



Wetland Functional and Impact Assessment for the Proposed Benya Solar Photovoltaic (PV) and Grid Connection Infrastructure Project

**Thabazimbi Local Municipality, Waterberg District
Municipality, Limpopo Province, South Africa**

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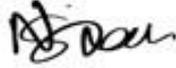
Report Name	Wetland Functional and Impact Assessment for the Proposed Benya Solar Photovoltaic (PV) and Grid Connection Infrastructure Project	
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Declaration	<p>The Biodiversity Company and its associates operate as independent consultants under the 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.</p>	

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1 Introduction

1.1 Background

The Biodiversity Company was commissioned to conduct a wetland baseline and impact assessment in support of the environmental and water use authorisation process for the proposed Benya Solar Photovoltaic (PV) and Electrical Grid Connection Infrastructure Project. The proposed project involves the development of a photovoltaic (PV) solar energy facility and an associated substation and overhead power line. The development area is situated approximately 21 km West of Dwaalboom within the Thabazimbi Local and Waterberg District Municipalities, in the Limpopo Province, South Africa (Figure 1-1). A 500 m area has been demarcated for the project to facilitate the identification of wetlands within the regulatory zone; this area is referred to as the Project Area of Influence (PAOI).

This assessment has been completed in accordance with the requirements of the published Government Notice (GN) 4167 by the Department of Water and Sanitation (DWS) (previously GN 509 of 2016 and GN 3139 of 2023). The said notice was published in the Government Gazette (no. 49833) under Section 39 of the National Water Act (Act no. 36 of 1998) in December 2023, for a Water Use Licence (WUL) in terms of Section 21(c) & (i) water uses. The GN 4167 process provides an allowance to apply for a WUL for Section 21(c) & (i) under a General Authorisation (GA), as opposed to a full Water Use Licence Application (WULA). A water use (or potential) qualifies for a GA under GN 4167 when the proposed water use/activity is subjected to analysis using the DWS Risk Assessment Matrix (RAM), provided the identified risks are all considered a low risk, and the applicant is listed under Appendix D1 or Appendix D2 of the same notice. This assessment will implement the RAM and provide a specialist opinion on the appropriate water use authorisation.

This assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations (2014) (GNR 326, 7 April 2017) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The approach has taken cognisance of the recently published Government Notices (GN) 320 (20 March 2020) and GN 1150 (30 October 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).

This report, after taking into consideration the findings and recommendation provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making with regards to the ecological viability of the proposed development and related activities.

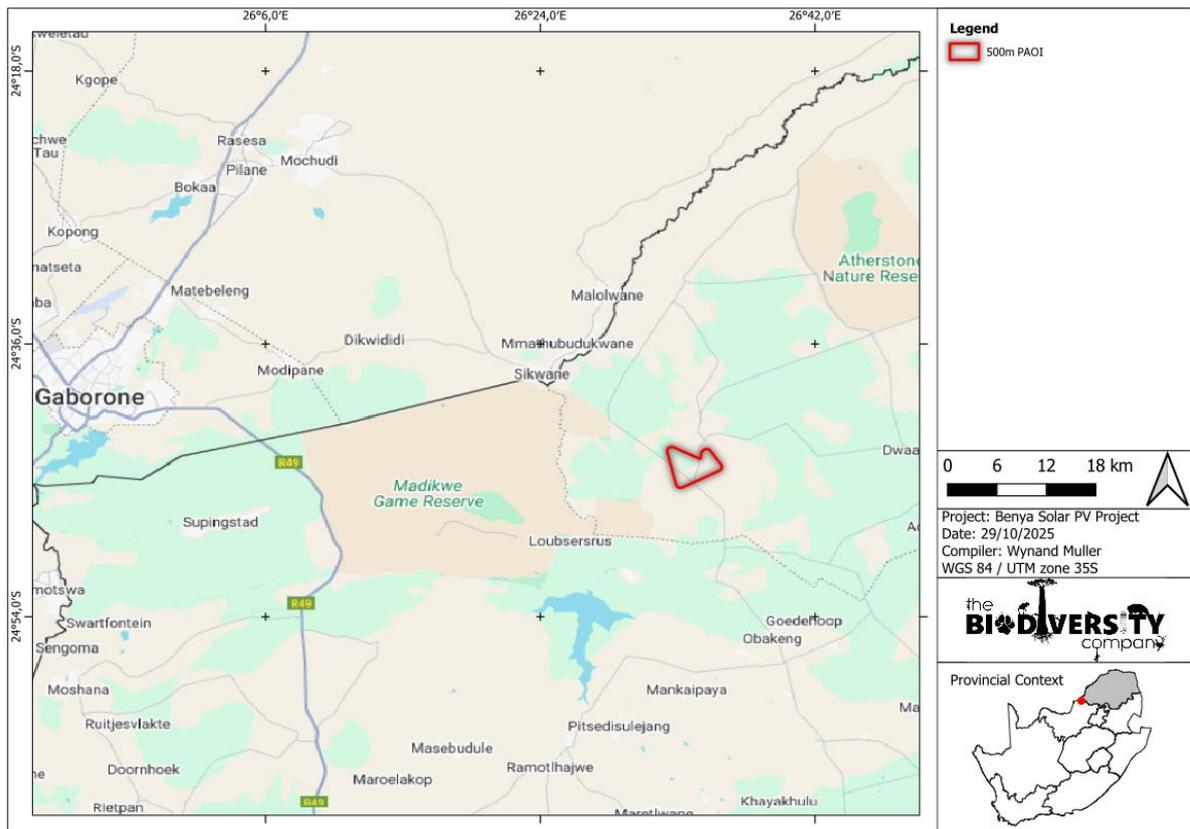


Figure 1-1 Location of the proposed project

1.2 Scope of Work

The following tasks were completed in fulfilment of the terms of reference for this assessment:

- A desktop assessment of available and related datasets to provide context of the freshwater biodiversity of the project area and to indicate potential wetland areas;
- The *in-situ* delineation, classification and assessment of wetlands within 500 m of the project area;
- An assessment of the related impacts through the use of the Risk Assessment (DWS, 2023);
- The provision of recommendations relevant to associated impacts; and
- Report compilation detailing the baseline findings.

1.3 Project Description and Technical Information

Benya Solar PV (RF) (Pty) Ltd is proposing the development of the proposed Benya Solar Photovoltaic (PV) Facility and associated infrastructure on the Remainder of Farm Portugal 198, as well as the Integrated Electrical Grid Connection Infrastructure (substations and power line) on the Remainder of Farm Portugal 198 and Farm Napoleon 216 in the Thabazimbi Local Municipality in the Waterberg District, Limpopo Province.

The solar PV facility will comprise of several arrays of PV panels and associated infrastructure and at this stage it is anticipated that it will have a contracted capacity of up to 300 MW. The solar PV facility

will also include associated electrical grid connection infrastructure (consisting of a 33kV/132kV IPP Step-up Substation, a 132kV Eskom Switching Substation and 132kV overhead power line) to evacuate the electricity generated by the solar PV facility. The project site is accessible via the existing D113 and D1629 roads that pass through the project site.

A study site of approximately 1 500 ha is being assessed as part of this Environmental Process for the PV facility and supporting infrastructure, which includes the on-site and switching substations and grid connection corridors for the placement of the power line infrastructure required to connect the substations to one (1) of the nearby existing 132kV Eskom overhead power lines. It should be noted that the solar PV and electrical grid connection infrastructure would not cover the entire extent of the study sites.

The key infrastructure associated with the Benya Solar PV Development includes the following:

- PV modules and mounting structures, up to 6m in height and a maximum footprint of up to 350 ha.
- Inverters and transformers.
- Operation and Maintenance buildings (up to 6m in height), including a gate house, ablution facilities, security building, control centre, offices, warehouses and workshops for storage and maintenance.
 - An area of up to 1.5 ha within the assessed development footprint will be occupied by buildings.
- Temporary and permanent laydown areas, situated within the assessed development footprint.
 - Temporary laydown areas will occupy up to 5 ha, while up to 1.5 ha will remain in place for the permanent laydown area, as required for facility operation.
- Site and internal access roads (between 6m and 8m wide). Existing internal roads will be used as far as possible.
- Perimeter fencing up to 3m in height.
- Battery Energy Storage System (BESS), up to 7.5 ha in extent and located within a 10 ha development area¹.
 - The infrastructure will be located within the assessed development footprint.
- Associated Electrical Grid Connection Infrastructure, including:
 - 33kV cabling between the project components and the on-site facility substation;
 - A 33kV/132kV Independent Power Producer (IPP) Step-up Substation, up to 1.83 ha in extent;
 - A 132kV Eskom Switching Substation, up to 1.64 ha in extent; and

¹ 10 ha development area assessed by specialists for the placement of BESS infrastructure.

- A 132kV overhead power line (up to 40m in height) connecting the on-site switching substation to one (1) of the nearby 132kV Eskom overhead power lines, via a Loop In – Loop Out (LILo) connection.

Table 1-1 Project Information

Project Name		Benya Solar PV Facility and Integrated Electrical Grid Connection Infrastructure.
Applicant Details		Applicant Name: Benya Solar PV (RF) (Pty) Ltd
Company Registration Number:		2025/570171/07
BBBEE Status:		N/A
Project Name:		Benya Solar PV Facility and Integrated Electrical Grid Connection Infrastructure
Site Details		
Size of the property	Description of the affected property	PV Facility and Integrated Electrical Grid Connection Infrastructure Remainder of Farm Portugal 198 (PV Facility & Grid Infrastructure) Farm Napoleon 216 (Grid Infrastructure – one of the three power line corridor alternatives)
Size of the study area	Size in ha of initial study area.	PV Site: 856 ha ² Electrical Grid Connection Site: 642 ha
Development Footprint	This includes the total footprint of PV panels, BESS auxiliary buildings, On-site Substation, Mini-substations, inverter stations and internal roads.	~440 ha ³
PV Technology Details		
Capacity of the facility	Capacity of the PV facility (in MW)	Net generation capacity of up to 300 MWAC
Solar technology selection	Type of technology	Solar photovoltaic (PV) with Monofacial or Bifacial PV panels to be utilised. The panels will either be fixed to a single- and/or double-axis horizontal tracking structures, or fixed-tilt structure. PV panels with single axis tracking is preferred over fixed-axis or double axis tracking systems from a technical perspective. Both technology options are considered feasible for the project site, however, the technology type will be determined during the final design phase.
Structure height		<ul style="list-style-type: none"> • PV Panels up to 6m in height • Buildings up to 6m in height • Fencing up to 3m in height
Surface area to be covered (including associated infrastructure such as roads)		~350 ha
Structure orientation		PV panels will either be fixed to a single- and/or double-axis horizontal tracking structure, or fixed-tilt structure, where the orientation of the panel varies according to the time of the day, as the sun moves from east to west or tilted at a fixed angle equivalent to the latitude at which the site is located in order to capture the most sun.

² This site also includes majority of the grid connection infrastructure that is also being assessed as part of this environmental process.

³ Total development footprint considering the largest/longest of the grid connection corridor alternatives currently under consideration. Only one (1) substation & O&M complex and grid connection corridor will however be proposed for authorisation and thus the total development footprint may be less than this (depending on preferred grid connection corridor).

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Laydown area dimensions	Temporary and permanent laydown areas will be situated within the assessed development footprint and will occupy up to 5 ha, while 1.5 ha will remain in place for the permanent laydown area, as required for facility operation.
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BESS Technology Details

BESS technology section	Capacity of BESS facility (in MWh)	Up to 300 MW capacity, with up to 1 800 MWh (6-hour) storage capacity
Type of technology (preferred)	Pre-Assembled Solid state Lithium-Ion or Sodium-Ion	
Type of technology (alternatives)	The BESS will make use of solid state or flow battery technology. Three (3) types of battery technologies can be considered for the proposed project: Lithium-ion (Lithium-Phosphate), Sodium-sulphur or Vanadium Redox flow battery, depending on which is most feasible at the time of implementation.	
Structure height	Containerized types, including all solid-state types = maximum of 4m from ground level (may have vent pipes and lightning conductors exceeding 4m above ground level).	
Surface area to be covered (including associated infrastructure such as roads)	Up to 7.5 ha in extent and located within a 10 ha study area ¹ . The infrastructure will be located within the assessed development footprint.	
Structure locations	DC Coupled BESS within the PV field and AC coupled BESS adjacent to the project substation.	

Grid Connection Infrastructure Details

Grid connection technology section	Power line capacity (in kV)	132kV
Switching substation capacity (in kV)	132kV	
Switching substation footprint	1.64 ha	
Step-up substation capacity (in kV)	33kV/132kV	
Step-up substation footprint	1.83 ha	
Power line corridor length	OHL Corridor Alternative 1 = 1km OHL Corridor Alternative 2 = 1.5km OHL Corridor Alternative 3 = 1.3km	
Power line corridor footprint	OHL Corridor Alternative 1 = 21 ha OHL Corridor Alternative 2 = 36 ha OHL Corridor Alternative 3 = 25 ha	
Power line servitude	32m	
Power line pylons	Monopole or Lattice pylons, or a combination of both where required	
Structure height	<ul style="list-style-type: none"> Switching substation = up to 6m in height Power line = up to 40m in height 	

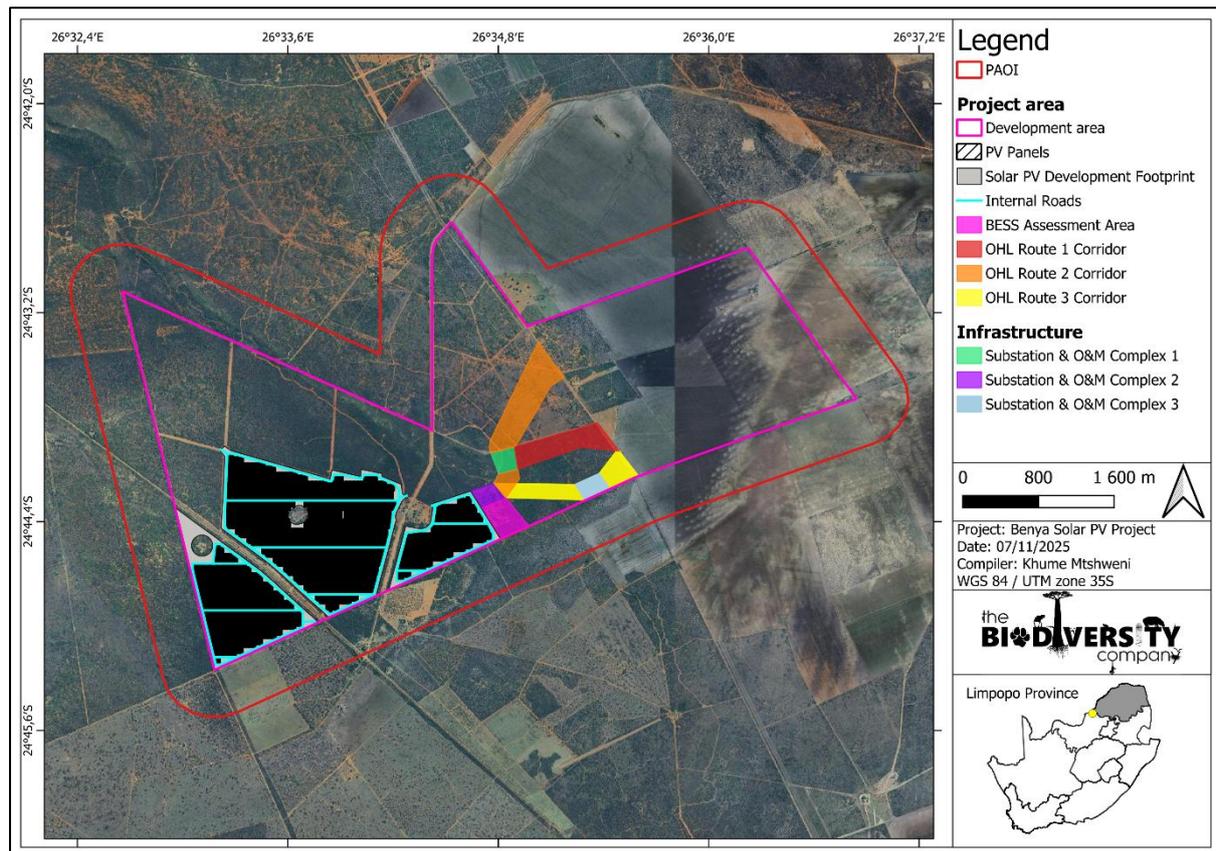


Figure 1-2 Proposed project site and project area of influence

1.4 Assumptions and Limitations

The following aspects were considered as limitations:

- It has been assumed that the spatial files provided to the specialist were accurate during the time of the field work assessment on 27th to the 29th of January 2025; It must be noted that the project layout changed on the 19th of September, meaning that any additional work done on the proposed project, was conducted at desktop level and would need to be field verified prior to construction commencing;
- Freshwater features within the larger 500 m PAOI were delineated and assessed via desktop;
- Areas characterised by external wetland attributes were the focus for this assessment, where potential wetlands were thereafter confirmed by soil form indicators;
- Representative sampling within the assessment area was conducted and by its nature would result in some areas of the assessment area not being covered on foot. However, the results derived were sufficient to derive a meaningful baseline of the study area in the context of freshwater ecosystems; and
- The GPS used for water resource delineations is accurate to within five metres. Therefore, the wetland delineation plotted digitally may be offset by a maximum of five metres to either side.

1.5 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 1-2 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 1-2 A list of key legislative requirements

Region	Legislation / Guideline	Comment
National	National Environmental Management Act (Act No. 107 of 1998) (NEMA)	To provide for the effective protection and controlled utilisation of the environment and for matters incidental thereto.
	NEMA: Environmental Impact Assessment Regulations (2014) (GNR 326, 7 April 2017), Appendix 6 requirements	Minimum content for specialist reports.
	NEMA: Government Notices (GN) 320 (20 March 2020) and GN 1150 (30 October 2020)	The minimum criteria for reporting. Protocol for the specialist assessment and minimum report content requirements.
	The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA), Threatened or Protected Species Regulations	The protection of species and ecosystems that warrant protection.
	National Environmental Management: Waste Act (Act No. 59 of 2008)	The regulation of waste management to protect the environment.
	National Water Act (Act No. 36 of 1998) (NWA)	To provide for the regulation of water uses.
	NWA: Government Notice (GN) 4167 (previously GN 509 of 2016 and GN 3139 of 2023)	Water Use Licence (WUL) in terms of Section 21(c) & (i) water uses and the provision to apply for a General Authorisation subject to usage and outcome of the Risk Assessment Matrix.
	NEMBA: Alien and Invasive Species Regulations (2014) (GNR R598, 1 August 2014)	The regulation and management of alien invasive species.
Provincial	Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA)	To provide for control over the utilisation of the natural agricultural resources, including the vegetation and the combating of weeds and invader plants.
	Limpopo Environmental Management Act, 2003 (Act No. 7 of 2003)	To consolidate and amend the environmental management legislation of or assigned to the Province; and to provide for matters incidental thereto.
	Limpopo Conservation Plan (2013)	A spatial tool comprising of set of maps of biodiversity priority areas accompanied by contextual information and land-use guidelines for use in land-use and development planning, environmental assessment and regulation, and natural resource management.

1.6 National Water Act (NWA, 1998)

The DWS is the custodian of South Africa's water resources and therefore assumes public trusteeship of water resources, which includes watercourses, surface water, estuaries, or aquifers. The National Water Act (Act No. 36 of 1998) (NWA) allows for the protection of water resources, which includes:

- The maintenance of the quality of the water resource to the extent that the water resources may be used in an ecologically sustainable way;
- The prevention of the degradation of the water resource; and
- The rehabilitation of the water resource.

A watercourse means:

- A river or spring;
- A natural channel in which water flows regularly or intermittently;

- A wetland, lake or dam into which, or from which, water flows; and
- Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

The NWA recognises that the entire ecosystem and not just the water itself, and any given water resource constitutes the resource and as such needs to be conserved. No activity may therefore take place within a watercourse unless it is authorised by the DWS. Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from the DWS in terms of Section 21 (c) and (i).

1.7 National Environmental Management Act (NEMA, 1998)

The National Environmental Management Act (NEMA) (Act 107 of 1998) and the associated Regulations as amended in April 2017, states that prior to any development taking place within a wetland or riparian area, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment Report (BAR) process or the Environmental Impact Assessment (EIA) process depending on the scale of the impact.

1.8 Legislative Framework

In line with the protocol for the specialist assessment and minimum report content requirements for environmental impacts on freshwater 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:

- “very high sensitivity” for aquatic biodiversity, must submit an Aquatic Biodiversity Specialist Assessment;
- “low sensitivity” for aquatic biodiversity, must submit an Aquatic Biodiversity Compliance Statement;
- Where the information gathered from the site sensitivity verification differs from the screening tool designation of “very high” aquatic biodiversity sensitivity, and it is found to be of a “low” sensitivity, an Aquatic Biodiversity Compliance Statement must be submitted;
- Similarly, where the information gathered from the site sensitivity verification differs from the screening tool designation of “low” aquatic biodiversity sensitivity, and it is found to be of a “very high” sensitivity, an Aquatic Biodiversity Specialist Assessment must be submitted.

An Aquatic / Freshwater Biodiversity Specialist Assessment Report must contain the information as presented in Table 1-3 below.

Table 1-3 Aquatic Biodiversity Specialist Assessment 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
The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP) with expertise in the field of aquatic sciences	7.4
Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae	7.4
A signed statement of independence by the specialist(s)	7.3
The assessment must be undertaken on the preferred site and within the proposed development footprint	1.3
A baseline description of the aquatic biodiversity and ecosystems on the site, including: aquatic ecosystem types; presence of aquatic species, and composition of aquatic species communities, their habitat, distribution and movement patterns.	3.1.4
The threat status of the ecosystem and species as identified by the screening tool	3.5.1
An indication of the national and provincial priority status of the aquatic ecosystem, including a description of the criteria for the given status (i.e. if the site includes a wetland or a river freshwater ecosystem priority area or sub catchment, a strategic water source area, a priority estuary, whether or not they are free-flowing rivers, wetland clusters, a critical biodiversity or ecologically sensitivity area)	3.1.4
A description of the ecological importance and sensitivity of the aquatic ecosystem including: (a) the description (spatially, if possible) of the ecosystem processes that operate in relation to the aquatic ecosystems on and immediately adjacent to the site (e.g., movement of surface and subsurface water, recharge, discharge, sediment transport, etc.); and (b) the historic ecological condition (reference) as well as present ecological state of rivers (in- stream, riparian and floodplain habitat), wetlands and/or estuaries in terms of possible changes to the channel and flow regime (surface and groundwater)	3.3
The assessment must identify alternative development footprints within the preferred site which would be of a “low” sensitivity as identified by the screening tool and verified through the site sensitivity verification and which were not considered appropriate	3.5.2
Related to impacts, a detailed assessment of the potential impacts of the proposed development on the following aspects must be undertaken to answer the following questions: Is the proposed development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal? Is the proposed development consistent with maintaining the resource quality objectives for the aquatic ecosystems present? How will the proposed development impact on fixed and dynamic ecological processes that operate within or across the site? This must include:	4.1
(a) impacts on hydrological functioning at a landscape level and across the site which can arise from changes to flood regimes (e.g. suppression of floods, loss of flood attenuation capacity, unseasonal flooding or destruction of floodplain processes); (b) will the proposed development change the sediment regime of the aquatic ecosystem and its sub-catchment (e.g. sand movement, meandering river mouth or estuary, flooding or sedimentation patterns); (c) what will the extent of the modification in relation to the overall aquatic ecosystem be (e.g. at the source, upstream or downstream portion, in the temporary / seasonal / permanent zone of a wetland, in the riparian zone or within the channel of a watercourse, etc.); and (d) to what extent will the risks associated with water uses and related activities change.	
How will the proposed development impact on the functioning of the aquatic feature? This must include: (a) base flows (e.g., too little or too much water in terms of characteristics and requirements of the system); (b) quantity of water including change in the hydrological regime or hydroperiod of the aquatic ecosystem (e.g., seasonal to temporary or permanent; impact of over -abstraction or instream or off stream impoundment of a wetland or river); (c) change in the hydrogeomorphic typing of the aquatic ecosystem (e.g., change from an unchanneled valley-bottom wetland to a channelled valley -bottom wetland); (d) quality of water (e.g., due to increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication);	-

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(e) fragmentation (e.g., road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal); and	
(f) the loss or degradation of all or part of any unique or important features associated with or within the aquatic ecosystem (e.g., waterfalls, springs, oxbow lakes, meandering or braided channels, peat soils, etc.)	
How will the proposed development impact on key ecosystems regulating and supporting services especially:	
(a) flood attenuation;	
(b) streamflow regulation;	
(c) sediment trapping;	
(d) phosphate assimilation;	-
(e) nitrate assimilation;	
(f) toxicant assimilation;	
(g) erosion control; and	
(h) carbon storage?	
How will the proposed development impact community composition (numbers and density of species) and integrity (condition, viability, predator-prey ratios, dispersal rates, etc.) of the faunal and vegetation communities inhabiting the site?	-
A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment	2.1
The methodology used to undertake the site inspection and the specialist assessment, including equipment and modelling used, where relevant	7.1
A description of the assumptions made, any uncertainties or gaps in knowledge or data	1.4
The location of areas not suitable for development, which are to be avoided during construction and operation, where relevant	3.4
Additional environmental impacts expected from the proposed development	-
Any direct, indirect and cumulative impacts of the proposed development on site	4
The degree to which impacts and risks can be mitigated	4
The degree to which the impacts and risks can be reversed	-
The degree to which the impacts and risks can cause loss of irreplaceable resources	0
A suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies	3.4
Proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr)	4.3
A motivation must be provided if there were development footprints identified as having a "low" aquatic biodiversity sensitivity and that were not considered appropriate	3.5.2
A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed development and if the proposed development should receive approval or not; and	5.2
Any conditions to which this statement is subjected	5.2

A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.

2 Fieldwork

2.1 Freshwater Biodiversity Field Assessment

A field survey for the area was undertaken from the 27th to the 29th of January 2025, which is a wet-season survey, to identify the presence of freshwater features (wetlands) and to delineate their spatial extents. Furthermore, to determine vegetation composition of the identified features and the likelihood of features to be used as habitat for fauna. The seasonality of the surveys is not considered to be a limiting factor with regard to the identification and delineation of wetlands as the survey was conducted in the preferred season.

3 Results & Discussion

3.1 Desktop Dataset Assessment

3.1.1 Climate

The climate for the Dwaalboom Thornveld vegetation type (SVcb 1) is characterised by a summer rainfall with a Mean Annual Precipitation (MAP) that ranges between 500 mm and 600 mm. 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).

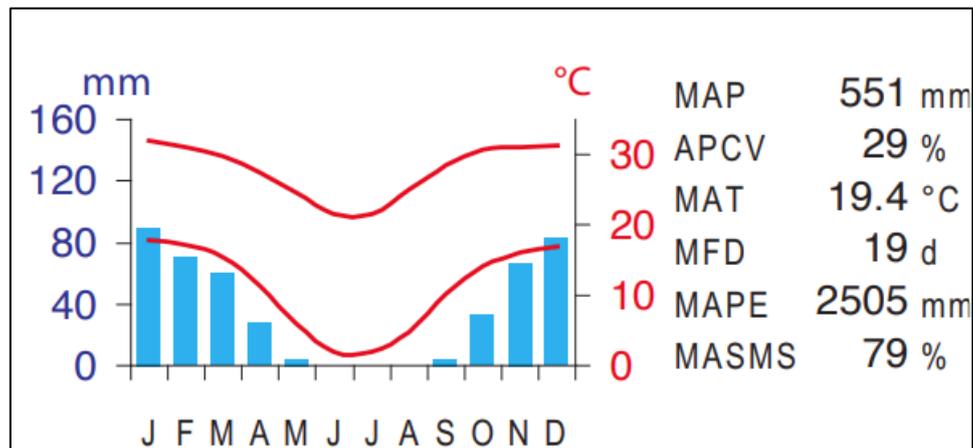


Figure 3-1 Climate for the Dwaalboom Thornveld (SVcb 1) vegetation type (Mucina & Rutherford, 2006)

3.1.2 Soils and Geology

The geology of the region is characterised by the Rustenburg Layered Suite as well as the Bushveld Igneous Complex 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).

According to the Land Type Database (Land Type Survey Staff, 1972 - 2006), the PAOI is predominantly characterized by the Bc land type, and partly by the Ae and Ea land types. The Bc land type is distinguished by a plinthic catena, where the soil profile exhibits a sequence of horizons with varying degrees of iron and manganese concretions. Upland duplex and marginal soils are infrequent within this classification, while eutrophic red soils are extensively distributed, contributing to the nutrient-rich nature of the area. The Ae land type consists of red-yellow apedal soils which are freely drained. The soils tend to have a high base status and is deeper than 300 mm. 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.

3.1.3 Hydrological Characteristics

The PAOI falls within the Limpopo Plain Ecoregion, and within the Limpopo-Olifants Water Management Area (WMA). At a finer scale, within the A32D and A32E quaternary catchments. The fine scale hydrological features are presented in the following section.

3.1.3.1 Topographical River Lines and Inland Water Areas

The topographical inland and river line data for the “2426” dataset indicated several non-perennial drainage features within the PAOI (Figure 3-2). One inland water area was identified within the PAOI, classified as a non-perennial pan.

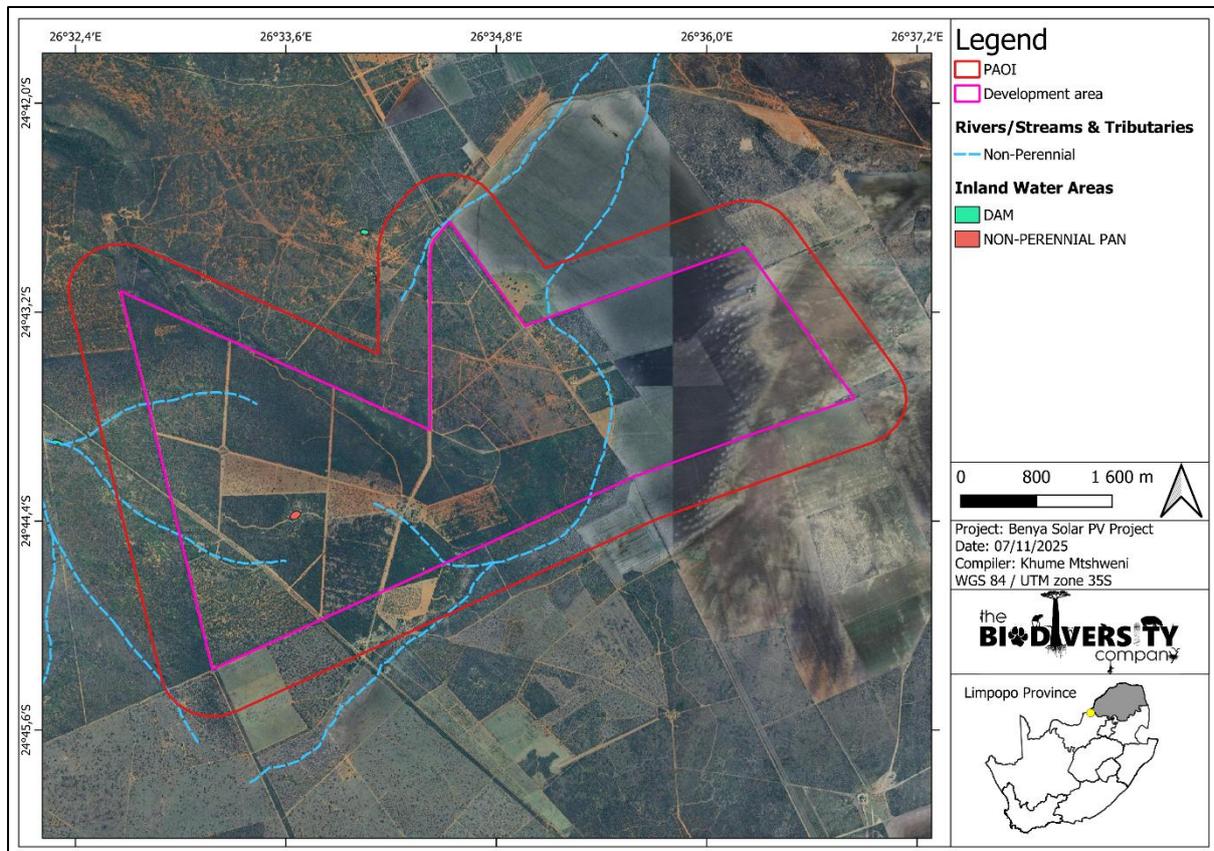


Figure 3-2 Topographical inland water areas and river lines that intersect the project area of influence

3.1.4 Ecologically Important Landscape Features

The GIS analysis pertaining to the relevance of the proposed project to ecologically important landscape features is summarised in Table 3-1. Only features that were identified to be relevant to the proposed project were further discussed.

Table 3-1 Summary of relevance of the proposed project to ecologically important landscape features

Desktop Information Considered	Relevant/Irrelevant	Section
South African Inventory of Inland Aquatic Ecosystems (SAIAE)	Relevant – PAOI overlaps with a SAIAE wetland and river.	3.1.4.1
National Freshwater Priority Area	Relevant – PAOI overlaps with NFEPA wetland and river.	3.1.4.2
Provincial Conservation Plan	Relevant – PAOI overlaps with CBA 1 and CBA 2.	3.1.4.3
Strategic Water Source Areas	Irrelevant – PAOI does not overlap with a SWSA.	-

3.1.4.1 South African Inventory of Inland Aquatic Ecosystems

A wetland classified as a depression was identified within the PAOI (Figure 3-3). The depression wetland is classified as being of Least Concern and Poorly Protected with regard to the Ecosystem

Threat Status and Ecosystem Protection Level, respectively. The Maselaje river was identified within the PAOI and is classified as a Least Threatened and Moderately Protected ecosystem according to the dataset.

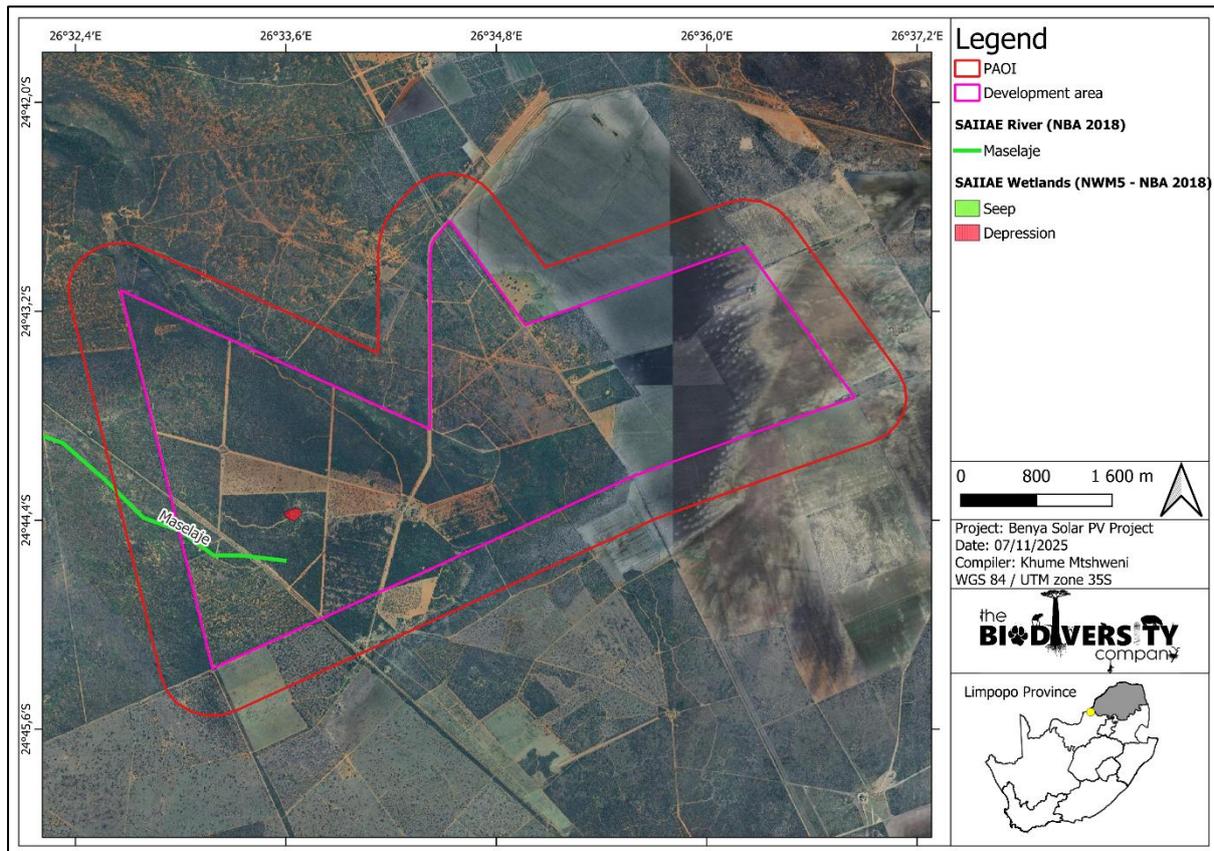


Figure 3-3 Wetland features identified within the project area of influence according to the South African Inventory of Aquatic Ecosystems dataset

3.1.4.2 National Freshwater Ecosystem Priority Areas

Two (2) NFEPA wetland types and one river was identified within the PAOI by means of the NFEPA dataset (Figure 3-4). According to the dataset, the identified wetlands have been classified as two (2) seeps and one (1) depression. The wetlands have been classified to have “Z3 – Heavily/Critically Modified” conditions for the two seeps, which were also classified as artificial wetlands. The depression wetland has been classified to have an “AB – Good” condition and classified to be a natural wetland. The river is classified to have a PES of “Class C – Moderately Modified”.

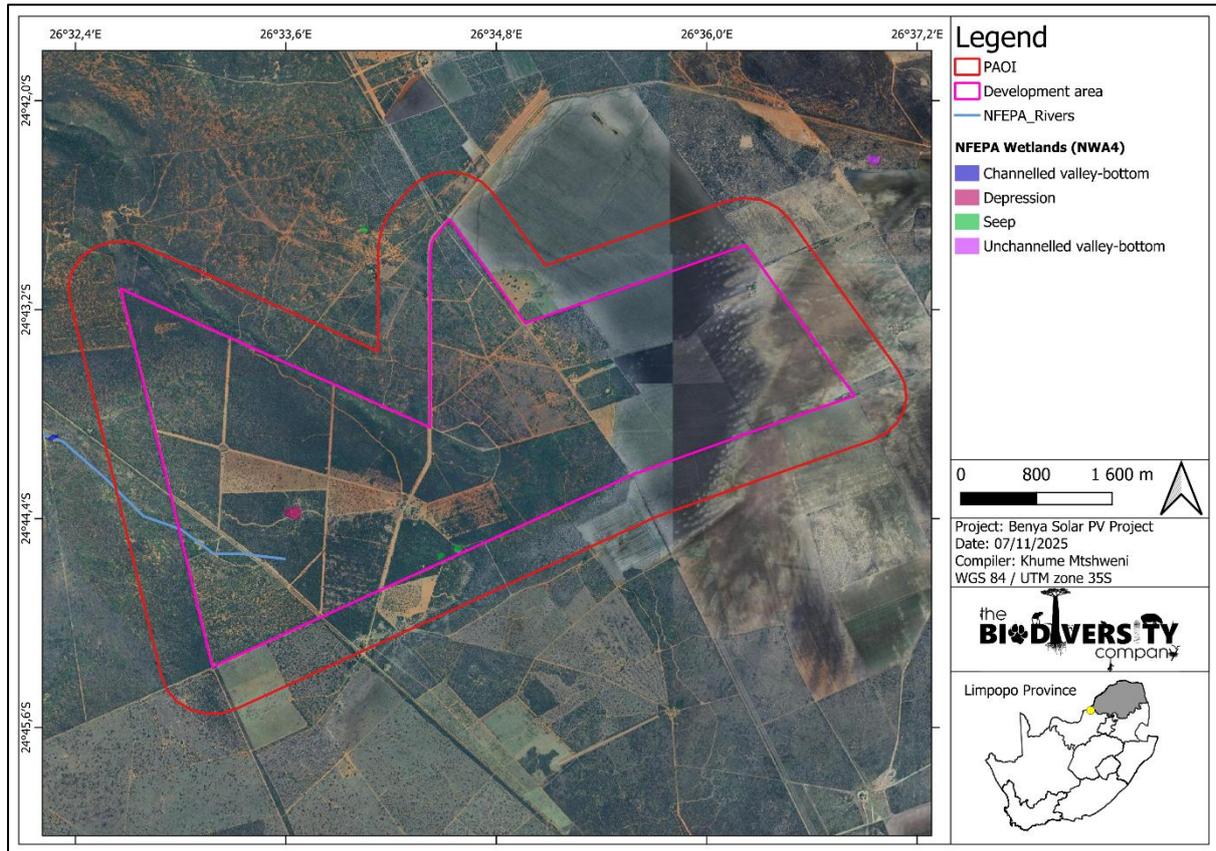


Figure 3-4 Wetland features identified within the project area of influence according to the National Freshwater Ecosystem Priority Areas dataset

3.1.4.3 Biodiversity Sector Plan

According to the Limpopo Biodiversity Sector Plan (Figure 3-5), the PAOI falls within areas characterised as:

- Critical Biodiversity Area 2 (CBA 2);
- Ecological Supported Area 2 (ESA 2); and
- No Natural Remaining.

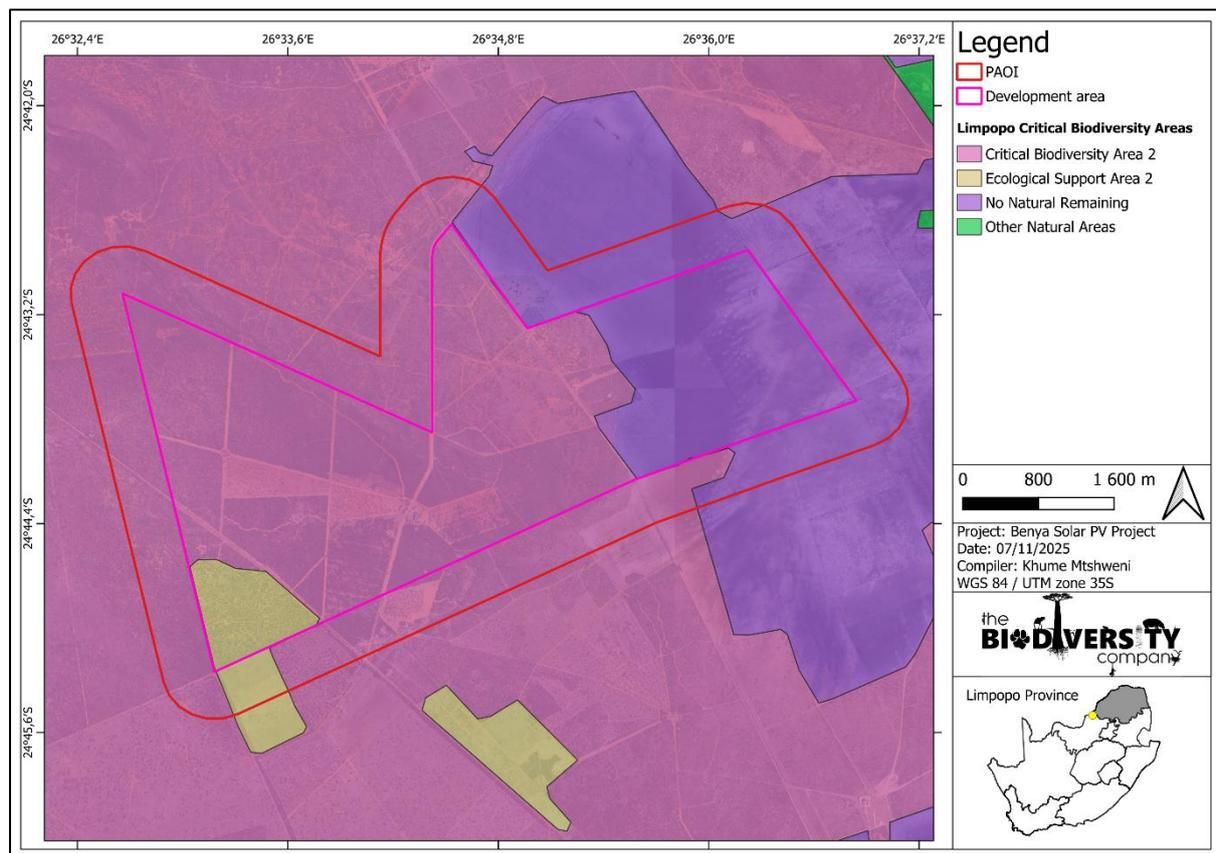


Figure 3-5 Biodiversity Sector Plan overlay for the project area of influence

3.2 Wetland Field Survey

3.2.1 Delineation

During the site visit one (1) hydrogeomorphic unit was identified and delineated, this system was classified as a depression wetland, which corresponds with the NFEPA wetland (depression) identified above in Figure 3-4. Furthermore, several dams (off-channel), and a sand quarry was identified (Figure 3-6). No other wetlands or rivers were identified during the site visit.

A summary of the wetland area and percentage cover of wetlands within the PAOI is provided in Table 3-2.

Table 3-2 Summary of wetland area within the project area of influence

HGM Unit	Area (ha)	Area (%)
HGM 1	1.28	100
Total	1.28	100

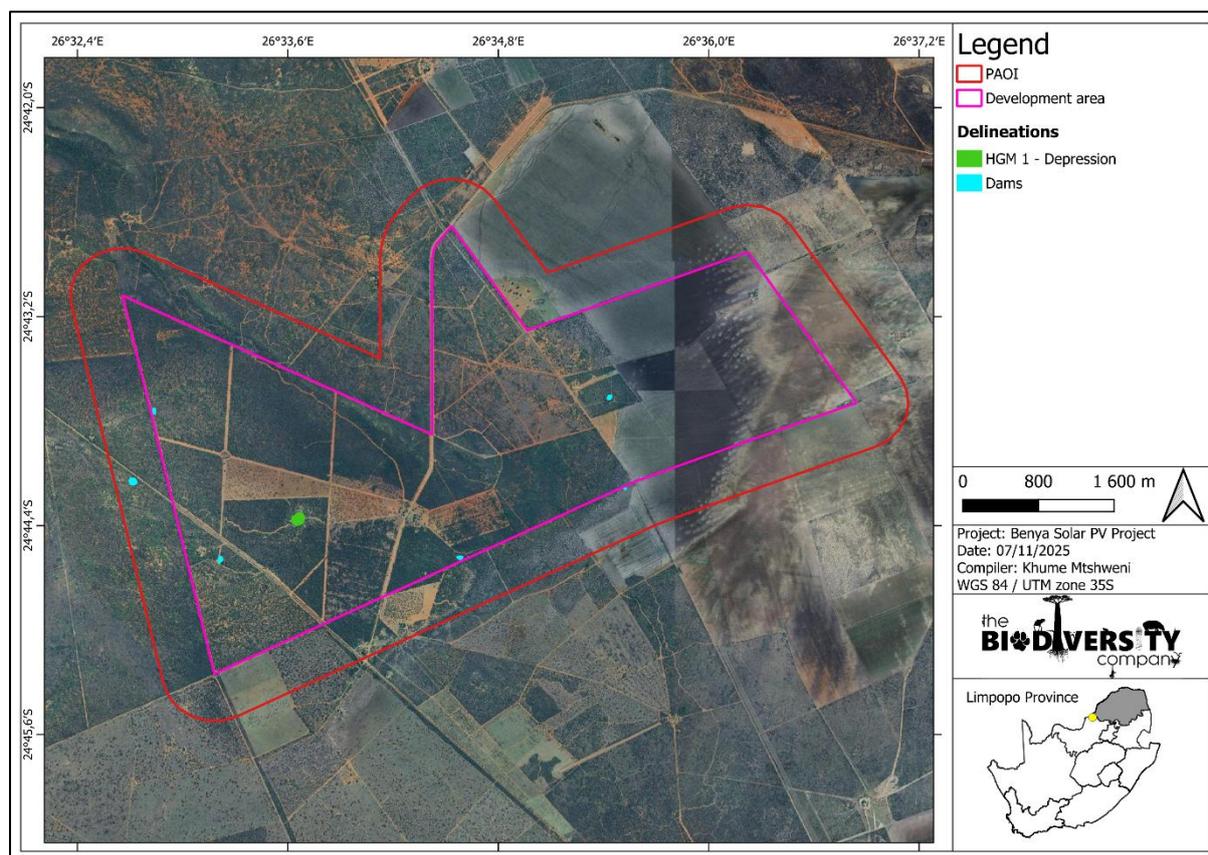


Figure 3-6 Delineation of the water resources within the project site and project area of influence



Figure 3-7 Representative photographs of the different identified features within the project area of influence. A) HGM 1 - Depression; B) Dam and; C) Quarry

3.2.2 Risk Screening

Table 3-3 provides the results of risk screening for the delineated watercourses and provides motivation for each of the determined categories. HGM 1 is perceived to be “At Risk” from the proposed activities. This is attributed to the proximity of the activities to the watercourse.

Table 3-3 Risk status of the delineated watercourses

HGM unit	Risk Status	Rationale
HGM 1	At Risk	This HGM unit was located within proximity and downslope of the proposed activities and, have therefore been determined as “At Risk”. It is anticipated that indirect impacts to the wetland system are potential.
Artificial Off-Channel Dams	Not applicable	Artificial dams are man-made systems that are dependent on some form of induced driver (excavation and wind pumps) for sustenance

and are therefore dependent on the long-term persistence of these drivers in order to provide ecological services. As such, standard wetland risk assessments are not applicable to these features, since their ecological processes, values, and sensitivities can be largely altered depending on the alteration of the drivers.

3.2.3 Classification and Description

The wetland classification as per SANBI guidelines (Ollis *et al.*, 2013) is presented in Table 3-4.

Table 3-4 Wetland classification as per SANBI guideline (Ollis *et al.*, 2013)

Wetland Unit	Level 1	Level 2		Level 3	Level 4		
	System	DWS Ecoregion/s	NFEPA Wet Veg Group/s	Landscape Unit	4A (HGM)	4B	4C
HGM 1	Inland	Limpopo Plain	Central Bushveld Group 2	Plain	Depression	Endorheic	Without Channelled Inflow

A depression wetland is characterized by its distinct geomorphological features (Ollis *et al.*, 2013). These wetlands are defined by closed or near-closed elevation contours, which increase in depth from the perimeter to a central area of greatest depth, where water typically accumulates. Depressions may be flat-bottomed, often referred to as pans, or round bottomed, and can have various combinations of inlets and outlets or lack them entirely. The hydrodynamics of a depression are typically dominated by vertical water level fluctuations, with water inputs primarily from precipitation, groundwater discharge, interflow, and diffuse or concentrated overland flow. The classification system further categorizes depressions based on their outflow drainage characteristics as exorheic (outward-draining), endorheic (inward-draining), or dammed, and by their inflow drainage characteristics as with or without channelled inflow. This detailed classification helps in understanding the ecological functions and management needs of depression wetlands in South Africa. Figure 3-8 presents a diagram of a typical depression wetland, showing the dominant movement of water into, through and out of the system.

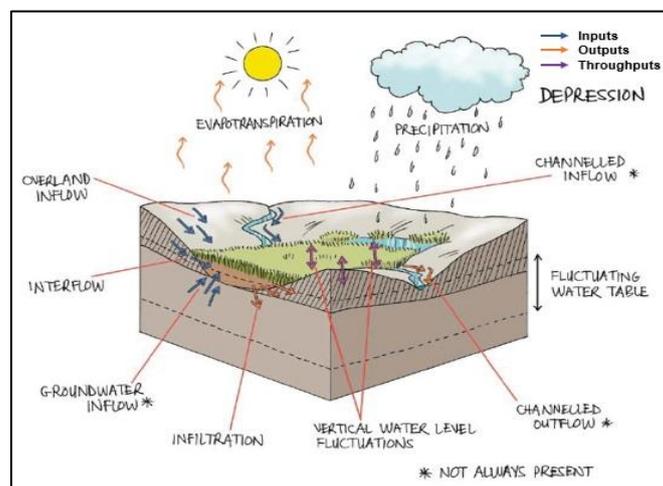


Figure 3-8 Amalgamated diagram of a typical depression wetland, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis *et al.* 2013)

3.3 Wetland Functional and Ecological Assessment

3.3.1 Functional Assessment

Only natural features perceived to be “At - Risk” from the proposed activities were assessed further in terms of their ecological features. Only HGM 1 was assessed.

3.3.1.1 General Functional Description

Depression wetlands are characterized by their basin-shaped areas with closed elevation contours, allowing for the accumulation of surface water. These wetlands are typically isolated from stream channels, which limits their role in streamflow regulation. However, they play a crucial role in capturing runoff, thereby reducing the volume of surface water that would otherwise contribute to downstream flooding. The inward-draining nature of depressions, combined with their generally impermeable underlying layers, means they are not significant contributors to streamflow regulation. Instead, they are more effective in nutrient cycling, particularly nitrogen, through processes such as denitrification and volatilization. The water quality in depression wetlands is influenced by local pedology, geology, and climate, which also affects their response to nutrient inputs. These wetlands can also serve as important sites for the precipitation of minerals, including phosphate minerals, due to the concentrating effects of evaporation (Kotze *et al.*, 2009).

3.3.1.2 Ecosystem Services

The ecosystem services provided by the relevant HGM units on site were assessed and rated using the WET-EcoServices method (Kotze *et al.*, 2009). The results of the assessment are presented in Table 3-5. The ecosystem services scores of the delineated wetland presents within the “Moderately High” class. The main ecosystem services provided by the wetlands relate to biodiversity maintenance and provisioning of food for livestock, other services are provided in a limited capacity.

Table 3-5 Summary of the average ecosystem supply scores of the assessed wetland unit

		Wetland Unit		HGM 1	
Ecosystem Services Supplied by Wetlands	Indirect Benefits	Regulating and supporting benefits	Flood attenuation	0	
			Streamflow regulation	0	
			Water Quality enhancement benefits	Sediment trapping	1
				Phosphate assimilation	1.1
				Nitrate assimilation	1.0
				Toxicant assimilation	0.9
				Erosion control	1.0
	Carbon storage	1.0			
	Direct Benefits	Provisioning benefits	Biodiversity maintenance	1.7	
			Provisioning of water for human use	1.0	
			Provisioning of food for livestock	4.0	
			Provisioning of harvestable resources	0.5	
			Provisioning of cultivated foods	2.1	
		Cultural benefits	Cultural heritage	1.3	
			Tourism and recreation	1.3	
Education and research			2.0		
Class				Moderately High	

HGM 1 being a depression wetland will not play an important role in streamflow regulation due to the fact that the wetland is not located inside a channel. HGM 1, however, plays a significant role as a carbon sink. The wetlands will also be very important in providing resources and habitat to multiple species during the dry season especially in such an arid landscape.

3.3.2 Present Ecological State

The wetland identified within the project area has exhibited some degree of modification resulting from natural physical changes as well as anthropogenically induced impacts at both the local and catchment level. Resultingly, the wetland scored an average Present Ecological State (PES) score within the “C – Moderately Modified” PES class. The results of the wetland health and integrity assessment is provided in Table 3-6.

Table 3-6 Average Present Ecological State scores for the assessed wetland

Unit	PES Assessment	Hydrology	Geomorphology	Water Quality	Vegetation
HGM 1	Impact Score	4.5	0.9	2.4	2.3
	Ecological Category	D	A	C	C
	Combined Impact Score	2.8			
	Combined Ecological Category	C – Moderately Modified			

The list below refers to the present-day local impacts observed within the assessed wetland areas:

- Alterations to hydrology and geomorphology through the development of informal roads and crossings within the wetland catchment;
- Loss of vegetation through grazing;
- Proliferation of alien invasive vegetation; and
- Erosion of watercourses from altered hydrology and geomorphology.

3.3.3 Ecological Importance and Sensitivity

The Ecological Importance and Sensitivity (EIS) assessment was applied to the HGM units in conjunction with the ecosystem service scores in the preceding sections, to assess the levels of sensitivity and ecological importance of the wetland. Various components pertaining to the protection status of a wetland is considered for the EIS, including Strategic Water Source Areas (SWSA), the NFEPA Wetveg protection status and the protection status of the wetland itself considering the NBA wetland dataset. The results of the assessment are shown in Table 3-7. The wetlands average EIS score presents within the “C – Moderate” class.

Table 3-7 Aspects considered in the Ecological Importance and Sensitivity assessment

HGM Type	NFEPA Wet Veg			NBA Wetlands			SWSA (Y/N)	CBA / ESA (Y/N)	EIS Class
	Type	Ecosystem Threat Status	Ecosystem Protection Level	Wetland Condition	Ecosystem Threat Status 2018	Ecosystem Protection Level			
Depression	Central Bushveld Group 3	Vulnerable	Moderately Protected	C Moderately Modified (Field visit)	Least Threatened	Poorly Protected	N	Y (CBA)	C – Moderate

3.3.4 Recommended Ecological Category and Recommended Management Objective

The REC and RMO for the wetland areas was determined from the results of the PES and EIS assessments. This assessment indicated that the wetland features within the site, had to an extent, underwent transformation as a result of historical and current impacts. Nevertheless, despite the altered

ecological integrity of the system, it is considered to provide ecological services. The appropriate REC and RMO estimated for the wetland area is to a class C and to Maintain the current PES.

3.4 Buffer Requirements

The buffer requirements for the wetlands were calculated using the Site-Based Tool: Determination of buffer zone requirements for wetland ecosystems (Macfarlane *et al.*, 2014). The recommended buffer zones are presented in Table 3-8 and Figure 3-9. The post-mitigation buffers for the wetland in relation to the proposed development area was calculated to be 32 m. No buffer was assigned to the off-channel dams as standard wetland risk assessments are not applicable to these features.

Table 3-8 Buffer requirements for the relevant wetland features

Aspect	Recommended Buffer
Wetlands	32 m

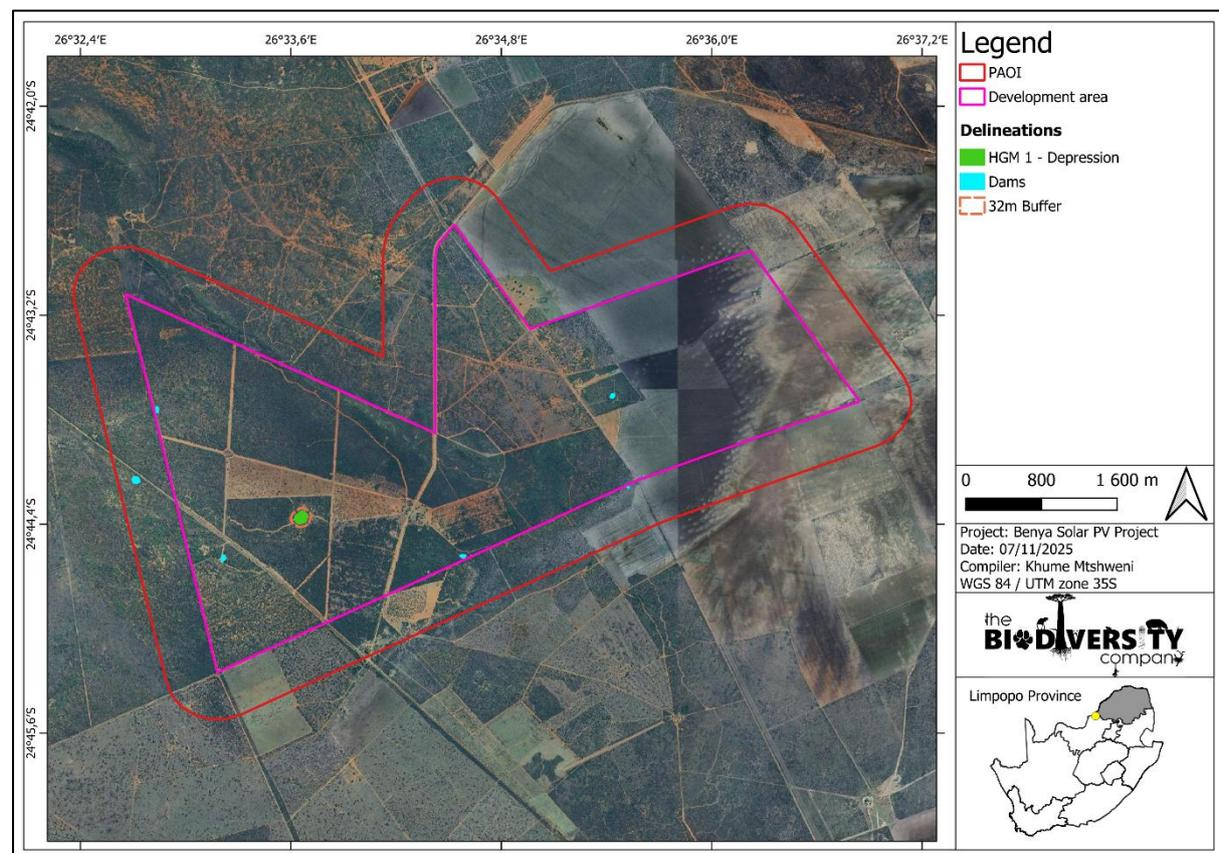


Figure 3-9 Recommended Buffers for the identified wetland in relation to the proposed development

3.4.1 Regulation Zones

Table 3-9 presents the legislated zones of regulation that would be applicable to the wetland areas.

In accordance with Government Notice (GN) 4167 of 2023 and GN 509 of 2016, as it relates to the NWA (1998), water uses as defined in Section 21 (c) and 21 (i) of the NWA must be considered if the proposed activities fall within the regulated zones of a watercourse as defined in the Act.

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.

Both types of authorisations (NEMA and NWA) are applicable given that the proposed development occurs within the relevant regulated zones (Figure 3-10).

Table 3-9 **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). GN 4167 as published in the Government Gazette 49833 of 2023. GN 509 as published in the Government Gazette 40229 of 2016.</p>	<p>In accordance with GN 4167 of 2023 and GN 509 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"> • the outer edge of the 1 in 100 year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam; • in the absence of a determined 1 in 100 year flood line or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or • a 500 m radius from the delineated boundary (extent) of any wetland or pan in terms of this regulation.
<p>Environmental Authorisation in terms of the Listed activities of the National Environmental Management Act, 1998 (Act No. 107 of 1998). EIA Regulations (2014), as amended.</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 metres or more; Where such development occurs— Within a watercourse; In front of a development setback; or If no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse.</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 that: “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>

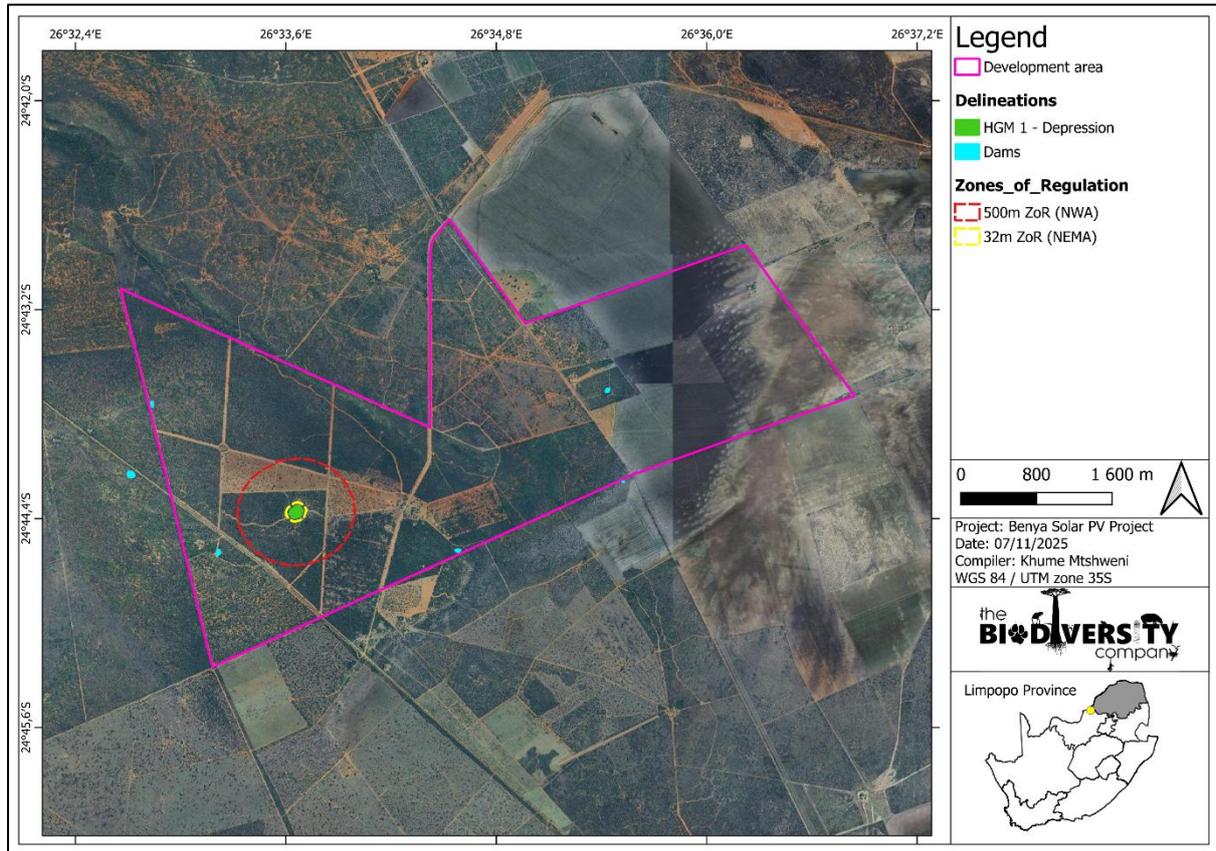


Figure 3-10 Zones of Regulation in relation to the identified wetland within the project area of influence

3.5 Site Sensitivity Verification

3.5.1 Desktop Ecological Sensitivity

The following is deduced from the National Web-based Environmental Screening Tool (Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended):

- Aquatic Biodiversity Theme sensitivity as “Very High” for the Development Area attributed to the presence of rivers and depression wetlands (Figure 3-11).

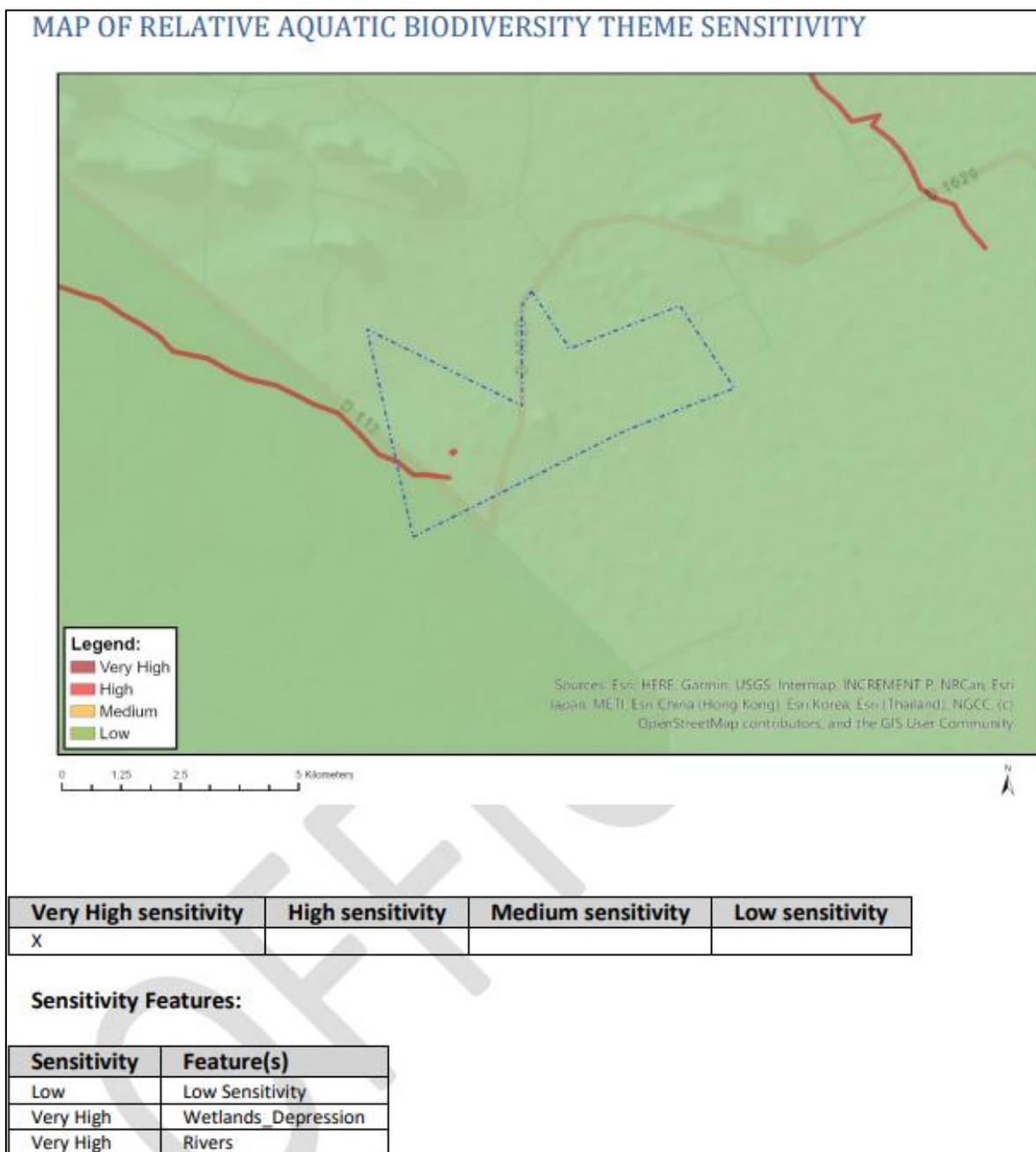


Figure 3-11 Aquatic Biodiversity Theme Sensitivity for the project site

3.5.2 Screening Tool Comparison

The allocated sensitivities for each of the relevant themes are either disputed or validated for the assessed areas in Table 3-10 below. A summative explanation for each result is provided as relevant. The specialist-assigned sensitivity ratings are based on the presence or absence of wetlands, the nature of features and the PES and EIS assessment processes followed in the previous section. Furthermore, consideration is given to any observed or likely presence of sensitive fauna and flora. The sensitivities are displayed in Figure 3-12.

Table 3-10 Summary of the screening tool vs specialist assigned sensitivities

Aspect	Screening Tool Theme	Screening Tool	Specialist Finding	Tool Validated or Disputed by Specialist - Reasoning
Wetland		Very High	Medium	Disputed – This area is representative of a natural wetland and is of Medium sensitivity, attributed to the presence of charismatic aquatic dependent species, and an intact natural buffer. It is also of Medium sensitivity due to the reliance of organisms in the area on it. This includes, breeding, drinking and feeding.
Off-channel dams and sand quarry	Aquatic Biodiversity Theme	Low	Low	Validated – These areas are not representative of natural wetlands, although they do have wetland characteristics that have been anthropogenically introduced.
32m Buffer		Low / Very High	Medium	Disputed – This area is representative of the wetland periphery and, is of Medium sensitivity attributed to its importance in terms of preventing disturbance to the wetland.
Remaining Area		Very High	Low	Validated – These areas are not representative of natural wetlands and lack typical wetland indicators.

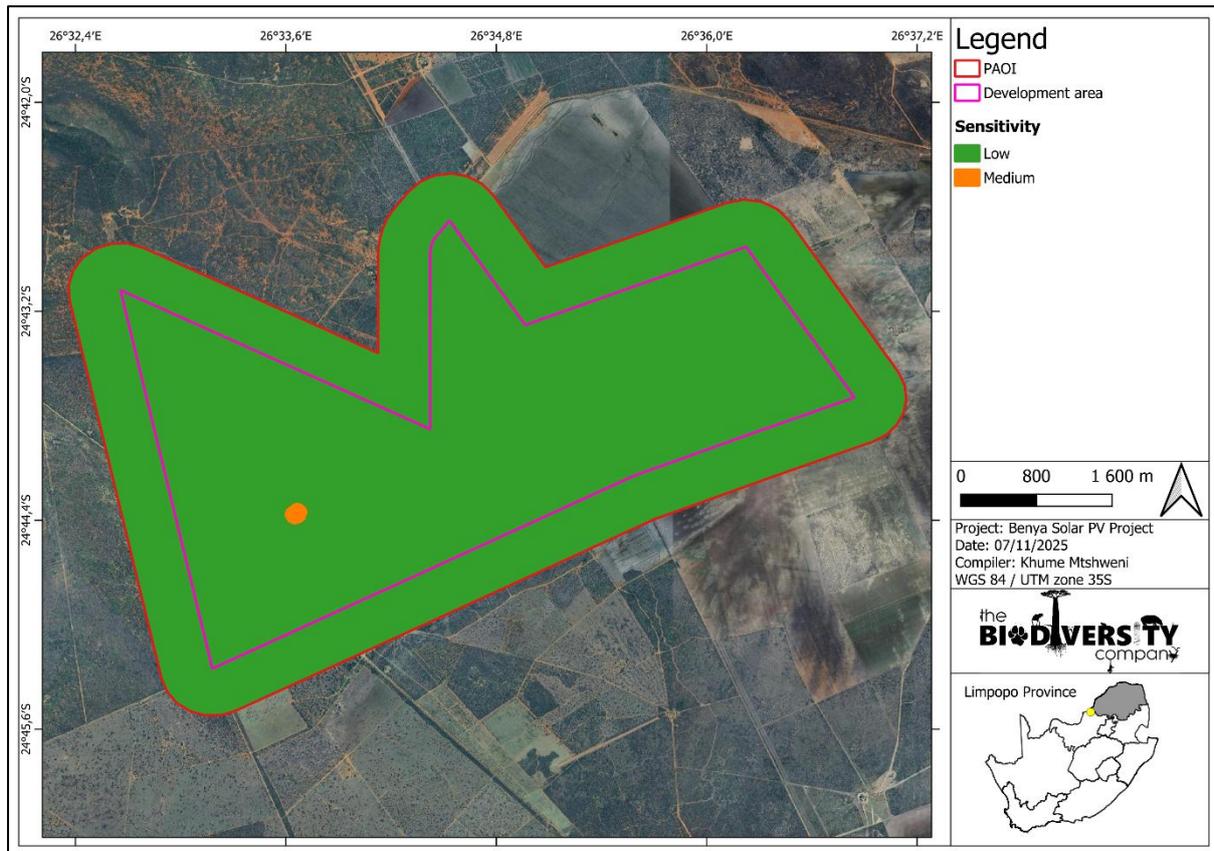


Figure 3-12 Freshwater Sensitivity for the project site and project area of influence

4 Risk and Impact Assessment

4.1 Quantitative Risk and Impact Assessment

The Risk / Impact Assessment considered the indirect impacts, to the wetland systems. The mitigation hierarchy as discussed by the Department of Environmental Affairs (2013) will be considered for this component of the assessment (Figure 4-1). In accordance with the mitigation hierarchy, the preferred mitigatory measure is to avoid impacts by considering options in project location, sitting, scale, layout, technology and phasing to avoid impacts.

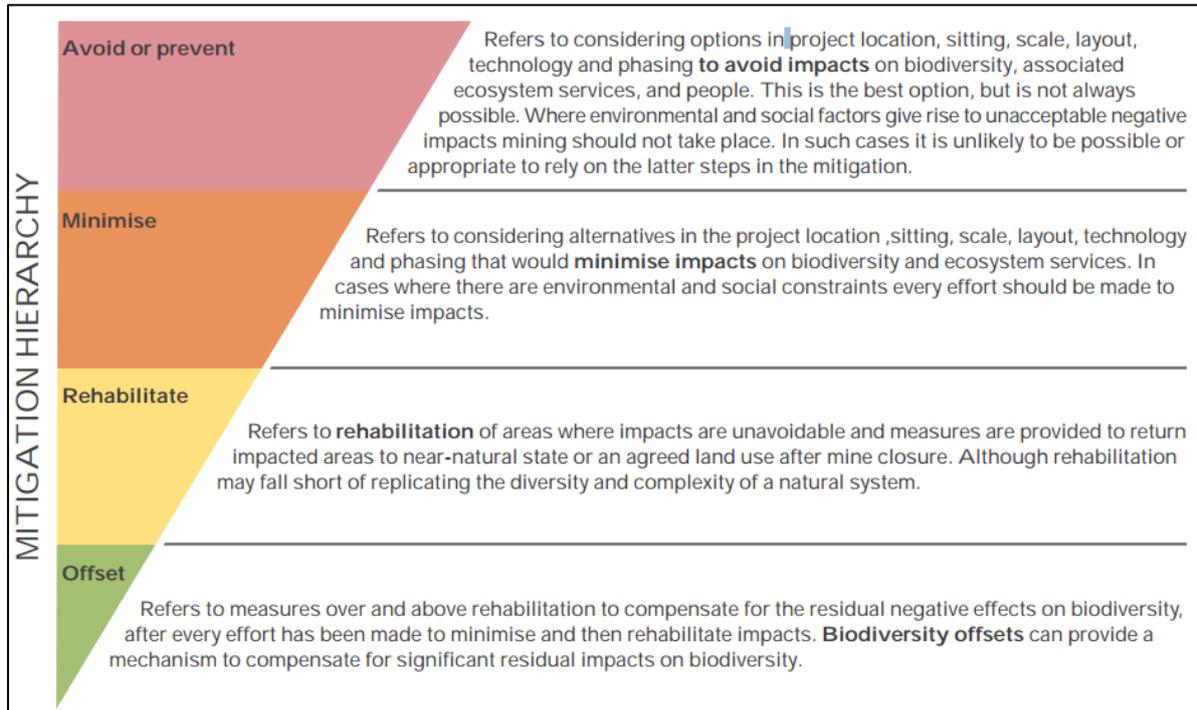


Figure 4-1 The mitigation hierarchy as described by the DEA (2013)

A risk assessment was conducted for the proposed development (Table 4-1) under the assumption that the wetland buffer will be avoided by the proposed development. For this assessment, the specialist was only provided with the boundaries of development. A wetland was identified within the Development Area, therefore the focus for mitigation was placed on minimising potential impacts. The proposed grid and substation infrastructure does not occur within 500 m of the wetland and no risks to the wetland are expected from these impacts, therefore these activities were not considered in the risk assessment.

A risk assessment (Table 4-1) and a cumulative impact assessment (Table 4-2) was conducted for the proposed activities. The risk assessment for the PV area is expected to be predominantly Moderate (pre-mitigation) due to the presence of a natural wetland within the proposed development area and associated PAOI. A descriptive layout plan illustrating where all the infrastructure will be placed was provided. The proposed solar PV development footprint avoids the wetland and its buffer entirely (Figure 4-2), therefore, no direct impacts to the wetland is expected, reducing the anticipated risks to LOW. The applicant will optimise the layout to avoid wetlands.

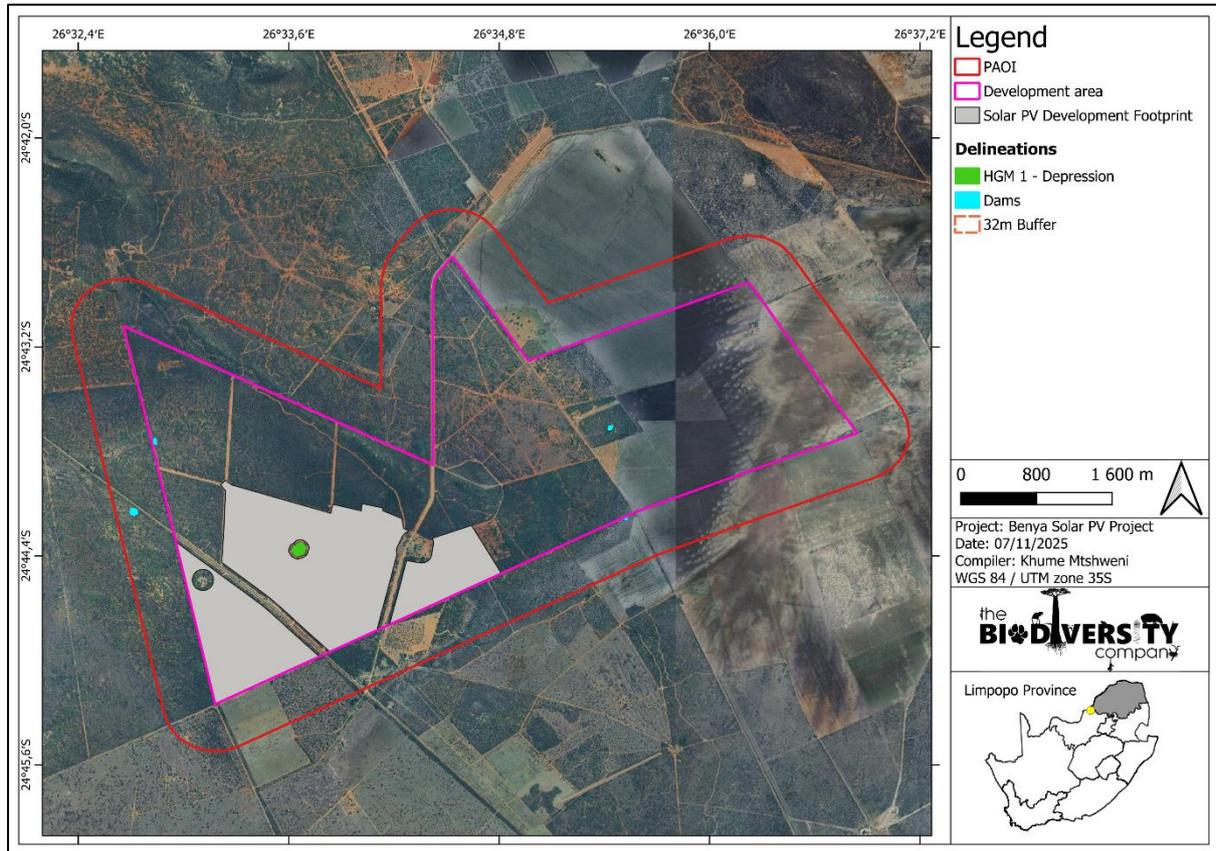


Figure 4-2 Location of the proposed PV development footprint in relation to the delineated wetland and its buffer.

Table 4-1 Summative results of the Risk Assessment conducted for the proposed development

Phase	Activity	Impact	Significance (max = 100)	Risk Rating
Construction	Construction of Solar Panels, Fencing, and Conservancy Tanks (Within 500m of wetlands) Site clearing and preparation Earthworks and vehicle movement Road construction Temporary and portable ablutions Civil works Transportation and installation of PV panels Wiring to central inverters Storage and use of hazardous substances and equipment	Altered Hydrology and induced erosion and sedimentation from soil compaction	19,2	L
		Loss of native vegetation and habitat fragmentation with proliferation of alien species from vegetation clearance	19,2	L
		Impaired water quality from contaminated runoff (accidental chemical and oil spills from machinery and equipment used for clearance activities and road development and leaks from temporary ablutions)	14,4	L
Operation	Operation of Solar Facility and associated infrastructure (Within 500m of wetlands) Infrastructure including (Substation, Roads, Fencing, PV Panels) Stormwater management Maintenance including washing panels	Altered overland flows from facility, hardened surfaces (roads) within the facility and stormwater management with induced erosion and sedimentation of watercourses	24	L
		Water quality impairment from contaminated runoff	18	L
		Continued proliferation of alien invasive vegetation	18	L
Decommissioning	Removal of Solar Facility Infrastructure (Within 500m of wetlands) Dismantlement and deconstruction of structures Re-landscaping Waste Management Stormwater Management	Altered Hydrology and induced erosion and sedimentation from soil compaction	19,2	L
		Loss of native vegetation and habitat fragmentation with proliferation of alien species from vegetation clearance	19,2	L
		Impaired water quality from contaminated runoff (accidental chemical and oil spills from machinery and equipment used for clearance activities and road development and leaks from temporary ablutions)	14,4	L

4.2 Cumulative Impacts

The quantitative impact of the proposed project in isolation on freshwater biodiversity is anticipated to be “Low” provided that the suggested mitigation measures are implemented (Table 4-2). The cumulative impact of the proposed project on freshwater biodiversity is also anticipated to be “Low”. It should be noted that pre-existing modifications to the wetland system does exist to some degree. Therefore, should the sensitive area be avoided by the proposed development layout and the other suggested measures be implemented, the wetland’s integrity and functionality conditions are not expected to deteriorate as a result of the proposed development, and no loss of freshwater biodiversity is anticipated.

Table 4-2 Cumulative Impact Assessment for the proposed development

Activity	Status	Cumulative Impact	Significance	Risk Rating
Construction, Operation and Decommissioning of Solar Facility	Impact in Isolation	1	14	L
	Cumulative Impact	2	24	L

4.3 Mitigation Measures

In light of the expected impacts from proposed activities the following mitigation measures have been proposed to lower the intensity of the impacts on the ecological integrity of the wetland catchment and its downslope wetland features.

The focus of mitigation measures should be to reduce the significance of potential environmental impacts associated with the mixed land use development and thereby to:

- Prevent the unnecessary destruction of, and fragmentation, of the vegetation community of the wetland areas; and
- Limit the construction area to the defined project areas and only impact those areas where it is unavoidable to do so otherwise.

Table 4-3 Recommended mitigation measures for the proposed project

Phase	Potential Environmental Impact	Mitigation Measures
Construction/Decommissioning	Altered hydrology and induced erosion/sedimentation from soil compaction	<ul style="list-style-type: none"> • Adherence to the buffer areas. These should be visibly demarcated to avoid encroachment. • Clearly demarcate the construction footprint to avoid unnecessary disturbance and compaction outside the authorized area. • Restrict vehicle and machinery movement to designated access routes and work areas and use existing routes before new roads are considered for construction. • Stabilize exposed soils promptly using mulch, geotextiles, or temporary cover

		<p>crops.</p> <ul style="list-style-type: none"> • Implement stormwater management measures across the site and along the margins of the roads (e.g., berms, silt fences, sediment traps) to control runoff and prevent erosion. • Address signs of erosion as they occur. • Till compacted soils to restore infiltration and prevent preferential flow paths. • Rehabilitate and re-vegetate disturbed areas as soon as possible after construction or decommissioning. • Schedule earthworks during dry periods where feasible to minimize erosion risk. • Locate stockpiles out of watercourse and buffer areas and ensure all stockpiles are located on flat terrain, in banded areas and are protected from rain-wash.
	<p>Loss of native vegetation and habitat fragmentation with proliferation of alien species from vegetation clearance</p>	<ul style="list-style-type: none"> • Minimize vegetation clearing and retain indigenous vegetation wherever possible. • Restrict the disturbance footprint to the authorized area only. • Promptly rehabilitate cleared areas with indigenous species. • Implement an alien invasive plant management plan, including regular monitoring and removal of alien species. • Avoid the use of herbicides near sensitive areas; opt for mechanical removal of alien plants. • Conduct pre-construction walk-throughs to identify and relocate any fauna at risk.
	<p>Impaired water quality from contaminated runoff (accidental chemical and oil spills from machinery and equipment used for clearance activities and road development and leaks from temporary ablutions)</p>	<ul style="list-style-type: none"> • Store fuels, oils, and chemicals in banded areas away from sensitive environments. • Ensure spill kits are available on site and staff are trained in spill response procedures. • Prohibit mixing of concrete and parking of machinery in or near wetlands and buffer areas. • Provide appropriate sanitation facilities for workers and service them regularly to prevent leaks. • Immediately treat or remove any contaminated soil for disposal at a licensed facility. • Regularly inspect and maintain machinery to prevent leaks.

Operational

Altered overland flows from facility, hardened surfaces (roads) within the facility and stormwater management with induced erosion and sedimentation of watercourses

- Design and implement effective stormwater management systems to control runoff from roads and hardened surfaces.
- Maintain stormwater infrastructure regularly to ensure functionality.
- Use permeable materials for roads and surfaces where possible to reduce runoff.
- Promote infiltration under panels using grass cover or gravel instead of paving.
- Monitor for signs of erosion and sedimentation and implement corrective actions as needed.
- Maintain vegetative buffers around the facility to slow and filter runoff.

Water quality impairment from contaminated runoff

- Regularly inspect and maintain all infrastructure to prevent leaks and spills.
- Ensure that any chemicals or hazardous substances used during maintenance are properly stored and handled.
- Maintain and service ablation and wastewater facilities to prevent leaks.

Continued proliferation of alien invasive vegetation

- Conduct regular monitoring for alien invasive species and remove alien species promptly using mechanical methods for watercourse areas.
- Maintain indigenous vegetation cover to outcompete potential invaders by relandscaping and revegetating any residual disturbed areas.

5 Conclusion

During the site assessment, one (1) hydrogeomorphic unit was identified and delineated, this system was classified as a depression wetland. Furthermore, several dams (off-channel), and a sand quarry was identified.

The wetland scored an overall PES score within the “C – Moderately Modified” class. The wetland scored “Moderate” importance and sensitivity score and the ecosystem service score presented within the “Moderately High” class.

A 32 m post-mitigation buffer was calculated for the wetland, which has been adhered to in the current proposed layout.

5.1 Risk and Impact Statement

A risk assessment was conducted for the proposed project. The post-mitigation risk present within the “Low” significance category given adherence to the post-mitigation buffers and prescribed mitigation measures. The dams and sand quarry may be decommissioned and developed, if required, as these are artificial features that do not represent natural ecological sensitivities. The decommissioning of the dams are subject to approval by the Competent Authority.

A General Authorisation in terms of GN 4167 as it relates to Section 21 (c and i) water uses of the National Water Act (No. 36 of 1998) will be permissible for the activities as assessed in this report.

It is the opinion of the specialist that the land will return to its pre-development state within two (2) years of completion for the linear infrastructure.

5.2 Specialist Opinion

Considering the assessment findings and the assumption that the suggested mitigation measures will be implemented, no fatal flaws are evident for the proposed project at this stage. It is the opinion of the specialists that the project may be favourably considered for authorisation.

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7 Appendix Items

7.1 Appendix A – Methodology

7.1.1 Desktop Dataset Assessment

The desktop assessment was undertaken using Geographic Information System (GIS) to access, view and overlay the latest available related datasets with the project area. The information represented within the datasets was used to develop the relevant digital maps used to identify potentially environmentally sensitive areas. These datasets and their respective dates of publishing are provided below:

- Vegetation Types - Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018 & Mucina and Rutherford 2006);
- Soils and Geology - Land Types Database (Land Type Survey Staff, 1972 - 2006); and
- Topographical Inland Water Areas and River Lines (based on the 1994 1:500 000 topographic maps as per the Chief Directorate of the National Geo-spatial Information).

7.1.1.1 Vegetation Types - Vegetation Map of South Africa, Lesotho and Swaziland

The Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018) is the latest and updated version of the maps published in earlier time such as those presented by Mucina and Rutherford (2006) and those presented in the National Biodiversity Assessment (2011). The map provides spatial details on the representative vegetation of South Africa and is complemented in this report using information from Strelitzia (Mucina & Rutherford, 2006) to provide insight on the landscape features, biogeography, climate, geology, and soils of the project area.

7.1.1.2 Soils and Geology - Land Type Database

The Land Type Survey provides information on the soils, terrain, climate, and geology of areas within South Africa. The data includes the pedological classification of soils and is used in this report to provide insight on the common soil forms associated with aquatic or freshwater systems of a particular area.

7.1.1.3 Topographical River Lines and Inland Water Areas

Topographical Inland Water Areas and River Lines for South Africa are based on the topographic maps dated 1994 as per the National Geo-spatial Information. These datasets are used in this report to provide insight on potential wetland areas and serves to highlight the location and extent of drainage features, dams, wetlands, reservoirs and other relevant inland waterbodies.

7.1.1.4 Ecologically Important Landscape Features

The datasets listed below were incorporated to establish the relation between the project and ecologically important or sensitive freshwater entities. Emphasis was placed around the following spatial datasets:

- South African Inventory of Inland Aquatic Ecosystems (SAIIAE), NBA 2018 Rivers and Wetlands (Van Deventer *et al.*, 2019);
- National Freshwater Priority Areas, Rivers and Wetlands, 2011 (Nel *et al.*, 2011); and
- Strategic Water Source Areas, 2021 (Lötter & Le Maitre, 2021).

7.1.1.4.1 The South African Inventory of Inland Aquatic Ecosystems

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was established during the 2018 NBA, the SAIIAE is a collection of spatial data layers that represent the extent of river and inland wetland ecosystem types as well as the pressures on these systems. The same two headline indicators, and their associated categorisations, are applied as with the terrestrial ecosystem NBA, namely Ecosystem Threat Status and Ecosystem Protection Level. The Ecosystem Threat Status of river and wetland ecosystem types are based on the extent to which each ecosystem type had been altered from its natural condition.

7.1.1.4.2 National Freshwater Ecosystem Priority Areas, Rivers and Wetlands

In an attempt to better conserve aquatic ecosystems, South Africa has categorised its inland aquatic systems according to set ecological criteria (i.e., ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs). The FEPAs are intended to be conservation support tools and it is envisioned that they will guide the effective implementation of measures to achieve the National Environment Management: Biodiversity Act's biodiversity conservation goals (Nel *et al.*, 2011).

7.1.1.4.3 Strategic Water Source Areas

SWSAs are defined as areas of land that supply a disproportionate quantity of mean annual surface water runoff in relation to their size, and therefore contribute considerably to the overall water supply of the country, as well as national aquatic and terrestrial biodiversity resources. These are considered key ecological infrastructure assets and the effective protection of SWSAs is vital for national security because a lack of water security will compromise national security and human wellbeing on all levels.

7.1.2 Wetland Field Survey

7.1.2.1 Identification and Mapping

The wetland areas were delineated in accordance with the DWAF (2005) guidelines, a cross section is presented in Figure 7-1. The outer edges of the wetland areas were identified by considering the following four specific indicators:

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

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

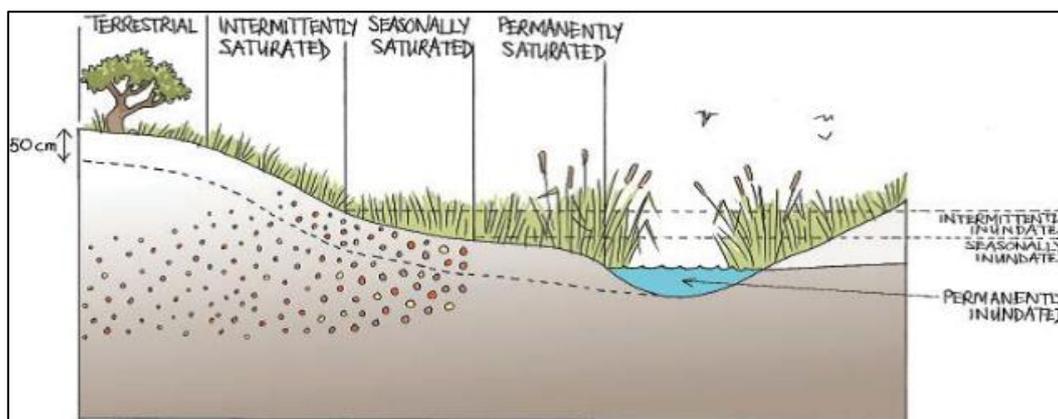


Figure 7-1 Cross section of a wetland, indicating how the soil wetness and vegetation indicators respond to changes in topography (Ollis et al. 2013)

7.1.2.2 Delineation

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

7.1.2.3 Classification and Description

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

7.1.3 Wetland Functional and Ecological Assessment

7.1.3.1 Functional Assessment

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

The assessment of the ecosystem services supplied by the identified wetlands was conducted per the guidelines as described in WET-EcoServices (Kotze et al., 2009). An assessment was undertaken that examines and rates the following services according to their degree of importance and the degree to which the services are provided (Table 7-1).

Table 7-1 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

7.1.3.2 Present Ecological Status

The overall approach as described by Macfarlane et al., 2009, 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 7-2.

Table 7-2 The Present Ecological Status categories (Macfarlane et al., 2009)

Impact Category	Description	Impact Score Range	PES Score (%)	PES
None	Unmodified, natural	0 to 0.9	90-100	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	80-89	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	60-79	C
Large	Largely Modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4.0 to 5.9	40-59	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	20-39	E
Critical	Critically Modified. 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	0-19	F

7.1.3.3 Ecological Importance and Sensitivity

The importance and sensitivity of water resources is determined in order establish resources that provide higher than average ecosystem services, biodiversity support functions or are particularly sensitive to impacts. The mean of the determinants as described by Rountree *et al.*, 2013, is used to assign the Ecological Importance and Sensitivity (EIS) category as listed in Table 7-3.

Table 7-3 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

7.1.3.4 Recommended Ecological Category and Recommended Management Objective

The Recommended Ecological Category (REC) and Recommended Management Objective (RMO) (Table 7-4) was determined based on the results obtained from the PES and EIS of the assessed wetlands, with the objective of recommending how a water resource should be managed. This is achieved by either maintaining or improving the ecological integrity of the wetland in order to ensure continued ecological functionality (DWA, 1999).

Table 7-4 Recommended Ecological Category and Recommended Management Objectives for water resources based on Present Ecological State and Ecological Importance and Sensitivity scores

PES	Ecological Importance and Sensitivity			
	Very High	High	Moderate	Low
A (Pristine)	A Maintain	A Maintain	A Maintain	A Maintain

	B (Natural)	A Improve	A/B Improve	B Maintain	B Maintain
	C (Good)	A Improve	B/C Improve	C Maintain	C Maintain
	D (Fair)	C Improve	C/D Improve	D Maintain	D Maintain
	E/F (Poor)	D Improve	E/F Improve	E/F Maintain	E/F Maintain

7.1.4 Buffer Requirements

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

7.1.5 Site Sensitivity Verification

The baseline aquatic / freshwater sensitivity of the project area was obtained using the National Web-based Environmental Screening Tool (Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended). The allocated sensitivities for each of the relevant themes are either disputed or validated for the assessed areas based on the specialist assigned Ecological Importance and Sensitivity of the different systems (where applicable), with consideration been given to the presence of observed or likely sensitive fauna and flora.

7.2 Appendix B – Risk and Impact Assessment

7.2.1 Risk Assessment

The Department of Water and Sanitation (DWS) risk matrix assesses impacts in terms of consequence and likelihood. The significance of the impact is rated according to the classes presented in Table 7-5.

Table 7-5 Significance ratings matrix

Rating	Class	Management Description
1 – 29	(L) Low Risk	Acceptable as is or with proposed mitigation measures. Impact to watercourses and resource quality small and easily mitigated, or positive.
30 – 60	(M) Moderate Risk	Risk and impact on watercourses are notable and require mitigation measures on a higher level, which costs more and require specialist input. Licence required.
61 – 100	(H) High Risk	Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve. Licence required.

7.3 Appendix C – Specialist Declaration of Independence

Declaration

I, Namitha Singh, 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.



Namitha Singh

Ecologist

The Biodiversity Company

July 2025

Declaration

I, Divan van Rooyen, 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.



Divan van Rooyen

Freshwater Ecologist

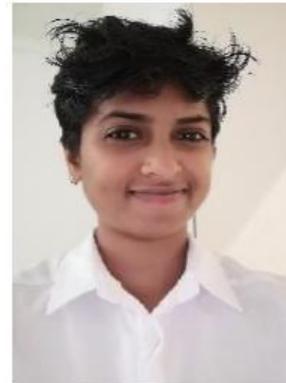
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July 2025

7.4 Appendix D – Specialist CVs

Namitha Singh

BSc. (Hons) Environmental Science
(Pr Sci Nat 157927)



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Identity Number: 9509260335089

Date of birth: 26 September 1995

Profile Summary

Working experience in South Africa.

Specialist experience within construction and development (residential/commercial/mixed-use/solar), wastewater infrastructure and agriculture.

Specialist expertise includes wetland resource management and rehabilitation, estuary and coastal management and, hydroponology.

Areas of Interest

Water Resource Management, Mining, Renewable Energy, Infrastructure Development, Agriculture, Land contamination, Sustainability and Conservation.

Key Experience

- Wetland Delineation and Functional Assessments
- Hydroponology Assessments
- Wetland Rehabilitation
- Coastal and Estuarine Assessments

Country Experience

South Africa

Nationality

South African

Languages

English – Proficient

Afrikaans – Basic

Qualifications

- Pr. Sci. Nat. 157 927
- BSc. Honours – Environmental Science (*Cum Laude*)
- BSc. Environmental Science and Life Science

Divan van Rooyen

Ph.D. Environmental Science

Pri Sci Nat (151272)

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Identity Number: 9312205072085

Date of birth: 20 December 1993



Profile Summary

Working experience throughout Southern Africa

Specialist experience with mining, WWTW's and construction.

Specialist expertise include wetlands resources, aquatic ecology and ecotoxicology.

Areas of Interest

Mining, Seismic Surveys, Renewable Energy, Bulk Services Infrastructure Development & WWTW's.

Key Experience

- Environmental Impact Assessments (EIA)
- Environmental Management Programmes (EMP)
- Wetland delineations and ecological assessments
- Rehabilitation Plans and Monitoring
- Aquatic biomonitoring

Country Experience

South Africa

Nationality

South African

Languages

English – Proficient

Afrikaans – Proficient

Qualifications

- PhD (North-West University of Potchefstroom) – Environmental Science with Aquatic Ecosystem Health
- MSc (North-West University of Potchefstroom) – Environmental Science (Ecological Remediation and Sustainable Management)
- BSc Honours (North-West University of Potchefstroom) – Environmental Science with Ecological Remediation and Sustainable Management
- BSc Environmental sciences
- Pri Sci Nat (151272)