WETLAND BASELINE AND IMPACT ASSESSMENT FOR THE PHAKWE RICHARDS BAY GAS POWER 3 FACILITY

Richards Bay, KwaZulu-Natal

March 2022

CLIENT

Prepared by:

The Biodiversity Company

Cell: +27 81 319 1225

Fax: +27 86 527 1965

info@thebiodiversitycompany.com

www.thebiodiversitycompany.com

Table of Contents

Figures

Tables

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 Specialist

The Biodiversity Company

March 2022

1 Introduction

The Biodiversity Company was commissioned to conduct a wetland baseline and impact assessment for the proposed up to 2000 MW combined cycle (CC) gas to power plant facility and associated infrastructure, located in Richards Bay, KwaZulu-Natal. Phakwe Richards Bay Gas Power 3 (Pty) Ltd intend on developing an up to 2000 MW combined gas to power plant located on various erven within the Richards Bay Industrial Development Zone (RBIDZ) phase 1F, Richards Bay, KwaZulu-Natal.

One wetland site visit was conducted on 10th of March 2021, this would constitute a wet season survey. 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 with regards to the proposed activity.

1.1 Project Description

The power plant will operate at mid-merit or baseload duty and will include the following main infrastructure:

1. A number of gas turbines for the generation of electricity through the use of natural gas (liquid or gas forms), or a mixture of Natural gas and Hydrogen (in a proportion scaling up from 30% H2) as fuel source, operating all turbines at mid-merit or baseload (estimated 16 to 24 hours daily operation).
2. Exhaust stacks associated with each gas turbine.
3. A number of Heat Recovery Steam Generator (HRSG to generate steam by capturing the heat from the turbine exhaust.
4. A number of steam turbines to generate additional electricity by means of the steam generated by the HRSG.
5. The water treatment plant will demineralise incoming water from municipal or similar supply, to the gas turbine and steam cycle requirements. The water treatment plant will produce two parts demineralised water and reject one-part brine, which will be discharged to the R IDZ stormwater system.
6. Steam turbine water system will be a closed cycle with air cooled condensers. Make-up water will be required to replace blow down.
7. Air cooled condensers to condensate used steam from the steam turbine.
8. Compressed air station to supply service and process air.
9. Water pipelines and water tanks for storage and distributing of process water. (Potential sourcing of alternative water outside RB IDZ supply (Municipality))
10. Water retention pond
11. Closed Fin-fan coolers to cool lubrication oil for the gas turbines
12. Gas generator Lubrication Oil System.

13. Gas pipeline supply conditioning process facility. Please note, gas supply will be via dedicated pipeline from the proposed Transnet supply pipeline network of Richards Bay (the location of this network has not yet been confirmed) or, alternatively directly from the Regasification facilities at RB Harbour. The gas pipeline will be separately authorized.
14. Site water facilities including potable water, storm water, wastewater.
15. Fire water (FW) storage and FW system.
16. Diesel emergency generator for start-up operation.
17. Onsite fuel conditioning including heating system.
18. All underground services: This includes stormwater and wastewater.
19. Ancillary infrastructure including:
    - Roads (access and internal);
    - Warehousing and buildings;
    - Workshop building;
    - Fire water pump building;
    - Administration and Control Building;
    - Ablution facilities;
    - Storage facilities;
    - Guard House;
    - Fencing;
    - Maintenance and cleaning area;
    - Operational and maintenance control centre.
20. Electrical facilities including:
    - Power evacuation including GCBs, GSU transformers, MV busbar, HV cabling and 1x275kV or 400kV GIS Power Plant substation;
    - Generators and auxiliaries;
    - Subject to a separate environmental authorisation application:
        - Eskom 275 or 400kV GIS interface Substation;
        - Underground 275 or 400kV power cabling connecting Power Plant GIS substation and Eskom GIS Interface substation; and
        - an overhead 275kV or 400kV power line connecting the ESKOM interface substation to the selected Eskom grid connection point;
21. Service infrastructure including:
    - Stormwater channels;

- Water pipelines; and
- Temporary work areas during the construction phase (laydown areas).

22. Fuel supply
    - A dedicated pipeline to connect into an on-site gas receiving and conditioning station will provide the natural gas or the mixture of natural gas and Hydrogen. The pipeline will be connected to the proposed Transnet supply pipeline network of Richards Bay (the location of this network has not yet been confirmed), or it will extend directly to the Regasification facilities in the RB Harbour; and
    - The dedicated pipeline will be separately environmentally authorized.

1.2 Authorisations

Environmnetal authorisation (Ref 14/12/16/3/3/2/665) was issued by the Department of Envionmental Affairs (DEA) on 27 September 2016 for the RBIDF Phase 1F, comprising the installation of the bulk infrastructure.

The Department of Water and Sanitation also issued a directive in terms of Section 22 (4) (c) of the National Water Act, 1998 to allow the IDZ to upgrade the railway line to the IDZ 1F, upgrade of Medway Road as 1A and development within the IDZ 1F.

1.3 Background

An initial wetland assessment for the RBIDZ land parcel was undertaken in 2010 (SiVest, 2010) along with various other environmental studies. The 2010 study delineated three HGM units within the project area and characterised them into a western and eastern wetland cluster (see Figure 1-1). The western cluster was scored a PES rating of B (Largely Natural) with the eastern cluster scoring a PES rating of C (Moderately Modified). In 2012 a more refined wetland level 1 assessment was conducted for phase 1F (RHDHV, 2013), which included recommendations for an offset and mitigation measures for the RBIDZ.

By using the previous wetland reports a wetland offset report was completed by RHDHV (2015). The report proposed offsets of a total of 16.45 Ha to make up for the loss of wetlands due to the proposed activities. Therefore, the main wetland systems within the assessment area were authorised to be degraded/lost by infilling.

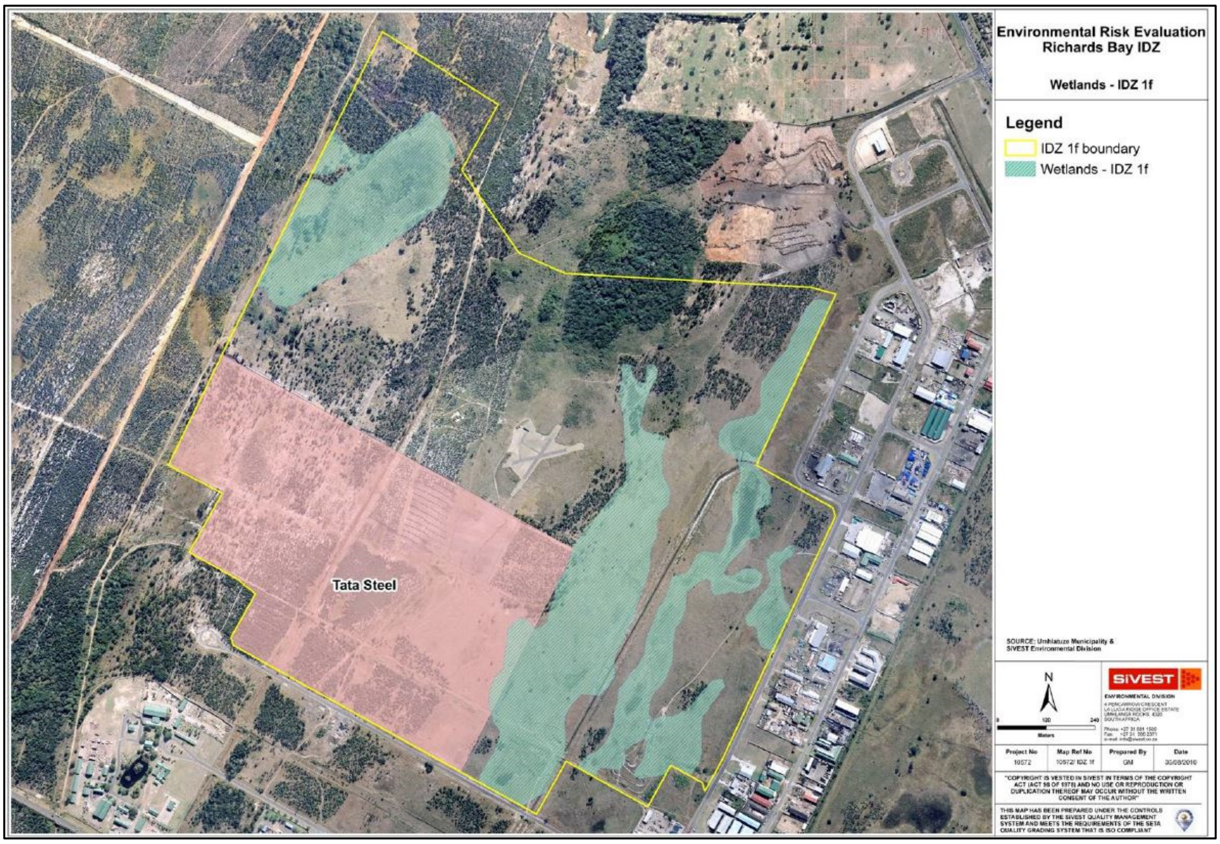

Figure 1-1 Wetland's delineated in the SiVest (2010) report.

1.4 Aims and Objectives

The aim of the assessment was to determine the current state of the associated water resources and the associated risks involved with the proposed activities. This was achieved through the following:

- The delineation and assessment of wetlands within the project area;
- The evaluation of the extent of site-related impacts;
- An impact assessment for the proposed development; and
- The prescription of mitigation measures and recommendations for identified risks.

1.5 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.

2 Project Area

The proposed development is located in Alton approximately 2 km north-west of the Richards Bay central and approximately 13 km east of Empangeni (see Figure 2-4). The project area is situated in the W12F quaternary catchment within the Pongola to Mtamvuna Water Management Area (WMA).

2.1 Vegetation Types

The project area is situated within the following KZN vegetation biomes and vegetation types, namely Freshwater Wetlands and Maputaland Wooded Grassland. The Subtropical Freshwater Wetlands ordinarily occur in low lying areas and are expected to be dominated by reeds, sedges, rushes, and water-logged meadows dominated by grasses. The dominant vegetation type is the Maputaland Wooded Grassland. This vegetation type is typically supported by coastal sandy grasslands rich in geoxylic suffritices, dwarf shrubs, small trees, and very rich herbaceous flora.

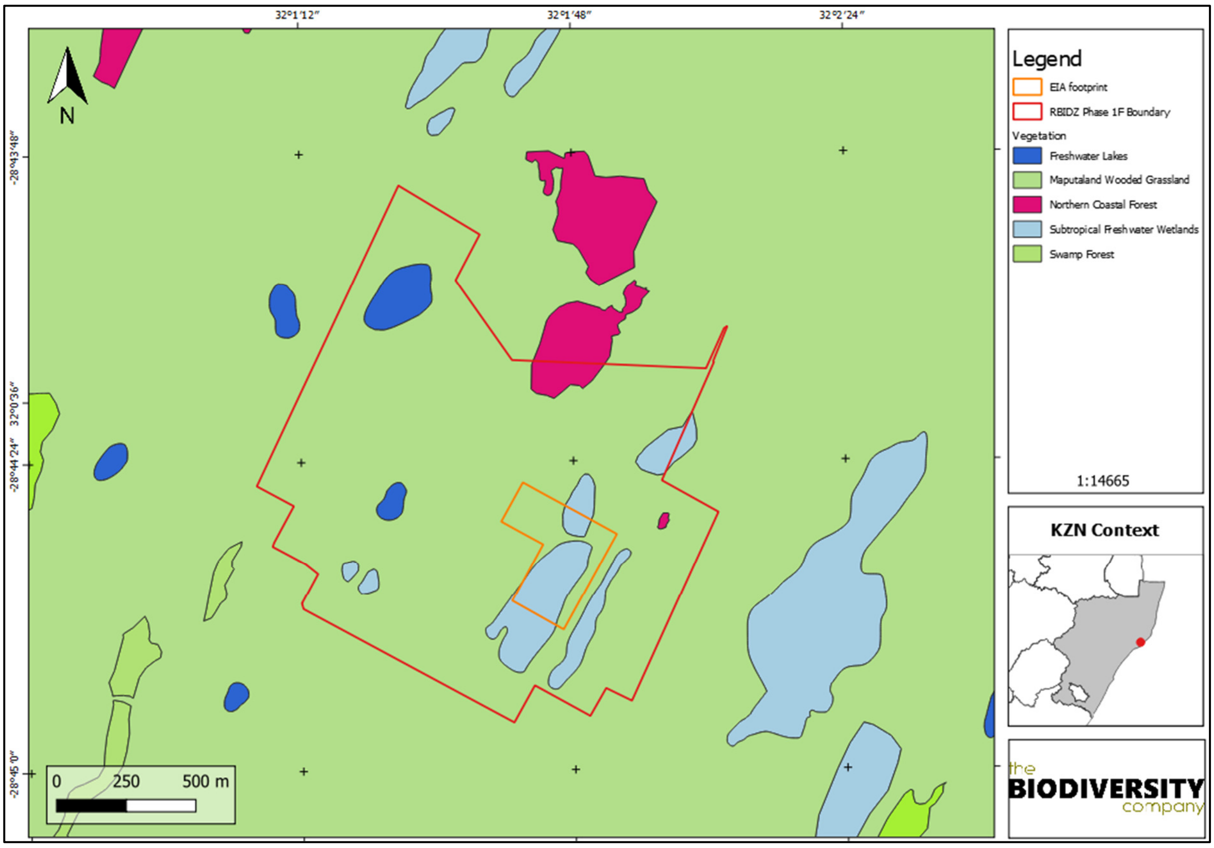

Figure 2-1 Vegetation types on the project area

2.2 Soils and Geology

According to the land type database (Land Type Survey Staff, 1972 - 2006) the development falls within Hb 69 land type. The Hb land type is characterised by grey regic sands and other grey soils. The terrain units and expected soil forms for the latter mentioned land type is illustrated in Figure 2-2 and Table 2-1.

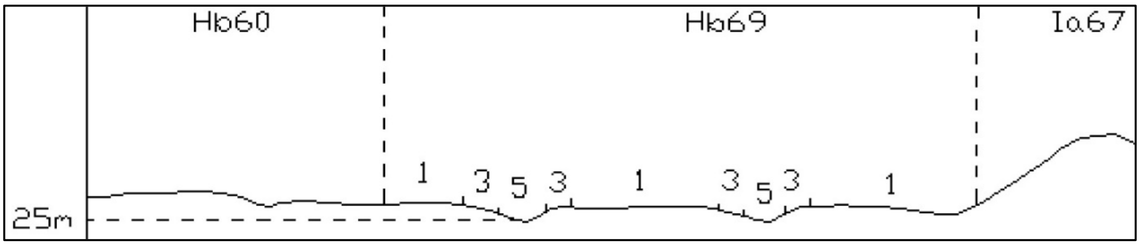

Figure 2-2 Illustration of land type Hb 69 terrain unit (Land Type Survey Staff, 1972 - 2006)

Table 2-1 Soils expected at the respective terrain units within the Hb 69 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units					
1 (70%)		**3 (25%)**		**5 (5%)**	
Fernwood	70%	Fernwood	65%	Champagne	50%
Vilafontes	10%	Champagne	10%	Fernwood	35%
Champagne	5%	Vilafontes	10%	Longlands	5%
Clovelly	5%	Hutton	5%	Kroonstad	5%
Hutton	5%	Clovelly	5%	Streambeds	5%
Shepstone	5%	Shepstone	5%		

2.3 Climate

Weak rainfall seasonality towards the coast with summer rainfall occurring towards the inward sections of this vegetation type. Up to 1 200 mm of annual rainfall occurs in the coastal areas with rainfall decreasing significantly towards the interior humidity. The climate of the CB 2 vegetation type is characterised by high temperatures and. The mean minimum and maximum monthly temperatures for Lake St. Lucia are 5.5°C and 35.3°C for June and January respectively with no incidences of frost (Mucina & Rutherford, 2006).

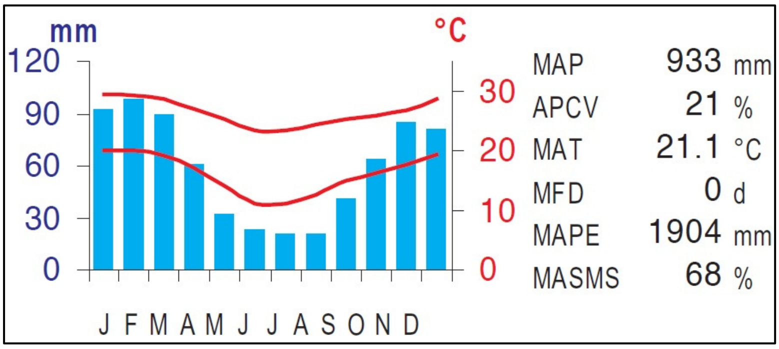

Figure 2-3 Climate for the Maputaland Coastal Belt (CB 2) (Mucina & Rutherford, 2006)

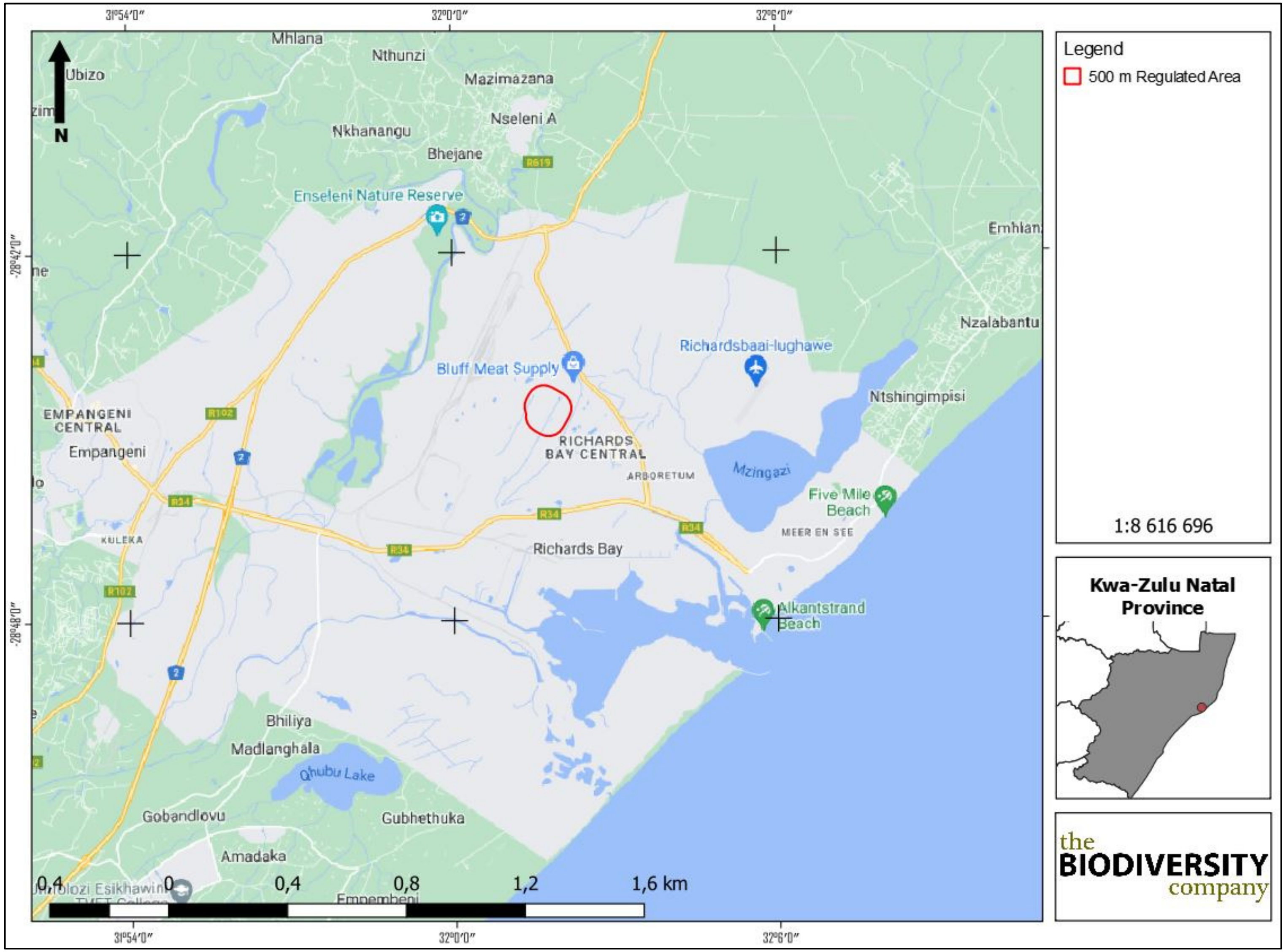

Figure 2-4 Location of the 500 m regulated area

2.4 Hydrological Setting

The project area is located within the Pongola - Mtamvuna Water Management Area (WMA 4) and predominantly falls within the W12F quaternary catchment (Figure 2-5). Two Sub Quaternary Reaches (SQRs) are associated with the Phase 1F boundary, namely the classified Nseleni River SQR W12H-3459 SQR and an unnamed SQR which serves as the Mhlatuze estuarine catchment which includes the Richards Bay Harbour. Several wetland areas are located within and around the development footprint area. The Nseleni River is a major tributary of the Mhlatuze River and contributes to the ecological functioning of the Mhlatuze lagoon and Richards Bay Harbour. The desktop ecological status and composition of the classified SQRs is shown in Table 2-2 (DWS, 2021).

Table 2-2 Desktop data pertaining to the ecological condition of the associated SQRs (DWS, 2021)

SQR	Nseleni W12H-3459	Nundwane W12J-3450
Present Ecological Status	Largely Modified (class D)	Moderately Modified (class C)
Ecological Importance	High	High
Ecological Sensitivity	Very High	Very High
Contributing Factors	Enseleni Nature Reserve, extensive cultivation (dryland sugarcane), Lake Nsezi - artificially raised, water supply to Richards Bay, back flooding entire reach, estuary in lower reach	Extensive forestry, swamp forest in Riparian Zone, Alien Invasive Plants, roads, urban in lower reach (Richard Bay), lower reach in Lake Mzingazi
Default Ecological Category	Natural (class A)	Natural (class A)

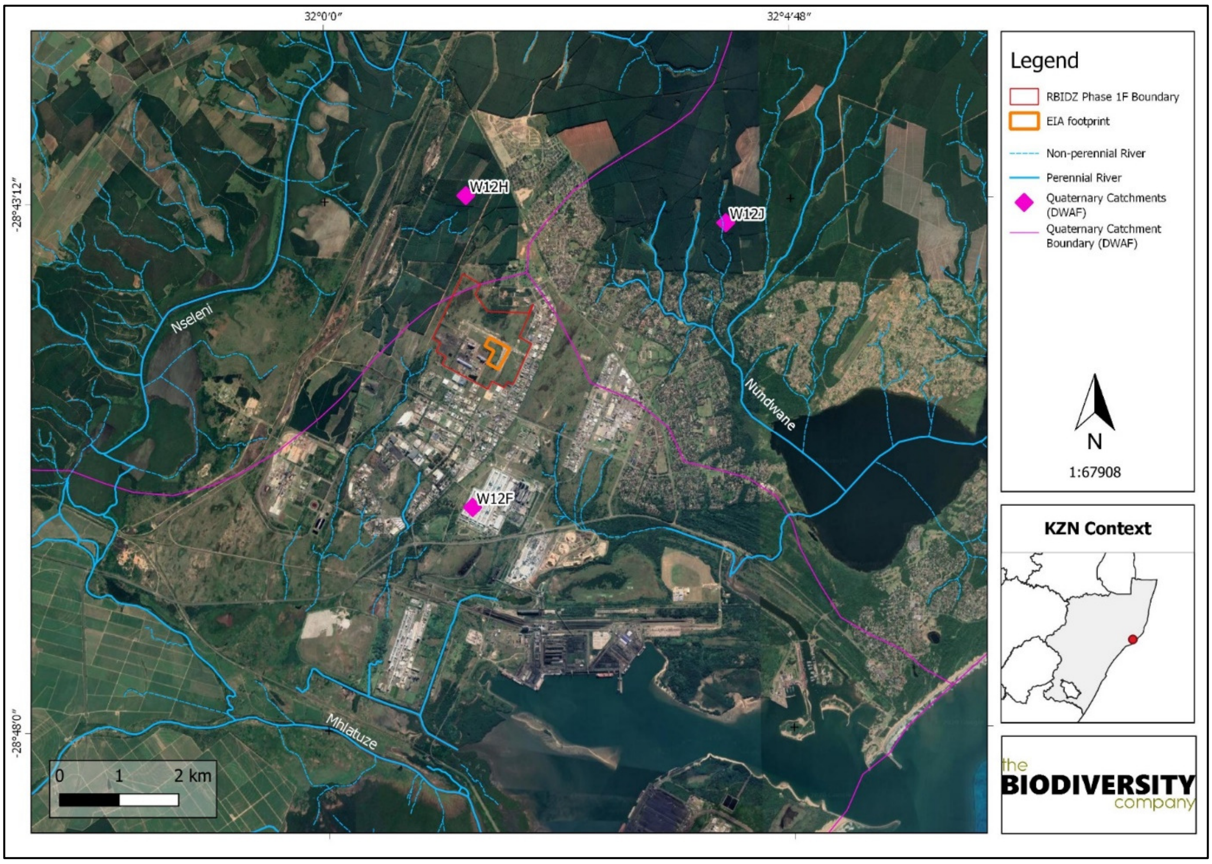

Figure 2-5 The project area in relation to the sub quaternary reach catchments

2.5 National Freshwater Priority Areas

2.5.1 Wetland National Freshwater Priority Areas

According to Nel *et al.* (2011), no wetland FEPAs are listed for the Phase 1F boundary. According to *Figure 2-6* numerous non-priority wetland areas are located within the general project area catchments. When assessing wetland systems directly within the Phase 1F boundary and associated EIA footprint, a number of systems are located within the development footprint. Majority of the EIA footprint directly overlaps with a valleyhead seep wetland. Other wetland systems within this boundary include depressions, flats and a valley bottom system.

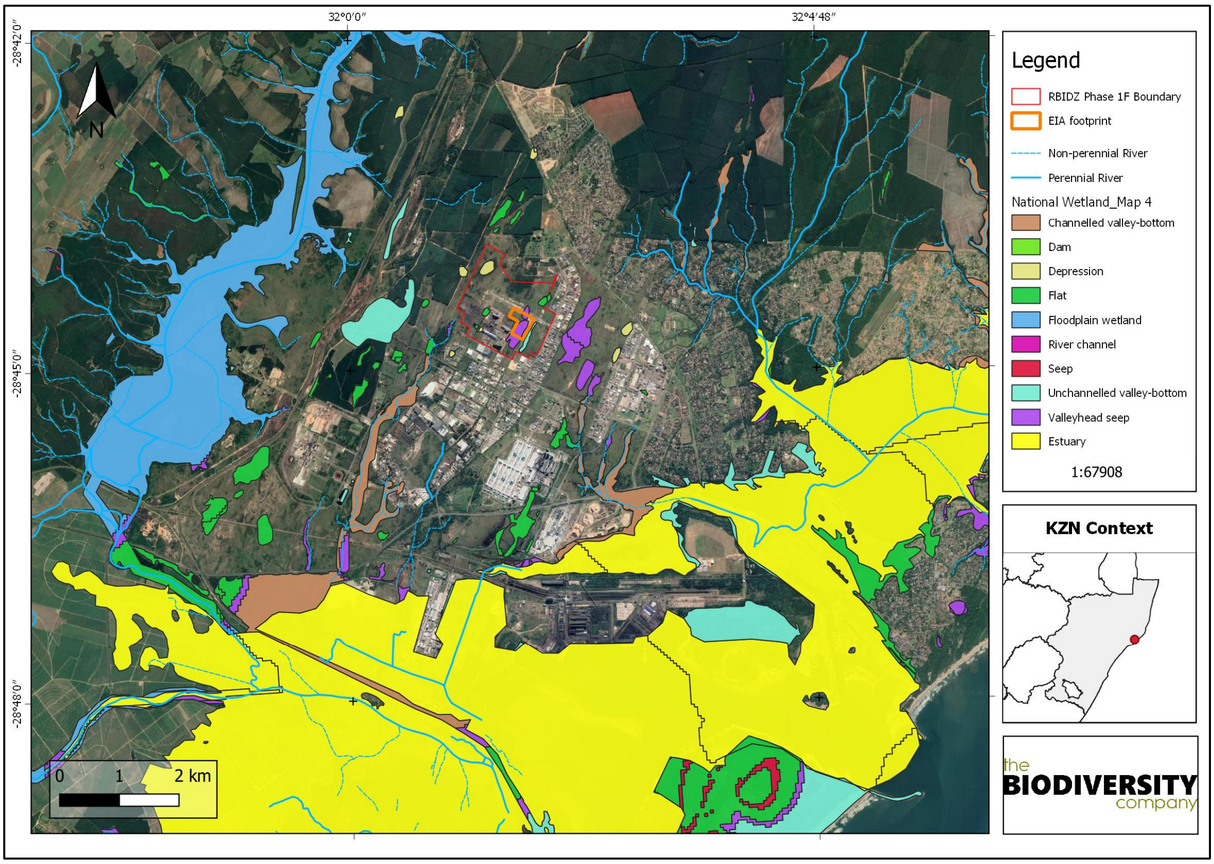

Figure 2-6 Layout of the proposed development area in relation to the wetland NFEPAs

2.5.2 River National Freshwater Priority Areas

The layout of the proposed development area and the National Freshwater Priority Area (NFEPA) layouts are provided in Figure 2-7. As indicated in the figure the development footprint is located outside of River FEPAs. Despite this, the development footprint is located in close proximity to two River FEPAs (Nseleni River to the west and the Nundwane River to the east) and the Richards Bay estuarine FEPA area, with unnamed non-perennial river systems draining the associated SQRs into the aforementioned FEPAs. A map illustrating the national estuarine delineation for the project area as per the South African National Biodiversity Institute (SANBI, 2012) GIS metadata for South African estuaries is presented in Figure 2-8.

Conserving the ecological functioning within the project related SQRs will aid in the protection of riverine, wetland and estuarine habitat supporting fish species occurring within the entire catchment and water quality for the downstream aquatic and terrestrial biota which includes coastal and marine biota in the downstream systems. The SQRs in which human activities occur need to be managed to maintain water quality and prevent further degradation of downstream water resources in order to contribute to national biodiversity goals and support sustainable use of water resources.

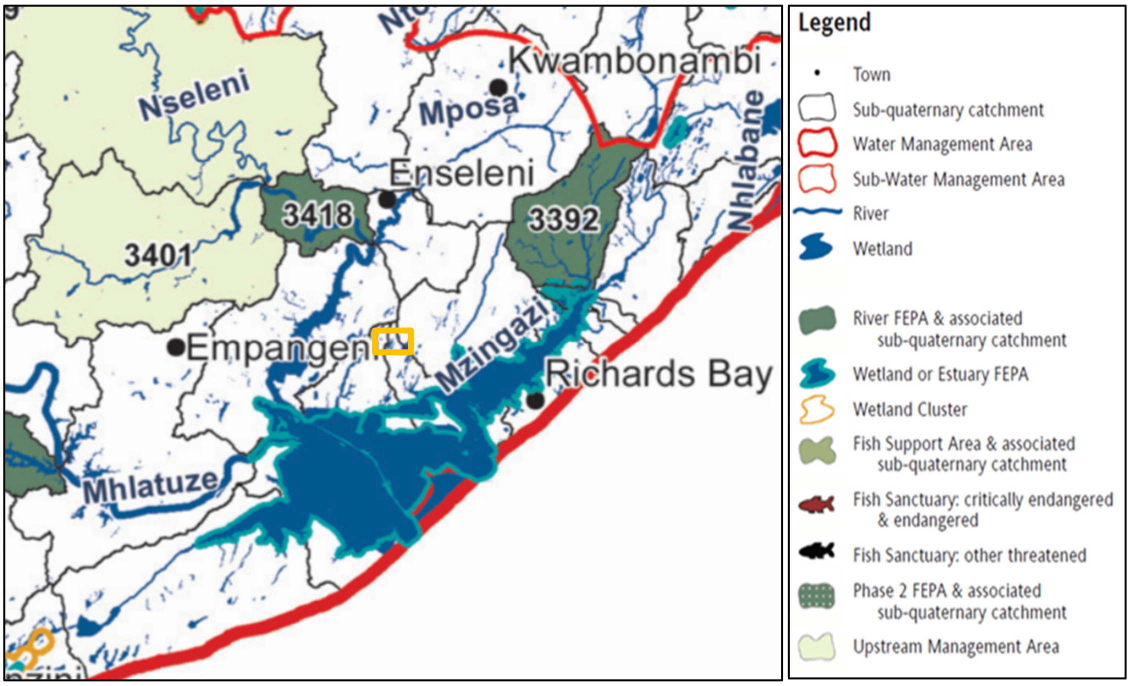

Figure 2-7 Illustration of NFEPAs associated with the project area (indicated by orange square) (Nel et al., 2011)

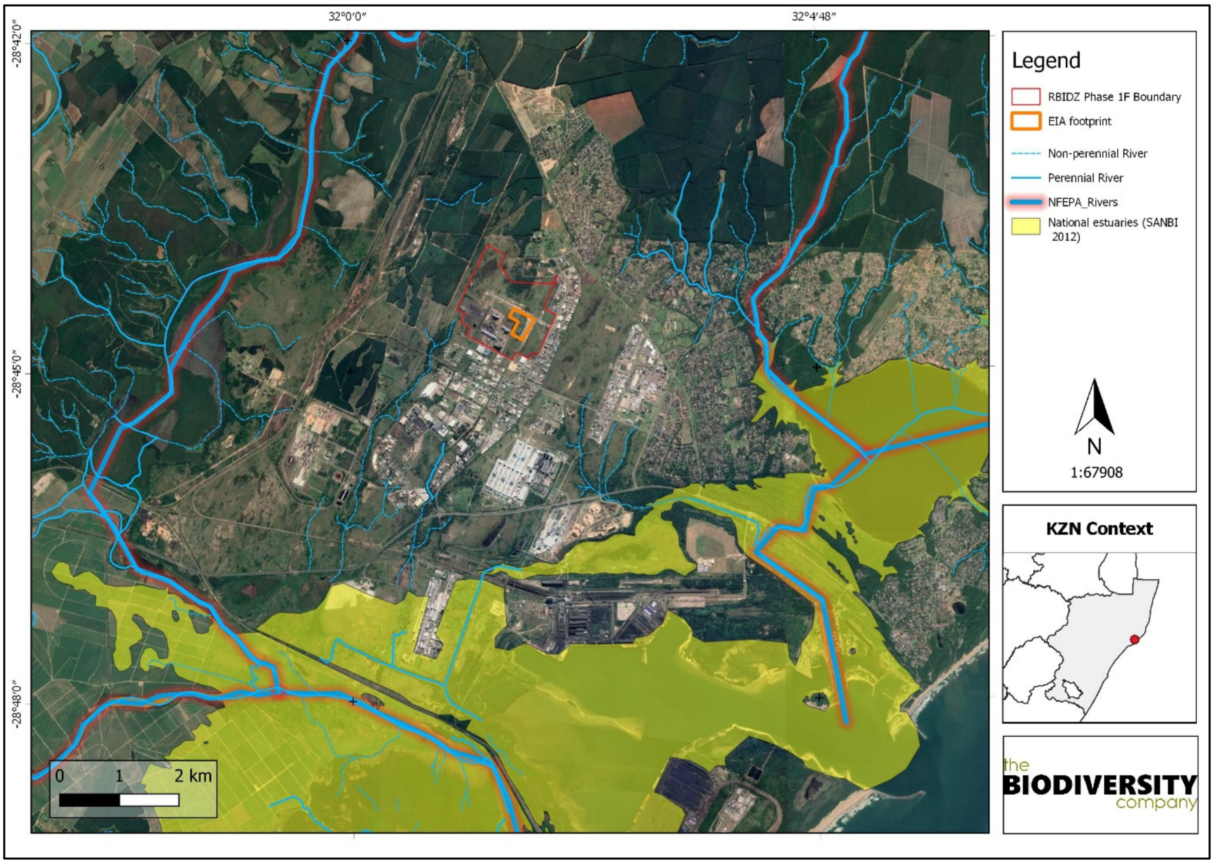

Figure 2-8 Layout of the proposed development area in relation to the riverine National Freshwater Priority Areas and National estuaries

2.6 National Wetland Map 5

The National Wetland Map 5 (NWM 5) spatial data was published in October 2019 (Deventer *et al*. 2019) in collaboration with SANBI with the specific aim of spatially representing the location, type and extent of wetlands in South Africa. The data represents a synthesis of a wide number of official watercourse data including rivers, inland wetlands and estuaries. This database recognises the presence of depression wetland within the project area belonging to Indian Ocean Coastal Belt Group 1 (Figure 2-9).

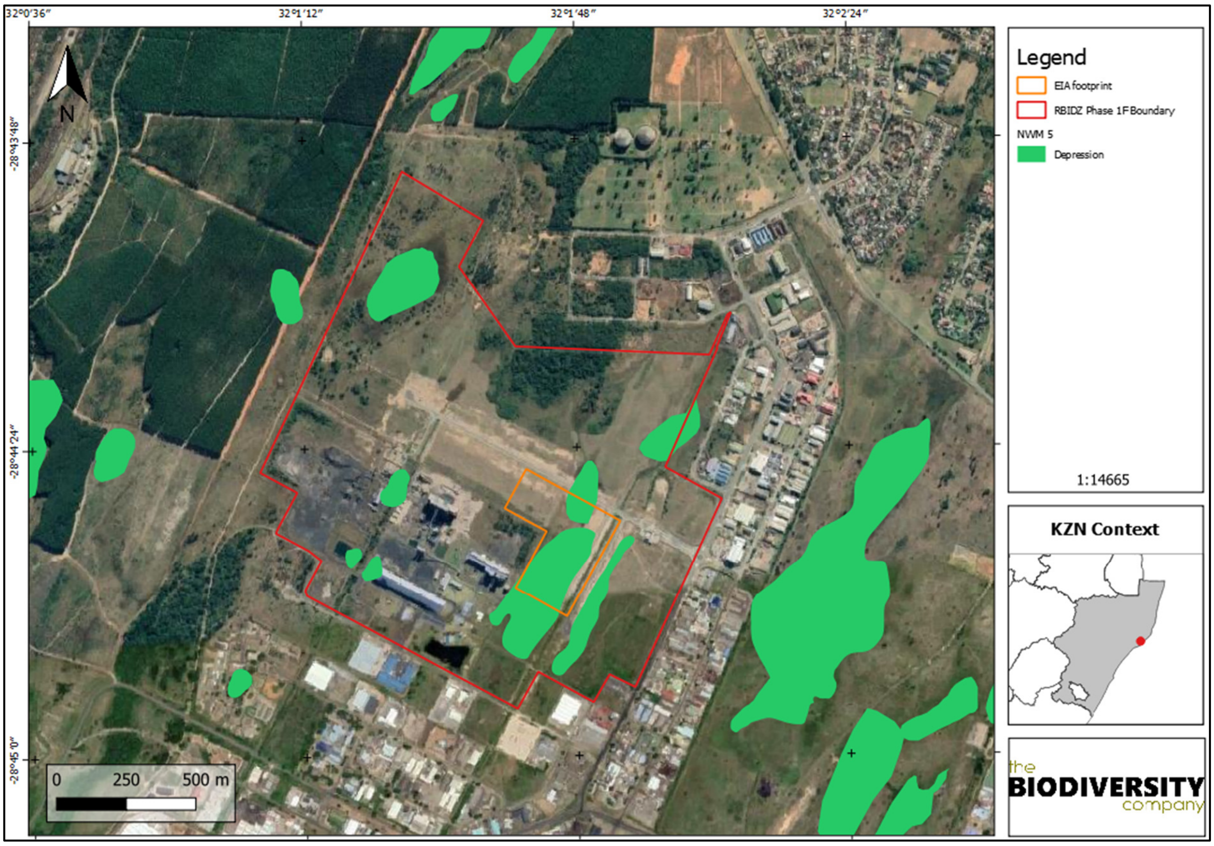

Figure 2-9 National wetland areas located within the development footprint

2.7 Watercourse, Catchment and Land-use Characteristics

In line with the minimum requirements the aquatic ecosystem types must be described and to achieve this the watercourses, catchments and land use characteristics are presented for the report.

As indicated in the hydrological setting section (section 2.4) of this report the watercourses considered in this assessment were located in the watershed of 3 SQRs which feed into the ecologically sensitive Richards Bay water resources. The watercourses are presented in Figure 2-10 below in relation to the proposed Phase 1F boundary. The dominant land uses surrounding the project area includes industry (urban built up), plantations, degraded and natural areas (Figure 2-11). The aquatic ecology status is largely influenced by land use and associated modification of the catchment, thus land cover provides an indication into the ecological status of the watercourses within the catchment.

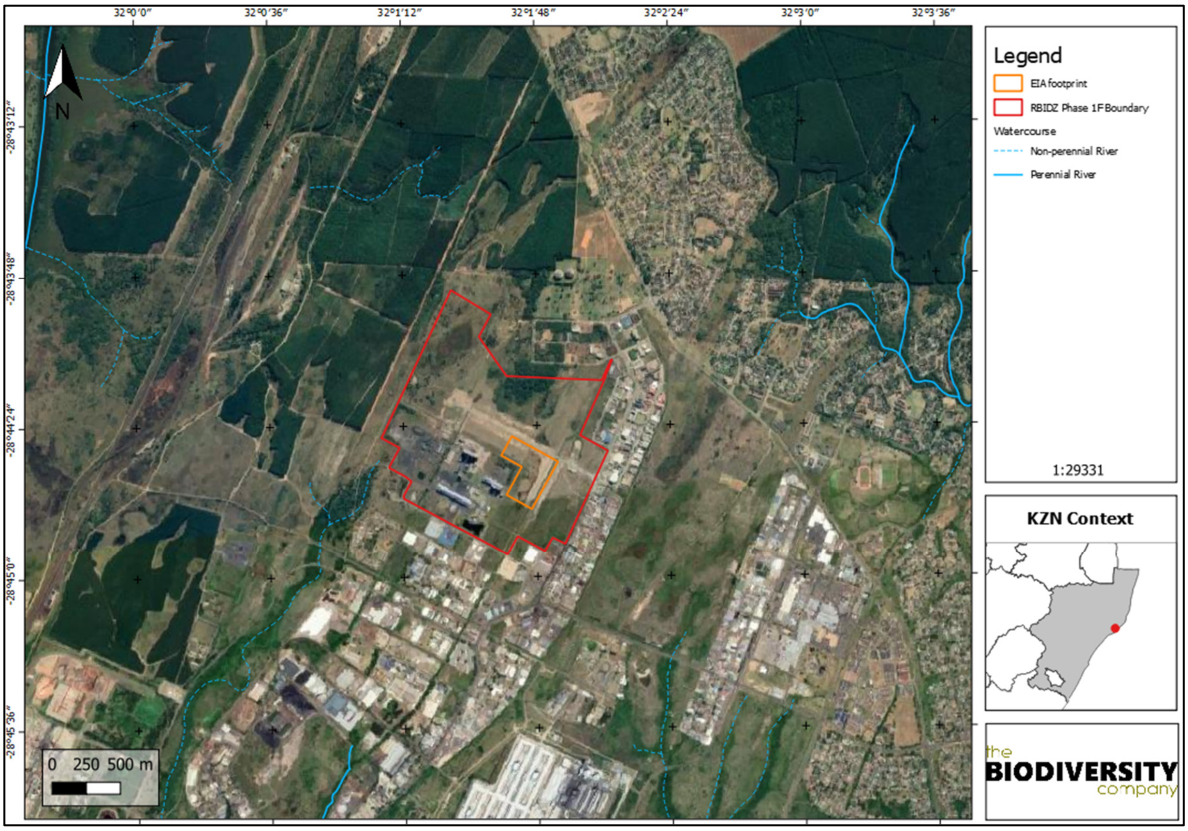

Figure 2-10 Watercourses associated with the Phase 1F boundary

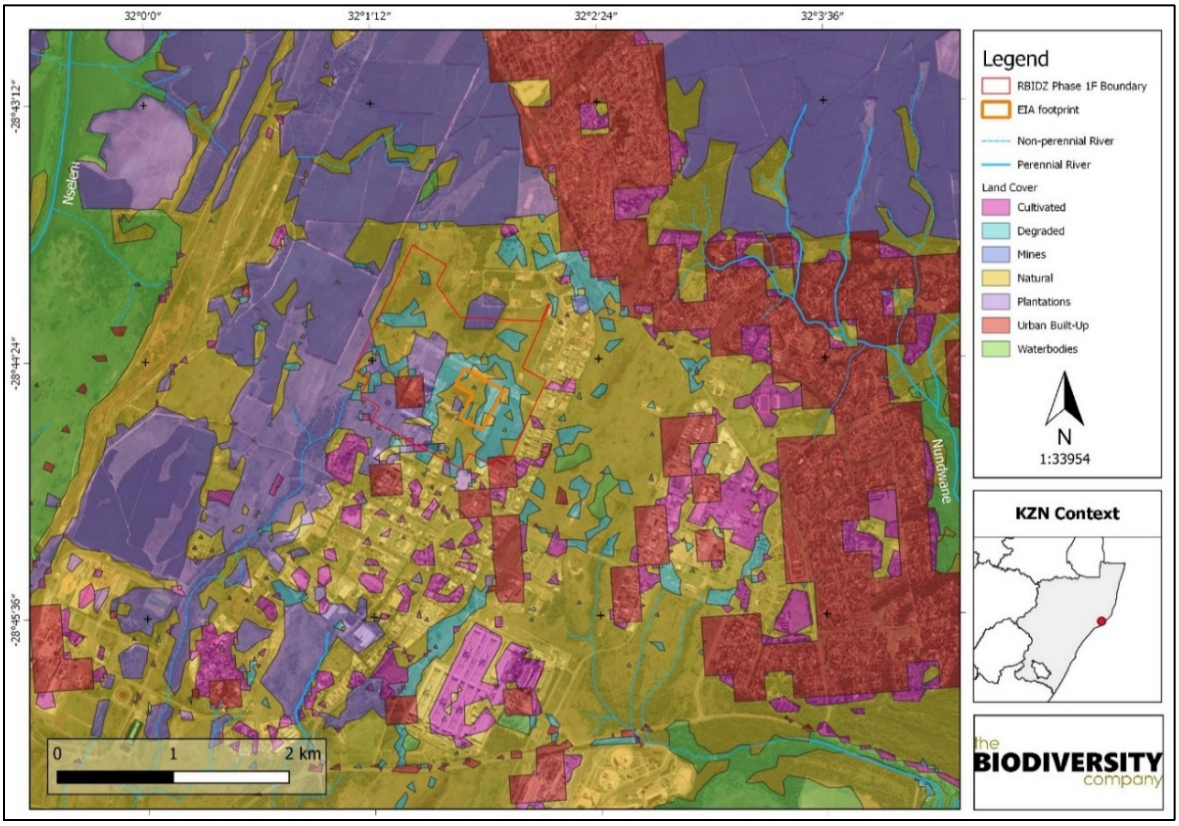

Figure 2-11 Land Use within the catchment area

2.8 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).

2.8.1 Digital Elevation Model

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 39 to 65 MASL. The lower laying areas (generally represented in dark blue) represent area that will have the highest potential to be characterised as wetlands (see Figure 2-12).

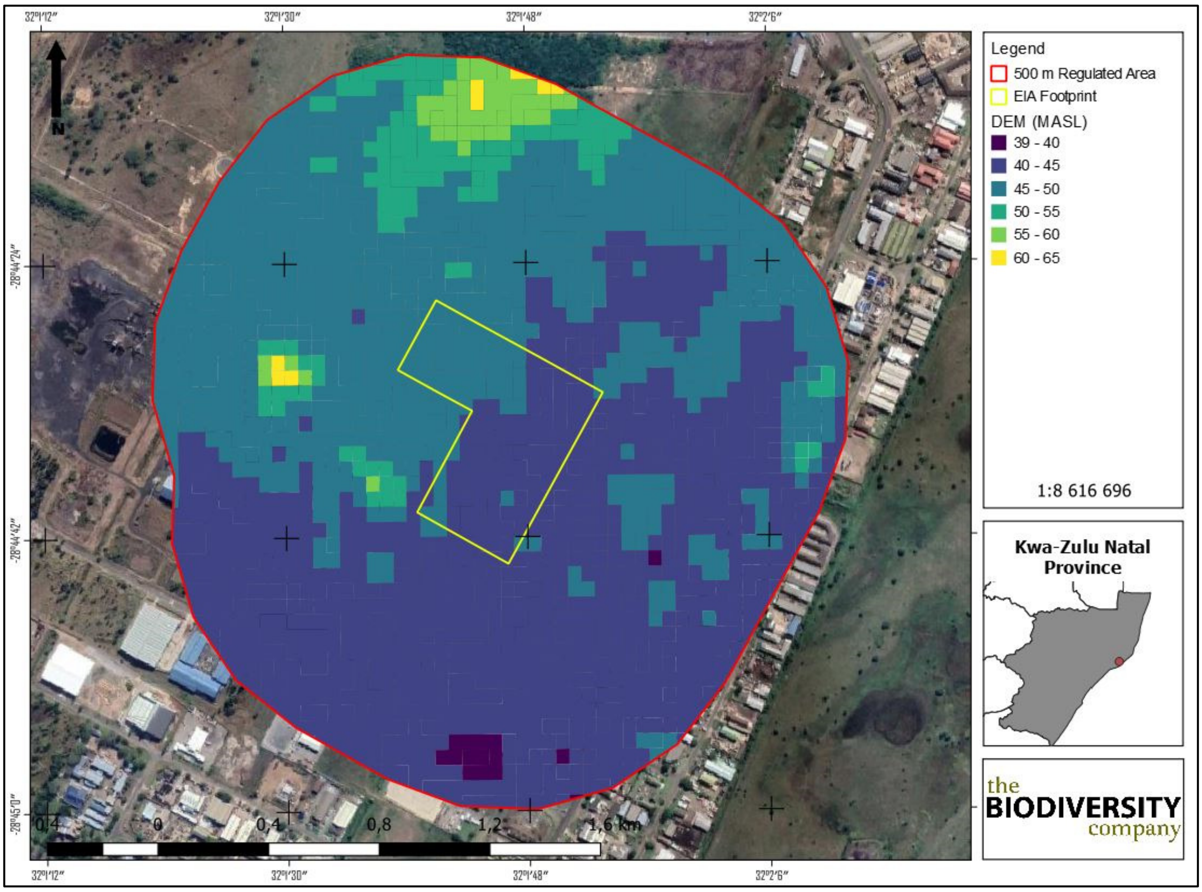

Figure 2-12 Digital Elevation Model of the 500 m regulated area

2.8.2 Slope Percentage

The slope percentage of the 500 m regulated area is illustrated in Table 2-3. The slope percentage ranges from 0.5% to 1.0%, with some smaller patches within the regulated area characterised by a slope percentage up to 2.7%. Besides the fact that hillslope seeps are likely to occur on any slope percentage, wetlands in general tend to accumulate in flatter areas.

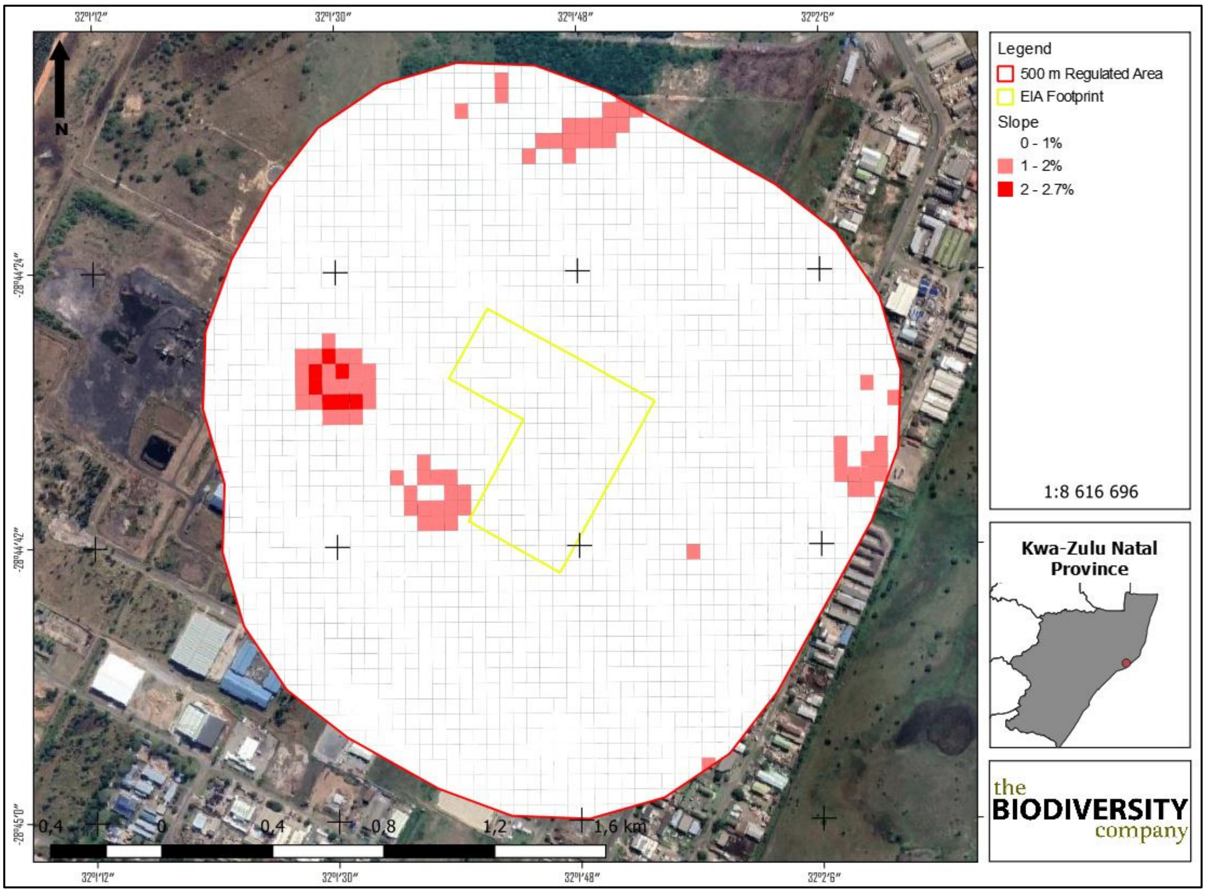

Table 2-3 Slope percentage of the 500 m regulated area

3 Key Legislative Requirements

3.1 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).

3.2 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.

4 Methodology

The wetland assessment fieldwork was undertaken from the 3rd to the 5th November 2020, which constitutes a wet season survey.

4.1 Identification and Mapping

The wetland areas were delineated in accordance with the DWAF (2005) guidelines, a cross section is presented in Figure 4-1. 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.

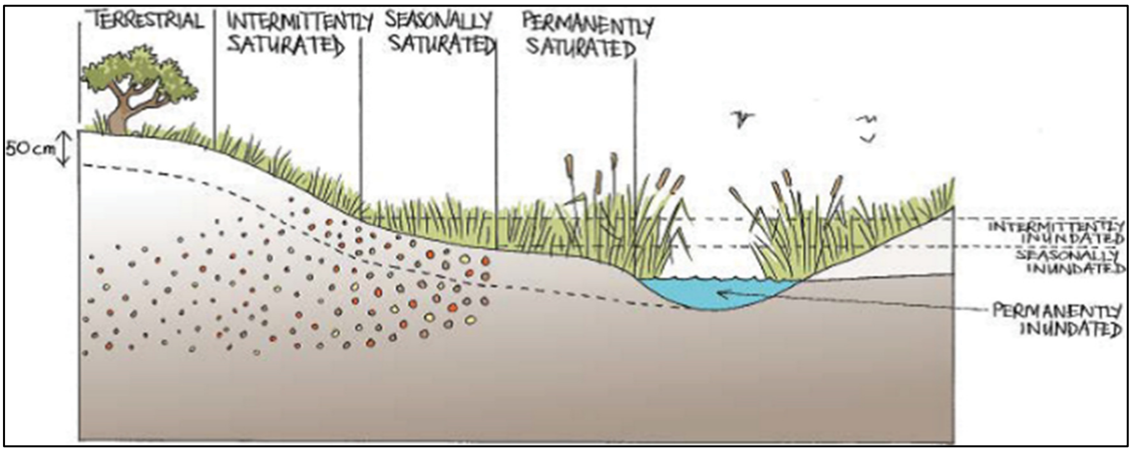

Figure 4-1 Cross section through a wetland, indicating how the soil wetness and vegetation indicators change (Ollis et al. 2013)

4.2 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.

4.3 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 serve as the main factor contributing to wetland functionality.

The assessment of the ecosystem services supplied by the identified wetlands was conducted per the guidelines as described in WET-EcoServices (Kotze *et al*. 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 4-1).

Table 4-1 Classes for determining the likely extent to which a benefit is being supplied

Score	Rating of likely extent to which a benefit is being supplied
< 0.5	Low
0.6 - 1.2	Moderately Low
1.3 - 2.0	Intermediate
2.1 - 3.0	Moderately High
> 3.0	High

4.4 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 4-2.

Table 4-2 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

4.5 Importance and Sensitivity

The importance and sensitivity of water resources is determined in order establish resources that provide higher than average ecosystem services, biodiversity support functions or are particularly sensitive to impacts. The mean of the determinants is used to assign the Importance and Sensitivity (IS) category as listed in Table 4-3.

Table 4-3 Description of Ecological 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

4.6 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).

4.7 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.

4.8 Risk Assessment

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

Table 4-4 Significance ratings matrix

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.

4.9 Knowledge Gaps

The following aspects were considered as limitations:

- It has been assumed that the extent of the project area provided to the specialist is accurate; and
- The GPS used for water resource delineations is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by at least five meters to either side.

5 Results and Discussion

5.1 Wetland Delineation and Description

The wetland areas were delineated in accordance with the DWAF (2005) guidelines (see Figure 5-3). Three HGM units were identified within the 500 m regulated area, including two unchannelled valley bottoms (see Figure 5-1) and a hillslope seep wetland (see Figure 5-2).

Figure 5-1 Examples of the different parts inside the two different unchannelled valley bottoms delineated inside the 500 m regulated area.

Figure 5-2 Example of the hillslope seep delineated within the 500 m regulated area.

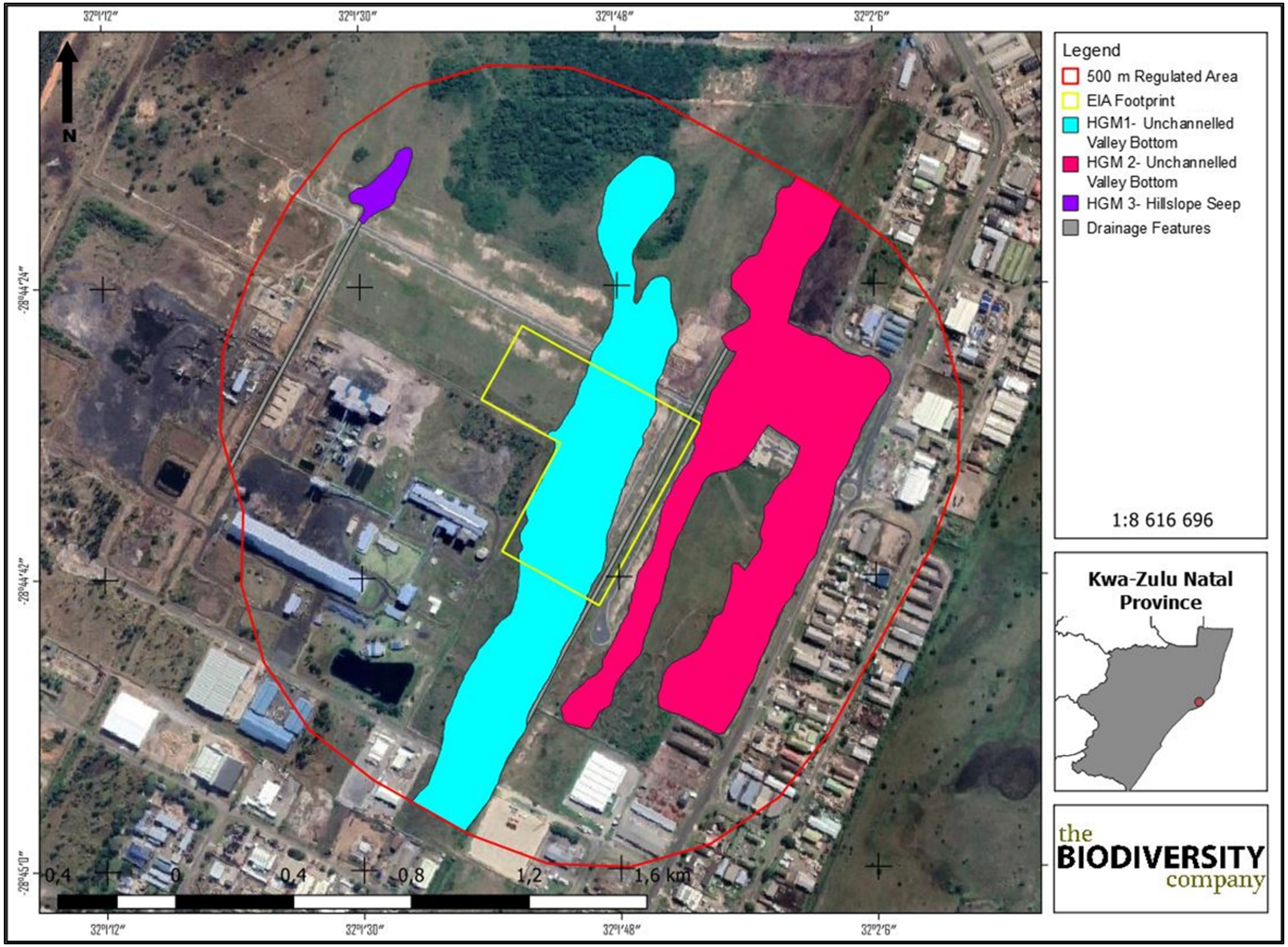

Figure 5-3 Delineation of all the wetlands HGM units located throughout the 500 m regulated area

5.2 Wetland Unit Setting

Unchannelled valley bottom wetlands are typically found on valley floors where the landscape does not allow high energy flows. Figure 5-4 presents a diagram of the relevant HGM units, showing the dominant movement of water into, through and out of the system.

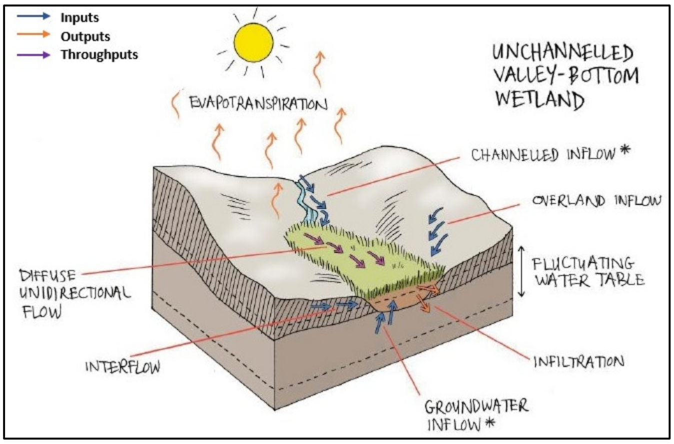

Figure 5-4 Amalgamated diagram of a typical unchannelled valley bottom, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al. 2013)

The hillslope seeps are located within slopes, as mentioned in Figure 5-5. 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 5-5 illustrates a diagram of the hillslope seeps, showing the dominant movement of water into, through and out of the system.

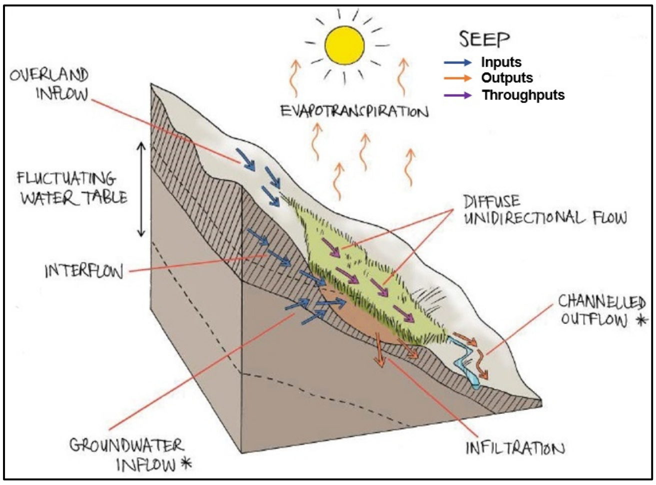

Figure 5-5 Amalgamated diagram of the HGM types, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al. 2013)

5.3 Wetland Indicators

5.3.1 Hydromorphic Soils

According to (DWAF, 2005), soils are the most important characteristic of wetlands in order to accurately identify and delineate wetland areas. One dominant soil form was identified within the identified wetland, namely the Manguzi soil form (see Figure 5-6) (Soil Classification Working Group, 2018).

The Manguzi soil form is characterised by an organic topsoil over an albic horizon. The soil family group identified for this soil form is that of the *2000* due to the extent of decomposition classified as Hemic.

According to (SASA, 1999), the Organic topsoil contains a high concentration of organic carbon, hence the dark colour of the soil type. This soil type forms under prolonged periods of saturation, which decreases the decomposition rate and ensures the formation of hemic or fibrous material.

Albic horizons are often characterised by uniform white-greyish colours from the residual clay and quartz particles making up the matrix of the horizon. The main characteristic of this diagnostic horizon is a bleached colouration, which is a resultant product of distinct redox and ferrolysis pedological processes combined with eluvial processes. According to the Soil Classification Working Group (2018), albic horizons often receive lateral sub-surface flows from hillslope processes.

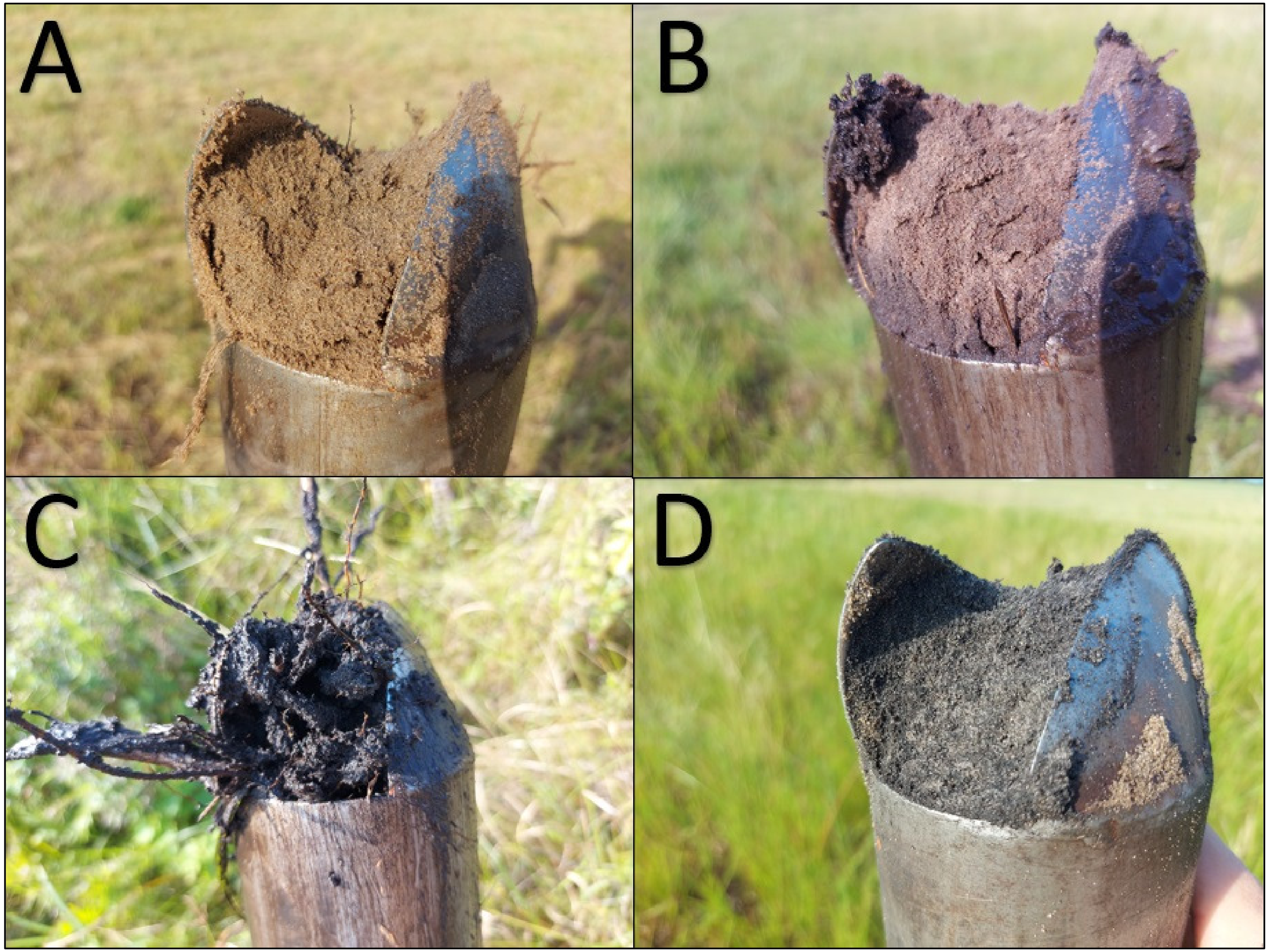

Figure 5-6 Soils identified during the site assessment. A) Orthic topsoil. B and D) Albic horizon. C) Organic topsoil.

5.3.2 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 *Nymphea* sp., *Schoenplectus* spp., *Phragmites australis* and *Cyperus* spp., (See Figure 5-7).

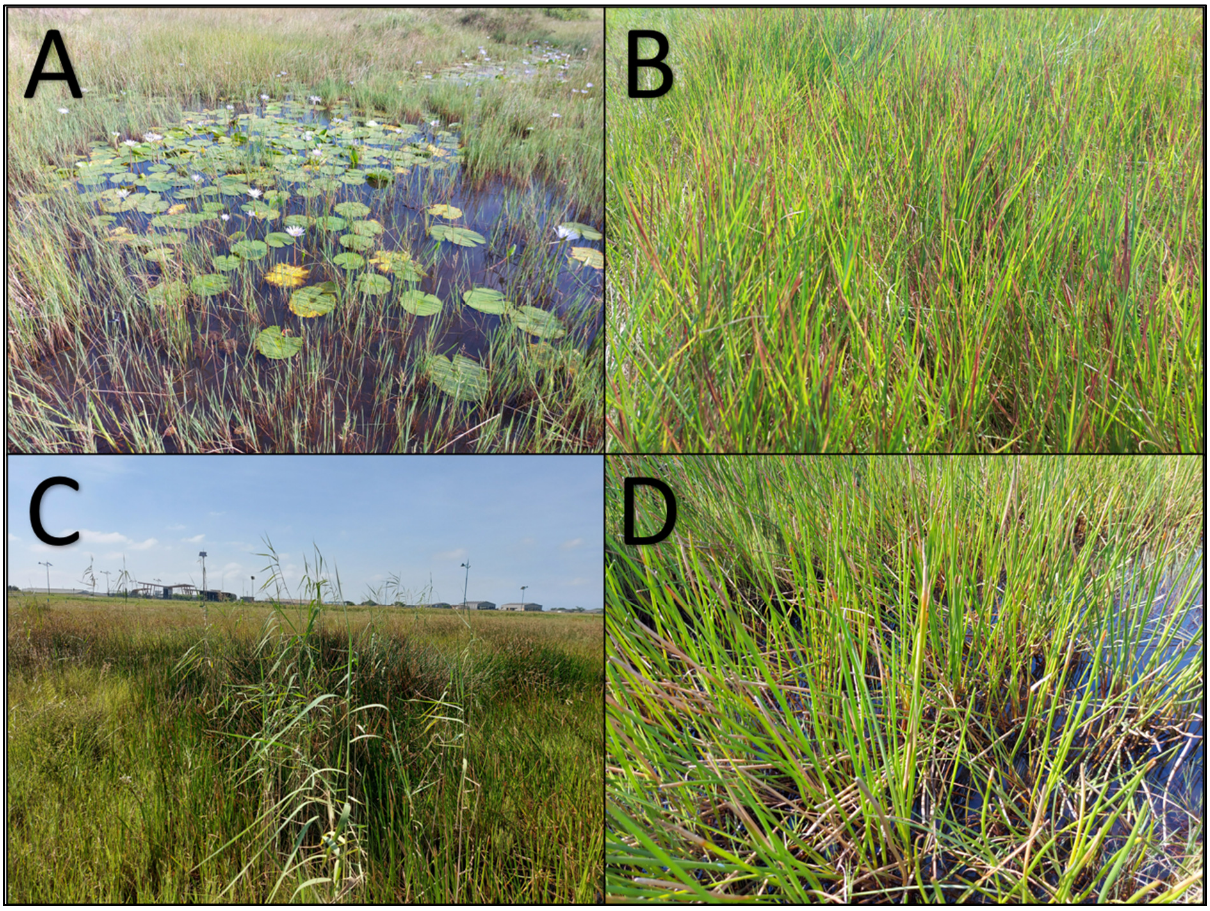

Figure 5-7 Hydrophytic vegetation identified within delineated watercourses. A) Nymphea sp. B) Cyperus spp. C) Phragmites australis. D) Schoenoplectus spp.

5.4 General Functional Description

Unchannelled 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). 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 mining 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 and therefore, the ecosystem services rated high for these systems on site might differ slightly to those expectations.

6 Impact Assessment

Environmental authorisation has already been (DEA, 2016) granted for the proposed development inside HGM units 1 and 2. HGM 3 is located to the northwest of the proposed development, but the wetland is located within a sub-basin that cannot be impacted through ground water movement (see Figure 6-1). According to the topography, HGM 3 can thus also not be impacted through surface flows or surface runoff from the proposed development area. Based on this no impacts to the system are expected.

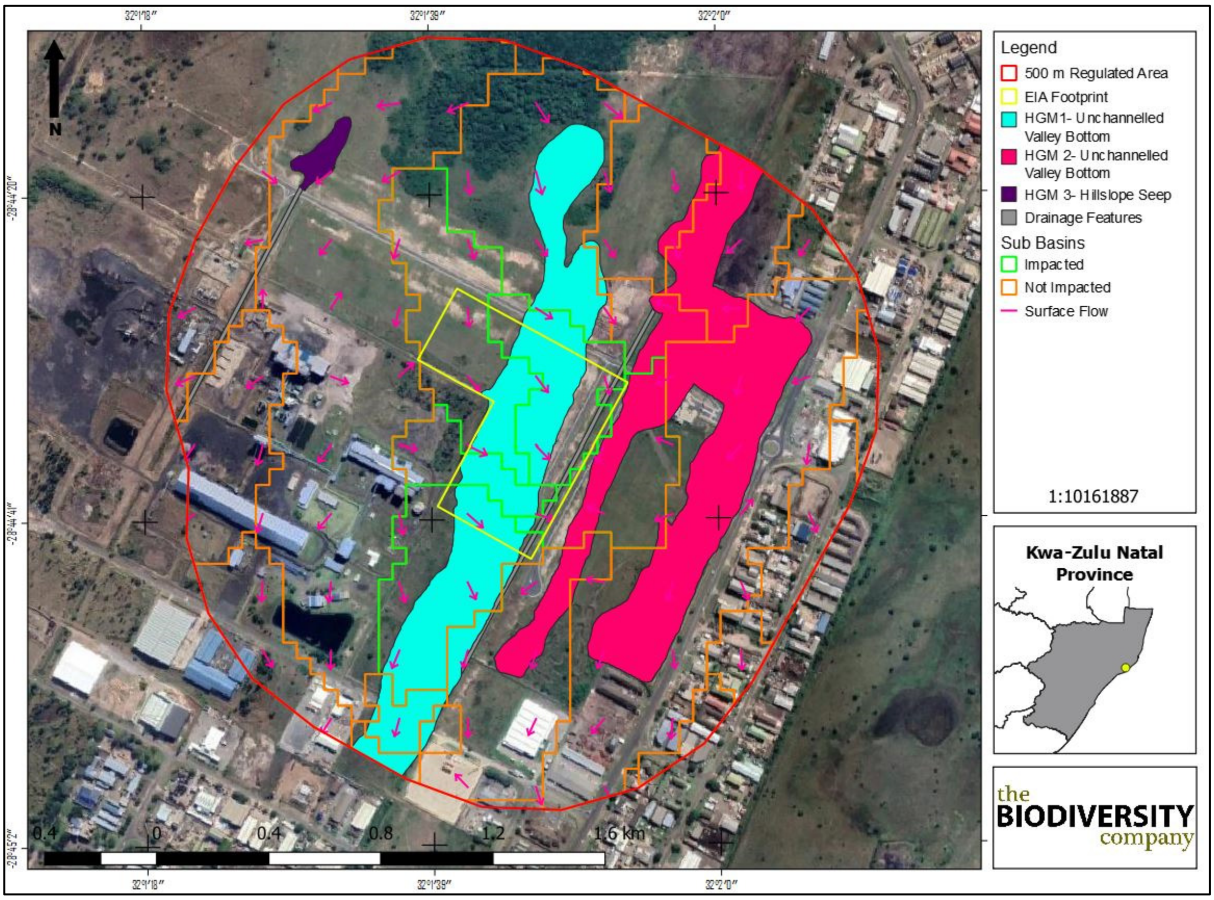

Figure 6-1 Sub-Basin and surface water flow inside the 500 m regulated area

According to DEA, 2016 the Richards Bay Industrial Development Zone has the authorisation to conduct the following activities associated with the proposed projects within the wetlands;

- Buildings exceeding 50 square metres in size;
- Infrastructure covering 50 square metres or more where the construction occurs within a watercourse or within 32 m of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line;
- The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, pebbles or rock from (i) a watercourse;
- Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more, except where such physical alteration takes place for: (linear development activities; or agriculture or afforestation where activity 16 in this Schedule will apply; and
- The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required for:
  - The undertaking of a process or activity included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), in which case the activity is regarded to be excluded from the list.
  - The undertaking of a linear activity falling below the thresholds mentioned in Listing Notice 1 in terms of GN No. 544 of 2010.

7 Conclusion

Three HGM units were identified within the 500 m regulated area, of which two have been classified as unchanneled valley bottom wetlands and one classified as a hillslope seep. The HGM units consist of one dominant soil form was identified within the identified wetland, namely the Manguzi soil form.

The Richards Bay Industrial Development Zone received environmental authorisation, which includes the development of two of the wetland areas. The remaining third wetland is not in a position in the landscape to be affected by the development. Therefore no additional authorisation or WUL is required for the proposed PRBGP3 project.

It is recommended that the conceptual wetland plan developed for the industrial zone (Royal Haskoning DHV, 2015) be implemented for the project.

8 References

Department of Environmental Affairs. 2013. Mining and biodiversity guideline- Mainstreaming biodiversity into the mining sector.

Department of Environmental Affairs. 2016. Environmental Authorisation for the construction of the proposed Richards Bay Industrial Development Zone phase 1F Installation of the bulk Infrastructure Services, Richards Bay, KwaZulu-Natal Province.

Department of Water Affairs and Forestry (DWAF) 2005. Final draft: A practical field procedure for identification and delineation of wetlands and Riparian areas.

Kotze DC, Marneweck GC, Batchelor AL, Lindley DC, Collins, NB. 2008. A Technique for rapidly assessing ecosystem services supplied by wetlands. Mondi Wetland Project.

Land Type Survey Staff. (1972 - 2006). Land Types of South Africa: Digital Map (1:250 000 Scale) and Soil Inventory Databases. Pretoria: ARC-Institute for Soil, Climate, and Water.

Macfarlane, D.M., Kotze, D.C., Ellery, W.N., Walters, D., Koopman, V., Goodman, P. Goge, C. 2008. WET-Health, A technique for rapidly assessing wetland health.

Macfarlane, D.M. & Bredin, I.P. 2017. Buffer Zone Guidelines for Rivers, Wetlands and Estuaries Buffer Zone Guidelines for Rivers, Wetlands and Estuaries. WRC Report No TT 715/1/17 Water Research Commission, Pretoria

Macfarlane, D.M., Dickens, J. & Von Hase, F. 2009. Development of a methodology to determine the appropriate buffer zone width and type for developments associated with wetlands, watercourses and estuaries.

Mucina, L. and Rutherford, M.C. (Eds.) 2006. The vegetation of South Africa, Lesotho and Swaziland. Strelizia 19. South African National Biodiversity Institute, Pretoria South African.

National Environmental Management Act. 1998. National Environmental Management Act (act no. 107 of 1998)- Environmental management framework regulations.

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.

RHDHV. 2013. Development of a Wetland Offest Management Plan for RBIDZ Phase 1F: Status Quo & Feasibility Report. Prepared by Royal HaskoningDHV on behalf of the Richards Bay IDZ. 46pp.

RHDHV. 2015. Richards Bay IDZ Phase 1F: Conceptual Wetland Offset Plan. Prepared by Royal HaskoningDHV on behalf Richards Bay IDZ.

Rountree MM and Kotze, DM. 2013. Manual for the Rapid Ecological Reserve Determination of Inland Wetlands (Version 2.0). Joint Department of Water Affairs/Water Research Commission Study. Report. Water Research Commission, Pretoria.

SiVest. 2010. Environmental Risk Assessment of Richards Bay IDZ 1A, 1B, 1C, 1D, & 1F. Wetland Assessment Report prepared for Thorn-Ex cc. by SiVest Environmental Division.

Soil Classification Working Group. (1991). Soil Classification A Taxonomic system for South Africa. Pretoria: The Department of Agricultural Development.

South African National Biodiversity Institute (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).

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.