Wetland Functional and Impact Assessment for the proposed Harmony Gold Mponeng Lower Compartment Tailings Storage Facility (TSF) Project

Merafong Local Municipality, West Rand District Municipality, Gauteng West Province, South Africa

13/01/2026

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Report Name	**Wetland Functional and Impact Assessment for the proposed Harmony Gold Mponeng Lower Compartment Tailings Storage Facility (TSF) Project**	
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Project Reference	Mponeng Lower Compartment TSF	
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Environmental Assessment Practitioner	EIMS ENVIRONMENTAL IMPACT MANAGEMENT SERVICES	
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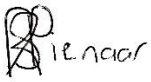
Reviewer	Rian Pienaar (SACNASP 135544)	
Declaration	The Biodiversity Company and its associates act as independent consultants in accordance with the requirements of the South African Council for Natural Scientific Professions. We confirm that we have no affiliation with, or vested financial interest in, the proponent, other than remuneration for professional services rendered in terms of the Environmental Impact Assessment Regulations. We have no conflicting interests in the proposed activity or any secondary developments arising from the authorisation of the project, and our work has been undertaken objectively and in accordance with accepted scientific principles.	

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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 authorisation and water use license application processes for the proposed Mponeng Lower Compartment Tailings Storage Facility (TSF) project. The proposed project involves recommencing deposition on the Mponeng Lower Compartment TSF (hereafter referred to as Mponeng Lower Compartment TSF). The Mponeng Lower Compartment TSF is currently not in operation and is used as a holding dam and partially as a landfill facility. Furthermore, the Mponeng Lower Compartment TSF is situated in close proximity to Carletonville, Merafong Local Municipality, West Rand District Municipality, Gauteng Province (Figure 1-1). A 500 m radius has been demarcated for the project to facilitate the identification of wetlands, and 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 General 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 favourability for 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).

After considering the findings and recommendation provided by the specialist herein, this report should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making regarding the ecological viability of the proposed development and related activities.

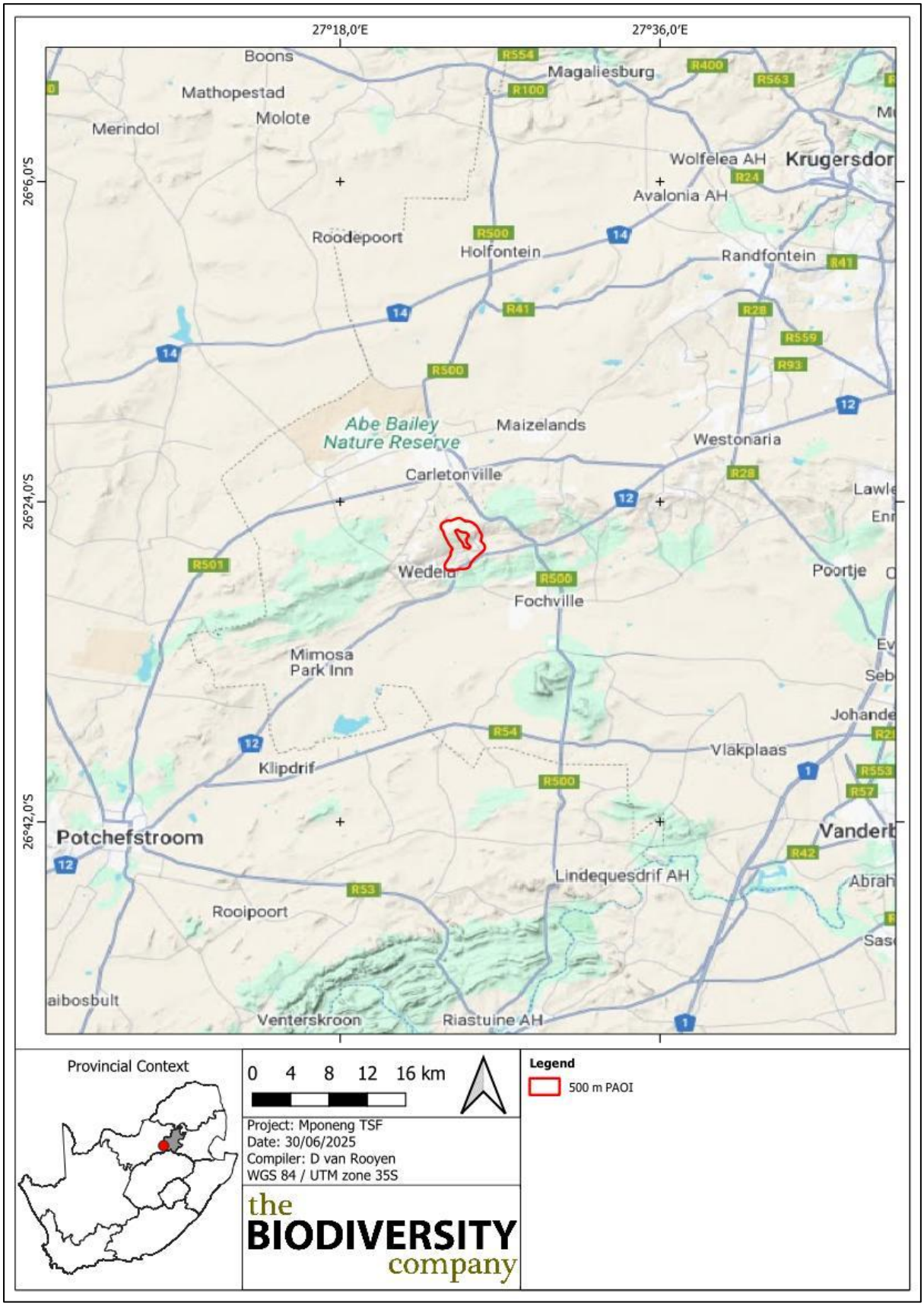


Figure 1-1 Location of the proposed project

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 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

Harmony Gold Mining Company Limited (hereafter referred to as the applicant) has appointed Environmental Impact Management Services (Pty) Ltd (EIMS) as the Environmental Assessment Practitioner (EAP) to undertake the necessary environmental authorisation and associated consultation processes. EIMS will compile and submit the required documentation in support of applications for:

- Environmental Authorisation under the National Environmental Management Act (NEMA) for various listed activities;
- A Waste Management Licence under the National Environmental Management: Waste Act (NEM:WA); and
- A Water Use Licence under the National Water Act (NWA).

Additional listed activities and/or water uses may be identified during the process.

The applicant owns and operates a number of Gold Mines and Plants in the West Wits region in the Gauteng Province. The Savuka Plant currently deposits tailings onto the Savuka 7a & 7b Tailings Storage Facilities (TSFs). However, these facilities are approaching their final and approved height, and the current planned Life of Mine (LOM) for the West Wits region exceeds the available deposition capacity of these TSFs. Accordingly, the applicant is undertaking a feasibility assessment to recommence deposition on the Mponeng TSF Lower Compartment.

The Mponeng TSF is located at 26°27'11.18"S; 27°24'43.88"E. Mponeng Lower TSF is an existing TSF, however, the Mponeng Lower Compartment TSF is no longer in operation and is currently utilised as a Holding Dam, and a portion of it is used as an authorised Landfill Facility. In order to redeposit on the Mponeng TSF, from the Savuka Plant, slurry pipelines will need to be constructed from the Savuka Plant to the TSF. The proposed slurry and return water pipes extend from the south of Savuka Plant at starting point 26°25'24.95"S; 27°23'58.94"E, extending southwards, parallel to each other until reaching the northern extent of Mponeng TSF where they split. Thereafter, the slurry pipeline extends to west before connecting to Mponeng TSF while the return water pipeline extends east then south around the TSF to the return water dam. There is an alternative slurry and return water pipeline route which extends to the east through Western Deep Levels then south along Mponeng Gold Mine before heading to the west where it connects to Mponeng TSF.

The proposed layout is illustrated in Figure 1-2 below

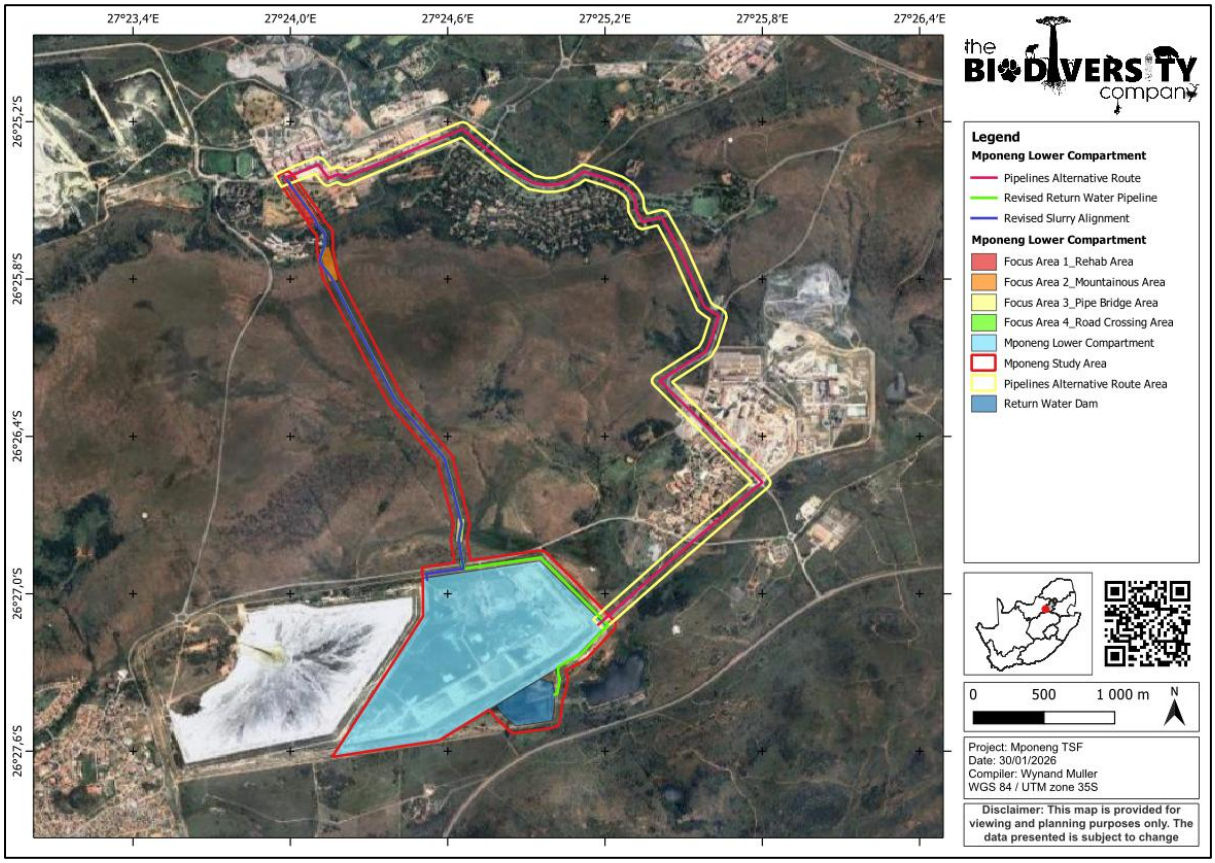


Figure 1-2 Detailed layout for the proposed project

1.4 Assumptions and Limitations

The following aspects were considered as limitations:

- It has been assumed that the extent of the project area provided to the specialist are accurate;
- Areas characterised by external wetland indicators have been the focus for this assessment. Areas lacking these characteristics have not been focussed on;
- Representative sampling for the different wetland areas was conducted and is considered to be sufficient for the purpose of this report;
- Freshwater features within the larger 500 m PAOI that were not considered to be an immediate surrounding of the proposed development were delineated and assessed via desktop wherever inaccessible;
- The delineations presented herein were derived from previous assessments undertaken for the area which were compiled under the following assumptions:
    - Representative sampling was conducted within the Project Site and PAOI and by its nature infers that not all areas were covered on foot. However, efforts were made to cover as much of the site as possible with the limitations of time and access and the results obtained are considered sufficient to derive a meaningful baseline for the Project Site;

- The results presented herein are an outcome of a rapid survey where areas characterised by external wetland attributes were the focus for assessment, where wetlands were therefore confirmed by soil form indicators; and

- The GPS used for water resource delineations is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by a maximum of five meters to either side.

1.5 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 1-1 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 1-1 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.
	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
	NEMA: Environmental Impact Assessment Regulations (2014), as amended, with cognisance of Appendix 6 requirements in GN 517 of 11 (June 2021, as amended).	The minimum criteria for reporting.
	NEMA: Government Notices (GN) 320 (20 March 2020) and GN 1150 (30 October 2020)	Protocol for the specialist assessment and minimum report content requirements.
	National Environmental Management: Waste Act (Act No. 59 of 2008)	The regulation of waste management to protect the environment.
	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 Lists (2020) (GN 1003, September 2020)	The regulation and management of alien invasive species.
	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.
Provincial	Transvaal Nature Conservation Ordinance (Act No. 12 of 1998)	To consolidate and amend the laws relating to nature conservation and to provide matters incidental thereto.
	Gauteng Conservation Plan (2024)	The spatial designation of conservation areas and targets within the province.

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 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 1-2 below.

Table 1-2 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)	7.4
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	3.6.1
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)	3.4.1
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	N/A
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: (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.	4.3
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); (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.)	4.3
How will the proposed development impact on key ecosystems regulating and supporting services especially: (a) flood attenuation; (b) streamflow regulation; (c) sediment trapping;	4.3

(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	3.5
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	0
The degree to which the impacts and risks can be reversed	0
The degree to which the impacts and risks can cause loss of irreplaceable resources	4
A suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies	7.1.5
Proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr)	0
A motivation must be provided if there were development footprints identified as having a “low” aquatic biodiversity sensitivity and that were not considered appropriate	-
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

An initial field survey which covered majority of the Mponeng Lower Compartment TSF project area was undertaken in conjunction with the Savuka 5a, 5b, 7a & 7b project on the 11th of December 2024 which constitutes as a wet season survey.

The field survey for the remainder of the Mponeng Lower Compartment TSF area was undertaken on the 3rd of July 2025 which constitutes a dry season survey. The seasonality is not considered to be a limiting factor to the assessment, and the results of this assessment are considered to be conclusive in the opinion of the specialist.

3 Results & Discussion

3.1 Desktop Dataset Assessment

3.1.1 Climate

The project area falls within the Gauteng Shale Mountain Bushveld vegetation. The area experiences summer rainfall with dry winters. The mean annual precipitation for the area ranges between 600 to 750 mm, west to east, respectively. The area also experiences frequent frost in the western and southern parts (Mucina & Rutherford, 2006; Figure 3-1).

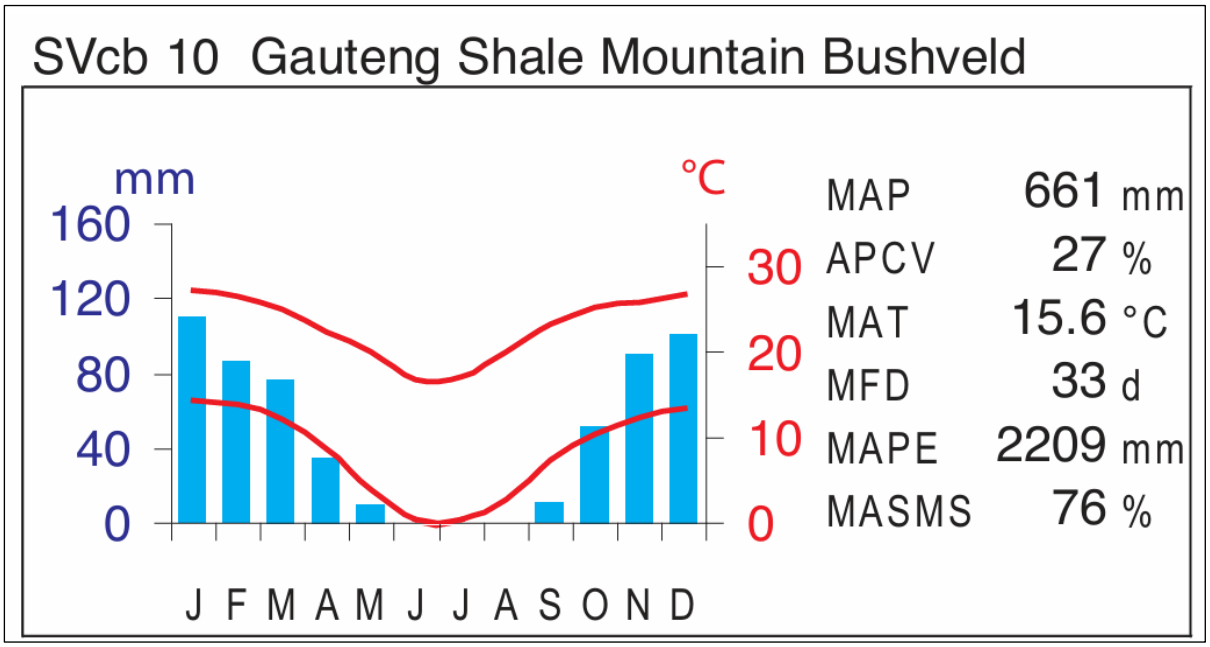


Figure 3-1 Climate for the Project Area of Influence based on the Gauteng Shale Mountain Bushveld (Mucina & Rutherford, 2006)

3.1.2 Geology and Soils

The geology of the area includes the sedimentary rocks such as the shale and andesite from the Pretoria Group (Transvaal Supergroup). The area is also underlain by Malmani dolomites of the Chuniespoort Group (Transvaal Supergroup). The area is characterised by land type Fb and Ib, with shallow Mispah soils forms.

According to the land type database (Land Type Survey Staff, 1972 - 2006) the assessment area to be focused on mainly falls within the Fb 5 and Fb 15 land types. The Fb 5 and Fb 15 land types consist of Mispah, Glenrosa, Hutton, Arcadia, Rensburg, Oakleaf and Dundee soil forms according to the Soil classification working group (1991), with the occurrence of other soils and rocky areas within the landscape. The Fb land types are characterised with shallow soils such as Glenrosa and Mispah soil forms. Lime is usually rare in the upper landscape but generally present in the lower terrains.

3.1.3 Hydrological Characteristics

The PAOI falls within the Highveld Ecoregion, within the Vaal_Orange Water Management Area (WMA). At a finer scale, the project occurs within the C23E and C23J quaternary catchments. The fine scale hydrological features are presented in the following section.

3.1.3.1 Topographical River Lines and Inland Water Areas

Three inland water areas, classified as dams, large reservoirs and marsh vleis have been identified within the PAOI by means of the “2627” quarter degree square topographical river line and inland water area data set (Figure 3-2). Additionally, multiple non-perennial features were identified within PAOI, of which traverses the entire project area and flow into the one perennial feature, identified to be located west of the Mponeng Lower Compartment.

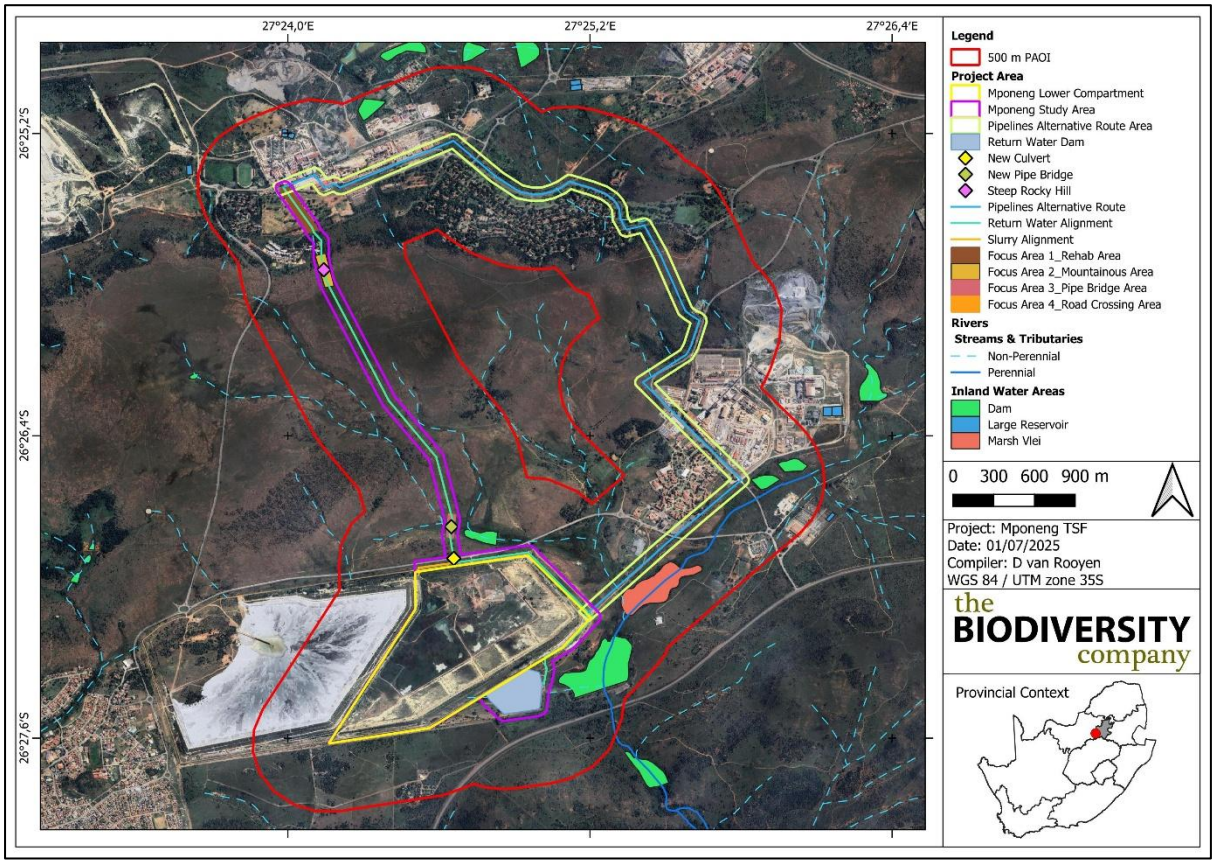


Figure 3-2 Topographical Drainage and Inland Water Areas relevant to the project

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.

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 (SAIIAE)	Relevant – PAOI overlaps with NBA wetlands.	3.1.4.1
National Freshwater Priority Area	Relevant – PAOI overlaps with NFEPA wetlands.	3.1.4.2
Provincial Conservation Plan	Relevant – POAI overlaps with Ecological Support Areas and Critical Biodiversity Areas of the Gauteng Conservation Plan.	3.1.4.3
Strategic Water Source Areas	irrelevant – PAOI does not overlaps with a SWSA.	-

3.1.4.1 South African Inventory of Inland Aquatic Ecosystems

Three wetland types by means of the SAIIAE were identified within the PAOI. These wetlands were identified as seep, unchannelled valley bottom and channelled valley bottom wetlands (Figure 3-3). The seep and channelled valley bottom wetlands are classified with a “DEF – Largely to Seriously Modified” condition and is “Critically Endangered” and “Not protected” with regards to the Ecosystem Threat Status and Ecosystem Protection Level, respectively. The unchannelled valley bottom wetlands are classified with a “A/B – Natural” condition and is “Critically Endangered” and “Not protected” with regards to the Ecosystem Threat Status and Ecosystem Protection Level, respectively.

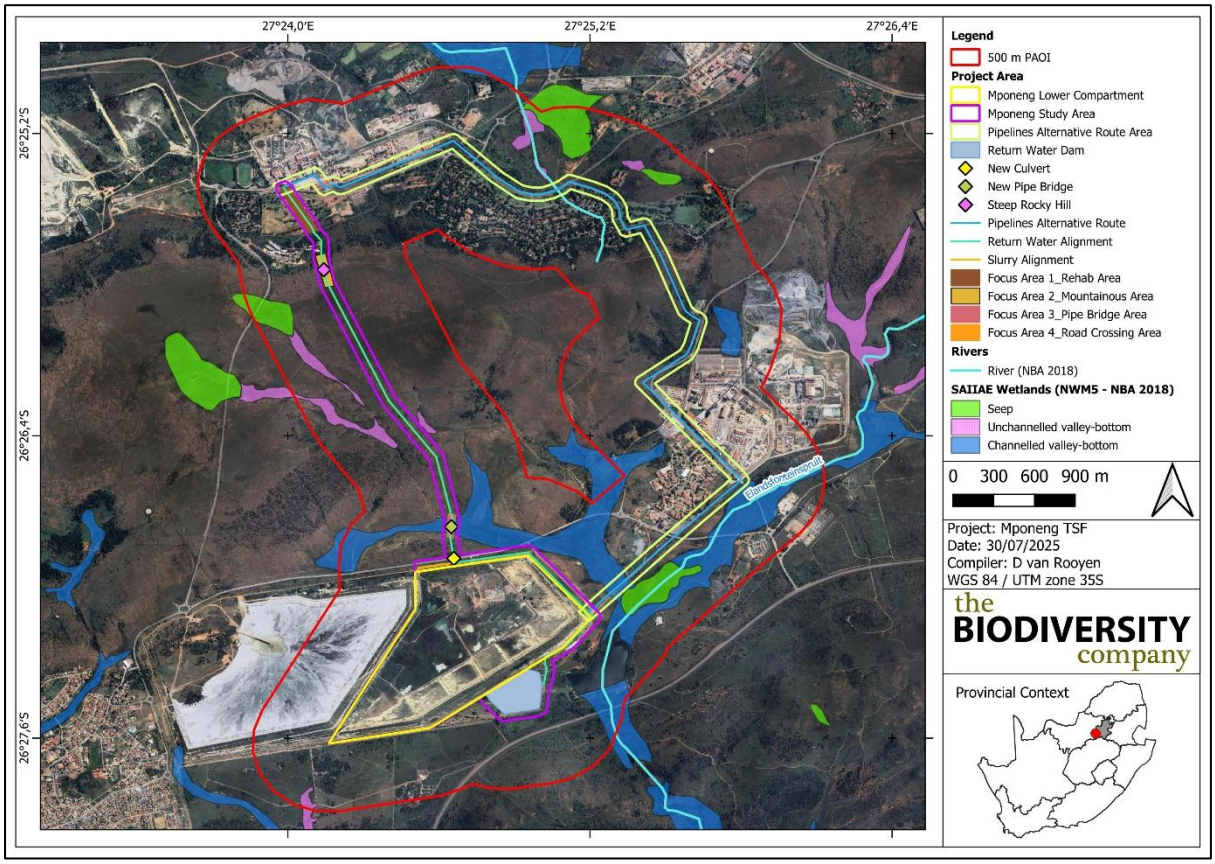


Figure 3-3 South African Inventory of Inland Aquatic Ecosystems with relevance to the project

3.1.4.2 National Freshwater Ecosystem Priority Areas

Three NFEPA wetland types were identified within the PAOI, namely a channelled valley-bottom, a wetland flat and seep wetlands by means of the NFEPA dataset (Figure 3-4). The channelled valley-bottom is classified to be artificial in the north, natural to the south and of non-priority status. The seep and flat wetlands were classified as artificial, within the "Z3 – Heavily to Critically Modified" condition category which refers to systems with "Less than 25% natural land cover remaining" category, as per the dataset.

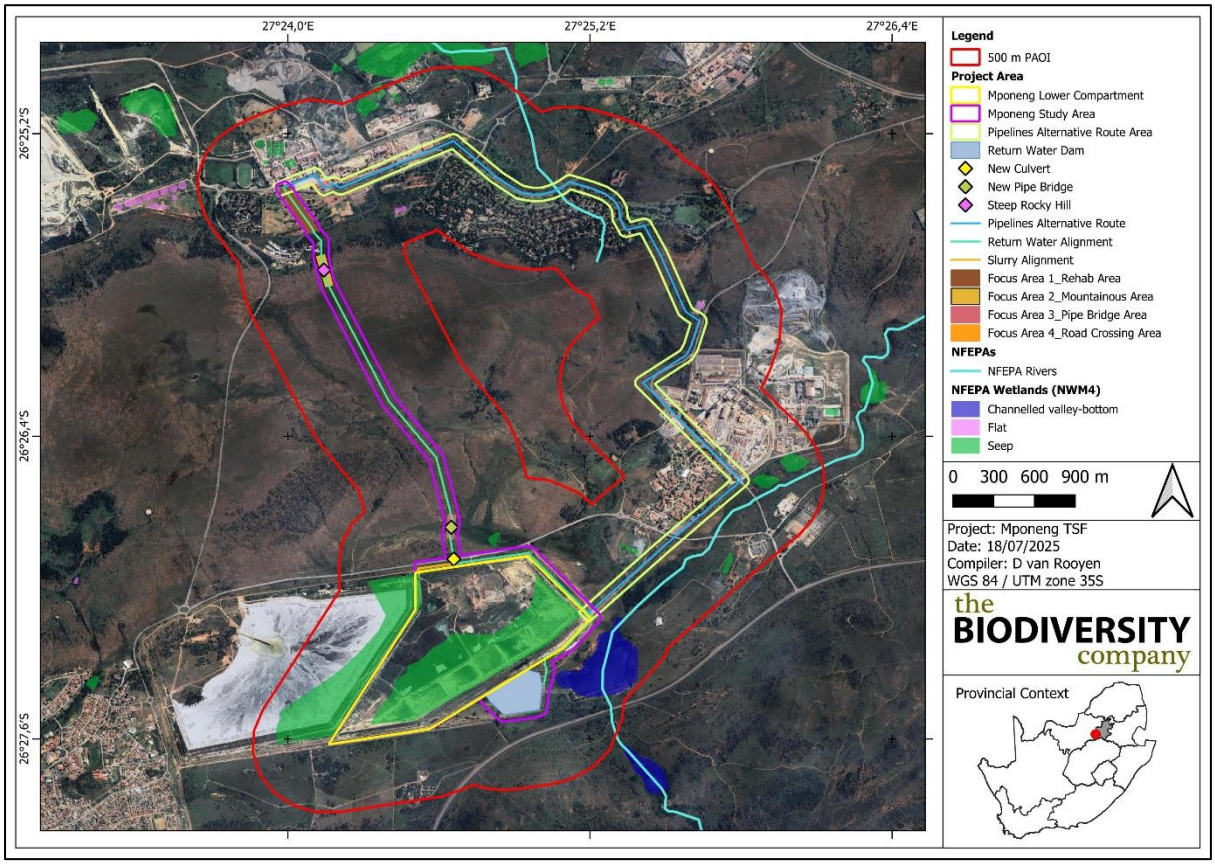


Figure 3-4 NFEPA Wetlands with relevance to the project

3.1.4.3 Gauteng Conservation Plan

The Gauteng Conservation Plan Version 4 (Desmet *et al.*, 2024) classifies areas within the province on the basis of their contributions to reaching the associated conservation targets within the province. These areas are primarily classified as either Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs). These biodiversity priority areas, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species, as well as the long-term ecological functioning of the landscape as a whole.

- CBAs are areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and healthy functioning of important species and ecosystems and the delivery of ecosystem services. Thus, if these areas are not maintained in a natural or near natural state then provincial biodiversity targets cannot be met (SANBI, 2017).
- ESAs are areas that are not essential for meeting biodiversity representation targets but play an important role in supporting the ecological functioning of ecosystems as well as adjacent Critical Biodiversity Areas, and/or in delivering ecosystem services that support socio-economic development (SANBI, 2017).

Provincial CBAs and ESAs are often further classified into sub-categories, such as CBA1 and CBA2 or ESA 1 and ESA 2. These present fine scale habitat and biodiversity area baseline requirements and associated land management objectives or outcomes. The highest categorization level is often referred to as an 'Irreplaceable Critical Biodiversity Area' which usually represents pristine natural habitat that is very important for conservation.

It was noted that most of the project components overlap with ESA 1 areas, including parts of the Mponeng Lower Compartment (Figure 3-5). Only parts of the pipelines were observed to overlap with CBA 2 area.

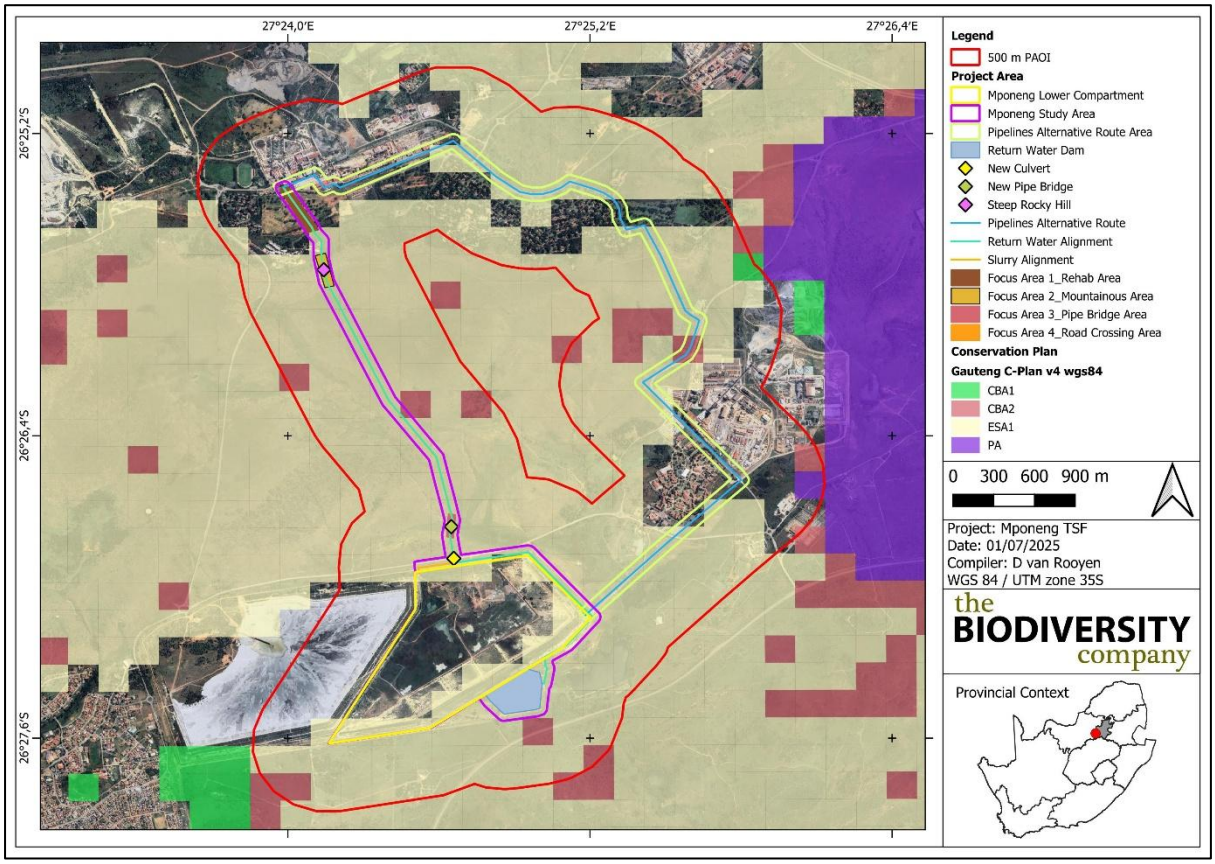


Figure 3-5 The Gauteng Conservation Plan v4 overlain on the project area

3.2 Wetland Field Survey

3.2.1 Delineation

Four distinct wetland types, each corresponding to a Hydrogeomorphic (HGM) unit, have been identified in relation to the proposed project site and its respective PAOI (Figure 3-6 and Figure 3-7). These wetland types are classified as follows: one channelled valley-bottom (HGM 1), one Unchannelled valley bottom (HGM 2), one hillslope seep (HGM 3) and one seep (HGM 4) wetland. All of the identified HGM units except for HGM 4 were intersected by the proposed infrastructure.

In addition to these four HGM units, several artificial watercourses were identified within the PAOI. These artificial watercourses include wetlands (seep), dams (holding dam, in-stream and off-channel dam) and artificial features. Furthermore, multiple non-perennial drainages were identified within the PAOI, along with a spring within the existing Mponeng Lower Compartment TSF, which is also being used as a holding dam and landfill facility.

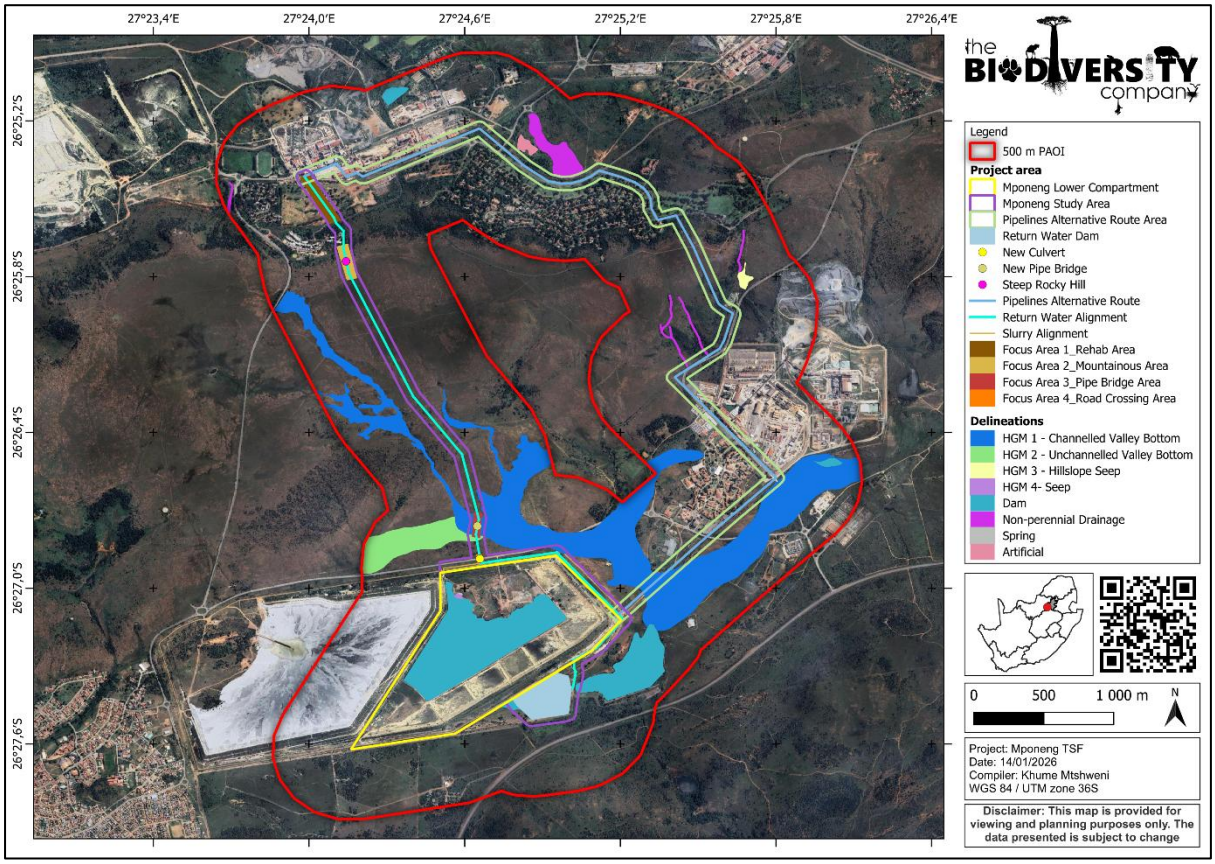


Figure 3-6 Delineation of wetland features within the Proposed Site and Project Area of Influence

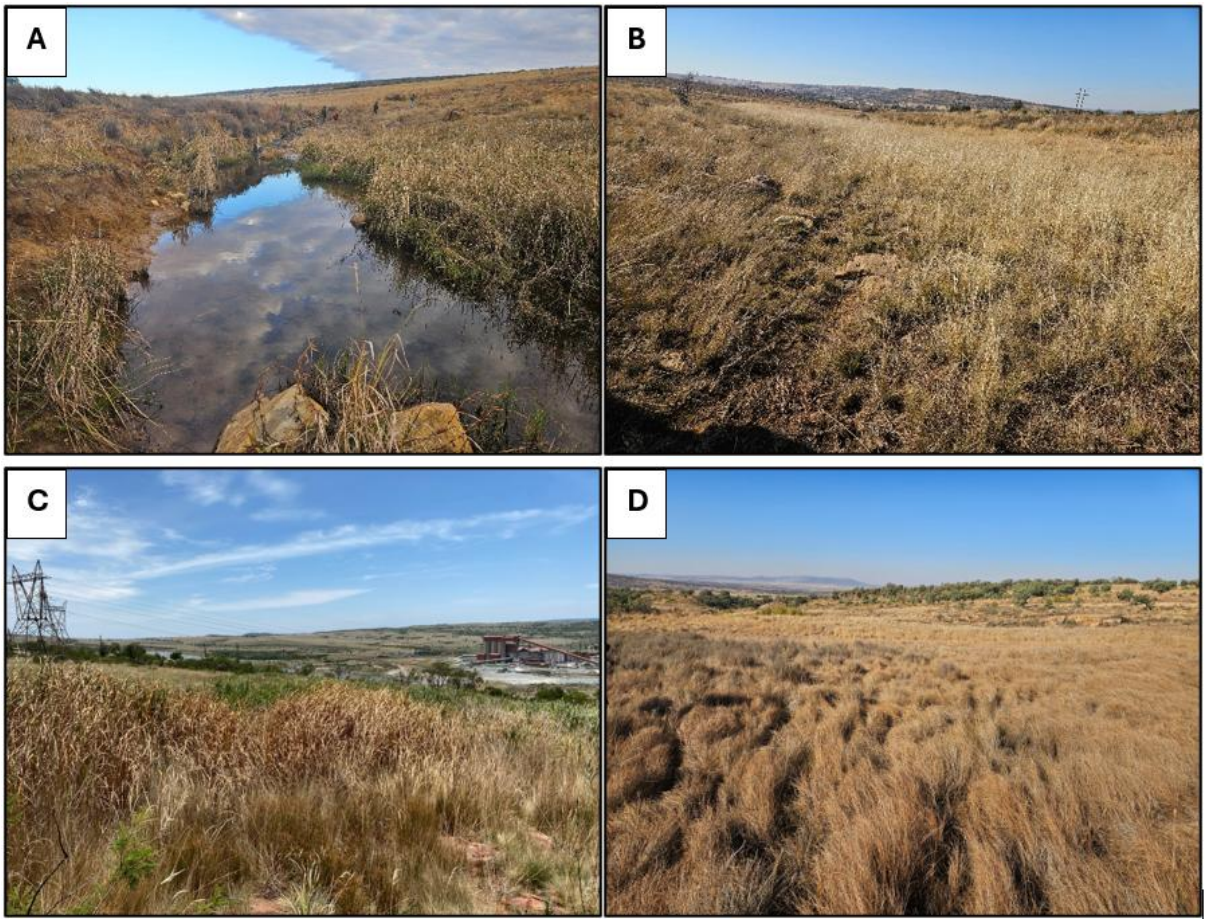


Figure 3-7 Examples of the wetlands delineated within the project area. A) HGM 1 – Channelled valley-bottom, B) HGM 2 - Unchannelled valley-bottom, C) Hillslope seep and D) Seep,

3.2.2 Area of Wetlands

The table below summarises the individual wetland areas and the percentage that each HGM unit comprises of the total wetland area within the PAOI, which amounts to 122.19 ha (Table 3-2).

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

HGM Units	Area (Ha)	Size (%)
HGM 1	108.21	88.56
HGM 2	13.01	10.65
HGM 3	0.82	0.67
HGM 4	0.15	0.12
Spring	0.01	0.01
Total	**122.20**	**100**

3.2.3 Classification and Description

The wetland classification as per SANBI guidelines (Ollis et al., 2013) for the proposed site is presented in

Table 3-3. Several different wetland types were identified within the project area, consisting of a channelled valley-bottom, an unchannelled valley-bottom and seep wetlands.

Table 3-3 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	Highveld	Central Bushveld Group 1	Valley-floor	Channelled valley-bottom	N/A	N/A
HGM 2				Valley floor	Unchannelled Valley-bottom	N/A	N/A
HGM 3				Slope	Seep	Without channelled outflow	N/A
HGM 4							

Unchannelled valley bottom wetlands are typically found on valley floors where the landscape does not allow high energy flows. Figure 3-8 presents a diagram of a typical unchannelled valley bottom wetland, showing the dominant movement of water into, through and out of the system.

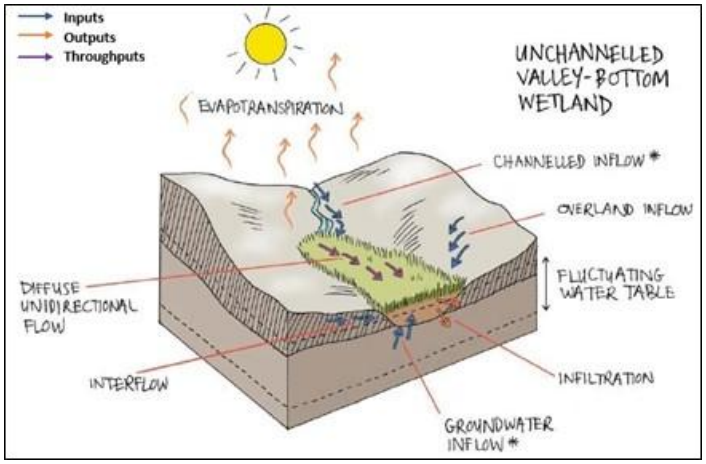


Figure 3-8 Amalgamated diagram of an unchannelled valley-bottom wetland, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al., 2013)

A seep wetland is typically located on gently to steeply sloping land and is characterized by the colluvial, unidirectional movement of water and material down-slope (Ollis *et al.,* 2013). Seeps are often found on the side-slopes of a valley but do not usually extend onto the valley floor. The primary water inputs for seeps are subsurface flows from an up-slope direction, with water movement through the seep mainly occurring as interflow. During and after rainfall events, diffuse overland flow, known as sheetwash, can also be significant. Seeps are associated with geological formations and topographic positions that either cause groundwater to discharge to the land surface or rain-derived water to seep down-slope as subsurface interflow. This unique hydrological setting allows seeps to support specific vegetation adapted to these conditions, contributing to their ecological significance in the landscape. Figure 3-9 illustrates a diagram of the hillslope seeps, showing the dominant movement of water into, through and out of the system.

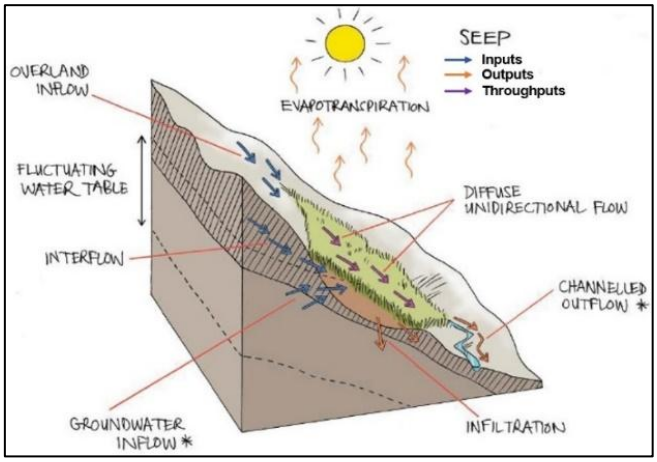


Figure 3-9 Amalgamated diagram of a typical seep wetland, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al. 2013)

A channelled valley-bottom wetland, is a wetland ecosystem located along a valley floor, characterized by the presence of a river channel running through it (Ollis *et al.,* 2013). These wetlands are distinct from floodplain wetlands due to the absence of characteristic floodplain features and the presence of a defined river channel. The landscape setting of a channelled valley-bottom wetland typically involves a valley floor where the wetland receives water inputs from the river channel, either as surface flow during flooding or as subsurface flow, and from adjacent valley side-slopes through overland flow or interflow. The hydrodynamics of these wetlands are influenced by the river channel, which provides a concentrated flow of water, contributing to the wetland's ecological functions such as sediment trapping, nutrient cycling, and habitat provision. This setting makes channelled valley-bottom wetlands crucial for maintaining the ecological integrity of riverine systems and supporting biodiversity. Figure 3-10 presents a diagram of a typical channelled valley bottom, showing the dominant movement of water into, through and out of the system.

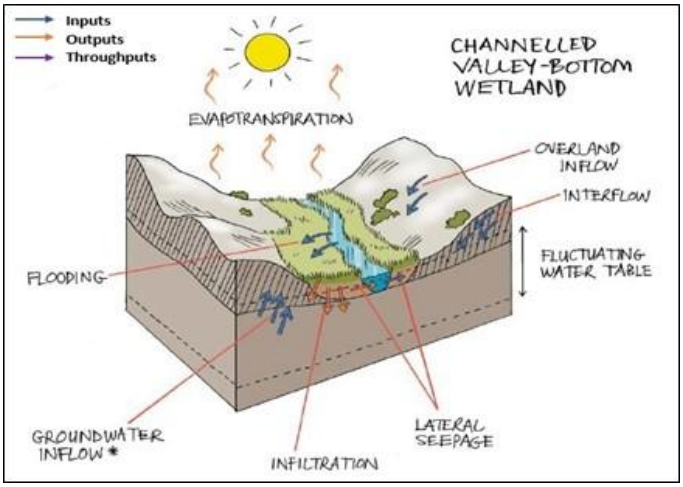


Figure 3-10 Amalgamated diagram of a typical channelled valley bottom, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al. 2013)

The DWAF (2005) manual separates the classification of watercourses into three (3) separate types of channels or sections defined by their position relative to the zone of saturation in the riparian area (Figure 3-11). The classification system separates channels into:

- those that do not have baseflow (‘A’ Sections);
- those that sometimes have baseflow (‘B’ Sections) or non-perennial; or

- those that always have baseflow ('C' Sections) or perennial.

The drainage feature on site can be described as "A Section" channels.

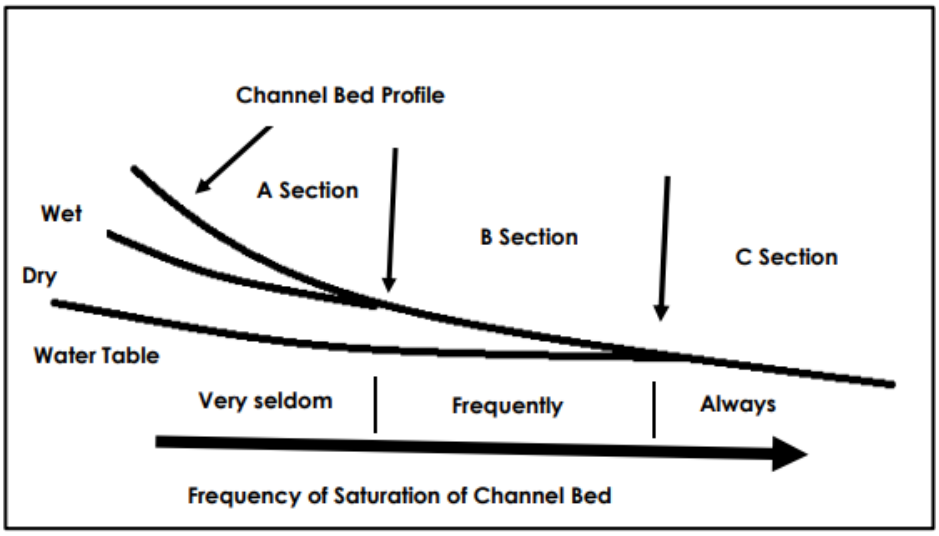


Figure 3-11 Watercourse classifications (DWAF, 2005)

3.3 Risk Screening

Table 3-4 provides the results of risk screening for the natural wetlands and provides motivation for each of the determined categories.

Table 3-4 Risk status of the delineated wetlands

HGM unit / Feature	Risk Status	Reasoning
HGM 1 and HGM 2	At Risk	The return water and slurry alignment pipes traverses the wetlands. Direct impacts to these features are therefore expected. Indirect impacts from the Mponeng Lower Compartments are expected to occur on HGM 1 due to slope and distance relative to the wetland.
HGM 4 / Spring	At Risk	These systems are located within the Mponeng Lower Compartments TSF. Any further activity within this TSF will result in the destruction of these systems.
HGM 3	Not at Risk	Due to the location of this feature within the landscape and its distance (approximately 150 m) to the proposed pipeline alternative route, the wetland is considered not to be at risk.

3.4 Functional and Ecological Assessment

Only wetlands at an appreciable level of risk in relation to the proposed project and related activities were considered for the Functional and Ecological Assessments. Instream dams were assessed as part of the HGM unit they occur within. Artificial features may provide ecosystem services however, they do not represent natural ecological settings and do not have reference states for ecosystem health assessments. HGM 4 and the spring wetland will be excluded from the functionality assessment due to the spring not being a true wetland, and the destruction of HGM 4, which occurs within a TSF.

3.4.1 Functional Assessment

3.4.1.1 General Functional Description

Unchanneled valley-bottoms are characterised by sediment deposition, a gentle gradient with streamflow generally being spread diffusely across the wetland, ultimately ensuring prolonged saturation levels and high levels of organic matter. The assimilation of toxicants, nitrates and phosphates are usually high for unchanneled valley-bottom wetlands, especially in cases where the

valley is fed by sub-surface interflow from slopes. The shallow depths of surface water within this system adds to the degradation of toxic contaminants by means of sunlight penetration (Kotze *et al*., 2009).

Hillslope seep wetlands are typically found on hillsides where water emerges from subsurface flows, creating a diffuse downslope movement. These wetlands are primarily fed by groundwater discharges, although surface water contributions can also supplement flows. Hillslope seeps are particularly effective in water quality enhancement, notably in the removal of excess nutrients and pollutants such as nitrates, through processes like denitrification. This is facilitated by the wetland's vegetation, which provides organic carbon necessary for microbial processes that assimilate these nutrients. The vegetation also plays a critical role in stabilizing the soil, thereby reducing erosion risks, although the generally steep slopes of hillslope seeps can increase erosion susceptibility if vegetation cover is compromised. Additionally, these wetlands contribute to streamflow regulation by slowing down subsurface water movement, which prolongs water contribution to stream systems during low flow periods, although their flood attenuation capacity is limited once the soils are saturated (Kotze *et al.,* 2009)

Channelled valley-bottom wetlands are characterized by their location in valley bottoms with a well-defined stream channel. These wetlands play a crucial role in hydrological processes, particularly in flood attenuation and sediment trapping. The presence of a channel allows for the movement of water, which can contribute to the regulation of streamflow, especially during periods of low flow. The vegetation in these wetlands provides resistance to water flow, thereby slowing down the movement of water and allowing for the deposition of sediments. This process not only helps in maintaining water quality by trapping sediments and associated nutrients but also supports the wetland's role in flood attenuation by spreading out and slowing down floodwaters. Additionally, channelled valley-bottom wetlands can contribute to the removal of nitrates and toxicants from the water, enhancing the overall water quality in the catchment area. These wetlands are integral to maintaining the ecological balance and providing essential ecosystem services, such as water purification and habitat provision for various species (Kotze *et al.,* 2009).

It should be noted that these characteristics are representative of ideal wetland features and may not necessarily represent the characteristics of all wetlands. The functionality of wetlands and the provision of benefits is largely dependent on wetland size and influence from abiotic drivers.

3.4.1.2 Ecosystem Services

The ecosystem services provided by the relevant wetland units on site were assessed and rated using the WET-EcoServices method (Kotze *et al.,* 2009). The results of the assessment are discussed below. Ecosystem services contributing to these scores include flood attenuation, stream flow regulation, nutrient and toxicant assimilation and the maintenance of biodiversity.

Ecosystem services contributing to scores determined for the valley bottom wetlands (HGM 1 and HGM 2), include Education and research, flood attenuation, stream flow regulation, nutrient and toxicant assimilation and the maintenance of biodiversity. Charismatic faunal and avifaunal species were observed at the permanently inundated areas such as the headwater outlets and springs of HGM 1. Vegetation robustness and density may have contributed to stream flow regulation, slowing down flow, which in turn aids in nutrient and toxicant assimilation.

HGM 2 was observed to have a gentler slope and dense graminoid vegetation. This may contribute to flood attenuation more than HGM 1 which presented steep banks and exposed bedrock in certain parts of the system.

3.4.2 Present Ecological State

Four modules, namely hydrology, geomorphology, water quality and vegetation, were assessed as a single unit for the HGM Units and subsequently an area weighted score was obtained for the HGM Units. The potential impacts of activities such as agriculture, drought, prospecting, mining, altered

hydrological functions and clearing of natural vegetation within the greater catchment were taken into consideration during the assessment.

HGM 1 and HGM 2 have been subject to heavy disturbances in the lower reaches as a result of mining activities. The wetlands contain geomorphic structural changes from impoundments such as dams, TSFs and roads. Greater impacts were observed at HGM 1 due to its location relative to mining and associated activities. HGM 2 was observed to be indirectly impacted by the mining activity but more so by the TSF and road locates south of the system. The impoundments and road crossing points at HGM 1 have resulted in changes to the hydrology of the system by limiting natural flows and creating concentrated flows during wet seasons. The wetlands (HGM 1 and HGM 2) catchment is dominated by mining and urban build-up, which play a role in changing the flow and sediment dynamics of the systems. Since disturbance has occurred within the wetlands, in the catchment and on the periphery of the wetlands, the removal of natural vegetation has created opportunity for the proliferation of alien vegetation such as *Bidens Pilosa*, *Cirsium vulgare* and *Verbena bonariensis*. Furthermore, changes to the hydrology of the HGM 1 has resulted in favourable conditions for reeds and reed grasses as opposed to sedges, rushes and grasses which are usually prevalent in channelled valley bottom wetlands.

HGM 1 has been subjected to the most disturbances compared to HGM 2. The wetland contains geomorphic structural changes from mining activities and access roads through the wetland, which justifies the PES score of E – Seriously modified.

HGM 2 presented a PES score of D – Largely Modified and has exhibited some change to its natural hydrology due to alterations of the surrounding landscape which is considered to be the wetlands catchment. Changes to the hydrological patterns of the wetland is assumed to have resulted in the vegetation composition of the wetland being limited to fewer sedge and more graminoid species. The geomorphic structure of the wetland is not perceived to have been altered significantly as no physical earth-moving changes within the wetland were evident except for road construction

3.4.3 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 are considered for the EIS, including the overlap with Strategic Water Source Areas (SWSAs), the NFEPA and NBA 2018 wetland type threat and the protection status and, the wetlands condition as displayed in Table 3-5. It should be noted that the delineated wetlands were not identified by the NBA 2018 dataset, hence the protection and threat status of the nearest wetlands of the same type within the catchment were used as a baseline for the assessment. The average EIS ratings were calculated to be “High” for HGM 1 and HGM 2 (Table 3-5).

Table 3-5 Aspects considered in the Ecological Importance and Sensitivity assessment

HGM Type	NFEPA Wet Type			NBA Wetlands			SWSA (Y/N)	CBA/ESA (Y/N)	EIS Rating
	Type	Ecosystem Threat Status	Ecosystem Protection Level	Wetland Condition	Ecosystem Threat Status 2018	Ecosystem Protection Level			
Channelled Valley-Bottom (HGM 1)	Central Bushveld Group 1	Vulnerable	Poorly Protected	E Seriously Modified (Field Visit)	Critically Endangered	Not Protected	N	Y	B - High
Unchannelled Valley-Bottom (HGM 2)		Least Threatened	Poorly Protected	D Largely Modified (Field Visit)	Critically Endangered	Not Protected	N	Y	B - High

3.4.4 Recommended Ecological Category and Recommended Management Objective

The Recommended Ecological Category (REC) and Recommended Management Objective (RMO) for the wetland areas was determined from the results of the PES and EIS assessments. These assessments indicated that the wetland feature within the site, had underwent transformation as a result of historical and current impacts. Nevertheless, despite the altered ecological integrity of the systems, they are considered to provide ecological services.

The results of the assessment are presented in the table below. The REC for all the wetlands is to Improve the current PES. The appropriate REC and RMO estimated for the wetland areas are presented in Table 3-6 below.

Table 3-6 Summary of the REC and RMO categories assigned to the relevant wetlands

HGM Unit	REC – RMO
HGM 1	E/F – Improve
HGM 2	C/D – Improve

3.5 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 3-7 below. The soil type and topography within the wetland and the catchment was considered in this assessment and contributed to the calculated buffer widths.

The post-mitigation buffer for the wetlands was calculated as 25 m (Figure 3-12).

The following infrastructure components are noted to occur within the delineated wetlands:

- Focus area 3_Pipe Bridge area;
- Return water pipeline alignment; and
- Pipelines Alternative Route

It is advised that any disturbance to the systems be remedied through post-construction rehabilitation of the watercourses which aims to remove alien vegetation, revegetate disturbed and denuded areas within the watercourse and improve the hydrological functioning of the system in terms of the artificial seep which has connectivity to a downstream natural channelled valley-bottom wetland.

Table 3-7 Buffer requirements

Aspect	Post-Mitigation
Construction of infrastructure and operation	25 m

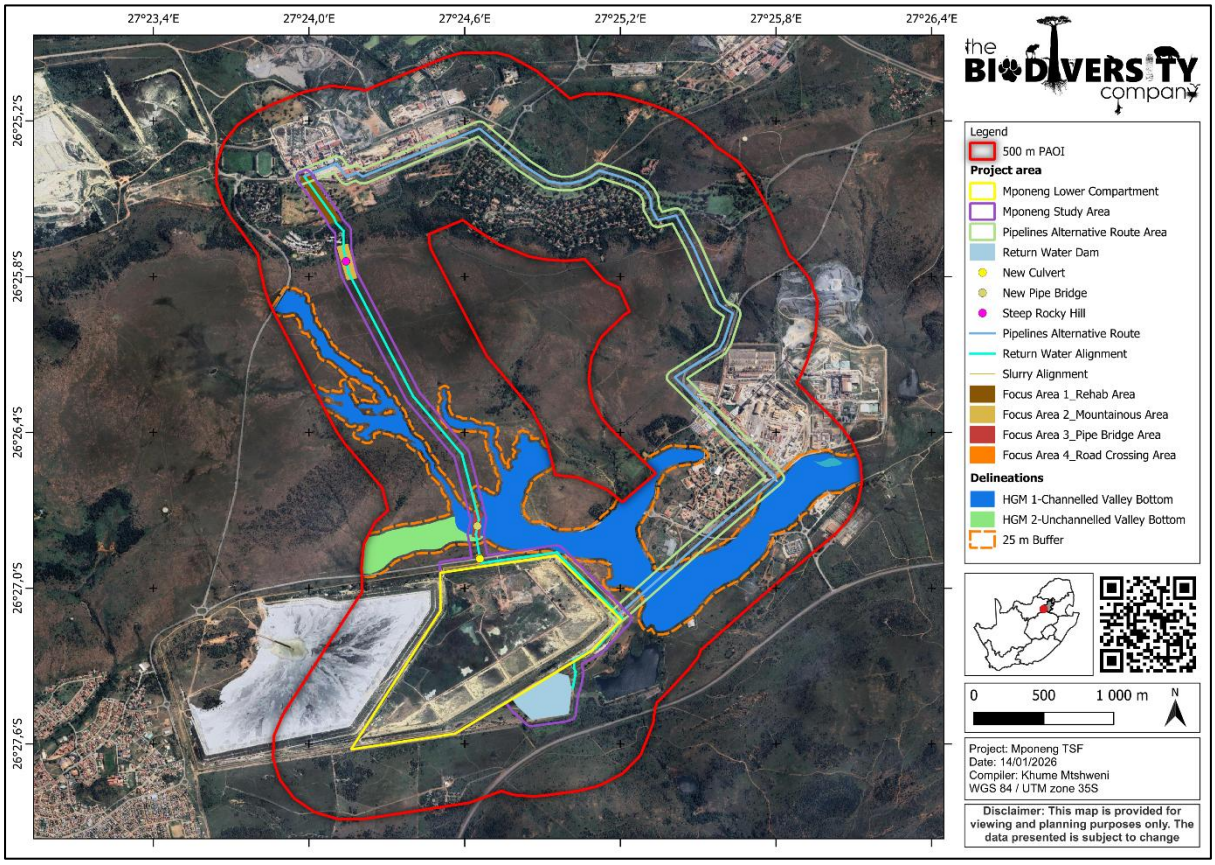


Figure 3-12 Recommended buffers for the identified wetlands (excluding activities within watercourses

3.5.1 Regulation Zones

Table 3-8 presents the legislated zones of regulation that would be applicable to the wetland areas.

The regulated areas of a watercourse in terms of GN 509 as it relates the NWA (1998) must be considered for infrastructure located within these areas.

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.

Given that the proposed development occurs within 32 m and 500 m of a watercourse, both authorisations are applicable for the project.

Table 3-8 Legislated zones of regulation

Regulatory authorisation required	Zone of applicability
Water Use License Application in terms of the National Water Act, 1998 (Act No. 36 of 1998). Department of Water and Sanitation (DWS)	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: 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.
Listed activities in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) EIA Regulations (2014), as amended.	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: The development of: (xii) Infrastructure or structures with a physical footprint of 100 square meters 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 meters of a watercourse, measured from the edge of a watercourse.
	Activity 14 of Listing Notice 3 (GN 327) of the National Environmental Management Act, 1998 (Act No.107 of 1998) EIA regulations, 2014 (as amended) states that: The development of— (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse.
	Activity 23 of Listing Notice 3 (GN 327) of the National Environmental Management Act, 1998 (Act No.107 of 1998) EIA regulations, 2014 (as amended) states that: The expansion of— (i) dams or weirs where the dam or weir is expanded by 10 square metres or more; or (ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more; where such expansion occurs— (a) within a watercourse; (b) in front of a development setback adopted in the prescribed manner; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse.

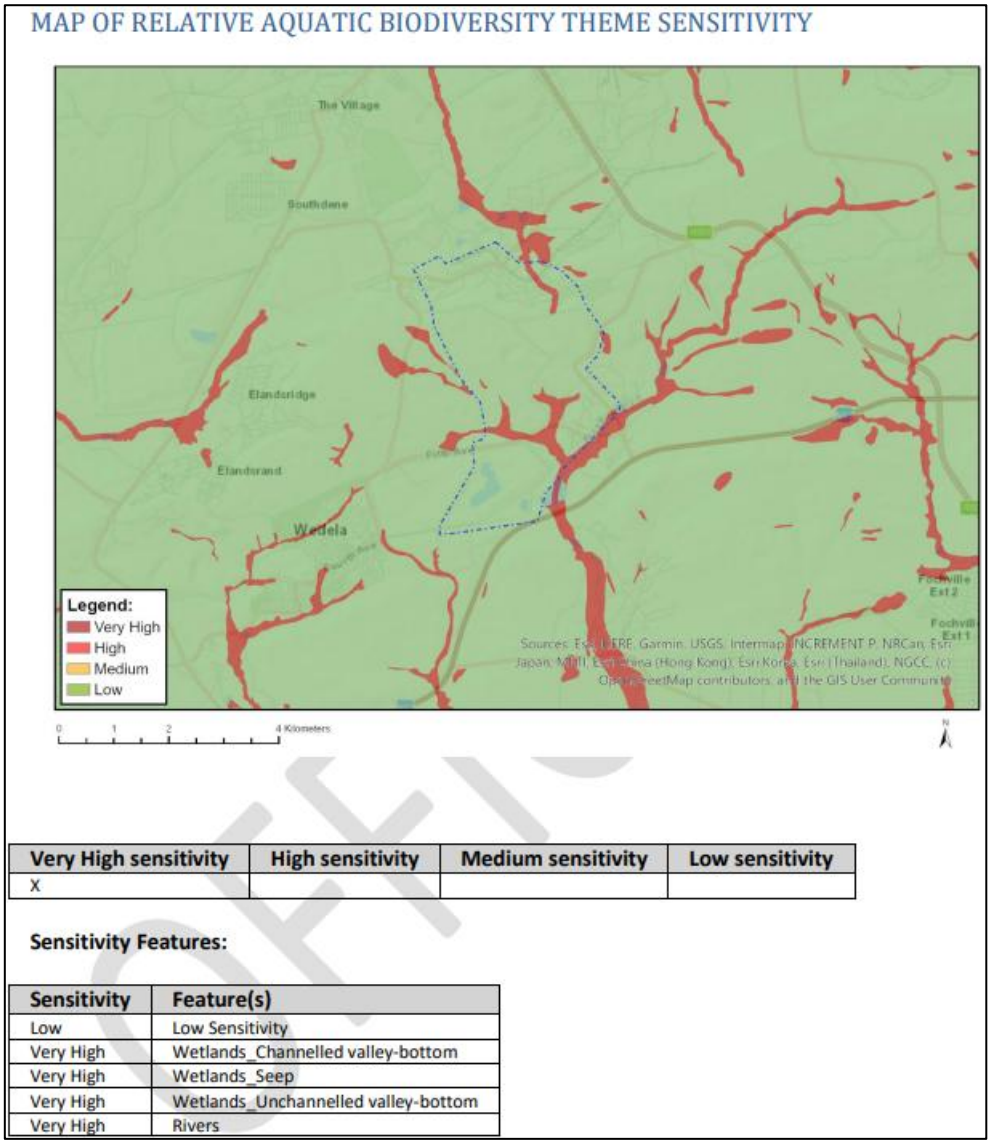
3.6 Site Sensitivity Verification

3.6.1 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):

- The National Web-based Environmental Screening Tool has characterised the Aquatic Biodiversity Theme sensitivity as “Low” for majority of the Project Site and PAOI (Figure 3-13); and

- The National Web-based Environmental Screening Tool has characterised the Aquatic Biodiversity Theme sensitivity as “Very High” for sections within the Project Site and PAOI, assigned for the presence of Wetlands (Channelled valley-bottom, Seep and Unchannelled valley-bottom) and Rivers (Figure 3-13).



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low Sensitivity
Very High	Wetlands_Channelled valley-bottom
Very High	Wetlands_Seep
Very High	Wetlands_Unchannelled valley-bottom
Very High	Rivers

Figure 3-13 The Aquatic Biodiversity Theme Sensitivity for the proposed project (National Environmental Web-based Screening Tool (DEA, 2024)

3.6.2 Screening Tool Comparison

The allocated sensitivities for each of the relevant themes are either disputed or validated for the assessed areas in Table 3-9 below. A summative explanation for each result is provided as relevant. It should be noted that the National Web-based Environmental Screening Tool allocates sensitivities to freshwater resources identified through the available national freshwater datasets based on their presence (very high) or absence (low). The specialist-assigned sensitivity ratings presented herein for the natural and assessed wetlands have considered the PES and EIS assessment processes followed in the previous section, and consideration has been given to any observed or likely presence of sensitive fauna and flora. A map highlighting the Freshwater Sensitivity for the PAOI is depicted in Figure 3-14.

Table 3-9 Summary of the screening tool vs specialist assigned sensitivities

Features	Screening Tool Theme	Environmental Screening Tool Sensitivity	Specialist Sensitivity	Tool Validated or Disputed by Specialist - Reasoning
HGM 1 (CVB) and HGM 2 (UVB)	Aquatic Biodiversity Theme	Very High	High	Screening Tool Sensitivity Disputed. Rational for the specialist assigned 'High' rating: This wetland systems have experienced historical impacts related to mining and impoundments. Even though largely and seriously modified, the wetlands still present functionality and this has contributed towards determining the sensitivity ratings. The wetlands have therefore been assigned a 'High' sensitivity rating.
HGM 3 (Seep)		Very High	High	Screening Tool Sensitivity Validated. Rational for the specialist assigned 'High' rating: This wetland system has experienced historical impact related to mining. Even though largely modified the wetland still has functionality and this has contributed towards determining the sensitivity rating. The wetland has therefore been assigned a 'High' sensitivity rating.
HGM 4 (Seep) and Spring		Low	Low	Screening Tool Sensitivity Validated. This seep occurs in a TSF that is used as a holding dam and landfill facility. This watercourse has been rated as "Low" due to this systems location. The spring is also located within the TSF and showed no connectivity to natural watercourses besides the TSF holding dams. It is in a disturbed state and presented no significant ecological services.
Non-perennial Drainage		Low	Medium	Screening Tool Sensitivity Disputed. Rational for the specialist assigned 'Medium' rating: These watercourses have experienced historical impact related to mining activities. The connectivity of some of the features to downstream watercourses increases their importance in maintaining the hydrological functioning of these systems and providing a corridor to the larger watercourses. This has contributed towards determining the sensitivity rating. The watercourses have therefore been assigned a 'Medium' sensitivity rating.
In-stream dam		Low	High	Screening Tool Sensitivity Disputed. Rational for the specialist assigned 'High' rating: This is an instream feature and will adopt the sensitivity of the watercourse it occurs within and has therefore been assigned a 'High' sensitivity rating.
Off-channel dam		Low	Low	Screening Tool Sensitivity Validated. Rational for the specialist assigned 'Low' rating: This is an off-channel feature and is artificial and has therefore been assigned a 'Low' sensitivity rating.
Artificial watercourses (Holding dams)		Low	Low	Screening Tool Sensitivity Validated. Rational for the specialist assigned 'Low' rating: This is an off-channel feature and is artificial and has therefore been assigned a 'Low' sensitivity rating.
Remaining Area		Low	Low	Screening Tool Sensitivity Validated. Rational for the specialist assigned 'Low' rating: Much of the area has been historically modified through agricultural and mining activity. The proposed activities are not anticipated to significantly modify the hydrological characteristics of the entire area; therefore a 'Low' sensitivity has been assigned for these areas in relation to freshwater biodiversity.

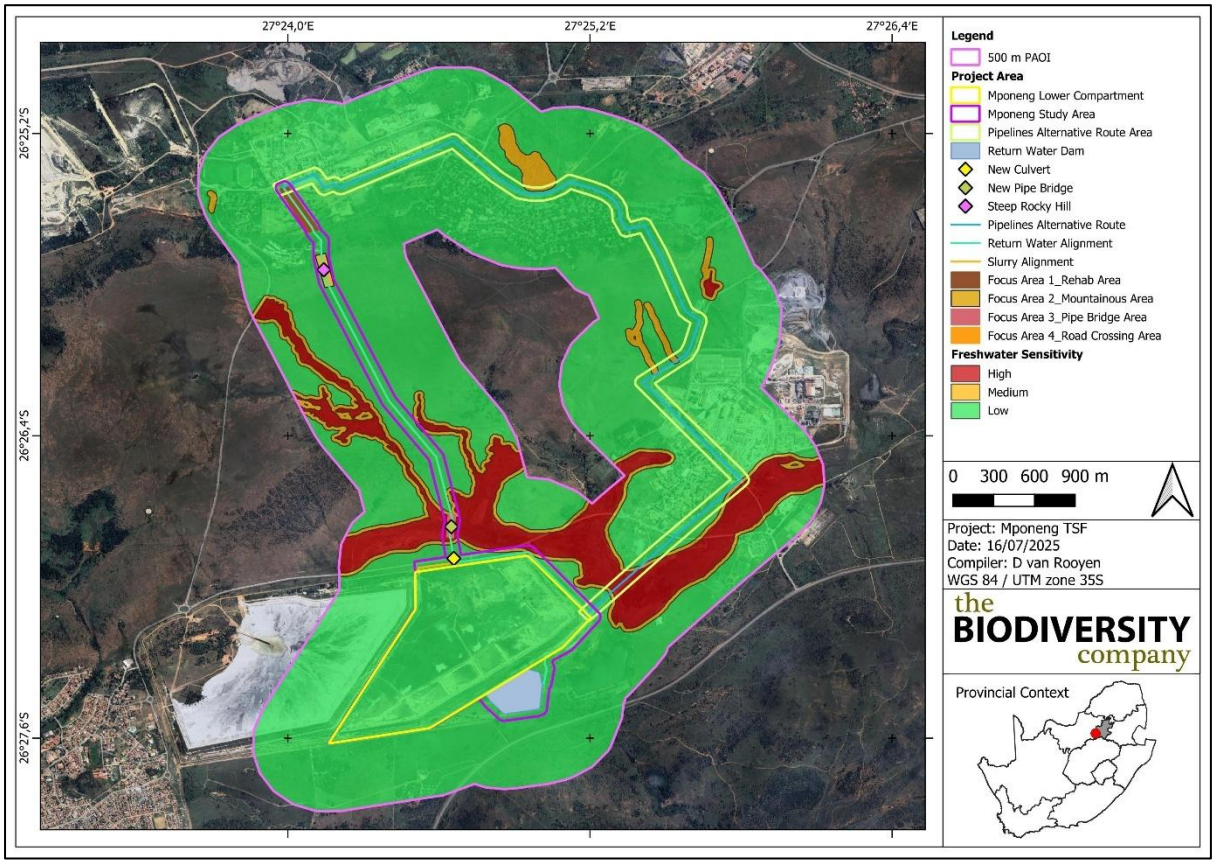


Figure 3-14 Sensitivity Map for the Project Area of Interest

4 Risk and Impact Assessment

4.1 Current Impacts to Freshwater Biodiversity

The assessed wetlands exhibit impacts at local scale. These impacts result from present and historical land use relating to agricultural practice, impoundments, access roads and to a large degree, mining activities which have transformed the wetland habitats and has altered their natural hydrological regime and vegetation composition. The list below refers to the present-day local impacts observed within the assessed wetland areas:

- Wetland disturbance from other mining practises, development of dams, urban build-up and traffic;
- Altered hydrological inputs resulting from changes to the surrounding landscape;
- Erosion induced from altered hydrodynamics in combination with the loss of wetland vegetation;
- Altered geomorphology from historical mining practises and development of dams within the wetlands;
- Loss of wetland vegetation from continual disturbances, historical land use and the establishment of alien invasive flora species in some approaches of the wetlands; and

4.2 Alternatives Considered

No other site alternatives were provided for the proposed project, and the assessed areas are considered to be the preferred options for development and have been used to determine potential impacts to the identified wetlands.

4.3 Quantitative Risk and Impact Assessment

The Risk / Impact Assessment considered the indirect impacts, to the wetland systems and drainage features. 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.

A Risk / Impact Assessment was undertaken for the various project components and is presented below.

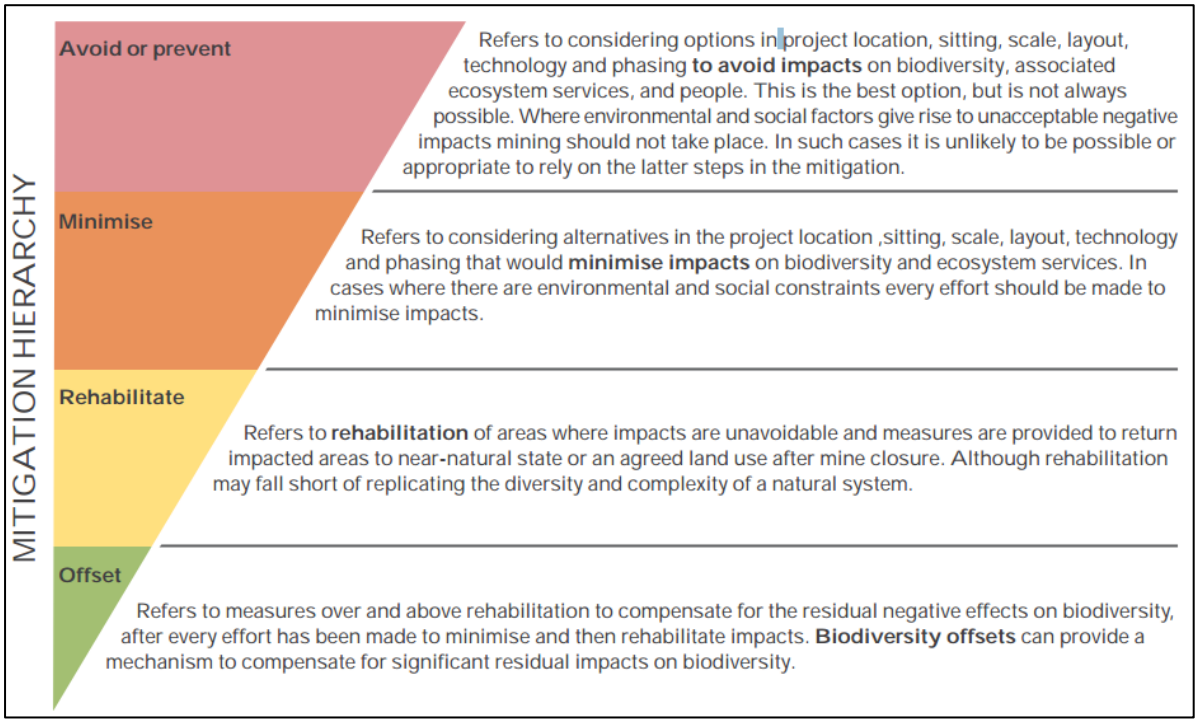


Figure 4-1 The mitigation hierarchy as described by the DEA (2013)

4.3.1 Potential Anticipated Impacts

Table 4-1 illustrates the potential aspects expected to threaten the integrity of sensitive receptors during the proposed activities. The pre- and post- mitigation significance ratings have been calculated considering various parameters, these results are presented in the subsequent tables.

It must be noted that the Risk and Impact assessments will mainly focus on the construction and operation of the proposed pipelines. Impacts resulting from the TSF are anticipated to be Low considering that it is an existing facility that will continue to be used, with that being mentioned, the main risks associated with the TSF may result from structural failure, dust pollution and toxicant seepage from unlined surfaces.

A decommissioning phase was not considered for this project due to TSFs sustaining extensive durations that exceed mining operations.

Table 4-1 Activities and impacts relevant to the proposed activity

Activity	Aspects and Impacts
Construction Phase	
Vegetation Clearing and Site Preparation; Excavation, Installation of pipelines; Construction of Culverts; Construction of pipe bridge; Storage of chemicals, mixes, and fuels with associated accident spills; Indiscriminate dumping of waste products or construction materials; Soil stockpiling and building material stockpiles; Operation of vehicles, equipment, and machinery.	Disturbance and degradation of wetland vegetation
	Alteration of surface topography (excavations, reshaping and compacting)
	Increased bare surfaces, runoff and potential for erosion
	Introduction and spread of alien and invasive vegetation
	Waste and pollutant spills
	Increased sediment loads to downstream reaches
	Contamination of wetlands with hydrocarbons due to leaks and spillages from machinery, equipment & vehicles as well as contamination and eutrophication of wetland systems with human sewerage and litter
	Terrain alteration for pipeline and bridges

	Final Landscaping and reshaping
Operational Phase	
Vehicles and machinery driving in and through wetlands Maintenance of vehicles and machinery. Storage of chemicals, mixes and fuel (Leak and spill hazard). Clearing of vegetation. Discharge of slurry, solvents, chemicals and hydrocarbons. Pipeline system failures TSF failure	Alteration of surface drainage and runoff
	Stormwater Management
	Trampling of wetland vegetation
	Proliferation of alien and invasive species
	Slurry and pollutant spills into water resources
	Water quality impairment

Indirect impacts from the TSF are potential to the wetlands identified to be at risk, whereas direct impacts are expected from the pipelines and bridges for the wetlands. Emphasis was therefore placed on minimising impacts by means of mitigation.

The potential impacts on HGM 3 are mitigated by distance, while impacts on HGM 4 are mitigated by the presence of existing infrastructure.

It should be noted that the project presents an opportunity to rehabilitate the watercourses which would result in a positive impact.

Table 4-2 Summative results of the Risk Assessment conducted for the proposed project

Phase	Activity	Impact	Potentially affected watercourses Name/s	Significance (max = 100)	Risk Rating	Confidence level
CONSTRUCTION	Vegetation Clearing and Site Preparation; Excavation, Installation of pipelines; Construction of Culverts; Construction of pipe bridge; Storage of chemicals, mixes, and fuels with associated accident spills; Indiscriminate dumping of waste products or construction materials; Soil stockpiling and building material stockpiles; Operation of vehicles, equipment, and machinery	Disturbance and degradation of wetland vegetation	HGM 1 and HGM 2	**32**	**M**	High
		Alteration of surface topography (excavations, reshaping and compacting)	HGM 1 and HGM 2	**32**	**M**	High
		Increased bare surfaces, runoff and potential for erosion	HGM 1 and HGM 2	**32**	**M**	High
		Introduction and spread of alien and invasive vegetation	HGM 1 and HGM 2	**32**	**M**	High
		Waste and pollutant spills	HGM 1 and HGM 2	**24**	**L**	High
		Increased sediment loads to downstream reaches	HGM 1 and HGM 2	**25,6**	**L**	High
		Contamination of wetlands with hydrocarbons due to leaks and spillages from machinery, equipment & vehicles as well as contamination and eutrophication of wetland systems with human sewerage and litter	HGM 1 and HGM 2	**32**	**M**	High
		Terrain alteration for pipeline and bridges	HGM 1 and HGM 2	**40**	**M**	High
		Final Landscaping and reshaping	HGM 1 and HGM 2	**25,6**	**L**	High
OPERATIONAL	Routine operation and maintenance of the structures: Vehicles and machinery driving in and through wetlands Maintenance of vehicles and machinery. Storage of chemicals, mixes and fuel (Leak and spill hazard). Clearing of vegetation. Discharge of slurry, solvents, chemicals and hydrocarbons	Alteration of surface drainage and runoff	HGM 1 and HGM 2	**24**	**L**	High
		Stormwater Management	HGM 1 and HGM 2	**25,6**	**L**	High
		Trampling of wetland vegetation	HGM 1 and HGM 2	**28**	**L**	High
	Pipeline system failures TSF failure	Proliferation of alien and invasive species	HGM 1 and HGM 2	**32**	**M**	High

		Slurry and pollutant spills into water resources	HGM 1, HGM 2 and Spring	**33,6**	**M**	High
		Water quality impairment	HGM 1, HGM 2 and Spring	**36**	**M**	High

4.4 Impact Assessment

The impacts associated with the proposed activities, was assessed in the impact matrix provided by EIMS and the results are given in Table 4-3.

Table 4-3 Summative results of the Impact Assessment conducted for the proposed project, along with the prescribed mitigation measures.

Impact	Phase	Pre-mitigation ER	Post-mitigation ER	Final score
Direct loss, disturbance and degradation of wetlands	Construction	-6	-3	-3,75
Mitigation • Minimise the construction footprint and restrict vegetation clearing to the designated construction area. • Rehabilitate any disturbances within the watercourse by manually tilling the soil and replanting with native vegetation. • Limit vehicle and machinery movement near the wetland to designated routes. • Limit all other activities in watercourse areas to those explicitly authorised.				
Alteration of surface topography (reshaping and compacting)	Construction	-8	-5,25	-6,5625
Mitigation • Restrict vehicle and machinery usage to designated paths; • Ensure that sediment and erosion controls are incorporated into the suggested stormwater management plan; • Limit construction where possible to the dry season, especially for activities that occur within the watercourse or its buffer area; • Ensure that any unplanned establishment of concentrated flow paths together with any denuded areas are appropriately rehabilitated and revegetated; and • Ensure that soil stockpiles are located out of the watercourse, on flat terrain and is safe guarded against wind and rain erosion by bunding or temporary covering				
Increased bare surfaces, runoff and potential for erosion	Construction	-8,25	-4	-5
Mitigation • Maintain access roads to prevent erosion and sedimentation. • If supports must be constructed within the watercourse, remove and replace soil in the order it was excavated, with topsoil and subsoil stockpiled separately. Store stockpiles on a flat surface outside the watercourse, protected from rain and erosion. • Implement and maintain a stormwater management system that diverts clean runoff away from contaminated areas and directs potentially contaminated water to treatment facilities before discharge.				
Degradation of wetland vegetation and the introduction and spread of alien and invasive vegetation	Construction	-7,5	-3,5	-4,375
Mitigation • Monitor and manage invasive species in disturbed areas. • Minimise the construction footprint and restrict vegetation clearing to the designated construction area. Rehabilitate any disturbances within the watercourse by manually tilling the soil and replanting with native vegetation.				
Waste and pollutant spills	Construction	-9	-6	-7,5
Mitigation • Restrict the use of machinery and vehicles within the watercourse and buffer unless for the use on existing roads; • Ensure that all temporary sanitation structures are situated out of the watercourse and its buffer and that these facilities are regularly maintained and monitored for early detection of leaks; • Ensure that no machinery of vehicles is allowed to park within the wetland or buffer; • Ensure that all machinery and equipment is inspected and serviced regularly in a designated area situated out of the wetland and buffer areas; • Ensure that contractors are equipped with spill kits to timeously respond to spillages; • Ensure that all hydrocarbons, oils or other potentially hazardous substances are contained in a designated area which is located on flat terrain out of the watercourse and buffer and is safe guarded from leaking out of the designated area. Use spill containment systems like drip trays and barriers around machinery and storage areas; • Implement spill prevention plans and provide training for workers on spill response procedures;				

Increased sediment loads to downstream reaches	Construction	-7,5	-3,5	-4,375
Mitigation • Maintain access roads to prevent erosion and sedimentation. • If supports must be constructed within the watercourse, remove and replace soil in the order it was excavated, with topsoil and subsoil stockpiled separately. Store stockpiles on a flat surface outside the watercourse, protected from rain and erosion. • Loose soils are particularly prone to loss due to wind or water. It is therefore preferable that construction takes place during the dry season, where possible, to reduce the erosion potential of the exposed surfaces; • Practice good soil management across the construction footprint; • Implement a suitable stormwater management plan for the construction and operation phases; • Signs of erosion must be addressed immediately to prevent further erosion of the area to prevent head cut erosion from forming; • Temporary and permanent erosion control methods may include silt fences, flotation silt curtains, retention basins, detention ponds, interceptor ditches, seeding and sodding, riprap of exposed embankments, erosion mats, and mulching; and • The rehabilitation of watercourse banks must take place following construction. Key areas where erosion has occurred should be rehabilitated through bank reprofiling to gentler gradients and the revegetation of the marginal and riparian areas				
Contamination of wetlands with hydrocarbons due to machinery leaks and eutrophication of wetland systems with human sewerage and other waste	Construction	-8,25	-4,5	-5,625
Mitigation • Prohibit mixing of chemicals or concrete within the watercourse. Store all fuels and chemical mixtures in a bunded area, away from the watercourse. • Regularly inspect and maintain bunded areas around fuel, chemical, and waste storage. • Ensure all solid and hazardous waste is stored in designated, impermeable areas and regularly removed to licensed facilities. • Prevent any waste dumping or littering near the wetland. • Ensure all dirty water reports to a PCD (Pollution Control Dam). • All machinery and equipment should be inspected regularly for faults and possible leaks, these should be out of watercourses and in a designated area that is flat and bunded; • Have action plans on site, and training for contactors and employees in the event of spills, leaks and other impacts to the aquatic systems; • The contractors used for the project should have spill kits available to ensure that any fuel or oil spills are clean-up and discarded correctly; and • The stormwater management plan must aim to release only clean water in the environment				
Terrain alteration for pipeline and bridges	Construction	-7,5	-3	-3,75
Mitigation • Maintain access roads to prevent erosion and sedimentation. • If supports must be constructed within the watercourse, remove and replace soil in the order it was excavated, with topsoil and subsoil stockpiled separately. Store stockpiles on a flat surface outside the watercourse, protected from rain and erosion. • Implement and maintain a stormwater management system that diverts clean runoff away from contaminated areas and directs potentially contaminated water to treatment facilities before discharge**.**				
Final Landscaping and reshaping	Construction	7,5	4	5
• Activities relating to landscaping should be quick, along with a reduced machinery footprint				
Alteration of surface runoff and drainage	Operation	-7,5	-3	-3,75
Mitigation • Install the pipeline above ground when crossing the watercourse, ensuring supports span the entire width wherever feasible. • Limit all other activities in watercourse areas to those explicitly authorised. • Design and implement an effective stormwater management plan; • Re-vegetate denuded areas as soon as possible to increase surface roughness and promote infiltration; and • Regularly clear drains to prevent uncalled for accumulation of surface water and the establishment of concentrated flow paths out of the accumulation areas				
Increased water inputs (clean) to downstream wetlands	Operation	-12	-4,5	-5,625
Mitigation • Implement and maintain a stormwater management system that diverts clean runoff away from contaminated areas and directs potentially contaminated water to treatment facilities before discharge. • Perform regular maintenance and inspections of the pipelines and other water outlets to ensure their integrity and prevent increased volumes of water (with potential contaminates) from entering the watercourse. • Develop and implement emergency response protocols for potential pipeline leaks and retention dam breakages.				
Disruption of wetland soil profile, hydrological regime and increased sediment loads	Operation	-8,25	-4	-5
Mitigation				

• Restrict unauthorised and unnecessary activities within the wetlands and their respective buffers. No laydown areas or storage of equipment and material should be allowed within the wetlands and only activities necessary for construction of the relevant infrastructure (within watercourses) must be permitted. Authorised activities within the watercourse must be overseen by an ECO; • Minimise the disturbance footprint of the development or the proposed infrastructure areas and avoid land clearing outside of these areas to prevent indirect impact to the wetlands; • Clearly demarcate the construction footprint and restrict all activities to within the proposed infrastructure area; • Educate staff and relevant contractors on the location and importance of the identified wetlands through toolbox talks and by including them in site inductions as well as the making them aware of the overall site plan which should indicate sensitive areas, waste disposal areas and any other relevant project specifics. • Limit vehicle and machinery movement near the wetland to designated routes. • Maintain access roads to prevent erosion and sedimentation.				
Degradation of wetland vegetation and proliferation of alien and invasive species	Operation	-9	-3,5	-4,375
Mitigation • Monitor and manage invasive species in disturbed areas. • Minimise the construction footprint and restrict vegetation clearing to the designated construction area. Rehabilitate any disturbances within the watercourse by manually tilling the soil and replanting with native vegetation.				
Slurry and pollutant spills into water resources	Operation	-11,25	-9	-11,25
Mitigation • Monitor and manage TSF carrying capacity. • Rapidly deploy silt barriers, absorbent booms, and temporary gabion berms directly downstream of the breach to physically contain the slurry plume. • Use pumps and temporary diversion channels to reroute clean upstream water away from the contaminated wetland flow path. • Construct in-channel weirs and offline settling ponds or any other similar infrastructure / system within the wetland to slow water velocity and promote sedimentation. • Stabilize the failed TSF structure and exposed tailings with erosion-control matting and rapid hydroseeding. • Conduct careful, phased mechanical removal of gross tailings deposits using low-ground-pressure machinery. • Apply in-situ stabilization or install vertical hydraulic barriers for deeply mixed, contaminated substrates. • Implement a dense network of continuous water quality monitoring to dynamically adjust treatment. • Re-establish the natural wetland hydroperiod and morphology by restoring original topography and natural inlets/outlets. • Replant remediated areas using indigenous, metal-tolerant wetland plant species for phyto-remediation and stabilization.				
Water quality impairment	Operation	-12	-7,5	-9,375
Mitigation • Prohibit mixing of chemicals or concrete within the watercourse. Store all fuels and chemical mixtures in a bunded area, away from the watercourse. • Regularly inspect and maintain bunded areas around fuel, chemical, and waste storage. • Ensure all solid and hazardous waste is stored in designated, impermeable areas and regularly removed to licensed facilities. • Prevent any waste dumping or littering near the wetland. • Ensure all dirty water reports to a PCD (Pollution Control Dam). • All machinery and equipment should be inspected regularly for faults and possible leaks, these should be out of watercourses and in a designated area that is flat and bunded; • Have action plans on site, and training for contactors and employees in the event of spills, leaks and other impacts to the aquatic systems; • The contractors used for the project should have spill kits available to ensure that any fuel or oil spills are clean-up and discarded correctly; and • The stormwater management plan must aim to release only clean water in the environment				

5 Conclusion

Four distinct wetland types, each corresponding to a Hydrogeomorphic (HGM) unit, have been identified in relation to the proposed project site and its respective PAOI. These wetland types are classified as follows: one channelled valley-bottom (HGM 1), one Unchannelled valley bottom (HGM 2), one hillslope seep (HGM 3) and one seep (HGM 4) wetland. All of the identified HGM units except for HGM 4 were intersected by the proposed infrastructure.

In addition to these four HGM units, several artificial watercourses were identified within the PAOI. These artificial watercourses include wetlands (seep), dams (holding dam, in-stream and off-channel dam) and artificial features. Furthermore, multiple non-perennial drainages were identified within the PAOI, along with a spring within the existing Mponeng Lower Compartment TSF, which is also being used as a holding dam and landfill facility.

Wetlands were delineated for a broader area; however, only those wetlands relevant to the proposed development were included in the assessment. As a result, HGM units 4, the non-perennial features and the dams were excluded from the functionality assessment.

The ecological characteristics of the identified natural watercourses are described in Table 5-1. The spring was identified to be at risk and was included in the DWS impact assessment however, no functional assessments was conducted for this feature due to it not being a true wetland.

Table 5-1 Ecological characteristics and buffer requirements of the freshwater features

HGM Unit / Feature	PES	EIS	Ecosystem Services	REC - RMO	Buffer Requirement
HGM 1 - Seep	E - Seriously Modified	B - High	Moderately High	E/F - Improve	25 m
HGM 2 - Seep	D - Largely Modified	B - High	Moderately High	C/D - Improve	25 m

5.1 Risk and Impact Statement

A risk assessment was conducted for the proposed project. The post-mitigation risks for the project presented within the “Moderate and Low Risk” significance categories. Additionally, a second impact assessment was undertaken for the project and the pre-mitigation impact ratings were mostly observed to range between “Medium and Low”, whereas most the post-mitigation impact ratings were “Low”.

5.2 Specialist Opinion

It is the opinion of the specialists that the project can be considered for authorisation by the Competent Authority under these conditions: Where possible, the spring needs to be intercepted, deviated and allowed to pump into HGM 2, south of the TSF. All areas within affected watercourses should be rehabilitated post-construction. Post-construction rehabilitation of the watercourses is perceived to result in positive impacts and will be an effort to compensate for the loss and disturbance of the wetlands as result of the proposed activities.

5.3 Layout Approval

An updated project layout has been received (Figure 5-1). Based on the revised design, the project can be considered for authorisation by the Competent Authority under these conditions: Where possible, the spring needs to be intercepted, deviated and allowed to pump into HGM 2, south of the TSF. Post-construction rehabilitation of the watercourses is perceived to result in positive impacts and will be an effort to compensate for the loss and disturbance of the wetlands as result of the proposed activities. The specialist also confirms that if the mitigation measures of the EMPrs are implemented, the development is supported from a wetland perspective and no new risks are associated with the layout change.

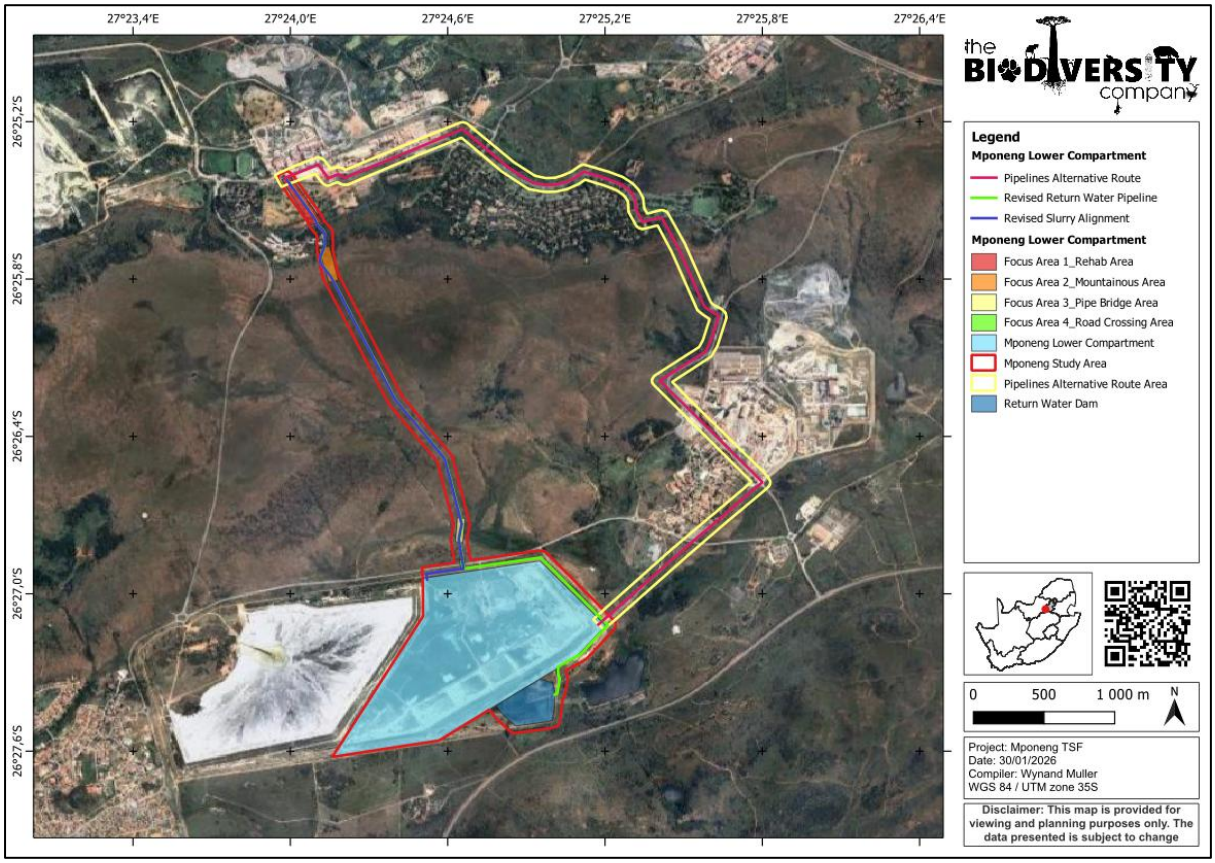


Figure 5-1 Updated layout for the proposed project

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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);
- North West Biodiversity Sector Plan (READ, 2015); 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 Gauteng C-Plan v4

The final spatial outcome of the systematic conservation planning process (ie. The Gauteng C-Plan) is a map that delineates biodiversity priority areas for conservation and sustainable land use management. The map, which is commonly referred to as a Critical Biodiversity Areas or CBA Map, identifies biodiversity priority areas in a number of major categories (Desmet *et al.*, 2024):

- Protected Areas;
- Critical Biodiversity Areas; and
- Ecological Support Areas.

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.

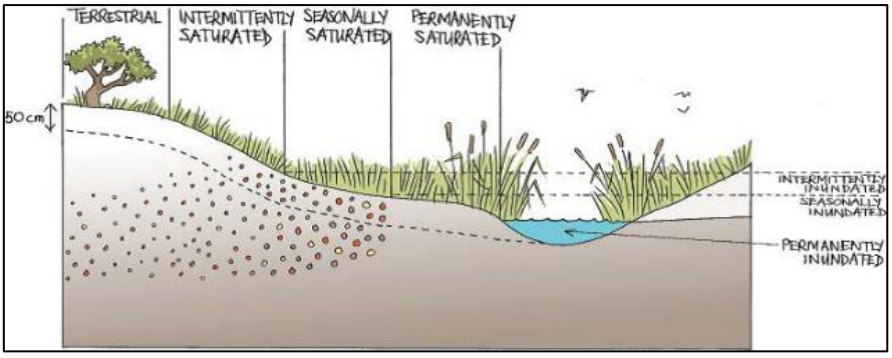


Figure 7-1 Cross section of a wetland, indicating how the soil wetness and vegetation indicators respond to changes in topography (Ollis et al. 2013)

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 Risk Screening

A risk screening procedure which considers the general topography of the proposed area in conjunction with the spatial proximity of the natural wetlands to the proposed areas of development was used to determine the 'Risk Status' of the delineated wetlands. Two broad categories are included in the screening process which classify wetlands to be 'At Risk' or 'Not at Risk'.

7.1.4 Wetland Functional and Ecological Assessment

7.1.4.1 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. Ecosystem 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

7.1.4.2 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 7-2.

Table 7-2 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

7.1.4.3 Ecological Importance and Sensitivity

The importance and sensitivity of water resources is determined in order establish resources that provide higher than average ecosystem service and biodiversity support functions with consideration given to their sensitivity to impacts in relation to their typology and functionality. The mean of the determinants 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

7.1.4.4 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

		Ecological Importance and Sensitivity			
		Very High	***High***	***Moderate***	***Low***
PES	***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

7.1.5 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.

7.1.6 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

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 – EIMS Impact Assessment

Table 7-6 EIMS Impact Assessment for the proposed activities

			Pre-Mitigation							Post Mitigation										
	Impact	Phase	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Pre-mitigation ER	Nature	Extent	Duration	Magnitude	Reversibility	Probability	Post-mitigation ER	Confidence	Cumulative	Irreplaceable	Priority Factor	Final score
1	Direct loss, disturbance and degradation of wetlands.	Construction	-1	1	1	3	3	3	-6	-1	1	1	2	2	2	-3	High	2	2	1,25	-3,75
2	Alteration of surface topography (excavations, reshaping and compacting)	Construction	-1	1	2	3	2	4	-8	-1	1	2	2	2	3	-5,25	High	2	2	1,25	-6,5625
3	Increased bare surfaces, runoff and potential for erosion	Construction	-1	3	2	3	3	3	-8,25	-1	3	1	2	2	2	-4	High	2	2	1,25	-5

4	Degradation of wetland vegetation and the introduction and spread of alien and invasive vegetation	Construction	-1	3	2	2	3	3	-7,5	-1	2	1	2	2	2	-3,5	High	2	2	1,25	-4,375
5	Waste and pollutant spills	Constructi	-1	3	2	3	4	3	-9	-1	2	2	2	2	3	-6	High	2	2	1,25	-7,5
6	Increased sediment loads to downstream reaches	Construction	-1	3	2	2	3	3	-7,5	-1	2	1	2	2	2	-3,5	High	2	2	1,25	-4,375
7	Contamination of wetlands with hydrocarbons due to machinery leaks and eutrophication of wetland systems with human sewerage and other waste.	Construction	-1	3	2	3	3	3	-8,25	-1	3	1	3	2	2	-4,5	High	2	2	1,25	-5,625

8	Terrain alteration for pipeline and bridges	Constructi	-1	3	1	3	3	3	-7,5	-1	1	1	2	2	2	-3	High	2	2	1,25	-3,75
9	Final Landscaping and reshaping	Constructi	1	2	2	3	3	3	7,5	1	2	2	2	2	2	4	High	2	2	1,25	5
10	Alteration of surface drainage and runoff	Operation	-1	3	3	3	3	4	-12	-1	2	3	2	2	2	-4,5	High	2	2	1,25	-5,625
11	Storm water	Operation	-1	3	3	3	3	3	-9	-1	2	1	2	2	2	-3,5	High	2	2	1,25	-4,375
12	Disruption of wetland soil profile, hydrological regime and increased sediment loads	Operation	-1	3	2	3	3	3	-8,25	-1	3	1	2	2	2	-4	High	2	2	1,25	-5
13	Degradation of wetland vegetation and the introduction and spread of alien and invasive vegetation	Operation	-1	3	2	2	3	3	-7,5	-1	2	1	2	2	2	-3,5	High	2	2	1,25	-4,375

14	Slurry and pollutant spills into water resources	Operation	-1	3	4	4	4	3	-11,25	-1	3	3	3	3	3	-9	High	2	2	1,25	-11,25
15	Water quality impairment	Operation	-1	4	4	4	4	3	-12	-1	4	4	3	4	2	-7,5	High	2	2	1,25	-9,375

7.4 Appendix D – Specialist Declaration of Independence

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

The Biodiversity Company

January 2026

I, Khume Mtshweni, 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.

Khume Mtshweni

Ecologist

The Biodiversity Company

January 2026

I, Rian Pienaar, 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.

Rian Pienaar

Ecologist

The Biodiversity Company

January 2026

7.5 Appendix E – Specialist CVs

Divan Van Rooyen

Pr Sci Nat 151272 +27 83 265 8776 divan@thebiodiversitycompany.com

PROFILE SUMMARY

Divan van Rooyen is an aquatic ecologist (Pri. Sci. Nat. 151272) with 4 years of experience in wetland identification and delineations. Divan completed his Ph.D. in environmental science at the North-West University Potchefstroom Campus. Divan has been part of wetland studies for seismic surveys, battery energy storage systems, renewable energy (wind and solar) and bulk services infrastructure development and part of aquatic biomonitoring studies for WWTW's and Mines.

PERSONAL INFO

Nationality: South African

Date of birth: 20 December 1993

EXPERIENCE

Environmental Impact Assessments (EIA)

Environmental Management Programmes (EMP)

Project Management

SKILLS

- ✓ Wetland functional assessments
- ✓ Ecology
- ✓ Rehabilitation
- ✓ Aquatic Biomonitoring
- ✓ Monitoring & Management Plans

LANGUAGES

English – Proficient

Afrikaans – Proficient

Signed: Divan van Rooyen

ACADEMIC QUALIFICATIONS

North-West University of Potchefstroom (2022): DOCTOR OF PHILOSOPHY (PhD) – Environmental Science (Aquatic Ecosystem Health):
Title: The role of the Usuthu River as refuge for the aquatic biodiversity of the lower Phongolo floodplain system

North-West University of Potchefstroom (2018): MASTER OF SCIENCE (MSc) – Environmental Science:
Title: Ecotoxicity of CdTe and its functional groups on *Enchytraeus albidus*

North-West University of Potchefstroom (2015): HONOURS BACHELOR OF SCIENCE (Hons) – Environmental Science (Ecological Remediation and Sustainable Management)

PROFESSIONAL EXPERIENCE

Mar 2024 – Present	**The Biodiversity Company** Freshwater Ecologist
Dec 2022 – Feb 2024	**Nitai Consulting** Aquatic and Environmental Consultant
Mar 2022 – Nov 2022	**Enviroworks** Aquatic and Environmental Consultant
Jan 2022 – Feb 2022	**ABS-Africa** Environmental Intern
Jan 2017 – Apr 2021	**North-West University** Research Assistant

INTERNATIONAL EXPERIENCE

South Africa

Khume Mtshweni

Pr Sci Nat 138592 +27 63 772 7501 khume@thebiodiversitycompany.com

PROFILE SUMMARY

Environmental and ecological specialist with 8 years' consulting experience, with international working experience. Specialist experience in mining, engineering, agriculture, renewable energy, and private sector developments. Project management of national multi-disciplinary projects. Provides specialist guidance, technical support, and facilitation for compliance with in-country legislative requirements. Registered Pr Sci Nat with the South African Council for Natural Scientific Professions.

PERSONAL INFO

Nationality: South African

Date of birth: 06 August 1994

EXPERIENCE

Comprehensive Wetland assessments

Rehabilitation Plans and Monitoring

Environmental Management Programmes (EMP)

Surface and Ground water Biomonitoring

Faunal and Floral Assessments

SKILLS

- ✓ Ecology
- ✓ Rehabilitation
- ✓ Offsets
- ✓ Monitoring & Management Plans

LANGUAGES

English – Proficient
Afrikaans – Proficient
Sepedi – Proficient
Isizulu – Proficient
Isindebele – Proficient
Sesotho – Proficient
Tsonga - Conversational

Signed: Khume Mtshweni

ACADEMIC QUALIFICATIONS

University of Johannesburg (2020): MAGISTER SCIENTIAE (MSc) - Aquatic Health

University of Johannesburg (2017): BACCALAUREUS SCIENTIAE CUM HONORIBUS (Hons) – Zoology

University of Johannesburg (2016): BACCALAUREUS SCIENTIAE IN NATURAL AND ENVIRONMENTAL SCIENCES. Majors: Zoology and Physiology.

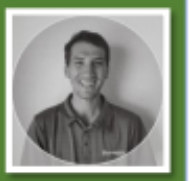
PROFESSIONAL EXPERIENCE

Apr 2023 – Present	**The Biodiversity Company** Ecology
March 2021 – March 2023	**Milnex CC** Ecologist / Manager
Jan 2017 – Jul 2020	**Golder Associates** Graduate Intern / Freshwater Ecology

INTERNATIONAL EXPERIENCE

Angola, Lesotho, South Africa

Rian Pienaar



Pr Sci Nat 135544 +27 78 505 0201 rian@thebiodiversitycompany.com

PROFILE SUMMARY

Environmental scientist and Pri Sci Nat (SACNASP 135544) with ~5+ years' specialist consulting experience across Southern Africa. Specialist expertise in wetland delineation and ecological assessments, wetland offset strategy design, rehabilitation and monitoring plans, as well as soil classification and agricultural potential assessments. Experienced in delivering high-quality field surveys and technical reporting aligned with in-country legislative requirements and international lender standards, and currently manages the operations at TBC.

PERSONAL INFO

Nationality: South African

Date of birth: 23 May 1994

EXPERIENCE

Environmental Impact Assessments (EIA)

Environmental Management Programmes (EMP)

Project Management

Logistics

SKILLS

- ✓ Wetland functional assessments
- ✓ Ecology
- ✓ Rehabilitation
- ✓ Monitoring & Management Plans

LANGUAGES

English – Proficient

Afrikaans – Proficient

Signed: Rian Pienaar

ACADEMIC QUALIFICATIONS

North-West University (2020): MASTER OF SCIENCE (MSc) – Environmental Sciences (Cum Lauda):
Title: The use *Clarias gariepinus* and associated helminthic parasites as bio-indicators of metal pollution in a subtropical ecosystem.

North-West University (2018): BACHELOR OF SCIENCE HONOURS IN ENVIRONMENTAL SCIENCE – Aquatic Ecosystem Health

North-West University (2018): BACHELOR OF SCIENCE IN ENVIRONMENTAL AND BIOLOGICAL SCIENCES – Zoology and Microbiology

PROFESSIONAL EXPERIENCE

Sept 2020 – Present **The Biodiversity Company**
Wetland Ecology

Jan 2018 – Dec 2018 **National Aquatic Bioassay Facility (NABF)**
Intern

INTERNATIONAL EXPERIENCE

South Africa, Mozambique, Botswana