September 2020

AQUATIC BIODIVERSITY IMPACT ASSESSMENT

SCOPING REPORT

Proposed development of the 450MW Emergency Risk Mitigation Power Plant (RMPP) and associated infrastructure on sites located in Alton, Richards Bay, KwaZulu-Natal.

Compiled for

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Field work and Wetland delineation and functionality assessment, Author and GIS mapping and analysis	Charleen Smuts	M.Sc. Plant Science Pr. Sci. Nat. (Botanical Science)	Charleen is a registered Professional Natural Scientist, member of the IAIASA and the South Africa Wetland Society (SAWS). She has 8 years of experience and has conducted numerous ecological and wetland delineation and functionality assessments. Furthermore, Charleen has been involved in a wide range of environmental authorisation projects.
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ABBREVIATIONS AND ACRONYMS	
CARA	Conservation of Agricultural Resources Act (Act 43 of 1983)
CBA	Critical Biodiversity Area
CCPP	Combined Cycle Power Plant
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CREW	Custodians of Rare and Endangered Wildflowers
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DEFF	Department of Environment, Forestry and Fisheries
DHSWS	Department of Human Settlements, Water and Sanitation
DO	Dissolved Oxygen
DWA	Department of Water Affairs
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EIS	Ecological Importance and Sensitivity
EMF	Environmental Management Framework
EMP	Environmental Management Plan
ESA	Ecological Support Areas
ESMP	Environmental Services Management Plan
GA	General Authorisation (GN 509)
GG	Government Gazette
GIS	Geographical Information Systems
GN	Government Notice
GPS	Global Positioning System
HGM	Hydro-Geomorphic (unit)
HRSG	Heat Recovery Steam Generators
IPP	Independent Power Producer
IUCN	International Union for Conservation of Nature and Natural Resource
LNG	Liquid Natural Gas
LPG	Liquid Petroleum Gas
KCDM	King Cetshwayo District Municipality
KZN	KwaZulu-Natal Province
NEMA	National Environmental Management Act (Act 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEMPAA	National Environmental Management: Protected Areas Act (Act 57 of 2003)
NERSA	National Energy Regulator of South Africa
NFA	National Forests Act (Act 84 of 1998)
NFEPA	National Freshwater Ecosystems Priority Areas
NWA	National Water Act (Act 36 of 1998)
NWCS	National Wetland Classification System
PA	Primary Aquifers
PAs	Protected Areas in terms of NEMPAA
PES	Present Ecological State
PRECIS	National Herbarium Pretoria (PRE) Computerised Information System
PU	Planning Unit
RMPPP	Risk Mitigation Power Procurement Programme
SANBI	South African National Biodiversity Institute
SARCA	South African Reptile Conservation Assessment
SDF	Spatial Development Framework

SIBIS	Integrated Biodiversity Information System
SWSAs	Strategic Water Source Areas
SWSA-gw	Strategic Water Source Areas for ground water
SWSA-sw	Strategic Water Source Areas for surface water
TOPS	NEMBA Threatened or Protected Species
TSS	Total suspended solids
TWQR	Target Water Quality Range
ULM	City of uMhlathuze Local Municipality
VEGMAP	Vegetation Map of Southern Africa
WMA	Water Management Area
WSAs	Water Source Areas

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EXECUTIVE SUMMARY

Exigent Engineering Consultants CC has been appointed by Savannah Environmental (Pty) Ltd, on behalf of Phinda Power Producers (Pty) Ltd, to conduct a specialist aquatic biodiversity impact assessment for the proposed construction of a 450MW Emergency Risk Mitigation Power Plant and associated infrastructure on development sites with a combined total extent of approximately 11,4 hectares, located in Alton industrial area, Richards Bay, within the City of uMhlathuze Local Municipality and the King Cetshwayo District Municipality, KwaZulu-Natal Province.

This study conforms to the requirements as set out in Government Notice No. 648 of Government Gazette 45421, published on 10 May 2019, which provides the criteria for the assessment and reporting of impacts on aquatic biodiversity for activities the terms of Government Notice No. 320 for the 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 an Environmental Authorisation, as released on the 20 March 2020.

Due to the waterlogged nature of the lower laying areas of the coastal plain, three major stormwater drainage channels were historically constructed to mitigate flooding and enable development in the Alton industrial area. One of these drainage channels forms the eastern boundary of the proposed development site.

Wetlands were delineated based on the principles and guideline documents from the Department of Water Affairs using wetland indicators such as wetland position in the landscape, soil form and wetness, as well as indicator vegetation where possible. Four wetland units were identified within the Department of Human Settlement, Water and Sanitation's 500 m regulated area. Two were classified as *Phragmites - Typha* channelled valley bottom wetlands; one located to the west of the proposed development site and the other along the eastern border of the site. Two *Imperata cylindrica* depression wetlands are located upstream on Erf 1854 at the northern boundary of the 500 m regulatory area. These depression wetlands will not experience change to one of the four main wetland drivers, viz. habitat, biota, flow and water quality by the proposed development therefore, no further assessment for the purposes of this development is required.

The *Phragmites - Typha* channelled valley bottom located at the eastern boundary of the site has experienced a moderate change in ecosystem processes and a loss of natural habitats has taken place however the basic ecosystem functions are still predominantly unchanged. This wetland is ecologically important and sensitive at a local scale. A 29 m buffer has been set for the wetland from the Department of Human Settlement Water and Sanitation guidelines for the determination of buffer zones for rivers, wetlands and estuaries by Macfarlane *et al.* (2017). The proposed development has taken cognisance of the buffer zone, excluding activities from this area.

Species of special concern were recorded in the wetland and includes *Ficus trichopoda* and *Barringtonia racemosa* individuals. The sensitivities presented were based on the findings of the site investigations to date. Final recommendations and mitigation measures will be presented in the EIA phase.

1. INTRODUCTION

Exigent Engineering Consultants CC (Exigent) has been appointed by Savannah Environmental (Pty) Ltd (Savannah), on behalf of Phinda Power Producers (Pty) Ltd (Phinda), to conduct a specialist aquatic biodiversity impact assessment for the proposed construction of a 450MW Emergency Risk Mitigation Power Plant (RMPP) and associated infrastructure in Alton industrial area, Richards Bay, within the City of uMhlathuze Local Municipality (ULM) and the King Cetshwayo District Municipality (KCDM), KwaZulu-Natal Province (KZN, Figure 1-1).

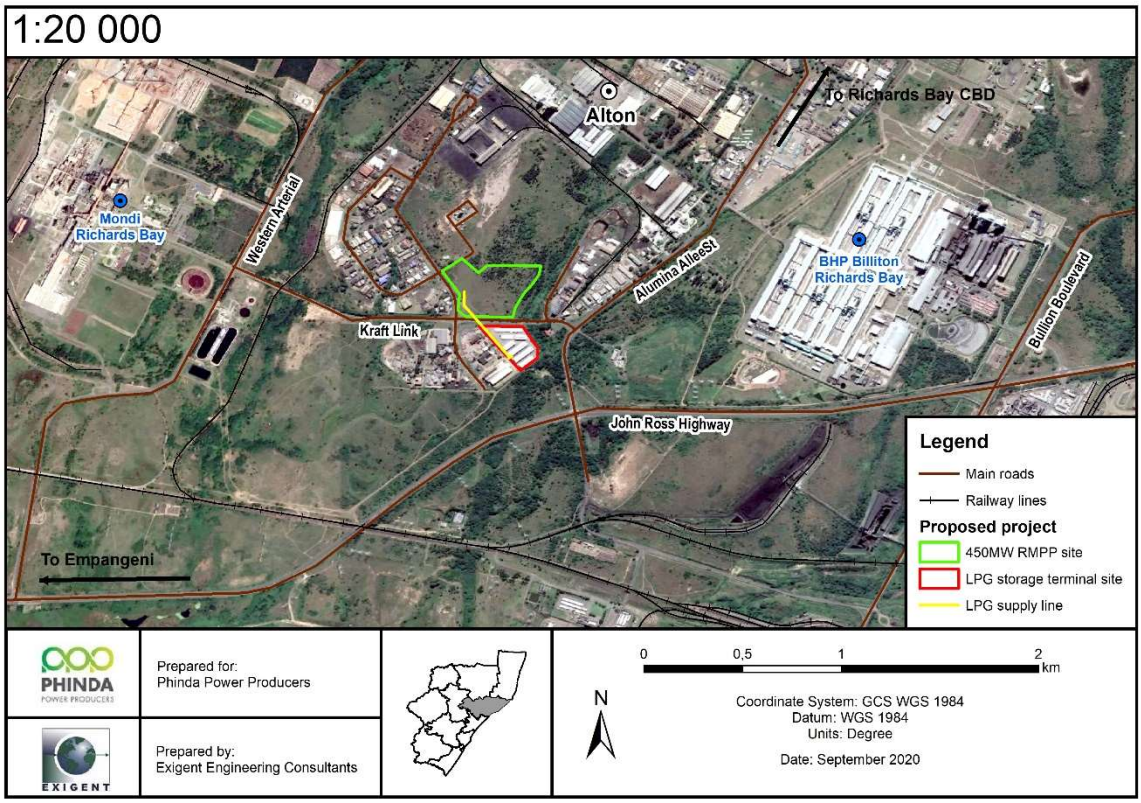

Figure 1-1. Locality of the proposed 450MW RMPP and associated infrastructure in Alton industrial area, Richards Bay, KZN.

1.1. Project description

Phinda proposes the construction of a 450MW Emergency RMPP which involves the construction of a gas-fired power station which will provide mid-merit power supply to the electricity grid.

The 450MW RMPP is planned to operate on a mid-merit basis at a minimum annual average dispatch rate of ~50% (i.e. operational between 5am and 9:30pm daily and being deployed on average for a minimum 72% over the year during this time period) and a maximum annual average dispatch rate of ~70%. The 450MW RMPP has been designed and developed as a power balance system to manage electricity demand during day time peak periods to provide energy, capacity and ancillary services to promote the stability of the national grid and assist in levelling out the variability in renewables energy electricity supply and meet short term fluctuations in electricity demand. In addition, the 450MR RMPP can provide back up support for daytime base load generation in the event of unscheduled maintenance on Eskom's base load electricity generation fleet.

The power station will have an installed capacity of up to 450MW, to be operated on either Liquid Petroleum Gas (LPG) or naphtha as the initial fuel source and later to be converted from utilising LPG/naphtha to liquid natural

gas (LNG). For the initial fuel source, either LPG would be supplied by road from the existing LPG import terminal in Richards Bay or naphtha would be supplied via pipeline from the import berths at Richards Bay. Once LNG import and regassification infrastructure is established in Richards Bay in accordance with the Department of Minerals and Energy, Transnet Limited and the Independent Power Producer (IPP) Office's planning, natural gas would be supplied to the 450MW RMPP via a natural gas pipeline from this import terminal. The use of either Naphtha or LPG and the associated infrastructure required in respect of each of these alternative fuel sources, will be investigated further within the EIA phase and the preferred fuel source presented. The LNG terminal and regassification infrastructure and naphtha supply infrastructure at the port of Richards Bay and the relevant pipelines do not form part of the scope of this assessment, whereas LPG infrastructure does form part of this report.

The main infrastructure associated with the facility includes the following:

- Main Power Island consisting of either gas turbines comprising of air intake, air filter structures and exhaust stack for the generation of electricity through the use of natural gas, naphtha or LPG; or Gas engines comprising of reciprocating internal combustion engines and exhaust stack utilising LPG or natural gas.
- Generator and Auxiliary transformers.
- Balance of Plant systems.
- Dry Cooling systems.
- Auxiliaries.
- 132kV interconnecting substation and power lines connecting to the grid transmission infrastructure (The power lines to the grid transmission structure will be applied for under a separate environmental approval process).
- LPG fuel pipe routing between the LPG storage site and the power plant site or Naphtha import pipeline from the port of Richards Bay to the onsite storage of Naphtha (the Naphtha pipeline will be applied for under a separate environmental approval process).
- Stormwater management ponds.
- LPG storage comprising of up to 15 000m^3 of storage in total, comprising of a number of either bullets or spheres storage tanks in design or;
- Naphtha storage on the power plant site of up to 90,000m^3 in total, comprising of a number of tanks.
- Once imported LNG is available in Richards Bay, the 450MP RMPP will be converted from utilising LPG / Naphtha to the use of regassified LNG by means of a new dedicated natural gas pipeline which will replace or supplement the LPG / Naphtha supply to the power plant (The approval for the pipeline will be conducted under a separate process).
- 3 effluent reticulation systems - i.e. 1) sanitary wastewater system; 2) oily water collection system and 3) storm water and rainwater collection system.
- Diesel generator to provide start-up power to the first gas engine / turbine.

This specific specialist report therefore entails an aquatic biodiversity scoping assessment for the proposed 450MW RMPP and associated infrastructure and reports on the environmental impacts that this proposed Plant may have. The report will form part of the submissions to the National Department of Environment, Forestry and Fisheries (DEFF) in terms of the National Environmental Management Act, 1998 (NEMA) (Act No. 108 of 1998) and the 2014 Environmental Impact Assessment (EIA) Regulations, as amended in April 2017.

2. SCOPE OF WORK

This study conforms to the requirements as set out in Government Notice (GN) No. 648 of Government Gazette (GG) 45421, published on 10 May 2019, which provides the criteria for the assessment and reporting of impacts on aquatic biodiversity for activities the terms of GN No. 320 for the 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 (NEMA, Act 107 of 1998), when applying for an Environmental Authorisation (EA), as released on the 20 March 2020.

2.1. Aquatic Biodiversity Impact Assessment

The following will be included in the Aquatic Biodiversity Impact Assessment Report:

1. A description of the preferred development site. The baseline description will include:
    - A description of the aquatic biodiversity and ecosystems on the site, including:
        - Aquatic ecosystem types;
        - Presence of aquatic species and composition of aquatic species communities, their habitat, distribution and movement patterns;
    - Threat status, including Listed Ecosystems, as well as locally important habitat types identified;
    - National and Provincial priority status of the aquatic ecosystem (i.e. is this a wetland or river Freshwater Ecosystem Priority Area (FEPA), a FEPA sub catchment, a Strategic Water Source Area (SWSA), whether or not they are free-flowing rivers, wetland clusters, etc., a CBA or an ESA; including for all a description of the criteria for their given status; and
    - A description of the Ecological Importance and Sensitivity of the aquatic ecosystem including:
        - The description of the ecosystem processes that operate in relation to the aquatic ecosystems on and immediately adjacent to the site;
        - The historic ecological condition (reference) as well as Present Ecological State (PES) of rivers (in-stream, riparian and floodplain habitat) and/or wetlands in terms of possible changes to the channel, flow regime (surface and groundwater).
2. Identify any alternative development footprints within the preferred development site which would be of a "low" sensitivity and verified through the Initial Site Sensitivity Verification;
3. Assessment of impacts - a detailed assessment of the potential impact(s) of the proposed development on the following very high sensitivity areas/ features:
    - Is the development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal?
    - Is the development consistent with maintaining the Resource Quality Objectives for the aquatic ecosystems present?
    - How will the development impact on fixed and dynamic ecological processes that operate within or across the site, including:
        - Impacts on hydrological functioning at a landscape level and across the site which can arise from changes to flood regimes;
        - Change in the sediment regime of the aquatic ecosystem and its sub-catchment;
        - The extent of the modification in relation to the overall aquatic ecosystem; and
        - Assessment of the risks associated with water use/s and related activities.
    - How will the development impact on the functionality of the aquatic feature, including:
        - Base flows;
        - Quantity of water including change in the hydrological regime or hydroperiod of the aquatic ecosystem;
        - Change in the hydrogeomorphic typing of the aquatic ecosystem;
        - Quality of water;
        - Fragmentation; and
        - The loss or degradation of all or part of any unique or important features associated with or within the aquatic ecosystem.
    - How will the development impact on key ecosystem regulating and supporting services especially:
        - Flood attenuation;
        - Streamflow regulation;
        - Sediment trapping;
        - Phosphate assimilation;
        - Nitrate assimilation
        - Toxicant assimilation;
        - Erosion control; and

- Carbon storage.
- How will the development impact community composition and integrity of the faunal and vegetation communities inhabiting the site?
- A motivation must be provided if there were development footprints that were identified as having a "low" biodiversity sensitivity and were not considered appropriate.

4. The findings of this assessment are captured in this Aquatic Biodiversity Impact Assessment Report.

3. RELEVANT LEGISLATION

3.1. Biodiversity legislation

3.1.1. Constitution of the Republic of South Africa Act (Act 108 of 1996)

The Constitution of the Republic of South Africa Act (Act No. 108 of 1996) places a duty on the State and citizens to protect the environment. Section 24 provides that:

"*Everyone has the right –*

(b) to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that

i) prevent pollution and ecological degradation.
ii) promote conservation.
iii) secure ecologically sustainable development and use of natural resources while promoting
iv) justifiable economic and social development".

3.1.2. National Environmental Management Act (Act 107 of 1998)

The principles underpinning environmental management contained in the National Environmental Management Act (Act 107 of 1998) (NEMA) must be considered by any organ of state in the exercise of any power that may impact on the environment. Section 2 (4a) states that sustainable development requires the consideration of all relevant factors including the following:

- That the disturbance of ecosystems and loss of biological diversity are avoided, or where they cannot be altogether avoided, are minimized and remedied.
- That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimized and remedied.
- That the development, use and exploitation of renewable resources and the ecosystems of which they are a part do not exceed the level beyond which their integrity is jeopardized.
- That negative impacts on the environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimized and remedied.

3.1.3. National Environmental Management: Biodiversity Act (Act 10 of 2004)

The National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA) addresses, amongst others:

- Biodiversity planning and monitoring.
- Protection of threatened or protected ecosystems.
- Protection of threatened or protected species (TOPS).
- The control of alien species, invasive species and genetically modified organisms.

Species that are classified as threatened and/or protected are listed in Government Gazette 151 of February 2007 and the regulations are included in Government Gazette 152 of February 2007, with the most recent amendment in Government Notice 576 of July 2011.

Threatened ecosystems in need of protection are listed Government Notice 1002 of December 2011. The National Environmental Management: Biodiversity Act (10/2004): Alien and Invasive Species Lists, 2016 (No 864) was published on 29 July 2016 in GN 40166.

3.1.4. National Forest Act (Act 54 of 1998)

Government Gazette No 26731 of August 2004, and any later revisions as released, provide a list of tree species protected under the National Forests Act. In terms of the National Forests Act, indigenous trees within a natural forest or protected tree species may not be cut, disturbed, damaged or destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold except under licence granted by the Department of Environment, Forestry and Fisheries (DEFF, previously the Department of Agriculture, Forestry and Fisheries), or a delegated authority. Applications for such activities should be made to the responsible official in each province.

3.1.5. KZN Nature Conservation Ordinance (15 of 1974)

The KZN Nature Conservation Ordinance relates to nature conservation and concerns in the province. The ordinance lists the protected and specially protected plants in the province and prohibits the picking, sale, export or removal of protected plants. The ordinance also lists invader weeds, which must be controlled on study area and may not be sold or donated.

Schedule 12 is a list of protected indigenous species which requires a permit prior to being exported from or imported into the Province.

3.1.6. Additional biodiversity legislation

Locally, the South African Constitution, various Acts and two international treaties allow for the protection of wetlands and rivers. Additional to the aforementioned legislation, these wetland systems are also protected from destruction or pollution by the following:

- Agenda 21 – Action plan for sustainable development of the Department of Environmental Affairs and Tourism (DEAT) 1998.
- The Ramsar Convention, 1971 including the Wetland Conservation Programme (DEAT) and the National Wetland Rehabilitation Initiative (DEAT, 2000).
- Conservation of Agricultural Resources Act (Act 43 of 1983).
- Minerals and Petroleum Resources Development Act (Act 28 of 2002).

The Conservation of Agricultural Resources Act (CARA) (Act 43 of 1983) and the NEMBA also applies to this project. CARA and NEMBA has categorised many invasive plants together with associated obligations of the landowner.

3.2. Provincial legislation and policy for buffers

Previously, a standard 30 m buffer has been applied to wetlands in the province, disregarding site-specific conditions. The Ezemvelo KZN Wildlife Biodiversity Impact Assessment Guideline (2013) have however compiled criteria for determining the width of wetland and forest buffers based on the biophysical factors and the interactions between them. Other policies that are relevant include:

- Provincial Nature Conservation Ordinance (PNCO) – Protected Flora;
- KZN Biodiversity Conservation Plan; and
- KZN Vegetation Map (2011).

The buffers relevant to this study area will be determined using a combination of the EKZNW biodiversity guidelines and the guidelines for the determination of buffer zones for rivers, wetlands and estuaries by Macfarlane *et al*. (2017). The buffer model sheet for the results of the study area can be provided upon request.

4. ASSUMPTIONS AND LIMITATIONS

- The wetland boundaries mapped in this specialist report represent the approximate boundary on a gradient between saturated and terrestrial soil as determined by a specialist experienced in the delineation technique. On-site wetland boundaries were accurately surveyed for planning and mapping purposes. Wetlands identified in the regulatory area has been desktop delineated.
- In order to obtain a comprehensive understanding of the dynamics of the study area, as well as the status of endemic, rare or threatened species in any area, assessments should always consider investigations at different time scales (across seasons/years) and replication. Due to time constraints, such long-term studies are not always feasible, and conclusions will be based on field surveys conducted on 18-20 September 2019 and 28-31 January 2020. A follow-up site visit is planned prior to the submission of the Aquatic Biodiversity Impact Assessment Report during the Environmental Impact Assessment (EIA) phase of this project.

5. DESCRIPTION OF RECEIVING ENVIRONMENT

5.1. Locality

The development is proposed within the quarter degree grid cell 2832 CC and quaternary catchment W12F in the Alton industrial area of Richards Bay within the jurisdiction of the ULM and the KCDM, KZN Province.

The proposed 450MW RMPP and its associated infrastructure is located north of Kraft link, on the southern section of Erf 1854. With the centre point geographical coordinates at 28°45'58.62"S and 32°00'39.55"E. The proposed LPG storage terminal is located south of Kraft Link on Lot 1795 of the Richards Bay Industrial Park Portions 6-18 at centre point coordinates at 28°46'7.52"S and 32°00'44.11"E. The 450MW RMPP site will be accessed on the west side from the existing Kabelring road (Figure 5-2).

The 450MW RMPP and its associated infrastructure are proposed on an undeveloped area while existing mini-factories and warehouses exist on the proposed LPG Storage Terminal site. These structures will be demolished in order to accommodate the proposed development (Figure 5-1).

a)

b)

c)

d)

Figure 5-1. Land use where a) and b) depicts the undeveloped area proposed for the 450MW RMPP and associated infrastructure and c) and d) the existing mini-factories and warehouses on the proposed LPG Storage Terminal site.

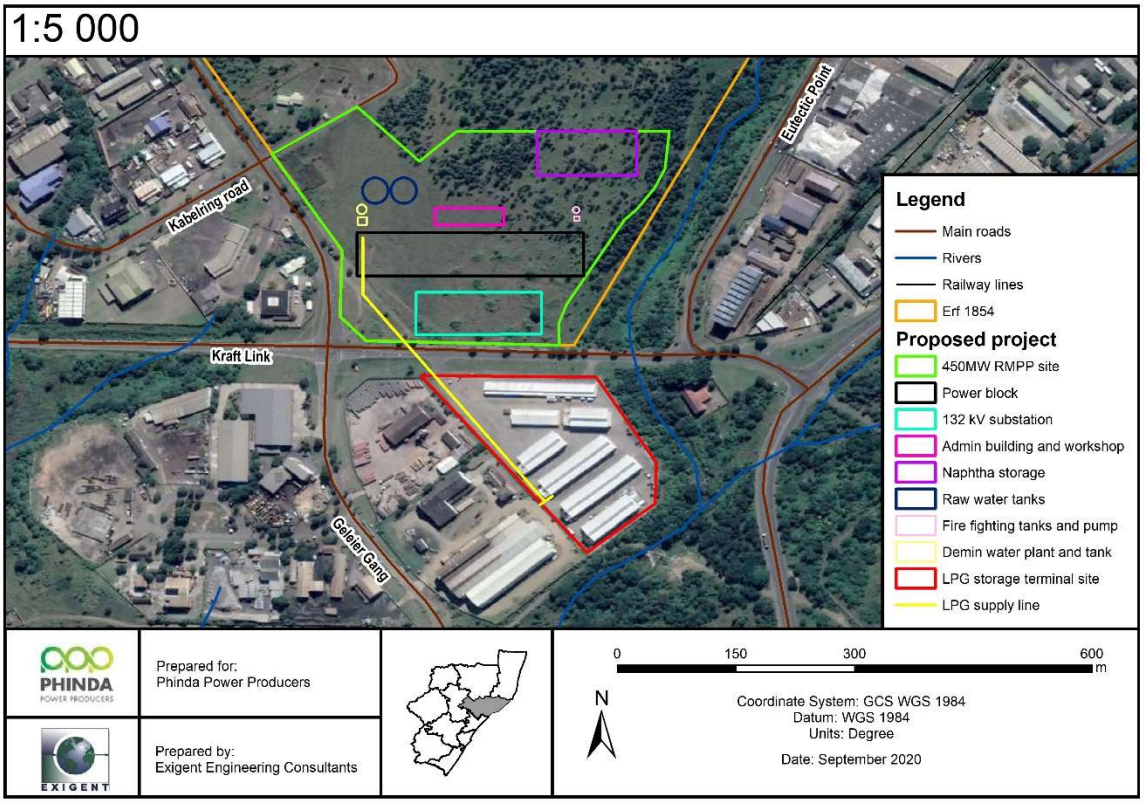

Figure 5-2. The proposed 450MW RMPP and associated infrastructure setting.

5.2. Biophysical description

5.2.1. Climate

The climate of the study area can be described as summer rainfall towards the interior but comprise generally of a weak rainfall seasonality, especially closer to the coast. It experiences relatively high precipitation reaching mean annual precipitation values of approximately 1200 mm in coastal localities, decreasing to the interior. High humidity

and temperature are experienced during summer months with the mean maximum being 35.3 °Celsius and a mean winter temperature of 5.5 °Celsius. No incidence of frost is recorded within the study area (Mucina & Rutherford, 2006).

5.2.2. Geology and geography

The study area is generally characterised as a relatively flat landscape. It comprises of 18 000 years old quaternary sediments of marine origin mainly with yellowish and argillaceous redistributed sands of the Berea and Muzi Formations (Maputaland Group). The soils are nutritiously very poor and well leached, except in the interdune depressions were organic-rich soils are often present (Mucina & Rutherford, 2006). The main land types "Ha" and "Hb" present on site may include the Constantia, Shepstone and Vilafontes soil forms while the less distributed "Db" land type on site is associated with a wide variety of geological units such as the basement granites, Natal Group sandstones, Dwyka tillites, Ecca shales and sandstones, mudstones, shale and/or sandstones of the Escourt, Emakwezini, Nyoka, Ntabene and Clarens Formations, siltsrone/sandstone of the Zululand Group and some Cenozoic deposits. The "Db" broad soil pattern is generally situated in low gradient slopes and are therefore prone to inundation/flooding. "Db" landtype unit is characterised by duplex soils with non–red B horizons (Council for Geoscience, 2012).

The site is underlain by the KwaMbonambi Formation which forms part of the Maputaland Group. The older Port Durnford Formation consists of mainly carbonaceous mudstone and claystones. The KwaMbonambi Formation consists of a variety of grey, orange and red sands. Peat occurs on the seaward, wetter margins of this formation (Roberts *et al*., 2006). According to Grundling & Grobler (2005), peat accumulates mostly along the eastern and southern coastline and the eastern parts of the central plateau in wetter areas of the country. They are very rare and unique wetland types of Southern Africa that provide an important ecosystem habitat due to the diversity that they support, their size, distribution and threats (Grundling & Grobler, 2005). No peat soils were detected during the site visit.

The Agricultural Potential and Soils Impact Assessment Report conducted for the proposed study (Phipson, 2020) confirms that the proposed project site is underlain mostly by the Fernwood Soil Form whilst the Witbank Soil Form was classified below the building rubble and road building detritus mounds located on the proposed development site.

5.2.3. Hydrology

The National Freshwater Ecosystems Priority Areas (NFEPA) used Water Source Areas (WSAs) to create a database that present various water and water related layers, including wetland delineation and vegetation data, catchment data, area of high groundwater recharge and water management areas using the criterion of the production of relatively large volumes of runoff which sustain lowland areas downstream. This work was then taken further in a study by the World Wide Fund for Nature – South Africa (WWF-SA) and the Council for Scientific and Industrial Research (CSIR) who identified 21 Strategic WSAs for surface water (SWSA-sw) which covered 8% of South Africa and supplied 50% of the mean annual runoff. More recently, the Water Research Commission (WRC) funded a study which identified water source areas for both ground and surface water resources (BGIS SANBI 2017). Strategic Water Source Areas (SWSAs) are now defined as areas of land that either:

(a) supply a disproportionate (i.e. relatively large) quantity of mean annual surface water runoff in relation to their size and so are considered nationally important; or

(b) have high groundwater recharge and where the groundwater forms a nationally important resource; or

(c) areas that meet both criteria (a) and (b). They include transboundary Water Source Areas that extend into Lesotho and Swaziland.

Based on the BGIS SANBI SWSAs database (2017) the study area is strategically important at the national level for water and economic security for South Africa as it lies in both the Zululand Coast surface water and the Richards Bay ground water-fed estuary SWSA. The accuracy of these delineations in the proposed development sites will

be determined from review of the surface and groundwater specialist reports in combination with ground truthing during the EIA phase of the project.

Surface Water

The study area falls within the Pongola to Mtamvuna Water Management Area (WMA, GN 1056 in GG 40279 of 16 September 2016). This WMA includes major rivers such as the Pongola, Mhlathuze, Mkuze, Thukela, Mvoti and Umgeni Rivers amongst various others, within the quaternary catchment W12F. The major water resources of the uMhlathuze Catchment is uMhlathuze and Nseleni rivers, Goedertrouw dam and several irrigation dams and impoundments, several lakes and pans (such as Lake Cubhu, Mzingazi Lake, Nhlabane Lake and Nsezi Lake), riparian areas along most of the riverine habitat, hillslope seepages, valley bottom wetland systems and Mhlathuze River Floodplain and Estuary. The most important wetland systems within the Umhlathuze Catchment are Mzingazi, Qhubu and Nhlabane Lake (as it supplies water to Richards Bay and surroundings), Mhlatuze Floodplain, Mhlatuze Estuary and its associated valley bottom wetland feeding into it, and Mountainous seeps in the upper reaches of Mhlatuze River (DWA, 2014).

The National spatial data (November, 2017) identifies several non-perennial and perennial rivers, lakes, vleis and open reservoirs in Alton of which only one perennial river runs directly adjacent to the 450MW RMPP and LPG Storage Terminal sites (Figure 5-3). Historically, a stormwater drainage channel was constructed in this river channel to mitigate flooding and enable development in the Alton industrial area. Although it has historically been artificially channelled, the channel bed is earthen and therefore functions as a natural river and associated wetland unit.

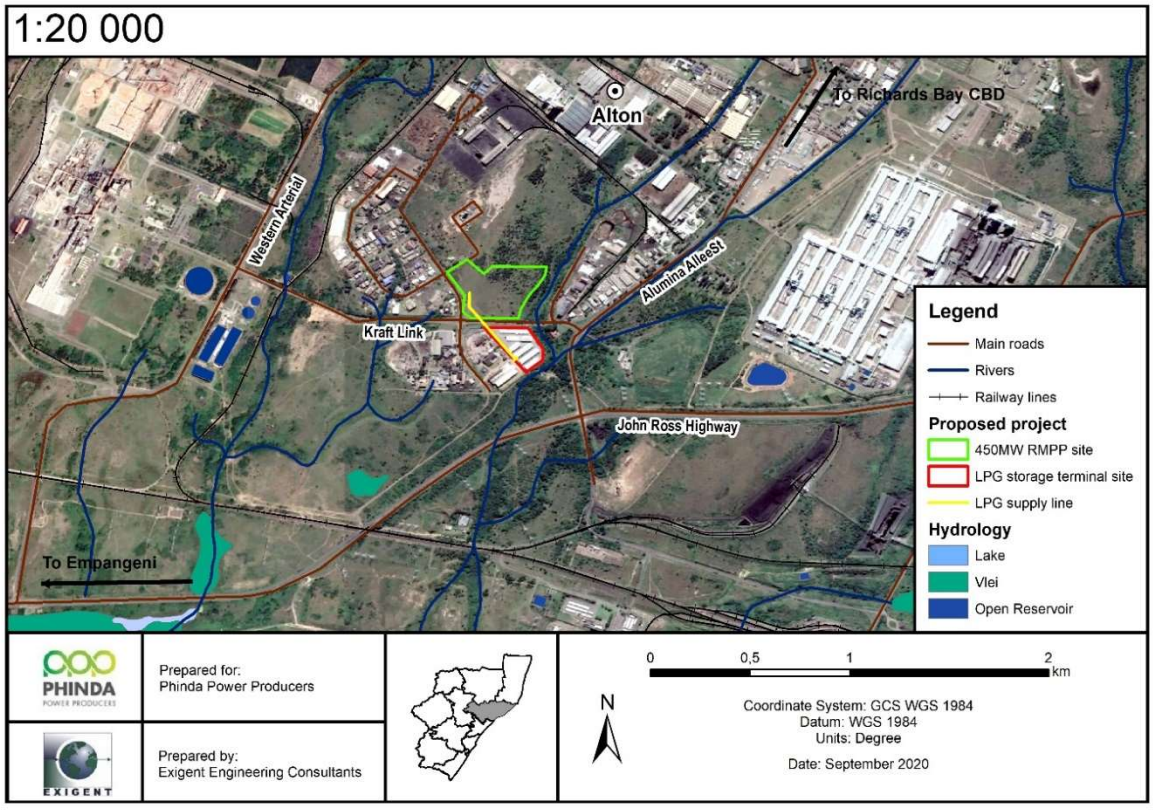

Figure 5-3. Hydrology of the study and surrounding areas

Based on ground truthing, four natural wetland units were identified within the DHSWS' 500 m regulated area. Two were classified as *Phragmites - Typha* channelled valley bottom wetlands; one located to the west of the proposed

development site and the other along the eastern border of the site. Two *Imperata cylindrica* depression wetlands are located upstream on Erf 1854 at the northern boundary of the 500 m regulatory area. These depression wetlands will not experience change to one of the four main wetland drivers, viz. habitat, biota, flow and water quality by the proposed development therefore, no further assessment for the purposes of this development is required. A description of the channelled valley bottom wetlands are presented in section 7.1 of this report.

Resource Class, Resource Quality Objectives (RQO) and Reserve Determination

The water resources within this catchment has been awarded a PES rating of C (Moderately modified) and an EIS rating of Moderate. The river associated with the W12F quaternary catchment area is the Mhlathuze River with the catchment infrastructure the Mhlathuze Lagoon (DWA, 2014).

The aquatic resources are under threat from current land use practices and over-utilisation of water resources. Existing water resources should be protected through water conservation measures such as removal of alien invasive species, rehabilitation of wetlands, limiting groundwater abstraction to the set sustainable yield and minimizing the pollution of water resources (DWA, 2014).

Groundwater

The groundwater recharge of South Africa has been mapped and distributed as part of the National Freshwater Ecosystems Priority Areas (NFEPA) in 2011. This data aimed to provide the sub-quaternary catchments where the groundwater recharge was three-times higher than the average recharge ratio. Areas of high groundwater recharge are not necessarily classified as FEPAs, however they can be perceived as the 'recharge hotspots' of a region. It is critical to maintain the natural habitat in these areas of high groundwater recharge as to protect the functioning of the groundwater dependent ecosystems. Areas of groundwater recharge values higher than 300 indicate high groundwater recharge areas. In KwaZulu-Natal, there are no areas of high groundwater recharge. The study area has a groundwater recharge ratio of 170.

The aquifer classification map of South Africa has indicated that the study area has been identified as a major aquifer system. The water source in this area is surface water. According to the groundwater quality map of South Africa the electrical conductivity of the groundwater in the area ranges between 0 to 70 mS/m (millisiemens per metre).

The Geotechnical Investigation (Davies Lynn & Partners, 2019) conducted for the proposed development records groundwater seepage was encountered at depths ranging between 1,8 m and up to 2,7 m below existing ground levels in nine of the twenty Inspection Pit excavations. The standpipe piezometers installed in the Boreholes further revealed that the groundwater elevation is expected to be encountered at depths ranging between 2,25 m (BH 3-19), 3,28 m (BH 1-19) and up to 4,15 m (BH 2-19) below existing ground levels. Additionally, the shallow, less permeable recent sandy clay layers should be anticipated to retard vertical drainage and possibly give rise to temporary perched seepage water after prolonged periods of heavy rainfall.

5.2.4. General description of the vegetation of the area

The study area is located within the Indian Ocean Coastal Belt Biome, located within the Maputaland Coastal Belt vegetation type (Mucina & Rutherford, 2006). According to the National vegetation data (BGIS SANBI, 2018) and Ezemvelo KZN Wildlife (EKZNW, 2011), the 450MW RMPPP Power Plant and its associated infrastructure is located within the Maputaland Wooded Grassland. Both databases identify *Ficus trichopoda* swamp forest approximately 170 m to the west, outside of the proposed development area.

According to the Ecosystem Threat Status of the National Biodiversity Assessment (NBA, SANBI 2018) and EKZNW (2011) the Maputaland Wooded Grassland is classified as **Endangered**.

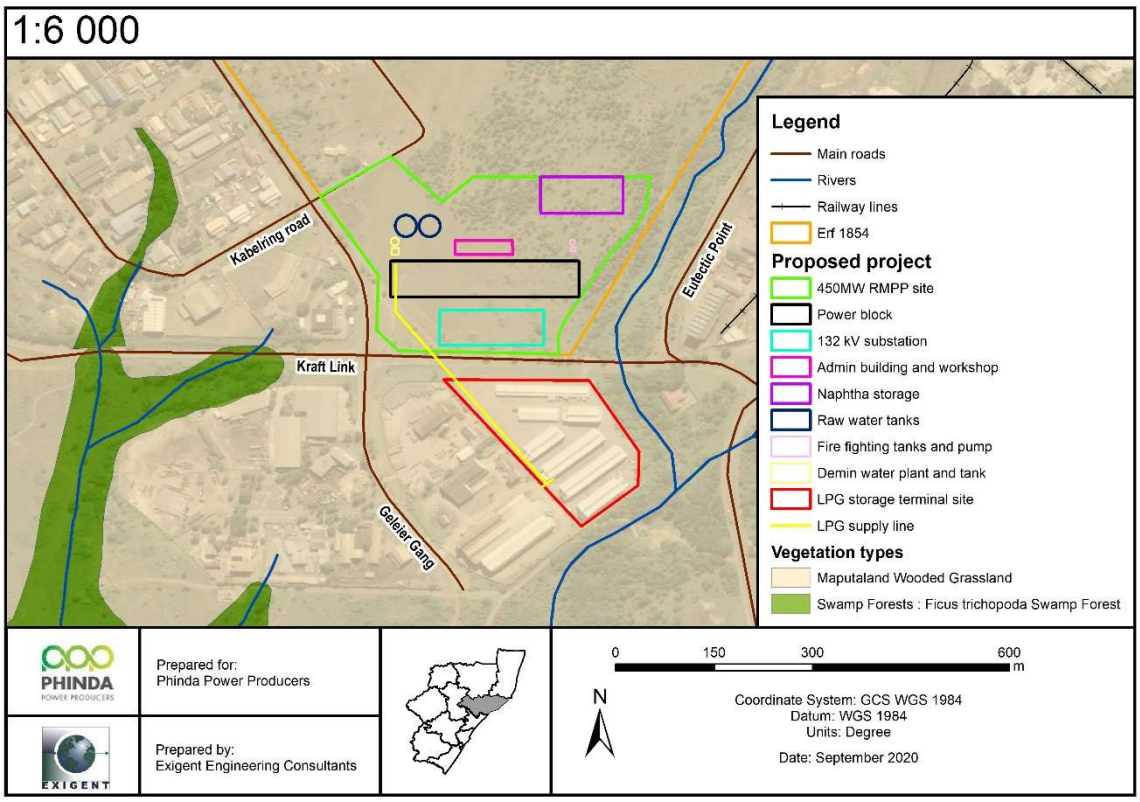

Figure 5-4. Vegetation types of the study area (BGIS SANBI, 2018, EKZNW, 2011).

However, following ground truthing, much of the area identified as Maputaland Wooded Grassland is, in fact industrial development. Vegetation confirmed on the development site resembles that of Maputaland Wooded Grassland albeit the natural woody layer has been greatly reduced. Detailed vegetation information is presented in the Ecological Biodiversity Impact Assessment Scoping Report for the proposed project (Exigent, 2020).

6. METHODOLODY AND DESKTOP RESULTS

6.1. Desktop evaluation

Prior to conducting the physical study area visit and wetland delineation, an initial level 1 (desktop) survey was done using Google Earth's map timeline function to detect changes in visible vegetation gradients. Maps are available from 2004-2019. Possible wetlands were identified, and GPS coordinates were noted to assist with the study area visit.

6.2. Literature review and database survey

A literature survey and database review were conducted to assist with the study. The full reference to resources used is listed in Section 13. The broad-scale national databases are used as baseline with focus then shifting to the available ULM databases.

6.2.1. National databases

The Integrated Biodiversity Information System (SIBIS) database from the South African National Biodiversity Institute (SANBI) contains information from several SANBI databases, namely:

- Acocks (plant species observations);
- Custodians of Rare and Endangered Wildflowers (CREW) (threatened plant species localities);
- Garden Accessions (plant collection records);
- MSB (plant seed collection records);
- National Herbarium Pretoria (PRE) Computerised Information System (PRECIS) (taxonomy and herbarium specimens);
- Species Status (NEMBA-listed species);
- TSP (threatened plant species);
- National Freshwater Ecosystems Priority Areas (NFEPA) – (Nel *et al*., 2011);
- National Spatial Biodiversity Assessment (2018).

NFEPA database includes various water and water related layers, including wetland delineation and vegetation data, catchment data, areas of high groundwater recharge and water management areas. Based on the NFEPA database, the study area lies within the Indian Ocean Coastal Belt Group 1 wetland vegetation type with a channelled valley bottom wetland located to the west, outside the development area. The NBA database classified the mid-section of this wetland unit as a unchannelled valley bottom wetland (SANBI, 2018) This wetland unit was identified during the site visit and is described with the wetland systems in Section 7.1 of this report.

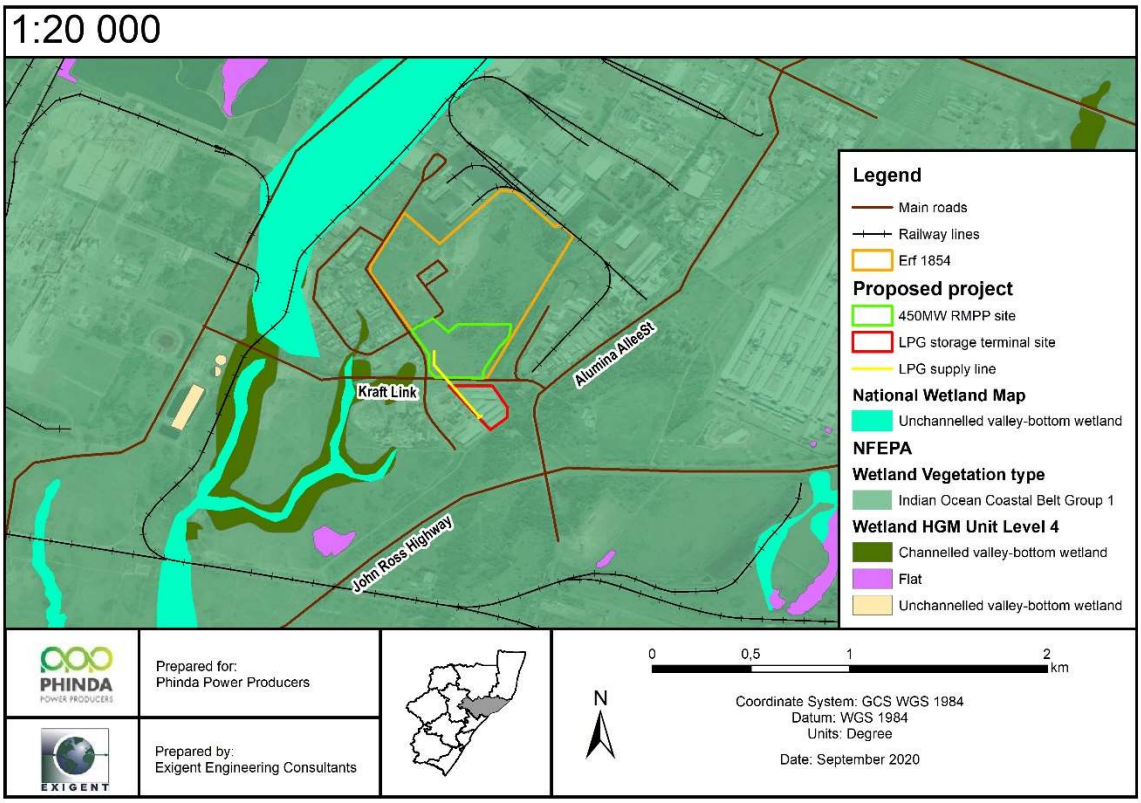

Figure 6-1. NFEPA and NBA map depicting water and water related features within the study and surrounding area (SANBI, 2018, Nel et al., 2011).

The development is proposed in the Indian Ocean Coastal Belt Group 1 but lies outside any wetlands identified in the NBA and NFEPA databases.

6.2.2. Provincial databases

The EKZNW Strategic Environmental Assessment (SEA) Database (2000) was used to model the distribution of a selection of 255 red data and endemic species.

The EKZNW Conservation Plan (C-Plan) was used in a GIS assessment of the study area. This database includes the layers of the following databases:

- National Land Cover 2000 (ver.1.2) edited for errors known to occur in provincial protected areas (January 2004);
- Provincial and national protected areas of the province (EKZNW);
- National Vegetation Map (BGIS SANBI, 2018);
- Forests of KZN (EKZNW, 2003);
- Wetlands of KZN (EKZNW, 2004);
- Biophysical data from Schulze, R.E. (1997);
- South African Atlas of Agrohydrology and Climatology. Water Research Commission, Pretoria; and
- Species distributions from Ezemvelo KZN Wildlife's Biodiversity database and supplemented by species specialist group records and inputs (EKZNW).

The first use of the conservation planning analysis in C-Plan is an **irreplaceability map** of the planning area. This map is divided into 2 x 2 km grid cells called 'planning units'. Each cell has associated with it an 'Irreplaceability Value' which is one reflection of the cell's importance with respect to the conservation of biodiversity. Irreplaceability reflects the planning units' ability to meet set 'targets' for selected biodiversity 'features' (EKZNW, 2004, Incomplete Draft). Where a planning unit has an irreplaceability value of 0, all biodiversity features recorded here are conserved to the target amount within reserves in South Africa, and there is unlikely to be a biodiversity concern with the development within the study area. An irreplaceability value of 1 would imply there are various issues of biodiversity concern within the study area, which requires conservation and, therefore, development of the study area is not recommended.

Minset is a feature that is utilized within the C-Plan. This tool uses a minimum amount of study areas to optimize the achievement of conservation targets by placing numerous constraints on the users. It presents the most efficient solution to achieving conservation targets and other land use constraints (EKZNW, 2011).

The EKZNW Minset data classifies the major conservation areas into 4 main categories:

Critical Biodiversity Area (CBA) Mandatory: These are areas that have no other options than to meet their required biodiversity targets for both the biodiversity patterns and the ecological process features. This category is subdivided into two sets, depending on the irreplaceability of the area.

  - CBA 1 Mandatory areas have an irreplaceability score that is equal to 1, meaning that the area is highly irreplaceable.
  - CBA 2 Mandatory areas have an irreplaceability score that lies between 0.8 and is smaller than 1.

CBA Optimal: These areas are ideal areas to meet their biodiversity conservation targets whilst aiming to avoid high cost areas. This classification is allocated to areas with an irreplaceability score that lies between 0 and 0.8. This category as well as the CBA Mandatory Areas are determined by the National Threatened Ecosystems, the National and KZN Protected Area Expansion Strategy, the KZN threatened Ecosystems, Forests and macro-ecological corridors that are in areas that are under great environmental pressures.

Ecological Support Areas (ESA): Areas that are not essential for meeting biodiversity targets directly. However, they do play an important role in supporting and sustaining the ecological functioning of the CBAs. These areas are determined by the macro-ecological corridors.

Ecological Infrastructure (EI) or previously known as Ecosystem Goods and Service Areas (EGSA): These are areas that are classified as natural/near natural vegetation which has the capability of delivering important ecosystem goods and services to the KZN province and the inhabitants of the land.

Based on the EKZNW CBA data, the 450MW RMPP and LPG Storage Terminal sites are proposed within an irreplaceable area (Figure 6-2). These areas are considered critical for meeting biodiversity targets and thresholds and are required to ensure the persistence of viable populations of species and the functionality of ecosystems. The Land use management objectives are to maintain these areas in a natural state with limited to no biodiversity loss (EKZNW, 2016).

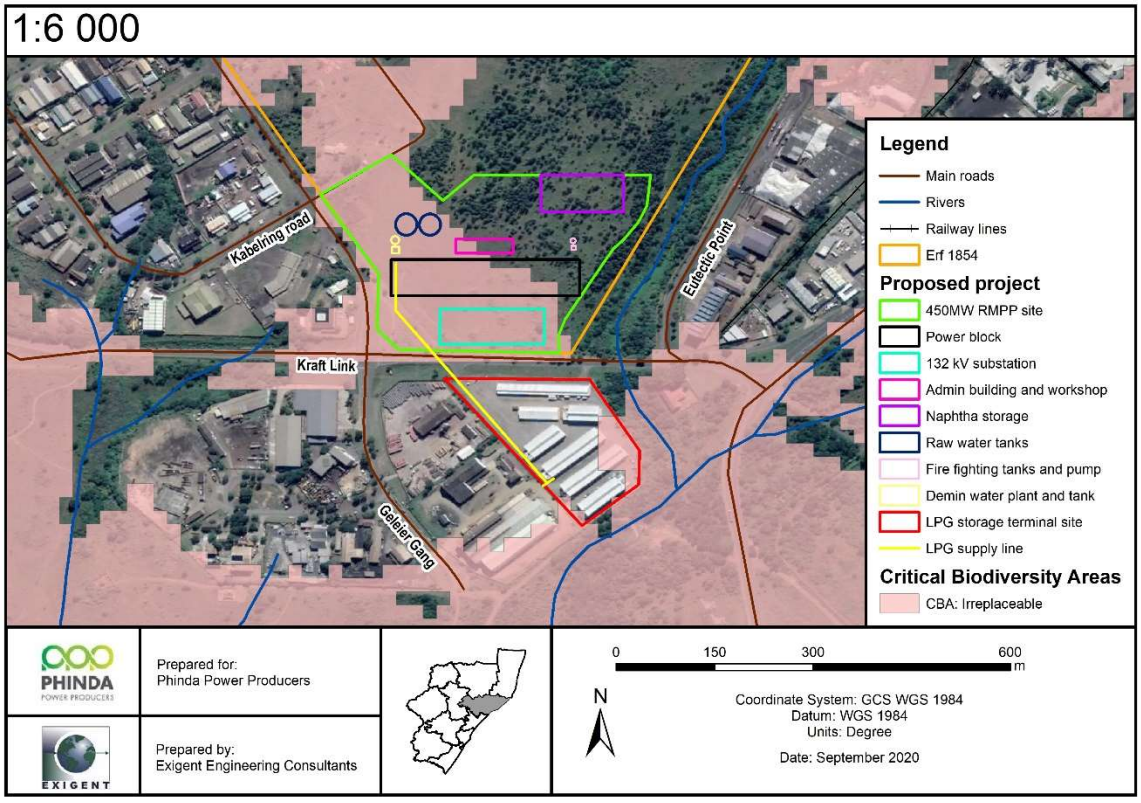

Figure 6-2. Critical Biodiversity Areas present in the study area.

According to EKZNW (2016), the planning units (PU) identified in these CBA's represents the localities for one or more biodiversity feature for which conservation targets can be achieved. The distribution of the biodiversity features is not always applicable to the entire extent of the PU but is more often confined to a specific niche habitat e.g. a forest or wetland reflected as a portion of the PU.

As seen by the pixelated blocks and inclusion of transformed industrial areas in Figure 6-2, these CBA areas are provincially mapped at a large scale. The site may have been incorrectly classified as CBA due to an error in the land cover map, or alternatively a disturbance to the site has occurred subsequent to the development of the CBA Map. The site must be assessed for its potential to be rehabilitated and/or its role as part of a landscape corridor and the potential presence of protected species. Further, the proposed activity at the site should be investigated in terms of its potential impact on adjacent correctly classified CBA and ESA's.

Recommended mitigation such as the exclusion of the wetland and its associated buffer zone from the proposed project and implementation of specific mitigation measures, as presented in section 8.3 of this report, may allow for sufficient conservation of this PU as well as allow for development within the proposed project footprint.

Following ground truthing, no protected species were observed during the site visit, however searches for the potential species will be continued during follow-up site visits. The relevance of the PU in the context of the CBA will be further assessed in the EIA phase of the project.

6.2.3. Local databases

The aim of the uMhlathuze Environmental Services Management Plan (ESMP) is to provide the municipality with a clear understanding of activities that need to be undertaken to protect and enhance the supply of environmental services in the area. Based on the final 2017/2018-2021/2022 uMhlathuze Spatial Development Framework (SDF, 2018), the two critical goals of the ESMP are:

- *'To define cohesive and functional spatial management units within the municipal area that need to be managed in order to optimise the delivery of environment services.'*
- *'To develop management plans for each management unit that identify the management activities required to secure environmental services supply.'*

The areas that provide environmental services to the City are spatially defined, and the following "Levels" of protection were determined:

Nature Reserves (Level 1): These are areas of high biodiversity and environmental significance that require a high level of legal protection. Included are unique habitats or areas that are considered important at International, National or Provincial level; estuaries, lakes, major wetlands, natural forests, coastal buffers and critically endangered habitats that are protected in terms of international or national legislation and/or treaties. It is recommended that these areas be proclaimed as nature reserves in terms of relevant legislation such as the National Environmental Management Protected Areas Act.

Conservation Zone (Level 2): Areas of biodiversity / environmental significance, which are not viable for proclamation as nature reserves, but that require some form of legal protection. Included are unique or regionally important natural habitats; wetland and forest areas that are protected in terms of national legislation; and all areas that fall within the 1:100-year flood line. No transformation of the natural assets or the development of land for purposes other than conservation should be permitted in this zone. Sustainable use of renewable resources is permitted.

Open Space Linkage Zone (Level 3): Included in the open space linkage zone are areas that provide a natural buffer for Level 1 and 2 Zones, areas that provide a natural link between Level 1 and 2 Zones and areas that supply, or ensure the supply of, significant environmental services. Transformation of natural assets and the development of land in these zones should only be permitted under controlled conditions.

Development Zone (Level 4): Includes all areas that are not included in Level 1, 2 and 3 zones. Areas in this zone are either already developed or transformed and contain land and natural assets that are not critical for environmental service supply. However, it is recognised that the development of these zones can impact on environmental services supply. As such, they should be developed in a manner that supports, or at least does not adversely impact on, the sustainability of environmental service supply in Level 1, 2 and 3 zones.

According to this finer scale local environmental plan database, the proposed development site lies within a development zone (Level 4). Areas earmarked as Municipal conservation zones (Level 2) and its associated open space linkage zones (Level 3) lies east of the proposed 450MW RMPP and LPG Storage Terminal sites. Even though portions of these zones were historically channelled to drain the Alton area, they are linked to the swamp forest and other aquatic habitats identified in this report (Figure 6-3) and therefore constitute an important ecological corridor for the area.

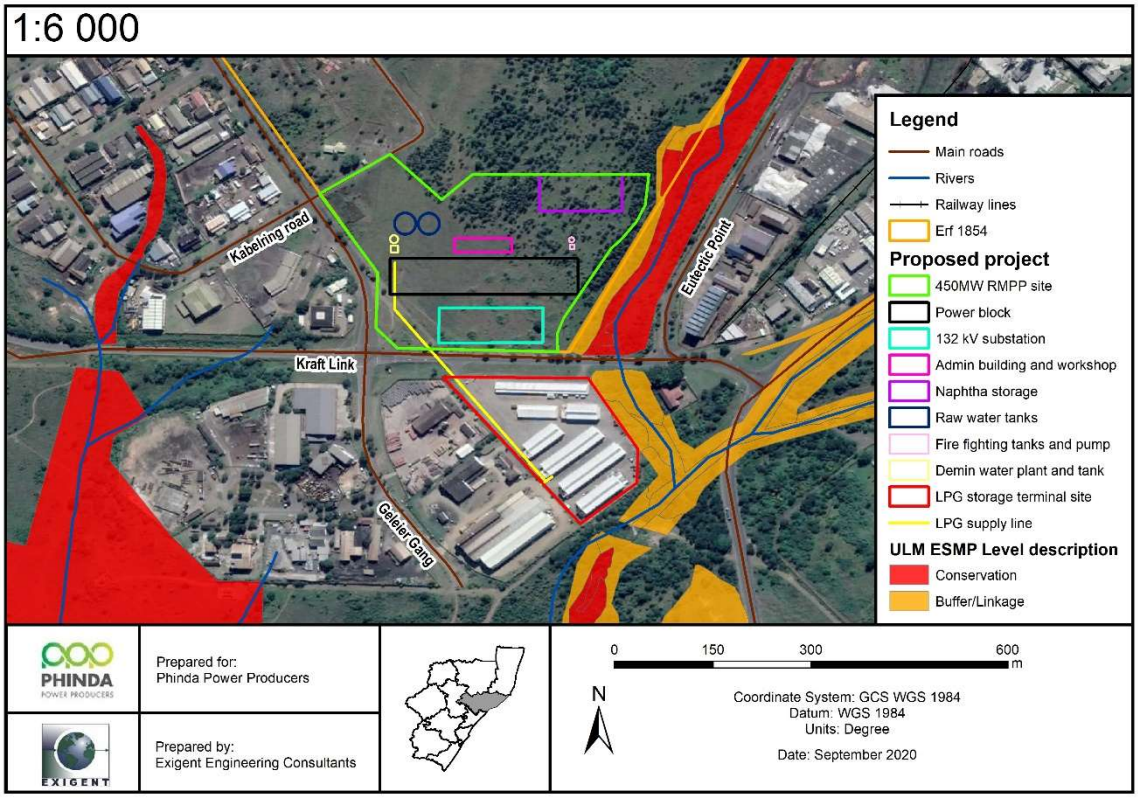

Figure 6-3. Municipal ESMP of the study area (SDF 2018).

Based on Figure 6-3, the proposed development sites are located within development zones and outside the Municipal ESMP Conservation and buffer/linkage zones.

6.3. Wetland assessment

The National Water Act (No 36 of 1998) defines a **wetland** as, "land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil." This definition includes all naturally occurring wetlands and pans, but excludes rivers, lakes and artificial wetlands. The transition zone from the river or lake and the terrestrial ecosystem may be included in some cases.

Any area where water collects for long enough and often enough to influence the flora, fauna and soil, can be classified as a wetland. The main distinguishing features of wetlands are the presence of water at or near the surface, hydromorphic soil and vegetation adapted to saturated soils. These features can be used to determine if a wetland occurs on the study area or not (DWAF 2003).

It should be noted that riparian systems that are not permanently or periodically inundated are not considered true wetlands, i.e. those associated with drainage lines.

6.3.1. Wetland delineation

Wetlands are delineated based on the principles in the Department of Water Affairs (DWA) guideline document "*A practical field procedure for identification and delineation of wetlands and riparian areas, Edition 1 (September 2005),* in conjunction with the updated draft delineation guideline "*Updated Manual for the Identification and*

Delineation of Wetlands and Riparian Areas". The criteria set out in the guidelines for assessment of presence of a wetland are as follows:

- Wetland (hydromorphic) soils that display characteristics resulting from prolonged saturation; such as grey horizons, mottling streaks, hard pans, organic matter depositions, iron and manganese concretion resulting from prolonged saturation;
- The presence, at least occasionally, of water loving plants (hydrophytes); and
- A high-water table that results in saturation at or near the surface, leading to anaerobic conditions developing in the top 50 cm of the soil.

Due to the variable nature of South Africa's climate the direct presence of water is often an unreliable indicator of wetland conditions. Prolonged saturation of soil has a characteristic effect on soil morphology, affecting soil matrix chroma and mottling in particular. Changes in the presence and frequency of mottling in the soils are the main methods of delineation. This is because mottles are usually not influenced by short term changes in the hydrology and vegetation of the wetland. The outer boundary of the wetland is defined as: "the point where the indicators are no longer visible" (DWA, 2005).

Wetlands are delineated by making use of the following wetland indicators (DWAF, 2005):

Terrain unit indicator helps identifying those parts of the landscape where wetlands are most likely to occur. Wetlands occupy characteristic positions in the landscape and can occur on the following terrain units: crest, midslope, footslope and valley bottom (Figure 6-4).

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.

Soil wetness indicator identifies the morphological signatures developed in the soil profile as a result of prolonged and frequent saturation. Notes were taken on soil chroma to a depth of 50 cm and this was related to hydrological conditions in terms of the criteria for distinguishing different soil saturation zones within a wetland (Kotze *et al*., 1994).

The vegetation indicator identifies hydrophytic vegetation associated with frequently saturated soils (Table 6-1).

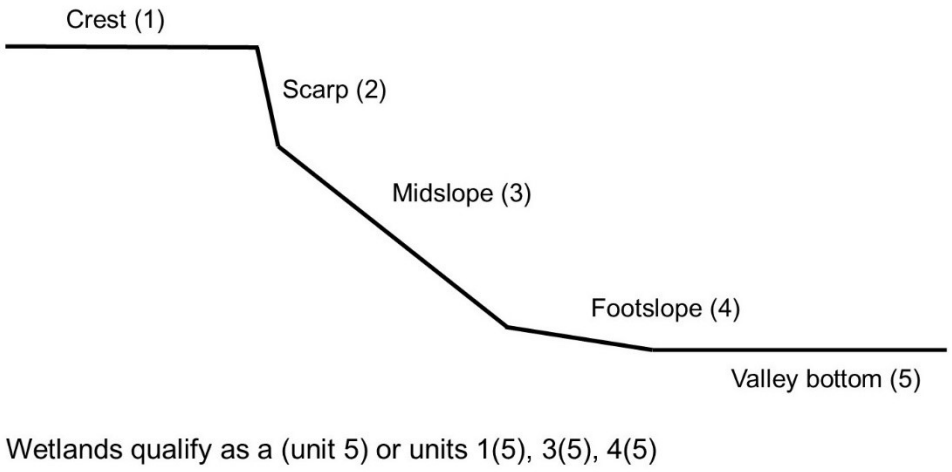

Figure 6-4. Terrain units.

Table 6-1. Criteria for distinguishing different soil saturation zones and hydric vegetation within wetlands (from Kotze et al., 1994).

SOIL	DEGREE OF WETNESS		
	Temporary	Seasonal	Permanent / Semi-permanent
Soil depth 0-20cm	Matrix brown to greyish brown (chroma 0-3, usually 1 or 2). Few/no mottles. Non-sulphuric.	Matrix brownish grey to grey (chroma 0-2). Many mottles. Sometimes sulphuric.	Matrix grey (chroma 0-1). Few/no mottles. Often sulphuric.
Soil depth 20-40cm	Matrix greyish brown (chroma 0-2, usually 1). Few/many mottles.	Matrix brownish grey to grey (chroma 0-1). Many mottles.	Matrix grey (chroma 0-1). No/few mottles.
VEGETATION			
If herbaceous:	Predominantly grass species; mixture of species, which occur extensively in non-wetland areas, and hydrophytic plant species, which are restricted largely to wetland areas.	Hydrophytic sedge and grass species which are restricted to wetland areas, usually <1m tall.	Dominated by: (1) emergent plants, including reeds (*Phragmites* sp.), sedges and bulrushes (*Typha* sp.), usually >1m tall (marsh); or (2) floating or submerged aquatic plants.

Changes in the presence and frequency of mottling in the soils are the main methods of delineation. This is because mottles are usually not influenced by short term changes in the hydrology and vegetation of the wetland. The outer boundary of the wetland is defined as: "*the point where the indicators are no longer visible*" (DWA, 2005). Using the desktop delineation GPS points, sampling took place, firstly, to verify if the desktop GPS points did in fact represent a wetland area and, secondly, using soil sampling and visual observation of plant species and moving away from the already proven wetland, further soil samples were taken until no wetland indicators were found.

6.3.2. Wetland classification system

Since the late 1960s, wetland classification systems have undergone a series of international and national revisions. These revisions allowed for the inclusion of additional wetland types, ecological and conservation rating metrics, together with a need for a system that would allude to the functional requirements of any given wetland (Ewart-Smith, J., Ollis. D., Day J. and Malan H., 2006). Wetland function is a consequence of biotic and abiotic factors, and wetland classification should strive to capture these aspects.

SANBI in collaboration with several specialists and stakeholders developed the newly revised and now accepted National Wetland Classification System (NWCS 2013). This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels, including structural features at the finer or lower levels of classification (SANBI 2009).

Wetlands develop in response to elevated water tables, linked either to rivers, groundwater flows or seepage from aquifers (Parsons, 2004). These water levels or flows then interact with localised geology and soil forms, which then determine the form and function of the respective wetlands. Water is, thus, the common driving force in the formation of wetlands (DWAF, 2005). It is significant that the HGM approach has now been included in wetland classification as the HGM approach has been adopted throughout the water resources management realm with regards to the determination of the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) and WET-Health assessments for aquatic environments. These systems are then easily integrated using the HGM approach in line with the Eco-classification process of river and wetland reserve determinations used by the DWS.

Level 4 Wetland Classification

A classification system developed for the National Wetlands Inventory is based on the principles of the hydro-geomorphic (HGM) approach to wetland classification (Ewart-Smith *et al.,* 2006). This classification system was further developed and refined and a new classification system, the "Classification System for Wetlands and other Aquatic Ecosystem in South Africa" was published (Ollis *et al.*, 2013).

The wetland adjacent to the study area was classified in terms of functional units in line with a Level 4 category recognised in the classification system (Table 6-2, Ollis *et al.*, 2013).

Table 6-2. Level 4 wetland classification.

LEVEL		CLASSIFICATION	NOTES
Level 1		Inland system	
Level 2: Regional setting			
SPATIAL FRAMEWORK	**DWS Ecoregion (Kleinhans *et al*., 2005)**	Ecoregion 13: Natal Coastal Plain	
	Bioregion (NFEPA WetVeg Group)	Indian Ocean Coastal Group 1	
Level 3: Landscape Setting		Valley floor	Classified as the base of a valley, situated between two distinct valley side-slopes, where alluvial or fluvial processes typically dominate (Ollis *et al*., 2013).
Level 4: Hydrogeomorphic Unit		River	Defined as a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water. A river is taken to include both the active channel and the riparian zone as a unit (Ollis *et al*., 2013)
		Channelled valley bottom wetlands	Characterised as a valley bottom wetland with a river running through it. In more arid parts of South Africa, they are often vegetated. They are characterised by their location on valley floors, the absence of characteristics floodplain features and the presence of a river channel flowing through the wetland (Ollis *et al*., 2013).

6.3.3. Wetland condition (WET-Health)

PES and Ecological importance

Kotze *et al*., 2008 has highlighted the importance of estimating the functioning importance or ecosystem services of a wetland. These functions are impacted by the connectivity of the wetland to other ecosystems as well as the size thereof. In this study, several other sources of information were also considered, which included the National Freshwater Ecosystems Priority Areas project completed by the CSIR (CSIR, 2011), and regional and national biodiversity assessments, the latest being the National Biodiversity Assessment released by SANBI (Driver *et al*., 2012).

Wetland Condition is defined as a measure of the deviation of wetland structure and function from its natural reference condition (Macfarlane *et al*., 2007). This current study serves as the current status quo in terms of the hydrological, geo-morphological and vegetation integrity for the wetland units associated with the study area and an assessment of the current Present Ecological Status (PES) score (Macfarlane *et al*., 2007) will ensue in the EIA phase of the project. Table 6-3 and Table 6-4 below display the criteria that will be used in the assessment of the habitat integrity of the wetland on site.

Table 6-3. Health categories used by WET-Health for describing the integrity of wetlands (Kleinhans *et al*., 1999; Macfarlane *et al*., 2007).

Description	PES Score	PES Rating	Management
Unmodified, natural	> 4	A	Protected systems; relatively untouched by human hands; no discharges or impoundments allowed.
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, but the ecosystem functions are essentially unchanged.	>3 and <=4	B	Some human-related disturbance, but mostly of low impact.
Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact and the basic ecosystem functions are still predominantly unchanged.	>2 and <=3	C	Multiple disturbances associated with need for socio-economic development, e.g. impoundment.
Largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	<=2	D	Habitat modification and water quality degradation.
The change in ecosystem processes and loss of natural habitat and biota is serious. The loss of natural habitat, biota and basic ecosystem functions is extensive.	>0 and <2	E	Often characterized by high human densities or extensive resource exploitation. Management intervention is needed to improve health, e.g. to restore flow patterns, river habitats or water quality.
Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.	0	F	

Table 6-4. Habitat assessment criteria for the wetlands on site (Source: Kotze *et al*., 2005).

Criteria and attributes	Relevance
Hydrologic	
Flow modification	Consequence of abstraction, regulation by impoundments or increased runoff from human settlements or agricultural land. Changes in flow regime (timing, duration, frequency), volumes and velocity, which affect inundation of wetland habitats resulting in vegetation changes or incorrect cues to biota. Abstraction of groundwater flows to the wetland.
Permanent inundation	Consequence of impoundment resulting in destruction of natural wetland habitat and cues for wetland biota.
Water quality	
Water quality modification	From point or diffuse sources. Measured directly by laboratory analysis or assessed indirectly from upstream agricultural activities, human settlements and industrial activities. Aggravated by volumetric decrease in flow delivered to the wetland.
Sediment load modification	Consequence of reduction due to entrapment by impoundments or increase due to land use practices such as overgrazing. Cause of unnatural rates of erosion, accretion or infilling of wetlands and change in habitats.
28ydraulic/Geomorphic	
Canalisation	Results in desiccation or changes to inundation patterns of wetlands and thus changes in habitats. River diversions or drainage.
Topographic alteration	Consequence of infilling, ploughing, dykes, trampling, bridges, roads, railway lines and other substrate disruptive activities that reduce or change wetland habitat directly in inundation patterns.
Biotic	
Terrestrial encroachment	Consequence of desiccation of wetland and encroachment of terrestrial plant species due to changes in hydrology or geomorphology. Change from wetland to terrestrial habitat and loss of wetland functions.

Criteria and attributes	Relevance
Indigenous vegetation removal	Direct destruction of habitat through farming activities, grazing or firewood collection affecting wildlife habitat and flow attenuation functions, organic matter inputs and increases potential for erosion.
Invasive plant encroachment	Affects habitat characteristics through changes in community structure and water quality changes (oxygen reduction and shading).
Alien fauna	Presence of alien fauna affecting faunal community structure.
Over utilisation of biota	Overgrazing, overfishing, etc.

Ecological importance and sensitivity

Ecological importance is an expression of a wetland's importance to the maintenance of ecological diversity and functioning on local and wider spatial scales. Ecological sensitivity refers to the system's ability to tolerate disturbance and its capacity to recover from disturbance once it has occurred (DWAF, 1999). This classification of water resources allows for an appropriate management class to be allocated to the water resource and includes the following:

- Ecological Importance in terms of ecosystems and biodiversity;
- Ecological functions; and
- Basic human needs.

Habitat and biotic factors are rated to a four-point scale (Table 6-5). The median of the resultant score will be calculated to derive the EIS category (Table 6-6).

Table 6-5. Four-point scale to assess biotic and habitat determinants that indicate importance or sensitivity.

Rating	Explanation
None, Rating = 0	Rarely sensitive to changes in biodiversity, landscape scale or wetland sensitivity
Low, Rating =1	One or a few elements sensitive to changes in biodiversity, landscape scale or wetland sensitivity
Moderate, Rating =2	Some elements sensitive to changes in biodiversity, landscape scale or wetland sensitivity
High, Rating =3	Many elements sensitive to changes in biodiversity, landscape scale or wetland sensitivity
Very high, Rating =4	Very many elements sensitive to in biodiversity, landscape scale or wetland sensitivity

Table 6-6. Environmental Importance and Sensitivity rating scale used for calculation of EIS scores (DWAF, 1999).

Ecological Importance and Sensitivity Categories	Rating	Recommended Ecological Management Class
Very High Wetlands that are considered ecologically important and sensitive on a national level. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water in major rivers	>3 and <=4	A
High Wetlands that are ecologically important and sensitive on a provincial level. The biodiversity of these wetlands may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers	>2 and <=3	B
Moderate Wetlands that are ecologically important and sensitive on a local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water in major rivers	>1 and <=2	C

Ecological Importance and Sensitivity Categories	Rating	Recommended Ecological Management Class
Low/Marginal Wetlands that is not ecologically important and sensitive at any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water in major rivers	>0 and <=1	D

WET-EcoServices

The overall goal of WET-EcoServices is to assist decision makers, government officials, planners, consultants and educators in undertaking quick assessments of the ecosystem services that wetlands provide. Ecosystem services of wetlands include regulating services such as flood control, supporting services such as nutrient recycling, provisioning services such as food and water, and cultural services such as education and recreation. Ecosystem services for each HGM unit is assessed separately (Kotze *et al.*, 2005).

Table 6-7 below lists and describes the ecosystem services of wetlands that are assessed when using the WET-EcoServices tool.

Table 6-7. Ecosystem services included and assessed by WET-EcoServices (Kotze *et al.*, 2005)

Ecosystem services supplied by wetlands	**Indirect benefits**	**Regulating and supporting benefits**	Flood attenuation		The spreading out and slowing down of floodwaters in the wetland, thereby reducing the severity of floods downstream.
			Streamflow regulation		Sustaining streamflow during low flow periods
			Water quality enhancement benefits	Sediment trapping	The trapping and retention in the wetland of sediments carried by runoff waters
				Phosphate assimilation	Removal by the wetland of phosphates carried by runoff waters
				Nitrate assimilation	Removal by the wetland of nitrates carried by runoff waters
				Toxicant assimilation	Removal by the wetland of toxicants (e.g. metals, biocides and salts carried by runoff waters
				Erosion control	Controlling of erosion at the wetland site, principally through the protection provided by vegetation
			Carbon Storage		The trapping of carbon by the wetland, principally as soil organic matter
	Direct benefits	**Biodiversity maintenance**			Through the provision of habitat and maintenance of the natural process by the wetland, a contribution is made to maintaining biodiversity
		Provisioning benefits	Provision of water for human use		The provision of water extracted directly from the wetland for domestic, agriculture of other purposes
			Provision of harvestable resources		The provision of natural resources from the wetland, including livestock grazing, craft plants, fish etc.
			Provision of cultivated foods		Provision of areas in the wetland favourable for the cultivation of foods
		Cultural benefits	Cultural heritage		Places of special cultural significance in the wetland, e.g. for baptisms or gathering of culturally significant plants
			Tourism and recreation		Sites of value for tourism and recreation in the wetland, often associated with scenic beauty and abundant birdlife
			Education and research		Sites of value in the wetland for education or research

6.4. Water Quality Assessment

Water quality monitoring, through *in-situ* water testing will provide insights into the health of the river-wetland ecosystem. The following variables will be measured:

- Temperature;
- Dissolved Oxygen;
- Conductivity @ 25°C;
- pH @ 25°C; and
- Flow Rate.

The recorded values will be compared to the acceptable ranges as indicated in the South African Water Quality Guidelines compiled by the Department of Water Affairs and Forestry (DWAF, 1998) for Aquatic Ecosystems. The result obtained will form the baseline survey from which changes to both upstream and downstream of the construction activities can be measured during the construction and operation phases of the proposed development.

6.4.1. Temperature

According to the guidelines, the target water quality range (TWQR) for temperature allows for variations in water temperature at a maximum of 2 ºC or <10 %, whichever estimate is more conservative. The measured in-situ temperature readings will provide baseline measurement to which future monitoring can be compared.

6.4.2. Electrical conductivity

Conductivity is a measure of how well water can transmit an electrical current or considered a measure of the salinity of water. The electrical conductivity of water is a direct reflection of the amount of ions within the water. The acceptable limit is 50 mS/m. Electrical conductivity can be used to determine the mineralisation of water (total dissolved solids), which in turn can be used to determine changes in water at different times of the year and in turn can determine certain physiological effects on plants and animals. The higher the salinity, the higher the osmotic pressure around the roots of plants which this prevents efficient water absorption by the plant. This affects the type of plants that can grow in the instream areas.

6.4.3. pH levels

pH is a logarithmic scale which is used to specify the acidity or basicity of an aqueous solution with pH values under 7 representing an acidic solution and values over 7 representing basic solutions. The pH levels recorded for the respective points will be compared to the defined limits of DWS.

6.4.4. Dissolved Oxygen (mg/ℓ)

Dissolved Oxygen (mg/ℓ) (DO) is the amount of gaseous oxygen dissolved in water. Contributing factors to the amount of dissolved oxygen in water is the water temperature and the volume of moving water. It is important to note that cold water holds less oxygen than warm water. DO levels that are too high or too low can harm aquatic life and affect the quality of water. DO is the amount of free oxygen in the water column, in other words oxygen that has not bonded with any other molecules. DO is utilised by plants mainly for respiration when there is little to no light present to promote photosynthesis. In freshwater systems, dissolved oxygen is affected by seasons, location and the depth of the water, generally indicating decreased DO in summer when compared to the readings taken in winter.

6.4.5. Flow rate

The flow rate of the watercourses is the measure of the how many meters per seconds the water moves in a system. Often variations exist where instream structures or infrastructure alters the flow example upstream and downstream of a culvert.

7. RESULTS

The EKZNW Guideline for Biodiversity Impact Assessments (2013) requires that specialist studies be conducted during the summer season (beginning of November to end of April). The initial field investigations for this study took place in spring and summer during 18-20 September 2019 and 28-31 January 2020 and thus falls within the preferred sampling period. A follow-up site visit is planned prior to the submission of the Aquatic Biodiversity Impact Assessment Report during the EIA phase of the project.

7.1. Wetland assessment

Due to the waterlogged nature of the lower laying areas of the coastal plain, three major stormwater drainage channels were historically constructed to mitigate flooding and enable development in the Alton industrial area. One of these drainage channels lies adjacent to the eastern boundary of the proposed 450MW RMPP and LPG Storage Terminal sites, following the low points in the landscape around the southern boundary of the LPG Storage Terminal (Figure 7-1). Although it has historically been artificially channelled, the channel bed is earthen and therefore functions as a natural river channel with its associated channelled valley bottom wetland. Identification of this wetland system was based on its position in the landscape, soil form, wetness, as well as indicator vegetation.

Four wetland units were identified within the DHSWS' 500 m regulated area. Two were classified as *Phragmites - Typha* channelled valley bottom wetlands; one located to the west of the proposed development site and the other along the eastern border of the site. Two *Imperata cylindrica* depression wetlands are located upstream on Erf 1854 at the northern boundary of the 500 m regulatory area. These depression wetlands will not experience change to one of the four main wetland drivers, viz. habitat, biota, flow and water quality by the proposed development therefore, no further assessment for the purposes of this development is required.

No wetlands were identified within the boundaries of the proposed 450MW RMPP site nor along the LPG supply line from the storage terminal to the plant site (Figure 7-1). The LPG Storage Terminal comprise of hard surface and is completely transformed.

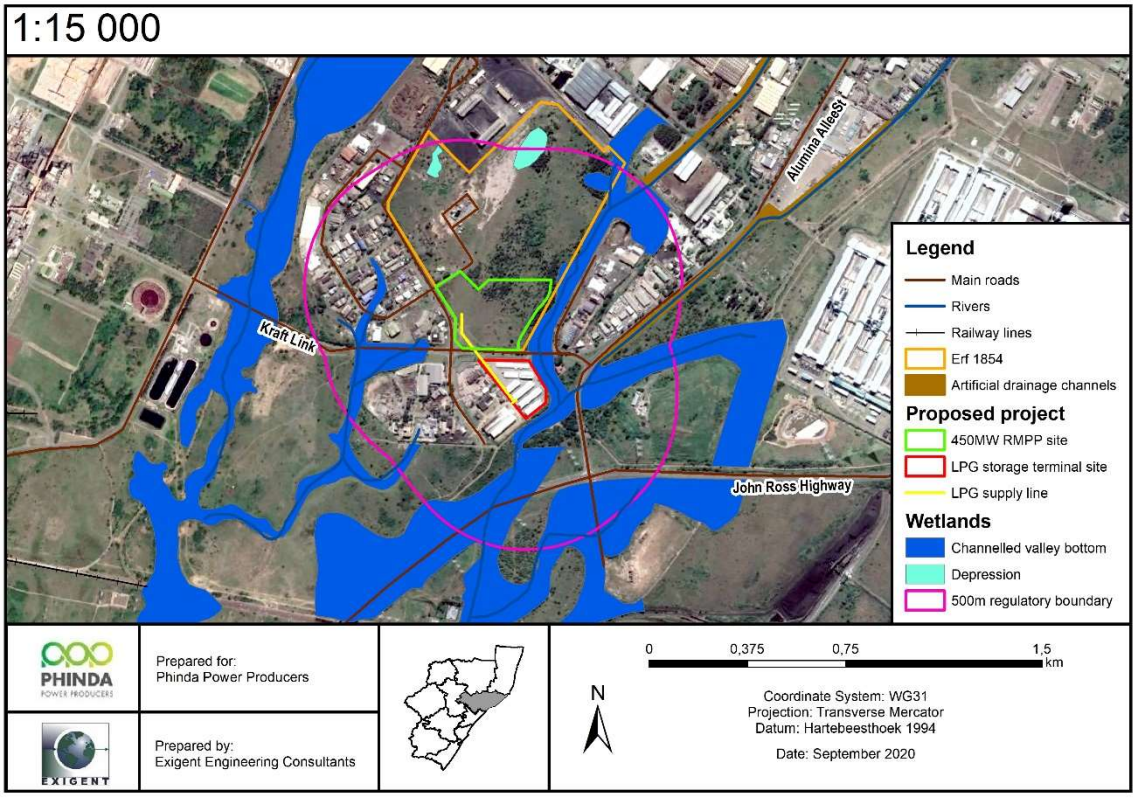

Figure 7-1. Channelled valley bottom wetland systems identified within the regulatory area of the proposed development sites.

As depicted in Figure 7-1, the developments are proposed outside of the delineated channelled valley bottom wetlands located in the study area.

7.1.1. *Phragmites – Typha* channelled valley bottom wetland

A *Phragmites - Typha* channelled valley bottom wetland lies adjacent to the eastern boundary of the proposed 450MW RMPP and LPG Storage Terminal sites, following the low points in the landscape around the southern boundary of the LPG Storage Terminal. This wetland unit is part of a large wetland system with an outflow indirectly into the Port of Richards Bay. Although *Phragmites australis* and *Typha capensis* are the dominant plant species, several pockets of swampy *Barringtonia racemosa* and *Ficus trichopoda* are imbedded in the channel with *Cyperus fastigiatus* also present in very dense stands (Figure 7-2). The topsoil is high in organic matter with no mottling present in the grey matrix of the permanently wet zones.

Sections of this wetland have undergone changes due to encroachment of the *Eucalyptus* Plantations, infestation of alien and invasive species and subsistence farming within the active channels and along the banks. Typical species in the active channels includes *Colocasia esculenta* (amadumbe or also known as taro) and *Musa* species (banana trees) while the banks comprises of a range of fruit and vegetables. These include *Carica papaya* (papaya), *Cucurbita* species (a range of pumpkin), *Zea mays* (maize) and *Solanum tuberosum* (potatoes).

Figure 7-2. Photographic presentation of *Phragmites* - *Typha* channelled valley bottom wetland adjacent to the study area.

7.1.2. Wetland buffer zone

Buffer zones are required to protect natural resources and limit the negative adverse effects of activities on the sensitive watercourse habitats. Threats to watercourses from adjacent proposed activities includes increases in sedimentation and turbidity, increased nutrient inputs, increased inputs of toxic organic and heavy metal contaminants and pathogen inputs as well as loss of habitat for aquatic to semi-aquatic species (Macfarlane *et. al*, 2017). By applying the DHSWS preferred method for determining buffer zones for rivers (Macfarlane *et al.,* 2017), a 29 m buffer is determined for the *Phragmites* - *Typha* channelled valley bottom wetland. This buffer takes into consideration general information for industrial developments, the characteristics of the channelled valley bottom wetland and the buffer areas. The proposed development has taken cognisance of this buffer zone, excluding activities from this area.

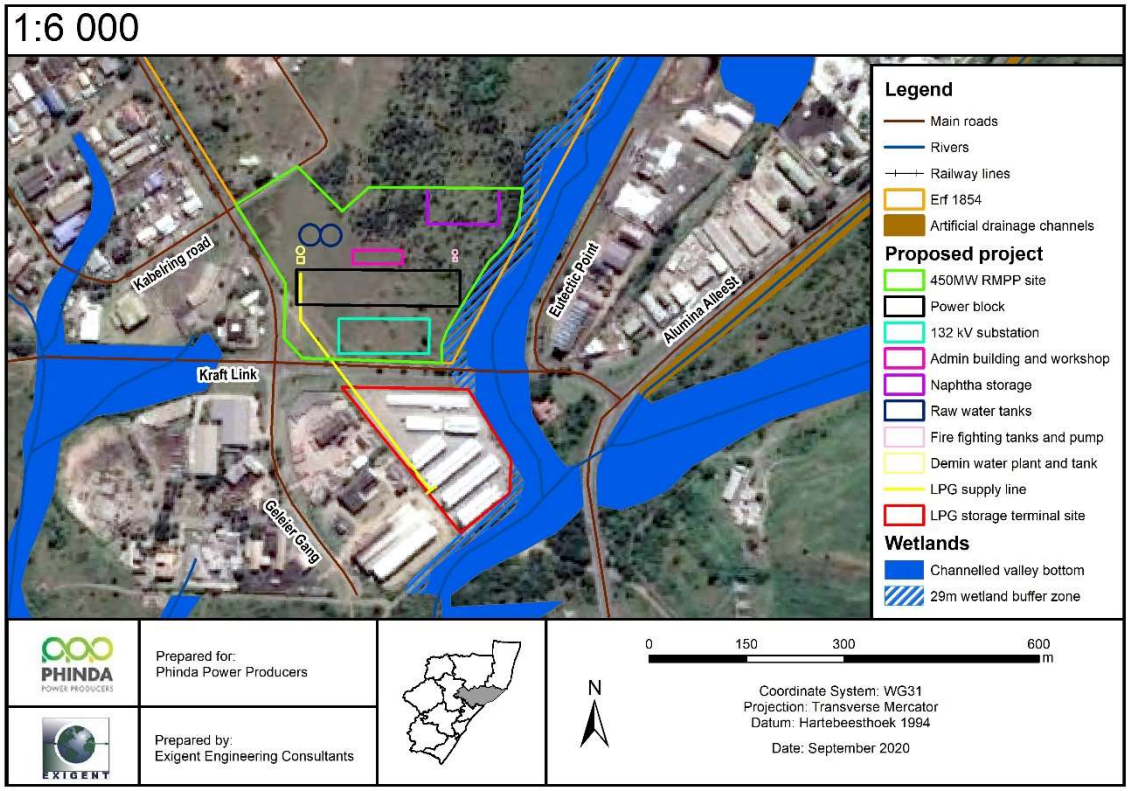

Figure 7-3. The proposed 450MW RMPP site excluding development in the buffer wetland zone.

The proposed development has taken cognisance of the 29 m buffer zone, excluding activities from this area.

7.1.3. Wetland Health

The description of the current state of this identified wetland, specifically focusing on Present Ecological State (PES), Ecological Importance and Sensitivity (EIS) as well as the Ecosystem Regulating and Supporting Services that this wetland system provides will be presented in the Aquatic Biodiversity Impact Assessment Report during the EIA phase of the project.

7.2. Water quality

In-situ water quality testing is planned during the follow-up site visit and the results will be presented and interpretation thereof presented in the Aquatic Biodiversity Impact Assessment Report which will be submitted during the EIA phase of the project.

The results obtained will form the baseline survey from which changes to both upstream and downstream of the construction activities can be measured during the construction and operation phases of the proposed development and will inform monitoring requirements for the project Environmental Management Programme (EMPr).

8. IMPACT ASSESSMENT

The methodology, as prescribed by Savannah, to assess the impacts of the proposed 450MW RMPP and associated infrastructure is described below. This methodology will be used in the EIA Phase to determine significance of impacts.

8.1. Impact Assessment Methodology

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high).
- The **duration**, wherein it will be indicated whether:
    - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
    - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
    - medium-term (5–15 years) – assigned a score of 3;
    - long term (> 15 years) - assigned a score of 4; or
    - permanent - assigned a score of 5;
- The **magnitude**, quantified on a scale from 0-10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** of occurrence, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).
- The **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high.
- The **status**, which will be described as either positive, negative or neutral.
- The degree to which the impact can be reversed.
- The degree to which the impact may cause irreplaceable loss of resources.
- The degree to which the impact can be mitigated.

The significance is calculated by combining the criteria in the following formula:

$S=(E+D+M)P$

S = Significance weighting
E = Extent
D = Duration
M = Magnitude

P = Probability

The significance weightings for each potential impact are as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area)
- 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated)
- > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

8.2. Assessment of Cumulative Impact

The role of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e. whether the addition of the proposed project in the area will increase the impact).

This section should address whether the construction of the proposed development will result in:

- Unacceptable risk
- Unacceptable loss
- Complete or whole-scale changes to the environment or sense of place
- Unacceptable increase in impact

A conclusion on whether the proposed development will result in any unacceptable loss or impact considering all the projects proposed in the area.

8.3. Project Impact and Cumulative Assessment

The following key issues have been identified and assessed during this aquatic biodiversity scoping assessment:

- Destruction of natural habitat –wetland habitat
- Potential loss of Species of Special Concern
- Habitat fragmentation (loss of corridors)
- Infestation of alien species
- Hydrological impacts; and
- Pollution of surface and groundwater due to chemical, oil and fuel spills.

8.3.1. Destruction of natural habitat –wetland habitat.

Four wetland units were identified within the DHSWS' 500 m regulated area. Two were classified as *Phragmites - Typha* channelled valley bottom wetlands; one located to the west of the proposed development site and the other along the eastern border of the site. Two *Imperata cylindrica* depression wetlands are located upstream on Erf 1854 at the northern boundary of the 500 m regulatory area. These depression wetlands will not experience change to one of the four main wetland drivers, viz. habitat, biota, flow and water quality by the proposed development therefore, no further assessment for the purposes of this development is required.

No wetlands were identified within the boundaries of the proposed 450MW RMPP site nor along the LPG supply line from the storage terminal to the plant site. A 29 m buffer has been set for the wetland from the DHSWS guidelines for the determination of buffer zones for rivers, wetlands and estuaries by Macfarlane et al. (2017). The proposed development has taken cognisance of the buffer zone, excluding activities from this area.

Nature:

Buffer zones are required to protect natural resources and limit the negative adverse effects of activities on the sensitive watercourse habitats. Threats to watercourses from adjacent proposed activities includes increases in sedimentation and turbidity, increased nutrient inputs, increased inputs of toxic organic and heavy metal contaminants and pathogen inputs as well as loss of habitat for aquatic to semi-aquatic species (Macfarlane *et. al,* 2017).

	Overall impact of proposed project		**Cumulative impact**
	Without mitigation	**With mitigation**	
Extent	Low (1)	Low (1)	Medium (3)
Duration	Permanent (5)	Medium-term (3)	Permanent (5)
Magnitude	Moderate (6)	Moderate (6)	High (8)
Probability	Very improbable (1)	Very improbable (1)	Probable (3)
Significance	Low (14)	Low (10)	Medium (48)
Status (positive or negative)	Negative	Negative	Negative
Reversibility	Low	Medium	Medium
Irreplaceable loss of resources?	Yes	No	Yes
Can impact be mitigated?	Yes		Yes

Mitigation:

- *Installation of environmentally friendly barrier fencing such as Clear Vu;*
- *A minimum impact approach must be adopted. Only vegetation in the project footprint, outside the buffer must be removed, leaving buffer vegetation intact;*
- *Demarcation of the wetland buffer by an ecologist/botanist prior to the commencement of construction activities. No construction activities, or movement of construction vehicles must be allowed within the buffer zone.*
- *No indigenous vegetation may be collected or used for firewood;*
- *No herbicides may be used on any vegetation, particularly within proximity to the Phragmites – Typha channelled valley bottom wetland;*
- *Excavated soils must be placed on the upslope side of the proposed development site, minimizing the risk of erosion and excess sediment entering the ecosystems;*
- *No chemical toilets or hazardous substances/chemical storage areas must be located within the buffer zone or 100 m from the channelled valley bottom wetlands;*
- *No rubble may be temporarily stockpiled or dumped within the buffer zone.*

Residual impacts:

- *None*

8.3.2. Potential loss of Species of Special Concern

Pockets of *Barringtonia racemosa* and *Ficus trichopoda* species were recorded in the *Phragmites – Typha* channelled valley bottom wetland adjacent to the proposed development activities. However, as no development will take place within this wetland system, the impact on species of special concern will be negligible and no permits in terms of the NEMBA, NFA or the KZN Nature Conservation Ordinance will be required

Nature: Potential loss of protected species and species of special concern within the aquatic and semi-aquatic habitats in the study area.			
	Overall impact of proposed project		**Cumulative impact**
	Without mitigation	**With mitigation**	
Extent	Low (1)	Low (1)	Medium (3)
Duration	Permanent (5)	Permanent (5)	Permanent (5)
Magnitude	High (8)	High (8)	High (8)
Probability	Improbable (1)	Improbable (1)	Probable (3)
Significance	Low (14)	Low (14)	Medium (48)
Status (positive or negative)	Negative	Negative	Negative
Reversibility	Low	Low	Low
Irreplaceable loss of resources?	Yes	Yes	Yes
Can impact be mitigated?	Yes, but no mitigation required		Yes
Mitigation: • *No mitigation required as no development will take place within this wetland system and therefore no species of special concern will be lost and no permits will be required.*			
Residual impacts: • *None*			

8.3.3. Habitat fragmentation (loss of corridors)

The *Phragmites - Typha* channelled valley bottom wetland which lies adjacent to the eastern boundary of the proposed 450MW RMPP and associated infrastructure, is part of a large wetland system with an outflow indirectly into the Port of Richards Bay. This wetland system provides connectivity to the other similar habitats in the area. As no development will take place in this wetland or wetland buffer, the migration corridor has no potential to be lost and migration of aquatic and semi-aquatic fauna and dispersal of flora seeds will remain possible during construction and the operational phases of the project.

Nature: Loss of migration corridors for aquatic and semi-aquatic fauna and dispersal of flora.			
	Overall impact of proposed project		**Cumulative impact**
	Without mitigation	**With mitigation**	
Extent	Low (1)	Low (1)	Medium (3)
Duration	Permanent (5)	Permanent (5)	Permanent (5)
Magnitude	Moderate (6)	Moderate (6)	High (8)

Probability	Very improbable (1)	Very improbable (1)	Probable (3)
Significance	Low (12)	Low (12)	Medium (48)
Status (positive or negative)	Negative	Negative	Negative
Reversibility	Medium	Medium	Medium
Irreplaceable loss of resources?	Yes	No	Yes
Can impact be mitigated?	Yes		Yes
Mitigation: • *Installation of environmentally friendly barrier fencing such as Clear Vu;* • *A minimum impact approach must be adopted. Only vegetation in the project footprint must be removed, leaving adjacent buffer vegetation intact;* • *No rubble may be temporarily stockpiled or dumped within the buffer zone.* • *The wetland buffer zone areas under the ownership of the applicant must be rehabilitated through removal of alien and invasive alien species and managed as natural open space, retaining the connectivity with adjacent natural open spaces. The management must facilitate natural processes, provide habitat for pollinators and reduce edge effects.*			
Residual impacts: • *Edge effects resulting in loss of habitat for aquatic to semi-aquatic species*			

8.3.4. Infestation of alien invasive species

The disturbance of the natural vegetation by the proposed activities may aid exotic species to invade. Utmost care should be taken not to disperse and increase the colonisation of these species.

Nature: Increase in the invasions by alien and invasive species through loss of natural vegetation and disturbance soil.			
	Overall impact of proposed project		**Cumulative impact**
	Without mitigation	**With mitigation**	
Extent	High (5)	Medium (3)	High (5)
Duration	Medium-term (3)	Short-term (2)	Long term (4)
Magnitude	Moderate (6)	Low (4)	High (8)
Probability	Highly - probable (4)	Probable (3)	Definite (5)
Significance	Medium (56)	Low (17)	High (85)
Status (positive or negative)	Negative	Negative	Negative
Reversibility	Medium	High	Medium
Irreplaceable loss of resources?	Yes	No	Yes
Can impact be mitigated?	Yes		Yes
Mitigation: • *Natural open spaces outside the development footprint should be left in their undeveloped state.* • *Any existing or new exotic vegetation within the proposed development site must be eradicated.* • *A monitoring program should be put in place to remove exotic vegetation and maintain areas free from exotic invasions during construction.*			

• *In proximity to the Phragmites – Typha channelled valley bottom wetland and buffer, successful re-vegetation is crucial to stabilise soils and limit infestation by invasive alien plant species. Rehabilitation should be undertaken on a progressive basis in these areas.*
Residual impacts: • *Invasion and replacement of natural vegetation by ruderal weed species, hence a loss of habitat for aquatic to semi-aquatic species.*

8.3.5. Hydrological Impacts

Vegetation clearance may result in sheet erosion and will further reduce the capacity of the land surface to retard the flow of surface water, thus, decreasing infiltration, and increasing both the quantity and velocity of surface water runoff and erosion.

Hydrological impacts relate to any alterations in the quantity, timing and distribution of water inputs and through flows within the wetlands. Construction activities associated with bulk earthworks (such as excavations, stockpiling, reshaping, back-filling and compaction) in the catchment area feeding downstream watercourses can alter natural patterns of surface runoff reaching water resources downslope/downstream. Excavations may impound and redirect water, thus starving downstream water resources. Infilling, compaction and rutting of soils caused by construction vehicles working outside the wetlands also alter the patterns of diffuse surface and sub-surface flows by altering micro-topography and the permeability of soil profiles. Changes in flow patterns reaching aquatic ecosystems does not only affect hydrological functionality and thus ecosystem integrity but may lead to erosion and sedimentation though increased runoff velocities linked to concentrated flow paths created during construction.

Nature:
Hydrological impacts by altering natural patterns of surface runoff, diffusion of surface and sub-surface flows and erosion and sedimentation of watercourses.

	Overall impact of proposed project		**Cumulative impact**
	Without mitigation	**With mitigation**	
Extent	High (5)	Medium (3)	High (5)
Duration	Permanent (5)	Permanent (5)	Permanent (5)
Magnitude	High (8)	Moderate (6)	High (5)
Probability	Definite (5)	Highly - probable (4)	Highly probable (4)
Significance	High (90)	Medium (56)	Medium (60)
Status (positive or negative)	Negative	Negative	Negative
Reversibility	Low	Medium	Medium
Irreplaceable loss of resources?	Yes	Yes	Yes
Can impact be mitigated?	Yes		Yes

Mitigation:

- *Silt traps must be installed on the development site boundary during construction;*
- *As the slopes are draining towards the freshwater ecosystems, small-scale diversion berms should be constructed, to reduce the risk of the earthworks becoming a preferred surface flow path leading to erosion;*
- *"Trench-breakers", which are in-trench barriers, should be installed within any trench excavations to intercept and minimise the accumulation of surface runoff water from upslope areas running down the trenches;*
- *Erosion control structures must be put in place where soil may be prone to erosion;*
- *Multiple discharge points that are reasonably spread out across the working areas adjoining the wetland habitat to allow a diffuse spread of surface runoff, maximising the amount of infiltration;*

- *Engineering structures (such as gabions or reno mattresses) for large discharge points must be used to dissipate and control energy of stormwater runoff before entering the watercourses;*
- *Bare areas where vegetation has been removed pose a risk of becoming a sediment load into the adjacent watercourses during heavy rainfall, this must be managed by placing it on the upslope side of the development site;*
- *Temporary stormwater management structures must be used during construction. Any areas damaged as a result of stormwater runoff from the construction site must be rehabilitated immediately; and*
- *During rehabilitation, prompt and progressive reinstatement of bare areas is required. During reinstatement, the topsoil layer is to be replaced last, to simulate the pre-construction soil conditions.*

Residual impacts:

- *An increase in hardened surfacing will result in an increase in surface water runoff especially during precipitation events and if uncontrolled, will potentially entrain suspended and dissolved sediments from stockpiles (during construction), hydrocarbons, and other chemicals (construction and operation), potentially affecting water quality of the river.*

8.3.6. Pollution of surface and groundwater due to chemical, oil and fuel spills.

Contaminants such as hydrocarbons, solids and pathogens will be generated from several potential sources (examples include naphtha, petrol/diesel, oil/grease, cement/concrete and other hazardous substances). These contaminants have the capacity to negatively affect aquatic ecosystems including sensitive or intolerant species of flora and fauna. Where significant changes in water quality occur, this will ultimately result in a shift in aquatic species composition, favouring more tolerant species, and potentially resulting in the localised exclusion of sensitive species. Sudden drastic changes in water quality can also have chronic effects on aquatic biota leading to localised extinctions.

Nature:

During the construction and operational phase of the proposed project, the potential for spills and leakages will occur. Contaminants will include mainly oil/ grease and petrol/ diesel. These pollutants may result from leakages from operating equipment, vehicles, oil changes during the servicing of equipment and vehicles or, or from spills as a result of incorrect handling of substances or equipment.

	Overall impact of proposed project		**Cumulative impact**
	Without mitigation	**With mitigation**	
Extent	High (5)	Medium (3)	High (5)
Duration	Long-term (4)	Medium - term (4)	Long-term (4)
Magnitude	High (8)	High (8)	High (5)
Probability	Highly probable (4)	Improbable (2)	Probable (3)
Significance	High (68)	Medium (45)	Medium (42)
Status (positive or negative)	Negative	Negative	Negative
Reversibility	Low	Medium	Medium
Irreplaceable loss of resources?	Yes	Yes	Yes
Can impact be mitigated?	Yes		Yes

Mitigation:

- *Extra care must be taken to prevent any potentially hazardous substances from entering the watercourse during heavy rainfall events;*
- *The use and handling of all chemicals and potentially hazardous substances must take place on an impermeable surface and bunded areas to prevent chemicals and potentially hazardous substances from infiltrating the soil;*

- *All rubble and other types of waste must be disposed at a licensed waste disposal site to prevent it from entering the watercourse;*
- *Contingency plans must be compiled for possible spillages of dangerous goods and include details for decontamination and process to be followed;*
- *A spill kit must be available in the event of a hydrocarbon or chemical spill;*
- *No chemical toilets or hazardous substances/chemical storage areas must be located within the buffer zone or 100 m from the channelled valley bottom wetlands;*
- *If an incident occurs, the following actions needs to be taken immediately:*
    - *Stop the source of the spill;*
    - *Contain and clean up the spill immediately and remediate or appropriately dispose of the contaminated material;*
    - *If outside an impermeable surface, the affected area should be scraped off to the depth of contamination using a spade (small area) or a front-end loader or scoop (large area), absorbent materials such as sawdust or sand must be used to absorb and clean up any fuel or oil spills;*
    - *The contaminated substrate must be stored in a suitable container for further appropriate disposal to an accredited landfill site. Hazardous waste disposal must be accompanied by a safe disposal certificate.*
    - *Report all spills in the onsite environmental incident book, including: the date, time and location, quantity and type of material spilled, circumstances that caused the spill, damage caused, description of the clean-up;*
    - *All significant spills must be reported to the DEDTEA (Waste Management) and other relevant authorities;*
    - *If remedial action is required, this must be taken in consultation with the DHSWS;*
    - *In the event that the spill cannot be contained the following departments must be informed of the incident within 48 hours:*
        - *Local Municipality;*
        - *DHSWS;*
        - *DEDTEA;*
        - *Local Fire Department; and*
        - *Any other affected departments.*

Residual impacts:

- *Potential spillage from overflowing of bunded areas during high rainfall events;*
- *Groundwater pollution through hazardous substance leakages of construction vehicles;*

9. PLAN OF STUDY FOR EIA PHASE

The purpose of this Plan of Study for the EIA phase of the project is to ensure that the Aquatic Biodiversity Impact Assessment Report produced satisfies the requirements of the DEFF, by ensuring that the Department is satisfied with the aspects discussed in this document, before the study is finalised.

9.1. Key issues identified during the scoping process

The key issues and impact of the proposed project are included in section 8.3 above and summarised in Table 9-1 below.

Table 9-1. Summary of key issues and impacts identified during the scoping phase of the proposed project.

Impact
Potential impacts on the aquatic biodiversity and pockets of *Barringtonia racemosa* and *Ficus trichopoda* protected species are expected to be negligible due to the location of the proposed project outside of the *Phragmites - Typha* channelled valley bottom wetland. A 29 m buffer has been set for the wetland however, the proposed development has taken cognisance of the buffer zone, excluding activities from this area. This wetland system is degraded through trampling, subsistence farming and alien plant infestations. Although a loss of natural habitat has taken place, the basic functions performed by this wetland system are still predominantly unchanged.

Issue	Nature of Impact	Extent of impact	No-Go areas
Destruction of wetland habitat	**Direct impacts:** • None **Indirect impacts:** • Increases in sedimentation and turbidity • Increased nutrient inputs • Increased inputs of toxic organic and heavy metal contaminants and pathogen inputs • Degradation to wetland health • Loss of habitat for aquatic to semi-aquatic species	Regional	*Phragmites* - *Typha* channelled valley bottom wetland and 29 m buffer zone
Potential loss of Species of Special Concern	**Direct impacts:** • None **Indirect impacts:** • Loss of protected species in aquatic and semi-aquatic habitat	National	None identified at this stage
Habitat fragmentation (loss of corridors)	**Direct impacts:** • Loss of habitat for aquatic to semi-aquatic species • Potential loss of migration of aquatic and semi-aquatic fauna • Potential degrease in dispersal of flora seeds **Indirect impacts:** • Edge effects to lead to potential loss of habitat for aquatic to semi-aquatic species • Potential loss of migration of aquatic and semi-aquatic fauna	Regional	*Phragmites* - *Typha* channelled valley bottom wetland and 29 m buffer zone.
Infestation of alien species	**Direct impacts:** • Increase in the invasions by alien and invasive species through loss of natural vegetation and disturbance soil **Indirect impacts:** • Loss of habitat for aquatic to semi-aquatic species • Potential loss of protected species in aquatic and semi-aquatic habitat	Regional	None identified at this stage
Hydrological impacts	**Direct impacts:** • Decreased infiltration • Increased quantity and velocity of surface water runoff • Impoundment and redirection of water • Alteration in the patterns of diffuse surface and sub-surface flows by altering micro-topography and the permeability of soil profiles **Indirect impacts**: • Starvation of downstream water resources • Erosion	Regional	29 m wetland buffer zone

	• Sedimentation of watercourse		
Pollution of surface and groundwater due to chemical, oil and fuel spills	**Direct impact:** • Changes to water quality • shift in aquatic species composition **Indirect impacts:** • Extinction of aquatic fauna and flora species • Extinction of protected species and species of special concern	Regional	29 m wetland buffer zone
Description of expected significance of impact			
The impacts on the aquatic resources are likely to be limited as the extent of the proposed project lies outside the sensitive *Phragmites - Typha* channelled valley bottom wetland. As no development will take place in the buffer zone, impacts can be minimised through the implementation of appropriate mitigation measures.			
Gaps in knowledge and recommendations for further study			
• The description of the current state of this identified wetland, specifically focusing on Present Ecological State (PES), Ecological Importance and Sensitivity (EIS) as well as the Ecosystem Regulating and Supporting Services that this wetland system provides will be presented in the Aquatic Biodiversity Impact Assessment Report during the EIA phase of the project; • In-situ water quality testing is planned during the follow-up site visit and the results will be presented and interpretation thereof presented in the Aquatic Biodiversity Impact Assessment Report which will be submitted during the EIA phase of the project; ○ The results obtained will form the baseline survey from which changes to both upstream and downstream of the construction activities can be measured during the construction and operation phases of the proposed development and will inform monitoring requirements for the project Environmental Management Programme (EMPr).		
Recommendations with regards to general field surveys			

• Water quality monitoring, through *in-situ* water testing will provide insights into the health of the river-wetland ecosystem. The following variables will be measured:
  ○ Temperature;
  ○ Dissolved Oxygen;
  ○ Conductivity @ 25°C;
  ○ pH @ 25°C; and
  ○ Flow Rate.
• The recorded values will be compared to the acceptable ranges as indicated in the South African Water Quality Guidelines compiled by the Department of Water Affairs and Forestry (DWAF, 1998) for Aquatic Ecosystems and presented and discussed in the Aquatic Biodiversity Impact Assessment Report during the EIA phase of the project.		

10. RECOMMENDATIONS

The following must be implemented together with mitigation measures of section 8:

10.1. Construction phase

- Pesticides should also be discouraged from use during the construction phase of the development.
- Throughout the lifetime of the proposed construction activities, nobody may capture, trap, hunt or kill any wild animal on study area.
- The wetland buffer must be delineated by an ecologist/botanist prior to the commencement of construction activities.
- Continued maintenance of slit traps.
- The buffer area identified within the applicants property must managed as natural open space, retaining the connectivity with adjacent natural open spaces.

- Contingency plans must be compiled for possible spillages of dangerous goods and include details for decontamination and process to be followed.

10.2. Operational phase

- Quarterly inspections of stormwater outlets for possible erosion for two years post construction. Corrective actions must be taken immediately, if and when required.
- Should efforts of rehabilitation and eradication of alien and invasive species not be successful, the services of qualified professionals must be contracted to further facilitate this process.

11. CONCLUSION

This Wetland delineation and functionality Assessment report considers and reports on the environmental impacts that the proposed development may have and will form part of the submissions to the DEFF in terms NEMA and the 2014 EIA Regulations, as amended in April 2017.

Four wetland units were identified within the DHSWS' 500 m regulated area. Two were classified as *Phragmites - Typha* channelled valley bottom wetlands; one located to the west of the proposed development site and the other along the eastern border of the site. Two *Imperata cylindrica* depression wetlands are located upstream on Erf 1854 at the northern boundary of the 500 m regulatory area. These depression wetlands will not experience change to one of the four main wetland drivers, viz. habitat, biota, flow and water quality by the proposed development therefore, no further assessment for the purposes of this development was required.

The *Phragmites - Typha* channelled valley bottom located at the eastern boundary of the site has experienced a moderate change in ecosystem processes and a loss of natural habitats has taken place however the basic ecosystem functions are still predominantly unchanged. This wetland is ecologically important and sensitive at a local scale. A 29 m buffer has been set for the wetland from the DHSWS' guidelines for the determination of buffer zones for rivers, wetlands and estuaries by Macfarlane *et al*. (2017). The proposed development has taken cognisance of the buffer zone, excluding activities from this area.

Species of special concern were recorded in the wetland and includes *Ficus trichopoda* and *Barringtonia racemosa* individuals. The sensitivities presented were based on the findings of the site investigations to date. Final recommendations and mitigation measures will be presented in the EIA phase.

12. GLOSSARY

Aerobic: having molecular oxygen (O^2) present.

Anaerobic: not having molecular oxygen (O^2) present.

Anthropogenic: of human creation

Delineation (of a wetland): to determine the boundary of a wetland based on soil, vegetation, and/or hydrological indicators (see definition of a wetland).

Endorheic: closed drainage e.g. a pan.

Infilling or Fill: dumping of soil or solid waste onto the wetland surface. Infilling generally has a very high and permanent impact on wetland functioning and is similar to drainage in that the upper soil layers are rendered less wet, usually so much so that the area no longer functions as a wetland.

Mottles: soils with variegated colour patters are described as being mottled, with the "background colour" referred to as the matrix and the spots or blotches of colour referred to as mottles.

Permanently wet soil: soil which is flooded or waterlogged to the soil surface throughout the year, in most years.

Riparian: the area of land adjacent to a stream or river that is influenced by stream-induced or related processes. Riparian areas which are saturated or flooded for prolonged periods would be considered wetlands and could be described as riparian wetlands. However, some riparian areas are not wetlands (e.g. an area where alluvium is periodically deposited by a stream during floods but which is well drained).

Runoff: total water yield from a catchment including surface and subsurface flow.

Seasonally wet soil: soil which is flooded or waterlogged to the soil surface for extended periods (>1 month) during the wet season, but is predominantly dry during the dry season.

Sedges: Grass-like plants belonging to the family Cyperaceae, sometimes referred to as nutgrasses.

Soil drainage classes: describe the soil moisture conditions as determined by the capacity of the soil and the study area for removing excess water. The classes range from very well drained, where excess water is removed very quickly, to very poorly drained, where excess water is removed very slowly. Wetlands include all soils in the very poorly drained and poorly drained classes, and some soils in the somewhat poorly drained class. These three classes are roughly equivalent to the permanent, seasonal and temporary classes

Temporarily wet soil: The soil close to the soil surface (i.e. within 50 cm) is wet for periods > 2 weeks during the wet season in most years. However, it is seldom flooded or saturated at the surface for longer than a month.

Water regime: When and for how long the soil is flooded or saturated.

Water quality: the purity of the water.

Waterlogged: soil or land saturated with water long enough for anaerobic conditions to develop.

Wetland: land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which under normal circumstances supports or would support vegetation typically adapted to life in saturated soil (Water Act 36 of 1998); land where an excess of water is the dominant factor determining the nature of the soil development and the types of plants and animals living at the soil surface (Cowardin et al., 1979).

Wetland catchment: the area up-slope of the wetland from which water flows into the wetland and including the wetland itself.

Wetland delineation: the determination and marking of the boundary of a wetland on a map.

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Websites:

http://pza.sanbi.org/typha-capensis

Addendum A: Curriculum Vitae

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Fax: 086 614 7327 | Fax: 086 614 7327

CURRICULUM VITAE

SURNAME	ADAM (Weiermans)
FIRST NAMES	JACOLETTE
IDENTITY NUMBER	7407190109082
DEGREES	MSc; LLM (Environmental Law)
PROFESSIONAL REGISTRATION	Professional Natural Scientist (400088/02) Environmental Assessment Practitioner of South Africa (2019/1040) EAPASA Assessor
NATIONALITY	South African
CONTACT NUMBER	+27 82 852 6417
YEARS OF PROFESSIONAL EXPERIENCE	20

CAREER HISTORY:

Jacolette obtained a Master of Science in Zoology from the University of Pretoria, South Africa in 2000. Her thesis, *Roads as Ecological Edges for Rehabilitating Coastal Dune Assemblages in Norther Kwa-Zulu-Natal, South Africa (*published in *Restoration Ecology* Vol 11, Issue 1, p: 43-46) was based on field work conducted in the rehabilitating forests of Richards Bay Minerals, north of Richards Bay. In 2019 she also obtained a LLM degree in Environmental Law. For this degree, her dissertation assessed the '*Legislative challenges with wetland mitigation banking in South Africa'*. This included aspects such as the available and required policy, tools and frameworks required for implementing wetland banking, specifically also addressing the finance options, such as BIOFIN and debating the business aspects of wetland banking.

Since 2016, Jacolette has been the Director of WETREST (Centre for Wetland Research and Training). WETREST is a Public Benefit Organisation (PBO) with the following objectives:

1. Identify research gaps/needs in wetland conservation, and raise funds to address these with scientific based research;
2. Establish a series of university accredited wetland training modules, and develop a series of practical/technical training courses to support wetland practitioners;
3. Render free expertise and support to Interested and Affected Parties where wetlands are threatened by development (mining, infrastructure, damming, pollution, draining etc); and
4. Develop a wise-use centre to support sustainable wetland utilization.

This PBO has been involved in various research projects within South Africa and on an international scale.

Jacolette has gained 20 years of professional experience in the environmental sector and has been a certified Professional Natural Scientist with the South African Council for Natural and Scientific Professionals (SACNASP) since 2002. In 2019 she was awarded the KZN Regional Business Women of the Year 2019 award in the Environmental Entrepreneur category. She is registered with the Environmental Assessment Practitioners of South African (2019/1040) and is also an EAPASA Assessor. She has been a Fellow member of the Water Institute of South Africa (WISA) since 2012.

Since 2002, she has led and completed numerous environmental assessments in terms of various legislated processes throughout South Africa and Africa, for a wide range of clients, including the mining sector, large-scale housing developments, private lodge developments, telecommunication industry, various engineering projects including linear projects such as pipelines, road construction, road upgrades as well as site based engineering services. She has also been responsible for various strategic

projects such as Integrated Environmental Management Programmes for municipalities as well as Provincial State of the Environment Reports. Her expert skill of environmental legislative knowledge provides value to the environmental applications and review of peer reviews of environmental legal matters.

Jacolette has proven the capability to complete environmental assessments of challenging projects with various approvals required from different authorities, including Department of Environmental Affairs, Department of Agriculture, Forestry and Fisheries, Department of Water and Sanitation and Department of Mineral Resources. Her expertise is in managing these complex projects with the wide range of specialists and identifying the key risks which needs to be mitigated.

As part of her specialist expertise, she has conducted ecological and wetland assessments throughout South Africa, for various different types of projects, including the challenges of linear and large-scale infrastructure. Linked to these ecological and wetland assessments, lies her passion for successfully implementing biodiversity offsets with relevant government Departments and related authorities. She has also been responsible and part of teams to conduct ecological cost benefit analysis for projects such as the Richards Bay Port Expansion Programme.

Her knowledge of statistical analysis was developed during her MSc studies, and further evolved during the years of assessing field work data. She has proven experience in time series analysis, linear and non-linear modelling, classification and clustering.

Being the managing member of Exigent, an environmental and engineering consultancy firm, since 2002, her responsibility has included on-time delivery, finance management and client liaison of the overall project, specifically focussing on management of the Environmental Impact Assessment (EIA) process, especially the interdisciplinary team of specialists, both in-house and contracted - thereby including all specialist studies, the EIA application process, the Integrated Water Use License Application and Environmental Management Programme Reporting process, ecological and/or wetland specialist studies, Red Data Species application, water quality assessments, biodiversity offsets, other related permits e.g. heritage and archaeological, protected species removal permits and Environmental Control Officer duties, where required.

As part of the environmental services to various mining houses, financial closure calculations have been assessed based on the previous and the more recently promulgated South African regulations. Furthermore, as part of her project manager responsibilities', was compiling the first draft of the Mining and Biodiversity Guidelines for the Chamber of Mines in 2008.

Jacolette has been involved in compilation of various strategic Environmental Management Documents, e.g. the Umhlathuze Integrated Environmental Management Plan, Environmental Aspects of the Mbonambi Nodal Framework Plans, Interim Report on Sustainable Development for the Department of Environmental Affairs in Northern Province as well as Strategic Business Plans for Johannesburg Water.

In 2008, she compiled an environmental awareness training course for a large Consulting Engineering firm, and it was presented it to all their branches country-wide. Throughout the years, she introduced the value of an environmental feasibility studies to various clients by assisting with initial site screenings for Red Data species, sensitive ecological habitats, such as watercourses and wetlands and their related buffers. This also involves an initial assessment of the environmental legal and physical site constraints. Numerous of these studies were conducted to a range of clients, which assists in decision-making early in the project development phase, reducing the risk to the client.

Since 2002, she has been appointed as the environmental specialist on various Public Private Partnership projects, as regulated by the Public Finance Management Act. This included strategic environmental input to various phases of the project, ranging from between different levels of detail of environmental contribution throughout the process.

During the 20 years, she has proven herself in a broad range of environmental expertise which includes the following: *Strategic Biodiversity Planning; Biodiversity Offset Plans; Red Data Species Evaluation,*

Environmental project management of large scale project; Environmental Impact Assessments (EIA); Environmental Management Programmes and Plan; State of Environment Reporting; Environmental license audits; Public Private Partnerships; Geographic Information Systems (GIS) based analysis; Applicability of Environmental Legislation; Environmental Control officers during project implementation; Specialist studies such as Wetland Assessments, Ecological Assessments, Water Quality Assessments, Wildlife Management Plans; *Management Plans such as Mine Rehabilitation Plans, Ecosystem rehabilitation plans; Water Services Development Plan; Environmental management legal and implementation course compilation and training and Environmental feasibility studies.*

EMPLOYMENT HISTORY:

Date	Employer	Position
2002 – currently	Exigent	Managing member
2001 – 2002	Dynacon Technologies	Environmental Project Manager
2000 – 2001	VKE Engineers	Environmental Scientist
1999	University of Pretoria	Conservation Researcher

2002 – Currently Exigent

In 2002 Jacolette took the step to exit corporate employment and became the Manager of the Environmental Business Unit. She is thus responsible for all project deliverables from within the Environmental Business Unit of Exigent. Exigent grew from 2002 being only herself, to 16 staff members in 2008, of which 14 were professional scientists. Exigent provides the full spectrum of all environmental services from the two offices, located in Richards Bay and Pretoria, and conducts projects throughout South Africa, and selected countries within Africa.

In December 2008, the Environmental Business Unit downscaled for a few years whilst circumnavigating on their yacht as a family. During this period of downscaling, Jacolette was responsible for an environmental assessment process for a large international mining company in Kwa-ZuluNatal. The legislated environmental assessment process started in 2009, and included 14 specialists with various expertise. This was a very sensitive and challenging project in terms of the surrounding ecosystems in close proximity to protected environments, Red Data species, as well as socio-economic aspects such as neighbouring communities and job opportunities. All three required environmental authorisations were successfully obtained.

Since 2013, the projects of Exigent has grown and are currently involved in a variety of projects for local and District level Municipalities, Richards Bay Minerals, Richards Bay Industrial Development Zone, Gautrain Management Agency, TRANSNET, Mpact, SMEC, Aurecon, Cosmopolitan Projects, SASOL and various private developers. The offices have since 2013 again grown into an entity of 5 professional environmental personnel.

PREVIOUS EMPLOYMENT:

2001 – 2002 Dynacon Technologies (VKE Engineers merging company) – Environmental Project Manager

After the merge of Dynacon Technologies with VKE Engineers, Jacolette was appointed as the Manager of the Environmental Impact Assessment section and had to manage all phases of the project process, client liaison, compiling proposals, financial management, specialist appointments and scope of works, compiling EIA reports, public meetings and public participation processes.

2000 – 2001 VKE Engineers - Environmental scientist

Jacolette joined the Environmental Department at the Johannesburg offices of VKE Engineers in 2000. Various EIAs and environmental management projects were conducted throughout South Africa and she was responsible for contacting specialists, client liaison and overall management of the projects as well as financial project flows and estimates. Specifically related to the project duties, her duties included compilation of the environmental assessment reports, ecological field assessments and specialist studies, as well as conducting the public participation processes and facilitation of public meetings.

1999 - University of Pretoria, Dr. Albert van Jaarsveld (for the Peregrine fund - Research position)

Jacolette conducted a GIS research project on the distribution of birds of prey in Madagascar for the Peregrine Fund. This project included making contact with various research organisations in South Africa as well as Madagascar in order to obtain sighting and other data of the various birds included in the study. All available information contained in atlases and research papers were included in the dataset and distribution maps.

Her responsibilities included the final report including maps on the distribution status of endangered raptors of Madagascar, as well as an electronic GIS database.

QUALIFICATIONS OBTAINED AND COURSES ATTENDED:

Date	Institution	Qualification Obtained
2020	UNDP Global Programme on Nature for Development. Learning for Nature.	Welcome to Climate Change course *(in process)*
		Protected Area Law (certificate course, May 2020)
		Biodiversity Finance (certificate course, May 2020)
		Ecosystem Services Valuation *(in process)*
2019	**University of KwaZulu-Natal**	**LLM (Environmental Law)**
2018	Alliance for Water Stewardship	AWS accreditation as a Water Stewardship Service Provider
2017	Water Institute of South Africa, KZN Branch	Water Use Licensing Workshop
2016	Department of Water and Sanitation	General Authorisation (GA) 509 training workshop
2017	Shepstone and Wiley	Environmental Law Breakfast Seminar, 2017 EIA Regulations
2015	Terra Firma Academy	Carbon Footprint Analyst (certificate course)
2015	Shepstone and Wiley	Environmental Law Half-Day Seminar, EIA Regulations
2015	WetRest – Centre for Wetland Research and Training	Wetlands – The basics: Identification, function and delineation (certificate course)
2004	The Directorate of Professional Programmes of the Geological Society of South Africa	Groundwater in South Africa: Our most valuable future resource (Certificate Course)
2003	Working for Wetlands	Wetland Rehabilitation Certificate Course
	Shangoni Management	Environmental Auditing Certificate Course-ISO 14001
	Rhodes University	Environmental and Resource Economics (Certificate Course)
2002	University of South Africa	Certificate course on Advanced Business Communication (1 year)
	DEA	Project Developer's Forum on Cleaner Development Mechanisms (CDM)
2001	AfriDev Consultants	SASS5 Biomonitoring Techniques Certificate
2000	VKE Engineers	Managing Projects in a Consulting Engineer's Practise Certificate
1999	University of Pretoria	GIS project Researcher - Madagascar raptors
2000	**University of Pretoria**	**MSc Zoology (Restoration Ecology)**
1996	**University of Pretoria**	**BSc (Hons) (Zoology)**
1995	**University of Pretoria**	**BSc (Zoology)**
1992	Verwoerdburg High School, Pretoria	Matriculation

SCIENTIFIC PUBLICATIONS AND CONFERENCES ATTENDED:

Date	Conference/publication
2019	IAIA SA KZN Branch Workshop on Offsets – presenter '*Legislative challenges with wetland mitigation banking in South Africa*'.
2019	Annual Environmental Law Association Conference, KZN. Presentation: '*Legislative challenges with wetland mitigation banking in South Africa*' *–26, 27 September 2019*
2019	Wetland Forum KZN, Specialist presentation: '*Legislative challenges with wetland mitigation banking in South Africa'*
2018	National Wetlands Indaba, Kimberley, Northern Cape. Presentation: 'Legislative challenges with wetland mitigation banking in South Africa'. Awarded 'Best presentation' at the Indaba.

Date	Conference/publication
2015	National Wetlands Indaba, Western Cape.
2012	Conservation Biology Oceania Conference, Charles Darwin University, Darwin, Australia
2000	Weiermans, J. & R. J. van Aarde. The effects of habitat edges in rehabilitating coastal dune communities in Richards Bay, KwaZulu – Natal, South Africa. *Restoration Ecology* Vol 11, Issue 1, p: 43-46.
2000	Weiermans, J. & R. J. van Aarde. The effects of habitat edges in rehabilitating coastal dune communities in Richards Bay, KwaZulu – natal, South Africa. Paper presented at the Wild-life Management Association of Southern Africa 2000 Symposium.
1997	Weiermans, J., A. van Jaarsveld & S. Chown. A multiple scale analysis of South African bird body – size distributions. Paper presented at the Zoological Society of Southern Africa 1997 conference.

MEMBERSHIP OF OTHER PROFESSIONAL BODIES OR RELEVANT ORGANISATIONS:

Jacolette is registered as a Professional Natural Scientist (Pr. Sci. Nat., Reg number: 400088/02) since 2002, registered Environmental Assessment Practitioner of South Africa (EAPASA 2019/1040), re-viewer of EAPASA applications, and a Fellow member of the Water Institute of South Africa (WISA). She is also a member of the Environmental Law Association of South Africa (ELA) (2016/224/KZN), the Wetlands Society of South Africa and Wetland Forum in Kwa-Zulu Natal, and the North Coast Region representative of the South African Affiliate of the International Association for Impact Assessment (IAIASA).

Jacolette has been Director of a Public Beneficial Organisation (WETREST) since 2016. WETREST is involved in research projects for organisations such as the Water Research Council (WRC) involved in scientific research, with specific focus on wetlands and restoration.

CURRICULUM VITAE

SURNAME	:	SMUTS (Coetzee)
FIRST NAMES	:	Charleen
IDENTITY NUMBER	:	8303150185080
PROFESSIONAL REGISTRATION	:	Professional Natural Scientist (Pr. Sci. Nat., Reg number: 115412) South African Affiliate of the International Association for Impact Assessment (IAIA, Membership Number 3824) South African Wetland Society, as well as Wetlands Forum KZN (Member)
NATIONALITY	:	South African
CONTACT NUMBER	:	081 398 1163
YEARS OF EXPERIENCE	:	8

CAREER HISTORY:

Charleen obtained a Master of Science in Botany from the University of Pretoria in 2012. Her thesis, *The effect of vegetation on the behaviour and movements of Burchell's Zebra, Equus burchelli (Gray 1824) in the Telperion Nature Reserve, Mpumalanga, South Africa*, was based on field work conducted in the eZemvelo Nature Reserve in Bronkhorstspruit.

She has gained 8 years of professional experience in the environmental sector. She has been certified as a Professional Natural Scientist and is a member of the South African Affiliate of the International Association for Impact Assessment, the South African Wetland Society and Botanical Society of South Africa.

She has successfully conducted project management for numerous environmental assessments in terms of various legislated processes throughout South Africa for a wide range of clients, including the large-scale housing developments, private lodge developments, various engineering projects including pipelines, road construction and road upgrades. She has been responsible for strategic projects such as Integrated Environmental Management Programmes for uMhlathuze Municipality.

Due to her training as an ecologist/botanist she also provides the specialist skill of wetland and ecological assessments. Charleen has worked in six of the provinces of South Africa.

Charleen has proven the capability to complete environmental assessments of challenging projects with various approvals required from different authorities, including Department of Environmental Affairs, Department of Agriculture, Forestry and Fisheries, and Department of Water and Sanitation. Her expertise is in managing these complex projects with the wide range of specialists, and identifying the key issues which needs to be mitigated. In line with the newer developments in the environmental field, she has obtained valuable experience in compiling biodiversity offset documents and negotiating these aspects with relevant government Departments and related authorities.

She has proven expertise in a broad range of environmental expertise which includes the following:

- *Strategic Biodiversity Planning*
- *Biodiversity Offset Plans*
- *Environmental project management of large scale projects*
- *Environmental audits*

- *Environmental Impact Assessments*
- *Environmental Management Plans*
- *State of Environment Reporting (SoER)*
- *Geographic Information Systems (GIS) based analysis*
- *Applicability of Environmental Legislation*
- *Environmental Control officers during project implementation*
- *Specialist studies such as Vegetation Assessments, Wetland Assessments, Ecological Assessments, Water Quality Assessments*
- *Environmental Feasibility Studies*

EMPLOYMENT HISTORY:

Date	Employer	Position
2014 – currently	Exigent	Senior Environmental Project Manager and Ecologist
2007-2009	MSA Group Services	Project Manager/Ecologist
2006-2007	University of Pretoria	Demonstrator/Field assistant

2014 – Current Senior Environmental Project Manager and Ecologist – Exigent Engineering

Charleen joined Exigent in 2014. Together with the Managing Member, Jacolette Adam, she conducts various Environmental Impact Assessments and environmental management projects throughout South Africa. Charleen is responsible for liaison with specialists, clients, authorities and stakeholders. She is also responsible for overall management of the projects. Specifically related to the project duties - her duties included development of terms of reference, tenders and project proposals. She manages project timeframes and compiles environmental risk assessment reports, screening reports, scoping reports, impact assessment reports, basic assessment reports and environmental auditing reports. She is responsible for water use license applications and motivation reports dealing with exemptions, ecological assessments, vegetation assessments and wetland delineations and functionality assessments, well as conducting and facilitating the public participation processes.

2007 – 2009 Environmental Project Manager and Ecologist – MSA Group Services

At MSA, Charleen was responsible for overall project management and administration of various projects around KwaZulu-Natal. She managed and co-ordinated project teams and specialists, liaison with clients, authorities and stakeholders, Co-ordinated and facilitated the public participation process. In addition, she developed of terms of reference, tenders and project proposals, managed project timeframes; and compiled basic assessment reports, environmental impact assessments, scoping reports, environmental screening reports, ecological assessments and wetland delineations, and used Geographic Information Systems (ArcGIS).

2006-2007 Demonstrator and field assistant – University of Pretoria

As a postgraduate student at the University of Pretoria, Charleen marked second year botany (BOT251) semester tests and were a demonstrator for first year Molecular and Cell Biology course (MLB 111), stand-in demonstrator for the first-year Biology course (BLG 150) and a demonstrator for the first year Botany 161 course. She also assisted in fieldwork of other postgraduate students throughout South Africa.

QUALIFICATIONS OBTAINED AND COURSES ATTENDED:

Date	Institution	Qualification Obtained
2019	GroundTruth: Water, Wetlands and Environmental Engineering	SASS5 course
2018	KZN Department of Agriculture & Rural	Soil classification and land capability

Date	Institution	Qualification Obtained
2019	GroundTruth: Water, Wetlands and Environmental Engineering	SASS5 course
	Development - Cedara College of agriculture	
2017	Water Research Commission	Wetland Plant Taxonomy Training
2015	WetRest – Centre for Wetland Research and Training	Wetlands – The basics: Identification, function and delineation
2015	International Association for Impact Assessments	IAP Public Participation Mini Training Event
2012	University of Pretoria	MSc Plant Science
2006	University of Pretoria	BSc (Hons) (Botany)
2005	University of Pretoria	BSc (Ecology)
2001	Brandwag High School, Benoni	Matriculation

SCIENTIFIC RESEARCH OUTPUTS AND CONFERENCES / WORKSHOPS ATTENDED:

Date	Research Outputs
2017	National Wetlands Indaba, KwaZulu-Natal
2017	Environmental Law Breakfast Seminar, Shepstone and Wiley
2017	Water Use Licensing Workshop, Water Institute of South Africa, KZN Branch
2016	General Authorisation (GA) 509 training workshop, Department of Water and Sanitation
2015	National Training and Development – Buffer Zone Workshop, Water Research Commission
2015	Environmental Law Half-Day Seminar, Shepstone and Wiley
2015	National Wetlands Indaba, Western Cape
2012	Coetzee, C. & Bredenkamp, G.J. The effect of vegetation on the behaviour and movements of Burchell's Zebra (*Equus burchelli burchelli*) in the Telperion Nature Reserve, Mpumalanga, South Africa). Dissertation.
2008	Coetzee, C & Bredenkamp, G.J. Black or white, which habitat is right? Department of Botany, University of Pretoria, dissertation Symposium 2008.
2006	Coetzee, C. & Van Rooyen, M.W. Seed bank size and species composition in the Upland Succulent Karoo: Commercial *versus* Communal rangelands.
2005	Coetzee, C. & Van Rooyen, M.W. Seed bank size and species composition in the Upland Succulent Karoo: Commercial *versus* Communal rangelands. Department of Botany, University of Pretoria, Project Presentation Symposium 2005.
2005	Coetzee, C & Van Wyk, A.E. *Acacia* species and ants: a love-hate relationship. Department of Botany, University of Pretoria, Seminar.
2005	Coetzee, C. & Bredenkamp, G.J. *Themeda triandra*: A prominent grass of South Africa. Department of Botany, University of Pretoria, Seminar
2005	Coetzee, C., Henstock, R., Wolmarans, R., Strumpher, C. Habitat fragmentation on the University of Pretoria Main campus and its effect on the bird populations.
2004	Coetzee, C., Wolmarans, R., Henstock, R., Peacock, F., Strumpher, C. A comparative study of the vegetation in the Drakensberg along different altitudinal gradients.

MEMBERSHIP OF OTHER PROFESSIONAL BODIES OR RELEVANT ORGANISATIONS:

Charleen is a member of the South African Council for Professional Natural Scientists (Pri. Sci. Nat. Reg. No. 115412), the South African Affiliate of the International Association for Impact Assessment (IAIAsa) and a member of the South African Wetland Society (SAWS) and the KwaZulu-Natal Wetland Forum branch.

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Addendum B: Declaration of Independence

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Development of the 450MW Emergency Risk Mitigation Power Plant (RMPP) and associated Infrastructure on sites located in Alton, Richards Bay, KwaZulu-Natal Province

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	Exigent Engineering Consultants cc			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100%
Specialist name:	Jacolette Adam			
Specialist Qualifications:	MSc. and LLM			
Professional affiliation/registration:	Pr. Sci. Nat. (400088/02). Environmental Law Association (ELA) of SA. International Association of Impact Assessment (South African Chapter). South African Institute of Ecologists and Environmental Scientists. Fellow member of the Water Institute of South Africa.			
Physical address:	10 Water Ways Estate Bridgetown road Richards Bay			
Postal address:	PO Box 9514, Richards Bay			
Postal code:	3900	Cell:	082 852 6417	
Telephone:	035 788 0398	Fax:	086 614 7327	
E-mail:	jacolette@exigent.co.za			

2. DECLARATION BY THE SPECIALIST

I, __Jacolette Adam_____, 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 48 and is punishable in terms of section 24F of the Act.

Jadam

Signature of the Specialist

Exigent Engineering Consultants

Name of Company:

29/09/2020

Date

3. **UNDERTAKING UNDER OATH/ AFFIRMATION**

I, Jacolette Adam, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

Exigent

Name of Company

29/09/2020

Date

Signature of the Commissioner of Oaths

OPERATIONAL RESPONSE SERVICE
RICHARDS BAY
2020 -09- 29
COMMUNITY SERVICE CENTRE
SEA BORDER POLICE

2020-09-29

Date