



# The Terrestrial Biodiversity Assessment for the proposed Euphorbia Solar Photovoltaic (PV) Energy Generation Facility

## Lichtenburg, North West Province

April 2022

**CLIENT**

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Report Name	<b>The Terrestrial Biodiversity Assessment for the proposed Euphorbia Solar Photovoltaic (PV) Energy Generation Facility</b>
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Declaration	<p>The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.</p>

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## 1 Introduction

### 1.1 Background

The Biodiversity Company was appointed to undertake a fauna and flora baseline and impact assessment for the Houthaalboomen North Cluster projects, which comprises three (3) separate Photovoltaic (PV) facilities (Figure 1-1 and Figure 1-2). The *three PV facilities ('the cluster')* were jointly considered for the scoping assessment but are now assessed through a separate Environmental Impact Assessment (EIA) process. This report specifically focuses on the *Verbena PV (Pty)*. For the purposes of this assessment, the Houthaalboomen North Cluster area has been collectively referred to as the 'project area'. The following information is as provided by the client:

*The Applicant Euphorbia PV (Pty) is proposing the construction of a photovoltaic (PV) solar energy facility (known as Euphorbia PV) located on a site approximately 5km -north-west of the town of Lichtenburg in the North West Province. The solar PV facility project area is situated within the Ditsobotla Local Municipality within the Ngaka Modiri Molema District Municipality and is accessible via the R505, located east of the development area.*

*The development area for the PV facility and associated infrastructure will be located on the following properties:*

- *Portion 2 of the Farm Houthaalboomen 31*
- *Portion 3 of the Farm Houthaalboomen 31*
- *Portion 4 of the Farm Houthaalboomen 31*

*Two PV facilities (or clusters) were jointly considered for the scoping assessment, but each PV facility was assessed through a separate Environmental Impact Assessment (EIA) process. This report specifically focuses on the Euphorbia PV (Pty). For the Euphorbia PV facility, an area of approximately 207 ha is being assessed, as part of each EIA process and the infrastructure associated with the facility includes:*

- *PV modules and mounting structures;*
- *Inverters and transformers;*
- *Site access road up to 8m wide (three alternative access points assessed) ;*
- *Internal access roads (up to 8m wide);*
- *Auxiliary buildings (22kV or 33kV switch room, gate-house and security, control centre, office, warehouse, canteen & visitors centre, staff lockers etc.);*
- *Temporary and permanent laydown area;*
- *Grid connection infrastructure, including:*
  - *Underground medium-voltage cabling between the project components and the facility substation (within a 100 m wide and 1.5 km in length corridor); and*
  - *Up to 132kV facility substation.*

The Euphorbia PV facility substation (as well as the Hillardia PV and Verbena PV facility substations) will be located directly adjacent to the Houthaalboomen North collector switching station in the south-eastern corner of Portion 4 of the Farm Houthaalboomen 31.

The Houthaalboomen North collector substation/ switching station will facilitate the connection of the cluster facility substations to the Watershed Main Transmission Substation (MTS) via a single or double circuit 132 kV overhead powerline.

The connection infrastructure associated with this grid solution (i.e. between the collector switching station and the MTS) will be assessed as part of a separate Environmental Application.

The alternative site access points and associated routes assessed include:

**Access Road Alternative 1:** Access to the facility off the R505-5 at a new farm access point at km 13. This road alternative is ~5.9 km long and aligned as follows:

- From the R505-5, this route follows the northern boundary of Portion 25 of Farm Houthaalboomen in a westerly direction for ~2.5 km. This portion of the route will be new;
- Continues in a southerly direction along the eastern boundary of Portions 3 and 4 of Farm Houthaalboomen 31 for 0.8 km; and
- Continues in westerly direction along the southern boundary of Portion 4 of Farm Houthaalboomen 31 for ~1.5 km. This portion of the route will be new and is common amongst the other access road alternatives.

**Access Road Alternative 2:** Access to the facility off the R505-5 at an existing farm access point at km 11.59. This road alternative is ~6.1 km long and aligned as follows:

- From the R505-5, this route follows an existing farm road that dissects Portion 25 of Farm Houthaalboomen in a westerly direction for ~2.5 km;
- Continues along an existing gravel road in a northerly direction along the eastern boundary of Portions 5 and 6 of Farm Houthaalboomen 31 for ~1 km; and
- Continues in westerly direction along the southern boundary of Portion 4 of Farm Houthaalboomen 31 for ~1.5 km. This portion of the route will be new and is common amongst the other access road alternatives.

**Access Road Alternative 3:** Access to the facility off the R505-5 at an existing farm access point at km 14.87. This road alternative is ~6.7 km long and aligned as follows:

- From the R505-5, this route follows an existing farm road on the southern border of Remaining Extent and Portion 3 of Farm Houthaalboomen 2 in a westerly direction for ~2.2 km;
- Continues along an existing gravel road in a southerly direction along the eastern boundary of Portions 3 and 4 of Farm Houthaalboomen 31 for ~1.9 km; and

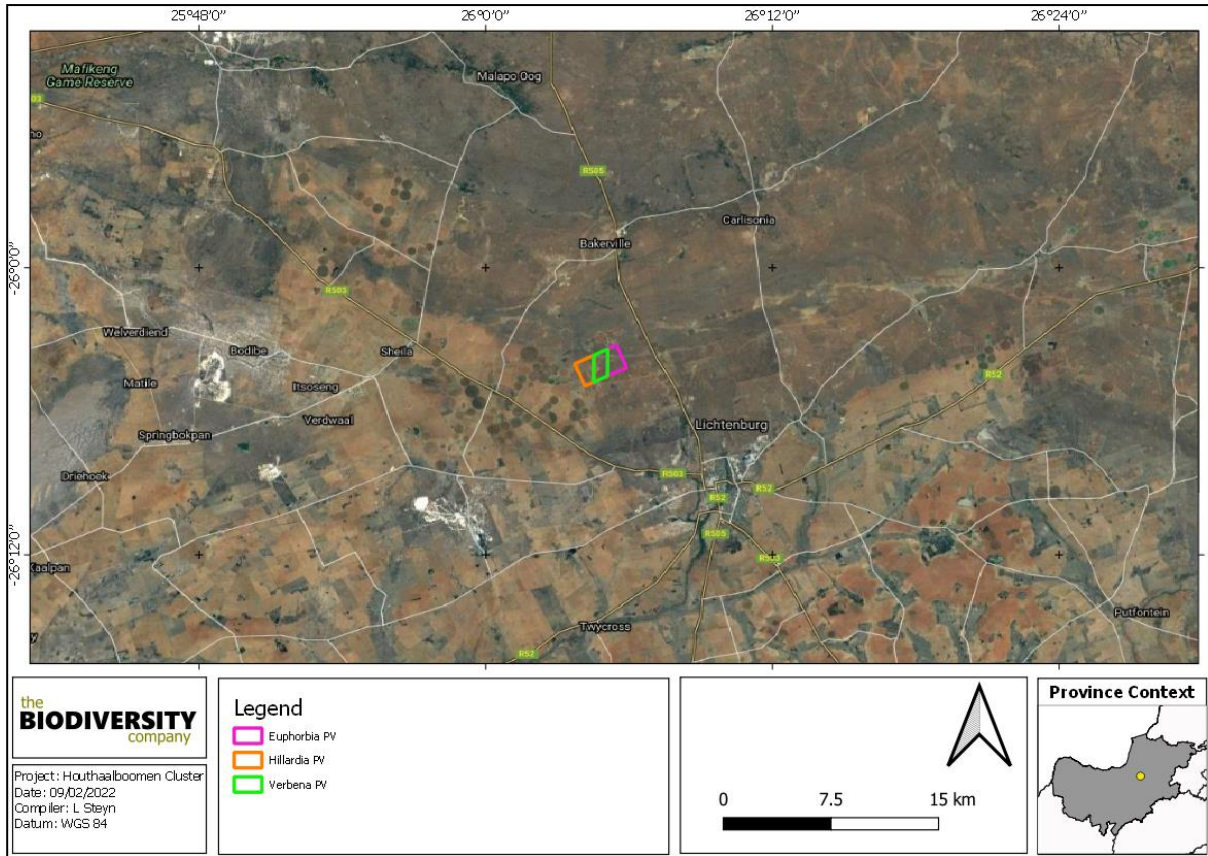
- Continues in westerly direction along the southern boundary of Portion 4 of Farm Houthaalboomen 31 for ~1.5 km. This portion of the route will be new and is common amongst the other access road alternatives.

This assessment was conducted per 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). This report was compiled to fulfil the requirement for a Terrestrial Biodiversity Assessment as per the 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 NEMA (GNR 320), as gazetted on 20 March 2020. This report is undertaken as supporting information as part of a greater environmental application process and is compliant in terms of the requirements in the above regulations in terms of Terrestrial Biodiversity. In terms of the 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 NEMA, gazetted on 30 October 2020, relating to requirements relating specifically to the Terrestrial Plant and Animal (species) themes, this report includes these requirements.

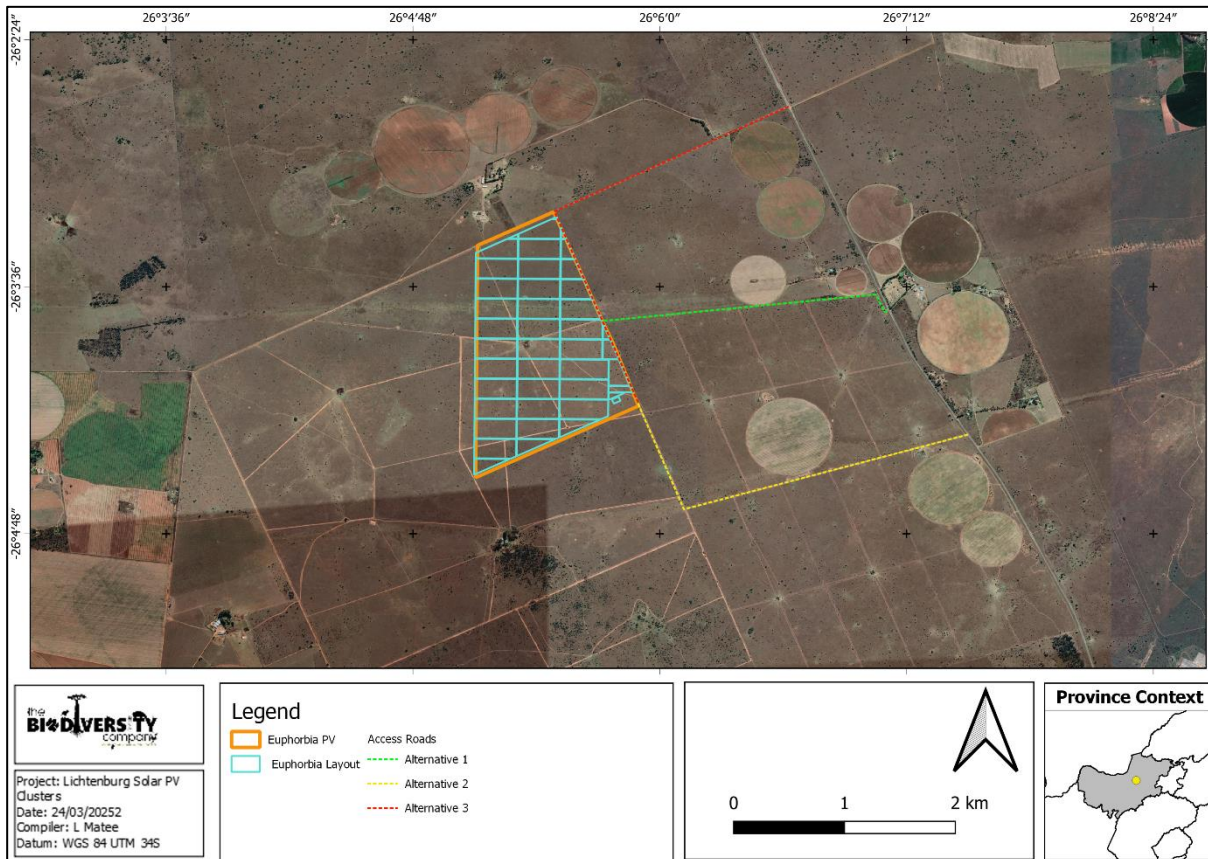
The following is deduced from the National Web-based Environmental Screening Tool:

- Terrestrial Biodiversity Theme sensitivity is “High” for the proposed project due to the project area traversing an Ecological Support Area 1;
- Plant Species Theme sensitivity ranges from “Medium” with several sensitive species predicted to be present; an
- Animal Species Theme sensitivity is classified as “Low”.

The purpose of the specialist studies is to provide relevant input into the environmental authorisation process and to provide a report for the proposed activities associated with the project. This report, after taking into consideration the findings and recommendations provided by the specialist herein, 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.



**Figure 1-1** Map illustrating the location of the proposed Houthaalboomen North Cluster



**Figure 1-2** Map illustrating the location and specific components of the Euphorbia PV.

## 1.2 Scope of Work

The principal aim of the assessment was to provide information to guide the risk of the activity to the flora and fauna communities of the associated ecosystems within the project area. This was achieved through the following:

- Desktop assessment to identify the relevant ecologically important geographical features within the project area;
- Desktop assessment to compile an expected species list and possible threatened flora and fauna species that occur within the project area;
- Field survey to ascertain the species composition of the present flora and fauna community within the project area;
- Delineate and map the habitats and their respective sensitivities that occur within the project area; and
- Completion of an impact assessment and the prescription of mitigation measures and recommendations for potential risks.

## 1.3 Key Legislative Requirements

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

**Table 1-1** *A list of key legislative requirements relevant to biodiversity and conservation in the North West*

Region	Legislation
<b>International</b>	Convention on Biological Diversity (CBD, 1993)
	The Convention on Wetlands (RAMSAR Convention, 1971)
	The United Nations Framework Convention on Climate Change (UNFCCC, 1994)
	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)
	The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)
<b>National</b>	Constitution of the Republic of South Africa (Act No. 108 of 2006)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management Biodiversity Act (Act No. 10 of 2004)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24, No 42946 (January 2020)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24, No 43110 (March 2020)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989) and associated EIA Regulations
	National Protected Areas Expansion Strategy (NPAES)
	Environmental Conservation Act (Act No. 73 of 1983)
Natural Scientific Professions Act (Act No. 27 of 2003)	

	National Biodiversity Framework (NBF, 2009)
	National Forest Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)
	National Spatial Biodiversity Assessment (NSBA)
	World Heritage Convention Act (Act No. 49 of 1999)
	National Heritage Resources Act, 1999 (Act 25 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations, 2014
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
	White Paper on Biodiversity
	North-West Biodiversity Sector Plan of 2015 (READ, 2015).
<b>Provincial</b>	North West Biodiversity Management Act ( Act No. 4 of 2016)
	The North West Biodiversity Management Amendment Bill, 2017

## 2 Methods

### 2.1 Desktop Assessment

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

#### 2.1.1 Ecologically Important Landscape Features

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

- National Biodiversity Assessment 2018 (Skowno et al, 2019) (NBA)- The purpose of the NBA is to assess the state of South Africa's biodiversity based on the best available science, with a view to understanding trends over time and informing policy and decision-making across a range of sectors. The NBA deals with all three components of biodiversity: genes, species, and ecosystems; and assesses biodiversity and ecosystems across terrestrial, freshwater, estuarine and marine environments. The two headline indicators assessed in the NBA are:
  - Ecosystem Threat Status – an indicator of an ecosystem's wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition.
  - Ecosystem Protection Level – an indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or

Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems.

- Protected areas:
  - South Africa Protected Areas Database (SAPAD) (DEA, 2021) – The (SAPAD) Database contains spatial data for the conservation of South Africa. It includes spatial and attributes information for both formally protected areas and areas that have less formal protection. SAPAD is updated continuously and forms the basis for the Register of Protected Areas, which is a legislative requirement under the National Environmental Management: Protected Areas Act, Act 57 of 2003.
  - National Protected Areas Expansion Strategy (NPAES) (SANBI, 2017) – The NPAES provides spatial information on areas that are suitable for terrestrial ecosystem protection. These focus areas are large, intact and unfragmented and therefore, of high importance for biodiversity, climate resilience and freshwater protection.
- The North-West Department of Rural, Environment, and Agricultural Development (READ), as custodian of the environment in the North West, is the primary implementing agent of the Biodiversity Sector Plan. The spatial component of the Biodiversity Sector Plan is based on systematic biodiversity planning undertaken by READ. The purpose of a Biodiversity Sector Plan is to inform land-use planning, environmental assessments, land, and water use authorisations, as well as natural resource management, undertaken by a range of sectors whose policies and decisions impact on biodiversity. This is done by providing a map of biodiversity priority areas, referred to as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), with accompanying land-use planning and decision-making guidelines (READ, 2015).
- Important Bird and Biodiversity Areas (IBAs) (BirdLife South Africa, 2015) – IBAs constitute a global network of over 13 500 sites, of which 112 sites are found in South Africa. IBAs are sites of global significance for bird conservation, identified through multi-stakeholder processes using globally standardised, quantitative, and scientifically agreed criteria; and
- South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (Van Deventer et al., 2018) – A South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was established during the National Biodiversity Assessment of 2018. It is a collection of data layers that represent the extent of river and inland wetland ecosystem types as well as pressures on these systems.

## 2.2 Desktop Flora Assessment

The Vegetation of South Africa, Lesotho, and Swaziland (Mucina & Rutherford, 2006) 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. 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.

### 2.2.1 Desktop Faunal Assessment

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

- Amphibian list, generated from the IUCN spatial dataset (2017) and AmphibianMap database (Fitzpatrick Institute of African Ornithology, 2021a), using the 2427 quarter degree square;
- Reptile list, generated from the IUCN spatial dataset (2017) and ReptileMap database (Fitzpatrick Institute of African Ornithology, 2021b), using the 2427 quarter degree square; and
- Mammal list from the IUCN spatial dataset (2017).

### 2.3 Biodiversity Field Assessment

A single field survey was undertaken from the 14<sup>th</sup> till the 18<sup>th</sup> of March 2022, which is a wet-season survey, to determine the presence of Species of Conservation Concern (SCC) and for the identification and assessment of habitat features. Effort was made to cover all the different habitat types, within the limits of time and access.

#### 2.3.1 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 rapid vegetation and ecological assessment at each sample site. Emphasis was placed on sensitive habitats, especially those overlapping with the 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 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 habitats 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.



**2.3.2 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;
- 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.

Relevant field guides and texts consulted for identification purposes including 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).

**2.4 Terrestrial Site Ecological Importance (SEI)**

The different habitat types within the project area were delineated and identified based on observations during the field assessment, and 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
<b>Very High</b>	Confirmed or highly likely occurrence of Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Extremely Rare or CR species that have a global extent of occurrence (EOO) of < 10 km <sup>2</sup> . 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).

<b>High</b>	Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km <sup>2</sup> . 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).
<b>Medium</b>	Confirmed or highly likely occurrence of populations of Near Threatened (NT) species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. Any area of natural habitat of threatened ecosystem type with status of VU. Presence of range-restricted species. > 50% of receptor contains natural habitat with potential to support SCC.
<b>Low</b>	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.
<b>Very Low</b>	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
<b>Very High</b>	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.
<b>High</b>	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.
<b>Medium</b>	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.
<b>Low</b>	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.
<b>Very Low</b>	Very small (< 1 ha) area. No habitat connectivity except for flying species or flora with wind-dispersed seeds. Several major current negative ecological impacts.

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

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

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

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

**Table 2-4 Summary of Resource Resilience (RR) criteria**

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

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

**Table 2-5 Matrix used to derive Site Ecological Importance (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 project 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
<b>Very High</b>	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.
<b>High</b>	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.
<b>Medium</b>	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
<b>Low</b>	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.
<b>Very Low</b>	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

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

## 2.5 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- The assessment area was based on the area provided by the client and any alterations to the route and/or missing GIS information pertaining to the assessment area would have affected the area surveyed;
- The area was only surveyed during a single site visit and therefore, this assessment does not consider temporal trends, however sufficient to derive meaningful baseline;
- The GPS used in the assessment has an accuracy of 5 m and consequently, any spatial features may be offset by 5 m.

## 3 Results & Discussion

### 3.1 Ecologically Important Landscape Features

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

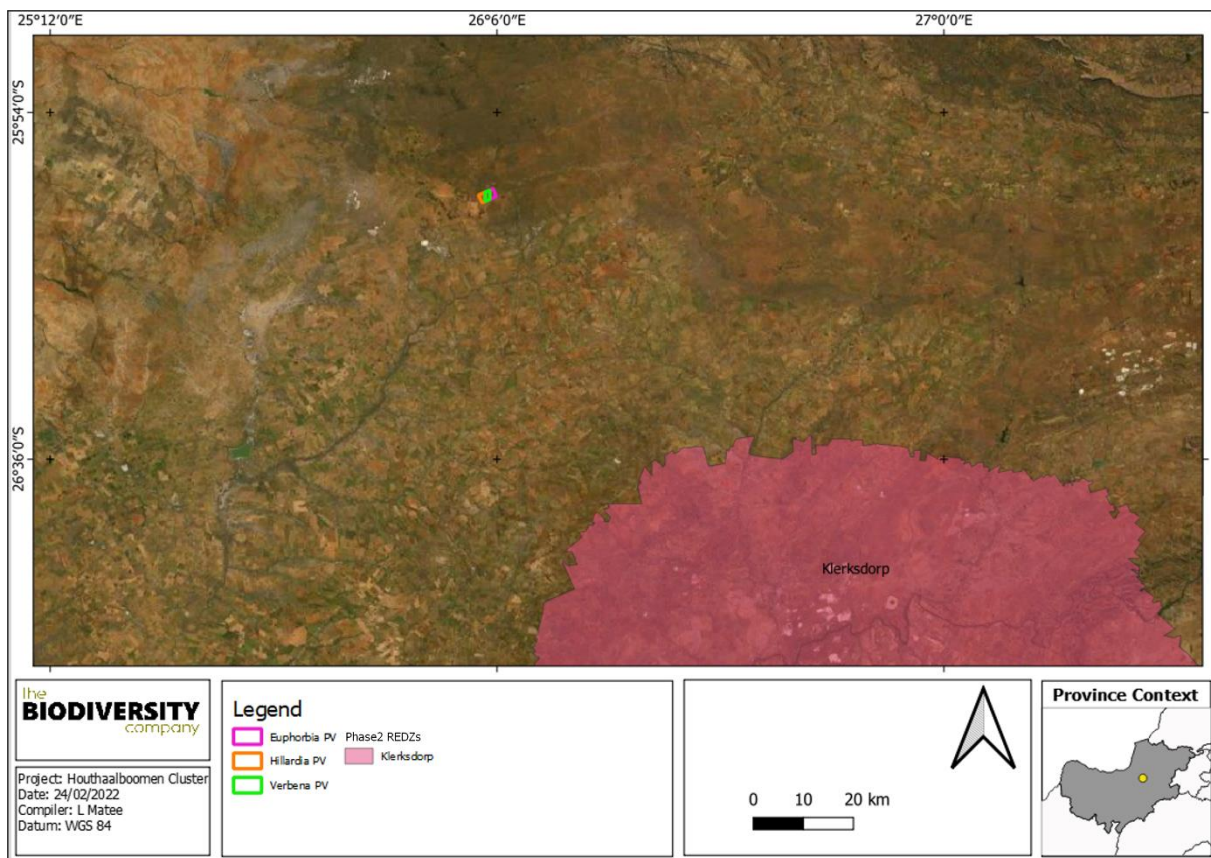
**Table 3-1 Summary of the relevance of the proposed development to ecologically important landscape features.**

Desktop Information Considered	Relevant/Irrelevant	Section
<b>Renewable Energy Database</b>	Adjacent to project "In Process" with several projects in the area "approved"	3.1.1
<b>Renewable Energy Development Zones</b>	The project area is approximately 68 km from the Klerksdorp REDZ (REDZ 10) area	3.1.1.1
<b>Ecosystem Threat Status</b>	Relevant – Located within a Least Concerned ecosystem	3.1.2.1
<b>Ecosystem Protection Level</b>	Relevant: The project area falls in a "Poorly Protected" area.	3.1.2.2
<b>National Threatened Ecosystem</b>	Irrelevant- The project area does not traverse any threatened ecosystem.	-
<b>Protected Areas</b>	Irrelevant: Located 5.4 km from the Marico Biosphere Reserve	-
<b>National Protected Areas Expansion Strategy</b>	The project area does not overlap with a Priority Focus Area, it is however located about 4 km from the Lichtenburg Game Breeding Centre. The breeding centre is operated by the National Zoological Gardens of South Africa	3.1.5
<b>Critical Biodiversity Area</b>	Irrelevant – According to the terrestrial NWBSP, the project area traverses a terrestrial ESA level 1 (ESA 1) (NWREAD, 2015) and according to the Aquatic BSP, it traverses an ESA 1 area.	3.1.3
<b>Important Bird and Biodiversity Areas</b>	Irrelevant: No Important Bird and Biodiversity Areas (IBAs) are situated within the project area.	-
<b>South African Inventory of Inland Aquatic Ecosystems</b>	Relevant – The project area is approximately 10 km away from a CR watercourse that is also considered poorly protected. The closest wetland is approximately 1.7 km away.	3.1.1
<b>National Freshwater Priority Area</b>	Irrelevant: No NFEPA designated to the associated SQR and no NFEPA wetlands were found within the 500 m regulation area.	3.1.4

<b>Strategic Water Source Areas</b>	Irrelevant – Not located within a SWSA, closest SWSA is more than 200 km away. The project area does overlay the Bo-Molopo Karst Belt groundwater SWSA.	-
<b>Vegetation Type</b>	The project area occurs in the Carletonville Dolomite Grasslands (Gh15) Vulnerable (VU).	3.2.1.1

**3.1.1 Renewable Energy Development Zones**

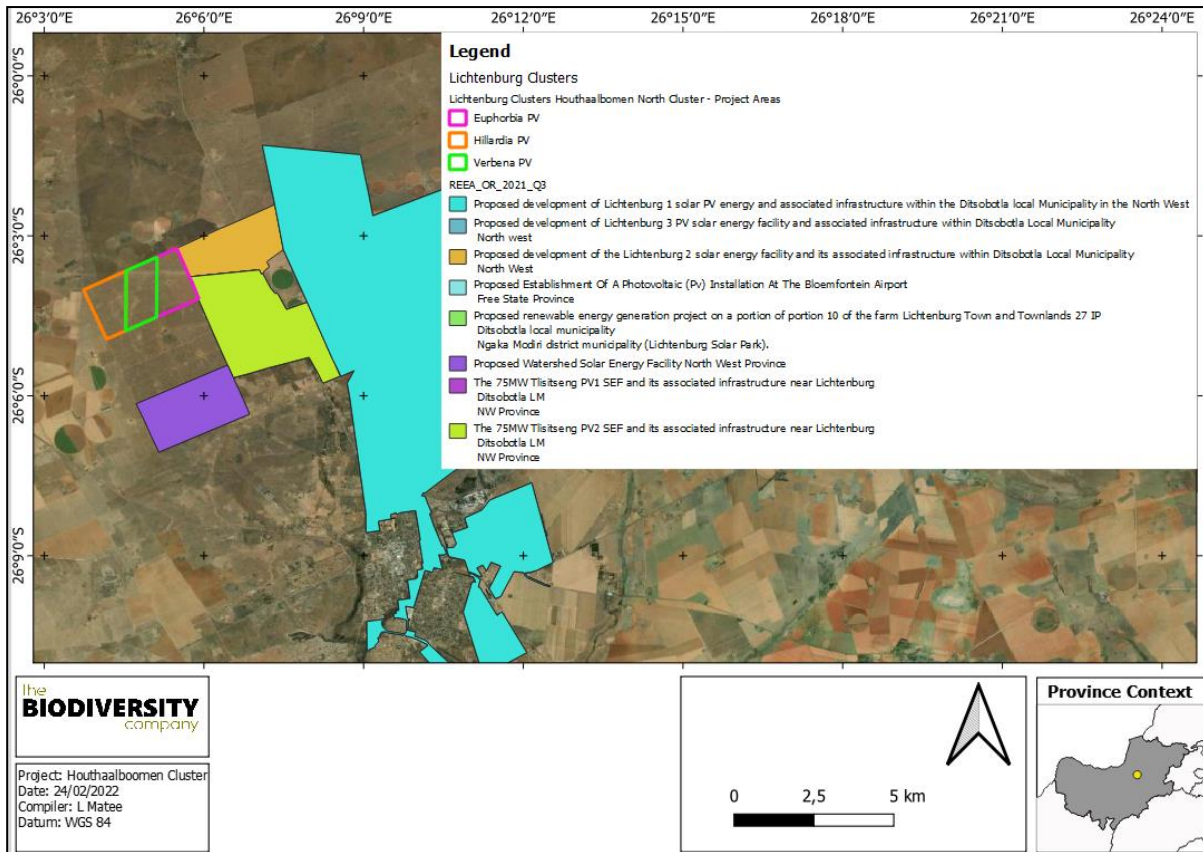
In 2018 Government Notice No. 114 in Government Gazette No. 41445 was published where 8 renewable energy development zones important for the development of large-scale wind and solar photovoltaic facilities were identified. In 2021 an additional 3 sites were included. The REDZs were identified through the undertaking of 2 Strategic Environmental Assessments. More detailed information can be obtained from <https://egis.environment.gov.za/redz>. Figure 3-1 shows the project area is approximately 68 km from the Klerksdorp REDZ (REDZ 10) area.



**Figure 3-1 The project area in relation to the Renewable Energy Development Zone**

**3.1.1.1 Authorised Renewable Energy Projects Database**

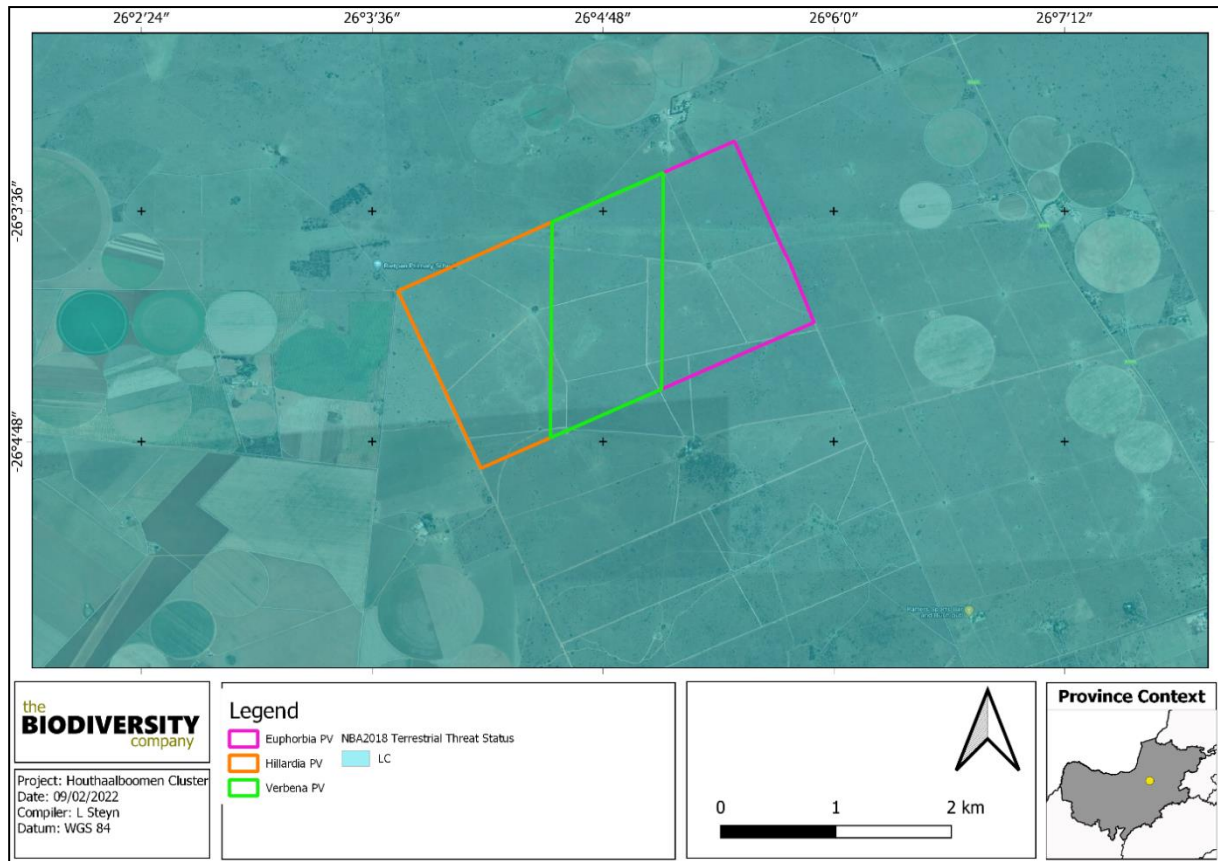
The Renewable Energy Database (<http://egis.environment.gov.za/>), shows that there are 8 projects in the nearby vicinity (Figure 3-2) that have received Environmental authorisation except for the Tlisitseng PV1 Solar Energy Facility (SEF) which is still under process. This may increase the overall cumulative impact on the biodiversity in the area, but approval for all these projects is uncertain. The proposed developments are all solar PV developments.



**Figure 3-2** The project area in relation to the renewable energy database projects in the area

### 3.1.1.2 Ecosystem Threat Status

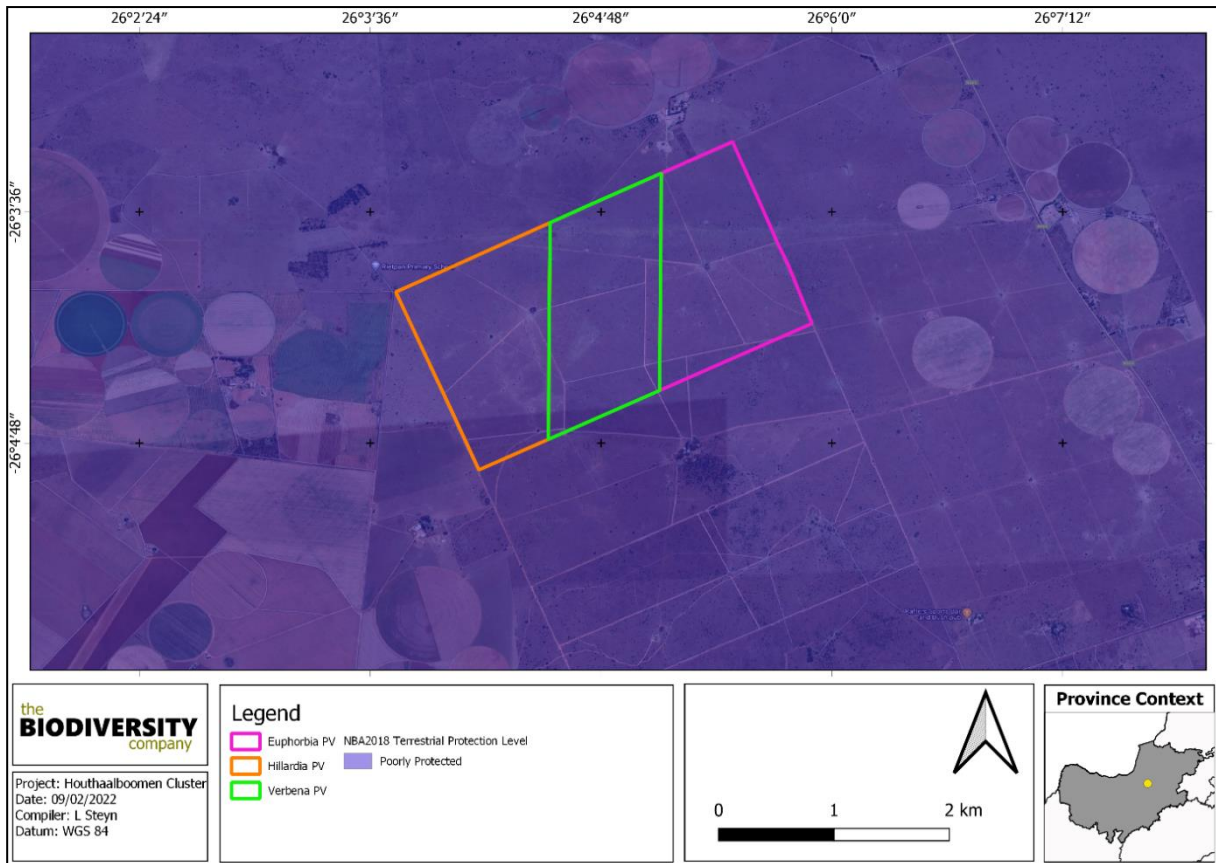
The Ecosystem Threat Status is an indicator of an ecosystem’s wellbeing, based on the level of change in structure, function or composition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU), Near Threatened (NT) or Least Concern (LC), based on the proportion of the original extent of each ecosystem type that remains in good ecological condition. According to the most recent NBA database, dated 2018 and released in 2019, the project area forms part of the remaining extent of Carletonville Dolomite Grassland with a threat status of LC (Figure 3-3).



**Figure 3-3** Map illustrating the ecosystem threat status associated with the assessment area

### 3.1.1.3 Ecosystem Protection Level

Indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. Not Protected, PP or MP ecosystem types are collectively referred to as under-protected ecosystems. The proposed development overlaps with a PP ecosystem (Figure 3-4).



**Figure 3-4** Map illustrating the ecosystem protection level associated with assessment area

### 3.1.2 The National List of Threatened Terrestrial Ecosystems

The National List of Threatened Terrestrial Ecosystems for South Africa (NEM:BA: National list of ecosystems that are threatened and in need of protection, (GN 34809, GN 1002), 9 December 2011) was published in terms of NEM: BA and the list categorizes ecosystems into Critically Endangered (CR) which have undergone severe degradation; Endangered (EN) which have undergone lesser degradation; Vulnerable (VU), which are at a high risk of undergoing degradation and protected which are of high conservation importance. The criteria used for identifying threatened terrestrial ecosystems was done through extensive stakeholder engagement and based on the best available science. The criteria for thresholds for CR, EN, and VU ecosystems are summarized in Table 3-2.

For EIAs, the 2011 National list of Threatened Ecosystems remains the trigger for a Basic Assessment in terms of Listing Notice 3 of the EIA Regulations 2014, as amended published under the National Environmental Management Act, 1998 (Act No. 107 of 1998). However, the updated 2018 ecosystem threat status has been considered in the assessment of impact significance in EIAs. The purpose of listing threatened, or protected ecosystems is primarily to preserve sites of exceptionally high conservation value.

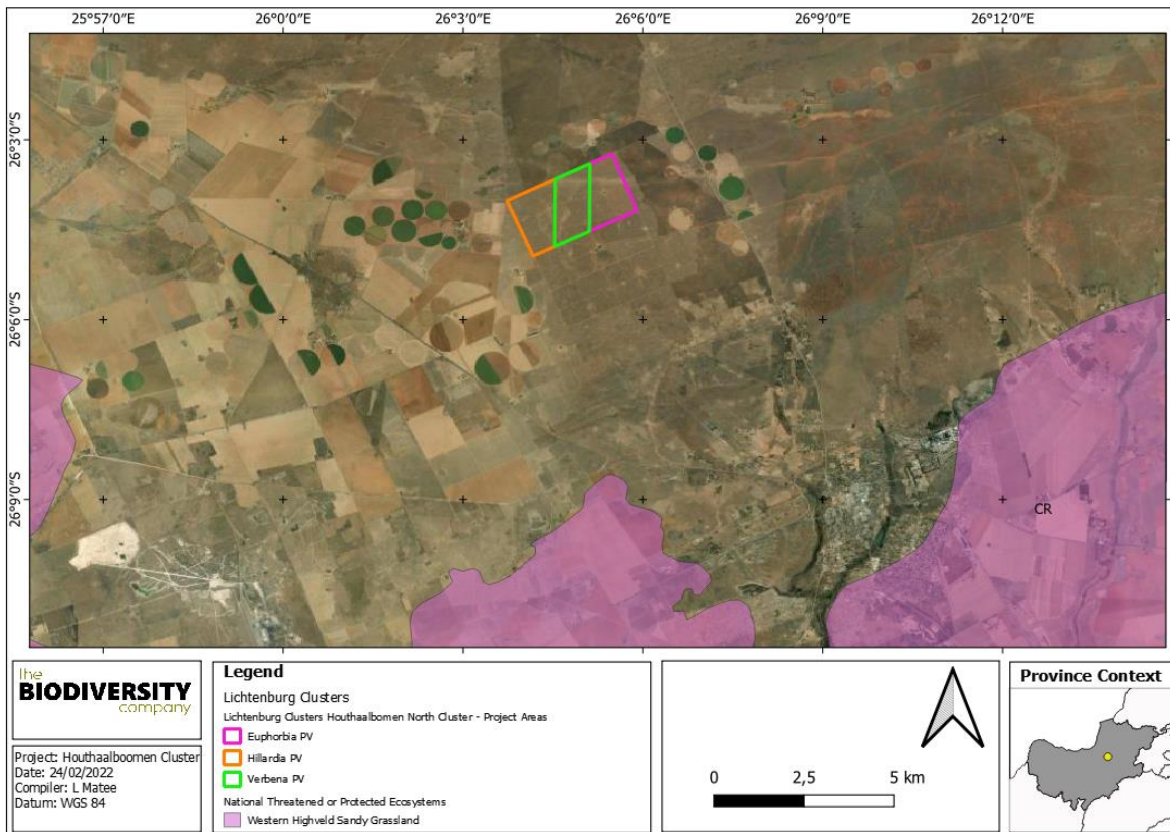


**Table 3-2 Criteria used to identify threatened terrestrial ecosystems**

Criterion	Critically Endangered	Endangered	Vulnerable
<b>A1: Irreversible loss of natural habitat</b>	Remaining natural habitat < biodiversity target	Remaining natural habitat < biodiversity target + 15%	Remaining natural habitat < 60% of the original area
<b>A2: Ecosystem degradation and loss of integrity</b>	> 60% of ecosystem significantly degraded	> 40% of ecosystem significantly degraded	> 20% of ecosystem significantly degraded
<b>C: Limited extent and imminent threat</b>	-	Ecosystem extent < 3000ha and imminent threat	Ecosystem extent < 6000ha and imminent threat
<b>D: Threatened plant species associations</b>	> 80 threatened Red List plant species	> 60 threatened Red List plant species	> 40 threatened Red List plant species
<b>F: Priority areas for meeting explicit biodiversity targets as defined in a systematic biodiversity plan</b>	Very high irreplaceability and high threat	Very high irreplaceability and medium threat	Very high biodiversity and low threat

There are four main types of implications of listed ecosystems on development:

- Planning related implications, linked to the requirement in the National Environmental Management Biodiversity Act (NEM: BA) for listed ecosystems to be considered in municipal Integrated Development Plans (IDPs) and Spatial Development Frameworks (SDFs);
- Environmental authorisation implications, especially in terms of NEMA and EIA regulations;
- Proactive management implications, in terms of the Biodiversity Act; and
- Monitoring and reporting implications, in terms of the Biodiversity Act.



**Figure 3-5** Map illustrating the locations of National Threatened Ecosystems proximal to the project area.

### 3.1.3 Protected and Conservation Areas

The South African Protected Areas Database (SAPAD) contains spatial data for the “conservation estate” of South Africa. It includes spatial and attribute information for both formally protected areas and areas that have less formal protection (collectively abbreviated to “PAs”).

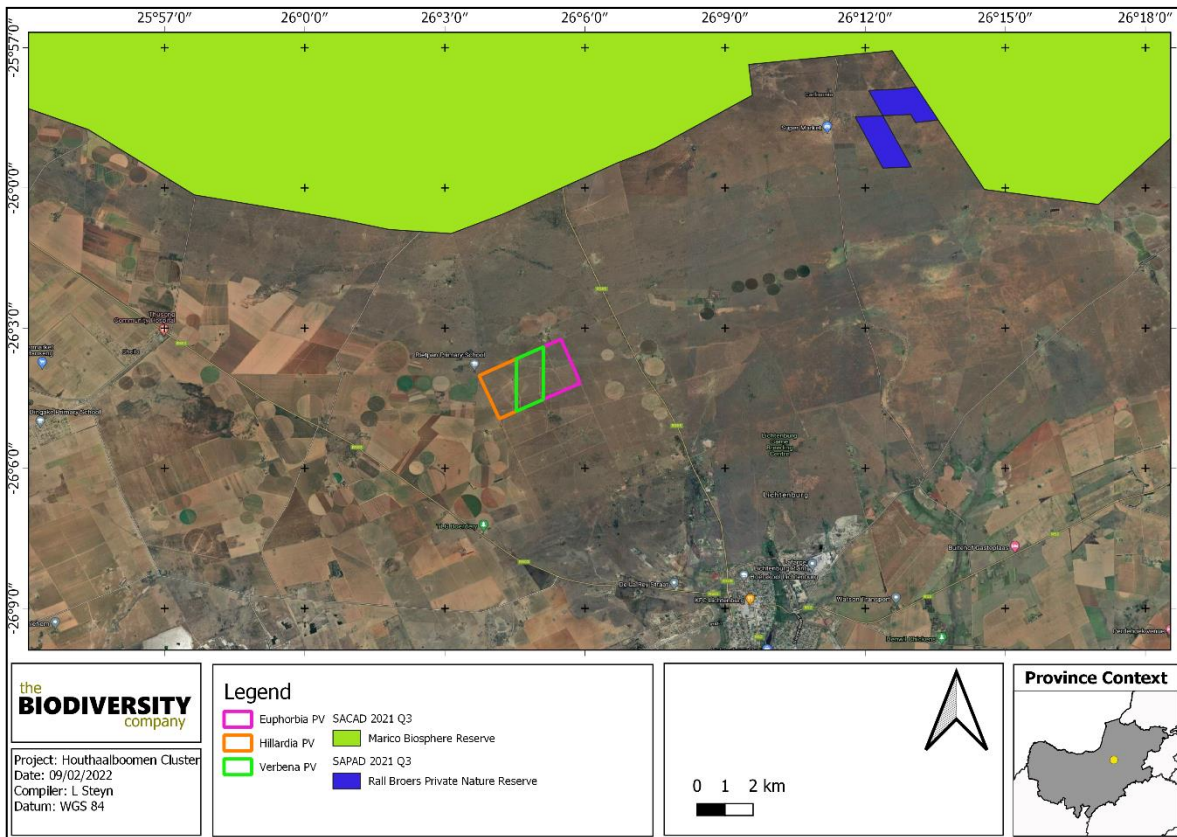
According to the protected area spatial datasets, the proposed development does not occur within any PA in terms of the National Environmental Management: Protected Areas Act, 2003. The nearest PA is the Rall Broers Private Nature Reserve approximately 13 km north-east of the project area (Figure 3-6).

It is important to differentiate PAs from conservation areas (CAs). Conservation areas are areas of land not formally protected by law but informally protected by the current owners and users and managed at least partly for biodiversity conservation.

The South African Conservation Areas Database SACAD provides access to the authoritative database on conserved areas in South Africa in a spatial format and forms the basis for the Register of Protected Areas which is a legislative requirement under the National Environmental Management: Protected Areas Act, Act 57 of 2003.

SACAD is suitable for a wide range of planning, assessment, and analysis and display purposes. Although SACAD is not legally declared, it is still important to consider these areas in impact assessments.

According to the conservation area spatial datasets, the proposed development does not occur within any CA. The nearest CA is the Marico Biosphere Reserve approximately 5 km north from the project area Protected Areas (Figure 3-6).



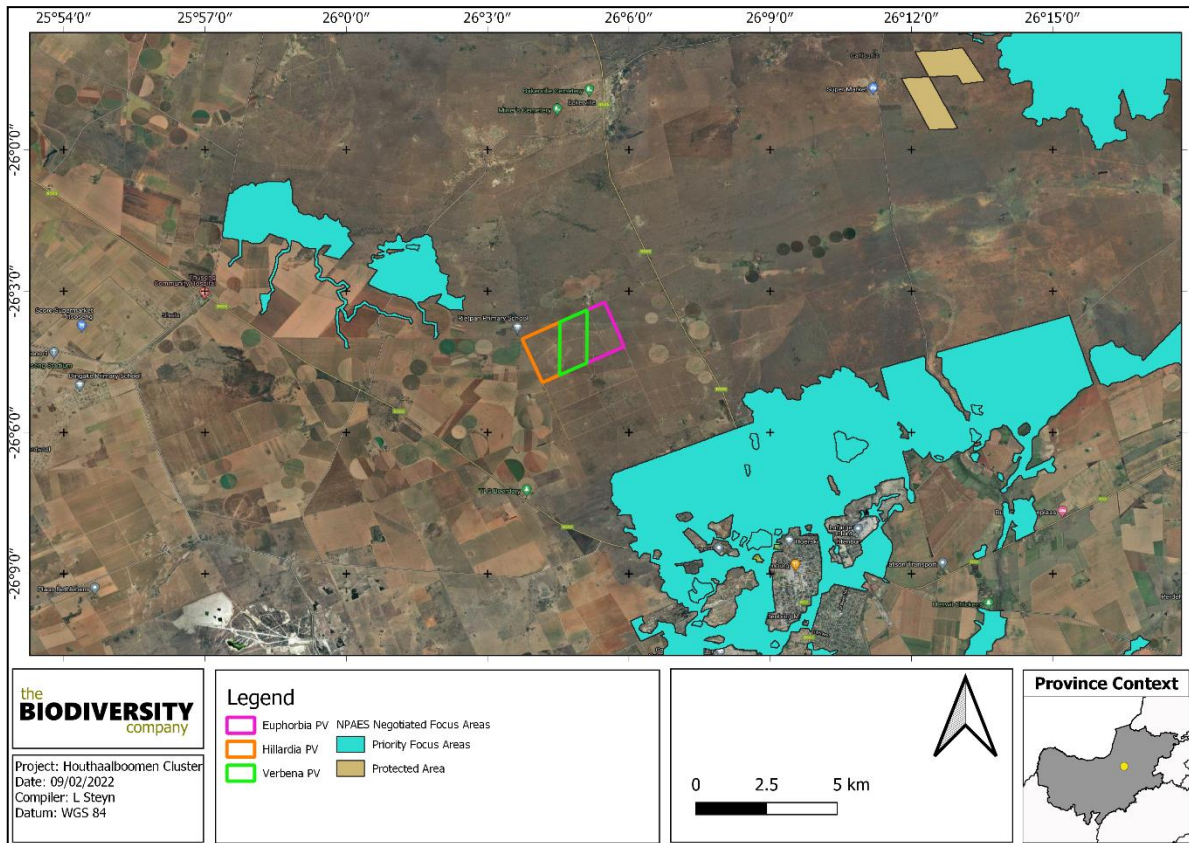
**Figure 3-6** Map illustrating the location of protected areas proximal to the assessment area

### 3.1.4 National Protected Area Expansion Strategy

National Protected Area Expansion Strategy 2016 (NPAES) were identified through a systematic biodiversity planning process. They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with a strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems.

These areas (referred to as “Priority Focus Areas”) should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES. They are also not a replacement for fine-scale planning which may identify a range of different priority sites based on local requirements, constraints, and opportunities (NPAES, 2016).

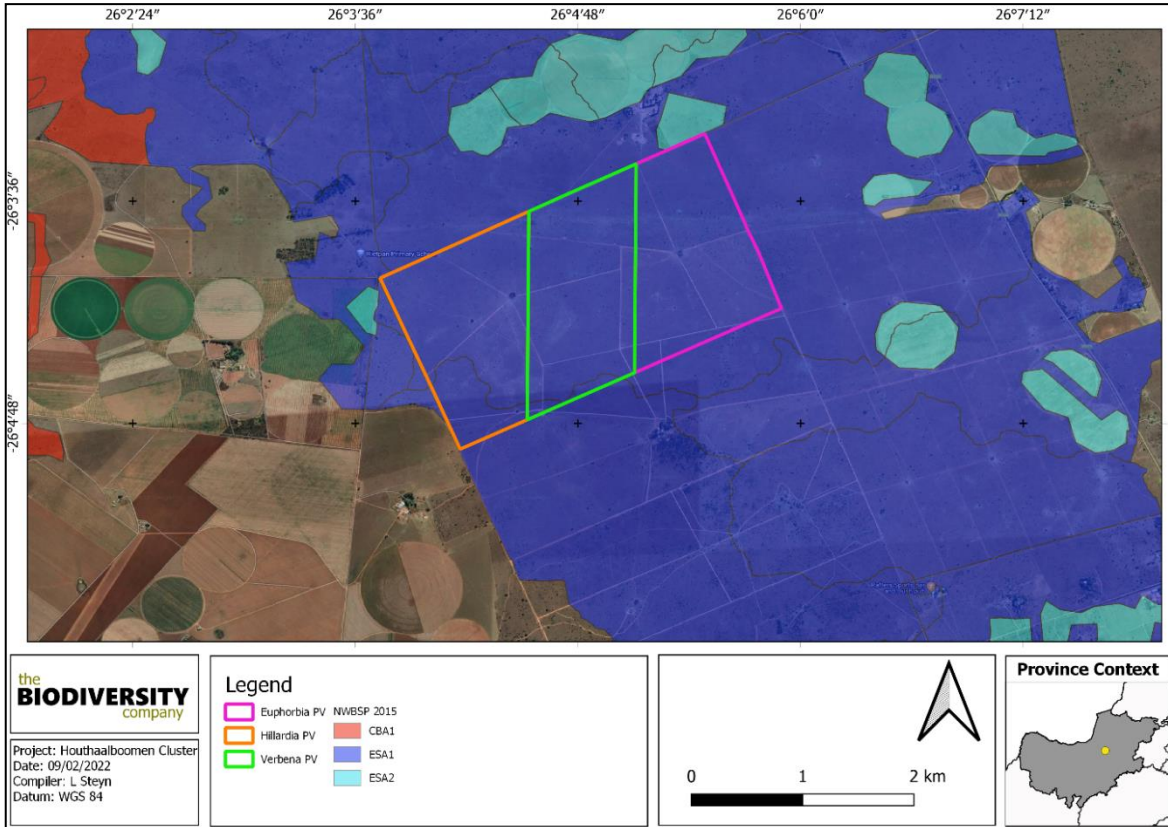
The project area does not overlap with a Priority Focus Area as can be seen in Figure 3-7.



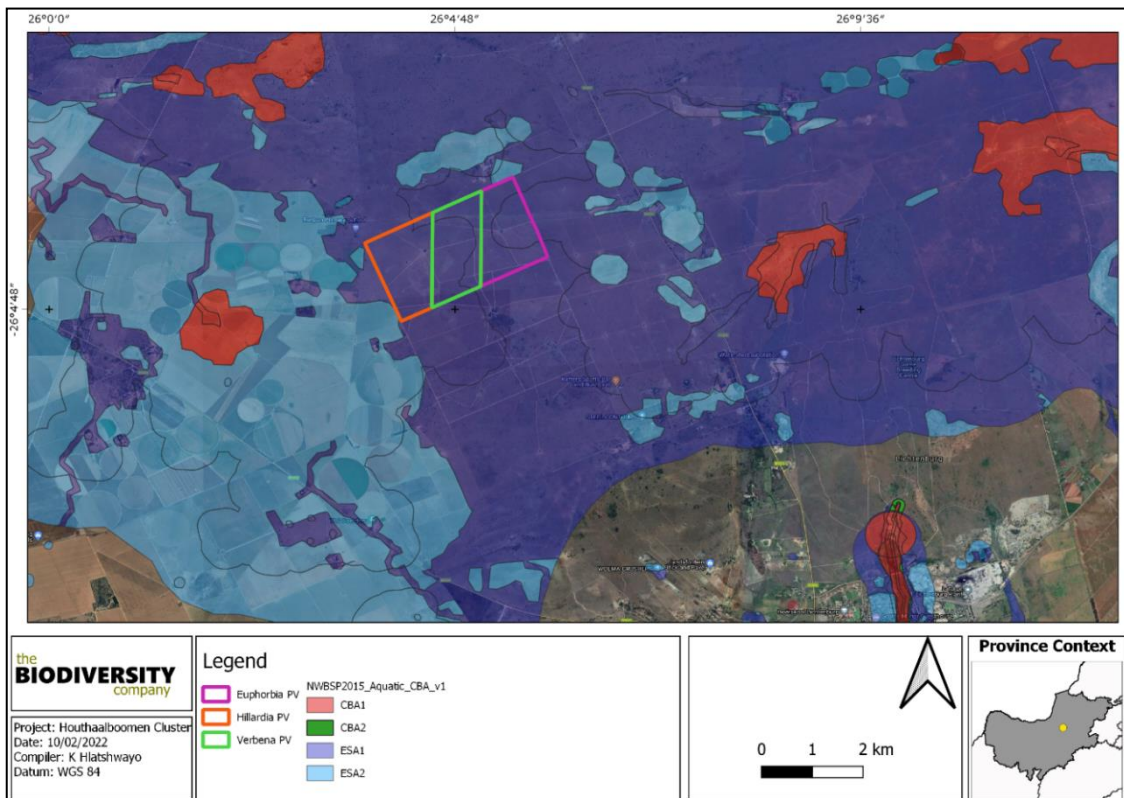
**Figure 3-7** Map illustrating the location of NPAES proximal to the assessment area

**3.1.5 Biodiversity Sector Plan**

Conservation of CBAs is crucial, in that if these areas are not maintained in a natural or near-natural state, biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (SANBI-BGIS, 2017). According to the terrestrial NWBSP, the project area traverses a terrestrial ESA level 1 (ESA 1) (NWREAD, 2015) (Figure 3-8). These ESA 1 areas function as linkages/corridors (comprising of natural vegetation) between the important biodiversity areas and major freshwater resource and their fringing terrestrial habitats. The management mandate for ESA 1 is to maintain at least a semi-natural state and basic natural attributes. The aquatic BSP depict the project area as overlapping with an area regarded as ESA 1 (Figure 3-9).



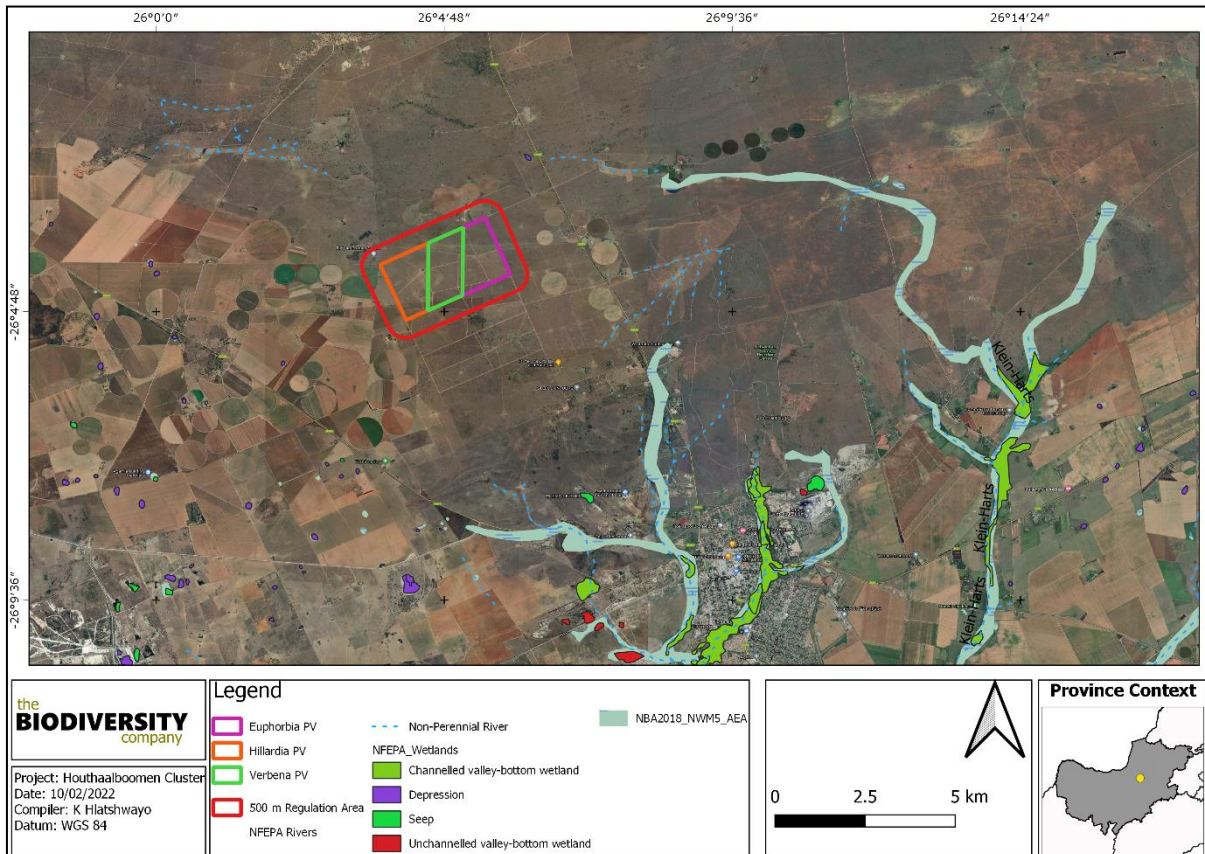
**Figure 3-8** Map illustrating the Terrestrial Ecological Support Areas associated with the assessment area



**Figure 3-9** Map illustrating the aquatic Ecological Support Areas associated with the assessment area

### 3.1.6 South African Inventory of Inland Aquatic Ecosystems

This spatial dataset is part of the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) which was released as part of the National Biodiversity Assessment (NBA) 2018. National Wetland Map 5 includes inland wetlands and estuaries, associated with river line data and many other data sets within the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) 2018. The two headline indicators assessed in the NBA are *ecosystem threat status* and *ecosystem protection level* (Skowno *et al.*, 2019). According to the SAIIAE data, there are no wetlands found within the 500 m regulation area. The closest drainage line and wetlands are approximately 1.71 km outside the regulation area (Figure 3-10).

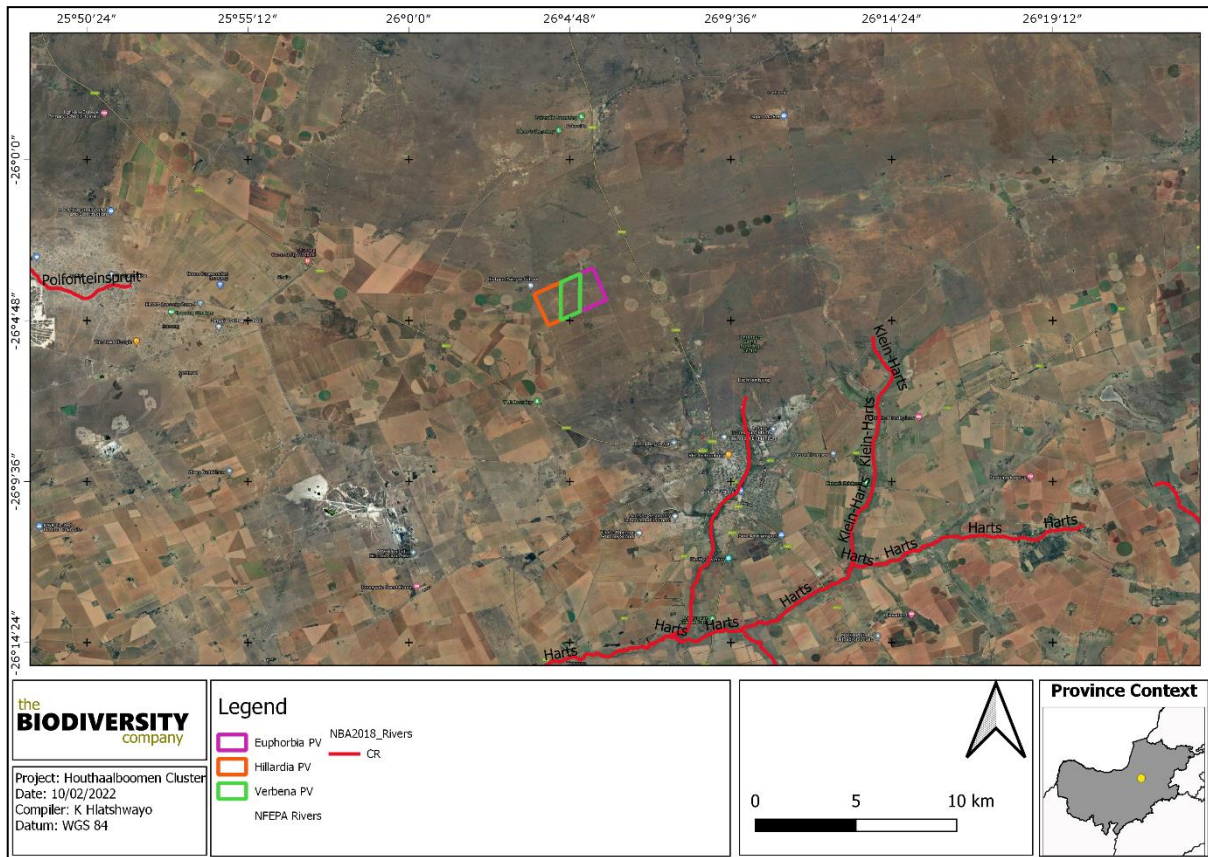


**Figure 3-10** Map illustrating wetlands associated with the project area (NBA, 2018 and NFEPA wetland, 2011)

#### 3.1.6.1 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 Threatened (LT), based on the proportion of each ecosystem type that remains in good ecological condition (Skowno *et al.*, 2019). The project area was superimposed on the aquatic ecosystem threat status (Figure 3-11). Based on Figure 3-11 the project area does not traverse aquatic ecosystems, however, the aquatic ecosystems that are closest to the proposed project area (ca. 10 km) are considered CR.

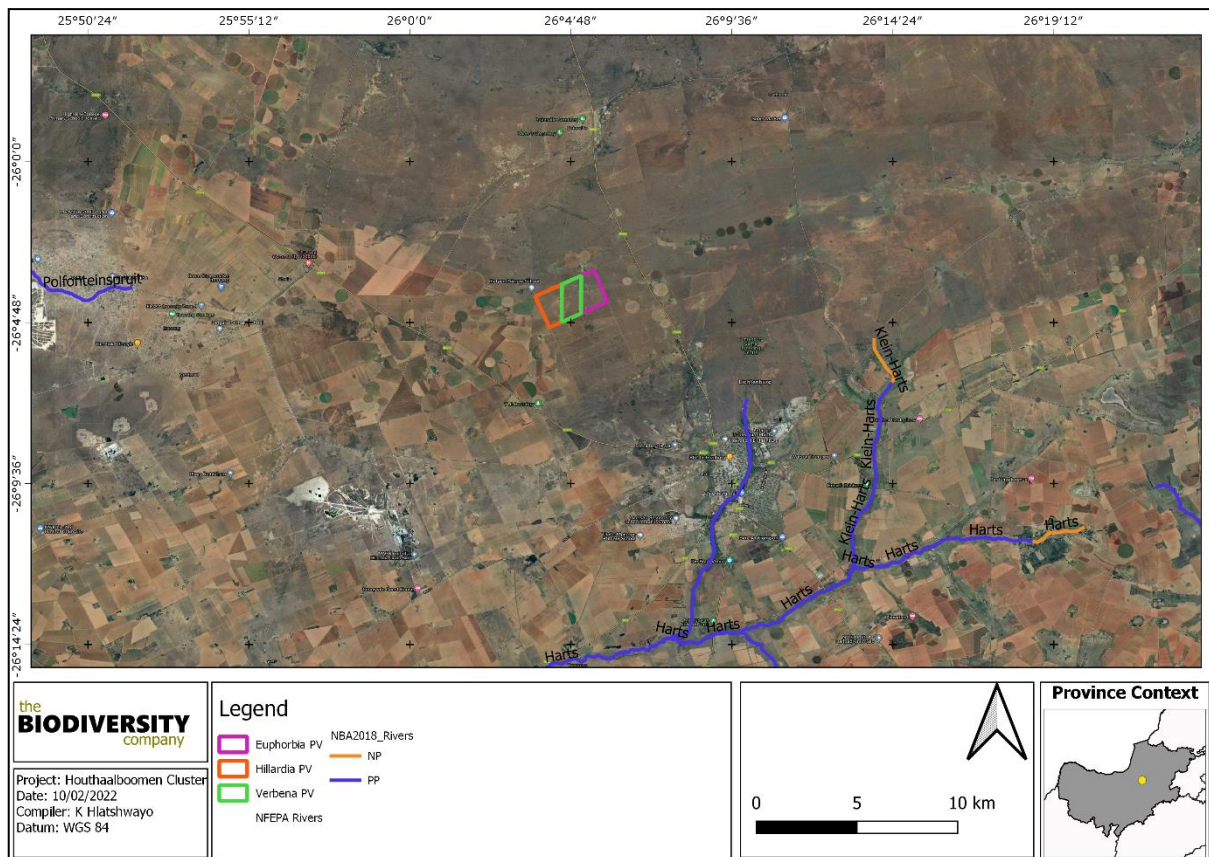


**Figure 3-11** The project area showing the regional ecosystem threat status of the associated aquatic ecosystems (NBA, 2018)

### 3.1.6.2 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 aquatic ecosystems associated with the development (Figure 3-12). Based on Figure 3-12 the project area does not traverse aquatic ecosystems, however, the aquatic ecosystems that are closest to the proposed project area (ca. 10 km) are rated as poorly protected, with the upper reaches of Klein-Harts and the larger Harts River rated as Not Protected.



**Figure 3-12** The project area showing the regional level of protection of aquatic ecosystems (NBA, 2018)

### 3.1.7 Strategic Water Source Areas

A national Strategic Water Source Areas of South Africa (SWSA) are those areas that supply a disproportionate amount of mean annual runoff in relation to the size of the geographical region. These areas are important because they have the potential to contribute significantly to overall water quality and supply, supporting growth and development needs that are often a far distance away. These areas make up 8% of the land area across South Africa, Lesotho, and Swaziland, but provide 50% of the water in these countries (SANBI). Based on the March 2021 SWSA spatial data (WRC, 2021) (the proposed project is not situated within a Strategic Water Source Area and the specific activity is unlikely to have an impact on any downstream water resources, as it is unlikely to alter water flows.

### 3.1.8 National Freshwater Ecosystem Priority Area Status

The National Freshwater Ecosystem Priority Areas (NFEPA) database forms part of a comprehensive approach to the sustainable and equitable development of South Africa's scarce water resources. This database guides how many rivers, wetlands and estuaries, and which ones, should remain in a natural or near-natural condition to support the water resource protection goals of the National Water Act (Act 36 of 1998). This directly applies to the National Water Act, which feeds into Catchment Management Strategies, water resource classification, reserve determination, and the setting and monitoring of resource quality objectives (Nel *et al.*, 2011). The NFEPA's are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act's biodiversity goals (NEM:BA) (Act 10 of 2004), informing both the listing of



threatened freshwater ecosystems and the process of bioregional planning provided for by this Act (Nel *et al.*, 2011). No FEPA rivers nor wetlands are within proximity to the project area, with no systems located in the project area.

### 3.2 Flora Assessment

#### 3.2.1 Vegetation Type

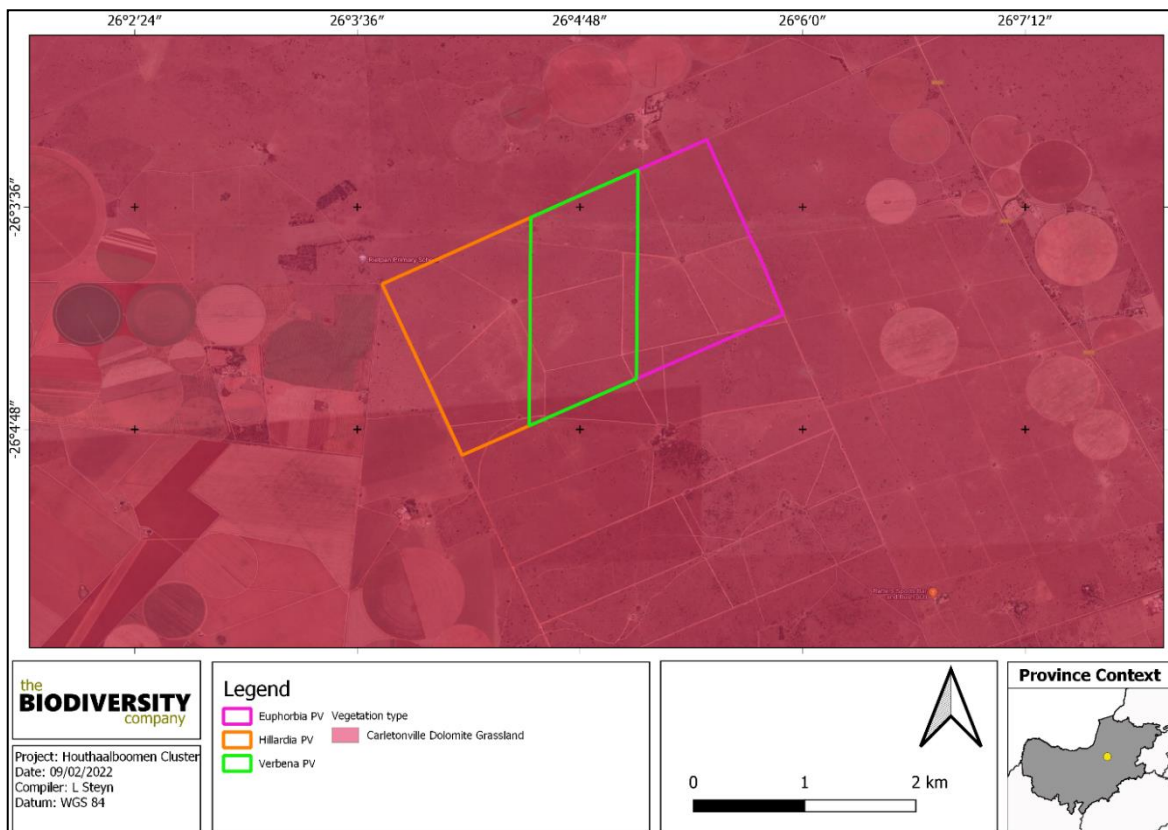
The project area is situated within the grassland biome. This biome is centrally located in southern Africa and adjoins all except the desert, fynbos, and succulent Karoo biomes (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the grassland biome include:

- a) Seasonal precipitation; and
- b) The minimum temperatures in winter (Mucina & Rutherford, 2006).

The grassland biome is found chiefly on the high central plateau of South Africa, and the inland areas of KwaZulu-Natal and the Eastern Cape. The topography is mainly flat and rolling but includes the escarpment itself. Altitude varies from near sea level to 2 850 m above sea level.

Grasslands are dominated by a single layer of grasses. The amount of cover depends on rainfall and the degree of grazing. The grassland biome experiences summer rainfall and dry winters with frost (and fire), which are unfavourable for tree growth. Thus, trees are typically absent, except in a few localized habitats. Geophytes (bulbs) are often abundant. Frosts, fire, and grazing maintain the grass dominance and prevent the establishment of trees.

On a fine-scale vegetation type, the project area overlaps with the Carletonville Dolomite Grassland vegetation type (Figure 3-13).



**Figure 3-13** Map illustrating the vegetation type associated with the assessment area

### 3.2.1.1 Carletonville Dolomite Grassland

This vegetation type occurs on slightly undulating plains dissected by prominent rocky chert ridges. Species-rich grasslands forming a complex mosaic pattern dominated by many species (Mucina & Rutherford, 2006). This vegetation type occurs in the North-West, Gauteng and marginally into the Free State Province: In the region of Potchefstroom, Ventersdorp and Carletonville, extending westwards to the vicinity of Ottoshoop, but also occurring as far east as Centurion and Bapsfontein in Gauteng Province.

#### Important Plant Taxa

Important plant taxa are those species that have a high abundance, a frequent occurrence or are prominent in the landscape within a particular vegetation type (Mucina & Rutherford, 2006).

The following species are important in the **Carletonville Dolomite Grassland** vegetation type:

**Graminoids:** *Aristida congesta*, *Brachiaria serrata*, *Cynodon dactylon*, *Digitaria tricholaenoides*, *Diheteropogon amplexans*, *Eragrostis chloromelas*, *E. racemosa*, *Heteropogon contortus*, *Loudetia simplex*, *Schizachyrium sanguineum*, *Setaria sphacelata*, *Themeda triandra*, *Alloteropsis semialata* subsp. *eckloniana*, *Andropogon schirensis*, *Aristida canescens*, *A. diffusa*, *Bewsia biflora*, *Bulbostylis burchellii*, *Cymbopogon caesius*, *C. pospischillii*, *Elionurus muticus*, *Eragrostis curvula*, *E. gummiflua*, *E. plana*, *Eustachys paspaloides*, *Hyparrhenia hirta*, *Melinis nerviglumis*, *M. repens* subsp. *repens*, *Monocymbium ceresiiforme*, *Panicum coloratum*, *Pogonarthria squarrosa*, *Trichoneura grandiglumis*, *Triraphis andropogonoides*, *Tristachya leucothrix*, *T. rehmannii*.

**Herbs:** *Acalypha angustata*, *Barleria macrostegia*, *Chamaecrista mimosoides*, *Chamaesyce inaequilatera*, *Crabbea angustifolia*, *Dianthus mooiensis*, *Dicoma anomala*, *Helichrysum caespititium*, *H. miconiifolium*, *H. nudifolium* var. *nudifolium*, *Ipomoea ommaneyi*, *Justicia anagalloides*, *Kohautia amatymbica*, *Kyphocarpa angustifolia*, *Ophrestia oblongifolia*, *Pollichia campestris*, *Senecio coronatus*, *Vernonia oligocephala*.

**Geophytic Herbs:** *Boophone disticha*, *Habenaria mossii*.

**Low Shrubs:** *Anthospermum rigidum* subsp. *pumilum*, *Indigofera comosa*, *Pygmaeothamnus zeyheri* var. *rogersii*, *Rhus magalismontana*, *Tylosema esculentum*, *Ziziphus zeyheriana*.

**Geoylic Suffrutices:** *Elephantorrhiza elephantina*, *Parinari capensis* subsp. *capensis*.

#### Conservation Status of the Vegetation Type

According to Mucina and Rutherford (2006), this vegetation type is classified as Vulnerable (VU). The national target for conservation protection for both these vegetation types is 24%, but only a small extent is conserved in statutory (Sterkfontein Caves — part of the Cradle of Humankind World Heritage Site, Oog Van Malmanie, Abe Bailey, Boskop Dam, Schoonspruit, Krugersdorp, Olifantsvlei, Groenkloof) and in at least six private conservation areas. Almost a quarter already transformed for cultivation, by urban sprawl or by mining activity as well as the building of the Boskop and Klerkskraal Dams.

### 3.2.2 Expected Flora Species

The POSA database indicates that 283 species of indigenous plants are expected to occur within the project area (Appendix A). One (1) nationally protected tree could be expected within the project area and are provided in Table 3-3 below.

**Table 3-3 Threatened flora species that may occur within the project area**

Family	Taxon	Author	IUCN	Ecology
Fabaceae	<i>Vachellia erioloba</i>	(E. Mey.) P.J.H. Hurter	LC	Indigenous

### 3.2.3 Faunal Assessment

### 3.2.4 Amphibians

Based on the IUCN Red List Spatial Data and AmphibianMap, 19 amphibian species are expected to occur within the area (Appendix B). One (1) are regarded as threatened (Table 3-4).

**Table 3-4 Threatened amphibian species that are expected to occur within the project area**

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2021)	
<i>Pyxicephalus adspersus</i>	Giant Bullfrog	NT	LC	High

Giant Bull Frog (*Pyxicephalus adspersus*) is a species of conservation concern that could likely occur in the project area, as wetlands are present in the nearby areas. The Giant Bull Frog is listed as NT on a regional scale. It is a species of drier savannas where it is fossorial for most of the year, remaining buried in cocoons. They emerge at the start of the rains, and breed in shallow, temporary waters in pools, pans, and ditches (IUCN, 2017).

### 3.2.5 Reptiles

Based on the IUCN Red List Spatial Data and the ReptileMAP database, 42 reptile species are expected to occur within the area (Appendix C). None of the species is regarded as threatened.

### 3.2.6 Mammals

The IUCN Red List Spatial Data lists 68 mammal species that could be expected to occur within the area (Appendix D). This list excludes large mammal species that are normally restricted to protected areas. Ten (10) of these expected species are regarded as threatened (Table 3-5), eight of these have a low likelihood of occurrence based on the lack of suitable habitat and food sources in the project area.

**Table 3-5 Threatened mammal species that are expected to occur within the project area**

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2021)	
<i>Aonyx capensis</i>	Cape Clawless Otter	NT	NT	Low
<i>Atelerix frontalis</i>	South Africa Hedgehog	NT	LC	Moderate
<i>Crocidura mariquensis</i>	Swamp Musk Shrew	NT	LC	Low
<i>Felis nigripes</i>	Black-footed Cat	VU	VU	Moderate
<i>Hydrictis maculicollis</i>	Spotted-necked Otter	VU	NT	Low
<i>Mystromys albicaudatus</i>	White-tailed Rat	VU	EN	Low
<i>Panthera pardus</i>	Leopard	VU	VU	Low
<i>Parahyaena brunnea</i>	Brown Hyaena	NT	NT	Low
<i>Poecilogale albinucha</i>	African Striped Weasel	NT	LC	Low

<i>Smutsia temminckii</i>	Temminck's Ground Pangolin	VU	VU	Low
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*Atelerix frontalis* (South African Hedgehog) has a tolerance to a degree for habitat modification and occurs in a wide variety of semi-arid and sub-temperate habitats (IUCN, 2017). Based on the Red List of Mammals of South Africa, Lesotho, and Swaziland (2016), *A. frontalis* populations are decreasing due to the threats of electrocution, veld fires, road collisions, predation from domestic pets and illegal harvesting. Suitable grasslands occur in the project area, although somewhat disturbed (based on brief screening assessment), that can function as habitat for this species, as such the likelihood of occurrence is rated as moderate.

*Felis nigripes* (Black-footed cat) is endemic to the arid regions of southern Africa. This species is naturally rare, has cryptic colouring, is small in size and is nocturnal. These factors have contributed to a lack of information on this species. The highest densities of this species have been recorded in the more arid Karoo region of South Africa. The habitat in the project area can be considered to be somewhat suitable for the species and the likelihood of occurrence is therefore rated as moderate.

### 3.3 Freshwater Assessment

#### 3.3.1 Hydrological Setting

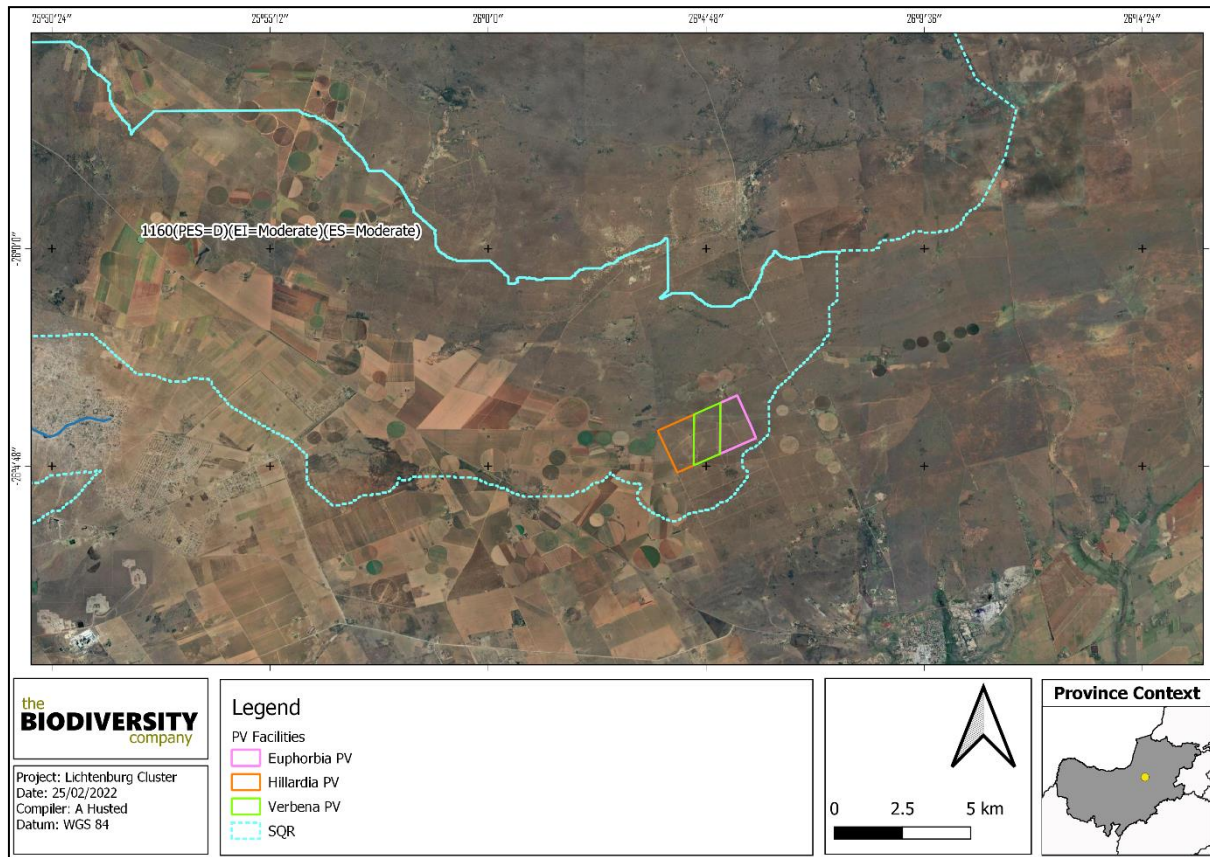
The project area is within the Vaal Water Management Area (WMA), Highveld – Lower Aquatic Ecoregion and within the C31A quaternary catchment.

#### 3.3.2 Present Ecological Status

##### 3.3.2.1 Status of Sub-Quaternary Reaches

The project area overlaps the C31A and D41A quaternary catchments, with all three PV facilities situated in the same SQR (D41A-01160), with information obtained from DWS (2014) (Figure 3-14). The D41A-01160 SQR spans 9.04 km of the Lotlhakane River, with the nearest watercourse more than 20 km from the project area.

The PES category of the reach is classed as largely modified (class D) (Table 3-6). The moderately modified state of the reach was attributed to serious potential flow modifications activities, potential instream habitat modification activities, impacts to wetland and riparian zone, impacts to the instream habitat continuity, physico-chemical conditions (water quality) and large riparian and wetland zone continuity.



**Figure 3-14** Location of the project area in relation to the SQR

**Table 3-6** Summary of the Present Ecological State of the D41A-01160 SQR

Component/Catchment	D41A-01160
Present Ecological Status	Largely Modified (class D)
Ecological Importance Class	Moderate
Ecological Sensitivity	Moderate
Default Ecological Category	Moderately Modified (class C)

## 4 Field Assessment

### 4.1 Indigenous Flora

The vegetation assessment was conducted throughout the extent of the project area. A total of 84 trees, shrubs, herbaceous and graminoid plant species were recorded in the project area during the field assessment (Table 4-1). Plants listed as Category 1 alien or invasive species under the NEMBA appear in green text.

The list of plant species recorded is by no means comprehensive, a survey conducted under guard may likely yield up to 40% additional flora species for the project area. However, floristic analysis conducted to date is regarded as a sound representation of the local flora for the project area.

**Table 4-1** *Trees, shrubs and herbaceous plant species recorded in the project area*

Scientific Name	Common Name	Threat Status (SANBI, 2017)	SA Endemic	Alien Category
<i>Albuca setosa</i>	Soldier-in-the-box	LC	Indigenous, Not Endemic	
<i>Aloe greatheadii</i>	Spotted Aloe	LC	Indigenous, Not Endemic	
<i>Ammocharis coranica</i>	Karoo lily	LC	Indigenous, Not Endemic	
<i>Argemone mexicana</i>	Mexican Prickly Poppy	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
<i>Aristida bipartita</i>	Rolling grass	LC	Indigenous, Not Endemic	
<i>Aristida congesta subsp barbicollis</i>	Spreading Three-awn	LC	Indigenous, Not Endemic	
<i>Aristida congesta subsp. congesta</i>	Tassel Three-awned Grass	LC	Indigenous, Not Endemic	
<i>Aristida diffusa</i>		LC	Indigenous, Not Endemic	
<i>Aristids congesta subsps congesta</i>	Tassel Three-awn	LC	Indigenous, Not Endemic	
<i>Asparagus larycinus Burch.</i>	Cluster-leaf asparagus	LC	Indigenous, Not Endemic	
<i>Babiana bainsei (hypogea)</i>	Bobbejaanuintjie	LC (TNCO (Schedule 7))	Indigenous, Not Endemic	
<i>Berkheya onopordifolia</i>	Mohato	LC	Indigenous, Not Endemic	
<i>Bidens pilosa</i>	Blackjack	NE	Not Indigenous; Naturalized exotic weed	
<i>Boophone disticha</i>	Poison Bulb	LC	Indigenous, Not Endemic	
<i>Bothriochloa insculpta</i>	Pinhole Grass	LC	Indigenous, Not Endemic	
<i>Buddleja saligna</i>	Olive Sagewood	LC	Indigenous, Not Endemic	
<i>Bulbine abyssinica</i>	Bushy Bulbine	LC	Indigenous, Not Endemic	
<i>Celtis africana</i>	White Stinkwood	LC	Indigenous, Not Endemic	
<i>Celtis africana</i>	White Stinkwood, Witstinkhout	LC	Indigenous, Not Endemic	
<i>Cenchrus ciliaris</i>	Foxtail Buffalo Grass, African Foxtail	LC	Indigenous, Not Endemic	
<i>Cenchrus setaceus (Pennisetum setaceum)</i>	Fountain Grass	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
<i>Chloris gayana</i>	Rhodes grass	LC	Indigenous, Not Endemic	

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<i>Conyza bonariensis</i>	Flax-leaf Fleabane	NE	Not Indigenous; Naturalized exotic weed	Naturalized exotic weed
<i>Cymbopogon caesius</i>	Broad-leaved Turpentine Grass	LC	Indigenous, Not Endemic	
<i>Cynodon dactylon</i>	Couch grass	LC	Indigenous, Not Endemic	
<i>Datura ferox</i>	Large Thorn Apple	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
<i>Dichrostachys cinerea subsp. nyassana</i>	Sickle Bush, Kalahari Christmas Tree	LC	Indigenous, Not Endemic	
<i>Digitaria eriantha</i>	Smuts Finger Grass	LC	Indigenous, Not Endemic	
<i>Digitaria eriantha</i>	Finger Grass	LC	Indigenous, Not Endemic	
<i>Eragrostis chloromelas</i>	Blue Love Grass	LC	Indigenous, Not Endemic	
<i>Eragrostis curvula</i>	Weeping Love Grass	LC	Indigenous, Not Endemic	
<i>Eragrostis gummiflua</i>	Gum Grass	LC	Indigenous, Not Endemic	
<i>Eragrostis lehmanniana var. lehmanniana</i>	Eastern Province Vlei Grass, Land-Grass, Lehman Love Grass	LC	Indigenous, Not Endemic	
<i>Eragrostis superba</i>	Wilman Lovegrass	LC	Indigenous, Not Endemic	
<i>Eragrostis trichophora</i>	Atherstone's Grass	LC	Indigenous, Not Endemic	
<i>Flaveria bidentis</i>	Speedyweed	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
<i>Gomphocarpus tomentosus Burch. subsp. Tomentosus</i>	Woolly Milkweed	LC	Indigenous, Not Endemic	
<i>Grass Loudetia simplex</i>	Common Russet	LC	Indigenous, Not Endemic	
<i>Grewia flava</i>	Velvet Raisin	LC	Indigenous, Not Endemic	
<i>Grewia flava</i>	Wild Raisin	LC	Indigenous, Not Endemic	
<i>Grewia monticola</i>	Cross Berry	LC	Indigenous, Not Endemic	
<i>Grewia monticola</i>	Grey Raisin	LC	Indigenous, Not Endemic	
<i>Helichrysum aureum</i>	Bright Yellow Everlasting	LC	Indigenous, Not Endemic	
<i>Heteropogon contortus</i>	Tanglehead, Spear Grass	LC	Indigenous, Not Endemic	
<i>Hyparrhenia hirta</i>	Common Thatching Grass, Blougras (a)	LC	Indigenous, Not Endemic	
<i>Hypoxis hemerocallidea</i>	Star-flower	LC	Indigenous, Not Endemic	
<i>Hypoxis rigidula Baker var. pilosissima Baker</i>	Hpoxis	LC	Indigenous, Not Endemic	

<i>Ipomoea papilio</i> Hallier f.	Morning Glory	LC	Indigenous, Not Endemic	
<i>Lantana camara</i>	Lantana	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
<i>Ledebouria ovatifolia</i>	Flat-leaved African Hyacinth	LC	Indigenous, Not Endemic	
<i>Ledebouria revoluta</i>	Common African Hyacinth	LC	Indigenous, Not Endemic	
<i>Loudetia simplex</i>	Russet Grass	LC	Indigenous, Not Endemic	
<i>Melia azedarach</i>	Chinaberry	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
<i>Melinis repens</i>	Natal Red Top	LC	Indigenous, Not Endemic	
<i>Obetia tenax</i>	Tree Nettle	LC	Indigenous, Not Endemic	
<i>Opuntia ficus-indica</i>	Prickly pear	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
<i>Ozoroa paniculosa</i>	Common Resin Tree	LC	Indigenous, Not Endemic	
<i>Panicum maximum</i>	Guinea Grass	LC	Indigenous, Not Endemic	
<i>Panicum natalense</i>	Natal Buffalo Grass	LC	Indigenous, Not Endemic	
<i>Pogonarthria squarrosa</i>	Herringbone Grass	LC	Indigenous, Not Endemic	
<i>Polygala hottentotta</i>	Small Purple Broom	LC	Indigenous, Not Endemic	
<i>Schkuhria pinnata</i>	Dwarf Marigold	NE	Not Indigenous; Naturalized exotic weed	
<i>Searsia lancea</i>	Karee	LC	Indigenous, Not Endemic	
<i>Senegalia mellifera</i> (Vahl) Seigel & Ebinger subsp. <i>detinens</i>	Black Thorn	LC	Indigenous, Not Endemic	
<i>Senna didymobotrya</i>	Peanut butter cassia	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
<i>Sesbania bispinosa</i> (Jacq.) W. Wight var. <i>bispinosa</i>	Spiny Sesbania	NE	Indigenous, Not Endemic	
<i>Setaria sphacelata</i> var. <i>sphacelata</i>	Common bristle grass; Golden Timothy Grass	LC	Indigenous, Not Endemic	
<i>Solanum aculeatissimum</i>	Love-apple Nightshade	NE	Not Indigenous; Naturalized exotic weed	
<i>Solanum lichtensteinii</i>	Large Yellow Bitter Apple		Not Indigenous; Naturalized exotic weed	
<i>Solanum sisymbriifolium</i>	Wild Tomato, Dense; Thorned Bitter Apple	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
<i>Sporobolus africanus</i>	Ratstail Dropseed; Rush Grass	LC	Not Endemic	



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<i>Tagetes minuta</i>	Khaki Bush, Khaki Weed, African Marigold	NE	Not Indigenous; Naturalized exotic weed
<i>Themeda triandra</i>	Angle Grass	LC	Indigenous, Not Endemic
<i>Tragus berteronianus</i>	Carrot Seed Grass	LC	Indigenous, Not Endemic
<i>Urochloa brachyura</i>	Urochloa	LC	Indigenous, Not Endemic
<i>Vachellia erioloba</i>	Camel Thorn	LC-Nationally Protected	Indigenous, Not Endemic
<i>Vachellia hebeclada</i>	Candle-pod Thorn	LC	Indigenous, Not Endemic
<i>Vachellia karroo</i>	Sweet Thorn	LC	Indigenous, Not Endemic
<i>Verbena brasiliensis</i>	Brazilian Verbena, Gin Case	NE	Not Indigenous; Naturalized exotic weed
<i>Ximenia americana</i>	Blue Sour Plum	LC	Indigenous, Not Endemic
<i>Zinnia peruviana</i>	Peruvian zinnia	NE	Not Indigenous; Naturalized exotic weed
<i>Ziziphus zeyheriana</i>	Dwarf Buffalothorn	LC	Indigenous, Not Endemic
<i>Ziziphus mucronata</i>	Buffalo Thorn	LC	Indigenous, Not Endemic



**Figure 4-1** A collage of images illustrating some of the species recorded in the project area, A) *Datura ferox*, B) *Zinnia peruviana* (Peruvian zinnia), C) Red grass (*Themeda triandra*), D) *Vachellia erioloba* (Camel Thorn), and E) *Ledebouria ovatifolia* (Flat-leaved African Hyacinth).

## 4.2 Invasive Alien Plants

Invasive Alien Plants (IAPs) tend to dominate or replace indigenous flora, thereby transforming the structure, composition and functioning of ecosystems. Therefore, these plants must be controlled by means of an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species.

NEMBA is the most recent legislation pertaining to alien invasive plant species. In August 2014, the list of Alien Invasive Species was published in terms of the NEMBA. The Alien and Invasive Species Regulations were published in the Government Gazette No. 44182 on, 24th of February 2021. The legislation calls for the removal and/or control of AIP species (Category 1 species). In addition, unless authorised thereto in terms of the NWA, no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam, or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse. Below is a brief explanation of the three categories in terms of the NEMBA:

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

Note that according to the Alien and Invasive Species Regulations, a person who has under his or her control a category 1b listed invasive species must immediately:

Notify the competent authority in writing

Take steps to manage the listed invasive species in compliance with:

- Section 75 of the NEMBA;
- The relevant invasive species management programme developed in terms of regulation 4; and
- Any directive issued in terms of section 73(3) of the NEMBA.

Eight (8) IAP species were recorded within the project area. These species are listed under the Alien and Invasive Species List 2021, Government Gazette No. 44182 as Category 1b. Category 1b species must be controlled by implementing an IAP Management Programme, in compliance of section 75 of the NEMBA, as stated above.

**Table 4-2 IAP species recorded in the project area**

Scientific Name	Common Name	Threat Status (SANBI, 2017)	SA Endemic	Alien Category
<i>Argemone mexicana</i>	Mexican Prickly Poppy	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
<i>Cenchrus setaceus (Pennisetum setaceum)</i>	Fountain Grass	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
<i>Conyza bonariensis</i>	Flax-leaf Fleabane	NE	Not Indigenous; Naturalized exotic weed	Naturalized exotic weed
<i>Datura ferox</i>	Large Thorn Apple	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
<i>Flaveria bidentis</i>	Speedyweed	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
<i>Lantana camara</i>	Lantana	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
<i>Melia azedarach</i>	Chinaberry	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
<i>Opuntia ficus-indica</i>	Prickly pear	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
<i>Senna didymobotrya</i>	Peanut butter cassia	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
<i>Solanum sisymbriifolium</i>	Wild Tomato, Dense; Thorned Bitter Apple	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.

### 4.3 Ethnobotanical and Red Data Listed Plant Species

Ethnobotany is a branch of botany that places focus on the use of plants for medicines and other practical purposes. The use of native plants for ethnobotanical uses can be detrimental to populations that are overexploited. According to the Department of Agriculture, Forestry and Fisheries (DAFF) medicinal plants are those used in herbalism and thought to have certain extractable/compounds in their leaves, stems, flowers, and fruit and used as inputs in the pharmaceutical, nutraceutical, insecticide, and other chemical industries (DAFF, 2013). It is estimated that more than 750 plant species in South Africa are actively utilised for their medicinal attributes (Van Wyk and Prinsloo, 2018). Plant species of medicinal importance that were recorded on site are listed in Table 4-4.

Species of conservation concern are either categorized as Red Data Listed species (RDL species), according to specific scientifically researched criteria and administered by the South African National Biodiversity Institute (SANBI), as protected trees by the National Forests Act (NFA) (Act No. 84 of 1998), or as Protected Trees and Plants by The NEMBA Threatened or Protected Species Regulations 152 of 2007 ("TOPS Regulations") and the Lists of Critically Endangered, Endangered, Vulnerable and Protected Species (TOPS Lists) and the provincial nature conservation legislation, in the context of this report the North West Biodiversity Management Act (Act No. 4 of 2016) (NWBMA). One provincially protected species (Transvaal Nature Conservation Ordinance) and one protected tree (National Forest Act) were confirmed to be present in the project area. In addition to these two species, another two species that are declining but not listed as RDL were recorded in the project area

**Table 4-3 Protected Plant Species recorded within the affected properties. "TNCO" = Transvaal Nature Conservation Ordinance; "NFA" = National Forest Act**

Scientific Name	Common Name	Protection
<i>Boophone disticha</i>	Poison Bulb	Not Protected (Listed as Declining)
<i>Babiana hypogea</i>	Bobbejaanuintjie	TNCO Schedule 7
<i>Hypoxis hemerocallidea</i>	Star-flower	Not Protected (Listed as Declining)
<i>Vachellia erioloba</i>	Camel Thorn	NFA protected.

**Table 4-4 Plant species of ethnobotanical importance that were recorded in the project area**

Scientific Name	Common Name	Medicinal uses
<i>Dichrostachys cinerea subsp. africana</i>	Small-leaved Sickle Bush	The bark, roots, and leaves are used in the treatment of dysentery, headaches, toothaches, elephantiasis, snakebites and scorpion stings, leprosy, syphilis, coughs, epilepsy, gonorrhoea, boils, and sore eyes. It can also be used as a contraceptive for women, as a laxative, and for massage of fractures
<i>Tagetes minuta</i>	Khaki Bush	The repellent properties of essential oil have been known for a long time and were found to be effective in preventing sheep from becoming infected with blow-fly larvae. Many gardeners use warm water extracts of the fresh plant to keep roses and other garden plants free from insects and fungal diseases. The essential oil is used in perfumery and as a flavourant in food, beverages, and tobacco.
<i>Ziziphus mucronata</i>	Buffalo thorn	Warm bark infusions (sometimes together with roots or leaves added) are used as expectorants (also as emetics) in cough and chest problems, while root infusions are a popular remedy for diarrhoea and dysentery. Decoctions of roots and leaves (or chewed leaves) are applied externally to boils, sores and glandular swellings, to promote healing and as an analgesic.

#### 4.4 Faunal Assessment

Herpetofauna, mammal and avifauna observations and recordings are addressed in this section.

##### 4.4.1 Amphibians and Reptiles

Five common reptile species (Table 4-5), and no SCC were recorded thus herpetofauna diversity was considered low. The lack of species was likely due to the combination of the disturbed nature of the site and the inherently secretive nature of reptile species. One species was regarded as a SCC, namely *Pyxicephalus adspersus* (Giant Bullfrog). No permanent wetlands were found present within the project area, it is thus assumed that, as explained in section 3.3, they may be found in shallow, temporary waters in pools, pans and ditches.

**Table 4-5 Summary of herpetofauna species recorded within the project area**

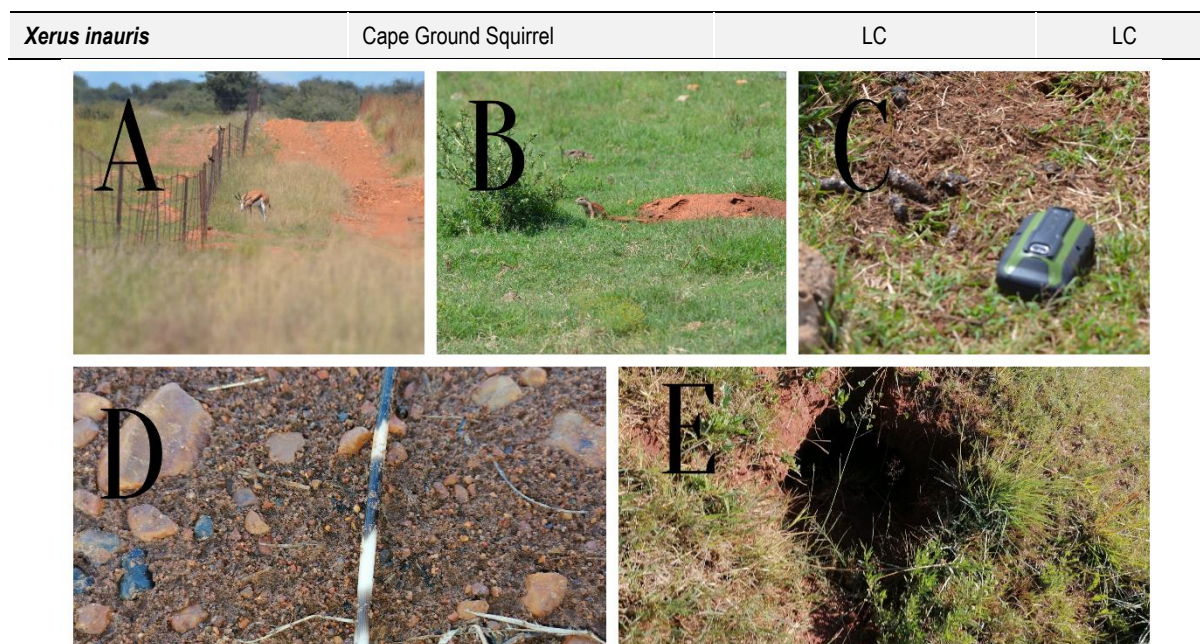
Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
<i>Cacosternum boettgeri</i>	Boettger's Caco	LC	LC
<i>Pseudaspis cana</i>	Mole Snake	LC	Unlisted
<i>Pyxicephalus adspersus</i>	Giant Bullfrog	NT	LC
<i>Trachylepis capensis</i>	Cape Skink	LC	Unlisted
<i>Trachylepis varia</i>	Variable Skink	LC	LC

##### 4.4.2 Mammals

Twelve mammal species were observed during the survey based by either direct observation or the presence of visual tracks and signs, these are listed in Table 4-6. This includes one species listed as Near Threatened (NT) on both a regional and global scale, the Brown Hyaena (*Parahyaena brunnea*) is endemic to southern Africa. This species occurs in dry areas, generally with annual rainfall less than 100 mm, particularly along the coast, semidesert, open scrub and open woodland savanna

**Table 4-6 Summary of mammal species recorded within the project area**

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
<i>Antidorcas marsupialis</i>	Springbok	LC	LC
<i>Canis mesomelas</i>	Black-backed Jackal	LC	LC
<i>Cynictis penicillata</i>	Yellow Mongoose	LC	LC
<i>Herpestes sanguineus</i>	Common Slender Mongoose	LC	LC
<i>Hystrix africaeaustralis</i>	Cape Porcupine	LC	LC
<i>Lepus saxatilis</i>	Scrub Hare	LC	LC
<i>Orycteropus afer</i>	Aardvark	LC	LC
<i>Parahyaena brunnea</i>	Brown Hyaena	NT	NT
<i>Phacochoerus africanus</i>	Common Warthog	LC	LC
<i>Raphicerus campestris</i>	Steenbok	LC	LC
<i>Sylvicapra grimmia</i>	Common Duiker	LC	LC



**Figure 4-2** Some of the small mammal species recorded in the project area: A) *Antidorcas marsupialis* (Springbok), B) Cape ground squirrel (*Xerus inauris*), C) *Cynictis penicillata* (Yellow Mongoose scat), D) *Hystrix africae australis* (Cape Porcupine) quill and E) *Orycteropus afer* (Aardvark) burrow.

## 5 Habitat Assessment and Site Ecological Importance

### 5.1 Habitat Assessment

Figure 5-2 includes habitats within the boundary as well as habitats in adjacent areas, only the habitats described in the text below are specific to the boundary.

Three vegetation units or rather habitat types were recorded within the Euphorbia PV project area, these include the following Table 5-1 and Figure 5-2:

#### Transformed

The Transformed habitat unit which is the smallest of the three units represents areas where vegetation cover has been significantly impacted by current agricultural activities as well as through infrastructure placement such as artificial dams/reservoirs as well as access roads. From ecological perspective the habitat has a low conservation value.

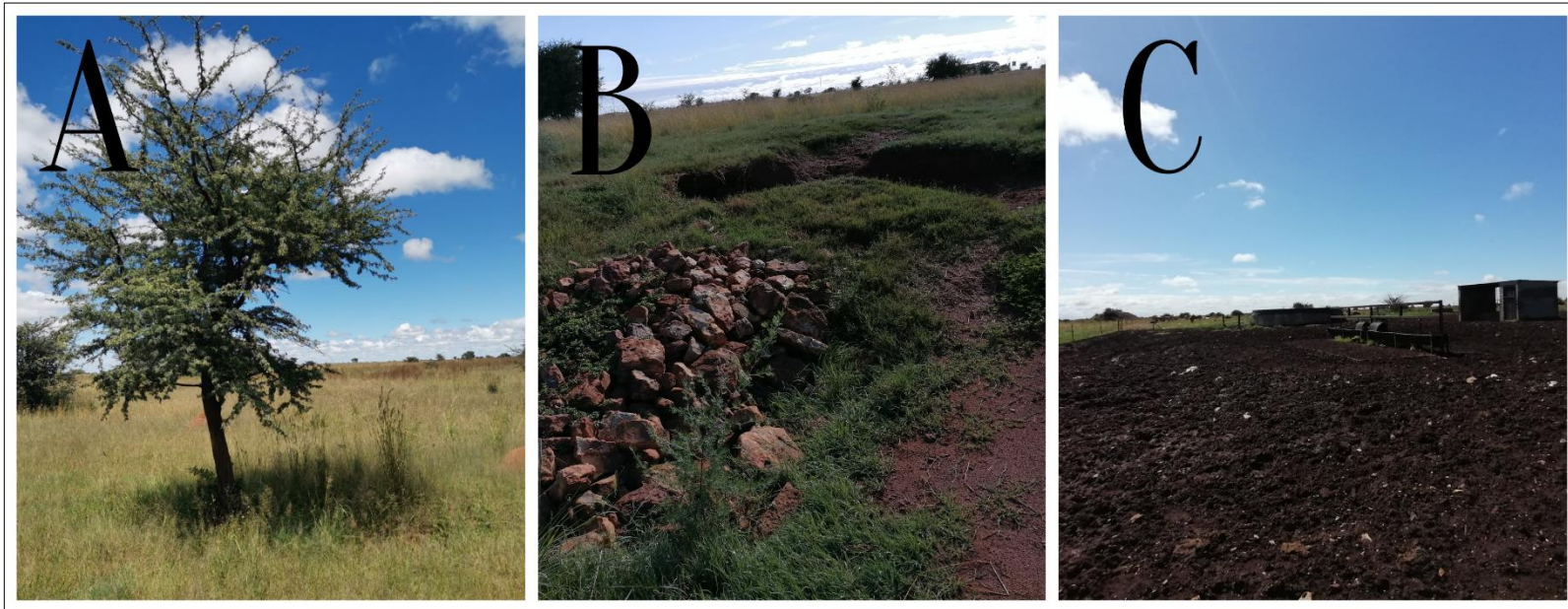
#### Degraded Open Savanna Grassland

The Degraded Open Savanna Grassland represents areas that are similar to the Open Savanna Grassland, however the distinguishing factor is the fact that these habitats are not entirely transformed but in a constant disturbed state. They cannot recover to a more natural state due to ongoing disturbances and impacts received from AIP encroachment, active agricultural practices and edge effects from the adjacent mining and mineral processing activities. Although the habitat units are not entirely transformed, ongoing and historic disturbances have resulted in the plant community no longer being fully representative of the reference vegetation thus this was assigned a medium sensitivity.

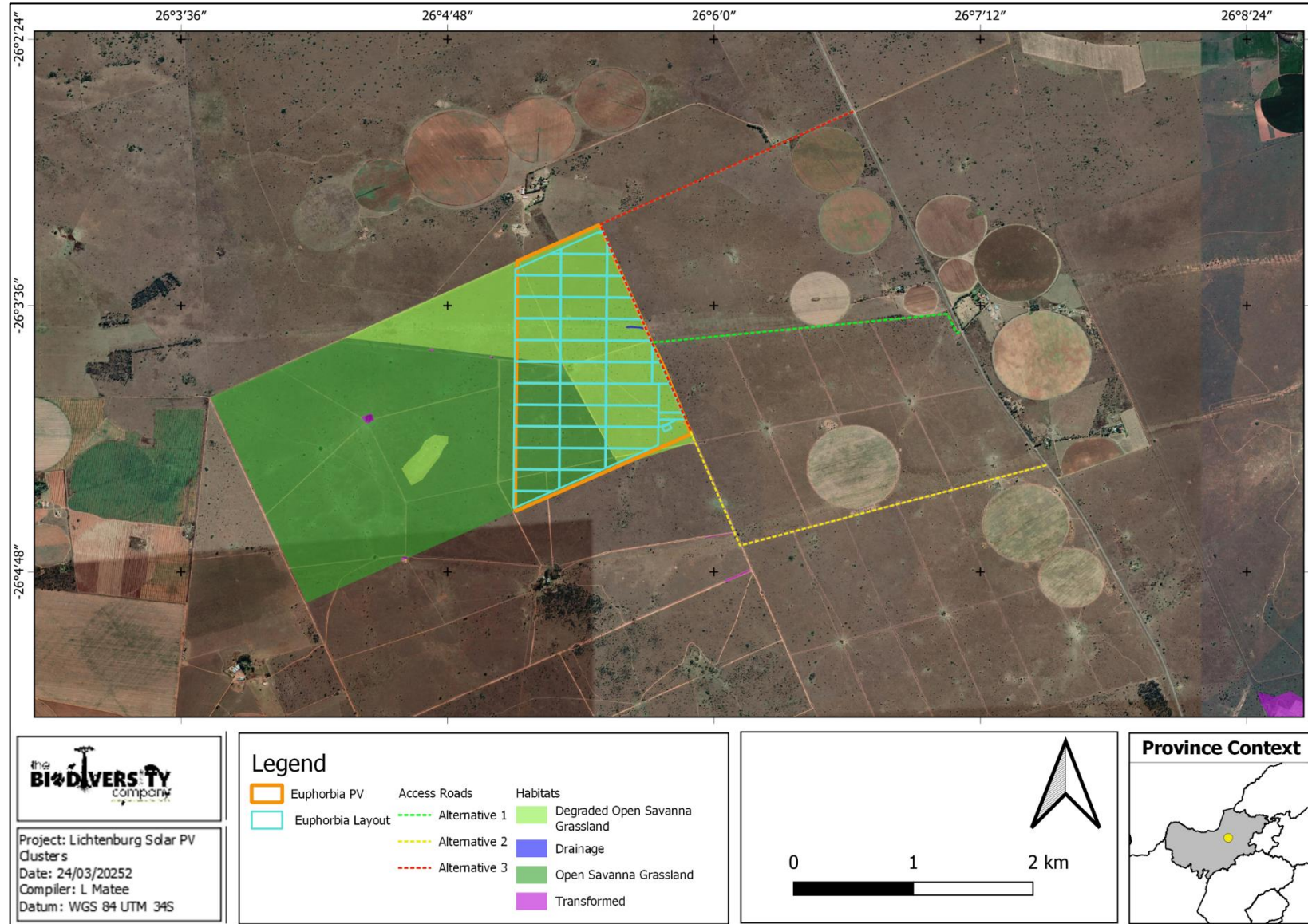
#### Open Savanna Grassland



The Open Savanna Grassland represents grasslands with a few scattered trees that are typical of savanna landscapes i.e., *Celtis africana*, *Grewia flava*, *Gymnosporia sp* and *Vachellia sp* an open tree canopy (i.e., scattered trees) above a continuous tall grass understory (the vegetation layer between the forest canopy and the ground). In this particular habitat the grasses formed the dominant layer, however forbs were also quite prominent and relative high in diversity. Higher shrubs and trees were typically clustered together with such clumps scattered throughout the grassland layer.



**Figure 5-1** Collage illustrating examples of the habitats recorded in the project area, A) Open Savanna Grassland, B) Degraded Open Savanna Grassland and C) Transformed.

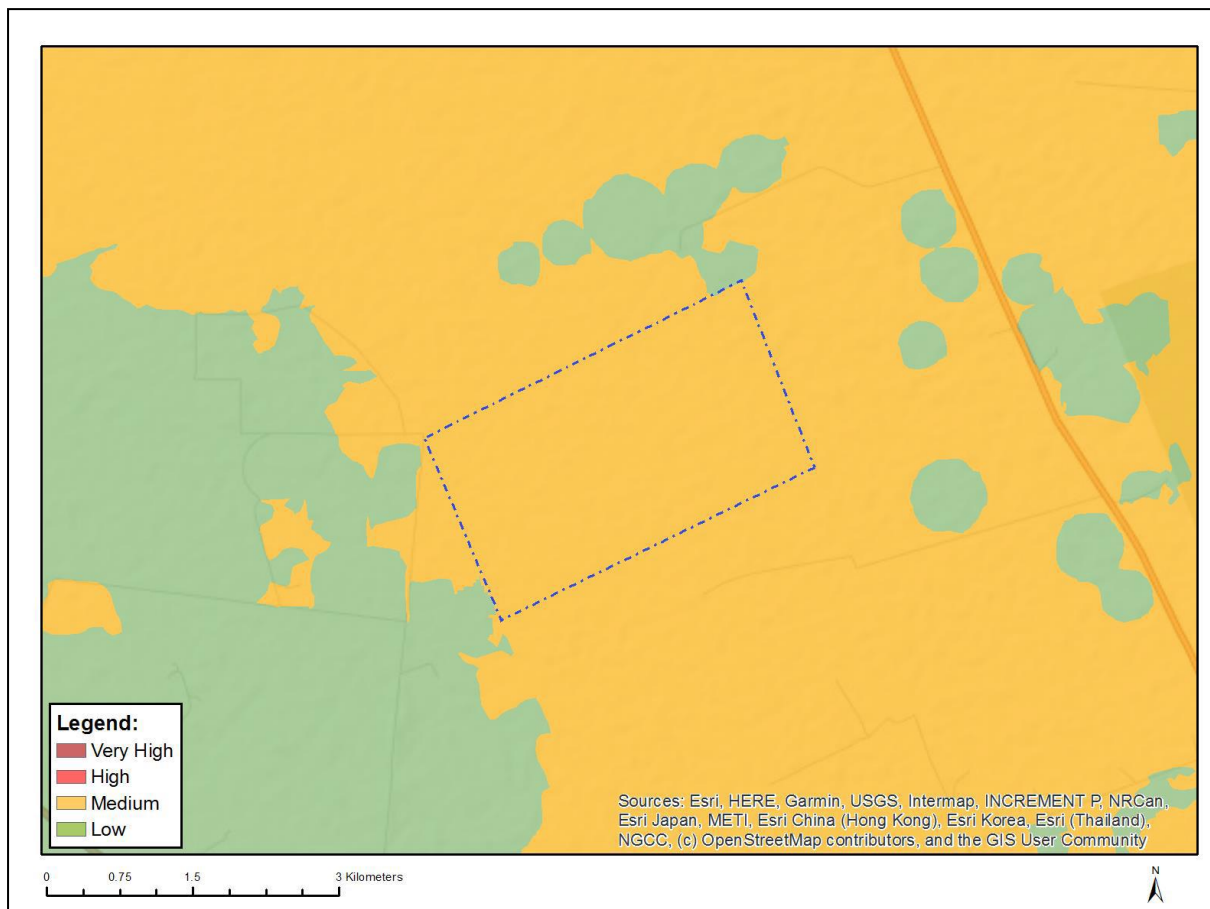


**Figure 5-2** Habitats identified in the project area

### 5.1.1 Screening Sensitivity

The following desktop screening sensitivities are associated with the Euphorbia PV area and the other areas within the cluster:

- Terrestrial Biodiversity Theme sensitivity is “High” for the proposed project due to the project area traversing an ESA 1;
- Plant Species Theme sensitivity ranges from “Medium” with several sensitive species predicted to be present; and
- Animal Species Theme sensitivity is classified as “Low”.



**Figure 5-3** Map illustrating the Flora Theme Sensitivity as generated from the National Environmental Screening Tool



**Figure 5-4** Map illustrating the Fauna Theme Sensitivity as generated from the National Environmental Screening Tool



**Figure 5-5** Map illustrating the combined Terrestrial Theme Sensitivity as generated from the National Environmental Screening Tool

### 5.1.2 Confirmation of Site Sensitivity

The medium to low sensitivity for the Plant Species Theme is confirmed for a certain portion of the project area, however certain areas have a higher sensitivity due to the abundance of SCC (Figure 5-6). Figure 5-6 indicates the confirmed sensitivity for the site. The low Animal Species Theme sensitivity is disputed as several faunal species or signs were recorded in the project area and this also includes a SCC. The Terrestrial Biodiversity Theme sensitivity for the entire project area is confirmed, the project area has an overall medium sensitivity due to the condition of the open savanna grassland.

### 5.2 Site Ecological Importance

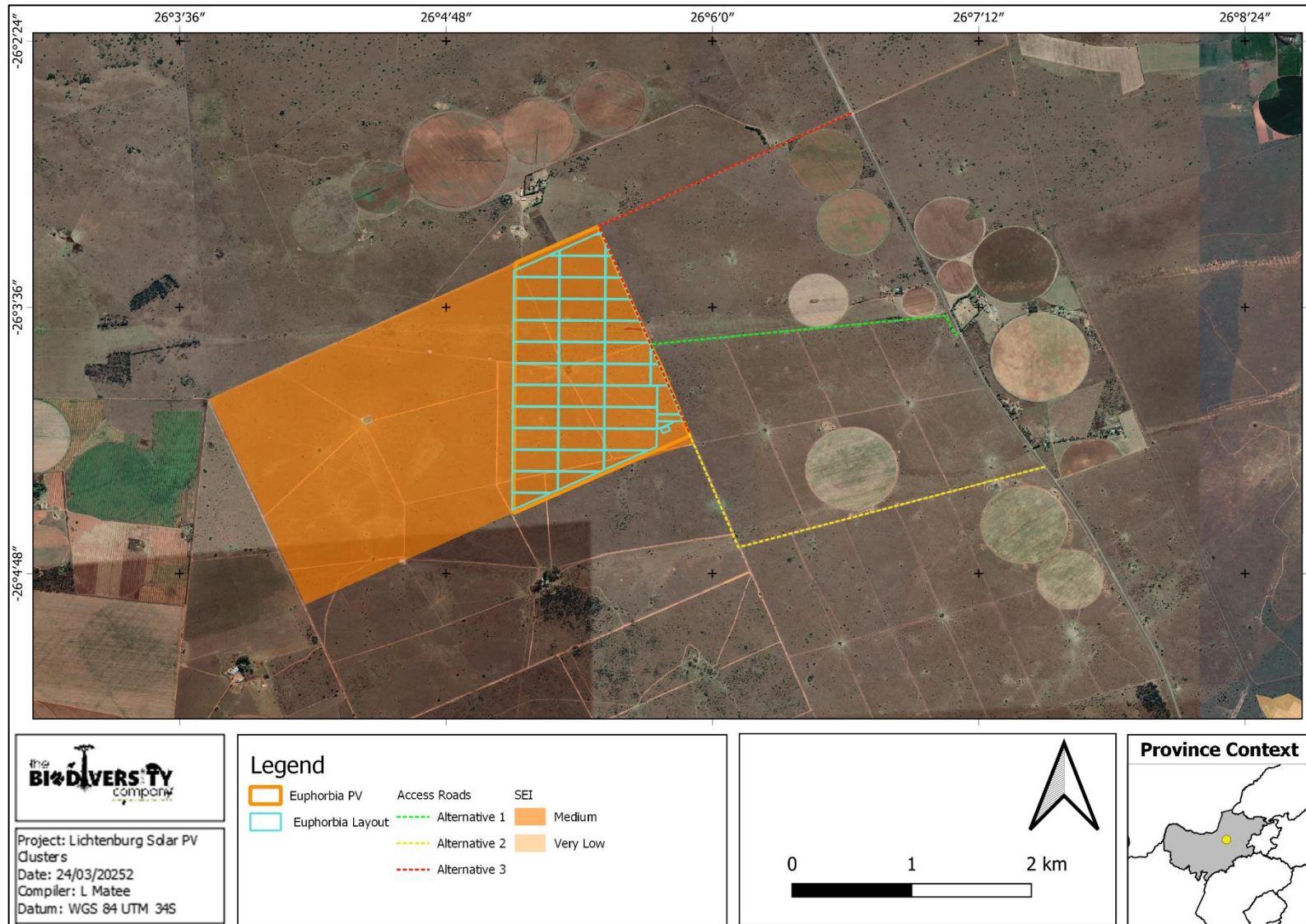
The location and extent of all habitats are illustrated in Figure 5-2. Based on the criteria provided in Section 2.4 of this report, all habitats within the assessment area of the project were allocated a sensitivity category (Table 5-1). The sensitivities of the habitat types delineated are illustrated in Figure 5-6. Table 5-2 provides guidelines for interpreting Site Ecological Importance in the context of the development activities. The SEI matrix approach links ecosystem types or habitat types to ecosystem services, species present and ecological condition by providing a score for to the sensitivity based on the matrices as per section 2.4. A freshwater assessment was undertaken for the cluster development. A drainage feature was identified in the north-west of the facility (refer to Figure 5-2) and the sensitivity of this feature was deemed Low sensitivity. The table above should be read with the habitat descriptions above, vegetation condition in each habitat and species present as well as the methodology provided in section 2.4.

**Table 5-1 Summary of habitat types delineated within the field assessment area of the Euphorbia Solar Photovoltaic (PV) and their respective SEI**

Habitat	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Transformed	Very Low (No natural habitat remaining)	Very Low	Very Low	Very High	Very Low
Open Savanna Grassland	Medium (Confirmed or highly likely occurrence of populations of Near Threatened (NT) species)	High (Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type)	Medium	Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality: .	Medium
Degraded Open Savanna Grassland	Medium	High	Medium	Medium	Medium
Drainage	Low	Low	Low	Medium	Low

**Table 5-2 Guidelines for interpreting Site Ecological Importance in the context of the development activities**

Site Ecological Importance	Interpretation in relation to development 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.



**Figure 5-6 Ecological sensitivity map of the project area.**

## 6 Impact Assessment

### 6.1 Current Impacts

Multitemporal aerial imagery as well as site observations were used to record current and historical impacts in the project area. Both these show that the site has experienced quite a number of anthropogenically conditioned landscape changes, there is evidence of informal and mechanised prospective digging throughout the area as well as edge effects of mining as well as current mining related impacts. The current impacts observed during surveys are listed below. Photographic evidence of a selection of these impacts is shown in Figure 6-1.

- Livestock grazing and over trampling;
- Footpaths and litter associated with the human infringement;
- Small access roads within the property
- Erosion;
- Alien and/or invasive plants;
- Litter and rubble dumping;
- Soil waste dumping; and
- Vegetation removal.





**Figure 6-1** *Some of the identified impacts within the project area.*

## 6.2 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 development were then subjected to a prescribed impact assessment methodology, the impact is defined in a semi-quantitative way and will be assessed according to methodology prescribed in the following section. The likelihood and consequence descriptors are presented in Table 6-1 and Table 6-2. The significance rating matrix is presented in Table 6-3.

### 6.2.1 Scale utilised for the evaluation of the Environmental Risk Ratings:

**Table 6-1 Likelihood Descriptors**

Probability of impact	Rating
Highly unlikely	1
Possible	2
Likely	3
Highly likely	4
Definite	5
Sensitivity of receiving environment	Rating
Ecology not sensitive/important	1
Ecology with limited sensitivity/importance	2
Ecology moderately sensitive/ /important	3
Ecology highly sensitive /important	4
Ecology critically sensitive /important	5

**Table 6-2 Consequence Descriptors**

Severity of impact	Rating
Insignificant / ecosystem structure and function unchanged	1
Small / ecosystem structure and function largely unchanged	2
Significant / ecosystem structure and function moderately altered	3
Great / harmful/ ecosystem structure and function largely altered	4
Disastrous / ecosystem structure and function seriously to critically altered	5
Spatial scope of impact	Rating
Activity specific/ < 5 ha impacted / Linear features affected < 100m	1
Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	2
Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	3
Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	4
Entire habitat unit / Entire system/ > 2000ha impacted / Linear features affected > 3000m	5
Duration of impact	Rating
One day to one month: Temporary	1
One month to one year: Short Term	2

One year to five years: Medium Term	3
Life of operation or less than 20 years: Long Term	4
Permanent	5

**Table 6-3 Significance Rating Matrix**

	CONSEQUENCE (Severity + Spatial Scope + Duration)															
	0	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Absent
LIKELIHOOD (Frequency of activity + Frequency of impact)	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	Low
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	
	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	Moderate
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90	Moderately High
	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105	
	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	High
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	Critical

### 6.2.2 Anticipated impacts

Table 6-4 presents the aspects anticipated for the proposed infrastructure as well as fencing are considered in order to predict and quantify these impacts and assess & evaluate the magnitude on the identified terrestrial biodiversity.

**Table 6-4 Anticipated impacts for the proposed development on terrestrial biodiversity**

Main Impact	Project activities that can cause loss/impacts to habitat (especially with regard to the proposed infrastructure areas):	Secondary impacts anticipated
<b>1. Destruction, fragmentation and degradation of habitats and ecosystems</b>	Physical removal of vegetation, including protected species.	Displacement/loss of flora & fauna (including possible SCC) Increased potential for soil erosion Habitat fragmentation Increased potential for establishment of alien & invasive vegetation Erosion Increased potential for establishment of alien & invasive vegetation
	Proposed grids	
	Soil dust precipitation	
	Dumping of waste products	
	Random events such as fire (cooking fires or cigarettes)	
	Water leakages	
Main Impact	Project activities that can cause the spread and/or establishment of alien and/or invasive species	Secondary impacts anticipated
<b>2. Spread and/or establishment of alien and/or invasive species</b>	Vegetation removal	Habitat loss for native flora & fauna (including SCC) Spreading of potentially dangerous diseases due to invasive and pest species Alteration of fauna assemblages due to habitat modification
	Vehicles potentially spreading seed	
	Unsanitary conditions surrounding infrastructure promoting the establishment of alien and/or invasive rodents	
	Creation of infrastructure suitable for breeding activities of alien and/or invasive birds	
Main Impact	Project activities that can cause direct mortality of fauna	Secondary impacts anticipated
<b>3. Direct mortality of fauna</b>	Clearing of vegetation	Loss of habitat Loss of ecosystem services Increase in rodent populations and associated disease risk
	Roadkill due to vehicle collision	
	Pollution of water resources due to dust effects, chemical spills, etc.	
	Intentional killing of fauna for food (hunting)	
Main Impact	Project activities that can cause reduced dispersal/migration of fauna	Secondary impacts anticipated
<b>4. Reduced dispersal/migration of fauna</b>	Loss of landscape used as corridor	Reduced dispersal/migration of fauna Loss of ecosystem services Reduced plant seed dispersal
	Compacted roads	
	Removal of vegetation	
Main Impact	Project activities that can cause pollution in watercourses and the surrounding environment	Secondary impacts anticipated
<b>5. Environmental pollution due to water runoff, spills from vehicles and erosion</b>	Chemical (organic/inorganic) spills	Pollution in watercourses and the surrounding environment Faunal mortality (direct and indirectly) Groundwater pollution Loss of ecosystem services
	Erosion	
Main Impact	Project activities that can cause disruption/alteration of ecological life cycles due to sensory disturbance.	Secondary impacts anticipated
<b>6. Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise, dust, and light pollution.</b>	Operation of machinery (Large earth moving machinery, vehicles)	Disruption/alteration of ecological life cycles due to noise Loss of ecosystem services Secondary impacts associated with disruption/alteration of ecological life cycles due to dust
	Project activities that can cause disruption/alteration of ecological life cycles due to dust	
	Vehicles	

Main Impact	Project activities that can cause staff to interact directly with potentially dangerous fauna	Secondary impacts anticipated
		Loss of ecosystem services
<b>8. Staff and others interacting directly with fauna (potentially dangerous) or poaching of animals</b>	All unregulated/supervised activities outdoors	Loss of SCCs

### 6.2.3 Alternatives considered

The alternative site access points and associated routes assessed include:

**Access Road Alternative 1:** Access to the facility off the R505-5 at a new farm access point at km 13. This road alternative is ~5.9 km long and aligned as follows:

- From the R505-5, this route follows the northern boundary of Portion 25 of Farm Houthaalboomen in a westerly direction for ~2.5 km. This portion of the route will be new;
- Continues in a southerly direction along the eastern boundary of Portions 3 and 4 of Farm Houthaalboomen 31 for 0.8 km; and
- Continues in westerly direction along the southern boundary of Portion 4 of Farm Houthaalboomen 31 for ~1.5 km. This portion of the route will be new and is common amongst the other access road alternatives.

**Access Road Alternative 2:** Access to the facility off the R505-5 at an existing farm access point at km 11.59. This road alternative is ~6.1 km long and aligned as follows:

- From the R505-5, this route follows an existing farm road that dissects Portion 25 of Farm Houthaalboomen in a westerly direction for ~2.5 km;
- Continues along an existing gravel road in a northerly direction along the eastern boundary of Portions 5 and 6 of Farm Houthaalboomen 31 for ~1 km; and
- Continues in westerly direction along the southern boundary of Portion 4 of Farm Houthaalboomen 31 for ~1.5 km. This portion of the route will be new and is common amongst the other access road alternatives.

**Access Road Alternative 3:** Access to the facility off the R505-5 at an existing farm access point at km 14.87. This road alternative is ~6.7 km long and aligned as follows:

- From the R505-5, this route follows an existing farm road on the southern border of Remaining Extent and Portion 3 of Farm Houthaalboomen 2 in a westerly direction for ~2.2 km;
- Continues along an existing gravel road in a southerly direction along the eastern boundary of Portions 3 and 4 of Farm Houthaalboomen 31 for ~1.9 km; and
- Continues in westerly direction along the southern boundary of Portion 4 of Farm Houthaalboomen 31 for ~1.5 km. This portion of the route will be new and is common amongst the other access road alternatives.

The impacts associated with alternatives 1,2 and 3 is deemed to be the same and negligible, as they are within existing servitudes.

#### 6.2.4 Initial Impact – No-go Scenario

The current land use is predominantly grazing, and the associated impacts caused by this to the terrestrial ecology is considered to be low. However, if this grazing land use is left unmanaged for the foreseeable future, it is probable that the ecological integrity and functioning of the grassland area will deteriorate. However, if the land use is well managed, then the long term impacts to the local ecology will continue to be low. This will require that grazing areas are rotated, grazing capacities are sustained and stocking densities are controlled. Under the current circumstances, the ‘no-go’ alternative is considered to represent a low long-term negative impact on the environment.

#### 6.2.5 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 6-5 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 6-5 Summary of unplanned events for terrestrial biodiversity**

Unplanned Event	Potential Impact	Mitigation
Hydrocarbon spills into the surrounding environment	Contamination of habitat as well as water resources associated with the spillage.	A spill response kit must be available at all times. The incident must be reported on and if necessary, a biodiversity specialist must investigate the extent of the impact and provide rehabilitation recommendations.
Fire	Uncontrolled/unmanaged fire that spreads to the surrounding natural grassland and ridges	Appropriate/Adequate fire management plan need to be implemented.
Wind erosion	Reduce habitat and remove topsoil layer	Rehabilitation and erosion monitoring plan

#### 6.2.6 Identification of Potential Impacts

##### 6.2.6.1 Construction Phase

The potential impacts on the biodiversity during construction are assessed in (Table 6-6).

This phase refers to the period during construction when the proposed infrastructure is constructed. The impacts of construction phase on ecology can be both direct in terms of vegetation and habitat loss/displacement and indirect due to increased noise and heavy equipment and vehicular movement which will be limited to construction phase only. The clearing of vegetation will result in a further transformation of the already limited existing natural habitat, thus will ultimately lead to 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 and the fragmentation of habitat. The following potential impacts were considered:

- Destruction, further loss and fragmentation of the of habitats, ecosystems and vegetation community, including protected species;
- Spread and/or establishment of alien and/or invasive species;
- Displacement of faunal community (possibly including SCC) due to habitat loss, direct mortalities, and disturbance (road collisions, noise, light, dust, vibration);

- Chemical pollution associated with dust suppressants.

#### **6.2.6.2 Operational phase**

The operational phase of the impact 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 (Table 6-7). Dust reduces the ability of plants to photosynthesize and thus leads to degradation/retrogression of the veld. The use of non-environmentally friendly chemical for the cleaning of the PV panels can lead to the pollution of water sources and ultimately death of fauna and flora. The following potential impacts were considered:

- Continued fragmentation and degradation of habitats and ecosystems;
- Spread of alien and/or invasive species;
- Ongoing displacement and direct mortalities of faunal community due to disturbance (road collisions, noise, light, dust, vibration).
- Chemical pollution associated with measures to keep PV clean.

#### **6.2.6.3 Decommissioning phase**

This phase is when the scaling down of activities ahead of temporary or permanent closure is initiated. During this phase, the operational phase impacts will persist until the activity reduces and the rehabilitation measures are implemented. The following potential impacts were considered (Table 6-8):

- Continued fragmentation and degradation of habitats;
- Continued spread of IAPs; and
- Displacement of the faunal community (including SCC) due to disturbance (road collisions, noise, dust, vibration, electrocution, and collision).

**Table 6-6 Assessment of significance of potential impacts on terrestrial fauna and flora associated with the construction phase of the project**

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Destruction, further loss and fragmentation of the of habitats, ecosystems and vegetation community, including protected species	5	3	4	3	5		3	2	3	3	3	
	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Definite	<b>Moderately High</b>	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	<b>Low</b>
Spread and/or establishment of alien and/or invasive species	4	3	3	3	4		2	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Highly likely	<b>Moderate</b>	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	<b>Low</b>
Displacement of faunal community	4	3	3	4	4		2	2	2	3	3	
	Life of operation	Local area/	Significant / ecosystem	Ecology highly	Highly likely	<b>Moderately High</b>	One month to	Development specific/	Small / ecosystem	Ecology moderately sensitive/ /important	Likely	<b>Low</b>



(possibly including SCC) due to habitat loss, direct mortalities, and disturbance (road collisions, noise, light, dust, vibration)	or less than 20 years: Long Term	within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	structure and function moderately altered	sensitive /important			one year: Short Term	within the site boundary / < 100 ha impacted / Linear features affected < 100m	structure and function largely unchanged			
	4	3	4	3	3		2	2	2	2	3	
Chemical pollution associated with dust suppressants	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Likely	<b>Moderate</b>	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	<b>Low</b>

**Table 6-7 Assessment of significance of potential impacts on terrestrial fauna and flora associated with the operational phase of the project.**

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Continued fragmentation and degradation of habitats and ecosystems	4	3	3	3	4		3	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Highly likely	<b>Moderate</b>	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	<b>Low</b>
Spread and/or establishment of alien and/or invasive species	4	3	3	3	3		2	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	<b>Moderate</b>	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	<b>Low</b>
Ongoing displacement and direct mortalities of faunal community due to disturbance (road collisions, noise, light, dust, vibration).	4	3	3	4	3		3	2	3	3	2	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	<b>Moderate</b>	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Possible	<b>Low</b>

	4	3	3	3	3		2	2	2	2	3	
Chemical pollution associated with measures to keep PV clean	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	<b>Moderate</b>	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	<b>Low</b>

**Table 6-8 Assessment of significance of potential impacts on terrestrial fauna and flora associated with the decommissioning phase of the project.**

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Continued fragmentation and degradation of habitats	4	3	3	3	4		3	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Highly likely	<b>Moderate</b>	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	<b>Low</b>
Continued spread of IAPs	4	3	3	3	3		2	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	<b>Moderate</b>	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	<b>Low</b>
Displacement and direct mortalities of faunal community (including SCC) due to disturbance (road collisions, collisions with	4	3	4	3	3		3	2	2	2	2	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function	Ecology moderately sensitive/ /important	Likely	<b>Moderate</b>	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha	Small / ecosystem structure and function	Ecology with limited sensitivity/importance	Possible	<b>Low</b>

substation, noise, light, dust, vibration)			largely altered					impacted / Linear features affected < 100m	largely unchanged			
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### 6.2.7 Potential 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 similar to 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.

Solar energy projects as part of the Renewable Energy Database indicated that the region would experience surface clearing for several PV projects (the undergrowth will be brush cut and topsoil will remain in place). Projects that were considered in terms of their potential cumulative terrestrial ecological impacts are in an approximate 30 km radius of the Verbena PV facility. Eleven PV Solar projects can be found in this area, their cumulative impacts are expected to be high if all these projects are approved. Cumulatively these developments will be responsible for the destruction of a large portion of relatively intact grasslands that are home to several SCC including *Vachellia erioloba* and *Parahyaena brunnea*.

Considering the number of known and planned other PV facilities and the associated powerlines in the area, the cumulative impact is expected to be medium. These would collectively result in a large area of habitat disturbance/loss. Long-term cumulative impacts due to extensive solar farm footprint, powerlines and substations can lead to the loss of endemic species and threatened species, loss of habitat and vegetation types and even degradation of well conserved areas.

The proposed cluster is located in Carletonville Dolomite Grassland. The total footprint area proposed to be developed for the cluster measures 824 ha, assuming the total extent of the area is developed (Table 6-9). A total area of the habitat type within the 30 km radius equates to approximately 199,256 ha of Carletonville Dolomite Grassland habitat. Due to the development in the habitat type, a total area measuring 824 ha of Carletonville Dolomite Grassland could be lost. This equates to 0.4% of habitat area being lost due to the cluster development (Table 6-9). Based on this, the overall impact of the proposed cluster development considered in isolation is expected to be low

**Table 6-9 Calculations for the loss of habitats as a result of the cluster**

Vegetation Type	Pre-Development (ha)	Post-Development (ha)	Area Lost (ha)	Overall Percentage
Carletonville Dolomite Grassland	199,256	198,432	824	0.4%

It must be noted that it is unlikely that all planned eleven solar projects will proceed for the area. The potential for these projects to proceed is based on whether these projects are included are bid in the REIPPPP, which does not guarantee that the project will be approved. Further to this point, the local substation also doesn't have capacity to connect all the projects, which further makes it unlikely that all these projects will proceed.

## 7 Specialist Management Plan

The aim of the management outcomes is to present the mitigations in such a way that they can be incorporated into the Environmental Management Programme (EMPr), allowing for more successful implementation and auditing of the mitigations and monitoring. Table 7-1 presents the recommended mitigation measures and the respective timeframes, targets and performance indicators for the terrestrial assessment.

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 ecologically sensitive 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; and

Prevent the direct and indirect loss and disturbance of faunal species and community (including potentially occurring species of conservation concern).

**Table 7-1 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				
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 minimized and avoided where possible. Brush cutting of vegetation beneath the panels should be, implemented, otherwise controlled grazing by small livestock like sheep. No topsoil stripping or complete vegetation removal beneath the panels. No imported material to be placed under the modules.	Life of operation	Project manager, Environmental Officer	Areas of indigenous vegetation	Ongoing
Where possible, existing access routes and walking paths 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 medium sensitivity areas. Any materials may not be stored for extended periods of time and must be removed from the project area once the construction/closure phase has been concluded. 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.	Operational phase	Environmental Officer & Contractor	Assess the state of rehabilitation and encroachment of alien vegetation	Quarterly for up to two years after the closure
Any woody material removed can be shredded and used in conjunction with the topsoil to augment soil moisture and prevent further erosion.	Operational and Decommissioning phase	Environmental Officer & Contractor	Woody material around footprint	During Phase
A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment on site unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers. Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them leaking and entering the environment.	Life of operation	Environmental Officer & Contractor	Spill events, Vehicles dripping.	Ongoing
A carefully considered surface water/drainage management plan must be developed for the site including attention to the use of environmentally friendly cleaning chemicals for cleaning of panels during the operational phase. No mass herbicide application to be applied beneath modules during operation.	Life of operation	Environmental Officer & Design Engineer	Water Quality and presence of erosion	Ongoing



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
Rocks removed in the construction phased may not be dumped, but can be used in areas where erosion control needs to be performed	Operational phase	Environmental Officer & Contractor	Rock piles	During Phase
Any individual of the nationally protected trees or protected plants that was observed needs a relocation or destruction permit in order for any individual that may be removed or destroyed due to the development. Preferably, the trees/plants should be avoided. Hi visibility flags must be placed near any protected plants in order 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.	Life of operation	Project manager, Environmental Officer Lodge Manager	Protected Tree/Plant species	Ongoing
The Solar panel surfaces may not have reflective surfaces which can lead to veld fires	Operational phase	Environmental Auditor & O&M Contractor	Fire Management	During Phase

Management outcome: Fauna

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
The areas to be developed must be specifically demarcated to prevent movement of staff or any individual into the surrounding environments, <ul style="list-style-type: none"> <li>Signs must be put up to enforce this</li> </ul>	Construction/Operational Phase	Project manager, Environmental Officer	Infringement into these areas	Ongoing
Noise must be kept to an absolute minimum during the evenings and 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 <ul style="list-style-type: none"> <li>Signs must be put up to enforce this;</li> </ul>	Life of operation	Environmental Officer	Evidence of trapping etc	Ongoing
Try incorporating motion detection lights as much as possible to reduce the duration of illumination. Heights of light columns to be minimised to reduce light spill. Baffles, hoods, or louvres to also be used to reduce light spill	Construction Phase	Environmental Officer & Design Engineer	Light pollution	Ongoing
Facility lighting during construction & operation should be kept to a minimum and should make use of latest technology to ensure that light disturbance is minimised. This will also reduce the attraction of insects (and in turn insectivorous bats) to the facility. Lighting to be limited to O&M complex and substation. No Perimeter security lighting to be allowed (if perimeter security is a concern, security cameras rather than lighting.)	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Light pollution and period of light.	Ongoing
Outside lighting should be designed and limited to minimize impacts on fauna. All outside lighting should be directed away from highly sensitive	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Light pollution and period of light.	Ongoing

<p>areas. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (green/red) lights should be used wherever possible.</p> <p>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.</p>	Life of operation	Health and Safety Officer	Compliance to the training.	Ongoing
<p>Schedule activities and operations during least sensitive periods, to avoid migration, nesting, and breeding seasons.</p>	Life of operation	Project manager, Environmental Officer & Design Engineer	Activities should take place during the day in the case.	Ongoing
<p>Heat generated from the substations must be monitored to ensure it does not negatively affect the local fauna</p>	Life of operation	Environmental Officer & Contractor	Heat generated by substations	Ongoing
<p>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.</p>	Construction and Operational phase	Project manager, Environmental Officer	Presence of Nests and faunal species	Planning, Construction and Rehabilitation
<p>Any holes/deep excavations must be dug and planted in a progressive manner; Should the holes overnight they must be covered temporarily to ensure no small fauna species fall in and subsequently inspected prior to backfilling</p>	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of trapped animals and open holes	Ongoing
<p>Ensure that all AC cables and connections are insulated successfully to reduce electrocution risk.</p>	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of electrocuted fauna	Ongoing
<p>Wildlife-permeable fencing with holes large enough for mongoose and other smaller mammals should be installed, the holes must not be placed in the fence where it is next to a major road as this will increase road killings in the area</p>	Planning and construction	Environmental Officer & Contractor, Engineer	Fauna movement corridor	Ongoing
<p>Use environmentally friendly cleaning and dust suppressant products</p>	Construction and operation	Environmental Officer & Contractor, Engineer	Presence of chemicals in and around the project area	Ongoing
<p>Fencing mitigations:</p> <ul style="list-style-type: none"> <li>• Top 2 strands must be smooth wire</li> <li>• Routinely retention loose wires</li> <li>• Minimum 30cm between wires</li> <li>• Place markers on fences</li> </ul>	Planning, construction, and operation	Environmental Officer & Contractor, Engineer	Monitor fences for slack wires	Ongoing
<p>Once the development layout has been confirmed, the open areas must be fenced off appropriately pre-construction in order to allow animals to move or be moved into these areas before breaking ground activities occur. Construction activities must take place systemically. The perimeter fence should not be completed -i.e. leaving sections unfenced to allow fauna to escape. Drilling etc should start one side of the site and progress towards the section of the site where fences are incomplete.</p>	Planning/Construction Phase	Environmental Officer & Design Engineer	Areas not to be developed and construction direction	Ongoing

Management outcome: Alien species

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
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
An alien management plan must be implemented quarterly for 2 years after initial clearing phase.	Construction phase and Decommissioning phase	Project manager, Environmental Officer & Contractor	Assess presence and encroachment of alien vegetation	Quarterly for 2 years after phase
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 wetting of exposed soft soil surfaces. <ul style="list-style-type: none"> <li>No non environmentally friendly suppressants may be used as this could result in pollution of water sources</li> </ul>	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 adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site. <ul style="list-style-type: none"> <li>Refuse bins will be emptied and secured;</li> <li>Temporary storage of domestic waste shall be in covered waste skips; and</li> <li>Maximum domestic waste storage period will be 10 days.</li> </ul>	Construction Phase	Environmental Officer & Health and Safety Officer	Presence of waste	Life of operation
Toilets at the recommended Health and Safety standards must be provided. These should be emptied twice a day, to prevent staff from using the surrounding vegetation.	Construction Phase	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. Under no circumstances may domestic waste be burned on site	Construction Phase	Environmental Officer & Health and Safety Officer	Availability of bins and the collection 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.	Construction Phase	Environmental Officer, Contractor & Health and Safety Officer	Management of bins and collection of waste	Ongoing

Suitable temporary solid waste facilities are to be incorporated into the design to prevent unsanitary conditions. These are to be cleared weekly and waste collected by the local waste management department. The residents must be encouraged to recycle.

Operational Phase

Project manager

Management of bins and collection of waste

Ongoing

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 Red / Orange List species, their identification, conservation status and importance, biology, habitat requirements and management requirements the Environmental Authorisation and within the EMPr.	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. <ul style="list-style-type: none"> <li>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;</li> <li>Signs must be put up to enforce this.</li> </ul>	Life of operation	Project manager, Environmental Officer	Water Runoff from road surfaces	Ongoing
Where possible, existing access routes and walking paths must be made use of.	Life of operation	Project manager, Environmental Officer	Routes used within the area	Ongoing
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events 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

## 8 Conclusion and Impact Statement

It is the opinion of the ecologists that this study provides the relevant information required in order to implement an Integrated Environmental Management plan. As well as to ensure that the best long-term use of the ecological resources in the project area are made in support of the principle of sustainable development. The construction and operation of the infrastructure are not anticipated to pose significant threats to the receiving environment provided the mitigation measures are effectively applied, thus the proposed development can obtain approval.

Through the analysis of various database and satellite imagery as well as the infield screening assessment it was determined that although the project area has been impacted by historical impacts and current livestock grazing regimes as well as trampling and overstocking, a part of the project area is still relatively intact and also possess a few sensitive receptors. These sensitivity receptors relate to traversing a terrestrial ESA level 1 (ESA 1) (NWREAD, 2015). These ESA 1 areas function as linkages/corridors (comprising of natural vegetation) between the important biodiversity areas and major freshwater resource and their fringing terrestrial habitats. The other sensitivity includes being within a poorly protected ecosystem, marginally overlapping with a Priority Focus Area, being close (ca 4 km) to an informal protected area which is the Lichtenburg Game Breeding Centre. The breeding centre is operated by the National Zoological Gardens of South Africa and is there mainly to further the breeding programmes of endangered species already in place by the National Zoo, and to supplement the populations of local and international zoos

The project area has a long association with anthropogenic activities, mainly agricultural practices historically, with IAP proliferation and recreational activities forming the current main driving forces of disturbances within the project area. Three habitat units were recorded in the project area, Transformed, Degraded Open Savanna Grassland and Open Savanna Grassland. The Open Savanna Grasslands were both assigned a medium sensitivity whereas the Transformed unit was assigned a very low sensitivity respectively.

The main habitat type that the proposed project and related infrastructure will mainly impact is the Open savanna Grassland habitat. This habitat unit within the project area was relatively intact, a number of SCC were recorded within this habitat unit. The Open Savanna Grassland has a relatively high abundance of *Vachellia erioloba* and loss of relatively high numbers of individuals cannot be avoided. The number of trees lost would however not exceed the DAFF threshold for offsets. DAFF mainly relies on internal guidelines which stipulate that the removal of 2000+ mature individuals of a nationally protected tree species would warrant the investigation of a biodiversity offset area as a potentially suitable mitigation measure. *Vachellia erioloba* was also recorded in the other two PV areas that are considered for application and the long term residual ecological impact associated with the destruction of this significant number of nationally protected tree species could trigger the requirement of a biodiversity offset to be investigated from DAFF's side. As such a protected tree assessment and permit applications is recommended before any clearing commences, any SSC species that will be impacted on should be relocated to similar habitat in the vicinity of the project area with the assistance of a suitably qualified specialist.

In terms of faunal species, one confirmed mammal species of concern the Brown Hyena (*Parahyaena brunnea*) were recorded in the project area as well as other faunal species that are not RDL but need to be conserved.

The proposed Solar PV project activities will impact on the different habitat units to varying degrees and is discussed in more detail throughout the report in relation to their SEI as well as the level of current disturbance in each habitat unit. The greatest impacts of the development were identified as the loss of habitat and fragmentation. The appropriate permit applications must be followed for the national protected trees, of which a number of specimens are found throughout the project area. Should the impacts be mitigated successfully, majority of them can be reduced substantially.

#### Alternatives

The impacts associated with alternatives 1,2 and 3 is deemed to be the same and negligible, as they are within existing servitudes.

### 8.1 Impact Statement

The main expected impacts of the proposed infrastructure will include the following:

- Habitat loss and fragmentation;
- Degradation of surrounding habitat;
- Entrapment in perimeter fences
- Sensory disturbance and possible extirpation of SCC;
- Disturbance and displacement caused during the construction and maintenance phases; and
- Direct mortality during the construction phase.

Mitigation measures as described in this report can be implemented to reduce the significance of the risk to an acceptable level of significance. The overall cumulative impact expected for the cluster development is expected to be low.

Considering the above-mentioned information, no fatal flaws are evident for the proposed project. The average post-mitigation impact significance for the project is moderately low. It is the opinions of the specialists that the project may be favourably considered, on condition that all prescribed mitigation measures are implemented.

A freshwater assessment was undertaken for the cluster development, and a small drainage feature was identified in the north-west of the facility and the sensitivity of this feature was deemed Low sensitivity. As such, a standalone aquatic impact assessment has not been undertaken or deemed necessary.

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## 10 Appendices

### 10.1 Appendix A – Flora species expected to occur in the project area.

Family	Species Name	Author1	IUC N	Ecology
Oleaceae	<i>Olea europaea subsp. cuspidata</i>	L.		Indigenous
Pteridaceae	<i>Pellaea calomelanos var. calomelanos</i>	(Sw.) Link	LC	Indigenous
Ranunculaceae	<i>Clematis brachiata</i>	Thunb.	LC	Indigenous
Poaceae	<i>Triraphis andropogonooides</i>	(Steud.) Phillips	LC	Indigenous
Verbenaceae	<i>Verbena bonariensis</i>	L.		Not indigenous; Naturalised; Invasive
Cactaceae	<i>Cylindropuntia imbricata</i>	(Haw.) F.M. Knuth		Not indigenous; Naturalised; Invasive
Apiaceae	<i>Pastinaca sativa</i>	L.		Not indigenous; Naturalised
Fabaceae	<i>Indigostrum costatum subsp. macrum</i>	(Guill. & Perr.) Schrire	LC	Indigenous
Poaceae	<i>Eustachys paspaloides</i>	(Vahl) Lanza & Mattei	LC	Indigenous
Aizoaceae	<i>Nananthus vittatus</i>	(N.E.Br.) Schwantes	DD	Indigenous
Apocynaceae	<i>Raphionacme hirsuta</i>	(E. Mey.) R.A. Dyer	LC	Indigenous
Fabaceae	<i>Leobordea hirsuta</i>	(Schinz) B.-E. van Wyk & Boatwr.	LC	Indigenous; Endemic
Polygalaceae	<i>Polygala hottentotta</i>	C.Presl	LC	Indigenous
Fabaceae	<i>Pearsonia cajanifolia subsp. cajanifolia</i>	(Harv.) Polhill	LC	Indigenous; Endemic
Fabaceae	<i>Indigofera oxytropis</i>	Benth. ex Harv.	LC	Indigenous
Casuarinaceae	<i>Casuarina cunninghamiana</i>	Miq.	NE	Not indigenous; Naturalised; Invasive
Boraginaceae	<i>Cynoglossum austroafricanum</i>	Hilliard & B.L. Burt	LC	Indigenous
Verbenaceae	<i>Lantana rugosa</i>	Thunb.	LC	Indigenous
Lamiaceae	<i>Mentha aquatica</i>	L.	LC	Indigenous
Poaceae	<i>Setaria incrassata</i>	(Hochst.) Hack.	LC	Indigenous
Malvaceae	<i>Brachychiton populneus</i>	(Schott & Endl.) R.Br.		Not indigenous; Naturalised
Asteraceae	<i>Senecio digitalifolius</i>	DC.	LC	Indigenous
Asteraceae	<i>Berkheya onopordifolia var. onopordifolia</i>	(DC.) O. Hoffm. ex Burt Davy	LC	Indigenous
Cannabaceae	<i>Cannabis sativa var. sativa</i>	L.	NE	Not indigenous; Naturalised
Ebenaceae	<i>Diospyros lycioides subsp. lycioides</i>	Desf.	LC	Indigenous
Poaceae	<i>Eragrostis barbinodis</i>	Hack.	LC	Indigenous
Santalaceae	<i>Viscum verrucosum</i>	Harv.	LC	Indigenous
Menispermaceae	<i>Antizoma angustifolia</i>	(Burch.) Miers ex Harv.	LC	Indigenous
Asteraceae	<i>Helichrysum callicomum</i>	Harv.	LC	Indigenous
Poaceae	<i>Oropetium capense</i>	Stapf	LC	Indigenous
Poaceae	<i>Schizachyrium sanguineum</i>	(Retz.) Alston	LC	Indigenous
Chrysobalanaceae	<i>Parinari capensis subsp. capensis</i>	Harv.	LC	Indigenous
Cucurbitaceae	<i>Cucumis zeyheri</i>	Sond.	LC	Indigenous

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<b>Poaceae</b>	<i>Brachiaria marlothii</i>	(Hack.) Stent	LC	Indigenous
<b>Convolvulaceae</b>	<i>Ipomoea bathycolpos</i>	Hallier f.	LC	Indigenous; Endemic
<b>Acanthaceae</b>	<i>Blepharis squarrosa</i>	(Nees) T. Anderson	LC	Indigenous; Endemic
<b>Poaceae</b>	<i>Andropogon schirensis</i>	Hochst. ex A. Rich.	LC	Indigenous
<b>Aizoaceae</b>	<i>Drosanthemum sp.</i>			
<b>Scrophulariaceae</b>	<i>Chaenostoma patrioticum</i>	(Hiern) Kornhall	LC	Indigenous
<b>Aizoaceae</b>	<i>Delosperma sp.</i>	L.Bolus		
<b>Asteraceae</b>	<i>Geigeria aspera var. aspera</i>	Harv.	LC	Indigenous
<b>Commelinaceae</b>	<i>Cyanotis speciosa</i>	(L.f.) Hassk.	LC	Indigenous
<b>Poaceae</b>	<i>Hyparrhenia hirta</i>	(L.) Stapf	LC	Indigenous
<b>Orobanchaceae</b>	<i>Striga gesnerioides</i>	(Willd.) Vatke	LC	Indigenous
<b>Poaceae</b>	<i>Trichoneura grandiglumis</i>	(Nees) Ekman	LC	Indigenous
<b>Poaceae</b>	<i>Aristida vestita</i>	Thunb.	LC	Indigenous
<b>Rubiaceae</b>	<i>Kohautia amatymbica</i>	Eckl. & Zeyh.	LC	Indigenous
<b>Asteraceae</b>	<i>Nidorella hottentotica</i>	DC.	LC	Indigenous
<b>Poaceae</b>	<i>Themeda triandra</i>	Forssk.	LC	Indigenous
<b>Agavaceae</b>	<i>Chlorophytum cooperi</i>	(Baker) Nordal	LC	Indigenous
<b>Asteraceae</b>	<i>Tarchonanthus parvicapitulatus</i>	P.P.J. Herman	LC	Indigenous
<b>Poaceae</b>	<i>Aristida stipitata subsp. graciliflora</i>	Hack.	LC	Indigenous
<b>Caryophyllaceae</b>	<i>Silene undulata</i>	Aiton		Indigenous
<b>Fabaceae</b>	<i>Tephrosia lupinifolia</i>	DC.	LC	Indigenous
<b>Cyperaceae</b>	<i>Cyperus congestus</i>	Vahl	LC	Indigenous
<b>Asteraceae</b>	<i>Cirsium vulgare</i>	(Savi) Ten.		Not indigenous; Naturalised; Invasive
<b>Scrophulariaceae</b>	<i>Jamesbrittenia atropurpurea subsp. atropurpurea</i>	(Benth.) Hilliard	LC	Indigenous
<b>Gentianaceae</b>	<i>Chironia palustris subsp. palustris</i>	Burch.	LC	Indigenous
<b>Fabaceae</b>	<i>Vachellia erioloba</i>	(E. Mey.) P.J.H. Hurter	LC	Indigenous
<b>Crassulaceae</b>	<i>Crassula natans var. natans</i>	Thunb.	LC	Indigenous
<b>Orchidaceae</b>	<i>Habenaria epipactidea</i>	Rchb.f.	LC	Indigenous
<b>Fabaceae</b>	<i>Senegalia hereroensis</i>	(Engl.) Kyal. & Boatwr.	LC	Indigenous
<b>Lamiaceae</b>	<i>Stachys spathulata</i>	Burch. ex Benth.	LC	Indigenous
<b>Scrophulariaceae</b>	<i>Nemesia fruticans</i>	(Thunb.) Benth.	LC	Indigenous
<b>Malvaceae</b>	<i>Grewia flava</i>	DC.	LC	Indigenous
<b>Solanaceae</b>	<i>Solanum lichtensteinii</i>	Willd.	LC	Indigenous
<b>Hyacinthaceae</b>	<i>Albuca prasina</i>	(Ker Gawl.) J.C. Manning & Goldblatt		Indigenous
<b>Asteraceae</b>	<i>Litogyne gariepina</i>	(DC.) Anderb.	LC	Indigenous
<b>Poaceae</b>	<i>Eragrostis superba</i>	Peyr.	LC	Indigenous
<b>Acanthaceae</b>	<i>Barleria macrostegia</i>	Nees	LC	Indigenous

<b>Scrophulariaceae</b>	<i>Selago sp.</i>			
<b>Asteraceae</b>	<i>Helichrysum harveyanum</i>	Wild	LC	Indigenous
<b>Acanthaceae</b>	<i>Crabbea angustifolia</i>	Nees	LC	Indigenous; Endemic
<b>Asteraceae</b>	<i>Nicolasia stenoptera subsp. stenoptera</i>	(O. Hoffm.) Merxm.	LC	Indigenous
<b>Onagraceae</b>	<i>Oenothera rosea</i>	L'Her. ex Aiton		Not indigenous; Naturalised; Invasive
<b>Rubiaceae</b>	<i>Vangueria pygmaea</i>	Schltr.	LC	Indigenous
<b>Geraniaceae</b>	<i>Pelargonium dolomiticum</i>	R. Knuth	LC	Indigenous
<b>Lamiaceae</b>	<i>Salvia runcinata</i>	L.f.	LC	Indigenous
<b>Poaceae</b>	<i>Leptochloa fusca</i>	(L.) Kunth	LC	Indigenous
<b>Convolvulaceae</b>	<i>Convolvulus ocellatus var. ocellatus</i>	Hook.	LC	Indigenous
<b>Cupressaceae</b>	<i>Cupressus sempervirens</i>	L.		Not indigenous; Cultivated; Naturalised
<b>Ricciaceae</b>	<i>Riccia argenteolimbata</i>	O.H. Volk & Perold		Indigenous
<b>Plantaginaceae</b>	<i>Plantago lanceolata</i>	L.	LC	Indigenous
<b>Cyperaceae</b>	<i>Cyperus sp.</i>			
<b>Fabaceae</b>	<i>Chamaecrista biensis</i>	(Steyaert) Lock	LC	Indigenous
<b>Asphodelaceae</b>	<i>Bulbine abyssinica</i>	A. Rich.	LC	Indigenous
<b>Fabaceae</b>	<i>Leobordea divaricata</i>	Eckl. & Zeyh.	LC	Indigenous
<b>Lamiaceae</b>	<i>Salvia radula</i>	Benth.	LC	Indigenous
<b>Boraginaceae</b>	<i>Trichodesma angustifolium subsp. angustifolium</i>	Harv.	LC	Indigenous
<b>Meliaceae</b>	<i>Melia azedarach</i>	L.	NE	Not indigenous; Naturalised; Invasive
<b>Apocynaceae</b>	<i>Cynanchum virens</i>	(E. Mey.) D.Dietr.	LC	Indigenous
<b>Convolvulaceae</b>	<i>Ipomoea obscura var. obscura</i>	(L.) Ker Gawl.	LC	Indigenous
<b>Poaceae</b>	<i>Tragus berteronianus</i>	Schult.	LC	Indigenous
<b>Celastraceae</b>	<i>Gymnosporia buxifolia</i>	(L.) Szyzyl.	LC	Indigenous
<b>Poaceae</b>	<i>Cynodon dactylon</i>	(L.) Pers.	LC	Indigenous
<b>Polygalaceae</b>	<i>Polygala producta</i>	N.E.Br.	LC	Indigenous
<b>Rubiaceae</b>	<i>Breonadia sp.</i>			
<b>Poaceae</b>	<i>Microchloa kunthii</i>	Desv.	LC	Indigenous
<b>Poaceae</b>	<i>Calamagrostis epigejos var. capensis</i>	(L.) Roth	LC	Indigenous
<b>Cupressaceae</b>	<i>Cupressus arizonica</i>	Greene		Not indigenous; Cultivated; Naturalised
<b>Fabaceae</b>	<i>Lessertia frutescens subsp. microphylla</i>	(L.) Goldblatt & J.C. Manning	LC	Indigenous
<b>Potamogetonaceae</b>	<i>Potamogeton pectinatus</i>	L.	LC	Indigenous
<b>Poaceae</b>	<i>Brachiaria serrata</i>	(Thunb.) Stapf	LC	Indigenous
<b>Asteraceae</b>	<i>Felicia muricata subsp. muricata</i>	(Thunb.) Nees	LC	Indigenous
<b>Polygonaceae</b>	<i>Oxygonum dregeanum subsp. canescens</i>	Meisn.	NE	Indigenous
<b>Cyperaceae</b>	<i>Abildgaardia ovata</i>	(Burm.f.) Kral	LC	Indigenous

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Poaceae	<i>Eragrostis pseudobtusa</i>	De Winter	NE	Indigenous; Endemic
Poaceae	<i>Pogonarthria squarrosa</i>	(Roem. & Schult.) Pilg.	LC	Indigenous
Solanaceae	<i>Lycium hirsutum</i>	Dunal	LC	Indigenous
Poaceae	<i>Panicum stapfianum</i>	Fourc.	LC	Indigenous
Malvaceae	<i>Sida chrysantha</i>	Ulbr.	LC	Indigenous
Asteraceae	<i>Ursinia nana subsp. leptophylla</i>	DC.	LC	Indigenous
Dipsacaceae	<i>Scabiosa columbaria</i>	L.	LC	Indigenous
Fabaceae	<i>Zornia milneana</i>	Mohlenbr.	LC	Indigenous
Poaceae	<i>Melinis repens subsp. grandiflora</i>	(Willd.) Zizka	LC	Indigenous
Fabaceae	<i>Rhynchosia monophylla</i>	Schltr.	LC	Indigenous
Asteraceae	<i>Geigeria brevifolia</i>	(DC.) Harv.	LC	Indigenous
Asteraceae	<i>Flaveria bidentis</i>	(L.) Kuntze		Not indigenous; Naturalised; Invasive
Poaceae	<i>Cymbopogon pospischilii</i>	(K. Schum.) C.E. Hubb.	NE	Indigenous
Caryophyllaceae	<i>Dianthus mooiensis subsp. mooiensis</i>	F.N. Williams	NE	Indigenous; Endemic
Anacardiaceae	<i>Ozoroa paniculosa var. paniculosa</i>	(Sond.) R. Fern. & A. Fern.	LC	Indigenous
Amaranthaceae	<i>Hermbstaedia odorata var. odorata</i>	(Burch.) T. Cooke	NE	Indigenous
Santalaceae	<i>Thesium goetzeanum</i>	Engl.	LC	Indigenous
Rhamnaceae	<i>Ziziphus zeyheriana</i>	Sond.	LC	Indigenous
Fabaceae	<i>Eriosema salignum</i>	E. Mey.	LC	Indigenous
Solanaceae	<i>Lycium cinereum</i>	Thunb.	LC	Indigenous
Verbenaceae	<i>Chascanum adenostachyum</i>	(Schauer) Moldenke	LC	Indigenous
Cannabaceae	<i>Celtis africana</i>	Burm.f.	LC	Indigenous
Poaceae	<i>Brachiaria nigropedata</i>	(Ficalho & Hiern) Stapf	LC	Indigenous
Boraginaceae	<i>Ehretia alba</i>	Retief & A.E. van Wyk	LC	Indigenous
Poaceae	<i>Aristida congesta subsp. congesta</i>	Roem. & Schult.	LC	Indigenous
Fabaceae	<i>Melilotus albus</i>	Medik.	NE	Not indigenous; Naturalised; Invasive
Hyacinthaceae	<i>Dipcadi marlothii</i>	Engl.	LC	Indigenous
Apiaceae	<i>Deverra burchellii</i>	(DC.) Eckl. & Zeyh.	LC	Indigenous
Cucurbitaceae	<i>Cucumis myriocarpus subsp. myriocarpus</i>	Naudin	LC	Indigenous
Ricciaceae	<i>Riccia albolimbata</i>	S.W. Arnell		Indigenous
Asteraceae	<i>Helichrysum nudifolium var. nudifolium</i>	(L.) Less.	LC	Indigenous
Ranunculaceae	<i>Ranunculus multifidus</i>	Forssk.	LC	Indigenous
Poaceae	<i>Eragrostis curvula</i>	(Schrad.) Nees	LC	Indigenous
Asteraceae	<i>Xanthium spinosum</i>	L.		Not indigenous; Naturalised; Invasive
Poaceae	<i>Loudetia simplex</i>	(Nees) C.E. Hubb.	LC	Indigenous
Asteraceae	<i>Chrysocoma obtusata</i>	(Thunb.) Ehr. Bayer	LC	Indigenous
Poaceae	<i>Diheteropogon amplexens var. amplexens</i>	(Nees) Clayton	LC	Indigenous

Poaceae	<i>Stipagrostis uniplumis var. neesii</i>	(Licht.) De Winter	LC	Indigenous
Agavaceae	<i>Chlorophytum sp.</i>			
Anacardiaceae	<i>Schinus molle</i>	L.	NE	Not indigenous; Naturalised; Invasive
Ebenaceae	<i>Diospyros austroafricana var. microphylla</i>	De Winter	LC	Indigenous
Lobeliaceae	<i>Lobelia erinus</i>	L.	LC	Indigenous
Cyperaceae	<i>Kyllinga alba</i>	Nees	LC	Indigenous
Asteraceae	<i>Nidorella resedifolia subsp. resedifolia</i>	DC.	LC	Indigenous
Asphodelaceae	<i>Trachyandra laxa var. rigida</i>	(N.E.Br.) Oberm.	LC	Indigenous
Fabaceae	<i>Medicago laciniata var. laciniata</i>	(L.) Mill.	NE	Not indigenous; Naturalised
Poaceae	<i>Sporobolus festinus</i>	Hochst. ex A. Rich.	LC	Indigenous
Iridaceae	<i>Gladiolus permeabilis subsp. edulis</i>	D.Delaroche	LC	Indigenous
Poaceae	<i>Hyparrhenia filipendula var. pilosa</i>	(Hochst.) Stapf	LC	Indigenous
Poaceae	<i>Aristida diffusa subsp. burkei</i>	Trin.	LC	Indigenous
Malvaceae	<i>Triumfetta sonderi</i>	Ficalho & Hiern	LC	Indigenous; Endemic
Orobanchaceae	<i>Striga elegans</i>	Benth.	LC	Indigenous
Poaceae	<i>Melinis repens subsp. repens</i>	(Willd.) Zizka	LC	Indigenous
Iridaceae	<i>Tritonia nelsonii</i>	Baker	LC	Indigenous
Fabaceae	<i>Trifolium africanum var. africanum</i>	Ser.	NE	Indigenous
Poaceae	<i>Leersia denudata</i>	Launert	LC	Indigenous
Orobanchaceae	<i>Cycnium adonense</i>	E. Mey. ex Benth.	LC	Indigenous
Poaceae	<i>Chrysopogon serrulatus</i>	Trin.	LC	Indigenous
Cleomaceae	<i>Cleome maculata</i>	(Sond.) Szyszyl.	LC	Indigenous
Poaceae	<i>Microchloa caffra</i>	Nees	LC	Indigenous
Fabaceae	<i>Vachellia hebeclada subsp. hebeclada</i>	(DC.) Kyal. & Boatwr.	LC	Indigenous
Cucurbitaceae	<i>Acanthosicyos naudinianus</i>	(Sond.) C.Jeffrey	LC	Indigenous
Cyperaceae	<i>Cyperus rubicundus</i>	Vahl	LC	Indigenous
Convolvulaceae	<i>Falkia oblonga</i>	Bernh. ex C. Krauss	LC	Indigenous
Poaceae	<i>Digitaria sanguinalis</i>	(L.) Scop.	NE	Not indigenous; Naturalised
Poaceae	<i>Sporobolus fimbriatus</i>	(Trin.) Nees	LC	Indigenous
Iridaceae	<i>Gladiolus sp.</i>			
Hyacinthaceae	<i>Dipcadi viride</i>	(L.) Moench	LC	Indigenous
Asteraceae	<i>Dicoma anomala subsp. anomala</i>	Sond.	LC	Indigenous
Onagraceae	<i>Oenothera glazioviana</i>	Micheli		Not indigenous; Naturalised; Invasive
Asteraceae	<i>Anthemis cotula</i>	L.		Not indigenous; Naturalised
Poaceae	<i>Urochloa brachyura</i>	(Hack.) Stapf	LC	Indigenous
Poaceae	<i>Eragrostis gummiflua</i>	Nees	LC	Indigenous
Amaryllidaceae	<i>Crinum graminicola</i>	I.Verd.	LC	Indigenous

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<b>Iridaceae</b>	<i>Moraea pallida</i>	(Baker) Goldblatt	LC	Indigenous
<b>Acanthaceae</b>	<i>Blepharis angusta</i>	(Nees) T. Anderson	LC	Indigenous; Endemic
<b>Lamiaceae</b>	<i>Salvia stenophylla</i>	Burch. ex Benth.		Indigenous
<b>Marsileaceae</b>	<i>Marsilea macrocarpa</i>	C.Presl	LC	Indigenous
<b>Verbenaceae</b>	<i>Chascanum pinnatifidum</i> var. <i>pinnatifidum</i>	(L.f.) E. Mey.	LC	Indigenous
<b>Asteraceae</b>	<i>Chrysocoma ciliata</i>	L.	LC	Indigenous
<b>Poaceae</b>	<i>Cymbopogon caesius</i>	(Hook. & Arn.) Stapf	LC	Indigenous
<b>Asteraceae</b>	<i>Osteospermum scariosum</i> var. <i>scariosum</i>	DC.	NE	Indigenous
<b>Poaceae</b>	<i>Eragrostis</i> sp.			
<b>Malvaceae</b>	<i>Hermannia stellulata</i>	(Harv.) K. Schum.	LC	Indigenous
<b>Myrtaceae</b>	<i>Eucalyptus sideroxyylon</i>	A. Cunn. ex Woolls		Not indigenous; Cultivated; Naturalised; Invasive
<b>Poaceae</b>	<i>Setaria sphacelata</i> var. <i>torta</i>	(Schumach.) Stapf & C.E. Hubb. ex M.B. Moss	LC	Indigenous
<b>Commelinaceae</b>	<i>Commelina livingstonii</i>	C.B. Clarke	LC	Indigenous
<b>Polygonaceae</b>	<i>Rumex lanceolatus</i>	Thunb.	LC	Indigenous
<b>Lamiaceae</b>	<i>Acrotome inflata</i>	Benth.	LC	Indigenous
<b>Poaceae</b>	<i>Eragrostis biflora</i>	Hack. ex Schinz	LC	Indigenous
<b>Poaceae</b>	<i>Paspalum dilatatum</i>	Poir.	NE	Not indigenous; Naturalised; Invasive
<b>Malvaceae</b>	<i>Hibiscus trionum</i>	L.		Not indigenous; Naturalised
<b>Malvaceae</b>	<i>Corchorus asplenifolius</i>	Burch.	LC	Indigenous
<b>Asphodelaceae</b>	<i>Trachyandra burkei</i>	(Baker) Oberm.	LC	Indigenous
<b>Fabaceae</b>	<i>Gleditsia triacanthos</i>	L.	NE	Not indigenous; Naturalised; Invasive
<b>Asphodelaceae</b>	<i>Bulbine frutescens</i>	(L.) Willd.	LC	Indigenous
<b>Amaranthaceae</b>	<i>Cyphocarpa angustifolia</i>	(Moq.) Lopr.	LC	Indigenous
<b>Poaceae</b>	<i>Urochloa panicoides</i>	P. Beauv.	LC	Indigenous
<b>Rubiaceae</b>	<i>Kohautia caespitosa</i> subsp. <i>brachyloba</i>	Schnizl.	LC	Indigenous
<b>Fabaceae</b>	<i>Indigastrum parviflorum</i> subsp. <i>parviflorum</i>	(B. Heyne ex Wight & Arn.) Schrire	NE	Indigenous
<b>Apocynaceae</b>	<i>Pentarrhinum insipidum</i>	E. Mey.	LC	Indigenous
<b>Polygalaceae</b>	<i>Polygala gracilentia</i>	Burt Davy	LC	Indigenous
<b>Anacardiaceae</b>	<i>Searsia pyroides</i> var. <i>pyroides</i>	(Burch.) Moffett	LC	Indigenous
<b>Campanulaceae</b>	<i>Wahlenbergia denticulata</i> var. <i>denticulata</i>	(Burch.) A.DC.	LC	Indigenous
<b>Cyperaceae</b>	<i>Fuirena pubescens</i> var. <i>pubescens</i>	(Poir.) Kunth	LC	Indigenous
<b>Asparagaceae</b>	<i>Asparagus laricinus</i>	Burch.	LC	Indigenous
<b>Fabaceae</b>	<i>Vigna unguiculata</i> subsp. <i>stenophylla</i>	(L.) Walp.	LC	Indigenous
<b>Convolvulaceae</b>	<i>Convolvulus thunbergii</i>	Roem. & Schult.	LC	Indigenous
<b>Poaceae</b>	<i>Urelytrum agropyroides</i>	(Hack.) Hack.	LC	Indigenous

Poaceae	<i>Fingerhuthia africana</i>	Lehm.	LC	Indigenous
Rubiaceae	<i>Anthospermum rigidum</i> subsp. <i>rigidum</i>	Eckl. & Zeyh.	LC	Indigenous
Rubiaceae	<i>Galium capense</i> subsp. <i>capense</i>	Thunb.	LC	Indigenous
Poaceae	<i>Panicum coloratum</i>	L.	LC	Indigenous
Poaceae	<i>Anthephora pubescens</i>	Nees	LC	Indigenous
Poaceae	<i>Heteropogon contortus</i>	(L.) Roem. & Schult.	LC	Indigenous
Fabaceae	<i>Ophrestia oblongifolia</i> var. <i>oblongifolia</i>	(E. Mey.) H.M.L. Forbes	LC	Indigenous
Fabaceae	<i>Vachellia karroo</i>	(Hayne) Banfi & Galasso	LC	Indigenous
Poaceae	<i>Tragus racemosus</i>	(L.) All.	LC	Indigenous
Apocynaceae	<i>Brachystelma foetidum</i>	Schltr.	LC	Indigenous
Polygalaceae	<i>Polygala rehmannii</i>	Chodat	LC	Indigenous
Lobeliaceae	<i>Cyphia stenopetala</i>	Diels	LC	Indigenous
Cyperaceae	<i>Cyperus marginatus</i>	Thunb.	LC	Indigenous
Poaceae	<i>Eragrostis chloromelas</i>	Steud.	LC	Indigenous
Lamiaceae	<i>Teucrium trifidum</i>	Retz.	LC	Indigenous
Poaceae	<i>Echinochloa holubii</i>	(Stapf) Stapf	LC	Indigenous
Rubiaceae	<i>Pygmaeothamnus zeyheri</i> var. <i>zeyheri</i>	(Sond.) Robyns	LC	Indigenous
Poaceae	<i>Aristida canescens</i> subsp. <i>canescens</i>	Henrard	LC	Indigenous
Fabaceae	<i>Indigofera heterotricha</i>	DC.	LC	Indigenous
Asteraceae	<i>Senecio</i> sp.			
Geraniaceae	<i>Monsonia burkeana</i>	Planch. ex Harv.	LC	Indigenous
Poaceae	<i>Elionurus muticus</i>	(Spreng.) Kunth	LC	Indigenous
Lamiaceae	<i>Plectranthus neochilus</i>	Schltr.	LC	Indigenous
Malvaceae	<i>Pavonia burchellii</i>	(DC.) R.A. Dyer	LC	Indigenous
Asphodelaceae	<i>Bulbine narcissifolia</i>	Salm-Dyck	LC	Indigenous
Fabaceae	<i>Erythrostemon gilliesii</i>	Klotzsch		Not indigenous; Naturalised; Invasive
Malvaceae	<i>Hermannia tomentosa</i>	(Turcz.) Schinz ex Engl.	LC	Indigenous
Poaceae	<i>Eragrostis micrantha</i>	Hack.	LC	Indigenous
Poaceae	<i>Phragmites australis</i>	(Cav.) Steud.	LC	Indigenous
Poaceae	<i>Eragrostis plana</i>	Nees	LC	Indigenous
Amaryllidaceae	<i>Crinum macowanii</i>	Baker	LC	Indigenous
Fabaceae	<i>Melilotus indicus</i>	(L.) All.	NE	Not indigenous; Naturalised; Invasive
Apocynaceae	<i>Gomphocarpus fruticosus</i> subsp. <i>fruticosus</i>	(L.) W.T. Aiton	LC	Indigenous
Poaceae	<i>Aristida congesta</i> subsp. <i>barbicollis</i>	Roem. & Schult.	LC	Indigenous
Lobeliaceae	<i>Lobelia thermalis</i>	Thunb.	LC	Indigenous
Euphorbiaceae	<i>Euphorbia inaequilatera</i>	Sond.	LC	Indigenous
Boraginaceae	<i>Cynoglossum lanceolatum</i>	Forssk.	LC	Indigenous

<b>Commelinaceae</b>	<i>Commelina africana</i> var. <i>krebsiana</i>	L.	LC	Indigenous
<b>Poaceae</b>	<i>Chloris virgata</i>	Sw.	LC	Indigenous
<b>Rubiaceae</b>	<i>Rubia petiolaris</i>	DC.	LC	Indigenous
<b>Asteraceae</b>	<i>Gnaphalium filagopsis</i>	Hilliard & B.L. Burtt	LC	Indigenous
<b>Poaceae</b>	<i>Digitaria eriantha</i>	Steud.	LC	Indigenous
<b>Asteraceae</b>	<i>Dicoma anomala</i> subsp. <i>gerrardii</i>	Sond.	LC	Indigenous
<b>Crassulaceae</b>	<i>Crassula lanceolata</i> subsp. <i>transvaalensis</i>	(Eckl. & Zeyh.) Endl. ex Walp.	LC	Indigenous
<b>Poaceae</b>	<i>Eragrostis trichophora</i>	Coss. & Durieu	LC	Indigenous
<b>Cucurbitaceae</b>	<i>Coccinia sessilifolia</i>	(Sond.) Cogn.	LC	Indigenous
<b>Poaceae</b>	<i>Setaria</i> sp.			
<b>Onagraceae</b>	<i>Epilobium hirsutum</i>	L.	LC	Indigenous
<b>Asteraceae</b>	<i>Nolletia ciliaris</i>	(DC.) Steetz	LC	Indigenous
<b>Elatinaceae</b>	<i>Bergia decumbens</i>	Planch. ex Harv.	LC	Indigenous
<b>Rhamnaceae</b>	<i>Ziziphus mucronata</i> subsp. <i>mucronata</i>	Willd.	LC	Indigenous
<b>Malvaceae</b>	<i>Sida cordifolia</i> subsp. <i>cordifolia</i>	L.	LC	Indigenous
<b>Asteraceae</b>	<i>Geigeria burkei</i> subsp. <i>burkei</i>	Harv.	NE	Indigenous
<b>Nyctaginaceae</b>	<i>Commicarpus pentandrus</i>	(Burch.) Heimerl	LC	Indigenous
<b>Asteraceae</b>	<i>Geigeria burkei</i> subsp. <i>burkei</i>	Harv.	NE	Indigenous
<b>Poaceae</b>	<i>Aristida scabrivalvis</i> subsp. <i>scabrivalvis</i>	Hack.	LC	Indigenous
<b>Asteraceae</b>	<i>Berkheya pinnatifida</i> subsp. <i>stobaeoides</i>	(Thunb.) Thell.	LC	Indigenous
<b>Zygophyllaceae</b>	<i>Tribulus terrestris</i>	L.	LC	Indigenous
<b>Amaranthaceae</b>	<i>Aerva leucura</i>	Moq.	LC	Indigenous
<b>Caryophyllaceae</b>	<i>Pollichia campestris</i>	Aiton	LC	Indigenous
<b>Poaceae</b>	<i>Trachypogon spicatus</i>	(L.f.) Kuntze	LC	Indigenous
<b>Poaceae</b>	<i>Setaria nigrirostris</i>	(Nees) T. Durand & Schinz	LC	Indigenous
<b>Solanaceae</b>	<i>Solanum campylacanthum</i>	Hochst. ex A. Rich.		Indigenous
<b>Cyperaceae</b>	<i>Bulbostylis burchellii</i>	(Ficalho & Hiern) C.B. Clarke	LC	Indigenous
<b>Verbenaceae</b>	<i>Lippia scaberrima</i>	Sond.	LC	Indigenous
<b>Convolvulaceae</b>	<i>Ipomoea oblongata</i>	E. Mey. ex Choisy	LC	Indigenous
<b>Poaceae</b>	<i>Triraphis schinzii</i>	Hack.	LC	Indigenous
<b>Scrophulariaceae</b>	<i>Selago densiflora</i>	Rolfe	LC	Indigenous



## 10.2 Appendix B – Amphibian species expected to occur in the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
<i>Amietia delalandii</i>	Delalande's River Frog	LC	Unlisted
<i>Amietia fuscigula</i>	Cape River Frog	LC	LC
<i>Breviceps adspersus</i>	Bushveld Rain Frog	LC	LC
<i>Cacosternum boettgeri</i>	Common Caco	LC	LC
<i>Kassina senegalensis</i>	Bubbling Kassina	LC	LC
<i>Phrynobatrachus natalensis</i>	Snoring Puddle Frog	LC	LC
<i>Phrynomantis bifasciatus</i>	Banded Rubber Frog	LC	LC
<i>Ptychadena anchietae</i>	Plain Grass Frog	LC	LC
<i>Pyxicephalus adspersus</i>	Giant Bullfrog	NT	LC
<i>Schismaderma carens</i>	African Red Toad	LC	LC
<i>Sclerophrys capensis</i>	Raucous Toad	LC	LC
<i>Sclerophrys garmani</i>	Olive Toad	LC	LC
<i>Sclerophrys gutturalis</i>	Guttural Toad	LC	LC
<i>Sclerophrys poweri</i>	Power's Toad	LC	LC
<i>Strongylopus fasciatus</i>	Striped Stream Frog	LC	LC
<i>Tomopterna cryptotis</i>	Tremelo Sand Frog	LC	LC
<i>Tomopterna natalensis</i>	Natal Sand Frog	LC	LC
<i>Tomopterna tandyi</i>	Tandy's Sand Frog	LC	LC
<i>Xenopus laevis</i>	Common Platanna	LC	LC

### 10.3 Appendix C – Reptile species expected to occur in the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
<i>Acontias gracilicauda</i>	Thin-tailed Legless Skink	LC	LC
<i>Afrotyphlops bibronii</i>	Bibron's Blind Snake	LC	LC
<i>Agama aculeata distanti</i>	Eastern Ground Agama	LC	LC
<i>Agama atra</i>	Southern Rock Agama	LC	LC
<i>Aparallactus capensis</i>	Black-headed Centipede-eater	LC	LC
<i>Bitis arietans arietans</i>	Puff Adder	LC	Unlisted
<i>Boaedon capensis</i>	Brown House Snake	LC	LC
<i>Causus rhombeatus</i>	Rhombic Night Adder	LC	LC
<i>Chamaeleo dilepis</i>	Common Flap-neck Chameleon	LC	LC
<i>Cordylus vittifer</i>	Common Girdled Lizard	LC	LC
<i>Crotaphopeltis hotamboeia</i>	Red-lipped Snake	LC	Unlisted
<i>Dasypeltis scabra</i>	Rhombic Egg-eater	LC	LC
<i>Gerrhosaurus flavigularis</i>	Yellow-throated Plated Lizard	LC	Unlisted
<i>Hemachatus haemachatus</i>	Rinkhals	LC	LC
<i>Hemidactylus mabouia</i>	Common Tropical House Gecko	LC	Unlisted
<i>Kinixys lobatsiana</i>	Lobatse hinged-back Tortoise	LC	LC
<i>Lamprophis aurora</i>	Aurora House Snake	LC	LC
<i>Leptotyphlops scutifrons scutifrons</i>	Peters' Thread Snake	LC	Unlisted
<i>Lycodonomorphus rufulus</i>	Brown Water Snake	LC	Unlisted
<i>Lycophidion capense capense</i>	Cape Wolf Snake	LC	Unlisted
<i>Lygodactylus capensis</i>	Common Dwarf Gecko	LC	Unlisted
<i>Monopeltis capensis</i>	Cape Worm Lizard	LC	LC
<i>Naja nivea</i>	Cape Cobra	LC	Unlisted
<i>Nucras holubi</i>	Holub's Sandveld Lizard	LC	Unlisted
<i>Pachydactylus capensis</i>	Cape Gecko	LC	Unlisted
<i>Panaspis wahlbergi</i>	Wahlberg's Snake-eyed Skink	LC	Unlisted
<i>Pelomedusa galeata</i>	South African Marsh Terrapin	Not evaluated	Unlisted
<i>Prosymna ambigua</i>	Angolan Shovel-snout	Unlisted	LC
<i>Prosymna sundevallii</i>	Sundevall's Shovel-snout	LC	LC
<i>Psammophis brevirostris</i>	Short-snouted Grass Snake	LC	Unlisted
<i>Psammophis trinasalis</i>	Fork-marked Sand Snake	LC	Unlisted
<i>Psammophylax rhombeatus</i>	Spotted Grass Snake	LC	Unlisted
<i>Psammophylax tritaeniatus</i>	Striped Grass Snake	LC	LC
<i>Pseudaspis cana</i>	Mole Snake	LC	Unlisted
<i>Rhinotyphlops lalandei</i>	Delalande's Beaked Blind Snake	LC	Unlisted
<i>Stigmochelys pardalis</i>	Leopard Tortoise	LC	LC

<i>Trachylepis capensis</i>	Cape Skink	LC	Unlisted
<i>Trachylepis punctatissima</i>	Speckled Rock Skink	LC	LC
<i>Trachylepis punctulata</i>	Speckled Sand Skink	LC	Unlisted
<i>Trachylepis varia</i>	Variable Skink	LC	LC
<i>Varanus albigularis albigularis</i>	Southern Rock Monitor	LC	Unlisted
<i>Varanus niloticus</i>	Water Monitor	LC	Unlisted

#### 10.4 Appendix D – Mammal species expected to occur within the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
<i>Aethomys ineptus</i>	Tete Veld Rat	LC	LC
<i>Aethomys namaquensis</i>	Namaqua rock rat	LC	LC
<i>Aonyx capensis</i>	Cape Clawless Otter	NT	NT
<i>Atelerix frontalis</i>	South Africa Hedgehog	NT	LC
<i>Atilax paludinosus</i>	Water Mongoose	LC	LC
<i>Canis mesomelas</i>	Black-backed Jackal	LC	LC
<i>Caracal caracal</i>	Caracal	LC	LC
<i>Crocidura cyanea</i>	Reddish-grey Musk Shrew	LC	LC
<i>Crocidura mariquensis</i>	Swamp Musk Shrew	NT	LC
<i>Cynictis penicillata</i>	Yellow Mongoose	LC	LC
<i>Dendromus melanotis</i>	Grey Climbing Mouse	LC	LC
<i>Desmodillus auricularis</i>	Short-tailed Gerbil	LC	LC
<i>Elephantulus brachyrhynchus</i>	Short-snouted Sengi	LC	LC
<i>Elephantulus myurus</i>	Eastern Rock Sengi	LC	LC
<i>Eptesicus hottentotus</i>	Long-tailed Serotine Bat	LC	LC
<i>Felis nigripes</i>	Black-footed Cat	VU	VU
<i>Felis silvestris</i>	African Wildcat	LC	LC
<i>Genetta genetta</i>	Small-spotted Genet	LC	LC
<i>Gerbilliscus brantsii</i>	Highveld Gerbil	LC	LC
<i>Gerbilliscus leucogaster</i>	Bushveld Gerbil	LC	LC
<i>Gerbillurus paeba</i>	Hairy-footed Gerbil	LC	LC
<i>Graphiurus microtis</i>	Large Savanna African Dormouse	LC	LC
<i>Herpestes sanguineus</i>	Slender Mongoose	LC	LC
<i>Hydrictis maculicollis</i>	Spotted-necked Otter	VU	NT
<i>Hystrix africae australis</i>	Cape Porcupine	LC	LC
<i>Ichneumia albicauda</i>	White-tailed Mongoose	LC	LC
<i>Ictonyx striatus</i>	Striped Polecat	LC	LC

<i>Lemniscomys rosalia</i>	Single-striped Mouse	LC	LC
<i>Lepus capensis</i>	Cape Hare	LC	LC
<i>Lepus saxatilis</i>	Scrub Hare	LC	LC
<i>Lepus victoriae</i>	African Savanna Hare	LC	LC
<i>Malacothrix typica</i>	Gerbil Mouse	LC	LC
<i>Mastomys coucha</i>	Multimammate Mouse	LC	LC
<i>Mellivora capensis</i>	Honey Badger	LC	LC
<i>Mungos mungo</i>	Banded Mongoose	LC	LC
<i>Mus indutus</i>	Desert Pygmy Mouse	LC	LC
<i>Mus musculus</i>	House Mouse	Unlisted	LC
<i>Mystromys albicaudatus</i>	White-tailed Rat	VU	EN
<i>Neoromicia capensis</i>	Cape Serotine Bat	LC	LC
<i>Nycteris thebaica</i>	Egyptian Slit-faced Bat	LC	LC
<i>Orycteropus afer</i>	Aardvark	LC	LC
<i>Otocyon megalotis</i>	Bat-eared Fox	LC	LC
<i>Panthera pardus</i>	Leopard	VU	VU
<i>Papio ursinus</i>	Chacma Baboon	LC	LC
<i>Parahyaena brunnea</i>	Brown Hyaena	NT	NT
<i>Pedetes capensis</i>	Springhare	LC	LC
<i>Phacochoerus africanus</i>	Common Warthog	LC	LC
<i>Poecilogale albinucha</i>	African Striped Weasel	NT	LC
<i>Procavia capensis</i>	Rock Hyrax	LC	LC
<i>Proteles cristata</i>	Aardwolf	LC	LC
<i>Raphicerus campestris</i>	Steenbok	LC	LC
<i>Rattus rattus</i>	House Rat	Exotic (Not listed)	LC
<i>Rhabdomys pumilio</i>	Xeric Four-striped Mouse	LC	LC
<i>Rhinolophus clivosus</i>	Geoffroy's Horseshoe Bat	LC	LC
<i>Rhinolophus darlingi</i>	Darling's Horseshoe Bat	LC	LC
<i>Saccostomus campestris</i>	Pouched Mouse	LC	LC
<i>Sauromys petrophilus</i>	Flat-headed Free-tail Bat	LC	LC
<i>Scotophilus dinganii</i>	Yellow House Bat	LC	LC
<i>Smutsia temminckii</i>	Temminck's Ground Pangolin	VU	VU
<i>Steatomys krebsii</i>	Krebs's Fat Mouse	LC	LC
<i>Steatomys pratensis</i>	Fat Mouse	LC	LC
<i>Suncus varilla</i>	Lesser Dwarf Shrew	LC	LC
<i>Suricata suricatta</i>	Suricate	LC	LC
<i>Sylvicapra grimmia</i>	Common Duiker	LC	LC
<i>Tadarida aegyptiaca</i>	Egyptian Free-tailed Bat	LC	LC
<i>Thallomys paedulus</i>	Tree Rat	LC	LC

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<i>Vulpes chama</i>	Cape Fox	LC	LC
<i>Xerus inauris</i>	Cape Ground Squirrel	LC	LC

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## 10.5 Appendix E – Protocol Checklist

“Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Terrestrial Biodiversity” gazetted 20 March 2020, published in Government Notice No. 320

Paragraph	Item	Section	Comment
2.1	The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of terrestrial biodiversity.	Page i	
2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint.	Section 1	
2.3.1	A description of the ecological drivers or processes of the system and how the proposed development will impact these.	Section 6 and 9	
2.3.2	Ecological functioning and ecological processes (e.g., fire, migration, pollination, etc.) that operate within the preferred site	Section 4 and 5	
2.3.3	The ecological corridors that the proposed development would impede including migration and movement of flora and fauna.	Section 5	
2.3.4	The description of any significant terrestrial landscape features (including rare or important flora-faunal associations, presence of strategic water source areas (SWSAs) or freshwater ecosystem priority area (FEPA) sub catchments.	Section 3	
2.3.5	A description of terrestrial biodiversity and ecosystems on the preferred site, including: (a) main vegetation types; (b) threatened ecosystems, including listed ecosystems as well as locally important habitat types identified.	Section 3.1.4 and 3.2.1	
2.3.6	The assessment must identify any alternative development footprints within the preferred site which would be of a “low” sensitivity as identified by the screening tool and verified through the site sensitivity verification.	Section -5.2	Site contains small portions of low sensitivity areas, however the majority of the area is medium.
2.3.7.1	Terrestrial Critical Biodiversity Areas (CBAs), including: (a) the reasons why an area has been identified as a CBA; (b) an indication of whether or not the proposed development is consistent with maintaining the CBA in a natural or near natural state or in achieving the goal of rehabilitation; (c) the impact on species composition and structure of vegetation with an indication of the extent of clearing activities in proportion to the remaining extent of the ecosystem type(s); (d) the impact on ecosystem threat status; (e) the impact on explicit subtypes in the vegetation; (f) the impact on overall species and ecosystem diversity of the site; and (g) the impact on any changes to threat status of populations of species of conservation concern in the CBA.	-	No CBAs recorded within the assessment area. only ESA areas

2.3.7.2	<p>Terrestrial ecological support areas (ESAs), including:</p> <p>(a) the impact on the ecological processes that operate within or across the site;</p> <p>(b) the extent the proposed development will impact on the functionality of the ESA; and</p> <p>(c) loss of ecological connectivity (on site, and in relation to the broader landscape) due to the degradation and severing of ecological corridors or introducing barriers that impede migration and movement of flora and fauna.</p>	Section 3.1.7 and Section 5	The project area traverses ESA 1 areas and these ESA 1 areas function as linkages/corridors (comprising of natural vegetation) between the important biodiversity areas and major freshwater resource and their fringing terrestrial habitats
2.3.7.3	<p>Protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including-</p> <p>(a) an opinion on whether the proposed development aligns with the objectives or purpose of the protected area and the zoning as per the protected area management plan.</p>	Section 3.1.5	
2.3.7.4	<p>Priority areas for protected area expansion, including-</p> <p>(a) the way in which in which the proposed development will compromise or contribute to the expansion of the protected area network.</p>	Section 3.1.6	
2.3.7.5	<p>SWSAs including:</p> <p>(a) the impact(s) on the terrestrial habitat of a SWSA; and</p> <p>(b) the impacts of the proposed development on the SWSA water quality and quantity (e.g. describing potential increased runoff leading to increased sediment load in water courses)</p>	Section 3.1.9-	
2.3.7.6	<p>FEPA sub catchments, including-</p> <p>(a) the impacts of the proposed development on habitat condition and species in the FEPA sub catchment</p>	Section 3.1.10	
2.3.7.7	<p>indigenous forests, including:</p> <p>(a) impact on the ecological integrity of the forest; and</p> <p>(b) percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.</p>	-	No forest habitats within the area
3.1.1.	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae.	Page i	
3.1.2	A signed statement of independence by the specialist.	Appendix F	
3.1.3	A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment.	Section 2	
3.1.4	A description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant.	Section 2	
3.1.5	A description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations.	Section 3	

3.1.6	A location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant).	-	No areas unsuitable for development identified
3.1.7	Additional environmental impacts expected from the proposed development.	Section 6	
3.1.8	Any direct, indirect and cumulative impacts of the proposed development.	Section 6	
3.1.9	The degree to which impacts and risks can be mitigated.	Section 7	
3.1.10	The degree to which the impacts and risks can be reversed.	Section 7	
3.1.11	The degree to which the impacts and risks can cause loss of irreplaceable resources.	Section 6.2.2	
3.1.12	Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr).	Section 7	
3.1.13	A motivation must be provided if there were development footprints identified as per paragraph 2.3.6 above that were identified as having a "low" terrestrial biodiversity sensitivity and that were not considered appropriate.	-	N/A
3.1.14	A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not;	Section 8.1.1	
3.1.15	any conditions to which this statement is subjected	Section 8	



## 10.6 Appendix F – Specialist Declaration of Independence

I, Andrew Husted, declare that:

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



Andrew Husted

Ecologist

The Biodiversity Company

April 2022

I, Lusanda Matee, declare that:

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



Lusanda Matee

Terrestrial Ecologist

The Biodiversity Company

April 2022