



# FRESHWATER ECOLOGY COMPLIANCE STATEMENT

## Zionsheuwel Solar Photovoltaic Facility

### De Aar, Northern Cape

May 2023

CLIENT



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## Executive Summary

Zionsheuwel Solar Energy (Pty) Ltd (a consortium consisting of Akuo Energy Afrique, Africoast Investments and Golden Sunshine Trading) propose to develop the Zionsheuwel Solar Photovoltaic (PV) Facility and its associated electrical infrastructure on the Remainder of Farm Leeuwberg 79 in the Renosterberg Local Municipality in the greater Pixley ka Seme District Municipality in the Northern Cape Province. The project site is located approximately 20 km north of Philipstown and 30 km west of Petrusville and within the Central Transmission Corridor. The Project (Zionsheuwel Solar PV Facility) is part of a cluster known as the Crossroads Green Energy Solar PV Cluster. The Cluster entails the development of up to Twenty-one (21) solar energy facilities. Each is considered within a separate environmental application process. A technically suitable project site of ~2964 ha has been identified by the Applicant for the establishment of the Zionsheuwel Solar PV Facility. The proposed facility will have a contracted capacity of 240 MW.

The Biodiversity Company was appointed to undertake a freshwater ecology (aquatic biodiversity theme) assessment for the proposed PV solar development. The project area refers to the farm portions whereas the developable area refers to the proposed footprint area for the PV facility.

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 is in accordance with 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). Whilst the National Web based Environmental Screening Tool does not pertain specifically to wetlands, the presence of wetlands does contribute to the aquatic theme sensitivity being characterised as “Low” for the developable area, and “High” for the watercourses which fall outside of the PV area. A single dry season survey was conducted between the 4<sup>th</sup> and 8<sup>th</sup> of July 2022 by a registered freshwater ecologist.

The purpose of the specialist study is to provide relevant input into the basic assessment process and 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.

### Baseline Aquatic Ecology

One (1) form of a watercourse was identified and delineated within the regulated area. This includes an ephemeral river (watercourse). No natural wetland systems, or even cryptic wetlands were identified for the area. The proposed development area is more than 500 m east of the watercourse. The results of the habitat assessment indicates natural (class A) and largely natural (class B) instream and riparian conditions for the watercourse catchment respectively. The recommended buffer was calculated to be 20 m for the river. A site sensitivity verification forms part of reporting requirements. In this regard, the allocated sensitivities of low for the general area and medium to high sensitivity for the drainage features agrees with the Environmental Screening Tool. The project must take cognizance of this and avoid any unnecessary disturbance of the drainage features and adjacent habitat. Therefore, the aforementioned post-mitigation buffer should be implemented and treated as ‘no go areas’.

The development footprint is not located within 100 m of the delineated water resource [as per the National Water Act, 1998 (Act No. 36 of 1998) in accordance with GN509 of 2016 as it relates to the National Water Act, 1998 (Act 36 of 1998), a regulated area of a watercourse in terms of water uses as listed in Section 21(c) and 21(i)].

### **Impact Assessment**

Since the development footprint is outside of the regulation zone and buffer zone, no risks to the freshwater systems are foreseen for the proposed project. Therefore, no impacts or risks were anticipated to the freshwater systems and therefore not assessed in this report. Despite the absence of risks expected for the project, this report presents supporting mitigation and management measures for consideration.

### **Specialist Recommendation**

It is the specialist's opinion that no fatal flaws were identified for the project, and the development may be favourably considered and all prescribed mitigation measures must be considered by the issuing authority. No monitoring measures are deemed necessary for the development.

## Report and Specialist Details

<b>Report Name</b>	Freshwater Ecology Compliance Statement for the proposed Zionsheuwel Solar Photovoltaic Facility – May 2023	
<b>Submitted to</b>	Jo-Anne Thomas	
<b>Survey Date</b>	4 - 8 July 2022	
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<b>Report Writer</b>	Andrew Husted info@thebiodiversitycompany.com	
	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 years' experience in the environmental consulting field.	
<b>Declaration</b>	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, 2014 (as amended). 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 principles of science.	

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## 1 Introduction

### 1.1 Project Description

Zionsheuwel Solar Energy (Pty) Ltd (a consortium consisting of Akuo Energy Afrique, Africoast Investments and Golden Sunshine Trading) propose to develop the Zionsheuwel Solar Photovoltaic (PV) Facility and its associated electrical infrastructure on the Remainder of Farm Leeuwberg 79 in the Renosterberg Local Municipality in the greater Pixley ka Seme District Municipality in the Northern Cape Province. The project site is located approximately 20 km north of Philipstown and 30 km west of Petrusville and within the Central Transmission Corridor. The Project (Zionsheuwel Solar PV Facility) is part of a cluster known as the Crossroads Green Energy Solar PV Cluster. The Cluster entails the development of up to Twenty-one (21) solar energy facilities. Each is considered within a separate environmental application process.

A technically suitable project site of ~2964 ha has been identified by the Applicant for the establishment of the Zionsheuwel Solar PV Facility. The proposed facility will have a contracted capacity of 240 MW and will include the following infrastructure:

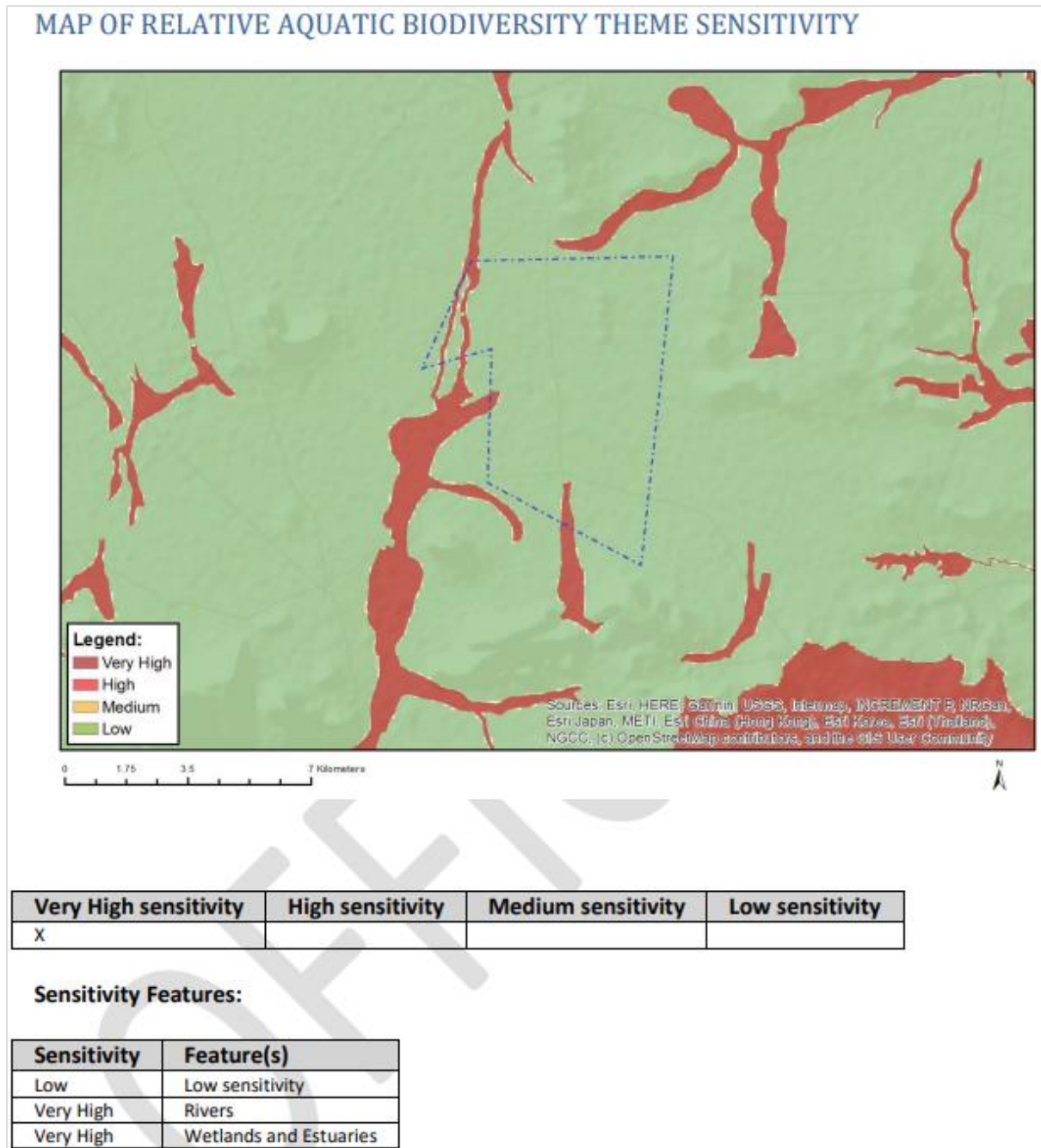
- Solar PV array comprising PV modules and mounting structures (monofacial or bifacial and a single axis tracking system);
- Inverters and transformers;
- Cabling between the project components;
- Battery Energy Storage System (BESS);
- On-site facility substation and power lines between the solar PV facility and the Eskom substation (to be confirmed and assessed through a separate process);
- Site offices, Security office, operations and control, and maintenance and storage laydown areas; and
- Access roads, internal distribution roads.

### 1.2 Background

The Biodiversity Company was appointed to undertake a freshwater ecology (aquatic biodiversity theme) assessment for the proposed PV solar development. The project area refers to the farm portions whereas the developable area refers to the proposed footprint area for the PV facility.

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 is in accordance with 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). Whilst the National Web based Environmental Screening Tool does not pertain specifically to wetlands, the presence of wetlands does contribute to the aquatic theme sensitivity being characterised as “Low” for the developable area, and “High” for the watercourses which fall outside of the PV area (Figure 1-1). A single dry season survey was conducted between the 4<sup>th</sup> and 8<sup>th</sup> of July 2022 by a registered freshwater ecologist.





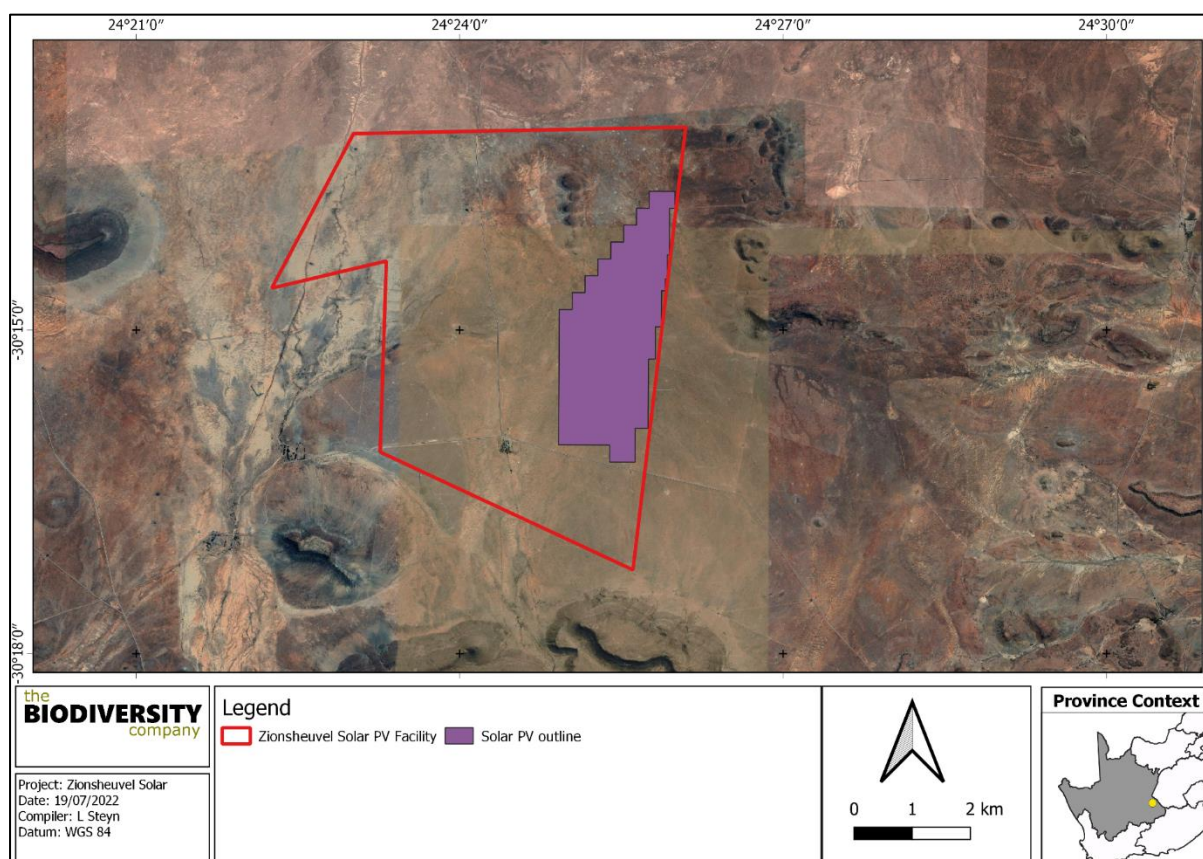
**Figure 1-1 The aquatic theme sensitivity**

### 1.3 Presentation

The Project Area of Influence (PAOI) comprises the collective extent of the farms proposed for the Crossroads Green Energy Solar PV Cluster. The baseline information presented herein pertains to the PAOI. Table 1-1 presents the project names which comprise the cluster development, and the corresponding farm portions and planned capacity. A summary of ecological features specific to the Zionsheuwel Solar Photovoltaic Facility is provided in this report. Further to this, impacts expected for the development of renewable energy projects in the area have also been presented. The layout of the Zionsheuwel solar plant on the property is presented in Figure 1-2.

**Table 1-1 The project name, farm portion and accompanying capacity for the Crossroads Green Energy Solar PV Cluster**

No	Project name	Farm Name and portion Number	Capacity
1	Tafelkop Solar PV Facility	Portion 3 of the Farm Grass Pan 40	240 MW
2	Koppy Alleen Solar PV Facility	Portion 5 of the Farm Koppy Alleen 83	100 MW
3	Vrede Solar PV Facility	Portion 5 of the Farm Bas Berg 88	150 MW
4	Zionsheuwel Solar PV Facility	Remainder of Farm Leeuwberg 79	240 MW
5	Amper Daar Solar PV Facility	Remainder of Farm Wolwe Kuil 44	100 MW
6	Wag-'n-Bietjie Solar PV Facility	Portion 1 of the Farm Leeuwe Berg 45	100 MW
7.1	Ruspoort 1 Solar PV Facility (Option A)	Portion 5 of the Farm Bokken Kraal 81 (Option A)	100 MW
7.2	Ruspoort 1 Solar PV Facility (Option B)	Portion 4 on the Farm Knoffelfontein 74 Portion 1 on the Farm 78 Portion 2 on the Farm Leeuwberg 79 (Option B)	100 MW
8	Ruspoort 2 Solar PV Facility	Portion 2 of the Farm Leeuwberg 79	100 MW
9	Middelplaas Solar PV Facility	Portion 4 of the Farm Grass Pan 40	100 MW



**Figure 1-2 The layout of the solar plant on the property**

## 1.4 Legislative Framework

In line with the protocol for the specialist assessment and minimum report content requirements for environmental impacts on aquatic biodiversity, as per Government Notice 320 published in terms of NEMA, dated 20 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, when applying for Environmental Authorisation” – the following has been assumed:

- An applicant intending to undertake an activity identified in the scope of this protocol on a site identified on the screening tool as being of:
  - “low sensitivity” for aquatic biodiversity, must submit an Aquatic Biodiversity Compliance Statement.

An Aquatic Biodiversity Compliance Statement must contain the information as presented in Table 1-2 below.

**Table 1-2 Aquatic Biodiversity Compliance Statement information requirements as per the relevant protocol, including the location of the information within this report**

Information to be Included (as per GN 320, 20 March 2020)	Report Section
Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae	1.4
A signed statement of independence by the specialist	9.1
A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment	1.2
A baseline profile description of biodiversity and ecosystems of the site	5
The methodology used to verify the sensitivities of the aquatic biodiversity features on the site including the equipment and modelling used where relevant;	4.2
In the case of a linear activity, confirmation from the aquatic biodiversity specialist that, in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase	N/A
Where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr	6
A description of the assumptions made as well as any uncertainties or gaps in knowledge or data	1.6
Any conditions to which this statement is subjected	7

## 1.5 Limitations

The following limitations should be noted for the 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;
- The priority for the statement was the developable areas and associated regulatory zone which are located within low sensitivity areas; and
- The assessment area was based on the spatial file provided by the client and any alterations to the development area may affect the results.

## 2 Scope of Work

The principle aim of the assessment was to provide information to guide the risk of the proposed activity to the ecological 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 species that occur within the project area;
- A desktop description of the ecological status of the local watercourses within the area;
- A site visit to investigate and ground truth the site characteristics;

- Identify the manner that the proposed project impacts based on the screening assessment information and the desktop and site visit information, and evaluate the level of risk of these potential impacts; and
- The prescription of mitigation measures and recommendations for identified risks.

### 3 Key Legislative Requirements

The legislation listed below in Table 3-1 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 3-1** *A list of key legislative requirements relevant to biodiversity and conservation in the Northern Cape*

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);
	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)
	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	Northern Cape Nature Conservation act no. 9 of 2009
	Northern Cape Planning and Development Act no. 7 of 1998
	Northern Cape Critical Biodiversity Area 2017

## 4 Methods

### 4.1 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.

#### 4.1.1 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.
- 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.

## 4.2 Freshwater Ecology

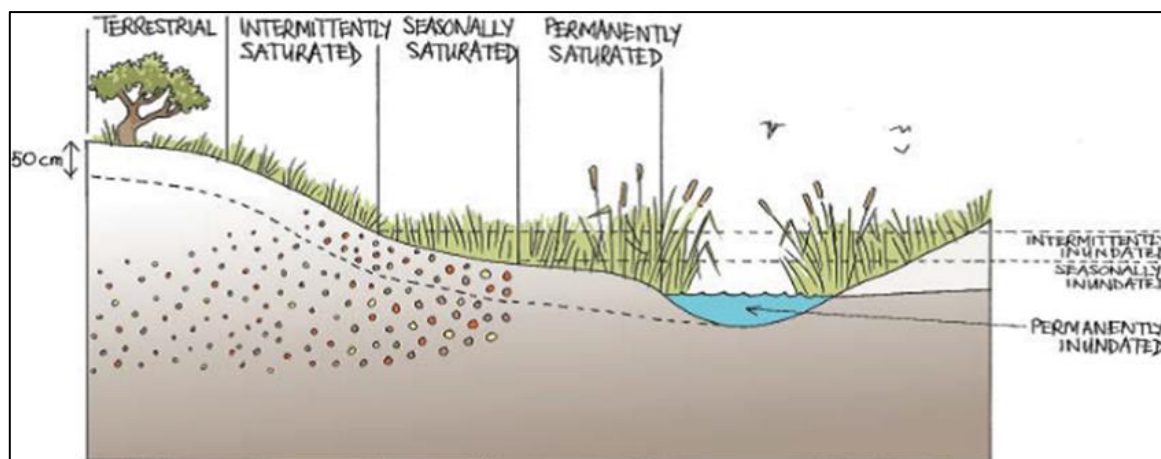
### 4.2.1 Wetland Identification and Mapping

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 also includes 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 4-1. 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 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 4-1** Cross section through a wetland, indicating how the soil wetness and vegetation indicators change (Ollis et al., 2013)

#### 4.2.2 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 4-1).

**Table 4-1** 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

#### 4.2.3 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 4-2.

**Table 4-2 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

#### 4.2.4 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 4-3 (Rountree and Kotze, 2013).

**Table 4-3 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

#### 4.2.5 Determining Buffer Requirements

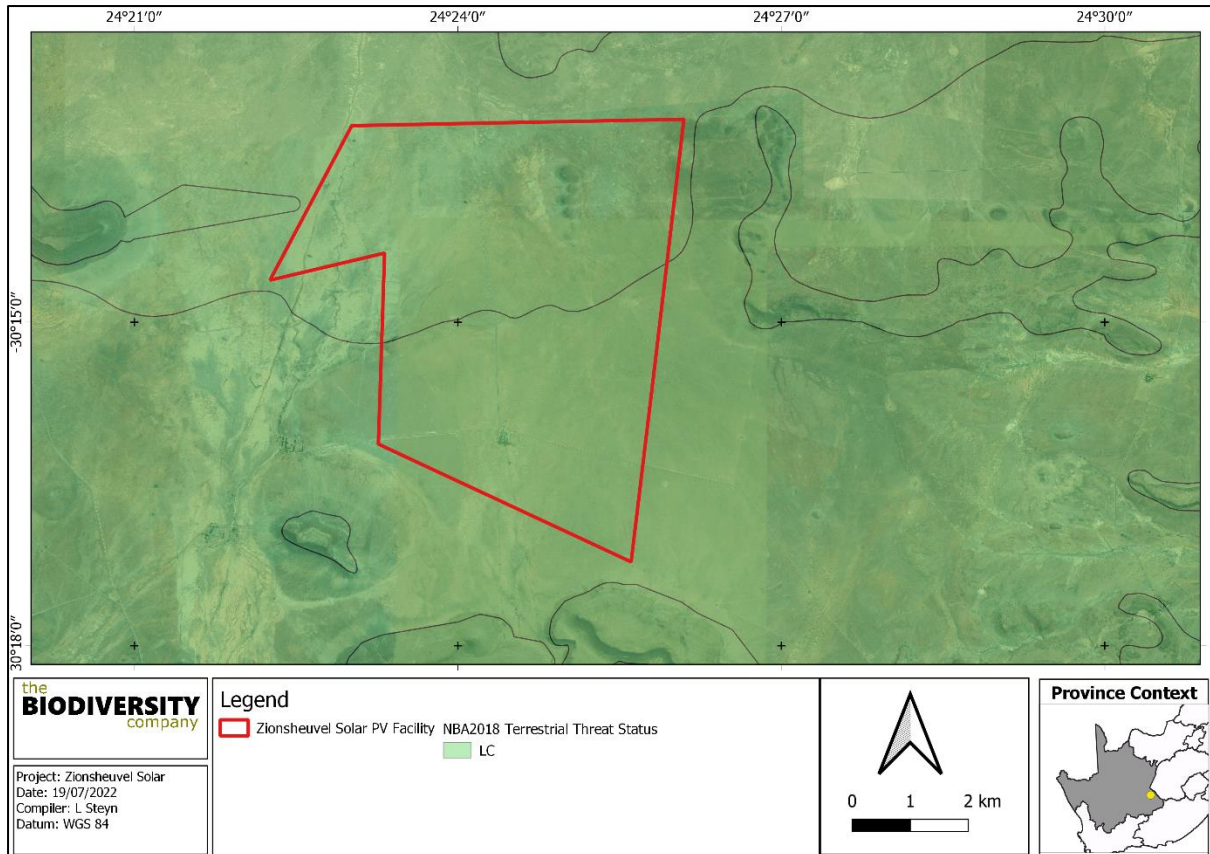
The “Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries” (Macfarlane et al., 2014) will be used to determine the appropriate buffer zone for the proposed activity.

## 5 Results & Discussion

### 5.1 Desktop Assessment

#### 5.1.1 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 PAOI overlaps with a LC ecosystem (Figure 5-1).

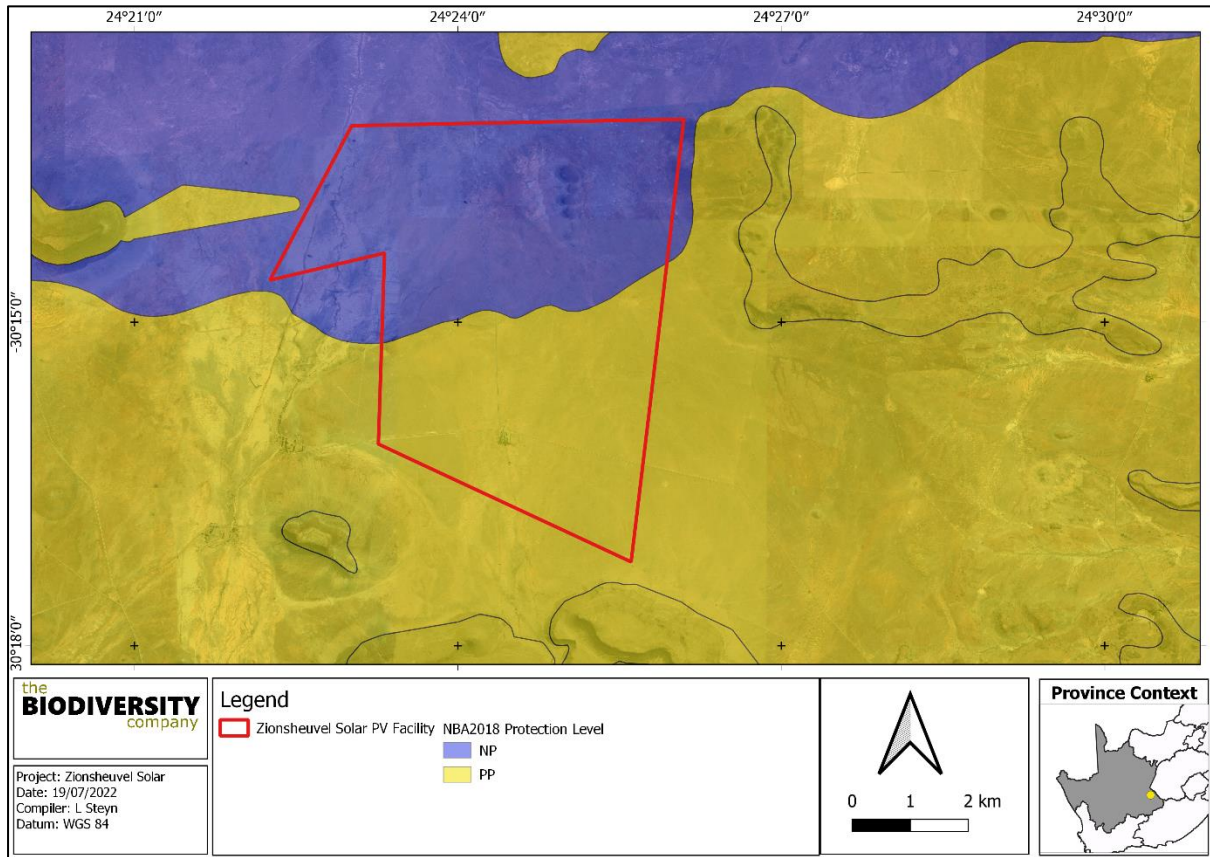


**Figure 5-1** Map illustrating the ecosystem threat status associated with the PAOI



**5.1.2 Ecosystem Protection Level**

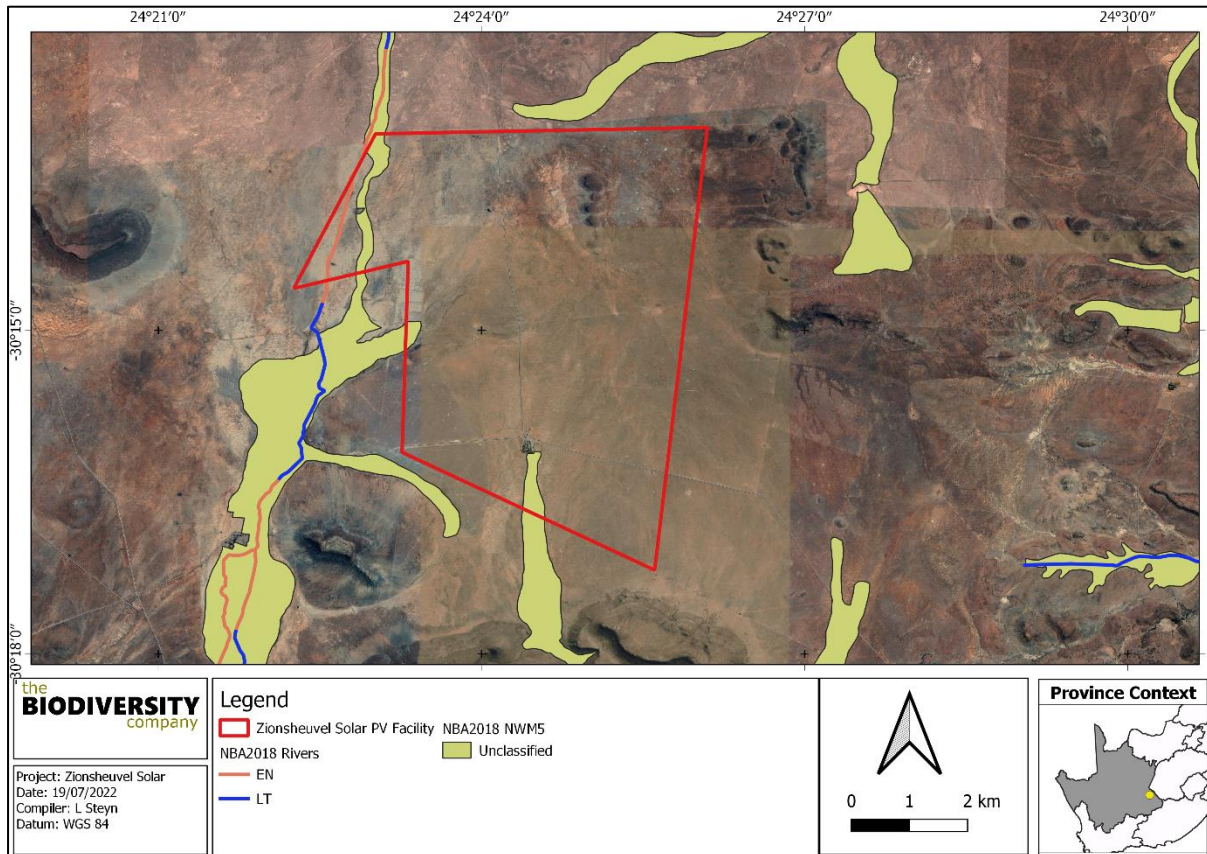
This is an indicator of the extent to which ecosystems are adequately protected or under-protected. Ecosystem types are categorised as Well Protected (WP), Moderately Protected (MP), Poorly Protected (PP), or Not Protected (NP), based on the proportion of the biodiversity target for each ecosystem type that is included within one or more protected areas. NP, PP or MP ecosystem types are collectively referred to as under-protected ecosystems. The PAOI overlaps with NP and PP ecosystems (Figure 5-2).



**Figure 5-2** Map illustrating the ecosystem protection level associated with the PAOI

### 5.1.3 Hydrological Setting

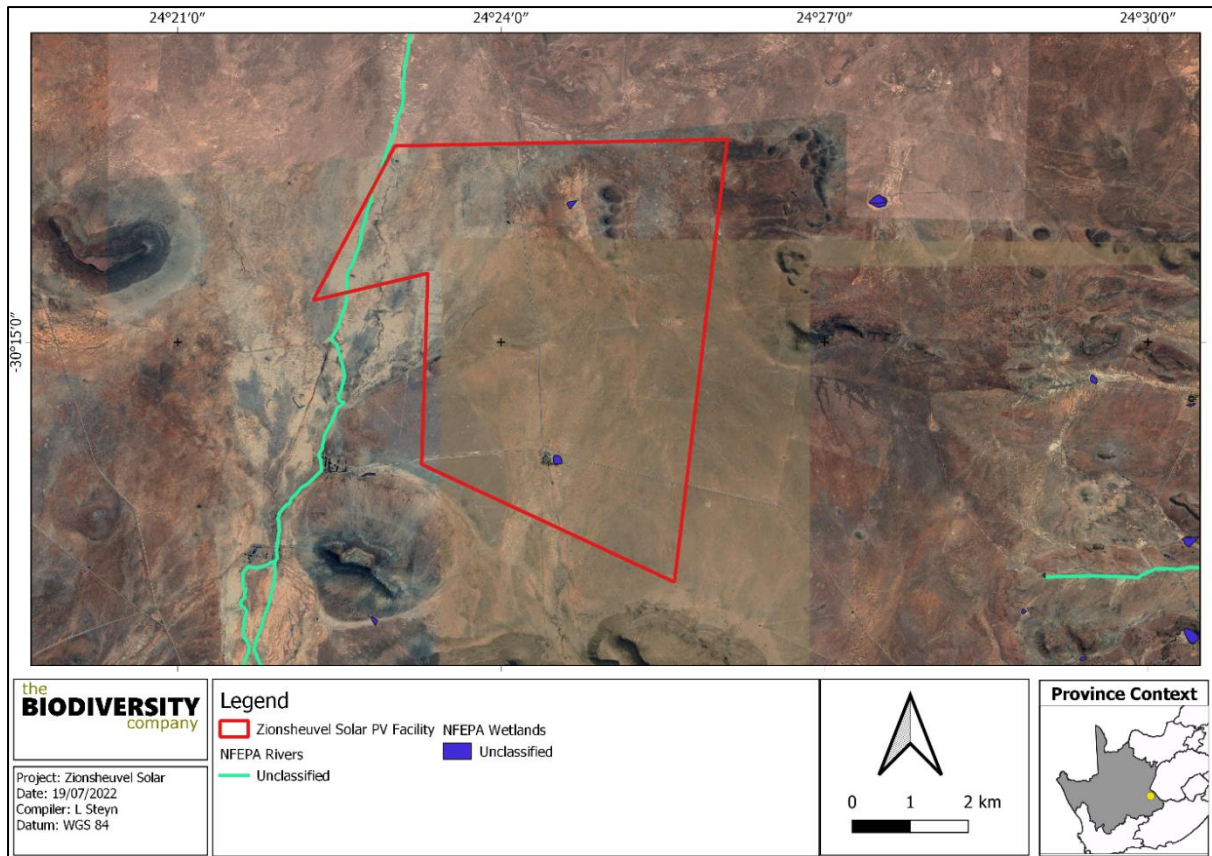
The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was released with the NBA 2018. Ecosystem threat status (ETS) of river and wetland ecosystem types are based on the extent to which each river ecosystem type had been altered from its natural condition. Ecosystem types are categorised 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 PAOI overlaps with an unclassified wetland and an EN river (Figure 5-3).



**Figure 5-3** Map illustrating ecosystem threat status of rivers and wetland ecosystems in the PAOI

### 5.1.4 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) (Nel *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 5-4 shows the PAOI overlaps with unclassified wetlands and an unclassified river.



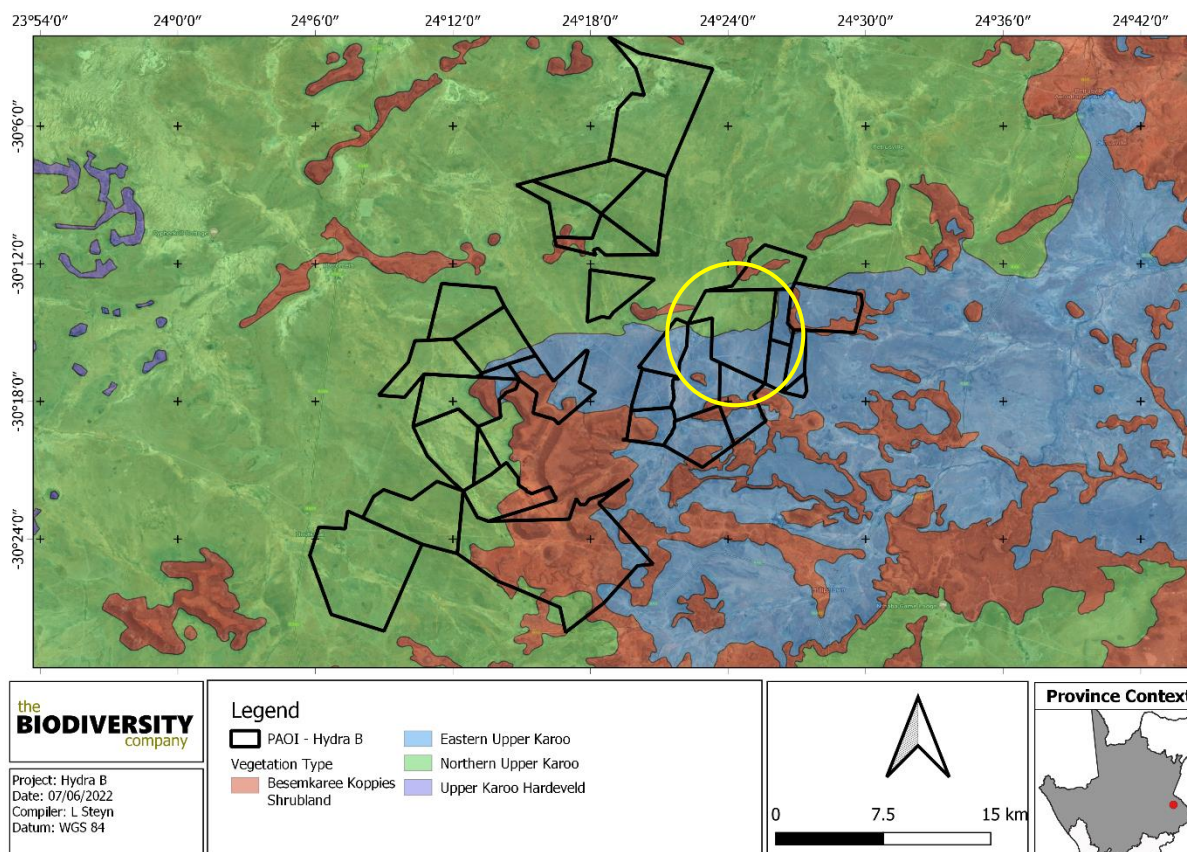
**Figure 5-4** The PAOI in relation to the National Freshwater Ecosystem Priority Areas

### 5.1.5 Vegetation

The project area is situated in the Nama-Karoo Biome. It is a large, landlocked region that lies on the central plateau of the western half of South Africa and extends into southeastern Namibia. In terms of climate, the Nama-Karoo Biome is arid and characterised by the presence of mostly nonperennial rivers, highly variable and unreliable low rainfall, and unpredictable and sometimes prolonged droughts (Booyesen & Rowsell 1983; Mucina & Rutherford, 2006). On the plains to the northeast, there are gradual transitions between the Nama-Karoo and Grassland Biomes, making the border between the two biomes difficult to map (Mucina & Rutherford, 2006).

Generally, the vegetation of the Nama-Karoo Biome are a filtered subset of the vegetation of surrounding biomes, including Savanna, Grassland, Fynbos, Succulent Karoo and Albany Thicket Biomes (Hilton-Taylor, 1987). The three most dominant floral families are Asteraceae, Fabaceae and Poaceae, similar to the vegetation structure of other arid and semi-arid areas (Mucina & Rutherford).

On a fine-scale vegetation type, the project area overlaps with two vegetation types, namely the Northern Upper Karoo (Nku 3) and Eastern Upper Karoo (Nku 4), with the conservation status of these vegetation types classified as Least Threatened.



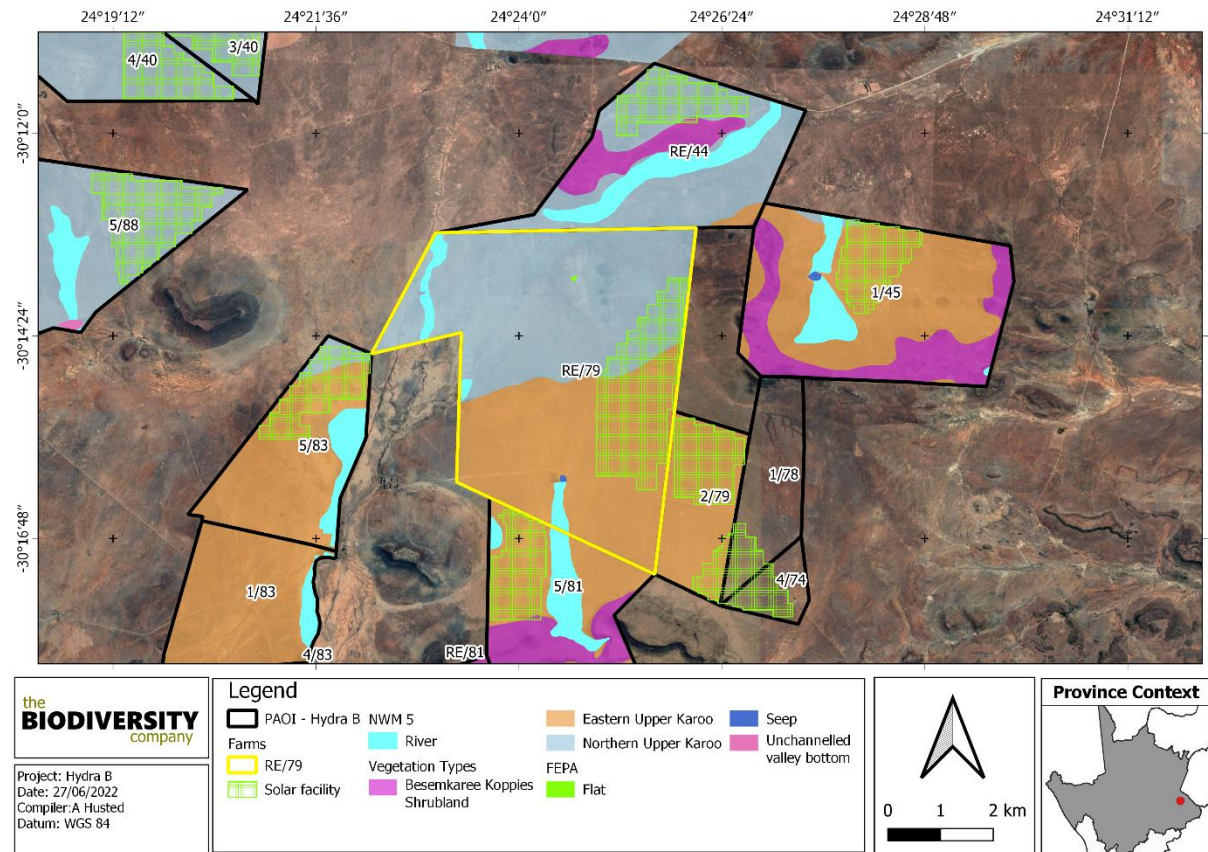
**Figure 5-5** Vegetation types associated with the PAOI (yellow circle)

## 5.2 Zionsheuwel Solar Photovoltaic Facility Summary

A summary of ecological features and habitat characteristics pertinent to the PAOI is summarised in Table 5-1. A summary of ecological features and habitat characteristics pertinent to the facility is summarised in the subsequent table. These ecological features pertain to the respective farm portions (Figure 5-6).

**Table 5-1** Summary of relevance of the PAOI to ecologically important landscape features

Desktop Information Considered	Relevant/Irrelevant
Ecosystem Threat Status	Relevant – Overlaps with a Least Concern ecosystem
Protected Areas	Irrelevant – The project area does not overlap with a protected area
Renewable Energy Development Zones	Irrelevant - The project area is not within a REDZ
Powerline Corridor	Relevant- The project area falls within the Central Corridor
National Protected Areas Expansion Strategy	Irrelevant – The project area does not overlap with a NPAES protected area
Important Bird and Biodiversity Areas	Relevant – The project area is located in the Platberg-Karoo Conservancy IBA
Strategic Water Source Areas	Irrelevant- The project area is not located in a SWSA



**Figure 5-6** The respective farm portions in consideration of the ecological features

**Table 5-2 Summary of relevance of the proposed facility to ecologically important landscape features**

Project	NWM5			C-Plan	FEPA Type	Vegetation Type		NBA 2018 Rivers		Ecosystem	
	System	Threat Status	Protection Level	Category	-	Threat Status	Protection Level	Threat Status	Protection Level	Threat Status	Protection Level
<b>Zionsheuwel Solar PV Facility – 240 MW</b>	River	-	-	ESA	Seep, Flat	NP, PP	LC	EN	NP	LC	NP, PP

### 5.3 Field Assessment

Freshwater systems were delineated in accordance with the DWAF (2005) guidelines. Vegetation is used as the primary wetland indicator. However, whilst wetland vegetation is adapted to life in saturated soil under normal circumstances, such features are not always present in arid to semi-arid environments such as the Northern Cape (based on experience within the region) due to the typically arid conditions of the region, additional indicators, as provided by Day *et al* (2010) were utilised, relevant conclusions include:

- No one indicator provides adequate information about wetland presence, type, hydroperiod, biodiversity, function and principle ecological and hydrological drivers to be useful on its own – particularly with regard to actual or suspected cryptic and/or temporary wetlands;
- The absence of an indicator does not necessarily equate to the absence of a wetland;
- Indicators that a wetland is present are usually associated with a higher level of confidence than interpretation of indicators of specific wetland character/habitat type;
- Seasonally/ephemerally inundated wetlands may be identifiable to a higher level of confidence than seasonally saturated systems; and
- Detailed delineation of cryptic wetlands is unlikely to be achievable with any useful degree of confidence based on a dry season assessment only.

Based on a combination of desktop and in-field delineation, one (1) form of a watercourse was identified and delineated within the regulated area. This includes an ephemeral river (watercourse) and dam with associated episodic drainage lines/ features located more than 500 m west of the development area. No natural wetland systems, or even cryptic wetlands were identified for the area. An episodic river refers to systems formed from run-off channels in very dry regions. The river and drainage lines are both classified as a river HGM type system (Table 5-3). The drainage lines are not characterised by riparian vegetation and grasses, these systems represent bare surfaces with evidence of surface run-off. The ephemeral nature of this river means that it is largely dependent on the smaller drainage features that feed into the main channel. No watercourses were identified within the development area (Figure 5-7). Photographs of the identified features within the PAOI are presented in Figure 5-8.

***The level 1-4 classification of the HGM units as per the national classification system (Ollis et al., 2013) is presented in Table 5-3. The systems were classified as Inland Systems falling within the Nama Karoo Aquatic Ecoregion.***

**Table 5-3 Characterization of the watercourses for the project according to the Classification System (Ollis et al., 2013)**

System	Level 3: Landscape unit	Level 4: Hydrogeomorphic Unit
		HGM Type
River	Plain: an extensive area of low relief characterised by relatively level, gently undulating or uniformly sloping land.	River: a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water.
Drainage features	Valley floor: The base of a valley, situated between two distinct valley side-slopes.	



**Figure 5-7** Photographs of the development area



**Figure 5-8** Photographs of features within the general PAOI: A) Dry river; and B) Drainage feature

### 5.3.1 Catchment Level Habitat Assessment

Due to the absence of wetland systems for the area, approaches for the assessment of river systems were adopted.

The Intermediate Habitat Integrity Assessment (IHIA) model was used to assess the integrity of the habitats from a riparian and instream perspective as described in Kleynhans (1996). The habitat integrity of a river refers to the maintenance of a balanced composition of physico-chemical and habitat characteristics on a temporal and spatial scale which are comparable to the characteristics of natural habitats of the region (Kleynhans, 1996).

This model compares current conditions with reference conditions that are expected to have been present. Specification of the reference condition follows an impact-based approach where the intensity and extent of anthropogenic changes are used to interpret the impact on the habitat integrity of the system. To accomplish this, information on abiotic changes that can potentially influence river habitat integrity are obtained from surveys or available data sources. These changes are all related and interpreted in terms of modification of the drivers of the system, namely hydrology, geomorphology and physico-chemical conditions and how these changes would impact on the natural riverine habitats.



The spatial framework for each IHIA was 5 km up and downstream of the respective area of interest, from the highest elevation to the lowest elevation within the watercourse. The results of the IHIA for the catchment are provided in Table 5-4.

**Table 5-4 Results for the habitat assessment**

<b>Instream</b>	<b>Average Score</b>	<b>Impact Score</b>
Water abstraction	0	0
Flow modification	4	2.08
Bed modification	4	2.08
Channel modification	4	2.6
Water quality	2	1.12
Inundation	1	0.4
Exotic macrophytes	1	0.36
Exotic fauna	0	0
Solid waste disposal	0	0
<b>Total Instream</b>		<b>91.36</b>
<b>Category</b>		<b>A</b>
<b>Riparian</b>	<b>Average Score</b>	<b>Impact Score</b>
Indigenous vegetation removal	2	1.04
Exotic vegetation encroachment	1	0.48
Bank erosion	4	2.24
Channel modification	4	1.92
Water abstraction	0	0
Inundation	1	0.44
Flow modification	5	2.4
Water quality	2	2.6
<b>Total Riparian</b>		<b>88.88</b>
<b>Category</b>		<b>B</b>

The results of the IHIA indicates natural (class A) and largely natural (class B) instream and riparian conditions for the catchment respectively. Modifications to instream habitat, albeit limited, are attributed to channel modification, and also flow and bed modification. Modifications to the riparian areas are attributed to vegetation clearing, and also bank and channel changes.

### 5.3.2 Sensitivity and Buffer Analysis

To determine a more “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. 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.

According to the buffer guideline (Macfarlane *et al.*, 2014) a high-risk activity would require a buffer that is 95% effective to reduce the risk of the impact to a low-level threat. The tool is regarded as a guideline, adjustments have been made to provide a better suited buffer width. According to the Macfarlane *et al.* (2014) buffer tool the required pre-mitigation buffer is 41 m for the construction phase and 20 m for the operational phase.

Other case studies completed by Macfarlane *et al.* (2009) focused on reviewing the functions, values and limitations of buffer zones. This study indicated that there are specific characteristics or variables that affect a buffer's ability to perform various functions, in this case it would be sediment trapping/removal due to the arid region and high potential for erosion. According to Macfarlane *et al.* (2009) sediment removal begins with a reduction in the flow rate, mainly through the presence of vegetation which increases the surface roughness. The relationship between the length covered by the runoff (buffer width) and sediment removal is not linear, which indicated that most sediment are deposited in outer portions of a buffer. According to Macfarlane *et al.* (2009) based on a range of studies between 1973 and 2005 and according to various authors there are various proposed buffer zone widths for sediment removal. According to Ghaffarzadeh *et al.* (1992) 85% of sediment were removed in 9.1 m buffers. Several other authors also indicated a maximum buffer width of 15 m to be sufficient in removing/trapping sediment.

Based on the above-mentioned case studies it is, nevertheless, important to focus on the width of the buffer, but also imperative that the focus be shifted to the effectiveness of the buffer. Subsequently, it is important that when implementing the 15 m buffer in this development it be done in a proactive and consistent manner in order to continuously attain its purpose.

The expected risks were reduced to Low with the prescribed mitigation measures and therefore the recommended buffer was calculated to be 20 m for the dry river and associated drainage lines Table 5-5), for the construction and operational phases.

**Table 5-5 Post-mitigation buffer requirement**

Phase	River
Construction Phase	20 m
Operational Phase	20 m

The buffered areas and drainage features have been allocated as a medium sensitivity, with the river, allocated as a high sensitivity. The remaining extent of the area has been allocated an overall low sensitivity.

A site sensitivity verification forms part of reporting requirements. In this regard, the allocated sensitivities of low for the general area and medium to high sensitivity for the drainage features agrees with the Environmental Screening Tool as presented in Figure 1-1. The project must take cognizance of this and avoid any unnecessary disturbance of the drainage features and adjacent habitat. Therefore, the aforementioned post-mitigation buffer should be implemented and treated as 'no go areas'.

### 5.3.3 Regulation Zone

Table 5-6 presents the legislated zones of regulation that would be applicable to the delineated watercourse.

In accordance with General Notice (GN) 509 of 2016 as it relates to the NWA (1998), a regulated area of a watercourse for Section 21 (c) and 21 (i) of the NWA, 1998 means the outer edge of the 1 in 100 year flood or where no flood line has been determined it means 100 m from the edge of a watercourse or a 500 m radius from the delineated boundary (extent) of any wetland or pan.

Listed activities in terms of the NEMA (1998), (Act 107 of 1998) EIA Regulations as amended in April 2017 must be taken into consideration if any infrastructure is to be placed within the applicable zone of regulation, which in this case is a 32 m zone of regulation.

**Table 5-6 The legislated zones of regulation**

Regulatory authorisation required	Zone of applicability
<p>Water Use License Application in terms of the National Water Act, 1998 (Act No. 36 of 1998). Department of Water and Sanitation (DWS)</p>	<p>Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998).</p> <p>In accordance with GN509 of 2016 as it relates to the National Water Act, 1998 (Act 36 of 1998), a regulated area of a watercourse in terms of water uses as listed in Section 21c and 21i is defined as:</p> <ul style="list-style-type: none"> <li>• 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;</li> <li>• 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</li> <li>• a 500m radius from the delineated boundary (extent) of any wetland or pan in terms of this regulation.</li> </ul>
<p>Listed activities in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) EIA Regulations (2014), as amended. Department of Environmental Affairs and Development Planning (DEA&amp;DP)</p>	<p>Activity 12 of Listing Notice 1 (GN 327) of the National Environmental Management Act, 1998 (Act No.107 of 1998) EIA regulations, 2014 (as amended) states that:</p> <p>The development of:</p> <p>(xii) Infrastructure or structures with a physical footprint of 100 square meters or more; Where such development occurs—</p> <ol style="list-style-type: none"> <li>a) Within a watercourse;</li> <li>b) In front of a development setback; or</li> <li>c) If no development setback has been adopted, within 32 meters of a watercourse, measured from the edge of a watercourse.</li> </ol> <p>Excluding – ... (dd) where such development occurs within an urban area.</p> <p>Activity 19 of Listing Notice 1 (GN 327) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) EIA regulations, 2014 (as amended) states "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."</p>

## 6 Management Measures

The development footprint is not located within 100 m of the delineated water resource [as per the National Water Act, 1998 (Act No. 36 of 1998) in accordance with GN509 of 2016 as it relates to the National Water Act, 1998 (Act 36 of 1998), a regulated area of a watercourse in terms of water uses as listed in Section 21(c) and 21(i)]. However, the closest water resource (ephemeral river) is rated as Very High sensitivity, and no development activities should take place within the system and delineated buffer zone. Since the development footprint is outside of the regulation zone and buffer zone, no risks to the freshwater systems are foreseen for the proposed project. Therefore, no impacts or risks were anticipated to the freshwater systems and therefore not assessed in this report. Despite the absence of risks expected for the project, this report presents supporting mitigation and management measures for consideration.

**Table 6-1 Mitigation measures for the proposed solar development**

Activity	Aspect	Impact	Control Measures
Site clearing and preparation.	Water resource disturbance / loss.	Direct disturbance / degradation / loss to water resource soils or vegetation due to the construction of the solar facility.	<ul style="list-style-type: none"> <li>Clearly demarcate the construction footprint and restrict all construction activities to within the proposed infrastructure area.</li> <li>When clearing vegetation, allow for some vegetation cover as opposed to bare areas. Maintain vegetation cover beneath the panels.</li> <li>Minimize the disturbance footprint and the unnecessary clearing of vegetation outside of this area.</li> <li>Educate staff and relevant contractors on the location and importance of the identified water resources through toolbox talks and by including them in site inductions as well as the overall master plan.</li> <li>All activities (including driving) must adhere to the 20 m buffer area.</li> <li>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.</li> <li>Landscape and re-vegetate all denuded areas as soon as possible.</li> </ul>
	Water runoff from construction site.	Increased erosion and sedimentation.	<ul style="list-style-type: none"> <li>Ensure soil stockpiles and concrete / building sand are sufficiently safeguarded against rain wash.</li> <li>No activities are permitted within the water resource and associated buffer areas.</li> <li>Landscape and re-vegetate all unnecessarily denuded areas as soon as possible.</li> </ul>
		Potential contamination of water resources with machine oils and construction materials.	<ul style="list-style-type: none"> <li>Make sure all excess consumables and building materials / rubble is removed from site and deposited at an appropriate waste facility.</li> <li>Appropriately stockpile topsoil cleared from the project area.</li> <li>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 water resources.</li> <li>No activities are permitted within the water resource and associated buffer areas.</li> </ul>
Operation of the solar facility.	Hardened surfaces.	Potential for increased stormwater runoff leading to increased erosion and sedimentation.	<ul style="list-style-type: none"> <li>Design and Implement an effective stormwater management plan.</li> <li>Promote water infiltration into the ground beneath the solar panels.</li> <li>Release only clean water into the environment.</li> <li>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. perforated bricks such as Armorflex blocks with rocks/ aggregate placed overtop).</li> <li>Re-vegetate denuded areas as soon as possible.</li> <li>Regularly clear drains.</li> <li>Minimise the extent of concreted / paved / gravel areas.</li> <li>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.</li> <li>Avoid excessively compacting the ground beneath the solar panels.</li> </ul>
	Contamination.	Potential for increased contaminants entering the water resource systems.	<ul style="list-style-type: none"> <li>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.</li> </ul>
	Rehabilitation.	Potential loss or degradation of nearby	<ul style="list-style-type: none"> <li>Develop and implement a rehabilitation and closure plan.</li> <li>Appropriately rehabilitate the project area by ripping,</li> </ul>

Activity	Aspect	Impact	Control Measures
Decommissioning of the solar facility.		water resources through inappropriate closure.	landscaping and re-vegetating with locally indigenous species.

## 7 Conclusion

One (1) form of a watercourse was identified and delineated within the regulated area. This includes an ephemeral river (watercourse). No natural wetland systems, or even cryptic wetlands were identified for the area. The proposed development area is more than 500 m east of the watercourse. The results of the habitat assessment indicates natural (class A) and largely natural (class B) instream and riparian conditions for the watercourse catchment respectively. The recommended buffer was calculated to be 20 m for the river. A site sensitivity verification forms part of reporting requirements. In this regard, the allocated sensitivities of low for the general area and medium to high sensitivity for the drainage features agrees with the Environmental Screening Tool. The project must take cognizance of this and avoid any unnecessary disturbance of the drainage features and adjacent habitat. Therefore, the aforementioned post-mitigation buffer should be implemented and treated as 'no go areas'.

The development footprint is not located within 100 m of the delineated water resource [as per the National Water Act, 1998 (Act No. 36 of 1998) in accordance with GN509 of 2016 as it relates to the National Water Act, 1998 (Act 36 of 1998), a regulated area of a watercourse in terms of water uses as listed in Section 21(c) and 21(i)].

Since the development footprint is outside of the regulation zone and buffer zone, no risks to the freshwater systems are foreseen for the proposed project. Therefore, no impacts or risks were anticipated to the freshwater systems and therefore not assessed in this report. Despite the absence of risks expected for the project, this report presents supporting mitigation and management measures for consideration.

No fatal flaws were identified for the project, and the development may be favourably considered and all prescribed mitigation measures must be considered by the issuing authority. No monitoring measures are deemed necessary for the development.

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## 9 Appendix Items

### 9.1 Appendix A – Specialist Declaration of Independence

I, Andrew Husted, declare that:

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



Andrew Husted

Freshwater Ecologist

The Biodiversity Company

April 2023



I, Dale Kindler, 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.



Dale Kindler

Freshwater Ecologist

The Biodiversity Company

April 2023