WETLAND BASELINE & RISK ASSESSMENT FOR THE PROPOSED BUFFELSPOORT SOLAR PHOTOVOLTAIC (PV) ENERGY FACILITY

MooiNooiNorth West Provinces

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CLIENT

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1 Introduction

1.1 Background

The Biodiversity Company was appointed to undertake a wetland baseline and risk assessment for the proposed Buffelspoort Solar Photovoltaics (PV) Energy Facility on Portions 75 and 134 of the Farm Buffelspoort 343JQ and its associated infrastructure near Mooinooi hereafter referred to the Project Site (Figure 2-1). The Project Site is located approximately 6 km west of Mooinooi, within jurisdiction of the Rustenburg Local Municipality and the Bojanala Platinum District Municipality in the North West Province (Figure 2-2).

A Project Area of Influence (PAOI) was created to incorporate the proposed Buffelspoort ESIA development footprint, Substation as well as the Buffelspoort OHL and represents the total area assessed.

This assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations. 2014 (No. 326, 7 as amended April 2017) of the National Environmental Management Act, 1998 (Act No. 107 of 1998). The assessment approach has taken cognisance of the recently published Government Notice 320 in terms of NEMA dated 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 National Web based Environmental Screening Tool has characterised the aquatic theme biodiversity for the project area as "very high sensitivity".

The purpose of the specialist studies is to provide relevant input into the impact assessment process and to provide a report for the proposed activities associated with the development of the Solar PV Energy Facility. This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making, as to the ecological viability of the proposed project.

1.2 Project

The proposed project will have a contracted capacity of up to 40 MWp. The purpose of the Solar PV Energy Facility will be to supply power to a private off-taker by connecting the Facility via a newly proposed ~2.5 km long 88kV single circuit overhead power line that will be routed over Privately -owned properties from the onsite Facility substation to the point of interconnection, north of the N4. The development, construction and operation of the Solar PV Energy Facility aims to enable the private off-taker to diversify their energy mix and to reduce their reliance on Eskom supplied power and is a conscious effort for the off-taker to contribute to their sustainability targets and reduce their carbon footprint. A grid connection corridor which varies in width from 200 m to 300 m and is up to 2.5 km in length has been identified for the assessment and suitable placement of the grid connection infrastructure within the corridor. This corridor will provide for the avoidance of sensitive environment areas and technical constraints. A Development Footprint of up to ~77 ha has been identified within the Project Site (~223 ha) by Buffelspoort Solar Project for the development of the Buffelspoort Solar PV Energy Facility.

Infrastructure associated with the Buffelspoort Solar PV Energy Facility will include the following:

- Solar PV arrays comprising PV panels and mounting structures;
- Inverters and transformers;
- Cabling between the arrays;
- Onsite facility substation;
- 88kV single circuit overhead power line for the distribution of the generated power, which will be connected to an existing 88kV Substation just north of the proposed Project Site;

- Battery Energy Storage System (BESS) – to be initiated at a later stage than the Solar PV Energy Facility[1];
- Temporary laydown area;
- Operations and Maintenance (O&M) building, which will include a site security office, warehouse, storage area and workshop;
- Main access road (existing – to be upgraded with hard surface) and internal (new) gravel roads; and
- Fencing around the site, including an access gate and security point.

[1] The BESS is included as part of the ESIA process albeit that the facility will only be installed after the Solar PV Energy Facility has come into operation. The total electricity requirements for the offtaker is currently under review and an energy master plan is being developed, which will only be finalised post implementation of the Solar PV Energy Facility to address all the electricity needs of the offtaker. The BESS has been included in this ESIA in order to ensure that should the energy master plan require this component to be included sooner than expected that it has already been authorized.

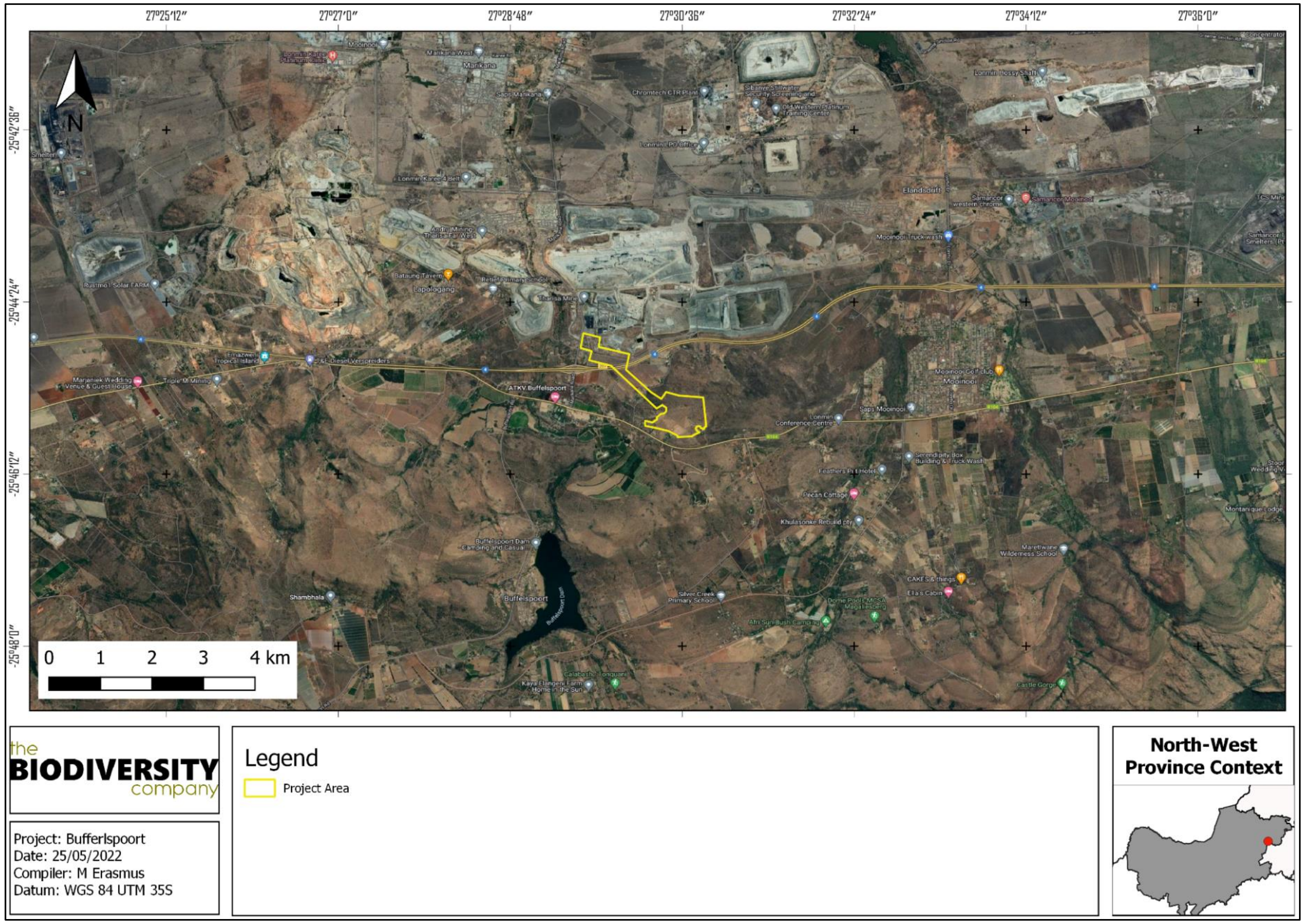

Figure 2-1 Proposed location of the Project Site in relation to the nearby towns

Figure 2-2 ***The proposed Development Footprint and Grid Connection Corridor***

1.3 Specialist Details

Report Name	**WETLAND BASELINE & RISK ASSESSMENT FOR THE PROPOSED BUFFELSPOORT SOLAR PHOTOVOLTAIC (PV) ENERGY FACILITY**	
Reference	**Buffelspoort Solar PV**	
Submitted to	savannah environmental	
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 has 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 13 years' experience in the environmental consulting field.	
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.	

1.4 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 Site;
- Conduct risk assessments relevant to the proposed activity;
- Recommendations relevant to associated impacts; and
- Report compilation detailing the baseline findings.

1.5 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 Geographic Information System (GIS) information would have affected the area surveyed;
- Only the Development Footprint area and a 20 m corridor around the powerlines have been ground truthed with the surrounding 500 m regulated area being covered via desktop studies; and
- The GPS used for the survey has a 5 m accuracy and therefore any spatial features may be offset by 5 m.

1.6 Key Legislative Requirements

1.6.1 National Water Act (NWA, 1998)

The Department of Water and Sanitation (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).

1.6.2 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. For the Buffelspoort Solar PV Energy Facility an EIA process has been triggered.

2 Methods

A site visit was conducted on the 20th of April 2022, which constitutes as a 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. 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.

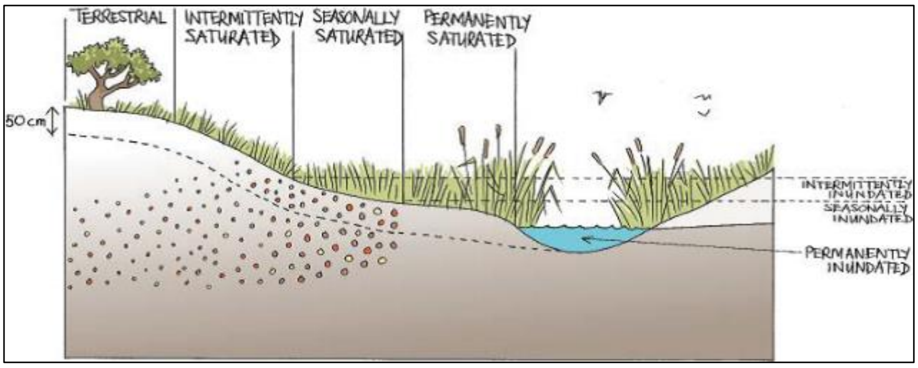

Figure 2-1 Cross section through a wetland, indicating how the soil wetness and vegetation indicators change (Ollis et al. 2013)

2.1.1 Delineation

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

2.1.2 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 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

2.1.3 Present Ecological Status

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

2.1.4 Importance and Sensitivity

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

2.1.5 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).

2.1.6 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 Project.

3 Results and Discussion

3.1 Desktop Baseline

3.1.1 Vegetation Types

The Project Site is situated in the Savanna biome. The savanna vegetation of South Africa represents the southernmost extension of the most widespread biome in Africa (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the Savanna biome include a seasonal precipitation and a sub-tropical thermal regime with no or usually low incidence of frost (Mucina & Rutherford, 2006).

The Savanna biome is the largest biome in South Africa, extending throughout the east and north-eastern areas of the country. The Savanna Biome is characterised by a dominant grass layer, over-topped by a discontinuous, but distinct woody plant layer (Mucina & Rutherford, 2006). At a structural level, Africa's Savanna biomes can be broadly categorised as either fine-leaved (microphyllous) savannas or broad-leaved savannas. Fine-leaved savannas typically occur on nutrient rich soils and are dominated by microphyllous woody plants of the Mimosaceae family (Common genera include *Vachellia* and *Albizia*) and a generally dense herbaceous layer (Scholes & Walker, 1993).

On a fine-scale vegetation type, the Development Footprint and Grid Connection Corridor overlaps with the Marikana Thornveld and Moot Plains Bushveld vegetation types (Figure 3-1).

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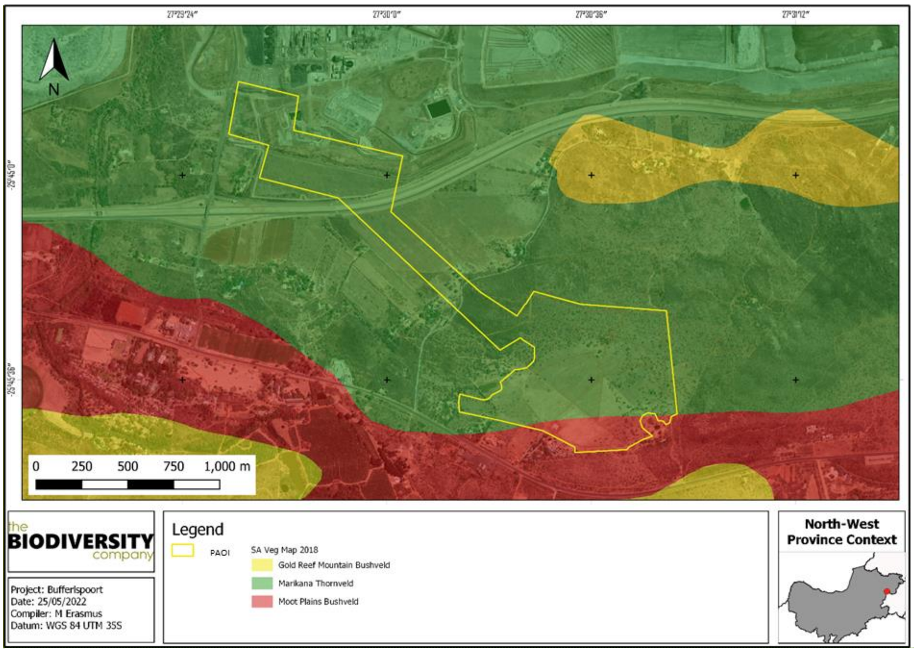

Figure 3-1 Map illustrating the vegetation type associated with the PAOI

3.1.1.1 Marikana Thornveld (SVcb 6)

Marikana Thornveld extends on the broad plains from Rustenburg in the West, through Marikana and Brits, and towards Pretoria in the East (Mucina & Rutherford, 2006). It is characterised by open *Vachellia karroo* woodland, which occurs in valleys and on undulating plains and hills (Mucina & Rutherford, 2006). Fire-protected habitats, such as drainage lines, rocky outcrops and termitaria are typically dominated by denser, shrub-dominated vegetation (Mucina & Rutherford, 2006).

Important Plant Taxa in the Marikana Thornveld

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

Tall Tree: *Senegalia burkei*.

Small Trees: *Senegalia caffra*, *Vachellia gerrardii*, *Vachellia karroo*, *Combretum molle*, *Searsia lancea*, *Ziziphus mucronata*, *Vachellia nilotica, Vachellia tortilis* subsp. *heteracantha*, *Celtis africana*, *Dombeya rotundifolia*, *Pappea capensis*, *Peltophorum africanum*, *Terminalia sericea*.

Tall Shrubs: *Euclea crispa* subsp. *crispa*, *Olea europaea* subsp. *africana*, *Searsia pyroides* var. *pyroides*, *Diospyros lycioides* subsp. *guerkei*, *Ehretia rigida* subsp. *rigida*, *Euclea undulata*, *Grewia flava*, *Pavetta gardeniifolia*.

Low Shrubs: *Asparagus cooperi*, *Rhynchosia nitens*, *Indigofera zeyheri*, *Justicia flava*.

Woody Climbers: *Clematis brachiata*, *Helinus integrifolius*.

Herbaceous Climbers: *Pentarrhinum insipidum*, *Cyphostemma cirrhosum*.

Graminoids: *Elionurus muticus*, *Eragrostis lehmanniana*, *Setaria sphacelata*, *Themeda triandra*, *Aristida scabrivalvis* subsp. *scabrivalvis*, *Fingerhuthia africana*, *Heteropogon contortus*, *Hyperthelia dissoluta*, *Melinis nerviglumis*, *Pogonarthria squarrosa*.

Herbs: *Hermannia depressa*, *Ipomoea obscura*, *Barleria macrostegia*, *Dianthus mooiensis* subsp. *mooiensis*, *Ipomoea oblongata*, *Vernonia oligocephala*.

Geophytic Herbs: *Ledebouria revoluta*, *Ornithogalum tenuifolium*, *Sansevieria aethiopica*.

Conservation Status

According to Mucina and Rutherford (2006), this vegetation type is classified as Endangered, with its national conservation target being 19%. Over 48% has already been transformed by urban expansion and cultivation, and alien invasive plants occur in high densities, especially along drainage lines (Mucina & Rutherford, 2006). Erosion is very low to moderate (Mucina & Rutherford, 2006). Less than 1% is conserved in the Magaliesberg Nature Area, De Onderstepoort Nature Reserve and other reserves. Erosion is very low to moderate (Mucina & Rutherford, 2006).

3.1.1.2 Moot Plains Bushveld

The main belt of the Moot Plains Bushveld extends from the Selons River Valley south of the Magaliesberg, through Maanhaarrand and the valley bottom of the Magalies River, east of the Hartebeestpoort Dam between the Magaliesberg and Daspoort mountain ranges and to Pretoria (Mucina & Rutherford, 2006). It is characterised by low-lying savanna dominated by *Vachellia* species*.* occurring on the bottomlands and plains, or woodlands on the lower hillsides vary in height and density (Mucina & Rutherford, 2006). Grasses dominate the herbaceous layer (Mucina & Rutherford, 2006).

Important Plant Taxa in the Moot Plains Bushveld

Mucina and Rutherford (2006) noted the following species as important taxa in the Moot Plains Bushveld:

Small trees: *Vachellia nilotica*, *Vachellia tortillis* subsp. *heteracantha*, *Searsia lancea*.

Tall shrubs: *Buddleja saligna*, *Euclea undulata*, *Olea europaea* subsp. *africana*, *Grewia occidentalis*, *Gymnosporia polyacantha*, *Mystroxylon aethiopicum* subsp. *burkeanum*.

Low shrubs: *Aptosimum elongatum*, *Felicia fascicularis*, *Lantana rugosa*, *Teucrium trifidum*.

Succulent shrub: *Kalanchoe paniculata*.

Woody climber: *Jasminum breviflorum*.

Herbaceous climber: *Lotononis bainesii*.

Graminoids: *Heteropogon contortus*, *Setaria sphacelata*, *Themeda triandra*, *Aristida congesta*, *Chloris virgata*, *Cynodon dactylon*, *Sporobolus nitens*, *Tragus racemosus*.

Herbs: *Achyropsis avicularis*, *Corchorus asplenifolius*, *Evolvulus alsinoides*, *Helichrysum nudifolium*, *Helichrysum undulatum*, *Hermannia depressa*, *Osteospermum muricatum*, *Phyllanthus maderaspatensis*.

Conservation Status

According to Mucina and Rutherford (2006), this vegetation type is classified as Vulnerable, with its national conservation target being 19%. About 28% has been transformed by cultivation as well as urban and built-up areas (Mucina & Rutherford, 2006). Erosion is mainly very low to low, but also moderate in some areas (Mucina & Rutherford, 2006). About 13% is statutorily conserved, mainly in the Magaliesberg Nature Area (Mucina & Rutherford, 2006). Outside protected areas there are very scattered occurrences to sometimes dense patches of this vegetation type in places of various alien plants such as *Cereus jamacaru*, *Eucalyptus* species, *Jacaranda mimosifolia*, *Lantana camara*, *Melia azedarach* and *Schinus* species (Mucina & Rutherford, 2006).

3.1.2 Soils and Geology

According to the land type database (Land Type Survey Staff, 1972 - 2006), the Project Site is characterised by the Ea 3 land type. The Ea land type consists of one or more of the following soils: Vertic, Melanic and red structured diagnostic horizons, of which these soils are all undifferentiated.

This region is characterised by norite and gabbro with anorthosite interlayered. Small patches of the Rashoop Granophyre Suite are can also be noted in this area (all from the Bushveld Igneous Complex). Large boulders and lithic horizons are distributed throughout with very well-drained Glenrosa and Mispah soil forms. Vertic and melanic soils are also abundant with the main land types being Ib and Ea (Mucina and Rutherford, 2006).

3.1.3 Climate

This region is characterised by a summer rainfall with dry winters. The Mean Annual Precipitation (MAP) ranges from 600 to 700 mm with frost rarely occurring during winter months (also see Figure 3-2).

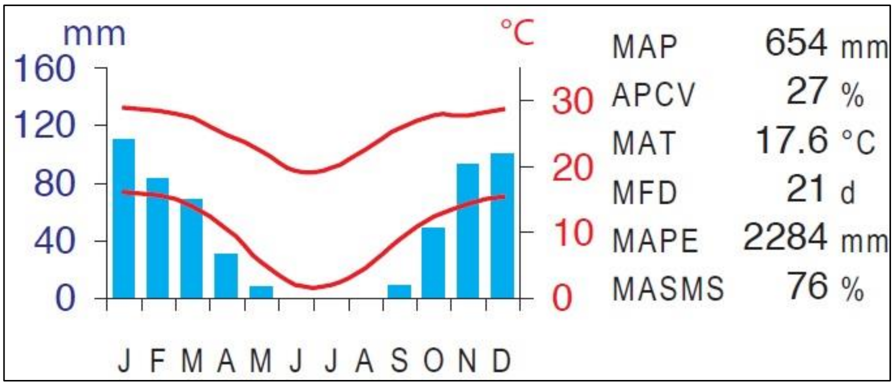

Figure 3-2 Climate for the region

3.1.4 National Freshwater Ecosystem Priority Area Status

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

Figure 3-3 shows the location of the Development Footprint and Grid Connection Corridor in relation to wetland FEPAs. Based on this information, the Development Footprint and Grid Connection Corridor does not overlap with a FEPA river or wetland. There are however five areas marked as NFEPA's located within the 500 m regulated area around the Development Footprint. These were classified as artificial unchannelled valley bottoms.

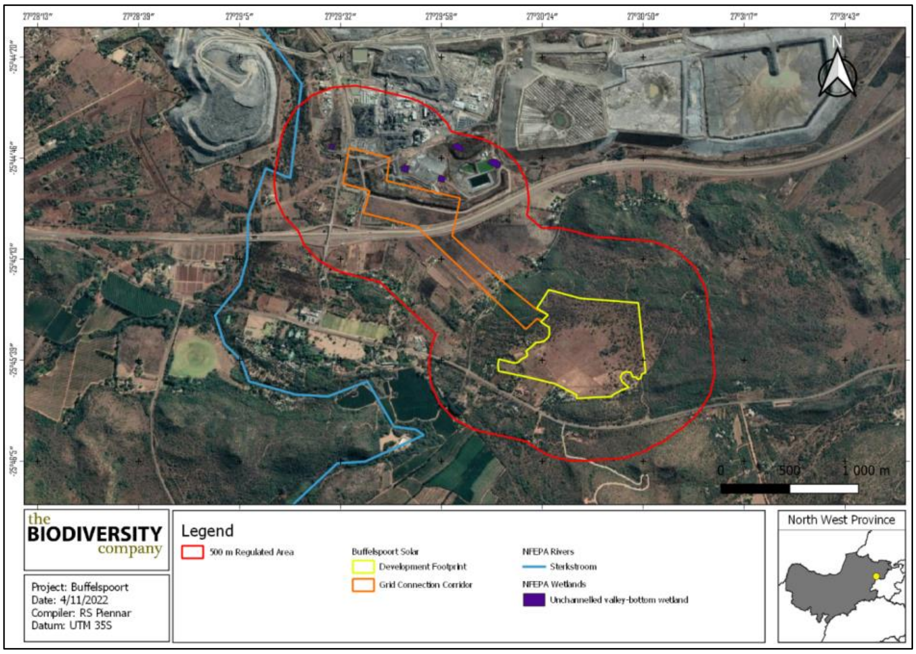

Figure 3-3 NFEPA wetland areas located within the PAOI

3.1.5 South African Inventory of Inland Aquatic Ecosystems

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was released with the NBA 2018. Ecosystem threat status (ETS) of river and wetland ecosystem types are based on the extent to which each river ecosystem type had been altered from its natural condition. Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Threatened (LT), with CR, EN and VU ecosystem types collectively referred to as 'threatened' (Van Deventer *et al.,* 2019; Skowno *et al.,* 2019). The 500 m regulated area around the PAOI overlaps with a CR river, the Sterkstroom (Figure 3-4).

Figure 3-4 Map illustrating the SAIIAE river and wetland ecosystems in the proposed 500 m regulated area.

3.1.6 Terrain

The terrain of the 500 m regulated area has been analysed to determine potential areas where wetlands are more likely to accumulate (due to convex topographical features, preferential pathways, or more gentle slopes).

3.1.6.1 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 500 m regulated area ranges from 1194 to 1336 metres above sea level (MASL). The lower laying areas (generally represented in dark blue) represent the area that will have the highest potential to be characterised as wetlands (see Figure 3-5).

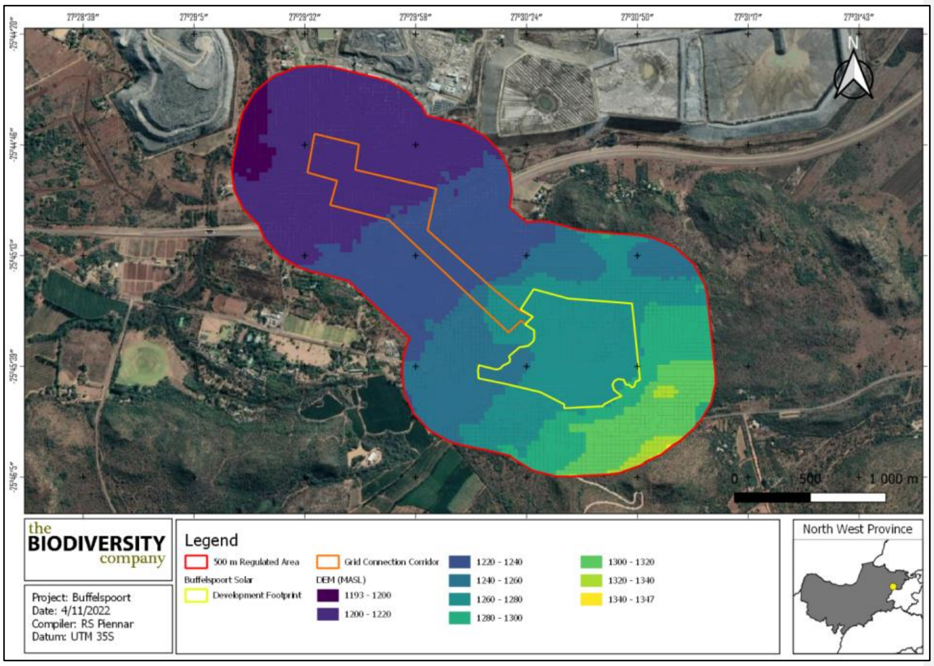

Figure 3-5 Digital Elevation Model of the 500 m regulated area of the Development Footprint and Grid Connection Corridor

3.1.6.2 Slope

The slope percentage of the 500 m regulated area is illustrated in Figure 3-6. The slope percentage ranges from 0 to 52% due to rocky outcrops located inside the 500 m regulated area. Most of the 500 m regulated area is characterised by slopes ranging between 0 – 10% which classifies the area as gently sloped. Besides the fact that hillslope seeps are likely to occur on any slope percentage, wetlands in general tend to accumulate in flatter areas.

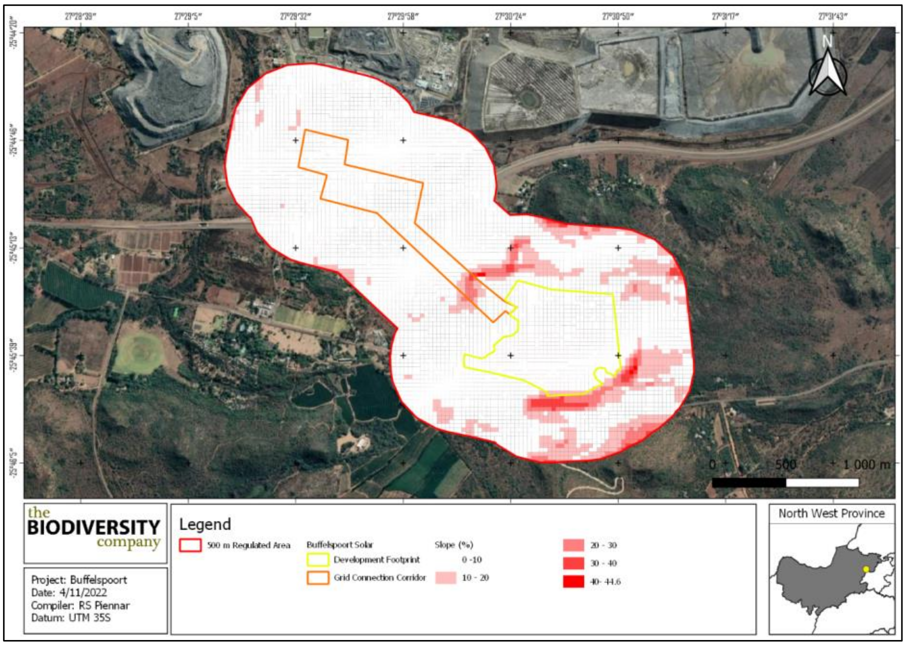

Figure 3-6 ***The slope percentage of the 500 m regulated area of the Development Footprint and Grid Connection Corridor***

3.2 Field Assessment

3.2.1 Delineation and Description

During the site visit, four (4) HGM units were identified within the 500 m regulated area (see Figure 3-8). The wetland areas were delineated in accordance with the DWAF (2005) guidelines (see Figure 3-7 and Figure 3-8). Two HGM units have been identified as (2) depression wetlands, one (1) has been identified as a hillslope seep wetland and one as a (1) unchannelled valley bottom wetland. Along with the wetlands multiple drainage features as well as artificial wetlands and a few dams were also delineated. Although these systems do not classify as a natural wetland system it is important to note where they are and to preserve them.

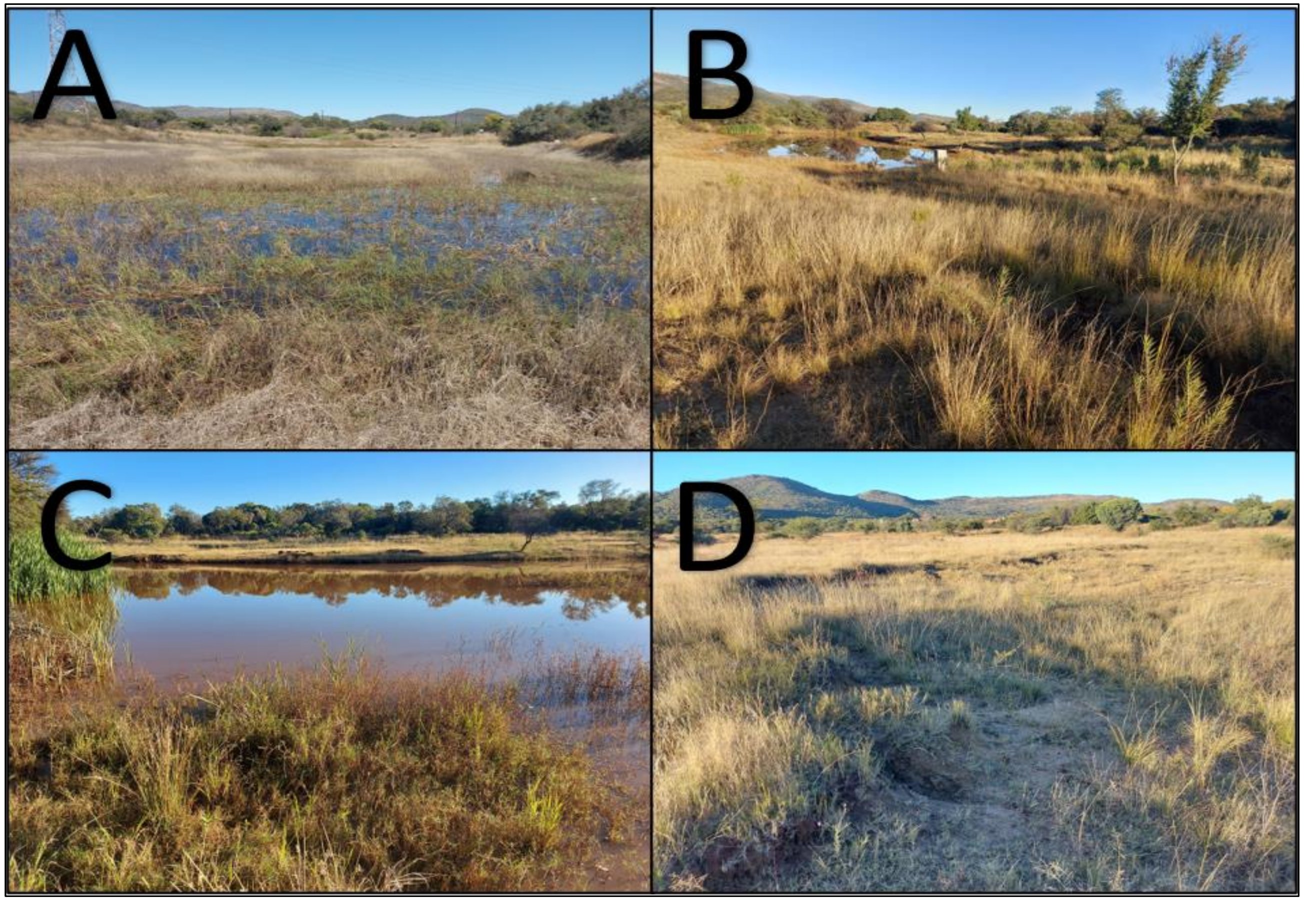

Figure 3-7 Photographical evidence of the different wet areas found within the 500 m regulated area, A) Seep. B) Depression. C) Dam and D) Drainage features.

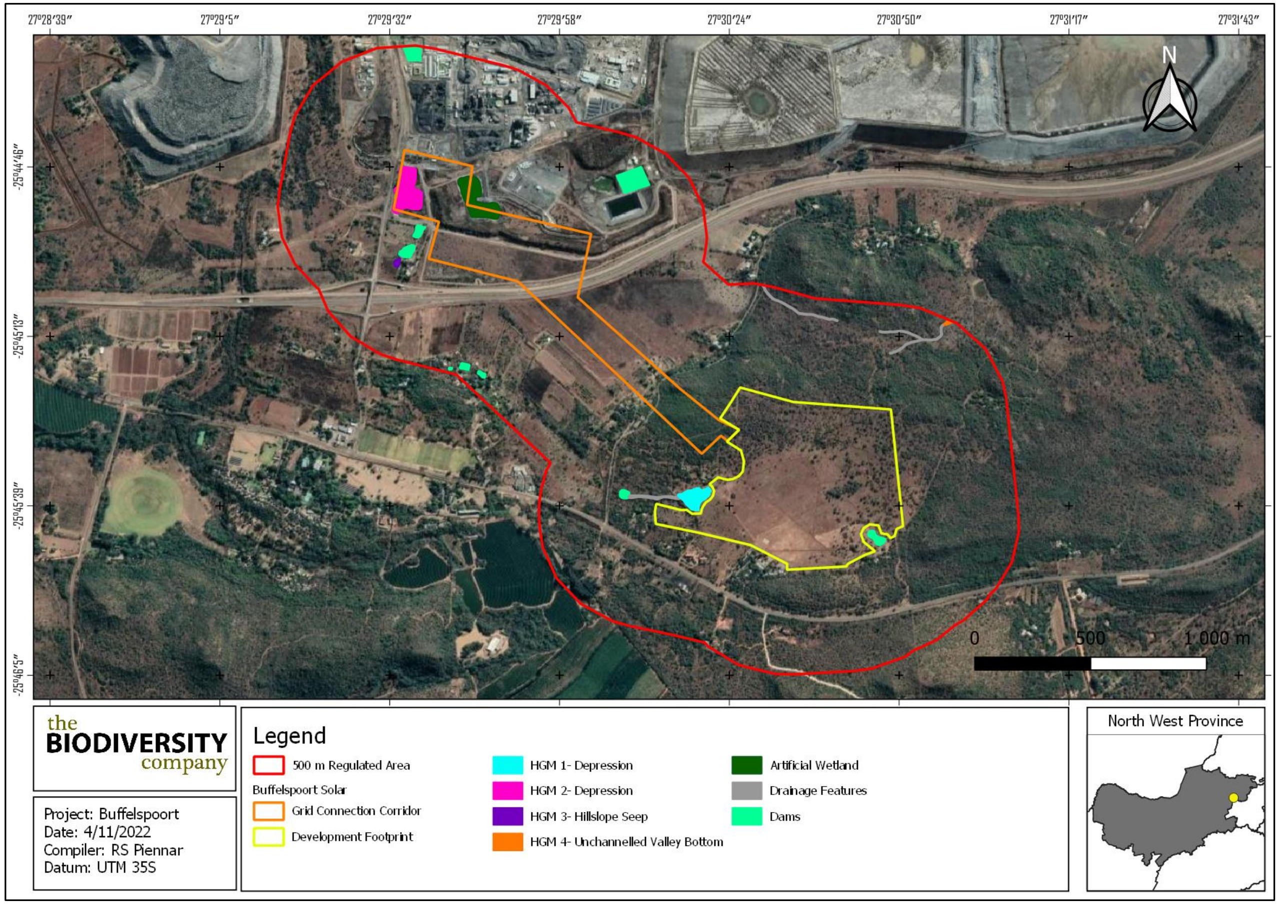

Figure* 3-8** ***Delineation and location of the different HGM units identified within the 500 m regulated area of the Development Footprint and Grid Connection Corridor

3.3 Wetland Unit Setting

Depression wetlands are located on the "slope" landscape unit. Depressions are inward draining basins with an enclosing topography which allows for water to accumulate within the system. Depressions, in some cases, are also fed by lateral sub-surface flows in cases where the dominant geology allows for these types of flows. Figure 3-9 presents a diagram of a typical depression wetland, showing the dominant movement of water into, through and out of the system.

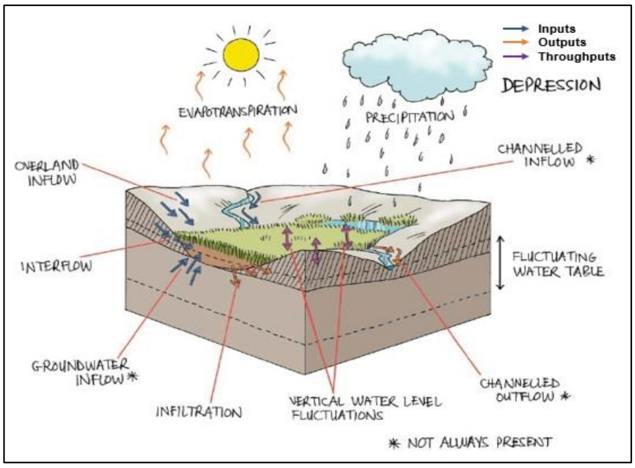

Figure 3-9 ***Amalgamated diagram of atypical depression wetland, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al. 2013)***

The hillslope seeps are located within slopes, as mentioned in Figure 3-10. 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 3-10 illustrates a diagram of the hillslope seeps, showing the dominant movement of water into, through and out of the system.

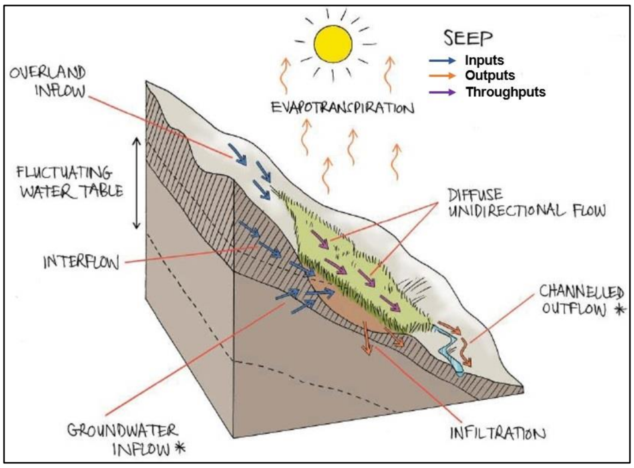

Figure 3-10 ***Amalgamated diagram of a typical hillslope seep, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al. 2013)***

Unchanneled valley bottom wetlands are typically found on valley floors where the landscape does not allow high energy flows. Figure 3-11 presents a diagram of the relevant HGM unit, showing the dominant movement of water into, through and out of the system.

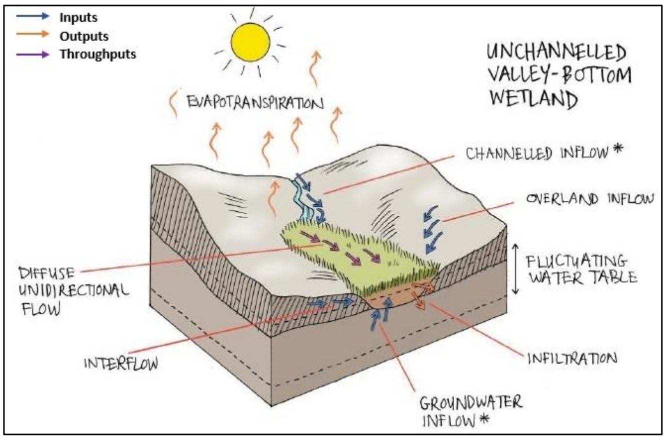

Figure 3-11 Amalgamated diagram of a typical unchanneled valley bottom, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al. 2013)

3.3.1 Indicators

3.3.1.1 Hydromorphic Soils

According to (DWAF, 2005), soils are the most important characteristic of wetlands in order to accurately identify and delineate wetland areas. Two (2) dominant soil forms were identified within the identified wetland, namely the Rensburg and Dundee soil forms (see Figure 3-12) (Soil Classification Working Group, 2018).

The Rensburg soil form consists of a vertic topsoil on top of a gley horizon. The soil family group identified for the Rensburg soil form on-site has been classified as the "1000" soil family due to the non-calcareous nature of the gley horizon.

The Dundee soil form consists of an Orthic topsoil on top of a stratified alluvium horizon. The soil family group identified for the Dundee soil form is "2222" due to the chromic colour of the topsoil, the brown colour of the subsoil, the non-calcareous nature of the soil form as well as the presence of alluvial wetness.

Vertic topsoil have a high clay content with smectic clay particles being dominant (Soil Classification Working Group, 2018). The smectic clays have swell and shrink properties during wet and dry periods respectively. Peds will be shiny, well-developed with a highly plastic consistency during wet periods as a result of the dominance of smectic clays. During shrinking periods, cracks form on the surface and rarely occurs in shallow vertic clays.

Orthic topsoils are mineral horizons that have been exposed to biological activities and varying intensities of mineral weathering. The climatic conditions and parent material ensure a wide range of properties differing from one orthic topsoil to another (i.e. colouration, structure etc) (Soil Classification Working Group, 2018).

Gley horizons that are well developed and have homogenous dark to light grey colours with smooth transitions. Stagnant and reduced water over long periods is the main factor responsible for the formation of a gley horizon and could be characterised by green or blue tinges due to the presence of a mineral called Fougerite which includes sulphate and carbonate complexes. Even though grey colours are dominant, yellow and/or red striations can be noticed throughout a gley horizon. The structure of a gley horizon mostly is characterised as strong pedal, with low hydraulic conductivities and a clay texture, although sandy gley horizons are known to occur. The gley soil form commonly occurs at the toe of hillslopes (or benches) where lateral water inputs (sub-surface) are dominant and the underlaying geology is characterised by a low hydraulic conductivity. The gley horizon usually is second in diagnostic sequence in shallow profiles yet is known to be lower down in sequence and at greater depths (Soil Classification Working Group, 2018).

The stratified alluvium horizon is formed via alluvial or colluvial processes. This soil type is stratified and closely resembles the natural materials of this soil type. Stratified alluvium generally is fertile and is often therefore used for cultivation purposes.

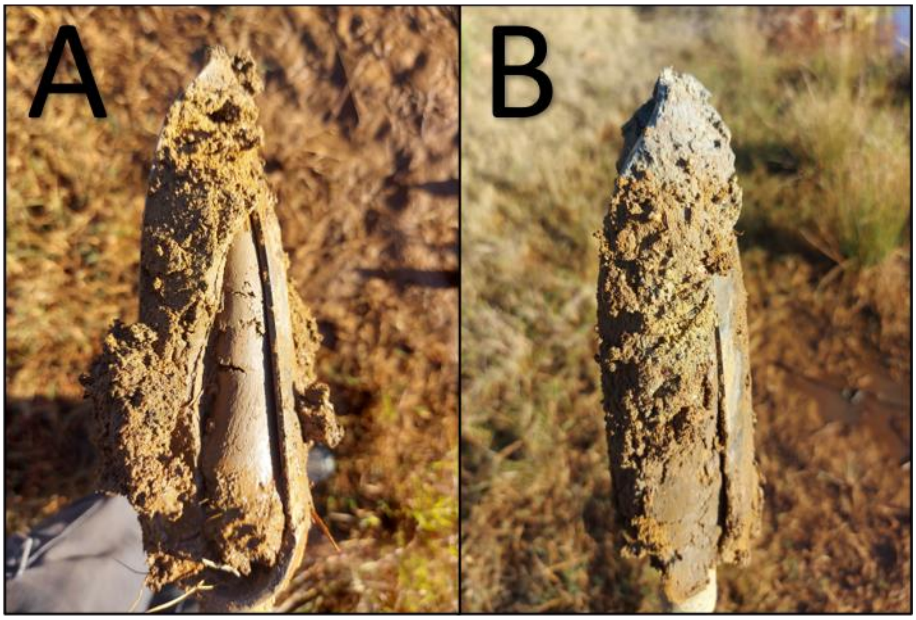

Figure 3-12 Different soil forms found inside the wetlands, A) Orthic topsoil. B) Transition from orthic topsoil to gleyic subsoil.

3.3.1.2 Hydrophytes

Vegetation plays a considerable role in identifying, classifying and accurately delineating wetlands (DWAF, 2005). During the site visit, various hydrophytic species were identified (including facultative species). Examples include *Typha capensis, and Schoenoplectus spp.* (See Figure 3-13).

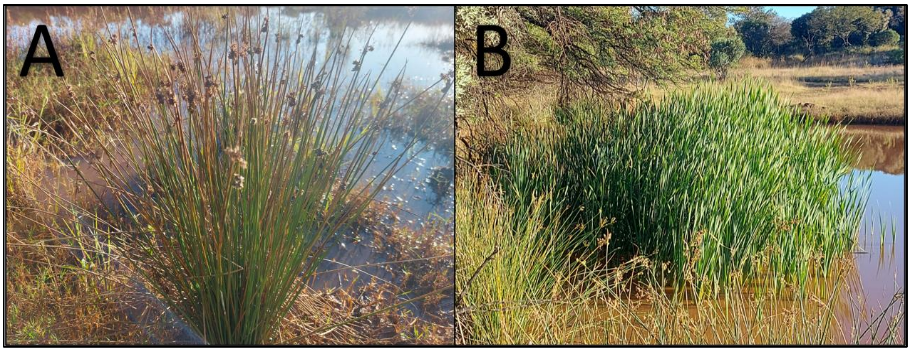

Figure 3-13 Hydrophytic vegetation identified within delineated watercourses. A) Schoenoplectus spp. B) Typha capensis.

3.4 General Functional Description

The generally impermeable nature of depressions and their inward draining features are the main reasons why the streamflow regulation ability of these systems is mediocre. Regardless of the nature of depressions in regard to trapping all sediments entering the system, sediment trapping is another eco service that is not deemed as one of the essential services provided by depressions, even though some systems might contribute to a lesser extent. The reason for this phenomenon is due to winds picking up sediments within pans during dry seasons which ultimately leads to the removal of these sediments and the deposition thereof elsewhere. The assimilation of nitrates, toxicants and sulphates are some of the higher rated eco services for depressions. This latter statement can be explained the precipitation as well as continues precipitation and dissolving of minerals and other contaminants during dry and wet seasons respectively, (Kotze et al., 2009).

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). The accumulation of organic matter additionally 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 as well provides erosion control. These eco services are not provided by the wetland given the nature of the typical seep's position on slopes.

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).

It is however important to note that the descriptions of the above-mentioned functions are merely typical expectations. All wetland systems are unique and therefore, the ecosystem services rated high for these systems on site might differ slightly to those expectations.

3.4.1 Ecological 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). HGM units 1 & 2 scored "Moderately High" ecosystem service scores with HGM 3 scoring "Moderately Low" and HGM 4 "Intermediate" ecosystem services scores respectively. The average ecosystem service scores for the delineated systems are illustrated in Table 3-1 and Figure 3-14.

Ecosystem services contributing to these scores include flood attenuation, streamflow regulation, sediment trapping, phosphate assimilation, nitrate assimilation, toxicant assimilation, erosion control, biodiversity maintenance and tourism and recreation.

Table 3-1 Average ecosystem service scores for delineated wetlands

Moderately High	Intermediate	Moderately Low
HGM 1	HGM 4	HGM 3
HGM 2		

HGM 1 & 2 scored a higher ecosystem services score than the rest of the wetlands due to the high volumes of hydrophyte vegetation in and around the two (2) wetlands. The vegetation plays a very important role in biodiversity maintenance and the assimilation of toxicants as well as phosphate and nitrates from the environments as well as erosion control and sediment trapping. HGM 1 is located at the bottom of a slope where sediment will flow to during the raining season. The HGM will then prevent the loss of sediment as well as prevent erosion from occurring. HGM 2 is located close to an active mine where toxicants and pollution flows into the HGM unit through overland flows during rain. The HGM unit then acts as a sink to contain the toxicants and prevent the toxicants from reaching the river systems. The HGM unit then uses its vegetation to remove the toxicants from the environment.

HGM 3 scored the lowest ecosystem services score due to its location as well as the wetland type. The wetland is located on a hillslope within agricultural fields. The agricultural field means that the wetland is stripped from all hydrophyte vegetation which limits its ability to contribute to biodiversity maintenance and to provide habitat for species. The wetland does however provide water for some crops that grows within the wetland.

HGM 4 scored "Intermediate" ecosystem services scores due to the presence of hydrophyte vegetation which contributes to biodiversity maintenance and provides habitat and resources. The wetland however is located within the more natural areas of the regulated area away from most of the pollution and toxicants. The wetland thus does not play an important role in the assimilation of pollutants and toxicants out of the environment.

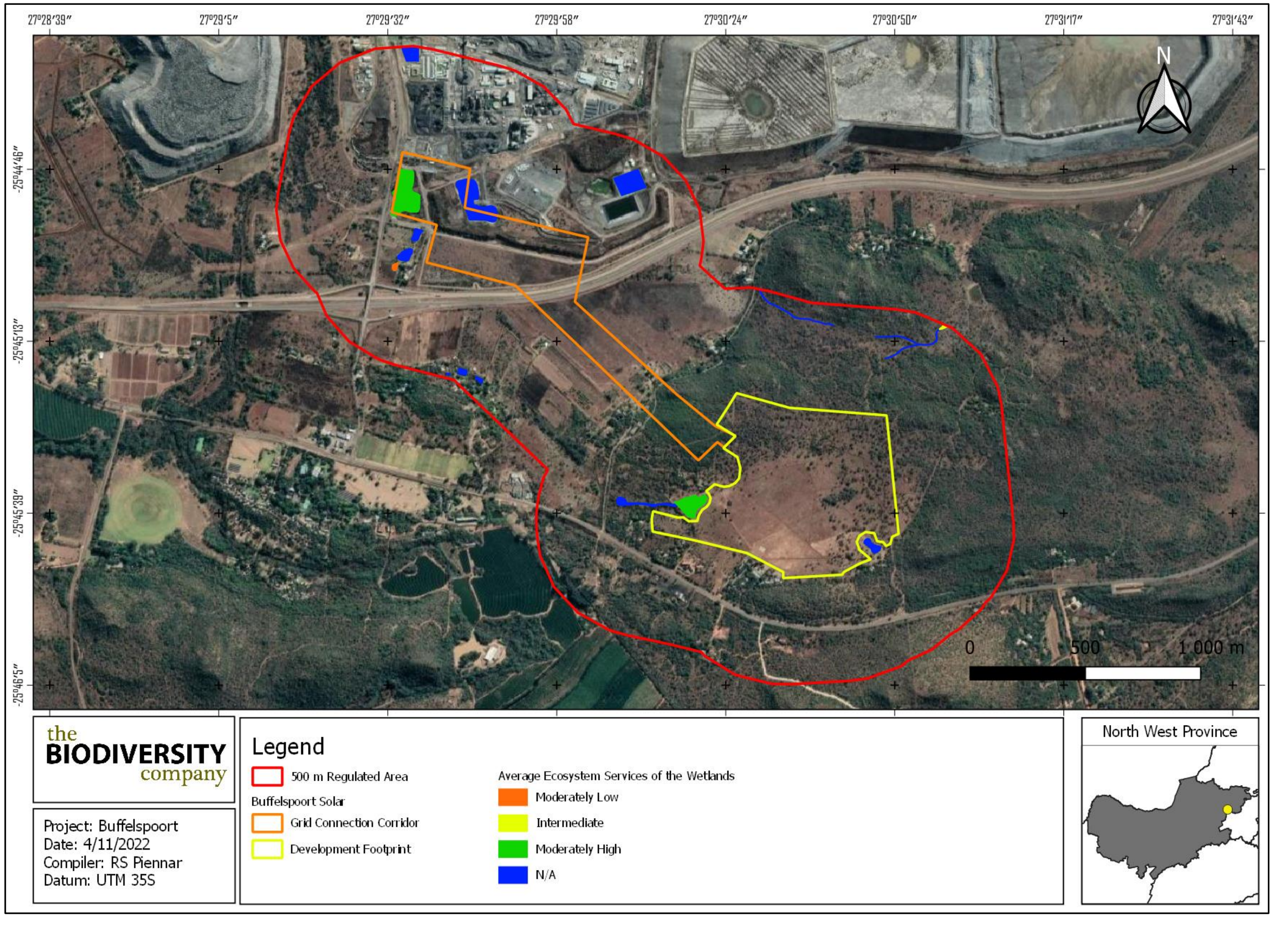

Figure 3-14 Average ecosystem service scores for the delineated wetland systems

3.4.2 The Ecological Health Assessment

The PES for the assessed HGM units is presented in Table 3-2 and Figure 3-15. The delineated wetland systems have scored overall PES ratings ranging between "Largely Modified" (class D) to "Seriously Modified" (class E).

The wetlands that were rated as "Largely Modified" are located in the more natural areas of the Project Site within the game farm. Although the wetlands are located within more natural areas, multiple anthropogenic impacts still occur on the systems. These systems are characterised by overgrazing and trampling by game as well as the building of fences and roads through the wetlands.

The wetlands that were rated as being "Seriously Modified" are located in the vicinity of the proposed Project with some development taking place within the wetland boundary. During the site visit evidence was seen of excavations taking place within the wetland as well as trucks driving through the wetlands. These will remove the hydrophyte vegetations as well as compress the soils inside the wetland altering its ecological state.

Table 3-2 Average present ecological state of the wetlands

Largely Modified	Seriously Modified
HGM 1	HGM 2
HGM 4	HGM 3

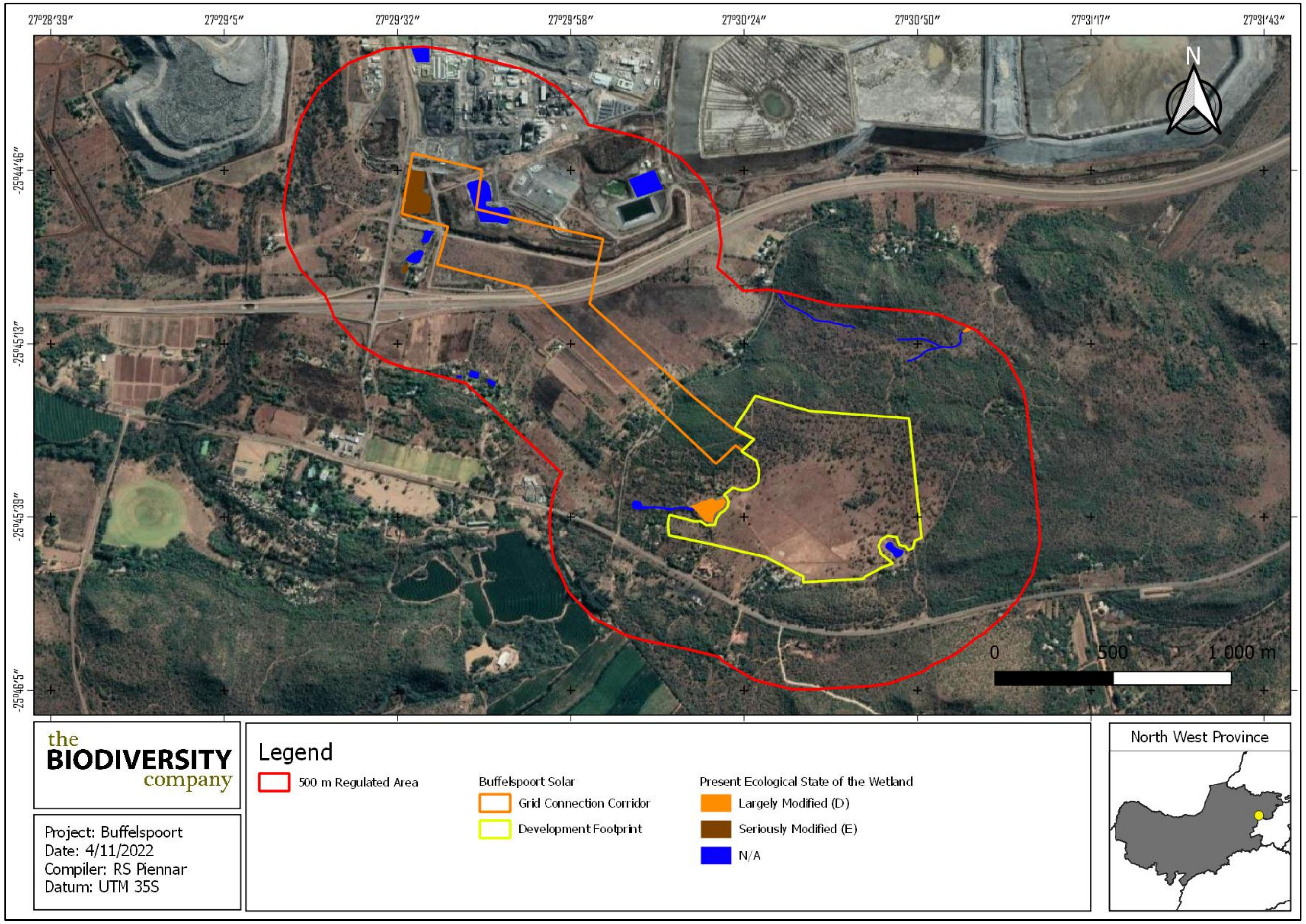

Figure 3-15 Overall present ecological state of delineated wetlands

3.4.3 The Importance & Sensitivity Assessment

The results of the ecological IS assessment are shown in Table 3-3. Various components pertaining to the protection status of a wetland are considered for the IS, including Strategic Water Source Areas (SWSA), the NFEPA wet veg protection status and the protection status of the wetland itself considering the NBA wetland data set. The IS of the depression and hillslope seep HGM units have been calculated to be "Low" due to the low protection for both the wet veg and the wetland itself. The IS for all the unchannelled valley bottom HGM units have been calculated to be "Moderate", which combines the moderate protection status of the wet veg type and the low protection status of the wetland itself.

Table 3-3 The IS results for the delineated HGM unit

HGM Type	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		
HGM 1 & 2	Central Bushveld Group 2	Vulnerable	Moderately Protected	N/A	N/A	N/A	N	**Low**
HGM 3	Central Bushveld Group 2	Least Threatened	Poorly Protected	N/A	N/A	N/A	N	**Low**
HGM 4	Central Bushveld Group 2	Vulnerable	Moderately Protected	N/A	N/A	N/A	N	**Moderate**

3.4.4 Buffer Requirements

The scientific buffer calculation (Macfarlane *et al*., 2014) was used to determine the size of the buffer zones relevant to the proposed development of the Solar PV Energy Facility, its onsite substation and the proposed powerline. The buffer size for both the Development Footprint and the powerline corridor were determined to be 15 m post mitigation (see Table 3-4 and Figure 3-16). These buffer widths are applicable to each wetland unit.

Table 3-4 Pre- and post-mitigation buffer requirements

Aspect	Pre-Mitigation Buffer Size (m)	Post Mitigation Buffer Size (m)
PV and Substation	36	15
Powerlines	30	15

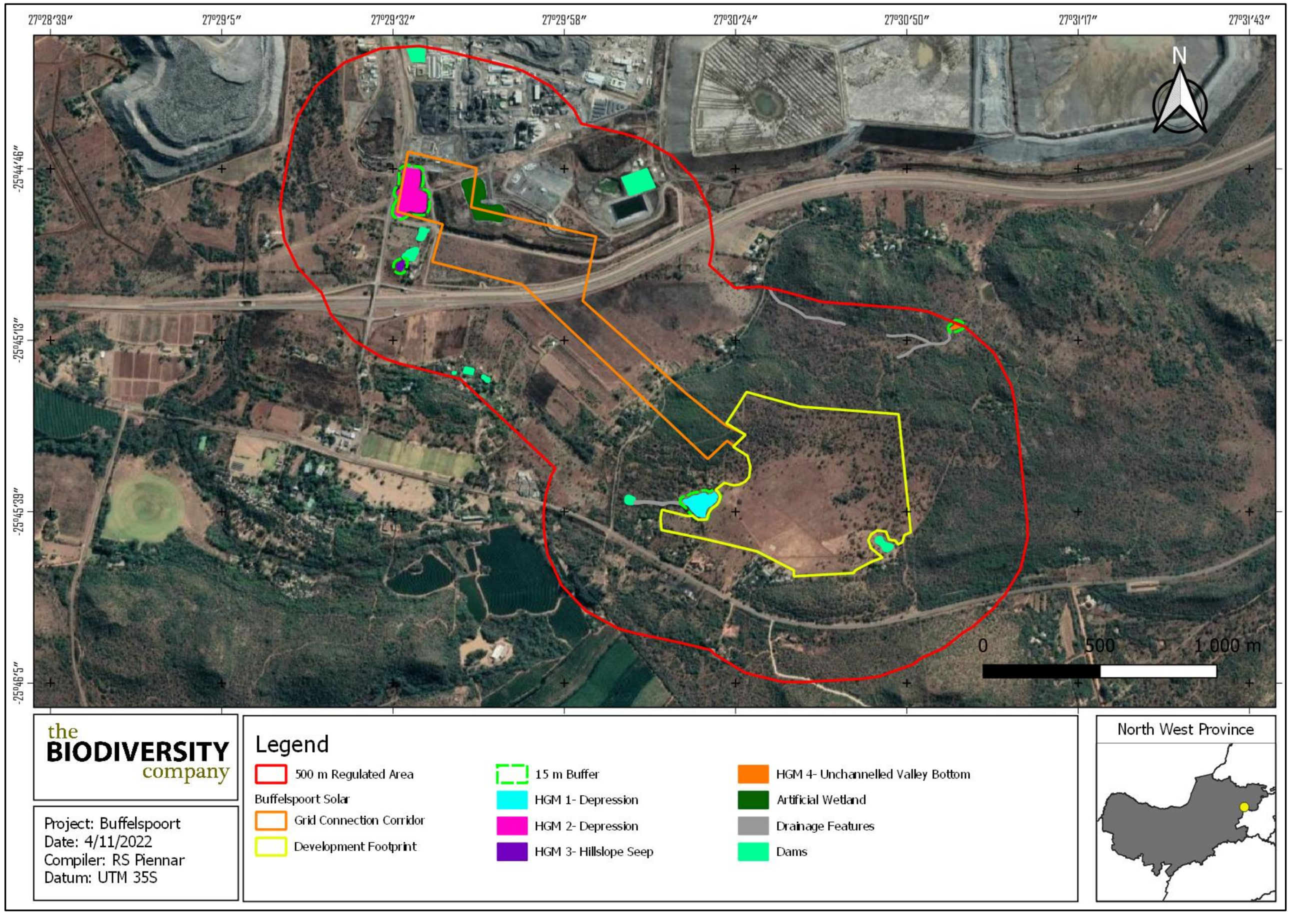

Figure 3-16 Recommended 15 m buffer zone for the delineated wetlands

4 Risk Assessment

4.1 Potential Impacts

The impact assessment considered both direct and indirect impacts, if any, to the wetland system. The mitigation hierarchy as discussed by the Department of Environmental Affairs (2013) will be considered for this component of the study (Figure 4-1). In accordance with the mitigation hierarchy, the preferred mitigatory measure is to avoid impacts by considering options in project location, sitting, scale, layout, technology and phasing to avoid impacts. Figure 4-2 below indicates that avoidance will be possible.

Three (3) levels of risk have been identified and considered for the overall risk assessment, these include high, medium and low risks. The high risks refer to the wetlands directly impacted by the solar panels themselves, these risks can be avoided by placing the solar panels outside the wetland buffer. Medium risk refers to wetland areas that are either directly affected or on the periphery of the infrastructure and at an indirect risk. These risks are associated with powerlines crossing over wetlands as well as the project infrastructure located over drainage features identified within the 500 m regulated area. Low risks are wetland systems beyond the Project Site that would be avoided, or wetland areas that could be avoided if feasible. The medium risks were the priority for the risk assessment, focussing on the expected potential for these indirect risks. The significance of all post-mitigation risks was determined to be low.

For this Project we will focus on using the first step in the hierarchy which is the avoidance of the impacts on the wetland. Due to the fact that direct and indirect impacts will degrade delineated wetland systems, a risk assessment has been compiled to determine the potential risk towards sensitive receptors.

Table 6-1 illustrates various aspects that are expected to impact upon the delineated wetlands during the construction and operational phase.

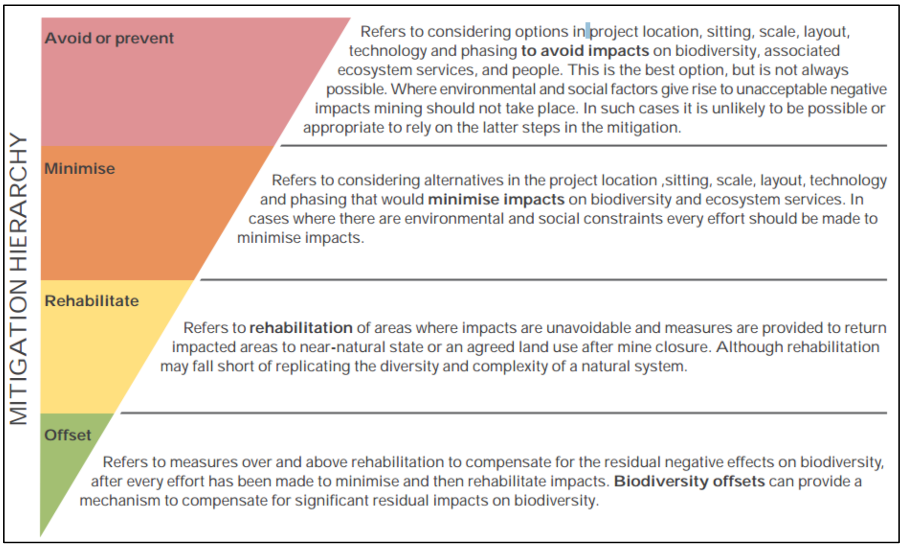

Figure 4-1 The mitigation hierarchy as described by the DEA (2013)

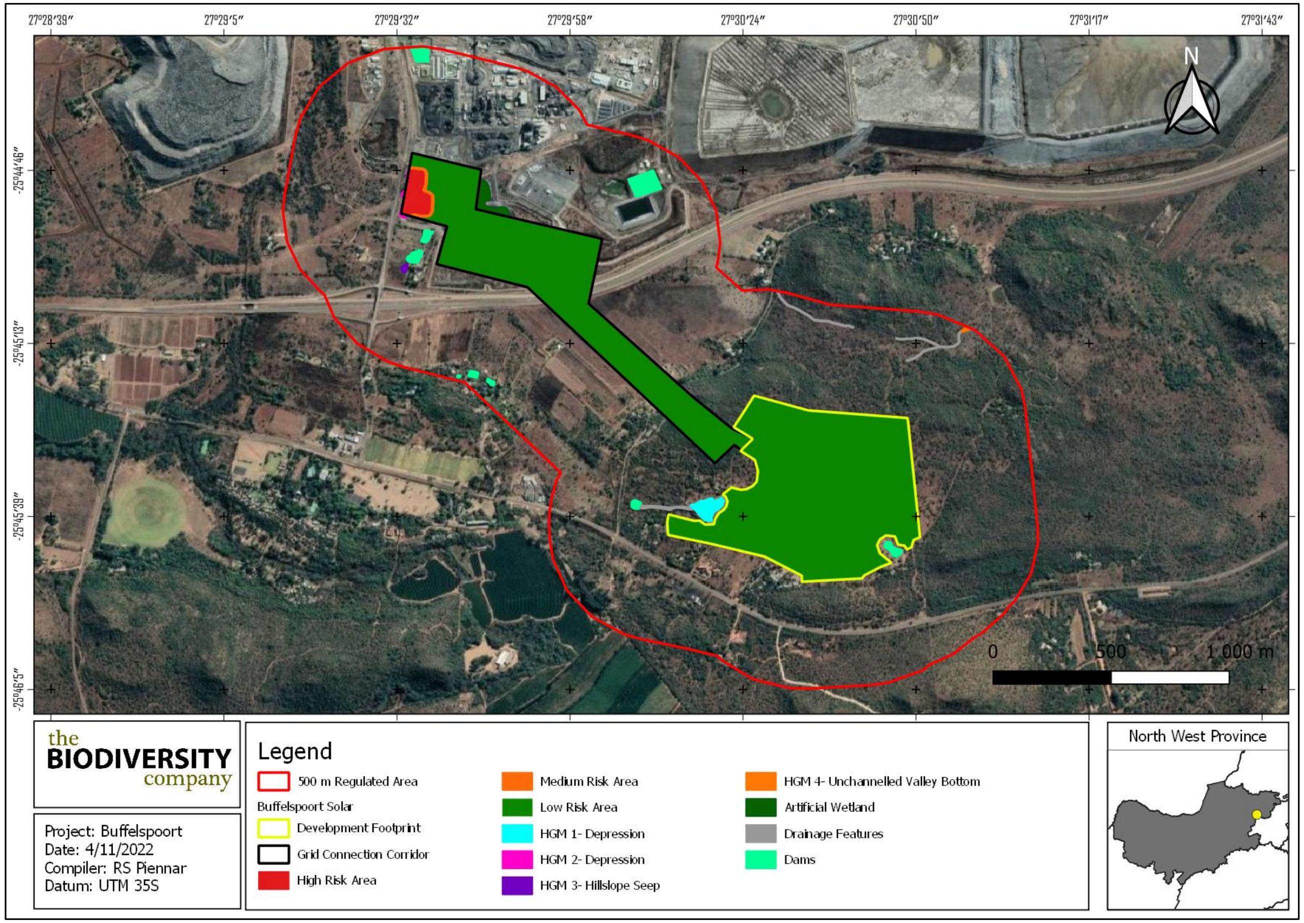

Figure 4-2 The identified risk areas

Table 4-1 ***Impacts assessed for the proposed project***

Activity	Aspect	Impact
Construction Phase	Clearing of vegetation Stripping and stockpiling of topsoil Establish working area Vehicles / Equipment Activities Water use for construction Vehicle access Leaks and spillages from machinery, equipment & vehicles Solid waste disposal Human sanitation& ablutions Cement mixing, chemical/agent uses Backfill of material, compaction and landscaping	● Altered surface flow dynamics; ● Erosion; ● Alteration of sub-surface flow dynamics; ● Sedimentation of the water resource; ● Direct and indirect loss of wetland areas; ● Water quality impairment; ● Compaction; ● Decrease in vegetation; ● Change of drainage patterns; ● Altering hydromorphic properties; and ● Indirect loss of wetland areas.
Operational Phase	Traffic Vehicles / Equipment Activities Waste Disposal	
Decommissioning Phase	Removal of structures, machinery and equipment Rehabilitation of site to agreed land use	

Table 4-2 DWS Risk Impact Matrix for the proposed Project

Aspect	Flow Regime	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Consequence
Construction Phase (Development Footprint, Substations and OHL)								
Clearing of vegetation	5	5	5	5	5	3	2	10
Stripping and stockpiling of topsoil	5	5	5	5	5	2	2	9
Establish working area	5	5	5	5	5	1	1	7
Excavation of hole / foundations	5	5	5	5	5	2	1	8
Water use for construction	5	5	5	5	5	2	1	8
Vehicle access	5	5	5	5	5	2	1	8
Leaks and spillages from machinery, equipment & vehicles	5	5	5	5	5	2	1	8
Solid waste disposal	5	5	5	5	5	2	1	8
Human sanitation& ablutions	5	5	5	5	5	2	1	8
Cement mixing, chemical/agent uses	5	5	5	5	5	1	1	7
Backfill of material, compaction and landscaping	5	5	5	5	5	2	2	9
Operational Phase (PV site, Substations and OHL)								
Traffic	1	2	1	3	1,75	2	5	8,75
Vehicles / Equipment Activities	1	2	2	2	1,75	1	4	6,75
Waste Disposal	1	2	2	2	1,75	1	4	6,75
Decommissioning Phase (PV site, Substations and OHL)								
Removal of structures, machinery and equipment	1	2	1	2	1,5	2	1	4,5
Rehabilitation of site to agreed land use	1	2	1	2	1,5	2	1	4,5

Table 4-3 DWS Risk Impact Matrix for the proposed project continued

Aspect	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Sig.	Without Mitigation	With Mitigation
Construction Phase								
Clearing of vegetation	1	2	5	1	9	90	Moderate	Low
Stripping and stockpiling of topsoil	3	3	1	3	10	90	Moderate	Low
Establish working area	1	2	1	2	6	42	Low	Low
Excavation of hole / foundations	3	2	1	4	10	80	Moderate	Low
Water use for construction	1	2	1	1	5	40	Low	Low
Vehicle access	2	2	1	2	7	56	Moderate	Low
Leaks and spillages from machinery, equipment & vehicles	2	2	1	3	8	64	Moderate	Low
Solid waste disposal	2	2	1	2	7	56	Moderate	Low
Human sanitation& ablutions	2	2	1	2	7	56	Moderate	Low
Cement mixing, chemical/agent uses	2	2	1	2	7	49	Low	Low
Backfill of material, compaction and landscaping	1	2	1	2	6	54	Low	Low
Operational Phase								
Traffic	2	1	1	1	5	43,75	Low	Low
Vehicles / Equipment Activities	5	1	1	1	8	54	Low	Low
Waste Disposal	3	1	1	1	6	40,5	Low	Low
Decommissioning Phase								
Removal of structures, machinery and equipment	2	2	1	3	8	36	Low	Low
Rehabilitation of site to agreed land use	2	2	1	3	8	36	Low	Low

4.1.1 Mitigation Measures

The following general mitigation measures are provided in view of the expected Low levels of residual risk posed to the wetland areas:

- The wetland and buffer areas must be avoided;
- A stormwater management plan must be compiled and implemented for the Project, facilitating the diversion of clean water to the delineated resources;
- The construction vehicles and machinery must make use of existing access routes as much as possible, before new tracks/routes are considered for access;
- Laydown yards, camps and storage areas must be within Development Footprint;
- 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;
- All chemicals and toxicants to be used for the construction must be stored within the designated bunded area;
- All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site, except in an emergency.
- All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good “housekeeping”;
- Adequate sanitary facilities and ablutions must be provided for all personnel throughout the Development Footprint. Use of these facilities must be enforced (these facilities must be kept clean so that they are a desired alternative to the surrounding vegetation);
- Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems;
- Any exposed earth should be rehabilitated promptly by planting suitable vegetation (vigorous indigenous grasses) to protect the exposed soil;
- No dumping of material on-site may take place;
- All waste generated on-site during construction must be adequately managed. Separation and recycling of different waste materials should be supported;
- Promote water infiltration into the ground beneath the solar panels;
- Release only clean water info the environment; and
- Stormwater leaving the site should not be concentrated n 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).

5 Conclusion and Recommendation

5.1 Baseline Ecology

During the site assessment, four (4) HGM units were identified and assessed within the 500 m regulated area namely two depression wetlands, one hillslope seep and one unchannelled valley bottom. Two (2) of the HGM units scored overall PES scores of D – “Largely Modified” due to the modification to the hydrology and vegetation of the wetland through anthropogenic activities. The remaining two (2) HGM units scored overall PES scores of E – “Seriously Modified”. The unchannelled valley bottom wetlands scored “Medium” importance and sensitivity scores due to the moderate protection level of both the wet veg and wetland units. The depression and hillslope seep wetlands scored a "Low" importance and sensitivity score due to the low protection level of the wet veg as well as the wetland itself. The average ecosystem service score ranges between "Moderately Low" and "Moderately High". A 15 m post mitigation buffer was assigned to the wetland systems.

5.2 Specialist Recommendation

Based on the results and conclusions presented in this report, it is expected that the proposed activities will have low residual impacts on the wetlands and thus no fatal flaws were identified for the project. A General Authorisation (GN 509 of 2016) is required for the water use authorisation.

The following Zones of Regulation (ZoR) are applicable to the drainage line identified within the assessment area:

- A 32 m Zone of Regulation in accordance with the National Environmental Management Act, 1998 (Act No. 107 of 1998) should be assigned to the drainage lines; and
- A 100 m ZoR in accordance with the National Water Act, 1998 (Act No. 36 of 1998) should be assigned to the drainage lines.

6 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). 2020. 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.

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).