THE TERRESTRIAL BIODIVERSITY & WETLAND IMPACT ASSESSMENT FOR THE PROPOSED HIGHVELD SOLAR PHOTOVOLTAIC FACILITY

Stilfontein, North-West Province

October 2022

CLIENT

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1 Introduction

1.1 Background

The Biodiversity Company was appointed to undertake a terrestrial and wetland assessment for the proposed Highveld Solar PV Facility near Stilfontein, North-West Province (Figure 1-1 & Figure 1-2). WKN Windcurrent SA (Pty) Ltd has identified a development area up to 1300 ha within the larger project area of 1400 ha, with the larger area referred to as the Project Area of Influence (PAOI). The project is located in the JB Marks Local Municipality and Dr Kenneth Kaunda District Municipality in the North-West Province. The project area is located approximately 20 km north-east of the town of Stilfontein. The proposed development will comprise the following:

- Solar PV arrays, modules, and mounting structures;
- Inverters and transformers;
- A Battery Energy Storage System (BESS);
- On-site facility substation;
- Cabling between the project components;
- Site and internal access roads and fencing around the development area; and
- Temporary and permanent laydown areas and O&M buildings.

The approach was informed by the Environmental Impact Assessment Regulations. 2014 (GNR 326, 7 April 2017) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The approach has taken cognisance of the recently published Government Notices 320 (20 March 2020) in terms of NEMA, dated 20 March and 30 October 2020: "*Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation*" (Reporting Criteria). The National Web based Environmental Screening Tool has characterised the terrestrial sensitivity of the project area as "Very-High".

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.

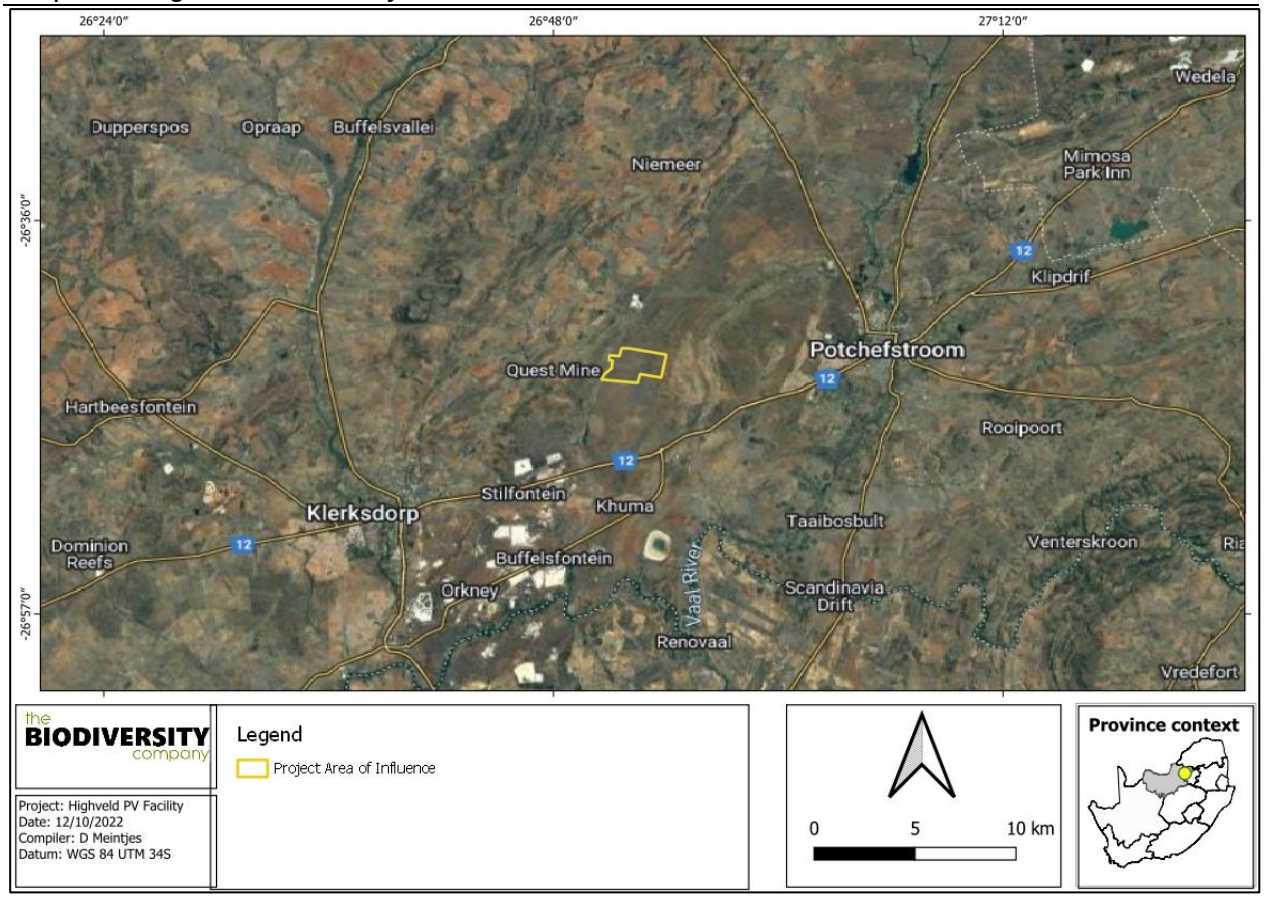


Figure 1-1 Proposed location of the project area in relation to the nearby towns

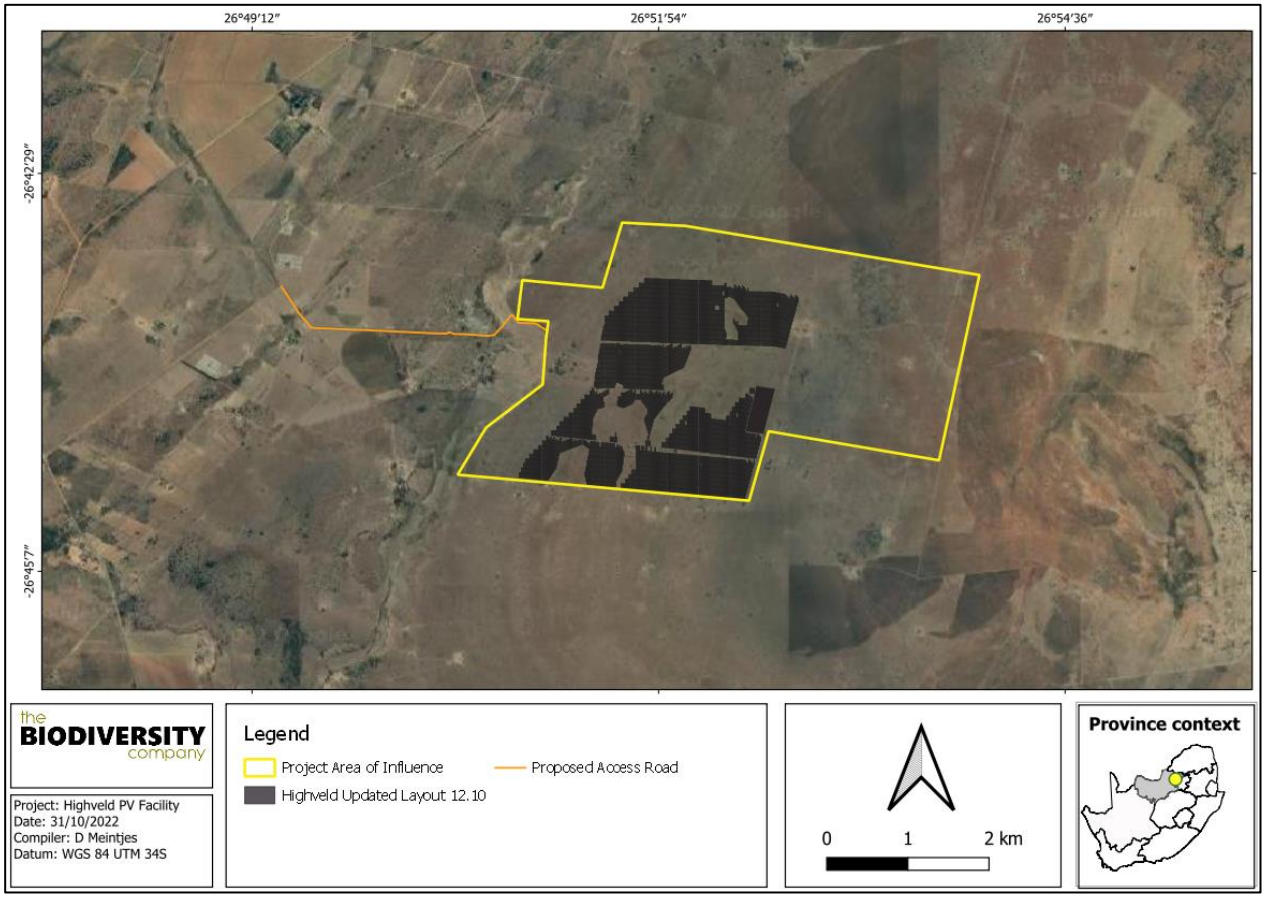


Figure 1-2 The project area

1.2 Specialist Details

Report Name	**THE TERRESTRIAL BIODIVERSITY & WETLAND IMPACT ASSESSMENT FOR THE PROPOSED HIGHVELD SOLAR PHOTOVOLTAIC FACILITY**
Reference	**Highveld PV**
Submitted to	savannah environmental
Report Writer	**Daniel Meintjes**  Daniel Meintjes obtained his B.Sc. Honours (*Cum Laude*) degree in Geography at the University of Johannesburg. Daniel has been conducting EIA's, Basic Assessments and Terrestrial Biodiversity Surveys since 2020.
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 13 experience in the environmental consulting field.
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.

1.3 Terms of Reference

The Terms of Reference (ToR) included the following:

- Description of the baseline receiving environment specific to the field of expertise (general surrounding area as well as site specific environment);
- Identification and description of any sensitive receptors in terms of relevant specialist disciplines (biodiversity and wetlands) that occur in the project area, and the manner in which these sensitive receptors may be affected by the activity;
- Identify 'significant' ecological, botanical and faunal features within the proposed project areas;
- Identification of conservation significant habitats around the project area which might be impacted;
- Screening to identify any critical issues (potential fatal flaws) that may result in project delays or rejection of the application;
- Provide a map to identify sensitive receptors in the project area, based on available maps and database information;
- Conduct risk assessments relevant to the proposed activity;
- Impact assessment, mitigation and rehabilitation measures to prevent or reduce the possible impacts; and
- The delineation, classification, and assessment of wetlands within 500 m of the project area.

1.4 Assumptions and Limitations

- The assessment area was based on the spatial data provided by the client and any alterations to the proposed development area and/or missing GIS information pertaining to the assessment area would have affected the area surveyed;
- The assessment area was surveyed during a single site visit and therefore, this assessment does not consider temporal trends, however sufficient to derive meaningful baseline information;
- The field investigation was conducted by external specialists that withdrew from the project, data and photographs were provided to supplement writing this report; however, there were some limitations in terms of the quality of photographs provided and the location of some protected species; and
- All wetlands delineated within this report were by DPR Ecologists from field work conducted in March/April 2022.

2 Key Legislative Requirements

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

Table 2-1 A list of key legislative requirements relevant to biodiversity and conservation in the North-West Province

Region	Legislation / Guideline
National	Constitution of the Republic of South Africa (Act No. 108 of 1996)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management: Protected Areas Act (Act No. 57 of 2003)

	The National Environmental Management: Biodiversity Act (Act No. 10 of 2004), Threatened or Protected Species Regulations
	Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 320 of Government Gazette 43310 (March 2020)
	Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 1150 of Government Gazette 43855 (October 2020)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989)
	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 Water Act (NWA) (Act No. 36 of 1998)
	World Heritage Convention Act (Act No. 49 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations and, Alien and Invasive Species List 20142020, published under NEMBA
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)
Provincial	North West Biodiversity Management Act, No. 4 of 2016
	North West Biodiversity Sector Plan, 2015

3 Methods

3.1 Desktop Assessment

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

3.1.1 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 around the following spatial datasets:

- National Biodiversity Assessment 2018 (NBA) (Skowno *et al*., 2019):

  The purpose of the NBA is to assess the state of South Africa's biodiversity based on 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* – 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* – 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 2021:
    - *South Africa Protected Areas Database (*SAPAD) (DEA, 2021*)* – The (SAPAD) Database contains spatial data for the conservation of South Africa. It includes spatial and attribute information for both formally protected areas and areas that have less formal protection (such as South African Conservation Areas). SAPAD is updated on a continuous basis 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) (DEA, 2016) – 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.
- North West Biodiversity Sector Plan 2015 (NWBSP) (READ, 2015):

  The North West Biodiversity Sector Plan was completed in 2015 for the North West Department of Rural, Environment and Agricultural Development (READ). The purpose of the sector plan is to develop the spatial component of a bioregional plan (i.e. map of Critical Biodiversity Areas and associated land-use guidelines). A North West Biodiversity Sector Plan map was produced as part of this plan and sites were assigned the following CBA categories based on their biodiversity characteristics, spatial configuration and requirement for meeting targets for both biodiversity pattern and ecological processes:

    - Critical Biodiversity Area 1 (CBA1);
    - Critical Biodiversity Area 2 (CBA2);
    - Ecological Support Area 1 (ESA1);
    - Ecological Support Area 2 (ESA2);
    - Other Natural Area (ONA);
    - No Natural Habitat Remaining (NNR); and
    - Protected Area (PA).

  Critical Biodiversity Areas (CBAs) are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (READ, 2015).

  Ecological Support Areas (ESAs) are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services (READ, 2015). Critical Biodiversity Areas and Ecological Support Areas may be terrestrial or aquatic.

  Other Natural Areas are areas that still contain natural habitat but that are not required to meet biodiversity targets. No Natural Habitat Remaining includes areas without intact habitat remaining (READ, 2015).

  Protected Areas are declared and formally protected under the Protected Areas Act, such as National Parks, legally declared Nature Reserves, World Heritage Sites and Protected Environments that are secured by appropriate legal mechanisms. These areas must be managed according to a specific protected area management plan (READ, 2015).

The NWBSP also categorises aquatic areas according to their biodiversity characteristics, spatial configuration, and requirement for meeting targets for both biodiversity pattern and ecological processes. These areas are categorised into CBA and ESA areas much in the same way as the terrestrial areas are, as described above, and they are assigned the same land management objectives.

- 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 (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.

- National Freshwater Ecosystem Priority Areas, Rivers and Wetlands (Nel *et al*., 2011):

  To better conserve aquatic ecosystems, South Africa has categorised its inland aquatic systems according to set ecological criteria (i.e., ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs).

3.1.2 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 (Figure 3-1). The Red List of South African Plants (Raimondo *et al.,* 2009; SANBI, 2020) was utilized to provide the most current national conservation status of flora species.

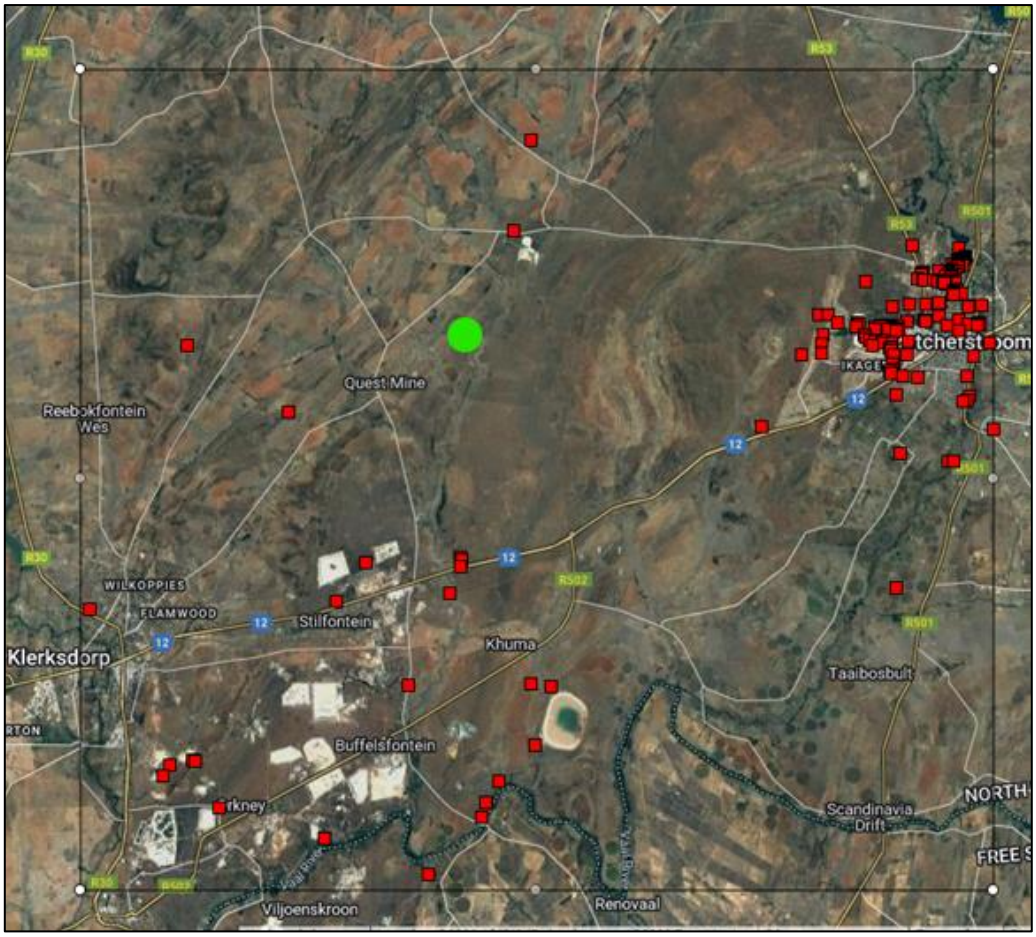


Figure 3-1 ***Map illustrating extent of area used to obtain the expected flora species list from the Plants of South Africa (POSA) database. Green dot indicates approximate location of the project area. The red squares are cluster markers of botanical records as per POSA data.***

3.1.3 Desktop Faunal Assessment

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

- Amphibian list, generated from the IUCN spatial dataset (2017) and FrogMap database (Fitzpatrick Institute of African Ornithology, 2021a), using the 2626 quarter degree square;
- Reptile list, generated from the IUCN spatial dataset (2017) and ReptileMap database (Fitzpatrick Institute of African Ornithology, 2021b), using the 2626 quarter degree square;
- Avifauna list, generated from the SABAP2 dataset by looking at pentads 2445_2715; 2445_2720; 2445_2725; 2450_2715; 2450_2720; 2450_2725; 2455_2715; 2455_2720 and 2455_2725); and
- Mammal list from the IUCN spatial dataset (2017) and MammalMap database (Fitzpatrick Institute of African Ornithology, 2021c), using the 2626 quarter degree square.

A field survey was undertaken from 30 March 2022 to 1 April 2022 (DPR Ecologists), which is a wet season survey, to determine the presence of Species of Conservation Concern (SCC). Effort was made to cover all of the different habitat types, within the limits of time and access.

3.2 Terrestrial Ecology

3.2.1 Flora Survey

A field survey was undertaken in October 2022. The fieldwork and sample sites were placed within targeted areas (i.e. target sites) perceived as ecologically sensitive based on the preliminary interpretation of satellite imagery (Google Corporation) and GIS analysis (which included the latest applicable biodiversity datasets) available prior to the fieldwork. The focus of the fieldwork was therefore to maximise coverage and navigate to each target site in the field, to perform a rapid vegetation and ecological assessment at each sample site. Emphasis was placed on sensitive habitats, especially those overlapping with the 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 field survey undertaken from 30 March 2022 to 1 April 2022 (DPR Ecologists). Emphasis was placed mostly on sensitive habitats overlapping with the project areas.

The timed random meander method is highly efficient for conducting floristic analysis, specifically in detecting flora SCC and maximising floristic coverage. In addition, the method is time and cost effective and highly suited for compiling flora species lists and therefore gives a rapid indication of flora diversity. The timed meander search was performed based on the original technique described by Goff *et al.* (1982). Suitable habitat for SCC were identified according to Raimondo (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.), and a subjective recording of dominant vegetation species and any sensitive features (e.g. wetlands, outcrops etc.) was also made. In addition, opportunistic observations were made while navigating through the project area.

3.2.2 Fauna Survey

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

- Visual and auditory searches - This typically comprised of meandering and using binoculars to view species from a distance without them being disturbed; and listening to species calls;
- Active hand-searches - 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 included the following:

- Field Guide to Snakes and other Reptiles of Southern Africa (Branch, 1998);
- A Complete Guide to the Snakes of Southern Africa (Marais, 2004);
- Atlas and Red List of the Reptiles of South Africa, Lesotho and Swaziland (Bates *et al,* 2014);
- A Complete Guide to the Frogs of Southern Africa (du Preez and Carruthers, 2009);
- Smithers' Mammals of Southern Africa (Apps, 2008);
- A Field Guide to the Tracks and Signs of Southern and East African Wildlife (Stuart and Stuart, 2000);
- Birds of Africa (Sinclair and Ryan, 2010); and
- Taylor *et al.* (2015), Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. Used for conservation status, nomenclature and taxonomical ordering.

3.2.3 Terrestrial Site Ecological Importance

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 3-1 and Table 3-2, respectively.

Table 3-1 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 3-2 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 3-3.

Table 3-3 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 3-4.

Table 3-4 Summary of Receptor Resilience (RR) criteria

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

After the determination of the BI and RR, the SEI can be ascertained using the matrix as provided in Table 3-5.

Table 3-5 Matrix used to derive Site Ecological Importance from Receptor Resilience (RR) and Biodiversity Importance (BI)

Site Ecological Importance		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 project is provided in Table 3-6.

Table 3-6 Guidelines for interpreting Site Ecological Importance in the context of the development activities

Site Ecological Importance	Interpretation in relation to 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.

3.3 Wetland Ecology

3.3.1 Identification and Mapping

The wetland areas were delineated in accordance with the DWAF (2005) guidelines, a cross section is presented in Figure 3-2. The outer edges of the wetland areas were identified by considering the following four specific indicators:

- The Terrain Unit Indicator helps to identify those parts of the landscape where wetlands are more likely to occur;
- The Soil Form Indicator identifies the soil forms, as defined by the Soil Classification Working Group (1991), which are associated with prolonged and frequent saturation.
    - The soil forms (types of soil) found in the landscape were identified using the South African soil classification system namely; Soil Classification: A Taxonomic System for South Africa (Soil Classification Working Group, 1991);

- The Soil Wetness Indicator identifies the morphological "signatures" developed in the soil profile as a result of prolonged and frequent saturation; and
- The Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils.

Vegetation is used as the primary wetland indicator. However, in practise the soil wetness indicator tends to be the most important, and the other three indicators are used in a confirmatory role.

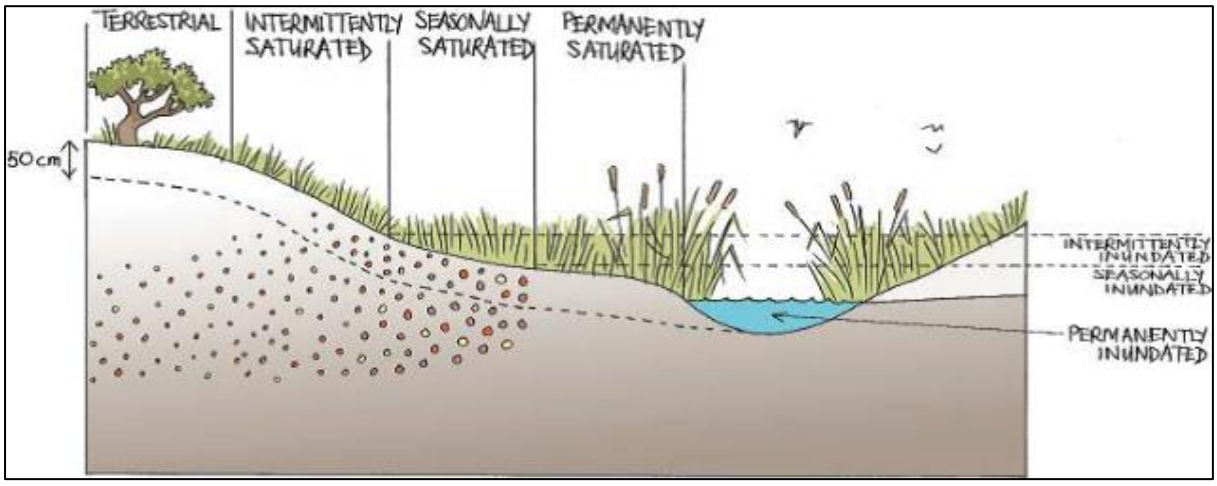


Figure 3-2 Cross section through a wetland, indicating how the soil wetness and vegetation indicators change (Ollis et al. 2013)

3.3.2 Delineation

The wetland indicators described above are used to determine the boundaries of the wetlands within the project area. These delineations are then illustrated by means of maps accompanied by descriptions.

3.3.3 Functional Assessment

Wetland Functionality refers to the ability of wetlands to provide healthy conditions for the wide variety of organisms found in wetlands as well as humans. Eco Services serves as the main factor contributing to wetland functionality.

The assessment of the ecosystem services supplied by the identified wetlands was conducted per the guidelines as described in WET-EcoServices (Kotze *et al*. 2008). An assessment was undertaken that examines and rates the following services according to their degree of importance and the degree to which the services are provided (Table 3-7).

Table 3-7 Classes for determining the likely extent to which a benefit is being supplied

Score	Rating of likely extent to which a benefit is being supplied
< 0.5	Low
0.6 - 1.2	Moderately Low
1.3 - 2.0	Intermediate
2.1 - 3.0	Moderately High
> 3.0	High

3.3.4 Present Ecological Status

The overall approach is to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a Present Ecological Status (PES) score. This takes the form of assessing the spatial extent of impact of individual activities/occurrences and then separately assessing the intensity of impact of each activity in the affected area. The extent and intensity are then combined to determine an overall magnitude of impact. The Present State categories are provided in Table 3-8.

Table 3-8 The Present Ecological Status categories (Macfarlane, et al., 2008)

Impact Category	Description	Impact Score Range	PES
None	Unmodified, natural	0 to 0.9	A
Small	Largely Natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1.0 to 1.9	B
Moderate	Moderately Modified. A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.	2.0 to 3.9	C
Large	Largely Modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4.0 to 5.9	D
Serious	Seriously Modified. The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognizable.	6.0 to 7.9	E
Critical	Critical Modification. The modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8.0 to 10	F

3.3.5 Importance and Sensitivity

The importance and sensitivity of water resources are determined to establish resources that provide higher than average ecosystem services, biodiversity support functions or are particularly sensitive to impacts. The mean of the determinants is used to assign the Importance and Sensitivity (IS) category as listed in Table 3-9.

Table 3-9 Description of Importance and Sensitivity categories

IS Category	Range of Mean	Recommended Ecological Management Class
Very High	3.1 to 4.0	**A**
High	2.1 to 3.0	**B**
Moderate	1.1 to 2.0	**C**
Low Marginal	< 1.0	**D**

3.3.6 Ecological Classification and Description

The National Wetland Classification Systems (NWCS) developed by the South African National Biodiversity Institute (SANBI) will be considered for this study. This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels, and then also includes structural features at the lower levels of classification (Ollis *et al*., 2013).

3.3.7 Buffer Requirements

The “Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries” (Macfarlane *et al.,* 2014) was used to determine the appropriate buffer zone for the proposed activity.

4 Results & Discussion

4.1 Desktop Assessment

4.1.1 Ecologically Important Landscape Features

The GIS analysis pertaining to the relevance of the proposed project to ecologically important landscape features is summarised in Table 4-1.

Table 4-1 Summary of relevance of the proposed project to ecologically important landscape features.

Desktop Information Considered	Relevant/Irrelevant	Section
Ecosystem Threat Status	Relevant – Overlaps with a Least Concern Ecosystem.	4.1.1.1
Ecosystem Protection Level	Relevant – Overlaps mainly with a Poorly Protected Ecosystem and a Not Protected Ecosystem in the west of the project area.	4.1.1.2
Protected Areas	Relevant – The project area lies within the 5 km Protected Area Buffer Zone of the proposed Highveld National Park.	4.1.1.4
National Protected Areas Expansion Strategy	Relevant – The project area overlaps with a Priority Focus Area.	4.1.1.5
Critical Biodiversity Area	Relevant – The project area overlaps with an Aquatic ESA 1 area in the central area and a small portion in the west; an Aquatic CBA 1 area in the central area; a Terrestrial CBA 2 and a small portion of a Terrestrial CBA 1 in the west of the project area.	4.1.1.3
Important Bird and Biodiversity Areas	Irrelevant – The project area is 90km from the closest IBA	-
South African Inventory of Inland Aquatic Ecosystems	Relevant – The project area overlaps with an NBA wetlands & river in the far west of the project area.	4.1.1.6
National Freshwater Priority Area	Relevant – The project area overlaps with one non-FEPA river.	4.1.1.7
Strategic Water Source Areas	Irrelevant- The project area is 229 km from the closest SWSA.	-
REDZ	Relevant – The project area falls within the Klerksdorp REDZ.	4.1.1.10
Strategic Transmission Corridors (EGI)	Relevant – The project overlaps with the Central EGI corridor	4.1.1.8
Renewable Energy Database	Relevant - Limited projects in area; “Approved” and “lapsed” projects in regional area.	4.1.1.9

4.1.1.1 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 spatial dataset the proposed project overlaps with a LC ecosystem – this means that the ecosystem is still largely intact and the proposed development poses no risk to a threatened ecosystem (Figure 4-1).

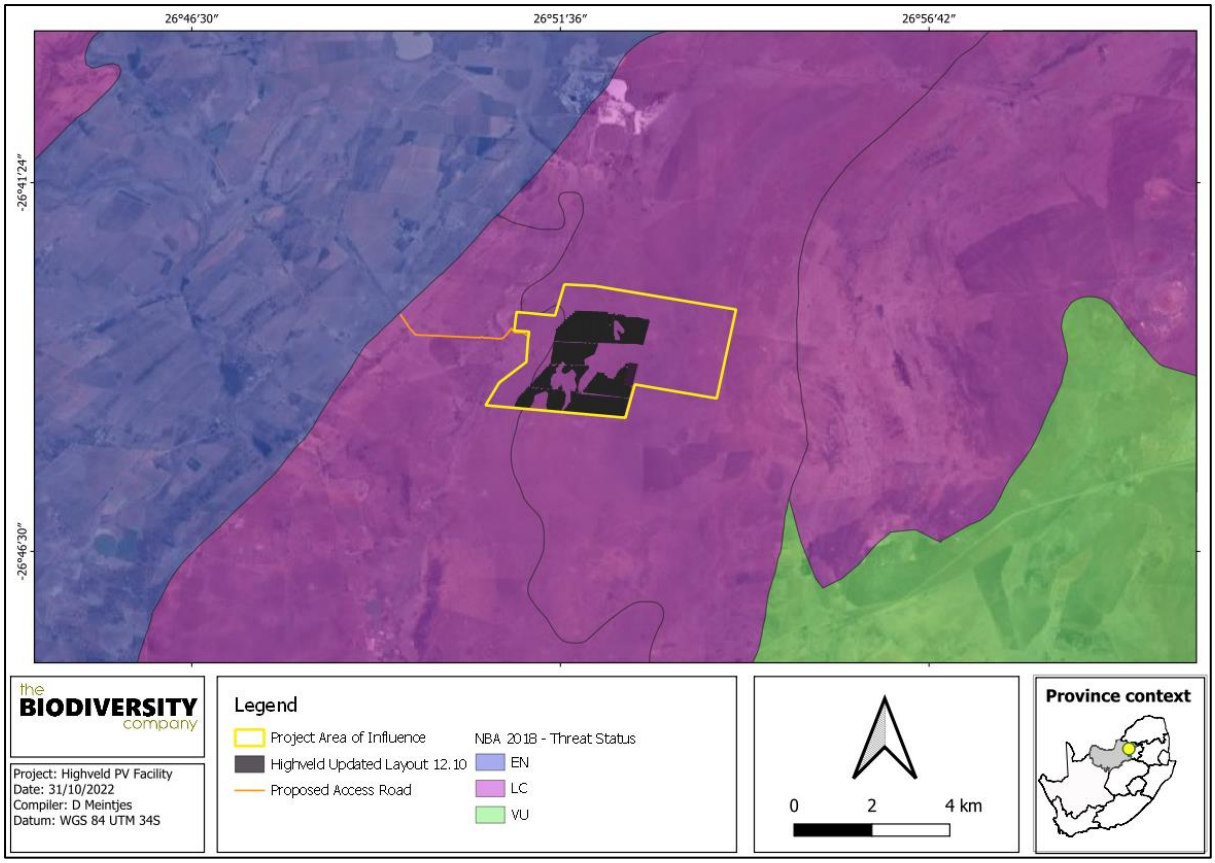


Figure 4-1 Map illustrating the ecosystem threat status associated with the project area

4.1.1.2 Ecosystem Protection Level

This is 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. The proposed project overlaps mainly with a PP ecosystem and a NP ecosystem in the western section – these ecosystems have very little areas that exist within formally protected areas as per the SAPAD – this aspect in isolation however does not necessarily prevent development in these zones (Figure 4-2).

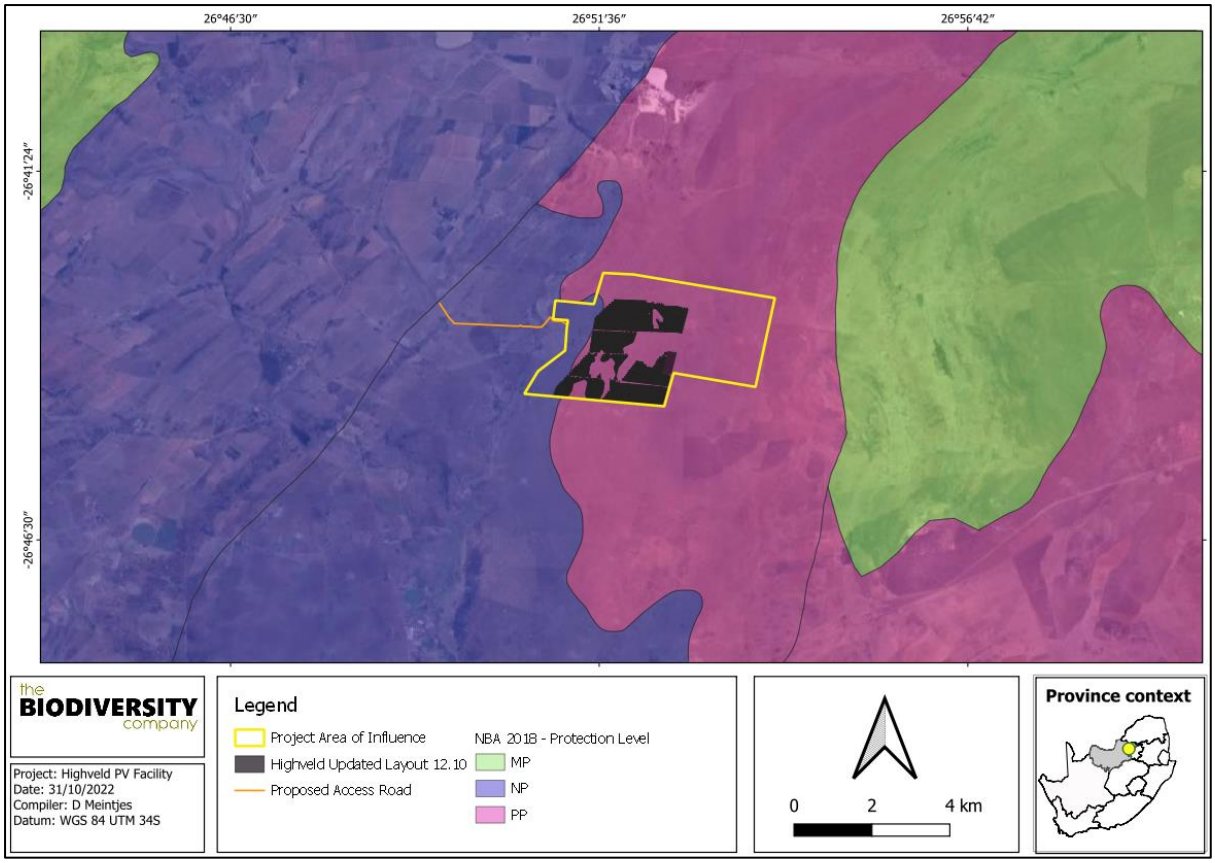


Figure 4-2 Map illustrating the ecosystem protection level associated with the project area

4.1.1.3 Critical Biodiversity Areas and Ecological Support Areas

The NWBSP dataset contains spatial data for both terrestrial and aquatic CBA and ESA areas as relevant to the province.

Figure 4-3 below shows that the project area mostly overlaps with terrestrial CBA 2 areas, with a small portion overlapping with terrestrial CBA 1 in the west. In addition, the project area overlaps with an aquatic CBA 1 in the central region, an aquatic CBA 1 in the central region and a small portion of an aquatic CBA 1 in the west. CBA1 areas should be avoided as far as possible, and the proposed development footprint does achieve this.

Ecological Support Areas (ESAs) are terrestrial and aquatic areas that are not essential for meeting biodiversity representation targets (thresholds), but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree or extent of restriction on land use and resource use in these areas may be lower than that recommended for CBAs. ESA areas are typically not as essential as CBA areas and some development may occur over these areas where they are confirmed not to contain any sensitive features (such as in the case of the proposed layout).

The land management objective for ESA1 areas is to maintain them in at least a semi-natural state as ecologically functional landscapes that retain basic natural attributes (READ, 2015).

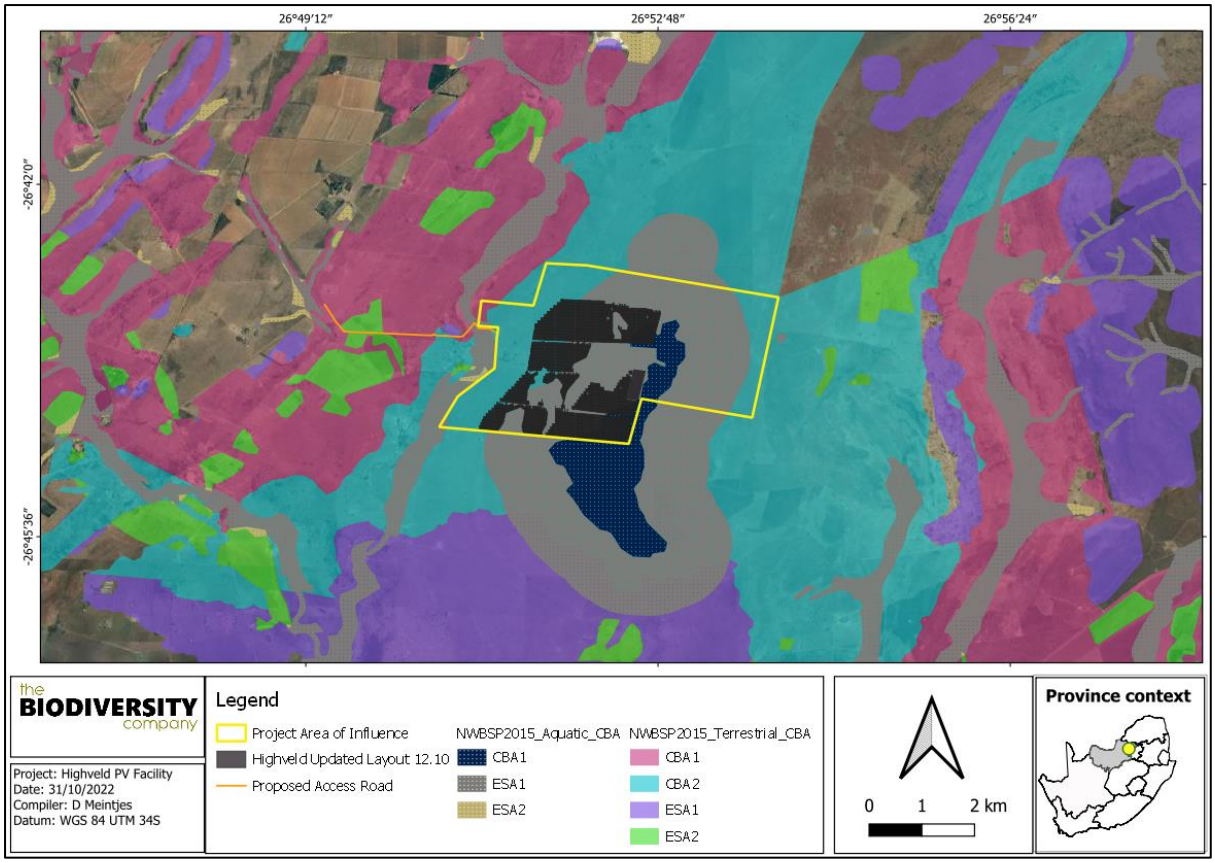


Figure 4-3 Map illustrating the locations of CBAs and ESAs in the project area

4.1.1.4 Protected areas

According to the protected area spatial datasets from SAPAD (2022) and SACAD (2022), the project area does not overlap with any protected areas or conservation areas. However, it is located approximately 3 km North-West from the Faan Meintjes Private Nature Reserve (Figure 4-4) and will be located within the 5 km Protected Area Buffer Zone of the proposed Highveld National Park protected area (Figure 4-5).

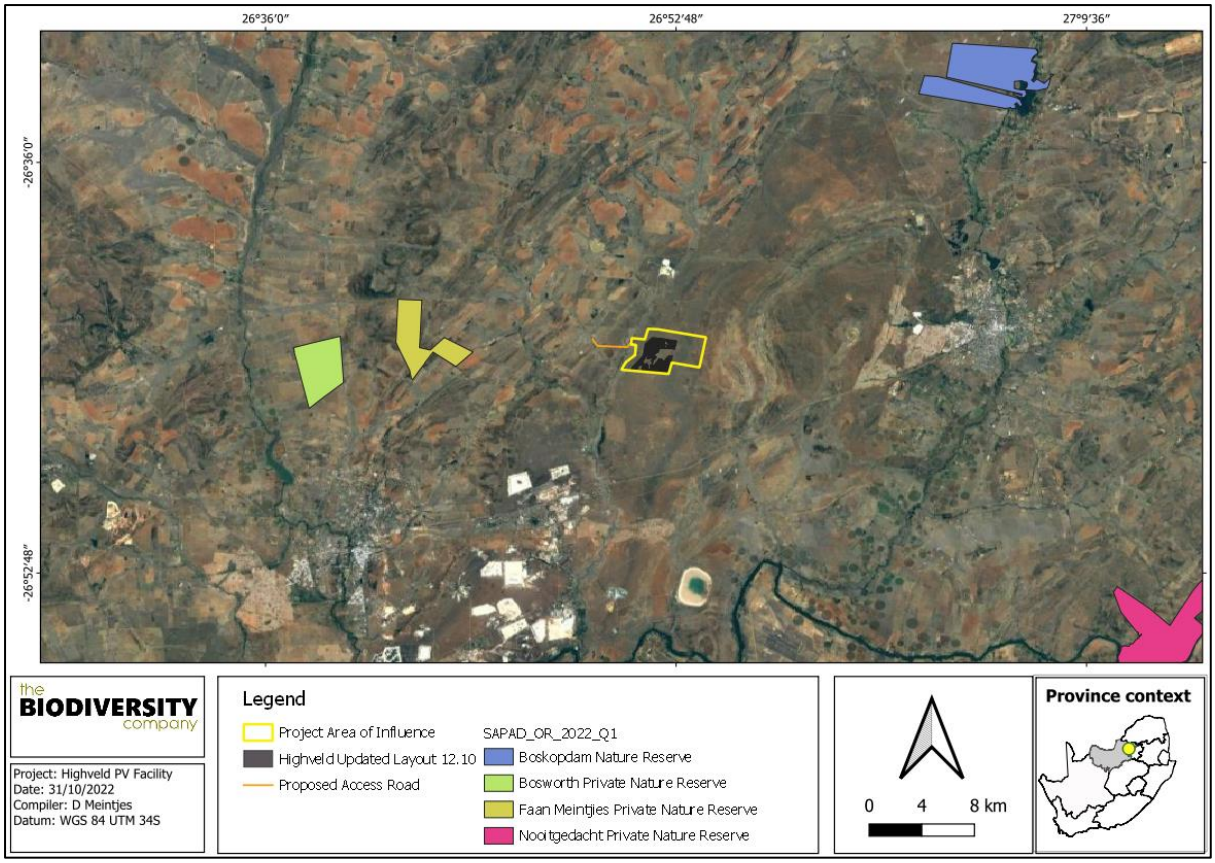


Figure 4-4 The project area in relation to the protected areas

4.1.1.5 National Protected Area Expansion Strategy

National Protected Area Expansion Strategy 2016 (NPAES) areas 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 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 finescale planning which may identify a range of different priority sites based on local requirements, constraints and opportunities (NPAES, 2016).

The project area does overlap with a Priority Focus Area[1] and the proposed Highveld National Park would be situated adjacent to the project area in the north-east corner, should the national park come into existence (Figure 4-5).

[1] It has been communicated (to us) that the North West Parks Board that this park is no longer being planned for development, and official communication has not been gazetted.

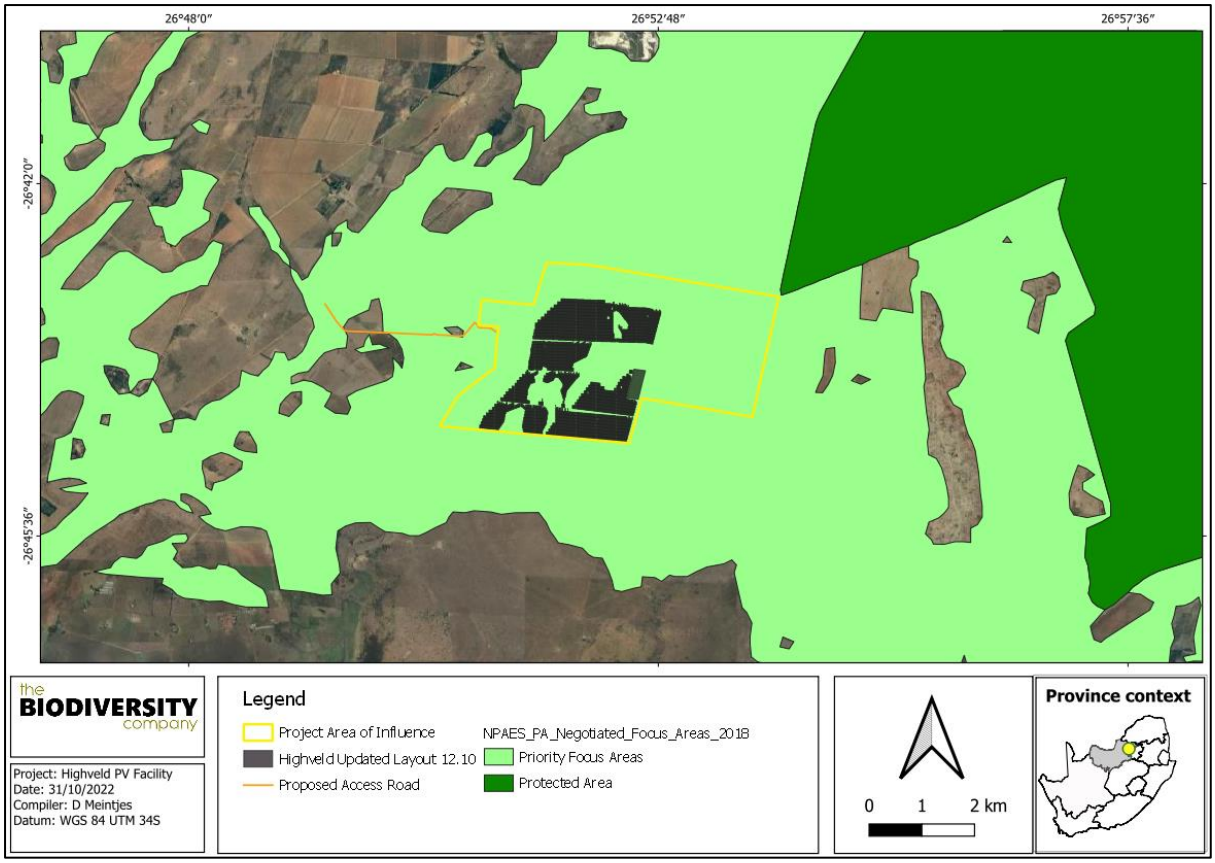


Figure 4-5 The project area in relation to the National Protected Area Expansion Strategy

4.1.1.6 Hydrological Setting

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was released with the NBA 2018. Ecosystem threat status (ETS) of river and wetland ecosystem types are based on the extent to which each river ecosystem type had been altered from its natural condition, methodology is complex and can be found in Van Deventer *et al.,* 2019 and Skowno *et al.,* 2019. The project area overlaps with a Critically Endangered classified river and wetland in the far west (Figure 4-6). These systems are close to collapse and should be protected as far as possible with appropriate buffers and mitigations for close-by developments.

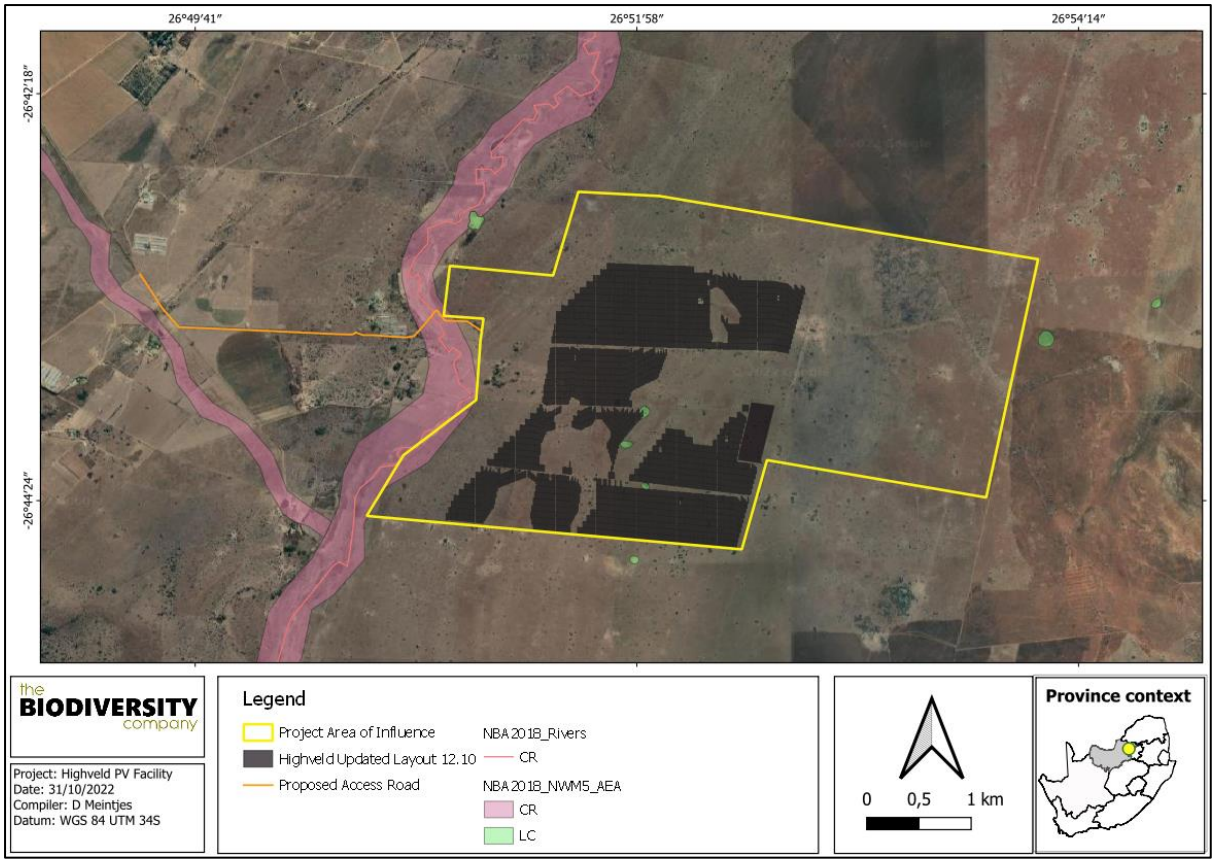


Figure 4-6 Map illustrating ecosystem threat status of rivers and wetland ecosystems in the project area

4.1.1.7 National Freshwater Ecosystem Priority Area Status

In an attempt to better conserve aquatic ecosystems, South Africa has categorised its river systems according to set ecological criteria (i.e., ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs) (Driver *et al.,* 2011). The FEPAs 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 (NEM:BA) biodiversity goals (Nel *et al.,* 2011).

Figure 4-7 shows that the POAI does not overlap with any wetlands, but an unclassified NFEPA river is located on the western boundary of the area.

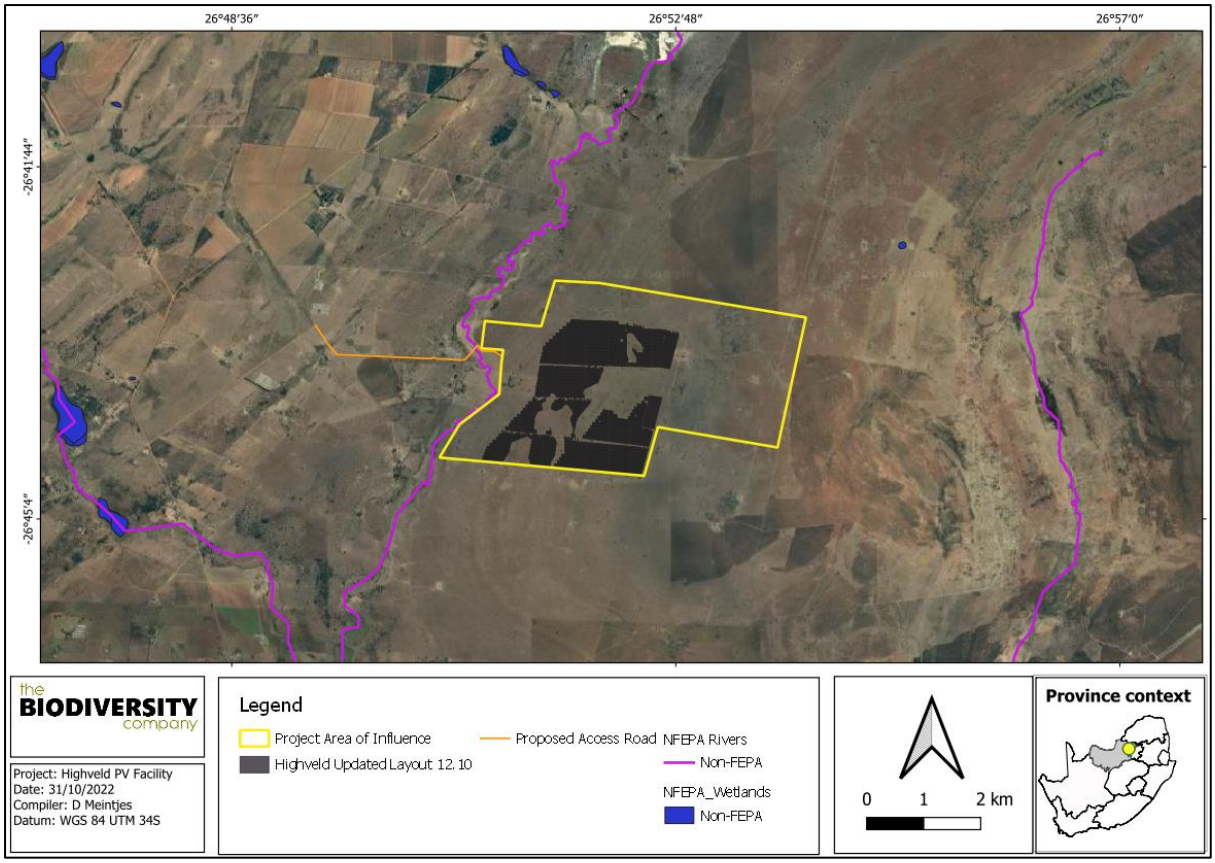


Figure 4-7 The project area in relation to the National Freshwater Ecosystem Priority Areas

4.1.1.8 Strategic Transmission Corridors (EGI)

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

On 29 April 2021, Minister Barbara Dallas Creecy published Government Notice No. 383 in Government Gazette No. 44504, which expanded the eastern and western transmission corridors and gave notice of the applicability of the application procedures identified in Government Notice No. 113, to these expanded corridors. More information on this can be obtained from https://egis.environment.gov.za/egi.

Figure 4-8 shows the project overlaps with the Central EGI corridor (only applicable to the supportive grid infrastructure, covered in a separate report).

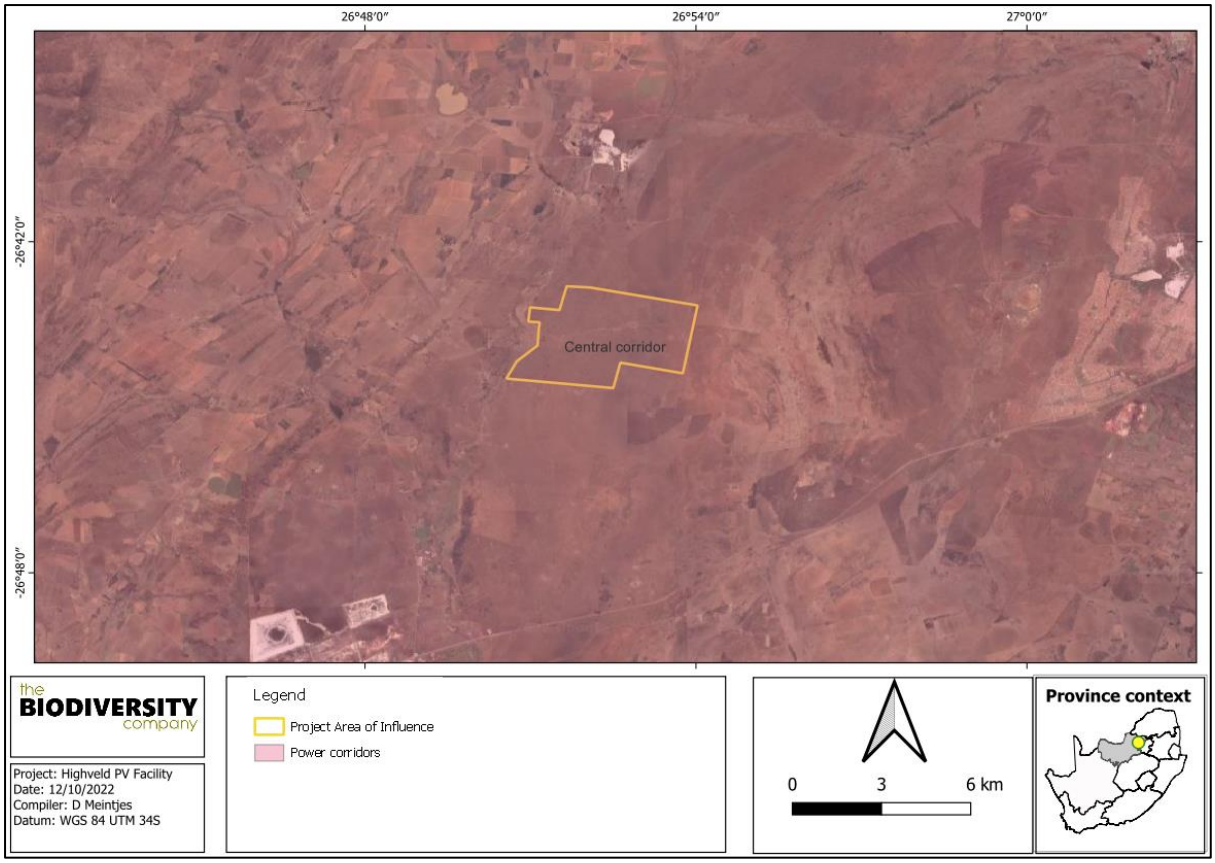


Figure 4-8 The project area in relation to the strategic transmission corridors

4.1.1.9 Renewable Energy Database

The Renewable Energy Database (http://egis.environment.gov.za/), shows that there are limited other projects in the near vicinity (Figure 4-9). This reduces the overall impact on the habitats in the area. The proposed development will not impede on any remaining habitat corridors.

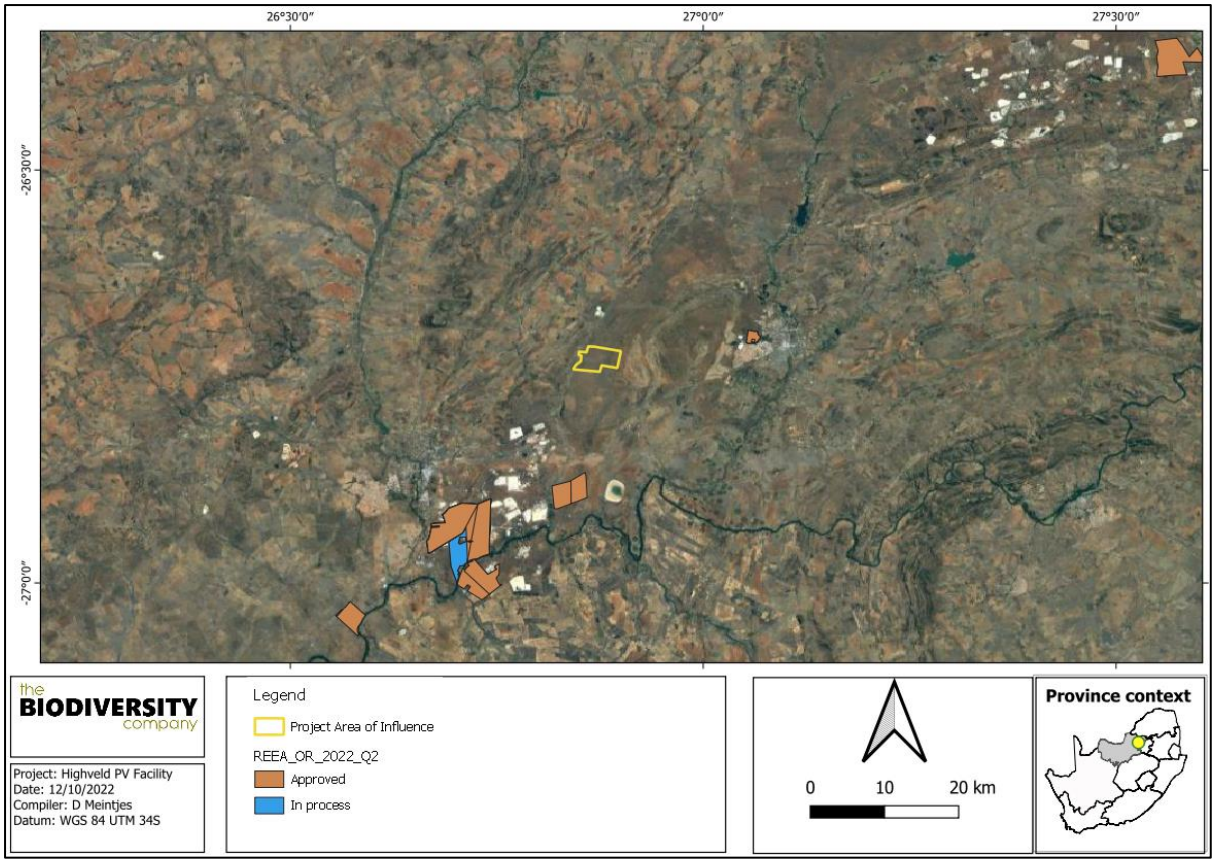


Figure 4-9 The project area in relation to the renewable energy database projects in the area.

4.1.1.10 Renewable Energy Development Zones (REDZ)

In 2018 the 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. Information here includes the Government Notice No. 142, 144 and 145 in Government Gazette No. 44191 that specifies the procedures to be followed when applying for environmental authorisation for electricity transmission or distribution infrastructure or large-scale wind and solar photovoltaic energy facilities in these REDZs.

The project area falls within the Klerksdorp REDZ (Figure 4-10).

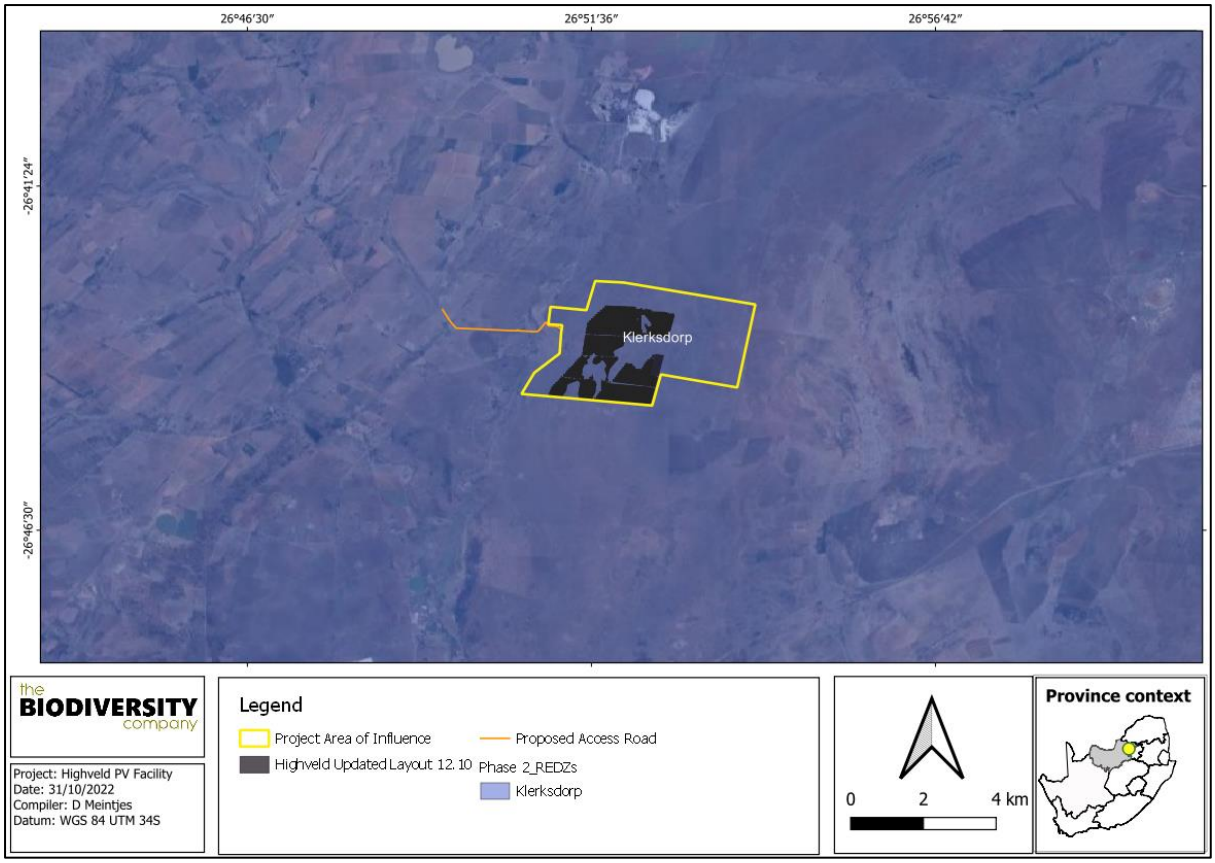


Figure 4-10 The project area in relation to the Renewable Energy Development Zone spatial data.

4.1.2 Flora Assessment

This section is divided into a description of the vegetation type expected to occur under natural conditions and the expected flora species.

4.1.2.1 Vegetation Type

The project area is situated within the Grassland Biome. The Grassland Biome in South Africa occurs mainly on the Highveld, the inland areas of the eastern seaboard, the mountainous areas of KwaZulu-Natal and the central parts of the Eastern Cape.

The topography is mainly flat to rolling, but also includes mountainous regions and the Escarpment (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the Grassland Biome include:

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

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

The Grassland Biome is comprised of 4 parent bioregions and a total of 72 different vegetation types. The project area is situated within both the Vaal Reefs Dolomite Sinkhole Woodland and the Carletonville Dolomite Grassland – both of the Dry Highveld Grassland Bioregion (Figure 4-11).

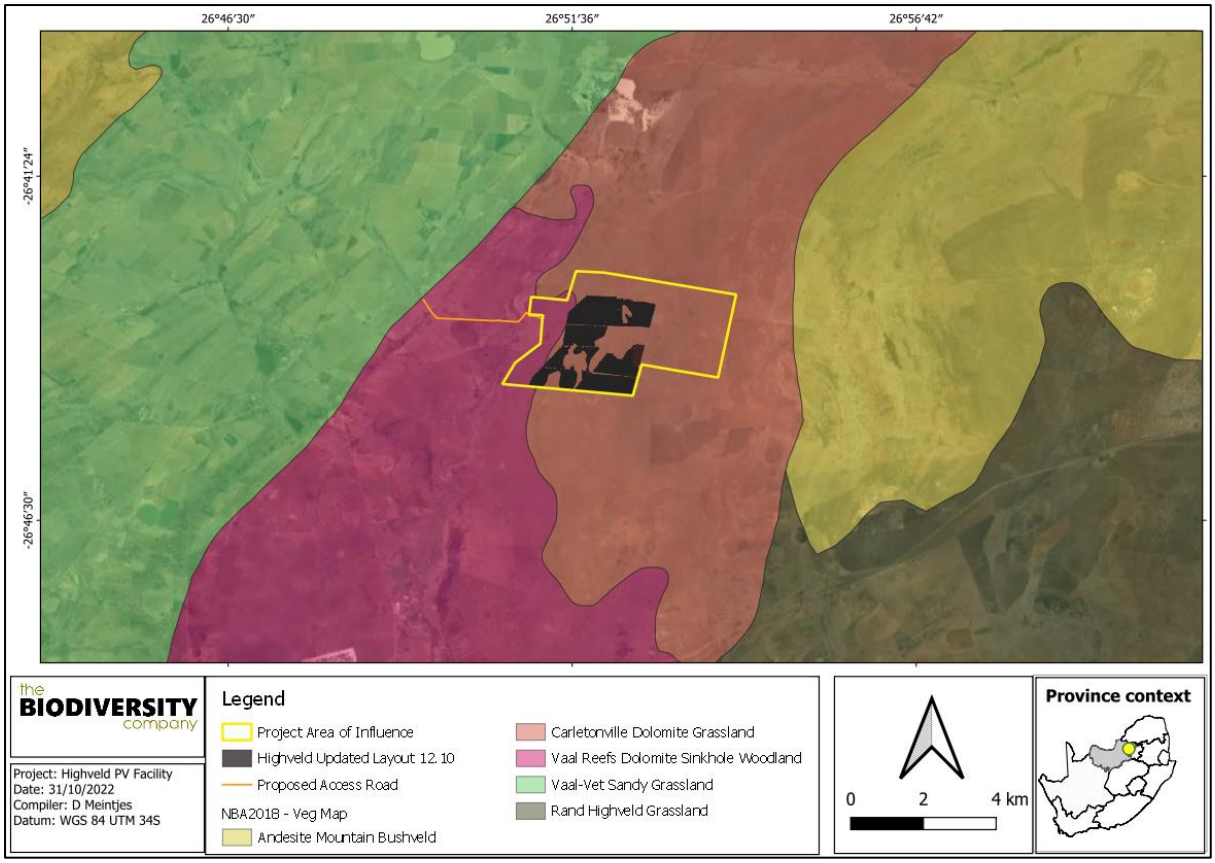


Figure 4-11 Map illustrating the vegetation type associated with the project area

4.1.2.1.1 Carletonville Dolomite Grassland

Carletonville Dolomite Grassland is restricted to the North-West (mainly) and Gauteng, and marginally extends 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. Its main vegetation and landscape features include slightly undulating plains dissected by prominent rocky chert ridges. These are a species-rich grasslands, forming a complex mosaic pattern dominated by many species.

Important Plant Taxa in Carletonville Dolomite Grassland

Mucina and Rutherford (2006) note the following species that are important taxa in the Carletonville Dolomite Grassland:

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, Searsia magalismontana, Tylosema esculentum, Ziziphus zeyheriana.*

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

Endemic Taxon - Succulent Shrub: *Delosperma davyi.*

Conservation Status

According to Mucina and Rutherford (2006) the Carletonville Dolomite Grassland is classified as Vulnerable. Although the target for conservation is 24%, only a small extent is conserved statutorily in the Sterkfontein Caves, Oog Van Malmanie, Abe Bailey, Boskop Dam, Schoonspruit, Krugersdorp, Olifantsvlei, and Groenkloof protected areas, and in at least six private conservation areas. Almost a quarter is already transformed for cultivation, by urban sprawl or by mining activity as well as the building of the Boskop and Klerkskraal Dams (Mucina & Rutherford, 2006).

4.1.2.2 Vaal Reefs Dolomite Sinkhole

Vaal Reefs Dolomite Sinkhole Woodland is restricted to the North-West and Free State Provinces, it covers a small area associated with the dolomite sinkholes in and around Stilfontein and Orkney (Vaal Reefs). The Vaal River forms the southern distribution limit of this vegetation unit. Its main vegetation and landscape features include a slightly undulating landscape dissected by prominent rocky chert ridges and supporting a grassland-woodland vegetation complex. The most typical vegetation feature is the woodland, which occurs naturally in clumps around sinkholes, especially in places of dolomite outcrops.

Important Plant Taxa in Vaal Reefs Dolomite Sinkhole Woodland

Based on Mucina and Rutherford's (2006) vegetation classification, important plant taxa are those species that have a high abundance, a frequent occurrence (not being particularly abundant) or are prominent in the landscape within a particular vegetation type. They note the following species that are important taxa in the Vaal Reefs Dolomite Sinkhole Woodland:

Small trees: *Vachellia erioloba, Celtis africana, Searsia lancea, Senegalia caffra, Vachellia karroo, V. robusta* subsp. *clavigera.*

Tall shrubs: *Diospyros lycioides* subsp*. lycioides, Ehretia rigida, Grewia flava.*

Low shrubs: A*sparagus suaveolens, Gymnosporia heterophylla, Pavonia burchellii, Sida dregei, Anthospermum hispidulum, Asparagus laricinus, Diospyros pallens, Felicia muricata, Indigofera heterotricha, Menodora africana, Phyllanthus incurvus, Triumfetta sonderi, Ziziphus zeyheriana.*

Graminoids: *Aristida congesta, Digitaria eriantha, Eragrostis biflora, E. curvula, Themeda triandra, Anthephora pubescens, Aristida canescens, Bewsia biflora, Brachiaria nigropedata, B. serrata, Chloris pycnothrix, Cymbopogon caesius, C. pospischilii, Cynodon dactylon, Cyperus margaritaceus, Diheteropogon amplectens, Elionurus muticus, Eragrostis chloromelas, E. lehmanniana, E. racemosa, E. superba, Eustachys paspaloides, Heteropogon contortus, Melinis repens* subsp. *repens, Panicum coloratum, Setaria sphacelata, Triraphis andropogonoides.*

Conservation Status

According to Mucina and Rutherford (2006) the Vaal Reefs Dolomite Sinkhole Woodland is classified as Vulnerable. Although the target for conservation is 24%, only a small patch is conserved in the statutory conservation area of Sterkfontein Caves. The proposed 'Highveld National Park[1]' is supposed to conserve a considerable area of this vegetation unit. Aesthetically this is one of the most scenic landscapes in the western Grassland Biome and certainly deserves high conservation priority. Almost

a quarter has been transformed already - mainly by mining, cultivation, urban sprawl and road-building. The region of this unit contains possibly the highest concentration of mines than any other vegetation in South Africa (Mucina & Rutherford, 2006).

4.1.2.3 Expected Flora Species

The POSA database indicates that 414 species of indigenous plants are expected to occur within the project area (9.2 Appendix B – Flora species expected to occur in the project area. provides the list of all the expected species and their respective conservation statuses and endemism classifications. Two SCCs based on their conservation status could be expected to occur within the project area and are provided in Table 4-2 below. Refer to the field survey and conclusion sections for any permitting requirements.

Table 4-2 Threatened flora species that may occur within the project area

Family	Taxon	Author	IUCN	Ecology
Fabaceae	*Pearsonia bracteata*	(Benth.) Polhill	NT	Indigenous; Endemic
Crassulaceae	*Adromischus umbraticola* subsp. *umbraticola*	C.A.Sm.	NT	Indigenous; Endemic

4.1.3 Faunal Assessment

4.1.3.1 Amphibians

Based on the IUCN Red List Spatial Data and FrogMap, 21 amphibian species are expected to occur within the area (9.3 Appendix C – Amphibian species expected to occur in the project area). One of the expected species is an SCC (Table 4-3), the Giant Bullfrog. This species has a moderate likelihood of occurrence based on the wetlands found west near to the project area. The likelihood of occurrence is based on literature (section 3.2.2) describing their habitat preferences and the level of adaptability to disturbed areas. Refer to the field survey and conclusion sections for any permitting requirements.

Table 4-3 Amphibians Species of conservation concern that may occur in the project area

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2021)	
Pyxicephalus adspersus	Giant Bullfrog	NT	LC	Moderate

4.1.3.2 Reptiles

Based on the IUCN Red List Spatial Data and the ReptileMAP database, 43 reptile species may occur within the area (9.4 Appendix D – Reptile species expected to occur in the project area). One (1) is regarded as threatened (Table 4-4). Refer to the field survey and conclusion sections for any permitting requirements.

Table 4-4 Reptile Species of conservation concern that may occur within the project area

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2021)	
Psammophis leightoni	Cape Sand Snake	VU	LC	Low

Psammophis leightoni (Cape Sand Snake) is listed as VU on a regional basis. This snake is most commonly found in sand fynbos and strandveld habitat in the Western Cape. The species therefore has a low likelihood of occurrence.

4.1.3.3 Mammals

The IUCN Red List Spatial Data and the MammalMap database lists 90 mammal species that could be expected to occur within the area (9.5 Appendix E – Mammal species expected to occur within the

project area). This list excludes large mammal species that are normally limited to protected areas. Thirteen (13) of these expected species are regarded as SCC (Table 4-5), and five of these have a moderate-high likelihood of occurrence based on the suitable habitat and food sources present in the project area.

Table 4-5 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	African Clawless Otter	NT	NT	Low
Atelerix frontalis	Southern African Hedgehog	NT	LC	Moderate
Crocidura maquassiensis	Makwassie musk shrew	VU	LC	Low
Crocidura mariquensis	Swamp Musk Shrew	NT	LC	Low
Eidolon helvum	African Straw-colored Fruit Bat	LC	NT	Low
Felis nigripes	Black-footed Cat	VU	VU	Low
Hydrictis maculicollis	Spotted-necked Otter	VU	NT	Low
Leptailurus serval	Serval	NT	LC	High
Mystromys albicaudatus	African White-tailed Rat	VU	EN	Moderate
Otomys auratus	Southern African Vlei Rat (Grassland type)	NT	NT	High
Panthera pardus	Leopard	VU	VU	Low
Parahyaena brunnea	Brown Hyaena	NT	NT	Moderate
Poecilogale albinucha	African Striped Weasel	NT	LC	Low

Atelerix frontalis (South African Hedgehog) has a tolerance for 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, that can function as habitat for this species, as such the likelihood of occurrence is rated as moderate.

Leptailurus serval (Serval) occurs widely through sub-Saharan Africa and is commonly recorded from most major national parks and reserves (IUCN, 2017). The Serval's status outside reserves is not certain, but they are inconspicuous and may be common in suitable habitat as they are tolerant of farming practices provided there is cover and food available. In sub-Saharan Africa, they are found in habitat with well-watered savanna long-grass environments and are particularly associated with reedbeds and other riparian vegetation types. Suitable habitat is present for this species in the project area, as such the likelihood of occurrence is rated as high.

Mystromys albicaudatus (African White-tailed Rat) is endemic to South Africa and Lesotho, where they inhabit Highveld grasslands primarily, but also Succulent Karoo and fynbos. They are often associated with calcrete soils within grasslands, and they are never found on soft, sandy substrate, rocks, wetlands or river banks. Furthermore, records from the Free State Province and Borakalalo Nature Reserve, North West Province show that they can occur in disturbed areas and in sparse grasslands (Avenant *et al.,* 2016). This species has a moderate likelihood of project area occurrence due to the type of grassland habitat present.

Otomys auratus (Southern African Vlei Rat (Grassland type)) is widely distributed throughout the Highveld grasslands and Drakensberg Escarpment of South Africa, Lesotho and Swaziland, with isolated populations found in the Soutpansberg Mountains of northern Limpopo and the Eastern

Highlands of Zimbabwe. The species is associated with mesic grasslands and wetlands within alpine, montane and sub-montane regions, typically occurring in dense vegetation in close proximity to water (Taylor *et al.,* 2016). The state of the grasslands and the proximity to water means that this species has a high likelihood of project area occurrence.

Parahyaena brunnea (Brown Hyaena) is endemic to southern Africa except for a marginal extension into the arid parts of southwestern Angola. It mainly occurs in the arid countries of Namibia, Botswana, South Africa and Zimbabwe. This species remains widespread in South Africa, with high levels of occupancy recorded in the northwest regions. It is commonly found in desert and semi-desert, open scrub and open woodland savannah habitats, also showing an ability to survive close to urban areas (Yarnell *et al*., 2016). The large open grassland habitat available, and close proximity to water sources, means that the Brown Hyaena has a moderate likelihood of project area occurrence.

4.2 Field Survey

4.2.1 Flora

The vegetation assessment was conducted throughout the extent of the project area. A total of 77 tree, shrub, herbaceous and graminoid plant species were recorded in the project area during the field assessment (Table 4-6). Plants listed as Category 1 alien or invasive species under the NEMBA appear in green text. Plants listed as 'not indigenous' or 'naturalised' according to NEMBA, appear in blue text. Plants that are Red Listed according to NEMBA appear in red text.

The list of plant species recorded to is by no means comprehensive, a survey conducted under guard may likely yield up to 30% additional flora species for the project area. However, floristic analysis conducted to date is however regarded as a sound representation of the local flora for the project area. Some of the plants recorded can be seen in (Figure 4-12) below.

Table 4-6 Trees, shrub and herbaceous plant species recorded in the project area

Family	*Scientific Name*	Threat Status (SANBI, 2017)	SA Endemic	Alien Category
Acanthaceae	*Crabbea angustifolia*	LC	Endemic	
Aizoaceae	*Lithops lelliei*	NT	Not Endemic	
Amaranthaceae	*Aerva lanata*	LC	Not Endemic	
Amaranthaceae	*Gomphrena celosioides*			Naturalized exotic
Amaryllidaceae	*Boophone disticha*	LC	Not Endemic	
Anacardiaceae	*Searsia lancea*	LC	Not Endemic	
Anacardiaceae	*Searsia pyroides var. pyroides*	LC	Not Endemic	
Asparagaceae	*Asparagus laricinus*	LC	Not Endemic	
Asphodelaceae	*Aloe greatheadii var. davyana*	LC	Not Endemic	
Asteraceae	*Helichrysum callicomum*	LC	Not Endemic	
Asteraceae	*Helichrysum rugulosum*	LC	Not Endemic	
Asteraceae	*Schkuhria pinnata*			Naturalized exotic
Asteraceae	*Senecio inornatus*	LC	Not Endemic	
Asteraceae	*Seriphium plumosum*	LC	Not Endemic	
Asteraceae	*Tagetes minuta*			Naturalized exotic
Asteraceae	*Zinnia peruviana*			Naturalized exotic
Asteraceae	*Bidens pilosa*			Naturalized exotic weed

Asteraceae	*Helichrysum nudifolium var. nudifolium*	LC-Protected	Not Endemic	
Asteraceae	*Xanthium strumarium*			NEMBA Category 1b.
Boraginaceae	*Ehretia rigida*	LC	Endemic	
Campanulaceae	*Wahlenbergia undulata*	LC	Not Endemic	
Commelinaceae	*Commelina erecta*	LC	Not Endemic	
Crassulaceae	*Kalanchoe rotundifolia*	LC	Not Endemic	
Cucurbitaceae	*Cucumis zeyheri*	LC	Not Endemic	
Fabaceae	*Elephantorrhiza elephantina*	LC	Not Endemic	
Fabaceae	*Senegalia caffra*	LC	Not Endemic	
Fabaceae	*Vachellia erioloba*	LC-Protected Tree	Not Endemic	
Fabaceae	*Vachellia hebeclada subsp. hebeclada*	LC	Not Endemic	
Fabaceae	*Vachellia karroo*	LC	Not Endemic	
Fabaceae	*Vachellia robusta subsp. robusta*	LC	Not Endemic	
Hyacinthaceae	*Ledebouria luteola*	LC	Not Endemic	
Hyacinthaceae	*Ledebouria marginata*	LC	Not Endemic	
Hypoxidaceae	*Hypoxis acuminata*	LC	Not Endemic	
Hypoxidaceae	*Hypoxis rigidula*	LC	Not Endemic	
Malvaceae	*Hermannia depressa*	LC	Not Endemic	
Malvaceae	*Hermannia grandistipula*	LC	Not Endemic	
Malvaceae	*Sida rhombifolia subsp. rhombifolia*	LC	Not Endemic	
Malvaceae	*Triumfetta sonderi*	LC	Not Endemic	
Orobanchaceae	*Striga elegans*	LC	Not Endemic	
Oxalidaceae	*Oxalis purperea*	LC	Endemic	
Pedaliaceae	*Harpagophytum procumbens*	LC	Not Endemic	
Poaceae	*Andropogon chinensis*	LC	Not Endemic	
Poaceae	*Aristida adscensionis*	LC	Not Endemic	
Poaceae	*Aristida congesta subsp. barbicollis*	LC	Not Endemic	
Poaceae	*Aristida congesta subsp. congesta*	LC	Not Endemic	
Poaceae	*Brachiaria serrata*	LC	Not Endemic	
Poaceae	*Cymbopogon caesius*	LC	Not Endemic	
Poaceae	*Cynodon dactylon*	LC	Not Endemic	
Poaceae	*Digitaria eriantha*	LC	Not Endemic	
Poaceae	*Eragrostis curvula*	LC	Not Endemic	
Poaceae	*Eragrostis gummiflua*	LC	Not Endemic	
Poaceae	*Eragrostis rigidior*	LC	Not Endemic	
Poaceae	*Eragrostis superba*	LC	Not Endemic	
Poaceae	*Fingerhuthia africana*	LC	Not Endemic	
Poaceae	*Heteropogon contortus*	LC	Not Endemic	
Poaceae	*Hyparrhenia hirta*	LC	Not Endemic	

Poaceae	*Hyperthelia dissoluta*	LC	Not Endemic	
Poaceae	*Leersia hexandra*	LC	Not Endemic	
Poaceae	*Melinis repens*	LC	Not Endemic	
Poaceae	*Microchloa caffra*	LC	Not Endemic	
Poaceae	*Pogonarthria squarrosa*	LC	Not Endemic	
Poaceae	*Schizachyrium sanguineum*	LC	Not Endemic	
Poaceae	*Setaria sphacelata var. sphacelata*	LC	Not Endemic	
Poaceae	*Themeda triandra*	LC	Not Endemic	
Poaceae	*Tristachya leucothrix*	LC	Not Endemic	
Poaceae	*Paspalum dilatatum*	LC	Indigenous	
Poaceae	*Pogonarthria squarrosa*	LC	Not Endemic	
Polygalaceae	*Polygala leptophylla var. leptophylla*	LC	Not Endemic	
Rhamnaceae	*Ziziphus mucronata subsp. mucronata*	LC	Not Endemic	
Rhamnaceae	*Ziziphus zeyheriana*	LC	Not Endemic	
Rubiaceae	*Oldenlandia herbacea*	LC	Not Endemic	
Salicaceae	*Populus alba*			NEMBA Category 2
Solanaceae	*Datura ferox*			NEMBA Category 1b.
Solanaceae	*Solanum campylacanthum*	LC	Not Endemic	
Solanaceae	*Solanum elaeagnifolium*			NEMBA Category 1b.
Solanaceae	*Solanum lichtensteinii*	LC	Not Endemic	
Typhaceae	*Typha capensis*	LC	Not Endemic	
Verbenaceae	*Lippia scaberrima*	LC	Not Endemic	

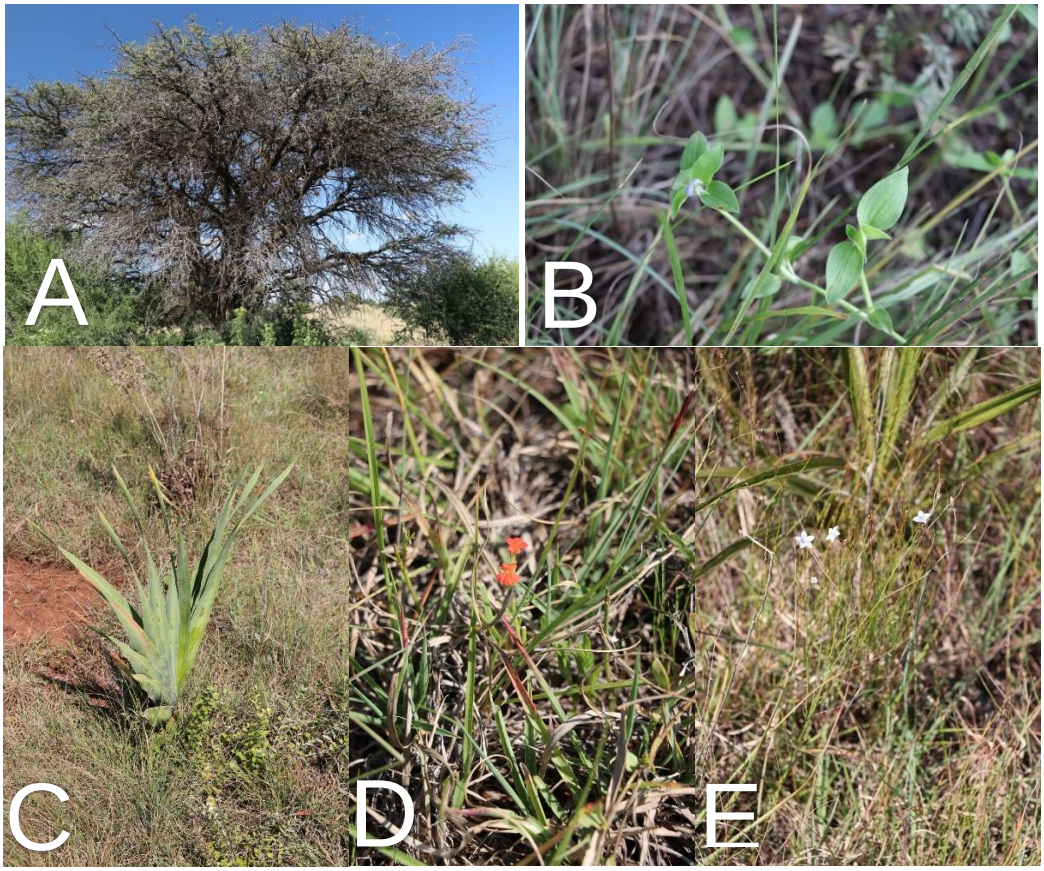


Figure 4-12 Some of the plant species recorded in the area: A) Vachellia erioloba (Protected), B) Commelina erecta, C) Boophone disticha, D) Striga elegans, E) Oldenlandia herbacea

4.2.1.1 Invasive Alien Plants

Invasive Alien Plants (IAPs) tend to dominate or replace indigenous flora, thereby transforming the structure, composition and functioning of ecosystems. Therefore, it is important that these plants are 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, 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.

Four (4) 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 and Category 2. Category 1b species must be controlled by implementing an IAP Management Programme, in compliance of section 75 of the NEMBA, as stated above.

4.2.1.2 Floral Species of Concern

During the field assessment one species of protected trees were observed: *Vachellia erioloba* (Camel Thorn). The protected trees observed are protected by the List of Protected Tree Species under the National Forests Act, 1998 (Act No. 84 of 1998) (NFA).

In terms of the NFA, no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate, or in any other manner acquire or dispose of any protected tree or any product derived from a protected tree, except under a licence or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated. Contravention of this declaration is regarded as a first category offence. The locations of the Camel thorn trees were not shared and would have to be determined with a follow-up site visit.

During the field assessment a colony of Red Listed plants, *Lithops lesliei*, was identified in the south-eastern portion of the site (Figure 5-5). This species is currently listed as being Near Threatened and is regarded as having a very-high conservation value. This colony consists of approximately 50 to 100 plants scattered over an area of stony ridges and should be excluded from the development. The locations of the plants will be demarcated with a walk-through survey.

4.2.2 Fauna

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

4.2.2.1 Amphibians and Reptiles

No reptile or amphibian species were recorded during the site assessment.

4.2.2.2 Mammals

Five (5) mammal species were observed that could naturally occur outside of protected areas. These observations were based on either direct observation (including camera traps) or the presence of visual tracks and signs (Figure 4-13).

Table 4-7 Summary of mammal species recorded within the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Canis mesomelas	Black-backed Jackal	LC	LC
Cryptomys hottentotus	Southern African Mole-rat	LC	LC
Hystrix africaeaustralis	Cape Porcupine	LC	LC
Pedetes capensis	Southern African Springhare	LC	LC
Raphicerus campestris	Steenbok	LC	LC

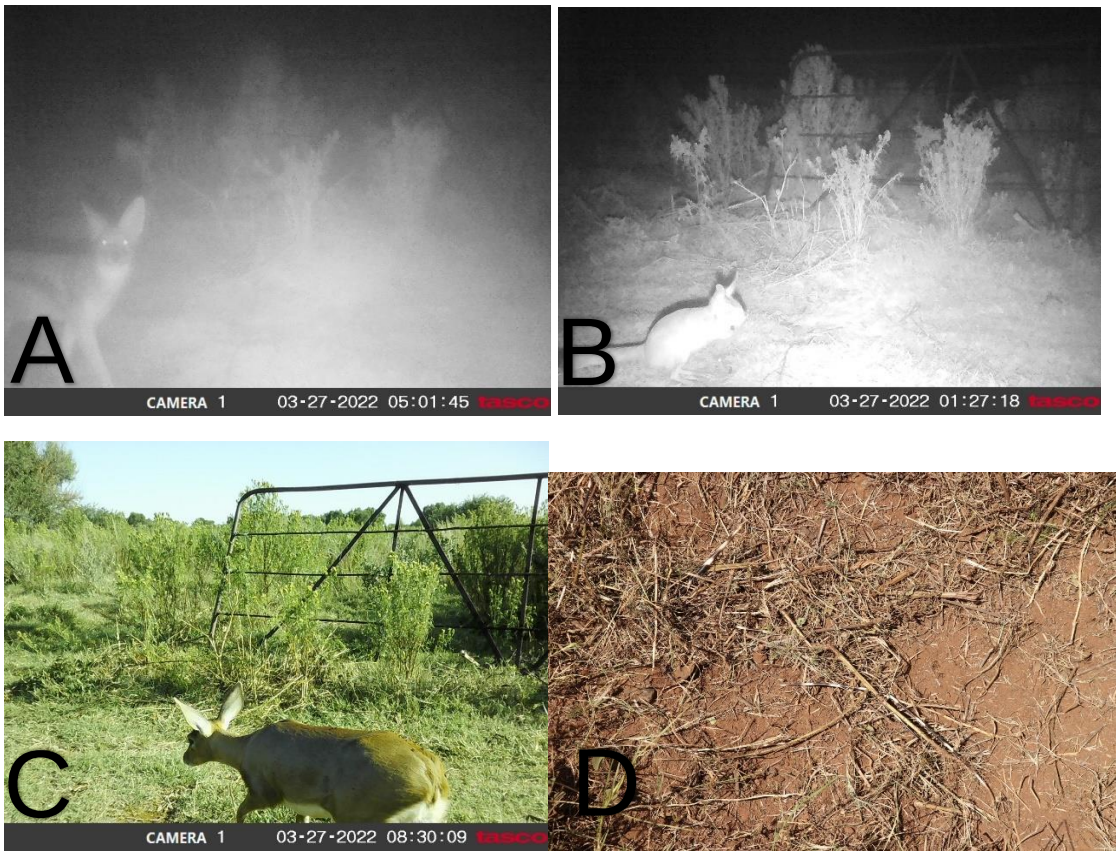


Figure 4-13 Some of the mammal species recorded in the project area: A) Canis mesomelas, B) Pedetes capensis, C) Raphicerus campestris, D) Hystrix africaeaustralis

5 Habitat Assessment and Site Ecological Importance

5.1 Habitat Assessment

The main habitat types identified across the project area were initially identified largely based on aerial imagery. These main habitat types were refined based on the field coverage and data collected during the survey; the delineated habitats can be seen in Figure 5-1. Emphasis was placed on limiting timed meander searches along the proposed project area within the natural habitats and therefore habitats with a higher potential of hosting SCC.

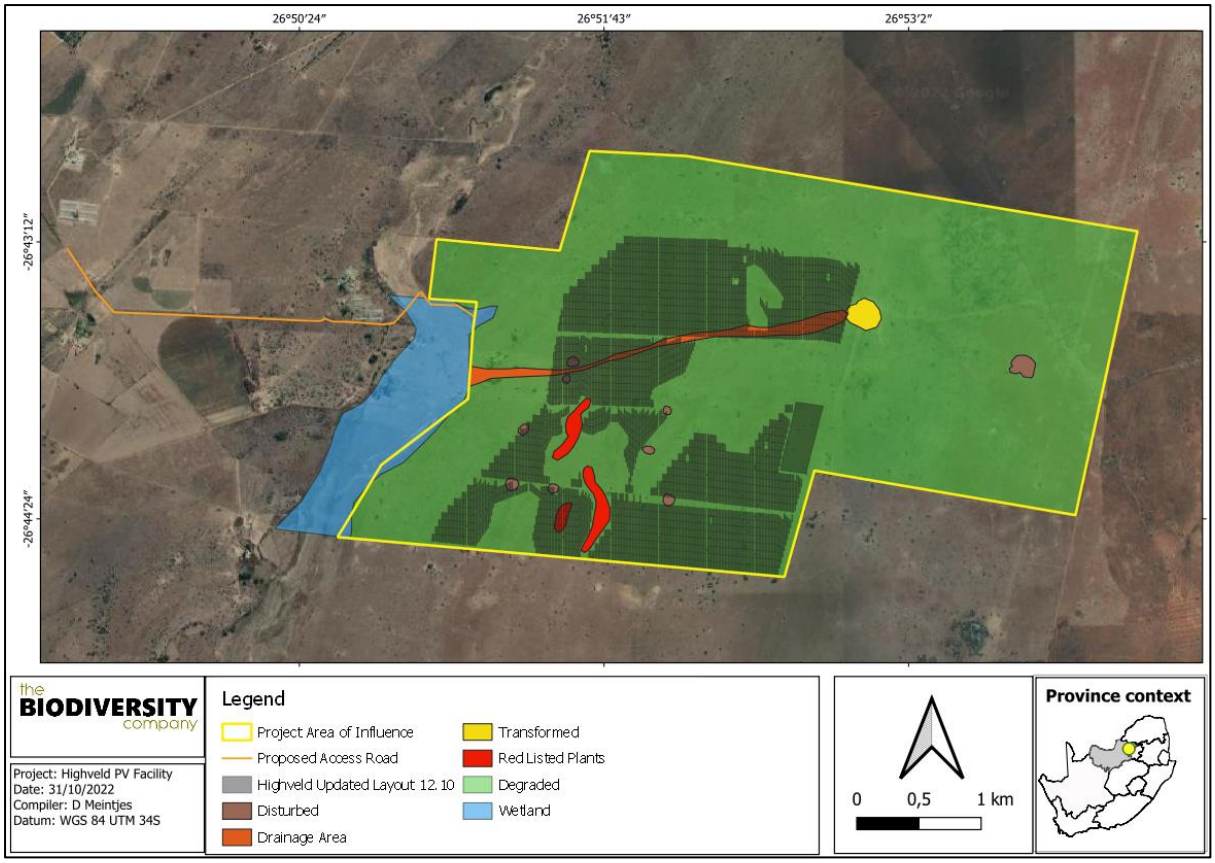


Figure 5-1 Habitats identified in the overall project area of interest

Degraded habitat

This habitat type is regarded as degraded or semi-natural, it is the remainder of the habitat that has not been as disturbed by recent and historic grazing. This habitat represents an amalgamation of grassland-woodland vegetation resulting in a complex with slightly undulating landscape dissected by areas with dolomite extrusions in certain areas. Areas where more woody vegetation is found have deeper soils, whereas rocky/dolomite areas were occupied by shrubs and herbaceous plants and grasses. The current ecological condition of this habitat, with regards to the main driving forces, are intact, which is evident by the high species diversity and number of plant species recorded. Current human infringement occurs, especially in areas close to roads. The unit acts as remaining greenlands which supports viable plant species populations and is also used for foraging. The unit also serves as a movement corridor for fauna within a landscape.

Figure 5-2 Representative example of the degraded grassland-woodland vegetation unit identified on the project area

Disturbed Habitat

This area has been significantly disturbed and modified from its natural state, it represents habitat that is more disturbed than the 'degraded habitat' area, but not as disturbed as the 'transformed' area. This habitat is linked to areas that have been impacted more by historic overgrazing (waterpoints), mismanagement and land use (historic agriculture). These habitats are not entirely transformed but exist in a constant disturbed state as it cannot recover to a more natural state due to ongoing disturbances and impacts it receives from grazing and mismanagement. These areas are considered to have a low sensitivity.

Figure 5-3 Representative example of the disturbed habitat units identified on the project area

Transformed

The transformed areas are the areas which have little to no natural areas left due to the land being transformed. These habitats exist in a constant disturbed state as it cannot recover to a more natural state due to ongoing disturbances and impacts it receives. Development should be limited to these areas as far as possible.

Wetland Habitat

Even though somewhat disturbed, the ecological integrity, importance and functioning of these areas play a crucial role as a water resource system. The preservation of this system is the most important aspect to consider for the proposed development. This habitat needs to be conserved and improved due to the role of this habitat as a water resource. Development must avoid these areas, refer to the recommendations sections for specific mitigations.

Figure 5-4 An example of the wetland habitat from the project area

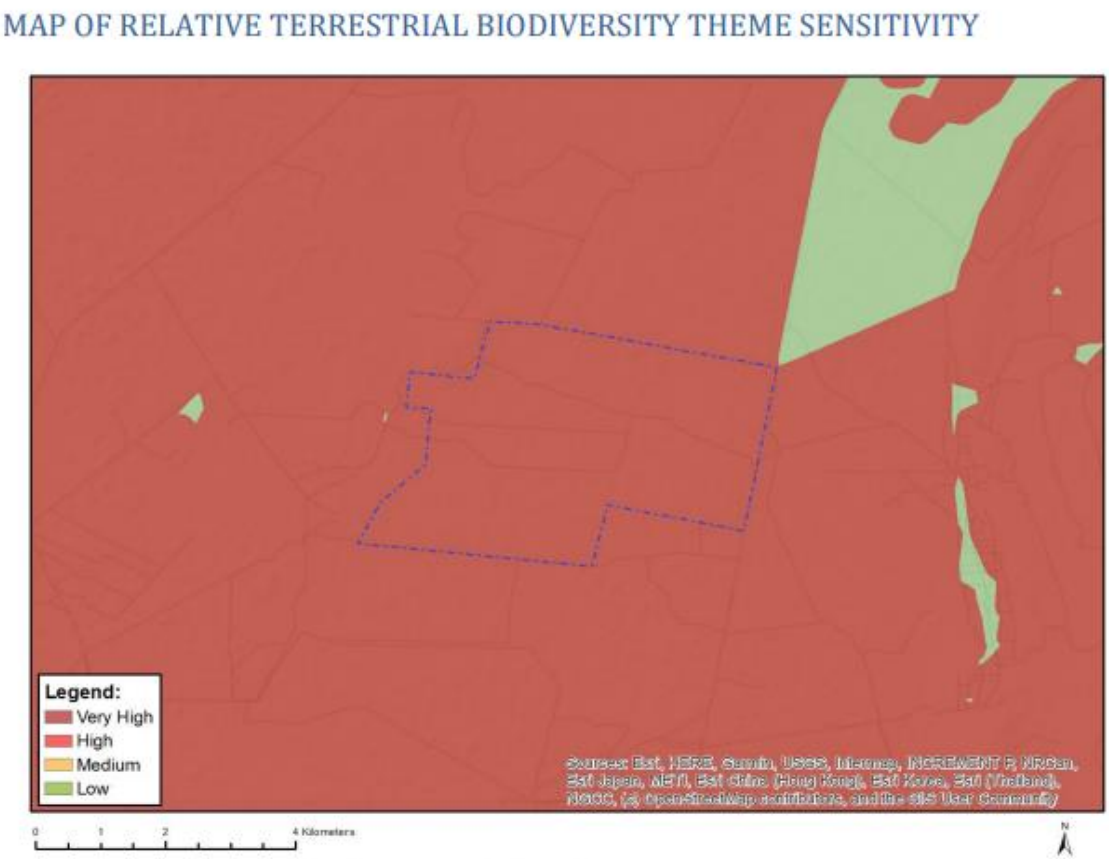
Red Listed Plants

A colony of Red Listed plants, *Lithops lesliei*, was identified in the south-eastern portion of the site. This species is currently listed as being Near Threatened and is regarded as having a high conservation value. This colony consists of approximately 50 to 100 plants scattered over an area of stony ridges and should be excluded from the development. These colonies must be avoided.

Figure 5-5 An example of the Red Listed plant species Lithops lesliei growing in the south-eastern portion of the project area

5.2 Site Ecological Importance

The biodiversity theme sensitivity, as indicated in the screening report, was derived to be Very High, mainly due to the project area overlapping with a CBA 1, CBA 2, and Protected Areas Expansion Strategy (Figure 5-6). The animal and plant's theme sensitivity were indicated as medium.



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	Critical biodiveristy area 1
Very High	Critical biodiveristy area 2
Very High	Protected Areas Expansion Strategy

Figure 5-6 Terrestrial Biodiversity Theme Sensitivity, National Web based Environmental Screening Tool.

The whole site lies within the extent of a Terrestrial CBA 2 and only a small portion of a Terrestrial CBA 1 overlays with the project area in the far west. The aquatic CBA 1 and ESA 1 indicated in (Figure 4-3) depicts a depression wetland, however the site survey confirmed that no wetland conditions are present and instead the area is dominated by fractured dolomite (Figure 5-7).

Although the screening tool has classified the overall sensitivity to be very high, based on the findings of this report the overall sensitivity is confirmed to be medium-high.

Figure 5-7 Area indicated as a depression wetland (Aquatic CBA 1 and ESA 1) is dominated by fractured dolomite and no wetland conditions are present.

The location and extent of these habitats are illustrated in Figure 5-1Figure 5-1. Based on the criteria provided in Section 3.2.3 of this report, all habitats within the assessment area of the proposed project were allocated a sensitivity category (Table 5-1). The sensitivities of the habitat types delineated are illustrated in Figure 5-1. 'Very High-High Sensitivity' areas are due to the following and the guidelines can be seen in Table 5-2:

- ESA;
- Unique, important (water resource) and low resilience habitats;
- Threatened/Protected flora and fauna species were abundant and ubiquitous within the assessment area; and
- A high richness of protected fauna species was present within the assessment area.

Table 5-1 SEI Summary of habitat types delineated within field assessment area of project area

Habitat	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Red Listed Plants	High	High	High	Very Low	Very High
Wetland	Medium	High	Medium	Low	High
Drainage area	Medium	Medium	Medium	Medium	Medium
Degraded	Medium	Medium	Medium	Medium	Medium
Disturbed	Low	Low	Low	Medium	Low
Transformed	Very Low	Very Low	Very Low	Low	Very Low

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

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

Site Ecological Importance	Interpretation in relation to proposed development activities
Very Low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

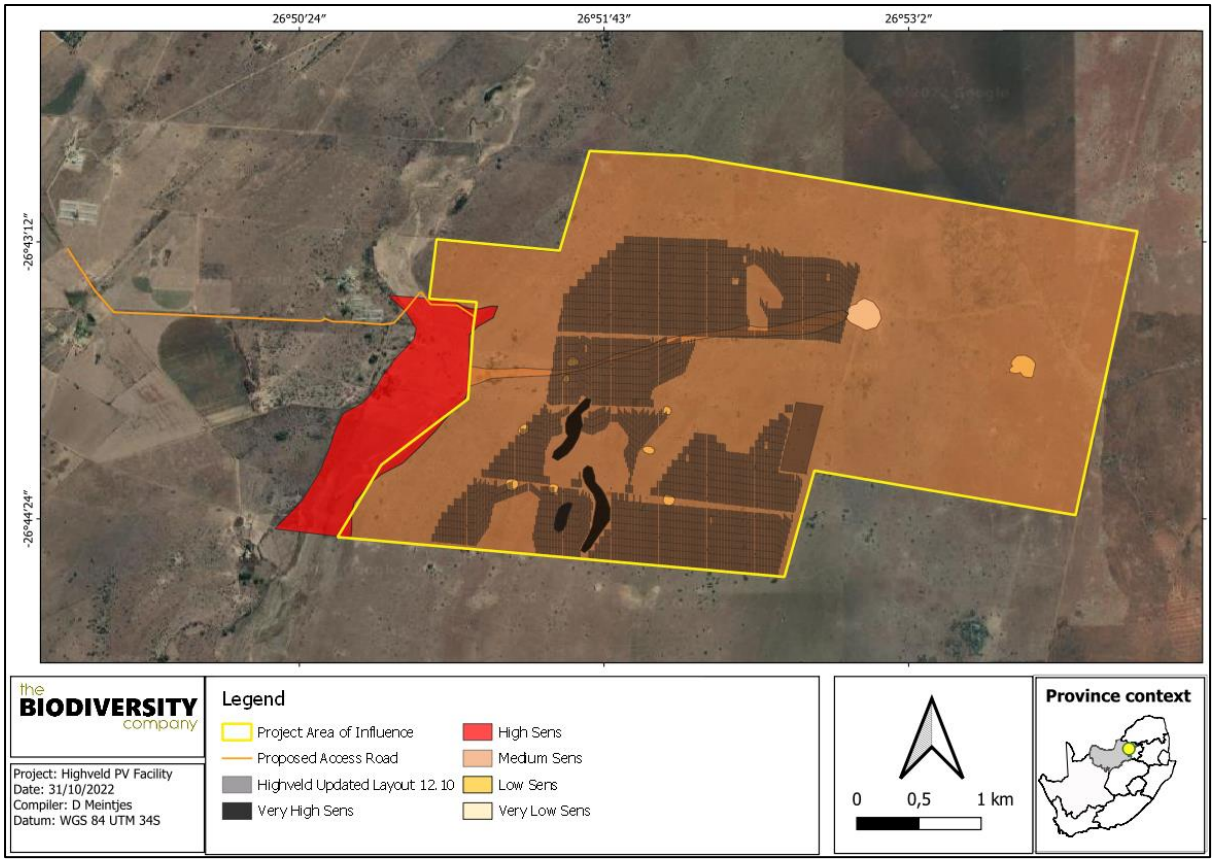


Figure 5-8 The site ecological importance of the various habitats identified in the project area

5.3 Wetland Assessment

5.3.1 Ecological Functional Assessment

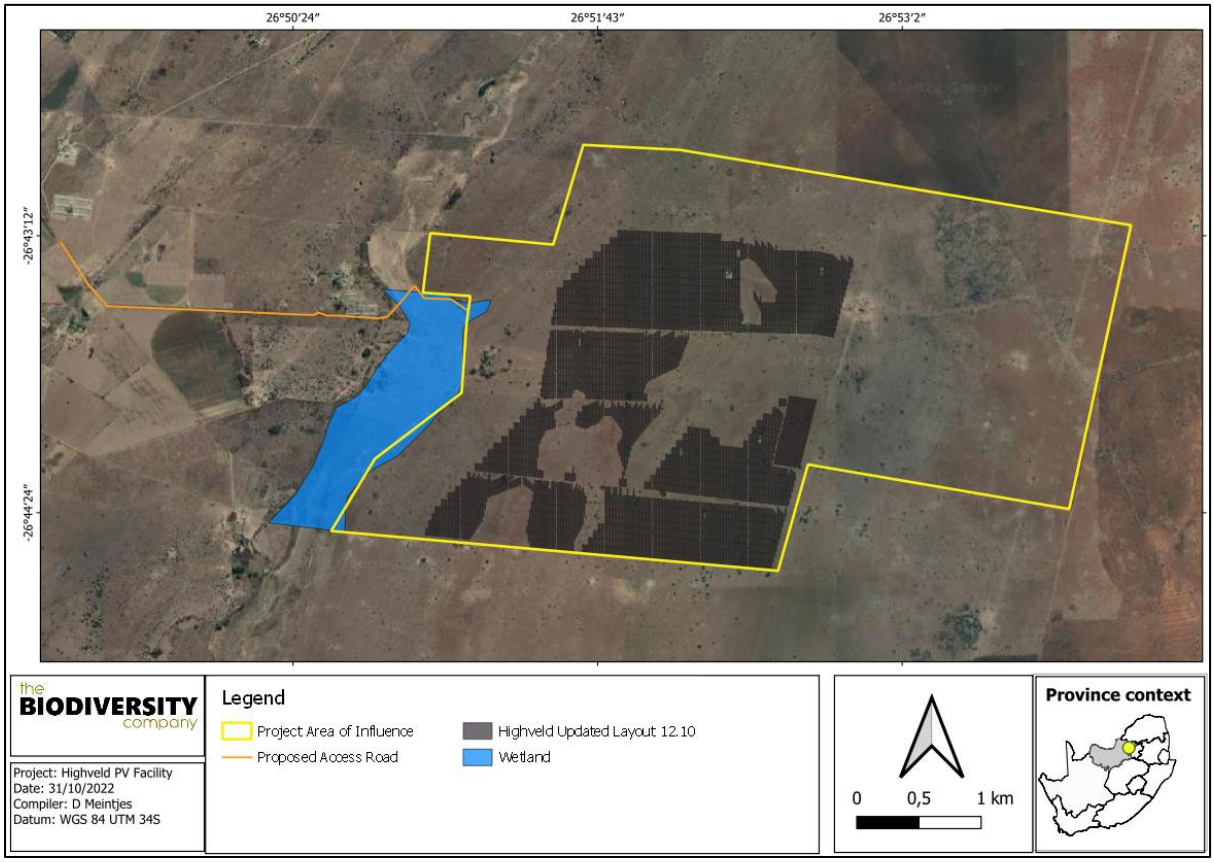


Figure 5-9 Map illustrating the wetland associated with the project area

The ecosystem services provided by the wetland unit identified on site were assessed and rated using the WET-EcoServices method (Kotze *et al.,* 2008). The summarised results for HGM 1 are illustrated in Table 5-3 and Figure 5-10. The supply and demand for the wetland is provided in Figure 5-10.

The supply indicates the capacity of an ecosystem (wetland) to deliver a service where the demand societal demand for an ecosystem service. The integration of supply and demand to provide a rating of importance relative to the case ecosystem services provision.

The average ecosystem services score for HGM 1 have been determined to be “Intermediate” to “Moderately High” (Table 3-7) due to its ability to regulated stream flow as well as to trap sediment. The HGM unit had high volumes of hydromorphic vegetation cover which help with the assimilation of toxicants in the aquatic ecosystem to ensure cleaner water downstream. The HGM 1 scored a “Very High” score for the biodiversity maintenance due to the different habitats provided within the wetland (see Table 5-3).

Table 5-3 The ecosystem services being provided by the HGM 1

	ECOSYSTEM SERVICE	Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	2,3	0,3	1,0	Low
	Stream flow regulation	3,7	1,3	2,8	High
	Sediment trapping	2,8	2,0	2,3	Moderate
	Erosion control	1,3	1,9	0,8	Very Low

	Phosphate assimilation	2,6	2,0	2,1	Moderate
	Nitrate assimilation	2,8	2,0	2,3	Moderately High
	Toxicant assimilation	2,6	2,0	2,1	Moderate
	Carbon storage	2,6	2,7	2,4	Moderately High
	Biodiversity maintenance	3,9	3,0	3,9	Very High
PROVISIONING SERVICES	Water for human use	3,2	2,0	2,7	High
	Harvestable resources	2,5	1,3	1,7	Moderately Low
	Food for livestock	1,5	1,3	0,7	Very Low
	Cultivated foods	1,7	0,7	0,5	Very Low
CULTURAL SERVICES	Tourism and Recreation	1,8	1,3	0,9	Low
	Education and Research	1,5	0,3	0,2	Very Low
	Cultural and Spiritual	3,0	0,3	1,7	Moderately Low

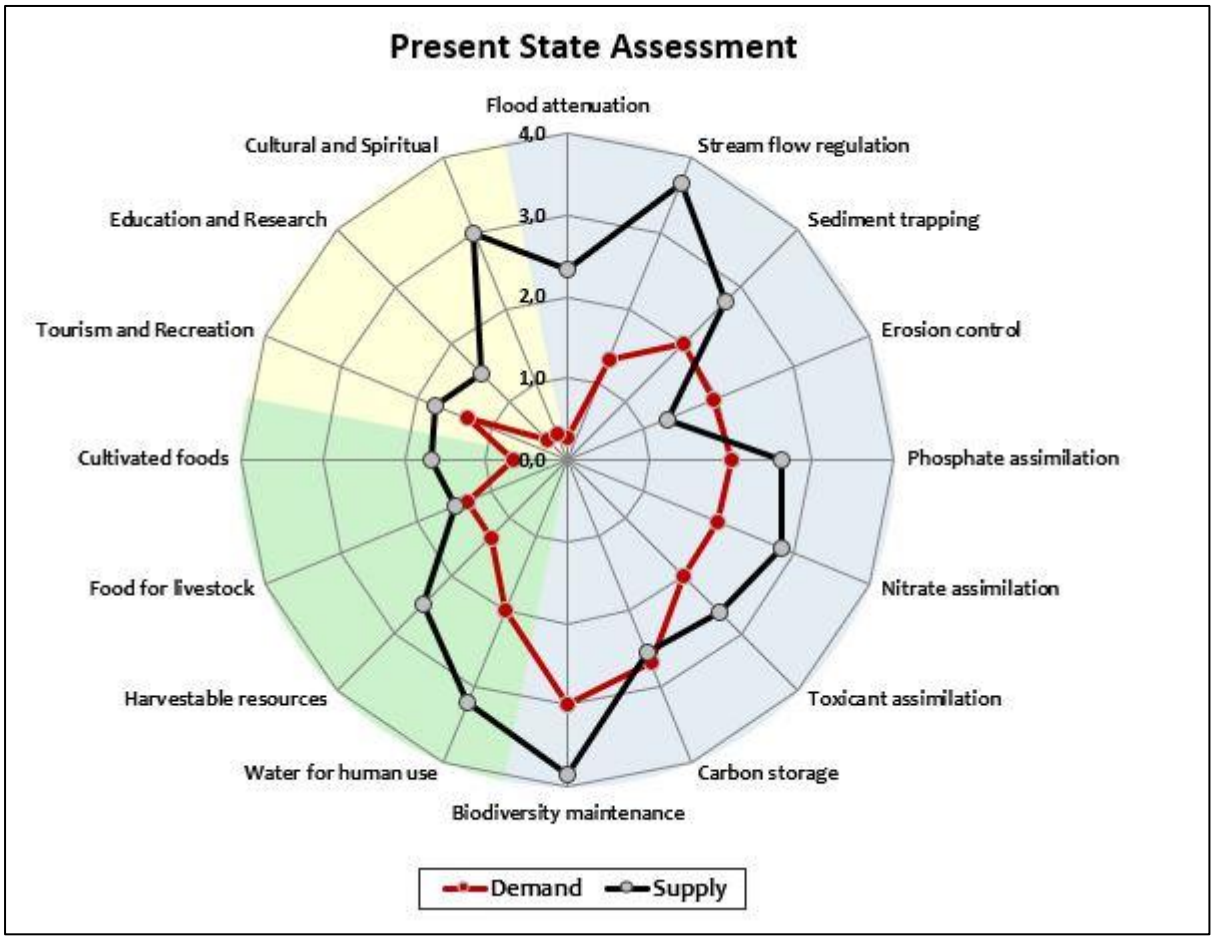


Figure 5-10 Radar map showing the demand and supply of the different ecosystem services in HGM 1.

5.3.2 The Present Ecological State Assessment

The PES for the assessed HGM type is presented in Table 5-4. The hydrology of HGM 1 has been rated as being “Largely Modified” predominantly by grazing of livestock and channelization within the system. The grazing and trampling by livestock inside the wetlands affect the natural draining and waterflow within the wetland as well as limits the effectiveness of the hydrophytes in erosion control and water retention. Additionally, the historical agricultural practices within the wetland’s catchment have

contributed to the level of modification. Channelization also causes and increase in flow rate within the wetland that will cause the outer parts of the fsystem to lose their function over time.

The occurrence of some alien invasive shrubs and weeds (*Opuntia ficus-indica, Cirsium vulgare, Eucalyptus* camaldulensis) inside HGM 1 contributes to the "Moderately Modified" rating. At present time the alien invasives do not pose a major threat to the wetland but if left unattended they will begin to out compete the endemic hydrophytes which will lead to a decrease in wetland function in the long haul. The vegetation is also under threat by grazing of livestock within the wetland.

The overall Present Ecological State (PES) for HGM 1 has been determined to be "Moderately Modified" which indicates that the wetland have been altered by anthropogenic activities but not yet to such an extent that the wetland is completely degraded.

Table 5-4 Summary of the scores for the HGM 1

Wetland	Hydrology		Geomorphology		Vegetation	
	Rating	Score	Rating	Score	Rating	Score
HGM 1	D: Largely Modified	4.0	C: Moderately Modified	2.2	C: Moderately Modified	3.4
Overall PES Score		3.8		Overall, PES Class		C: Moderately Modified

5.3.3 The Importance & Sensitivity Assessment

The results of the ecological IS assessment for the HGM unit is shown in Table 5-5. Various components pertaining to the protection status of a wetland are considered for the IS, including Strategic Water Source Areas (SWSA), the NFEPA wet veg protection status and the protection status of the wetland itself considering the NBA wetland data set. The IS for the HGM unit has been calculated to be "Low", which combines the relatively low protection status of the wet veg type and the low protection status of the wetland itself.

Table 5-5 The IS results for the delineated HGM unit

HGM Type	Wet Veg			NBA Wetlands			SWSA (Y/N)	Calculated IS
	Type	Ecosystem Threat Status	Ecosystem Protection Level	Wetland Condition	Ecosystem Threat Status 2018	Ecosystem Protection Level		
HGM 1	Mesic Highveld Grassland Group 3	Critically Threatened	Not Protected	D/E/F Largely Modified	Critical	Not Protected	N	**Low**

5.3.4 Buffer Requirements

The "Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries" (Macfarlane *et al.,* 2014) was used to determine the appropriate buffer zone for the proposed activity. A pre-mitigation buffer zone of 30 m from identified wetlands is recommended for all project infrastructure, which can be decreased to 15 m if all prescribed mitigation measures are implemented (see Table 5-6 as well as Table 6-2).

Table 5-6 Pre- and post-mitigation buffer sizes

	Buffer Widths
Pre-mitigation buffer	30 m
Post-mitigation buffer	15 m

6 Impact Risk Assessment

6.1.1 Present Impacts to Biodiversity

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

- Historic agriculture and grazing;
- Clearance of vegetation;
- Farm roads;
- Alien and/or Invasive Plants (AIP);
- Poaching; and
- Fences and associated maintenance.

6.1.2 Impact Assessment

Potential impacts were evaluated against the data captured during the desktop and field assessments to identify relevance to the project area.

Anthropogenic activities drive habitat destruction causing displacement of fauna and flora and possibly direct mortality. Land clearing destroys local wildlife habitat and can lead to the loss of local breeding grounds, nesting sites and wildlife movement corridors such as rivers, streams and drainage lines, or other locally important features. The removal of natural vegetation may reduce the habitat available for fauna species and may reduce animal populations and species compositions within the area. Development of the catchment can also altered the surface run-off dynamics, resulting in erosion of the slope and sedimentation of the receiving systems. The placement (or upgrade) of infrastructure that traverses watercourse can also altered the hydrology of the system.

6.1.3 Alternatives Considered

Avoidance and minimisation mitigation measures are the most important with respect to the mitigation hierarchy (Figure 6-1).

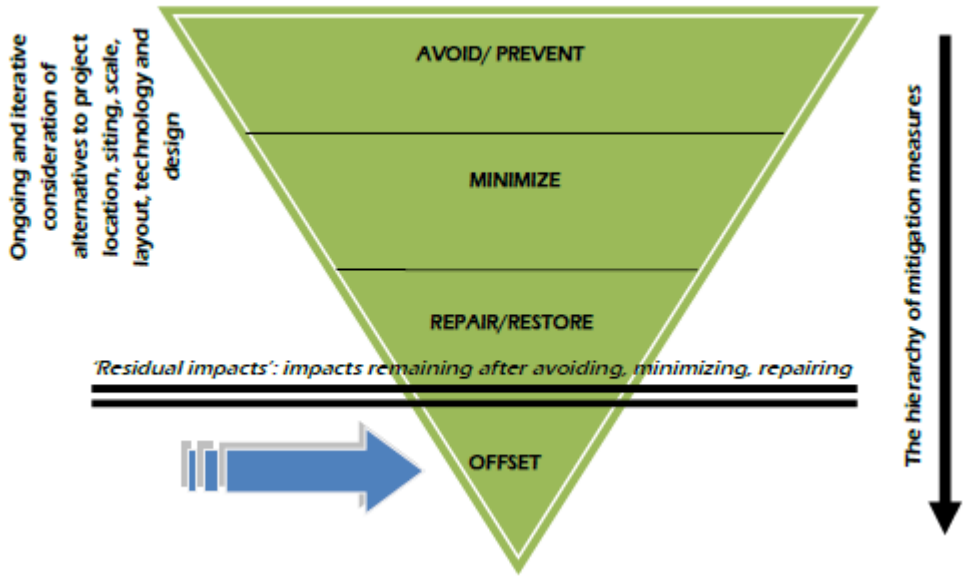


Figure 6-1 Schematic diagram illustrating the mitigation hierarchy indicating where residual impacts are considered.

No alternatives were provided for the development. However the development layout was designed to as best possible avoid highly sensitive areas, although no alternatives were considered, the layout was changed to mitigate impacts.

6.1.4 Terrestrial Biodiversity Impacts

The impacts anticipated for the activities are considered in order to predict and quantify these impacts and assess & evaluate the magnitude on the identified terrestrial biodiversity (Table 6-1).

Table 6-1 Anticipated impacts for the activities 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.	Displacement/loss of flora & fauna (including possible SCC)
	Access roads and servitudes	Increased potential for soil erosion
	Soil dust precipitation	Habitat fragmentation
	Dumping of waste products	Increased potential for establishment of alien & invasive vegetation
	Random events such as fire (cooking fires or cigarettes)	Erosion
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	Habitat loss for native flora & fauna (including SCC)
	Vehicles potentially spreading seed	Spreading of potentially dangerous diseases due to invasive and pest species
	Unsanitary conditions surrounding infrastructure promoting the establishment of alien and/or invasive rodents	Alteration of fauna assemblages due to habitat modification
	Creation of infrastructure suitable for breeding activities of alien and/or invasive birds	

Main Impact	Project activities that can cause direct mortality of fauna	Secondary impacts anticipated
3. Direct mortality of fauna	Clearing of vegetation	Loss of habitat
		Loss of ecosystem services
	Roadkill due to vehicle collision	
	Pollution of water resources due to dust effects, chemical spills, etc.	Increase in rodent populations and associated disease risk
	Intentional killing of fauna for food (hunting)	
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	Reduced dispersal/migration of fauna
		Loss of ecosystem services
	Compacted roads	Reduced plant seed dispersal
	Removal of vegetation	
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	Pollution in watercourses and the surrounding environment
	Erosion	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)	Disruption/alteration of ecological life cycles due to noise
		Loss of ecosystem services
	Project activities that can cause disruption/alteration of ecological life cycles due to dust	Secondary impacts associated with disruption/alteration of ecological life cycles due to dust
	Vehicles	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

6.1.4.1 Construction Phase

The following potential main impacts on the biodiversity (based on the framework above) were considered for the construction phase of the proposed development. This phase refers to the period during construction when the proposed features are constructed; and is considered to have the largest direct impact on biodiversity. The following potential impacts to terrestrial biodiversity were considered (Table 6-2):

- Destruction, loss and fragmentation of the of habitats (including watercourses), ecosystems (ESA areas) and vegetation community, including protected species;
- Spread and/or establishment of alien and/or invasive species;
- Displacement of faunal community due to habitat loss, direct mortalities and disturbance (road collisions, noise, dust, vibration, fencing and poaching); and
- Chemical pollution associated with dust suppressants.

The loss of habitat cannot be mitigated completely, it can be reduced somewhat with mitigations such as the restriction of the footprint and ensuring areas adjacent to the footprint is not disturbed. This impact was rated as "high" pre-mitigation and "medium" post mitigation. The spread of alien fauna and flora is rated as "medium" pre-mitigations and "low" post-mitigations. With the successful implementation of an alien management plan and the management of waste on site this impact can be managed successfully.

Table 6-2 Assessment of significance of potential impacts on terrestrial biodiversity associated with the construction phase of the project

Nature: Habitat and vegetation loss		
Destruction, loss and fragmentation of the of habitats, ecosystems (CBA 1, CBA2 and ESA 1) and vegetation community, including protected species and red listed species.		
	Without mitigation	**With mitigation**
Extent	Low (2)	Very low (1)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Moderate (6)
Probability	Definite (5)	Definite (5)
Significance	**High (70)**	**Medium (55)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation:		
Very-high and high sensitivity areas should be excluded from development and should be permanently cordoned off to avoid any disturbance to these areas (treated as no-go areas) A walk-through survey should be conducted by a qualified ecologist to identify any remaining individuals of *Lithops lesliei* that potentially grow outside the areas already rated as having a very-high sensitivity. Permits should be obtained to transplant any remaining individuals of the species *Lithops lesliei* *Vachellia erioloba* (Camel thorn) specimens were recorded on the project area. Prior to development a thorough walk-through survey should be conducted to mark the locations of remaining Camel thorns. Permits will have to be obtained for the translocation / destruction of Camel Thorn trees.		
Residual Impacts:		
The loss of currently intact vegetation is an unavoidable consequence of the development and cannot be entirely mitigated. The residual impact would however be low.		

Nature: Introduction of alien species, especially plants		
Spread of alien and/or invasive species		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Low (2)
Duration	Long term (4)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (52)**	**Low (24)**
Status (positive or negative)	Negative	Negative

Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
Compilation of and implementation of an alien vegetation management plan Waste must be removed from the area on a weekly basis to prevent pest species from becoming a problem.		
Residual Impacts:		
Erosion and habitat degradation		

Nature: Loss of fauna		
Displacement of faunal community due to habitat loss, direct mortalities and disturbance (road collisions, noise, dust, vibration, fencing and poaching)		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Low (2)
Duration	Moderate term (3)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (36)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation:		
A qualified environmental control officer must be on site when construction begins to identify species that will be directly disturbed and to relocate fauna/flora that is found during construction (including all reptiles and amphibians) 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 likely Red / Orange List species, their identification, conservation status and importance, biology, habitat requirements and management requirements the Environmental Authorisation and within the EMPr If any faunal species are recorded during construction, activities should temporarily cease, and an appropriate specialist should be consulted to identify the correct course of action No trapping, killing or poisoning of any wildlife is to be allowed on site, including snakes, birds, lizards, frogs, insects or mammals. Signs must be put up to enforce this		
Residual Impacts:		
Loss of fauna species, including locally common species, will lead to the loss of ecological services such as seed dispersal, pest control and soil management		

Nature: Pollution		
Chemical pollution associated with dust suppressants or spills		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Low (2)
Duration	Long term (4)	Moderate term (3)
Magnitude	High (8)	Moderate (6)

Probability	Probable (3)	Improbable (2)
Significance	**Medium (45)**	**Low (22)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Moderate
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation:		
A spill management plan must be in place Dust-reducing mitigation measures must be put in place and must be strictly adhered to, for all roads and dumps especially. This includes wetting of exposed soft soil surfaces and not conducting activities on windy days which will increase the likelihood of dust being generated No non environmentally friendly suppressants may be used as this could result in pollution of water sources Reducing the dust generated by the listed activities above, especially the earth moving machinery, through wetting the soil surface (with "dirty water") and putting up signs to enforce speed limit as well as speed bumps built to force slow speeds		
Residual Impacts:		
Pollution can enter water sources and spread well beyond the project area		

6.1.4.2 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. 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 (including watercourses), ecosystems and CBA/ESA areas;
- Continuing spread of alien and/or invasive species;
- Displacement and direct mortalities of faunal community due to disturbance (road collisions, noise, light, dust and vibration) and reduced dispersal/migration of fauna; and
- Chemical pollution associated with measures to keep PV clean.

The continued fragmentation of the habitats was rated as "high" pre-mitigation and "moderate" post mitigation. This can be mitigated by the management of dust and edge effects.

Table 6-3 Assessment of significance of potential impacts on terrestrial biodiversity associated with the operational phase of the project

Nature: Continued fragmentation and degradation of habitats and ecosystems		
Continued fragmentation and degradation of habitats, ecosystems and CBA/ESA areas		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Low (2)
Duration	Long term (4)	Moderate term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Probable (3)

Significance	**Medium (52)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
Dust-reducing mitigation measures must be put in place and must be strictly adhered to, for all roads and dumps especially. This includes wetting of exposed soft soil surfaces and not conducting activities on windy days which will increase the likelihood of dust being generated Progressive rehabilitation will enable topsoil to be returned more rapidly, thus ensuring more recruitment from the existing seedbank 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		
Residual Impacts:		
No notable impacts.		

Nature: Spread of alien and/or invasive species		
Degradation and loss of surrounding natural vegetation due to AIP		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Low (2)
Duration	Long term (4)	Short term (2)
Magnitude	Moderate (6)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Medium (39)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
Implementation of an alien vegetation management plan 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 Maximum domestic waste storage period will be 10 days A pest control plan must be put in place and implemented; it is imperative that poisons not be used due to the likely presence of SCCs		
Residual Impacts:		
None.		

Nature: Ongoing displacement and direct mortalities of faunal community due to disturbance

Road collisions, noise, light, dust and vibration, and the reduced dispersal/migration of fauna		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Low (2)
Duration	Moderate term (3)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (36)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
Noise reduction measures must be installed for all machines, vehicles and equipment. Appropriate silencers to control potentially disrupting noises to be fitted. The noise impact assessment must advise Lighting should be kept to a minimum to avoid disturbing crepuscular and nocturnal species. Lighting fixtures should be fitted with baffles, hoods or louvres and directed downward, to minimize light pollution which could attract night-flying birds and night migrating species Staff should be made environmentally aware during the inductions and potentially as part of the environmental awareness plan		
Residual Impacts:		
None.		

Nature: Pollution		
Chemical pollution associated with measures to keep PV clean		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Low (2)
Duration	Long term (4)	Short term (2)
Magnitude	High (8)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (45)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
No non-environmentally friendly cleaning products may be used as this could result in pollution of water sources.		
Residual Impacts:		
Extensive pollution to surrounding water courses.		

6.1.4.3 Decommissioning Phase

This phase is when the scaling down of activities ahead of temporary or permanent closure is initiated. During this phase, the operational phase impacts will persist until the activity reduces and the rehabilitation measures are implemented (Table 6-4).

The following potential impacts were considered:

- Continued fragmentation and degradation of habitats and ecosystems; and

- Spread of alien and/or invasive species.

Should the area successfully be rehabilitated, and an alien management plan appropriately implemented, these impacts can be reduced to "low "post mitigation, the area will not likely return to its pre-construction condition and therefore this impact cannot be regarded as "absent".

Table 6-4 Assessment of significance of potential impacts on terrestrial biodiversity associated with the rehabilitation phase of the project

Continued fragmentation and degradation of habitats		
	Without mitigation	**With mitigation**
Extent	Low (2)	Low (2)
Duration	Long term (4)	Very short term (1)
Magnitude	Moderate (6)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Medium (36)**	**Low (15)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
Implementation of rehabilitation plan. Develop post-development environments in conjunction with regional development plans as well as the recreation of habitats where possible or structure altered landscapes to be compatible with regional habitats Monitoring of rehabilitation implementation on an annual basis for 5 years post-closure. The plan and interventions must be amended accordingly Any gullies or dongas must also be backfilled The area must be shaped to a natural topography Trees (or vegetation stands) removed must be replaced No grazing must be permitted to allow for the recovery of the area.		
Residual Impacts:		
None		

Spread of alien and/or invasive species		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Low (2)
Duration	Long term (4)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (52)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:
Ongoing implementation of an alien vegetation management plan as well as the monitoring of the plants
Residual Impacts:
None

6.1.5 Cumulative Impact Assessment

Cumulative impacts are assessed in context of the extent of the proposed project area; other developments in the area; and general habitat loss and transformation resulting from other activities in the area.

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 fauna and flora.

Localised cumulative impacts include the cumulative effects from operations that are close enough to potentially cause additive effects on the environment or sensitive receivers (such as nearby renewable energy or PV activities within the area). These include dust deposition, noise and vibration, disruption of corridors or habitat, groundwater drawdown, groundwater and surface water quality, and transport.

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 PV panels and associated infrastructure are expected to have a moderate detrimental cumulative impact, due to the mining, urban area, and agriculture in the regional area, especially to the south. Cumulatively these developments will be responsible for the destruction of a large portion of grassland in the area.

6.1.5.1 Spatial cumulative assessment

In order to spatially quantify the cumulative effects of the proposed development, the project in isolation is compared with the overall effects of surrounding development (including total transformation and transformation as a result of new and proposed developments of a similar type, i.e., solar). Refer to (TAB) for an overview of the assessment.

According to the 2018 National Biodiversity Assessment, the total amount of Vaal Reefs Dolomite Sinkhole Woodland habitat within 30 km of the project amounts to 34 640 ha, but when considering the transformation that has taken place within this radius – only 20 784 ha remains. Therefore, the area within 30 km of the project has experienced approximately 40% loss in natural habitat. Considering this context, the project footprint that will overlap with this habitat is 200 ha (assuming the total extent of the PAOI is developed), and a few similar projects exists in the 30 km region measuring a maximum of 4000 ha (as per the latest South African Renewable Energy EIA Application Database). This means that the total amount of remaining habitat lost as a result of solar projects in the region amounts to 20% (the sum of all related developments as a percentage of the total remaining habitat). Table 6-5 outlines the calculation procedure for the spatial assessment of cumulative impacts.

Table 6-5 Loss of Vaal Reefs Dolomite Sinkhole Woodland habitat within a 30 km radius of the project

	Total Habitat (ha)	Tot. Remaining Habitat (ha)	Total Historical Loss	Project Footprint (ha)	Similar Projects (ha)	Cumulative Habitat Lost

Project cumulative effects (Spatial)	34 640	20 784	**40%**	200	4000	**20%**

Only a few functional corridors remain, and this means that the 20% loss in remaining habitat is relatively significant, the cumulative impact of the project is thus rated as 'High'. This means that the careful spatial management and planning of the entire region must be a priority, and existing large infrastructure projects must be carefully monitored over the long term.

According to the 2018 National Biodiversity Assessment, the total amount of Carletonville Dolomite Grassland habitat within 30 km of the project amounts to 36 316 ha, but when considering the transformation that has taken place within this radius – only 32 684 ha remains. Therefore, the area within 30 km of the project has experienced approximately 10% loss in natural habitat. Considering this context, the project footprint that will overlap with this habitat is 1073 ha (assuming the total extent of the PAOI is developed), and one similar project exists in the 30 km region measuring a maximum of 25 ha (as per the latest South African Renewable Energy EIA Application Database). This means that the total amount of remaining habitat lost as a result of solar projects in the region amounts to 3.4% (the sum of all related developments as a percentage of the total remaining habitat). Table 6-6 outlines the calculation procedure for the spatial assessment of cumulative impacts.

Table 6-6 Loss of Carletonville Dolomite Grassland habitat within a 30 km radius of the project

	Total Habitat (ha)	Tot. Remaining Habitat (ha)	Total Historical Loss	Project Footprint (ha)	Similar Projects (ha)	Cumulative Habitat Lost
Project cumulative effects (Spatial)	36 316	32 684	**10%**	1073	25	**3.4%**

Some functional corridors remain, and this means that the 3.4% loss in remaining habitat is relatively significant, the cumulative impact of the project is thus rated as 'Medium'. This means that the careful spatial management and planning of the entire region must be a priority, and existing large infrastructure projects must be carefully monitored over the long term.

Table 6-7 Cumulative Impacts Summary

Nature: Cumulative habitat loss within the region		
The development of the proposed infrastructure will contribute to cumulative habitat loss within CBA/ESAs and thereby impact the ecological processes in the region.		
	Without mitigation	**With mitigation**
Extent	Very high (5)	High (4)
Duration	Long term (4)	Moderate term (3)
Magnitude	High (8)	High (8)
Probability	Highly probable (4)	Probable (3)
Significance	**High**	**Medium**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation:		
The remaining local vegetation types must be carefully managed to maintain intact habitat corridors.		

6.1.6 Watercourse Impact Assessment

6.1.6.1 Construction Phase

The following potential main impacts to delineated watercourses were considered for the construction phase of the proposed project. This phase refers to the period during construction when the proposed features are constructed. The following potential impacts during site clearing and preparation were considered:

- Watercourse disturbance / loss.
    - Direct disturbance / degradation / loss to soils or vegetation due to the construction of the solar facility.
- Altered hydrology.
    - Changes to the hydrology of the watercourse due to infrastructure traversing the system/s.
- Water runoff from construction site.
    - Increased erosion and sedimentation.

Table 6-8 Assessment of significance of potential impacts on wetlands associated with the construction phase of the project

Nature: Wetland disturbance / loss		
Direct disturbance / degradation / loss to soils or vegetation due to the construction of the solar facility		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Very low (1)
Duration	Moderate term (3)	Short term (2)
Magnitude	Moderate (6)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (36)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, avoidance of wetlands is possible.	
Mitigation:		
Clearly demarcate the construction footprint and restrict all construction activities to within the proposed infrastructure area. When clearing vegetation, allow for some vegetation cover as opposed to bare areas. Keep as much vegetation as possible beneath the panels. Minimize the disturbance footprint and unnecessary clearing of vegetation outside of this area. Educate staff and relevant contractors on the location and importance of the identified wetlands through toolbox talks and by including them in site inductions and the overall master plan. All activities (including driving) must adhere to the 15 m buffer area. Promptly remove / control all AIPs that may emerge during construction (i.e. weedy annuals and other alien forbs) must be removed. Landscape and re-vegetate all denuded areas as soon as possible.		
Residual Impacts:		

The loss of wetlands is unexpected, as no wetlands overlap with the development area. The proposed development does overlap with a drainage feature. The residual impact would be low.

Nature: Altered hydrology		
Changes to the hydrology of the watercourse due to infrastructure traversing the system/s		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Low (2)
Duration	Moderate term (3)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (36)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
Undertake the upgrade of the crossing during the low flow period (between May and August). Minimise the extent of activities within the watercourse. Prioritise the upgrade by placing machines and equipment on the existing structure and embankments, and not within the watercourse. Where necessary, machines and equipment may be positioned in the watercourse. Disturbed areas must be rehabilitated once machinery and equipment are removed. The upgraded structure must accommodate high flows, and be designed for a 1:100 year flood peak. Minimise the number (and extent) of piers within the watercourse. The piers must not be placed within a preferential flow path. The crossing must also be inspected frequently (suggested weekly) during the high flow period (between October and April), and after rainfall events. All debris trapped by the crossing must be removed.		
Residual Impacts:		
Long term broad scale erosion and sedimentation		

Nature: Water runoff from construction site		
Increased erosion and sedimentation		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Low (2)
Duration	Moderate term (3)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (48)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No

Nature: Water runoff from construction site	
Increased erosion and sedimentation	
Can impacts be mitigated?	Yes
Mitigation:	
Limit construction activities near (< 30 m) of wetland to winter (as much as possible) when rain is least likely to wash concrete and sand into the wetland. Only clear vegetation on a needs, keeping to a minimum the amount of vegetation to be cleared. Ensure soil stockpiles and concrete / building sand are sufficiently safeguarded against rain wash. No activities are permitted within the wetland and associated buffer areas. Landscape and re-vegetate all unnecessarily denuded areas as soon as possible.	
Residual Impacts:	
Long term broad scale erosion and sedimentation	

6.1.6.2 Operation Phase

The operational phase refers to the phase when the construction has been completed and the infrastructure is functional. It is anticipated to increase stormwater runoff due to the hardened surfaces or potentially contaminate any wetland systems, particularly the system west of the proposed project area.

The following potential impacts were considered:

- Hardened surfaces.
    - Potential for increased stormwater runoff, leading to increased erosion and sedimentation.
- Contamination.
    - Potential for increased contaminants entering the wetland systems.

Table 6-9 Assessment of significance of potential impacts on wetlands associated with the operation phase of the project

Nature: Hardened surfaces		
Potential for increased stormwater runoff leading to increased erosion and sedimentation		
	Without Mitigation	With Mitigation
Extent	High (4)	Low (2)
Duration	Moderate term (3)	Short term (2)
Magnitude	High (8)	Moderate (6)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (60)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes, with proper management and avoidance, this impact can be mitigated to a low level.	
Mitigation:		

Nature: Hardened surfaces
Potential for increased stormwater runoff leading to increased erosion and sedimentation
Design and Implement an effective stormwater management plan. This plan must consider the drainage feature overlapped by the facility. Promote water infiltration into the ground beneath the solar panels. Release only clean water into the environment. Stormwater leaving the site should not be concentrated in a single exit drain but spread across multiple drains around the site, each fitted with energy dissipaters (e.g. slabs of concrete with rocks cemented in). Re-vegetate denuded areas as soon as possible. Regularly clear drains. Minimise the extent of concreted / paved / gravel areas. A covering of soil and grass (regularly cut and maintained) below the solar panels is ideal for infiltration. If not feasible, then gravel is preferable over concrete or paving. Avoid excessively compacting the ground beneath the solar panels.
Residual Impacts
Long-term broad scale erosion and sedimentation

Nature: Contamination		
Potential for increased contaminants entering the wetland systems		
	Without mitigation	**With mitigation**
Extent	High (4)	Low (2)
Duration	Long term (4)	Short term (2)
Magnitude	Moderate (6)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (56)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
Where possible, minimise the use of surfactants to clean solar panels and herbicides to control vegetation beneath the panels. If surfactants and herbicides must be used, do so well prior to any significant predicted rainfall events.		
Residual Impacts:		
Wetland deterioration over time		

6.1.6.3 Decommissioning Phase

This phase is when the scaling down of activities ahead of temporary or permanent closure is initiated. During this phase, the operational phase impacts will persist until the activity reduces and the

rehabilitation measures are implemented. No decommissioning of the access road has been considered. The following potential impacts were considered:

- Water runoff from site.
    - Increased erosion and sedimentation.

Table 6-10 Assessment of significance of potential impacts on wetlands associated with the decommissioning phase of the project

Nature: Water runoff from construction site		
Increased erosion and sedimentation		
	Without mitigation	**With mitigation**
Extent	Moderate (3)	Low (2)
Duration	Moderate term (3)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (48)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
No activities are permitted within the wetland and associated buffer areas. Landscape and re-vegetate all unnecessarily denuded areas as soon as possible.		
Residual Impacts:		
Long term broad scale erosion and sedimentation		

6.1.7 Cumulative Impact Assessment

The overall cumulative impact is expected to be low, this is based on the assumption that complete clearing of vegetation will not be undertaken beneath the panels. The catchment area is characterised by degraded grassland and some agricultural practices, with limited hardened surfaces in the area. The placement of the PV facility in the catchment will contribute to altered surface flow characteristics, but an effective stormwater management plan can mitigate any impacts stemming from changes to surface flow dynamics. The upgrade of the crossing for the access route poses a negligible cumulative impact owing to the fact this is an upgraded structure.

Table 6-11 Cumulative Impacts Summary

Nature: Cumulative habitat loss within the region		
The development of the proposed infrastructure will contribute to cumulative wetland loss and altered hydrology of the receiving watercourse		
	Without mitigation	**With mitigation**
Extent	High (4)	Low (2)
Duration	Long term (4)	Moderate term (3)
Magnitude	High (8)	Moderate (6)
Probability	Highly probable (4)	Improbable (2)

Significance	**High (64)**	**Low (22)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation:		
Water loss is not expected for the catchment, but altered surface hydrology may contribute to erosion and sedimentation of the watercourse.		

6.2 Recommendations

The following recommendations should be considered for the authorisation:

- A stormwater management plan must be developed and implemented for the project. This plan must advise on watercourses to be avoided by the development.
- A freshwater biomonitoring programme must be implemented for the development. This should comprise bi-annual biomonitoring of the watercourse on the western boundary of the PAOI, and at least annual wetland monitoring for all wetlands within 100 m of the PAOI;
- A pre-mitigation buffer zone of 30 m from identified wetlands is recommended for all project infrastructure, which can be decreased to 15 m if all prescribed mitigation measures are implemented;
- It is recommended that a General Notice (GN) 509 risk assessment be completed for any listed water uses as per the National Water Act (Act no. 36 of 1998);
- The Very High and High sensitivity area should be excluded from development;
- A pre-construction survey should be conducted to identify any individuals of the Red Listed plant species *Lithops lesliei* that are not included in the very-high sensitive area and permits will have to be obtained to transplant these individuals; and
- A pre-construction survey should be conducted to identify the locations of all *Vachellia erioloba* (Camel thorn) trees within the project area. Permits are to be obtained for the relocation / destruction of any remaining *Vachellia eriolaba* trees. The survey must also verify the positions of all SCC.

7 Conclusion and Impact Statement

7.1 Terrestrial Ecology

The completion of a comprehensive desktop study, in conjunction with the results from the field survey (completed by an external specialist), suggest there is a good confidence in the information provided. The survey ensured that there was a suitable groundtruth coverage of the assessment area and most habitats and ecosystems were assessed to obtain a general species (fauna and flora) overview and the major current impacts were observed. The conservation status is classified as Least Concern albeit the protection level is regarded as 'Poorly Protected' Ecosystem. Moreover, the proposed activity overlaps with an ESA 1, CBA 1, CBA 2, and the Central Power corridor.

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

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

Development within confirmed ESA areas is not considered favourably by the regulating authorities, and implementation of the mitigation hierarchy must be demonstrated. This must include concerted efforts to avoid these high sensitivity areas. Development in High sensitivity areas must demonstrate avoidance mitigation, and offset mitigation may be further required. The area indicated as a depression wetland (Aquatic CBA 1 and ESA 1) is dominated by fractured dolomite and no wetland conditions are present (Figure 4-3 & Figure 5-7). Disturbances to the medium sensitivity area must be kept to a minimum. The high sensitivity terrestrial areas still:

- Serve as and represent ESA as per the Conservation Plan;
- Serve as fundamental water resources for the region;
- Supports and protects fauna and flora (including protected and threatened species); and
- Support various organisms and may play a more important role in the ecosystem if left to recover from the superficial impacts.

The ecological integrity, importance and functioning of these terrestrial biodiversity areas provide a variety of ecological services considered beneficial, with one key service being the maintenance of biodiversity and water resources. The preservation of these systems is the most important aspect to consider for the proposed project.

Any development on the High sensitivity areas will lead the direct destruction and loss of portions of functional ESA, and also the floral and faunal species that are expected to utilise this habitat. Thus, if these areas are not maintained in a natural or near natural state, destroyed or fragmented, then meeting targets for biodiversity features will not be achieved. The mitigations, management and associated monitoring regarding these operational impacts will be the most important factor of this project and must be considered by the issuing authority.

7.2 Wetland

A key consideration for the impact assessment is the presence of the identified water resources in relation to the project area. The available data also suggests the presence of features in proximity to the project area, with wetland systems expected for the 500 m regulation area.

Construction could result in the encroachment into water resources and result in the loss or degradation of these system, most of which are functional and provide ecological services. These disturbances could also result in the infestation and establishment of alien vegetation would affect the functioning of the systems. Leaks and/or spillages could result in contamination of the receiving water resources. Contaminated water resources are likely to have an effect on the associated biota. An increase in stormwater runoff could result in physical changes to the receiving systems caused by erosion, run-off and also sedimentation, and the functional changes could result in changes to the vegetative structure of the systems.

7.3 Impact Statement

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

- Habitat loss and fragmentation;
- Altered hydrological regime;
- Degradation of surrounding habitat;

- Direct loss of drainage areas; and
- Mortality, disturbance and displacement caused during the construction and operational phases.

Mitigation measures as described in this report can be implemented to reduce the significance of the risk. Considering that this area has been identified as being of significance for biodiversity maintenance and ecological processes (ESAs & CBA), development may proceed but with caution and only with the implementation of mitigation measures, especially the red listed plant community. Due to the fact that the proposed access road traversing the wetland is an upgrade, the residual risk was determined to be low.

Considering the above-mentioned information, no fatal flaws are evident for the proposed project. It is the opinion of the specialists that the project, may be cautiously considered, on condition that all prescribed mitigation measures and supporting recommendations are implemented.

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9 Appendix Items

9.1 Appendix A – Specialist Declaration of Independence

I, Daniel Meintjes, 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.

Daniel Meintjes

Terrestrial Ecologist

The Biodiversity Company

October 2022

9.2 Appendix B – Flora species expected to occur in the project area.

Family	Species	Author	SANBI – Red List	Ecology
Fabaceae	*Acacia mearnsii*	De Wild.	NE	Not indigenous; Naturalised; Invasive
Fabaceae	*Acacia sp.*			
Euphorbiaceae	*Acalypha angustata*	Sond.	LC	Indigenous
Euphorbiaceae	*Acalypha caperonioides var. caperonioides*	Baill.	DD	Indigenous
Sapindaceae	*Acer buergerianum*	Miq.		Not indigenous; Naturalised; Invasive
Sapindaceae	*Acer negundo*	L.		Not indigenous; Naturalised; Invasive
Crassulaceae	***Adromischus umbraticola subsp. umbraticola***	**C.A.Sm.**	**NT**	**Indigenous; Endemic**
Amaranthaceae	*Aerva leucura*	Moq.	LC	Indigenous
Podocarpaceae	*Afrocarpus falcatus*	(Thunb.) C.N.Page		Indigenous
Loranthaceae	*Agelanthus natalitius subsp. zeyheri*	(Meisn.) Polhill & Wiens (Harv.) Polhill & Wiens	LC	Indigenous
Poaceae	*Agrostis lachnantha var. lachnantha*	Nees	LC	Indigenous
Hyacinthaceae	*Albuca glauca*	Baker	LC	Indigenous; Endemic
Hyacinthaceae	*Albuca setosa*	Jacq.	LC	Indigenous
Amaranthaceae	*Alternanthera pungens*	Kunth		Not indigenous; Naturalised
Amaranthaceae	*Amaranthus deflexus*	L.		Not indigenous; Naturalised
Amaranthaceae	*Amaranthus hybridus subsp. cruentus*	L. (L.) Thell.		Not indigenous; Naturalised
Amaranthaceae	*Amaranthus hybridus subsp. hybridus var. hybridus*	L.		Not indigenous; Naturalised
Amaranthaceae	*Amaranthus viridis*	L.		Not indigenous; Naturalised
Lythraceae	*Ammannia anagalloides*	Sond.		Indigenous
Apiaceae	*Ammi majus*	L.		Not indigenous; Naturalised
Poaceae	*Andropogon appendiculatus*	Nees	LC	Indigenous
Malvaceae	*Anisodontea scabrosa*	(L.) Bates	LC	Indigenous; Endemic
Poaceae	*Anthephora pubescens*	Nees	LC	Indigenous
Scrophulariaceae	*Aptosimum elongatum*	(Hiern) Engl.	LC	Indigenous
Papaveraceae	*Argemone ochroleuca subsp. ochroleuca*	Sweet		Not indigenous; Naturalised; Invasive
Poaceae	*Aristida adscensionis*	L.	LC	Indigenous
Poaceae	*Aristida canescens subsp. canescens*	Henrard	LC	Indigenous
Poaceae	*Aristida congesta subsp. barbicollis*	Roem. & Schult. (Trin. & Rupr.) De Winter	LC	Indigenous
Poaceae	*Aristida congesta subsp. congesta*	Roem. & Schult.	LC	Indigenous
Asteraceae	*Artemisia afra var. afra*	Jacq. ex Willd.	LC	Indigenous
Poaceae	*Arundo donax*	L.	NE	Not indigenous; Naturalised; Invasive
Apocynaceae	*Asclepias aurea*	(Schltr.) Schltr.	LC	Indigenous

Apocynaceae	*Asclepias brevipes*	(Schltr.) Schltr.	LC	Indigenous; Endemic
Apocynaceae	*Asclepias meyeriana*	(Schltr.) Schltr.	LC	Indigenous
Asparagaceae	*Asparagus africanus*	Lam.	LC	Indigenous
Asparagaceae	*Asparagus cooperi*	Baker	LC	Indigenous
Asparagaceae	*Asparagus laricinus*	Burch.	LC	Indigenous
Asparagaceae	*Asparagus suaveolens*	Burch.	LC	Indigenous
Apocynaceae	*Aspidoglossum biflorum*	E.Mey.	LC	Indigenous
Amaranthaceae	*Atriplex semibaccata*	R.Br.		Not indigenous; Naturalised; Invasive
Salviniaceae	*Azolla filiculoides*	Lam.	NE	Not indigenous; Naturalised; Invasive
Iridaceae	*Babiana bainesii*	Baker	LC	Indigenous
Acanthaceae	*Barleria macrostegia*	Nees	LC	Indigenous
Berberidaceae	*Berberis julianae*	C.K.Schneid.		Not indigenous; Cultivated; Naturalised; Invasive
Elatinaceae	*Bergia decumbens*	Planch. ex Harv.	LC	Indigenous
Betulaceae	*Betula pendula*	Roth		Not indigenous; Cultivated; Naturalised
Asteraceae	*Bidens bipinnata*	L.		Not indigenous; Naturalised
Asteraceae	*Bidens pilosa*	L.		Not indigenous; Naturalised
Acanthaceae	*Blepharis serrulata*	(Nees) Ficalho & Hiern	LC	Indigenous
Acanthaceae	*Blepharis sp.*			
Nyctaginaceae	*Boerhavia erecta*	L.		Not indigenous; Naturalised
Orchidaceae	*Bonatea antennifera*	Rolfe	LC	Indigenous
Capparaceae	*Boscia albitrunca*	(Burch.) Gilg & Gilg-Ben.	LC	Indigenous
Poaceae	*Bothriochloa insculpta*	(Hochst. ex A.Rich.) A.Camus	LC	Indigenous
Poaceae	*Brachiaria eruciformis*	(Sm.) Griseb.	LC	Indigenous
Poaceae	*Bromus catharticus*	Vahl	NE	Not indigenous; Naturalised; Invasive
Scrophulariaceae	*Buddleja salviifolia*	(L.) Lam.	LC	Indigenous
Asphodelaceae	*Bulbine capitata*	Poelln.	LC	Indigenous
Asphodelaceae	*Bulbine narcissifolia*	Salm-Dyck	LC	Indigenous
Cannaceae	*Canna generalis*	L.H.Bailey	NE	Not indigenous; Naturalised; Invasive
Brassicaceae	*Capsella bursa-pastoris*	(L.) Medik.		Not indigenous; Naturalised
Cannabaceae	*Celtis africana*	Burm.f.	LC	Indigenous
Cannabaceae	*Celtis sinensis*	Pers.		Not indigenous; Cultivated; Naturalised; Invasive
Poaceae	*Cenchrus ciliaris*	L.	LC	Indigenous
Ceratophyllaceae	*Ceratophyllum muricatum subsp. muricatum*	Cham.	LC	Indigenous
Solanaceae	*Cestrum parqui*	L'Her.		Not indigenous; Naturalised; Invasive

Fabaceae	*Chamaecrista mimosoides*	(L.) Greene	LC	Indigenous
Verbenaceae	*Chascanum adenostachyum*	(Schauer) Moldenke	LC	Indigenous
Amaranthaceae	*Chenopodiastrum murale*	(L.) S.Fuentes, Uotila & Borsch		Not indigenous; Naturalised; Invasive
Amaranthaceae	*Chenopodium album*	L.		Not indigenous; Naturalised; Invasive
Poaceae	*Chloris pycnothrix*	Trin.	LC	Indigenous
Poaceae	*Chloris virgata*	Sw.	LC	Indigenous
Asteraceae	*Cichorium intybus subsp. intybus*	L.		Not indigenous; Naturalised; Invasive
Asteraceae	*Cineraria lyratiformis*	Cron	LC	Indigenous
Lauraceae	*Cinnamomum camphora*	(L.) J.Presl	NE	Not indigenous; Naturalised; Invasive
Asteraceae	*Cirsium vulgare*	(Savi) Ten.		Not indigenous; Naturalised; Invasive
Ranunculaceae	*Clematis brachiata*	Thunb.	LC	Indigenous
Cleomaceae	*Cleome monophylla*	L.	LC	Indigenous
Combretaceae	*Combretum erythrophyllum*	(Burch.) Sond.	LC	Indigenous
Commelinaceae	*Commelina africana var. barberae*	L. (C.B.Clarke) C.B.Clarke	LC	Indigenous
Commelinaceae	*Commelina africana var. lancispatha*	L. C.B.Clarke	LC	Indigenous
Commelinaceae	*Commelina erecta*	L.	LC	Indigenous
Commelinaceae	*Commelina livingstonii*	C.B.Clarke	LC	Indigenous
Nyctaginaceae	*Commicarpus pentandrus*	(Burch.) Heimerl	LC	Indigenous
Convolvulaceae	*Convolvulus sagittatus*	Thunb.	LC	Indigenous
Asteraceae	*Conyza podocephala*	DC.		Indigenous
Malvaceae	*Corchorus asplenifolius*	Burch.	LC	Indigenous
Malvaceae	*Corchorus schimperi*	Cufod.	LC	Indigenous
Apocynaceae	*Cordylogyne globosa*	E.Mey.	LC	Indigenous
Asteraceae	*Coreopsis lanceolata*	L.		Not indigenous; Cultivated; Naturalised; Invasive
Rosaceae	*Cotoneaster glaucophyllus*	Franch.		Not indigenous; Naturalised; Invasive
Rosaceae	*Cotoneaster pannosus*	Franch.		Not indigenous; Cultivated; Naturalised; Invasive
Crassulaceae	*Cotyledon orbiculata var. orbiculata*	L.	LC	Indigenous
Acanthaceae	*Crabbea angustifolia*	Nees	LC	Indigenous; Endemic
Crassulaceae	*Crassula sp.*	A.DC.		
Fabaceae	*Crotalaria lotoides*	Benth.	LC	Indigenous
Convolvulaceae	*Cuscuta campestris*	Yunck.		Not indigenous; Naturalised; Invasive
Araliaceae	*Cussonia paniculata subsp. sinuata*	Eckl. & Zeyh. (Reyneke & Kok) De Winter	LC	Indigenous
Apiaceae	*Cyclospermum leptophyllum*	(Pers.) Sprague ex Britton & P.Wilson		Not indigenous; Naturalised
Poaceae	*Cymbopogon caesius*	(Hook. & Arn.) Stapf	LC	Indigenous

Poaceae	*Cynodon dactylon*	(L.) Pers.	LC	Indigenous
Poaceae	*Cynodon nlemfuensis*	Vanderyst	NE	Not indigenous; Naturalised; Invasive
Cyperaceae	*Cyperus margaritaceus var. margaritaceus*	Vahl	LC	Indigenous
Cyperaceae	*Cyperus obtusiflorus var. flavissimus*	Vahl (Schrad.) Boeckeler	LC	Indigenous
Cyperaceae	*Cyperus sphaerospermus*	Schrad.	LC	Indigenous
Cyperaceae	*Cyperus uitenhagensis*	(Steud.) C.Archer & Goetgh.	LC	Indigenous
Lobeliaceae	*Cyphia persicifolia*	C.Presl	LC	Indigenous; Endemic
Poaceae	*Dactyloctenium australe*	Steud.	LC	Indigenous
Solanaceae	*Datura ferox*	L.		Not indigenous; Naturalised; Invasive
Solanaceae	*Datura stramonium*	L.		Not indigenous; Naturalised; Invasive
Hyacinthaceae	*Daubenya comata*	(Burch. ex Baker) J.C.Manning & A.M.van der Merwe	LC	Indigenous; Endemic
Aizoaceae	*Delosperma herbeum*	(N.E.Br.) N.E.Br.	LC	Indigenous
Aizoaceae	*Delosperma sp.*	L.Bolus		
Fabaceae	*Desmanthus virgatus*	(L.) Willd.	NE	Not indigenous; Naturalised
Caryophyllaceae	*Dianthus mooiensis subsp. kirkii*	F.N.Williams (Burtt Davy) S.S.Hooper	NE	Indigenous
Fabaceae	*Dichilus strictus*	E.Mey.	LC	Indigenous
Acanthaceae	*Dicliptera leistneri*	K.Balkwill	LC	Indigenous; Endemic
Iridaceae	*Dierama reynoldsii*	I.Verd.	LC	Indigenous; Endemic
Poaceae	*Digitaria debilis*	(Desf.) Willd.	LC	Indigenous
Poaceae	*Digitaria eriantha*	Steud.	LC	Indigenous
Poaceae	*Digitaria sanguinalis*	(L.) Scop.	NE	Not indigenous; Naturalised
Amaranthaceae	*Dysphania carinata*	(R.Br.) Mosyakin & Clemants		Not indigenous; Naturalised; Invasive
Poaceae	*Ehrharta erecta var. erecta*	Lam.	LC	Indigenous
Cyperaceae	*Eleocharis dregeana*	Steud.	LC	Indigenous
Fabaceae	*Elephantorrhiza elephantina*	(Burch.) Skeels	LC	Indigenous
Poaceae	*Eleusine coracana subsp. africana*	(L.) Gaertn. (Kenn.-O'Byrne) Hilu & de Wet	LC	Indigenous
Polygonaceae	*Emex australis*	Steinh.	LC	Indigenous
Poaceae	*Enneapogon cenchroides*	(Licht. ex Roem. & Schult.) C.E.Hubb.	LC	Indigenous
Onagraceae	*Epilobium hirsutum*	L.	LC	Indigenous
Poaceae	*Eragrostis barbinodis*	Hack.	LC	Indigenous
Poaceae	*Eragrostis barrelieri*	Daveau	NE	Not indigenous; Naturalised
Poaceae	*Eragrostis biflora*	Hack. ex Schinz	LC	Indigenous
Poaceae	*Eragrostis chloromelas*	Steud.	LC	Indigenous
Poaceae	*Eragrostis cilianensis*	(All.) Vignolo ex Janch.	LC	Indigenous
Poaceae	*Eragrostis curvula*	(Schrad.) Nees	LC	Indigenous
Poaceae	*Eragrostis echinochloidea*	Stapf	LC	Indigenous

Poaceae	*Eragrostis gummiflua*	Nees	LC	Indigenous
Poaceae	*Eragrostis obtusa*	Munro ex Ficalho & Hiern	LC	Indigenous
Poaceae	*Eragrostis rigidior*	Pilg.	LC	Indigenous
Poaceae	*Eragrostis rotifer*	Rendle	LC	Indigenous
Poaceae	*Eragrostis sp.*			
Poaceae	*Eragrostis superba*	Peyr.	LC	Indigenous
Poaceae	*Eragrostis trichophora*	Coss. & Durieu	LC	Indigenous
Asteraceae	*Erigeron sumatrensis*	Retz.		Not indigenous; Naturalised; Invasive
Brassicaceae	*Erucastrum austroafricanum*	Al-Shehbaz & Warwick	LC	Indigenous
Papaveraceae	*Eschscholzia californica subsp. californica*	Cham.		Not indigenous; Cultivated; Naturalised
Myrtaceae	*Eucalyptus camaldulensis*	Dehnh.		Not indigenous; Cultivated; Naturalised; Invasive
Myrtaceae	*Eucalyptus microtheca*	F.Muell.		Not indigenous; Naturalised
Euphorbiaceae	*Euphorbia hirsuta*	L.		Not indigenous; Naturalised; Invasive
Euphorbiaceae	*Euphorbia hirta*	L.	NE	Not indigenous; Naturalised
Euphorbiaceae	*Euphorbia peplus*	L.	NE	Not indigenous; Naturalised
Euphorbiaceae	*Euphorbia prostrata*	Aiton	NE	Not indigenous; Naturalised
Euphorbiaceae	*Euphorbia serpens*	Kunth	NE	Not indigenous; Naturalised
Asteraceae	*Felicia muricata subsp. muricata*	(Thunb.) Nees	LC	Indigenous
Poaceae	*Festuca arundinacea*	Schreb.	NE	Not indigenous; Naturalised
Asteraceae	*Flaveria bidentis*	(L.) Kuntze		Not indigenous; Naturalised; Invasive
Apiaceae	*Foeniculum vulgare var. vulgare*	Mill.		Not indigenous; Cultivated; Naturalised; Invasive
Oleaceae	*Fraxinus angustifolia*	Vahl		Not indigenous; Naturalised; Invasive
Asteraceae	*Galinsoga parviflora*	Cav.		Not indigenous; Naturalised; Invasive
Rubiaceae	*Galium capense subsp. capense*	Thunb.	LC	Indigenous
Asteraceae	*Gazania krebsiana*	Less.		Indigenous
Asteraceae	*Gazania krebsiana subsp. serrulata*	Less. (DC.) Roessler	LC	Indigenous
Asteraceae	*Geigeria brevifolia*	(DC.) Harv.	LC	Indigenous
Asteraceae	*Geigeria ornativa*	O.Hoffm.		Indigenous
Geraniaceae	*Geranium multisectum*	N.E.Br.	LC	Indigenous
Gisekiaceae	*Gisekia africana var. africana*	(Lour.) Kuntze	LC	Indigenous
Verbenaceae	*Glandularia aristigera*	(S.Moore) Tronc.		Not indigenous; Naturalised; Invasive
Fabaceae	*Gleditsia triacanthos*	L.	NE	Not indigenous; Naturalised; Invasive
Apocynaceae	*Gomphocarpus rivularis*	Schltr.	LC	Indigenous
Scrophulariaceae	*Gomphostigma virgatum*	(L.f.) Baill.	LC	Indigenous
Amaranthaceae	*Gomphrena celosioides*	Mart.		Not indigenous; Naturalised

Malvaceae	*Grewia flava*	DC.	LC	Indigenous
Malvaceae	*Grewia occidentalis var. occidentalis*	L.	LC	Indigenous
Amaranthaceae	*Guilleminea densa*	(Humb. & Bonpl. ex Schult.) Moq.		Not indigenous; Naturalised; Invasive
Celastraceae	*Gymnosporia buxifolia*	(L.) Szyszyl.	LC	Indigenous
Poaceae	*Harpochloa falx*	(L.f.) Kuntze	LC	Indigenous
Araliaceae	*Hedera canariensis*	Willd.		Not indigenous; Cultivated; Naturalised
Asteraceae	*Helichrysum caespititium*	(DC.) Harv.	LC	Indigenous
Asteraceae	*Helichrysum callicomum*	Harv.	LC	Indigenous
Asteraceae	*Helichrysum paronychioides*	DC.	LC	Indigenous
Asteraceae	*Helichrysum rugulosum*	Less.	LC	Indigenous
Asteraceae	*Helichrysum zeyheri*	Less.	LC	Indigenous
Asteraceae	*Helminthotheca echioides*	(L.) Holub		Not indigenous; Naturalised; Invasive
Poaceae	*Hemarthria altissima*	(Poir.) Stapf & C.E.Hubb.	LC	Indigenous
Malvaceae	*Hermannia depressa*	N.E.Br.	LC	Indigenous
Malvaceae	*Hermannia grandistipula*	(Buchinger ex Hochst.) K.Schum.	LC	Indigenous
Malvaceae	*Hermannia quartiniana*	A.Rich.	LC	Indigenous
Malvaceae	*Hermannia stellulata*	(Harv.) K.Schum.	LC	Indigenous
Poaceae	*Heteropogon contortus*	(L.) Roem. & Schult.	LC	Indigenous
Malvaceae	*Hibiscus calyphyllus*	Cav.	LC	Indigenous
Malvaceae	*Hibiscus microcarpus*	Garcke	LC	Indigenous
Malvaceae	*Hibiscus pusillus*	Thunb.	LC	Indigenous
Malvaceae	*Hibiscus syriacus*	L.		Not indigenous; Naturalised
Asteraceae	*Hilliardiella elaeagnoides*	(DC.) Swelank. & J.C.Manning		Indigenous
Poaceae	*Hyparrhenia hirta*	(L.) Stapf	LC	Indigenous
Acanthaceae	*Hypoestes aristata var. alba*	(Vahl) Sol. ex Roem. & Schult. K.Balkwill	LC	Indigenous
Hypoxidaceae	*Hypoxis acuminata*	Baker	LC	Indigenous
Hypoxidaceae	*Hypoxis argentea var. sericea*	Harv. ex Baker Baker	LC	Indigenous
Hypoxidaceae	*Hypoxis hemerocallidea*	Fisch., C.A.Mey. & Ave-Lall.	LC	Indigenous
Fabaceae	*Indigofera daleoides var. daleoides*	Benth. ex Harv.	NE	Indigenous
Fabaceae	*Indigofera heterotricha*	DC.	LC	Indigenous
Fabaceae	*Indigofera torulosa var. torulosa*	E.Mey.	LC	Indigenous
Fabaceae	*Indigofera vicioides subsp. vicioides*	Jaub. & Spach	LC	Indigenous
Convolvulaceae	*Ipomoea bathycolpos*	Hallier f.	LC	Indigenous; Endemic
Convolvulaceae	*Ipomoea crassipes var. crassipes*	Hook.	LC	Indigenous
Convolvulaceae	*Ipomoea oblongata*	E.Mey. ex Choisy	LC	Indigenous
Convolvulaceae	*Ipomoea obscura var. obscura*	(L.) Ker Gawl.	LC	Indigenous

Convolvulaceae	*Ipomoea purpurea*	(L.) Roth		Not indigenous; Naturalised; Invasive
Convolvulaceae	*Ipomoea sp.*			
Poaceae	*Ischaemum afrum*	(J.F.Gmel.) Dandy	LC	Indigenous
Euphorbiaceae	*Jatropha zeyheri*	Sond.	LC	Indigenous
Juncaceae	*Juncus rigidus*	Desf.	LC	Indigenous
Crassulaceae	*Kalanchoe rotundifolia*	(Haw.) Haw.	LC	Indigenous
Achariaceae	*Kiggelaria africana*	L.	LC	Indigenous
Sapindaceae	*Koelreuteria paniculata*	Laxm.		Not indigenous; Cultivated; Naturalised
Asteraceae	*Lactuca inermis*	Forssk.	LC	Indigenous
Asteraceae	*Lactuca serriola*	L.		Not indigenous; Naturalised
Verbenaceae	*Lantana rugosa*	Thunb.	LC	Indigenous
Poaceae	*Leersia hexandra*	Sw.	LC	Indigenous
Euphorbiaceae	*Leidesia procumbens*	(L.) Prain	LC	Indigenous
Araceae	*Lemna minor*	L.	LC	Indigenous
Lamiaceae	*Leonotis pentadentata*	J.C.Manning & Goldblatt	LC	Indigenous
Brassicaceae	*Lepidium africanum subsp. africanum*	(Burm.f.) DC.	LC	Indigenous
Brassicaceae	*Lepidium bonariense*	L.		Not indigenous; Naturalised
Rosaceae	*Leucosidea sericea*	Eckl. & Zeyh.	LC	Indigenous
Oleaceae	*Ligustrum lucidum*	W.T.Aiton		Not indigenous; Cultivated; Naturalised; Invasive
Verbenaceae	*Lippia scaberrima*	Sond.	LC	Indigenous
Fabaceae	*Listia bainesii*	(Baker) B.-E.van Wyk & Boatwr.	LC	Indigenous
Fabaceae	*Listia heterophylla*	E.Mey.	LC	Indigenous
Boraginaceae	*Lithospermum cinereum*	A.DC.	LC	Indigenous
Poaceae	*Lolium temulentum*	L.	NE	Not indigenous; Naturalised; Invasive
Berberidaceae	*Mahonia oiwakensis*	Hayata		Not indigenous; Cultivated; Naturalised
Malvaceae	*Malva arborea*	(L.) Webb & Berthel.		Not indigenous; Naturalised; Invasive
Malvaceae	*Malva parviflora*	L.		Not indigenous; Naturalised
Malvaceae	*Malva parviflora var. parviflora*	L.		Not indigenous; Naturalised
Malvaceae	*Malva sylvestris*	L.		Not indigenous; Naturalised
Malvaceae	*Malvastrum coromandelianum*	(L.) Garcke		Not indigenous; Naturalised; Invasive
Euphorbiaceae	*Manihot esculenta*	Crantz	NE	Not indigenous; Cultivated; Naturalised
Marsileaceae	*Marsilea farinosa subsp. farinosa*	Launert	LC	Indigenous
Marsileaceae	*Marsilea sp.*			
Fabaceae	*Medicago polymorpha*	L.	NE	Not indigenous; Naturalised; Invasive
Fabaceae	*Medicago sativa*	L.	NE	Not indigenous; Cultivated; Naturalised; Invasive

Myrtaceae	*Melaleuca citrina*	(Curtis) Dum.Cours.		Not indigenous; Cultivated; Naturalised; Invasive
Myrtaceae	*Melaleuca viminalis subsp. viminalis*	(Sol. ex Gaertn.) Byrnes		Not indigenous; Cultivated; Naturalised; Invasive
Meliaceae	*Melia azedarach*	L.	NE	Not indigenous; Naturalised; Invasive
Melianthaceae	*Melianthus comosus*	Vahl	LC	Indigenous
Fabaceae	*Melilotus albus*	Medik.	NE	Not indigenous; Naturalised; Invasive
Oleaceae	*Menodora africana*	Hook.	LC	Indigenous
Phrymaceae	*Mimulus gracilis*	R.Br.	LC	Indigenous
Nyctaginaceae	*Mirabilis jalapa*	L.		Not indigenous; Naturalised; Invasive
Malvaceae	*Modiola caroliniana*	(L.) G.Don		Not indigenous; Naturalised
Cucurbitaceae	*Momordica balsamina*	L.	LC	Indigenous
Moraceae	*Morus alba*	L.		Not indigenous; Naturalised; Invasive
Moraceae	*Morus alba var. alba*	L.		Not indigenous; Naturalised
Fabaceae	*Mundulea sericea*	(Willd.) A.Chev.		Indigenous
Haloragaceae	*Myriophyllum spicatum*	L.		Not indigenous; Cultivated; Naturalised; Invasive
Berberidaceae	*Nandina domestica*	Thunb.		Not indigenous; Cultivated; Naturalised; Invasive
Scrophulariaceae	*Nemesia fruticans*	(Thunb.) Benth.	LC	Indigenous
Fabaceae	*Neorautanenia ficifolia*	(Benth.) C.A.Sm.	LC	Indigenous
Amaryllidaceae	*Nerine krigei*	W.F.Barker	LC	Indigenous; Endemic
Apocynaceae	*Nerium oleander*	L.	NE	Not indigenous; Naturalised; Invasive
Asteraceae	*Nidorella anomala*	Steetz	LC	Indigenous
Alliaceae	*Nothoscordum borbonicum*	Kunth	NE	Not indigenous; Naturalised; Invasive
Alliaceae	*Nothoscordum gracile*	(Aiton) Stearn		Not indigenous; Naturalised; Invasive
Onagraceae	*Oenothera rosea*	L'Her. ex Aiton		Not indigenous; Naturalised; Invasive
Onagraceae	*Oenothera tetraptera*	Cav.		Not indigenous; Naturalised; Invasive
Oleaceae	*Olea europaea subsp. cuspidata*	L. (Wall. ex G.Don) Cif.		Indigenous
Resedaceae	*Oligomeris dregeana*	(Mull.Arg.) Mull.Arg.	LC	Indigenous
Cactaceae	*Opuntia ficus-indica*	(L.) Mill.	NE	Not indigenous; Cultivated; Naturalised; Invasive
Asteraceae	*Osteospermum scariosum var. scariosum*	DC.	NE	Indigenous
Oxalidaceae	*Oxalis corniculata*	L.		Not indigenous; Naturalised; Invasive
Oxalidaceae	*Oxalis latifolia*	Kunth		Not indigenous; Naturalised; Invasive
Poaceae	*Panicum coloratum*	L.	LC	Indigenous
Poaceae	*Panicum maximum*	Jacq.	LC	Indigenous
Poaceae	*Panicum schinzii*	Hack.	LC	Indigenous
Poaceae	*Paspalum dilatatum*	Poir.	NE	Not indigenous; Naturalised; Invasive

Rubiaceae	*Pavetta zeyheri subsp. zeyheri*	Sond.	LC	Indigenous
Malvaceae	*Pavonia burchellii*	(DC.) R.A.Dyer	LC	Indigenous
Fabaceae	***Pearsonia bracteata***	**(Benth.) Polhill**	**NT**	**Indigenous; Endemic**
Poaceae	*Pennisetum clandestinum*	Hochst. ex Chiov.	NE	Not indigenous; Naturalised; Invasive
Poaceae	*Pennisetum macrourum*	Trin.	LC	Indigenous
Poaceae	*Pennisetum setaceum*	(Forssk.) Chiov.	NE	Not indigenous; Naturalised; Invasive
Poaceae	*Perotis patens*	Gand.	LC	Indigenous
Polygonaceae	*Persicaria hystricula*	(J.Schust.) Sojak	LC	Indigenous
Polygonaceae	*Persicaria lapathifolia*	(L.) Delarbre		Not indigenous; Naturalised; Invasive
Molluginaceae	*Pharnaceum sp.*			
Arecaceae	*Phoenix canariensis*	Chabaud		Not indigenous; Cultivated; Naturalised; Invasive
Poaceae	*Phragmites australis*	(Cav.) Steud.	LC	Indigenous
Poaceae	*Phragmites mauritianus*	Kunth	LC	Indigenous
Phyllanthaceae	*Phyllanthus incurvus*	Thunb.	LC	Indigenous
Phyllanthaceae	*Phyllanthus maderaspatensis*	L.	LC	Indigenous
Solanaceae	*Physalis viscosa*	L.		Not indigenous; Naturalised; Invasive
Plantaginaceae	*Plantago lanceolata*	L.	LC	Indigenous
Plantaginaceae	*Plantago major*	L.		Not indigenous; Naturalised
Plumbaginaceae	*Plumbago auriculata*	Lam.	LC	Indigenous
Poaceae	*Poa annua*	L.	NE	Not indigenous; Naturalised
Podocarpaceae	*Podocarpus henkelii*	Stapf ex Dallim. & A.B.Jacks.	LC	Indigenous; Endemic
Poaceae	*Pogonarthria squarrosa*	(Roem. & Schult.) Pilg.	LC	Indigenous
Polygalaceae	*Polygala leptophylla var. leptophylla*	Burch.	LC	Indigenous
Polygonaceae	*Polygonum aviculare*	L.		Not indigenous; Naturalised
Salicaceae	*Populus canescens*	(Aiton) Sm.		Not indigenous; Naturalised; Invasive
Salicaceae	*Populus deltoides subsp. deltoides*	Bartram ex Marshall		Not indigenous; Naturalised; Invasive
Salicaceae	*Populus nigra var. italica*	L. Munchh.		Not indigenous; Naturalised; Invasive
Portulacaceae	*Portulaca sp.*			
Potamogetonaceae	*Potamogeton pectinatus*	L.	LC	Indigenous
Asteraceae	*Pseudognaphalium luteoalbum*	(L.) Hilliard & B.L.Burtt	LC	Cryptogenic
Asteraceae	*Pseudognaphalium oligandrum*	(DC.) Hilliard & B.L.Burtt	LC	Indigenous
Asteraceae	*Pseudopegolettia tenella*	(DC.) H.Rob., Skvarla & V.A.Funk		Indigenous
Pedaliaceae	*Pterodiscus speciosus*	Hook.	LC	Indigenous
Rosaceae	*Pyracantha angustifolia*	(Franch.) C.K.Schneid.		Not indigenous; Cultivated; Naturalised; Invasive
Rosaceae	*Pyracantha koidzumii*	(Hayata) Rehder		Not indigenous; Cultivated; Naturalised; Invasive

Rosaceae	*Pyracantha sp.*			
Fagaceae	*Quercus robur*	L.		Not indigenous; Cultivated; Naturalised; Invasive
Ranunculaceae	*Ranunculus dregei*	J.C.Manning & Goldblatt	LC	Indigenous
Ranunculaceae	*Ranunculus multifidus*	Forssk.	LC	Indigenous
Apocynaceae	*Raphionacme hirsuta*	(E.Mey.) R.A.Dyer	LC	Indigenous
Apocynaceae	*Raphionacme velutina*	Schltr.	LC	Indigenous
Brassicaceae	*Rapistrum rugosum*	(L.) All.		Not indigenous; Naturalised; Invasive
Rhamnaceae	*Rhamnus prinoides*	L'Her.	LC	Indigenous
Rosaceae	*Rhaphiolepis indica*	(L.) Lindl.		Not indigenous; Cultivated; Naturalised
Fabaceae	*Rhynchosia totta var. totta*	(Thunb.) DC.	LC	Indigenous
Fabaceae	*Robinia pseudoacacia*	L.	NE	Not indigenous; Naturalised; Invasive
Polygonaceae	*Rumex crispus*	L.		Not indigenous; Naturalised; Invasive
Salicaceae	*Salix babylonica var. babylonica*	L.		Not indigenous; Naturalised
Salicaceae	*Salix fragilis var. fragilis*	L.		Not indigenous; Cultivated; Naturalised; Invasive
Salicaceae	*Salix mucronata subsp. mucronata*	Thunb.	LC	Indigenous
Amaranthaceae	*Salsola kali*	L.		Not indigenous; Naturalised; Invasive
Lamiaceae	*Salvia disermas*	L.	LC	Indigenous
Lamiaceae	*Salvia runcinata*	L.f.	LC	Indigenous
Adoxaceae	*Sambucus nigra*	L.		Not indigenous; Naturalised; Invasive
Anacardiaceae	*Schinus molle*	L.	NE	Not indigenous; Naturalised; Invasive
Anacardiaceae	*Schinus terebinthifolius*	Raddi	NE	Not indigenous; Cultivated; Naturalised; Invasive
Poaceae	*Schizachyrium sanguineum*	(Retz.) Alston	LC	Indigenous
Asteraceae	*Schkuhria pinnata*	(Lam.) Kuntze ex Thell.		Not indigenous; Naturalised
Cyperaceae	*Schoenoplectus muricinux*	(C.B.Clarke) J.Raynal	LC	Indigenous
Anacardiaceae	*Searsia erosa*	(Thunb.) Moffett	LC	Indigenous
Anacardiaceae	*Searsia lancea*	(L.f.) F.A.Barkley	LC	Indigenous
Anacardiaceae	*Searsia pyroides var. pyroides*	(Burch.) Moffett	LC	Indigenous
Convolvulaceae	*Seddera capensis*	(E.Mey. ex Choisy) Hallier f.	LC	Indigenous
Scrophulariaceae	*Selago burkei*	Rolfe	LC	Indigenous; Endemic
Scrophulariaceae	*Selago welwitschii var. australis*	Rolfe Hilliard	LC	Indigenous
Asteraceae	*Senecio consanguineus*	DC.	LC	Indigenous
Asteraceae	*Senecio sp.*			
Asteraceae	*Senecio venosus*	Harv.	LC	Indigenous
Fabaceae	*Senegalia caffra*	(Thunb.) P.J.H.Hurter & Mabb.	LC	Indigenous

Fabaceae	*Senna corymbosa*	(Lam.) H.S.Irwin & Barneby	NE	Not indigenous; Cultivated; Naturalised
Fabaceae	*Senna italica subsp. arachoides*	Mill. (Burch.) Lock	LC	Indigenous
Fabaceae	*Sesbania punicea*	(Cav.) Benth.	NE	Not indigenous; Naturalised; Invasive
Poaceae	*Setaria incrassata*	(Hochst.) Hack.	LC	Indigenous
Poaceae	*Setaria sphacelata var. torta*	(Schumach.) Stapf & C.E.Hubb. ex M.B.Moss (Stapf) Clayton	LC	Indigenous
Poaceae	*Setaria verticillata*	(L.) P.Beauv.	LC	Indigenous
Malvaceae	*Sida chrysantha*	Ulbr.	LC	Indigenous
Malvaceae	*Sida dregei*	Burtt Davy	LC	Indigenous
Malvaceae	*Sida rhombifolia subsp. rhombifolia*	L.	LC	Indigenous
Malvaceae	*Sida spinosa var. spinosa*	L.	LC	Indigenous
Caryophyllaceae	*Silene burchellii subsp. pilosellifolia*	Otth ex DC. (Cham. & Schltdl.) J.C.Manning & Goldblatt		Indigenous
Caryophyllaceae	*Silene gallica*	L.		Not indigenous; Naturalised
Brassicaceae	*Sisymbrium irio*	L.		Not indigenous; Naturalised
Solanaceae	*Solanum chenopodioides*	Lam.		Not indigenous; Naturalised; Invasive
Solanaceae	*Solanum elaeagnifolium*	Cav.		Not indigenous; Naturalised; Invasive
Solanaceae	*Solanum mauritianum*	Scop.		Not indigenous; Naturalised; Invasive
Solanaceae	*Solanum nigrum*	L.		Not indigenous; Naturalised
Asteraceae	*Sonchus asper subsp. asper*	(L.) Hill		Not indigenous; Naturalised; Invasive
Asteraceae	*Sonchus oleraceus*	L.		Not indigenous; Naturalised; Invasive
Malvaceae	*Sphaeralcea bonariensis*	(Cav.) Griseb.		Not indigenous; Naturalised
Poaceae	*Sporobolus africanus*	(Poir.) Robyns & Tournay	LC	Indigenous
Poaceae	*Sporobolus fimbriatus*	(Trin.) Nees	LC	Indigenous
Poaceae	*Sporobolus pyramidalis*	P.Beauv.	LC	Indigenous
Lamiaceae	*Stachys spathulata*	Burch. ex Benth.	LC	Indigenous
Apocynaceae	*Stenostelma capense*	Schltr.	LC	Indigenous
Poaceae	*Stipagrostis uniplumis var. neesii*	(Licht.) De Winter (Trin. & Rupr.) De Winter	LC	Indigenous
Strelitziaceae	*Strelitzia reginae*	Banks		Indigenous
Strelitziaceae	*Strelitzia reginae subsp. reginae*	Banks	LC	Indigenous
Asteraceae	*Tagetes minuta*	L.		Not indigenous; Naturalised; Invasive
Talinaceae	*Talinum caffrum*	(Thunb.) Eckl. & Zeyh.	LC	Indigenous
Asteraceae	*Taraxacum officinale*	Weber		Not indigenous; Naturalised
Cupressaceae	*Taxodium distichum var. distichum*	(L.) Rich.		Not indigenous; Cultivated; Naturalised
Santalaceae	*Thesium costatum var. juniperinum*	A.W.Hill A.W.Hill	LC	Indigenous
Santalaceae	*Thesium impeditum*	A.W.Hill	LC	Indigenous
Santalaceae	*Thesium procerum*	N.E.Br.	LC	Indigenous; Endemic

Santalaceae	*Thesium resedoides*	A.W.Hill	LC	Indigenous
Santalaceae	*Thesium sp.*	L.		
Santalaceae	*Thesium transvaalense*	Schltr.	LC	Indigenous; Endemic
Santalaceae	*Thesium utile*	A.W.Hill	LC	Indigenous
Fabaceae	*Tipuana tipu*	(Benth.) Kuntze		Not indigenous; Naturalised; Invasive
Commelinaceae	*Tradescantia pallida*	(Rose) D.R.Hunt		Not indigenous; Cultivated; Naturalised
Asteraceae	*Tragopogon dubius*	Scop.		Not indigenous; Naturalised
Poaceae	*Tragus berteronianus*	Schult.	LC	Indigenous
Zygophyllaceae	*Tribulus terrestris*	L.	LC	Indigenous
Fabaceae	*Trifolium burchellianum subsp. burchellianum*	Ser.	LC	Indigenous
Fabaceae	*Trifolium repens*	L.	NE	Not indigenous; Naturalised
Poaceae	*Triraphis andropogonoides*	(Steud.) E.Phillips	LC	Indigenous
Malvaceae	*Triumfetta sonderi*	Ficalho & Hiern	LC	Indigenous; Endemic
Alliaceae	*Tulbaghia acutiloba*	Harv.	LC	Indigenous
Alliaceae	*Tulbaghia simmleri*	P.Beauv.	LC	Indigenous; Endemic
Alliaceae	*Tulbaghia violacea subsp. violacea*	Harv.	LC	Indigenous; Endemic
Ulmaceae	*Ulmus minor*	Mill.		Not indigenous; Cultivated; Naturalised
Ulmaceae	*Ulmus parvifolia*	Jacq.		Not indigenous; Cultivated; Naturalised; Invasive
Poaceae	*Urochloa mosambicensis*	(Hack.) Dandy	LC	Indigenous
Fabaceae	*Vachellia karroo*	(Hayne) Banfi & Galasso	LC	Indigenous
Fabaceae	*Vachellia robusta subsp. robusta*	(Burch.) Kyal. & Boatwr.	LC	Indigenous
Vahliaceae	*Vahlia capensis subsp. vulgaris var. linearis*	(L.f.) Thunb. Bridson E.Mey. ex Bridson	NE	Indigenous
Verbenaceae	*Verbena bonariensis*	L.		Not indigenous; Naturalised; Invasive
Verbenaceae	*Verbena officinalis*	L.		Not indigenous; Naturalised
Fabaceae	*Vigna unguiculata subsp. stenophylla*	(L.) Walp. (Harv.) Marechal, Mascherpa & Stainier	LC	Indigenous
Fabaceae	*Vigna vexillata var. vexillata*	(L.) A.Rich.	LC	Indigenous
Apocynaceae	*Vinca major*	L.	NE	Not indigenous; Naturalised; Invasive
Poaceae	*Vulpia myuros*	(L.) C.C.Gmel.	NE	Not indigenous; Naturalised; Invasive
Campanulaceae	*Wahlenbergia denticulata var. transvaalensis*	(Burch.) A.DC. (Adamson) Welman	LC	Indigenous; Endemic
Campanulaceae	*Wahlenbergia magaliesbergensis*	Lammers	LC	Indigenous; Endemic
Asteraceae	*Xanthium spinosum*	L.		Not indigenous; Naturalised; Invasive
Asteraceae	*Zinnia peruviana*	(L.) L.		Not indigenous; Naturalised; Invasive
Rhamnaceae	*Ziziphus mucronata subsp. mucronata*	Willd.	LC	Indigenous
Rhamnaceae	*Ziziphus zeyheriana*	Sond.	LC	Indigenous

9.3 Appendix C – Amphibian species expected to occur in the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Amietia angolensis	Angolan River Frog	Unlisted	LC
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 Bull Frog**	**NT**	**LC**
Schismaderma carens	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

9.4 Appendix D – Reptile species expected to occur in the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Acontias gracilicauda	Thin-tailed Legless Skink	LC	LC
Afroedura nivaria	Drankensberg Flat Gecko	LC	LC
Afrotyphlops bibronii	Bibron's Blind Snake	LC	LC
Agama aculeata distanti	Distant's 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 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		
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 wahlbergii	Wahlberg's Snake-eyed Skink		
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 leightoni	**Cape Sand Snake**	**VU**	**LC**
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		
Trachylepis varia sensu lato	Common Variable Skink Complex		
Varanus albigularis albigularis	Rock Monitor	LC	Unlisted
Varanus niloticus	Water Monitor	LC	Unlisted

9.5 Appendix E – Mammal species expected to occur within the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Aethomys ineptus	Tete Veld Aethomys	LC	LC
Aethomys namaquensis	Namaqua Rock Mouse	LC	LC
Aonyx capensis	**African Clawless Otter**	**NT**	**NT**
Atelerix frontalis	**Southern African Hedgehog**	**NT**	**LC**
Atilax paludinosus	Marsh Mongoose	LC	LC
Canis mesomelas	Black-backed Jackal	LC	LC
Caracal caracal	Caracal	LC	LC
Chaerephon pumilus	Little Free-tailed Bat	LC	LC
Chlorocebus pygerythrus	Vervet Monkey	LC	LC
Crocidura cyanea	Reddish-grey Musk Shrew	LC	LC
Crocidura fuscomurina	Tiny Musk Shrew	LC	LC
Crocidura maquassiensis	**Makwassie musk shrew**	**VU**	**LC**
Crocidura mariquensis	**Swamp Musk Shrew**	**NT**	**LC**
Cryptomys hottentotus	Southern African Mole-rat	LC	LC
Cynictis penicillata	Yellow Mongoose	LC	LC
Dama dama	Fallow Deer		
Dendromus melanotis	Gray African Climbing Mouse	LC	LC
Desmodillus auricularis	Short-tailed Gerbil	LC	LC
Eidolon helvum	**African Straw-colored Fruit Bat**	**LC**	**NT**
Elaphurus davidianus	Père David's Deer		
Elephantulus myurus	Eastern Rock Elephant Shrew	LC	LC
Epomophorus wahlbergi	Wahlberg's epauletted fruit bat	LC	LC
Eptesicus hottentotus	Long-tailed Serotine Bat	LC	LC
Felis nigripes	**Black-footed Cat**	**VU**	**VU**
Felis silvestris	African Wildcat	LC	LC
Galerella sp.	Slender Mongooses		
Genetta genetta	Common Genet	LC	LC
Genetta maculata	Common Large-spotted Genet	LC	LC
Genetta tigrina	Cape Genet (Cape Large-spotted Genet)	LC	LC
Gerbilliscus brantsii	Highveld Gerbil	LC	LC
Gerbilliscus leucogaster	Bushveld Gerbil	LC	LC
Graphiurus (Graphiurus) platyops	Flat-headed African Dormouse		
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
Leptailurus serval	**Serval**	**NT**	**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	Southern African Mastomys	LC	LC
Mastomys natalensis	Natal Mastomys	LC	LC
Mastomys sp.	Multimammate Mice		
Mellivora capensis	Honey Badger	LC	LC
Miniopterus natalensis	Natal Long-fingered Bat		
Mus (Nannomys) indutus	Desert Pygmy Mouse		
Mus (Nannomys) minutoides	Southern African Pygmy Mouse		
Mus musculus	House Mouse	Unlisted	LC
Myosorex varius	Forest Shrew	LC	LC
Myotis tricolor	Temminck's Myotis	LC	LC
Mystromys albicaudatus	**African White-tailed Rat**	**VU**	**EN**
Neoromicia capensis	Cape Serotine	LC	LC
Neoromicia zuluensis	Aloe Bat	LC	LC
Nycteris thebaica	Egyptian Slit-faced Bat	LC	LC
Orycteropus afer	Aardvark	LC	LC
Otocyon megalotis	Bat-eared Fox	LC	LC
Otomys auratus	**Southern African Vlei Rat (Grassland type)**	**NT**	**NT**
Otomys irroratus	Vlei Rat (Fynbos type)	LC	LC
Panthera pardus	**Leopard**	**VU**	**VU**
Papio ursinus	Chacma Baboon	LC	LC
Parahyaena brunnea	**Brown Hyaena**	**NT**	**NT**
Paraxerus cepapi	Smith's Bush Squirrel	LC	LC
Pedetes capensis	South African Spring Hare	LC	LC
Phacochoerus africanus	Common Warthog	LC	LC
Poecilogale albinucha	**African Striped Weasel**	**NT**	**LC**
Potamochoerus larvatus koiropotamus	Bush-pig (subspecies koiropotamus)		
Potamochoerus porcus	Red River Hog		
Procavia capensis	Cape Rock Hyrax	LC	LC
Pronolagus randensis	Jameson's Red Rock Hare	LC	LC
Pronolagus sp.	Rock-hares		
Proteles cristata	Aardwolf	LC	LC
Raphicerus campestris	Steenbok	LC	LC
Rattus rattus	House Rat	Exotic (Not listed)	LC

Rhabdomys pumilio	Xeric Four-striped Grass Rat	LC	LC
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	LC	LC
Rhinolophus darlingi	Darling's Horseshoe Bat	LC	LC
Saccostomus campestris	Southern African Pouched Mouse	LC	LC
Scotophilus dinganii	Yellow House Bat	LC	LC
Steatomys krebsii	Krebs's Fat Mouse	LC	LC
Steatomys pratensis	Fat Mouse	LC	LC
Suncus varilla	Lesser Dwarf Shrew	LC	LC
Suricata suricatta	Meerkat	LC	LC
Sylvicapra grimmia	Bush Duiker	LC	LC
Tadarida aegyptiaca	Egyptian Free-tailed Bat	LC	LC
Thryonomys swinderianus	Greater Cane Rat	LC	LC
Vulpes chama	Cape Fox	LC	LC
Xerus inauris	South African Ground Squirrel	LC	LC

9.6 Appendix F – Avifauna species expected to occur within the project area

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Accipiter badius	Shikra	Unlisted	LC
Accipiter melanoleucus	Black Sparrowhawk	Unlisted	LC
Acridotheres tristis	Common Myna	Unlisted	LC
Acrocephalus arundinaceus	Great Reed Warbler	Unlisted	LC
Acrocephalus baeticatus	African Reed Warbler	Unlisted	Unlisted
Acrocephalus gracilirostris	Lesser Swamp Warbler	Unlisted	LC
Acrocephalus palustris	Marsh Warbler	Unlisted	LC
Actitis hypoleucos	Common Sandpiper	Unlisted	LC
Afrotis afraoides	Northern Black Korhaan	Unlisted	LC
Alopochen aegyptiaca	Egyptian Goose		
Amadina erythrocephala	Red-headed Finch	Unlisted	LC
Amadina fasciata	Cut-throat Finch	Unlisted	Unlisted
Amandava subflava	Orange-breasted Waxbill	Unlisted	Unlisted
Amblyospiza albifrons	Thick-billed Weaver	Unlisted	LC
Anas capensis	Cape Teal	Unlisted	LC
Anas erythrorhyncha	Red-billed Teal	Unlisted	LC
Anas platyrhynchos	Mallard	Unlisted	LC
Anas sparsa	African Black Duck	Unlisted	LC
Anas undulata	Yellow-billed Duck	Unlisted	LC
Anhinga rufa	African Darter	Unlisted	LC
Anomalospiza imberbis	Cuckoo Finch	Unlisted	LC
Anser anser	Domestic Goose	Unlisted	LC
Anthoscopus minutus	Cape Penduline Tit	Unlisted	LC
Anthus cinnamomeus	African Pipit	Unlisted	LC
Anthus leucophrys	Plain-backed Pipit	Unlisted	LC
Anthus nicholsoni	Nicholson's Pipit		
Anthus vaalensis	Buffy Pipit	Unlisted	LC
Apalis thoracica	Bar-throated Apalis	Unlisted	LC
Apus affinis	Little Swift	Unlisted	LC
Apus apus	Common Swift	Unlisted	LC
Apus barbatus	African Black Swift	Unlisted	LC
Apus caffer	White-rumped Swift	Unlisted	LC
Apus horus	Horus Swift	Unlisted	LC
Ardea alba	Great Egret		
Ardea cinerea	Grey Heron	Unlisted	LC
Ardea goliath	Goliath Heron	Unlisted	LC

Ardea intermedia	Intermediate Egret	Unlisted	LC
Ardea melanocephala	Black-headed Heron	Unlisted	LC
Ardea purpurea	Purple Heron	Unlisted	LC
Ardeola ralloides	Squacco Heron	Unlisted	LC
Asio capensis	Marsh Owl	Unlisted	LC
Batis molitor	Chinspot Batis	Unlisted	LC
Batis pririt	Pririt Batis	Unlisted	LC
Bostrychia hagedash	Hadada Ibis	Unlisted	LC
Bradypterus baboecala	Little Rush Warbler	Unlisted	LC
Brunhilda erythronotos	Black-faced Waxbill		
Bubo africanus	Spotted Eagle-Owl	Unlisted	LC
Bubulcus ibis	Western Cattle Egret	Unlisted	LC
Buphagus erythrorynchus	Red-billed Oxpecker		
Burhinus capensis	Spotted Thick-knee	Unlisted	LC
Buteo buteo	Common Buzzard	Unlisted	LC
Buteo rufofuscus	Jackal Buzzard	Unlisted	LC
Calandrella cinerea	Red-capped Lark	Unlisted	LC
Calendulauda sabota	Sabota Lark	Unlisted	LC
Calidris ferruginea	**Curlew Sandpiper**	**LC**	**NT**
Calidris minuta	Little Stint	LC	LC
Calidris pugnax	Ruff		
Campethera abingoni	Golden-tailed Woodpecker	Unlisted	LC
Caprimulgus rufigena	Rufous-cheeked Nightjar	Unlisted	LC
Cecropis abyssinica	Lesser Striped Swallow	Unlisted	LC
Cecropis cucullata	Greater Striped Swallow	Unlisted	LC
Cecropis semirufa	Red-breasted Swallow	Unlisted	LC
Centropus burchellii	Burchell's Coucal	Unlisted	Unlisted
Cercotrichas leucophrys	White-browed Scrub Robin	Unlisted	LC
Cercotrichas paena	Kalahari Scrub Robin	Unlisted	LC
Certhilauda semitorquata	Eastern Long-billed Lark	Unlisted	LC
Ceryle rudis	Pied Kingfisher	Unlisted	LC
Chalcomitra amethystina	Amethyst Sunbird	Unlisted	LC
Charadrius pecuarius	Kittlitz's Plover	Unlisted	LC
Charadrius tricollaris	Three-banded Plover	Unlisted	LC
Chersomanes albofasciata	Spike-heeled Lark	Unlisted	LC
Chlidonias hybrida	Whiskered Tern	Unlisted	LC
Chlidonias leucopterus	White-winged Tern	Unlisted	LC
Chroicocephalus cirrocephalus	Grey-headed Gull	Unlisted	LC
Chrysococcyx caprius	Diederik Cuckoo	Unlisted	LC

Chrysococcyx klaas	Klaas's Cuckoo	Unlisted	LC
Ciconia nigra	**Black Stork**	**VU**	**LC**
Cinnyris talatala	White-bellied Sunbird	Unlisted	LC
Circaetus pectoralis	Black-chested Snake Eagle	Unlisted	LC
Circus macrourus	**Pallid Harrier**	**NT**	**NT**
Circus ranivorus	**African Marsh Harrier**	**EN**	**LC**
Cisticola aridulus	Desert Cisticola	Unlisted	LC
Cisticola ayresii	Wing-snapping Cisticola	Unlisted	LC
Cisticola chiniana	Rattling Cisticola	Unlisted	LC
Cisticola fulvicapilla	Neddicky	Unlisted	LC
Cisticola juncidis	Zitting Cisticola	Unlisted	LC
Cisticola lais	Wailing Cisticola	Unlisted	LC
Cisticola rufilatus	Tinkling Cisticola	Unlisted	LC
Cisticola textrix	Cloud Cisticola	Unlisted	LC
Cisticola tinniens	Levaillant's Cisticola	Unlisted	LC
Clamator glandarius	Great Spotted Cuckoo	Unlisted	LC
Clamator jacobinus	Jacobin Cuckoo	Unlisted	LC
Colius colius	White-backed Mousebird	Unlisted	LC
Colius striatus	Speckled Mousebird	Unlisted	LC
Columba guinea	Speckled Pigeon	Unlisted	LC
Columba livia	Rock Dove	Unlisted	LC
Coracias caudatus	Lilac-breasted Roller	Unlisted	LC
Coracias garrulus	**European Roller**	**NT**	**LC**
Corvus albus	Pied Crow	Unlisted	LC
Corythornis cristatus	Malachite Kingfisher		
Cossypha caffra	Cape Robin-Chat	Unlisted	LC
Cossypha humeralis	White-throated Robin-Chat	Unlisted	LC
Creatophora cinerea	Wattled Starling	Unlisted	LC
Crinifer concolor	Grey Go-away-bird		
Crithagra atrogularis	Black-throated Canary	Unlisted	LC
Crithagra flaviventris	Yellow Canary	Unlisted	LC
Crithagra gularis	Streaky-headed Seedeater	Unlisted	LC
Crithagra mozambica	Yellow-fronted Canary		
Cuculus solitarius	Red-chested Cuckoo	Unlisted	LC
Curruca communis	Common Whitethroat		
Curruca subcoerulea	Chestnut-vented Warbler		
Cursorius temminckii	Temminck's Courser	Unlisted	LC
Cypsiurus parvus	African Palm Swift	Unlisted	LC
Delichon urbicum	Common House Martin	Unlisted	LC

Dendrocygna bicolor	Fulvous Whistling Duck	Unlisted	LC
Dendrocygna viduata	White-faced Whistling Duck	Unlisted	LC
Dendropicos fuscescens	Cardinal Woodpecker	Unlisted	LC
Egretta ardesiaca	Black Heron	Unlisted	LC
Egretta garzetta	Little Egret	Unlisted	LC
Elanus caeruleus	Black-winged Kite	Unlisted	LC
Emberiza capensis	Cape Bunting	Unlisted	LC
Emberiza flaviventris	Golden-breasted Bunting	Unlisted	LC
Emberiza tahapisi	Cinnamon-breasted Bunting	Unlisted	LC
Eremomela icteropygialis	Yellow-bellied Eremomela	Unlisted	LC
Eremopterix leucotis	Chestnut-backed Sparrow-Lark	Unlisted	LC
Estrilda astrild	Common Waxbill	Unlisted	LC
Euplectes afer	Yellow-crowned Bishop	Unlisted	LC
Euplectes albonotatus	White-winged Widowbird	Unlisted	LC
Euplectes ardens	Red-collared Widowbird	Unlisted	LC
Euplectes orix	Southern Red Bishop	Unlisted	LC
Euplectes progne	Long-tailed Widowbird	Unlisted	LC
Falco amurensis	Amur Falcon	Unlisted	LC
Falco biarmicus	**Lanner Falcon**	**VU**	**LC**
Falco naumanni	Lesser Kestrel	Unlisted	LC
Falco rupicoloides	Greater Kestrel	Unlisted	LC
Falco rupicolus	Rock Kestrel	Unlisted	LC
Fulica cristata	Red-knobbed Coot	Unlisted	LC
Gallinago nigripennis	African Snipe	Unlisted	LC
Gallinula chloropus	Common Moorhen	Unlisted	LC
Glareola nordmanni	**Black-winged Pratincole**	**NT**	**NT**
Granatina granatina	Violet-eared Waxbill	Unlisted	LC
Grus paradisea	Blue Crane		
Gymnoris superciliaris	Yellow-throated Bush Sparrow	Unlisted	LC
Gyps africanus	**White-backed Vulture**	**CR**	**CR**
Halcyon albiventris	Brown-hooded Kingfisher	Unlisted	LC
Halcyon senegalensis	Woodland Kingfisher	Unlisted	LC
Haliaeetus vocifer	African Fish Eagle	Unlisted	LC
Himantopus himantopus	Black-winged Stilt	Unlisted	LC
Hippolais icterina	Icterine Warbler	Unlisted	LC
Hirundo albigularis	White-throated Swallow	Unlisted	LC
Hirundo dimidiata	Pearl-breasted Swallow	Unlisted	LC
Hirundo rustica	Barn Swallow	Unlisted	LC
Indicator minor	Lesser Honeyguide	Unlisted	LC

Jynx ruficollis	Red-throated Wryneck	Unlisted	LC
Lagonosticta rhodopareia	Jameson's Firefinch	Unlisted	LC
Lagonosticta rubricata	African Firefinch	Unlisted	LC
Lagonosticta senegala	Red-billed Firefinch	Unlisted	LC
Lamprotornis bicolor	Pied Starling	Unlisted	LC
Lamprotornis nitens	Cape Starling	Unlisted	LC
Laniarius atrococcineus	Crimson-breasted Shrike	Unlisted	LC
Laniarius ferrugineus	Southern Boubou	Unlisted	LC
Lanius collaris	Southern Fiscal	Unlisted	LC
Lanius collurio	Red-backed Shrike	Unlisted	LC
Lanius minor	Lesser Grey Shrike	Unlisted	LC
Lophaetus occipitalis	Long-crested Eagle	Unlisted	LC
Lybius torquatus	Black-collared Barbet	Unlisted	LC
Macronyx capensis	Cape Longclaw	Unlisted	LC
Megaceryle maxima	Giant Kingfisher		
Melaenornis mariquensis	Marico Flycatcher		
Melaenornis silens	Fiscal Flycatcher		
Melaniparus cinerascens	Ashy Tit		
Melierax canorus	Pale Chanting Goshawk	Unlisted	LC
Merops apiaster	European Bee-eater	Unlisted	LC
Merops bullockoides	White-fronted Bee-eater	Unlisted	LC
Merops hirundineus	Swallow-tailed Bee-eater	Unlisted	LC
Merops persicus	Blue-cheeked Bee-eater	Unlisted	LC
Merops pusillus	Little Bee-eater	Unlisted	LC
Microcarbo africanus	Reed Cormorant		
Micronisus gabar	Gabar Goshawk		
Milvus aegyptius	Yellow-billed Kite	Unlisted	Unlisted
Mirafra africana	Rufous-naped Lark	Unlisted	LC
Mirafra cheniana	**Melodious Lark**	**LC**	**NT**
Mirafra fasciolata	Eastern Clapper Lark	Unlisted	LC
Motacilla capensis	Cape Wagtail	Unlisted	LC
Muscicapa striata	Spotted Flycatcher	Unlisted	LC
Mycteria ibis	**Yellow-billed Stork**	**EN**	**LC**
Myrmecocichla formicivora	Ant-eating Chat	Unlisted	LC
Myrmecocichla monticola	Mountain Wheatear		
Netta erythrophthalma	Southern Pochard	Unlisted	LC
Nilaus afer	Brubru	Unlisted	LC
Numida meleagris	Helmeted Guineafowl	Unlisted	LC
Nycticorax nycticorax	Black-crowned Night Heron	Unlisted	LC

Oena capensis	Namaqua Dove	Unlisted	LC
Oenanthe familiaris	Familiar Chat		
Oenanthe pileata	Capped Wheatear	Unlisted	LC
Oriolus larvatus	Black-headed Oriole	Unlisted	LC
Ortygospiza atricollis	Quailfinch	Unlisted	LC
Oxyura maccoa	**Maccoa Duck**	**NT**	**VU**
Passer diffusus	Southern Grey-headed Sparrow	Unlisted	LC
Passer domesticus	House Sparrow	Unlisted	LC
Passer melanurus	Cape Sparrow	Unlisted	LC
Pavo cristatus	Indian Peafowl	Unlisted	LC
Pernis apivorus	European Honey-buzzard	Unlisted	LC
Petrochelidon spilodera	South African Cliff Swallow	Unlisted	LC
Phalacrocorax lucidus	White-breasted Cormorant	Unlisted	LC
Phoeniconaias minor	Lesser Flamingo		
Phoeniculus purpureus	Green Wood Hoopoe	Unlisted	LC
Phylloscopus trochilus	Willow Warbler	Unlisted	LC
Platalea alba	African Spoonbill	Unlisted	LC
Plectropterus gambensis	Spur-winged Goose	Unlisted	LC
Plegadis falcinellus	Glossy Ibis	Unlisted	LC
Plocepasser mahali	White-browed Sparrow-Weaver	Unlisted	LC
Ploceus capensis	Cape Weaver	Unlisted	LC
Ploceus velatus	Southern Masked Weaver	Unlisted	LC
Podiceps cristatus	Great Crested Grebe	Unlisted	LC
Podiceps nigricollis	Black-necked Grebe	Unlisted	LC
Polemaetus bellicosus	**Martial Eagle**	**EN**	**EN**
Porphyrio madagascariensis	African Swamphen	Unlisted	Unlisted
Prinia flavicans	Black-chested Prinia	Unlisted	LC
Prinia subflava	Tawny-flanked Prinia	Unlisted	LC
Prodotiscus regulus	Brown-backed Honeybird	Unlisted	LC
Pternistis natalensis	Natal Spurfowl	Unlisted	LC
Pternistis swainsonii	Swainson's Spurfowl	Unlisted	LC
Pterocles namaqua	Namaqua Sandgrouse	Unlisted	LC
Pycnonotus nigricans	African Red-eyed Bulbul	Unlisted	LC
Pycnonotus tricolor	Dark-capped Bulbul	Unlisted	Unlisted
Pytilia melba	Green-winged Pytilia	Unlisted	LC
Quelea quelea	Red-billed Quelea	Unlisted	LC
Rallus caerulescens	African Rail	Unlisted	LC
Recurvirostra avosetta	Pied Avocet	Unlisted	LC
Rhinopomastus cyanomelas	Common Scimitarbill	Unlisted	LC

Riparia cincta	Banded Martin	Unlisted	LC
Riparia paludicola	Brown-throated Martin	Unlisted	LC
Sagittarius serpentarius	**Secretarybird**	**VU**	**EN**
Sarothrura rufa	Red-chested Flufftail	Unlisted	LC
Saxicola torquatus	African Stonechat	Unlisted	LC
Scleroptila gutturalis	Orange River Francolin	Unlisted	LC
Scopus umbretta	Hamerkop	Unlisted	LC
Spatula hottentota	Blue-billed Teal		
Spatula smithii	Cape Shoveler		
Spilopelia senegalensis	Laughing Dove		
Sporopipes squamifrons	Scaly-feathered Weaver	Unlisted	LC
Stenostira scita	Fairy Flycatcher	Unlisted	LC
Streptopelia capicola	Cape Turtle Dove	Unlisted	LC
Streptopelia semitorquata	Red-eyed Dove	Unlisted	LC
Struthio camelus	Common Ostrich	Unlisted	LC
Sylvietta rufescens	Long-billed Crombec	Unlisted	LC
Tachybaptus ruficollis	Little Grebe	Unlisted	LC
Tadorna cana	South African Shelduck	Unlisted	LC
Tchagra australis	Brown-crowned Tchagra	Unlisted	LC
Telophorus zeylonus	Bokmakierie	Unlisted	LC
Terpsiphone viridis	African Paradise Flycatcher	Unlisted	LC
Thalassornis leuconotus	White-backed Duck	Unlisted	LC
Threskiornis aethiopicus	African Sacred Ibis	Unlisted	LC
Trachyphonus vaillantii	Crested Barbet	Unlisted	LC
Tricholaema leucomelas	Acacia Pied Barbet	Unlisted	LC
Tringa glareola	Wood Sandpiper	Unlisted	LC
Tringa nebularia	Common Greenshank	Unlisted	LC
Tringa stagnatilis	Marsh Sandpiper	Unlisted	LC
Turdus litsitsirupa	Groundscraper Thrush	Unlisted	Unlisted
Turdus smithi	Karoo Thrush	Unlisted	LC
Tyto alba	Western Barn Owl	Unlisted	LC
Upupa africana	African Hoopoe	Unlisted	LC
Uraeginthus angolensis	Blue Waxbill	Unlisted	LC
Urocolius indicus	Red-faced Mousebird	Unlisted	LC
Vanellus armatus	Blacksmith Lapwing	Unlisted	LC
Vanellus coronatus	Crowned Lapwing	Unlisted	LC
Vanellus senegallus	African Wattled Lapwing	Unlisted	LC
Vidua chalybeata	Village Indigobird	Unlisted	LC
Vidua funerea	Dusky Indigobird	Unlisted	LC

Vidua macroura	Pin-tailed Whydah	Unlisted	LC
Vidua paradisaea	Long-tailed Paradise Whydah	Unlisted	LC
Vidua purpurascens	Purple Indigobird	Unlisted	LC
Vidua regia	Shaft-tailed Whydah	Unlisted	LC
Zapornia flavirostra	Black Crake		
Zosterops pallidus	Orange River White-eye	Unlisted	LC
Zosterops virens	Cape White-eye	Unlisted	LC