# Wetland Baseline & Risk Assessment for the proposed Glencore Lydenburg Solar Photovoltaic (PV) Project

# Lydenburg Local Municipality, Ehlanzeni District Municipality, Mpumalanga Province, South Africa

November 2023

**CLIENT**

**Prepared by:**

**The Biodiversity Company**

Cell: +27 81 319 1225

Fax: +27 86 527 1965

info@thebiodiversitycompany.com

www.thebiodiversitycompany.com

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## Document Guide

The table below provides the minimum requirements for aquatic specialist assessments, and the relevant sections in the reports where these requirements are addressed. These are as per the "Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity" gazetted 20 March 2020, published in Government Notice No. 320.

| Item | Section | Comment |
|---|---|---|
| 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. | 1.3 | |
| Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae. | 1.3 | CV available on request |
| A signed statement of independence by the specialist(s). | 8 | |
| The assessment must be undertaken on the preferred site and within the proposed development footprint. | 1.1 | |
| A baseline description of the aquatic biodiversity and ecosystems on the site, including:<br>(a) aquatic ecosystem types;<br>(b) presence of aquatic species, and composition of aquatic species communities, their habitat, distribution and movement patterns. | 3 | |
| The threat status of the ecosystem and species as identified by the screening tool; | 1.1 | |
| 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 (NFEPA) or sub catchment, a strategic water source area (SWSA), a priority estuary, whether or not they are free -flowing rivers, wetland clusters, a critical biodiversity or ecologically sensitivity area); | 3 | |
| A description of the ecological importance and sensitivity of the aquatic ecosystem including:<br>(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<br>(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). | 4 | |
| 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 | |
| A description of the methodology used to undertake the site verification and impact assessment and site inspection, including equipment and modelling used, where relevant. | 2 | |
| A description of the assumptions made and any uncertainties or gaps in knowledge or data. | 2.9 | |
| The assessment must identify any 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. | 5 | Recommendations have been included to avoid sensitive areas |
| 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:<br><br>Is the proposed development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal?<br><br>Is the proposed development consistent with maintaining the resource quality objectives for the aquatic ecosystems present?<br><br>How will the proposed development impact on fixed and dynamic ecological processes that operate within or across the site? This must include:<br><br>(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);<br><br>(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); | 5 | |

| | | |
|---|---|---|
| (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 I seasonal I permanent zone of a wetland, in the riparian zone or within the channel of a watercourse, etc.); and<br><br>(d) to what extent will the risks associated with water uses and related activities change. | | |
| How will the proposed development impact on the functioning of the aquatic feature? This must include:<br><br>(a) base flows (e.g., too little or too much water in terms of characteristics and requirements of the system);<br><br>(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);<br><br>(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);<br><br>(d) quality of water (e.g., due to increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication);<br><br>(e) fragmentation (e.g., road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal); and<br><br>(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.); | 5 | |
| 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? | N/A | |
| A location of the areas not suitable for development, which are to be avoided during construction and operation (where relevant). | 4.8 and 5 | |
| Additional environmental impacts expected from the proposed development. | N/A | |
| Any direct, indirect and cumulative impacts of the proposed development. | 5.2 | |
| The degree to which impacts and risks can be mitigated. | N/A | |
| The degree to which the impacts and risks can be reversed. | N/A | |
| The degree to which the impacts and risks can cause loss of irreplaceable resources. | 5.2 | |
| A suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies. | 4.8 | |
| Proposed impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr). | 5 | |
| A motivation must be provided if there were development footprints identified as per above that were identified as having a "low" aquatic biodiversity sensitivity and that were not considered appropriate. | N/A | |
| A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability, or not, of the proposed development, if it should receive approval or not; | 6.4 | |
| Any conditions to which this above statement is subjected | 6.4 | Subject to the implementation of the mitigation measures. |

# 1 Introduction

## 1.1 Background

The Biodiversity Company was appointed to undertake a wetland baseline and impact assessment for the Lydenburg Solar Photovoltaic (PV) Project located near Lydenburg, within the Lydenburg Local Municipality, Ehlanzeni District, Northwest Province (Figure 1-1~~Figure 1-1~~). The area that is being investigated for the proposed solar power plant is located just northeast of Lydenburg and approximately 70 km northwest of Mbombela, in Mpumalanga Province.

In order to assess the baseline ecological state of the area and to present a description of the receiving environment, a desktop assessment as well as a field survey was conducted on the 21$^{st}$ and 22$^{nd}$ of November 2023. Both levels of assessment entailed the detection, identification, and description of any locally relevant water resources. Furthermore, the way these sensitive features may be affected by the proposed development was also investigated.

This report pertains to the assessment of the footprint for the proposed SPP area and associated activities. The property boundary of the Lydenburg Smelter was given as the assessment area and was the focus point of the study (Figure 1-2). A 500 m radius around the proposed SPP areas, which is the suggested regulation area for the identification of water resources in terms of the proposed project, has been demarcated and is referred to hereafter as the Project Area of Influence (PAOI).

This assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations, 2014 (amended by GNR 326, 7 April 2017 and GNR. 517, 11 June 2021) of the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998). The approach has taken cognisance of the recently published Government Notice 320 in terms of NEMA dated 20 March 2020 as well as the Government Notice 1150 in terms of NEMA dated 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". The relative sensitivity in relation to aquatic biodiversity features present within the project area is displayed in Figure 1-3.

The purpose of conducting the specialist study is to provide relevant input into the overall Environmental Authorisation application process, with a focus on the proposed project activities and their associated impacts. This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Registered Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making as to the ecological viability of the proposed project.

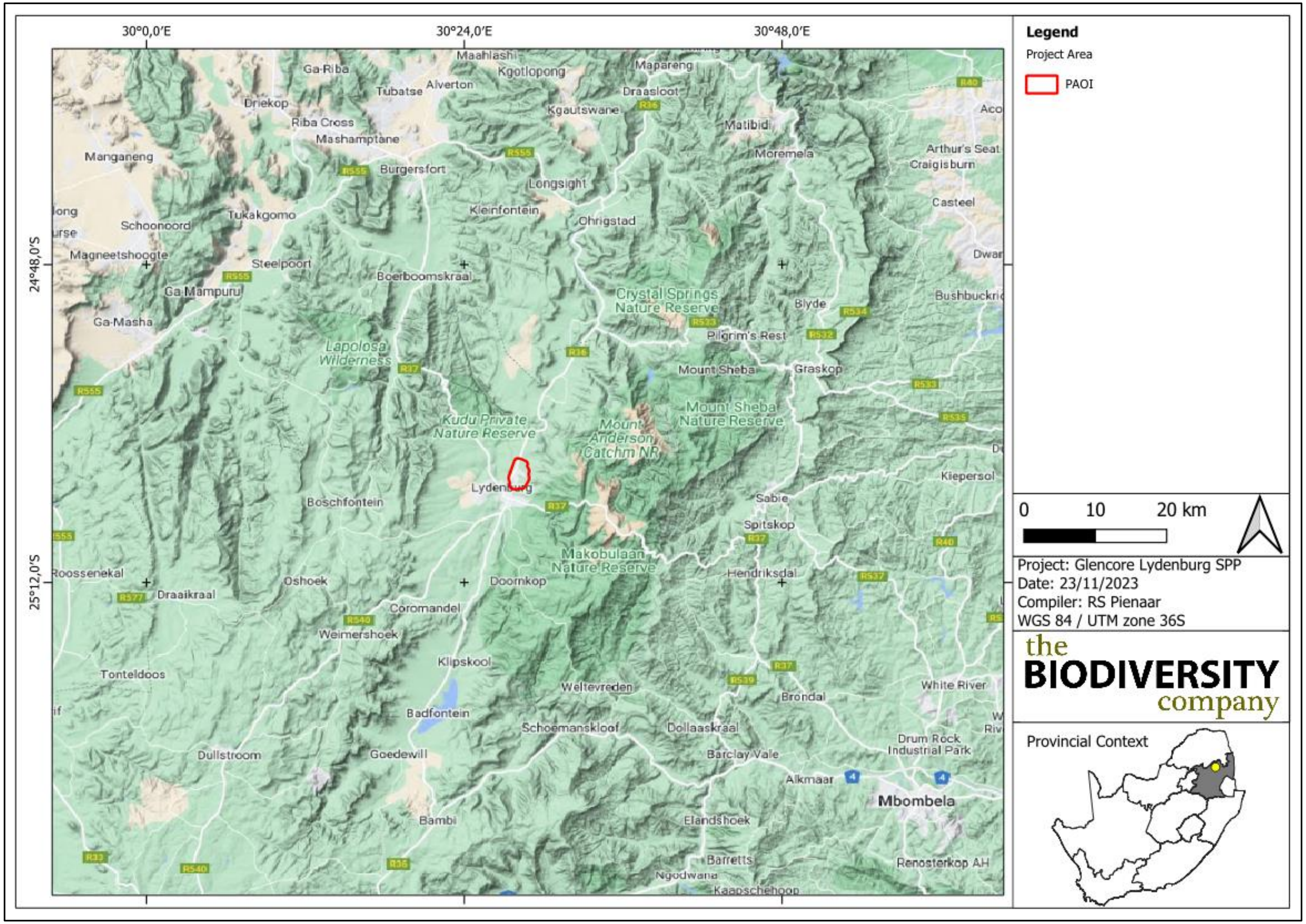



***Figure 1-1 Map illustrating the location of the proposed project***

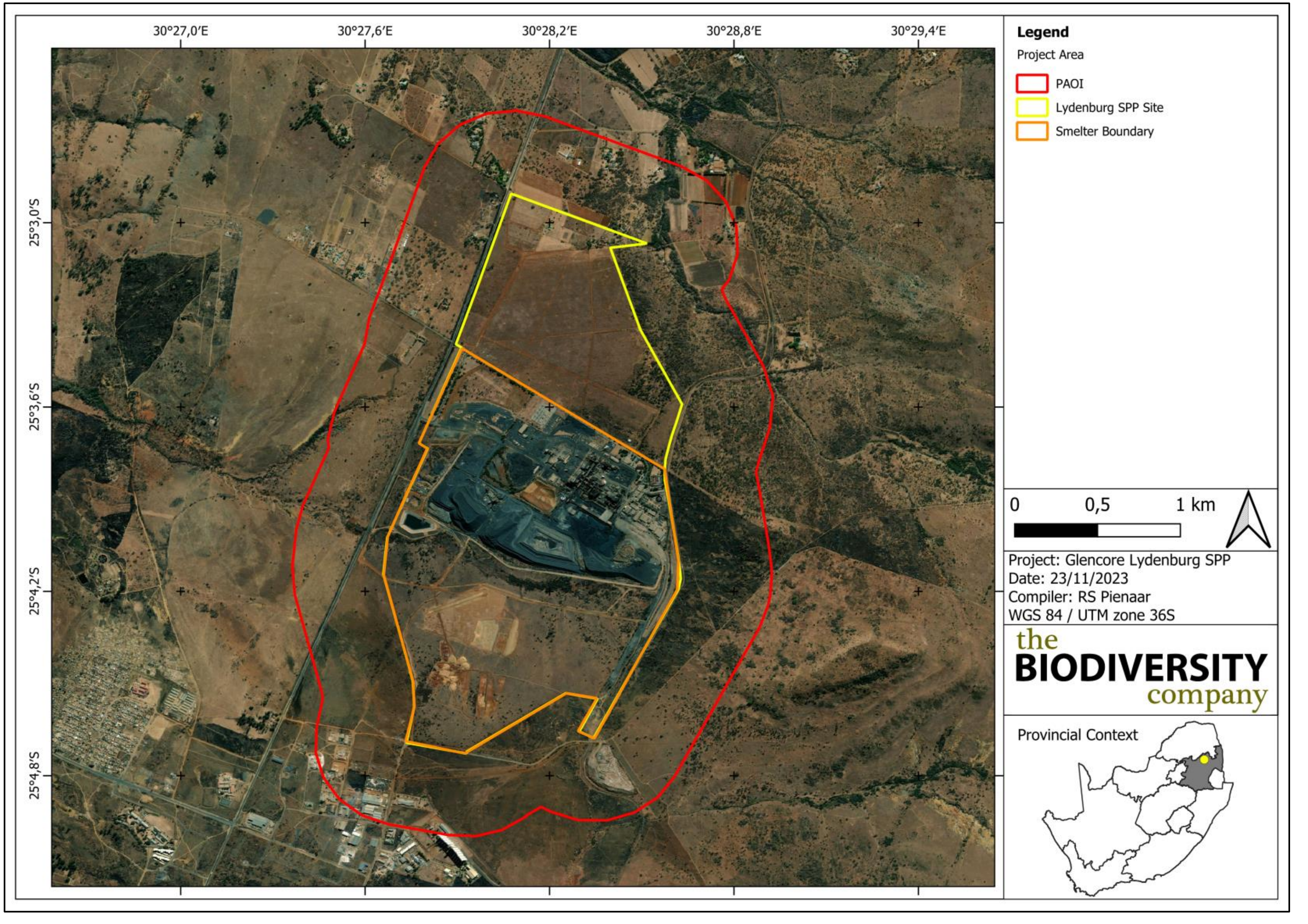
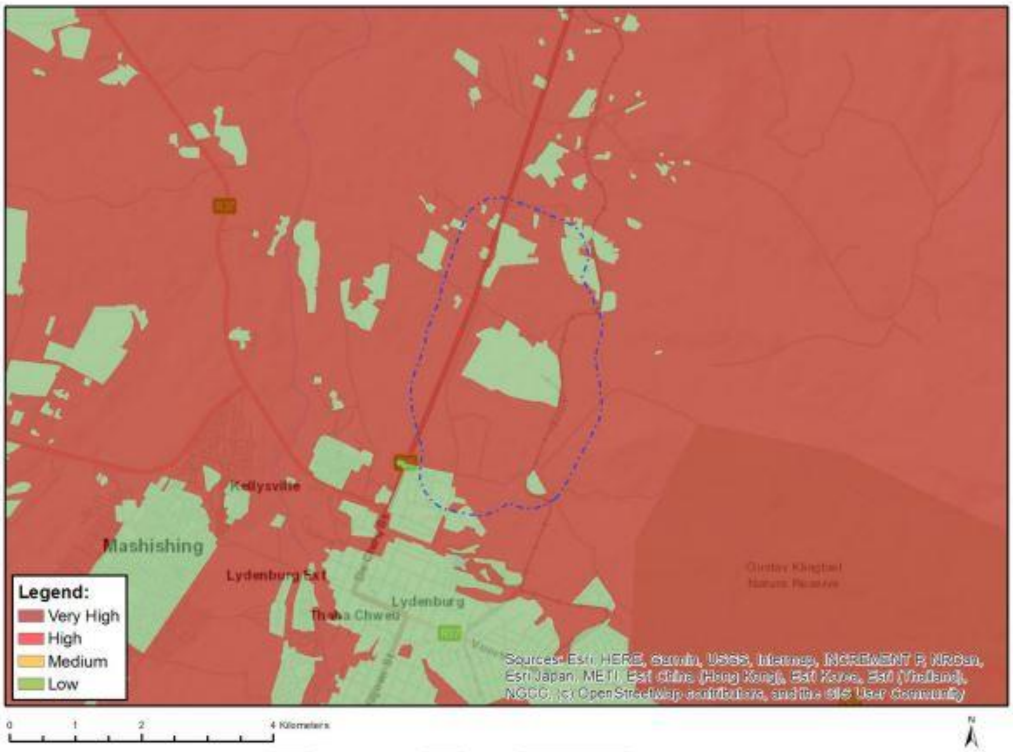



***Figure 1-2 Broad layout of the proposed area***

MAP OF RELATIVE AQUATIC BIODIVERSITY THEME SENSITIVITY




| Very High sensitivity | High sensitivity | Medium sensitivity | Low sensitivity |
|---|---|---|---|
| X | | | |

**Sensitivity Features:**

| Sensitivity | Feature(s) |
|---|---|
| Low | Low sensitivity |
| Very High | ESA: Important subcatchments |
| Very High | Rivers_Z |

***Figure 1-3 Aquatic biodiversity sensitivity for the proposed project area (National Environmental Web-based Screening Tool, 2023)***

The National Environmental Web-based Screening Tool (2023) has classified majority of the area within the project area as "Very High" sensitivity attributed to the presence of "Very High" sensitivity features (Figure 1-3). Furthermore, areas classified as "Very High" sensitivity attributed to the presence of Ecological Support Areas were identified. These sensitivities are validated in the opinion of the specialist as wetlands and non-perennial drainage features were identified in the areas classified as "Very High" sensitivity. Furthermore, the "Low" sensitivity areas did not display any direct relation to aquatic biodiversity.

## 1.2 Project Information and Technical Details

The following information was obtained from EIMS (2023) and pertains to the project information and technical details of the proposed project. No design layout has been provided for this stage of the project. The proposed development includes a; up to 300 MW PV facility, ~~88kV~~ 132kV powerline, on site switching station, and possible battery storage facility.

## 1.3 Specialist Details

| | |
|---|---|
| Report Name | **Wetland Baseline & Risk Assessment for the Proposed Glencore Lydenburg Solar Photovoltaic (PV) Project** |
| Reference | **Proposed Lydenburg Solar Photovoltaic Project** |
| Submitted to | EIMS |
| Report Writer & Fieldwork | **Rian Pienaar** |
| | Rian Pienaar is an aquatic ecologist (Cand. Sci. Nat. 135544) with experience in wetland identification and delineations. Rian completed his M.Sc. in environmental science at the North-West University Potchefstroom Campus. Rian have been part of wetland studies for road and culvert upgrades, power station and dam construction. |
| Reviewer | **Andrew Husted** |
| | Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant. |
| Declaration | The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science. |

## 1.4 Terms of Reference

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

- The delineation, classification and assessment of wetlands within 500 m of the project area;
- Conduct risk assessments relevant to the proposed activity;
- Recommendations relevant to associated impacts; and
- Report compilation detailing the baseline findings.

### 1.5 Key Legislative Requirements

#### 1.5.1 National Water Act (NWA, 1998)

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

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

A watercourse means;

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

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

#### 1.5.2 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.

## 2 Methods

A wetland site visit was conducted on the 21$^{st}$ and 22$^{nd}$ of November 2023 for the proposed development areas, constituting an early wet season survey.

### 2.1 Identification and Mapping

The wetland areas were delineated in accordance with the DWAF (2005) guidelines, a cross section is presented in Figure 2-1~~Figure 2-1~~. 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.

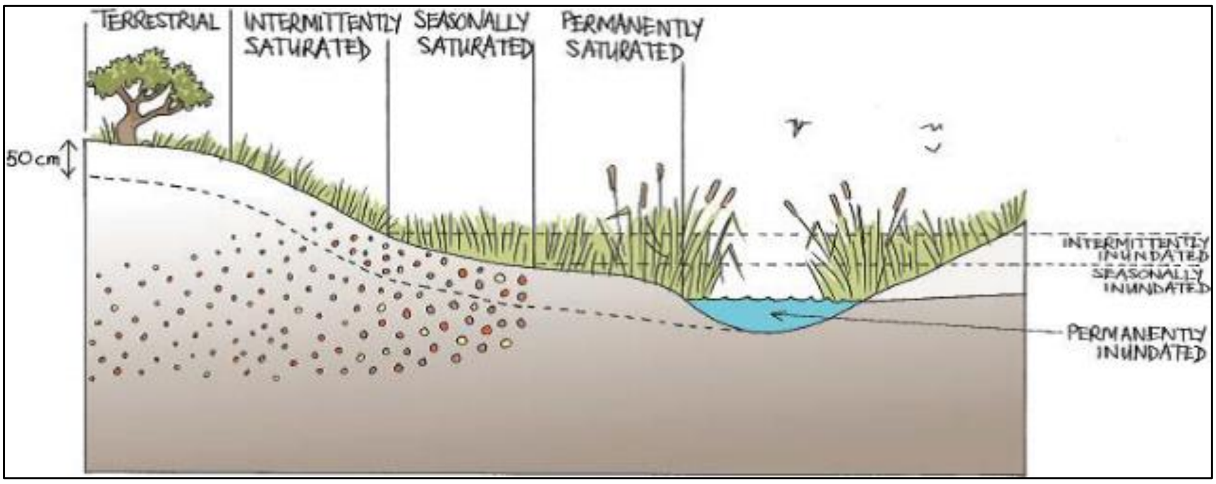



***Figure 2-1 Cross section through a wetland, indicating how the soil wetness and vegetation indicators change (Ollis et al. 2013)***

### 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.

### 2.3 Functional Assessment

Wetland Functionality refers to the ability of wetlands to provide healthy conditions for the wide variety of organisms found in wetlands as well as humans. Eco Services serves 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*. 2008). An assessment was undertaken that examines and rates the following services according to their degree of importance and the degree to which the services are provided (Table 2-1~~Table 2-1~~).

***Table 2-1 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 |

### 2.4 Present Ecological Status

The overall approach is to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a Present Ecological Status (PES) score. This takes the form of assessing the spatial extent of impact of individual activities/occurrences and then separately assessing the intensity of impact of each activity in the affected area. The extent and intensity are then combined to determine an overall magnitude of impact. The Present State categories are provided in Table 2-2~~Table 2-2~~.

***Table 2-2 The Present Ecological Status categories (Macfarlane, et al., 2008)***

| Impact Category | Description | Impact Score Range | PES |
|---|---|---|---|
| None | Unmodified, natural | 0 to 0.9 | A |
| Small | Largely Natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place. | 1.0 to 1.9 | B |
| Moderate | Moderately Modified. A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact. | 2.0 to 3.9 | C |
| Large | Largely Modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred. | 4.0 to 5.9 | D |
| Serious | Seriously Modified. The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still 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 |

### 2.5 Importance and Sensitivity

The importance and sensitivity of water resources is determined to establish resources that provide higher than average ecosystem services, biodiversity support functions or are particularly sensitive to impacts. The mean of the determinants is used to assign the Importance and Sensitivity (IS) category as listed in Table 2-3~~Table 2-3~~.

***Table 2-3 Description of Importance and Sensitivity categories***

| IS 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** |

### 2.6 Ecological Classification and Description

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

### 2.7 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.

### 2.8 Risk Assessment (DWS, 2016)

The Department of Water and Sanitation (DWS) risk matrix assesses impacts in terms of consequence and likelihood. The significance (product of the likelihood and consequence) of the impact is then rated according to Table 2-4.

***Table 2-4 Significance ratings (DWS, 2016)***

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

### 2.9 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- The focus area was based on the spatial files provided by the client and any alterations to the area and/or missing GIS information would have affected the area surveyed;
- Only the outline area of the Lydenburg smelter property was provided to the specialist;
- The GPS used for the survey has a 5 m accuracy and therefore any spatial features may be offset by 5 m; and
- Where inaccessible, areas within the broader 500 m PAOI were assessed via desktop only.

# 3 Desktop Baseline

## 3.1 Vegetation Type

The project area falls within two vegetation types namely the The Lydenburg Thornveld (Gm 21) vegetation types.

The Lydenburg Thornveld (GM 21) vegetation type is situated between the Kwena Dam and the high-lying mountains north of Ohrigstad at an elevation of 1 160 to 1 660 meters above sea level (Mucina & Rutherford, 2006).

This vegetation type occurs on undulating plains and at the foot of mountains. The vegetation is characterised by frost-hardy, open woodlands. Wooded grasslands cover this vegetation type which are characterised by a denser growth in rocky areas and less-so in areas characterised by frost (Mucina & Rutherford, 2006).

The GM 21 vegetation type has been labelled as vulnerable with a conservation target percentage of 27 and only 2% protected in the Ohrigstad Dam Nature Reserve and the Gustav Klingbiel Nature Reserve. 22% of this vegetation type has been transformed by cultivation (Mucina & Rutherford, 2006).

## 3.2 Soils and Geology

According to the land type database (Land Type Survey Staff, 1972 - 2006), the project area is characterised by the Ba 66 land type. According to the land type database (Land Type Survey Staff, 1972 - 2006), the Ba 1 land type is characterised by plinthic catena with upland duplex and margalitic soils being rare. Dystrophic and mesotrophic red soils are widespread. For dystrophic soils, the sum of the exchangeable basic cations is less than 5 cmol (+) kg-1 whereas mesotrophic soils are defined as soils that have between 5 and 15 cmol (+) kg-1 exchangeable basic cations. These basic cations include Ca, Mg, K and Na and are essential for a well-functioning soil.

The region is covered in red clay soils derived from the Pretoria Group (including Timeball Hill and Silverton Formations) shales. Andesite or quartzite often intercept shale formations. Mispah, Glenrosa and Hutton soils are dominant in this region.

## 3.3 Climate

This region occurs in the rain shadow of the Escarpment, where the winters are characterised by extreme cold, and the climate is dry (with a mean annual temperature of 16 °C). The rainfall in this region is lower than the surrounding areas with a mean annual precipitation of 707 mm. Frost infrequently occurs within this region.

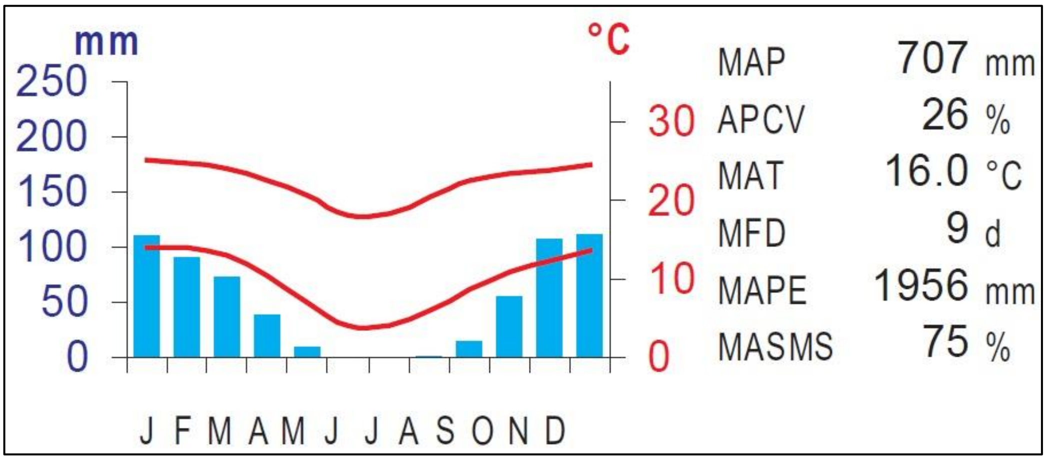



***Figure 4- 1 Climate diagram for the Lydenburg Thornveld (Mucina & Rutherford, 2006).***

### 3.4 South African Inventory of Inland Aquatic Ecosystems

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) wetland dataset is a recent outcome of the National Biodiversity Assessment (Van Deventer et al. 2018) and, was a collaborative project by the South African National Biodiversity Institute (SANBI) and the Council for Scientific and Industrial Research (CSIR). The SAIIAE dataset provides further insight into wetland occurrences and extents building on the information from the NFEPA, as well as other datasets.

No wetlands were identified within the PAOI by means of this dataset.

### 3.5 National Freshwater Ecosystem Priority Areas

The National Freshwater Ecosystem Priority Areas (NFEPA) wetland dataset is a collaborative project between multiple stakeholders such as CSIR, the WRC and SANBI. The objective of the project was to identify priority areas to conserve and protect as well as to promote sustainable water use, thereby assisting in meeting the biodiversity goals for freshwater habitats set out in all levels of government (Nel et al. 2011).

In comparison to the SAIIAE dataset, the NFEPA dataset represents three wetland types within the PAOI, namely a wetland flat and a unchannelled valley-bottom and (Figure 3-1~~Figure 3-1~~). The identified wetlands coincide with the dam delineations as identified though the Topographic Inland Water Areas dataset. The identified wetlands as per the NFEPA dataset were also classified as being non-priority wetlands.

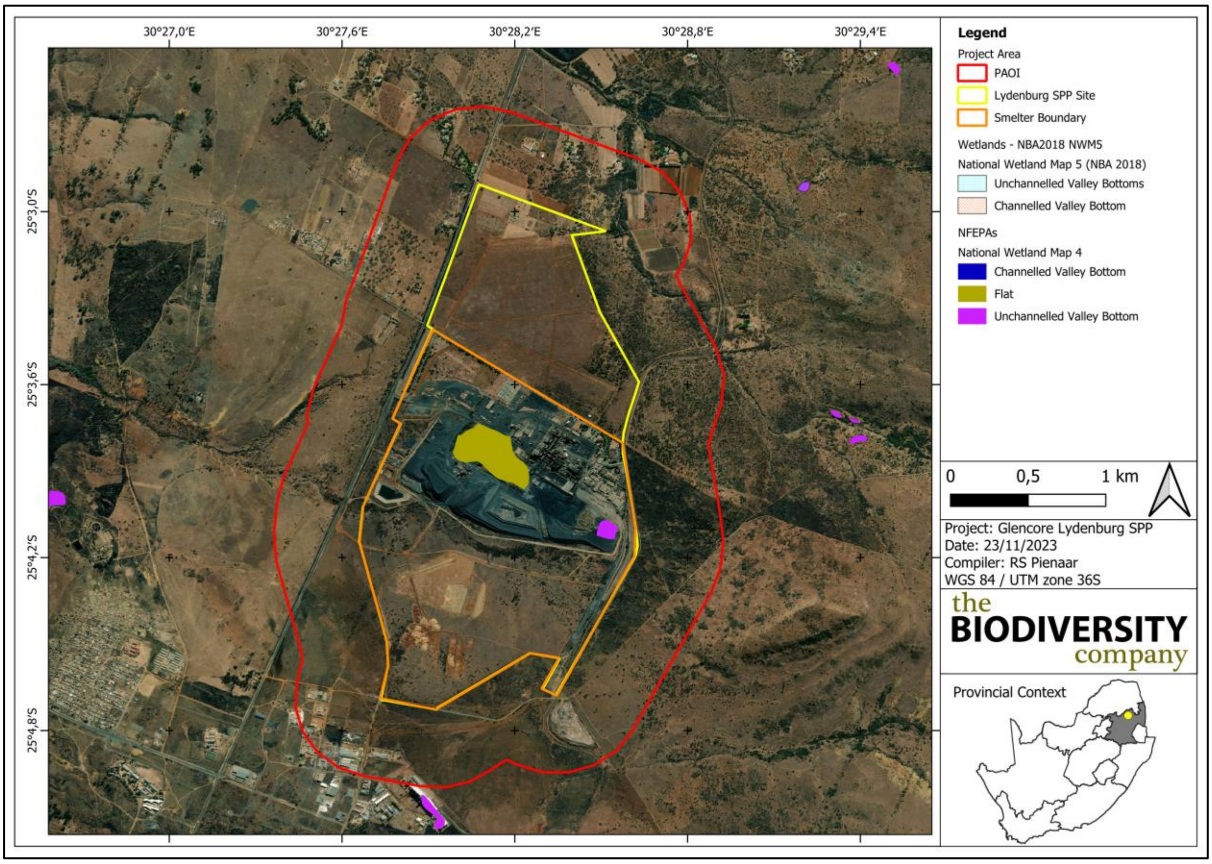



*Figure 3-1 NFEPA wetlands located within PAOI*

### 3.6 Topographical Inland Water and River Lines

The topographical inland and river line data for “2530” quarter degree was used to identify potential wetland areas within the PAOI. This data set indicates two inland water areas classified as dams (Figure 3-2~~Figure 3-2~~). Furthermore, multiple non-perennial drainage lines were identified.

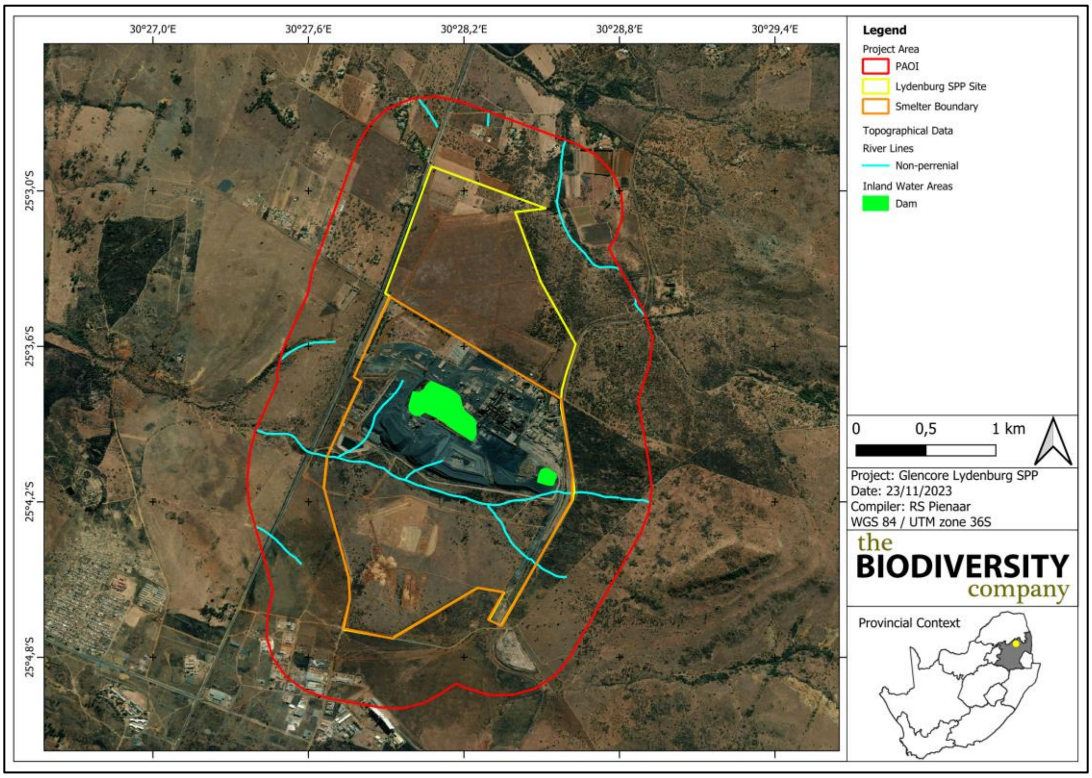



*Figure 3-2 Topographical River Lines and Inland Water Areas located within the PAOI*

### 3.7 Terrain

The terrain of the PAOI has been analysed to determine potential areas where water is more likely to accumulate (due to convex topographical features, preferential pathways, or more gentle slopes).

#### 3.7.1 Digital Elevation Model (DEM)

A Digital Elevation Model (DEM) has been created to identify lower laying regions as well as potential convex topographical features which could point towards preferential flow paths. The PAOI ranges from 1 375 to 1 519 meters above sea level (MASL). The lower lying areas (generally represented in dark blue) represent the area that will have the highest potential to be characterised as wetlands (Figure 3-3~~Figure 3-3~~).

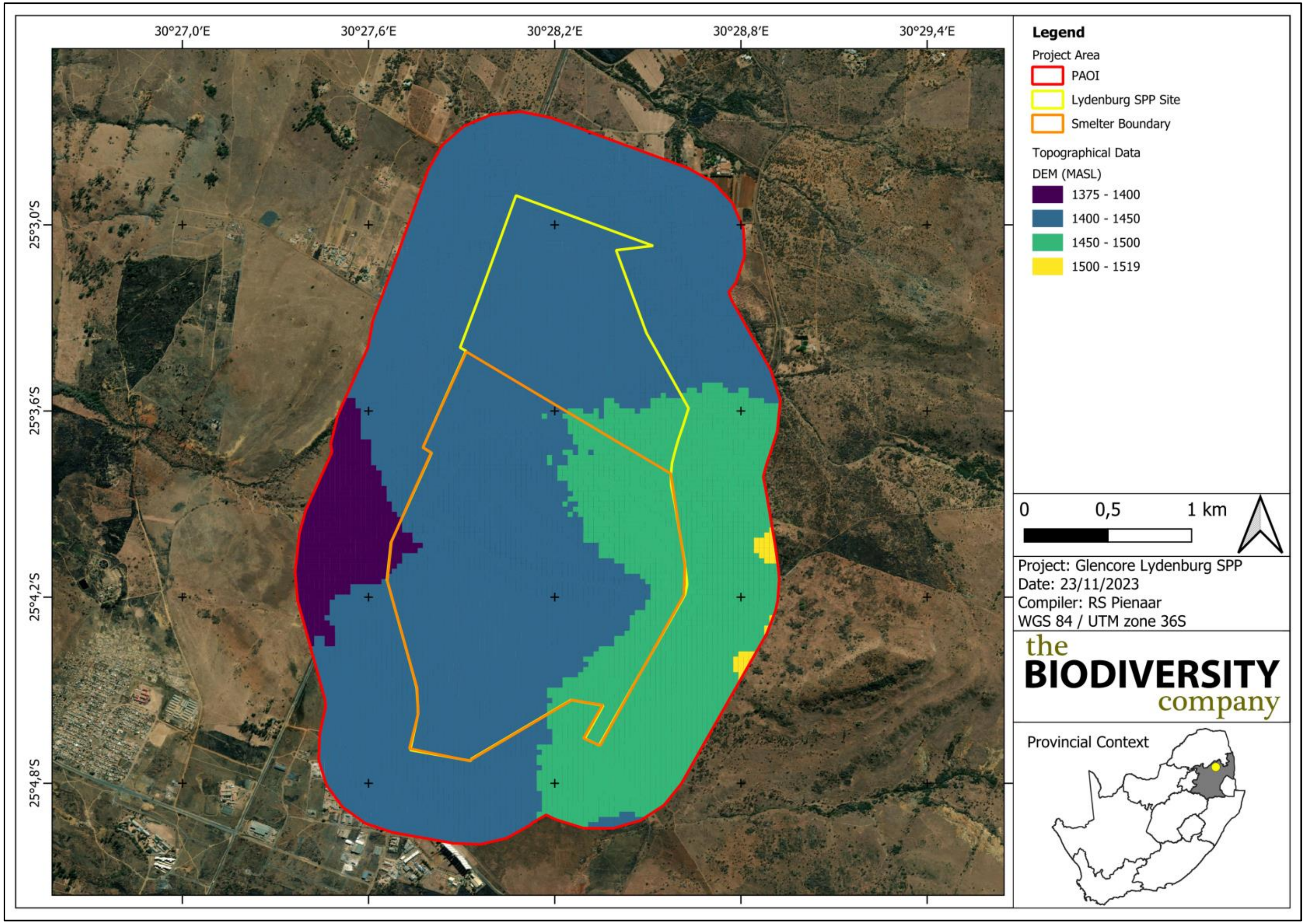



***Figure 3-3 Digital Elevation Model of the PAOI***

# 4 Field Assessment

## 4.1 Delineation and Description

During the site visit, five HGM units were identified within the PAOI which were classified as a channelled valley-bottoms (HGM 1 & HGM 4), unchannelled valley bottoms (HGM 2 & HGM 5), and a wetland seep (HGM 3) (Figure 4-2~~Figure 4-2~~). Only wetlands at an appreciable level of risk in relation the proposed development were assessed further. Therefore HGM 4 and 5 were excluded from further assessment as the wetland occurs within the 500m PAOI only and is not anticipated to be impacted by the proposed development. HGM 1, 2 and 3 are located south of the smelter and flows into a perennial river west of the project area of influence. Along with these wetlands multiple drainage lines were also identified within the proposed site (Figure 4-2~~Figure 4-2~~).

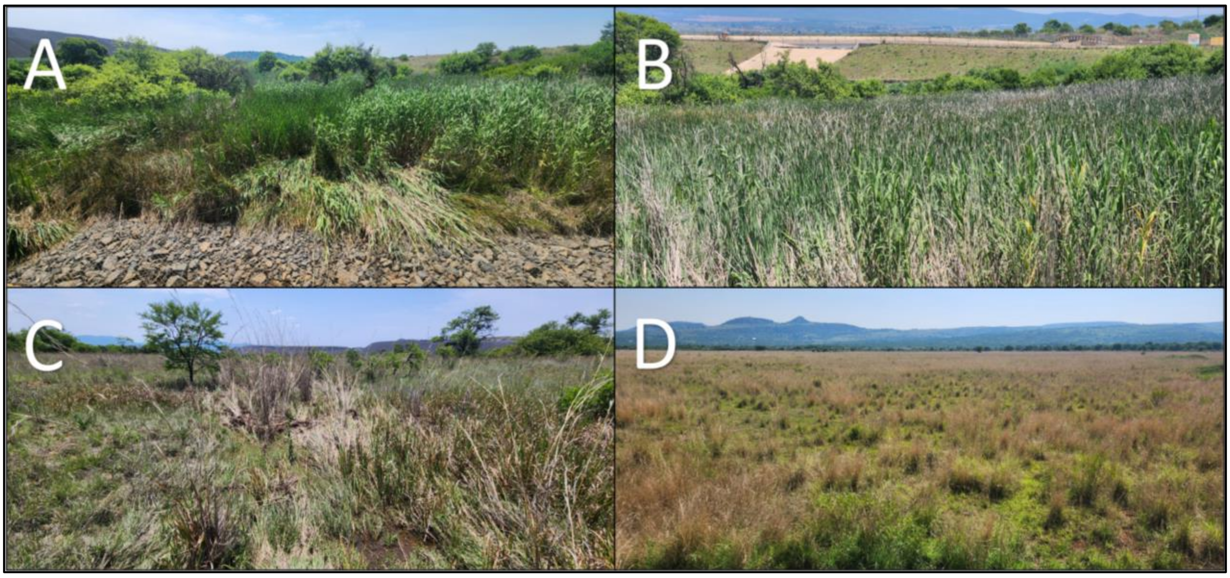



***Figure 4-1 Photographical evidence of the different wet areas. A & B) Channelled valley-bottom; C) Unchannelled Valley Bottom wetland, and D) Wetland seep***

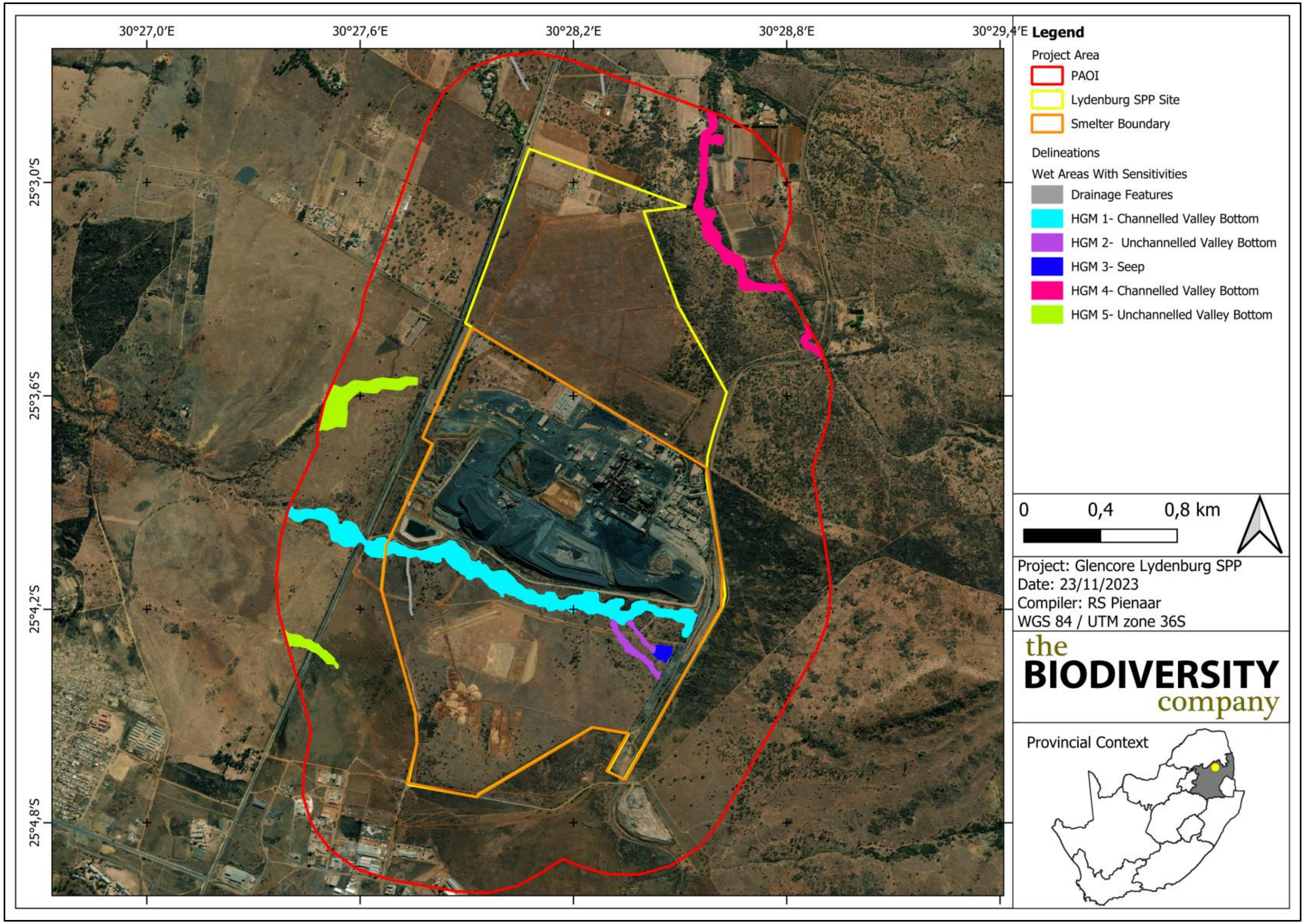



***Figure 4-2 Delineation and location of the different HGM units identified within the PAOI***

## 4.2 Unit Identification

The wetland classification as per SANBI guidelines (Ollis et al., 2013) is presented in Table 4-1~~Table 4-1~~. Two wetland types were identified within the project area, namely a channelled valley-bottom (HGM 1) and a depression (HGM 2).

***Table 4-1 Wetland classification as per SANBI guideline (Ollis et al. 2013)***

| Wetland System | 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 | Eastern Bankenveld | Mesic Highveld Grassland Group 7 | Plain | Channelled Valley Bottom | N/A | N/A |
| HGM 2 | Inland | Eastern Bankenveld | Mesic Highveld Grassland Group 7 | Plain | Unchannelled valley Bottom | N/A | N/A |
| HGM 3 | Inland | Eastern Bankenveld | Mesic Highveld Grassland Group 7 | Slope | Hillslope Seep | With channelled outflow | N/A |

## 4.3 Unit Setting

Channelled valley bottom wetlands are typically found on valley floors with a clearly defined, finite stream channel and lacks floodplain features, referring specifically to meanders. Channelled valley bottom wetlands are known to undergo loss of sediment in cases where the wetlands' slope is steep and the deposition thereof in cases of low relief. Figure 4-3 presents a diagram of a typical channelled valley bottom, showing the dominant movement of water into, through and out of the system.

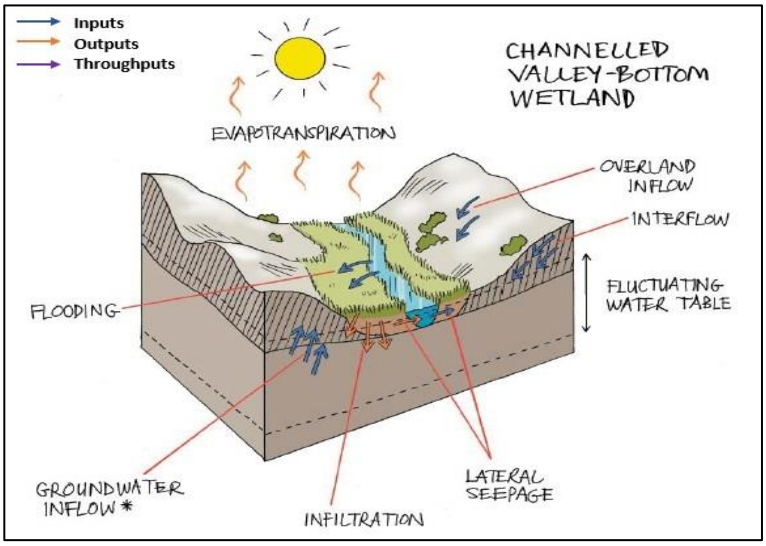



***Figure 4-3 Amalgamated diagram of a typical channelled valley bottom, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al. 2013)***

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

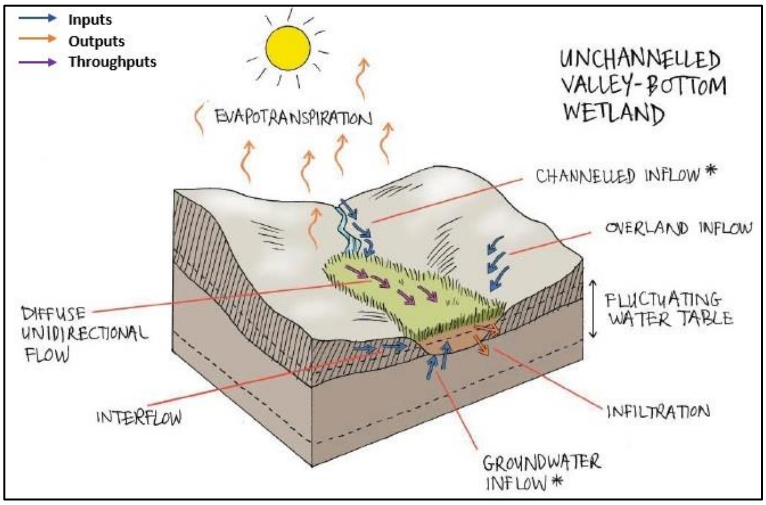



***Figure 4-4 Amalgamated diagram of a typical unchannelled valley bottom, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al. 2013)***

A typical hillslope seep is located within slopes, as mentioned in Figure 4-5~~Figure 4-5~~. Isolated hillslope seeps are characterised by colluvial movement of material. These systems are fed by very diffuse sub-surface flows which seep out at very slow rates, ultimately ensuring that no direct surface water connects this wetland with other water courses within the valleys. Figure 4-5~~Figure 4-5~~ illustrates a diagram of the hillslope seeps, showing the dominant movement of water into, through and out of the system.

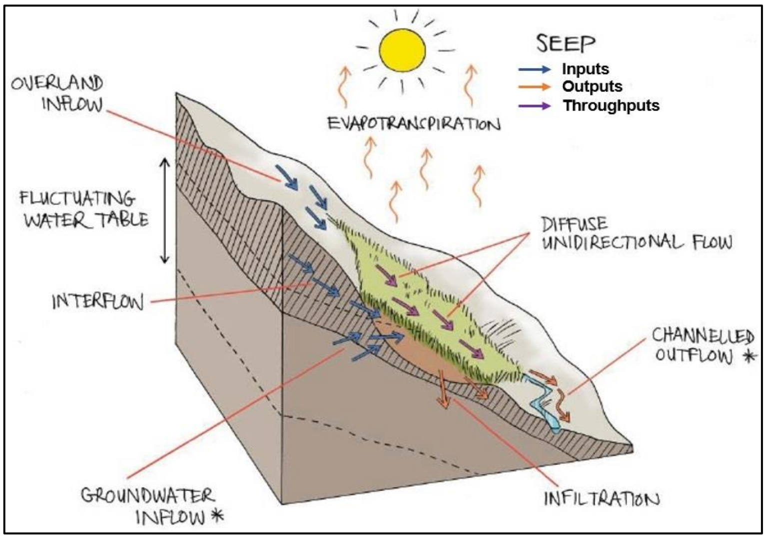



***Figure 4-5 Amalgamated diagram of a typical hillslope seep, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al. 2013)***

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. 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.

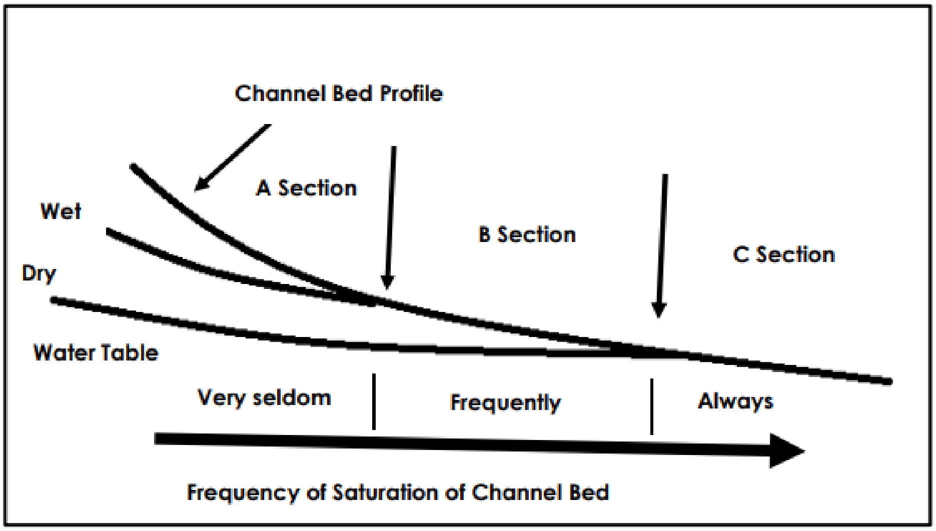



***Figure 4-6 The watercourse classifications (DWAF, 2005)***

## 4.4 General Functional Description

Channelled valley bottom wetlands tend to contribute less to sediment trapping and flood attenuation than other systems. Channelled valley bottom wetlands are well known to improve the assimilation of toxicants, nitrates and sulphates, especially in cases where sub-surface flows contribute to the system's water source (Kotze et al., 2009).

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.

Hillslope seeps are well documented by (Kotze et al., 2009) to be associated with sub-surface ground water flows. These systems tend to contribute to flood attenuation given their diffuse nature. This attenuation only occurs while the soil within the wetland is not yet fully saturated. The accumulation of organic material and sediment contributes to prolonged levels of saturation due to this deposition slowing down the sub-surface movement of water. Water typically accumulates in the upper slope (above the seep). Additionally, organic matter accumulation is essential in the denitrification process involved with nitrate assimilation. Seeps generally also improve the quality of water by removing excess nutrient and inorganic pollutants originating from agriculture, industrial or mine activities. The diffuse nature of flows ensures the assimilation of nitrates, toxicants and phosphates with erosion control being one of the Eco Services provided very little by the wetland given the nature of a typical seep's position on slopes.

It is however important to note that the descriptions of the above-mentioned functions are merely typical expectations. All wetland systems are unique therefore, the ecosystem services ratings for the wetlands on site may differ slightly to the general expectation given by the nature of the wetland type in relation to its topographic setting.

## 4.5 Functional Assessment

The ecosystem services provided by the wetland units identified on site were assessed and rated using the WET-EcoServices method (Kotze *et al.,* 2008). The average ecosystem service score for HGM 1 was determined to be “Moderately High” and HGM 2 and HGM 3 was determined to be “Intermediate”.

***Table 4-2 Summary of Ecosystem service scores for HGM 1***

| | | | | Wetland Unit | HGM 1 | HGM 2 | HGM 3 |
|---|---|---|---|---|---|---|---|
| Ecosystem Services Supplied by Wetlands | Indirect Benefits | Regulating and supporting benefits | | Flood attenuation | 2.5 | 2.1 | 1.0 |
| | | | | Streamflow regulation | 2.8 | 2.2 | 0.9 |
| | | | Water Quality enhancement benefits | Sediment trapping | 2.2 | 2.0 | 2.2 |
| | | | | Phosphate assimilation | 2.3 | 1.9 | 1.8 |
| | | | | Nitrate assimilation | 2.4 | 1.8 | 1.6 |
| | | | | Toxicant assimilation | 2.6 | 1.8 | 1.7 |
| | | | | Erosion control | 2.8 | 2.1 | 1.1 |
| | | | | Carbon storage | 2.3 | 2.0 | 2.1 |
| | Direct Benefits | | | **Biodiversity maintenance** | 2.1 | 2.1 | 2.1 |
| | | Provisioning benefits | | Provisioning of water for human use | 1.1 | 1.0 | 0.6 |
| | | | | Provisioning of harvestable resources | 1.0 | 1.0 | 0.6 |
| | | | | Provisioning of cultivated foods | 0.5 | 0.5 | 0.5 |
| | | Cultural benefits | | Cultural heritage | 1.0 | 1.0 | 1.0 |
| | | | | Tourism and recreation | 1.1 | 1.1 | 1.1 |
| | | | | Education and research | 2.8 | 1.8 | 1.4 |
| | | | | **Overall** | 29.6 | 24.4 | 19.7 |
| | | | | **Average** | 2.0 | 1.6 | 1.3 |
| | | | | **Class** | Moderately High | Intermediate | Intermediate |

HGM 1 score the highest scores for ecosystem services due to the wetland type and the location of the wetland. HGM 1 was classified as being a channelled valley bottom located south of the smelter and its associated stockpiles. The wetland has high volumes of hydrophyte vegetation and thus plays an important role in streamflow regulations and flood attenuations. Due to the location of the wetlands high volumes of nitrates, phosphates and toxicants flows into the system through runoff from the stockpiles and will thus play an important role in the assimilation and providing cleaner water downstream. The wetland however does not provide high resources for humans, but the vegetation does provide habitat to animals.

Although HGM 2 will also play an important role in streamflow regulation and flood attenuation it scored lower ecosystem services scores due to the location of the wetland. The wetland is located away form the smelters activities with HGM 1 between the activities and the wetland. The wetland thus does not play such a big role in the assimilation of nitrates, phosphates, and toxicants as HGM 1. The wetland also has less hydrophyte cover lowering the erosion control of the wetland. The wetland does however provide habitat to multiple species and do provide some resources for humans to use.

HGM 3 scored the lowest ecosystem services scores due to the type of wetland and the location of the wetland. The wetland was classified as a seep wetland which is not know for their ability to help with streamflow regulation and flood attenuation, the wetland did however score well in sediment trapping and carbon storage. HGM 3 also scored high scores for biodiversity maintenance due to the hydrophyte vegetation providing resources and habitat for multiple species.

The wetlands are located within private land, therefore the tourism potential as well as the ability to be used for cultural practices is essentially non-existent attributed to lack of access by the public. Furthermore, the wetlands have been transformed with only limited hydrophytes remaining which reduces the potential to be used for harvestable building resources or cultivated foods.

## 4.6 Present Ecological Status

The overall PES scored for HGM 1 was calculated to be within “Class - C” which represents “Moderately Modified” systems and HGM 2 and HMG 3 was calculated to be within “Class – D” which represents “Largely Modified” (Table 4-3~~Table 4-3~~).

***Table 4-3 Summary of PES Scores for HGM 1***

| Wetland | Hydrology | | Geomorphology | | Vegetation | |
|---|---|---|---|---|---|---|
| | Rating | Score | Rating | Score | Rating | Score |
| **HGM A** | D: Largely Modified | 5.1 | C: Moderately Modified | 2.1 | C: Moderately Modified | 3.7 |
| **Overall PES Score** | 3.9 | | Overall PES Class | | C: Moderately Modified | |
| **Wetland** | **Hydrology** | | **Geomorphology** | | **Vegetation** | |
| | **Rating** | **Score** | **Rating** | **Score** | **Rating** | **Score** |
| **HGM B** | E: Seriously Modified | 6.5 | E: Moderately Modified | 2.1 | D: Largely Modified | 5.9 |
| **Overall PES Score** | 6.1 | | Overall PES Class | | D: Largely Modified | |
| **Wetland** | **Hydrology** | | **Geomorphology** | | **Vegetation** | |
| | **Rating** | **Score** | **Rating** | **Score** | **Rating** | **Score** |
| **HGM C** | C: Moderately Modified | 3.5 | D: Largely Modified | 4.1 | D: Largely Modified | 5.9 |
| **Overall PES Score** | 4.4 | | Overall PES Class | | D: Largely Modified | |

The main modifications to all the wetlands can be seen to the hydrology and the hydrophyte vegetation of the wetlands. The hydrology of the systems has been modified through the modification of the wetlands catchment through the building of roads and the smelters infrastructure.

## 4.7 Importance and Sensitivity

The results of the ecological IS assessment are shown in Table 4-4~~Table 4-4~~. Various components pertaining to the protection status of a wetland are considered for the IS, including Strategic Water Source Areas (SWSA), the NFEPA wetland vegetation (wet veg) threat status and the protection status of the wetland. The IS for all the HGM units were calculated to be “Moderate”.

***Table 4-4 The IS results for the delineated HGM unit***

| HGM Type | NFEPA Wet Veg | | | NBA Wetlands | | | SWSA (Y/N) | Calculated IS |
|---|---|---|---|---|---|---|---|---|
| | Type | Ecosystem Threat Status | Ecosystem Protection Level | Wetland Condition | Ecosystem Threat Status 2018 | Ecosystem Protection Level | | |
| **Channelled valley-bottom** | Mesic Highveld Grassland Group 7 | Critically Endangered | Not Protected | D/E/F Largely Modified | Critically Endangered | Not Protected | N | **Moderate** |
| **Unchannelled Valley Bottom** | Mesic Highveld Grassland Group 7 | Critically Endangered | Not Protected | D/E/F Largely Modified | Critically Endangered | Not Protected | N | **Moderate** |
| **Hillslope Seep** | Mesic Highveld Grassland Group 7 | Least Threatened | Not Protected | C Moderately Modified | Critically Endangered | Poorly Protected | N | **Moderate** |

## 4.8 Buffer Requirements

It is worth noting that the scientific buffer calculation (Macfarlane *et al*., 2014) was used to determine the size of the buffer zones relevant to the proposed project. A pre-mitigation buffer of 32 m and a post-mitigation wetland and watercourse buffer of 15 m (Table 4-5~~Table 4-5~~ and Figure 4-7~~Figure 4-7~~) is recommended for the delineated wetlands in relation to the proposed development.

***Table 4-5 Calculated Buffers for the HGM units***

| Aspect | Pre-Mitigation | Post-Mitigation |
|---|---|---|
| PV Area | 32m | 15m |

### 4.8.1 Regulation Zones

Table 4-6~~Table 4-6~~ presents the legislated zones of regulation that would be applicable to the wetland areas.

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

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

***Table 4-6 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).<br>Department of Water and Sanitation (DWS) | Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998).<br><br>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:<br>• 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;<br>• 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<br>• 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.<br><br>Department of Environmental Affairs and Development Planning (DEA&DP) | 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:<br><br>The development of:<br><br>(xii) Infrastructure or structures with a physical footprint of 100 square meters or more;<br>Where such development occurs—<br>**a)** Within a watercourse;<br>**b)** In front of a development setback; or<br>**c)** If no development setback has been adopted, within 32 meters of a watercourse, measured from the edge of a watercourse.<br>Excluding –<br>…<br>(dd) where such development occurs within an urban area…<br><br>Activity 19 of Listing Notice 1 (GN 327) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) EIA regulations, 2014 (as amended) states "The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse." |

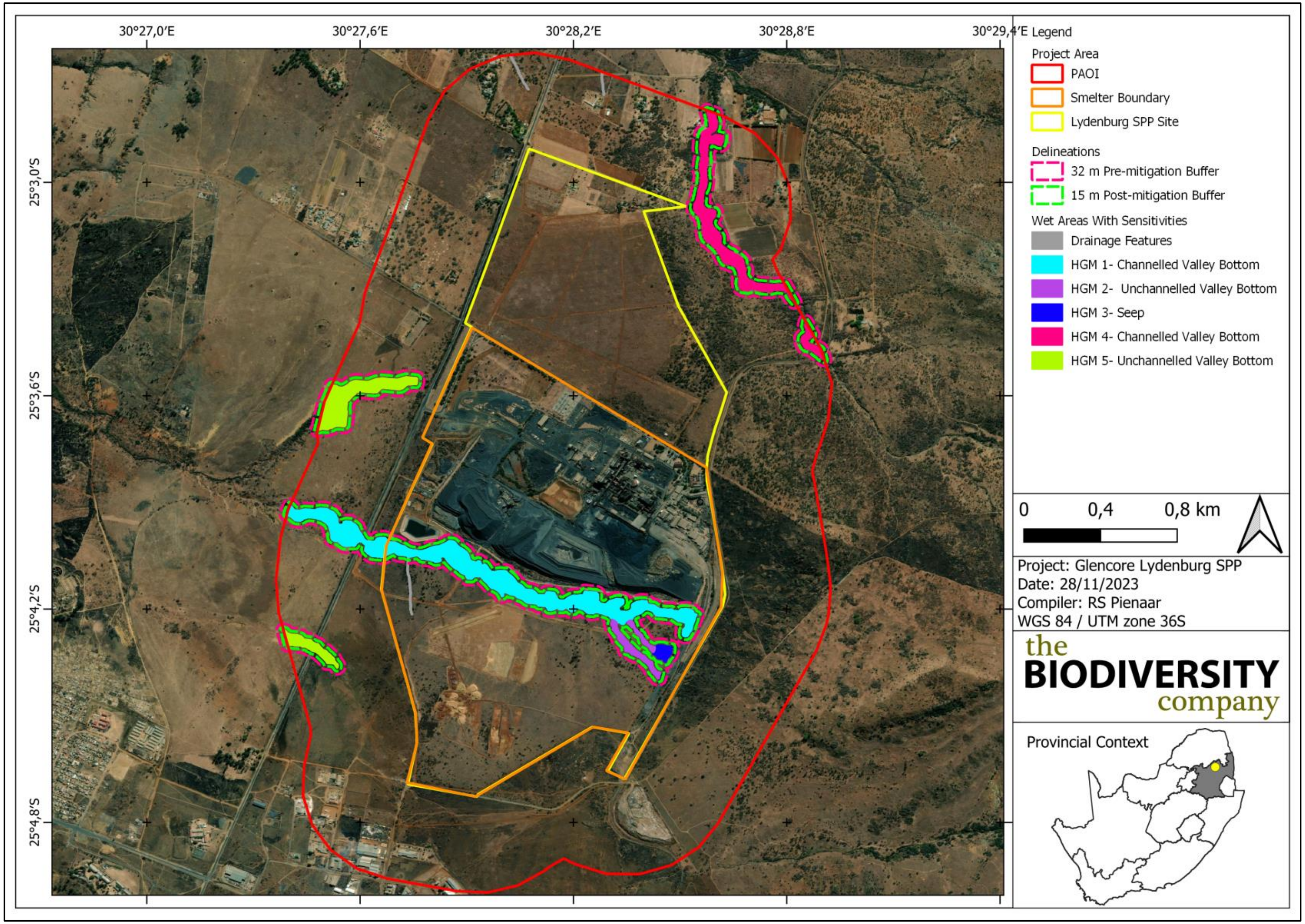



***Figure 4-7 Buffer Map for the delineated wetlands and watercourses within the PAOI***

# 5 Potential Impacts

The impact assessment considered the anticipated direct and indirect impacts to the wetland systems as a result of the proposed development (Table 5-1~~Table 5-1~~). The mitigation hierarchy as discussed by the Department of Environmental Affairs (2013) will be considered for this component of the assessment (

Figure 5-1

~~Figure 5-1~~). In accordance with the mitigation hierarchy, the preferred mitigatory measure is to avoid impacts by considering alternate options in project location, sitting, scale, layout, technology and implementing project/activity phasing to avoid impacts.

Should avoidance, minimisation of impact and rehabilitation of wetlands and watercourses be deemed impossible in terms of the project requirements, the preparation and implementation of a wetland offset plan will be required to compensate for the loss of the natural systems. This plan does not negate the rehabilitation requirements for other partially or indirectly impacted systems.

Figure 4-7~~Figure 4-7~~ indicates that HGM 1, 2 and 3 are located within the proposed development area. Under the assumption that the proposed facility will be designed such that the wetland and its respective in-feeding non-perennial drainage features will be avoided, the pre- and post- mitigation risks were therefore determined to be “Moderate” and “Low”, respectively in relation to the proposed development. It should be noted that even if avoided, some direct as well as indirect impacts are potential, therefore the focus will be on minimising impacts to the watercourses and wetlands.

It should be noted that whilst the delineated stormwater drainage features are unnatural, the features should still be maintained or upgraded to prevent further alterations to the hydrological regime of the wetland. These features have therefore been assigned a “Moderate” risk rating together with the natural wetland and non-perennial drainage features (Figure 5-2~~Figure 5-2~~).

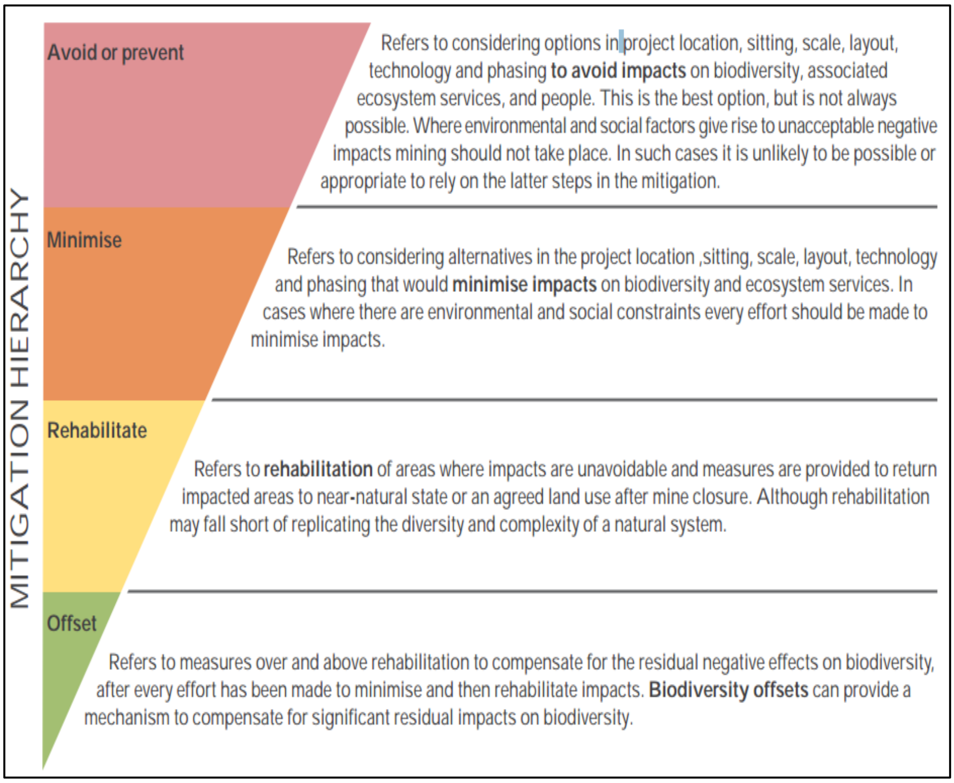



***Figure 5-1 The mitigation hierarchy as described by the DEA (2013)***

***Table 5-1 Anticipated Impacts arising from the proposed development***

| Activity | Impacts |
|---|---|
| Clearing wetland vegetation | • Loss/degradation of wetland habitat<br>• Potential erosion<br>• Proliferation of alien invasive species |
| Minor excavations | • Potential erosion and subsequent sedimentation of downstream watercourses<br>• Altered surface flow conditions |
| Establishment of ablution facilities, laydown areas and servitudes | • Disturbance of wetland habitat with altered surface flow conditions<br>• Proliferation of alien invasive species |
| Operation of equipment and plant within or in near-proximity wetlands | • Disturbance within wetland habitat<br>• Potential for the proliferation of species from inter-site movement of plant |
| Stochastic spills and leaks from plant and vehicles | • Loss/degradation of wetland vegetation/habitat<br>• Soil contamination<br>• Impaired water quality |
| Stripping and stockpiling excavated soil | • Potential proliferation of alien invasive species<br>• Altered surface flow conditions<br>• Sedimentation of downstream watercourses |
| Vehicle movement through wetlands | • Disturbance within wetland habitat<br>• Dispersal of alien invasive species |
| Solid waste disposal | • Loss/degradation of wetland habitat<br>• Pollution of watercourses<br>• Impaired water quality within wetland<br>• Altered surface flows |

## 5.1 Risk Assessment

***Table 5-2 DWS Risk Impact Matrix for PV area (Andrew Husted Pr Sci Nat 400213/11)***

| Activity | Aspect | Impact | Mitigation | Severity: Flow Regime | Severity: Water Quality | Severity: Habitat | Severity: Biota | Total | Spatial scale | Duration | Consequence | Frequency of activity | Frequency of impact | Legal Issues | Detection | Likelihood | Significance | Risk Rating | Control Measures |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Construction** | | | | | | | | | | | | | | | | | | | |
| Site clearing and preparation. | Wetland disturbance / loss. | Direct disturbance / degradation / loss to wetland soils or vegetation due to the construction of the solar facility. | Without | 3 | 2 | 3 | 2 | 2.5 | 2 | 3 | 7.5 | 3 | 4 | 1 | 1 | 9 | 68 | **M** | • Clearly demarcate the construction footprint and restrict all construction activities to within the proposed infrastructure area.<br>• When clearing vegetation, allow for some vegetation cover as opposed to bare areas.<br>• Minimize the disturbance footprint and the unnecessary clearing of vegetation outside of this area.<br>• Use the wetland shapefiles to signpost the edge of the wetlands closest to site. Place the sign 25 m from the edge (this is the buffer zone). Label these areas as environmentally sensitive areas, keep out.<br>• 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 overall master plan.<br>• All activities (including driving) must adhere to the 25 m buffer area.<br>• Promptly remove / control all alien and invasive plant species that may emerge during construction (i.e. weedy annuals and other alien forbs) must be removed.<br>• All alien vegetation along the transmission servitude should be managed in terms of the Regulation GNR.1048 of 25 May 1984 (as amended) issued in terms of the Conservation of Agricultural Resources Act, Act 43 of 1983. By this Eskom is obliged to control.<br>• Landscape and re-vegetate all denuded areas as soon as possible. |
| | | | With | 2 | 1 | 2 | 1 | 1.5 | 2 | 3 | 6.5 | 3 | 3 | 1 | 1 | 8 | 52 | **L** | |

| Activity | Aspect | Impact | Mitigation | Severity: Flow Regime | Water Quality | Habitat | Biota | Total | Spatial scale | Duration | Consequence | Frequency of activity | Frequency of impact | Legal Issues | Detection | Likelihood | Significance | Risk Rating | Control Measures |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Water runoff from construction site. | Increased erosion and sedimentation. | Without | 3 | 3 | 2 | 2 | 2.5 | 2 | 3 | 7.5 | 3 | 3 | 1 | 2 | 9 | 68 | M | • Limit construction activities near (< 50m) wetlands to winter (as much as possible) when rain is least likely to wash concrete and sand into the wetland. Activities in black turf soils can become messy during the height of the rainy season and construction activities should be minimised during these times to minimise unnecessary soil disturbances.<br>• Ensure soil stockpiles and concrete / building sand are sufficiently safeguarded against rain wash.<br>• No activities are permitted within the wetland and associated buffer areas.<br>• Landscape and re-vegetate all unnecessarily denuded areas as soon as possible. |
| | | | With | 2 | 2 | 1 | 1 | 1.5 | 2 | 2 | 5.5 | 3 | 2 | 1 | 1 | 7 | 39 | L | |
| | | Potential contamination of wetlands with machine oils and construction materials. | Without | 1 | 3 | 2 | 2 | 2 | 1 | 2 | 5 | 3 | 3 | 1 | 2 | 9 | 45 | L | • Make sure all excess consumables and building materials / rubble is removed from site and deposited at an appropriate waste facility.<br>• Appropriately stockpile topsoil cleared from the project area.<br>• Appropriately contain any generator diesel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) or construction materials on site (e.g. concrete) in such a way as to prevent them leaking and entering the wetlands.<br>• No activities are permitted within the wetland and associated buffer areas. |
| | | | With | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 4 | 1 | 2 | 1 | 2 | 6 | 24 | L | |
| **Operation** | | | | | | | | | | | | | | | | | | | |
| Operation of the solar facility. | Hardened surfaces. | Potential for increased stormwater runoff leading to | Without | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 7 | 3 | 3 | 1 | 2 | 9 | 63 | M | • Design and Implement an effective stormwater management plan.<br>• Promote water infiltration into the ground beneath the solar panels. |

| Activity | Aspect | Impact | Mitigation | Severity: Flow Regime | Water Quality | Habitat | Biota | Total | Spatial scale | Duration | Consequence | Frequency of activity | Frequency of impact | Legal Issues | Detection | Likelihood | Significance | Risk Rating | Control Measures |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Increased erosion and sedimentation. | With | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 5 | 1 | 2 | 1 | 1 | 5 | 25 | L | • Release only clean water into the environment.<br>• Stormwater leaving the site should not be concentrated in a single exit drain but spread across multiple drains around the site each fitted with energy dissipaters (e.g. slabs of concrete with rocks cemented in).<br>• Re-vegetate denuded areas as soon as possible.<br>• Regularly clear drains.<br>• Minimise the extent of concreted / paved / gravel areas.<br>• A covering of soil and grass (regularly cut and maintained) below the solar panels is ideal for infiltration. If not feasible then gravel is preferable over concrete or paving.<br>• Avoid excessively compacting the ground beneath the solar panels. |
| | Contamination. | Potential for increased contaminants entering the wetland systems. | Without | 2 | 3 | 2 | 2 | 2.3 | 3 | 2 | 7.3 | 3 | 3 | 1 | 2 | 9 | 65 | M | • Where possible minimise the use surfactants to clean solar panels and herbicides to control vegetation beneath the panels. If surfactants and herbicides must be used do so well prior to any significant predicted rainfall events. |
| | | | With | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 5 | 1 | 2 | 1 | 1 | 5 | 25 | L | |
| **Closure** | | | | | | | | | | | | | | | | | | | |
| Decommissioning of the solar facility. | Rehabilitation. | Potential loss or degradation of nearby wetlands through inappropriate closure. | Without | 2 | 2 | 3 | 2 | 2.3 | 2 | 3 | 7.3 | 3 | 3 | 1 | 1 | 8 | 58 | M | • Develop and implement a rehabilitation and closure plan.<br>• Appropriately rehabilitate the project area by ripping, landscaping and re-vegetating with locally indigenous species. |
| | | | With | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 5 | 1 | 2 | 1 | 1 | 5 | 25 | L | |

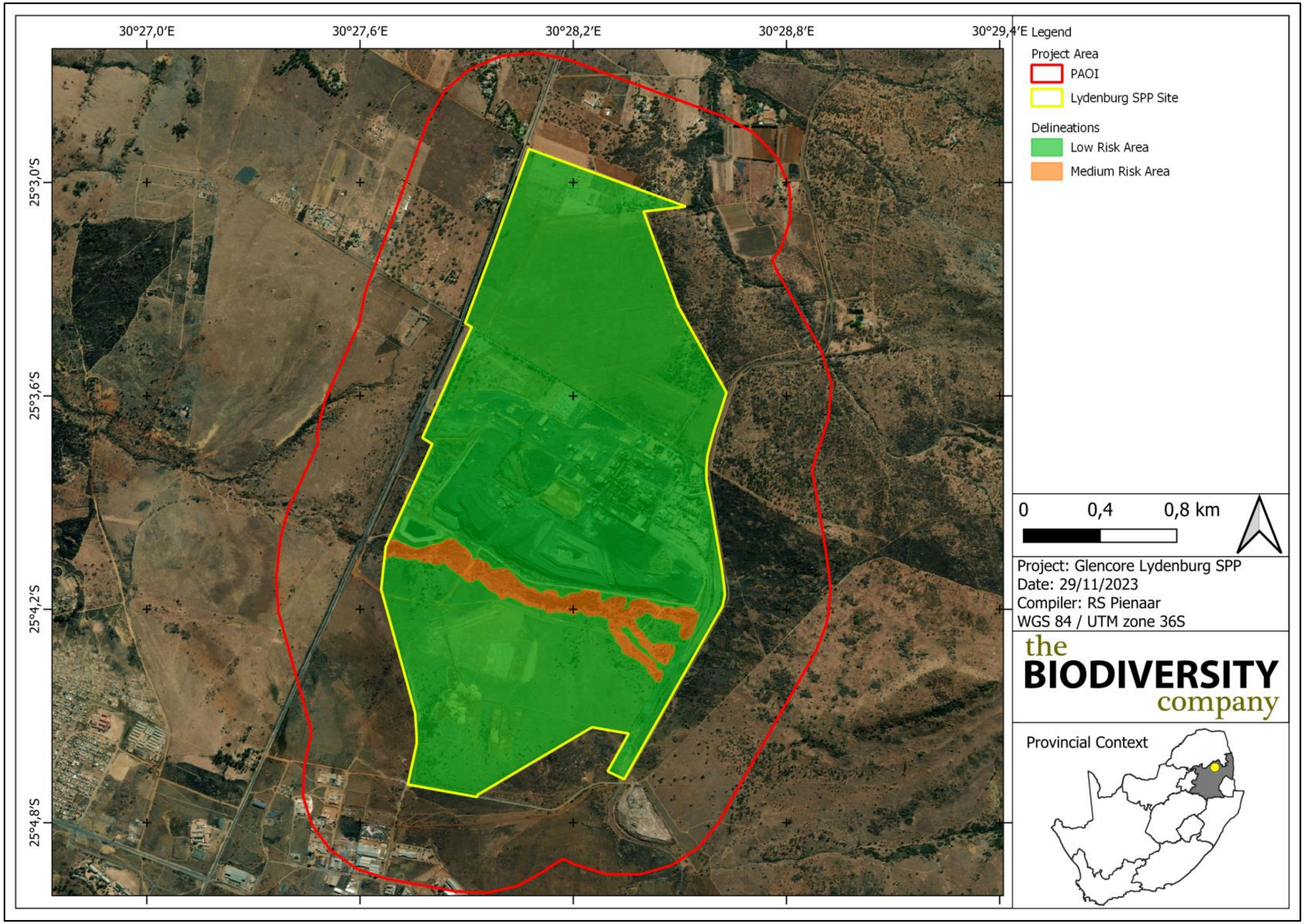



***Figure 5-2*** ***Risk areas identified for the proposed project***

## 5.2 Impact Assessment

The proposed project will not result in the loss of watercourse habitats (HGM 1, 2 and 3) as it is assumed that the proposed infrastructure will avoid the wetland. The clearing of vegetation throughout the site will still have the potential to impact on the wetland since the surface drainage patterns will be altered and the creation of disturbed areas will provide optimal sites for the proliferation of alien invasive species. It should be noted that all the mentioned impacts have a feedback mechanism and collectively, if left unchecked, a disruption to the biotic community structure due to the fragmentation and deterioration of habitat can result. This will subsequently reduce the level of ecosystem service benefit provide by the affected systems. Vehicle movement in proximity of the watercourses would also create erosion hotspots which could contribute to the sedimentation of any receiving watercourses. Due to the soil type of the area, infrastructure in proximity to watercourses could create preferential flow paths, causing increased surface run-off volumes and velocities causing erosion to the area.

The impacts associated with the proposed activities, was assessed in the impact matrix provided by EIMS and the results are given in Table 5-3~~Table 5-3~~.

***Table 5-3 Impact assessment for the proposed project***

| Impact | Phase | Pre-mitigation ER | Post-mitigation ER | Confidence | Cumulative Impact | Irreplaceable loss | Final score |
|---|---|---|---|---|---|---|---|
| Direct disturbance / degradation / loss to wetland soils or vegetation due to the construction of the solar facility. | Construction | -6 | -3 | High | 1 | 1 | -3 |
| Proliferation of alien invasive species due to surrounding disturbances. | Construction | -9 | -4 | High | 1 | 1 | -4 |
| Pollution and littering through inappropriate management of domestic and Industrial waste. | Construction | -3,5 | -3 | High | 1 | 1 | -3 |
| Altered hydrology due to hardened surfaces and stormwater channelling. | Construction | -9 | -4 | High | 1 | 1 | -4 |
| Increased erosion and sedimentation. | Construction | -8 | -3,5 | High | 1 | 1 | -3,5 |
| Potential contamination of wetlands with machine oils/pesticides/insecticides/herbicides and construction materials. | Construction | -3,5 | -3 | High | 1 | 1 | -3 |
| Altered hydrology due to hardened surfaces and stormwater channelling. | Operational | -9 | -4 | High | 1 | 1 | -4 |
| Increased erosion and sedimentation. | Operational | -8 | -3,5 | High | 1 | 1 | -3,5 |
| Potential contamination of wetlands with machine oils/pesticides/insecticides/herbicides and construction materials. | Operational | -3,5 | -3 | High | 1 | 1 | -3 |
| Pollution and littering through inappropriate management of domestic and Industrial waste. | Operational | -3,5 | -3 | High | 1 | 1 | -3 |
| Continued proliferation of Alien Invasive species. | Operational | -6,75 | -4 | High | 1 | 1 | -4 |
| Direct disturbance / degradation / loss to wetland soils or vegetation due to the construction of the solar facility. | Decommissioning | -5,25 | -3 | High | 1 | 1 | -3 |
| Proliferation of alien invasive species due to surrounding disturbances. | Decommissioning | -9 | -4 | High | 1 | 1 | -4 |
| Pollution and littering through inappropriate management of domestic and Industrial waste. | Decommissioning | -3,5 | -3 | High | 1 | 1 | -3 |
| Altered hydrology due to hardened surfaces and stormwater channelling. | Decommissioning | -9 | -4 | High | 1 | 1 | -4 |
| Increased erosion and sedimentation. | Decommissioning | -7 | -3 | High | 1 | 1 | -3 |
| Potential contamination of wetlands with machine oils/pesticides/insecticides/herbicides and construction materials. | Decommissioning | -3,5 | -3 | High | 1 | 1 | -3 |

## 5.3 Cumulative Impact and Habitat Loss

The impact of the proposed development in relation to the freshwater resource is considered to be "Low" and related mainly to minorly altering the hydrological input of the wetland. In consideration of the historic and current surrounding land use and activities, the impact to freshwater resources at a catchment scale will be considerably higher.

As such, the proposed development is not anticipated to result in an irreversible loss of freshwater resources.

# 6 Conclusion and Recommendation

## 6.1 Baseline Ecology

During the site assessment, three HGM units were identified and delineated within the Project Area of Influence. The wetlands were classified as a channelled valley-bottom, a unchannelled valley bottom and a seep wetland. The present ecological state of the wetlands ranges from class C – Moderately Modified to class D - Largely Modified”. In terms of the provision of ecosystem services, the wetlands scored “Moderately High” and “Intermediate” respectively, attributed to the modified state of the system. All HGM units scored “Moderate” in terms of importance and sensitivity. A pre-mitigation buffer of 32 m and a post-mitigation buffer of 15 m was calculated for the delineated wetlands and the non-perennial drainage features present within the site.

## 6.2 Risk Assessment

Under the assumption that the wetland and non-perennial drainage areas are avoided by the proposed development during the design finalisation stages of the project and that the calculated buffers are abided by, it is anticipated that the wetland will be indirectly and minorly impacted by the construction and operational phases of the proposed development. The risk assessment (DWS, 2016) concludes that the wetlands will be at “Moderate Risk” prior to mitigation which can be reduced to “Low Risk” with the implementation of the recommended mitigation measures.

## 6.3 Impact Assessment

The impact assessment considered both direct and indirect impacts, to the water resources. It is evident that the pre-mitigation impacts to the wetlands will be moderate which can be reduced to low impacts given adherence to the suggested wetland buffers and the implementation of the other recommended mitigation measures.

## 6.4 Specialist Statement

No fatal flaws were identified for the project. Based on the results and conclusions presented in this report, it is expected that the proposed activities will pose low residual risks on the wetlands provided that the mitigatory measures are implemented. It is the specialist opinion that the proposed project may be favourably considered for authorisation.

# 7 References

Department of Water Affairs and Forestry (DWAF). 2005a. A Practical Field Procedure for Identification and Delineation of Wetlands and Riparian Areas.

Department of Water and Sanitation (DWS). 2005b. River Ecoclassification: Manual for Ecostatus Determination. First Draft for Training Purposes. Department of Water Affairs and Forestry.

Department of Water and Sanitation (DWS). 2016. General Authorisation in Terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998) for water uses as defined in Section 21(c) or section 21(i). Government Gazette Notice: 509 in Government Gazette 40229 of 26 August 2016.

Department of Water and Sanitation (DWS). 2014. A Desktop Assessment of the Present Ecological State, Ecological Importance and Ecological Sensitivity per Sub Quaternary Reaches for Secondary Catchments in South Africa. Draft. Compiled by RQS-RDM.

Kotze, D.C., Marneweck, G.C., Batchelor, A.L., Lindley, D.C., and Collins, N.B. 2009. A Technique for rapidly assessing ecosystem services supplied by wetlands, Mondi Wetland Project.

Macfarlane, D.M., Bredin, I.P., Adams, J.B., Zungu, M.M., Bate, G.C. and Dickens, C.W.S. 2014. Preliminary guideline for the determination of buffer zones for rivers, wetlands and estuaries. Final Consolidated Report. WRC Report No TT 610/14, Water Research Commission, Pretoria.

Macfarlane, D.M., Kotze, D.C., Ellery, W.N., Walters, D., Koopman, V., Goodman, P. and Goge, C. 2007. A technique for rapidly assessing wetland health: WET-Health. WRC Report TT 340/08.

Mucina, L. and Rutherford, M.C., 2010. The vegetation of South Africa, Lesotho and Swaziland.

Nel J.L. and Driver A. 2012. South African National Biodiversity Assessment 2011: Technical Report. Volume 2: Freshwater Component. CSIR Report Number CSIR/NRE/ECO/IR/2012/0022/A, Council for Scientific and Industrial Research, Stellenbosch.

Nel JL, Murray KM, Maherry AM, Petersen CP, Roux DJ, Driver A, Hill L, Van Deventer H, Funke N, Swartz ER, Smith-Adao LB, Mbona N, Downsborough L and Nienaber S. 2011. Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.

North West Department of Rural, Environment andAgricultural Development (READ). 2015. North West Biodiversity Sector Plan. North West Provincial Government, Mahikeng. December 2015.

Ollis DJ, Snaddon CD, Job NM, and Mbona N. 2013. Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems. SANBI Biodiversity Series 22. South African Biodiversity Institute, Pretoria.

SANBI. 2009. Further Development of a Proposed National Wetland Classification System for South Africa. Primary Project Report. Prepared by the Freshwater Consulting Group (FCG) for the South African National Biodiversity Institute (SANBI).

SANBI (South African National Biodiversity Institute). 2017. Technical guidelines for CBA Maps: Guidelines for developing a map of Critical Biodiversity Areas & Ecological Support Areas using systematic biodiversity planning. A., Holness, S. & Daniels, F. (Eds). 1st Edition. South African National Biodiversity Institute, Pretoria.

Van Deventer, H., Smith-Adao, L., Mbona, N., Petersen, C., Skowno, A., Collins, N.B., Grenfell, M., Job, N., Lötter, M., Ollis, D., Scherman, P., Sieben, E. & Snaddon, K. 2018. South African National Biodiversity Assessment 2018: Technical Report. Volume 2a: South African Inventory of Inland Aquatic Ecosystems (SAIIAE). Version 3, final released on 3 October 2019. Council for Scientific and Industrial

Research (CSIR) and South African National Biodiversity Institute (SANBI): Pretoria, South Africa. Report Number: CSIR report number CSIR/NRE/ECOS/IR/2018/0001/A

# 8 Specialist Declarations

## Declaration

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**

**Wetland Ecologist**

The Biodiversity Company

November 2023

# Declaration

I, Andrew Husted declare that:

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

**Andrew Husted**

**Aquatic Ecologist**

The Biodiversity Company

November 2023