APPENDIX D

TERRESTRIAL ECOLOGY REPORT

The Scoping Assessment for the proposed Northam Photovoltaic Zondereinde Self Generation Project

Northam, Limpopo Province

May 2022 (Updated September 2022)

CLIENT

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1 Introduction

1.1 Background

The Biodiversity Company was appointed to undertake a terrestrial, wetland and soil scoping assessment for the proposed Northam Zondereinde Solar PV Energy Facility on the Farm Kopje near Northam, Limpopo Province (Figure 1-2). Zondereinde Solar (Pty) Ltd has identified a development area of approximately 250 ha within the larger project site of 1185 ha. The proposed development will comprise the following:

- Solar PV array, comprising PV modules and mounting structures;
- Inverters and transformers;
- Cabling between the project components;
- An 80MV on-site facility substation to facilitate the connection between the Solar PV Energy Facility and mine electrical distribution system;
- Offices, control room/s and a storage facility;
- A 33kV overhead power line for the distribution of the generated power, which will be connected to the existing metallurgical complex and shaft substations;
- Temporary laydown areas; and
- An access road (paved/gravel), internal gravel roads and fencing around the development area.

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

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

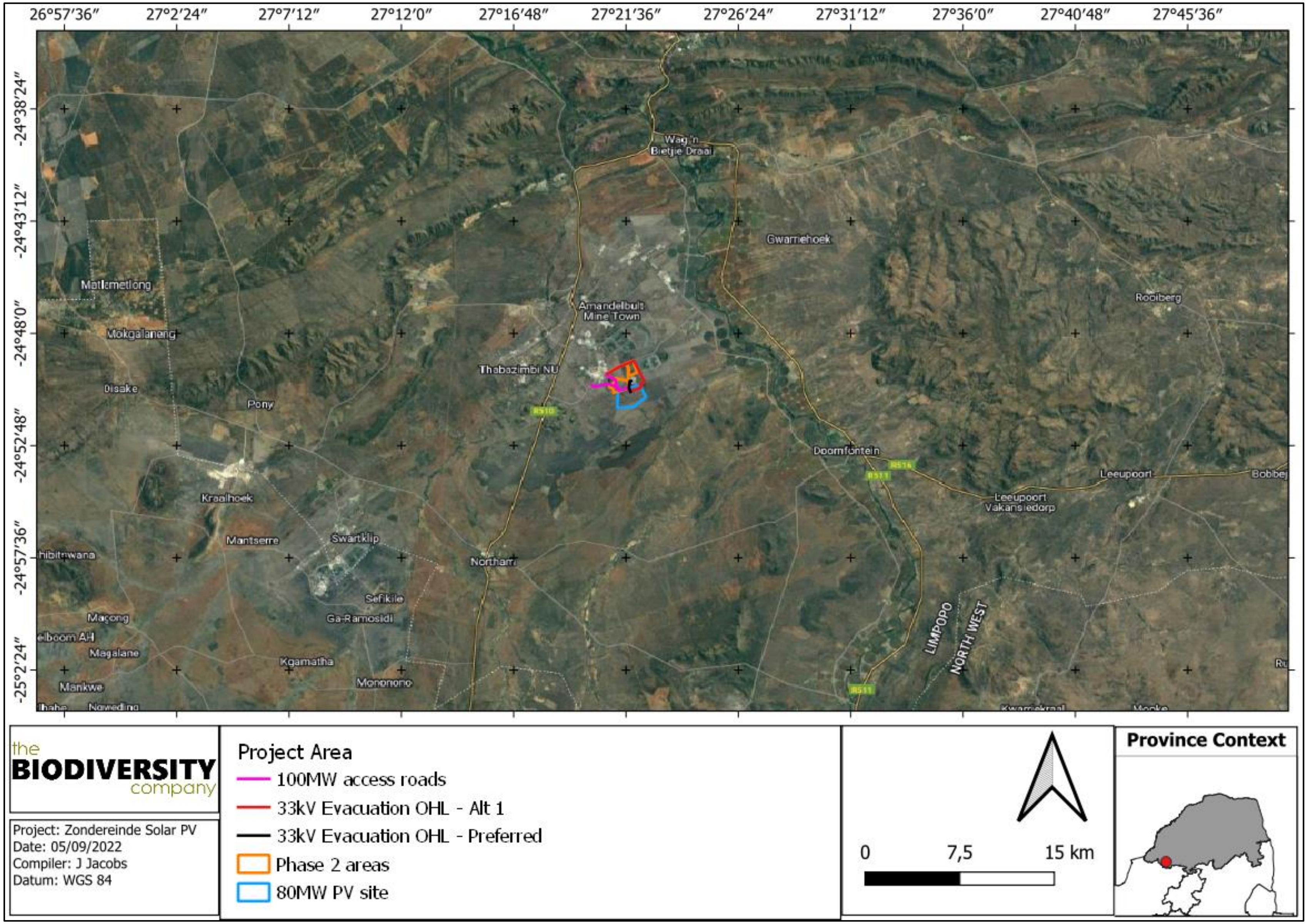

Figure 1-1 Proposed location of the project area in relation to the nearby towns

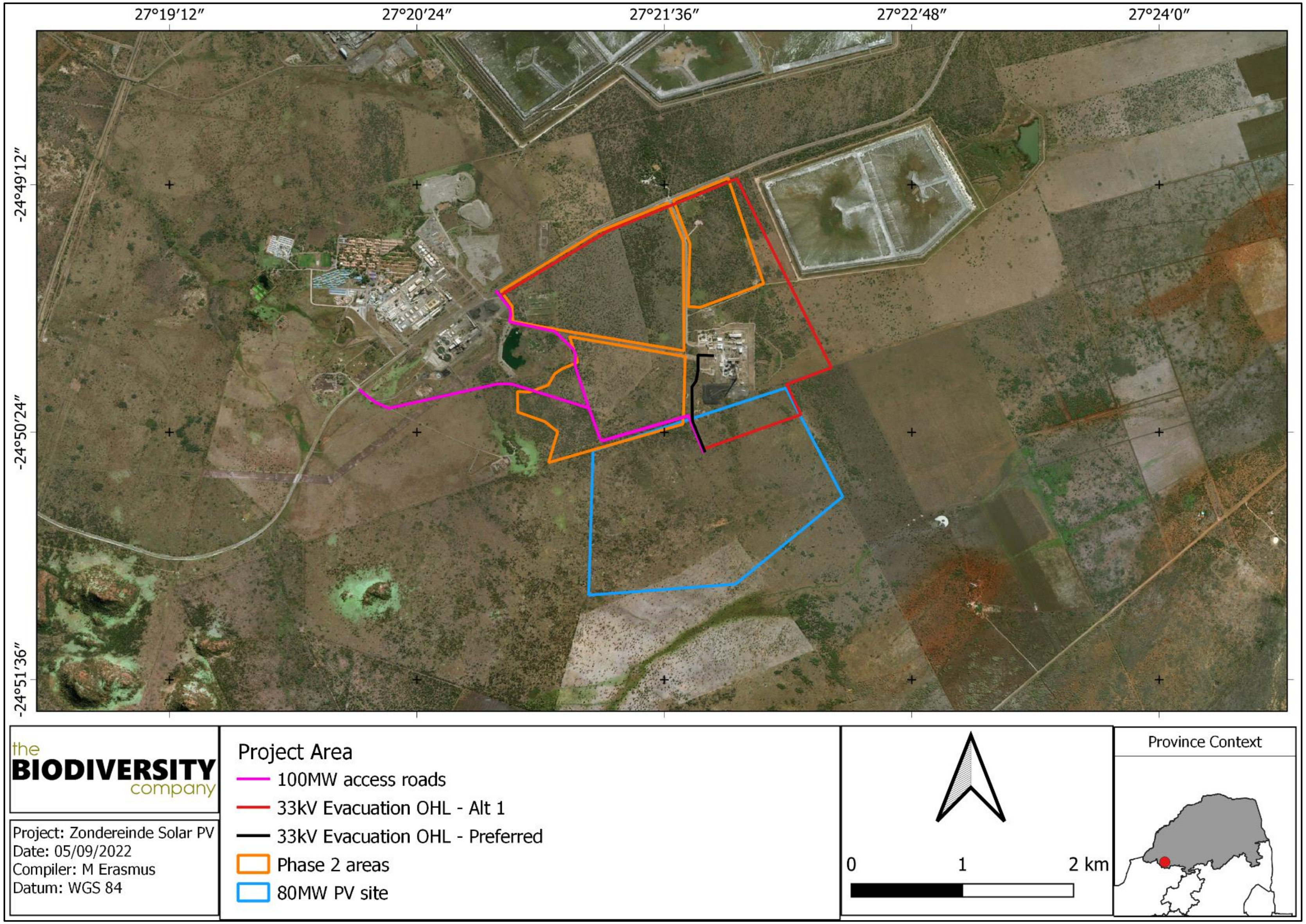

Figure 1-2 The project area

1.2 Specialist Details

Report Name	**The Scoping Assessment for the proposed Northam Photovoltaic Zondereinde Self Generation Project**	
Reference	**Zondereinde PV**	
Submitted to	savannah environmental	
Report Writer	**Jan Jacobs**	
	Jan Jacobs completed his BSc Honours degree in Biodiversity and Conservation Biology at the University of the Western Cape in 2016 and completed his Master of Applied Science degree in Nature Conservation at the Tshwane University of Technology in 2022. His Masters thesis is currently under examination, and he is expected to officially graduate in October 2022.	
Reviewer	**Andrew Husted**	
	Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 13 experience in the environmental consulting field.	
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.	

1.3 Scope of Work

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

- Desktop assessment to identify the relevant ecologically important geographical features within the project area;
- Desktop assessment to compile an expected species list and identify possible threatened flora and fauna species that occur within the project area;
- Identify the manner that the proposed project impacts the flora and fauna community based on the screening assessment information and the desktop information, 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
National	Constitution of the Republic of South Africa (Act No. 108 of 1996)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management: Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management: Biodiversity Act (Act No. 10 of 2004), Threatened or Protected Species Regulations
	Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 320 of Government Gazette 43310 (March 2020)
	Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, GNR 1150 of Government Gazette 43855 (October 2020)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Biodiversity Framework (NBF, 2009)
	National Forest Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)
	National Water Act (NWA) (Act No. 36 of 1998)
	World Heritage Convention Act (Act No. 49 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations and, Alien and Invasive Species List 20142020, published under NEMBA
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA)
Provincial	Limpopo Conservation Plan (2018)
	Limpopo Environmental Management Act (2003)

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 pertinent to the conservation of South African biodiversity. 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 Plan:
    - 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, 2017) – IBAs constitute a global network of over 13 500 sites, of which 112 sites are found in South Africa. IBAs are sites of global significance for bird conservation, identified through multi-stakeholder processes using globally standardised, quantitative and scientifically agreed criteria; and
- South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (Van Deventer *et al.,* 2018) – A SAIIAE was established during the NBA of 2018. It is a collection of data layers that represent the extent of river and inland wetland ecosystem types and pressures on these systems.

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.

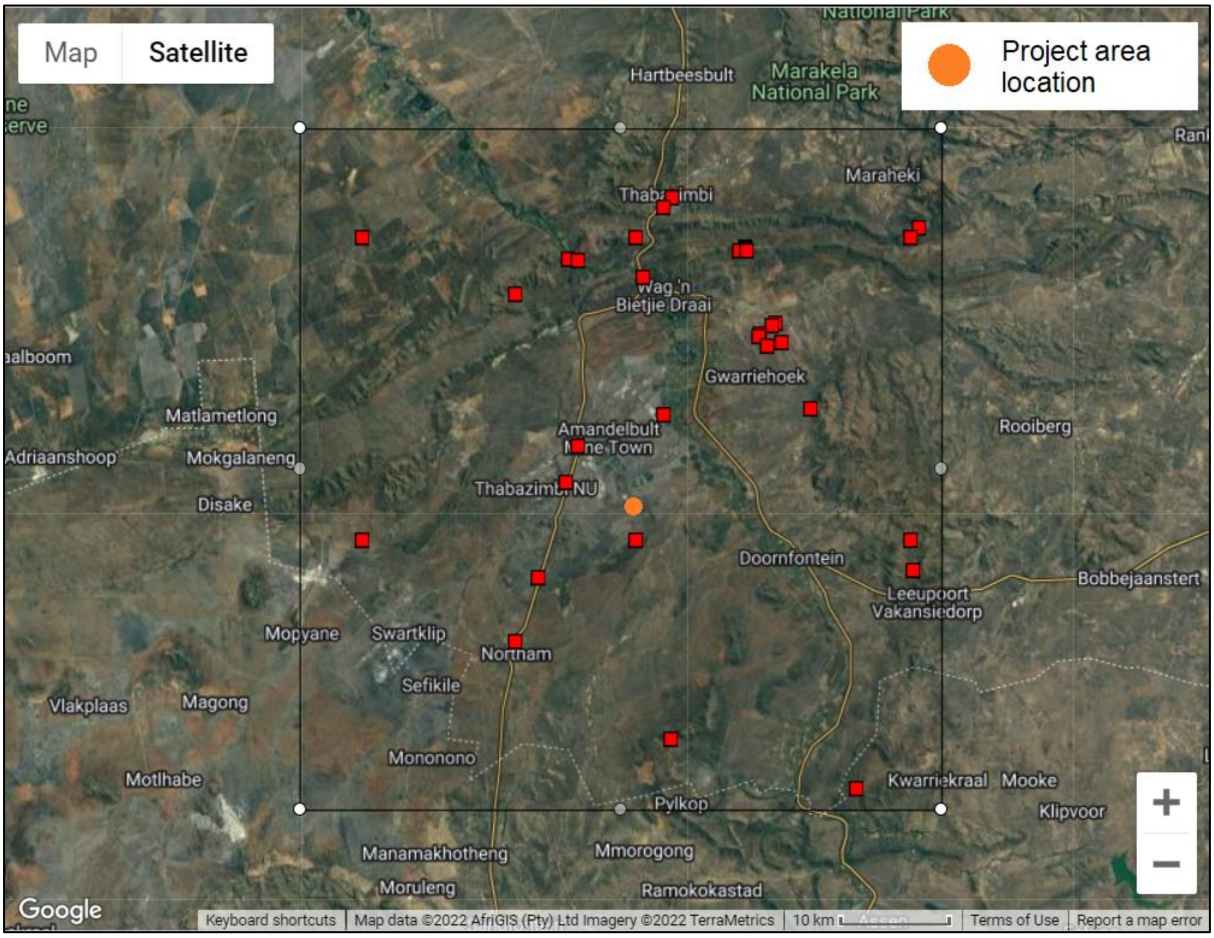

Figure 3-1 ***Map illustrating extent of area used to obtain the expected flora species list from the Plants of South Africa (POSA) database. Orange dot indicates approximate location of the project area. The red squares are cluster markers of botanical records as per POSA data.***

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 FrogMap database (Fitzpatrick Institute of African Ornithology, 2021a), using the 2427 quarter degree square;
- Reptile list, generated from the IUCN spatial dataset (2017) and ReptileMap database (Fitzpatrick Institute of African Ornithology, 2021b), using the 2427 quarter degree square;
- Avifauna list, generated from the SABAP2 dataset by looking at pentads 2445_2715; 2445_2720; 2445_2725; 2450_2715; 2450_2720; 2450_2725; 2455_2715; 2455_2720 and 2455_2725); and
- Mammal list from the IUCN spatial dataset (2017).

3.2 Wetland Assessment

3.2.1 Wetland Identification and Mapping

The National Wetland Classification Systems (NWCS) developed by the SANBI will be considered for this assessment. This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels. In addition, the method will also include the assessment of structural features at the lower levels of classification (Ollis *et al*., 2013).

The wetland areas will be delineated in accordance with the DWAF (2005) guidelines. A cross section is presented in Figure 3-2. The outer edges of the wetland areas will be 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;
- 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);
- Soil Wetness Indicator identifies the morphological "signatures" developed in the soil profile due to prolonged and frequent saturation; and
- Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils.

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

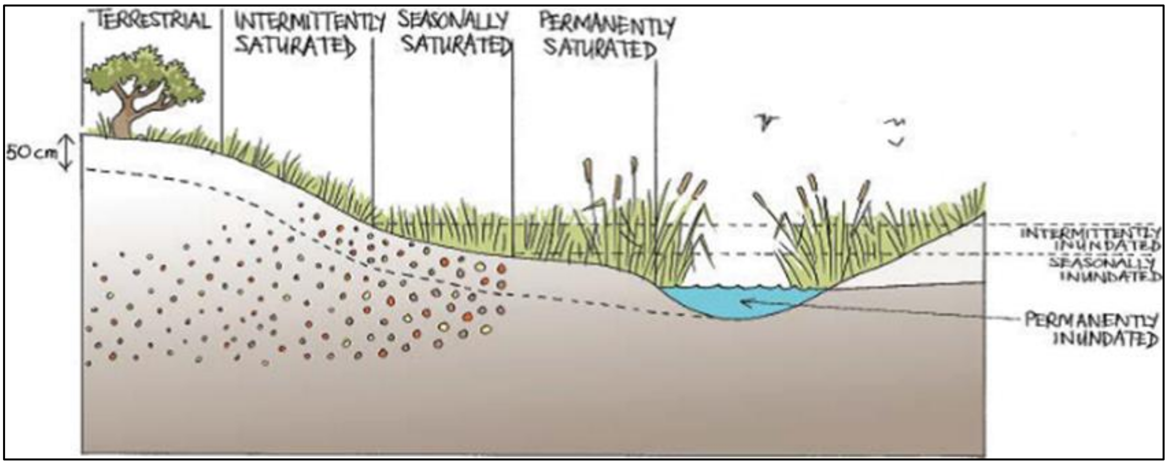

Figure 3-2 Cross section through a wetland, indicating how the soil wetness and vegetation indicators change (Ollis et al., 2013).

3.2.2 Functional Assessment

Wetland Functionality refers to the ability of wetlands to provide healthy conditions for the wide variety of organisms found in wetlands and humans. EcoServices serve as the main factor contributing to wetland functionality.

The assessment of the ecosystem services supplied by the identified wetlands will be conducted per the guidelines as described in WET-EcoServices (Kotze *et al*. 2008). An assessment will be 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

3.2.3 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., 2009)

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

3.2.4 Importance and Sensitivity

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

Table 3-3 Description of Ecological 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**

3.2.5 Determining Buffer Requirements

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

3.3 Land Capability

Land capability and agricultural potential will be determined by a combination of soil, terrain and climate features. Land capability is defined by the most intensive long-term sustainable use of land under rain-fed conditions. At the same time an indication is given about the permanent limitations associated with the different land use classes.

Land capability is divided into eight classes, and these may be divided into three capability groups. Table 3-4 shows how the land classes and groups are arranged in order of decreasing capability and ranges of use. The risk of use and sensitivity increases from class I to class VIII (Smith, 2006).

Table 3-4 Land capability class and intensity of use (Smith, 2006)

Land Capability Class	Increased Intensity of Use									Land Capability Groups
I	W	F	LG	MG	IG	LC	MC	IC	VIC	Arable Land
II	W	F	LG	MG	IG	LC	MC	IC		
III	W	F	LG	MG	IG	LC	MC			
IV	W	F	LG	MG	IG	LC				
V	W	F	LG	MG						Grazing Land
VI	W	F	LG	MG						
VII	W	F	LG							
VIII	W									Wildlife
W - Wildlife		**MG - Moderate Grazing**			**MC - Moderate Cultivation**					
F- Forestry		**IG - Intensive Grazing**			**IC - Intensive Cultivation**					
LG - Light Grazing		**LC - Light Cultivation**			**VIC - Very Intensive Cultivation**					

Land capability has been classified into 15 different categories by DAFF (2017) which indicates the national land capability category and associated sensitivity related to soil resources. Given the fact that ground truthing and DSM exercises have indicated anomalies in the form of high sensitivity soil resources (which was not indicated by the DAFF (2017) raster file), the ground-truthed baseline delineations and sensitivities were used for this assessment rather than that of DAFF (2017).

The land potential classes are determined by combining the land capability results and the climate capability of a region as shown in Table 3-5. The final land potential results are then described in Table 3-6. These land potential classes are regarded as the final delineations subject to sensitivity, given the comprehensive addition of climatic conditions as those relevant to the DAFF (2017) land capabilities. The main contributors to the climatic conditions as per Smith (2006) is that of Mean Annual Precipitation (MAP), Mean Annual Potential Evaporation (MAPE), mean September temperatures, mean June temperatures and mean annual temperatures. These parameters will be derived from Mucina and Rutherford (2006) for each vegetation type located within the relevant project area. This will give the specialist the opportunity to consider micro-climate, aspect, topography etc.

Table 3-5 The combination table for land potential classification

Land capability class	Climate capability class							
	C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
I	L1	L1	L2	L2	L3	L3	L4	L4

II	L1	L2	L2	L3	L3	L4	L4	L5
III	L2	L2	L3	L3	L4	L4	L5	L6
IV	L2	L3	L3	L4	L4	L5	L5	L6
V	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei
VI	L4	L4	L5	L5	L5	L6	L6	L7
VII	L5	L5	L6	L6	L7	L7	L7	L8
VIII	L6	L6	L7	L7	L8	L8	L8	L8

Table 3-6 The Land Potential Classes.

Land potential	Description of land potential class
L1	Very high potential: No limitations. Appropriate contour protection must be implemented and inspected.
L2	High potential: Very infrequent and/or minor limitations due to soil, slope, temperatures or rainfall. Appropriate contour protection must be implemented and inspected.
L3	Good potential: Infrequent and/or moderate limitations due to soil, slope, temperatures or rainfall. Appropriate contour protection must be implemented and inspected.
L4	Moderate potential: Moderately regular and/or severe to moderate limitations due to soil, slope, temperatures or rainfall. Appropriate permission is required before ploughing virgin land.
L5	Restricted potential: Regular and/or severe to moderate limitations due to soil, slope, temperatures or rainfall.
L6	Very restricted potential: Regular and/or severe limitations due to soil, slope, temperatures or rainfall. Non-arable
L7	Low potential: Severe limitations due to soil, slope, temperatures or rainfall. Non-arable
L8	Very low potential: Very severe limitations due to soil, slope, temperatures or rainfall. Non-arable

3.3.1 Climate Capability

According to Smith (2006), climatic capability is determined by taking into consideration various steps pertaining to the temperature, rainfall and Class A-pan of a region. The first step in this methodology is to determine the Mean Annual Precipitation (MAP) to Class A-pan ratio.

Table 3-7 Climatic capability (step 1) (Smith, 2006)

Climatic Capability Class	Limitation Rating	Description	MAP: Class A-pan Class
C1	None to Slight	Local climate is favourable for good yields for a wide range of adapted crops throughout the year.	0.75-1.00
C2	Slight	Local climate is favourable for a wide range of adapted crops and a year-round growing season. Moisture stress and lower temperature increase risk and decrease yields relative to C1.	0.50-0.75
C3	Slight to Moderate	Slightly restricted growing season due to the occurrence of low temperatures and frost. Good yield potential for a moderate range of adapted crops.	0.47-0.50
C4	Moderate	Moderately restricted growing season due to the occurrence of low temperatures and severe frost. Good yield potential for a moderate range of adapted crops but planting date options more limited than C3.	0.44-0.47
C5	Moderate to Severe	Moderately restricted growing season due to low temperatures, frost and/or moisture stress. Suitable crops at risk of some yield loss.	0.41-0.44
C6	Severe	Moderately restricted growing season due to low temperatures, frost and/or moisture stress. Limited suitable crops that frequently experience yield loss.	0.38-0.41
C7	Severe to Very Severe	Severely restricted choice of crops due to heat and moisture stress.	0.34-0.38
C8	Very Severe	Very severely restricted choice of crops due to heat and moisture stress. Suitable crops at high risk of yield loss.	0.30-0.34

In the event that the MAP: Class A-pan ratio is calculated to fall within the C7 or C8 class, no further steps are required, and the climatic capability can therefore be determined to be C7 or C8. In cases where the above-mentioned ratio falls within C1-C6, steps 2 to 3 will be required to further refine the climatic capability.

Step 2

Mean September temperatures;

- <10℃ = C6;
- 10 - 11℃ = C5;
- 11 - 12℃ = C4;
- 12 - 13℃ = C3; and
- >13℃ = C1.

Step 3

Mean June temperatures;

- <9℃ = C5;
- 9 - 10℃ = C4;
- 10 - 11℃ = C3; and
- 11 - 12℃ = C2.

3.3.2 Current Land Use

A generalised land-use will be derived for the larger project area considering agricultural productivity.

- Mining;
- Bare areas;
- Agriculture crops;
- Natural veld;
- Grazing lands;
- Forest;
- Plantation;
- Urban;
- Built-up;
- Waterbodies; and
- Wetlands.

3.4 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- The assessment area was based on the area provided by the client and any alterations to the footprint and/or missing GIS information pertaining to the assessment area would have affected the area surveyed; and
- The species likelihood of occurrence is based on desktop information and might be changed after the assessment.

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 lies within the 5 km Protected Area Buffer Zone of the Sharme Private Nature Reserve.	4.1.1.4
National Protected Areas Expansion Strategy	Relevant – The project area lies within 5 km of an NPAES Protected Area.	4.1.1.5
Critical Biodiversity Area	Relevant – The project area overlaps with an ONA and an NNR classified area.	4.1.1.3
Important Bird and Biodiversity Areas	Relevant – Overlaps with the Northern Turf Thornveld IBA.	4.1.1.6
South African Inventory of Inland Aquatic Ecosystems	Irrelevant – The project area does not overlap with any NBA wetlands or rivers.	4.1.1.7
National Freshwater Priority Area	Relevant – The project area overlaps with two unclassified FEPA wetlands.	4.1.1.8
Strategic Water Source Areas	Irrelevant- The project area is 41 km from the closest SWSA.	-
REDZ	Irrelevant – Does not overlap with any Renewable Energy Development Zones	
Powerline Corridor	Irrelevant – Does not overlap with any Powerline Corridor	

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).

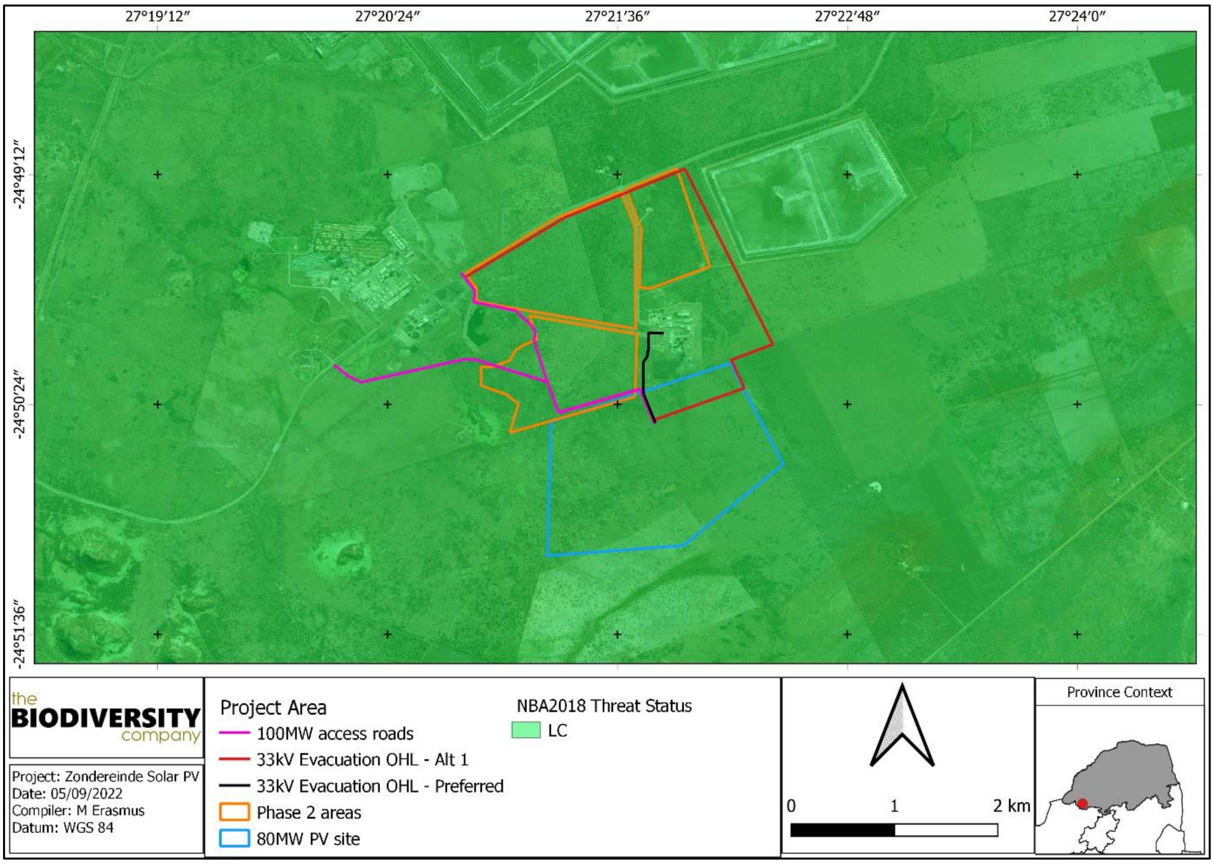

Figure 4-1 Map illustrating the ecosystem threat status associated with the project area

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).

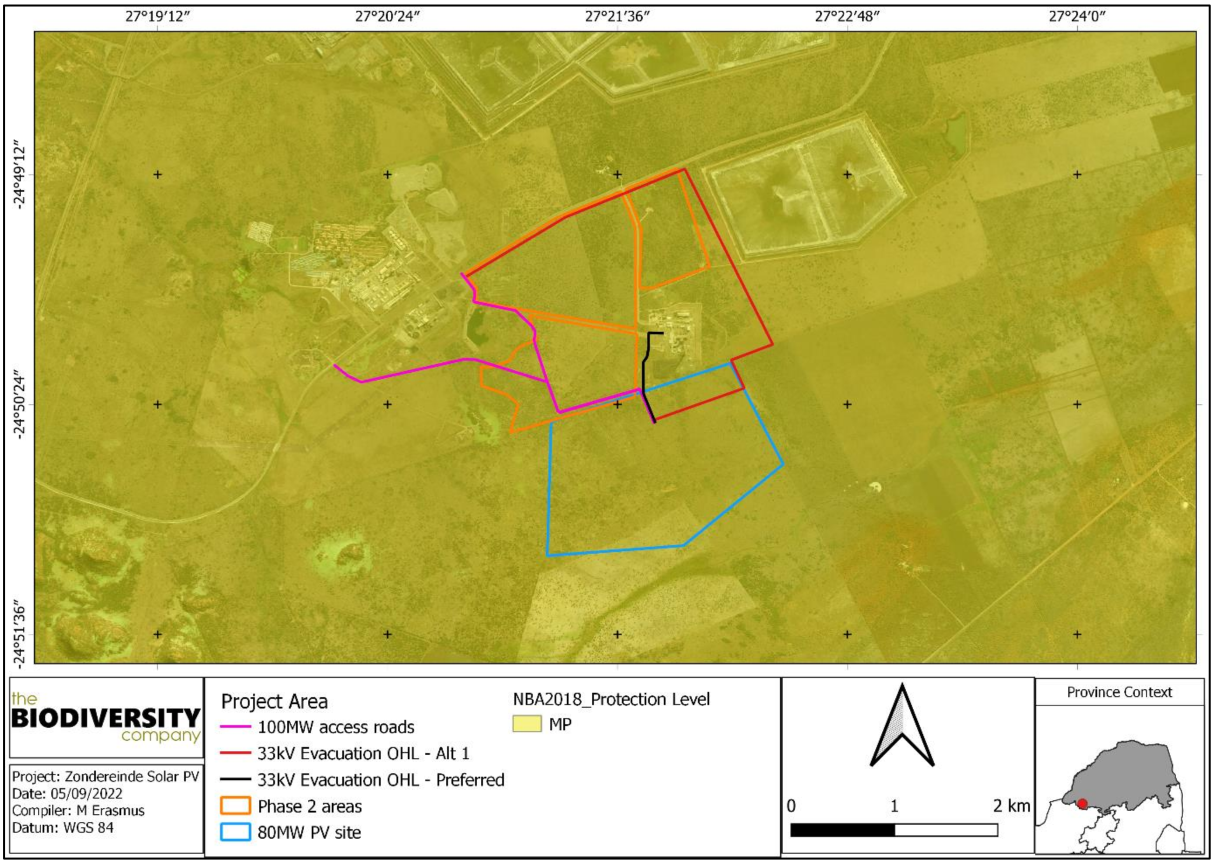

Figure 4-2 Map illustrating the ecosystem protection level associated with the project area

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 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 mainly with an ONA and marginally with an NNR. The project area also borders another NNR.

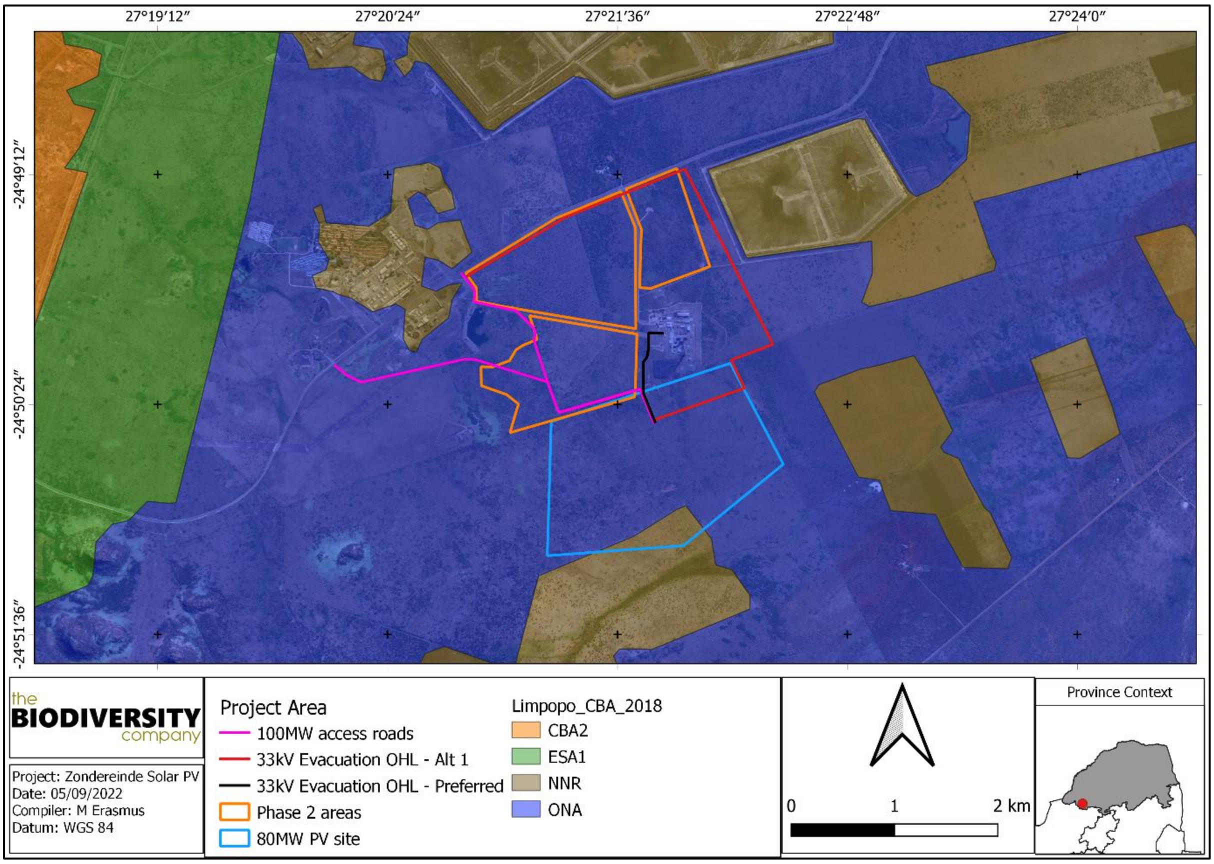

Figure 4-3 Map illustrating the locations of CBAs in the project area

4.1.1.4 Protected areas

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

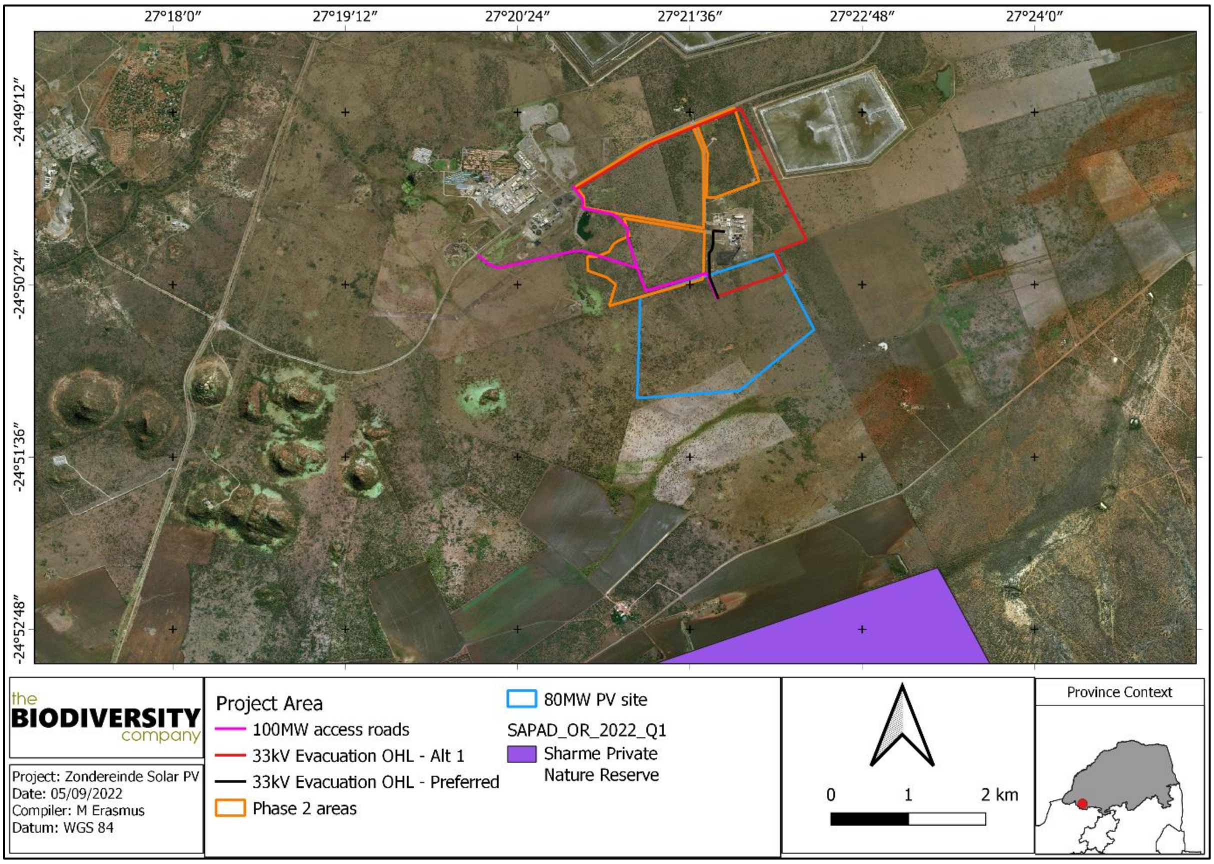

Figure 4-4 The project area in relation to the protected areas

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 does not overlap with any NPAES areas but does occur within the 5 km buffer zone of an NPAES protected area (Figure 4-5).

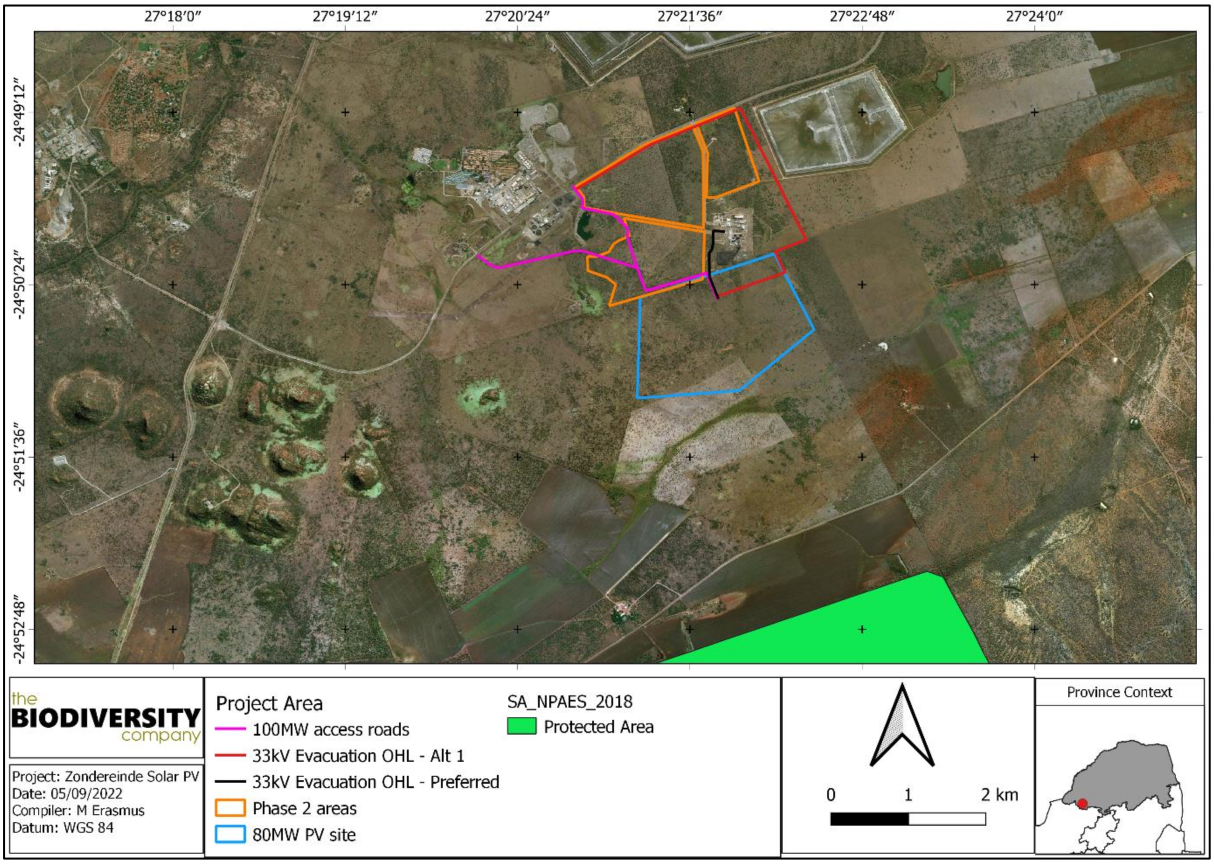

Figure 4-5 The project area in relation to the National Protected Area Expansion Strategy

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 South Africa, 2017).

According to Birdlife South Africa (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 overlaps with the Northern Turf Thornveld IBA.

The Northern Turf Thornveld IBA consists of a group of privately owned farms that forms a triangle delineated roughly by the Crocodile River in the east and the Bierspruit River in the west; the confluence of these two rivers is approximately 3 km south-west of Thabazimbi. This IBA is important as it is home to the Yellow-throated Sandgrouse (*Pterocles gutturalis*) *and* is regarded as the core of the resident South African population (Birdlife South Africa, 2015).

Other important birds in the IBA include the Secretarybird *Sagittarius serpentarius*, Kori Bustard *Ardeotis kori*, Lanner Falcon (*Falco biarmicus*) and Black-winged Pratincole (*Glareola nordmanni*).

Common biome-restricted species found within this IBA include Kurrichane Thrush *Turdus libonyanus*, White-throated Robin-Chat (*Cossypha humeralis*), Burchell's Starling (*Lamprotornis australis*), White-bellied Sunbird (*Cinnyris talatala*) and the fairly common Kalahari Scrub Robin (*Erythropygia paena*) (Birdlife South Africa, 2015).

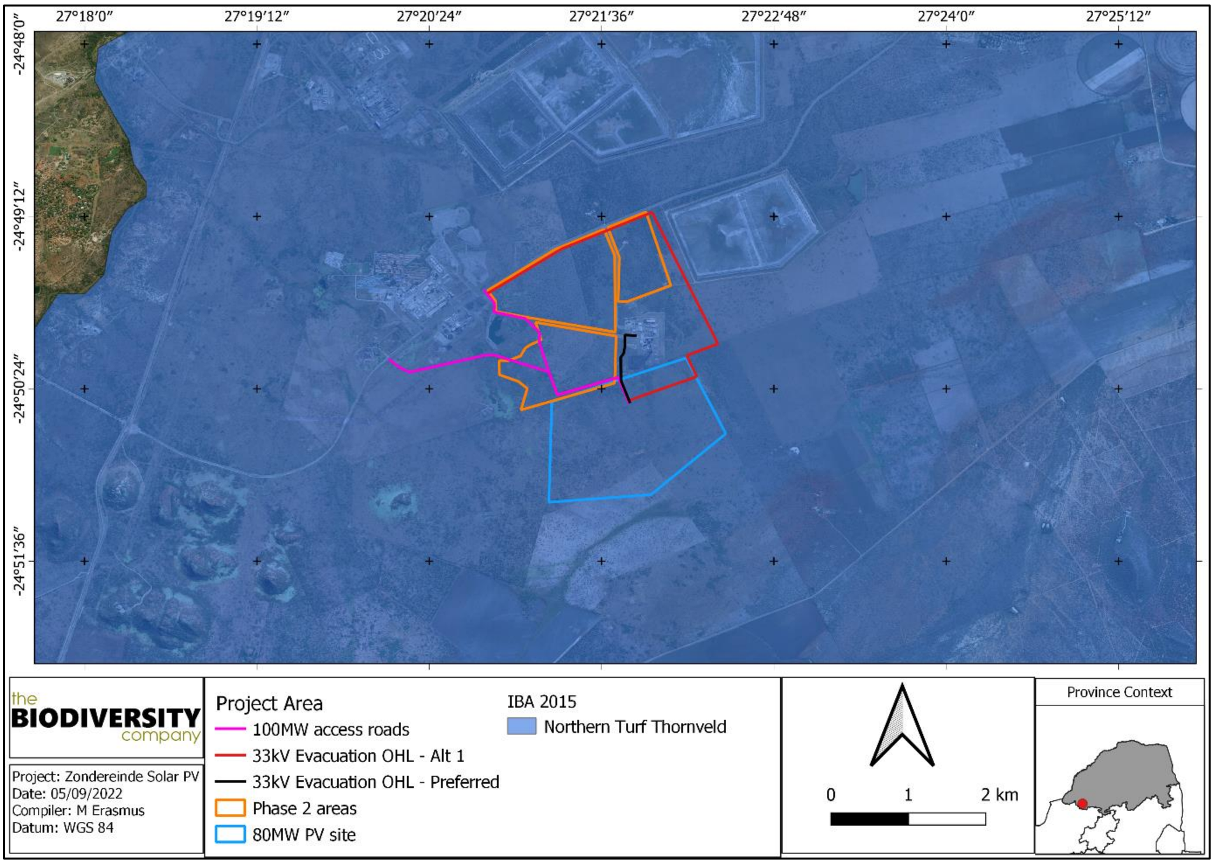

Figure 4-6 The project area in relation to the Northern Turf Thornveld IBA

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 does not overlap with any NBA wetlands or rivers (Figure 4-7).

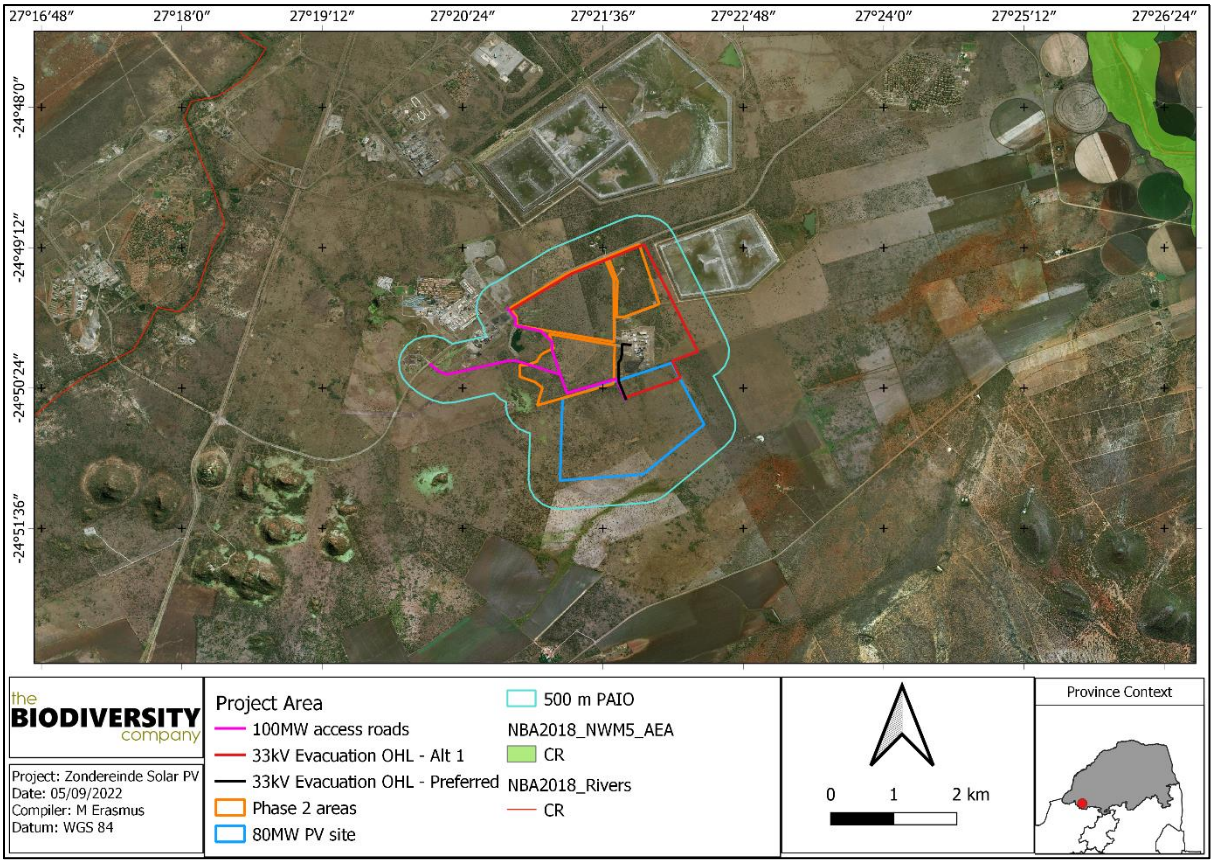

Figure 4-7 Map illustrating ecosystem threat status of rivers and wetland ecosystems in the project area

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 that the project area's 500 m regulated area overlaps with one unclassified NFEPA wetland.

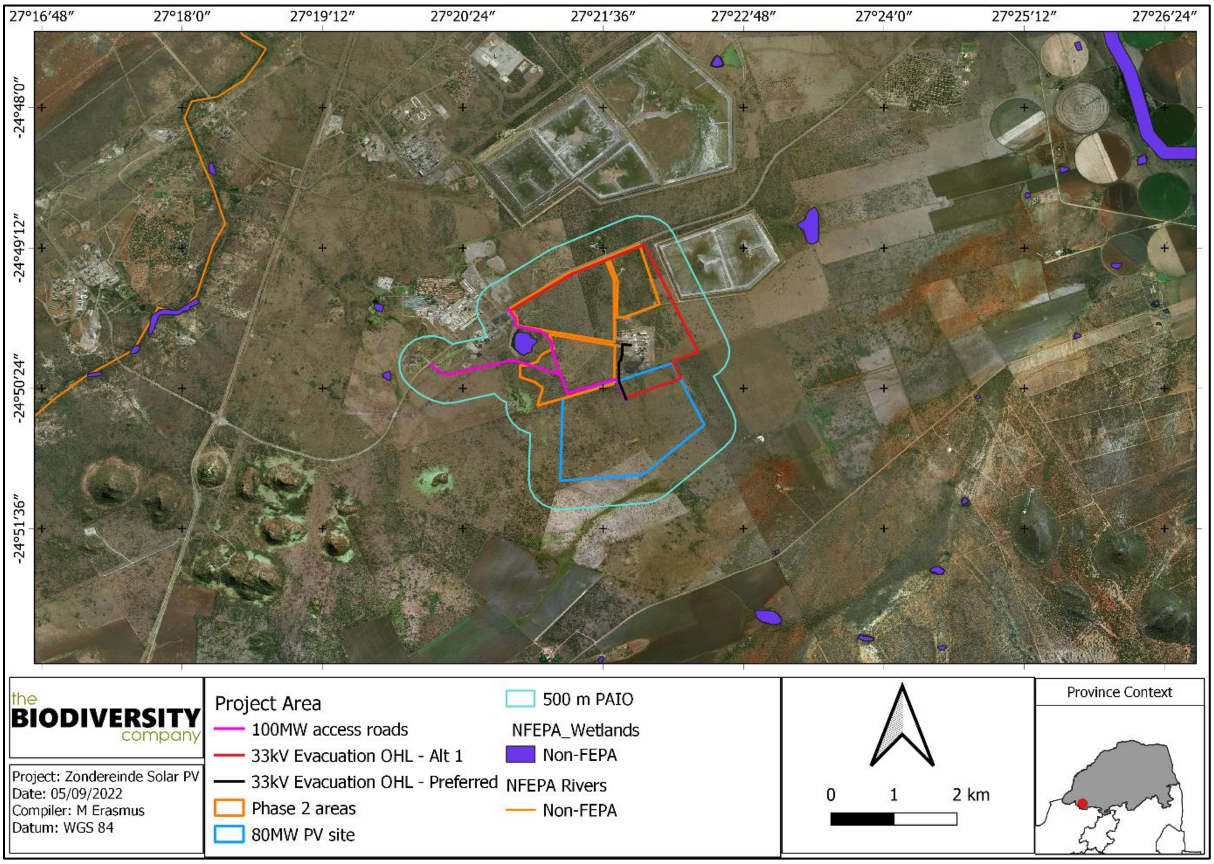

Figure 4-8 The project area in relation to the National Freshwater Ecosystem Priority Areas

4.1.2 Flora Assessment

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

4.1.2.1 Vegetation Type

The project area is situated 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 a sub-tropical thermal regime with no or usually low incidence of frost (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 (Mucina & Rutherford, 2006). 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 Dwaalboom Thornveld vegetation type (Figure 4-9).

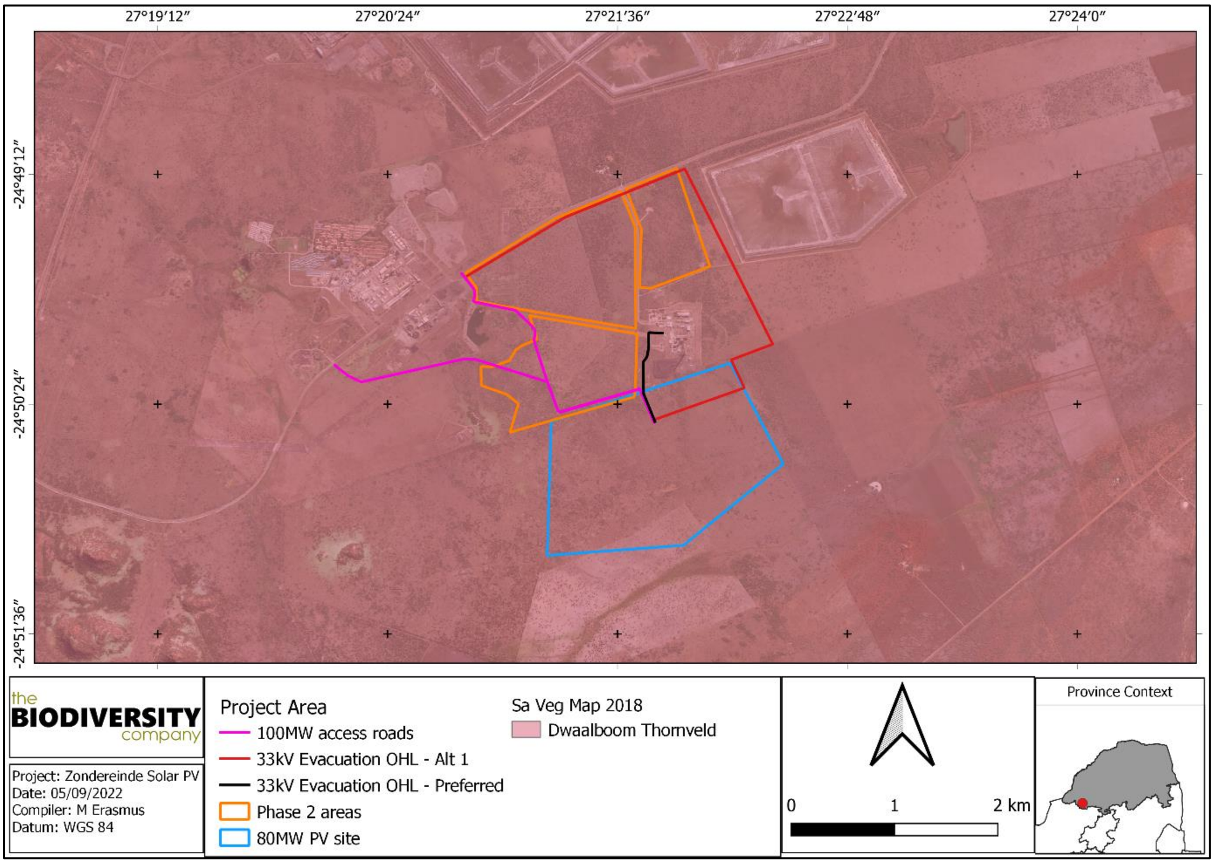

Figure 4-9 Map illustrating the vegetation type associated with the project area

4.1.2.1.1 Dwaalboom Thornveld

Dwaalboom Thornveld is restricted to, and is distributed in, the Limpopo and North-West Provinces within flats north of the Dwarsberge and associated ridges mainly west of the Crocodile River in the Dwaalboom area but including a patch around Sentrum. South of the ridges it extends eastwards from the Nietverdiend area, north of the Pilanesberg to the Northam area at an altitude range of between 900 and 1.200 m.a.s.l. Its main vegetation and landscape features include plains with a layer of scattered, low to medium high, deciduous microphyllous trees and shrubs with a few broad-leaved tree species. There is almost a continuous herbaceous layer dominated by grass species.

Important Plant Taxa in Dwaalboom Thornveld

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

Trees: *Vachellia erioloba*, *Vachellia erubescens*, *Vachellia nilotica*, *Vachellia tortilis* subsp *heteracantha, Senegalia fleckii, Senegalia burkei, Searsia lancea* (Mucina & Rutherford, 2006).

Shrubs: *Diospyros lycioides* subsp. *lycioides, Grewia flava, Mystroxylon aethiopicum* subsp. *burkenum, Agathisanthemum bojeri* (Mucina & Rutherford, 2006).

Graminoids: *Aristida bipartite, Bothriochloa insculpta, Digitaria eriantha* subsp *eriantha, Ischaemum afrum, Panicum maximum* and *Cymbopogon pospischilii* (Mucina & Rutherford, 2006).

Conservation Status

According to Mucina and Rutherford (2006) Dwaalboom Thornveld is classified as Least Threatened. Although the target for conservation is 19%, only 6% of this vegetation type is currently under statutory conservation in reserves such as the Madikwe Game Reserve (approximately 150km west of the project area). Cultivation and to a lesser extend urbanisation have resulted in the transformation of approximately 14% of Dwaalboom Thornveld and exotic invasive plants are present. Incidences of erosion are low to very low (Mucina & Rutherford, 2006).

4.1.2.2 Expected Flora Species

The POSA database indicates that 452 species of indigenous plants are expected to occur within the project area (The full list of species will be provided in the final report). Two SCCs based on their conservation status could be expected to occur within the project area and are provided in Table 4-2 below.

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

Family	Taxon	Author	IUCN	Ecology
Apocynaceae	*Stenostelma umbelluliferum*	(Schltr.) Bester & Nicholas	NT	Indigenous; Endemic
Scrophulariaceae	*Jamesbrittenia bergae*	Lemmer	VU	Indigenous; Endemic

4.1.3 Faunal Assessment

4.1.3.1 Amphibians

Based on the IUCN Red List Spatial Data and FrogMap, 30 amphibian species are expected to occur within the area (The full list will be provided in the final assessment). No amphibian SCCs are expected to occur within the area.

4.1.3.2 Reptiles

Based on the IUCN Red List Spatial Data and the ReptileMAP database, 69 reptile species are expected to occur within the area (The full list will be provided in the final assessment). One species is regarded as threatened (Table 4-3).

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

Species	Common Name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2021)	
Kinixys lobatsiana	Lobatse Hinged Tortoise	VU	VU	Moderate

Kinixys lobatsiana (Lobatse Hinged Tortoise) is listed as VU on a regional and global basis. It occurs in South Africa and Botswana, where it prefers rocky hillsides in habitats of mixed *Vachellia* and *Combretum* woodland, tropical Bushveld as well as Thornveld where vegetation ranges from dense, short shrubland to open tree savanna (IUCN, 2017). Main threats are habitat destruction and degradation due to urbanization, mining, agriculture and alien invasive plants (IUCN, 2017). The presence of savanna habitat within the project area contributes to a moderate likelihood of occurrence for this species.

4.1.3.3 Mammals

The IUCN Red List Spatial Data lists 85 mammal species that could be expected to occur within the area (The full list will be provided in the final assessment). This list excludes large mammal species that are normally restricted to protected areas. Eleven of these expected species are regarded as threatened (Table 4-4). Of these 11 SCCs, one has a low likelihood of occurrence based on the lack of suitable habitat in the project area.

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

Species	Common Name	Conservation Status

		Regional (SANBI, 2016)	IUCN (2021)	Likelihood of occurrence
Aonyx capensis	Cape Clawless Otter	NT	NT	Low
Atelerix frontalis	South African Hedgehog	NT	LC	Moderate
Cloeotis percivali	Short-eared Trident Bat	EN	LC	Low
Crocidura mariquensis	Swamp Musk Shrew	NT	LC	Low
Eidolon helvum	African Straw-colored Fruit Bat	LC	NT	Low
Felis nigripes	Black-footed Cat	VU	VU	Moderate
Panthera pardus	Leopard	VU	VU	High
Parahyaena brunnea	Brown Hyaena	NT	NT	Moderate
Pelea capreolus	Grey Rhebok	NT	LC	Low
Redunca fulvorufula	Mountain Reedbuck	EN	LC	Low
Smutsia temminckii	Temminck's Ground Pangolin	VU	VU	Low

Aonyx capensis (Cape Clawless Otter) is the most widely distributed otter species in Africa (IUCN, 2017). This species is predominantly aquatic, and it is seldom found far from water (IUCN, 2017). It is mostly threatened by riverine habitat destruction due to bush clearing, deforestation, overgrazing, siltation, draining of wetlands or water extraction or denudation of riparian vegetation (IUCN, 2017). This species has a low likelihood of occurrence based on the lack of rivers in the project area.

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), South African Hedgehog populations are decreasing due to the threats of electrocution, veld fires, road collisions, predation from domestic pets and illegal harvesting. Suitable grasslands occur in the project area, although somewhat disturbed, that can function as habitat for this species, as such the likelihood of occurrence is rated as moderate.

Cloeotis percivali (Short-eared Trident Bat) occurs in savanna areas where there is sufficient cover in the form of caves and mine tunnels for day roosting (IUCN, 2017). It feeds exclusively on moths and appears to be very sensitive to disturbance (IUCN, 2017). The lack of suitable roosting habitats contributed to the low likelihood of occurrence in the project area for this species.

Crocidura maquassiensis (Maquassie Musk Shrew) is listed as VU on a regional basis and is known to be found in rocky, mountain habitats (IUCN, 2017). It may tolerate a wider range of habitats and individuals have been collected in Kwa-Zulu Natal from a garden, and in mixed bracken and grassland alongside a river at 1,500 m (IUCN, 2017). This species has a low likelihood of occurrence based on the lack of rocky, mountain habitats in the project area.

Eidolon helvum (African Straw-coloured Fruit Bat) has a wide distribution across Sub-Saharan Africa as well as marginally on the South-West border of Saudi Arabia and Yemen (IUCN, 2017). It occupies a variety of habitats, including various types of forests, moist and dry savanna and mosaics as well as modified or urbanised habitats with woodland (IUCN, 2017). Major threats include habitat loss, persecution and hunting (IUCN, 2017). The lack of woodlands in the project area contributed to a low likelihood of occurrence for this species.

Felis nigripes (Black-footed cat) is endemic to the arid regions of southern Africa (IUCN, 2017). 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 (IUCN, 2017). The highest densities of this species have been recorded in the more arid Karoo region of South Africa (IUCN, 2017). 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.

Panthera pardus (Leopard) has a wide habitat tolerance and are quite adaptable to human encroachment and crop-farming areas (Apps, 2012). It is mostly nocturnal, although it can be seen during the day, especially in protected areas (Apps, 2012). The Leopard's ability to adapt to anthropogenic activities and the presence of protected areas within 5 km of the project area contributed to a high likelihood of occurrence in the project area for this species.

Parahyaena brunnea (Brown Hyaena) is endemic to southern Africa (IUCN, 2017). This species occurs in dry areas, generally with annual rainfall less than 100 mm, particularly along the coast, semi-desert, open scrub and open woodland savanna (IUCN, 2017). Given its known ability to persist outside of formally protected areas the likelihood of occurrence of this species in the project area is moderate.

Pelea capreolus (Grey Rhebok) is endemic to South Africa, eSwatini and Lesotho (IUCN, 2017). In the eastern parts of this species' distribution, it is found on rocky hills, grassy mountain slopes, and plateau grasslands (IUCN, 2017). In the south and southwest, it is associated with the rocky hills of mountain fynbos and the little Karoo (IUCN, 2017). It is mainly threatened is most likely the bushmeat trade and illegal sport hunting with dogs (IUCN, 2017). The lack of rocky outcrops and grassy areas in the project area contributed to a low likelihood of occurrence of this species.

Redunca fulvorufula (Mountain Reedbuck) is endemic to southern Africa and prefers dry, stony slopes (with a angle of 20 to 30 degrees) with grass cover and scattered bushes and trees. It is also dependent on water (Apps, 2012; IUCN, 2017). The lack of suitable habitats in the project area contributed to the low likelihood of occurrence for this species.

Smutsia temminckii (Temminck's Ground Pangolin) is endemic to Sub-Saharan Africa and mainly lives in savannas and woodlands in low-lying regions with moderate to dense scrub (IUCN, 2017). It also occurs in floodplain grasslands, rocky slopes, sandveld and well-managed livestock farms where it is protected from human persecution (IUCN, 2017). It is largely water independent (but will utilise available free-standing water) and most likely requires a sufficient population of ants and termites and the availability of dens or above-ground debris for shelter (IUCN, 2017). The main threats to Temminck's Ground Pangolin are the increasing local and international demand for their scales for medicinal and superstitious purposes as well as habitat loss and alteration due to agricultural activities (IUCN, 2017). The lack of suitable habitats in the project area contributed to a low likelihood of occurrence for this species.

4.1.3.4 Avifauna

The SABAP2 Data lists 298 avifauna species that could be expected to occur within the area (The full list will be provided in the final assessment). Seventeen of these expected species are regarded as threatened (Table 4-5). Seven of the species have a low likelihood of occurrence due to lack of suitable habitat and food sources in the project area.

Table 4-5 Threatened avifauna species that are expected to occur within the project area.

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2021)	
Calidris ferruginea	Curlew Sandpiper	LC	NT	Low
Ciconia ciconia	White Stork	NT	LC	Moderate
Coracias garrulus	European Roller	NT	LC	Moderate
Falco biarmicus	Lanner Falcon	VU	LC	High
Glareola nordmanni	Black-winged Pratincole	NT	NT	Low
Gyps coprotheres	Cape Vulture	EN	EN	High
Leptoptilos crumenifer	Marabou Stork	NT	LC	High
Mycteria ibis	Yellow-billed Stork	EN	LC	Low

Phoeniconaias minor	Lesser Flamingo	NT	NT	Low
Phoenicopterus roseus	Greater Flamingo	NT	LC	Low
Podica senegalensis	African Finfoot	VU	LC	Low
Poicephalus meyeri	Meyer's Parrot	LC	LC	Moderate
Polemaetus bellicosus	Martial Eagle	EN	EN	High
Pterocles gutturalis	Yellow-throated Sandgrouse	NT	LC	High
Rostratula benghalensis	Greater Painted-snipe	NT	LC	Low
Sagittarius serpentarius	Secretarybird	VU	EN	High
Torgos tracheliotos	Lappet-faced Vulture	EN	EN	High

Calidris ferruginea (Curlew Sandpiper) is a resident of Africa which migrates to the Russian Federation during the breeding season (IUCN, 2017). During the winter, the Curlew Sandpiper prefers a wide variety of coastal habitats such as brackish lagoons, tidal mudflats and sandflats, estuaries, saltmarshes and rocky shores. Inland habitats include the muddy edges of marshes, large rivers and lakes (both saline and freshwater), irrigated land, flooded areas, dams and saltpans (IUCN, 2017). The lack of suitable habitats in the project area contributed to a low likelihood of occurrence for this species.

Ciconia ciconia (White Stork) is a Palearctic migrant which breeds in several countries in Europe and Asia (IUCN, 2017). It mostly inhabits open areas (IUCN, 2017). During the winter, this species prefers grasslands, steppe, savanna as well as cultivated fields, often gathering near water bodies (IUCN, 2017). The presence of suitable habitats in the project area contributed to a moderate likelihood of occurrence for this species.

Coracias garrulous (European Roller) is a winter migrant from most of South-central Europe and Asia occurring throughout sub-Saharan Africa (IUCN, 2017). The European Roller has a preference for bushy plains and dry savannah areas (IUCN, 2017). The presence of open areas in the project area, which the European Roller prefers to forage in, contributed to a moderate likelihood of occurrence for this species.

Falco biarmicus (Lanner Falcon) is native to South Africa and inhabits a wide variety of habitats, from lowland deserts to forested mountains (IUCN, 2017). Their diet is mainly composed of small birds such as pigeons and francolins (IUCN, 2017). The likelihood of incidental records of this species in the project area is rated as high due to the suitable habitat and the expected presence of many bird species on which Lanner Falcons may predate.

Glareola nordmanni (Black-winged Pratincole) is a resident of Africa which breeds in Europe and Asia (IUCN, 2017). When they are not breeding, Black-winged Pratincoles occur in seasonally wet grasslands, savannas, and sandbanks along large rivers as well as at the edges of salt pans. The lack of suitable habitats in the project area contributed to a low likelihood of occurrence for this species.

Gyps coprotheres (Cape Vulture) is found in southern Africa, where it prefers protected areas and woody vegetation for foraging and steep cliffs for roosting (IUCN, 2017). Various threats are leading to a decline in this species' population numbers, including poisoning (deliberate and accidental), collision with cables, wind farm developments, habitat loss and unsustainable harvesting for traditional uses (IUCN, 2017). The presence of protected areas near the project area as well as the presence of woody vegetation in and around the project area has contributed to a high likelihood of occurrence for this species.

Leptoptilos crumenifer (Marabou Stork) is native to Sub-Saharan Africa where it can be found in open dry savannas, grasslands, swamps, riverbanks, lake shores and receding pools where fish are concentrated (IUCN, 2017). It mainly feeds on carrion and fish scraps discarded by humans as well as live prey such as fish, termites, locusts, frogs, lizards, snakes, rats, mice and birds. The presence of suitable habitat in and around the project area as well as the expected presence of prey species has contributed to a high likelihood of occurrence for this species.

Mycteria ibis (Yellow-billed Stork) is migratory and has a large distributional range which includes much of sub-Saharan Africa (IUCN, 2017). It is typically associated with freshwater ecosystems, especially wetlands and the margins of lakes and dams (IUCN, 2017). The lack of water bodies within the project area contributed to a low likelihood of occurrence for this species.

Phoeniconaias minor (Lesser Flamingo) occurs mainly in sub-Saharan Africa but is also found in the southernmost part of Yemen and several locations in India (IUCN, 2017). It breeds on large, undisturbed alkaline and saline lakes, salt pans or coastal lagoons, usually far out from the shore (IUCN, 2017). The lack of suitable habitat within the project area contributed to a low likelihood of occurrence for this species.

Phoenicopterus roseus (Greater Flamingo) is distributed from West Africa eastward throughout the Mediterranean to South West and South Asia, and throughout sub-Saharan Africa (IUCN, 2017). It prefers shallow eutrophic water bodies such as saline lagoons, saltpans and large saline or alkaline lakes (IUCN, 2017). However, it is also found frequenting sewage treatment pans, inland dams, estuaries and coastal waters (IUCN, 2017). The lack of suitable habitat within the project area contributed to a low likelihood of occurrence for this species.

Podica senegalensis (African Finfoot) occurs in sub-Saharan Africa (IUCN, 2017). It prefers a variety of freshwater habitats, especially those that are well-vegetated along the edge of the water (IUCN, 2017). It is mainly threatened by habitat loss due to the expansion of woody vegetation, human encroachment and the excessive burning of grasslands (IUCN, 2017). The lack of suitable habitat within the project area contributed to a low likelihood of occurrence for this species.

Poicephalus meyeri (Meyer's Parrot) occurs in the savannas of sub-Saharan Africa, from the northern parts of South Africa to the southern parts of Chad and Sudan (IUCN, 2017). It can also be found in habitats largely modified by humans (IUCN, 2017). International trade is the main threat to this species. The presence of savanna habitat in the project area contributed to a moderate likelihood of occurrence for this species.

Polemaetus bellicosus (Martial Eagle) is listed as EN on a regional scale and on a global scale (IUCN, 2017). This species has an extensive range across much of sub-Saharan Africa, but populations are declining due to deliberate and incidental poisoning, habitat loss, reduction in available prey, pollution and collisions with power lines (IUCN, 2017). It inhabits open woodland, wooded savanna, bushy grassland, thorn-bush and, in southern Africa, more open country and even sub-desert (IUCN, 2017). The presence of suitable foraging and breeding habitat in the project area contributed to a high likelihood of occurrence for this species.

Pterocles gutturalis (Yellow-throated Sandgrouse) occurs from northern South Africa to Ethiopia, and prefers open grassland to scrub savannas (Sinclair *et al*., 2002; IUCN, 2017). It can also be found in desert, wetlands and habitats modified by humans (IUCN, 2017). The presence of suitable open habitats in the project area contributed to a moderate likelihood of occurrence for this species.

Rostratula benghalensis (Greater Painted-snipe) has a wide global distribution, occurring widely throughout sub-Saharan Africa as well as India, China and Southeast Asia (IUCN, 2017). It prefers recently flooded areas in shallow lowland freshwater temporary or permanent wetlands in the tropics and subtropics and also forages in open grasslands adjacent to wetlands (IUCN, 2017). The lack of suitable habitats in the project area contributed to a low likelihood of occurrence for this species.

Sagittarius serpentarius (Secretarybird) occurs in sub-Saharan Africa and inhabits grasslands, open plains, and lightly wooded savanna (IUCN, 2017). It is also found in agricultural areas and sub-desert (IUCN, 2017). It mainly eats insects (86% of diet) but will also prey on rodents and other mammals, lizards, snakes, eggs, young birds and amphibians (IUCN, 2017). The likelihood of occurrence for this species is rated as high due to the open areas present in the project area as well as the expected presence of several prey species.

Torgos tracheliotos (Lappet-faced Vulture) has a wide distribution across sub-Saharan Africa as well as Saudi Arabia, Yemen and Oman (IUCN, 2017). It inhabits dry savanna, arid plains, deserts and open mountain slopes up to 3,500 m.a.s.l. and ranges widely while foraging (IUCN, 2017). The likelihood of occurrence for this species is rated as high due to the savanna areas present in the project area.

4.1.4 Land Capability

As part of the desktop assessment, soil information was obtained using published South African Land Type Data. Land type data for the site was obtained from the Institute for Soil Climate and Water (ISCW) of the Agricultural Research Council (ARC) (Land Type Survey Staff, 1972 - 2006). The land type data is presented at a scale of 1:250 000 and comprises of the division of land into land types.

4.1.5 Climate

The SVcb 1 vegetation type is characterised by a summer rainfall with a Mean Annual Precipitation (MAP) that ranges between 500 mm and 600 mm (see Figure 4-10). Of the savanna vegetation units that are located outside Kalahari bioregions, this unit has the highest mean annual potential evaporation. In the winter season frost is frequent (Mucina & Rutherford, 2006).

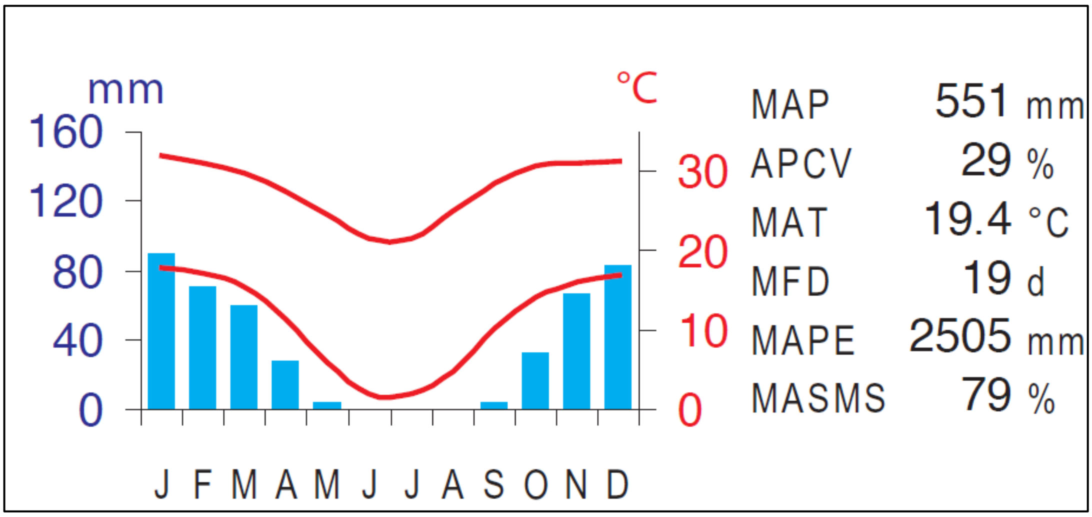

Figure 4-10 Climate for the Dwaalboom Thornveld (Mucina & Rutherford, 2006)

4.1.5.1 Geology and Soil

According to the land type database (Land Type Survey Staff, 1972 - 2006) the development falls within the Ea 70 land types.

The Ea land type consists of one or more of the following soils: Vertic, Melanic, and red structured diagnostic horizons, of which these soils are all undifferentiated. The Ea 70 land type terrain units and expected soils are illustrated in Figure 4-11 and Table 4-6 respectively.

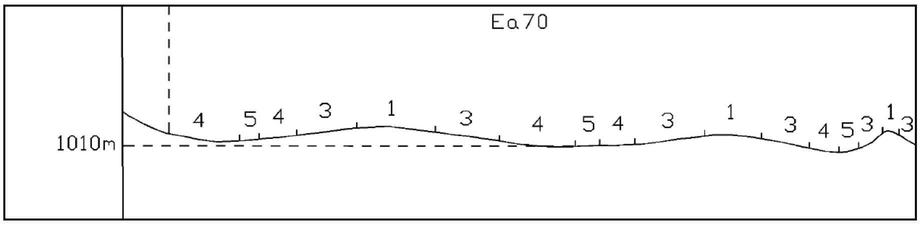

Figure 4-11 Illustration of land type Ea 70 terrain units (Land Type Survey Staff, 1972 – 2006)

Table 4-6 Soils expected at the respective terrain units within the Ea 70 land type (Land Type Survey Staff, 1972 - 2006)

Terrain units							
1 (20%)		3 (40%)		4 (31%)		5 (9%)	
Arcadia	60%	Arcadia	74%	Arcadia	76%	Rensburg	34%
Bare Rock	15%	Shortlands	9%	Swartland	11%	Arcadia	33%
Hutton	8%	Bare Rock	6%	Shortlands	6%	Dundee	22%
Shortlands	7%	Hutton	5%	Hutton	5%	Bonheim	6%
Glenrosa	7%	Glenrosa	4%	Bonheim	2%	Swartland	5%
Milkwood	5%	Milkwood	2%				

The Rustenburg Layered Suite as well as the Bushveld Igneous Complex are present in this region with a lot of mafic intrusive rocks present. The underlying geology of this region is a granite-gneiss terrane (Archaean) and it is covered partly with chemical and clastic sediments and volcanics derived from Rayton and Silverton formation which both form part of the Pretoria Group. Vertic clays had developed in the area due to the presence of norite and gabbro rocks. The land types Ea and Ae are mostly present in these areas (Mucina and Rutherford, 2006).

5 Impact Screening

5.1 Terrestrial Impact Assessment

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

The terrestrial habitat expected in the project area consists of Dwaalboom Thornveld (Least Threatened), which based on the desktop scoping assessment is expected to host two flora SCCs, namely *Stenostelma umbelluliferum* and *Jamesbrittenia bergae*. Portions of the project area are classified as ONA and NNR. The 500 m buffer zone around the project area also overlaps with unclassified NFEPA wetlands. A total of 12 fauna SCCs were given a high likelihood of occurrence, while a further ten were given a moderate likelihood of occurrence. Based on the desktop assessment information it can be said that the majority of the project area will have a moderate sensitivity rating.

Table 5-1 Scoping evaluation table summarising the impacts identified to terrestrial biodiversity

Impact **Biodiversity loss/disturbance**			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Destruction, fragmentation and degradation of habitats and ecosystems	<u>Direct impacts:</u> » Disturbance / degradation / loss to vegetation and habitats » Ecological corridors are disrupted » Habitat fragmentation <u>Indirect impacts:</u> » Erosion risk increases » Fire risk increases » Increase in invasive alien species	Local	None identified at this stage

Spread and/or establishment of alien and/or invasive species	Direct impacts: » Loss of vegetation and habitat due to increase in alien species Indirect impacts: » Creation of infrastructure suitable for breeding activities of alien and/or invasive species » Spreading of potentially dangerous diseases due to invasive and pest species	Local	None identified at this stage
Direct mortality of fauna	Direct impacts: » Loss of SCC species » Loss of fauna diversity Indirect impacts: » Loss of diversity and species composition in the area. » Possible impact on the food chain	Regional	None identified at this stage
Reduced dispersal/migration of fauna	Direct impacts: » Loss of genetic diversity » Isolation of species and groups leading to inbreeding Indirect impacts: » Reduced seed dispersal » Loss of ecosystem services	Regional/National	None identified at this stage
Environmental pollution due to water runoff, spills from vehicles and erosion	Direct impacts: » Pollution in waterbodies and the surrounding environment » Faunal mortality (direct and indirectly) Indirect impacts: » Ground water pollution » Loss of ecosystem services	Regional	None identified at this stage
Disruption/alteration of ecological life cycles (breeding, migration, feeding) due to noise, dust, heat radiation and light pollution.	Direct impacts: » Disruption/alteration of ecological life cycles due to noise » Reduced pollination and growth of vegetation due to dust » Faunal mortality due to light pollution (nocturnal species becoming more visible to predators) » Heat radiation could lead to the displacement of species Indirect impacts: » Loss of ecosystem services	Local	None identified at this stage
Staff and others interacting directly with fauna (potentially dangerous) or poaching of animals	Direct impacts: » Loss of SCCs or TOPS species Indirect impacts: » Loss of ecosystem service » Loss of genetic diversity	Local	None identified at this stage

Description of expected significance of impact

The development of the area could result in the loss or degradation of the habitat and vegetation, most of which is still in a natural condition and is expected to support a number of fauna species. The construction of the solar facility could also lead to the displacement/mortalities of the fauna and more specifically SCC fauna species. The operation of the facility could result in the disruption of ecological life cycles. This could be as a result of a number of things, but mainly due to dust, noise, light pollution and heat radiation. The disturbance of the soil/vegetation layer will allow for the establishment of flora alien invasive species. In turn, the new infrastructure will provide refuge for invasive/feral fauna species. Erosion is another possible impact that could result from the disturbance of the top soil and vegetation cover. A number of machines, vehicles and equipment will be required, aided by chemicals and concrete mixes for

the project. Leaks, spillages or breakages from any of these could result in contamination of the receiving water resources. Contaminated water resources are likely to have an effect on the associated biota.
Gaps in knowledge & recommendations for further study
» This is completed at a desktop level only. » Identification and descriptions of habitats. » Identification of the Site Ecological Importance. » Location and identification of SCCs as well as in the case of fauna their location of the nests/dens. » Determine a suitable buffer width for the identified features.
Recommendations with regards to general field surveys
» Field surveys to prioritise the development areas, but also consider the 500 m PAOI. » Fieldwork to be undertaken during the wet season period. » Avifauna assessment field work to be conducted over two seasons to ensure migratory species are considered.

5.1.1 Cummulative 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 (such as nearby solar farm activities within the area). These include dust deposition, noise and vibration, disruption of corridors or habitat, groundwater drawdown, groundwater and surface water quality, and transport.

Long-term cumulative impacts due to extensive solar development footprint, powerlines and substations can lead to the loss of endemic species and threatened species, loss of habitat and vegetation types and even degradation of well conserved areas (Table 5-2).

Table 5-2 Cumulative impact of the solar plant and battery system

The development of the proposed infrastructure will contribute to cumulative habitat loss within the ONA and thereby impact the ecological processes in the region.		
	Overall impact of the proposed development considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Low (2)	High (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	High (8)
Probability	Probable (3)	Highly probable (4)
Significance	**Medium**	**High**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation:		
• This impact cannot be mitigated as the loss of vegetation is unavoidable.		

Residual Impacts:
Will result in the loss of: » **An ONA** » **Endemic species;** » **SCC fauna and flora species; and** » **Two unclassified NFEPA wetlands.**

5.2 Wetland Impact Assessment

A key consideration for the scoping level impact assessment is the presence of the water resources delineated in proximity beyond the project area. The available data also suggests the presence of drainage features and wetlands within proximity to the project area. A Zone of Regulation (ZoR) of 500 m is applicable for any wetland system that is present beyond the project boundary.

Table 5-3 Scoping evaluation table summarising the impacts identified to wetlands

Impact **Wetland disturbance / loss**			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Disturbance / degradation / loss to wetland soils or vegetation due to the construction of the facility and associated infrastructure, such as crossings	Direct impacts: » Disturbance / degradation / loss to wetland soils or vegetation Indirect impacts: » Loss of ecosystem services	Local	None identified at this stage
Increased erosion and sedimentation & contamination of resources	Direct impacts: » Erosion and structural changes to the systems Indirect impacts: » Sedimentation & contamination of downstream reaches	Local	None identified at this stage
Description of expected significance of impact The development of the area could result in the encroachment into water resources and result in the loss or degradation of these system. Water resources are also likely to be traversed by linear infrastructure, but these systems can be avoided by spanning infrastructure. These disturbances could also result in the infestation and establishment of alien vegetation would affect the functioning of the systems. Earthworks will expose and mobilise earth materials which could result in sedimentation of the receiving systems. A number of machines, vehicles and equipment will be required, aided by chemicals and concrete mixes for the project. Leaks, spillages or breakages from any of these could result in contamination of the receiving water resources. Contaminated water resources are likely to influence the associated biota. It is anticipated to increase stormwater runoff due to the hardened surfaces and the crossings will result in an increase in run-off volume and velocities, resulted in altered flow regimes. The changes could result in physical changes to the receiving systems caused by erosion, run-off and also sedimentation, and the functional changes could result in changes to the vegetative structure of the systems. The reporting of surface run-off to the systems could also result in the contamination of the systems, transporting (in addition to sediment) diesel, hydrocarbons and soil from the operational areas.			
Gaps in knowledge & recommendations for further study » This is completed at a desktop level only. » Identification, delineation and characterisation of water resources. » Undertake a functional assessment of systems where applicable. » Determine a suitable buffer width for the resources. **Recommendations with regards to general field surveys** » Field surveys to prioritise the development areas, but also consider the 500 m regulation area. » Beneficial to undertake fieldwork during the wet season period.			

5.2.1 Cumulative Impacts

Cumulative impacts are assessed in context of the extent of the proposed project area; other developments in the area; and general wetland loss and transformation resulting from other activities in the area (Table 4-2).

Table 5-2 Cumulative wetland impact assessment

Impact Wetland disturbance / loss			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Disturbance / degradation / loss to wetland soils or vegetation due to the construction of the facility and associated infrastructure, such as crossings	Direct impacts: » Disturbance / degradation / loss to wetland soils or vegetation Indirect impacts: » Loss of ecosystem services	Regional	None identified at this stage
Increased erosion and sedimentation & contamination of resources	Direct impacts: » Erosion and structural changes to the systems Indirect impacts: » Sedimentation & contamination of downstream reaches	Regional	None identified at this stage
Description of expected significance of impact The expected post-mitigation risk significance for the project is expected to be low, with limited developments in the catchment area.			
Gaps in knowledge & recommendations for further study » This is completed at a desktop level only. » Identification, delineation and characterisation of water resources. » Undertake a functional assessment of systems where applicable. » Determine a suitable buffer width for the resources. **Recommendations with regards to general field surveys** » Field surveys to prioritise the development areas, but also consider the 500 m regulation area. » Beneficial to undertake fieldwork during the wet season period.			

5.3 Soil Impact Assessment

Considering the occurrence of various soil forms that are commonly associated with high land capabilities, it is unlikely that areas with high land capability sensitivity do occur within the project area. Further to this, due to the climatic capability, the ultimate land potential is more likely to be low.

Table 5-4 Scoping evaluation table summarising the impacts identified to soils

Impact Loss of land capability			
Issue	**Nature of Impact**	**Extent of Impact**	**No-Go Areas**
Compaction/soil stripping/transformation of land use which leads to loss of land capability	Direct impacts: » Loss of soil / land capability Indirect impacts: » Loss of land capability	Local	None identified at this stage
Description of expected significance of impact The development of the area could result in the encroachment into areas characterised by high land potential properties, which can ultimately result in the loss of land capability. These disturbances could also result in the infestation and establishment of alien vegetation, which in turn can have a detrimental impact on soil resources. Earthworks will expose and mobilise earth materials which could result in compaction and/or erosion. A number of machines, vehicles and equipment will be required, aided by chemicals and concrete mixes for the project. Leaks, spillages or breakages from any of these could result in contamination of soil resources, which could affect the salinity			

or pH of the soil, which can render the fertility of the soil unable to provide nutrition to plants. During the operational phase, the impacts associated with the substation and collector sub will be easily managed by best "housekeeping" practices.

Gaps in knowledge & recommendations for further study

- This is completed at a desktop level only.
- Identification and delineation of soil forms.
- Determine of soil sensitivity.

Recommendations with regards to general field surveys

- Field surveys to prioritise the development areas.

5.3.1 Cumulative Impacts

Cumulative impacts are assessed in context of the extent of the proposed project area; other developments in the area; and general loss of high-quality land capability areas (Table 4-4).

Table 5-4 Cumulative soil impact assessment

Impact

Loss of land capability

Issue	Nature of Impact	Extent of Impact	No-Go Areas
Compaction/soil stripping/transformation of land use which leads to loss of land capability	Direct impacts: » Loss of soil / land capability Indirect impacts: » Loss of land capability	Regional	None identified at this stage

Description of expected significance of impact

The expected post-mitigation risk significance is expected to be low, and the overall cumulative impact is also expected to be low.

Gaps in knowledge & recommendations for further study

- This is completed at a desktop level only.
- Identification and delineation of soil forms.
- Determine of soil sensitivity.

Recommendations with regards to general field surveys

- Field surveys to prioritise the development areas.

6 Conclusion

6.1 Terrestrial Ecology

Based on the desktop assessment it can be said that the project area is sensitive with a moderate to high likelihood of species of conservation concern occurring. This assumption is based on the ONA, close proximity (less than 5 km) to a NPAES protected area (Sharme Private Nature Reserve), Northern Turfveld IBA and two unclassified NFEPA wetlands around the project area.

The expected post-mitigation risk significance for the project in isolation is expected to be medium, but in consideration of other projects in the area, it is considered to be high. The expectant anthropogenic activities are likely to drive habitat destruction causing displacement of fauna and flora and possibly event direct mortality. Land clearing destroys local wildlife habitat and can lead to the loss of local breeding grounds, nesting sites and wildlife movement corridors such as rivers, streams and drainage lines, or other locally important features. The removal of natural vegetation may reduce the habitat available for fauna species and may reduce animal populations and species compositions within the area.

6.2 Wetlands

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

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

6.3 Land Capability

Various soil forms are expected throughout the project area, of which some are commonly associated with higher land capabilities. Even though the soil depth, texture and permeability of these soils ensure higher land capability, the climatic capability of the area often reduces the land potential considerably. Areas characterised by “High” land potential are expected for selected areas.

The proposed development can result in the loss of land capability. The disturbances could further also result in the infestation and establishment of alien vegetation, which in turn can have a detrimental impact on soil resources. The development of the area could also result in compaction and/or erosion. Further to this, these activities could also cause leaks and/or spillages resulting in contamination of soil resources, which could affect the salinity or pH of the soil, which can render the fertility of the soil unable to provide nutrition to plants.

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8 Appendix Items

8.1 Appendix A – Specialist Declaration of Independence

I, Jan Jacobs, 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.

J. Jacobs

Jan Jacobs

Terrestrial Ecologist

The Biodiversity Company

May 2022