The Terrestrial Biodiversity Assessment for the proposed HillardiaSolar Photovoltaic (PV) Energy Generation Facility

Lichtenburg, North West Province

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CLIENT

Hillardia PV (Pty) Ltd

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Report Name	**The Terrestrial Biodiversity Assessment for the proposed HillardiaSolar Photovoltaic (PV) Energy Generation Facility**
Reference	**Houthaalboomen North PV Cluster**
Submitted to	Hillardia PV (Pty) Ltd
Report Writer	**Lusanda Matee** 
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Reviewer	**Andrew Husted** 
	Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant.
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.

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1 Introduction

1.1 Background

The Biodiversity Company was appointed to undertake 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 refered to as the 'project area'. The following information is as provided by the client:

The Applicant Hillardia PV (Pty) is proposing the construction of a photovoltaic (PV) solar energy facility (known as Hillardia 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*

Three 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 Hillardia PV (Pty). For the Hillardia 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 Hillardia PV facility substation (as well as the Verbena PV and Euphorbia 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 Houthaaldoorns 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; and
- 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

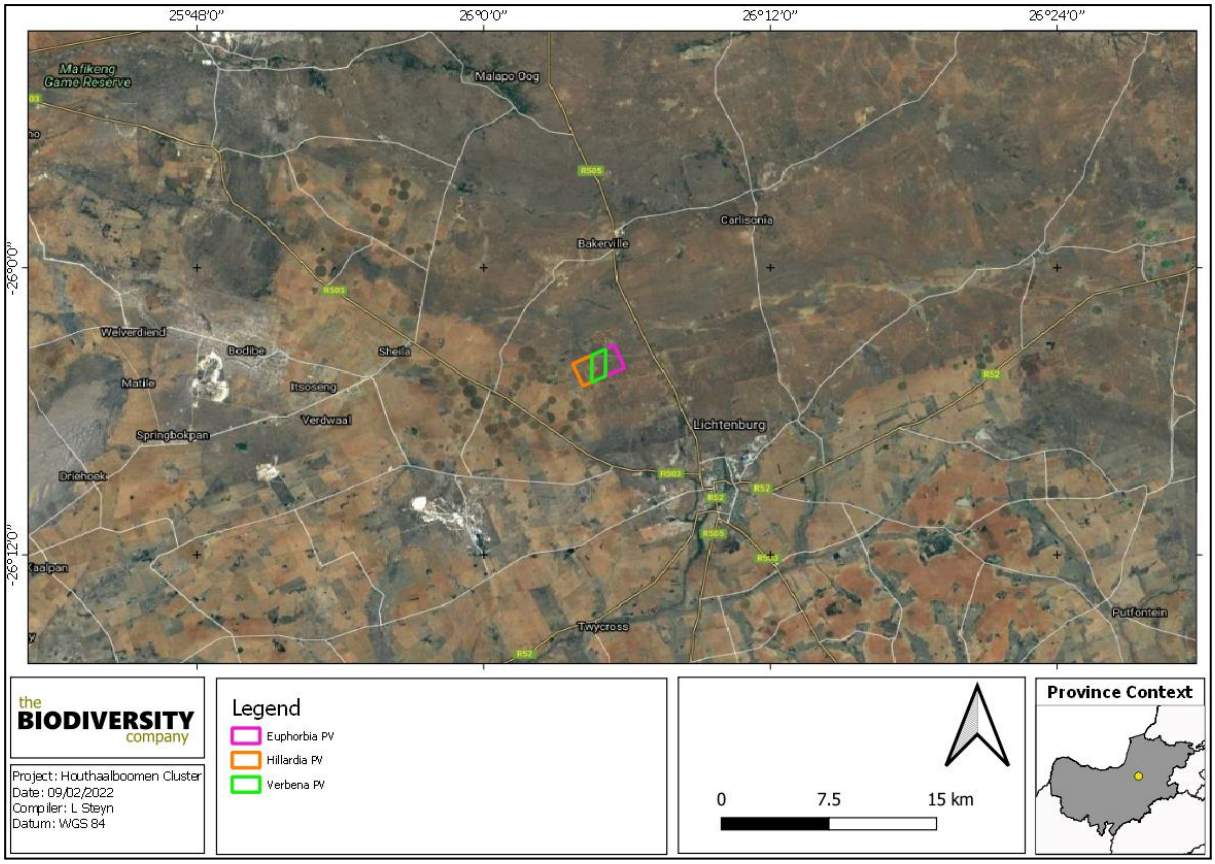

Figure 1-1 Map illustrating the location of the proposed Houthaalboomen North Cluster

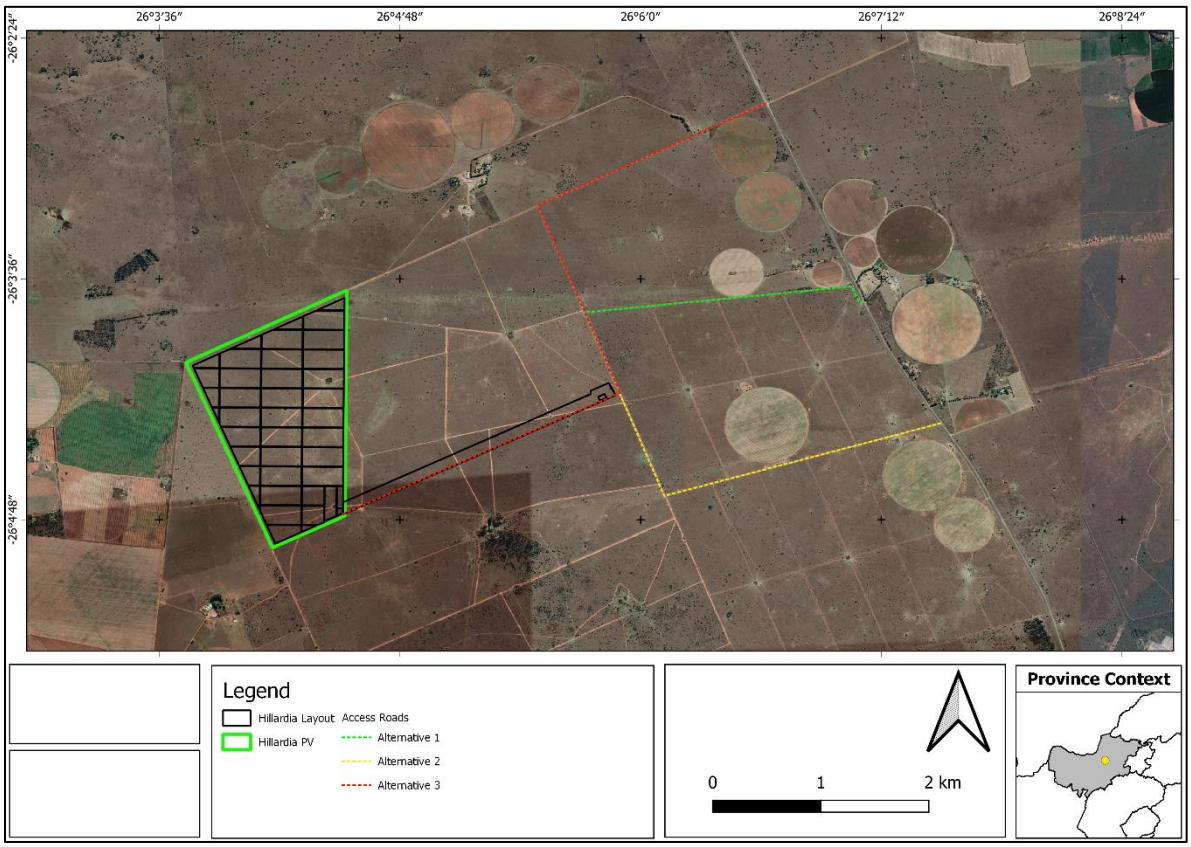

Figure 1-2 Map illustrating the location and specific components of the Hillardia PV.

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

	National Biodiversity Framework (NBF, 2009)
	National Forest Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)
	National Spatial Biodiversity Assessment (NSBA)
	World Heritage Convention Act (Act No. 49 of 1999)
	National Heritage Resources Act, 1999 (Act 25 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations, 2014
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
	White Paper on Biodiversity
Provincial	North-West Biodiversity Sector Plan of 2015 (READ, 2015).
	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 14th till the 18th 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 area.

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), 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
Very High	Confirmed or highly likely occurrence of Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Extremely Rare or CR species that have a global extent of occurrence (EOO) of < 10 km^2. Any area of natural habitat of a CR ecosystem type or large area (> 0.1% of the total ecosystem type extent) of natural habitat of an EN ecosystem type. Globally significant populations of congregatory species (> 10% of global population).
High	Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^2. IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. If listed as threatened only under Criterion A, include if there are less than 10 locations or < 10 000 mature individuals remaining. Small area (> 0.01% but < 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (> 0.1%) of natural habitat of VU ecosystem type. Presence of Rare species.

	Globally significant populations of congregatory species (> 1% but < 10% of global population).
Medium	Confirmed or highly likely occurrence of populations of Near Threatened (NT) species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. Any area of natural habitat of threatened ecosystem type with status of VU. Presence of range-restricted species. > 50% of receptor contains natural habitat with potential to support SCC.
Low	No confirmed or highly likely populations of SCC. No confirmed or highly likely populations of range-restricted species. < 50% of receptor contains natural habitat with limited potential to support SCC.
Very Low	No confirmed and highly unlikely populations of SCC. No confirmed and highly unlikely populations of range-restricted species. No natural habitat remaining.

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

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

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

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

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

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

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

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

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

Table 2-5 Matrix used to derive Site Ecological Importance (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
Very High	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e., last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted, limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very Low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

The SEI evaluated for each taxon can be combined into a single multi-taxon evaluation of SEI for the assessment area. Either a combination of the maximum SEI for each receptor should be applied, or the SEI may be evaluated only once per receptor but for all necessary taxa

simultaneously. For the latter, justification of the SEI for each receptor is based on the criteria that conforms to the highest CI and FI, and the lowest RR across all taxa.

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
Renewable Energy Database	Adjacent to project "In Process" with several projects in the area "approved"	3.1.1
Renewable Energy Development Zones	The project area is approximately 68 km from the Klerksdorp REDZ (REDZ 10) area	3.1.1.1
Ecosystem Threat Status	Relevant – Located within a Least Concerned ecosystem	3.1.2.1
Ecosystem Protection Level	Relevant: The project area falls in a "Poorly Protected" area.	3.1.2.2
National Threatened Ecosystem	Irrelevant- The project area does not traverse any threatened ecosystem.	-
Protected Areas	Irrelevant: Located 5.4 km from the Marico Biosphere Reserve	-
National Protected Areas Expansion Strategy	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
Critical Biodiversity Area	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
Important Bird and Biodiversity Areas	Irrelevant: No Important Bird and Biodiversity Areas (IBAs) are situated within the project area.	-
South African Inventory of Inland Aquatic Ecosystems	Relevant – The project area is approximately 10km away from a CR watercourse that is also considered poorly protected. The closest wetland is approximately 1.7 km away.	3.1.1
National Freshwater Priority Area	Irrelevant: No NFEPA designated to the associated SQR and no NFEPA wetlands were found within the 500 m regulation area.	3.1.4
Strategic Water Source Areas	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.	-
Vegetation Type	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.

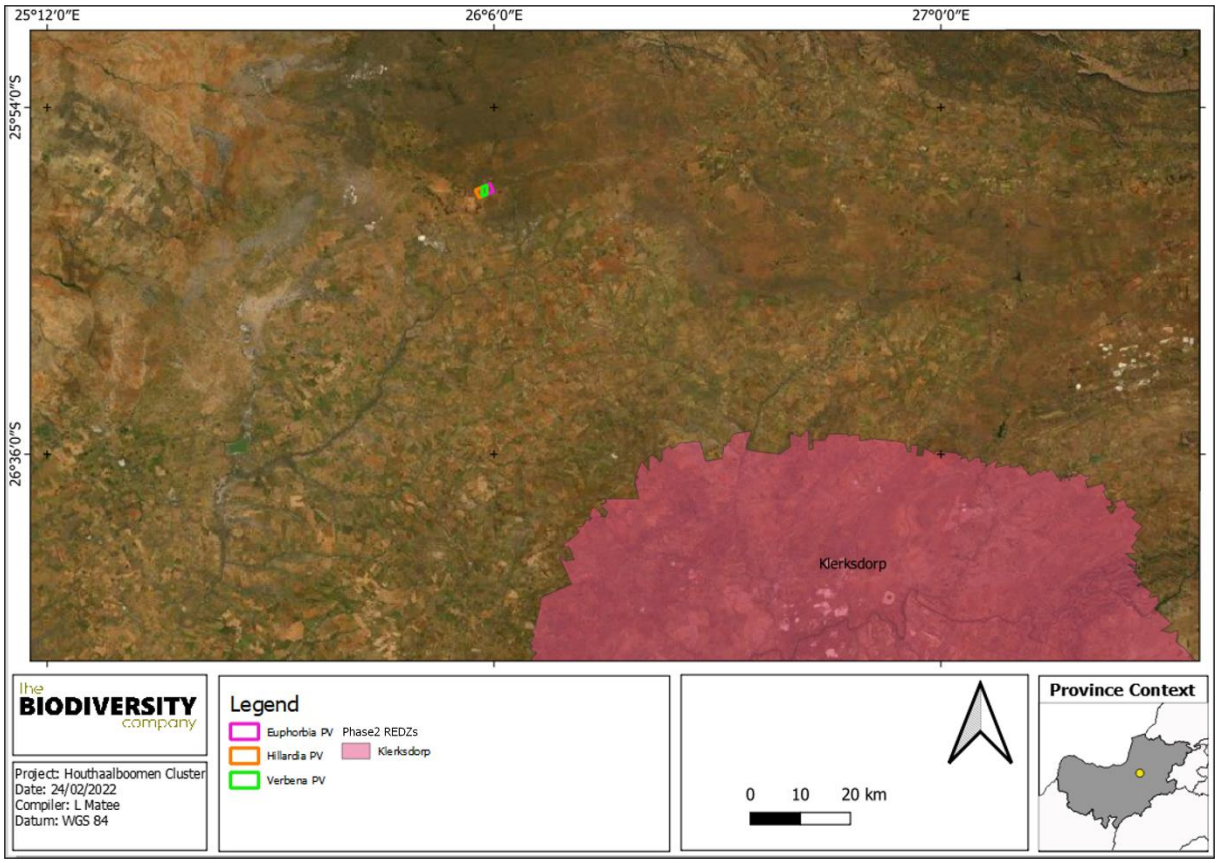

Figure 3-1 The project area in relation to the Renewable Energy Development Zone

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 uncrtain. The proposed developments are all solar PV developments.

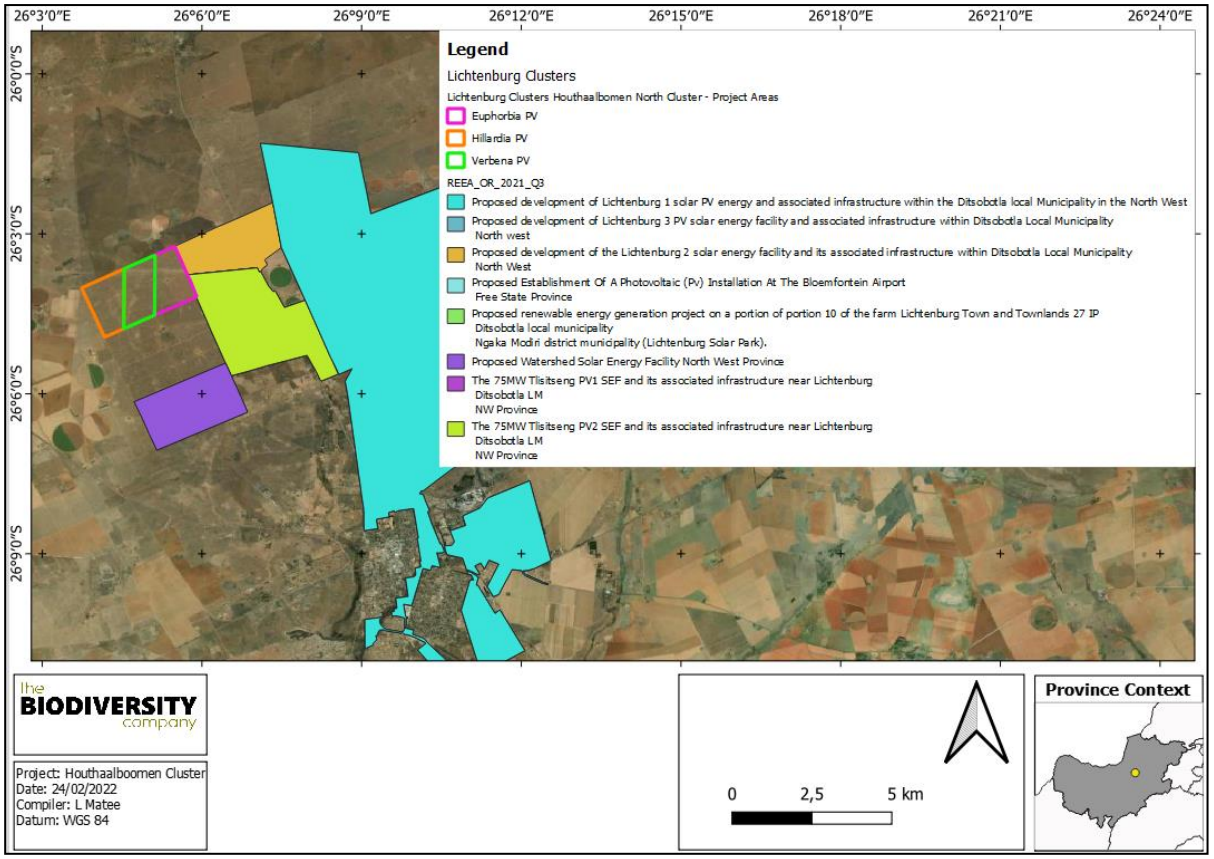

Figure 3-2 The project area in relation to the renewable energy database projects in the area

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).

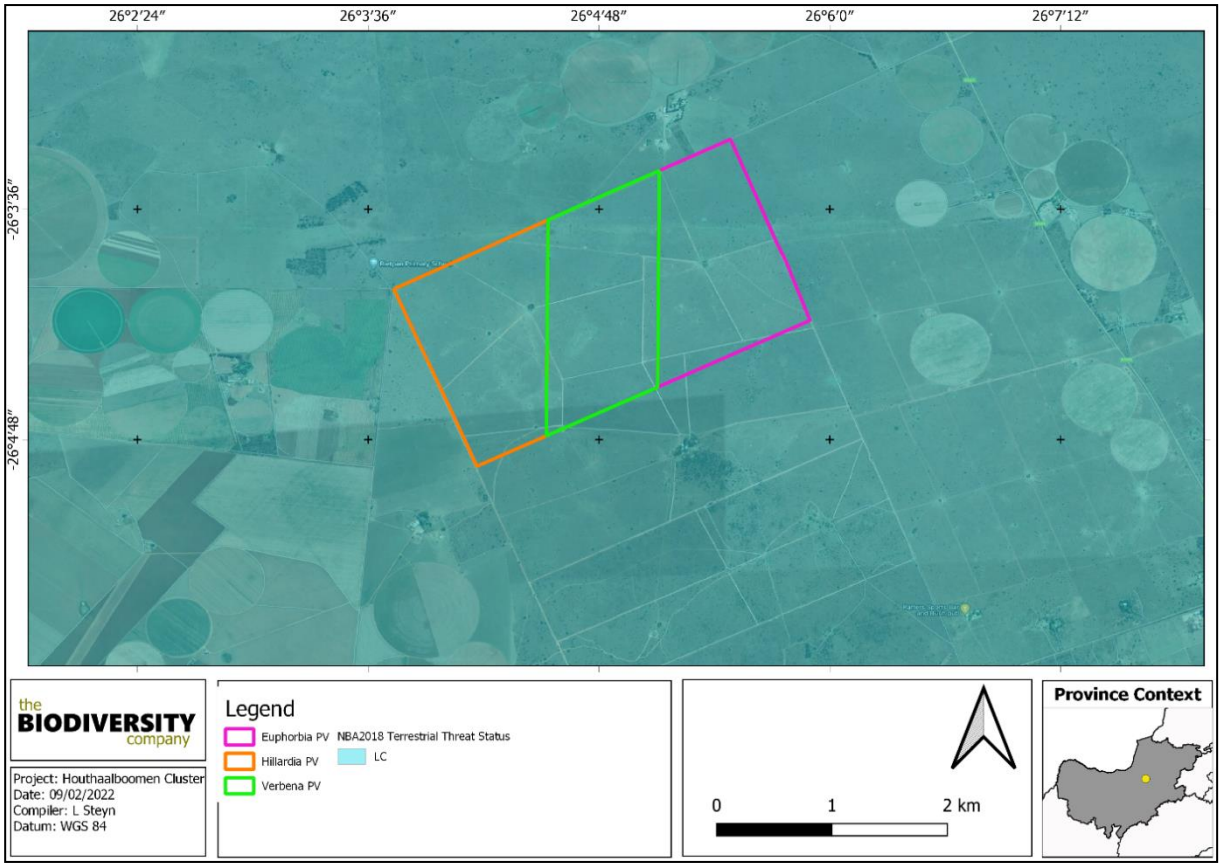

Figure 3-3 Map illustrating the ecosystem threat status associated with the assessment area

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).

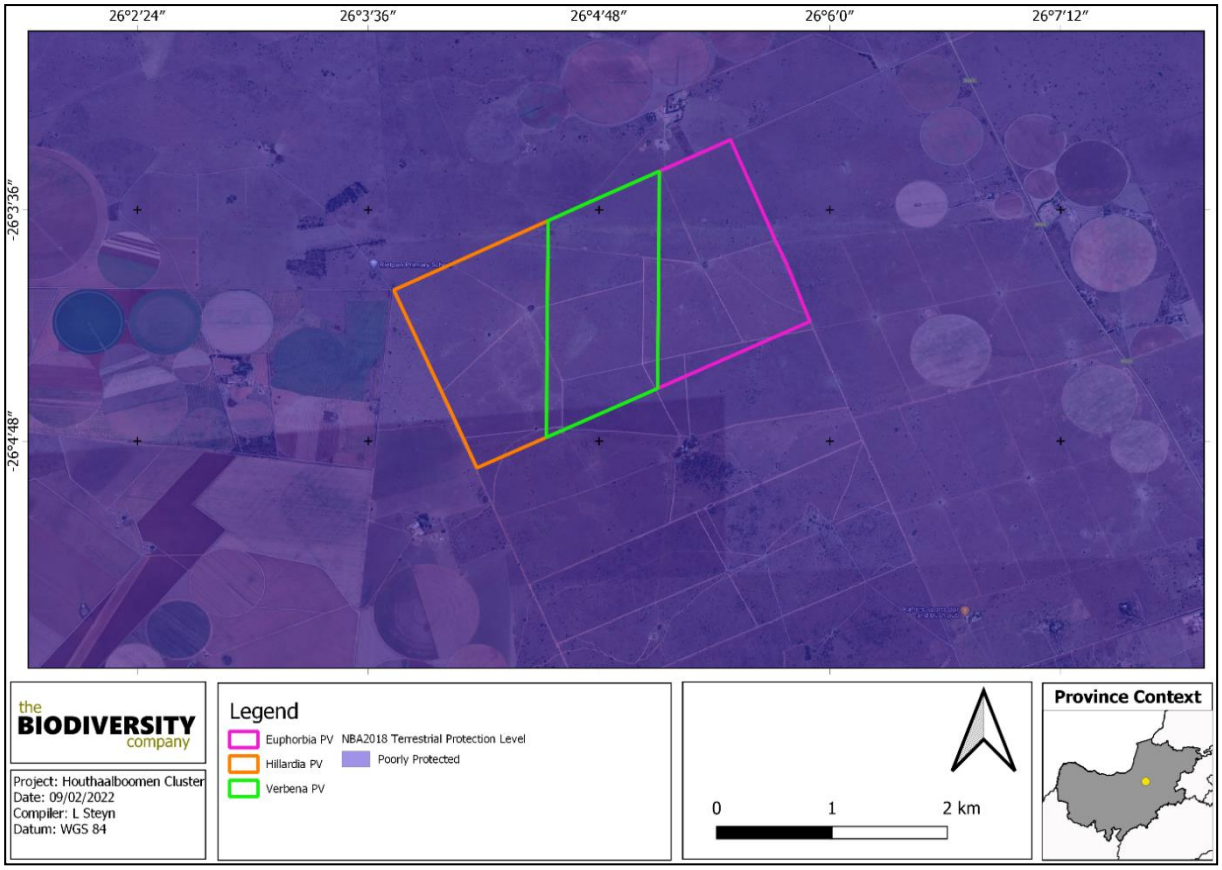

Figure 3-4 Map illustrating the ecosystem protection level associated with assessment area

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

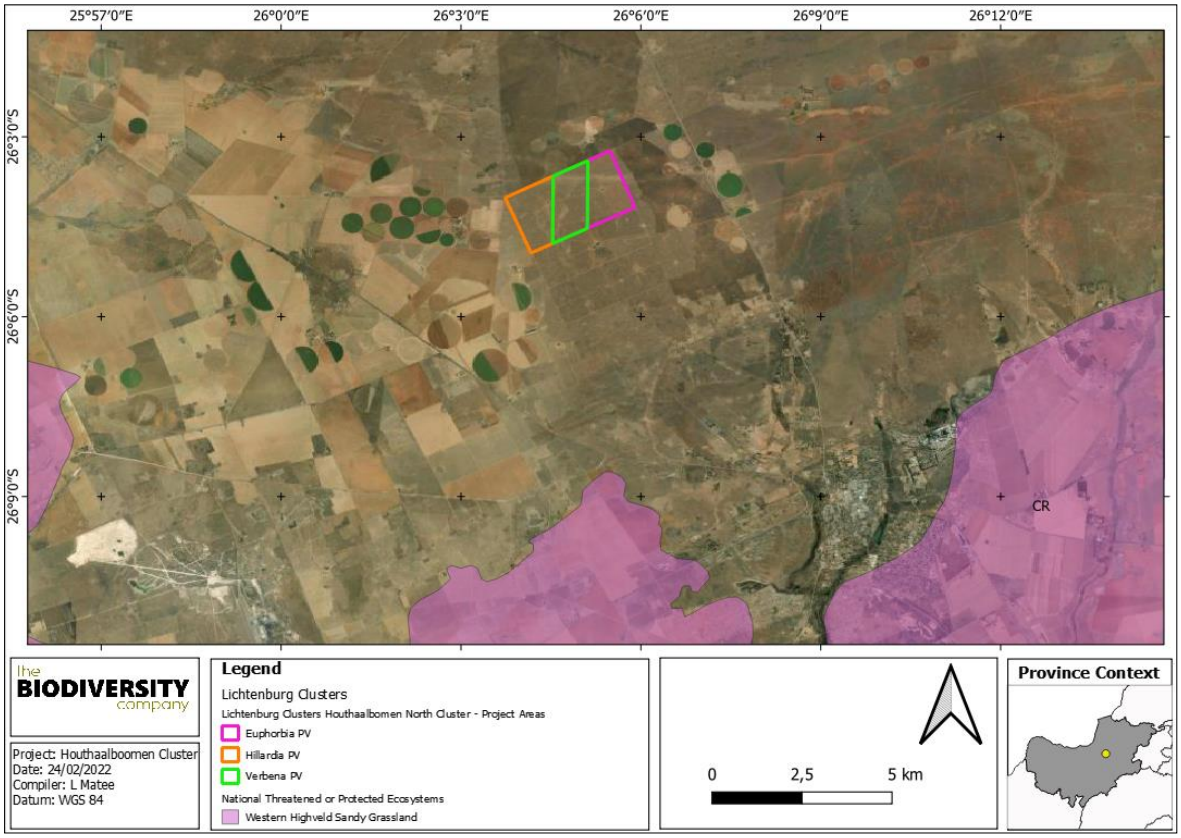

Figure 3-5 Map illustrating the locations of National Threatened Ecosystems proximal to the Data Centre project area.

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).

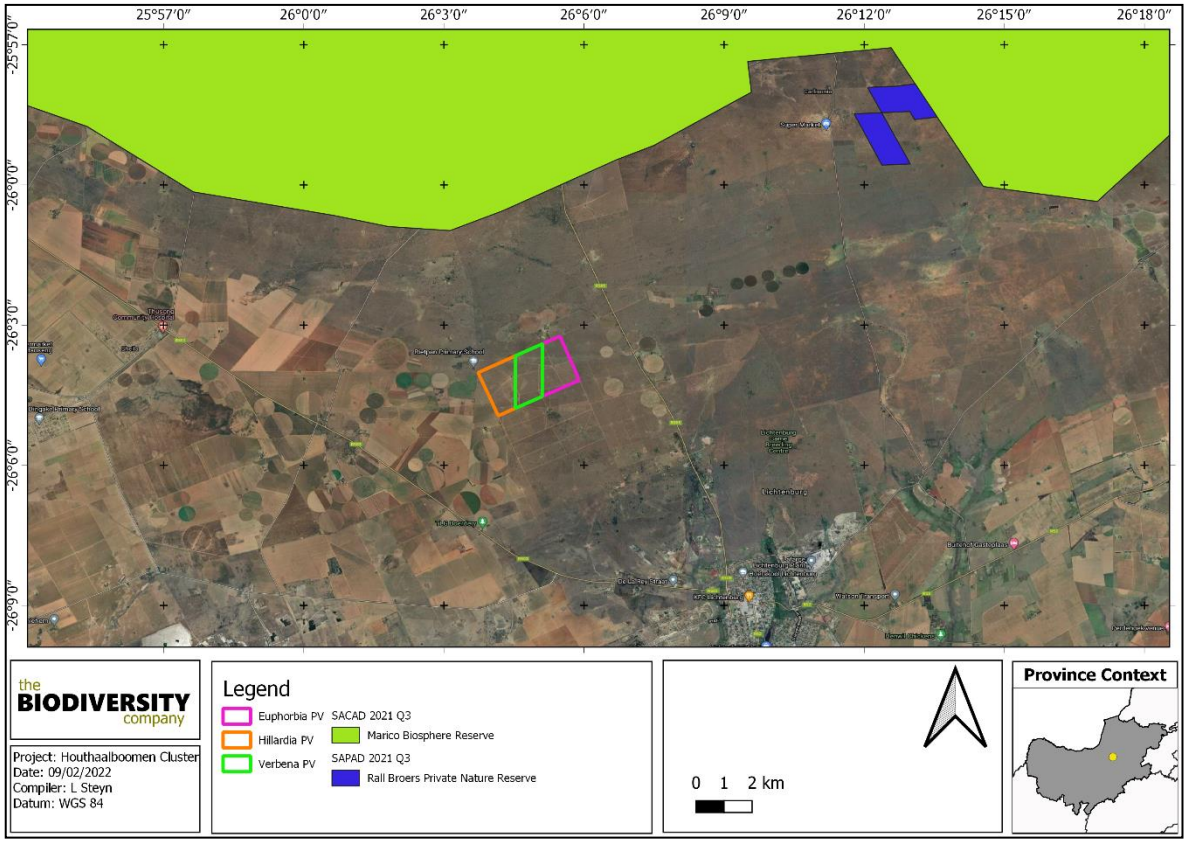

Figure 3-6 Map illustrating the location of protected areas proximal to the assessment area

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.

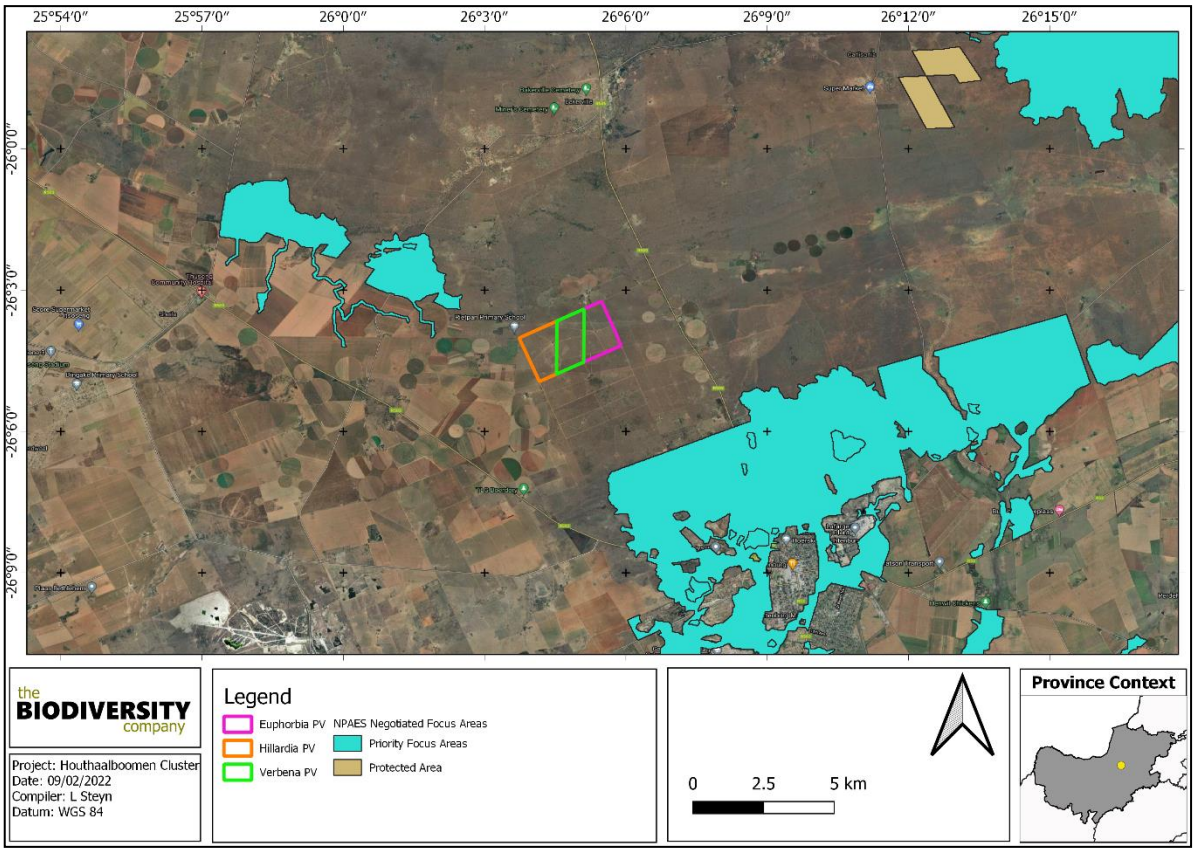

Figure 3-7 Map illustrating the location of NPAES proximal to the assessment area

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).

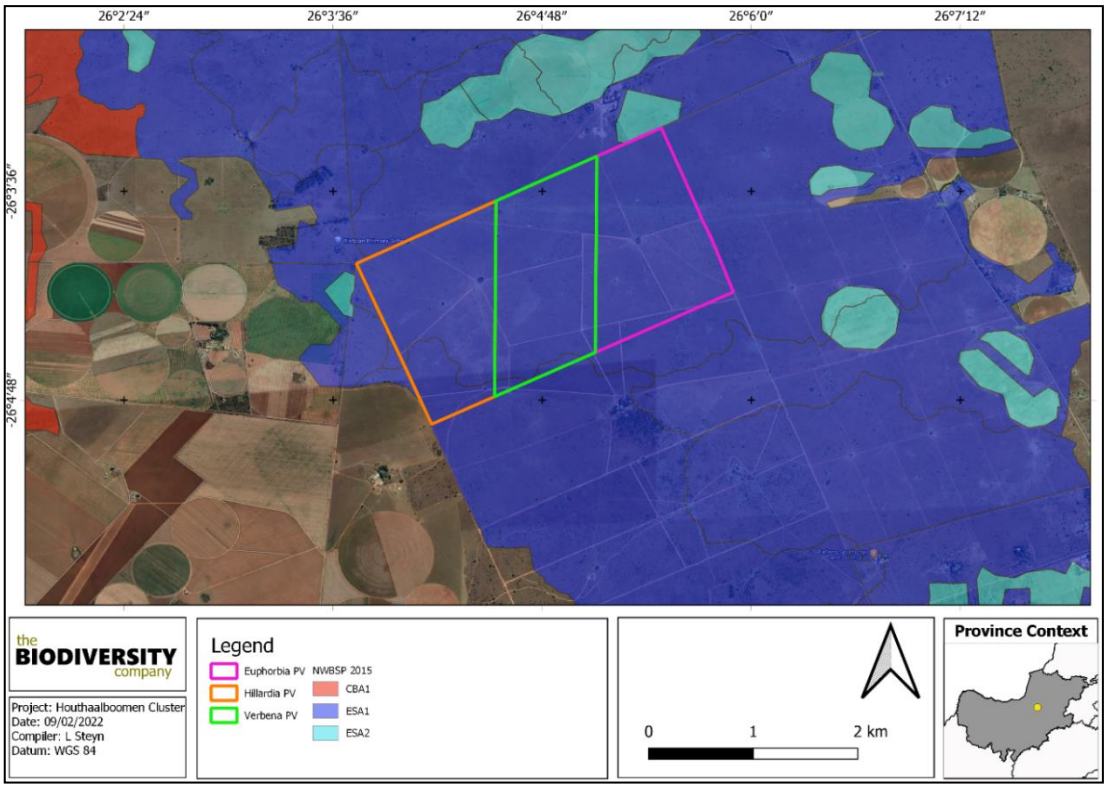

Figure 3-8 Map illustrating the Terrestrial Ecological Support Areas associated with the assessment area

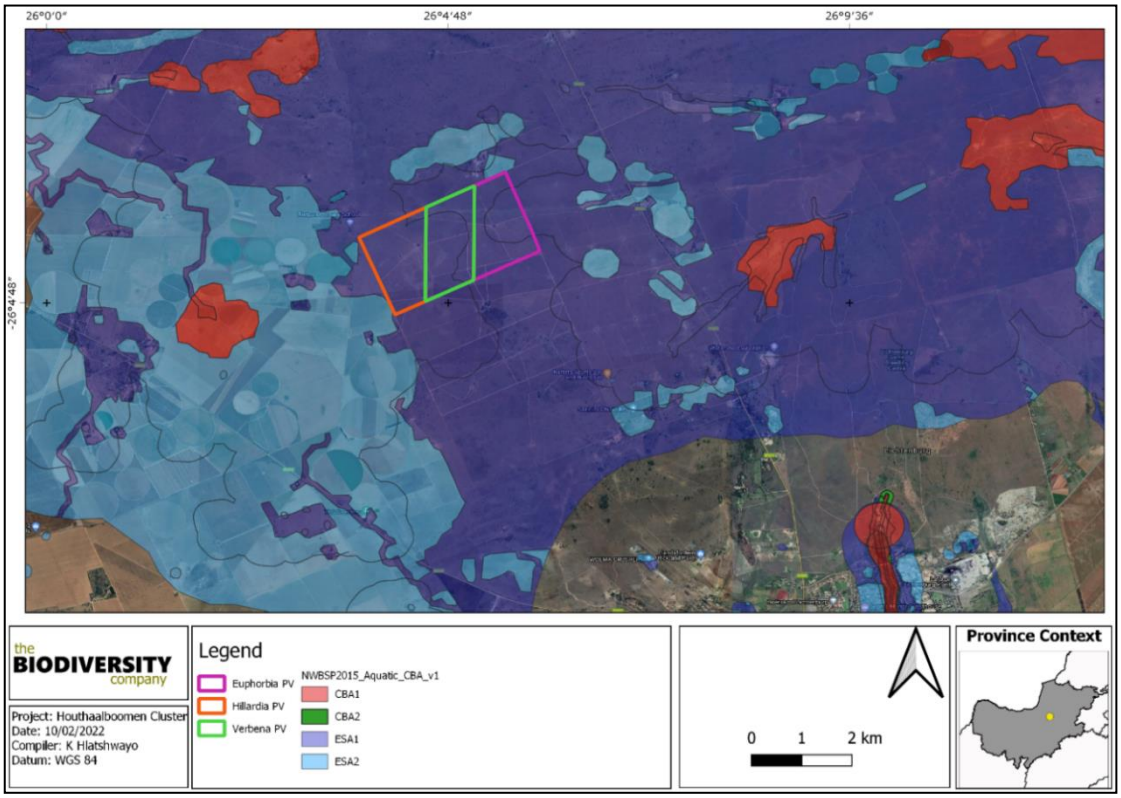

Figure 3-9 Map illustrating the aquatic Ecological Support Areas associated with the assessment area

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).

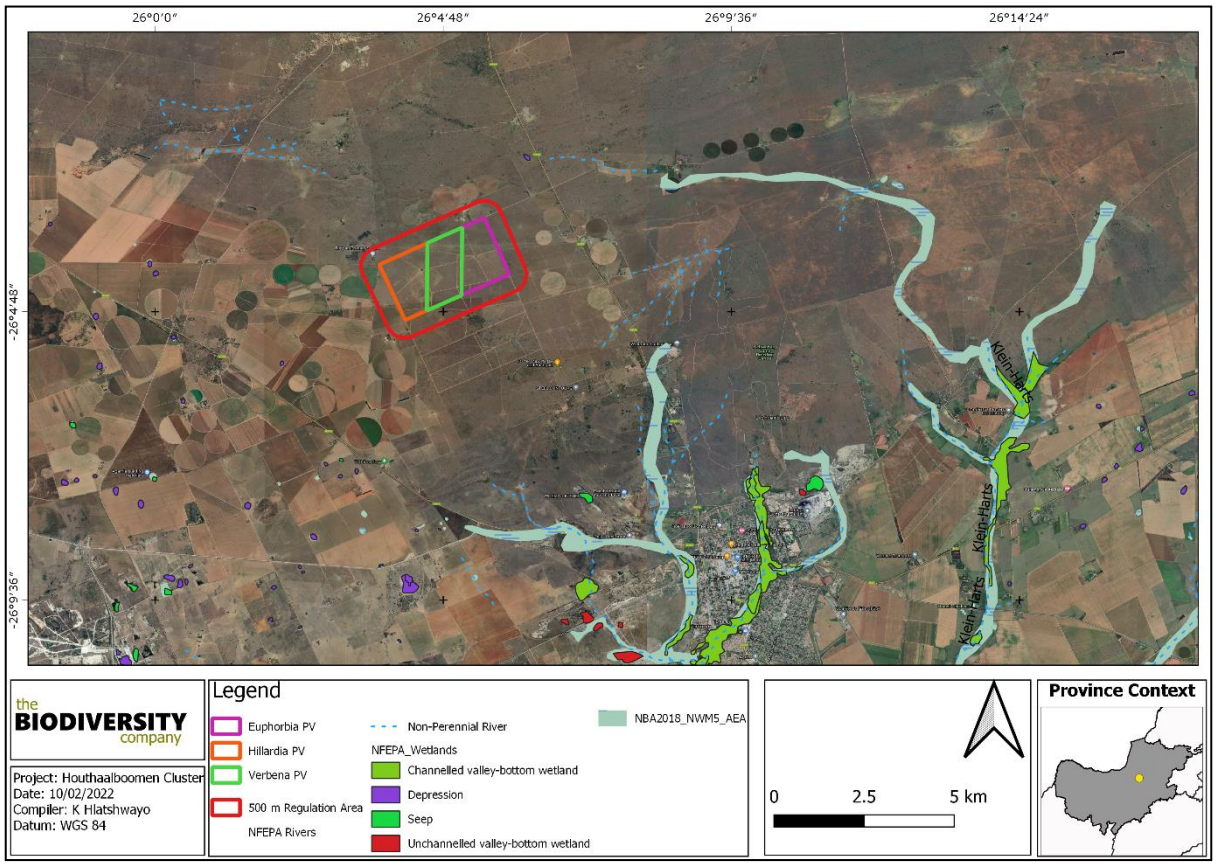

Figure 3-10 Map illustrating wetlands associated with the project area (NBA, 2018 and NFEPA wetland, 2011)

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.

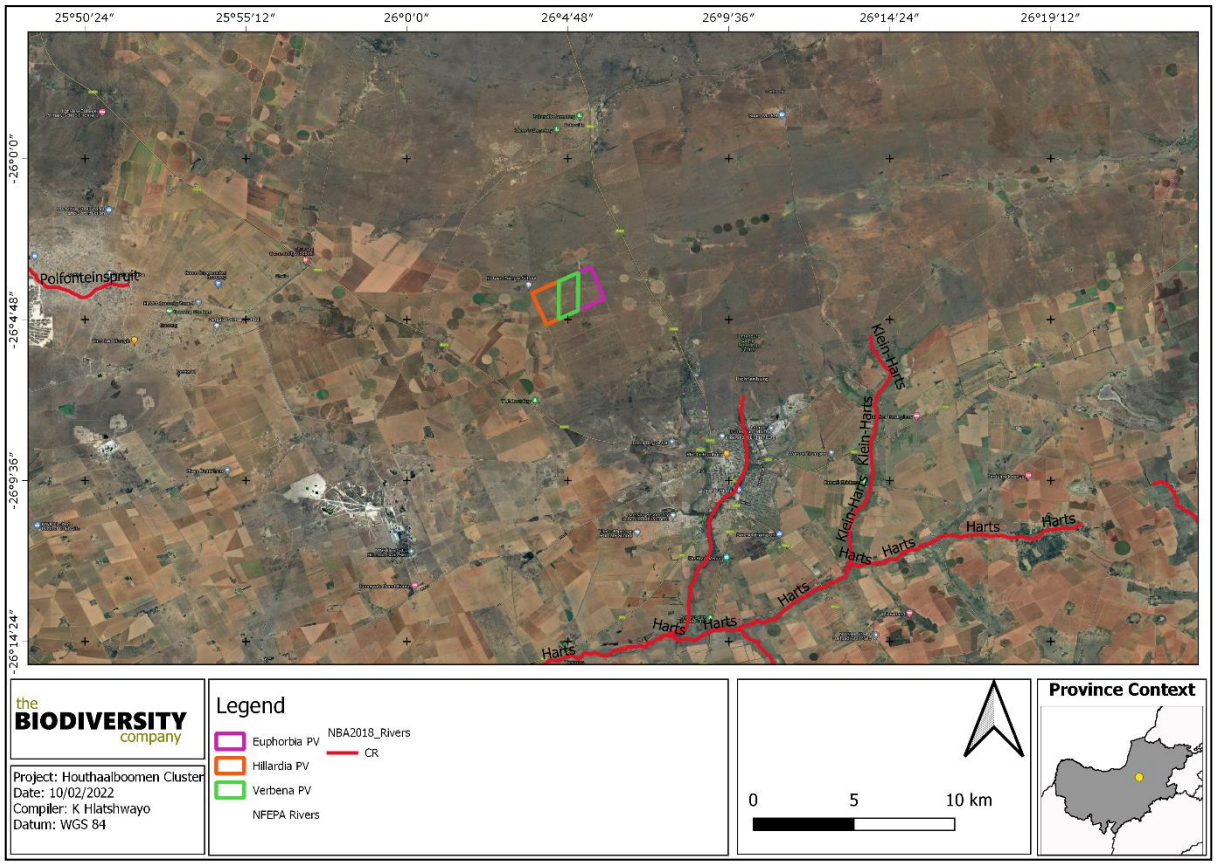

Figure 3-11 The project area showing the regional ecosystem threat status of the associated aquatic ecosystems (NBA, 2018)

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.

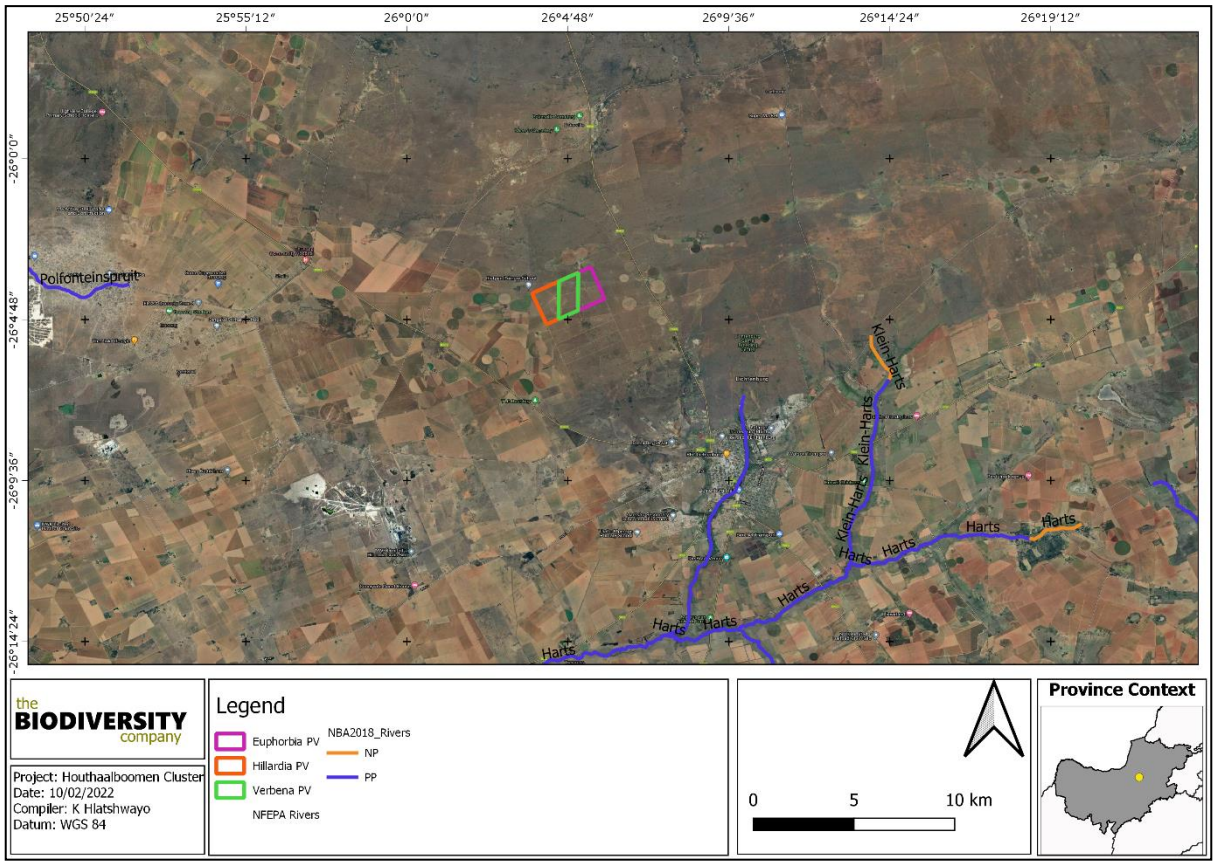

Figure 3-12 The project area showing the regional level of protection of aquatic ecosystems (NBA, 2018)

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 SWSAs 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 NFEPAs 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).

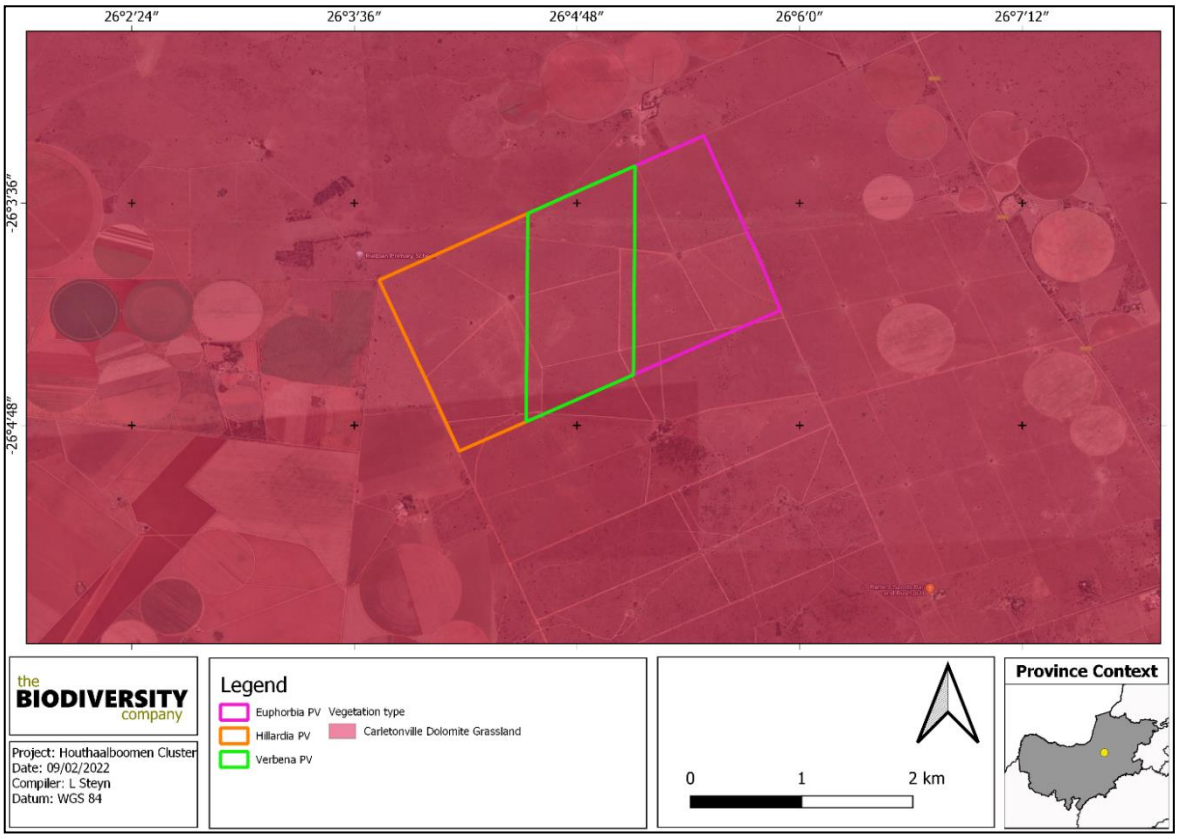

Figure 3-13 Map illustrating the vegetation type associated with the assessment area

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 amplectens, 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. pospischilii, 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.*

Geoxylic 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	*Vachellia erioloba*	(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)	
Pyxicephalus adspersus	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)	
Aonyx capensis	Cape Clawless Otter	NT	NT	Low
Atelerix frontalis	South Africa Hedgehog	NT	LC	Moderate
Crocidura mariquensis	Swamp Musk Shrew	NT	LC	Low
Felis nigripes	Black-footed Cat	VU	VU	Moderate
Hydrictis maculicollis	Spotted-necked Otter	VU	NT	Low
Mystromys albicaudatus	White-tailed Rat	VU	EN	Low
Panthera pardus	Leopard	VU	VU	Low
Parahyaena brunnea	Brown Hyaena	NT	NT	Low
Poecilogale albinucha	African Striped Weasel	NT	LC	Low
Smutsia temminckii	Temminck's Ground Pangolin	VU	VU	Low

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.

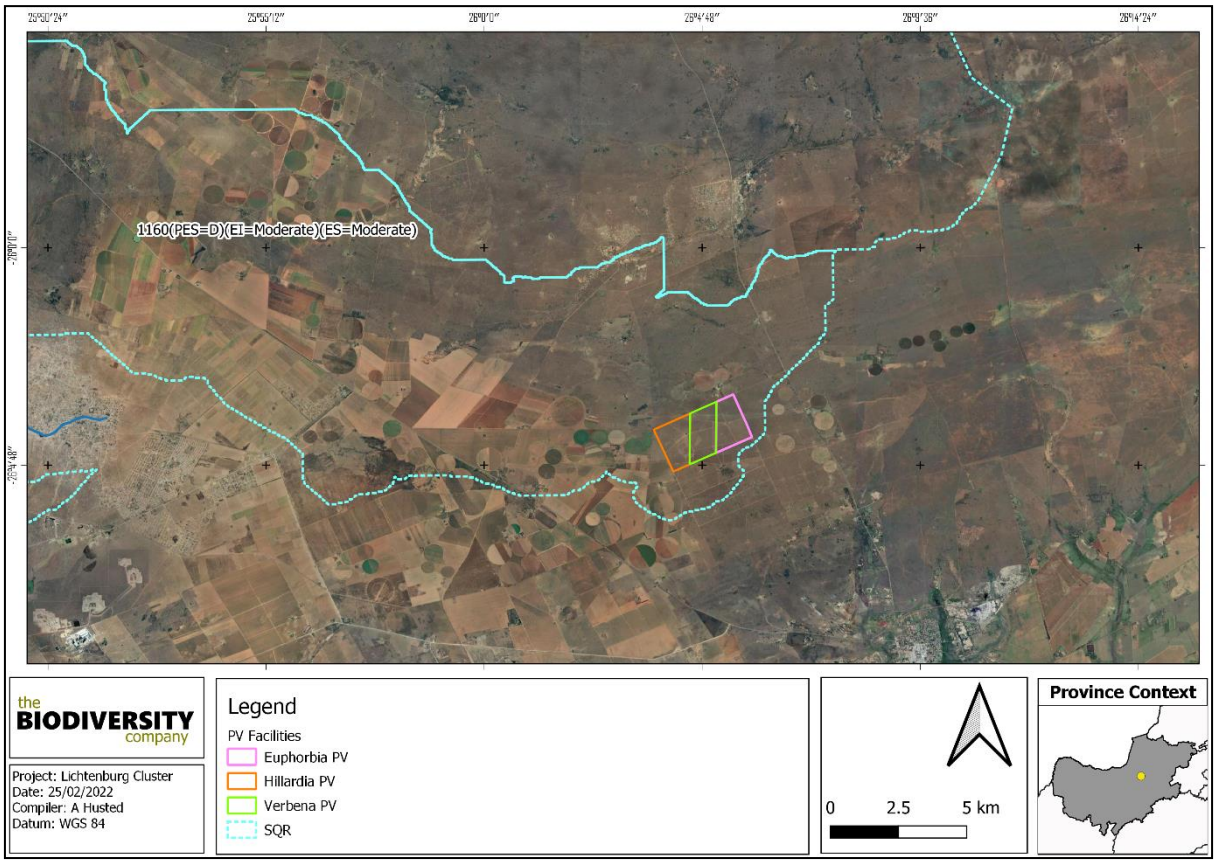

Figure 3-14 Location of the project area in relation to the SQR

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

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

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

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

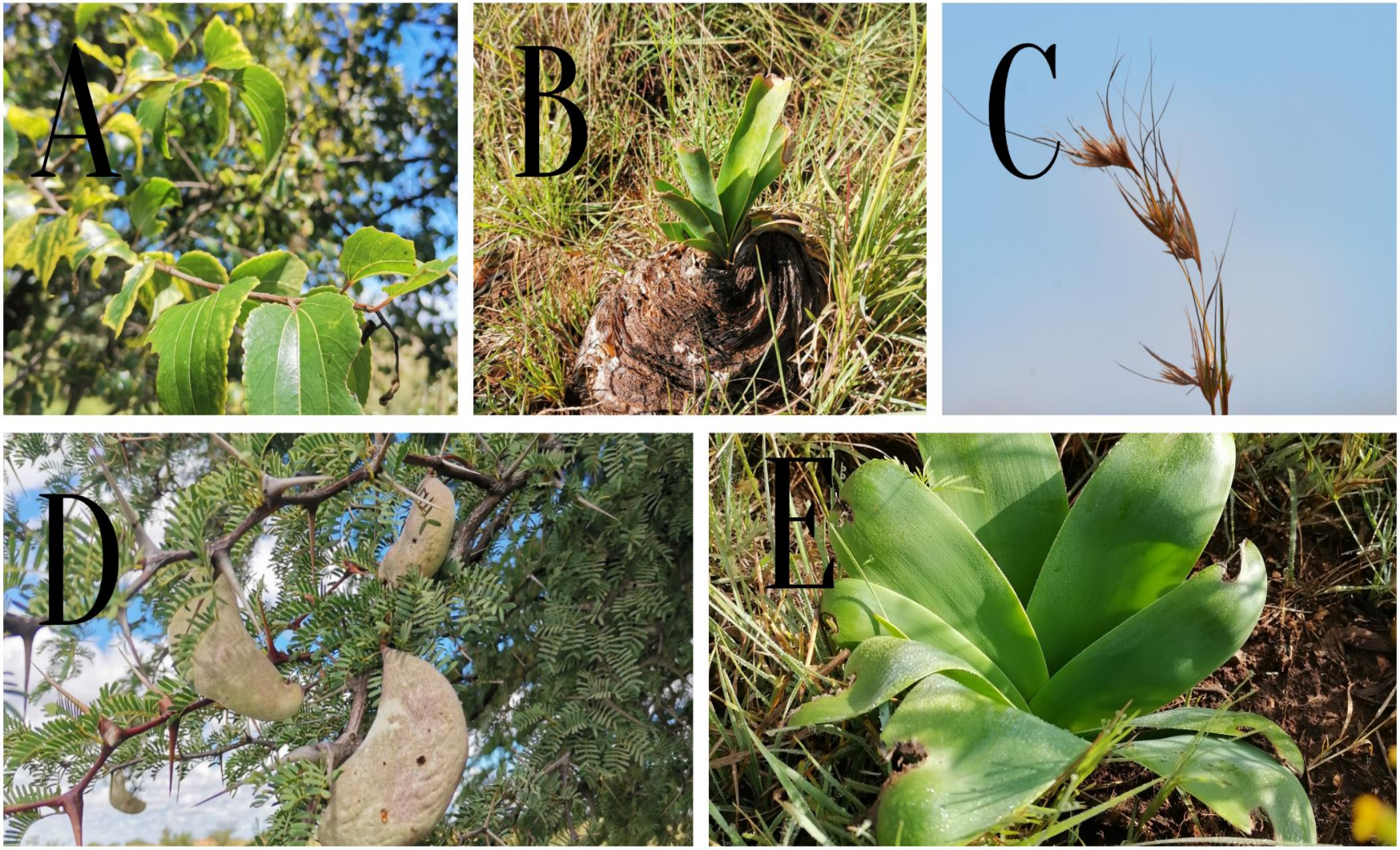

Figure 4-1 A collage of images illustrating some of the species recorded in the project area, A) Ziziphus mucronata, B) Boophone disticha), C) Red grass (Themeda triandra), D) Vachellia erioloba (Camel Thorn), and E) Ammocharis coranica.

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
Argemone mexicana	Mexican Prickly Poppy	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
Cenchrus setaceus (Pennisetum setaceum)	Fountain Grass	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
Conyza bonariensis	Flax-leaf Fleabane	NE	Not Indigenous; Naturalized exotic weed	Naturalized exotic weed
Datura ferox	Large Thorn Apple	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
Flaveria bidentis	Speedyweed	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
Lantana camara	Lantana	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
Melia azedarach	Chinaberry	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
Opuntia ficus-indica	Prickly pear	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
Senna didymobotrya	Peanut butter cassia	NE	Not Indigenous; Naturalized exotic weed	NEMBA Category 1b.
Solanum sisymbriifolium	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. Table 4-4Species 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
Boophone disticha	Poison Bulb	Not Protected (Listed as Declining)
Babiana hypogea	Bobbejaanuintjie	TNCO Schedule 7
Hypoxis hemerocallidea	Star-flower	Not Protected (Listed as Declining)
Vachellia erioloba	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
Dichrostachys cinerea subsp. africana	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
Tagetes minuta	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.
Ziziphus mucronata	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 and mammal 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)
Cacosternum boettgeri	Boettger's Caco	LC	LC
Pseudaspis cana	Mole Snake	LC	Unlisted
Pyxicephalus adspersus	Giant Bullfrog	NT	LC
Trachylepis capensis	Cape Skink	LC	Unlisted
Trachylepis varia	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)
Antidorcas marsupialis	Springbok	LC	LC
Canis mesomelas	Black-backed Jackal	LC	LC
Cynictis penicillata	Yellow Mongoose	LC	LC
Herpestes sanguineus	Common Slender Mongoose	LC	LC
Hystrix africaeaustralis	Cape Porcupine	LC	LC
Lepus saxatilis	Scrub Hare	LC	LC
Orycteropus afer	Aardvark	LC	LC
Parahyaena brunnea	Brown Hyaena	NT	NT
Phacochoerus africanus	Common Warthog	LC	LC
Raphicerus campestris	Steenbok	LC	LC
Sylvicapra grimmia	Common Duiker	LC	LC
Xerus inauris	Cape Ground Squirrel	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 africaeaustralis (Cape Porcupine) quill and E) Orycteropus afer (Aardvark) burrow.

5 Habitat Assessment and Site Ecological Importance

5.1 Habitat Assessment

Figure 6 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 Hillardia 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 an 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 where also quite prominent and relive high in diversity. Higher shrubs and trees were typically clustered together with such clumps scattered throughout the grassland layer.

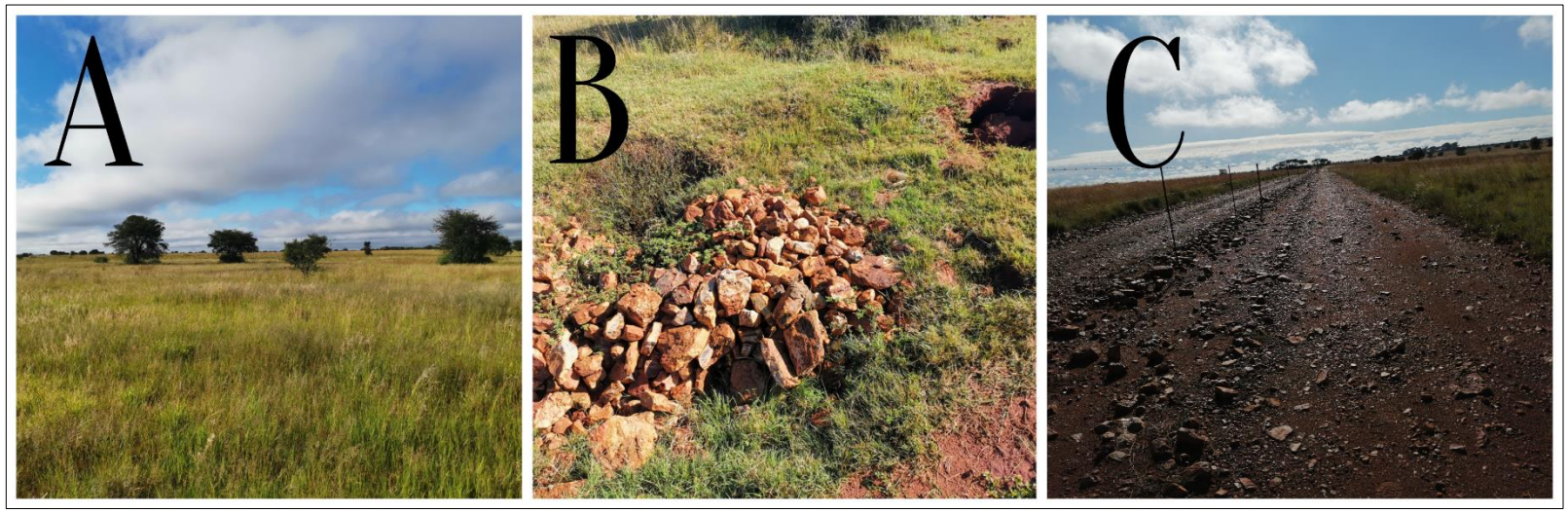

Figure 5-1 Collage illustrating examples of the habitats recorded in the project area, A) Open Savanna Grassland., B) Degraded Open Savanna Grassland and C) Transformed.

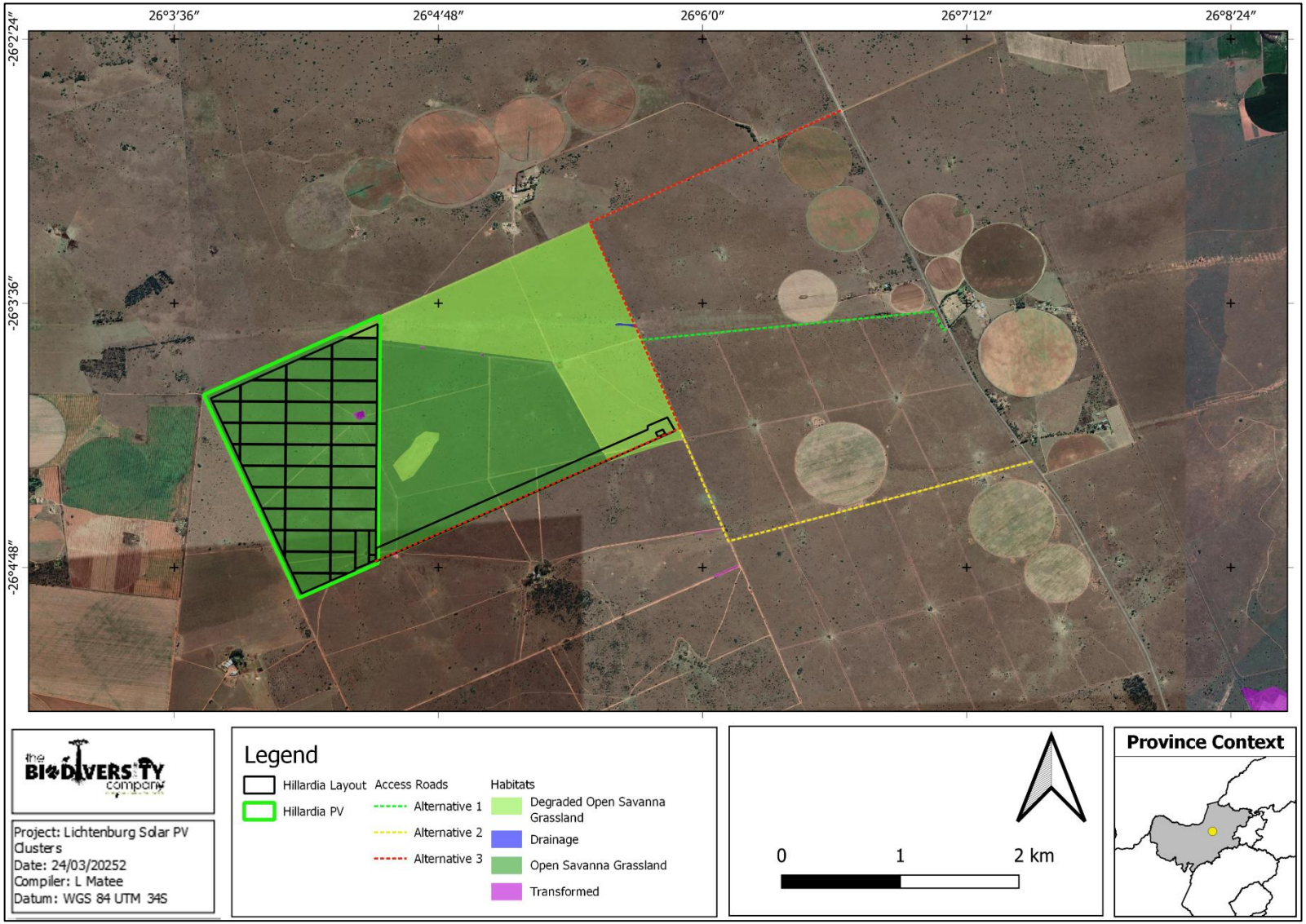

Figure 5-2 Habitats identified in the project area

5.1.1 Screening Sensitivity

The following desktop screening sensitivities are associated with the Hillardia 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”.

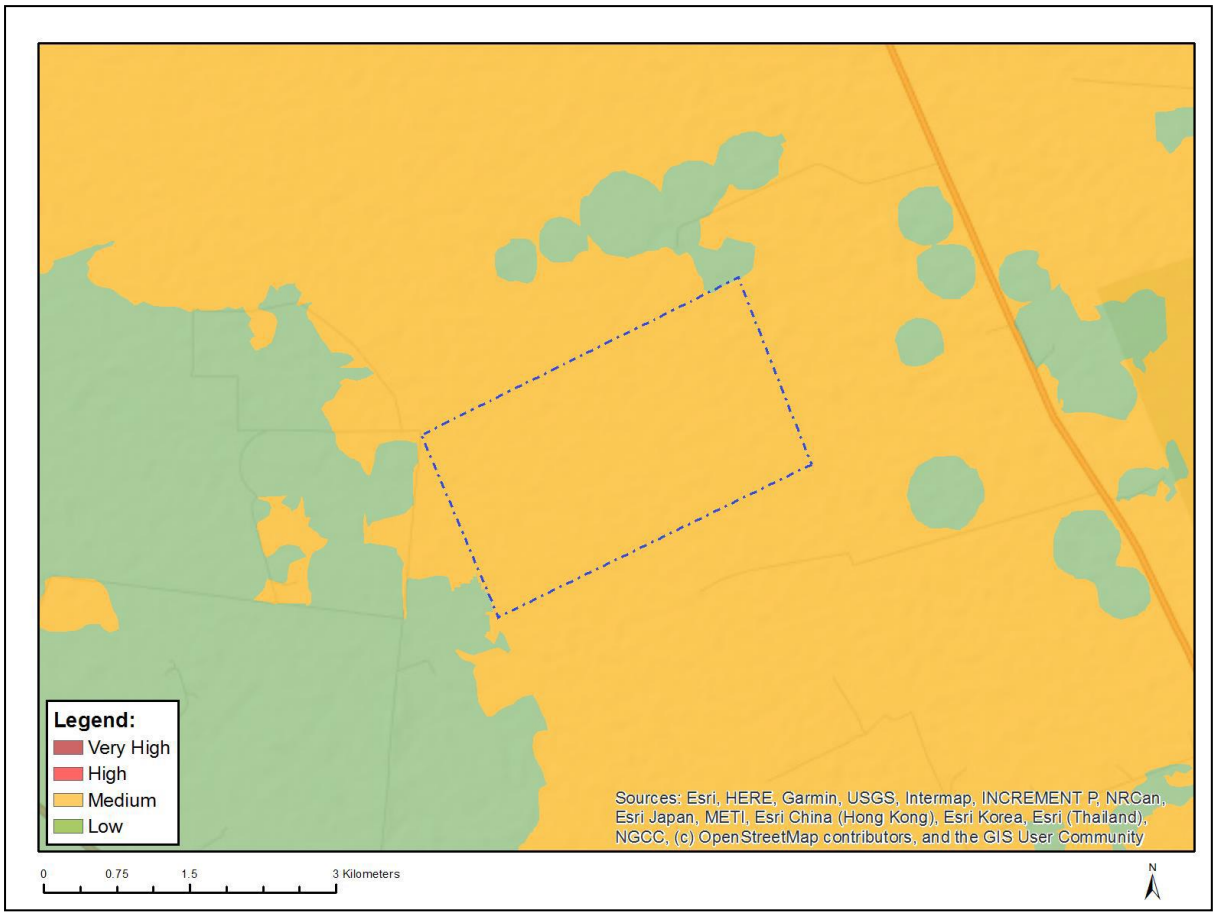

Figure 5-3 Map illustrating the Flora Theme Sensitivity as generated from the National Environmental Screening Tool

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 a medium sensitivity due to the 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 below. 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 5-1 and Figure 5-2 below. 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. 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 Hillardia 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

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

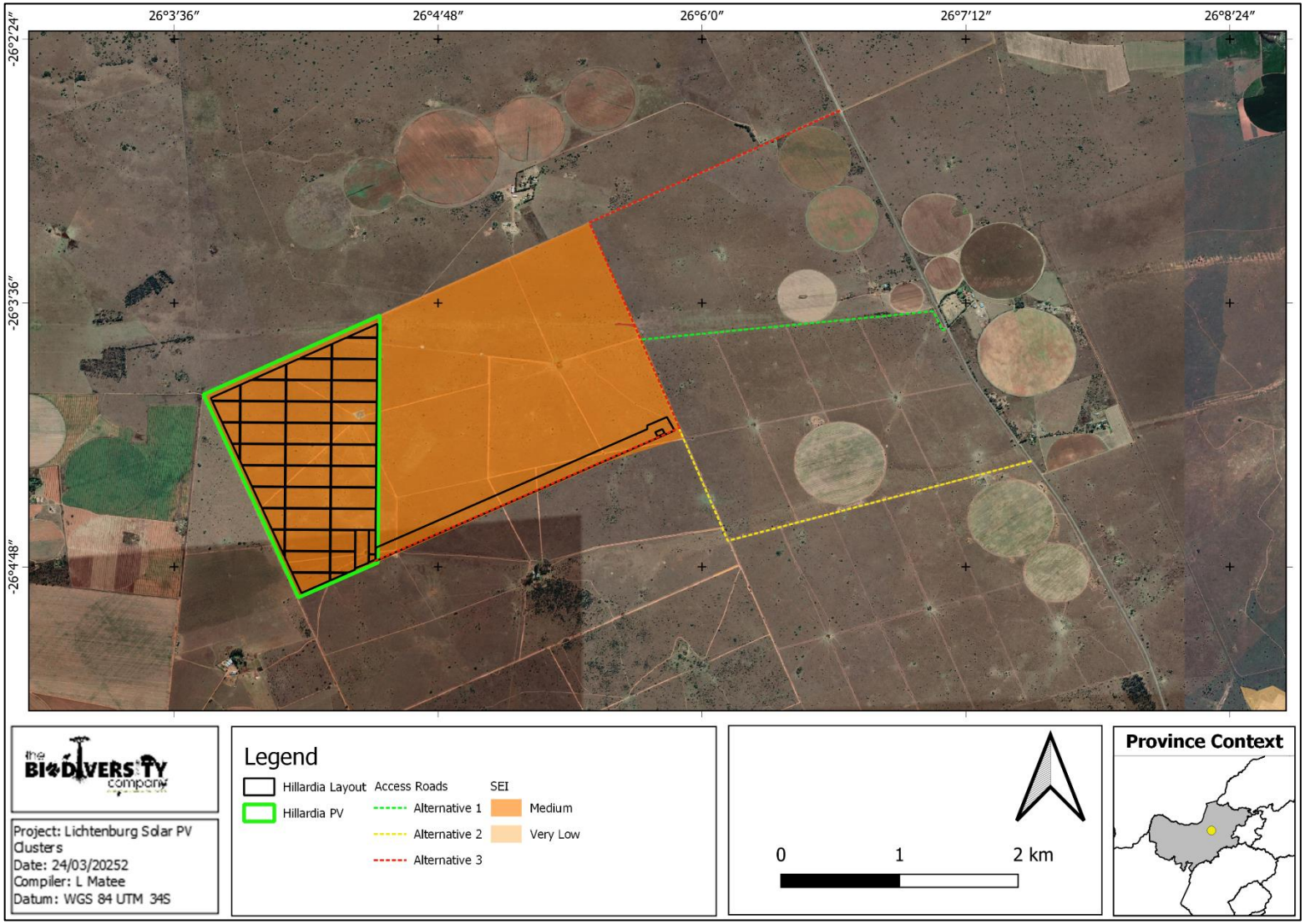

Figure 5-6 Ecological sensitivity map of the project area

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 (AIP);
- 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)															
LIKELIHOOD (Frequency of activity + Frequency of impact)	0	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Absent
	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	301	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	High
	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120	
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	Critical
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	

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
1. Destruction, fragmentation and degradation of habitats and ecosystems	Physical removal of vegetation, including protected species. Proposed grids Soil dust precipitation Dumping of waste products Random events such as fire (cooking fires or cigarettes) Water leakages	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
Main Impact	**Project activities that can cause the spread and/or establishment of alien and/or invasive species**	**Secondary impacts anticipated**
2. Spread and/or establishment of alien and/or invasive species	Vegetation removal 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	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
Main Impact	**Project activities that can cause direct mortality of fauna**	**Secondary impacts anticipated**
3. Direct mortality of fauna	Clearing of vegetation Roadkill due to vehicle collision Pollution of water resources due to dust effects, chemical spills, etc. Intentional killing of fauna for food (hunting)	Loss of habitat Loss of ecosystem services Increase in rodent populations and associated disease risk
Main Impact	**Project activities that can cause reduced dispersal/migration of fauna**	**Secondary impacts anticipated**
4. Reduced dispersal/migration of fauna	Loss of landscape used as corridor Compacted roads Removal of vegetation	Reduced dispersal/migration of fauna Loss of ecosystem services Reduced plant seed dispersal
Main Impact	**Project activities that can cause pollution in watercourses and the surrounding environment**	**Secondary impacts anticipated**
5. Environmental pollution due to water runoff, spills from vehicles and erosion	Chemical (organic/inorganic) spills Erosion	Pollution in watercourses and the surrounding environment Faunal mortality (direct and indirectly) Groundwater pollution Loss of ecosystem services
Main Impact	**Project activities that can cause disruption/alteration of ecological life cycles due to sensory disturbance.**	**Secondary impacts anticipated**
6.Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise, dust, and light pollution.	Operation of machinery (Large earth moving machinery, vehicles) Project activities that can cause disruption/alteration of ecological life cycles due to dust 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

		Loss of ecosystem services
Main Impact	**Project activities that can cause staff to interact directly with potentially dangerous fauna**	**Secondary impacts anticipated**
8. Staff and others interacting directly with fauna (potentially dangerous) or poaching of animals	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 Houthaaldoorns 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 and 2 is deemed to be the same and negligible, as they are within existing servitudes. The impact ratings as per Table 6.3

apply to alternative 3, largely the 1.5 km portion of the route that will be new and is common amongst the other access road alternatives.

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 of 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	**Moderately High**	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	**Low**
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	**Moderate**	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	**Low**
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	**Moderately High**	One month to	Development specific/	Small / ecosystem	Ecology moderately sensitive/ /important	Likely	**Low**

(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	**Moderate**	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	**Low**

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	**Moderate**	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	**Low**
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	**Moderate**	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	**Low**
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	**Moderate**	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	**Low**

Chemical pollution associated with measures to keep PV clean	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	**Moderate**	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	**Low**

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	**Moderate**	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	**Low**
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	**Moderate**	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	**Low**
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	**Moderate**	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	**Low**

substation, noise, light, dust, vibration)			largely altered					impacted / Linear features affected < 100m	largely unchanged			

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 the 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, • Signs must be put up to enforce this	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 • Signs must be put up to enforce this;	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

areas. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (green/red) lights should be used wherever possible.				
All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited.	Life of operation	Health and Safety Officer	Compliance to the training.	Ongoing
Schedule activities and operations during least sensitive periods, to avoid migration, nesting, and breeding seasons.	Life of operation	Project manager, Environmental Officer & Design Engineer	Activities should take place during the day in the case.	Ongoing
Heat generated from the substations must be monitored to ensure it does not negatively affect the local fauna	Life of operation	Environmental Officer & Contractor	Heat generated by substations	Ongoing
All areas to be developed must be walked through prior to any activity to ensure no nests or fauna species are found in the area. Should any Species of Conservation Concern not move out of the area, or their nest be found in the area a suitably qualified specialist must be consulted to advise on the correct actions to be taken.	Construction and Operational phase	Project manager, Environmental Officer	Presence of Nests and faunal species	Planning, Construction and Rehabilitation
Any holes/deep excavations must be dug and planted in a progressive manner; Should the holes overnight they must be covered temporarily to ensure no small fauna species fall in and subsequently inspected prior to backfilling	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of trapped animals and open holes	Ongoing
Ensure that all AC cables and connections are insulated successfully to reduce electrocution risk.	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of electrocuted fauna	Ongoing
Wildlife-permeable fencing with holes large enough for mongoose and other smaller mammals should be installed, the holes must not be placed in the fence where it is next to a major road as this will increase road killings in the area	Planning and construction	Environmental Officer & Contractor, Engineer	Fauna movement corridor	Ongoing
Use environmentally friendly cleaning and dust suppressant products	Construction and operation	Environmental Officer & Contractor, Engineer	Presence of chemicals in and around the project area	Ongoing
Fencing mitigations: • Top 2 strands must be smooth wire • Routinely retention loose wires • Minimum 30cm between wires • Place markers on fences	Planning, construction, and operation	Environmental Officer & Contractor, Engineer	Monitor fences for slack wires	Ongoing
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.	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. • No non environmentally friendly suppressants may be used as this could result in pollution of water sources	Life of operation	Contractor	Dustfall	Dust monitoring program.
Management outcome: Waste management				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site. • Refuse bins will be emptied and secured; • Temporary storage of domestic waste shall be in covered waste skips; and • Maximum domestic waste storage period will be 10 days.	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. • Reducing the dust generated by the listed activities above, especially the earth moving machinery, through wetting the soil surface and putting up signs to enforce speed limit as well as speed bumps built to force slow speeds; • Signs must be put up to enforce this.	Life of operation	Project manager, Environmental Officer	Water Runoff from road surfaces	Ongoing
Where possible, existing access routes and walking paths must be 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 Savana 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 and 2 is deemed to be the same and negligible, as they are within existing servitudes. The impact ratings as per Table 6.3 apply to alternative 3, largely the 1.5 km portion of the route that will be new and is common amongst the other access road alternatives.

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, but no water resources were identified within the 500 m regulation area for the project. Based on this conclusion, no water use authorisation is required for the project.

9 References

ADU (Animal Demography Unit). (2017). Virtual Museum.

Alexander, G. & Marais, J. (2007). A guide to the Reptiles of Southern Africa. Struik, Cape Town.

Bates, M.F., Branch, W.R., Bauer, A.M., Burger, M., Marais, J., Alexander, G.J & de Villiers, M.S. (Eds). 2014. Atlas and Red List of Reptiles of South Africa, Lesotho, and Swaziland. Suricata 1. South African Biodiversity Institute, Pretoria.

BGIS (Biodiversity GIS). (2017). http://bgis.sanbi.org/

BODATSA-POSA. (2022). Plants of South Africa - an online checklist. POSA ver. 3.0. http://newposa.sanbi.org/.

Boycott, R. and Bourquin, R. 2000. The Southern African Tortoise Book – A Guide to Southern African Tortoises, Terrapins and Turtles. Revised Edition. Hilton. 228 pages.

Branch, W.R. (1998). Field Guide to Snakes and Other Reptiles of Southern Africa. Struik, Cape Town.

Bird Atlas Project (SABAP2). (2012). http://vmus.adu.org.za/

Broadley, D.G. 1990. FitzSimons' Snakes of Southern Africa. Jonathan Ball & Ad Donker Publishers. 387pp.

Business and Biodiversity Offsets Programme (BBOP). 2012. Resource Paper: No Net Loss and Loss-Gain Calculations in Biodiversity Offsets. BBOP, Washington, D.C.

Desmet, P. G., Holness, S., Skowno, A. & Egan, V.T. (2018). 2018 Limpopo Province Map of Critical Biodiversity Areas and Ecological Support Areas. http://bgis.sanbi.org/SpatialDataset/Detail/5707

Du Preez, L. & Carruthers, V. (2009) A Complete Guide to the Frogs of Southern Africa. Struik Nature, Cape Town.

Eskom. (2015). Taylor, M.R., Peacock, F. & Wanless, R.M. (Eds). The 2015 Eskom Red Data Book of birds of South Africa, Lesotho, and Swaziland. BirdLife South Africa, Johannesburg.

EWT. (2016). Mammal Red List 2016. www.ewt.org.za

EWT (Endangered Wildlife Trust). (2017). Threatened Amphibian Programme. (2015). The Southern African Frog Atlas Project https://www.ewt.org.za/TAP/refrence.html (SAFAP, now FrogMAP). http://vmus.adu.org.za

Fish, L., Mashau, A.C., Moeaha, M.J. & Nembudani, M.T. (2015). Identification Guide to Southern African Grasses: An Identification Manual with Keys, Descriptions, and Distributions. SANBI, Pretoria.

Goff, F. G., Dawson, G. A., & Rochow, J. J. (1982). Site examination for threatened and endangered plant species. Environmental Management, 6(4), 307-316.

IUCN. (2021). The IUCN Red List of Threatened Species. www.iucnredlist.org

Johnson, S. & Bytebier, B. (2015). Orchids of South Africa: A Field Guide. Struik publishers, Cape Town.

MammalMap. (2017). http://mammalmap.adu.org.za/

Measey, G.J. (2011). Ensuring a Future for South Africa's Frogs: A Strategy for Conservation Research. South African National Biodiversity Institute, Pretoria.

Minter, L., Burger, M., Harrison, J.A. & Kloepfer, D. (2004). Atlas and Red Data Book of the Frogs of South Africa, Lesotho, and Swaziland. Smithsonian Institute Avian Demography Unit, Washington; Cape Town.

Monadjem, A., Taylor, P.J., Coterrill, F.D.P. & Schoeman, C. (2010). Bats of southern and central Africa: a biogeographic and taxonomic synthesis. Wits University Press, Johannesburg.

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

Mucina, L., Rutherford, M.C. & Powrie, L.W. (Eds.). 2007. Vegetation map of South Africa, Lesotho, and Swaziland. 1:1 000 000 scale sheet maps. 2nd ed. South African National Biodiversity Institute, Pretoria.

National Protected Areas Expansion Strategy for South Africa (NPAES) (2016). Department of Environmental Affairs, Pretoria, South Africa.

NBA (2018). National Biodiversity Assessment spatial data. http://bgis.sanbi.org/

Nel JL, Murray KM, Maherry AM, Petersen CP, Roux DJ, Driver A, Hill L, Van Deventer H, Funke N, Swartz ER, Smith-Adao LB, Mbona N, Downsborough L and Nienaber S. 2011. Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.

Raimonde, D. (2009). Red list of South African Plants. SANBI, Pretoria.

SADAP (South Africa Protected Areas Database) and SACAD (South Africa Conservation Areas Database) (2021). http://egis.environment.gov.za

SANBI. 2013. Grasslands Ecosystem Guidelines: landscape interpretation for planners and managers. Compiled by Cadman, M., de Villiers, C., Lechmere-Oertel, R. and D. McCulloch. South African National Biodiversity Institute, Pretoria. 139 pages.

SANBI-BGIS. 2017. Technical guidelines for CBA Maps: Guidelines for developing a map of Critical Biodiversity Areas & Ecological Support Areas using systematic biodiversity planning.

SANBI. (2017). South African National Biodiversity Institute – Red List of South African Plants. http://redlist.sanbi.org/

Skowno, A.L., Raimondo, D.C., Poole, C.J., Fizzotti, B. & Slingsby, J.A. (eds.). 2019. South African National Biodiversity Assessment 2018 Technical Report Volume 1: Terrestrial Realm. South African National Biodiversity Institute, Pretoria.

Stuart, C., & Stuart, T. (2000). A field guide to the tracks and signs of southern and east African wildlife. Cape Town.

Taylor, M. R, Peacock, F., & Wanless, R. 2015. The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho & Swaziland.

Van Deventer, H., Smith-Adao, L., Collins, N.B., Grenfell, M., Grundling, A., Grundling, P-L., Impson, D., Job, N., Lötter, M., Ollis, D., Petersen, C., Scherman, P., Sieben, E., Snaddon, K., Tererai, F. and Van der Colff D. 2019. South African National Biodiversity Assessment 2018: Technical Report. Volume 2b: Inland Aquatic (Freshwater) Realm. CSIR report number CSIR/NRE/ECOS/IR/2019/0004/A. South African National Biodiversity Institute, Pretoria. http://hdl.handle.net/20.500.12143/6230.

Van Deventer, H., Smith-Adao, L., Mbona, N., Petersen, C., Skowno, A., Collins, N.B., Grenfell, M., Job, N., Lötter, M., Ollis, D., Scherman, P., Sieben, E. & Snaddon, K. 2018. South African National Biodiversity Assessment 2018: Technical Report. Volume 2a: South African Inventory of Inland Aquatic Ecosystems (SAIIAE). Version 3, final released on 3 October 2019. Council for Scientific and Industrial Research (CSIR) and South African National Biodiversity Institute (SANBI): Pretoria, South Africa.

10 Appendices

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

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

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

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

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

Cyperaceae	*Kyllinga alba*	Nees	LC	Indigenous
Asteraceae	*Nidorella resedifolia subsp. resedifolia*	DC.	LC	Indigenous
Asphodelaceae	*Trachyandra laxa var. rigida*	(N.E.Br.) Oberm.	LC	Indigenous
Fabaceae	*Medicago laciniata var. laciniata*	(L.) Mill.	NE	Not indigenous; Naturalised
Poaceae	*Sporobolus festivus*	Hochst. ex A. Rich.	LC	Indigenous
Iridaceae	*Gladiolus permeabilis subsp. edulis*	D.Delaroche	LC	Indigenous
Poaceae	*Hyparrhenia filipendula var. pilosa*	(Hochst.) Stapf	LC	Indigenous
Poaceae	*Aristida diffusa subsp. burkei*	Trin.	LC	Indigenous
Malvaceae	*Triumfetta sonderi*	Ficalho & Hiern	LC	Indigenous; Endemic
Orobanchaceae	*Striga elegans*	Benth.	LC	Indigenous
Poaceae	*Melinis repens subsp. repens*	(Willd.) Zizka	LC	Indigenous
Iridaceae	*Tritonia nelsonii*	Baker	LC	Indigenous
Fabaceae	*Trifolium africanum var. africanum*	Ser.	NE	Indigenous
Poaceae	*Leersia denudata*	Launert	LC	Indigenous
Orobanchaceae	*Cycnium adonense*	E. Mey. ex Benth.	LC	Indigenous
Poaceae	*Chrysopogon serrulatus*	Trin.	LC	Indigenous
Cleomaceae	*Cleome maculata*	(Sond.) Szyszyl.	LC	Indigenous
Poaceae	*Microchloa caffra*	Nees	LC	Indigenous
Fabaceae	*Vachellia hebeclada subsp. hebeclada*	(DC.) Kyal. & Boatwr.	LC	Indigenous
Cucurbitaceae	*Acanthosicyos naudinianus*	(Sond.) C.Jeffrey	LC	Indigenous
Cyperaceae	*Cyperus rubicundus*	Vahl	LC	Indigenous
Convolvulaceae	*Falkia oblonga*	Bernh. ex C. Krauss	LC	Indigenous
Poaceae	*Digitaria sanguinalis*	(L.) Scop.	NE	Not indigenous; Naturalised
Poaceae	*Sporobolus fimbriatus*	(Trin.) Nees	LC	Indigenous
Iridaceae	*Gladiolus sp.*			
Hyacinthaceae	*Dipcadi viride*	(L.) Moench	LC	Indigenous
Asteraceae	*Dicoma anomala subsp. anomala*	Sond.	LC	Indigenous
Onagraceae	*Oenothera glazioviana*	Micheli		Not indigenous; Naturalised; Invasive
Asteraceae	*Anthemis cotula*	L.		Not indigenous; Naturalised
Poaceae	*Urochloa brachyura*	(Hack.) Stapf	LC	Indigenous
Poaceae	*Eragrostis gummiflua*	Nees	LC	Indigenous
Amaryllidaceae	*Crinum graminicola*	I.Verd.	LC	Indigenous
Iridaceae	*Moraea pallida*	(Baker) Goldblatt	LC	Indigenous
Acanthaceae	*Blepharis angusta*	(Nees) T. Anderson	LC	Indigenous; Endemic
Lamiaceae	*Salvia stenophylla*	Burch. ex Benth.		Indigenous
Marsileaceae	*Marsilea macrocarpa*	C.Presl	LC	Indigenous
Verbenaceae	*Chascanum pinnatifidum var. pinnatifidum*	(L.f.) E. Mey.	LC	Indigenous
Asteraceae	*Chrysocoma ciliata*	L.	LC	Indigenous

Poaceae	*Cymbopogon caesius*	(Hook. & Arn.) Stapf	LC	Indigenous
Asteraceae	*Osteospermum scariosum var. scariosum*	DC.	NE	Indigenous
Poaceae	*Eragrostis sp.*			
Malvaceae	*Hermannia stellulata*	(Harv.) K. Schum.	LC	Indigenous
Myrtaceae	*Eucalyptus sideroxylon*	A. Cunn. ex Woolls		Not indigenous; Cultivated; Naturalised; Invasive
Poaceae	*Setaria sphacelata var. torta*	(Schumach.) Stapf & C.E. Hubb. ex M.B. Moss	LC	Indigenous
Commelinaceae	*Commelina livingstonii*	C.B. Clarke	LC	Indigenous
Polygonaceae	*Rumex lanceolatus*	Thunb.	LC	Indigenous
Lamiaceae	*Acrotome inflata*	Benth.	LC	Indigenous
Poaceae	*Eragrostis biflora*	Hack. ex Schinz	LC	Indigenous
Poaceae	*Paspalum dilatatum*	Poir.	NE	Not indigenous; Naturalised; Invasive
Malvaceae	*Hibiscus trionum*	L.		Not indigenous; Naturalised
Malvaceae	*Corchorus asplenifolius*	Burch.	LC	Indigenous
Asphodelaceae	*Trachyandra burkei*	(Baker) Oberm.	LC	Indigenous
Fabaceae	*Gleditsia triacanthos*	L.	NE	Not indigenous; Naturalised; Invasive
Asphodelaceae	*Bulbine frutescens*	(L.) Willd.	LC	Indigenous
Amaranthaceae	*Cyphocarpa angustifolia*	(Moq.) Lopr.	LC	Indigenous
Poaceae	*Urochloa panicoides*	P. Beauv.	LC	Indigenous
Rubiaceae	*Kohautia caespitosa subsp. brachyloba*	Schnizl.	LC	Indigenous
Fabaceae	*Indigastrum parviflorum subsp. parviflorum*	(B. Heyne ex Wight & Arn.) Schrire	NE	Indigenous
Apocynaceae	*Pentarrhinum insipidum*	E. Mey.	LC	Indigenous
Polygalaceae	*Polygala gracilenta*	Burtt Davy	LC	Indigenous
Anacardiaceae	*Searsia pyroides var. pyroides*	(Burch.) Moffett	LC	Indigenous
Campanulaceae	*Wahlenbergia denticulata var. denticulata*	(Burch.) A.DC.	LC	Indigenous
Cyperaceae	*Fuirena pubescens var. pubescens*	(Poir.) Kunth	LC	Indigenous
Asparagaceae	*Asparagus laricinus*	Burch.	LC	Indigenous
Fabaceae	*Vigna unguiculata subsp. stenophylla*	(L.) Walp.	LC	Indigenous
Convolvulaceae	*Convolvulus thunbergii*	Roem. & Schult.	LC	Indigenous
Poaceae	*Urelytrum agropyroides*	(Hack.) Hack.	LC	Indigenous
Poaceae	*Fingerhuthia africana*	Lehm.	LC	Indigenous
Rubiaceae	*Anthospermum rigidum subsp. rigidum*	Eckl. & Zeyh.	LC	Indigenous
Rubiaceae	*Galium capense subsp. capense*	Thunb.	LC	Indigenous
Poaceae	*Panicum coloratum*	L.	LC	Indigenous
Poaceae	*Anthephora pubescens*	Nees	LC	Indigenous
Poaceae	*Heteropogon contortus*	(L.) Roem. & Schult.	LC	Indigenous
Fabaceae	*Ophrestia oblongifolia var. oblongifolia*	(E. Mey.) H.M.L. Forbes	LC	Indigenous

Fabaceae	*Vachellia karroo*	(Hayne) Banfi & Galasso	LC	Indigenous
Poaceae	*Tragus racemosus*	(L.) All.	LC	Indigenous
Apocynaceae	*Brachystelma foetidum*	Schltr.	LC	Indigenous
Polygalaceae	*Polygala rehmannii*	Chodat	LC	Indigenous
Lobeliaceae	*Cyphia stenopetala*	Diels	LC	Indigenous
Cyperaceae	*Cyperus marginatus*	Thunb.	LC	Indigenous
Poaceae	*Eragrostis chloromelas*	Steud.	LC	Indigenous
Lamiaceae	*Teucrium trifidum*	Retz.	LC	Indigenous
Poaceae	*Echinochloa holubii*	(Stapf) Stapf	LC	Indigenous
Rubiaceae	*Pygmaeothamnus zeyheri var. zeyheri*	(Sond.) Robyns	LC	Indigenous
Poaceae	*Aristida canescens subsp. canescens*	Henrard	LC	Indigenous
Fabaceae	*Indigofera heterotricha*	DC.	LC	Indigenous
Asteraceae	*Senecio sp.*			
Geraniaceae	*Monsonia burkeana*	Planch. ex Harv.	LC	Indigenous
Poaceae	*Elionurus muticus*	(Spreng.) Kunth	LC	Indigenous
Lamiaceae	*Plectranthus neochilus*	Schltr.	LC	Indigenous
Malvaceae	*Pavonia burchellii*	(DC.) R.A. Dyer	LC	Indigenous
Asphodelaceae	*Bulbine narcissifolia*	Salm-Dyck	LC	Indigenous
Fabaceae	*Erythrostemon gilliesii*	Klotzsch		Not indigenous; Naturalised; Invasive
Malvaceae	*Hermannia tomentosa*	(Turcz.) Schinz ex Engl.	LC	Indigenous
Poaceae	*Eragrostis micrantha*	Hack.	LC	Indigenous
Poaceae	*Phragmites australis*	(Cav.) Steud.	LC	Indigenous
Poaceae	*Eragrostis plana*	Nees	LC	Indigenous
Amaryllidaceae	*Crinum macowanii*	Baker	LC	Indigenous
Fabaceae	*Melilotus indicus*	(L.) All.	NE	Not indigenous; Naturalised; Invasive
Apocynaceae	*Gomphocarpus fruticosus subsp. fruticosus*	(L.) W.T. Aiton	LC	Indigenous
Poaceae	*Aristida congesta subsp. barbicollis*	Roem. & Schult.	LC	Indigenous
Lobeliaceae	*Lobelia thermalis*	Thunb.	LC	Indigenous
Euphorbiaceae	*Euphorbia inaequilatera*	Sond.	LC	Indigenous
Boraginaceae	*Cynoglossum lanceolatum*	Forssk.	LC	Indigenous
Commelinaceae	*Commelina africana var. krebsiana*	L.	LC	Indigenous
Poaceae	*Chloris virgata*	Sw.	LC	Indigenous
Rubiaceae	*Rubia petiolaris*	DC.	LC	Indigenous
Asteraceae	*Gnaphalium filagopsis*	Hilliard & B.L. Burtt	LC	Indigenous
Poaceae	*Digitaria eriantha*	Steud.	LC	Indigenous
Asteraceae	*Dicoma anomala subsp. gerrardii*	Sond.	LC	Indigenous
Crassulaceae	*Crassula lanceolata subsp. transvaalensis*	(Eckl. & Zeyh.) Endl. ex Walp.	LC	Indigenous
Poaceae	*Eragrostis trichophora*	Coss. & Durieu	LC	Indigenous

Cucurbitaceae	*Coccinia sessilifolia*	(Sond.) Cogn.	LC	Indigenous
Poaceae	*Setaria sp.*			
Onagraceae	*Epilobium hirsutum*	L.	LC	Indigenous
Asteraceae	*Nolletia ciliaris*	(DC.) Steetz	LC	Indigenous
Elatinaceae	*Bergia decumbens*	Planch. ex Harv.	LC	Indigenous
Rhamnaceae	*Ziziphus mucronata subsp. mucronata*	Willd.	LC	Indigenous
Malvaceae	*Sida cordifolia subsp. cordifolia*	L.	LC	Indigenous
Asteraceae	*Geigeria burkei subsp. burkei*	Harv.	NE	Indigenous
Nyctaginaceae	*Commicarpus pentandrus*	(Burch.) Heimerl	LC	Indigenous
Asteraceae	*Geigeria burkei subsp. burkei*	Harv.	NE	Indigenous
Poaceae	*Aristida scabrivalvis subsp. scabrivalvis*	Hack.	LC	Indigenous
Asteraceae	*Berkheya pinnatifida subsp. stobaeoides*	(Thunb.) Thell.	LC	Indigenous
Zygophyllaceae	*Tribulus terrestris*	L.	LC	Indigenous
Amaranthaceae	*Aerva leucura*	Moq.	LC	Indigenous
Caryophyllaceae	*Pollichia campestris*	Aiton	LC	Indigenous
Poaceae	*Trachypogon spicatus*	(L.f.) Kuntze	LC	Indigenous
Poaceae	*Setaria nigrirostris*	(Nees) T. Durand & Schinz	LC	Indigenous
Solanaceae	*Solanum campylacanthum*	Hochst. ex A. Rich.		Indigenous
Cyperaceae	*Bulbostylis burchellii*	(Ficalho & Hiern) C.B. Clarke	LC	Indigenous
Verbenaceae	*Lippia scaberrima*	Sond.	LC	Indigenous
Convolvulaceae	*Ipomoea oblongata*	E. Mey. ex Choisy	LC	Indigenous
Poaceae	*Triraphis schinzii*	Hack.	LC	Indigenous
Scrophulariaceae	*Selago densiflora*	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)
Amietia delalandii	Delalande's River Frog	LC	Unlisted
Amietia fuscigula	Cape River Frog	LC	LC
Breviceps adspersus	Bushveld Rain Frog	LC	LC
Cacosternum boettgeri	Common Caco	LC	LC
Kassina senegalensis	Bubbling Kassina	LC	LC
Phrynobatrachus natalensis	Snoring Puddle Frog	LC	LC
Phrynomantis bifasciatus	Banded Rubber Frog	LC	LC
Ptychadena anchietae	Plain Grass Frog	LC	LC
Pyxicephalus adspersus	Giant Bullfrog	NT	LC
Schismaderma carens	African Red Toad	LC	LC
Sclerophrys capensis	Raucous Toad	LC	LC
Sclerophrys garmani	Olive Toad	LC	LC
Sclerophrys gutturalis	Guttural Toad	LC	LC
Sclerophrys poweri	Power's Toad	LC	LC
Strongylopus fasciatus	Striped Stream Frog	LC	LC
Tomopterna cryptotis	Tremelo Sand Frog	LC	LC
Tomopterna natalensis	Natal Sand Frog	LC	LC
Tomopterna tandyi	Tandy's Sand Frog	LC	LC
Xenopus laevis	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)
Acontias gracilicauda	Thin-tailed Legless Skink	LC	LC
Afrotyphlops bibronii	Bibron's Blind Snake	LC	LC
Agama aculeata distanti	Eastern Ground Agama	LC	LC
Agama atra	Southern Rock Agama	LC	LC
Aparallactus capensis	Black-headed Centipede-eater	LC	LC
Bitis arietans arietans	Puff Adder	LC	Unlisted
Boaedon capensis	Brown House Snake	LC	LC
Causus rhombeatus	Rhombic Night Adder	LC	LC
Chamaeleo dilepis	Common Flap-neck Chameleon	LC	LC
Cordylus vittifer	Common Girdled Lizard	LC	LC
Crotaphopeltis hotamboeia	Red-lipped Snake	LC	Unlisted
Dasypeltis scabra	Rhombic Egg-eater	LC	LC
Gerrhosaurus flavigularis	Yellow-throated Plated Lizard	LC	Unlisted
Hemachatus haemachatus	Rinkhals	LC	LC
Hemidactylus mabouia	Common Tropical House Gecko	LC	Unlisted
Kinixys lobatsiana	Lobatse hinged-back Tortoise	LC	LC
Lamprophis aurora	Aurora House Snake	LC	LC
Leptotyphlops scutifrons scutifrons	Peters' Thread Snake	LC	Unlisted
Lycodonomorphus rufulus	Brown Water Snake	LC	Unlisted
Lycophidion capense capense	Cape Wolf Snake	LC	Unlisted
Lygodactylus capensis	Common Dwarf Gecko	LC	Unlisted
Monopeltis capensis	Cape Worm Lizard	LC	LC
Naja nivea	Cape Cobra	LC	Unlisted
Nucras holubi	Holub's Sandveld Lizard	LC	Unlisted
Pachydactylus capensis	Cape Gecko	LC	Unlisted
Panaspis wahlbergi	Wahlberg's Snake-eyed Skink	LC	Unlisted
Pelomedusa galeata	South African Marsh Terrapin	Not evaluated	Unlisted
Prosymna ambigua	Angolan Shovel-snout	Unlisted	LC
Prosymna sundevallii	Sundevall's Shovel-snout	LC	LC
Psammophis brevirostris	Short-snouted Grass Snake	LC	Unlisted
Psammophis trinasalis	Fork-marked Sand Snake	LC	Unlisted
Psammophylax rhombeatus	Spotted Grass Snake	LC	Unlisted
Psammophylax tritaeniatus	Striped Grass Snake	LC	LC
Pseudaspis cana	Mole Snake	LC	Unlisted
Rhinotyphlops lalandei	Delalande's Beaked Blind Snake	LC	Unlisted
Stigmochelys pardalis	Leopard Tortoise	LC	LC

Trachylepis capensis	Cape Skink	LC	Unlisted
Trachylepis punctatissima	Speckled Rock Skink	LC	LC
Trachylepis punctulata	Speckled Sand Skink	LC	Unlisted
Trachylepis varia	Variable Skink	LC	LC
Varanus albigularis albigularis	Southern Rock Monitor	LC	Unlisted
Varanus niloticus	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)
Aethomys ineptus	Tete Veld Rat	LC	LC
Aethomys namaquensis	Namaqua rock rat	LC	LC
Aonyx capensis	Cape Clawless Otter	NT	NT
Atelerix frontalis	South Africa Hedgehog	NT	LC
Atilax paludinosus	Water Mongoose	LC	LC
Canis mesomelas	Black-backed Jackal	LC	LC
Caracal caracal	Caracal	LC	LC
Crocidura cyanea	Reddish-grey Musk Shrew	LC	LC
Crocidura mariquensis	Swamp Musk Shrew	NT	LC
Cynictis penicillata	Yellow Mongoose	LC	LC
Dendromus melanotis	Grey Climbing Mouse	LC	LC
Desmodillus auricularis	Short-tailed Gerbil	LC	LC
Elephantulus brachyrhynchus	Short-snouted Sengi	LC	LC
Elephantulus myurus	Eastern Rock Sengi	LC	LC
Eptesicus hottentotus	Long-tailed Serotine Bat	LC	LC
Felis nigripes	Black-footed Cat	VU	VU
Felis silvestris	African Wildcat	LC	LC
Genetta genetta	Small-spotted Genet	LC	LC
Gerbilliscus brantsii	Highveld Gerbil	LC	LC
Gerbilliscus leucogaster	Bushveld Gerbil	LC	LC
Gerbillurus paeba	Hairy-footed Gerbil	LC	LC
Graphiurus microtis	Large Savanna African Dormouse	LC	LC
Herpestes sanguineus	Slender Mongoose	LC	LC
Hydrictis maculicollis	Spotted-necked Otter	VU	NT
Hystrix africaeaustralis	Cape Porcupine	LC	LC
Ichneumia albicauda	White-tailed Mongoose	LC	LC
Ictonyx striatus	Striped Polecat	LC	LC

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

Vulpes chama	Cape Fox	LC	LC
Xerus inauris	Cape Ground Squirrel	LC	LC

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	Terrestrial ecological support areas (ESAs), including: (a) the impact on the ecological processes that operate within or across the site; (b) the extent the proposed development will impact on the functionality of the ESA; and (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.	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	Protected areas as defined by the National Environmental Management: Protected Areas Act, 2004 including- (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.	Section 3.1.5	
2.3.7.4	Priority areas for protected area expansion, including- (a) the way in which in which the proposed development will compromise or contribute to the expansion of the protected area network.	Section 3.1.6	
2.3.7.5	SWSAs including: (a) the impact(s) on the terrestrial habitat of a SWSA; and (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)	Section 3.1.9-	
2.3.7.6	FEPA sub catchments, including- (a) the impacts of the proposed development on habitat condition and species in the FEPA sub catchment	Section 3.1.10	
2.3.7.7	indigenous forests, including: (a) impact on the ecological integrity of the forest; and (b) percentage of natural or near natural indigenous forest area lost and a statement on the implications in relation to the remaining areas.	-	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