads, PV panel arrays and ancillary infrastructure, as well as fences. The main anticipated impact includes the clearing of vegetation, which will ultimately lead to habitat destruction and the proliferation of

alien plant species along the roads and cleared areas as well as the severing of movement corridors for fauna, loss of fauna and flora SCCs (if present) and the fragmentation of habitat.

During the impact of site clearing, the habitats that have been rated as high and medium ecological importance will be impacted on, this activity will include the compete removal of vegetation where infrastructure will be located (see SEI).

Table 7-3 to Table 7-6 summarises the significance of potential impacts associated with the development on biodiversity before and after implementation of mitigation measures. The loss vegetation within the development footprint is rated as a 'High' significance and cannot be lowered significantly as the loss of vegetation is unavoidable, however can be lowered to a 'Moderate' risk after the implementation of mitigation measures. The degradation of surrounding habitats due to improper waste disposal, dust precipitation and spilling of hazardous waste is a 'High' risk but can be lowered to a 'Low' risk after the implementation of mitigation measures. The destruction of threatened and protected plant species within the development footprint is rated as a 'Moderate' significance and can be lowered to a 'Low' risk after the implementation of mitigation measures.

The direct mortality of fauna due to construction phase activities is a 'Medium' risk but can be lowered to a 'Low' risk. The disruption/alteration of species activities such as reproduction, migration and feeding due to noise are vibration is a 'Moderate' risk can be lowered to a 'Low' significance. The spread and/or establishment of invasive alien species is rated as a 'High' risk but can be lowered to a 'Low' risk.

7.3.2 Impact Ratings

The impact of the loss of the vegetation, habitat and ecosystem areas on site is rated in Table 7-3 to Table 7-6.

Table 7-3: Assessment of significance of potential impacts on terrestrial biodiversity associated with the construction phase of the project Interaction 1: Loss of vegetation and habitat types

Aspect	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Fauna	No	Negative	2 (Local)	4 (Long-Term)	8 (High)	5 (Definite)	70 (High)
	Yes	Negative	1 (Site only)	4 (Long-Term)	4 (Low)	4 (High)	36 (Medium)
Flora	No	Negative	2 (Local)	4 (Long-Term)	8 (High)	5 (Definite)	70 (High)
	Yes	Negative	1 (Site only)	4 (Long-Term)	4 (Low)	4 (High)	36 (Medium)
Corrective Actions	Refer to Table 9-1						

Table 7-4: Assessment of significance of potential impacts on terrestrial biodiversity associated with the construction phase of the project Interaction 2: Degradation of surrounding habitats due to improper waste disposal, dust precipitation and spilling of hazardous waste

Aspect	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Fauna	No	Negative	2 (Local)	4 (Long-Term)	8 (High)	5 (Definite)	70 (High)
	Yes	Negative	1 (Site only)	4 (Long-Term)	6 (Moderate)	3 (Medium)	33 (Medium)
Flora	No	Negative	2 (Local)	4 (Long-Term)	8 (High)	5 (Definite)	70 (High)
	Yes	Negative	1 (Site only)	4 (Long-Term)	6 (Moderate)	3 (Medium)	33 (Medium)
Corrective Actions	Refer to Table 9-1						

Table 7-5: Assessment of significance of potential impacts on terrestrial biodiversity associated with the construction phase of the project Interaction 3: Destruction of threatened and protected plant species and Direct mortality of fauna (including possible SSC).

Aspect	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Fauna	No	Negative	2 (Local)	4 (Long-Term)	8 (High)	4 (High)	40 (Medium)
	Yes	Negative	1 (Site only)	4 (Long-Term)	4 (Low)	3 (Medium)	29 (Low)
Flora	No	Negative	2 (Local)	4 (Long-Term)	8 (High)	4 (High)	40 (Medium)
	Yes	Negative	1 (Site only)	4 (Long-Term)	4 (Low)	3 (Medium)	29 (Low)
Corrective Actions	Refer to Table 9-1						

Table 7-6: Assessment of significance of potential impacts on terrestrial biodiversity associated with the construction phase of the project Interaction 4: Spread and/or establishment of invasive alien species

Aspect	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Fauna	No	Negative	2 (Local)	4 (Long-Term)	8 (High)	5 (Definite)	70 (High)
	Yes	Negative	1 (Site only)	4 (Long-Term)	4 (Low)	4 (High)	36 (Medium)
Flora	No	Negative	2 (Local)	4 (Long-Term)	8 (High)	5 (Definite)	70 (High)
	Yes	Negative	1 (Site only)	4 (Long-Term)	4 (Low)	3 (Medium)	27 (Low)
Corrective Actions	Refer to Table 9-1						

7.4 Operations Phase

7.4.1 Project Activities Assessed

The operational phase of daily activities is anticipated to further spread the alien invasive plants, as well as the deterioration of the habitats due to the increase of dust and edge effect impacts. Dust reduces the ability of plants to photosynthesize and thus leads to degradation/retrogression of the veld.

Table 7-7 summarises the significance of the operational phase impacts on biodiversity before and after implementation of mitigation measures.

The impact significance of continued fragmentation and degradation of habitats and ecosystems was rated as 'Moderate' but lowered to 'Low'.

The impact significance of continued encroachment by alien invasive plant species into surrounding habitat that was disturbed, was rated as 'Moderately' prior to mitigation. Implementation of mitigation measures reduced the significance of the impact to an 'Low' level.

The direct mortalities of faunal community (including SCC) due to disturbance (road collisions, collisions with substation, noise, light, dust, vibration) was rated as a Moderate significance, which was lowered to Low, with mitigation measures.

Table 7-7: Assessment of significance of potential impacts on terrestrial biodiversity associated with the operational phase of the project Interaction 5: Continued fragmentation and degradation of habitats and ecosystems.

Aspect	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Fauna	No	Negative	2 (Local)	4 (Long-Term)	8 (High)	4 (High)	40 (Medium)
	Yes	Negative	1 (Site only)	4 (Long-Term)	4 (Low)	3 (Medium)	29 (Low)
Flora	No	Negative	2 (Local)	4 (Long-Term)	8 (High)	4 (High)	40 (Medium)
	Yes	Negative	1 (Site only)	4 (Long-Term)	4 (Low)	3 (Medium)	29 (Low)
Corrective Actions	Refer to Table 9-1						

Table 7-8: Assessment of significance of potential impacts on terrestrial biodiversity associated with the operational phase of the project Interaction 6: Spread and/or further establishment of alien and/or invasive species

Aspect	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Fauna	No	Negative	2 (Local)	4 (Long-Term)	8 (High)	4 (High)	40 (Medium)
	Yes	Negative	1 (Site only)	4 (Long-Term)	4 (Low)	3 (Medium)	29 (Low)
Flora	No	Negative	2 (Local)	4 (Long-Term)	8 (High)	4 (High)	40 (Medium)
	Yes	Negative	1 (Site only)	4 (Long-Term)	4 (Low)	3 (Medium)	29 (Low)
Corrective Actions	Refer to Table 9-1						

Table 7-9: Assessment of significance of potential impacts on terrestrial biodiversity associated with the operational phase of the project Interaction 7: Displacement and direct mortalities of faunal community (including SCC) due to disturbance (road collisions, collisions with substation, noise, light, dust, vibration)

Aspect	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Fauna	No	Negative	2 (Local)	4 (Long-Term)	8 (High)	4 (High)	40 (Medium)
	Yes	Negative	1 (Site only)	4 (Long-Term)	4 (Low)	3 (Medium)	29 (Low)
Corrective Actions	Refer to Table 9-1						

7.5 Rehabilitation Phase

7.5.1 Project Activities Assessed

This phase is when the PV panels could be removed or replaced. During this phase, the operational phase impacts will persist until of the activity reduces and the rehabilitation measures are implemented.

The following potential impacts were considered:

- Continued fragmentation and degradation of habitats and ecosystems;
- Erosion; and
- Spread of alien and/or invasive species.

Table 7-10: Assessment of significance of potential impacts on terrestrial biodiversity associated with the closure phase of the project Interaction 8: Continued fragmentation and degradation of habitats and ecosystems, and erosion

Aspect	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Fauna	No	Negative	2 (Local)	4 (Long-Term)	8 (High)	4 (High)	40 (Medium)
	Yes	Negative	1 (Site only)	4 (Long-Term)	4 (Low)	3 (Medium)	29 (Low)
Flora	No	Negative	2 (Local)	4 (Long-Term)	8 (High)	4 (High)	40 (Medium)
	Yes	Negative	1 (Site only)	4 (Long-Term)	4 (Low)	3 (Medium)	29 (Low)
Corrective Actions	Refer to Table 9-1						

Table 7-11: Assessment of significance of potential impacts on terrestrial biodiversity associated with the closure phase of the project Interaction 9: Spread and/or establishment of alien and/or invasive species

Aspect	Corrective measures	Impact rating criteria					Significance
		Nature	Extent	Duration	Magnitude	Probability	
Fauna	No	Negative	2 (Local)	4 (Long-Term)	8 (High)	4 (High)	40 (Medium)
	Yes	Negative	1 (Site only)	4 (Long-Term)	4 (Low)	3 (Medium)	29 (Low)
Flora	No	Negative	2 (Local)	4 (Long-Term)	8 (High)	4 (High)	40 (Medium)
	Yes	Negative	1 (Site only)	4 (Long-Term)	4 (Low)	3 (Medium)	29 (Low)
Corrective Actions	Refer to Table 9-1						

8 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 in an area or region, it is appropriate to consider the cumulative effects of development. This is like the concept of shifting baselines, which describes how the environmental baseline at a point in time may represent a significant change from the original state of the system. This section describes the potential impacts of the project that are cumulative for terrestrial fauna and flora.

Localised cumulative impacts include the cumulative effects from operations that are close enough to potentially cause additive effects on the environment or sensitive receivers. These include dust deposition, noise and vibration, disruption of wildlife corridors or habitat. The cumulative impact of the PV project can best be described by quantifying the current PV power plants in a 30km radius. This is completed by using the current number of active PV plants in the general project area. According to the Independent Power Producer Procurement Program, one PV plant can be found within a 30km radius. The 50MW De Wildt Photovoltaic Crystalline- Single Axis power plant, which is active, is located 20 km to the south.

9 Specialist Management Plan

The aim of the management outcomes is to present the mitigations in such a way that the can be incorporated into the Environmental Management Programme (EMPr), allowing for more successful implementation and auditing of the mitigations and monitoring guidelines Table 9.1presents the recommended mitigation measures and the respective timeframes, targets and performance indicators for the terrestrial study.

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

- Prevent the further loss and fragmentation of vegetation communities and the CBA areas in the vicinity of the project area;
- As far as possible, reduce the negative fragmentation effects of the development and enable safe movement of faunal species;
- Prevent the direct and indirect loss and disturbance of faunal species and community (including occurring and potentially occurring species of conservation concern); and
- Follow the guidelines for interpreting Site Ecological Importance (SEI).

Table 9-1: Mitigation measures including requirements for timeframes, roles, and responsibilities for the terrestrial study

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Management outcome: Vegetation and Habitats				
All high sensitivity areas should be avoided as far as possible, and development must be prioritised in low or medium areas.	Construction Phase	Project manager, Environmental Officer	Development footprint	Ongoing
Watercourses, drainage lines, streams and wetlands must be avoided, and a no-go buffer of 20m must be applied around them.	Life of operation	Project manager, Environmental Officer	Development footprint	Ongoing
Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further. Clearing of vegetation should be considered, and high sensitive areas must be avoided, with areas not earmarked for clearance conserved. All activities must be restricted too within the low/medium sensitivity areas. No further loss of high sensitivity areas should be permitted. It is recommended that areas to be developed be specifically 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
Existing access routes, especially roads must be made use of.	Construction/Operational Phase	Environmental Officer & Design Engineer	Roads and paths used	Ongoing
All laydown, chemical toilets etc. should be restricted to low sensitivity areas. Any materials may not be stored for extended periods of time and must be removed from the project area once the construction phase has been concluded. 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 project areas.	Construction/Operational Phase	Environmental Officer & Design Engineer	Laydown areas	Ongoing
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood and wind events. This will also reduce the likelihood of encroachment by alien invasive plant species. All livestock must always be kept out of the project area, especially areas that have been recently 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	Life of operation	Environmental Officer & Contractor	Spill events, Vehicles dripping.	Ongoing

prevent them leaking and entering the environment. Construction activities and vehicles could cause spillages of lubricants, fuels and waste material potentially 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.				
It should 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 might have on the surrounding areas.	Life of operation	Environmental Officer & Contractor	Fire Management	During Phase
Any individual of the protected plants that are present needs a relocation or destruction permit for any individual that may be removed or destroyed due to the development. High visibility flags must be placed near any threatened/protected plants to avoid any damage or destruction of the species. If left undisturbed the sensitivity and importance of these species needs to be part of the environmental awareness program. Development areas where protected plants cannot be avoided, must adhere to a SCC management plan, and these plants should be removed and relocated/ re-planted in similar habitats where they should be able to resprout and grow again. All protected and red-data plants should be relocated, and as many other species as possible.	Life of operation	Project manager, Environmental Officer	Protected Tree/Plant species	Ongoing
For the threatened species that may not be destroyed, it is recommended that professional service providers that deal with plant search and rescue be used to remove such plants and use them either for later rehabilitation work other conservation projects.	Planning Phase, Pre-Construction	Project manager, Environmental Officer & Contractor	Fire Management	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 construction begins. A site walk through is recommended by a suitably qualified ecologist prior to any construction activities, preferably during the wet season and any SSC should be noted. In situations where the threatened and protected plants 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 of a search, rescue and recovery program is suggested for the protection of these species. Should animals not move out of the area	Construction Phase	Environmental Officer, Contractor	Presence of any floral or faunal species.	During phase

on their own relevant specialists must be contacted to advise on how the species can be relocated				
The areas to be developed must be specifically demarcated to prevent 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 construction should be minimized to as short 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 at night to minimize all possible disturbances to amphibian species and nocturnal mammals	Construction/Operational Phase	Environmental Officer	Noise levels	Ongoing
No trapping, killing, or poisoning of any wildlife is to be allowed □ Signs must be put up to enforce this;	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 highly 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 still 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 in the case.	Ongoing
All areas to be developed must be walked through prior to any activity to ensure no nests or fauna species are found in the area. Should any Species of Conservation Concern not move out of the area or their nest be found in the area a suitably qualified specialist must be consulted to advise on the correct actions to be taken.	Construction and Operational phase	Project manager, Environmental Officer	Presence of Nests and faunal species	Planning, Construction and Rehabilitation
Any holes/deep excavations must be dug and planted in a progressive manner and shouldn't be left open overnight; □ Should the holes overnight they must be covered temporarily to ensure no small fauna species fall in.	Planning and Construction	Environmental Officer & Contractor, Engineer	Presence of trapped animals and open holes	Ongoing
Ensure that cables and connections are insulated successfully to reduce electrocution risk.	Life of project	Environmental Officer & Contractor, Engineer	Presence of electrocuted fauna	Ongoing
Any exposed parts must be covered (insulated) to reduce electrocution risk.	Life of project	Environmental Officer & Contractor, Engineer	Presence of electrocuted fauna	Ongoing
Management outcome: Alien species				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency

Compilation of and implementation of an alien vegetation management plan for the project area	Life of operation	Project manager, Environmental Officer & Contractor	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. Footprint 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	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 due to the likely presence of SCCs	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 using dust suppressants. □ No non environmentally friendly suppressants may be used as this could result in pollution of water sources	Life of operation	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.	Life of operation	Environmental Officer & Contractor	Waste Removal	Weekly
Litter, spills, fuels, chemicals and human waste in and around the project area.	Construction/Closure Phase	Environmental Officer & Health and Safety Officer	Presence of Waste	Daily
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	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 regarding waste management. Under no circumstances may domestic waste be burned on site	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Collection/handling of the waste.	Ongoing

Refuse bins will be emptied and secured Temporary storage of domestic waste shall be in covered 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 to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the project area to inform contractors and site staff of the presence of protected species, their identification, conservation status and importance, biology, habitat requirements and management requirements the Environmental Authorisation and within the EMPr. The avoidance and protection of the wetland areas must be included into a site induction. Contractors and employees must all undergo the induction and made aware of the "no-go" to be avoided.	Life of operation	Health and Safety 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. • Reducing the dust generated by the listed activities above, especially the earth moving machinery, through wetting the soil surface and putting up signs to enforce speed limit as well as speed bumps built to force slow speeds; • Signs must be put up to enforce this.	Life of operation	Project manager, Environmental Officer	Water Runoff from road surfaces	Ongoing
Where possible, existing access routes and walking paths must be used.	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 and strong winds.	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

10 Consultation Undertaken

No comments directly related to flora and fauna have been received.

11 Conclusions

The completion of a comprehensive desktop study, in conjunction with the results from the field survey, suggest there is a high confidence in the information provided. The survey ensured that there was a suitable groundtruth coverage of the assessment area and major habitats and ecosystems were assessed to obtain a general species (fauna and flora) overview and the major current impacts were observed. The conservation status is classified as Endangered, and the protection level is regarded as 'Poorly Protected" Ecosystem. Moreover, the proposed activity does not overlap with terrestrial CBA, but borders on such an area, which is adjacent the PAOI, the remainder of the study area is not classified.

The current project area, fall within sensitive habitats and other areas of high biodiversity potential, however the infrastructure layout was not available at the time of writing and this impact could change. The current project area would be considered to have a significant and high negative impact as it would directly affect sensitive landscapes as well as the habitat of threatened plant species and expected SCC that depend on these ecosystems.

It is recommended that a layout or design which represents a compromise between the needs of the project and the environmental concerns at the site, especially regarding the high sensitivity areas be considered.

Historically, overgrazing from cattle and mismanagement has led to the deterioration habits present. However, the high sensitivity areas can be regarded as important, not only within the local landscape, but also regionally; as they are used for habitat, foraging, water resource and movement corridors for fauna within the landscape.

The importance of these habitats is regarded as crucial, due to the species recorded as well as the role of this intact unique habitat to biodiversity within a very fragmented disturbed local landscape, not to mention the sensitivity according to various ecological datasets.

The high sensitivity terrestrial areas still:

- Occur adjacent to terrestrial ESA as per the NWBSP;
- Overlaps an Aquatic ESA;
- Possibly supports and protects threatened fauna and flora; and
- Support various organisms and may play a more important role in the ecosystem if left to recover from the superficial impacts.

The completion of the terrestrial biodiversity assessment confirmed the high sensitivity of certain parts of the project area and therefore corroborates the screening report with regards to the riparian areas, further studies in the form of flood line delineation and wetland studies are expected to refine this.

The ecological integrity, importance and functioning of the high sensitive areas play a crucial role as a water resource system and an important habitat for various fauna and flora. The preservation of these habitats is the most important aspect to consider for the proposed

project. These habitats need to be protected and improved due to the role of this crucial and limited habitat within this disturbed local area.

12 Impact Statement

The main expected impacts of the Vametco Solar project and associated infrastructure will include the following:

- habitat loss and fragmentation, including the possible loss of floral SCC;
- degradation of surrounding habitat;
- disturbance and displacement caused during the construction and operational phases.

Mitigation measures as described in this report can be implemented to reduce the significance of the risk but there is still a high possibility of the loss of SCC, and there are impacts that cannot be reduced to a low risk. Considering that this area that has been identified as being of significance for biodiversity maintenance and ecological processes (CBA), development may proceed but with caution. All mitigations measures prescribed herein must be considered by the issuing authority for authorisation. No fatal flaws are evident for the proposed project, especially if the high sensitivity areas are managed in terms of the objectives set forth on this report.

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Appendix A: CV

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Terrestrial Ecology Specialist

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Experience

Rudolph's current role is that of a senior terrestrial ecologist, with specific reference to fauna and flora biodiversity management. In this capacity he is responsible for the execution management of terrestrial ecological studies and the management of numerous specialists who perform this function under his leadership.

He has completed numerous standalone reports where the sole focus was terrestrial ecology as well as integrated projects such as EIA reports and ESIA reports. With regards to the latter he has extensive experience in the interrelationship of the various biotic and abiotic specialist components and the concepts that can have an impact and must be discussed across the board. These reports are used for environmental authorisations or are focused specialist studies which meet local and international standards.

He is well versed in the demands of inter disciplinary cooperation and has executed projects where a combination of qualified specialists have reported to him. He has experience in stakeholder engagement where the relationships with NGO's and other interested and affected parties must be established for the completion of projects to an acceptable international standard.

Rudolph has extensive experience in the application of the International Finance Corporation Performance standards, specifically performance standard 6. In this field he has worked within the extractive and energy sectors across Africa to ensure their compliance to IFC PS6. In applying international best practice, he has gained experience in applying the No Net Loss and Net Positive Impact approaches for Biodiversity in a business context. He has experience in applying leading practice according to the Equator Principles, Business and Biodiversity Offset Program, the Cross Sectoral Biodiversity Initiative, the Energy and Biodiversity Initiative, Fauna and Flora International, the International Petroleum Industry Environmental Conservation Association's guidance documents, the Economics of Ecosystems and Biodiversity and World Bank criteria, specifically Criteria 7.

Rudolph is responsible for off set design after a mitigation hierarchy is applied, in this regard he compiles Biodiversity Land Management Programs/Biodiversity Action Plans, where various specialist studies are collated into a working document for clients in order to aid in pre or post mining management and achieving the No Net Loss and Net Positive Impacts.

Further to this he is also involved in rehabilitation design studies which entail the planning, implementation and monitoring of vegetative rehabilitation. He is responsible for the planning of post mine land use and the various methods utilised to achieve this.

Rudolph also fulfils the role of project manager. Here he manages national and international projects across Africa, specifically west, central and southern Africa, managing a multi-disciplinary team of specialists.

Rudolph is also involved in the acquisition of regulatory permits for clients, this includes the planning of relocation strategies for protected and endangered plant species in areas where mines are to be established. This involves the planning and execution of data gathering surveys. Thereafter he manages the process involving relevant provincial and National authorities in order to obtain the specific permit that allows for a development to continue.

Information pertaining to the technical expertise of Rudolph includes knowledge and working experience in the following:

- Environmental Impact Assessments (EIAs), Basic Assessments and Environmental Management Plans (EMPs) for environmental authorisations in terms of the South African National Environmental Management Act (NEMA), 1998 (Act 107 of 1998);
- Implementation of Government Notice 320 (dated 20 March 2020) and Government Notice 1150 (dated 30 October 2020) in terms of NEMA: "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;
- Environmental pre-feasibility studies for gold tailings reclamation and iron ore and coal mining projects;
- Convention on Biological Diversity, Strategic Planning for Biodiversity, Mechanisms for implementation, Cooperation and Partnerships;
- Business and Biodiversity Off Sets program, standards on biodiversity off sets;
- International Finance Corporation (IFC) related projects across central and west Africa, applying performance standards and Equator Principles on the Environmental Health and Safety Guidelines set down by the IFC;
- International Council for Mining and Metals, Conservation of Biodiversity and Integrated approaches to land use planning;
- European Investment Bank; application of sustainability principles, such as those of the International Finance Corporation (part of the World Bank Group), in particular on biodiversity. Standard 3 on Biodiversity and Ecosystems, as part of the EIB Environmental and Social Standards;
- Environmental and Social Impact Assessments (ESIA) for Environmental Authorisation;
- Environmental off-Set studies, determining off-set liability, applying the Mitigation hierarchy and best practice in the form of IFC performance standard 6.
- Large Mammal Monitoring Projects;
- Biodiversity Assessments including Mammalia, Avifauna, Herpetofauna and Arthropoda;

- Environmental Impact Assessments (EIA) based Impacts to the terrestrial Ecological environment;
- Geographic Information Systems (GIS), frequent use of ArcGIS, QGIS.
- Biodiversity Action Plan, design and Implementation;
- Biodiversity and Land Management Programs;
- Protected plant species management strategies planning and implementation;
- Monitoring of rehabilitation success by means of vegetation establishment;
- Rehabilitation planning;
- Environmental auditing of rehabilitated areas;
- Project management of ecological specialist studies;
- Planning and design of Rehabilitation off-set strategies.

Tertiary Education

- 2005-2006: B-tech Degree in Nature Conservation, Nelson Mandela Metropolitan University (NMMU).
- 2001- 2004: National Diploma in Nature Conservation, Nelson Mandela Metropolitan University (NMMU).

Skills

- Project management and leadership skills;
- Sound organizational, good people skills;
- Good verbal presentation, written communication, language skills and excellent report writing skills;
- Researching, analysing and integrating data;
- Working experience in Environmental Impact Assessment processes and knowledge of the Environmental Impact Assessment Regulations 2010 & 2014;
- Understanding of the Municipal Land Use application processes;
- Knowledge and experience in the National Environmental Management Act, (No. 107 of 1998), as amended;
- Knowledge and working experience of the National Environmental Management: Biodiversity (Act no, 10 of 2004) and the National Management Protected Areas (Act no. 57 of 2003);
- Experience in working with multi-stakeholder groups, organizations;
- Working experience in Geographical Information Systems;
- Advanced computer skills (Microsoft (MS) word, MS excel, MS PowerPoint, Internet & Email, GIS and Remote Sensing), QGIS;
- Ecostatus classification, specifically Riparian Vegetation Response Index.

Training

- Measurements of Biodiversity at the University of the Free State, led by Prof. M. T. Seaman. September 2008.
- IFC performance standards implementation training, Lee-Ann Joubert, January 2013.
- Bird Identification course led by Ettiene Marais November 2009.
- Introduction to VEGRAI and Eco-classification led by Dr. James Mackenzie December 2009 and January 2018.
- Dangerous snake handling and snake bite treatment with Mike Perry 2011, 2015.
- Rehabilitation of Mine impacted areas, with Fritz van Oudshoorn, Dr Wayne Truter and Gustav le Roux 2011.
- First aid Level 2, School of Emergency and Critical Care, Netcare, 2013
- First aid Level 2, National First Aid Academy, 2017.

Projects

The following project list is indicative of Rudolph's experience, providing insight into the various projects, roles and locations he has worked in.

Project	Location	Client	Main project features	Positions held	Activities performed
Tongon Off-set project	Ivory Coast	Randgold Resources Limited	Applying IFC, BBOP and other best practice guidelines in designing an Off-set project for the residual Impact of the Tongon Gold Mine	Project Lead Technical Specialist	
Annual Large Mammal Monitoring in the Niokola Koba National Park.	Senegal	DPN Direction des Parcs Nationaux du Sénégal	Applying Aerial, Ground and vehicle, large mammal monitoring techniques in the National Park.	Aerial game counter, project specialist.	Training of field staff, recording of data in the vehicle and aerial surveys, Report reviews
Biodiversity Management for Massawa Gold Mine	Senegal	Barrick Gold	With the discovery of Western Chimpanzees in close proximity to the project area, detailed field work was conducted by world renowned experts. Leading to various mitigation measures.	Project Manager	Project design, Specialist Management. Producing Synthesis reports on results of specialists. Designing Monitoring Off sets and management plans
Mmamabula Energy Project (MEP).	Botswana	CIC energy	Construction of a railway, opencast mine, wellfield, conveyors, addits, housing.	Technical Specialist Ecologist	IFC level specialist studies, Fauna and Flora surveys for the project features, including impact assessments, management plans. Alien eradication plans.
Orlight Solar PV Power Project	South Africa	Orlight SA	Environmental Impact Assessment (EIA) process for five proposed Solar Photovoltaic (PV) Power Plants	Technical Specialist Ecologist	EIA Terrestrial Biodiversity studies, IFC level specialist studies

Twenty Nine Capitol	South Africa	CSIR	Photovoltaic Power stations	Technical Specialist Ecologist	EIA Terrestrial Biodiversity studies, in support of the EIA report, IFC level specialist studies
Tongan Biodiversity Land Management Plan	Ivory Coast	Randgold Resources Limited	Design, compilation and implementation of the BLMP	Technical Specialist Ecologist, Project Manager	Fauna and Flora surveys for the BLMP, compilation of BLMP. Alien eradication plans. IFC level specialist studies
Kibali Gold mine	DRC Congo	Randgold Resources Limited	Gold mine infrastructure	Technical Specialist Ecologist	Technical specialist, fauna and flora, for the Kibali ESIA. IFC level specialist studies
Kibali Gold mine	DRC Congo	Randgold Resources Limited	ESIA Update	Technical Specialist Ecologist	Technical specialist, fauna and flora, for the Kibali ESIA. IFC level specialist studies
Nzoro Hydroelectric station	DRC Congo	Randgold Resources Limited	Hydroelectric plant	Technical Specialist Ecologist	Technical specialist, fauna and flora, for the Nzoro ESIA. IFC level specialist studies.
Loulo Biodiversity Land Management Plan	Mali	Randgold Resources Limited	Design, compilation and implementation of the BLMP	Technical Specialist Ecologist, Project Manager	Fauna and Flora surveys for the project features, compilation of BLMP.
Koidu Diamond Mine	Sierra Leone	Koidu Resources	Construction of new open pit	Technical Specialist Ecologist	Technical specialist, fauna and flora, for the Koidu ESIA. IFC level specialist studies, terrestrial ecology management plans

Resource Generation	South Africa	Temo Coal	Coal mine/Railway Line	Technical Specialist Ecologist	Fauna and Flora surveys, Protected plant species management plans, Permitting and Rehabilitation design.
Impunzi Rehabilitation monitoring	South Africa	Glencore	Monitoring of rehabilitation success and suggested management measures	Technical Specialist Flora specialist, Project manager	Vegetation surveys, rehabilitation monitoring. Alien eradication plan.

Professional Registration

- South African Council for Natural Scientific Professions, *Professional Natural Scientist* in the field of practice *Conservation Science,* registration number, *400018/17*;
- IAIA, International Association for Impact assessments;
- Botanical Society of South Africa;
- The Land Rehabilitation Society of Southern Africa, LARSA (Membership No. 0085);
- Grassland Society of Southern Africa.

Employment

- 2021- current: Founder, Principal Biodiversity Specialist, RJG Consulting, Johannesburg.
- 2020-2021: Senior Biodiversity Specialist ERM, Johannesburg
- 2016-2019: Digby Wells Environmental, Johannesburg, International. Manager: Group Biodiversity.
- 2011-2016: Digby Wells Environmental, Johannesburg, International. Unit Manager: Fauna, Flora and Wetlands.
- 2009-2011: Digby Wells and Associates, Johannesburg, South Africa. Senior Consultant.
- 2006 – 2009: Digby Wells and Associates, Johannesburg, South Africa. Consultant.
- 2002 - 2003: Shamwari Game Reserve, Eastern Cape, South Africa.
- 2001: Kop-Kop Geotechnical instrumentation specialists, Johannesburg, South Africa.

Publications

- Biodiversity Action Plans for faunal habitat maintenance and expansion in mining. Poster presented at the 48th Annual Grassland Society of Southern Africa (GSSA) conference.

- Limpopo Province South Africa – the Biodiversity perspective Paper presentation, presented at the Limpopo Minerals Conference and Trade show, hosted by the fossil fuel foundation and LEDET, 2015/11/11.
- Sustainability and Biodiversity Strategic Planning, Randgold Resources, 2018.
- Niokola Koba National Park, Senegal. Annual Census of Large Mammals, contributing author, 2018

Appendix B: Expected Plant Species

Family	*Genus*	*Sp1*	IUCN
Apiaceae	*Ammi*	*majus*	
Scrophulariaceae	*Jamesbrittenia*	*aurantiaca*	LC
Fabaceae	*Melilotus*	*indicus*	NE
Moraceae	*Ficus*	*thonningii*	
Asparagaceae	*Asparagus*	*cooperi*	LC
Malpighiaceae	*Sphedamnocarpus*	*pruriens*	LC
Agavaceae	*Chlorophytum*	*fasciculatum*	LC
Poaceae	*Sporobolus*	*fimbriatus*	LC
Polygalaceae	*Polygala*	*transvaalensis*	LC
Ricciaceae	*Riccia*	*okahandjana*	
Moraceae	*Ficus*	*salicifolia*	LC
Apocynaceae	*Orbea*	*carnosa*	LC
Apocynaceae	*Raphionacme*	*hirsuta*	LC
Pottiaceae	*Weissia*	*latiuscula*	
Boraginaceae	*Ehretia*	*rigida*	LC
Rhamnaceae	*Ziziphus*	*mucronata*	LC
Malvaceae	*Sida*	*rhombifolia*	LC
Poaceae	*Setaria*	*incrassata*	LC
Poaceae	*Eragrostis*	*superba*	LC
Euphorbiaceae	*Tragia*	*incisifolia*	LC
Ricciaceae	*Riccia*	*atropurpurea*	
Malvaceae	*Hibiscus*	*calyphyllus*	LC
Cyperaceae	*Cyperus*	*decurvatus*	LC
Malvaceae	*Triumfetta*	*sonderi*	LC
Thymelaeaceae	*Lasiosiphon*	*capitatus*	LC

Cucurbitaceae	*Kedrostis*	*leloja*	LC
Pteridaceae	*Cheilanthes*	*viridis*	LC
Archidiaceae	*Archidium*	*ohioense*	
Asteraceae	*Chrysocoma*	*sp.*	
Pontederiaceae	*Pontederia*	*crassipes*	
Fabaceae	*Peltophorum*	*africanum*	LC
Vahliaceae	*Vahlia*	*capensis*	NE
Vitaceae	*Rhoicissus*	*tridentata*	NE
Xyridaceae	*Xyris*	*congensis*	LC
Malvaceae	*Hermannia*	*sp.*	
Poaceae	*Eragrostis*	*barbinodis*	LC
Potamogetonaceae	*Zannichellia*	*palustris*	LC
Malvaceae	*Corchorus*	*argillicola*	
Proteaceae	*Protea*	*caffra*	
Fabaceae	*Eriosema*	*burkei*	LC
Fabaceae	*Rhynchosia*	*caribaea*	LC
Orchidaceae	*Eulophia*	*ovalis*	LC
Ophioglossaceae	*Ophioglossum*	*polyphyllum*	LC
Fabaceae	*Crotalaria*	*distans*	LC
Lamiaceae	*Ocimum*	*gratissimum*	NE
Stilbaceae	*Halleria*	*lucida*	LC
Ruscaceae	*Eriospermum*	*porphyrium*	LC
Acanthaceae	*Barleria*	*obtusa*	LC
Malvaceae	*Hibiscus*	*subreniformis*	LC
Anacardiaceae	*Ozoroa*	*paniculosa*	LC
Asteraceae	*Brachylaena*	*rotundata*	LC
Malvaceae	*Hermannia*	*bicolor*	LC
Lamiaceae	*Plectranthus*	*neochilus*	LC
Poaceae	*Elionurus*	*muticus*	LC

Asteraceae	*Senecio*	*venosus*	LC
Fabaceae	*Indigofera*	*adenoides*	LC
Asteraceae	*Xanthium*	*strumarium*	
Asteraceae	*Helichrysum*	*nudifolium*	LC
Asteraceae	*Centaurea*	*melitensis*	
Asteraceae	*Cotula*	*nigellifolia*	LC
Lythraceae	*Ammannia*	*baccifera*	
Ebenaceae	*Diospyros*	*sp.*	
Euphorbiaceae	*Euphorbia*	*sp.*	
Rhamnaceae	*Ziziphus*	*zeyheriana*	LC
Fabaceae	*Mundulea*	*sericea*	LC
Malvaceae	*Sida*	*dregei*	LC
Fabaceae	*Indigofera*	*sp.*	
Poaceae	*Aristida*	*stipitata*	LC
Myrtaceae	*Syzygium*	*sp.*	
Solanaceae	*Physalis*	*peruviana*	
Crassulaceae	*Kalanchoe*	*rotundifolia*	LC
Capparaceae	*Maerua*	*cafra*	LC
Amaryllidaceae	*Scadoxus*	*puniceus*	LC
Ricciaceae	*Riccia*	*volkii*	
Fabaceae	*Rhynchosia*	*albissima*	LC
Rubiaceae	*Pentanisia*	*angustifolia*	LC
Oleaceae	*Olea*	*europaea*	
Rubiaceae	*Oldenlandia*	*herbacea*	LC
Poaceae	*Cymbopogon*	*caesius*	LC
Phyllanthaceae	*Bridelia*	*mollis*	LC
Poaceae	*Eustachys*	*paspaloides*	LC
Malvaceae	*Hermannia*	*stellulata*	LC
Santalaceae	*Viscum*	*combreticola*	LC

Sematophyllaceae	*Sematophyllum*	*brachycarpum*	
Euphorbiaceae	*Croton*	*gratissimus*	LC
Rubiaceae	*Otiophora*	*calycophylla*	LC
Poaceae	*Tricholaena*	*monachne*	LC
Rubiaceae	*Vangueria*	*infausta*	LC
Fabaceae	*Erythrina*	*lysistemon*	LC
Caryophyllaceae	*Corrigiola*	*litoralis*	NE
Loranthaceae	*Tapinanthus*	*oleifolius*	LC
Oliniaceae	*Olinia*	*emarginata*	LC
Apocynaceae	*Acokanthera*	*oppositifolia*	LC
Asteraceae	*Nolletia*	*jeanettae*	LC
Poaceae	*Aristida*	*spectabilis*	LC
Apocynaceae	*Gomphocarpus*	*fruticosus*	LC
Euphorbiaceae	*Acalypha*	*glabrata*	LC
Brassicaceae	*Erucastrum*	*strigosum*	LC
Fabaceae	*Indigofera*	*daleoides*	NE
Poaceae	*Eragrostis*	*sclerantha*	LC
Lobeliaceae	*Lobelia*	*erinus*	LC
Pedaliaceae	*Dicerocaryum*	*senecioides*	LC
Fabaceae	*Crotalaria*	*lotoides*	LC
Malvaceae	*Pavonia*	*leptocalyx*	LC
Thelypteridaceae	*Christella*	*gueintziana*	
Ebenaceae	*Euclea*	*crispa*	LC
Apocynaceae	*Rauvolfia*	*caffra*	LC
Poaceae	*Andropogon*	*huillensis*	LC
Portulacaceae	*Portulaca*	*kermesina*	LC
Apocynaceae	*Pentarrhinum*	*insipidum*	LC
Combretaceae	*Combretum*	*imberbe*	LC
Poaceae	*Setaria*	*sphacelata*	LC

Poaceae	*Eragrostis*	*nindensis*	LC
Asparagaceae	*Asparagus*	*virgatus*	LC
Asteraceae	*Helichrysum*	*nudifolium*	LC
Aizoaceae	*Khadia*	*acutipetala*	LC
Hyacinthaceae	*Dipcadi*	*marlothii*	LC
Poaceae	*Bewsia*	*biflora*	LC
Acanthaceae	*Ruttya*	*ovata*	LC
Orchidaceae	*Eulophia*	*ovalis*	LC
Poaceae	*Eragrostis*	*hierniana*	LC
Scrophulariaceae	*Nemesia*	*rupicola*	LC
Anacardiaceae	*Searsia*	*leptodictya*	NE
Acanthaceae	*Blepharis*	*stainbankiae*	LC
Malvaceae	*Grewia*	*occidentalis*	LC
Asteraceae	*Afroaster*	*peglerae*	LC
Orobanchaceae	*Cycnium*	*adonense*	LC
Poaceae	*Paspalum*	*dilatatum*	NE
Poaceae	*Bothriochloa*	*bladhii*	LC
Asteraceae	*Artemisia*	*afra*	LC
Anacardiaceae	*Searsia*	*lancea*	LC
Orchidaceae	*Eulophia*	*hereroensis*	LC
Asteraceae	*Conyza*	*scabrida*	
Malvaceae	*Pavonia*	*columella*	LC
Hydrocharitaceae	*Lagarosiphon*	*muscoides*	LC
Hyacinthaceae	*Dipcadi*	*viride*	LC
Poaceae	*Brachiaria*	*serrata*	LC
Proteaceae	*Faurea*	*saligna*	LC
Amaryllidaceae	*Crinum*	*macowanii*	LC
Cucurbitaceae	*Kedrostis*	*africana*	LC
Pedaliaceae	*Harpagophytum*	*zeyheri*	LC

Boraginaceae	*Trichodesma*	*physaloides*	LC
Poaceae	*Melinis*	*nerviglumis*	LC
Convolvulaceae	*Convolvulus*	*thunbergii*	LC
Hyacinthaceae	*Ledebouria*	*revoluta*	LC
Ochnaceae	*Ochna*	*pretoriensis*	LC
Fabaceae	*Rhynchosia*	*totta*	LC
Commelinaceae	*Commelina*	*bella*	DD
Sapindaceae	*Pappea*	*capensis*	LC
Ricciaceae	*Riccia*	*microciliata*	
Vitaceae	*Cyphostemma*	*lanigerum*	LC
Fabaceae	*Rhynchosia*	*nitens*	LC
Lamiaceae	*Aeollanthus*	*sp.*	
Anacardiaceae	*Searsia*	*zeyheri*	LC
Acanthaceae	*Dicliptera*	*eenii*	LC
Poaceae	*Diheteropogon*	*amplectens*	LC
Iridaceae	*Freesia*	*grandiflora*	LC
Verbenaceae	*Verbena*	*bonariensis*	
Poaceae	*Sorghum*	*versicolor*	LC
Linderniaceae	*Craterostigma*	*plantagineum*	LC
Thymelaeaceae	*Lasiosiphon*	*sericocephalus*	LC
Convolvulaceae	*Ipomoea*	*transvaalensis*	LC
Poaceae	*Themeda*	*triandra*	LC
Asteraceae	*Helichrysum*	*paronychioides*	LC
Verbenaceae	*Verbena*	*officinalis*	
Poaceae	*Eriochloa*	*fatmensis*	LC
Malvaceae	*Triumfetta*	*annua*	NE
Boraginaceae	*Trichodesma*	*angustifolium*	LC
Poaceae	*Ischaemum*	*afrum*	LC
Ochnaceae	*Ochna*	*pulchra*	LC

Fabaceae	*Crotalaria*	*sphaerocarpa*	LC
Apocynaceae	*Carissa*	*bispinosa*	LC
Amaryllidaceae	*Haemanthus*	*humilis*	LC
Cyperaceae	*Carex*	*uhligii*	
Bryaceae	*Bryum*	*argenteum*	
Geraniaceae	*Pelargonium*	*luridum*	LC
Polygalaceae	*Polygala*	*uncinata*	LC
Apiaceae	*Conium*	*chaerophylloides*	LC
Malvaceae	*Hermannia*	*coccocarpa*	LC
Selaginellaceae	*Selaginella*	*dregei*	LC
Amaryllidaceae	*Crinum*	*lugardiae*	LC
Hyacinthaceae	*Ledebouria*	*sp.*	
Asphodelaceae	*Aloe*	*transvaalensis*	
Pteridaceae	*Cheilanthes*	*viridis*	LC
Fabaceae	*Crotalaria*	*magaliesbergensis*	LC
Acanthaceae	*Blepharis*	*subvolubilis*	LC
Malvaceae	*Waltheria*	*indica*	LC
Bignoniaceae	*Spathodea*	*campanulata*	
Commelinaceae	*Commelina*	*africana*	LC
Poaceae	*Stipagrostis*	*uniplumis*	LC
Poaceae	*Eragrostis*	*plana*	LC
Lamiaceae	*Stachys*	*natalensis*	LC
Asteraceae	*Adenostemma*	*caffrum*	LC
Fabaceae	*Neonotonia*	*wightii*	LC
Poaceae	*Andropogon*	*schirensis*	LC
Cannabaceae	*Trema*	*orientalis*	LC
Poaceae	*Tripogon*	*minimus*	LC
Lamiaceae	*Plectranthus*	*ramosior*	LC
Cyperaceae	*Cyperus*	*congestus*	LC

Iridaceae	*Gladiolus*	*pretoriensis*	LC
Poaceae	*Cymbopogon*	*prolixus*	LC
Asteraceae	*Schistostephium*	*crataegifolium*	LC
Burseraceae	*Commiphora*	*neglecta*	LC
Fabaceae	*Tephrosia*	*burchellii*	LC
Poaceae	*Hyparrhenia*	*anamesa*	LC
Euphorbiaceae	*Croton*	*gratissimus*	LC
Hypoxidaceae	*Hypoxis*	*rigidula*	LC
Crassulaceae	*Kalanchoe*	*lanceolata*	LC
Gentianaceae	*Sebaea*	*junodii*	LC
Cyperaceae	*Schoenoplectus*	*sp.*	
Combretaceae	*Combretum*	*erythrophyllum*	LC
Fabaceae	*Dichrostachys*	*cinerea*	NE
Ruscaceae	*Eriospermum*	*mackenii*	NE
Anemiaceae	*Mohria*	*vestita*	LC
Potamogetonaceae	*Potamogeton*	*crispus*	LC
Orchidaceae	*Eulophia*	*clitellifera*	LC
Fabaceae	*Eriosema*	*psoraleoides*	LC
Solanaceae	*Solanum*	*lichtensteinii*	LC
Rubiaceae	*Psydrax*	*livida*	LC
Malvaceae	*Dombeya*	*rotundifolia*	LC
Potamogetonaceae	*Potamogeton*	*pusillus*	LC
Malvaceae	*Grewia*	*monticola*	LC
Asparagaceae	*Asparagus*	*suaveolens*	LC
Malvaceae	*Hibiscus*	*lunariifolius*	LC
Convolvulaceae	*Evolvulus*	*alsinoides*	LC
Lamiaceae	*Ocimum*	*angustifolium*	LC
Fabaceae	*Rhynchosia*	*densiflora*	LC
Cucurbitaceae	*Zehneria*	*marlothii*	

Fabaceae	*Eriosema*	*cordatum*	LC
Poaceae	*Setaria*	*plicatilis*	LC
Asteraceae	*Tithonia*	*rotundifolia*	
Asteraceae	*Conyza*	*podocephala*	
Poaceae	*Eragrostis*	*sp.*	
Dioscoreaceae	*Dioscorea*	*retusa*	LC
Fabroniaceae	*Fabronia*	*rehmannii*	
Rubiaceae	*Pavetta*	*revoluta*	LC
Orobanchaceae	*Alectra*	*orobanchoides*	LC
Malvaceae	*Hibiscus*	*engleri*	LC
Asteraceae	*Geigeria*	*burkei*	NE
Asteraceae	*Psiadia*	*punctulata*	LC
Fabaceae	*Rhynchosia*	*minima*	NE
Solanaceae	*Solanum*	*retroflexum*	LC
Fabaceae	*Zornia*	*linearis*	LC
Rubiaceae	*Galium*	*capense*	LC
Nyctaginaceae	*Commicarpus*	*pentandrus*	LC
Celastraceae	*Mystroxylon*	*aethiopicum*	LC
Verbenaceae	*Lantana*	*rugosa*	LC
Campanulaceae	*Wahlenbergia*	*undulata*	LC
Euphorbiaceae	*Tragia*	*physocarpa*	LC
Lamiaceae	*Rotheca*	*louwalbertsii*	LC
Cyperaceae	*Cyperus*	*uitenhagensis*	LC
Malvaceae	*Hermannia*	*burkei*	LC
Malvaceae	*Pavonia*	*transvaalensis*	LC
Poaceae	*Ehrharta*	*erecta*	LC
Asteraceae	*Nidorella*	*hottentotica*	LC
Lamiaceae	*Tetradenia*	*brevispicata*	LC
Poaceae	*Arundinella*	*nepalensis*	LC

Salicaceae	*Salix*	*mucronata*	LC
Poaceae	*Brachiaria*	*nigropedata*	LC
Passifloraceae	*Adenia*	*digitata*	LC
Acanthaceae	*Hypoestes*	*forskaolii*	LC
Poaceae	*Panicum*	*maximum*	LC
Fabaceae	*Elephantorrhiza*	*elephantina*	LC
Asteraceae	*Dichrocephala*	*integrifolia*	LC
Anacardiaceae	*Ozoroa*	*paniculosa*	LC
Lamiaceae	*Orthosiphon*	*suffrutescens*	LC
Asteraceae	*Wedelia*	*glauca*	
Rubiaceae	*Pavetta*	*gardeniifolia*	LC
Fabaceae	*Vachellia*	*karroo*	LC
Combretaceae	*Combretum*	*molle*	LC
Poaceae	*Bothriochloa*	*insculpta*	LC
Fabaceae	*Indigofera*	*melanadenia*	LC
Pteridaceae	*Pteris*	*cretica*	LC
Verbenaceae	*Verbena*	*brasiliensis*	
Fabaceae	*Sesbania*	*transvaalensis*	LC
Malvaceae	*Abutilon*	*galpinii*	LC
Poaceae	*Eragrostis*	*chloromelas*	LC
Meliaceae	*Turraea*	*obtusifolia*	LC
Cyperaceae	*Cyperus*	*austro-africanus*	LC
Poaceae	*Eragrostis*	*rigidior*	LC
Poaceae	*Andropogon*	*eucomus*	LC
Geraniaceae	*Erodium*	*cicutarium*	
Equisetaceae	*Equisetum*	*ramosissimum*	LC
Malvaceae	*Hibiscus*	*aethiopicus*	LC
Thelypteridaceae	*Thelypteris*	*confluens*	LC
Scrophulariaceae	*Aptosimum*	*elongatum*	LC

Euphorbiaceae	*Spirostachys*	*africana*	LC
Poaceae	*Mosdenia*	*leptostachys*	LC
Limeaceae	*Limeum*	*viscosum*	NE
Cucurbitaceae	*Cucumis*	*melo*	LC
Fabaceae	*Crotalaria*	*eremicola*	LC
Fabaceae	*Chamaecrista*	*comosa*	LC
Oleaceae	*Jasminum*	*breviflorum*	LC
Solanaceae	*Solanum*	*campylacanthum*	
Rutaceae	*Zanthoxylum*	*capense*	LC
Apocynaceae	*Marsdenia*	*sylvestris*	LC
Poaceae	*Poa*	*annua*	NE
Poaceae	*Melinis*	*repens*	LC
Malvaceae	*Corchorus*	*aspleniifolius*	LC
Amaryllidaceae	*Crinum*	*graminicola*	LC
Convolvulaceae	*Ipomoea*	*coscinosperma*	LC
Plumbaginaceae	*Plumbago*	*auriculata*	LC
Araliaceae	*Cussonia*	*transvaalensis*	LC
Poaceae	*Aristida*	*aequiglumis*	LC
Rubiaceae	*Cordylostigma*	*virgatum*	
Poaceae	*Heteropogon*	*contortus*	LC
Cyperaceae	*Bulbostylis*	*oritrephes*	LC
Apocynaceae	*Cryptolepis*	*oblongifolia*	LC
Asteraceae	*Hilliardiella*	*elaeagnoides*	
Bryaceae	*Rosulabryum*	*capillare*	
Asteraceae	*Gamochaeta*	*pensylvanica*	
Asteraceae	*Oocephala*	*staehelinoides*	
Cyperaceae	*Cyperus*	*sexangularis*	LC
Rubiaceae	*Afrocanthium*	*mundianum*	LC
Malvaceae	*Grewia*	*subspathulata*	LC

Asparagaceae	*Asparagus*	*asparagoides*	LC
Asteraceae	*Dicoma*	*anomala*	LC
Poaceae	*Enneapogon*	*scoparius*	LC
Onagraceae	*Oenothera*	*stricta*	
Fabaceae	*Elephantorrhiza*	*burkei*	LC
Poaceae	*Oropetium*	*capense*	LC
Dichapetalaceae	*Dichapetalum*	*cymosum*	LC
Poaceae	*Aristida*	*congesta*	LC
Campanulaceae	*Wahlenbergia*	*sp.*	
Combretaceae	*Combretum*	*apiculatum*	LC
Lamiaceae	*Volkameria*	*glabra*	LC
Peraceae	*Clutia*	*pulchella*	LC
Poaceae	*Enneapogon*	*pretoriensis*	LC
Lamiaceae	*Leonotis*	*ocymifolia*	
Bryaceae	*Bryum*	*dichotomum*	
Poaceae	*Hyparrhenia*	*hirta*	LC
Sapotaceae	*Mimusops*	*zeyheri*	LC
Poaceae	*Eragrostis*	*capensis*	LC
Iridaceae	*Afrosolen*	*sandersonii*	
Malvaceae	*Hermannia*	*floribunda*	LC
Loranthaceae	*Tapinanthus*	*quequensis*	LC
Ebenaceae	*Diospyros*	*lycioides*	LC
Apocynaceae	*Pachycarpus*	*schinzianus*	LC
Solanaceae	*Datura*	*stramonium*	
Asteraceae	*Ursinia*	*nana*	LC
Poaceae	*Aristida*	*junciformis*	LC
Rubiaceae	*Anthospermum*	*rigidum*	LC
Poaceae	*Leersia*	*hexandra*	LC
Poaceae	*Pogonarthria*	*squarrosa*	LC

Pteridaceae	*Cheilanthes*	*hirta*	LC
Asteraceae	*Laggera*	*crispata*	LC
Malpighiaceae	*Sphedamnocarpus*	*pruriens*	LC
Amaranthaceae	*Pupalia*	*lappacea*	LC
Polygalaceae	*Polygala*	*producta*	LC
Zygophyllaceae	*Tribulus*	*terrestris*	LC
Asteraceae	*Senecio*	*pentactinus*	LC
Fabaceae	*Indigofera*	*nebrowniana*	LC
Araliaceae	*Cussonia*	*paniculata*	LC
Pteridaceae	*Pteris*	*dentata*	LC
Asteraceae	*Helichrysum*	*setosum*	LC
Fabaceae	*Rhynchosia*	*crassifolia*	LC
Apocynaceae	*Raphionacme*	*galpinii*	LC
Meliaceae	*Trichilia*	*dregeana*	LC
Crassulaceae	*Adromischus*	*umbraticola*	NT
Celastraceae	*Salacia*	*rehmannii*	LC
Scrophulariaceae	*Chaenostoma*	*leve*	LC
Aspleniaceae	*Asplenium*	*aethiopicum*	LC
Poaceae	*Eragrostis*	*stapfii*	LC
Icacinaceae	*Cassinopsis*	*ilicifolia*	LC
Poaceae	*Oplismenus*	*hirtellus*	LC
Asteraceae	*Berkheya*	*carlinopsis*	LC
Poaceae	*Cymbopogon*	*nardus*	LC
Poaceae	*Hyperthelia*	*dissoluta*	LC
Asteraceae	*Felicia*	*fascicularis*	LC
Rubiaceae	*Pavetta*	*eylesii*	LC
Asteraceae	*Phymaspermum*	*athanasioides*	LC
Cleomaceae	*Cleome*	*monophylla*	LC
Sapotaceae	*Englerophytum*	*magalismontanum*	LC

Polygalaceae	*Polygala*	*hottentotta*	LC
Asteraceae	*Cineraria*	*parvifolia*	LC
Malvaceae	*Triumfetta*	*rhomboidea*	LC
Commelinaceae	*Commelina*	*imberbis*	LC
Lamiaceae	*Teucrium*	*trifidum*	LC
Crassulaceae	*Crassula*	*swaziensis*	LC
Poaceae	*Perotis*	*patens*	LC
Asparagaceae	*Asparagus*	*transvaalensis*	LC
Rubiaceae	*Pavetta*	*gardeniifolia*	LC
Fabaceae	*Indigofera*	*sordida*	LC
Velloziaceae	*Xerophyta*	*viscosa*	LC
Caryophyllaceae	*Dianthus*	*mooiensis*	NE
Vahliaceae	*Vahlia*	*capensis*	LC
Asteraceae	*Senecio*	*barbertonicus*	LC
Fabaceae	*Tephrosia*	*rhodesica*	LC
Stilbaceae	*Nuxia*	*congesta*	LC
Malvaceae	*Sida*	*cordifolia*	LC
Acanthaceae	*Barleria*	*pretoriensis*	LC
Cyperaceae	*Cyperus*	*capensis*	LC
Fabaceae	*Rhynchosia*	*totta*	
Poaceae	*Agrostis*	*lachnantha*	LC
Verbenaceae	*Duranta*	*erecta*	
Leucobryaceae	*Campylopus*	*pyriformis*	
Apocynaceae	*Huernia*	*transvaalensis*	LC
Euphorbiaceae	*Acalypha*	*sp.*	
Leucobryaceae	*Campylopus*	*thwaitesii*	
Cucurbitaceae	*Trochomeria*	*debilis*	LC
Fabaceae	*Tephrosia*	*elongata*	LC
Scrophulariaceae	*Chaenostoma*	*floribundum*	LC

Ruscaceae	*Eriospermum*	*porphyrovalve*	LC
Polygonaceae	*Rumex*	*sagittatus*	LC
Pottiaceae	*Trichostomum*	*brachydontium*	
Asteraceae	*Nidorella*	*resedifolia*	LC
Verbenaceae	*Chascanum*	*hederaceum*	LC
Asteraceae	*Berkheya*	*speciosa*	LC
Asteraceae	*Tarchonanthus*	*camphoratus*	LC
Cyperaceae	*Abildgaardia*	*ovata*	LC
Anacardiaceae	*Searsia*	*pallens*	LC
Malvaceae	*Corchorus*	*schimperi*	LC
Convolvulaceae	*Ipomoea*	*magnusiana*	LC
Combretaceae	*Terminalia*	*sericea*	LC
Apocynaceae	*Ceropegia*	*multiflora*	LC
Apocynaceae	*Stenostelma*	*umbelluliferum*	NT
Aspleniaceae	*Asplenium*	*cordatum*	LC
Asteraceae	*Erigeron*	*canadensis*	
Poaceae	*Urelytrum*	*agropyroides*	LC
Euphorbiaceae	*Dalechampia*	*capensis*	LC
Acanthaceae	*Ruellia*	*patula*	LC
Ebenaceae	*Diospyros*	*whyteana*	LC
Sematophyllaceae	*Sematophyllum*	*subpinnatum*	
Poaceae	*Eragrostis*	*curvula*	LC
Funariaceae	*Funaria*	*longicollis*	
Boraginaceae	*Heliotropium*	*ciliatum*	LC
Poaceae	*Setaria*	*lindenbergiana*	LC
Santalaceae	*Colpoon*	*compressum*	LC
Asteraceae	*Hilliardiella*	*hirsuta*	LC
Vitaceae	*Cyphostemma*	*sandersonii*	LC
Asteraceae	*Zinnia*	*peruviana*	

Dipsacaceae	*Scabiosa*	*columbaria*	LC
Commelinaceae	*Cyanotis*	*speciosa*	LC
Hypoxidaceae	*Hypoxis*	*rigidula*	LC
Iridaceae	*Gladiolus*	*sericeovillosus*	LC
Poaceae	*Aristida*	*diffusa*	LC
Aspleniaceae	*Asplenium*	*phillipsianum*	LC
Elatinaceae	*Elatine*	*ambigua*	LC
Menispermaceae	*Antizoma*	*angustifolia*	LC
Brachytheciaceae	*Eurhynchiella*	*zeyheri*	
Verbenaceae	*Lippia*	*javanica*	LC
Apocynaceae	*Ceropegia*	*haygarthii*	LC
Orobanchaceae	*Striga*	*forbesii*	LC
Leucobryaceae	*Campylopus*	*savannarum*	
Verbenaceae	*Lippia*	*scaberrima*	LC
Boraginaceae	*Ehretia*	*rigida*	LC
Rubiaceae	*Pavetta*	*zeyheri*	LC
Poaceae	*Microchloa*	*caffra*	LC
Poaceae	*Loudetia*	*simplex*	LC
Asteraceae	*Afroaster*	*serrulatus*	LC
Combretaceae	*Combretum*	*zeyheri*	LC
Euphorbiaceae	*Acalypha*	*angustata*	LC
Fabaceae	*Dolichos*	*linearis*	LC
Fabaceae	*Desmodium*	*repandum*	LC
Asphodelaceae	*Aloe*	*davyana*	
Iridaceae	*Gladiolus*	*permeabilis*	LC
Fissidentaceae	*Fissidens*	*curvatus*	
Amaryllidaceae	*Nerine*	*laticoma*	LC
Araceae	*Spirodela*	*punctata*	LC
Celastraceae	*Pterocelastrus*	*echinatus*	LC

Anacardiaceae	*Sclerocarya*	*birrea*	LC
Asteraceae	*Pseudopegolettia*	*tenella*	
Salicaceae	*Dovyalis*	*zeyheri*	LC
Poaceae	*Eragrostis*	*racemosa*	LC
Ranunculaceae	*Clematis*	*brachiata*	LC
Fabaceae	*Dichilus*	*lebeckioides*	LC
Boraginaceae	*Cynoglossum*	*hispidum*	LC
Malvaceae	*Corchorus*	*confusus*	LC
Asteraceae	*Schkuhria*	*pinnata*	
Poaceae	*Setaria*	*nigrirostris*	LC
Apocynaceae	*Cryptolepis*	*cryptolepioides*	LC
Asteraceae	*Lopholaena*	*coriifolia*	LC
Pedaliaceae	*Ceratotheca*	*triloba*	LC
Solanaceae	*Withania*	*somnifera*	LC
Lamiaceae	*Salvia*	*radula*	LC
Poaceae	*Sporobolus*	*nitens*	LC
Malpighiaceae	*Triaspis*	*glaucophylla*	LC
Lamiaceae	*Plectranthus*	*montanus*	
Elatinaceae	*Bergia*	*capensis*	LC
Rubiaceae	*Oldenlandia*	*tenella*	LC
Poaceae	*Aristida*	*transvaalensis*	LC
Iridaceae	*Gladiolus*	*crassifolius*	LC
Polygonaceae	*Rumex*	*crispus*	
Rubiaceae	*Vangueria*	*parvifolia*	LC
Chrysobalanaceae	*Parinari*	*capensis*	LC
Asteraceae	*Tagetes*	*minuta*	
Bryaceae	*Bryum*	*apiculatum*	
Poaceae	*Eragrostis*	*gummiflua*	LC
Santalaceae	*Osyris*	*lanceolata*	LC

Myrothamnaceae	*Myrothamnus*	*flabellifolius*	DD
Lamiaceae	*Leonotis*	*schinzii*	LC
Asphodelaceae	*Aloe*	*sp.*	
Poaceae	*Schizachyrium*	*sanguineum*	LC
Hypericaceae	*Hypericum*	*aethiopicum*	LC
Poaceae	*Panicum*	*natalense*	LC
Violaceae	*Afrohybanthus*	*serratus*	
Acanthaceae	*Justicia*	*rhodesiana*	
Urticaceae	*Pouzolzia*	*mixta*	LC
Lamiaceae	*Syncolostemon*	*canescens*	LC
Fabaceae	*Teramnus*	*labialis*	LC
Asteraceae	*Dicoma*	*anomala*	LC
Anacardiaceae	*Lannea*	*discolor*	LC
Fabaceae	*Dolichos*	*angustifolius*	LC
Fabaceae	*Indigofera*	*oxytropis*	LC
Anacardiaceae	*Searsia*	*pyroides*	LC
Lamiaceae	*Salvia*	*runcinata*	LC
Asteraceae	*Senecio*	*glanduloso-pilosus*	LC
Asteraceae	*Conyza*	*aegyptiaca*	
Cleomaceae	*Cleome*	*maculata*	LC
Convolvulaceae	*Ipomoea*	*gracilisepala*	LC
Rubiaceae	*Rubia*	*horrida*	LC
Rhamnaceae	*Phyllogeiton*	*zeyheri*	
Poaceae	*Digitaria*	*diagonalis*	LC
Asteraceae	*Felicia*	*muricata*	LC
Thymelaeaceae	*Lasiosiphon*	*microcephalus*	
Malvaceae	*Triumfetta*	*annua*	NE
Caryophyllaceae	*Polycarpaea*	*corymbosa*	
Poaceae	*Phalaris*	*paradoxa*	NE

Myrsinaceae	*Myrsine*	*africana*	LC
Santalaceae	*Thesium*	*transvaalense*	LC
Cucurbitaceae	*Coccinia*	*adoensis*	LC
Acanthaceae	*Crabbea*	*ovalifolia*	LC
Ruscaceae	*Eriospermum*	*abyssinicum*	
Cyperaceae	*Bulbostylis*	*burchellii*	LC
Lamiaceae	*Plectranthus*	*hereroensis*	LC
Fabaceae	*Senegalia*	*senegal*	LC
Pteridaceae	*Pellaea*	*calomelanos*	LC
Poaceae	*Avena*	*fatua*	NE
Orobanchaceae	*Striga*	*asiatica*	LC
Poaceae	*Sporobolus*	*pyramidalis*	LC
Asteraceae	*Helichrysum*	*kraussii*	LC
Solanaceae	*Solanum*	*giganteum*	LC
Poaceae	*Fingerhuthia*	*africana*	LC
Asteraceae	*Geigeria*	*burkei*	NE
Fabaceae	*Burkea*	*africana*	LC
Cucurbitaceae	*Cucumis*	*cinereus*	LC
Poaceae	*Sporobolus*	*festivus*	LC
Ruscaceae	*Sansevieria*	*aethiopica*	LC
Fabaceae	*Stylosanthes*	*fruticosa*	LC
Poaceae	*Paspalum*	*scrobiculatum*	LC
Combretaceae	*Combretum*	*hereroense*	
Scrophulariaceae	*Jamesbrittenia*	*burkeana*	LC

Appendix C: Plant Species Recorded

Scientific Name	Common Name	Ecological Status
Alloteropsis semialata	Black seed grass	Increaser 1 - Climax
Andropogon schirensis	Stab Grass	Climax Increaser 1
Aristida congesta congesta	Tassel Tree-awn	Increaser 2 - Pioneer
Aristida diffusa	Iron Grass	Subclimax climax Increaser 3
Asparagus aethiopicus		
Bothriochloa insculpta	Pinhole grass	Subclimax Increaser 2
Brachiaria brizantha	Common signal grass	Climax Increaser 1
Brachiaria eruciformis	Sweet Signal grass	Pioneer Increaser 2
Cenchrus ciliaris	Foxtail Buffalo grass	Subclimax climax Decreaser
Chamaecrista comosa	Trailing dwarf cassia	
Chloris gayana	Rhodes grass	Sub climax Decreaser
Commelina africana	Yellow Commelina	Medicinal
Cymbopogon plurinodis	Narrow-leaved Turpentine Grass	Increaser 3 - Climax
Cynodon dactylon	Couch Grass	Increaser 2 - Pioneer
Datura ferox	Large Thorn Apple	Alien Invasive*
Dicanthum annulatum	Vlei Finger Grass	Increaser 2 - Climax
Dichrostachys cinerea	Sickle bush	Medicinal
Diheteropogn amplectens	Broad-leaved Bluestem	Increaser 3 - Climax
Dombeya rotundifolia	Wild Pear	
Enneapogon cenchroides	Nine awned grass	Pioneer Subclimax Increaser 2
Eragrostis chloromelas	(Narrow) Curly Leaf	Increaser 2 - Subclimax to climax
Eragrostis trichophora	Hairy Love Grass	Increaser 2 - Subclimax
Eucomis autumnalis	Pine apple flower	
Flaveria bidentis	Smelter's bush	Alien invasive
Gladiolus crassifolius	Thick-leaved gladiolus	
Gomphocarpus fruticosus	Cotton Bush	Weed
Gymnosporea heterophylla	Spike thorn	

Heteropogon contortus	Spear Grass	Increaser 2 - Subclimax
Hibiscus cannabinus	Wild Stock Rose	Invasive
Hyparrhenia hirta	Common Thatching Grass	Increaser 1 - Subclimax to climax
Loudetia simplex	Common Russet Grass	Increaser 2 - Climax
Melinis repens	Natal Red Top	Increaser 2 - Pioneer to subclimax
Paspalum urvillei	Vasey Grass	Exotic
Rhoicissus tridentata	Bushmans Grape	
Schkuhria pinnata	Darf Marigold	Weed
Searsia lancea	Karee	Edible fruit
Searsia pyroides	Common Wild current	Medicinal
Sebaea grandis	Primrose Gentian	
Senegalia mellifera	Black thorn	
Sesamum trilobum	Wild Foxglove	
Setaria sphacelata var. sphacelata	Bristle Grass	Decreaser - Climax
Solanum panduriforme	Yellow Bitter-apple	Alien invasive
Solanum sisymbriifolium	Wild tomato	Alien invasive 1b
Tagetes minuta	Tall Khaki Weed	Alien Invasive
Tephrosia grandiflora	Pink Bush Pea	Medicinal
Terminalia prunoides	Cluster leaf	
Themeda triandra	Red Grass	Decreaser - Climax
Trachypogon spicatus	Giant Spear Grass	Increaser 1 - Climax
Trichoneura grandiglumis	Small Rolling Grass	Increaser 2 - Subclimax
Urochloa mosambicensis	Bushveld Signal Grass	Increaser 2 - Pioneer to subclimax
Vachellia caffra	Common hook thorn	Bush Encroacher
Vachellia karroo	Sweet thorn	Medicinal
Verbena bonariensis	Tall Verbena	Alien invasive
Xanthium spinosum	Spiny Cocklebur	Alien/Invasive
Ximenia caffra	Sourplum	Edible, traditional
Ziziphus mucronata	Buffalo thorn	Medicinal