THE TERRESTRIAL ECOLOGY & WETLAND BASELINE & IMPACT ASSESSMENTS FOR THE PROPOSED MUTSHO SOLAR PV 3 DEVELOPMENT

Makhado, Limpopo Province

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1 Introduction

1.1 Background

The Biodiversity Company was appointed to undertake a terrestrial ecology and a wetland assessment for the establishment of a Photovoltaic (PV) Solar Energy facility and associated infrastructure on the Farm Vrienden 589, located approximately 8 km south-west of Mopane and 39 km south-west of Musina, within the Musina Local Municipality and the Vhembe District Municipality in the Limpopo Province (Figure 1-1 and Figure 1-2). The project consists of four components (separate reports), the fieldwork was assessed simultaneously. Refer to Figure 1-3 for a map illustrating the proposed layout of the project The following is as per the project description provided by Savanna environmental:

"Mutsho Power (Pty) Ltd is proposing the construction and operation of a Photovoltaic (PV) Solar Energy Facility and associated infrastructure on the Farm Vrienden 589, located approximately 8 km south-west of Mopane and 39 km south-west of Musina, within the Musina Local Municipality and the Vhembe District Municipality in the Limpopo Province. The facility will have a contracted capacity of up to 100MW and will be known as Mutsho Solar PV3. The project is planned as part of a cluster of Solar PV Facilities with a total capacity of up to 400MW, and will be connected to the electricity grid via a 132kV Collector Station and 132kV double circuit overhead power line to the Nzhelele Substation. The grid connection infrastructure is the subject of a separate Basic Assessment process.

A preferred project site with an extent of ~1237ha and a development area of ~277ha within the project site has been identified by Mutsho Power (Pty) Ltd as a technically suitable area for the development of the Mutsho Solar PV3 Facility.

Infrastructure associated with the facility, which will enable the facility to supply a contracted capacity of up to 100MW, will include:

- Solar PV array comprising PV modules and mounting structures;
- Inverters and transformers;
- Cabling between the panels;
- 33/132kV onsite facility substation, including associated equipment and infrastructure;
- Electrical and auxiliary equipment required at the Collection Station that serves the solar energy facility, including a switchyard/bay, control building, fences, etc;
- Cabling from the onsite substation to the Collection Station (either underground or overhead);
- Site offices, warehouses, and guardhouses;
- Water storage tanks at admin block for human consumption;
- Laydown areas; and
- Internal gravel distribution roads.

The Solar PV Facility is proposed in response to the identified objectives of the national and provincial government and local and district municipalities to develop renewable energy facilities for power generation purposes. It is the developer's intention to bid the Mutsho Solar PV3 Facility under the Department of Mineral Resources and Energy's (DMRE's) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme, or a similar programme, with the aim of evacuating the generated power into the national grid. This will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP) with Mutsho Solar PV3 set to inject up to 100MW into the national grid".

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 sensitivities of the project area as "Very High", while the animal sensitivity is rated as 'Medium" and the plant sensitivity was rated as "Low".

This assessment has also been completed in accordance with the requirements of the published General Notice (GN) 509 by the Department of Water and Sanitation (DWS), and Appendix 6 of the EIA Regulations, 2014 (Government Notice (GN) R 982 of 2014, as amended). GN509 was published in the Government Gazette (no. 40229) under Section 39 of the National Water Act (Act no. 36 of 1998) in August 2016 and provides for the authorisation of Section 21(c) & (i) water uses in terms of a General Authorisation (GA) as opposed to a full water use license. A water use qualifies for a GA under GN 509 when the proposed water use/activity is subjected to analysis using the DWS Risk Assessment Matrix (RAM), and the risk class is determined to be low. This assessment will implement the RAM and provide a specialist opinion on the appropriate water use authorisation going forward. The National Web based Environmental Screening Tool has characterised the aquatic theme sensitivity for the area as "Very High", due to the presence of a freshwater ecosystem priority area quinary catchment.

The purpose of the specialist studies is to provide relevant input into the environmental authorisation process and to provide a report for the proposed activities associated with the project. This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making, as to the ecological viability of the proposed project.

1.2 Project Information

Specialist studies were undertaken for the proposed project, dated 2018. These studies have been considered to supplement the findings for the newly commissioned process. The following studies are applicable:

- Bathusi Environmental Consulting cc (2018). Terrestrial Biodiversity EIA assessment for the proposed Mutsho Power Project near Makhado, Limpopo Province. Reference Number SVE – MPS – 2018/07, Version 2018.04.12.03; and
- Digby Wells Environmental (2018). Aquatic Biodiversity, Groundwater, Surface Water and Wetland Impact Assessments for the proposed Coal-fired Mutsho Power Project near Makhado, Limpopo Province. Project Number: SAV4689.

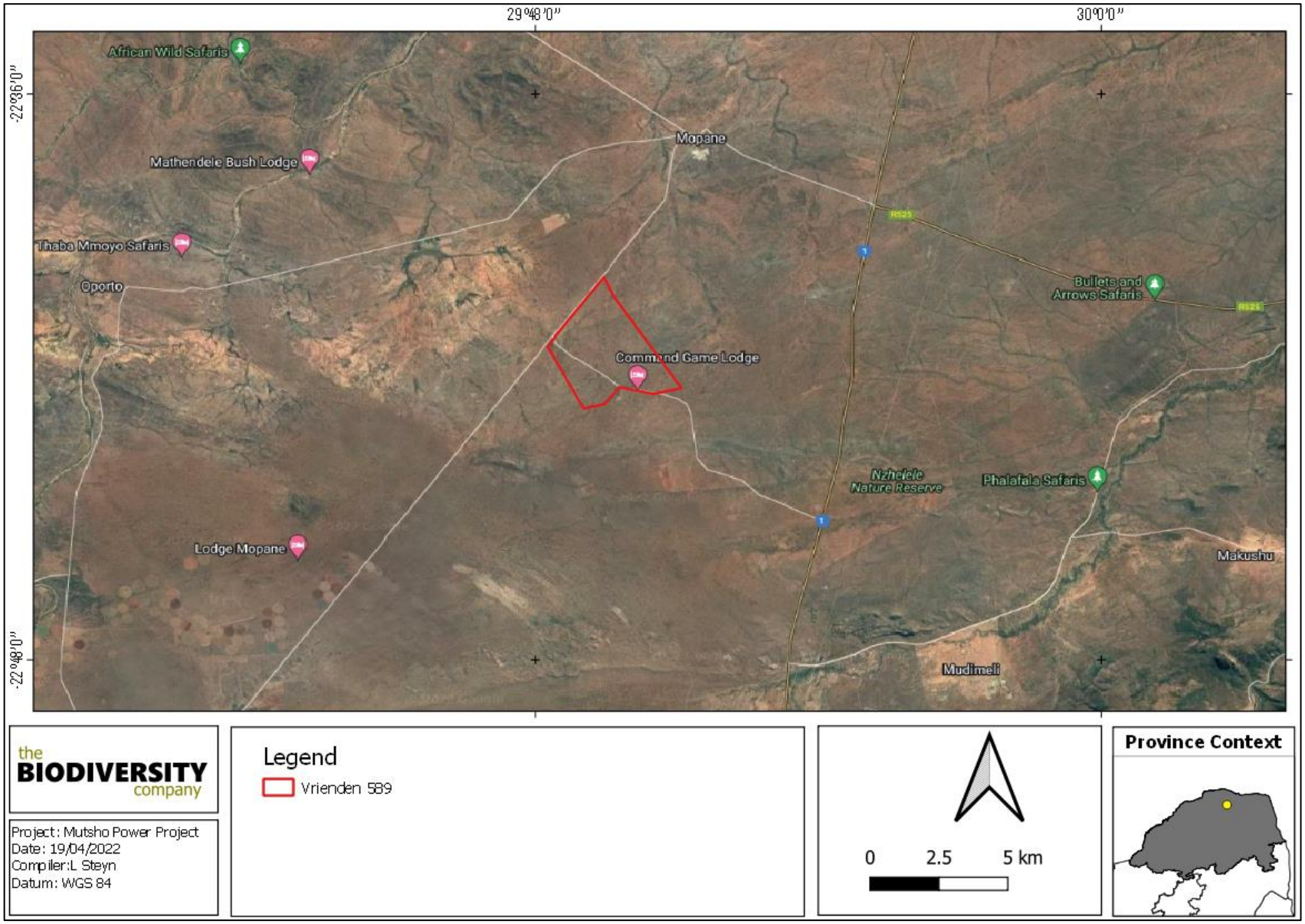


Figure 1-1 Map illustrating the location of the project area in relation to the nearby towns.

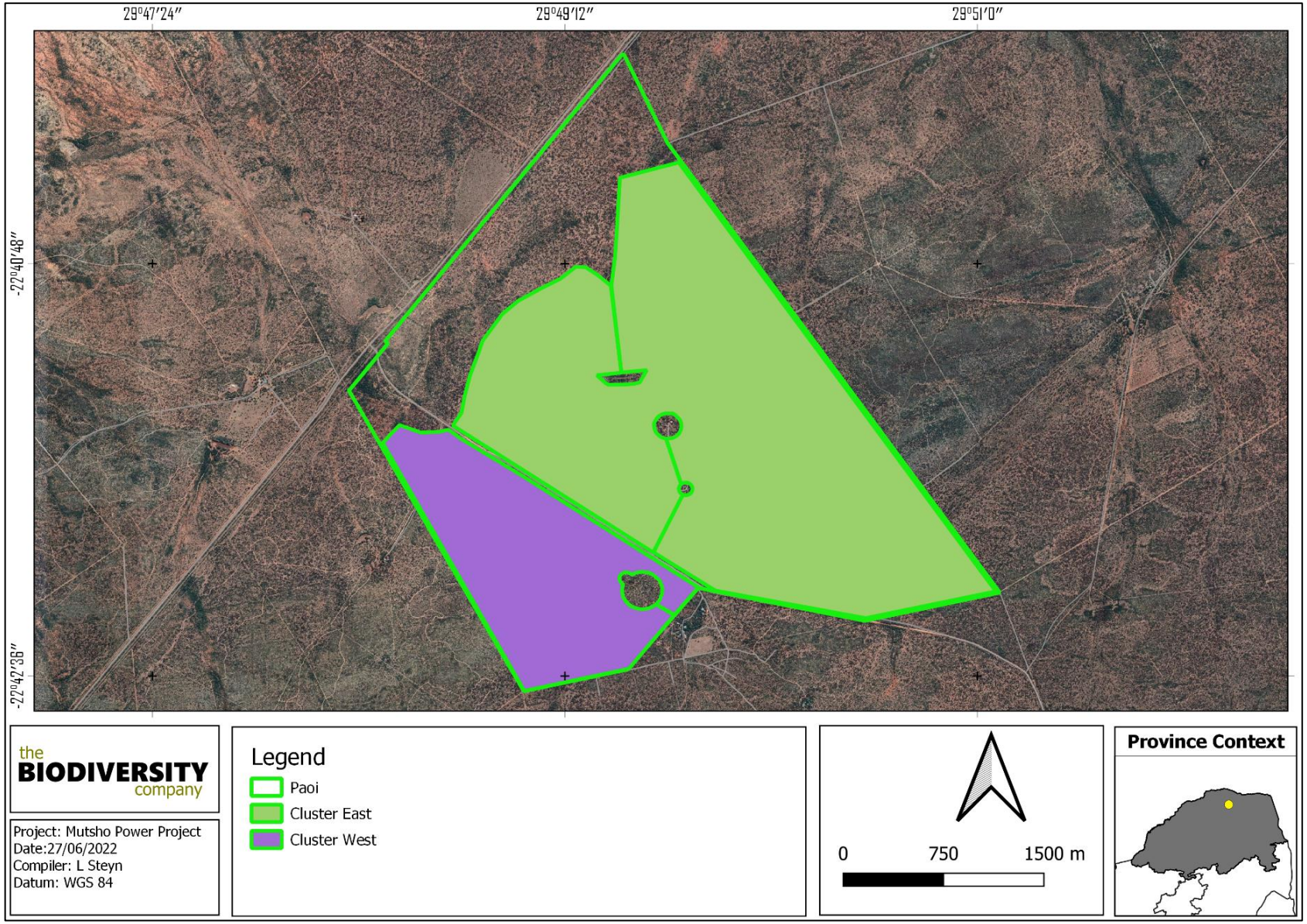


Figure 1-2 Map showing the various components of the project.

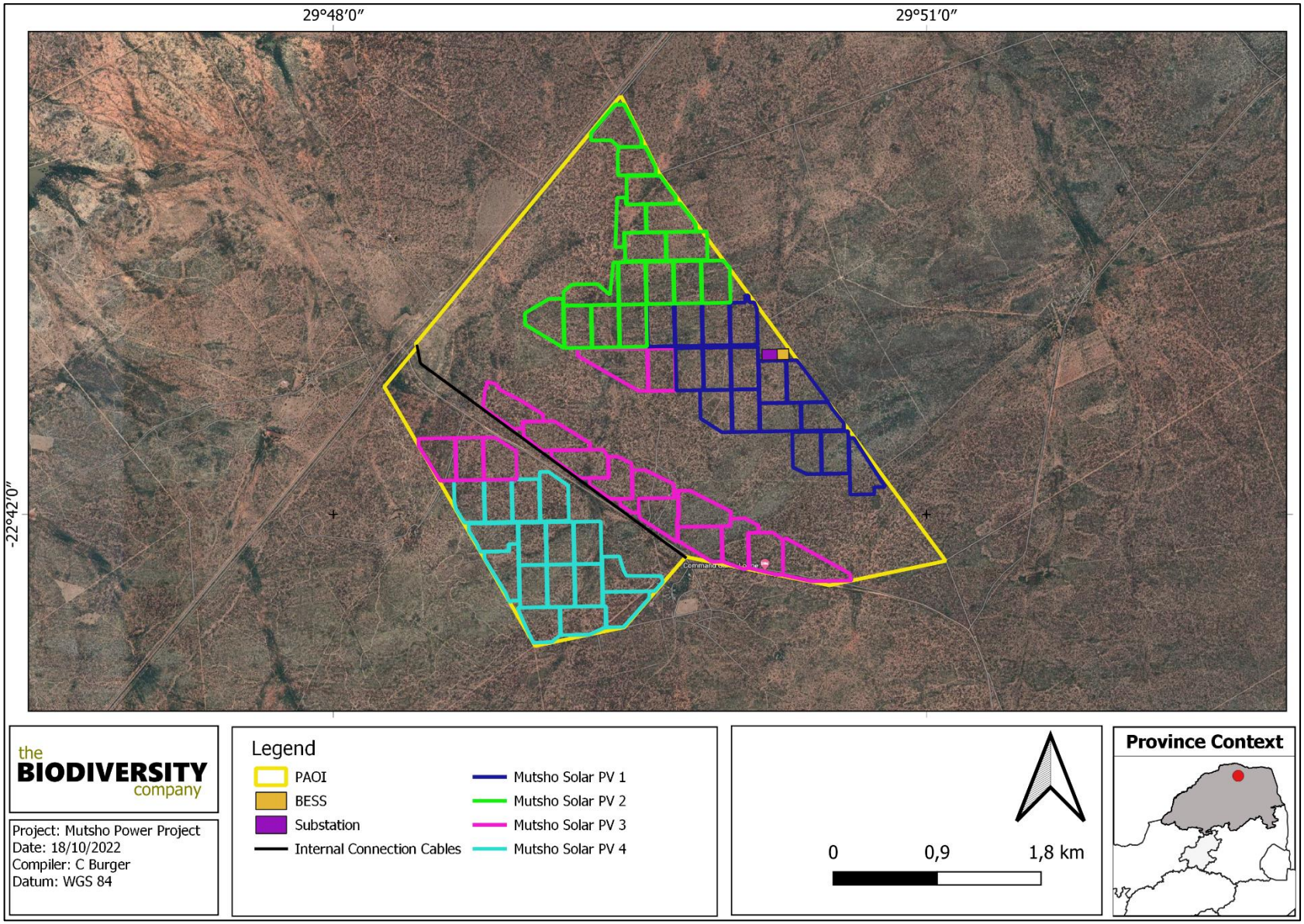


Figure 1-3 Map showing the layout of the various PV areas associated with the Project Area of Influence.

1.3 Specialist Details

Report Name	**THE TERRESTRIAL ECOLOGY & WETLAND BASELINE & IMPACT ASSESSMENTS FOR THE PROPOSED MUTSHO SOLAR PV 3 DEVELOPMENT**
Reference	**Mutsho Solar PV 3**
Submitted to	savannah environmental
Report Writer (Fauna and Flora)	**Carami Burger**  Carami Burger has completed her Bachelor of Science Honours degree in Ecological Interactions and Ecosystem Resilience. Carami is an ecologist and has completed various studies as part of Basic Assessments and Environmental Impact Assessments.
Report Writer/Reviewer (Wetland)	**Andrew Husted**  Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant.
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.

1.4 Scope of Work

The principle aim of the assessment was to provide information to identify the risks stemming from the proposed activity and to identify potential ecological constraints within the project area/corridor. This was achieved through the following:

- Desktop assessment to identify the relevant ecologically important geographical features within the project area;
- Desktop assessment to compile an expected species list and possible threatened flora and fauna species that occur within the project area;
- Field survey to ascertain the species composition of the present flora and fauna community within the project area;
- Field survey for the delineation, classification and assessment of wetlands within the 500 m regulated area;
- Delineate and map the habitats and their respective sensitivities that occur within the project area;
- Identify the manner that the proposed project impacts the ecological considerations and evaluate the level of risk of these potential impacts; and
- The prescription of mitigation measures and recommendations for identified risks.

2 Key Legislative Requirements

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

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

Region	Legislation / Guideline
International	Convention on Biological Diversity (CBD, 1993)
	The Convention on Wetlands (RAMSAR Convention, 1971)
	The United Nations Framework Convention on Climate Change (UNFCC,1994)
	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)
	The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)
National	Constitution of the Republic of South Africa (Act No. 108 of 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)
	National Protected Areas Expansion Strategy (NPAES)
	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)
	National Spatial Biodiversity Assessment (NSBA)
	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
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
	White Paper on Biodiversity
Provincial	Limpopo Conservation Plan (2018)
	Limpopo Environmental Management Act (2003)

2.1 National Environmental Management Act (NEMA, 1998)

The National Environmental Management Act (Act No. 107 of 1998) (NEMA) and the associated Environmental Impact Assessment (EIA) Regulations, as amended in April 2017, state that prior to certain listed activities taking place, an environmental authorisation application (EA) process needs to be followed. This could follow either the Basic Assessment (BA) process or the Scoping and EIA process, depending on the scale of the impact. A Scoping and EIA process is being undertaken for the project.GN 350 was gazetted on the 20 March 2020, which has replaced the requirements of Appendix 6 of the EIA Regulations in respect of certain specialist reports. These regulations provide the criteria and minimum requirements for specialist's assessments, in order to consider the impacts on soil for activities which require EA.

2.2 National Water Act (NWA, 1998)

The Department of Human Settlements Water and Sanitation (DHSWS) is the custodian of South Africa's water resources and therefore assumes public trusteeship of water resources, which includes watercourses, surface water, estuaries, or aquifers. The NWA allows for the protection of water resources, which includes the:

- Maintenance of the quality of the water resource to the extent that the water resources may be used in an ecologically sustainable way;
- Prevention of the degradation of the water resource; and
- Rehabilitation of the water resource.

A watercourse means;

- A river or spring;
- A natural channel in which water flows regularly or intermittently;
- A wetland, lake or dam into which, or from which, water flows; and
- Any collection of water which the minister may, by notice in the gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

The NWA recognises that the entire ecosystem and not just the water itself, and any given water resource constitutes the resource and as such needs to be conserved. No activity may therefore take place within a watercourse, unless it is authorised by the DHSWS. Any area within a wetland or riparian zone is therefore

excluded from development unless authorisation is obtained from the DHSWS in terms of Sections 21 (c) and (i) of the NWA.

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 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 proposed project might interact with any ecologically important entities. Emphasis was placed around the following spatial datasets:

- *National Biodiversity Assessment 2018 (Skowno et al, 2019) (NBA)*- The purpose of the NBA is to assess the state of South Africa's biodiversity based on 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:

  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. 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) (SANBI, 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.
- Conservation/Biodiversity Sector Plans:

The **Limpopo Conservation Plan** was completed in 2018 for the Limpopo Department of Economic Development, Environment & Tourism (LEDET) (Desmet *et al.,* 2013). The purpose of the LCPv2 was to develop the spatial component of a bioregional plan (i.e., map of Critical Biodiversity Areas and associated land-use guidelines). The previous Limpopo Conservation Plan (LCPv1) was completely

revised and updated (Desmet et al., 2013). A Limpopo Conservation Plan map was produced as part of this plan and sites were assigned to 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);
- Protected Area (PA); and
- No Natural Remaining (NNR).

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 (Desmet et al., 2013).

Ecological Support Areas (ESA's) 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 (SANBI, 2017). Critical Biodiversity Areas and Ecological Support Areas may be terrestrial or aquatic.

Other Natural Areas (ONAs) consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs. A biodiversity sector plan or bioregional plan must not specify the desired state/management objectives for ONAs or provide land-use guidelines for ONAs (Driver *et al.,* 2017).

Areas with No Natural Habitat Remaining (NNR) are areas in poor ecological condition that have not been identified as CBAs or ESAs. They include all irreversibly modified areas (such as urban or industrial areas and mines), and most severely modified areas (such as cultivated fields and forestry plantations). A biodiversity sector plan or bioregional plan must not specify the desired state/management objective or provide land-use guidelines for NNR areas (Driver *et al.,* 2017).

- 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

- Hydrological Setting:

  - South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (Van Deventer *et al,* 2018) – A South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was established during the National Biodiversity Assessment of 2018. It is a collection of data layers that represent the extent of river and inland wetland ecosystem types as well as pressures on these systems.

  - Strategic Water Source Areas (SWSAs) (Le Maitre *et al*, 2018) – SWSAs are defined as areas of land that supply a quantity of mean annual surface water runoff in relation to their size and therefore, contribute considerably to the overall water supply of the country. These are key ecological infrastructure assets and the effective protection of surface water

SWSAs areas is vital for national security because a lack of water security will compromise national security and human wellbeing.

- National Freshwater Ecosystem Priority Areas (NFEPA) – The NFEPA spatial data has been incorporated in the above mentioned SAIIAE spatial data set. However, to ensure that this data sets are considered we included it as the Freshwater Ecosystem Priority Areas (FEPAs) (Driver *et al*., 2011) are intended to be conservation support tools and are envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act (NEM:BA) biodiversity goals (Nel *et al.,* 2011).

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.

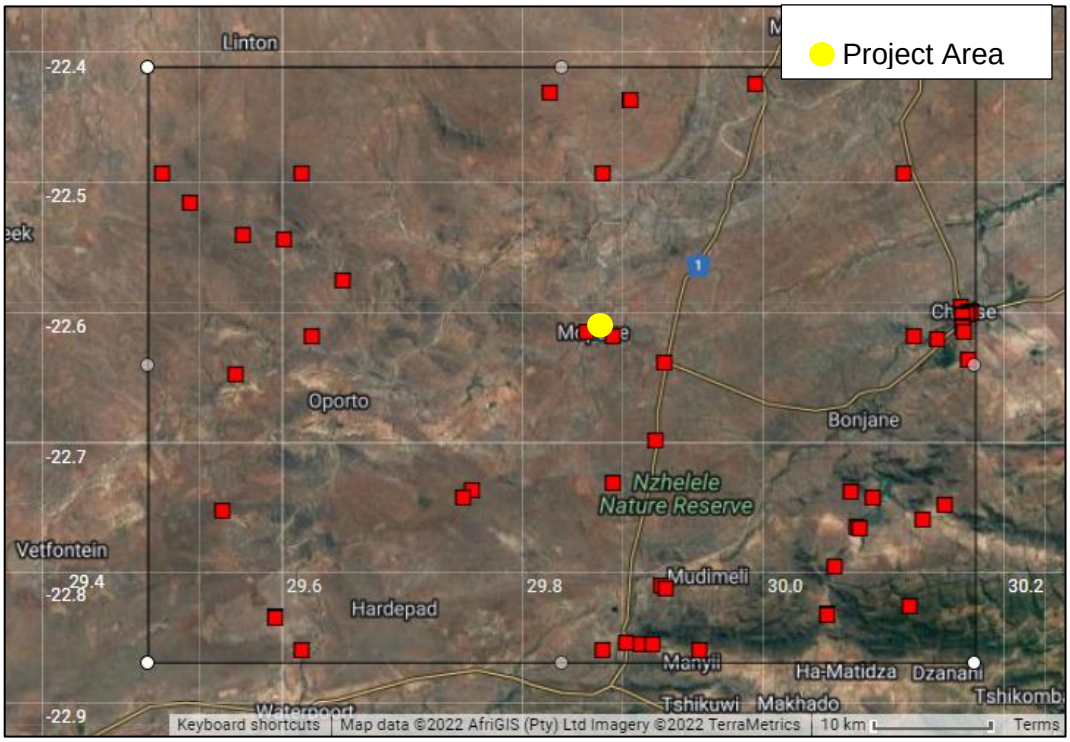


Figure 3-1 Map illustrating extent of area used to obtain the expected flora species list from the Plants of South Africa (POSA) database. Yellow dot indicates approximate location of the project area. The red squares are cluster markers of botanical records as per POSA data.

3.1.3 Desktop Faunal Assessment

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

- Amphibian list, generated from the IUCN spatial dataset (2017) and AmphibianMap database (Fitzpatrick Institute of African Ornithology, 2021a), using the 2229 quarter degree square;
- Reptile list, generated from the IUCN spatial dataset (2017) and ReptileMap database (Fitzpatrick Institute of African Ornithology, 2021b), using the 2229 quarter degree square; and
- Mammal list from the IUCN spatial dataset (2017).

3.2 Field Assessment

A single field survey was undertaken in June 2022 (winter), which is a dry-season survey, to determine the presence of Species of Conservation Concern (SCC). Effort was made to cover all the different habitat types within the limits of time and access. During the survey, notes were made regarding current impacts, recording of dominant species and any sensitive or important features (e.g., drainage lines, rock outcrops, termite mounds etc.).

3.2.1 Flora Survey

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

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

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

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

3.2.2 Fauna Survey

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

- *Visual and auditory searches* - This typically comprised of meandering and using binoculars to view species from a distance without them being disturbed; and listening to species calls;
- Active hand-searches - are used for species that shelter in or under particular micro-habitats (typically rocks, exfoliating rock outcrops, fallen trees, leaf litter, bark etc.); and
- Utilization of local knowledge.

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

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

3.3 Wetland Assessment

The wetland areas are 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 because 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.

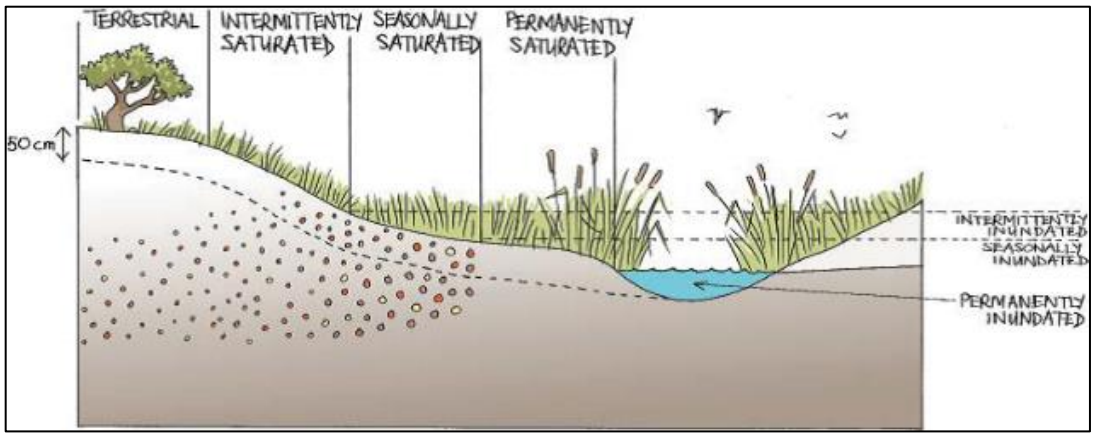


Figure 3-2 Cross section through a wetland, indicating how the soil wetness and vegetation indicators change (Ollis et al. 2013)

3.3.1 Delineation

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

3.3.2 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 also includes structural features at the lower levels of classification (Ollis et al., 2013).

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 serve as the main factor contributing to wetland functionality.

The assessment of the ecosystem services supplied by the identified wetlands was conducted per the guidelines 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 3-1).

Table 3-1 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 3-2.

Table 3-2 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 recognisable.	**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 is determined in order to establish resources that provide higher than average ecosystem services, biodiversity support functions are particularly sensitive to impacts. The mean of the determinants is used to assign the Importance and Sensitivity (IS) category as listed in Table 3-3 (Rountree and Kotze, 2013).

Table 3-3 Description of Importance and Sensitivity categories

EIS 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 Determining 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.

3.3.7 Risk Assessment

The Department of Water and Sanitation (DWS) risk matrix assesses impacts in terms of consequence and likelihood. The significance of the impact is calculated according to Table 3-4.

Table 3-4 Significance ratings matrix

Rating	Class	Management Description
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated. Wetlands may be excluded.
56 – 169	M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and require specialist input. Wetlands are excluded.
170 – 300	(H) High Risk	Always involves wetlands. Watercourse(s)impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve.

3.4 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 3-5 and Table 3-6, respectively.

Table 3-5 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 3-6 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 3-7.

Table 3-7 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 3-8.

Table 3-8 Summary of Resource Resilience (RR) criteria

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

Very Low	Habitat that is unable to recover from major impacts, or species that are unlikely to: (i) remain at a site even when a disturbance or impact is occurring, or (ii) return to a site once the disturbance or impact has been removed.

Subsequent to the determination of the BI and RR, the SEI can be ascertained using the matrix as provided in Table 3-9.

Table 3-9 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 proposed project is provided in Table 3-10.

Table 3-10 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.
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.

3.5 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- The assessment area was based on the area provided by the client and any alterations and/or missing GIS information pertaining to the assessment area would have affected the area surveyed;
- The assessment area was only surveyed during a single site visit and therefore this assessment does not consider temporal trends;
- Due to the time of sampling (dry-season) some of the vegetation was dry and most plants had already lost the green winter flush. Also, the spring dominant non-succulent annuals were not detectable;
- A separate avifauna assessment was conducted for the proposed project;
- No night surveys were performed due to safety risk;

- The assessment was a follow up assessment of a survey conducted in 2018 by Bathusi Environmental Consulting cc (2018). Terrestrial Biodiversity EIA assessment for the proposed Mutsho Power Project near Makhado, Limpopo Province. Reference Number SVE – MPS – 2018/07, Version 2018.04.12.03;
- This project as a whole consists of four separate development areas, the field assessment assessed the areas simultaneously;
- Although considerable time has been spent to ensure that information utilised in this report is verified. It is assumed that all third-party information utilised in the compilation of this report is correct at the time of compilation (e.g., spatial data, online databases, and species lists);
- It is assumed all datasets and information considered for the assessment is representative of the area and is well suited for the intended purposes of this report;
- The wetland component of this assessment has only considered wetlands (freshwater habitats);
- No wetlands were identified within the project area. Only watercourses that were likely to be impacted by proposed development activities were assessed in the field, and considered for the risk assessment. Watercourses not in a position within the landscape to be measurably affected by the developments were not considered as part of this assessment; and
- Due to the absence of natural wetlands for the project area, no functional assessment has been completed for the project.

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 with a Moderately Protected Ecosystem	4.1.1.2
Protected Areas	Relevant – The project area overlaps with the Vhembe Biosphere Reserve	4.1.1.4
Renewable Energy Development Zones	Irrelevant - The project area is 309 km for the closest REDZ	-
Powerline Corridor	Relevant- The project area overlaps with the International Corridor	-
National Protected Areas Expansion Strategy	Relevant – The project area is approximately 3.7 km from a priority focus area	4.1.1.5
Critical Biodiversity Area	Relevant – The project area overlaps with ESA1 classified areas	41.1.3
Important Bird and Biodiversity Areas	Relevant – The project area is 12 km to the Soutpansberg IBA.	4.1.1.6
South African Inventory of Inland Aquatic Ecosystems	Relevant - The project area is 11km away from the closest NBA river and 7.6 km away from the closest wetland	4.1.1.7
National Freshwater Priority Area	Relevant – A non-priority seepage system is located within the extent of the project area.	4.1.1.8
Strategic Water Source Areas	Irrelevant- The project area is 31 km from the closest SWSA	-

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 (Figure 4-1).

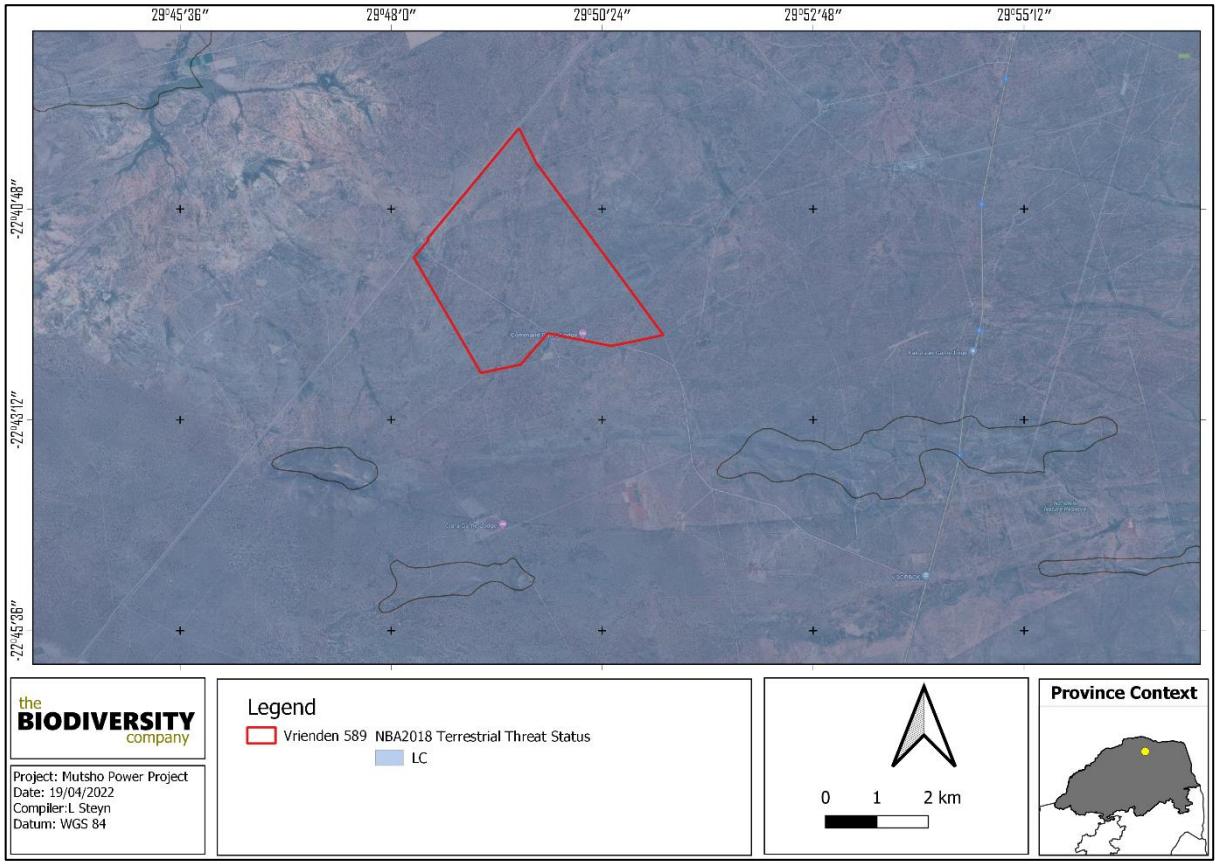


Figure 4-1 Map illustrating the ecosystem threat status associated with the project area.

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 with a MP ecosystem (Figure 4-2).

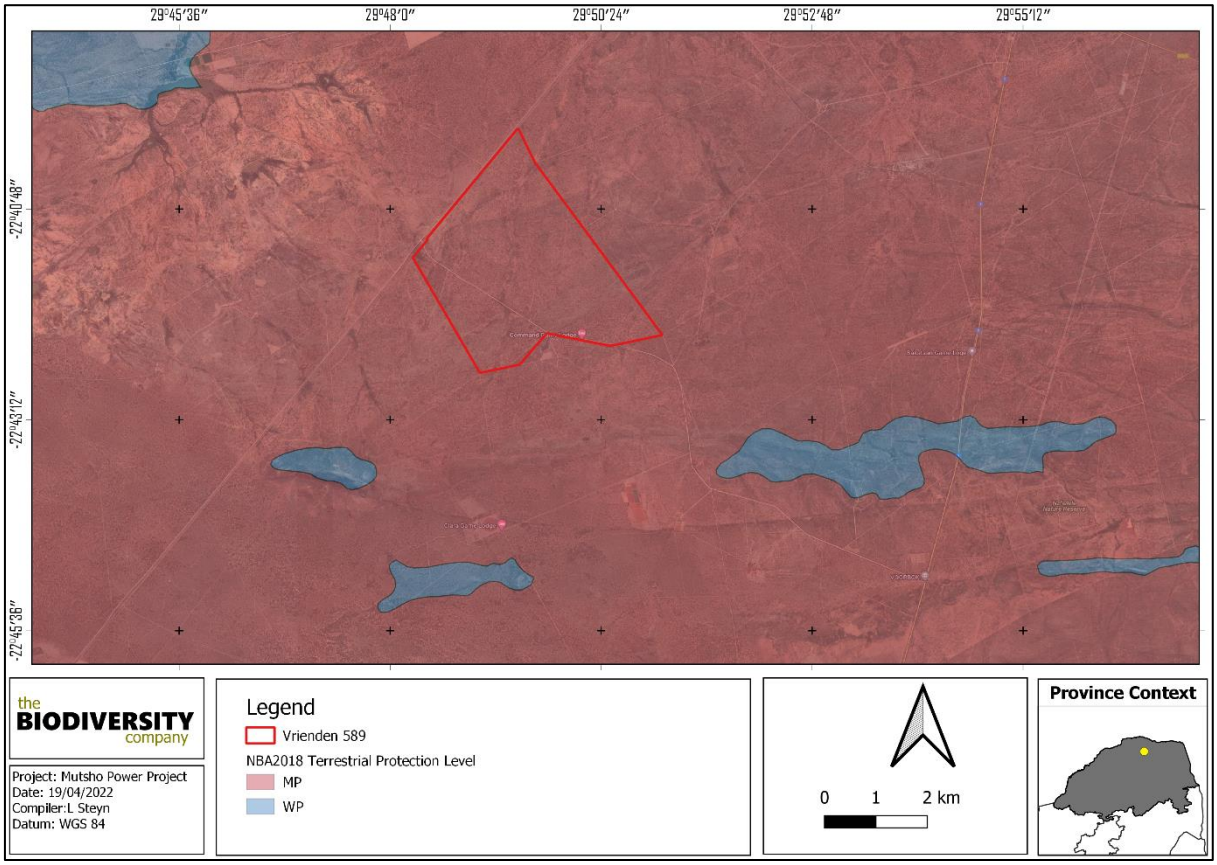


Figure 4-2 Map illustrating the ecosystem protection level associated with the project area

4.1.1.3 Critical Biodiversity Areas and Ecological Support Areas

The conservation of CBAs is crucial, in that if these areas are not maintained in a natural or near-natural state, biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (SANBI-BGIS, 2017).

The provincial CBA spatial data for the North West province indicates that both feasibility areas don't traverse any CBA nor Ecological Support Areas (ESAs) and Other Natural Areas (ONAs). Based on the Limpopo Conservation Plan the SCSC feasibility area traverses ESA1 and NNR areas, whereas the SBPM feasibility area traverses ESA1, NNR and ONA area.

The purpose of the Limpopo C-Plan (2018) is to inform land-use planning and development on a provincial scale and to aid in natural resource management. One of the outputs is a map of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). These are classified into different categories, namely Protected Areas, CBA1 areas, CBA2 areas, ESA1 areas, ESA2 areas, Other Natural Areas (ONAs) and areas with No Natural Habitat Remaining (NNR) based on biodiversity characteristics, spatial configuration, and requirements for meeting targets for both biodiversity patterns and ecological processes.

Figure 4-3 shows the project area superimposed on the Terrestrial CBA maps. The project area overlaps with ESA1 classified areas.

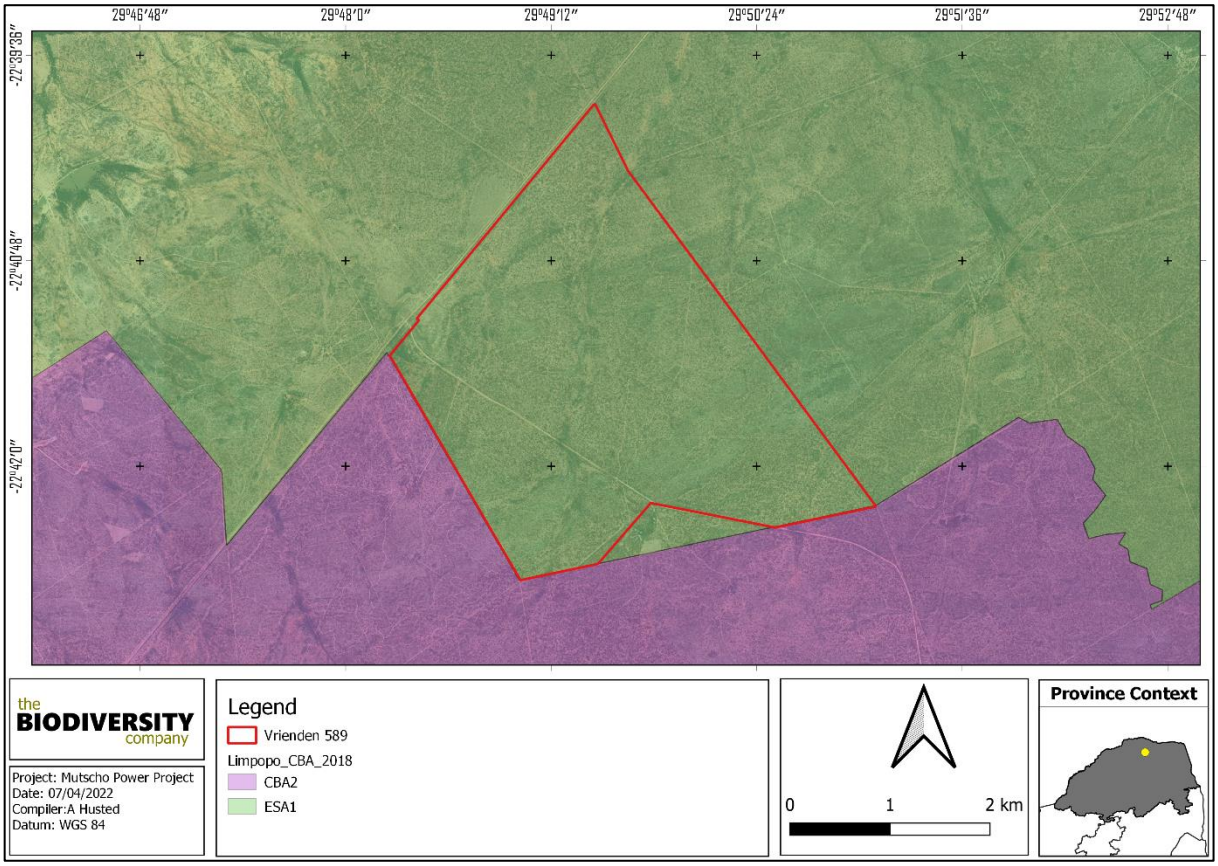


Figure 4-3 Map illustrating the locations of CBAs in the project area

4.1.1.4 Protected areas

According to the protected area spatial datasets from SAPAD (2021), the project area overlaps with the Vhembe Biosphere Reserve (Figure 4-4). No protected areas were found withing 5km of the project area. The closest reserve is the Boabab Private Nature Reserve that is 8.8 km form the project area.

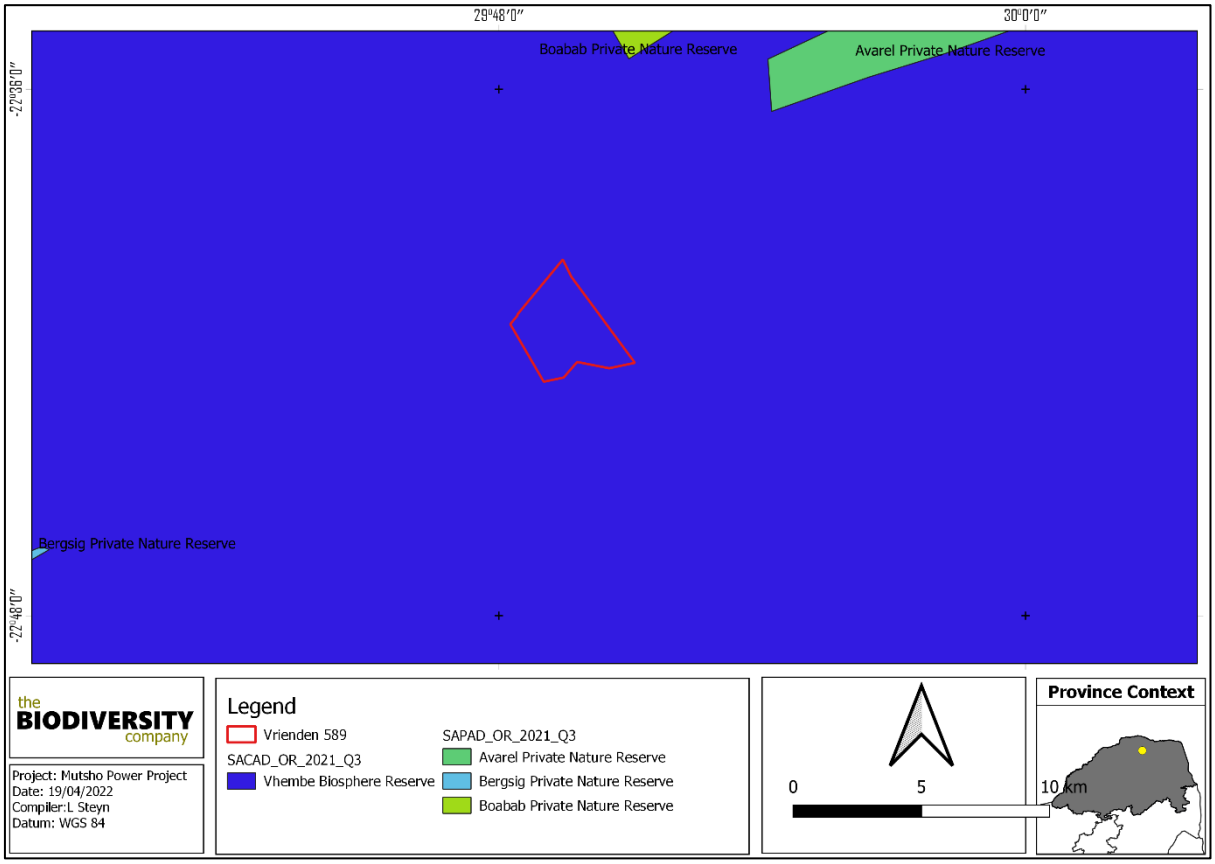


Figure 4-4 The project area in relation to the protected areas

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 is approximately 3.7 km from a priority focus area as can be seen in Figure 4-5.

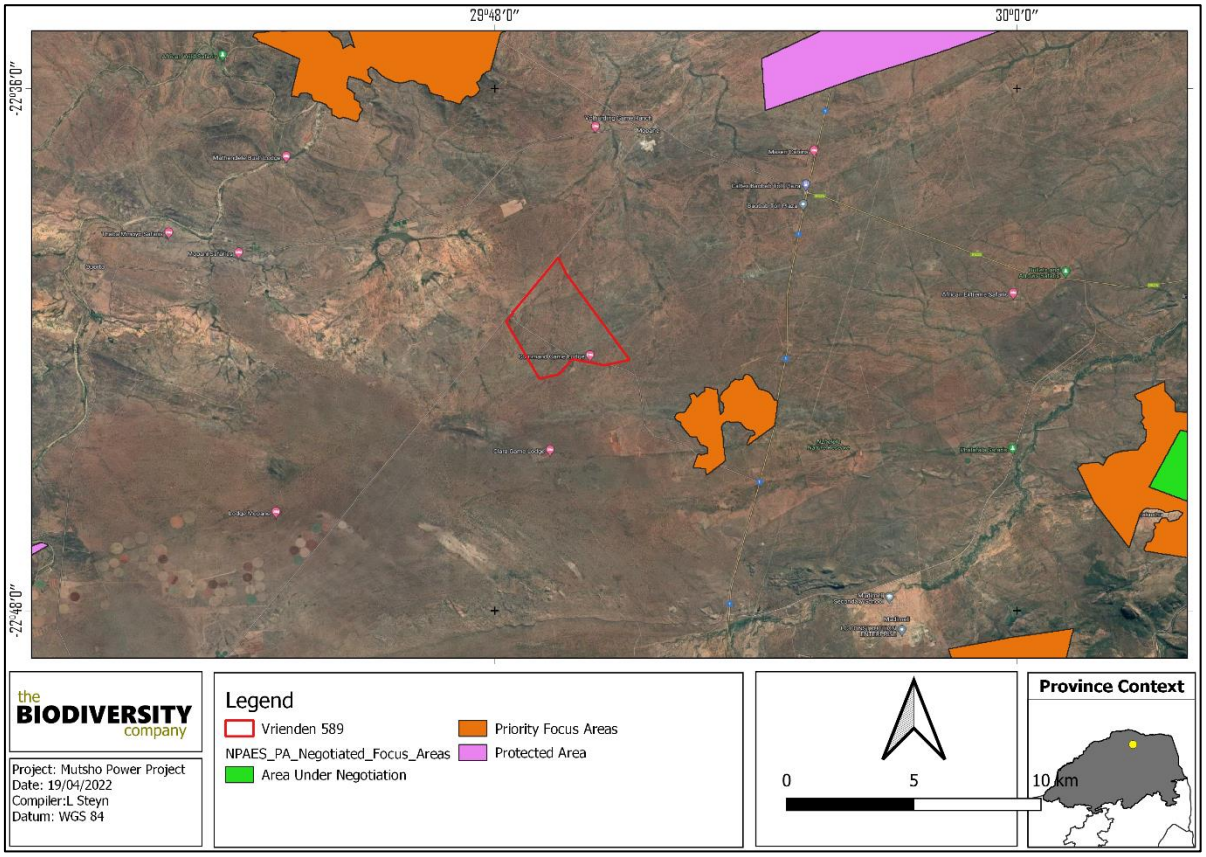


Figure 4-5 The project area in relation to the National Protected Area Expansion Strategy

4.1.1.6 Important Bird and Biodiversity Area

Important Bird & Biodiversity Areas (IBAs) are the sites of international significance for the conservation of the world's birds and other conservation significant species as identified by BirdLife International. These sites are also all Key Biodiversity Areas; sites that contribute significantly to the global persistence of biodiversity (Birdlife, 2017).

According to Birdlife International (2017), the selection of IBAs is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations. The criteria ensure that the sites selected as IBAs have true significance for the international conservation of bird populations and provide a common currency that all IBAs adhere to, thus creating consistency among, and enabling comparability between, sites at national, continental and global levels. Figure 4-6 shows the project area is 12 km to the Soutpansberg IBA.

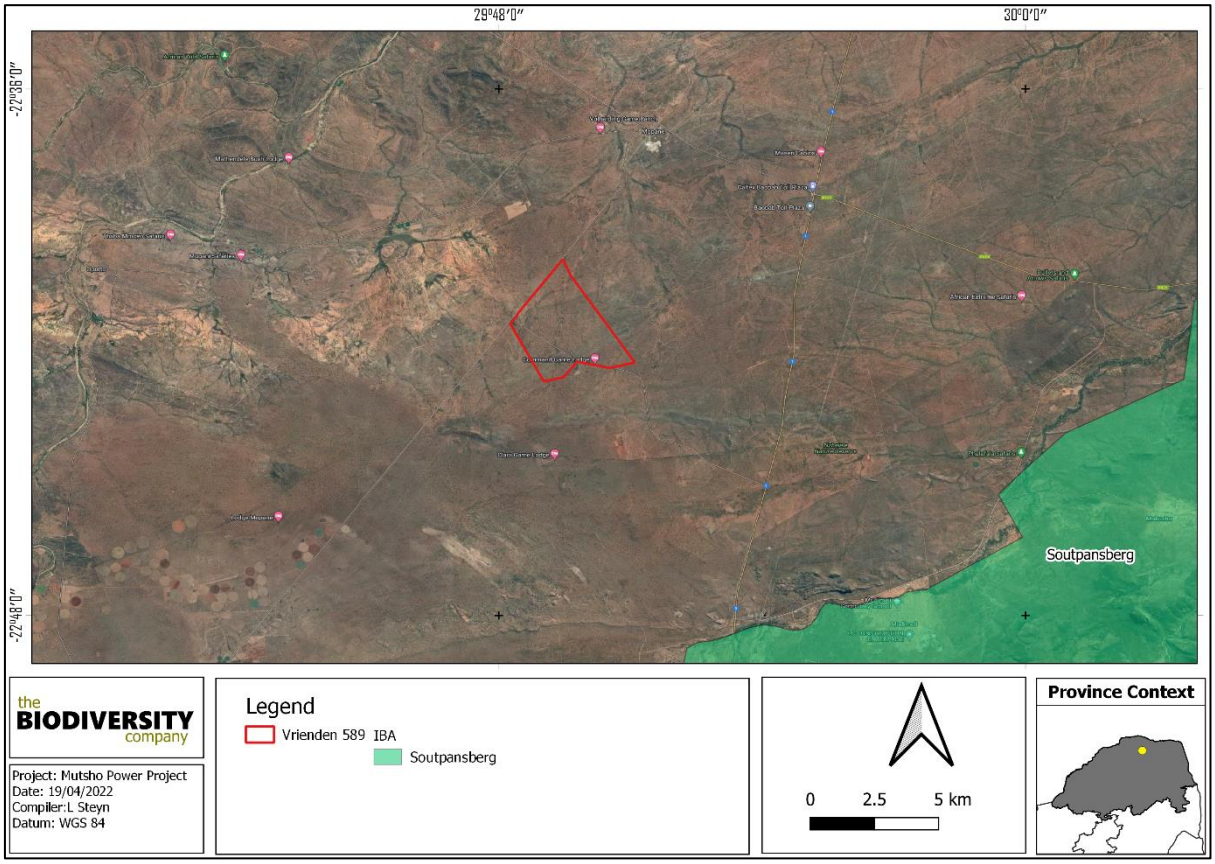


Figure 4-6 The project area in relation to the Soutpansberg IBA

4.1.1.7 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. Ecosystem types are categorised as CR, EN, VU or LT, with CR, EN and VU ecosystem types collectively referred to as 'threatened' (Van Deventer *et al.,* 2019; Skowno *et al.,* 2019). The project area is 11km away from the closest NBA river and 7.6 km away from the closest wetland (Figure 4-7).

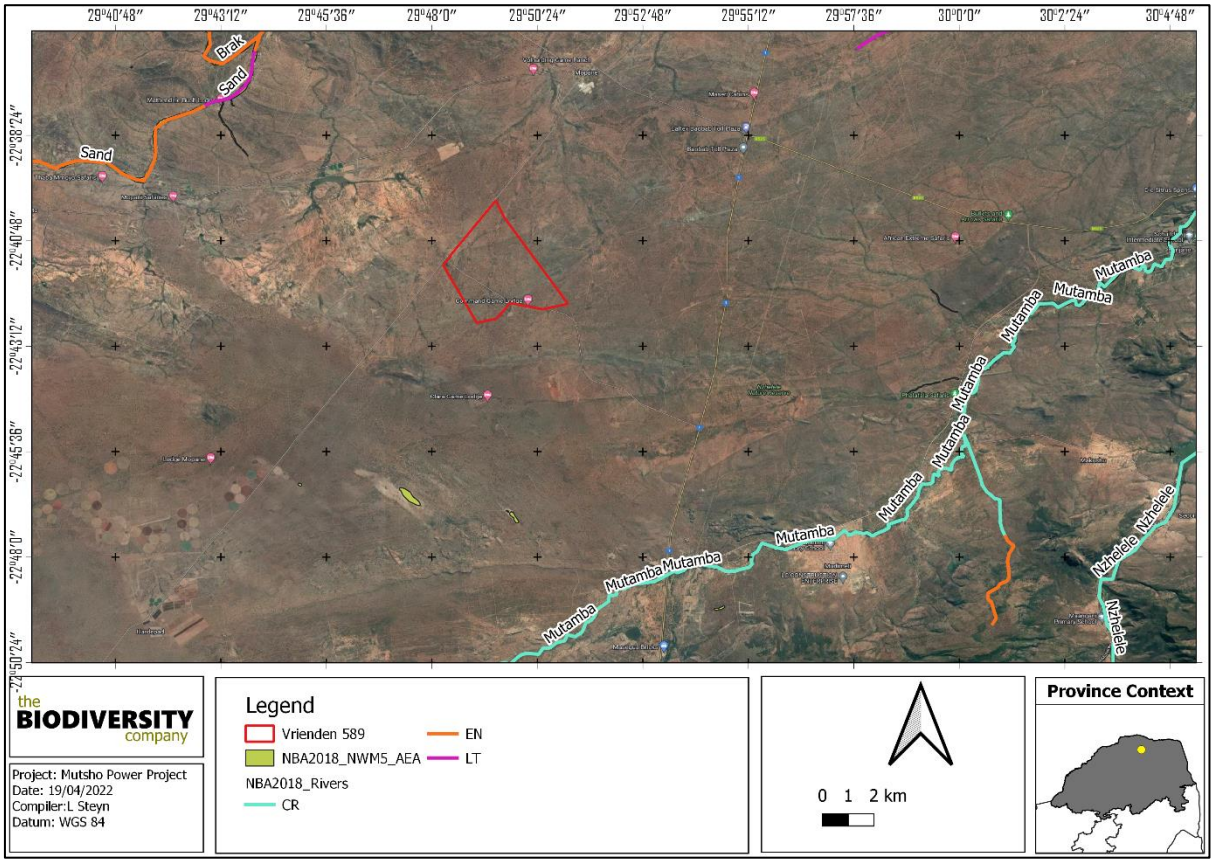


Figure 4-7 Map illustrating ecosystem threat status of rivers and wetland ecosystems in the project area

4.1.1.8 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 4-8 shows the location of the project area in relation to wetland FEPAs. Based on this information, a non-priority seepage system is located within the extent of the project area. The wetland is considered to be in a seriously modified ecological state.

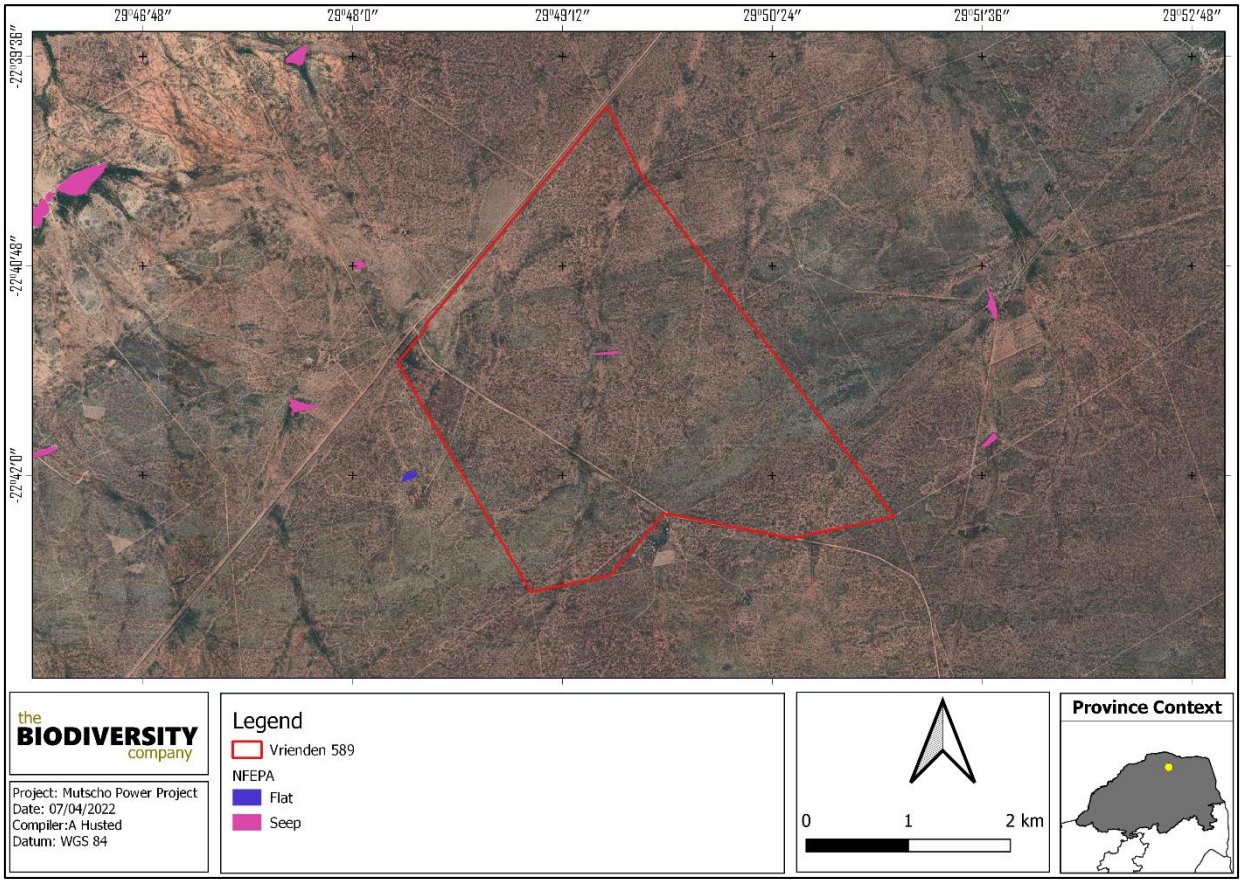


Figure 4-8 The project area in relation to the National Freshwater Ecosystem Priority Areas.

4.1.2 Catchment

The project area is located in the A71K quaternary catchments of the Limpopo Water Management Area as revised in the 2012 water management area boundary descriptions (government gazette No. 35517). According to the river line dataset for the Quarter Degree Square (QDS) a network of ephemeral watercourses is located within the project area, flowing in a northerly direction (Figure 4-9).

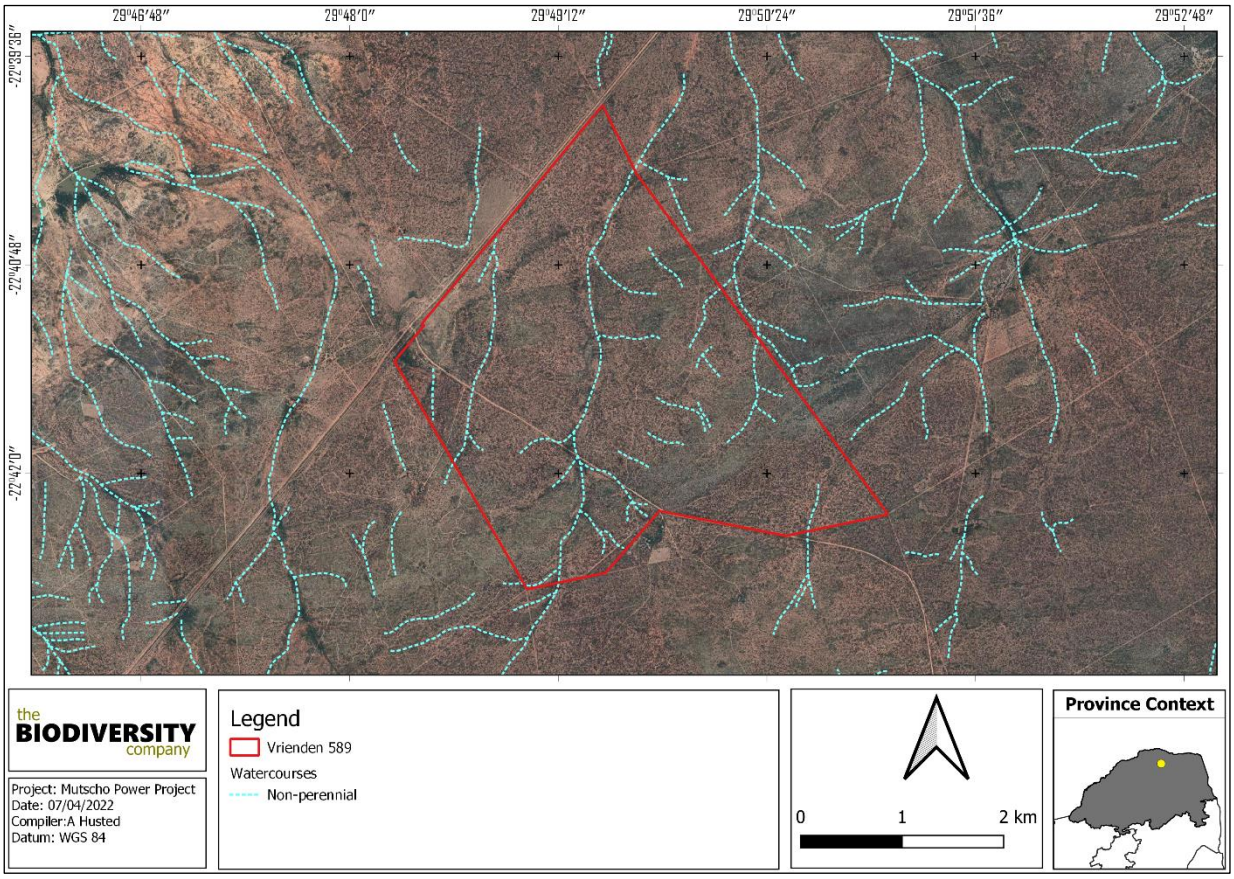


Figure 4-9 The extent of watercourses within the project area

4.1.3 Flora Assessment

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

4.1.3.1 Vegetation Type

The project area is situated in the Savanna biome. The savanna vegetation of South Africa represents the southernmost extension of the most widespread biome in Africa (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the Savanna biome include:

a) Seasonal precipitation; and

b) (Sub) tropical thermal regime with no or usually low incidence of frost (Mucina & Rutherford, 2006).

Most savanna vegetation communities are characterised by a herbaceous layer dominated by grasses and a discontinuous to sometimes very open tree layer (Mucina & Rutherford, 2006).

The savanna biome is the largest biome in South Africa, extending throughout the east and north-eastern areas of the country. Savannas are characterised by a dominant grass layer, over-topped by a discontinuous, but distinct woody plant layer. At a structural level, Africa's savannas can be broadly categorised as either fine-leaved (microphyllous) savannas or broad-leaved savannas. Fine-leaved savannas typically occur on nutrient rich soils and are dominated by microphyllous woody plants of the Mimosaceae family (Common genera include *Vachellia and Albizia*) and a generally dense herbaceous layer (Scholes & Walker, 1993).

On a fine-scale vegetation type, the project area overlaps with the Musina Mopane Bushveld vegetation type (Figure 4-10).

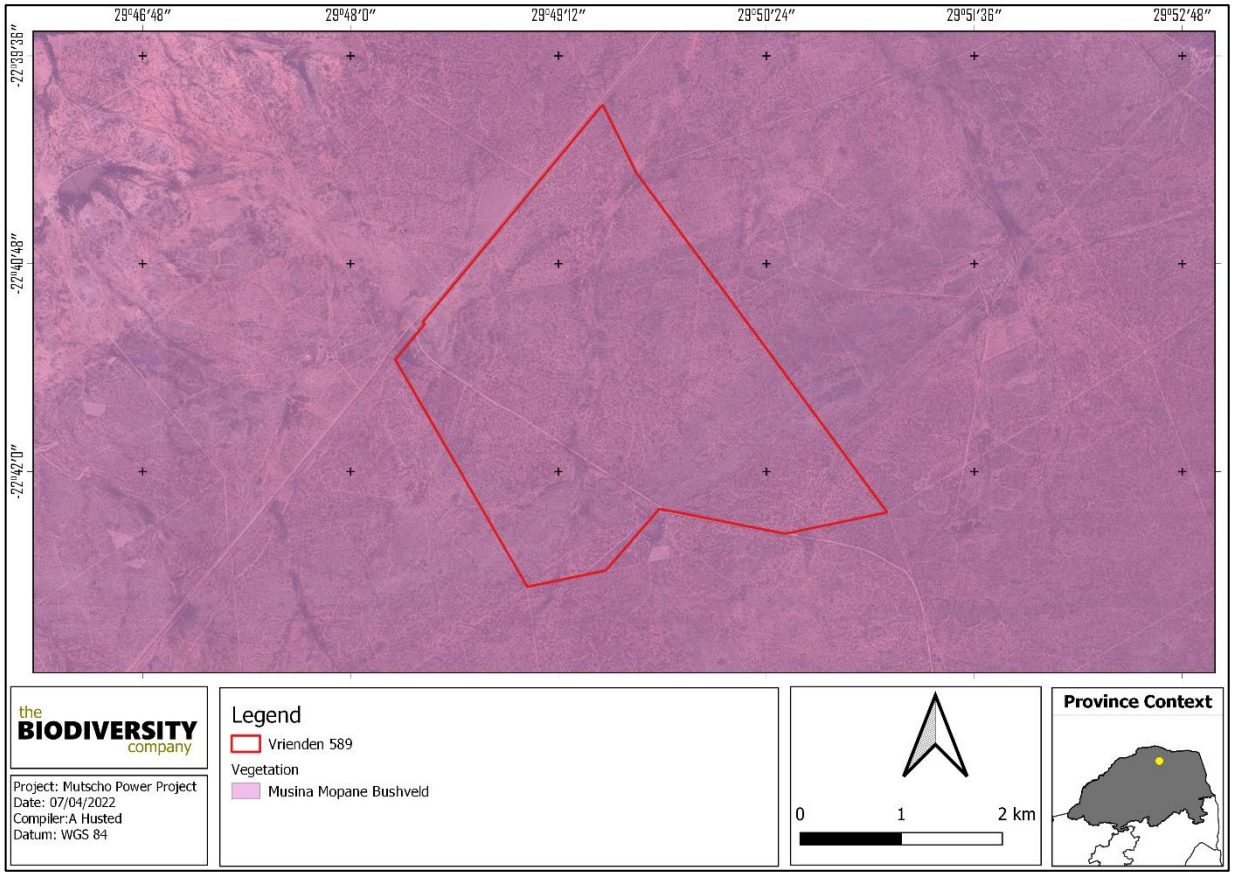


Figure 4-10 Map illustrating the vegetation type associated with the project area

4.1.3.1.1 Musina Mopane Bushveld

This vegetation type can be found in the Limpopo Province on undulating to very irregular plains, with some hills. In the western section, open woodland to moderately closed shrubveld dominated by *Colophospermum mopane* and *Combretum apiculatum* can be found. While in the Eastern section *Colophospermum mopane* and *Terminalia prunioides* dominates open shrubland.

Important Taxa (d = dominant species)

Tall Trees: *Senegalia nigrescens*, *Adansonia digitata*, *Sclerocarya birrea* subsp. *caffra*.

Small Trees: *Colophospermum mopane* (d), *Combretum apiculatum* (d), *Senegalia senegal* var. *leiorhachis*, *S. tortilis* subsp. *heteracantha*, *Boscia albitrunca*, *B. foetida* subsp. *rehmanniana*, *Commiphora glandulosa*, *C. tenuipetiolata*, *C. viminea*, *Sterculia rogersii*, *Terminalia prunioides*, *T. sericea*, *Ximenia americana*.

Tall Shrubs: *Grewia flava* (d), *Sesamothamnus lugardii* (d), *Commiphora pyracanthoides*, *Gardenia volkensii*, *Grewia bicolor*, *Maerua parvifolia*, *Rhigozum zambesiacum*, *Tephrosia polystachya*. Low Shrubs: *Acalypha indica*, *Aptosimum lineare*, *Barleria senensis*, *Dicoma tomentosa*, *Felicia clavipilosa* subsp. *transvaalensis*, *Gossypium herbaceum* subsp. *africanum*, *Hermannia glanduligera*, *Neuracanthus africanus*, *Pechuel-Loeschea leubnitziae*, *Ptycholobium contortum*, *Seddera suffruticosa*.

Succulent Shrub: *Hoodia currorii* subsp. *lugardii.*

Herbaceous Climber: *Momordica balsamina*.

Graminoids: *Schmidtia pappophoroides* (d), *Aristida adscensionis*, *A. congesta*, *Bothriochloa insculpta*, *Brachiaria deflexa*, *Cenchrus ciliaris*, *Digitaria eriantha* subsp. *eriantha*, *Enneapogon cenchroides*, *Eragrostis lehmanniana*, *E. pallens*, *Fingerhuthia africana*, *Heteropogon contortus*, *Sporobolus nitens*, *Stipagrostis hirtigluma* subsp. *patula*, *S. uniplumis*, *Tetrapogon tenellus*, *Urochloa mosambicensis*.

Herbs: *Acrotome inflata*, *Becium filamentosum*, *Harpagophytum procumbens* subsp. *transvaalense*, *Heliotropium steudneri*, *Hermbstaedtia odorata*, *Oxygonum delagoense*.

Succulent Herbs: *Stapelia gettliffei, S. kwebensis.*

Conservation Status

This vegetation type is classed as Least Concerned, with only 3 % statutorily conserved in the Mapungubwe National Park, Nwanedi and Honnet Nature Reserves and the Baobab Tree Reserve. The conservation target is 19 %.

4.1.3.2 Expected Flora Species

The POSA database indicates that 292 species of indigenous plants are expected to occur within the project area. Two (2) SCC based on their conservation status could be expected to occur within the project area and are provided in Table 4-2 below. Refer to appendix A for the full list of flora species expected to occur in the project area.

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

Family	Taxon	Author	IUCN	Ecology
Fabaceae	*Indigofera rehmannii*	Baker f.	EN	Indigenous; Endemic
Apocynaceae	*Ceropegia cimiciodora*	Oberm.	VU	Indigenous

4.1.4 Faunal Assessment

4.1.4.1 Amphibians

Based on the IUCN Red List Spatial Data and AmphibianMap, 35 amphibian species are expected to occur within the area. Two (2) are regarded as threatened (Table 4-3). Refer to appendix B for the full list of amphibian species expected to occur in the project area.

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

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	**IUCN (2021)**	
Breviceps sylvestris	Northern Forest Rain Frog	VU	VU	Low
Pyxicephalus adspersus	Giant Bullfrog	NT	LC	Moderate

Breviceps sylvestris (Northern Forest Rain Frog) is endemic to the Limpopo province, where they can be found in temperate forests, temperate grassland, and rural gardens. This species is threatened mainly by habitat loss. Suitable habitat cannot be found in the project area for this species.

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

4.1.4.2 Reptiles

Based on the IUCN Red List Spatial Data and the ReptileMAP database, 134 reptile species are expected to occur within the area. Seven (7) are regarded as threatened (Table 4-4). Refer to appendix C for the full list of reptile species expected to occur in the project area.

Table 4-4 Threatened reptile species that are expected to occur within the project area

Species	Common Name	Conservation Status

		Regional (SANBI, 2016)	IUCN (2017)	Likelihood of Occurrence
Chamaesaura macrolepis	Large-scaled Grass Lizard	NT	LC	Low
Chirindia langi occidentalis	Soutpansberg Worm Lizard	VU	Unlisted	Moderate
Crocodylus niloticus	Nile Crocodile	VU	LC	Low
Homopholis mulleri	Muller's Velvet Gecko	VU	LC	Moderate
Lygodactylus ocellatus soutsbergensis	Soutpansberg Dwarf Gecko	NT	LC	Low
Scelotes limpopoensis albiventris	White-bellied Dwarf Burrowing Skink	NT	Unlisted	Low
Vhembelacerta rupicola	Soutpansberg Rock Lizard	NT	LC	Low

Chirindia langi occidentalis is found in South Africa, Mozambique and Zimbabwe, where they occur in the savanna habitats. They are more specifically found under rocks on the soil surface, in burrows or in rotting logs. The main threats to this species is agriculture and changes in game stocking levels. Suitable habitat can be found in the project area for this species as such it was given a moderate likelihood of occurring.

Homopholis mulleri is a nocturnal species that can be found sheltering in the holes in the trunks of tree species such as Marula and Knob-thorn trees. Their range is threatened mainly by clearance of habitat for agricultural use, extraction of mature trees for firewood, wood carving and charcoal production. Suitable savannah tree species can be found that provides habitat for this species, the likelihood of occurrence is rated as moderate.

4.1.4.3 Mammals

The IUCN Red List Spatial Data lists 107 mammal species that could be expected to occur within the area. This list excludes large mammal species that are normally restricted to protected areas. Sixteen (16) (smaller non protected area restricted species) of these expected species are regarded as threatened (Table 4-5), twelve of these have a low likelihood of occurrence based on the lack of suitable habitat and food sources in the project area. Refer to appendix D for the full list of mammal species expected to occur 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	Cape Clawless Otter	NT	NT	Low
Atelerix frontalis	South Africa Hedgehog	NT	LC	Moderate
Cloeotis percivali	Short-eared Trident Bat	EN	LC	Low
Crocidura maquassiensis	Makwassie musk shrew	VU	LC	Low
Crocidura mariquensis	Swamp Musk Shrew	NT	LC	Low
Crocuta crocuta	Spotted Hyaena	NT	LC	Low
Dasymys incomtus	African Marsh rat	NT	LC	Low
Eidolon helvum	African Straw-colored Fruit Bat	LC	NT	Low
Felis nigripes	Black-footed Cat	VU	VU	Moderate
Leptailurus serval	Serval	NT	LC	Moderate
Lycaon pictus	Wild Dog	EN	CR	Low
Nycteris woodi	Wood's Slit Faced Bat	NT	LC	High
Panthera pardus	Leopard	VU	VU	Low
Parahyaena brunnea	Brown Hyaena	NT	NT	Low

Poecilogale albinucha	African Striped Weasel	NT	LC	Low
Redunca fulvorufula	Mountain Reedbuck	EN	EN	Low
Smutsia temminckii	Temminck's Ground Pangolin	VU	VU	Low

Atelerix frontalis (South African Hedgehog) has a tolerance to a degree for habitat modification and occurs in a wide variety of semi-arid and sub-temperate habitats (IUCN, 2017). Based on the Red List of Mammals of South Africa, Lesotho and Swaziland (2016), *A. frontalis* populations are decreasing due to the threats of electrocution, veld fires, road collisions, predation from domestic pets and illegal harvesting. Suitable habitat occur in the project area, although somewhat disturbed, as such the likelihood of occurrence is rated as moderate.

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

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. This species could use the project area for hunting, but the amount of trees found does make it not ideal habitat for Servals.

Nycteris woodi (Wood's Slit-faced Bat) occurs in semi-arid and moist woodland savannahs (including miombo and mopane woodlands) where suitable day-roosts are available. It roosts in hollow trees (particularly Baobabs *Adansonia digitata* and Sausage Trees *Kigelia africana*), sandstone caves, rock fissures, mine adits and buildings. Roosting habitat can be found in the project area.

4.2 Findings of the Previous Assessment

The biodiversity assessment was conducted in the summer of 2018 by Ecocheck Environmental Services cc and Bathusi Environmental Consulting cc (2018). (Terrestrial Biodiversity EIA assessment for the proposed Mutsho Power Project near Makhado, Limpopo Province. Reference Number SVE – MPS – 2018/07, Version 2018.04.12.03.) The 2018 study assessed a larger project area which consisted of Farm Du Toit 563 MS and Farm Vrienden 589 MS.

The following key findings and considerations were noted for the floristic environment (Bathusi Environmental Consulting, 2018):

- No plant species with IUCN status were recorded during the brief survey effort. However, taking cognisance of the habitat variability and existing status of the environment, the likelihood of plants of conservation concern persisting within the study area cannot be excluded;
- Four tree species that are protected under the National Forest Act (1998) were recorded in abundant numbers across the sites:
    - *Adansonia digitata L. (Baobab);*
    - *Boscia albitrunca (Burch.) Gilg & Gilg-Ben. (Shepard's tree);*
    - *Combretum imberbe Wawra (Leadwood); and*
    - *Sclerocarya birrea (A.Rich.) Hochst. subsp. caffra (Sond.) Kokwaro (Marula).*

- The localised presence of *Adansonia digitata* is regarded an important consideration. At every available opportunity, individuals with an estimated circumference more than 15 m (maximum approximately 22 m) were recorded;
- The average number of species recorded in releveès during the survey period is 23.5 per sampling bout (std. dev. = ±6.0), reflecting a poor floristic species richness of the vegetation on a local and regional scale;
- Typical woodland vegetation of the sites strongly reflects regional ecological attributes (Musina Mopane Bushveld);
- Twinspan analysis revealed a major community that accounts for the typical savanna woodland vegetation. Minor communities were recognised that accounts for ephemeral pans, anthropogenically transformed woodland (old fields) and emergence of calcareous washes and plains that is a typical and natural occurrence in the immediate region;
- Although not proven to be floristically distinct in the Twinspan analysis of this brief assessment, physiognomic variations are regarded as important units on a local and regional scale, contributing to the ecological infrastructure and functionality of the region and are therefore described as physiognomic variations within the typical woodland habitat;
- The following communities and variations were recognised from the TWINSPAN classification:
    - Community 1 – *Combretum imberbe – Phyllanthus reticulatus* ephemeral pans;
    - Community 2 - *Vachellia grandicornuta – Boscia foetida* eroded watercourses and calcareous plains/ washes, including the variations:
        - Quartzitic washes and sandy floodplains; and
        - Calcareous outcrops and washes;
    - Communities 3 and 4 – *Combretum apiculatum Grewia flavescens – Colophospermum mopane* Woodland, including the physiognomic variations:
        - Closed Woodland;
        - Open Woodland;
        - Closed Woodland Watercourses;
        - Open Woodland Watercourses;
        - Quartzitic Outcrop; and
        - Community 5 – *Vachellia tortilis – Cienfuegosia* – digitata old fields.
- Vegetation of the study area conforms to a uniform, but mixed, undifferentiated broadleaf woodland that comprises mostly of deep, highly leached sandy soils. Results of the floristic surveys reflect the proportional and notable prominence of typical woodland constituents such as *Vachellia tortilis, Dichrostachys cinerea* and *Colophospermum mopane*.

The following key findings and considerations were noted regarding the faunal component (Bathusi Environmental Consulting, 2018):

- During the site investigation the presence of one hundred and twenty-two (122) animal species were confirmed in the study area, representing twenty-two orders (22) and fifty-five (55) families. Of these 122 species, 111 were recorded on Farm Du Toit and 82 species on Farm Vrienden. The species recorded within the study areas included six red data listed species, namely:
    - *Copris cambeforti* Nguyen-Phung, 1988a (Dung Beetle) – Data Deficient;

- *Onthophagus quadrimaculatus* Raffray, 1877 (Dung Beetle) – Data Deficient;
- *Rhinolophus smithersi* Taylor, Stoffberg, Monadjem, 2012 (Smither's Horseshoe Bat) – Near Threatened;
- *Acinonyx jubatus* (Schreber, 1775) (Cheetah) – Vulnerable;
- *Panthera pardus* (Linnaeus, 1758) (Leopard) – Vulnerable; and
- *Parahyaena brunnea* (Thunberg, 1820) (Brown Hyaena) – Near Threatened.

4.3 Field Assessment

The following sections provide the results from the field survey for the proposed development that was undertaken from the 20th of June 2022 to the 23rd of June 2022.

4.3.1 Flora Assessment

This section is divided into two subdivisions:

- Indigenous flora; and
- Invasive Alien Plants (IAPs).

4.3.1.1 Indigenous Flora

The vegetation assessment was conducted throughout the extent of the project area. A total of 72 tree, shrub, herbaceous and graminoid plant species were recorded in the project area during the field assessment (Table 4-6). Plants listed in Category 2 or as 'not indigenous' or 'naturalised' according to NEMBA, appear in blue text. Some of the plant species recorded can be seen in Figure 4-11.The list of plant species recorded to is by no means comprehensive, and repeated surveys during different phenological periods not covered, may likely yield up to 20-30% 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.

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

Family	Scientific Name	Threat Status (SANBI, 2017)	SA Endemic	NEMBA Category
Acanthaceae	*Blepharis subvolubilis*	LC	No	
Amaranthaceae	*Kyphocarpa angustifolia*	LC		
Amaranthaceae	*Gomphrena celosioides*			Invasive
Anacardiaceae	*Lannea schweinfurthii*	LC	No	
Anacardiaceae	*Sclerocarya birrea*	LC Protected		
Apocynaceae	*Adenium multiflorum*	LC Sched 12 Protected	No	
Apocynaceae	*Sarcostemma viminale*	LC	No	
Asparagaceae	*Asparagus cooperi*	LC		
Asteraceae	*Geigeria acaulis*	LC	No	
Asteraceae	*Geigeria burkei*			
Asteraceae	*Pechuel-Loeschea leubnitziae*	LC	No	
Asteraceae	*Flaveria bidentis*			
Boraginaceae	*Cordia grandicalyx*	LC	No	
Boraginaceae	*Cordia monoica*	LC	No	

Burseraceae	*Commiphora africana*		
Burseraceae	*Commiphora edulis*		
Burseraceae	*Commiphora glandulosa*		
Burseraceae	*Commiphora mollis*		
Burseraceae	*Commiphora pyracanthoides*		
Burseraceae	*Commiphora schimperi*		
Caesalpiniaceae	*Colophospermum mopane*	LC	
Caesalpiniaceae	*Cassia abbreviata*	LC	No
Caesalpiniaceae	*Colophospermum mopane*	LC	No
Capparaceae	*Boscia foetida*	LC	No
Capparaceae	*Boscia albitrunca*	LC Protected	
Celastraceae	*Gymnosporia buxifolia*	LC	No
Combretaceae	*Terminalia prunioides*	LC	
Combretaceae	*Combretum apiculatum*	LC	
Combretaceae	*Combretum apiculatum*	LC	No
Convolvulaceae	*Evolvulus alsinoides*	LC	
Euphorbiaceae	*Euphorbia tirucalli*	LC	No
Euphorbiaceae	*Phyllanthus reticulatus*	LC	No
Fabaceae	*Dichrostachys cinerea*		
Fabaceae	*Senegalia erubescens*	LC	
Fabaceae	*Senegalia mellifera*	LC	
Fabaceae	*Senegalia nigrescens*	LC	
Fabaceae	*Tephrosia polystachya*	LC	No
Fabaceae	*Vachellia grandicornuta*	LC	
Fabaceae	*Vachellia karroo*	LC	
Fabaceae	*Vachellia tortilis*	LC	
Kirkiaceae	*Kirkia acuminata*	LC	No
Lamiaceae	*Ocimum americanum*	LC	
Loganiaceae	*Strychnos madagascariensis*	LC	No
Malvaceae	*Adansonia digitata*	LC Protected	
Malvaceae	*Grewia flava*	LC	No
Malvaceae	*Grewia flavescens*	LC	No
Malvaceae	*Grewia villosa*	LC	No
Malvaceae	*Grewia bicolor*	LC	No
Malvaceae	*Grewia monticola*	LC	No
Malvaceae	*Cienfuegosia digitata*	LC	No
Malvaceae	*Hermannia modesta*	LC	No
Meliaceae	*Melia azedarach*	NE	
Ochnaceae	*Ochna pulchra*	LC	No
Olacaceae	*Ximenia americana*	LC	No

Poaceae	*Aristida stipitata*	LC	No
Poaceae	*Cynodon dactylon*	LC	No
Poaceae	*Enneapogon cenchroides*	LC	No
Poaceae	*Eragrostis lehmanniana*	LC	No
Poaceae	*Panicum maximum*	LC	No
Poaceae	*Schmidtia pappophoroides*		No
Poaceae	*Aristida congesta*	LC	No
Poaceae	*Eragrostis rigidior*	LC	No
Poaceae	*Stipagrostis uniplumis*	LC	No
Poaceae	*Melinis nerviglumis*	LC	No
Poaceae	*Eragrostis rotifer*	LC	No
Poaceae	*Digitaria eriantha*	LC	No
Poaceae	*Chloris roxburghiana*	LC	No
Rhamnaceae	*Ziziphus mucronata*		
Ruscaceae	*Sansevieria aethiopica*	LC	
Sterculiaceae	*Sterculia rogersii*	LC	No
Tiliaceae	*Corchorus asplenifolius*	LC	No
Zygophyllaceae	*Balanites pedicellaris*	LC	

Figure 4-11 Photographs illustrating some of the flora recorded within the assessment area. A) Blepharis subvolubilis B) Geigeria acaulis, C) Colophospermum mopane and D) Adenium multiflorum (Provincially Protected).

4.3.1.2 Invasive Alien Plants

Invasive Alien Plants (IAPs) tend to dominate or replace indigenous flora, thereby transforming the structure, composition and functioning of ecosystems. Therefore, 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 on the 24th of February 2021. The legislation calls for the removal and / or control of IAP species (Category 1 species). In addition, unless authorised thereto in terms of the 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.

No NEMBA IAP species were recorded within the project area.

4.3.1.3 Protected Trees

During the field assessment 3 species of protected trees were observed: *Boscia albitrunca* (Shepard's tree), *Adansonia digitata* (Baobab), and *Sclerocarya birrea subsp. caffra* (Marula). 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 trees recorded in the project area can be seen in Figure 4-12. The information only provides an overview of the protected trees recorded on site and is not a representation of all the specimens present. It is of vital importance that a search a rescue along with permit applications be done prior to the commencement of the development. The density of the trees is regarded a very high especially in the case of *B. albitrunca*.

Limpopo Environmental Management Act (LEMA) (Act no 7 of 2003)

The LEMA provides for the consolidation and amendment of the environmental management legislation of, or assigned to the Province, and to provide for matters incidental thereto. In particular, Schedule 11 (Specially protected plants) and Schedule 12 (Protected plants) have relevance to this section. The species *Adansonia digitata* and *Adenium multiflorum* were found within the project area and is considered to be protected plants under Schedule 12 of LEMA.

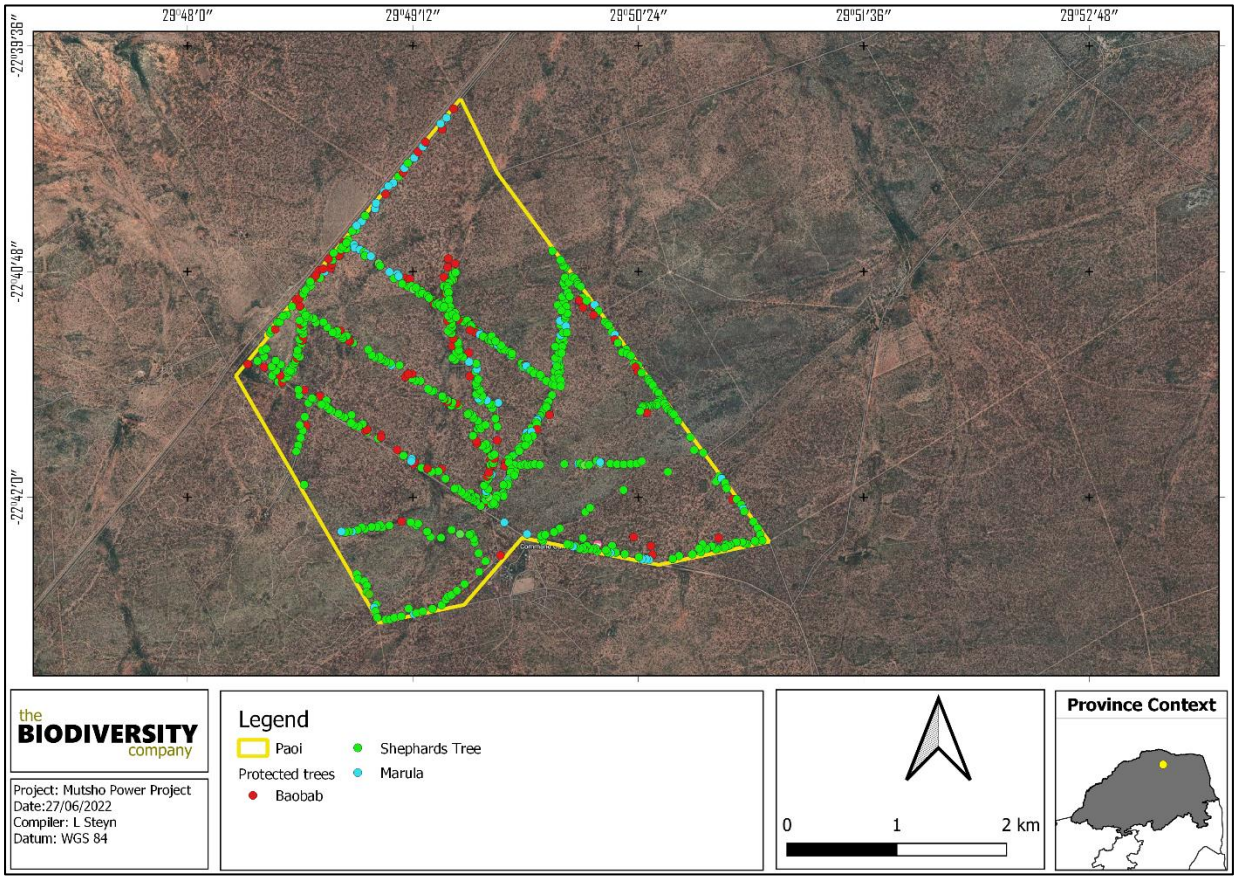


Figure 4-12 Location of protected flora species.

Figure 4-13 Examples of the protected trees recorded in the project area: A) Boscia albitrunca (Shepard's tree), B) Adansonia digitata (Baobab), and C) Sclerocarya birrea subsp. caffra (Marula).

4.3.2 Faunal Assessment

Herpetofauna and mammal observations and recordings fall under this section.

4.3.2.1 Amphibians and Reptiles

Three species of reptiles were recorded in the project area during survey period (Table 4-7). However, there is the possibility of at least several species being present, as certain reptile species are secretive and longer-term surveys are required in order to ensure adequate sampling. No amphibian species were recorded during the survey period (Table 4-7) (Figure 4-14). None of the herpetofauna species recorded are regarded as threatened.

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

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Acanthocercus atricollis	Southern Tree Agama	LC	LC
Agama armata	Northern Ground Agama	LC	Unlisted
Stigmochelys pardalis	Leopard Tortoise	LC	LC

Figure 4-14 Photographs illustrating one of the reptile species recorded within the assessment area. Leopard Tortoise (Stigmochelys pardalis)

4.3.2.2 Mammals

Thirteen (13) mammal species were observed during the survey of the project area (Table 4-8) based on either direct observation or the presence of visual tracks and signs (Figure 4-15). None of the species recorded are regarded as SCC.

Table 4-8 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
Chlorocebus pygerythrus	Vervet Monkey	LC	LC
Cynictis penicillata	Yellow Mongoose	LC	LC
Genetta genetta	Small-spotted Genet	LC	LC
Herpestes sanguineus	Slender Mongoose	LC	LC
Hystrix africaeaustralis	Cape Porcupine	LC	LC
Lepus saxatilis	Scrub Hare	LC	LC
Mungos mungo	Banded Mongoose	LC	LC
Papio ursinus	Chacma Baboon	LC	LC
Paraxerus cepapi	Tree Squirrel	LC	LC
Phacochoerus africanus	Common Warthog	LC	LC
Raphicerus campestris	Steenbok	LC	LC
Tragelaphus strepsiceros	Greater Kudu	LC	LC

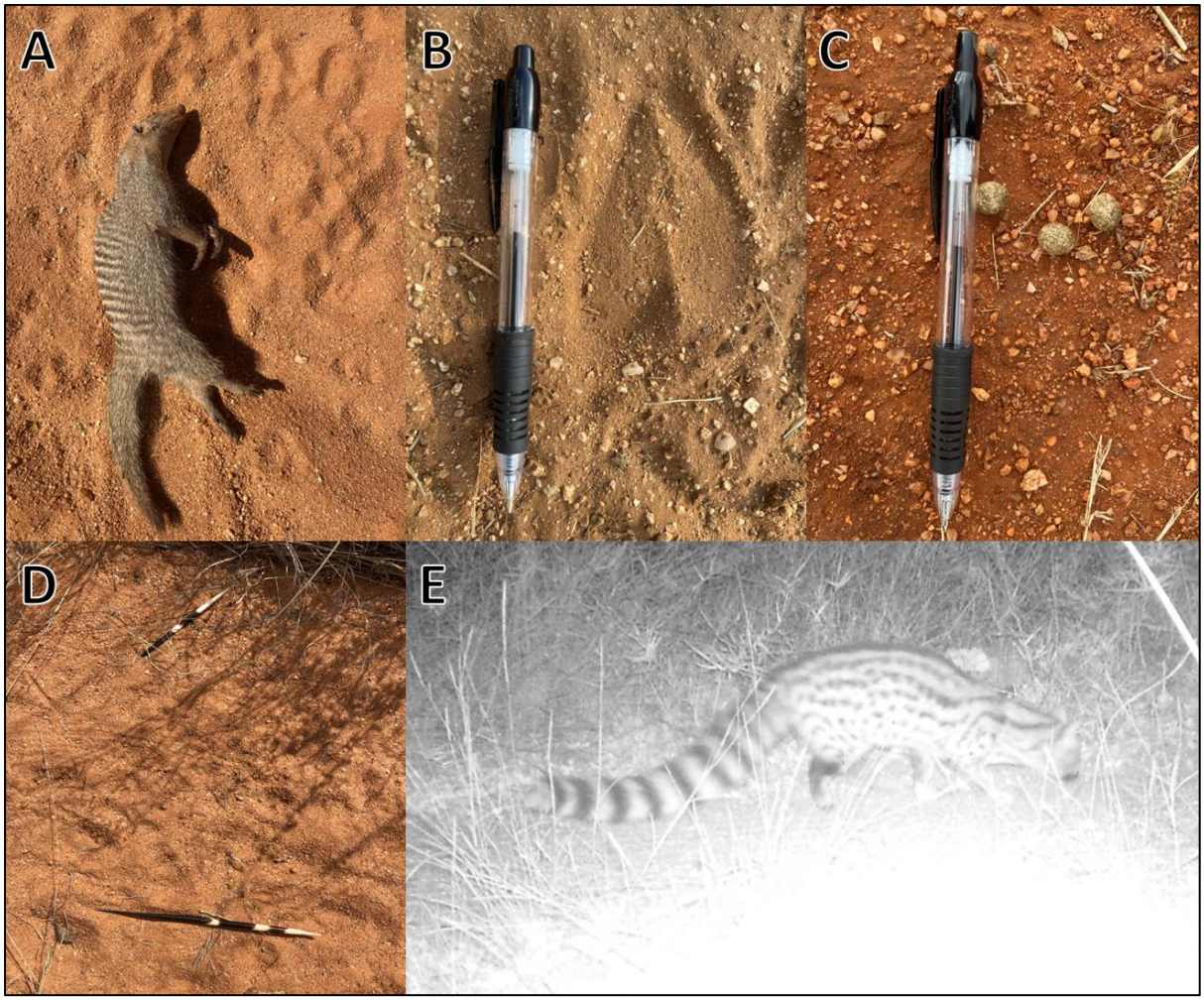


Figure 4-15 Photographs illustrating some of the mammal species recorded within the assessment area. A) Banded Mongoose, B) Greater Kudu Tracks, C) Shrub Hare droppings, D) Cape Porcupine quills and D) Small spotted Genet

5 Wetland Assessment

5.1 Findings

Digby Wells Environmental (2018) completed a freshwater (riverine and wetland) assessment for the project area. The assessment reported that all riverine sampling sites were 'dry' during the sampling period. Regarding the wetland component, no pans were recorded withing the project area, but a network of ephemeral drainage lines that cannot be defined as wetland or riparian resources were delineated.

The slope percentage of the project area has been calculated and is illustrated in Figure 5-1. Most of the project area is characterised by a slope percentage between 0 and 10%, with some smaller patches within the project area characterised by a slope percentage in excess of 12%. This illustration indicates a uniform topography with a relatively 'flat' landscape. The DEM of the project area (Figure 5-2) indicates an elevation of 694 to 748 Metres Above Sea Level (MASL), sloping in a northerly direction.

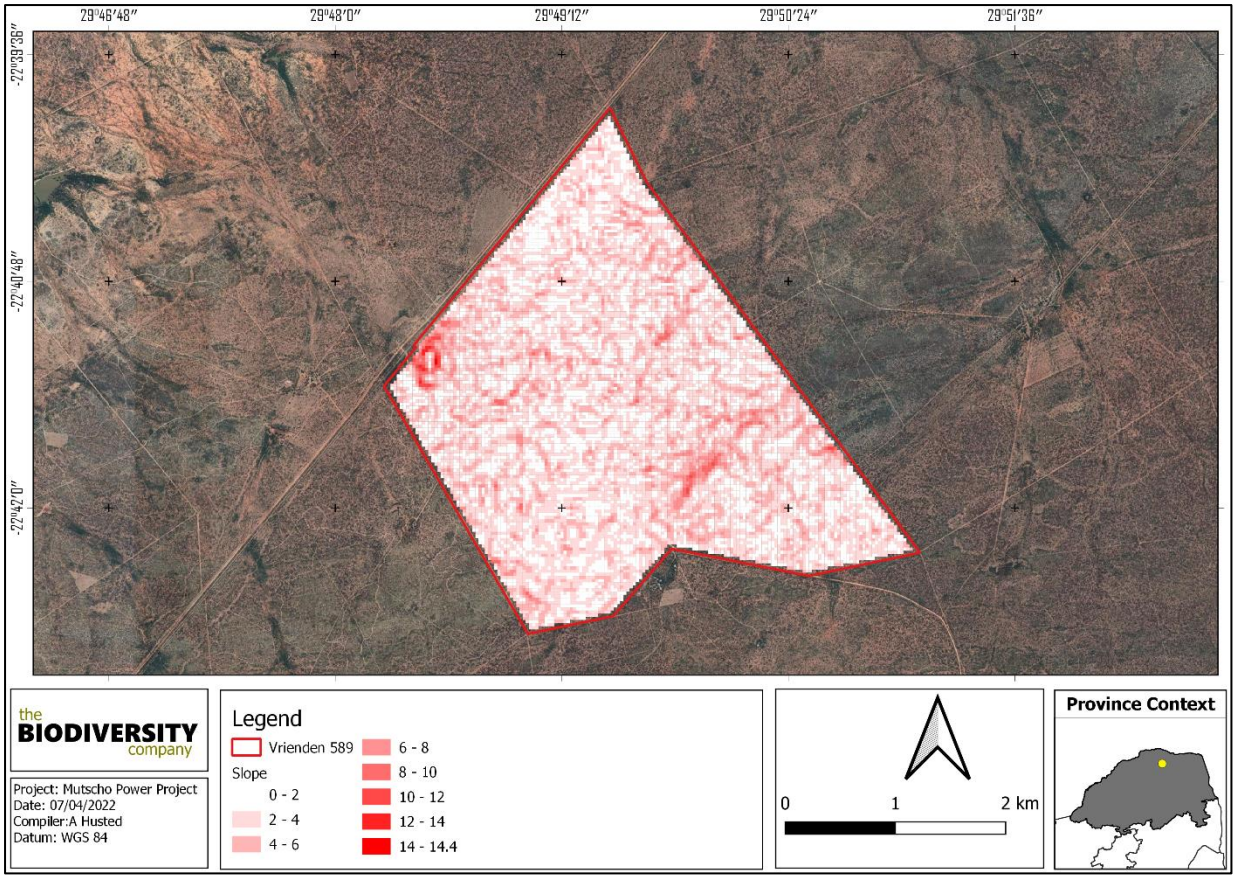


Figure 5-1 The slope percentage calculated for the project area

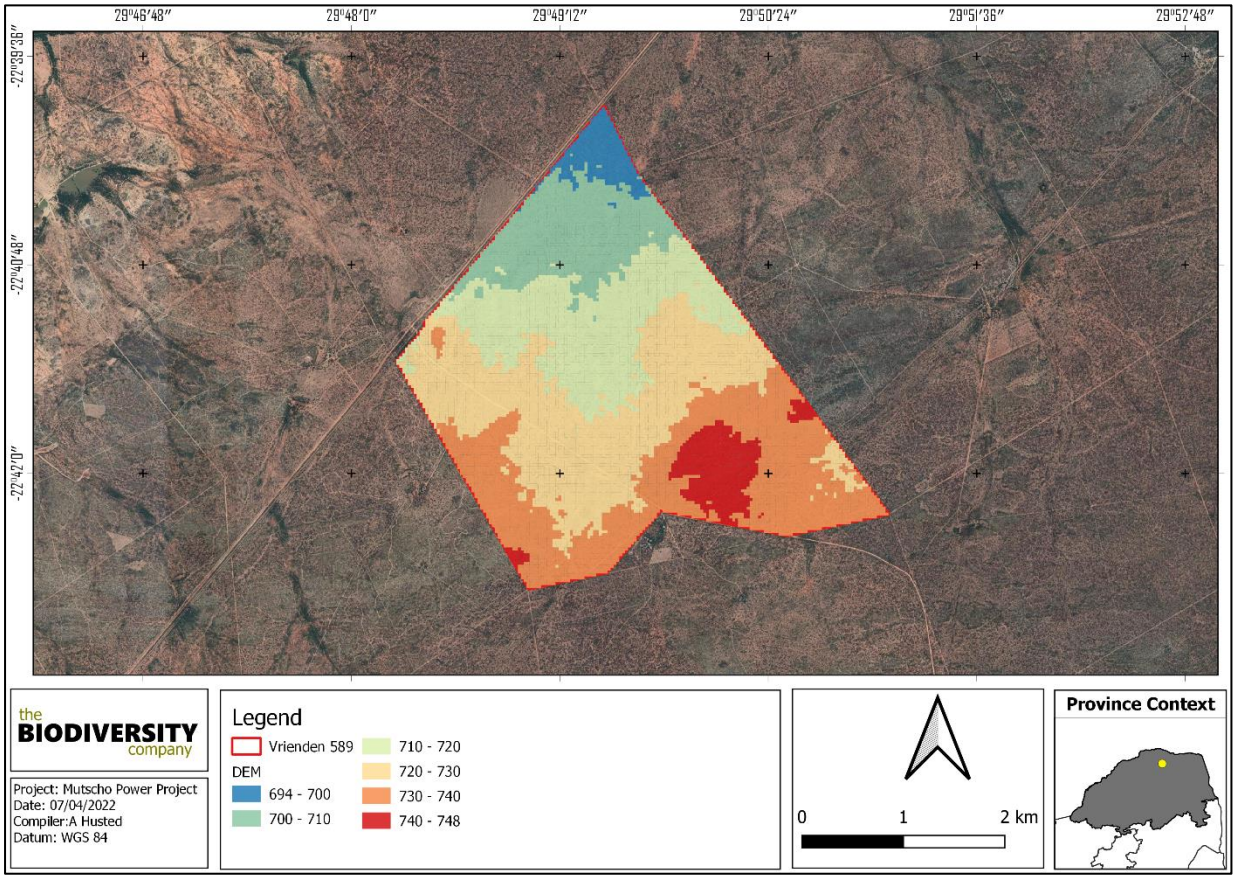


Figure 5-2 The DEM generated for the project area

Freshwater systems were delineated in accordance with the DWAF (2005) guidelines. Based on a combination of desktop and in-field delineation, one (1) form of a watercourse was identified and delineated within the regulated area applied, namely ephemeral drainage lines/ features (Figure 5-3). Due to the relatively 'flat' topography for the project area, with most of the project area characterised by a slope percentage between 0 and 10%, digital mapping was completed identify watercourse for the area.

The drainage lines are classified as a river HGM type system (Table 5-1). The drainage lines are not characterised by riparian vegetation and grasses, these systems represent bare surfaces with evidence of surface run-off. The network of drainage features identified within the project area are presented in Figure 5-3. Photographs of the identified features are presented in Figure 5-4.

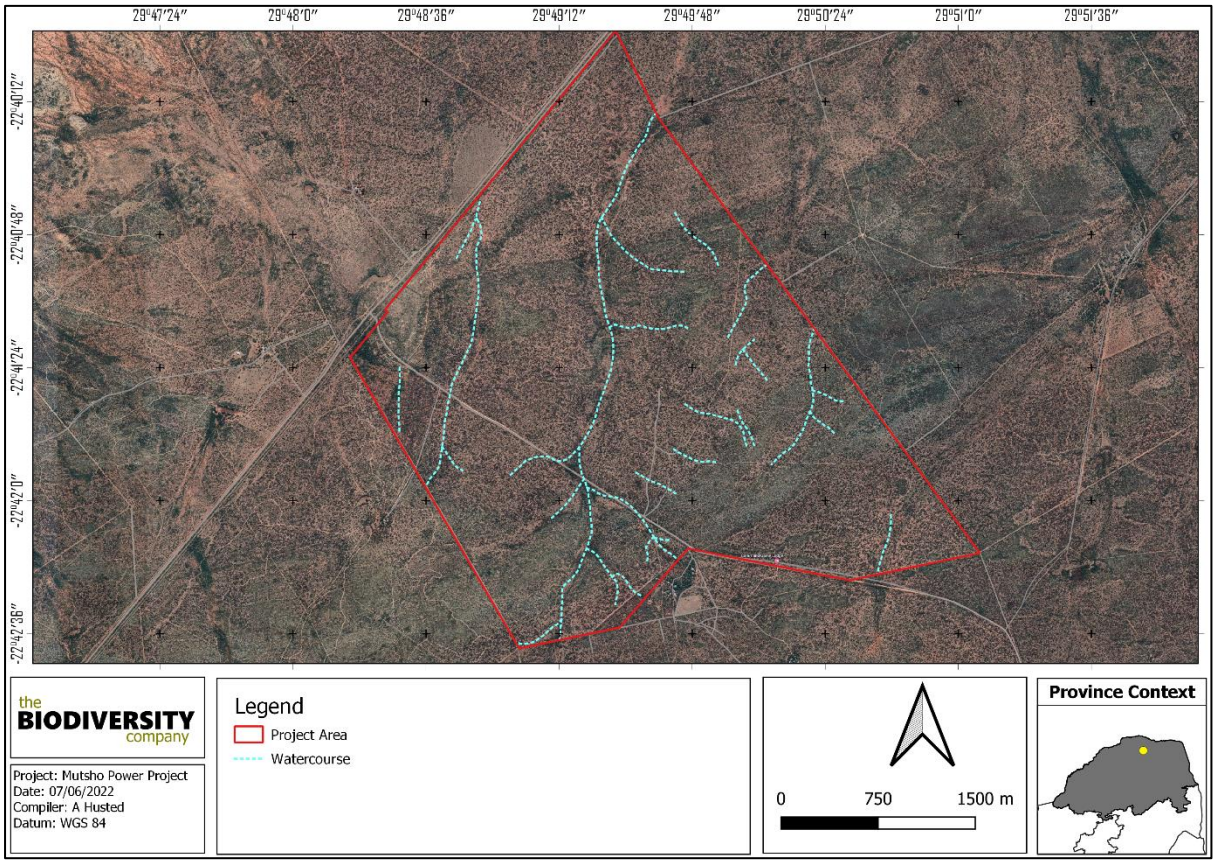


Figure 5-3 The delineated watercourses for the project area

The level 1-4 classification of the HGM units as per the national classification system (Ollis *et al*., 2013) is presented in Table 5-1. The systems were classified as Inland Systems falling within the Namaqua Highlands Aquatic Ecoregion.

Table 5-1 Characterization of the watercourse for the project according to the Classification System (Ollis et al., 2013)

System	Level 3: Landscape unit	Level 4: Hydrogeomorphic Unit HGM Type
Drainage features	**Valley floor: The base of a valley, situated between two distinct valley side-slopes.**	River: a linear landform with clearly discernible bed and banks, which periodically carries a concentrated flow of water.

Figure 5-4 Photographs of drainage lines identified within the project area

5.2 Buffer Delineation

To determine a "site specific" buffer zone for the proposed activity the "Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries" (Macfarlane, et al., 2014) was used during this assessment.

The buffer guideline of Macfarlane et al. (2014) enables the user to take into account the level of assessment as well as the proposed development and then generate a preliminary threat rating and buffer. In order to improve the buffer to be more site specific the tool enables the user to describe the sensitivity of the system, the site-based modifiers and whether there is any species of conservation concern. Furthermore, it enables the application of additional mitigation measures before determining the outcome of the buffer model.

The recommended buffer was calculated to be 15 m for the drainage lines (Table 5-2), for the construction and operational phases.

Table 5-2 Post-mitigation buffer requirement

Required Buffer after mitigation measures have been applied	
Phase	**Drainage Line**
Construction Phase	**15 m**
Operational Phase	**15 m**

5.3 Zone of Regulation

The proximity of certain proposed activities to these watercourses may trigger specific zones of applicability as per the 2017 amended Environmental Impact Assessment Regulations Listing Notices, published in terms of the National Environmental Management Act, No. 107 of 1998. Additionally, certain water uses are likely to be triggered as per the National Water Act, No. 36 of 1998. Refer to Table 5-3 for an overview of the possible zones of applicability as related to the relevant Listing Notice and/or water use activities. Figure 5-5 presents the extent of the regulatory zones in relation to the delineated watercourses.

Note: This table should not be seen as an all-inclusive list of applicable regulated activities in terms of the National Environmental Management Act, No. 107 of 1998, or the National Water Act, No. 36 of 1998. It is meant to serve as a guideline only.

Table 5-3 Possible zones of applicability as per relevant national legislation authorisation requirements

Regulatory Authorisation	Possible Zone of Applicability
Activity 19 of Listing Notice 1, GN 327 of *Gazette* 40772 of 7 April 2017 (In terms of the National Environmental Management Act, No. 107 of 1998).	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles, or rock of more than 10 cubic metres from a watercourse.
Activity 14 of Listing Notice 3, GN 324 of *Gazette* 40772 of 7 April 2017 (In terms of the National Environmental Management Act, No. 107 of 1998).	The development of – (iii) Bridges exceeding 10 square metres in size; (x) buildings exceeding 10 square metres in size; (xii) infrastructure or structures with a physical footprint of 10 square metres or more. Where such development occurs - (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse.
Water Use License Application in terms of the National Water Act, No. 36 of 1998. Note: Regulated area as defined in GN 509 of *Gazette* 40229 of 26 August 2016.	Where a water use is defined as: 21. (c) impeding or diverting the flow of water in a watercourse; (i) altering the bed, banks, course or characteristics of a watercourse. The regulated area of a watercourse in terms of water uses as listed in Section 21(c) and 21(i) is defined as: • The outer edge of the 1 in 100 year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam; • In the absence of a determined 1 in 100 year flood line or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or • A 500m radius from the delineated boundary (extent) of any wetland or pan in terms of this regulation.

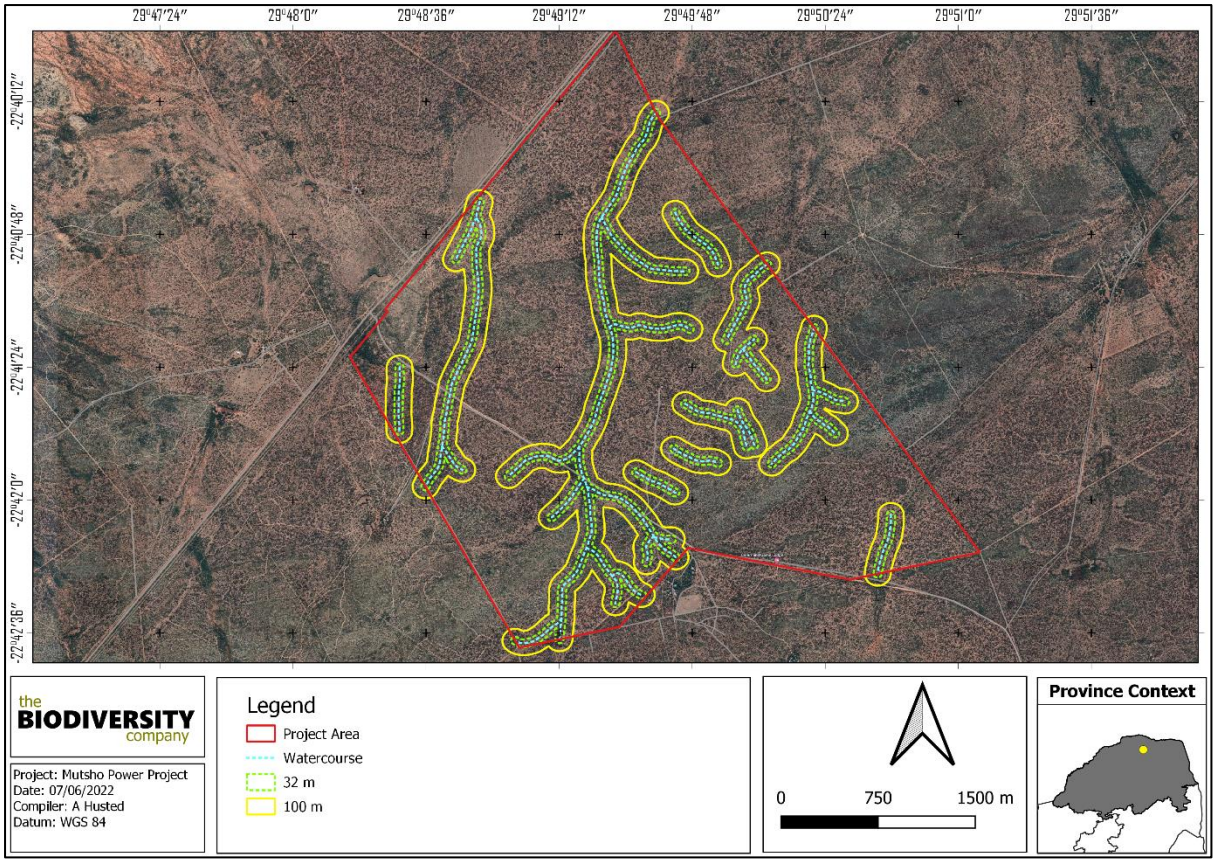


Figure 5-5 The zones of regulation in relation to the watercourses

6 Habitat Assessment and Site Ecological Importance

6.1 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 6-1. 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.

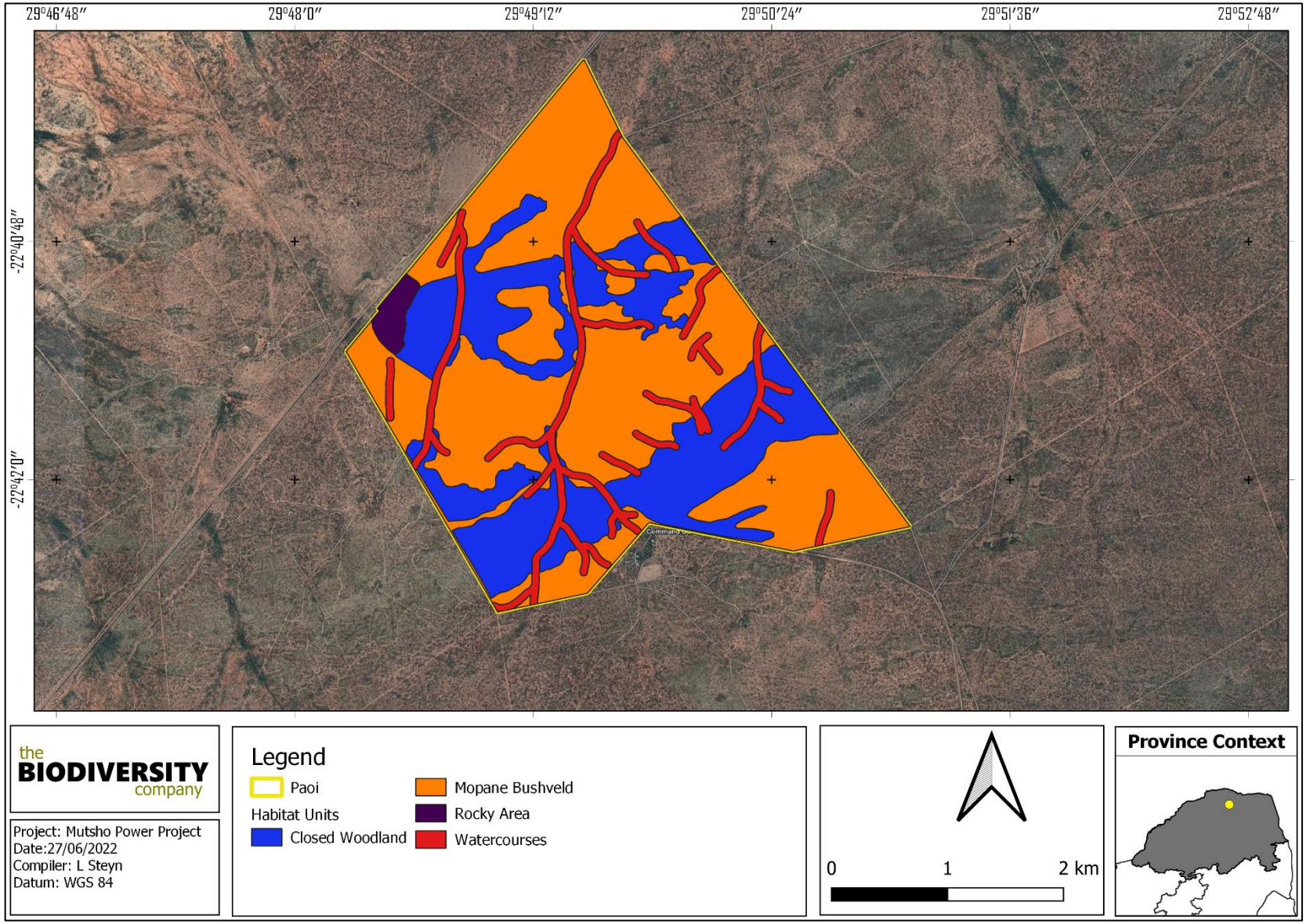


Figure 6-1 Habitats identified in the project area.

6.1.1 Closed Woodland

The Closed Woodland habitat was found to traverse the northern and southern portions of the project area. This habitat unit is characterised by typical woodland species forming a dense woody canopy on sandy soils (Figure 6-2 and Figure 6-3). Dominant woody species found along this habitat unit included *Combretum apiculatum*, *Grewia flavescens, Vachellia tortilis, Terminalia prunioides, Boscia albitrunca, Senegalia nigrescens Adansonia digitata, Sclerocarya birrea* and various *Commiphora* species. The herbaceous layer varied between portions of this habitat unit, with some areas comprising of a sparse or dense layer of grass species such as *Eragrostis lehmanniana, Aristida congesta*, and *Stipagrostis uniplumis* and herb species such as *Blepharis subvolubilis*, *Geigeria acaulis* and *Evolvulus alsinoides*. The closed woodland habitat found along the western cluster were more disturbed than that found in the eastern cluster. This is predominantly due to the fact that this area along the western cluster is currently used for grazing purposes ultimately rendering the area susceptible to degradation. Three protected tree species were found long this habitat unit and included *Boscia albitrunca* (Shepard's tree), *Adansonia digitata* (Baobab), and *Sclerocarya birrea subsp. caffra* (Marula).

Generally, this habitat unit has moderate ecological function attributed to floral communities, including the protected species. A condition gradient is, however, present in this habitat with some areas being exposed to more disturbance than others, this gradient is dependent on the level of overgrazing.

This habitat unit can thus be regarded as important, not only within the local landscape, but also regionally. The unit functions as remaining greenlands which supports viable plant species populations as well as protected trees. The unit also serves as a movement corridor for fauna; and is used for foraging. The habitat sensitivity of the Closed Woodland is regarded as high, due to the role of this intact habitat to biodiversity within the area and the provision of habitat to several protected species.

Figure 6-2 Examples of Closed woodland habitat from the project area

Figure 6-3 Examples of Closed woodland habitat from the project area

6.1.2 Rocky Area

The rocky area can be found along the north-western portion of the project area. This area is typically characterised by a quartzite substrate and a topographical difference from other areas (Figure 6-4). From a vegetation perspective the area does not present a prominent difference from adjacent woodland communities with dominant large woody species such *Boscia albitrunca*, *Sclerocarya birrea and Commiphora glandulos being present.*

Generally, this habitat unit has moderate ecological function attributed to floral communities, including the protected species. Despite this habitat comprising similar woody species as adjacent areas, it does provide a unique landscape which can be regarded as important within the local landscape as well as regionally. The unit supports viable plant species populations as well as protected trees and forms part of a unique limited habitat within the area in term of the faunal component by providing refugia, especially for the small mammal and reptile species. The habitat sensitivity of the rocky area is regarded as high, due to the role of this intact habitat to biodiversity within the area and the provision of atypical habitat.

Figure 6-4 Example of rocky habitat from the project area.

6.1.3 Mopane Bushveld

The mopane bushveld can be found along the majority of the project area. The vegetation component was dominated by *Colophospermum mopane* which is typical for this vegetation type, and most species from the Fabacea families were recorded throughout. The herbaceous layer varied between portions of the habitat unit, with the majority of the areas comprising a spare layer of herbs and grasses. The mopane bushveld found along the western cluster were more disturbed than that found in the eastern cluster (Figure 6-5 and Figure 6-6). This is predominantly due to the fact that the area along the western cluster is currently used for grazing purposes ultimately rendering the area susceptible to degradation. Three protected tree species were found long this habitat unit and included *Boscia albitrunca* (Shepard's tree), *Adansonia digitata* (Baobab), and *Sclerocarya birrea subsp. caffra* (Marula).

Generally, this habitat unit has moderate ecological function attributed to floral communities, including the protected species. A condition gradient is, however, present in this habitat with some areas being exposed to more disturbance than others, this gradient is dependent on the level of overgrazing.

This habitat unit can thus be regarded as important, not only within the local landscape, but also regionally. The unit functions as remaining green lands which supports viable plant species populations as well as protected trees. Due to the homogenous nature of this habitat unit and the lower species diversity as well as the variation in condition of the areas the mopane bushveld habitat is regarded as having a medium sensitivity.

Figure 6-5 Example of Mopane Bushveld from the project area (Western Cluster).

Figure 6-6 Example of Mopane Bushveld from the project area (Eastern Cluster).

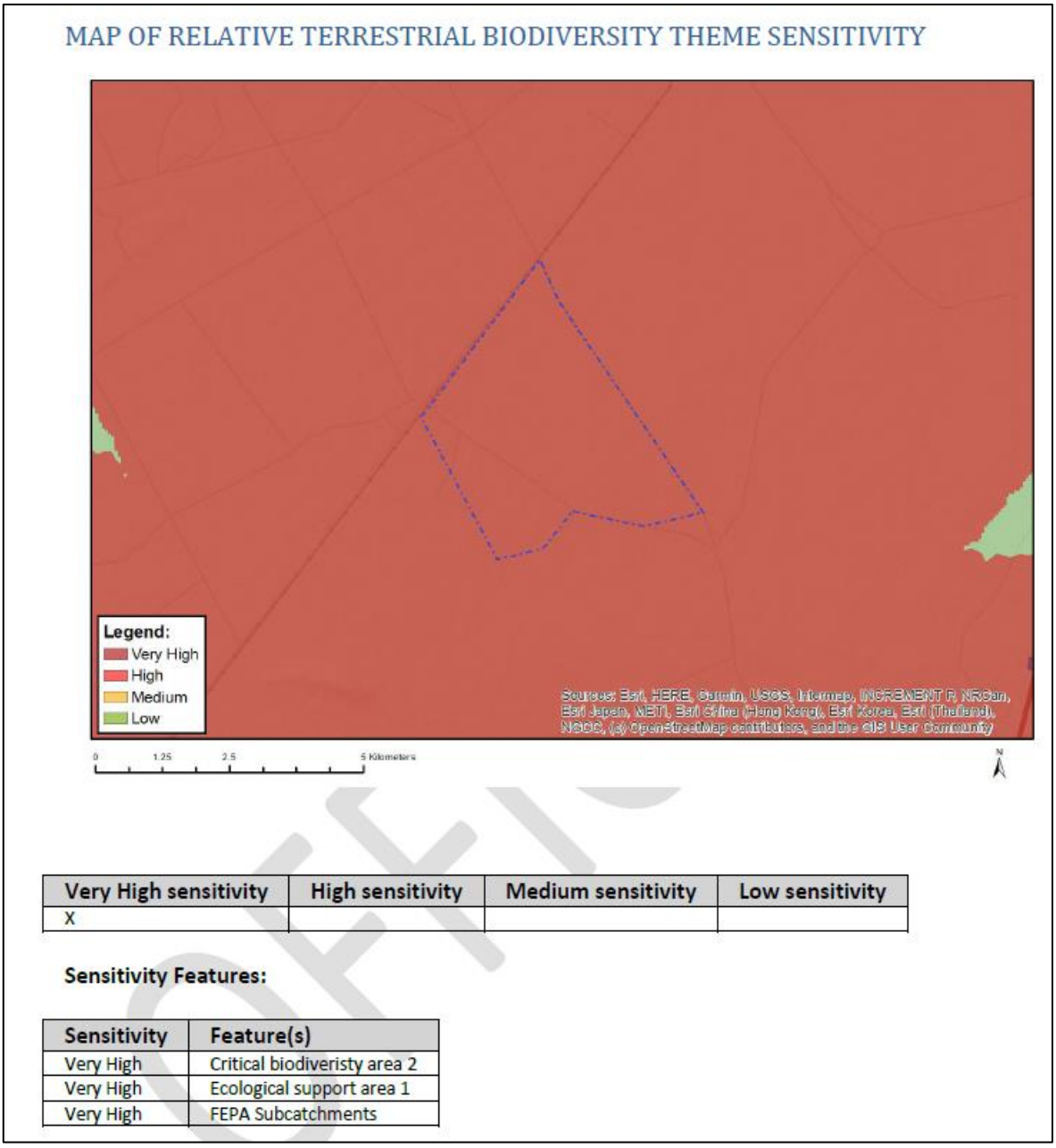
6.1.4 Watercourses

This habitat unit represents the watercourses fund along the project area. These habitats are represented in the wetland section. Even though disturbed, the ecological integrity, importance and functioning of these areas play a crucial role as a water resource system and an important habitat for various fauna and flora (Figure 6-7). The preservation of this system is the most important aspect to consider for the proposed development. This habitat needs to be protected and improved due to the role of this habitat as a water resource.

Figure 6-7 Examples of watercourses from the project area.

6.2 Site Ecological Importance

The biodiversity theme sensitivity, as indicated in the screening report, was derived to be “Very High”, (Figure 6-8) while the fauna sensitivity was rated as ‘Medium’. The very high sensitivity for the biodiversity theme was based on the presence of a CBA 2, an ESA 1 and FEPA Sub-catchments. The plant sensitivity was derived to be “Low”.



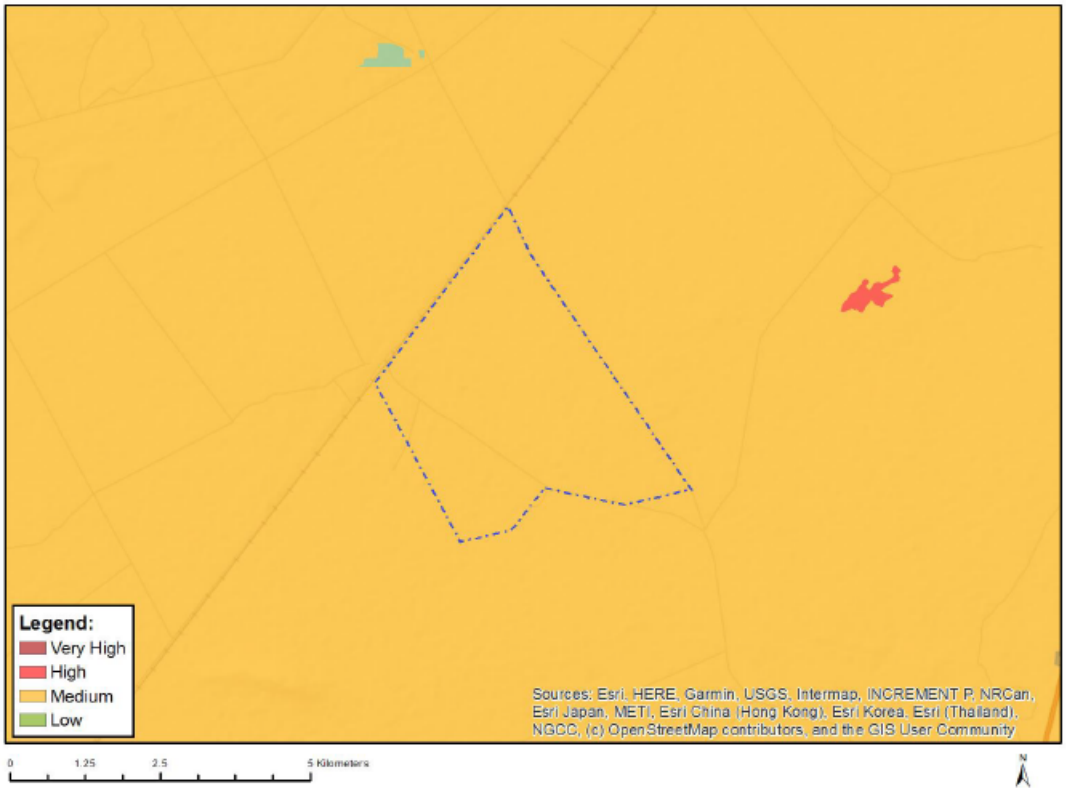
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Very High	Critical biodiveristy area 2
Very High	Ecological support area 1
Very High	FEPA Subcatchments

Figure 6-8 Terrestrial Biodiversity Theme Sensitivity, National Web based Environmental Screening Tool.

MAP OF RELATIVE ANIMAL SPECIES THEME SENSITIVITY



Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

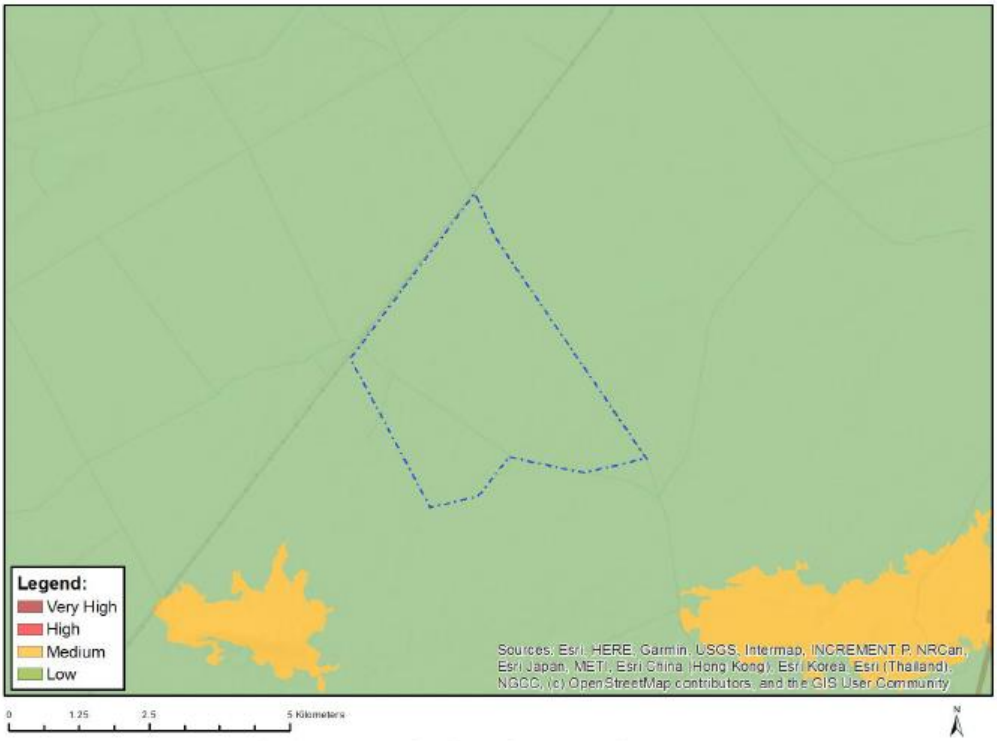
Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity Features:

Sensitivity	Feature(s)
Medium	Invertebrate-Thoracistus viridicrus
Medium	Aves-Terathopius ecaudatus
Medium	Mammalia-Dasymys robertsii
Medium	Mammalia-Lycaon pictus

Figure 6-9 Fauna Theme Sensitivity, National Web based Environmental Screening Tool.

MAP OF RELATIVE PLANT SPECIES THEME SENSITIVITY



Where only a sensitive plant unique number or sensitive animal unique number is provided in the screening report and an assessment is required, the environmental assessment practitioner (EAP) or specialist is required to email SANBI at eiadatarequests@sanbi.org.za listing all sensitive species with their unique identifiers for which information is required. The name has been withheld as the species may be prone to illegal harvesting and must be protected. SANBI will release the actual species name after the details of the EAP or specialist have been documented.

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity

Figure 6-10 Plant Species Theme Sensitivity, National Web based Environmental Screening Tool.

The location and extent of these habitats are illustrated in Figure 6-1. Based on the criteria provided in Section 3.4 of this report, all habitats within the assessment area of the proposed project were allocated a sensitivity category (Table 6-1). The sensitivities of the habitat types delineated are illustrated in Figure 6-11 and Figure 6-12.

'High Sensitivity' areas are due to the following and the guidelines can be seen in Table 6-2:

- Unique, sensitive water resources and low resilience habitats.

Table 6-1 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
Wetlands	Medium	Medium	Medium	Low	High
Closed Woodland	High	Medium	Medium	Low	High
Rocky Area	Medium	High	Medium	Low	High
Mopane Bushveld	Medium	Medium	Medium	Medium	Medium

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

Site Ecological Importance	Interpretation in relation to proposed development activities
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.

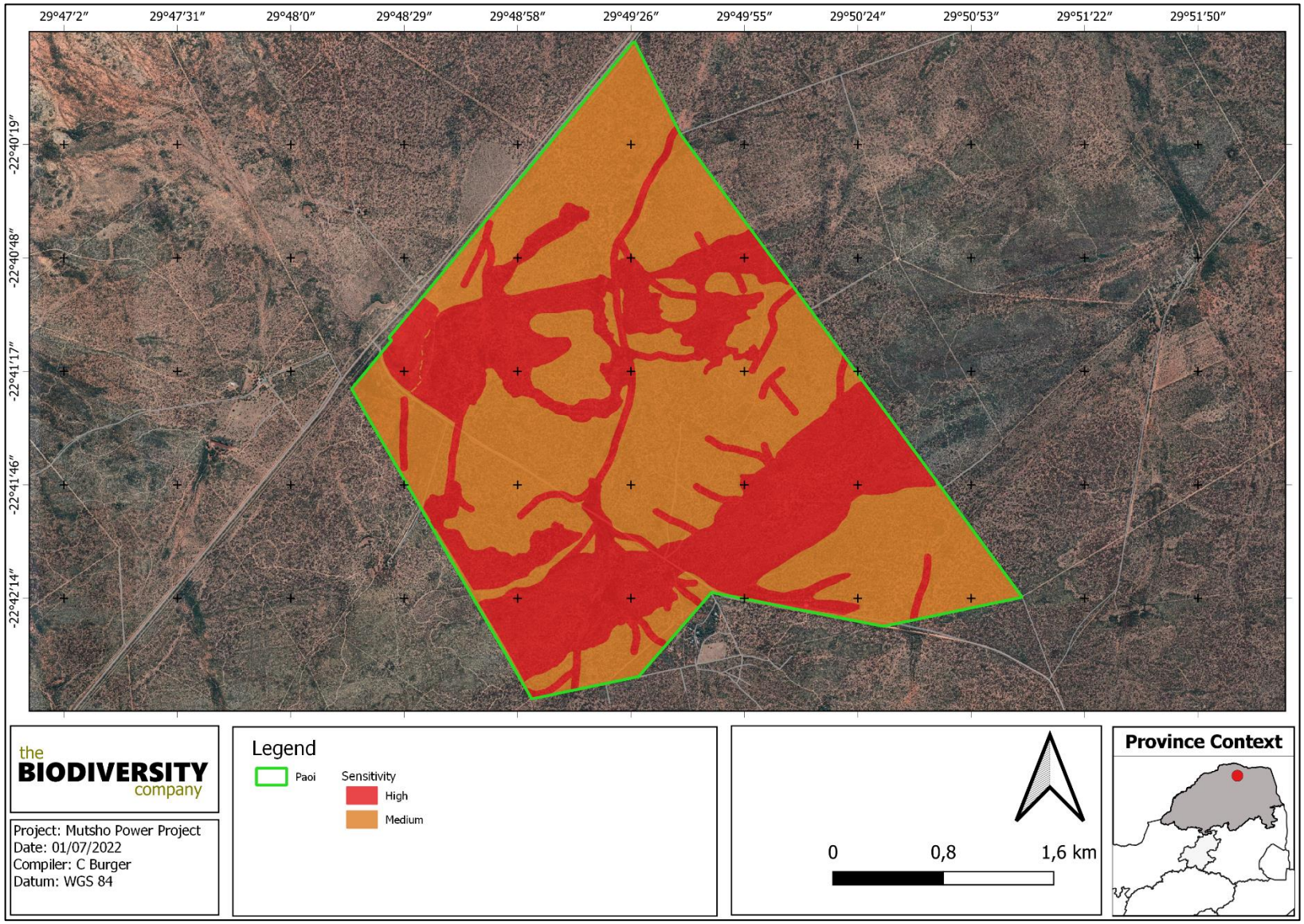


Figure 6-11 Sensitivity of the project area

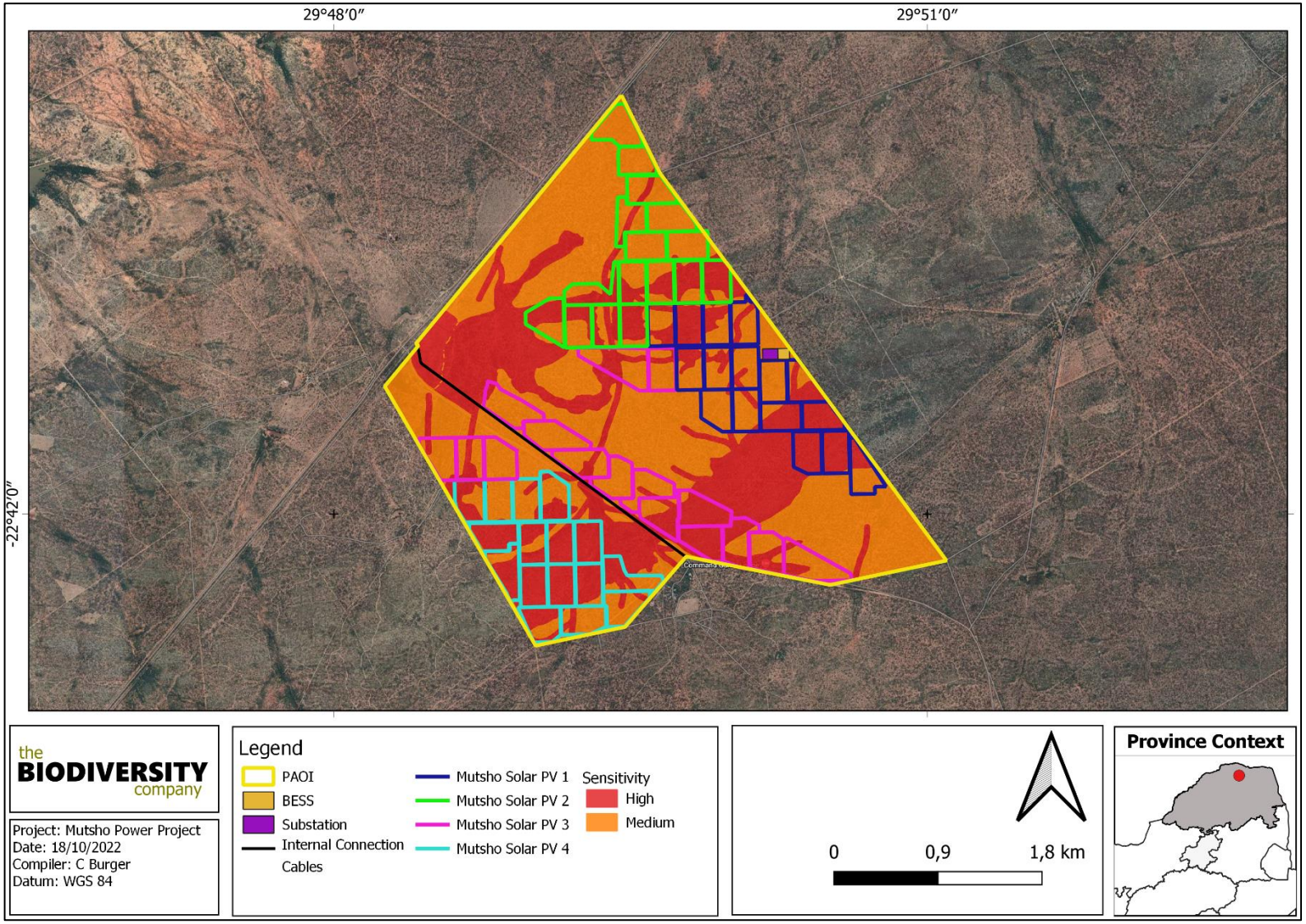


Figure 6-12 Sensitivities in relation to the project layout

7 Impact Risk Assessment

The section below and associated tables serve to indicate and summarise the significance of perceived impacts on the terrestrial ecology of the project area. Potential impacts were evaluated against the data captured during the desktop and field assessment to identify relevance to the project area. The relevant impacts associated with the proposed construction of the development were then subjected to a prescribed impact assessment methodology which was provided by Savannah Environmental and is available on request.

7.1 Biodiversity Risk Assessment

7.1.1 Present Impacts to Biodiversity

Considering the anthropogenic activities and influences within the landscape, several negative impacts to biodiversity were observed within the project area (Figure 7-1). These include:

- Multiple high voltage powerlines;
- Grazing and trampling of natural vegetation by livestock;
- Farm roads and main roads (and associated traffic and wildlife road mortalities);
- Railway track just outside the footprint; and
- Fences.

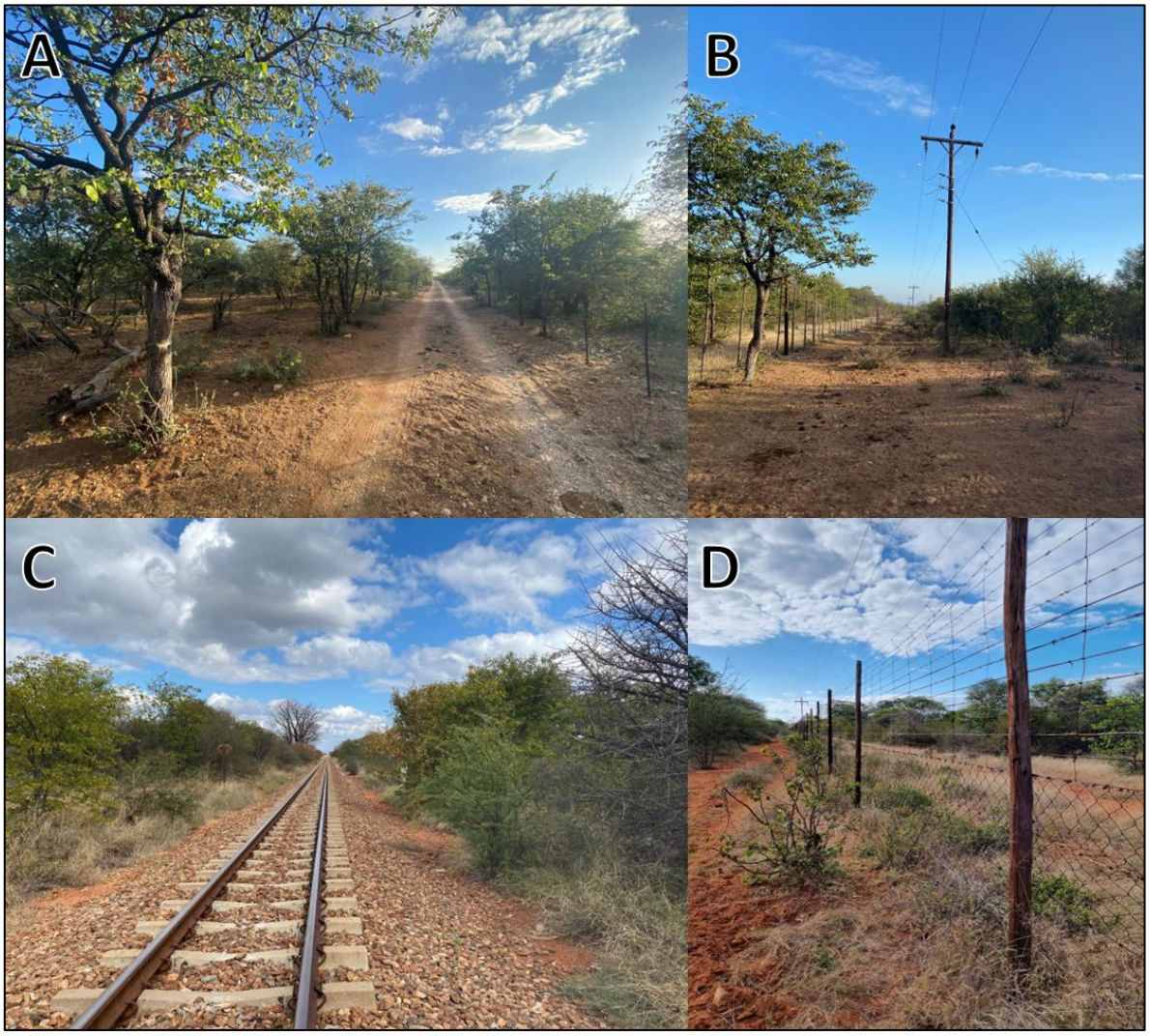


Figure 7-1 ***Some of the identified impacts within the project area; A) Fences and roads, B) Powerline, C) Railway Track, D) Fences.***

7.1.2 Terrestrial Impact Assessment

This section describes the potential impacts on flora, mammals and herpetofauna associated with the construction and operational phases of the proposed development and and is only relevant to the PV site and associated infrastructure and does not consider the powerline grid system. The impact section also takes into account the sensitivities and SCCs recorded in the Bathusi Environmental Consulting (2018) report, as this survey was conducted over a longer period of time and in the summer season.

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 and wildlife movement corridors such as rivers, streams and drainage lines, or other locally important features. The removal of natural vegetation may reduce the habitat available for fauna species and may reduce animal populations and species compositions within the area.

7.1.3 Alternatives Considered

No alternatives were provided for the development.

7.1.4 Loss of Irreplaceable Resources

- Watercourse resources may be lost;
- ESA1 areas may be lost; and
- Loss of protected trees as well as provincially protected flora species.

7.1.5 Anticipated Impacts

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

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

Main Impact	Project activities 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 species	
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	Increase in rodent populations and associated disease risk
	Pollution of water resources due to dust effects, chemical spills, etc.	
	Loss of nesting/burrowing sites	
	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

7.1.6 Unplanned Events

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

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

Table 7-2 Summary of unplanned events for terrestrial biodiversity

Unplanned Event	Potential Impact	Mitigation
Spills into the surrounding environment	Contamination of habitat as well as water resources associated with a spillage.	A spill response kit must be available at all times. The incident must be reported on and if necessary, a biodiversity specialist must investigate the extent of the impact and provide rehabilitation recommendations.
Fire	Uncontrolled/unmanaged fire that spreads to the surrounding natural Bushveld and ridge.	An appropriate/adequate fire management plan needs to be implemented.

Erosion caused by water runoff from the surface	Erosion on the side of the road	Storm water management plan must be compiled and implemented.

7.1.7 Identification of Additional Potential Impacts

7.1.7.1 Assessment of Impact Significance

The assessment of impact significance considers pre-mitigation as well as the implementation of post-mitigation scenarios. Additional mitigations can be seen in section 7.1.8.

7.1.7.2 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. The construction of the associated infrastructure and the PV site has been assessed collectively as their impacts overlap. The construction 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:

- Destruction, further loss and fragmentation of habitats (including watercourses), ecosystems and vegetation community (Table 7-3),
- Introduction of alien species, especially plants (Table 7-4);
- Destruction of protected plant species (Table 7-5); and
- Displacement of the faunal community due to habitat loss, direct mortalities and disturbance (road collisions, noise, dust, vibration and poaching) (Table 7-6).

Table 7-3 Construction Phase Impacts: Loss of vegetation within the development footprint

Impact Nature: Loss of vegetation within the development footprint		
Destruction, further loss and fragmentation of the habitats, ecosystems and vegetation community, including protected species.		
	Without mitigation	**With mitigation**
Extent	Regional (4)	Local Area (3)
Duration	Permanent (5)	Long term (4)
Magnitude	Very High (10)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**High (76)**	**Medium (52)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes, although this impact cannot be well mitigated as the loss of vegetation is unavoidable.	
Mitigation:		
• Limiting the impact area and construction activities to the proposed footprint area and the associated infrastructure servitude only. • Existing roads/servitudes should be considered first option over the construction of new roads/servitudes and must only be made where necessary • Minimise the extent of vegetation clearing for the infrastructure. Areas to be cleared must be clearly/visibly demarcated to avoid unnecessary clearing. • Fire management plan must be in place for the areas surrounding the project area and the road to restrict the impact from fire on the natural flora and fauna communities.		

• Progressive rehabilitation will enable topsoil to be returned more rapidly, thus ensuring more recruitment from the existing seedbank. Surplus rehabilitation material can be applied to other areas in need of stabilisation and vegetation cover.
Residual Impacts:
The loss of currently intact vegetation and destruction of protected tree species is an unavoidable consequence of the project and cannot be entirely mitigated. The disturbance may also cause some erosion and invasive alien plant encroachment. Movement corridors will be disrupted in the area.

Table 7-4 Construction Phase Impacts: Introduction of alien species, especially plants

Impact Nature: Introduction of alien species, especially plants		
Degradation and loss of surrounding natural vegetation arising from construction activities and dust precipitation		
	Without mitigation	**With mitigation**
Extent	Regional (4)	Local Area (3)
Duration	Long term (4)	Moderate (3)
Magnitude	High (8)	Moderate (6)
Probability	Highly probable (4)	Probable (3)
Significance	**High (64)**	**Medium (36)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
• Compile and implement an alien vegetation management plan from the onset of construction. The plan must identify areas for action (if any) and prescribe the necessary removal methods and frequencies to be applied. This plan must also prescribe a monitoring plan and be updated as/when new data is collated; • Remove organic waste from site weekly to prevent pest species from becoming a problem. A waste management plan must be compiled and implemented from the onset of the construction phase. The plan must designate collection areas, define the separation of waste and also prescribe removal measures and frequencies from the areas. This plan must be also prescribing a monitoring plan and be updated as/when new data is collated.		
Residual Impacts:		
Long-term broad scale IAP infestation if not mitigated.		

Table 7-5 Construction Phase Impacts: Destruction of protected plant species

Impact Nature: Destruction of protected plant species		
Loss of protected plant species, these are mainly provincially protected species		
	Without mitigation	**With mitigation**
Extent	Regional (4)	Local Area (3)
Duration	Permanent (5)	Permanent (5)
Magnitude	High (8)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**High (68)**	**Medium (56)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	The plant SCCs require a permit for destruction and/or relocation.	

Mitigation:

- A protected tree assessment must be completed prior to the commencement of the project;
- Any individual of the protected plants that are present needs a relocation or destruction permit in order for any individual to be removed or destroyed due to the development.
- High visibility flags must be placed near any protected plants in order to avoid any damage or destruction of the species. If left undisturbed the sensitivity and importance of these species needs to be part of the environmental awareness program.
- All protected plants should be relocated where possible.

Residual Impacts:

The loss of some of the protected species are unavoidable.

Table 7-6 Construction Phase Impacts: Displacement of faunal community due to habitat loss, direct mortalities and disturbance

Impact Nature: Displacement of faunal community due to habitat loss, direct mortalities and disturbance (including possible SCC)

Construction activity will likely lead to direct mortality of fauna due to earthworks, vehicle collisions, accidental hazardous chemical spills and persecution. Disturbance due to dust and noise pollution and vibration may disrupt behaviour.

	Without mitigation	With mitigation
Extent	Regional (4)	Local Area (3)
Duration	Long term (4)	Moderate (3)
Magnitude	High (8)	Moderate (6)
Probability	Highly probable (4)	Probable (3)
Significance	**High (64)**	**Medium (36)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, to some extent. Noise and disturbance cannot be well mitigated. Impacts on fauna due to human presence, such as vehicle collisions, poaching, and persecution can be mitigated.	

Mitigation:

- Signs must be put up stating that should any person be found poaching any species they will be fined.
- Construction must take place in the winter months as much is feasible.
- The areas to be developed must be specifically demarcated to prevent movement of staff or any individual into the surrounding environments, access to these areas must be controlled.
- Signs must be put up to enforce this.
- Speed limits must be implemented on all roads.
- Areas should be cleared and disturbed on a needs basis only, as opposed to clearing and disturbing a number of sites simultaneously.
- Any holes/deep excavations must done in a progressive manner on a needs basis only. No holes/excavations may be left open overnight. In the event holes/excavations are required to remain open overnight, these areas must be covered to prevent fauna falling into these areas.
- Where possible, work should be restricted to one area at a time and be systematic. This is to reduce the number and extent of on-site activities, allowing fauna to move off as the project progresses. This will give the smaller mammals and reptiles a chance to weather the disturbance in an undisturbed zone close to their natural territories.
- 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 SCC, their identification, conservation status and importance, biology, habitat requirements and management requirements the Environmental Authorisation and within the EMPr;
- Prior to vegetation clearing activities, the area to be cleared should be walked on foot by 1-2 individuals to create a disturbance in order for fauna to move off. Sites should be disturbed only prior to the area having to be cleared, not more than 1 day in advance.
- The timing between clearing of an area and subsequent development must be minimized to avoid fauna from re-entering the site to be disturbed.

Residual Impacts:

It is probable that some individuals of susceptible species will be lost to construction-related activities despite mitigation. However, this is not likely to impact the viability of the local population of any fauna species.

7.1.7.3 Operation Phase

It is anticipated that daily activities associated with the operation phase will lead to further spread the IAP, 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. Moving maintenance and mining vehicles do not only cause sensory disturbances to fauna, affecting their life cycles and movement, but will lead to direct mortalities due to collisions.

The following potential impacts were considered:

- Continued fragmentation and degradation of habitats and ecosystems (Table 7-7);
- Spread of alien and/or invasive species (Table 7-8); and
- Ongoing displacement and direct mortalities of faunal community (including SCC) due to disturbance (road collisions, collisions with substation, noise, light, dust, vibration) (Table 7-9).

Table 7-7 Operational phase impacts: Continued fragmentation and degradation of habitats and ecosystems

Impact Nature: Continued fragmentation and degradation of habitats and ecosystems		
Disturbance created during the construction phase will leave the project area vulnerable to erosion and IAP encroachment.		
	Without Mitigation	With Mitigation
Extent	Local Area (3)	Footprint & surrounding areas (2)
Duration	Permanent (5)	Moderate term (3)
Magnitude	High (8)	Moderate (6)
Probability	Highly probable (4)	Probable (3)
Significance	**High (64)**	**Medium (33)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, with proper management and avoidance, this impact can be mitigated.	
Mitigation:		
• 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. • Implementation of an alien vegetation management plan. • The area must be demarcated and no disturbance is to be allowed outside the direct development footprint.		
Residual Impacts		
There is still some potential for erosion and IAP encroachment even with the implementation of control measures. Impacts will however be low with the implementation of control measures.		

Table 7-8 Operational phase impacts: Spread of alien and/or invasive species

Impact Nature: Spread of alien and/or invasive species		
Degradation and loss of surrounding natural vegetation		
	Without mitigation	**With mitigation**
Extent	Regional (4)	Footprint & surrounding areas (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:

- Implementation of an alien vegetation management plan.
- Implementation of a waste management plan. Waste management must be a priority and all waste must be collected, stored and disposed of adequately. It is recommended that all waste be removed from site on a weekly basis (as a minimum) to prevent rodents and pests entering the site. No waste is to be burned on site.
- Refuse bins must be emptied and secured.
- Temporary storage of domestic waste must be in covered waste skips.
- Maximum domestic waste storage period will be 7 days.
- A pest control plan must be put in place and implemented; it is imperative that poisons not be used.

Residual Impacts:

Long term broad scale IAP infestation if not mitigated.

Table 7-9 Operational phase impacts: Ongoing displacement and direct mortalities of faunal community due to disturbance (road collisions, collisions with substation, noise, light, dust, vibration)

Impact Nature: Ongoing displacement and direct mortalities of faunal community (including SCC) due to disturbance (road collisions, collisions with substation, noise, light, dust, vibration)

The operation and maintenance of the proposed development may lead to disturbance or persecution of fauna in the vicinity of the development.

	Without Mitigation	**With Mitigation**
Extent	Local Area (3)	Footprint & surrounding areas (2)
Duration	Long term (4)	Moderate term (3)
Magnitude	High (8)	Low (4)
Probability	Highly probable (4)	Improbable (2)
Significance	**Medium (60)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- 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 migrating species.
- Lighting should be directed towards to footprint area and avoid unnecessary illumination of the adjacent undeveloped areas.
- Where feasible, motion detection lighting must be used to minimise the unnecessary illumination of areas
- Avoid using any road during the night.
- Fences must have 30 x 30 cm holes in at the bottom at every 250m to allow for free movement of fauna.

Residual Impacts

Disturbance from maintenance activities will occur albeit at a low and infrequent level.
Less migratory species will be found in the area.
Road killings are still a possibility.
Migratory routes of fauna will change, fauna and flora species composition will change.

7.1.7.4 Decomissioning Phase

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

The following potential impacts were considered:

- Continued fragmentation and degradation of habitats (Table 7-10); and
- Displacement of faunal community (including SCC) due to disturbance (road collisions, noise, dust, vibration) (Table 7-11).

Table 7-10 Decommissioning activities impacts: Continued fragmentation and degradation of habitats

Nature:		
Continued fragmentation and degradation of habitats		
	Without mitigation	With mitigation
Extent	Local area (3)	Footprint and surrounding areas (2)
Duration	Long term (4)	Very short term (1)
Magnitude	High (8)	Minor (2)
Probability	Highly probable (4)	Very improbable (1)
Significance	**Medium (60)**	**Low (5)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation:		
• Implementation of a rehabilitation plan. • Implementation of an alien invasive management plan and monitoring on an annual basis for 3 years post construction. • There should be follow-up rehabilitation and revegetation of any remaining bare areas with indigenous flora.		
Residual Impacts:		
No significant residual risks are expected, although IAP encroachment and erosion might still occur but would have a negligible impact if effectively managed.		

Table 7-11 Decommissioning activities impacts: Displacement of faunal community due disturbance

Nature:		
Displacement of faunal community due disturbance (road collisions, noise, dust, vibration).		
	Without mitigation	**With mitigation**
Extent	Regional (4)	Local Area (3)
Duration	Long term (4)	Moderate term (3)
Magnitude	High (8)	Moderate (6)
Probability	Highly probable (4)	Probable (3)
Significance	**High (64)**	**Medium (36)**

Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	
Mitigation:		
• Dust management needs to be undertaken in the areas where the infrastructure will be removed. This includes wetting of the soil. This area must be rehabilitated as soon as possible. • All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the decommissioning area. • All vehicles (construction or other) accessing the site should adhere to a low-speed limit on site (40 km/h max) to avoid collisions with susceptible fauna, such as nocturnal species which sometimes forage or rest on roads, especially at night. • The area must be walked through prior to decommissioning to ensure fauna species are not affected by the removal of the infrastructure.		
Residual Impacts:		
If this is mitigated and monitored correctly no residual impacts should be present.		

7.1.7.5 Cumulative Impacts

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, dust deposition, noise and vibration, disruption of corridors or habitat, groundwater drawdown, groundwater and surface water quality, and transport.

Table 7-12 Cumulative Impacts to biodiversity associated with the proposed project.

The development of the proposed infrastructure will contribute to cumulative habitat loss, especially in the ecological corridors like the wetland and thereby impact the water resource and ecological processes in the region.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local Area (3)	Local Area (3)
Duration	Moderate term (3)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Medium (30)**	**Medium (39)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation:		
Should the vegetation be removed, the impact cannot be mitigated.		

Residual Impacts:
Will result in the loss of: • Watercourses • ESA1 • Protected trees; • SCC fauna and avifauna species (especially the species listed in the Bathusi Environmental Consulting (2018) report; • Portions of the Vhembe Biosphere Reserve; and • Niche habitats.

7.1.8 Biodiversity Management Plan

The aim of the management outcomes is to present the mitigations in such a way that they can be incorporated into the Environmental Management Programme (EMPr), allowing for more successful implementation and auditing of the mitigations and monitoring guidelines Table 7-13 presents the recommended mitigation measures and the respective timeframes, targets and performance indicators for the Terrestrial and Freshwater Assessment. The mitigations above must be considered along with the mitigations listed below.

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

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

Table 7-13 Mitigation measures including requirements for timeframes, roles and responsibilities for the terrestrial study

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Responsible Party	Frequency
Management outcome: Vegetation and Habitats				
Areas rated as High sensitivity and their buffers in proximity to the development areas should be avoided as much is feasible. Infrastructure spanning delineated watercourses to prevent hydrological barriers is considered avoidance. Avoided areas must be declared as 'no-go' areas during the life of the project, and all efforts must be made to prevent access to these areas from construction workers and machinery. Mitigated development in medium sensitivity areas is permissible.	Planning and Construction Phase	Project manager, Environmental Officer, Contractor	Environmental Control Officer	Monthly
Areas outside of the direct project footprint, should under no circumstances be fragmented or disturbed further. Clearing of vegetation should be minimized and avoided where possible. All activities must be restricted to within the medium sensitivity areas. No further loss of high sensitivity areas should be permitted. It is recommended that areas to be developed be specifically demarcated so that during the construction phase, only the demarcated areas be impacted upon.	Construction/Operational Phase	Project manager, Environmental Officer, Contractor/Operator	Environmental Control Officer during construction and the developer's Environmental Officer during operation	Monthly
Existing access routes, especially roads must be made use of.	Construction/Operational Phase	Contractor/Operator, Environmental Officer & Design Engineer	Environmental Control Officer during construction and the developer's Environmental Officer during operation	Monthly
All laydown, chemical toilets etc. should be restricted to medium sensitivity areas. Any materials may not be stored for extended periods of time and must be removed from the project area once the construction phase has been concluded. No permanent construction phase structures should be permitted. Construction buildings should preferably be prefabricated or constructed of re-usable/recyclable materials where possible. No storage of vehicles or equipment will be allowed outside of the designated project areas.	Construction/Operational Phase	Contractor/Operator, Environmental Officer & Design Engineer	Environmental Control Officer during construction and the developer's Environmental Officer during operation	Monthly
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation where possible to prevent erosion during flood and wind events. This will also reduce the likelihood of encroachment by alien invasive plant species. All livestock must always be kept out of the project area, especially areas that have been recently re-planted	Post-construction/Operational phase	Contractor/Operator, Environmental Officer	Environmental Control Officer during construction and the developer's Environmental Officer during operation	Quarterly for up to two years after the closure
A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run	Construction/Operational Phase	Environmental Officer & Contractor/Operator	Environmental Control Officer during construction and the	Monthly

into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment on site unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers. Appropriately contain any generator diesel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them leaking and entering the environment. Construction activities and vehicles could cause spillages of lubricants, fuels and waste material potentially negatively affecting the functioning of the ecosystem. All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas outside of the project area.			developer's Environmental Officer during operation	
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.	Construction/Operational Phase	Project manager, Environmental Officer, Contractor/Operator	Environmental Control Officer during construction and the developer's Environmental Officer during operation	Monthly
A fire management plan needs to be complied and implemented to restrict the impact fire might have on the surrounding areas.	Construction/Operational Phase	Environmental Officer & Contractor/Operator	Environmental Control Officer during construction and the developer's Environmental Officer during operation	Monthly
Any individual of the protected plants that are present needs a relocation or destruction permit in order for any individual that may be removed or destroyed due to the development. High visibility flags must be placed near any protected plants in order to avoid any damage or destruction of the species. If left undisturbed the sensitivity and importance of these species needs to be part of the environmental awareness program. All protected plants should be relocated where feasible. If the plants cannot be relocated seed must be collected and utilised as part of the rehabilitation process.	Construction/Operational Phase	Project manager, Environmental Officer, Contractor/Operator	Environmental Control Officer during construction and the developer's Environmental Officer during operation	Monthly
Environmentally friendly dust suppressants must be utilised	Construction/Operational phase	Environmental Officer & Contractor/Operator	Environmental Control Officer during construction and the developer's Environmental Officer during operation	Monthly
The duration of construction phase should be kept to a minimum and must take place as much is feasible in the winter.	Construction	Project manager, Environmental Officer & Contractor	Environmental Control Officer	Monthly
Management outcome: Fauna				
Impact Management Actions	**Implementation**		**Monitoring**	

	Phase	Responsible Party	Responsible Party	Frequency
A qualified Environmental Control Officer must be on site when construction begins. A site walk through is recommended by a suitably qualified ecologist prior to any construction activities, preferably during the wet season and any SSC should be noted. In situations where the protected plants must be removed, the proponent may only do so after the required permission/permits have been obtained in accordance with national and provincial legislation. In the abovementioned situation the development of a search, rescue and recovery program is suggested for the protection of these species. Should animals not move out of the area on their own, relevant specialists must be contacted to advise on how the species can be relocated.	Construction Phase	Developer, Environmental Officer, Contractor	Environmental Control Officer	Monthly
The areas to be developed must be specifically demarcated to prevent movement of staff or any individual into the surrounding environments.	Construction/Operational Phase	Project manager, Environmental Officer, Contractor/Operator	Environmental Control Officer during construction and the developer's Environmental Officer during operation	Monthly
The duration of the construction phase should be minimized to as short term as possible, to reduce the period of disturbance on fauna.	Construction	Project manager, Environmental Officer & Contractor	Environmental Control Officer	Monthly
Noise must be kept to an absolute minimum during the evenings and at night to minimize all possible disturbances to amphibian species and nocturnal mammals	Construction/Operational Phase	Environmental Officer, Contractor/Operator	Environmental Control Officer during construction and the developer's Environmental Officer during operation	Monthly
No trapping, killing, or poisoning of any wildlife is to be allowed.	Construction/Operational Phase	Environmental Officer, Contractor/Operator	Environmental Control Officer during construction and the developer's Environmental Officer during operation	Monthly
Outside lighting should be designed and limited to minimize impacts on fauna. All outside lighting should be directed away from highly sensitive areas. Fluorescent and mercury vapor lighting should be avoided and sodium vapor (green/red) lights should be used wherever possible.	Construction/Operational Phase	Project manager, Environmental Officer, Contractor/Operator & Design Engineer	Environmental Control Officer during construction and the developer's Environmental Officer during operation	Monthly
All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited.	Construction/Operational Phase	Health and Safety Officer. Contractor/Operator	Environmental Control Officer during construction and the developer's Environmental Officer during operation	Monthly
All areas to be developed must be walked through prior to any activity to ensure no nests or fauna species are found in the area. Should any Species of Conservation Concern not move out of the area a suitably qualified specialist must be consulted to advise on the correct actions to be taken.	Construction and Operational phase	Project manager, Environmental Officer	Presence of Nests and faunal species	Planning, Construction and Rehabilitation

Any holes/deep excavations must be dug and planned in a progressive manner and shouldn't be left open overnight unless appropriate demarcation is in place; • Should the holes be left open overnight, they must be covered temporarily to ensure no small fauna species fall in.	Planning and Construction	Environmental Officer & Contractor, Engineer	Environmental Control Officer	Monthly
Ensure that cables and connections are insulated successfully to reduce electrocution risk and preferably buried.	Construction/Operational Phase	Environmental Officer & Contractor/Operator, Engineer	Environmental Control Officer during construction and the developer's Environmental Officer during operation	Monthly
Infrastructure should be consolidated where possible in order to minimise the amount of ground and air space used.	Planning and construction	Environmental Officer & Contractor, Engineer	Environmental Control Officer	Monthly

Management outcome: Alien species

Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Responsible Party	Frequency
Compilation of and implementation of an alien vegetation management plan.	Construction/Operation Phase	Project manager, Environmental Officer & Contractor/Operator	Environmental Control Officer during construction and developer's Environmental Officer during operation	Twice a year
The footprint area should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas. Footprint of the roads must be kept to prescribed widths.	Construction/Operational Phase	Project manager, Environmental Officer & Contractor/Operator	Environmental Control Officer during construction and developer's Environmental Officer during operation	Monthly
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.	Construction/Operational Phase	Environmental Officer & Health and Safety Officer	Environmental Control Officer during construction and developer's Environmental Officer during operation	Monthly
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	Construction/Operational Phase	Environmental Officer & Health and Safety Officer	Environmental Control Officer during construction and developer's Environmental Officer during operation	Monthly

Management outcome: Dust

Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Responsible Party	Frequency
Dust-reducing mitigation measures must be put in place and must be strictly adhered to. This includes wetting of exposed soft soil surfaces. • No non environmentally friendly suppressants may be used as this could result in pollution of water sources	Construction/Operation Phase	Contractor/Operator	Environmental Control Officer during construction and developer's Environmental	Monthly

			Officer during operation	
Management outcome: Waste management				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Responsible Party	Frequency
Waste management must be a priority and all waste must be collected and stored effectively.	Construction/Operation Phase	Environmental Officer & Contractor/Operator	Environmental Control Officer during construction and developer's Environmental Officer during operation	Monthly
Litter, spills, fuels, chemicals and human waste in and around the project area must be contained. Waste must be stored in designated areas, within suitable containers. Waste must be disposed of at licenced facilities.	Construction/Closure Phase	Environmental Officer & Health and Safety Officer	Presence of Waste	Daily
A minimum of one toilet must be provided per 10 persons. Portable toilets must be pumped dry to ensure the system does not degrade over time and spill into the surrounding area.	Construction/Operation Phase	Environmental Officer & Health and Safety Officer	Environmental Control Officer during construction and developer's Environmental Officer during operation	Monthly
The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility	Construction/Operation Phase	Environmental Officer, Contractor/Operator & Health and Safety Officer	Environmental Control Officer during construction and developer's Environmental Officer during operation	Monthly
Where a registered disposal facility is not available close to the project area, the Contractor shall provide a method statement with regard to waste management. Under no circumstances may domestic waste be burned on site	Construction/Operation Phase	Environmental Officer, Contractor/Operator & Health and Safety Officer	Environmental Control Officer during construction and developer's Environmental Officer during operation	Monthly
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 where possible.	Construction/Operation Phase	Environmental Officer, Contractor/Operator & Health and Safety Officer	Environmental Control Officer during construction and developer's Environmental Officer during operation	Monthly
Management outcome: Environmental Awareness Training				
Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the project area to inform contractors and site staff of the presence of SCC, their identification, conservation status and importance, biology, habitat requirements and management requirements the Environmental Authorisation and within the EMPr. The avoidance and protection of the	Construction/Operation Phase	Health and Safety Officer	Environmental Control Officer during construction and developer's Environmental Officer during operation	Monthly

watercourse areas must be included into a site induction. Contractors and employees must all undergo the induction and made aware of the "no-go" areas to be avoided.				

Management outcome: Erosion

Impact Management Actions	**Implementation**		**Monitoring**	
	Phase	Responsible Party	Aspect	Frequency
Speed limits must be put in place to reduce erosion. • Reduce dust generated by earth moving machinery through wetting the soil surface and putting up speed limit signs as well as speed bumps built to force slow speeds.	Construction/Operation Phase	Project manager, Environmental Officer, Contractor/Operator	Environmental Control Officer during construction and developer's Environmental Officer during operation	Monthly
A stormwater management plan must be compiled and implemented.	Construction/Operation Phase	Project manager, Environmental Officer, Contractor/Operator	Environmental Control Officer during construction and developer's Environmental Officer during operation	Monthly

7.2 Watercourse Impact Assessment

The assessment of impact significance considers pre-mitigation as well as implemented post-mitigation scenarios. Three phases were considered for the impact assessment:

- Construction Phase;
- Operational Phase; and
- Decommissioning Phase.

Mitigation measures must be implemented to negate potential impacts to water resources. The mitigation actions required to lower the risk of the impact.

7.2.1 Construction Phase

The following potential main impacts on the watercourses and associated biodiversity dependent on these systems were considered for the construction phase of the proposed development. This phase refers to the period during construction when the proposed infrastructure is constructed; and is considered to have direct impacts on aquatic ecosystems, notably where infrastructure intercepts or traverses the watercourses. This phase typically involves the removal of indigenous vegetation for infrastructure (laydown yards, powerlines, solar area and the associated road network structures), landscaping to desired topography, and the establishment of infrastructure. This involves earthworks activities (digging, soil moving and soil stockpiling) and the use of construction chemicals and materials and machinery all of which influence adjacent habitats and includes watercourses. The following construction phase related impacts to aquatic ecology were considered:

- Disturbance/ displacement/ loss of instream habitat (Habitat fragmentation),
- Contamination of watercourse and alteration of water quality; and
- Alteration of catchment hydrology.

Table 7-14 Impacts to watercourse habitat and biotic community associated with the construction phase

Impact Nature: Disturbance/ displacement/ loss of riparian, marginal and instream riverine habitat (Habitat fragmentation)		
Destruction, loss and fragmentation of the of habitats, ecosystems and biotic community responses to the alteration of the catchment for solar, grid and associated infrastructure.		
	Without mitigation (Impact Rating)	**With mitigation (Impact Rating)**
Extent	Local area (3)	Footprint & surrounding area (2)
Duration	Long term (4)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes, although this impact cannot be well mitigated as the loss of vegetation is unavoidable. However, the construction footprint can be realigned to avoid/minimise disturbance to drainage features and associated buffers	
Mitigation:		
• Buffer zones must be adhered too.		

Impact Nature: Disturbance/ displacement/ loss of riparian, marginal and instream riverine habitat (Habitat fragmentation)
• Infrastructure such as roads, cables must traverse watercourses in a perpendicular direction (preferable). • Implement stormwater management measures. • Minimise the unnecessary (and unauthorised) clearance of indigenous vegetation. • Minimise disturbance footprint areas. • Construction of watercourses crossings must be prioritized for the winter months. • Prevent uncontrolled vehicle and machine access through and within watercourses. • Erosion and sedimentation into the drainage lines must be minimised through the land scaping to gentle gradients and the re-vegetation of any disturbed areas. • Any exposed earth should be rehabilitated promptly by planting suitable vegetation (vigorous indigenous grasses that are drought tolerant) to protect the exposed soil. • Landscape and re-vegetate all cleared areas as soon as possible to limit erosion potential associated with steep slopes and bare/exposed soils.
Residual Impacts:
The loss of currently intact vegetation is an unavoidable consequence of the project and cannot be entirely mitigated. The residual impact following mitigation would however be low for the construction phase with focus on limiting erosion required.

Table 7-15 Contamination of watercourse and biotic community effects associated with the construction phase

Impact Nature: Pollution of water resources from construction activities		
Pollution stemming from construction activities (spills and leaks from machinery and construction materials, leaching from excavated soils and waste handling) that enters the natural environment and downslope watercourses, with associated impacts to soils, habitat integrity and ecological function which in turn lowers the aquatic and terrestrial biodiversity dependent on the affected ecosystems, notably in times of surface water availability.		
	Without mitigation (Impact Rating)	**With mitigation (Impact Rating)**
Extent	Local area (3)	Site specific (1)
Duration	Short term (2)	Very short term (0–1 years) (1)
Magnitude	Moderate and will result in processes continuing but in a modified way (6)	Minor and will not result in an impact on processes (2)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, although this impact cannot be well mitigated as some level of pollution is unavoidable, notably where powerline pylons and roads are to be built within drainage areas.	
Mitigation:		
• Have action plans on site, and training for contactors and employees in the event of spills, leaks and other impacts to the drainage systems. • The contractors used for the project should have spill kits available to ensure that any fuel or oil spills are clean-up and discarded correctly. • All chemicals and toxicants to be used for the construction must be stored outside the watercourses and in a bunded area. • Appropriately contain any generator diesel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) or construction materials on site (e.g. concrete) in such a way as to prevent them leaking and entering the environment; • All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site. • Mixing of concrete must under no circumstances take place within the drainage systems. Scrape the area where mixing and storage of sand and concrete occurred to clean once finished. • Implement stormwater measures. • No dumping of construction material on-site may take place. • All waste generated on-site during construction must be adequately managed. Separation and recycling of different waste materials should be supported. • Make sure all excess consumables and building materials / rubble are removed from site and deposited at an appropriate waste facility.		
Residual Impacts:		

Impact Nature: Pollution of water resources from construction activities
Some level of pollution is inevitable due to the nature of the construction activities and cannot be entirely mitigated. The residual impact following mitigation would however be low and of short duration for the construction phase.

Table 7-16 Impacts to catchment hydrology associated with the proposed construction phase

Impact Nature: Alteration of catchment hydrology and associated habitat ecology impacts from construction activities		
Construction phase activities that result in the reshaping and change in vegetative cover density for solar infrastructure with associated alterations of slope, runoff velocities, infiltration capacity and sediment movement from baseline conditions. This is expected to occur across the catchment, with associated impacts to slope stability, habitat integrity and ecological function. This is especially of concern due to the high erodibility of catchment soils in this arid environment and keys areas would include active working areas (road network, PV area, grid infrastructure, etc) where bare soils are exposed to washaway. This is of special concern in the PV area due to the extent of the alluvial fan drainage feature.		
	Without mitigation (Impact Rating)	**With mitigation (Impact Rating)**
Extent	Local area (3)	Footprint & surrounding area (2)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Moderate
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes, although this impact cannot be well mitigated as the hydrology alterations are unavoidable and long term. However, the construction footprint can be realigned to avoid watercourses and associated buffers	
Mitigation:		
• Buffer zones must be adhered too. • Watercourses crossings must not impeded flow. • Any exposed earth should be rehabilitated promptly by planting suitable vegetation (vigorous indigenous grasses that are drought tolerant) to protect the exposed soil. • Landscape and re-vegetate all cleared areas as soon as possible to limit erosion potential associated with steep slopes and bare/exposed soils.		
Residual Impacts:		
Alteration of the catchment hydrology is inevitable due to the nature of the construction activities and cannot be entirely mitigated. The residual impact following mitigation would however be low and of short duration for the construction phase.		

7.2.2 Operational Phase

The operational phase impacts are related to daily operational and maintenance activities which are anticipated to have indirect impacts on aquatic ecosystems, as well as the deterioration of the adjacent habitats due to the increase in maintenance vehicles across the project footprint. The modification of the catchment drainage will alter watercourse habitats through altered drainage from baseline conditions with increased erosion and sedimentation, especially in exposed/ denuded areas and increased hardened surfaces (solar panels and roads). Stormwater management will therefore be crucial within the proposed operations footprint. This phase typically involves the washing and maintenance of solar panels, and the operation of the road network and watercourse crossing structures. The following operational phase related impacts were considered:

- Continued fragmentation and degradation of habitats and ecosystems;
- Contamination of watercourse and altered water quality;
- Alteration of catchment hydrology and associated habitat ecology impacts.

Table 7-17 Impacts to watercourse habitat and biotic community associated with the operational phase

Impact Nature: Continued disturbance/ displacement/ loss of riparian, marginal and instream riverine habitat		
Disturbance created during the construction phase will leave the project area and watercourses vulnerable to erosion (highly erodible catchment) and encroachment by alien vegetation. The operational phase activities will result in the continued destruction, loss and fragmentation of habitats, ecosystems and biotic community responses.		
	Without mitigation (Impact Rating)	**With mitigation (Impact Rating)**
Extent	Local area (3)	Footprint & surrounding area (2)
Duration	Long term (4)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**Medium**	**Low**
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:		
• Buffer zones must be adhered too. • Any exposed earth should be rehabilitated promptly by planting suitable vegetation (vigorous indigenous grasses that are drought tolerant) to protect the exposed soil. • Landscape and re-vegetate all cleared areas as soon as possible to limit erosion potential associated with steep slopes and bare/exposed soils.		
Residual Impacts:		
Despite mitigation, erosion is expected across the project footprint, influencing downslope watercourses and habitat, especially where roads and powerline pylons intercept with watercourses. The residual impact following mitigation would however be low.		

Table 7-18 Contamination of watercourses and negative biotic community impacts associated with the operational phase

Impact Nature: Pollution of water resources from operational activities		
The operation and maintenance of the proposed development will involve the cleaning of the solar panel with chemicals which has the potential to pollute soils (should chemicals be used) and in times of flow will pollute surface runoff from contaminated soils and enter into the downslope watercourses, with associated impacts to habitat integrity and ecological function which in turn lowers the aquatic and terrestrial biodiversity dependent on the affected ecosystems. Further pollution impacts can be expected from hydrocarbons (fuels, oil, etc) from leaking maintenance vehicles which escape into the environment along the road network, entering downslope watercourses during rainfall events, with similar impacts to water quality and ecological functioning.		
	Without mitigation (Impact Rating)	**With mitigation (Impact Rating)**
Extent	Local area (3)	Site specific (1)
Duration	Moderate term (5–15 years) (3)	Very short term (0–1 years) (1)
Magnitude	Moderate and will result in processes continuing but in a modified way (6)	Minor and will not result in an impact on processes (2)
Probability	Definite (5)	Probable (3)
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes, although this impact cannot be well mitigated as some level of pollution is unavoidable. Despite this spill kits and other spill prevention measures should be in place	

Impact Nature: Pollution of water resources from operational activities
Mitigation:
• Have action plans on site, and training for contactors and employees in the event of spills, leaks and other impacts to the drainage systems. • All chemicals and toxicants to be used for the construction must be stored outside the watercourses and in a bunded area. • Appropriately contain any generator diesel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) or construction materials on site (e.g. concrete) in such a way as to prevent them leaking and entering the environment; • All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site. • Implement stormwater measures. • No dumping of construction material on-site may take place. • All waste generated on-site during construction must be adequately managed. Separation and recycling of different waste materials should be supported. • Make sure all excess consumables and building materials / rubble are removed from site and deposited at an appropriate waste facility.
Residual Impacts:
Some level of pollution is inevitable due to the nature of the operational activities and cannot be entirely mitigated. The residual impact following mitigation would be Low and of short duration following the implementation of mitigation.

Table 7-19 Impacts to catchment hydrology associated with the operational phase

Impact Nature: Alteration of catchment hydrology and associated habitat ecology impacts from operational activities		
As a result of the landscaping to new topography and change in vegetative cover type and density below the solar panels, together with increased hardened surfaces from solar panels and road network, new functioning regimes pertaining to surface runoff, infiltration and sediment movement patterns will influence the adjacent natural habitat characteristics. This in turn will potentially influence habitat integrity and ecological functioning, notably from increased return flows (surface runoff), erosion and instream sedimentation impacts. This would be applicable to habitat and watercourse features in proximity to the proposed infrastructure, notably the powerline pylons and downslope areas of the road network and PV area.		
	Without mitigation (Impact Rating)	**With mitigation (Impact Rating)**
Extent	Local area (3)	Footprint & surrounding area (2)
Duration	Long term (4)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium**	**Low**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Moderate
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes, although this impact cannot be well mitigated as the hydrology alterations are unavoidable. However, the operational activities need to avoid direct impacts to watercourses and associated buffers (no-go areas), notably erosion.	
Mitigation:		
• Buffer zones must be adhered too. • Watercourses crossings must not impeded flow. Crossing must be inspected on a regular basis for blockages. • Any exposed earth should be rehabilitated promptly by planting suitable vegetation (vigorous indigenous grasses that are drought tolerant) to protect the exposed soil. • Landscape and re-vegetate all cleared areas as soon as possible to limit erosion potential associated with steep slopes and bare/exposed soils.		
Residual Impacts:		
Residual impacts following mitigation are largely related to altered surface runoff and erosion due to altered hydro-dynamics and erodibility of the associated catchment.		

7.2.3 Decommissioning Phase

Solar projects typically operate for approximately thirty and forty years. Following the completion of the economic life of the project or approaching permit expiration, the project owner can apply for a new permit or remove/decommission the facility. The renewal of permits option could involve either operating

the same solar panels as the panels can operate past thirty years, albeit at lower efficiency, or "repower" the site by upgrading the facility with more efficient solar technology. Otherwise, the facility can be decommissioned. The solar project permits may define how a solar project is to be decommissioned.

Decommissioning refers to removal of equipment and restoration of the site to near baseline conditions or alternatively the site can be repurposed for other uses, such as agricultural production. Often the solar panels are recycled (glass and aluminium) or sold for off-grid applications or electrification in developing countries. The associated infrastructure (solar and grid, roads and fencing) and foundations are dismantled, and various parts are refurbished, recycled, or landfilled as appropriate. The restoration of the land would involve backfilling of excavations, de-compacting of compacted soils, landscaping to natural conditions, and revegetation of the entire project disturbance footprint.

The impacts for the decommission phase are considered to be similar in significance to the construction phase as the activities are similar and are carried out in reverse order. The impact ratings for this phase would therefore be similar and can be seen in Table 7-3 to Table 7-5.

7.3 Watercourse Risk Assessment

Due to the presence of watercourses (non-perennial) within the regulatory area, a risk assessment was conducted in line with Section 21 (c) and (i) of the National Water Act, 1998, (Act 36 of 1998).

This assessment has been completed in accordance with the requirements of the published General Notice (GN) 509 by the Department of Water and Sanitation (DWS). This notice was published in the Government Gazette (no. 40229) under Section 39 of the National Water Act (Act no. 36 of 1998) in August 2016, for a Water Use Licence (WUL) in terms of Section 21(c) & (i) water uses. The GN 509 process provides an allowance to apply for a WUL for Section 21(c) & (i) under a General Authorisation (GA), as opposed to a full Water Use Licence Application (WULA). A water use (or potential) qualifies for a GA under GN 509 when the proposed water use/activity is subjected to analysis using the DWS Risk Assessment Matrix (RAM). This assessment will implement the RAM and provide a specialist opinion on the appropriate water use authorisation.

Significance ratings for each of these risks are given for scenarios with and without mitigation. No natural wetlands were delineated within the project area, but consideration has been afforded to the numerous watercourses identified for the area. It is preferable that these watercourses be avoided and the hydrology of the systems, albeit temporary, unimpacted by the project.

The most potentially significant impacts to these systems are associated with increased hardened surfaces and inappropriate stormwater management during both construction and operation which could lead to increased stormflow flow velocities and ultimately the erosion and sedimentation of the downslope reaches. Another impact, although limited, involves the failure to effectively rehabilitate the site following closure leading to impaired soil infiltration and increased floodpeaks and sediments entering downstream systems. These impacts were assigned a pre-mitigation rating of Moderate. Encouragingly, however, given the position of the site (absent of wetlands) and nature of the project (relatively clean renewable energy), all the anticipated risks have the potential to be reduced to a Low significance, provided mitigation is effectively implemented. Proper establishment and management of the site has the potential to further reduce the overall residual risk of the area.

A number of mitigation measures are provided in Table 7-20 which would, if implemented effectively, reduce the significance of the anticipated impacts to Low. Of these, perhaps the most significant mitigation measures are as follows:

- Clearly demarcate the construction footprint and restrict all construction activities to within the proposed infrastructure area;
- Use the watercourse shapefiles to signpost the edge of the systems. Adhere to the 15 m buffer width;

- Educate staff and relevant contractors on the location and importance of the identified watercourses through toolbox talks and by including them in site inductions as well as the overall master plan;
- Promptly remove / control all alien and invasive plant species that may emerge during construction (i.e. weedy annuals and other alien forbs) must be removed;
- Limit most of the earth-moving activities to winter when rain is least likely to wash concrete and sand into the watercourses;
- Appropriately stockpile topsoil cleared from the project area and ensure soil stockpiles and concrete / building sand are sufficiently safeguarded against rain wash;
- Do not situate any of the construction material laydown areas within any watercourse and do not park machinery in the systems or their buffers;
- Make sure all excess consumables and building materials / rubble is removed from site and deposited at an appropriate waste facility;
- Design and Implement an effective stormwater management plan;
- Promote water infiltration into the ground beneath the solar panels (i.e. opt for grass or gravel over concrete or paving);
- 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);
- Avoid excessively compacting the ground beneath the solar panels;
- 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;
- Develop and implement a rehabilitation and closure plan; and
- Appropriately rehabilitate the project area by ripping, landscaping and re-vegetating with locally indigenous species.

Table 7-20 DWS Risk Impact Matrix for the proposed development

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Activity	Aspect	Impact	Severity: Mitigation	Flow Regime	Water Quality	Habitat	Biota	Total	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
Construction																			
Site clearing and preparation.	Watercourse disturbance / loss.	Direct disturbance / degradation to watercourse soils or vegetation due to the construction of the solar facility.	Without	2	4	4	4	3.5	2	1	6.5	1	1	5	1	8	52	L	• Clearly demarcate the construction footprint and restrict all construction activities to within the proposed infrastructure area. • Minimize the disturbance footprint and the unnecessary clearing of vegetation outside of this area. • Avoid drainage channels and the associated buffers. • Educate staff and relevant contractors on the location and importance of the identified watercourses through toolbox talks and by including them in site inductions as well as the overall master plan. • Promptly remove / control all alien and invasive plant species that may emerge during construction (i.e. weedy annuals and other alien forbs) must be removed. • Clearly demarcate construction footprint, and limit all activities to within this area. • Minimize unnecessary clearing of vegetation. • Landscape and re-vegetate all denuded areas as soon as possible.
			With	1	1	1	3	1.5	1	1	3.5	1	1	1	1	4	14	L	
	Water runoff from construction site.	Increased erosion and sedimentation.	Without	4	4	2	2	3	3	1	7	1	1	5	2	9	63	M	• Limit construction activities (as much is feasible) to winter when rain is least likely to wash concrete and sand into the watercourses. Activities in vertic (turf) soils can become. • Ensure soil stockpiles and concrete / building sand are sufficiently safeguarded

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Activity	Aspect	Impact	Severity: Mitigation	Flow Regime	Water Quality	Habitat	Biota	Total	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
			With	2	2	2	2	2	1	1	4	1	1	1	2	5	20	L	against rain wash. • Do not situate any of the construction material laydown areas within any watercourse. • No machinery should be allowed to park in any watercourse. • Landscape and re-vegetate all unnecessarily denuded areas as soon as possible.
		Potential contamination of watercourses with machine oils and construction materials.	Without	4	2	2	3	2.8	3	1	6.8	1	1	5	1	8	54	L	• Make sure all excess consumables and building materials / rubble is removed from site and deposited at an appropriate waste facility. • Appropriately stockpile topsoil cleared from the project area. • Appropriately contain any generator diesel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) or construction materials on site (e.g. concrete) in such a way as to prevent them leaking and entering the watercourses. Do not store any construction materials or equipment within any of the identified watercourses or their buffers. • Mixing of concrete must under no circumstances take place within any watercourse.
			With	1	2	2	2	1.8	2	2	5.8	1	1	1	2	5	29	L	
Operation																			
Operation of the solar facility.	Hardened surfaces.	Potential for increased stormwater runoff into the	Without	4	3	2	2	2.8	2	3	7.8	2	2	5	2	11	85	M	• Design and Implement an effective stormwater management plan. • Promote water infiltration into the ground beneath the solar panels.

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Activity	Aspect	Impact	Severity: Mitigation	Flow Regime	Water Quality	Habitat	Biota	Total	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
		north-western seep leading to Increased erosion and sedimentation.	With	3	2	2	2	2.3	1	1	4.3	2	2	1	2	7	30	L	• 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.
	Contamination.	Potential for increased contaminants entering the watercourse	Without	4	2	2	3	2.8	3	1	6.8	1	1	5	1	8	54	L	• Where possible minimise the use 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.
			With	1	2	2	2	1.8	2	2	5.8	1	1	1	2	5	29	L	
Closure																			
Decommissioning of the solar facility.	Rehabilitation.	Potential loss or degradation of nearby watercourses through inappropriate closure.	Without	2	2	2	2	2	2	5	9	1	1	5	1	8	72	M	• Develop and implement a rehabilitation and closure plan. • Appropriately rehabilitate the project area by ripping, landscaping and re-vegetating with locally indigenous species.
			With	1	3	2	2	2	2	2	6	1	1	1	2	5	30	L	

8 Conclusion and Impact Statement

8.1 Terrestrial Ecology

Based on the desktop assessment the project area falls within an ESA1, Vhembe Biosphere Reserve, the Musina Mopane Bushveld vegetation type and have a known occurrence of fauna SCCs found in and around the project area as well as protected tree species.

The field assessment was conducted in the winter season and is regarded as a follow up survey for the assessment performed by Bathusi Environmental Consulting (2018) in the summer.

Four habitat units were identified during the assessment and included closed woodland, a rocky area, watercourses, and mopane bushveld. The sensitivity of these habitats ranged from high to medium with the closed woodland, rocky area and watercourses regarded as high sensitivity due to the species recorded and the role of this intact unique habitat to biodiversity, whilst the mopane bushveld is regarded as having a medium sensitivity.

During the field assessment 3 species of protected trees were observed: *Boscia albitrunca* (Shepard's tree), *Adansonia digitata* (Baobab), and *Sclerocarya birrea subsp. caffra* (Marula). It is of vital importance that a search a rescue along with permit applications be done prior to the commencement of the development. The density of the trees is regarded a very high especially in the case of *B. albitrunca.*

Biodiversity maintenance is one key ecological service provided by the identified terrestrial biodiversity areas through their ecological integrity, importance and functioning. As such the preservation of these systems is an important aspect to consider for the proposed project.

Any development in high sensitivity areas must be avoided as far as possible, which will occur with the selection of the project area. Development within the high sensitivity areas within the project area will lead the direct destruction and loss of functional habitats; and the 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 mitigation measures, management and associated monitoring regarding the expected impacts will be the most important factor of this project and must be considered by the issuing authority.

8.2 Wetland Ecology

One (1) form of a watercourse was identified and delineated within the regulated area applied, namely ephemeral drainage lines/ features. Natural wetlands were absent from the project area. The nearest know 'pan' system is more than 3 km north-west of the project area. No functional assessment was completed for the delineated watercourses. A buffer width of 15 m is recommended for each of the drainage features.

Considering the findings of the assessment, no fatal flaws were identified from a freshwater ecology perspective. Provided that the mitigation is successfully implemented, the specialist is of the opinion that the establishment of the proposed solar facility is unlikely to pose a significant threat to local watercourses with all anticipated impacts having a Low residual risk rating. Supporting remediation measures prescribed herein should also be considered for a project specific stormwater management plan. Due to the overall Low residual risks expected for the project, a General Authorisation is applicable.

8.3 Impact Statement

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

- Habitat loss and fragmentation;

- Degradation of surrounding habitat;
- Direct loss of watercourses;
- Disturbance and displacement caused during the construction and maintenance phases; and
- Direct mortality during the construction phase.

Mitigation measures as described in this report must be implemented to reduce the significance of the risk, but there is still a possibility of impacts occurring. Considering that this area that has been identified as being of significance for biodiversity maintenance and ecological processes (Moderate and High sensitivity), development may proceed but with caution and only with the implementation of mitigation measures.

It is the opinions of the specialists that the project, may be favourably considered, on condition all prescribed mitigation measures and supporting recommendations are implemented.

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10 Appendix Items

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

Family	Taxon	Author	IUCN	Ecology
Malvaceae	*Abutilon angulatum var. angulatum*	(Guill. & Perr.) Mast.	LC	Indigenous
Malvaceae	*Abutilon austro-africanum*	Hochr.	LC	Indigenous
Malvaceae	*Abutilon fruticosum*	Guill. & Perr.	LC	Indigenous
Euphorbiaceae	*Acalypha segetalis*	Mull.Arg.	LC	Indigenous
Malvaceae	*Adansonia digitata*	L.		Indigenous
Passifloraceae	*Adenia repanda*	(Burch.) Engl.	LC	Indigenous
Passifloraceae	*Adenia spinosa*	Burtt Davy		Indigenous
Amaranthaceae	*Aerva leucura*	Moq.	LC	Indigenous
Violaceae	*Afrohybanthus enneaspermus*	(L.) Flicker	LC	Indigenous
Violaceae	*Afrohybanthus serratus*	(Engl.) Flicker	LC	Indigenous
Loranthaceae	*Agelanthus lugardii*	(N.E.Br.) Polhill & Wiens	LC	Indigenous
Loranthaceae	*Agelanthus natalitius subsp. zeyheri*	(Meisn.) Polhill & Wiens		Indigenous
Loranthaceae	*Agelanthus pungu*	(De Wild.) Polhill & Wiens	LC	Indigenous; Endemic
Orobanchaceae	*Alectra picta*	(Hiern) Hemsl.	LC	Indigenous
Fabaceae	*Alistilus bechuanicus*	N.E.Br.	NE	Indigenous
Asphodelaceae	*Aloe ammophila*	Reynolds	LC	Indigenous; Endemic
Asphodelaceae	*Aloe littoralis*	Baker		Indigenous
Asphodelaceae	*Aloe lutescens*	Groenew.	NE	Indigenous
Amaranthaceae	*Alternanthera sessilis*	(L.) DC.	LC	Not indigenous; Naturalised; Invasive
Amaranthaceae	*Amaranthus praetermissus*	Brenan	LC	Indigenous
Amaranthaceae	*Amaranthus spinosus*	L.	LC	Not indigenous; Naturalised
Acanthaceae	*Anisotes rogersii*	S.Moore	LC	Indigenous
Scrophulariaceae	*Aptosimum elongatum*	(Hiern) Engl.	LC	Indigenous
Poaceae	*Aristida adscensionis*	L.	LC	Indigenous
Poaceae	*Aristida congesta subsp. barbicollis*	Roem. & Schult.	LC	Indigenous
Poaceae	*Aristida congesta subsp. congesta*	Roem. & Schult.	LC	Indigenous
Annonaceae	*Artabotrys brachypetalus*	Benth.	LC	Indigenous
Annonaceae	*Artabotrys monteiroae*	Oliv.	NE	Indigenous
Asparagaceae	*Asparagus exuvialis forma ecklonii*	Burch.	LC	Indigenous
Asparagaceae	*Asparagus nelsii*	Schinz	LC	Indigenous
Zygophyllaceae	*Balanites pedicellaris subsp. pedicellaris*	Mildbr. & Schltr.	LC	Indigenous
Acanthaceae	*Barleria galpinii*	C.B.Clarke	LC	Indigenous
Acanthaceae	*Barleria heterotricha subsp. heterotricha*	Lindau	LC	Indigenous

Asteraceae	*Berkheya carlinopsis subsp. magalismontana*	Welw. ex O.Hoffm.	LC	Indigenous; Endemic
Acanthaceae	*Blepharis diversispina*	(Nees) C.B.Clarke	LC	Indigenous
Nyctaginaceae	*Boerhavia coccinea var. coccinea*	Mill.	LC	Indigenous
Nyctaginaceae	*Boerhavia cordobensis*	Kuntze	LC	Not indigenous; Naturalised
Nyctaginaceae	*Boerhavia diffusa var. diffusa*	L.	LC	Not indigenous; Naturalised
Nyctaginaceae	*Boerhavia erecta*	L.	LC	Not indigenous; Naturalised
Capparaceae	*Boscia albitrunca*	(Burch.) Gilg & Gilg-Ben.	LC	Indigenous
Capparaceae	*Boscia foetida subsp. foetida*	Schinz		Indigenous
Capparaceae	*Boscia foetida subsp. rehmanniana*	Schinz	LC	Indigenous
Poaceae	*Brachiaria deflexa*	(Schumach.) C.E.Hubb. ex Robyns	LC	Indigenous
Phyllanthaceae	*Bridelia cathartica subsp. cathartica*	G.Bertol.	LC	Indigenous
Phyllanthaceae	*Bridelia mollis*	Hutch.	LC	Indigenous
Capparaceae	*Cadaba termitaria*	N.E.Br.		Indigenous
Asteraceae	*Calostephane divaricata*	Benth.	LC	Indigenous
Apocynaceae	*Calotropis procera*	(Aiton) W.T.Aiton	LC	Not indigenous; Naturalised; Invasive
Rubiaceae	*Canthium armatum*	(K.Schum.) Lantz	LC	Indigenous
Capparaceae	*Capparis tomentosa*	Lam.	LC	Indigenous
Sapindaceae	*Cardiospermum corindum*	L.	LC	Indigenous
Fabaceae	*Cassia abbreviata subsp. beareana*	Oliv.	LC	Indigenous
Bignoniaceae	*Catophractes alexandri*	D.Don	LC	Indigenous
Apocynaceae	*Ceropegia ampliata var. ampliata*	E.Mey.		Indigenous
Apocynaceae	*Ceropegia cimiciodora*	Oberm.	LC	Indigenous
Verbenaceae	*Chascanum pinnatifidum var. racemosum*	(L.f.) E.Mey.	LC	Indigenous; Endemic
Poaceae	*Chloris roxburghiana*	Schult.	LC	Indigenous
Malvaceae	*Cienfuegosia digitata*	Cav.	LC	Indigenous
Vitaceae	*Cissus cornifolia*	(Baker) Planch.	LC	Indigenous
Vitaceae	*Cissus quadrangularis var. quadrangularis*	L.	LC	Indigenous
Cleomaceae	*Cleome angustifolia subsp. petersiana*	Forssk.	LC	Indigenous
Fabaceae	*Colophospermum mopane*	(J.Kirk ex Benth.) J.Kirk ex J.Leonard	LC	Indigenous
Combretaceae	*Combretum apiculatum subsp. apiculatum*	Sond.	LC	Indigenous
Combretaceae	*Combretum collinum subsp. suluense*	Fresen.		Indigenous
Combretaceae	*Combretum collinum subsp. taborense*	Fresen.	LC	Indigenous
Combretaceae	*Combretum hereroense*	Schinz	LC	Indigenous
Combretaceae	*Combretum imberbe*	Wawra	LC	Indigenous
Combretaceae	*Combretum mossambicense*	(Klotzsch) Engl.		Indigenous

Commelinaceae	*Commelina modesta*	Oberm.	LC	Indigenous
Burseraceae	*Commiphora africana var. africana*	(A.Rich.) Engl.	LC	Indigenous
Burseraceae	*Commiphora angolensis*	Engl.		Indigenous
Burseraceae	*Commiphora edulis subsp. edulis*	(Klotzsch) Engl.		Indigenous
Burseraceae	*Commiphora glandulosa*	Schinz	LC	Indigenous
Burseraceae	*Commiphora marlothii*	Engl.	LC	Indigenous
Burseraceae	*Commiphora mollis*	(Oliv.) Engl.	LC	Indigenous
Burseraceae	*Commiphora pyracanthoides*	Engl.	LC	Indigenous
Burseraceae	*Commiphora tenuipetiolata*	Engl.	LC	Indigenous
Burseraceae	*Commiphora viminea*	Burtt Davy	NE	Indigenous
Cucurbitaceae	*Corallocarpus triangularis*	Cogn.	LC	Indigenous
Malvaceae	*Corchorus kirkii*	N.E.Br.	EN	Indigenous
Malvaceae	*Corchorus trilocularis*	L.	LC	Not indigenous; Cultivated; Naturalised
Boraginaceae	*Cordia ovalis*	R.Br. ex DC.	LC	Indigenous
Crassulaceae	*Cotyledon barbeyi var. soutpansbergensis*	Schweinf. ex Baker	LC	Indigenous; Endemic
Crassulaceae	*Cotyledon sp.*		LC	
Fabaceae	*Crotalaria damarensis*	Engl.	LC	Indigenous
Fabaceae	*Crotalaria laburnifolia subsp. australis*	L.		Indigenous
Fabaceae	*Crotalaria schinzii*	Baker f.		Indigenous
Euphorbiaceae	*Croton gratissimus var. gratissimus*	Burch.	LC	Indigenous
Euphorbiaceae	*Croton gratissimus var. subgratissimus*	Burch.	LC	Indigenous
Euphorbiaceae	*Croton menyharthii*	Pax		Indigenous
Apocynaceae	*Cryptolepis oblongifolia*	(Meisn.) Schltr.	LC	Indigenous
Cucurbitaceae	*Cucumis metuliferus*	E.Mey. ex Naudin	LC	Indigenous
Araliaceae	*Cussonia paniculata subsp. sinuata*	Eckl. & Zeyh.	LC	Indigenous
Poaceae	*Dactyloctenium giganteum*	Fisher & Schweick.	LC	Indigenous
Poaceae	*Danthoniopsis pruinosa*	C.E.Hubb.	NE	Indigenous
Poaceae	*Diandrochloa namaquensis*	(Nees) De Winter	LC	Indigenous
Fabaceae	*Dichrostachys cinerea subsp. africana*	(L.) Wight & Arn.	LC	Indigenous
Fabaceae	*Dichrostachys cinerea subsp. nyassana*	(L.) Wight & Arn.	LC	Indigenous
Acanthaceae	*Dicliptera decorticans*	(K.Balkwill) I.Darbysh.	LC	Indigenous
Acanthaceae	*Dicliptera paniculata*	(Forssk.) I.Darbysh.	LC	Indigenous
Poaceae	*Digitaria longiflora*	(Retz.) Pers.	LC	Indigenous
Poaceae	*Digitaria velutina*	(Forssk.) P.Beauv.	LC	Indigenous
Ebenaceae	*Diospyros dichrophylla*	(Gand.) De Winter	LC	Indigenous
Hyacinthaceae	*Dipcadi glaucum*	(Burch. ex Ker Gawl.) Baker	LC	Indigenous
Hyacinthaceae	*Dipcadi vaginatum*	Baker		Indigenous

Hyacinthaceae	*Drimia altissima*	(L.f.) Ker Gawl.	LC	Indigenous
Amaranthaceae	*Dysphania carinata*	(R.Br.) Mosyakin & Clemants	LC	Not indigenous; Naturalised; Invasive
Poaceae	*Echinochloa colona*	(L.) Link	LC	Indigenous
Meliaceae	*Ekebergia capensis*	Sparrm.	LC	Indigenous
Poaceae	*Enneapogon cenchroides*	(Licht. ex Roem. & Schult.) C.E.Hubb.	LC	Indigenous
Poaceae	*Eragrostis biflora*	Hack. ex Schinz	LC	Indigenous
Poaceae	*Eragrostis inamoena*	K.Schum.	LC	Indigenous
Poaceae	*Eragrostis lehmanniana var. lehmanniana*	Nees	LC	Indigenous
Poaceae	*Eragrostis sp.*		LC	
Orchidaceae	*Eulophia angolensis*	(Rchb.f.) Summerh.		Indigenous
Euphorbiaceae	*Euphorbia guerichiana*	Pax	LC	Indigenous
Euphorbiaceae	*Euphorbia inaequilatera*	Sond.	LC	Indigenous
Euphorbiaceae	*Euphorbia indica*	Lam.	LC	Not indigenous; Naturalised
Euphorbiaceae	*Euphorbia limpopoana*	L.C.Leach ex S.Carter	DD	Indigenous
Euphorbiaceae	*Euphorbia lugardiae*	(N.E.Br.) Bruyns	LC	Indigenous
Euphorbiaceae	*Euphorbia neopolycnemoides*	Pax & K.Hoffm.	LC	Indigenous
Euphorbiaceae	*Euphorbia prostrata*	Aiton	LC	Not indigenous; Naturalised
Fabaceae	*Faidherbia albida*	(Delile) A.Chev.	LC	Indigenous
Moraceae	*Ficus glumosa*	Delile	LC	Indigenous
Moraceae	*Ficus lutea*	Vahl	LC	Indigenous
Moraceae	*Ficus salicifolia*	Vahl	LC	Indigenous
Phyllanthaceae	*Flueggea virosa subsp. virosa*	(Roxb. ex Willd.) Royle	LC	Indigenous
Cyperaceae	*Fuirena pubescens var. pubescens*	(Poir.) Kunth	LC	Indigenous
Rubiaceae	*Gardenia resiniflua subsp. resiniflua*	Hiern	LC	Indigenous
Asteraceae	*Geigeria burkei subsp. fruticulosa*	Harv.	LC	Indigenous
Gisekiaceae	*Gisekia africana var. decagyna*	(Lour.) Kuntze	LC	Indigenous
Apocynaceae	*Gomphocarpus tomentosus subsp. tomentosus*	Burch.	LC	Indigenous
Malvaceae	*Gossypium herbaceum subsp. africanum*	L.	LC	Indigenous
Malvaceae	*Grewia bicolor var. bicolor*	Juss.	LC	Indigenous
Malvaceae	*Grewia flavescens*	Juss.		Indigenous
Malvaceae	*Grewia hexamita*	Burret	LC	Indigenous
Malvaceae	*Grewia monticola*	Sond.	LC	Indigenous
Malvaceae	*Grewia occidentalis var. occidentalis*	L.		Indigenous
Malvaceae	*Grewia subspathulata*	N.E.Br.	LC	Indigenous
Malvaceae	*Grewia sulcata var. sulcata*	Mast.	LC	Indigenous
Malvaceae	*Grewia tenax*	(Forssk.) Fiori		Indigenous

Malvaceae	*Grewia villosa var. villosa*	Willd.	LC	Indigenous
Celastraceae	*Gymnosporia senegalensis*	(Lam.) Loes.	LC	Indigenous
Poaceae	*Harpochloa falx*	(L.f.) Kuntze	LC	Indigenous
Asteraceae	*Helichrysum argyrosphaerum*	DC.		Indigenous
Asteraceae	*Helichrysum setosum*	Harv.	LC	Indigenous
Boraginaceae	*Heliotropium zeylanicum*	(Burm.f.) Lam.	LC	Indigenous
Poaceae	*Hemarthria altissima*	(Poir.) Stapf & C.E.Hubb.	LC	Indigenous
Malvaceae	*Hermannia glanduligera*	K.Schum.	LC	Indigenous
Malvaceae	*Hermannia grisea*	Schinz	LC	Indigenous; Endemic
Malvaceae	*Hermannia modesta*	(Ehrenb.) Mast.	LC	Indigenous
Amaranthaceae	*Hermbstaedtia odorata var. albi-rosea*	(Burch.) T.Cooke	LC	Indigenous
Amaranthaceae	*Hermbstaedtia odorata var. odorata*	(Burch.) T.Cooke	LC	Indigenous
Malvaceae	*Hibiscus calyphyllus*	Cav.	LC	Indigenous
Malvaceae	*Hibiscus micranthus var. micranthus*	L.f.	LC	Indigenous
Malvaceae	*Hibiscus praeteritus*	R.A.Dyer	LC	Indigenous
Malvaceae	*Hibiscus sabiensis*	Exell	LC	Indigenous
Malvaceae	*Hibiscus sidiformis*	Baill.	LC	Indigenous
Asteraceae	*Hilliardiella sutherlandii*	(Harv.) H.Rob.	LC	Indigenous
Apocynaceae	*Huernia whitesloaneana*	Nel	LC	Indigenous; Endemic
Apocynaceae	*Huernia zebrina subsp. zebrina*	N.E.Br.	LC	Indigenous
Molluginaceae	*Hypertelis umbellata*	(Forssk.) Thulin	LC	Indigenous
Arecaceae	*Hyphaene petersiana*	Klotzsch ex Mart.	LC	Indigenous
Fabaceae	*Indigastrum costatum subsp. macrum*	(Guill. & Perr.) Schrire	LC	Indigenous
Fabaceae	*Indigastrum costatum subsp. theuschii*	(Guill. & Perr.) Schrire	LC	Indigenous
Fabaceae	*Indigofera dolichothyrsa*	Baker f.	VU	Indigenous
Fabaceae	*Indigofera ingrata*	N.E.Br.	LC	Indigenous
Fabaceae	*Indigofera nebrowniana*	J.B.Gillett	LC	Indigenous
Fabaceae	*Indigofera rehmannii*	Baker f.	LC	Indigenous; Endemic
Fabaceae	*Indigofera torulosa var. torulosa*	E.Mey.	LC	Indigenous
Convolvulaceae	*Ipomoea albivenia*	(Lindl.) Sweet	LC	Indigenous
Convolvulaceae	*Ipomoea cairica var. cairica*	(L.) Sweet	LC	Indigenous
Convolvulaceae	*Ipomoea magnusiana*	Schinz	LC	Indigenous
Oleaceae	*Jasminum fluminense subsp. fluminense*	Vell.	LC	Indigenous
Euphorbiaceae	*Jatropha schlechteri subsp. schlechteri*	Pax	LC	Indigenous
Euphorbiaceae	*Jatropha spicata*	Pax	LC	Indigenous
Acanthaceae	*Justicia odora*	(Forssk.) Lam.	LC	Indigenous
Kewaceae	*Kewa bowkeriana*	(Sond.) Christenh.	LC	Indigenous

Bignoniaceae	*Kigelia africana*	(Lam.) Benth.		Indigenous
Asteraceae	*Laggera decurrens*	(Vahl) Hepper & J.R.I.Wood	LC	Indigenous
Verbenaceae	*Lantana camara*	L.	LC	Not indigenous; Cultivated; Naturalised; Invasive
Thymelaeaceae	*Lasiosiphon polyanthus*	(Gilg) C.H.Wright	NE	Indigenous; Endemic
Hyacinthaceae	*Ledebouria apertiflora*	(Baker) Jessop	LC	Indigenous
Lamiaceae	*Leonotis sexdentata*	(Skan) J.C.Manning & Goldblatt	LC	Indigenous
Asteraceae	*Litogyne gariepina*	(DC.) Anderb.	LC	Indigenous
Solanaceae	*Lycium cinereum*	Thunb.	LC	Indigenous
Capparaceae	*Maerua angolensis subsp. angolensis*	DC.	LC	Indigenous
Capparaceae	*Maerua cafra*	(DC.) Pax	LC	Indigenous
Capparaceae	*Maerua juncea subsp. crustata*	Pax	LC	Indigenous
Capparaceae	*Maerua parvifolia*	Pax	LC	Indigenous
Bignoniaceae	*Markhamia zanzibarica*	(Bojer ex DC.) K.Schum.	LC	Indigenous
Apocynaceae	*Marsdenia macrantha*	(Klotzsch) Schltr.	LC	Indigenous
Celastraceae	*Maytenus undata*	(Thunb.) Blakelock	LC	Indigenous
Acanthaceae	*Megalochlamys kenyensis subsp. australis*	Vollesen	LC	Indigenous; Endemic
Malvaceae	*Melhania acuminata var. acuminata*	Mast.		Indigenous
Malvaceae	*Melhania prostrata*	DC.	LC	Indigenous
Malvaceae	*Melhania rehmannii*	Szyszyl.	LC	Indigenous
Poaceae	*Melinis repens subsp. grandiflora*	(Willd.) Zizka	LC	Indigenous
Poaceae	*Melinis repens subsp. repens*	(Willd.) Zizka	LC	Indigenous
Lamiaceae	*Mesosphaerum pectinatum*	(L.) Kuntze	LC	Not indigenous; Naturalised
Stilbaceae	*Nuxia congesta*	R.Br. ex Fresen.	LC	Indigenous
Stilbaceae	*Nuxia floribunda*	Benth.	LC	Indigenous
Ochnaceae	*Ochna inermis*	(Forssk.) Schweinf.	LC	Indigenous
Lamiaceae	*Ocimum filamentosum*	Forssk.	LC	Indigenous
Olacaceae	*Olax dissitiflora*	Oliv.	LC	Indigenous
Rubiaceae	*Oldenlandia rupicola var. rupicola*	(Sond.) Kuntze	LC	Indigenous
Loranthaceae	*Oncocalyx bolusii*	(Sprague) Wiens & Polhill	LC	Indigenous
Apocynaceae	*Orbea tapscottii*	(I.Verd.) L.C.Leach	LC	Indigenous
Asteraceae	*Orbivestus cinerascens*	(Sch.Bip.) H.Rob.	LC	Indigenous
Oxalidaceae	*Oxalis corniculata*	L.		Not indigenous; Naturalised; Invasive
Polygonaceae	*Oxygonum dregeanum subsp. lanceolatum*	Meisn.	LC	Indigenous
Anacardiaceae	*Ozoroa paniculosa var. salicina*	(Sond.) R.Fern. & A.Fern.	LC	Indigenous
Amaryllidaceae	*Pancratium tenuifolium*	Hochst. ex A.Rich.	LC	Indigenous
Poaceae	*Panicum coloratum*	L.	NE	Indigenous

Poaceae	*Panicum maximum*	Jacq.	LC	Indigenous
Asteraceae	*Pechuel-Loeschea leubnitziae*	(Kuntze) O.Hoffm.	LC	Indigenous
Apocynaceae	*Pergularia daemia subsp. daemia*	(Forssk.) Chiov.	LC	Indigenous
Acanthaceae	*Petalidium aromaticum var. canescens*	Oberm.		Indigenous
Fabaceae	*Philenoptera violacea*	(Klotzsch) Schrire	LC	Indigenous
Phyllanthaceae	*Phyllanthus maderaspatensis*	L.	LC	Indigenous
Rhamnaceae	*Phyllogeiton discolor*	(Klotzsch) Herzog	LC	Indigenous
Rhamnaceae	*Phyllogeiton zeyheri*	(Sond.) Suess.	LC	Indigenous
Pteridaceae	*Pityrogramma argentea*	(Willd.) Domin	LC	Indigenous
Lamiaceae	*Plectranthus barbatus*	Andrews	LC	Not indigenous; Naturalised
Asteraceae	*Pluchea bojeri*	(DC.) Humbert	LC	Indigenous
Polygalaceae	*Polygala albida subsp. albida*	Schinz	LC	Indigenous
Urticaceae	*Pouzolzia sp.*		LC	
Celastraceae	*Pristimera longipetiolata*	(Oliv.) N.Halle	LC	Indigenous
Celastraceae	*Pristimera peglerae*	(Loes.) R.H.Archer	LC	Indigenous; Endemic
Pottiaceae	*Pseudocrossidium porphyreoneurum*	(Mull.Hal.) R.H.Zander	LC	Indigenous
Asteraceae	*Psiadia punctulata*	(DC.) Vatke		Indigenous
Pedaliaceae	*Pterodiscus ngamicus*	N.E.Br. ex Stapf	LC	Indigenous
Fabaceae	*Ptycholobium contortum*	(N.E.Br.) Brummitt	LC	Indigenous
Cyperaceae	*Pycreus mundii*	Nees		Indigenous
Icacinaceae	*Pyrenacantha grandiflora*	Baill.	LC	Indigenous
Apocynaceae	*Rauvolfia caffra*	Sond.	LC	Indigenous
Bignoniaceae	*Rhigozum zambesiacum*	Baker	LC	Indigenous
Fabaceae	*Rhynchosia capensis*	(Burm.f.) Schinz	LC	Indigenous; Endemic
Fabaceae	*Rhynchosia totta var. rigidula*	(Thunb.) DC.	LC	Indigenous
Salicaceae	*Salix mucronata subsp. woodii*	Thunb.	LC	Indigenous
Salvadoraceae	*Salvadora australis*	Schweick.	LC	Indigenous
Fabaceae	*Schotia brachypetala*	Sond.	LC	Indigenous
Anacardiaceae	*Sclerocarya birrea subsp. caffra*	(A.Rich.) Hochst.	LC	Indigenous
Salicaceae	*Scolopia zeyheri*	(Nees) Harv.	LC	Indigenous
Apocynaceae	*Secamone parvifolia*	(Oliv.) Bullock	LC	Indigenous
Selaginellaceae	*Selaginella nivea subsp. nivea*	Alston ex Alston	LC	Indigenous
Fabaceae	*Senegalia schweinfurthii var. schweinfurthii*	(Brenan & Exell) Seigler & Ebinger		Indigenous
Fabaceae	*Senegalia senegal var. leiorhachis*	(L.) Britton	LC	Indigenous
Amaranthaceae	*Sericorema remotiflora*	(Hook.f.) Lopr.	LC	Indigenous
Pedaliaceae	*Sesamothamnus lugardii*	N.E.Br. ex Stapf	LC	Indigenous
Poaceae	*Setaria pumila*	(Poir.) Roem. & Schult.	LC	Indigenous

Malvaceae	*Sida alba*	L.	LC	Indigenous
Malvaceae	*Sida ovata*	Forssk.	NE	Indigenous
Malvaceae	*Sida sp.*		LC	
Solanaceae	*Solanum catombelense*	Peyr.	LC	Indigenous
Solanaceae	*Solanum tomentosum*	L.	LC	Indigenous
Poaceae	*Sporobolus virginicus*	(L.) Kunth	NE	Indigenous
Apocynaceae	*Stapelia gettliffei*	R.Pott	LC	Indigenous
Linderniaceae	*Stemodiopsis rivae*	Engl.	LC	Indigenous
Malvaceae	*Sterculia rogersii*	N.E.Br.	LC	Indigenous
Poaceae	*Stipagrostis uniplumis var. uniplumis*	(Licht.) De Winter	LC	Indigenous
Apocynaceae	*Strophanthus petersianus*	Klotzsch	LC	Indigenous
Myrtaceae	*Syzygium gerrardii*	(Harv. ex Hook.f.) Burtt Davy	LC	Indigenous
Myrtaceae	*Syzygium guineense subsp. guineense*	(Willd.) DC.	LC	Indigenous
Apocynaceae	*Tacazzea apiculata*	Oliv.	LC	Indigenous
Loranthaceae	*Tapinanthus forbesii*	(Sprague) Wiens	LC	Indigenous
Asteraceae	*Tenrhynea phylicifolia*	(DC.) Hilliard & B.L.Burtt		Indigenous
Fabaceae	*Tephrosia purpurea subsp. leptostachya*	(L.) Pers.		Indigenous
Fabaceae	*Tephrosia rhodesica*	Baker f.	LC	Indigenous
Fabaceae	*Tephrosia villosa subsp. ehrenbergiana*	(L.) Pers.	LC	Indigenous
Fabaceae	*Tephrosia zoutpansbergensis*	Bremek.	LC	Indigenous
Combretaceae	*Terminalia prunioides*	M.A.Lawson	LC	Indigenous
Poaceae	*Tetrapogon tenellus*	(Roxb.) Chiov.	LC	Indigenous
Poaceae	*Themeda triandra*	Forssk.		Indigenous
Asphodelaceae	*Trachyandra saltii var. saltii*	(Baker) Oberm.		Indigenous
Poaceae	*Trachypogon spicatus*	(L.f.) Kuntze	LC	Indigenous
Poaceae	*Tragus berteronianus*	Schult.		Indigenous
Zygophyllaceae	*Tribulus terrestris*	L.	LC	Indigenous
Zygophyllaceae	*Tribulus zeyheri subsp. zeyheri*	Sond.	LC	Indigenous
Boraginaceae	*Trichodesma zeylanicum*	(Burm.f.) R.Br.	NE	Indigenous
Turneraceae	*Tricliceras glanduliferum*	(Klotzsch) R.Fern.	LC	Indigenous
Salicaceae	*Trimeria grandifolia subsp. grandifolia*	(Hochst.) Warb.	NE	Indigenous
Poaceae	*Urochloa mosambicensis*	(Hack.) Dandy		Indigenous
Fabaceae	*Vachellia karroo*	(Hayne) Banfi & Galasso	LC	Indigenous
Fabaceae	*Vachellia nilotica subsp. kraussiana*	(L.) P.J.H.Hurter & Mabb.	LC	Indigenous
Fabaceae	*Vachellia permixta*	(Burtt Davy) Kyal. & Boatwr.	LC	Indigenous
Fabaceae	*Vachellia tortilis subsp. heteracantha*	(Forssk.) Galasso & Banfi	LC	Indigenous
Asteraceae	*Verbesina encelioides subsp. encelioides*	(Cav.) Benth. & Hook.f. ex A.Gray	LC	Not indigenous; Naturalised; Invasive

Fabaceae	*Vigna unguiculata subsp. unguiculata*	(L.) Walp.	LC	Indigenous
Campanulaceae	*Wahlenbergia undulata*	(L.f.) A.DC.	LC	Indigenous
Malvaceae	*Waltheria indica*	L.	LC	Indigenous
Fabaceae	*Xanthocercis zambesiaca*	(Baker) Dumaz-le-Grand	LC	Indigenous

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

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Amietia delalandii	Delalande's River Frog	LC	LC
Breviceps adspersus	Bushveld Rain Frog	LC	LC
Breviceps mossambicus	Mozambique Rain Frog	LC	LC
Breviceps sylvestris	Northern Forest Rain Frog	VU	VU
Cacosternum boettgeri	Common Caco	LC	LC
Chiromantis xerampelina	Southern Foam Nest Frog	LC	LC
Hemisus guineensis broadleyi	Guinea Shovel-nosed Frog	LC	LC
Hemisus marmoratus	Mottled Shovel-nosed Frog	LC	LC
Hyperolius marmoratus	Painted Reed Frog	LC	LC
Kassina senegalensis	Bubbling Kassina	LC	LC
Phrynobatrachus mababiensis	Dwarf Puddle Frog	LC	LC
Phrynobatrachus natalensis	Snoring Puddle Frog	LC	LC
Phrynomantis bifasciatus	Banded Rubber Frog	LC	LC
Poyntonophrynus fenoulheti	Northern Pygmy Toad	LC	LC
Ptychadena anchietae	Plain Grass Frog	LC	LC
Ptychadena mossambica	Mozambique Ridged Frog	LC	LC
Ptychadena oxyrhynchus	Sharp-nosed Grass Frog	LC	LC
Ptychadena porosissima	Striped Grass Frog	LC	LC
Ptychadena uzungwensis	Udzungwa Grass Frog	LC	LC
Pyxicephalus adspersus	Giant Bullfrog	NT	NT
Pyxicephalus edulis	African Bullfrog	LC	LC
Schismaderma carens	African Red Toad	LC	LC
Sclerophrys capensis	Raucous Toad	LC	LC
Sclerophrys garmani	Olive Toad	LC	LC
Sclerophrys gutturalis	Guttural Toad	LC	LC
Sclerophrys pusilla	Flatbacked Toad	LC	LC
Strongylopus fasciatus	Striped Stream Frog	LC	LC
Strongylopus grayii	Clicking Stream Frog	LC	LC
Tomopterna adiastola	Confused Sand Frog	LC	LC
Tomopterna cryptotis	Tremelo Sand Frog	LC	LC
Tomopterna krugerensis	Knocking Sand Frog	LC	LC
Tomopterna marmorata	Russet-backed Sand Frog	LC	LC
Tomopterna natalensis	Natal Sand Frog	LC	LC
Xenopus laevis	Common Platanna	LC	LC
Xenopus muelleri	Müller's Platanna	LC	LC

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

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Acanthocercus atricollis	Southern Tree Agama	LC	LC
Acontias cregoi	Cregoi's Legless Skink	LC	LC
Acontias kgalagadi subtaeniatus	Stripe-bellied Legless Skink	DD	LC
Acontias occidentalis	Savanna Legless Skink	LC	Unlisted
Acontias plumbeus	Giant Legless Skink	LC	LC
Afroedura broadleyi	Broadley's rock gecko	Unlisted	Unlisted
Afroedura pienaari	Pienaar's rock gecko	Unlisted	LC
Afroedura transvaalica	Zimbabwe Flat Gecko	LC	Unlisted
Afrotyphlops bibronii	Bibron's Blind Snake	LC	LC
Afrotyphlops mucruso	Zambezi Giant Blind-snake	Unlisted	LC
Afrotyphlops schlegelii	Schlegel's Beaked Blind Snake	LC	Unlisted
Agama aculeata distanti	Eastern Ground Agama	LC	LC
Agama armata	Nothern Ground Agama	LC	Unlisted
Agama atra	Southern Rock Agama	LC	LC
Amblyodipsas microphthalma nigra	Soutpansberg Purple-Glossed Snake	LC	LC
Amblyodipsas polylepis	Purple Gloss Snake	Unlisted	Unlisted
Aparallactus capensis	Black-headed Centipede-eater	LC	LC
Aparallactus lunulatus lunulatus	Plumbeous centipede-eater	LC	Unlisted
Aspidelaps scutatus scutatus	Common Shield Snake	LC	Unlisted
Atractaspis bibronii	Bibron's Stiletto Snake	LC	Unlisted
Bitis arietans arietans	Puff Adder	LC	Unlisted
Boaedon capensis	Brown House Snake	LC	LC
Bradypodion transvaalense	Nothern Dwarf Chameleon	LC	LC
Broadleysaurus major	Rough-scaled Plated Lizard	LC	Unlisted
Causus defilippii	Snouted Night Adder	LC	Unlisted
Causus rhombeatus	Rhombic Night Adder	LC	LC
Chamaeleo dilepis	Common Flap-neck Chameleon	LC	LC
Chamaesaura anguina anguina	Cape Grass Lizard	LC	Unlisted
Chamaesaura macrolepis	Large-scaled Grass Lizard	NT	LC
Chirindia langi occidentalis	Soutpansberg Worm Lizard	VU	Unlisted
Chondrodactylus turneri	Turner's Gecko	LC	Unlisted
Cordylus jonesii	Jones' Girdled Lizard	LC	Unlisted
Cordylus vittifer	Common Girdled Lizard	LC	LC
Crocodylus niloticus	Nile Crocodile	VU	LC
Crotaphopeltis hotamboeia	Red-lipped Snake	LC	Unlisted
Dasypeltis inornata	Southern Brown Egg-eater	LC	LC
Dasypeltis scabra	Rhombic Egg-eater	LC	LC
Dendroaspis polylepis	Black Mamba	LC	LC
Dispholidus typus	Boomslang	LC	Unlisted
Duberria lutrix	Common Slug-eater	LC	LC
Elapsoidea boulengeri	Boulenger's Garter Snake	LC	Unlisted
Elapsoidea sundevallii	Sundevall's Garter Snake	LC	Unlisted
Gerrhosaurus flavigularis	Yellow-throated Plated Lizard	LC	Unlisted

Gerrhosaurus intermedius	Eastern Black-lined Plated Lizard	LC	Unlisted
Gonionotophis capensis	Common File Snake	LC	LC
Gracililima nyassae	Black File Snake	LC	LC
Heliobolus lugubris	Bushveld Lizard	LC	Unlisted
Hemidactylus mabouia	Common Tropical House Gecko	LC	Unlisted
Hemirhagerrhis nototaenia	Eastern Bark Snake	LC	Unlisted
Homopholis arnoldi	Arnold's Velvet Gecko	Unlisted	LC
Homopholis mulleri	Muller's Velvet Gecko	VU	LC
Homopholis wahlbergii	Wahlberg's Velvet Gecko	LC	LC
Kinixys lobatsiana	Lobatse hinged-back Tortoise	LC	LC
Kinixys spekii	Speke's Hinged-Back Tortoise	LC	Unlisted
Lamprophis guttatus	Spotted Rock Snake	LC	LC
Leptotyphlops distanti	Distant's Tread Snake	LC	LC
Leptotyphlops incognitus	Incognito Thread Snake	LC	Unlisted
Leptotyphlops scutifrons scutifrons	Peters' Thread Snake	LC	Unlisted
Lycodonomorphus inornatus	Olive House Snake	LC	LC
Lycodonomorphus rufulus	Brown Water Snake	LC	Unlisted
Lycophidion capense capense	Cape Wolf Snake	LC	Unlisted
Lycophidion variegatum	Variegated Wolf Snake	LC	Unlisted
Lygodactylus bradfieldi	Bradfield's Dwarf Gecko	LC	Unlisted
Lygodactylus capensis	Common Dwarf Gecko	LC	Unlisted
Lygodactylus incognitus	Cryptic Dwarf Gecko	Unlisted	LC
Lygodactylus ocellatus soutsbergensis	Soutpansberg Dwarf Gecko	NT	LC
Lygodactylus stevensoni	Stevenson's Dwarf Gecko	LC	Unlisted
Matobosaurus validus	Common Giant Plated Lizard	LC	Unlisted
Meroles squamulosus	Common Rough-scaled Lizard	LC	Unlisted
Mochlus sundevallii	Sundevall's Writhing Skink	LC	LC
Monopeltis infuscata	Dusky Worm Lizard	LC	Unlisted
Monopeltis sphenorhynchus	Slender Worm Lizard	LC	Unlisted
Myriopholis longicauda	Long-tailed Thread Snake	LC	Unlisted
Naja annulifera	Snouted Cobra	LC	Unlisted
Naja mossambica	Mozambique Spitting Cobra	LC	Unlisted
Natriciteres olivacea	Olive Marsh Snake	Unlisted	LC
Nucras holubi	Holub's Sandveld Lizard	LC	Unlisted
Nucras intertexta	Spotted Sandveld Lizard	LC	Unlisted
Nucras lalandii	Delalande's Sandveld Lizard	LC	LC
Nucras ornata	Ornate Sandveld Lizard	LC	Unlisted
Pachydactylus affinis	Transvaal Gecko	LC	LC
Pachydactylus capensis	Cape Gecko	LC	Unlisted
Pachydactylus punctatus	Speckled Gecko	LC	LC
Pachydactylus tigrinus	Tiger Gecko	LC	Unlisted
Pachydactylus vansoni	VAN Son's Gecko	LC	LC
Panaspis maculicollis	Spotted-neck Snake-eyed Skink	Unlisted	LC
Panaspis wahlbergi	Wahlberg's Snake-eyed Skink	LC	Unlisted
Pedioplanis lineoocellata lineoocellata	Spotted Sand Lizard	LC	Unlisted
Pelomedusa subrufa	Central Marsh Terrapin	LC	Unlisted

Pelusios sinuatus	Serrated Hinged Terrapin	LC	Unlisted
Philothamnus occidentalis	Western Nalal Green Snake	Unlisted	Unlisted
Philothamnus semivariegatus	Spotted Bush Snake	LC	Unlisted
Platysaurus intermedius	Common Flat Lizard	Unlisted	LC
Platysaurus intermedius parvus	Blouberg Flat Lizard	LC	LC
Platysaurus relictus	Soutpansberg Flat Lizard	LC	LC
Prosymna ambigua	Angolan Shovel-snout	Unlisted	LC
Prosymna bivittata	Two-Striped Shovel-Snout	LC	Unlisted
Prosymna lineata	Lined Shovel-snout	LC	Unlisted
Prosymna stuhlmannii	East African Shovel-snout	LC	LC
Psammobates oculifer	Serrated Tent Tortoise	LC	Unlisted
Psammophis angolensis	Dwarf Sand Snake	LC	Unlisted
Psammophis brevirostris	Short-snouted Grass Snake	LC	Unlisted
Psammophis crucifer	Cross-marked Grass Snake	LC	LC
Psammophis jallae	Jalla's Sand Snake	LC	Unlisted
Psammophis mossambicus	Olive Grass Snake	LC	Unlisted
Psammophis subtaeniatus	Stripe-bellied Sand Snake	LC	LC
Psammophylax tritaeniatus	Striped Grass Snake	LC	LC
Pseudaspis cana	Mole Snake	LC	Unlisted
Ptenopus garrulus garrulus	Common Barking Gecko	LC	Unlisted
Python natalensis	Southern African Python	LC	Unlisted
Rhinotyphlops lalandei	Delalande's Beaked Blind Snake	LC	Unlisted
Scelotes limpopoensis albiventris	White-bellied Dwarf Burrowing Skink	NT	Unlisted
Scelotes limpopoensis limpopoensis	Limpopo Dwarf Burrowing Skink	LC	Unlisted
Smaug depressus	Flat Dragon Lizard	Unlisted	LC
Stigmochelys pardalis	Leopard Tortoise	LC	LC
Telescopus semiannulatus semiannulatus	Eastern Tiger Snake	LC	Unlisted
Thelotornis capensis	Southern Twig Snake	LC	LC
Trachylepis capensis	Cape Skink	LC	Unlisted
Trachylepis damarana	Damara skink	Unlisted	LC
Trachylepis laevigata	Variable Skink	DD	DD
Trachylepis margaritifera	Rainbow Skink	LC	LC
Trachylepis punctatissima	Speckled Rock Skink	LC	LC
Trachylepis punctulata	Speckled Sand Skink	LC	Unlisted
Trachylepis striata	Striped Skink	LC	Unlisted
Trachylepis varia	Variable Skink	LC	LC
Varanus albigularis albigularis	Southern Rock Monitor	LC	Unlisted
Varanus niloticus	Water Monitor	LC	Unlisted
Vhembelacerta rupicola	Soutpansberg Rock Lizard	NT	LC
Xenocalamus bicolor lineatus	Striped Quill-snouted Snake	LC	Unlisted
Xenocalamus transvaalensis	Speckled Quill-Snouted Snake	LC	LC
Zygaspis quadrifrons	Kalahari Dwarf Worm Lizard	LC	Unlisted

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

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2021)
Acomys spinosissimus	Spiny Mouse	LC	LC
Aethomys ineptus	Tete Veld Rat	LC	LC
Aethomys namaquensis	Namaqua rock rat	LC	LC
Aonyx capensis	Cape Clawless Otter	NT	NT
Atelerix frontalis	South Africa Hedgehog	NT	LC
Atilax paludinosus	Water Mongoose	LC	LC
Canis mesomelas	Black-backed Jackal	LC	LC
Caracal caracal	Caracal	LC	LC
Chlorocebus pygerythrus	Vervet Monkey	LC	LC
Civettictis civetta	African Civet	LC	LC
Cloeotis percivali	Short-eared Trident Bat	EN	LC
Crocidura cyanea	Reddish-grey Musk Shrew	LC	LC
Crocidura fuscomurina	Tiny Musk Shrew	LC	LC
Crocidura hirta	Lesser Red Musk Shrew	LC	LC
Crocidura maquassiensis	Makwassie musk shrew	VU	LC
Crocidura mariquensis	Swamp Musk Shrew	NT	LC
Crocuta crocuta	Spotted Hyaena	NT	LC
Cynictis penicillata	Yellow Mongoose	LC	LC
Dasymys incomtus	African Marsh rat	NT	LC
Dendromus melanotis	Grey Climbing Mouse	LC	LC
Dendromus mystacalis	Chestnut Climbing Mouse	LC	LC
Desmodillus auricularis	Short-tailed Gerbil	LC	LC
Eidolon helvum	African Straw-colored Fruit Bat	LC	NT
Elephantulus brachyrhynchus	Short-snouted Sengi	LC	LC
Elephantulus intufi	Bushveld sengi	LC	LC
Elephantulus myurus	Eastern Rock Sengi	LC	LC
Epomophorus crypturus	Gambian epauletted fruit bat	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
Galago moholi	Southern Lesser Galago	LC	LC
Genetta genetta	Small-spotted Genet	LC	LC
Genetta maculata	Rusty-spotted Genet	LC	LC
Gerbilliscus leucogaster	Bushveld Gerbil	LC	LC
Glauconycteris variegata	Butterfly Bat	LC	LC

Graphiurus microtis	Large Savanna African Dormouse	LC	LC
Graphiurus murinus	Woodland Dormouse	LC	LC
Graphiurus platyops	Rock Dormouse	LC	LC
Helogale parvula	Dwarf Mongoose	LC	LC
Herpestes sanguineus	Slender Mongoose	LC	LC
Heterohyrax brucei	Bush Hyrax	LC	LC
Hipposideros caffer	Sundevall's Leaf-nosed Bat	LC	LC
Hystrix africaeaustralis	Cape Porcupine	LC	LC
Ictonyx striatus	Striped Polecat	LC	LC
Kerivoula lanosa	Lesser Woolly Bat	LC	LC
Kobus ellipsiprymnus	Common Waterbuck	LC	LC
Laephotis botswanae	Botswanan long-eared bat	LC	LC
Lemniscomys rosalia	Single-striped Mouse	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
Mastomys coucha	Multimammate Mouse	LC	LC
Mastomys natalensis	Natal Multimammate Mouse	LC	LC
Mellivora capensis	Honey Badger	LC	LC
Mungos mungo	Banded Mongoose	LC	LC
Mus musculus	House Mouse	Unlisted	LC
Myotis welwitschii	Welwitsch's Hairy Bat	LC	LC
Neoromicia capensis	Cape Serotine Bat	LC	LC
Neoromicia nana	Banana Bat	LC	LC
Neoromicia zuluensis	Aloe Bat	LC	LC
Nycteris thebaica	Egyptian Slit-faced Bat	LC	LC
Nycteris woodi	Wood's Slit Faced Bat	NT	LC
Oreotragus oreotragus	Klipspringer	LC	LC
Orycteropus afer	Aardvark	LC	LC
Otocyon megalotis	Bat-eared Fox	LC	LC
Otolemur crassicaudatus	Thick-tailed Bushbaby	LC	LC
Otomys irroratus	Vlei Rat (Fynbos type)	LC	LC
Panthera pardus	Leopard	VU	VU
Papio ursinus	Chacma Baboon	LC	LC
Paracynictis selousi	Selous' Mongoose	LC	LC
Parahyaena brunnea	Brown Hyaena	NT	NT
Paraxerus cepapi	Tree Squirrel	LC	LC
Pedetes capensis	Springhare	LC	LC

Phacochoerus africanus	Common Warthog	LC	LC
Pipistrellus anchietae	Anchieta's Bat	LC	LC
Pipistrellus hesperidus	African Pipistrelle	LC	LC
Pipistrellus rusticus	Rusty Bat	LC	LC
Poecilogale albinucha	African Striped Weasel	NT	LC
Potamochoerus larvatus	Bushpig	LC	LC
Procavia capensis	Rock Hyrax	LC	LC
Pronolagus randensis	Jameson's Red Rock Rabbit	LC	LC
Proteles cristata	Aardwolf	LC	LC
Raphicerus campestris	Steenbok	LC	LC
Raphicerus sharpei	Sharpe's Grysbok	LC	LC
Redunca arundinum	Southern Reedbuck	LC	LC
Redunca fulvorufula	Mountain Reedbuck	EN	EN
Rhinolophus clivosus	Geoffroy's Horseshoe Bat	LC	LC
Rhinolophus darlingi	Darling's Horseshoe Bat	LC	LC
Rhinolophus hildebrandtii	Hildebrandt's Horseshoe Bat	LC	LC
Rhinolophus simulator	Bushveld Horseshoe Bat	LC	LC
Saccostomus campestris	Pouched Mouse	LC	LC
Sauromys petrophilus	Flat-headed Free-tail Bat	LC	LC
Scotophilus dinganii	Yellow House Bat	LC	LC
Smutsia temminckii	Temminck's Ground Pangolin	VU	VU
Steatomys pratensis	Fat Mouse	LC	LC
Suncus varilla	Lesser Dwarf Shrew	LC	LC
Sylvicapra grimmia	Common Duiker	LC	LC
Tadarida aegyptiaca	Egyptian Free-tailed Bat	LC	LC
Taphozous mauritianus	Mauritian Tomb Bat	LC	LC
Thallomys paedulcus	Tree Rat	LC	LC
Thryonomys swinderianus	Greater Cane Rat	LC	LC
Tragelaphus scriptus	Cape Bushbuck	LC	LC
Tragelaphus strepsiceros	Greater Kudu	LC	LC

10.5 Appendix E Specialist Declarations

DECLARATION

I, Carami Burger, 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.

Carami Burger

Ecologist

The Biodiversity Company

June 2022

DECLARATION

I, Andrew Husted, declare that:

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

Andrew Husted

Ecologist

The Biodiversity Company

June 2022

Appendix F Specialists CVs

Carami Burger

B.Sc. Honours – Ecological Interactions and Ecosystem Resilience (Cum Laude)

(*Cand Sci Nat*)

Cell: +27 83 630 9077

Email: Carami@thebiodiversitycompany.com

Identity Number: 9606250185084

Date of birth: 25 June 1996

Profile Summary

Working experience in South Africa and Mozambique.

Specialist experience with infrastructure development, road development, renewable energy, mining and prospecting.

Specialist expertise include terrestrial ecology, wetland resources, rehabilitation and management plans, environmental compliance and monitoring.

Areas of Interest

Renewable Energy & Bulk Services Infrastructure Development, Mining, Farming, Sustainability and Conservation.

Key Experience

- Environmental Impact Assessments (EIA)
- Basic Assessments
- Terrestrial Ecological Assessments
- Wetland Delineation and Ecological Assessments
- Environmental Management Programmes (EMPr)
- Rehabilitation Plans
- Invasive Species Plans
- Search and Rescue Plans
- Environmental Compliance Audits
- Water Use License Applications
- Dust Fallout Monitoring
- Water Quality Monitoring

Countries worked in

South Africa

Mozambique

Nationality

South African

Languages

English – Proficient

Afrikaans – Proficient

Qualifications

- BSc Hons Ecological Interactions and Ecosystem Resilience.
- BSc Botany and Zoology.
- Cand Sci Nat (121757)

SELECTED PROJECT EXPERIENCE

Project Name: The Central Térmica de Temane (CTT) Project - Management Plans

Client: TSK

Personal position / role on project: Author

Location: Inhambane Province, Mozambique

Main project features: Compile a Plant Search and Rescue Plan, Site Clearance Plan, Invasive Alien Species Plan and a Rehabilitation Plan for the Central Térmica de Temane (CTT) project

Project Name: The Central Térmica de Temane (CTT) Project - Flora and Fauna Survey and Report

Client: TSK

Personal position / role on project: Terrestrial Specialist

Location: Inhambane Province, Mozambique

Main project features: Conduct a Flora and Fauna survey and report during the dry and wet season for the Central Térmica de Temane (CTT) project, located in the vicinity of the town of Inhassoro, Inhambane Province, Mozambique

Project Name: Sikhwetha Lodge - Ridge and Terrestrial Ecological Assessment

Client: Neels Bezuidenhout Architects

Personal position / role on project: Terrestrial Specialist

Location: Roodeplaat, Gauteng

Main project features: Conduct a Ridge And Terrestrial Ecological Assessment as part of the Environmental Authorisation process for the proposed Sikhwetha Lodge located on Portion 2 of the Farm Doornfontein 291 JR.

Project Name: Rama City Bulk Service Infrastructure Development - Watercourse Delineation and Assessment

Client: RCDC

Personal position / role on project: Wetland Ecologist

Location: Ga-Rankuwa Gauteng

Main project features: Conduct a Watercourse Delineation and Assessment for the Rama City Bulk Service Infrastructure Development.

Project Name: Katoloso Minerals Prospecting Right – Terrestrial and Wetland Ecological Opinion

Client: Katoloso Minerals

Personal position / role on project: Terrestrial/ Wetland Ecologist

Location: Ventersdorp North West

Main project features: To conduct a terrestrial and wetland ecological opinion for the proposed Prospecting Right.

Project Name: Wetland Assessment as part of the Environmental Authorisation process for the proposed construction of residential units on Portion 9 of the farm Olievenhoutbosch 389-JR, Gauteng Province.

Personal position / role on project: Avifaunal specialist

Location: Olievenhoutbosch, Gauteng Province.

Main project features: To conduct a wetland assessment for the proposed construction of residential units.

Project Name: Copperton Wind Farm Project - Rehabilitation Method Statement

Personal position / role on project: Terrestrial Ecologist

Location: Copperton Northern Cape Province.

Main project features: To compile a rehabilitation method statement for the Copperton Wind Farm Project located on the farm Nelspoortjie (Farm No. 103 Portion 4 (a portion of portion 2) and 7 (a portion of portion 5) near Copperton in the Northern Cape Province.

Project Name: Wonderfontein Road Diversion - Terrestrial Ecological Scan

Personal position / role on project: Terrestrial Ecologist.

Location: Belfast, Mpumalanga Province

Main project features: To conduct a terrestrial ecological scan as part of the Environmental Authorisation Process for the Proposed Wonderfontein Road Diversion Near Wonderfontein Colliery.

Project Name: Terrestrial Ecological Report for the proposed construction of a crematorium on a portion of the remaining extent of the Farm Vulcania 279 IR, Gauteng Province

Personal position / role on project: Terrestrial Ecologist

Location: Springs, Gauteng

Main project features: Conduct a detailed terrestrial ecology basic assessment for the proposed construction of a crematorium.

Project Name: Wetland study as part of the Environmental Authorisation process for the proposed construction of a crematorium on a portion of the remaining extent of the Farm Vulcania 279 IR, Gauteng Province.

Personal position / role on project: Wetland Ecologist

Location: Springs, Gauteng

Main project features: To conduct a wetland delineation and ecological assessment for the proposed construction of a crematorium.

OVERVIEW

An overview of the specialist technical expertise includes the following:

- Terrestrial Ecological Assessments.
- Faunal surveys which include mammals, birds, amphibians and reptiles.
- Wetland Ecological Assessment.
- Management plan compilation (Plant Search and Rescue, Rehabilitation, Site Clearance, Alien Invasive Species Plans).
- Compliance audits.
- Water Use Licenses.
- Water Quality and Dust Fall Monitoring.

EMPLOYMENT EXPERIENCE

CURRENT EMPLOYMENT: The Biodiversity Company (May 2022 - Present)

Terrestrial Ecological Assessments, Wetland Ecological Assessment and management Plans.

EMPLOYMENT: EP3 Environmental - Senior Consultant and Ecologist (June 2019 - April 2022)

Responsibilities:

- Specialist studies
- Environmental Procedures
- Basic Assessment Reports
- Environmental Impact Assessment Reports
- Water Use License Applications
- Environmental Management Programmes
- Environmental Control Officer Audits and Reports
- Surface Water Quality Monitoring Reports

- Groundwater Quality Monitoring Reports
- Dust Fallout Monitoring Reports

EMPLOYMENT: Scientific Aquatic Services (SAS)- Internship (November 2018 - June 2019)

Responsibilities:

- Specialist studies
- Background Information, Mapping (ArcGIS) and Desktop Studies

ACADEMIC QUALIFICATIONS

North-West University of Potchefstroom (2017): BACCALAUREUS SCIENTIAE IN NATURAL AND ENVIRONMENTAL SCIENCES. Majors: Botany and Zoology.

North-West University of Potchefstroom (2013): BACCALAUREUS SCIENTIAE HONORIBUS (Hons) – Ecological Interactions and Ecosystem Resilience (Cum Laude)

Title: Mini-Dissertation on ecological information in Environmental Impact Assessments (EIA) at Mooi River Mall.

Andrew Husted

M.Sc Aquatic Health (*Pr Sci Nat*)

Cell: +27 81 319 1225

Email: andrew@thebiodiversitycompany.com

Identity Number: 7904195054081

Date of birth: 19 April 1979

Profile Summary

Working experience throughout South Africa, West and Central Africa and also Armenia.

Specialist experience with on-shore drilling, mining, engineering, hydropower and renewable energy.

Experience with project management of national and international multi-disciplinary projects. Including managing and compiling ESHIAs and EMPs

Specialist guidance, support and facilitation for the compliance with legislative processes, for in-country requirements, and international lenders.

Specialist expertise include Instream Flow and Ecological Water Requirements, aquatic ecology and wetlands resources.

Areas of Interest

Mining, Oil & Gas, Renewable Energy & Bulk Services Infrastructure Development, Sustainability and Conservation.

Key Experience

- Familiar with World Bank, Equator Principles and the International Finance Corporation requirements
- Environmental, Social and Health Impact Assessments (ESHIA)
- Environmental Management Programmes (EMP)
- Ecological Water Requirement determination experience
- Wetland delineations and ecological assessments
- Terrestrial Ecological Assessments
- Aquatic Ecological Assessments
- Rehabilitation Plans and Monitoring
- Aquaculture

Country Experience

Botswana, Cameroon

Democratic Republic of Congo

Ghana, Ivory Coast, Lesotho

Liberia, Mali, Mozambique

Nigeria, Republic of Armenia, Senegal

Sierra Leone, South Africa

Swaziland, Tanzania

Nationality

South African

Languages

English – Proficient

Afrikaans – Conversational

German - Basic

Qualifications

- MSc (University of Johannesburg) – Aquatic Health.
- BSc Honours (Rand Afrikaans University) – Aquatic Health
- BSc Natural Science
- Pr Sci Nat (400213/11)
- Certificate of Competence: Mondi Wetland Assessments
- Certificate of Competence: Wetland WET-Management
- SASS 5 (Expired) – Department of Water Affairs and Forestry for the River Health Programme
- EcoStatus application for rivers and streams

Publication of scientific journals and articles.

SELECTED PROJECT EXPERIENCE

Project Name: The Environmental and Social Impact Assessment (ESIA) the proposed Nondvo Dam

Client: WSP

Personal position / role on project: Project Manager.

Location: Swaziland

Main project features: To conduct a dual season terrestrial and aquatic ecological baseline and impact assessment for the proposed dam. The study was required to meet national and IFC requirements, including a Critical Habitat assessment.

Project Name: The environmental flow assessment for the Mara River system

Client: IHE Delft Institute for Water Education

Personal position / role on project: Project Manager / Freshwater Ecologist

Location: Tanzania

Main project features: To conduct a dual season campaign to the Lower Mara River Basin in Tanzania to collect hydrological and ecological information as part of an environmental flow assessment on the Tanzanian side of the Mara River in collaboration with GIZ and NBI-NELSAP.

Project Name: The Environmental and Social Impact Assessment (ESIA) the proposed solar photovoltaic facility and transmission in Cuamba

Client: WSP

Personal position / role on project: Project Manager.

Location: Mozambique

Main project features: To conduct a single season terrestrial and aquatic ecological baseline and impact assessment for the proposed dam. The study was required to meet national and IFC requirements, including a Critical Habitat assessment.

Project Name: A biodiversity baseline assessment for the proposed Siguiri Gold Mine Project, in Kankan Province, Guinea.

Client: SRK Consulting.

Personal position / role on project: Project Manager.

Location: Siguiri, Guinea, West-Africa (2018).

Main project features: To conduct a dual season ecological baseline assessment for the expected impact footprint area. The study was required to meet national and IFC requirements, including a Critical Habitat assessment.

Project Name: A biodiversity baseline and impact assessment for the proposed Lesotho Bulk Water Supply Scheme, Lesotho.

Client: WSP.

Personal position / role on project: Wetland & Aquatic Ecologist, PROBFLO and Project Manager.

Location: Mohale's Hoek, Lesotho (2018).

Main project features: To conduct a dual season terrestrial and aquatic ecological baseline and impact assessment for the pipeline route and proposed weir. The study was required to meet national and IFC requirements, including a Critical Habitat assessment. The study also contributed to prescribing Instream Flow Requirements using PROBFLO for the system.

Project Name: A biodiversity baseline and impact assessment for the proposed Pavua Hydropower Project, in Sofala Province, Central Mozambique.

Client: Mott MacDonald.

Personal position / role on project: Project Manager.

Location: Sofala Province, Mozambique (2017).

Main project features: To conduct a dual season terrestrial and aquatic ecological baseline and impact assessment for the expected impact footprint area, including Gorongosa National. The study was required to meet national and IFC requirements, including a Critical Habitat assessment. The study also contributed to prescribing Instream Flow Requirements for the system.

EMPLOYMENT EXPERIENCE

CURRENT EMPLOYMENT: The Biodiversity Company (January 2015 – Present)

I founded The Biodiversity Company in 2015, now consisting of experienced ecologists who provide technical expertise and policy advice to numerous sectors, such as mining, agriculture, construction and natural resources. The team at The Biodiversity Company have conducted stand-alone specialist studies, and provided overall guidance of studies with a pragmatic approach for the management of biodiversity that takes into account all the relevant stakeholders, most importantly the environment that is potentially affected. We manage risks to the environment to reduce impacts with practical, relevant and measurable methods.

EMPLOYMENT: Digby Wells Environmental (October 2013 – December 2014)

Digby Wells assigned me to the role of Country Manager for the united Kingdom. This was a new endeavour for the company as the company's global footprint continues to increase. The primary responsibilities for the role included the following:

- **Client liaison** to be able to interact more efficiently and personally with current mining clients, mining industry service providers, legal firms and banking institutions in order to introduce Digby Wells as a services provider with the aim of securing work.
- **Project management** for international projects which may require a presence in the united Kingdom, this was dependent on the location and needs of the client. These projects would mostly be based on the Equator Principles (EP) and International Finance Corporation (IFC) Performance Standards.

- **Technical input** to provide specialist technical expertise for projects, this included fauna, aquatic ecology, wetlands and rehabilitation. Continued with the design and implementation of Biodiversity and Land Management Plans to assist clients with managing the natural resources. Responsibilities also included the mentorship and management (including reviewing and guiding) other expertise such as flora, fauna and pedology.

EMPLOYMENT: Digby Wells Environmental (March 2012 – September 2013)

Manager of a multi-disciplinary department of scientists providing specialist services in support of national and international requirements as well as best practice guidelines, primarily focussing on the mining sector. In addition to managing the department, I was also expected to contribute specialist services, most notably focusing on water resources. Further responsibilities also included the management of numerous projects on a national or international scale. A general overview of the required responsibilities are as follows:

- **Project management** for single as well as multi-disciplinary studies on a national and international scale. This included legislation and commitments for the respective country being operated in, as well as included the World Bank (WB), EP and IFC requirements.
- **Individual and/or team management** in order to provide mentoring and supportive structures for development and growth in support of the company's strategic objectives.
- **Scientific report writing** to ensure that the relevant standards and requirements have been attained, namely local country legislation, as well as WB, EP and IFC requirements.
- **Report reviewing** in order to ensure compliance and consideration of relevant legislation and guidelines and also quality control.
- **Specialist management** to facilitate the collaboration and integration of specialist skills for the respective projects. This also included the development of Biodiversity and Land Management Plan for clients.
- **Client Resource Manager** for numerous clients in order to establish as well as maintain working relationships.

An overview of the tenure working with the company is provided below**:**

- **October 2013 – December 2014: London Operations Manager** – Deployed to establish a presence for the company (remote office) in the united Kingdom by means of generating project work to support the employment of staff and operation of a business structure.
- **March 2012 – September 2013: Biophysical Department Manager** – Responsible for the development and growth of the department to consist of four specialist units. This included the development of a new specialist unit, namely Rehabilitation.
- **January 2011 - February 2012: Ecological unit Manager** – In addition to implementing aquatic and wetland specialist services, the role required the overall management of additional specialist services which included fauna & flora.
- **June 2010 - December 2010: Aquatic Services Manager** – This required the marketing and implementation of specialist programmes for the client base such as biomonitoring and wetland off-set strategies. In addition to this, this also included expanding on the existing skill set to include services such as toxicity, bioaccumulation and ecological flow assessments.
- **August 2008: Aquatic ecologist** – Employed as a specialist to establish the aquatic services within the company. In addition to this, wetland specialist services were added to the existing portfolio.

PREVIOUS EMPLOYMENT: Econ@UJ (University of Johannesburg)

- June 2007 – July 2008: Junior aquatic ecologist
    - Researcher

- Technical assistant for fieldwork
- Reporting writing
- Project management

ADDITIONAL EXPERIENCE

Compliance audits	Conducting site investigations in order to determine the level compliance attained, ensuring that the client maintains appropriate measure of compliance with environmental regulatic by means of a legislative approach
Control officer	Acting as an independent Environmental Control Officer (EC acting as a quality controller and monitoring agent regarding environmental concerns and associated environmental impacts
Screening studies	Project investigations in order to determine the level of complexity for environmental and social studies required for a project. This is a form risk assessment to guide the advancement of the project.
Public consultation	The provision of specialist input in order to communicate proj findings as well as assist with providing feedback if and wh required.
Water use licenses	Consultation with the relevant authorities in order to establish t project requirements, as well as provide specia (aquatics/wetland) input for the application in order to achie authorisation.
Closure	Primarily the review of closure projects, with emphasis on t closure cost calculations. Support was also provided by assist with the measurements of structures during fieldwork.
Visual	The review of visual studies as well as the collation of field d considered for the visual interpretation for the project.

ACADEMIC QUALIFICATIONS

University of Johannesburg, Johannesburg, South Africa (2009): MAGISTER SCIENTIAE (MSc) - Aquatic Health:

Title: *Aspects of the biology of the Bushveld Smallscale Yellowfish (Labeobarbus polylepis): Feeding biology and metal bioaccumulation in five populations.*

Rand Afrikaans University (RAU), Johannesburg, South Africa (2004): BACCALAUREUS SCIENTIAE CUM HONORIBUS (Hons) – Zoology

Rand Afrikaans University (RAU), Johannesburg, South Africa (2001 - 2004): BACCALAUREUS SCIENTIAE IN NATURAL AND ENVIRONMENTAL SCIENCES. Majors: Zoology and Botany.

PUBLICATIONS

Mahomed D, Husted A, Fry C, Downsa CT and O'Brien GC. 2019. Spatial shifts and habitat partitioning of ichthyofauna within the middle-lower region of the Pungwe Basin, Mozambique, Journal of Freshwater Ecology, 34:1, 685-702, DOI: 10.1080/02705060.2019.1673221

Tate RB and Husted, A. 2015. Aquatic Biomonitoring in the upper reaches of the Boesmanspruit, Carolina, Mpumalanga, South Africa. African Journal of Aquatic Science.

Tate RB and Husted A. 2013. Bioaccumulation of metals in *Tilapia zillii* (Gervai, 1848) from an impoundment on the Badeni River, Cote D'Iviore. African Journal of Aquatic Science.

O'Brien GC, Bulfin JB, Husted A. and Smit NJ. 2012. Comparative behavioural assessment of an established and new Tigerfish (*Hydrocynus vittatus*) population in two manmade lakes in the Limpopo catchment, Southern Africa. African Journal of Aquatic Science.

Tomschi, H, Husted, A, O'Brien, GC, Cloete, Y, Van Dyk C, Pieterse GM, Wepener V, Nel A and Reisinger U. 2009. Environmental study to establish the baseline biological and physical conditions of the Letsibogo Dam near Selebi Phikwe, Botswana. EC Multiple Framework Contract Beneficiaries.8 ACP BT 13 – Mining Sector (EDMS). Specific Contract N° 2008/166788. Beneficiary Country: Botswana. By: HPC HARRESS PICKEL CONSULT AG

Husted A. 2009. Aspects of the biology of the Bushveld Smallscale Yellowfish (*Labeobarbus polylepis*): Feeding biology and metal bioaccumulation in five populations. The University of Johannesburg (Thesis).