Environmental Impact Assessment for the proposed Banna Ba Pifhu Wind Energy Project near Humansdorp, Eastern Cape: Final Environmental Impact Assessment Report

# Chapter 13:

# Wetland and Aquatic Impact Assessment

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# CHAPTER 13. WETLAND AND AQUATIC IMPACT ASSESSMENT

## 13.1 INTRODUCTION

Scherman Colloty & Associates (SC&A) was appointed by WKN Windcurrent SA (Pty) Ltd to assess the Present Ecological State (PES) assessment of all water bodies located within the development footprint as well as within a 500m radius of the site. This report will thus form part of the EIA submission and the Water Use License application detailing the potential impact of the proposed project on the aquatic environment, which includes river, streams and wetlands.

Drainage lines and small streams found within the development footprint were mostly associated with the headwater catchment areas of the Seekoei, Geelhoutboom and Krom rivers. However none of the study areas systems are directly linked to the above mentioned Seekoei and Krom estuarine systems, found in close proximity to the proposed wind farm (Figure 13.1 & 13.2). The natural wetlands observed are endorheic and thus not associated with any of the riverine catchments in the region.

SC&A is currently conducting a province wide PES assessment of all rivers, thus this study will utilise the updated methodology developed by DWA in 2010, supported by the information collected during the site visit in January 2012 and information housed in the National Rivers Database and the South African National Biodiversity Institute (SANBI). It was therefore important that the field assessment portion of this project assess the current state of the wetlands areas indicated in the national wetland inventories listed in the abovementioned databases.

This report will thus deal with the following:

- Riverine and riparian classification
- Rivers and drainage line Present Ecological State assessment
- Wetland classification according to the National Wetland Classification System
- Wetland Integrated Habitat Integrity Assessment
- Derivation of rivers and wetland importance and function
- Relevant river and wetland legislation & policy
- Impact assessment
- Potential mitigation and recommendations with regard suitable buffers and no-go areas.

Due to the nature of the study area and the types of aquatic systems observed on the site, the main focus of this report will be on the wetland systems, i.e. the streams or riverbeds observed on site were mostly drainage lines that would carry limited surface flows during high rainfall periods only and did not contain any permanent riparian zones. These will be assessed using a modified Water Research Commission Wet-Health Level 1 procedure developed by SC&A over a number of years. This approach includes additional aspects, which are more suited to wetland and riparian impact assessment. It should be noted from the onset that the study area drainage lines / water courses are already heavily impacted due to current land use practices (maize production). These practices have resulted in the restricted development of typical riparian vegetation (hydrophilic grasses), together with the further modification of the hydrological regime due to the high number of farm dams.

### 13.1.1 National Wetland classification System (NWCS 2010)

Since the late 1960's, 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 *et al*., 2006). Wetland function is a consequence of biotic and abiotic factors, and wetland classification should strive to capture these aspects.

The South African National Biodiversity Institute (SANBI) in collaboration with a number of specialists and stakeholders developed the newly revised and now accepted National Wetland Classification Systems (NWCS 2010). This system comprises a hierarchical classification process of defining a wetland based on the principles of the Hydrogeomorphic (HGM) approach at higher levels, with including structural features at the finer or lower levels of classification (SANBI 2009). The updated wetland nomenclature has consequently been revised within the National Wetland Inventory GIS data set (Figure 13.3), also managed by SANBI (SANBI, 2010)

Wetlands develop in a 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 determines 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 regard the determination of the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) and WET-Health assessments for aquatic environments. All of 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 Department of Water Affairs. The Ecological Reserve of a wetland or river is used by DWA to assess the water resource allocations when assessing water use license applications (WULA).

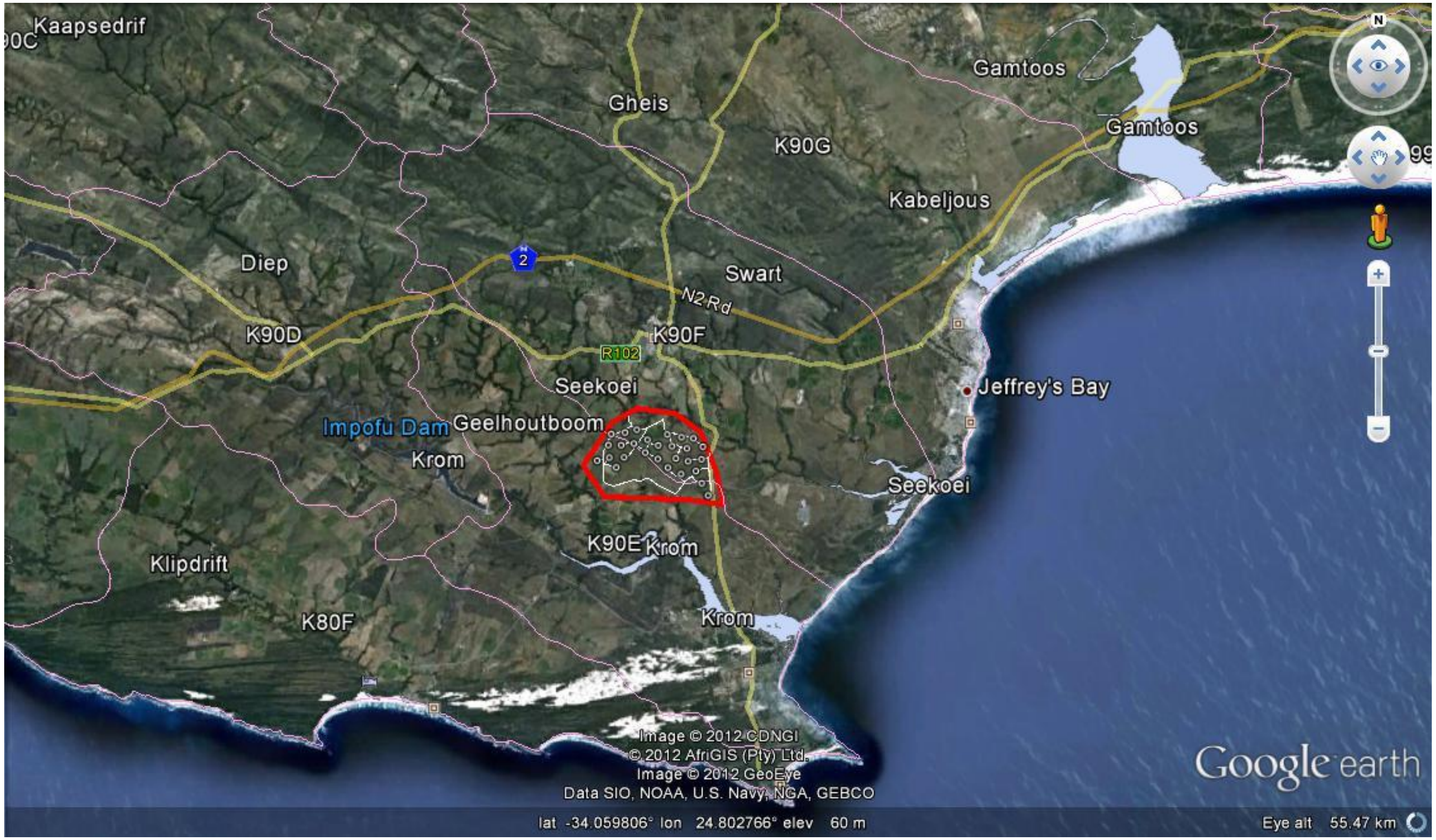


**Figure 13.1: The study area in relation to the various surrounding rivers, estuaries and associated catchments (Source DWA, WKN & Google Earth)**

The NWCS process is provided in more detail in the methods section of the report, but some of the terms and definitions used in this document are present below:

## DEFINITION BOX

**Present Ecological State** is a term for the current ecological condition of the resource. This is assessed relative to the deviation from the Reference State. Reference State/Condition is the natural or pre-impacted condition of the system. The reference state is not a static condition, but refers to the natural dynamics (range and rates of change or flux) prior to development. The PES is determined per component - for rivers and wetlands this would be for the drivers: flow, water quality and geomorphology; and the biotic response indicators: fish, macroinvertebrates, riparian vegetation and diatoms. PES categories for every component would be integrated into an overall PES for the river reach or wetland being investigated. This integrated PES is called the EcoStatus of the reach or wetland.

**EcoStatus** is the overall PES or current state of the resource. It represents the totality of the features and characteristics of a river and its riparian areas or wetland that bear upon its ability to support an appropriate natural flora and fauna and its capacity to provide a variety of goods and services. The EcoStatus value is an integrated ecological state made up of a combination of various PES findings from component EcoStatus assessments (such as for invertebrates, fish, riparian vegetation, geomorphology, hydrology and water quality).

**Reserve:** The quantity and quality of water needed to sustain basic *human needs* and *ecosystems* (e.g. estuaries, rivers, lakes, groundwater and wetlands) to ensure ecologically sustainable development and utilisation of a water resource. The *Ecological Reserve* pertains specifically to aquatic ecosystems.

**Reserve requirements**: The quality, quantity and reliability of water needed to satisfy the requirements of basic human needs and the Ecological Reserve (inclusive of instream requirements).

**Ecological Reserve determination study**: The study undertaken to determine Ecological Reserve requirements.

**Licensing applications**: Water users are required (by legislation) to apply for licenses prior to extracting water resources from a water catchment.

**Ecological Water Requirements**: This is the quality and quantity of water flowing through a natural stream course that is needed to sustain instream functions and ecosystem integrity at an acceptable level as determined during an EWR study. These then form part of the conditions for managing achievable water quantity and quality conditions as stipulated in the **Reserve Template**

**Water allocation process (compulsory licensing):** This is a process where all existing and new water users are requested to reapply for their licenses, particularly in stressed catchments where there is an over-allocation of water or an inequitable distribution of entitlements.

**Ecoregions** are geographic regions that have been delineated in a top-down manner on the basis of physical/abiotic factors. • NOTE: For purposes of the classification system, the 'Level I Ecoregions' for South Africa, Lesotho and Swaziland (Kleynhans *et al.* 2005), which have been specifically developed by the Department of Water Affairs & Forestry (DWAF) for rivers but are used for the management of inland aquatic ecosystems more generally, are applied at Level 2A of the classification system. These Ecoregions are based on physiography, climate, geology, soils and potential natural vegetation.

#### 13.1.1.1 Wetland definition

Although the National Wetland Classification System (SANBI, 2009) is used to classify wetland types it is still necessary to understand the definition of a wetland. Wetland definitions as with classification systems have changed over the years. Terminology currently strives to characterise a wetland not only on its structure (visible form), but also to relate this to the function and value of any given wetland.

The Ramsar Convention definition of a wetland is widely accepted as **"areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres"** (Davis 1994). South Africa is a signatory to the Ramsar Convention and therefore its extremely broad definition of wetlands has been adopted for the proposed NWCS, with a few modifications.

Whereas the Ramsar Convention included marine water to a depth of six metres, the definition used for the NWCS extends to a depth of ten metres at low tide, as this is recognised seaward boundary of the shallow photic zone (Lombard *et al*., 2005). An additional minor adaptation of the definition is the removal of the term 'fen' as fens are considered a type of peatland. The adapted definition for the NWCS is, therefore, as follows (SANBI, 2009):

WETLAND: an area of marsh, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed ten metres.

This definition encompasses all ecosystems characterised by the permanent or periodic presence of water other than marine waters deeper than ten metres. The only legislated definition of wetlands in South Africa, however, is contained within the National Water Act (Act No. 36 of 1998) (NWA), where wetlands are defined 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 adapted to life in saturated soil." This definition is consistent with more precise working definitions of wetlands and therefore includes only a subset of ecosystems encapsulated in the Ramsar definition. It should be noted that the NWA definition is not concerned with marine systems and clearly distinguishes wetlands from estuaries, classifying the later as a water course (SANBI, 2009). The DWA is however reconsidering this position with regard the management of estuaries due to the ecological needs of these systems with regard to water allocation. Table 13.1 provides a comparison of the various wetlands included within the main sources of wetland definition used in South Africa.

Although a subset of Ramsar-defined wetlands was used as a starting point for the compilation of the first version of the National Wetland Inventory (i.e. "wetlands", as defined by the National Water Act, together with open waterbodies), it is understood that subsequent versions of the Inventory include the full suite of Ramsar-defined wetlands in order to ensure that South Africa meets its wetland inventory obligations as a signatory to the Convention (SANBI, 2009).

Wetlands must therefore have one or more of the following attributes to meet the above definition (DWAF, 2005):

- A high water table that results in the saturation at or near the surface, leading to anaerobic conditions developing in the top 50cm of the soil.

- Wetland or hydromorphic soils that display characteristics resulting from prolonged saturation, i.e. mottling or grey soils
- The presence of, at least occasionally, hydrophilic plants, i.e. hydrophytes (water loving plants).

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

**Table 13.1: Comparison of ecosystems considered to be 'wetlands' as defined by the proposed NWCS, the National Water Act (Act No. 36 of 1998), and ecosystems are included in DWAF's (2005) delineation manual.**

| Ecosystem | NWCS "wetland" | National Water Act wetland | DWAF (2005) delineation manual |
|---|---|---|---|
| Marine | YES | NO | NO |
| Estuarine | YES | NO | NO |
| Waterbodies deeper than 2 m (i.e. limnetic habitats often describes as lakes or dams) | YES | NO | NO |
| Rivers, channels and canals | YES | NO[1] | NO |
| Inland aquatic ecosystems that are not river channels and are less than 2 m deep | YES | YES | YES |
| Riparian[2] areas that are permanently / periodically inundated or saturated with water within 50 cm of the surface | YES | YES | YES[3] |
| Riparian[2] areas that are not permanently / periodically inundated or saturated with water within 50 cm of the surface | NO | NO | YES[3] |

### *13.1.2 Wetland importance and function*

South Africa is a Contracting Party to the Ramsar Convention on Wetlands, signed in Ramsar, Iran, in 1971, and has thus committed itself to this intergovernmental treaty, which provides the framework for the national protection of wetlands and the resources they could provide. Wetland conservation is now driven by the South African National Biodiversity Institute, a requirement under the National Environmental Management: Biodiversity Act (No 10 of 2004).

Wetlands are among the most valuable and productive ecosystems on earth, providing important opportunities for sustainable development (Davies and Day, 1998). However wetlands in South Africa are still rapidly being lost or degraded through direct human induced pressures (Nel *et al.*, 2004).

The most common attributes or goods and services provided by wetlands include:

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[1] Although river channels and canals would generally not be regarded as wetlands in terms of the National Water Act, they are included as a 'watercourse' in terms of the Act

[2] According to the National Water Act and Ramsar, riparian areas are those areas that are saturated or flooded for prolonged periods would be considered riparian wetlands, opposed to non –wetland riparian areas that are only periodically inundated and the riparian vegetation persists due to having deep root systems drawing on water many meters below the surface.

[3] The delineation of 'riparian areas' (including both wetland and non-wetland components) is treated separately to the delineation of wetlands in DWAF's (2005) delineation manual.

- Improve water quality;
- Impede flow and reduce the occurrence of floods;
- Reeds and sedges used in construction and traditional crafts;
- Bulbs and tubers, a source of food and natural medicine;
- Store water and maintain base flow of rivers;
- Trap sediments; and
- Reduce the number of water borne diseases.

In terms of this study, the wetlands provide ecological (environmental) value to the area acting as refugia for various wetland associated plants, butterflies and birds, while impeding flow. Impeded flows reduce the occurrence of flooding, while trapping sediment and thus protecting downstream users from environmental degradation (Figure 13.2). This is particular significant in terms of the important downstream estuaries, that have remained clear waterbodies, and don't require in significant management actions in terms of sedimentation of erosion problems.

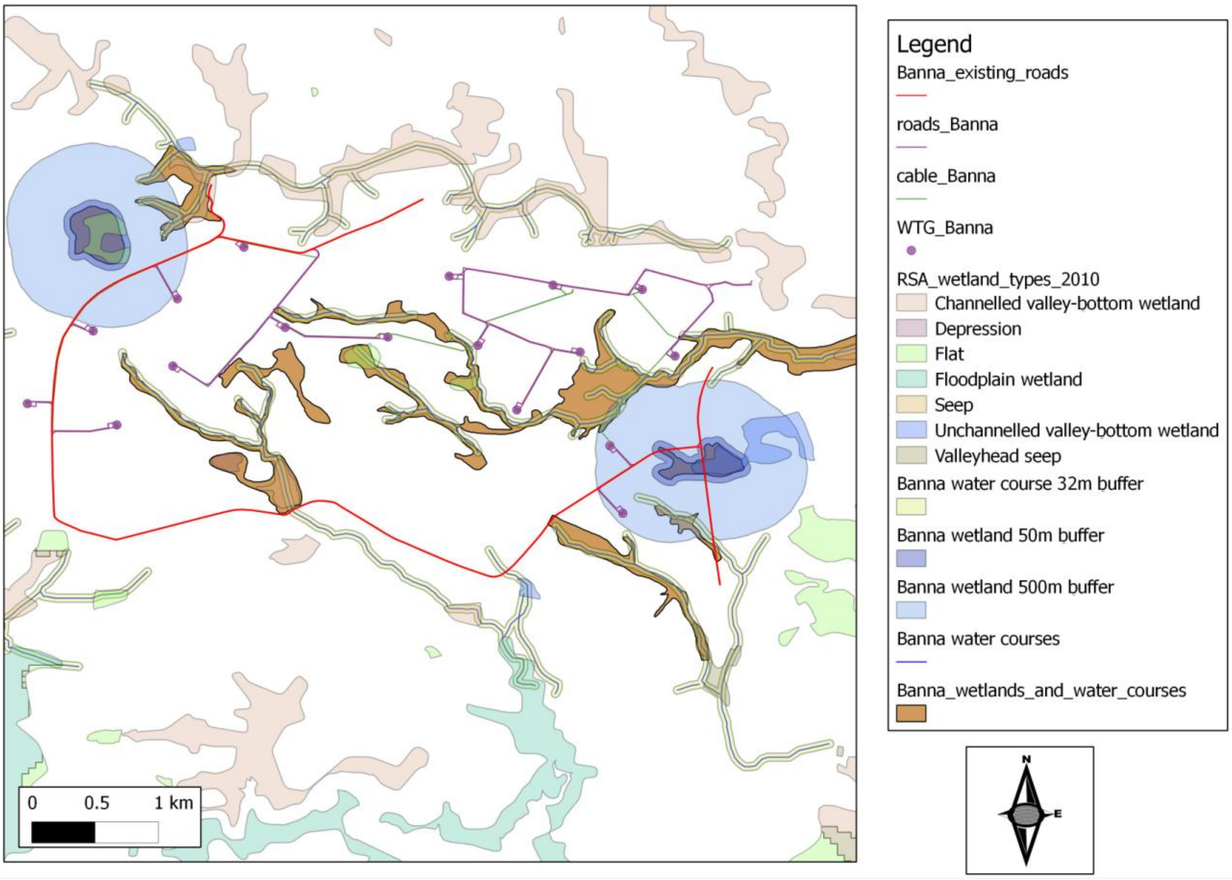



**Figure 13.2: Study site wetlands (blue) and water courses (green and grey areas) in relation to the 30.6 MW layout (preferred alternative)**

In the past wetland conservation has focused on biodiversity as a means of substantiating the protection of wetland habitat. However not all wetlands provide such motivation for their protection, thus wetland managers and conservationists began assessing the importance of wetland function within an ecosystem.

Table 13.2 summarises the importance of wetland function when related to ecosystem services or ecoservices (Kotze *et al*., 2008). One such example is emergent reed bed wetlands that function as transformers converting inorganic nutrients into organic compounds (Mitsch and Gosselink, 2000).

**Table 13.2: Summary of direct and indirect ecoservices provided by wetlands from Kotze *et al.*, 2008.**

| | | | | |
|---|---|---|---|---|
| **Ecosystem services supplied by wetlands** | Indirect benefits | Hydro-geochemical benefits | | Flood attenuation |
| | | | | Stream flow regulation |
| | | | Water quality enhancement benefits | Sediment trapping |
| | | | | Phosphate assimilation |
| | | | | Nitrate assimilation |
| | | | | Toxicant assimilation |
| | | | | Erosion control |
| | | | | Carbon storage |
| | | | | Biodiversity maintenance |
| | *Direct benefits* | | | *Provision of water for human use* |
| | | | | *Provision of harvestable resources*[2] |
| | | | | *Provision of cultivated foods* |
| | | | | *Cultural significance* |
| | | | | *Tourism and recreation* |
| | | | | *Education and research* |

## *13.1.3 Relevant wetland legislation and policy*

Locally the South African Constitution, seven Acts and two international treaties allow for the protection of wetlands and rivers. These systems are protected from the destruction or pollution by the following:

- Section 24 of The Constitution of the Republic of South Africa;
- 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);
- National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998) inclusive of all amendments, as well as the NEM: Biodiversity Act;
- National Water Act, 1998 (Act No. 36 of 1998);
- Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983); and
- Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).
- Nature and Environmental Conservation Ordinance (No. 19 of 1974)
- National Forest Act (No. 84 of 1998)
- National Heritage Resources Act (No. 25 of 1999)

Apart from NEMA, the Conservation of Agricultural Resources Act (CARA), 1983 (Act No. 43 of 1983) will also apply to this project. The CARA has categorised a large number of invasive plants together with associated obligations of the land owner. A number of Category 1 & 2 plants were found at all of the sites investigated, thus the contractors must take extreme care further spread of these plants doesn't occur. This should be done through proper stockpile management (topsoil) and suitable rehabilitation of disturbed areas after construction.

An amendment of the National Environmental Management was promulgated late December 2011, namely the Biodiversity Act or NEM:BA (Act No 10 of 2004), which lists 225 threatened ecosystems based on vegetation type (Vegmap, 2006 as amended). Should a vegetation type or ecosystem be listed, actions in terms of NEM:BA are triggered.

Humansdorp Shale Renosterveld (FRs19), listed as Endangered by this Act and would have dominated the majority of the site had it not been transformed by agricultural production. The Act thus requires a minimum of a Basic Assessment for any development, which would result in a loss of any area greater than 300m$^2$ and when determining the significance of impact on biodiversity in an EIA process, loss of natural habitat listed as either Critically endangered or Endangered ecosystem should be ranked as **highly significant.**

The National Water Act, requires any development to secure Water Use Licences with the following activities

- Section 21 (a), abstractive use of water for construction (if possible and required).
- Section 21 (c) and (i) use, i.e. river or wetland crossings, which includes any drainage lines by any infrastructure.

Currently Section 21 (c) and (i) General Authorizations (GAs) do not apply to the use of water within a 500m radius from the boundary of any wetland. Should construction within these boundaries be considered, licensing and **not registration** will have to take place.

The definitions of the above-mentioned activities are clarified in the General Authorisations (Government Notice No. 26187, Gazette No. 398, 26 March 2004, in terms of Section 39 of the NWA and Government Notice No. 32805, Gazette No. 1199, 18 December 2009). Water Use Registration is required in terms of a Notice issued under the Registration Regulations (Section 26(10) (c) of the NWA), or under a GA published in the Government Gazette.

Note that only once all forms are submitted, DWA will decide whether registration of licensing is required for the Section 21 (c and i) uses. Priority is thus placed on the submission of the forms after which DWA will advise further. The DWA will then produce a confirmation of receipt letter. DWA's particular concern is that the power generation structures should be out of any 1:100 year floodlines, determined by a registered engineer.

### *13.1.4 Provincial legislation and policy*

Various provincial guidelines on buffers have been issued within the province. These are stated below so that the engineers and contractors are aware of these buffers during the planning phase. Associated batch plants, stockpiles, lay down areas and construction camps should avoid these buffer areas.

Until national guidelines for riverine and wetland buffers are established, the guidelines set out in the Eastern Cape Biodiversity Conservation Plan documentation should be applied (Berliner & Desmet, 2007). Table 13.3 recommends buffers for rivers.

**Table 13.3: Recommended buffers for rivers, with the applicable buffer related to this study shaded in grey**

| River criterion used | Buffer width (m) | Rationale |
|---|---|---|
| Mountain streams and upper foothills of all 1:500 000 rivers | 50 | These longitudinal zones generally have more confined riparian zones than lower foothills and lowland rivers and are generally less threatened by agricultural practices. |
| Lower foothills and lowland rivers of all 1:500 000 rivers | 100 | These longitudinal zones generally have less confined riparian zones than mountain streams and upper foothills and are generally more threatened by agricultural practices. These larger buffers are particularly important to lower the amount of crop-spray reaching the river. |
| All remaining 1:50 000 streams | 32 | Generally smaller upland streams corresponding to mountain streams and upper foothills, smaller than those designated in the 1:500 000 rivers layer. They are assigned the riparian buffer required under South African legislation. |

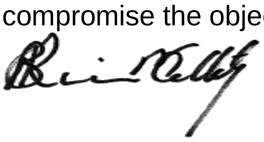
Currently there is no accepted priority ranking system for wetlands. Until such a system is developed, it is recommended that a **50 m buffer be set for all wetlands**.

Other policies that are relevant include:

- Provincial Nature Conservation Ordinance (PNCO) – Protected Flora. Any plants found within the sites are described in the ecological assessment.
- National Freshwater Ecosystems Priority Areas – CSIR 2011 draft. This mapping product highlights potential rivers and wetlands that should be earmarked for conservation on a national basis (Figure 13.3).

### *13.1.5 <u>Declaration of Independence</u>*

I, Dr Brian Colloty, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed WKN Windcurrent SA (Pty) Ltd Wind Energy Project, application or appeal in respect of which I was appointed, other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.



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## 13.2 PROJECT LOCALITY & DESCRIPTION

The study site is located approximately 5 km south east of Humansdorp, located on a plateau between the Seekoei and Krom / Geelhoutboom rivers (Figure 13.3). The majority being bisected by these two catchments and thus situated within quaternary catchments K90E and K90F respectively, (Figure 13.2). The proposed development does not have any direct link with the estuaries associated with these systems.

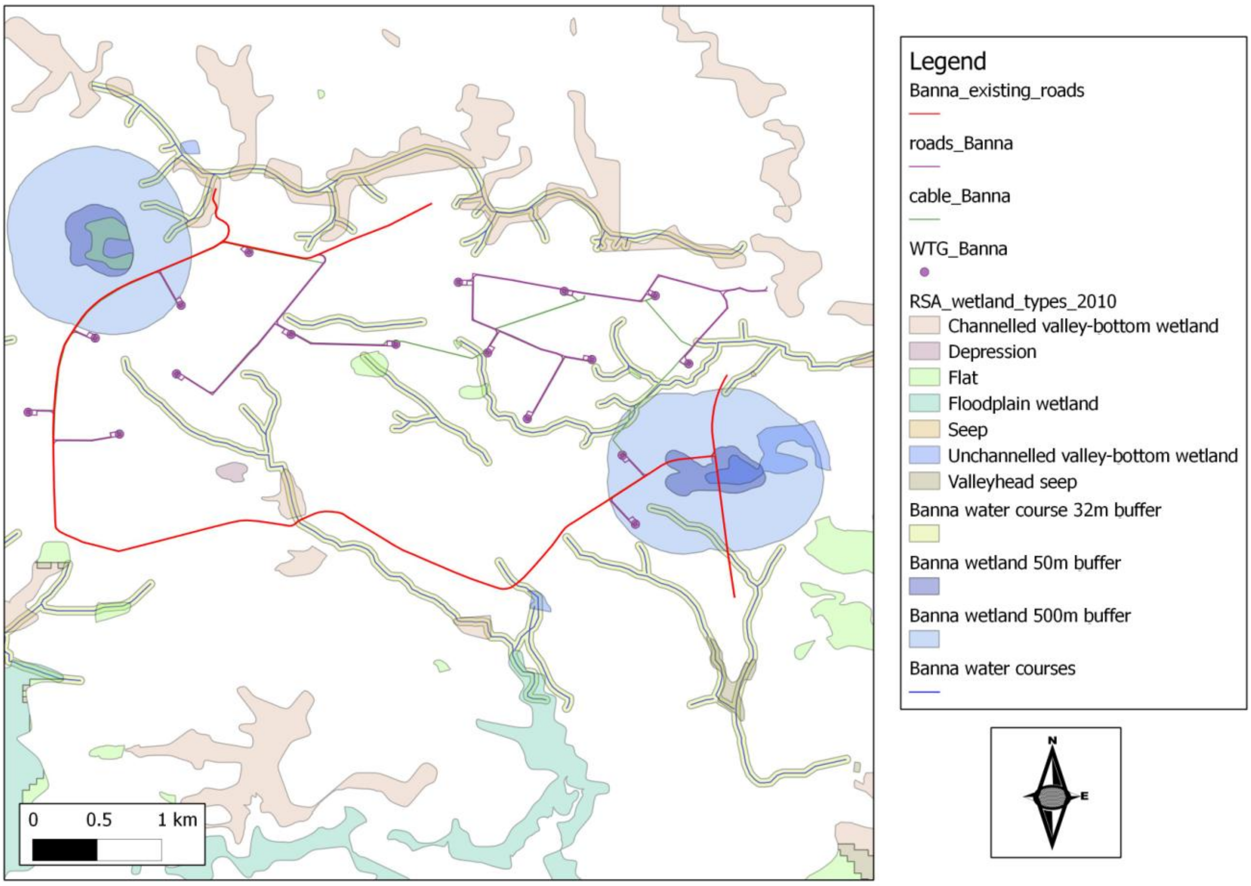


**Figure 13.3: Project locality map indicating various hydrological features within the region (Source EIA specialist report based on SANBI data)**

The project will also require the development of services (roads, bulk water, electrical and sewer reticulation) to establish this development, together with the necessary stormwater management measures. A the start of the project, the proponent intended to develop a 50 MW facility (Alternative 1), but based on a number of issues and the potential impacts on water courses and delineated wetlands, that layout would have required a higher number of Water Use License applications, i.e. new road crossings and infrastructure within 500 m of a wetland boundary. Therefore based on factors such as on-site grid connection, the wetland, agriculture and bat studies and recommendations, the preferred alternative 30.6 MW layout was developed (Figure 13. 2 and 13.3). The assessment focuses on both the preferred alternative layout of 30.6 MW and the alternative 1 layout of 50 MW (Tables 13. 5 and 13.6).

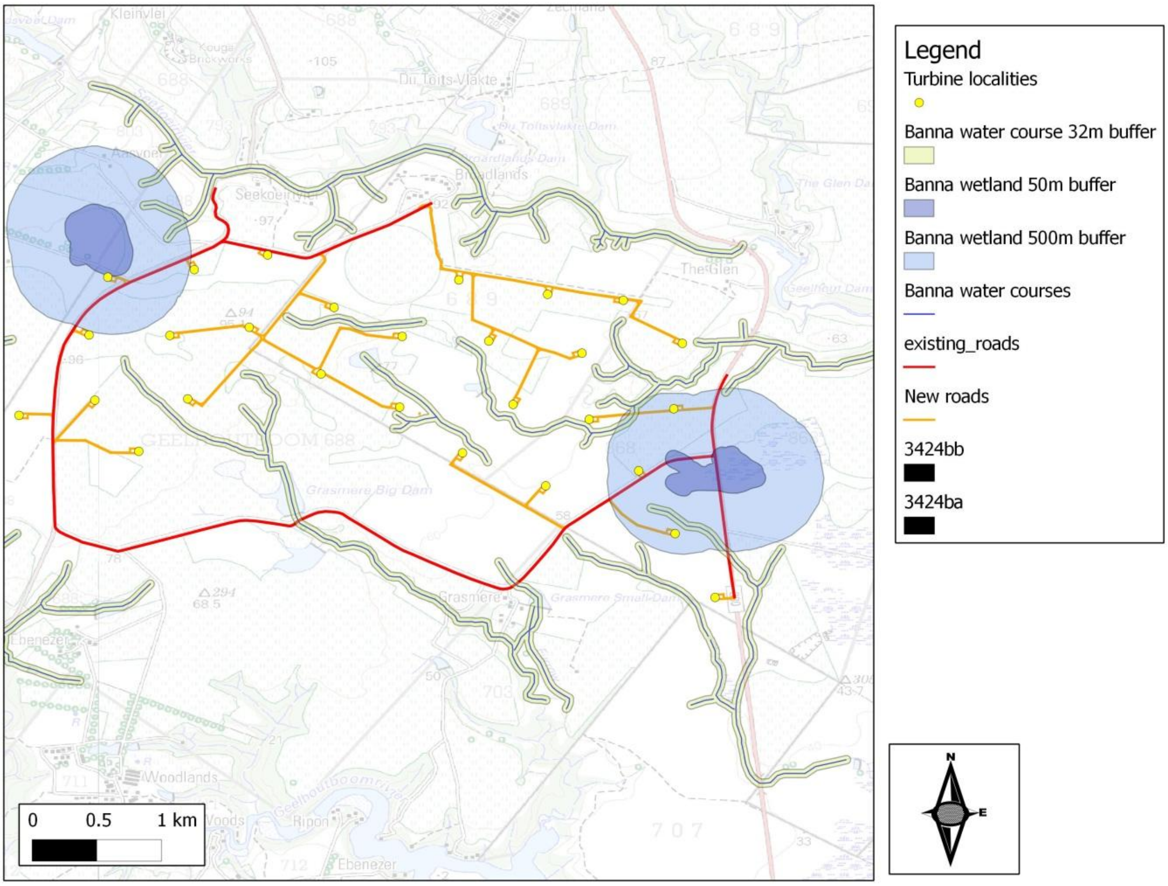


**Figure 13.4: Study site wetlands (blue) and water courses (green and grey areas) in relation to the 50MW layout (alternative)**

## 13.3 METHODS

### *13.3.1 Study terms of reference*

The terms of reference were to provide the following:

- A desktop biodiversity assessment of the study area. This would cover the development footprint in relation to available ecological information related to wetland and riverine ecosystems functioning within the region.
- A map demarcating the relevant local drainage area of the respective wetland/s, i.e. the wetland, its respective catchment and other wetland areas within a 500m radius of the study

area. This will demonstrate, from a holistic point of view the connectivity between the site and the surrounding regions, i.e. the zone of influence.

- Maps depicting demarcated wetland areas delineated to a scale of 1:10 000, following the methodology described by the Department of Water Affairs, together with a classification of delineated wetland areas. A detailed methodology is supplied in the Annexure.
- The determination of the ecological state of any wetland and riparian area, estimating their biodiversity, conservation and ecosystem importance. This will be based on the latest Present Ecological State / Ecological Importance & Sensitivity (PES/EIS) methodology being developed by DWA and SC&A for the Eastern Cape Province. Note that this determination will not include avifaunal, herpetological or invertebrate studies; however possible habitat for species of special concern would be commented on.
- Recommend buffer zones and No-go areas around any delineated wetland areas based on the relevant legislation (e.g. Eastern Cape Biodiversity Conservation Plan guidelines) or best practice judgement for those systems that are found to have ecological value, and should be retained.
- Assess the potential impacts, based on a supplied methodology
- Provide mitigations regarding project related impacts, including engineering services that could negatively affect demarcated wetland areas.
- Supply the client with geo-referenced GIS shape files of the wetland / riverine areas.
- Provide one draft report for comment, with a maximum of two rounds of comments addressed.

### *13.3.2 Study methods*

This impact assessment was initiated with a survey of the pertinent literature, past reports and the various conservation plans that exist for the study region. Maps and Geographical Information Systems (GIS) were then employed to ascertain, which portions of the proposed development, could have the greatest impact on the wetlands and associated habitats.

A one day site visit was then conducted to ground-truth the above findings, thus allowing critical comment of the development when assessing the possible impacts.

Wetland and riparian areas were then assessed on the following basis:

- Vegetation type – verification of type and its state or condition based, supported by species identification using Germishuizen and Meyer (2003), Vegmap (Mucina and Rutherford, 2006 as amended) and the South African Biodiversity Information Facility (SABIF) database.
- Plant species were further categorised as follows:
    - Terrestrial: species are not directly related to any surface or groundwater base-flows and persist solely on rainfall
    - Facultative: species usually found in wetlands (inclusive of riparian systems) (67 – 99% of occurrences), but occasionally found in terrestrial systems (non wetland) (DWAF, 2005)
    - Obligate: species that are only found within wetlands (>99% of occurrences) (DWAF, 2005)
- Assessment of the wetland type based on the NWCS method discussed below and the required buffers
- Mitigation or recommendations required

#### 13.3.2.1 National Wetland Classification System method

During this study due to the nature of the wetlands and watercourses observed, it was decided that the newly accepted National Wetlands Classification System (NWCS) be adopted. This classification approach has integrated aspects of the HGM approached used in the WET-Health system as well as the widely accepted eco-classification approach used for rivers.

The NWCS (SANBI, 2009) as stated previously, uses hydrological and geomorphological traits to distinguish the primary wetland units, i.e. direct factors that influence wetland function. Other wetland assessment techniques, such as the DWAF (2005) delineation method, only infer wetland function based on abiotic and biotic descriptors (size, soils & vegetation) stemming from the Cowardin approach (SANBI, 2009).

The classification system used in this study is thus based on SANBI (2009) and is summarised below:

The NWCS has a six tiered hierarchical structure, with four spatially nested primary levels of classification (Figure 13.5). The hierarchical system firstly distinguishes between Marine, Estuarine and Inland ecosystems (**Level 1**), based on the degree of connectivity the particular systems has with the open ocean (greater than 10 m in depth). Level 2 then categorises the regional wetland setting using a combination of biophysical attributes at the landscape level, which operate at a broad bioregional scale. This is opposed to specific attributes such as soils and vegetation. **Level 2** has adopted the following systems:

- Inshore bioregions (marine)
- Biogeographic zones (estuaries)
- Ecoregions (Inland)

**Level 3** of the NWCS assess the topographical position of inland wetlands as this factor broadly defines certain hydrological characteristics of the inland systems. Four landscape units based on topographical position are used in distinguishing between Inland systems at this level. No subsystems are recognised for Marine systems, but estuaries are grouped according to their periodicity of connection with the marine environment, as this would affect the biotic characteristics of the estuary.

**Level 4** classifies the hydrogeomorphic (HGM) units discussed earlier. The HGM units are defined as follows:

(i) Landform – shape and localised setting of wetland
(ii) Hydrological characteristics – nature of water movement into, through and out of the wetland
(iii) Hydrodynamics – the direction and strength of flow through the wetland

These factors characterise the geomorphological processes within the wetland, such as erosion and deposition, as well as the biogeochemical processes.

**Level 5** of the assessment pertains to the classification of the tidal regime within the marine and estuarine environments, while the hydrological and inundation depth classes are determined for the inland wetlands. Classes are based on frequency and depth of inundation, which are used to determine the functional unit of the wetlands and are considered secondary discriminators within the NWCS.

**Level 6** uses of six descriptors to characterise the wetland types on the basis of biophysical features. As with Level 5, these are non hierarchal in relation to each other and are applied in any order, dependent on the availability of information. The descriptors include:

(i) Geology;
(ii) Natural vs. Artificial;
(iii) Vegetation cover type;
(iv) Substratum;
(v) Salinity; and
(vi) Acidity or Alkalinity.

It should be noted that where sub-categories exist within the above descriptors, hierarchical systems are employed, thus are nested in relation to each other.

The HGM unit (Level 4) is the **focal point of the NWCS**, with the upper levels (Figure 13.6 – Inland systems only) providing means to classify the broad bio-geographical context for grouping functional wetland units at the HGM level, while the lower levels provide more descriptive detail on the particular wetland type characteristics of a particular HGM unit. Therefore Level 1 – 5 deals with functional aspects, while Level 6 classifies wetlands on structural aspects.

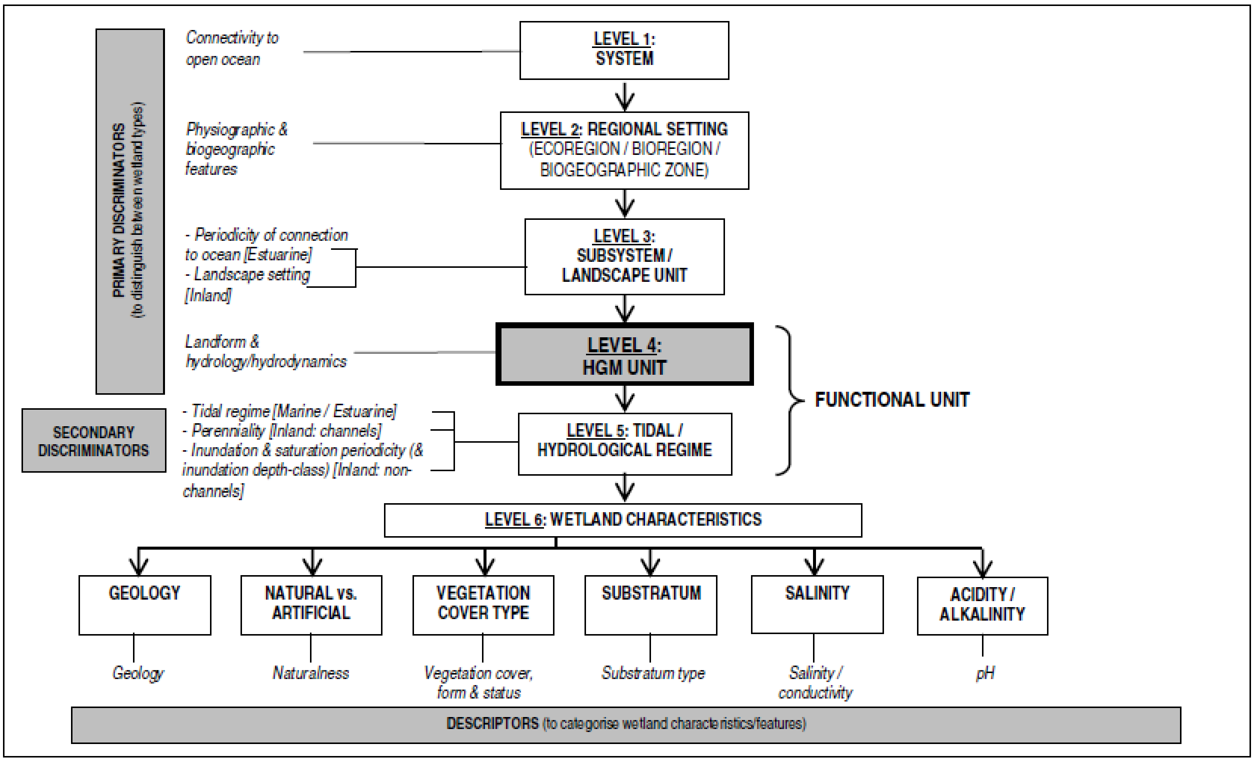


**Figure 13.5: Basic structure of the National Wetland Classification System, showing how 'primary discriminators' are applied up to Level 4 to classify Hydrogeomorphic (HGM) Units, with 'secondary discriminators' applied at Level 5 to classify the tidal/hydrological regime, and 'descriptors' applied at Level 6 to categorise the characteristics of wetlands classified up to Level 5 (From SANBI, 2009).**

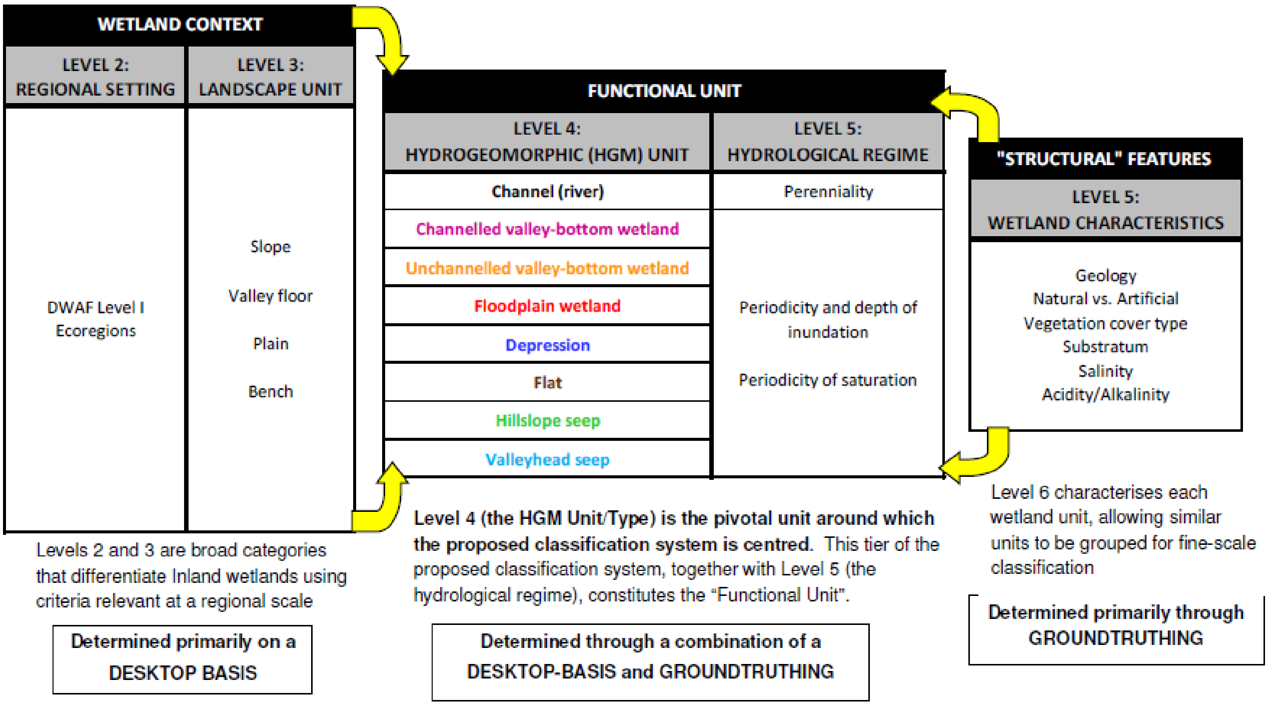


**Figure 13.6: Illustration of the conceptual relationship of HGM Units (at Level 4) with higher and lower levels (relative sizes of the boxes show the increasing spatial resolution and level of detail from the higher to the lower levels) for Inland Systems (from SANBI, 2009).**

### 13.3.2.2 Wetland condition and conservation importance assessment

To assess the Present Ecological State (PES) or condition of the observed wetlands, a modified Wetland Index of Habitat Integrity (DWAF, 2007) was used. The Wetland Index of Habitat Integrity (WETLAND-IHI) is a tool developed for use in the National Aquatic Ecosystem Health Monitoring Programme (NAEHMP), formerly known as the River Health Programme (RHP). The output scores from the WETLAND-IHI model are presented in the standard DWAF A-F ecological categories (Table 13.4), and provide a score of the Present Ecological State of the habitat integrity of the wetland system being examined. The author has included additional criteria into the model based system to include additional wetland types. This system is preferred when compared to systems such as WET-Health – wetland management series (WRC 2009), as WET-Health (Level 1) was developed with wetland rehabilitation in mind, and is not always suitable for impact assessments. This coupled to degraded state of the wetlands in the study area, a complex study approach was not warranted, i.e. conduct a Wet-Health Level 2 and WET-Ecosystems Services study required for an impact assessment.

**Table 13.4: Description of A – F ecological categories based on Kleynhans *et al*., (2005).**

| ECOLOGICAL CATEGORY | ECOLOGICAL DESCRIPTION | MANAGEMENT PERSPECTIVE |
|---|---|---|
| A | Unmodified, natural. | Protected systems; relatively untouched by human hands; no discharges or impoundments allowed |
| B | Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged. | Some human-related disturbance, but mostly of low impact potential |
| C | Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged. | **Multiple disturbances associated with need for socio-economic development, e.g. impoundment, habitat modification and water quality degradation** |
| D | Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred. | |
| E | Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive. | **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** |
| F | Critically / Extremely modified. Modifications have reached a critical level and the system has 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. | |

The WETLAND-IHI model is composed of four modules. The "Hydrology", "Geomorphology" and "Water Quality" modules all assess the contemporary ***driving processes*** behind wetland formation and maintenance. The last module, "Vegetation Alteration", provides an indication of the intensity of human landuse activities on the wetland surface itself and how these may have ***modified*** the condition of the wetland. The integration of the scores from these 4 modules provides an overall Present Ecological State (PES) score for the wetland system being examined. The WETLAND-IHI model is an MS Excel-based model, and the data required for the assessment are generated during a rapid site visit.

Additional data may be obtained from remotely sensed imagery (aerial photos; maps and/or satellite imagery) to assist with the assessment. The interface of the WETLAND-IHI has been developed in a format which is similar to DWAF's River EcoStatus models which are currently used for the assessment of PES in riverine environments.

Conservation importance of the individual wetlands was based on the following criteria:

- Habitat uniqueness
- Species of conservation concern
- Habitat fragmentation with regard ecological corridors
- Ecosystem service (social and ecological)

The presence of any or a combination of the above criteria would result in a HIGH conservation rating if the wetland was found in a near natural state (high PES). Should any of the habitats be found modified the conservation importance would rate as MEDIUM, unless a Species of conservation concern was observed (HIGH). Any systems that was highly modified (low PES) or had none of the above criteria, received a LOW conservation importance rating. Wetlands with HIGH and MEDIUM ratings should thus be excluded from development with incorporation into a suitable open space system, with the maximum possible buffer being applied. Wetlands which receive a LOW conservation importance rating could be included into stormwater management features, but should not be developed so as to retain the function of any ecological corridors.

## 13.4 RESULTS

Several aquatic systems were observed on site with the relevant delineations shown in Figure 13.7. The observed waterbodies could be divided into two broad groups, namely watercourses (drainage lines) and natural wetlands. Although man-made dams, such as those seen on site, are also construed as wetlands, these were not included in this report, so as not to create any confusion with regard the 500m wetland and development buffer and the required Section 21 Water Use License applications. This statement would be revised should any dam be used a crossing point and it were considered an important wetland area (e.g. Big Grasmere dam – Figure 13.3), although based on the current layout there is no need for any such option.

Based on the National Wetland Classification System, level 1 to 6, the observed wetland systems are typical of Inland Systems (Level 1), with no direct connection to the sea, within the South Eastern Coastal Belt Ecoregion (Level 2). All wetland areas were found either on a plain or within valley floor landscape units (Level 3), corresponding to the depression (pan) hydrogeomorphic unit (Level 4).

The study area drainage lines were associated with two main watercourses, which could be classified as headwater systems, with limited channel formation. Thus due to their position in the catchment (catchment divide plateaux), with limited surface water runoff being found within these systems and no permanent riparian (vegetation) zones were observed (Plate 1) (Level 5). These areas seem to have been wetland areas prior to the conversion of the area to agricultural production, but these areas are now reduced to small functional drainage lines.

However the two natural wetlands (depressions) contained several areas of facultative wetland vegetation, and ranged from freshwater sedges to saline soil halophytes (Figure 13.6).

Plant species associated with all wetland types found in the study area included the following facultative types, i.e. plants that occur in wetlands 60-99% of the time:

- *Ficinia lateralis*
- *Cyperus obtusiflorus var. obtusiflorus*
- *Setaria sphacelata var. sphacelata*
- *Stenotaphrum secundatum*
- *Cynodon dactylon*
- *Limonium scabrum*
- *Sarcocornia perennis*
- *Salicornia meyeriana*

No wetland protected or species of special concern (fauna & flora) were observed within the wetland areas during the site, however a large number of birds (water fowl) utilised the farm dams within the study area.


**Figure 13.7: Aerial photograph indicating the delineated aquatic systems in relation to the proposed 50m buffers**

**Plate 1: A typical representation of the natural drainage lines found within the maize fields**

**Plate 2: The salt marsh depressions found in the eastern portion of the study area**

**Plate 3: Typical halophytic (salt marsh) vegetation associated with the depressions**

#### 13.4.1.1 Present Ecological State and conservation importance

Based on the site visit results and other studies conducted in the area, the conservation importance of the respective depressions were assessed (Appendix 13.1). The Present Ecological State scores for both wetlands were C, however the saline depression (Wetland 2), was rated as having a higher conservation importance and sensitivity (HIGH). This was based on the unique geomorphological setting and plant species assemblages of this wetland, which forms part of any great network of similar wetlands within the region.

The Present Ecological State (PES) of the drainage lines were considered low due to farming related impacts (low D) and presently contribute little in terms of wetland function or conservation importance. However these should still be avoided by the development, so as to not further impact on the local hydrological regime, increasing the cumulative impacts of all the farm dams.

#### 13.4.1.2 Recommended buffers

National and provincial authorities have recommended that a 50 m buffer be used for any wetland, as recommended by the Eastern Cape Biodiversity Conservation Plan and shown in Figure 13.6. With regard the drainage lines, it is recommended that a minimum of a 32 m buffer be placed round these systems (Figure 13.6).

Figure 13.6 thus indicates the turbine localities in relation to the relevant wetland and drainage buffers showing how these have been avoided, minimising the number of Water Use Licenses applications needed. It should also be noted that several of the project components are within the prescribed 500m wetland buffers, and as such these construction activities would require a water use licence from DWA (Figure 13.6).

## 13.5 IMPACT ASSESSMENT

The impact assessment was derived from the methodology, the project description and the conceptual design layout provided by the client. These aspects were then measured against the current state and importance of the observed wetlands. Six major impacts have been highlighted and have been rated based on the direct versus indirect project actions / impacts, as well as any potential cumulative impacts during the construction and operational phases of the project. These were also assessed with and without mitigation. It should be noted that most of the impacts assessed would have a negative impact on the wetland systems, with a high degree of confidence based on the authors understanding of aquatic systems in the region and past experience from assessing similar types of proposals.

### *13.5.1 No-go option*

*Cause and comment*

Due to the current land use practices the natural wetland areas and water courses were found in a stable and functioning state, although with a limited degree of transformation due to the construction of dam walls, agricultural practices and road networks. This would not alter should the project not go ahead, but it is necessary to assess the importance of these wetlands within the overall catchment perspective.

*Significance of impact*

As there is limited conservation or management of the wetland systems within the region, it is important to retain these freshwater wetlands, to limit further habitat fragmentation between the Seekoei, and Krom rivers. If the project did not go ahead, the long-term severity of the impact without mitigation would result in a **MEDIUM** significance within the study area. With mitigation i.e. the wetlands would continue to function, providing a “stepping stone” for mobile aquatic species found in the localised region, the significance of the impact would be reduced to **LOW** (Table 13.5). This is particularly true for the saline endorheic pans, which seems to be unique to the region.

*Mitigation and management*

The present land owners should be encouraged to reduce present land use activities in such close proximity to the drainage lines as well as not escalate farm stocking densities or increase the number of dams or water abstraction sites within the study area.

*Reversibility of impact and irreplaceable loss of resources*

As no impacts would result from the proposed project in this option, this portion of the assessment is not applicable. However a significant amount of effort would be required to rehabilitate the water courses within the study area to revert the present day degradation.

### *13.5.2 Assessment of impacts and identification of management actions*

The criteria for the assessment of impacts are fully explained in the Chapter 4 of this report.

Both alternative layouts were assessed in the Wetland and Aquatic Impact Assessment. The impact assessments are provided in Table 13.5 (Preferred Alternative of 30.6 MW) and Table 13.6 (Alternative 1 of 50 MW) below. Due to the nature of the impacts and the current state of the water courses in the study area both of the proposed alternatives would have similar potential impacts on the aquatic environment. However due to the consolidated nature of the preferred alternative (30.6 MW), the potential impacts would present a lower risk, as well as reduce the number of Water Use License Applications required.

**Table 13.5: Impact assessment (Preferred Alternative of 30.6 MW)**

| Nature of impact | Status (Negative or positive | Extent | Duration | Intensity | Probability | Significance (no mitigation) | Mitigation or management Action | Significance (with mitigation) | Confidence level | Reversibility of impact | Irreplaceable loss of resources |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **NO-GO OPTION** | | | | | | | | | | | |
| Proposed project does not proceed | Neutral | Localised | Long-term | Low | Improbable | Medium | Current land use is altered and wetlands and streams are left unchanged | Low | High | N/A | N/A |
| **CONSTRUCTION PHASE** | | | | | | | | | | | |
| **Physical destruction of aquatic habitat** | | | | | | | | | | | |
| Removal of aquatic habitats due to road construction or installation of services (cables) | Negative | Localised | Permanent | Low | Definite | Medium | The proposed layout should keep the number of watercourse crossings to a minimum. Should new crossings be required, large hard engineered surfaces should be level with natural ground, when observed in cross section. | Low | High | Moderate | Low |
| **Loss of wetland habitat, ecosystem services and biodiversity services** | | | | | | | | | | | |
| Removal of aquatic habitats due to road construction or installation of services (cables) | Negative | Localised | Permanent | Low | Improbable | Medium | Wetland areas, together with a buffer are of 50 m and water courses with a 32 m buffer should be excluded from the development | Low | High | High | Low |
| **Loss of species of special concern** | | | | | | | | | | | |
| Destruction of vegetation | Negative | Regional | Permanent | High | Probable | High | No true wetland species of concern were observed and | Low | High | High | Low |

| Nature of impact | Status (Negative or positive | Extent | Duration | Intensity | Probability | Significance (no mitigation) | Mitigation or management Action | Significance (with mitigation) | Confidence level | Reversibility of impact | Irreplaceable loss of resources |
|---|---|---|---|---|---|---|---|---|---|---|---|
| and habitats | | | | | | | these areas should be avoided | | | | |
| **Habitat fragmentation – loss of ecological corridors** | | | | | | | | | | | |
| Construction of roads and related linear infrastructure | Negative | Localised | Permanent | Low | Improbable | Medium | Wetland areas, together with a buffer are of 50 m and water courses with a 32 m buffer should be excluded from the development | Low | High | High | Low |
| **Sedimentation and erosion** | | | | | | | | | | | |
| Increase in surface flow volumes / velocities | Negative | Localised | Permanent | Low | Probable | Medium | Limit the amount of hard surfaces and provide effective stormwater management | Low | High | High | Low |
| **OPERATIONAL PHASE** | | | | | | | | | | | |
| **Loss of wetland habitat, ecosystem services and biodiversity services** | | | | | | | | | | | |
| Further loss of wetland habitat due to changes in the local hydrological regime (stormwater control and or abstraction) | Negative | Localised | Permanent | Low | Improbable | Medium | Limit the amount of hard surfaces and provide effective stormwater management | Low | High | Moderate | Low |

| Nature of impact | Status (Negative or positive | Extent | Duration | Intensity | Probability | Significance (no mitigation) | Mitigation or management Action | Significance (with mitigation) | Confidence level | Reversibility of impact | Irreplaceable loss of resources |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Loss of species of special concern** | | | | | | | | | | | |
| Long term alteration in habitats due to operations (stormwater control and or water abstraction) | Negative | Localised | Permanent | Low | Improbable | Medium | Limit the amount of hard surfaces and provide effective stormwater management | Low | High | High | Low |
| **Habitat fragmentation – loss of ecological corridors** | | | | | | | | | | | |
| Long term alteration in habitats due to operations (stormwater control and or water abstraction) | Negative | Localised | Permanent | Low | Improbable | Medium | Limit the amount of hard surfaces and provide effective stormwater management | Low | High | High | Low |
| **Sedimentation and erosion** | | | | | | | | | | | |
| Long term alteration in habitats due to operations (stormwater control and or water abstraction) | Negative | Localised | Permanent | Low | Probable | Medium | Limit the amount of hard surfaces and provide effective stormwater management | Low | High | High | Low |

**Table 13.6: Impact assessment (Alternative 1 of 50 MW)**

| Nature of impact | Status (Negative or positive | Extent | Duration | Intensity | Probability | Significance (no mitigation) | Mitigation or management Action | Significance (with mitigation) | Confidence level | Reversibility of impact | Irreplaceable loss of resources |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **NO-GO OPTION** | | | | | | | | | | | |
| Proposed project does not proceed | Neutral | Localised | Long-term | Low | Improbable | Medium | Current land use is altered and wetlands and streams are left unchanged | Low | High | N/A | N/A |
| **CONSTRUCTION PHASE** | | | | | | | | | | | |
| **Physical destruction of aquatic habitat** | | | | | | | | | | | |
| Removal of aquatic habitats due to road construction or installation of services (cables) | Negative | Localised | Permanent | Low | Definite | Medium | The proposed layout should keep the number of watercourse crossings to a minimum. Should new crossings be required, large hard engineered surfaces should be level with natural ground, when observed in cross section. | Low | High | Moderate | Low |
| **Loss of wetland habitat, ecosystem services and biodiversity services** | | | | | | | | | | | |
| Removal of aquatic habitats due to road construction or installation of services (cables) | Negative | Localised | Permanent | Low | Improbable | Medium | Wetland areas, together with a buffer are of 50m and water courses with a 32m buffer should be excluded from the development | Low | High | High | Low |

| Nature of impact | Status (Negative or positive | Extent | Duration | Intensity | Probability | Significance (no mitigation) | Mitigation or management Action | Significance (with mitigation) | Confidence level | Reversibility of impact | Irreplaceable loss of resources |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Loss of species of special concern** | | | | | | | | | | | |
| Destruction of vegetation and habitats | Negative | Regional | Permanent | High | Probable | High | No true wetland species of concern were observed and these areas should be avoided | Low | High | High | Low |
| **Habitat fragmentation – loss of ecological corridors** | | | | | | | | | | | |
| Construction of roads and related linear infrastructure | Negative | Localised | Permanent | Low | Improbable | Medium | Wetland areas, together with a buffer are of 50m and water courses with a 32m buffer should be excluded from the development | Low | High | High | Low |
| **Sedimentation and erosion** | | | | | | | | | | | |
| Increase in surface flow volumes / velocities | Negative | Localised | Permanent | Low | Probable | Medium | Limit the amount of hard surfaces and provide effective stormwater management | Low | High | High | Low |
| **OPERATIONAL PHASE** | | | | | | | | | | | |
| **Loss of wetland habitat, ecosystem services and biodiversity services** | | | | | | | | | | | |
| Further loss of wetland habitat due to changes in the local hydrological regime (stormwater control and or abstraction) | Negative | Localised | Permanent | Low | Improbable | Medium | Limit the amount of hard surfaces and provide effective stormwater management | Low | High | Moderate | Low |

| Nature of impact | Status (Negative or positive | Extent | Duration | Intensity | Probability | Significance (no mitigation) | Mitigation or management Action | Significance (with mitigation) | Confidence level | Reversibility of impact | Irreplaceable loss of resources |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Loss of species of special concern** | | | | | | | | | | | |
| Long term alteration in habitats due to operations (stormwater control and or water abstraction) | Negative | Localised | Permanent | Low | Improbable | Medium | Limit the amount of hard surfaces and provide effective stormwater management | Low | High | High | Low |
| **Habitat fragmentation – loss of ecological corridors** | | | | | | | | | | | |
| Long term alteration in habitats due to operations (stormwater control and or water abstraction) | Negative | Localised | Permanent | Low | Improbable | Medium | Limit the amount of hard surfaces and provide effective stormwater management | Low | High | High | Low |
| **Sedimentation and erosion** | | | | | | | | | | | |
| Long term alteration in habitats due to operations (stormwater control and or water abstraction) | Negative | Localised | Permanent | Low | Probable | Medium | Limit the amount of hard surfaces and provide effective stormwater management | Low | High | High | Low |

### 13.5.3 Physical destruction of aquatic habitat

*Cause and comment*

The project footprint, with or without mitigation would result in no loss of any wetland or aquatic habitat within the study area, and the present layout design should be accepted (Figure 13.6). The only direct impacts would result from the **upgrading** of the present road network. Although new roads will be required these have been placed outside the 32 m buffer of any water courses, with the exception of one new crossing (near turbine 17), that will be placed within a drainage line that is already been highly impacted by farming activities and other road networks.

*Significance of impact*

The proposed layout will make use of existing road networks. Regardless, due to the nature of the aquatic systems, and the overall avoidance of the sensitive wetland areas, the overall significance rating without mitigation (Table 13.5) would be **MEDIUM**. With mitigation to overall significance would be reduced to **LOW**, as no significant wetland or aquatic habitat would be lost during the construction phase. No operational phase impacts are anticipated.

*Reversibility of impact and irreplaceable loss of resources*

As some impact will occur during the construction phase within the water courses, a degree of irreplaceable resource loss is anticipated, this is however negligible (Low) and is easily reversed with a Moderate amount of effort.

*Mitigation and management*

Roads should be constructed with permeable surfaces with the correct stormwater management structures in place. The only required crossing should be a concrete drift, which would allow any surfaces flows to run directly over the rod surface not creating any obstruction. This would minimise the need for a high degree of construction disturbance, while limiting the potential hydrological impacts, i.e. minimise the need for large erosion / stabilisation structures together within any of the required embankments needed for the installation of culverts.

A further legal requirement (National Water Act) that no stormwater be discharged directly into natural watercourses and any stormwater run-off is captured / managed on site to reduce the downstream effect of pollutants and the potential for flooding. This is particularly important due to the site, although not directly linked, being upstream of two estuarine systems. Grass swales are ideal in this scenario, as stormwater management features and are easily created due to the nature of the surrounding soils and geology.

The new structures being placed within 500 m of the wetland areas, although posing a low risk to the aquatic environment, would require a water use license.

#### 13.5.3.1 Loss of wetland habitat function, ecosystem services and associated biodiversity

*Cause and comment*

This impact is linked to the physical disturbance of the wetland or aquatic areas and would affect basic habitat function and ecosystem services such as surface flow attenuation (Water quantity issue) and surface flow filtration (Water quality risk of surface water / groundwater pollution). Potential impacts posed by the development would be similar during both the construction and operational phases, due to the relationship between wetland / aquatic system disturbance (without mitigation) and the loss in the provision of ecosystem services (e.g. flood attenuation or biodiversity maintenance). Linked to this impact is the possible alteration of the habitats due to the potential changes in the local hydrology, i.e. increased flow of surface water flow due to stormwater management brought about by roads or hard surfaces.

*Significance of impact*

As none of the wetlands would be lost due to the proposed layout of the development, all of the above wetland attributes would be retained. Therefore, due to the small size and seasonality of these wetlands, the overall impact intensity would be low within the region. The overall impact significance would be rated as **MEDIUM** (negative) without mitigation and **LOW** with mitigation in the long-term (Table 13.5).

*Reversibility of impact and irreplaceable loss of resources*

If the mitigations are upheld, then no direct impacts are anticipated, thus the reversibility of the impact would be High, and the irreplaceable loss of resources would be Low.

*Mitigation and management*

As described for the previous impact, it is advised that no wetlands should be impacted upon, while limiting the need for large engineered surfaces within close proximity to these areas.

#### 13.5.3.2 Loss of species of special concern

*Cause and comment*

Loss of wetlands or river systems could possibly result in the loss of species of special concern within the habitats as a result of their destruction during the construction phase. Changes in the hydrological region in the operational phase, could limit the presence of these species, should surface water flows be diverted or an over abstraction of water should occur. This would then limit the potential formation of the required habitats (fauna and flora).

However, no wetland flora and fauna species of special concern were evident during the study within the wetland or water course areas, due to the intensity of farm found in the study area. As a precautionary step, it is important that all wetland areas are retained and allowed to function, as a number of protected terrestrial plant species listed by the Provincial Nature Conservation Ordinance do occur within the region.

*Significance of impact*

The impact would be **HIGH** without mitigation, while with mitigation (avoidance of these areas) the impact would be **LOW** (Table13. 5).

*Reversibility of impact and irreplaceable loss of resources*

If the mitigations are upheld, then no direct impacts are anticipated, thus the reversibility of the impact would be High, and the irreplaceable loss of resources would be Low.

*Mitigation and management*

It was advised that all wetland areas with a buffer of 50 m and water courses including a 32 m buffer be excluded from the development footprint and that existing roads be used. This was subsequently carried out by the proponent to further minimise any risk to the aquatic environment.

During the operational phase, surface water flows should not be diverted or impeded, as well as over abstracted (inclusive of groundwater). This will prevent future changes in the hydrological regime that supports habitats and the associated species.

#### 13.5.3.3 Habitat fragmentation – loss of ecological corridors

*Cause and comment*

This impact would be categorised as a cumulative impact both in the construction and operational phase, as it would impact on the region with regard habitat fragmentation. The permanent loss of any freshwater systems between the Krom and Seekoei rivers would be seen as habitat fragmentation. The majority of mobile aquatic organisms require “stepping stones” to leap frog between their required habitats.

*Significance of impact*

Due to the current land use practices within the area, a degree of habitat fragmentation (agricultural production, fences and dam walls) has already occurred within the site. Should the project go ahead without mitigation, possible fragmentation would continue. The significance of this impact would however be **MEDIUM** in the long-term, due to the small wetlands areas observed. Should the wetlands and water courses remain un-affected by way of mitigation, then overall significance would be **LOW** (Table 13.5).

*Reversibility of impact and irreplaceable loss of resources*

If the mitigations are upheld, then no direct impacts are anticipated, thus the reversibility of the impact would be High, and the irreplaceable loss of resources would be Low.

*Mitigation and management*

It is advised that all wetlands, together with a minimum of the respective buffers that have been advised, and responsible stormwater management plans are implemented, i.e. during the operational phase, surface water flows should not be diverted or impeded. Then future changes in the hydrological regime will be prevented.

#### 13.5.3.4 Sedimentation and erosion

*Cause and comment*

This impact would be also categorised as a cumulative impact, as it would impact on the region with regard potential changes to downstream habitat quality. The increase in any surface water flow velocities within the site would then increase the risk of soil erosion and later downstream sedimentation. Should sediments eventually reach the downstream systems, this could have impacts on sediments loads, but also smother benthic habitats (plants and invertebrates).

*Significance of impact*

The significance of this impact would however be **MEDIUM**, due to the scale and locality of the operations in the construction phase as well as during the operational phase. Should surface water run-off be managed, in way of mitigation, using a stormwater management plan, then overall significance would be **LOW** for the construction and operations phase (Table 3.5).

*Reversibility of impact and irreplaceable loss of resources*

If the mitigations are upheld, then no direct impacts are anticipated, thus the reversibility of the impact would be **High**, and the irreplaceable loss of resources would be **Low.**

*Mitigation and management*

During construction, erosions should be monitored while areas of vegetation are being cleared. Hard engineered surfaces that increase surface water run-off should be limited and a stormwater management plan should be created for the development for the operations phase.

## 13.6 CONCLUSION AND RECOMMENDATIONS

This study has assessed a number of aquatic ecosystems, which were mostly characterised as wetlands or ephemeral drainage lines. The wetlands perform an important role in attenuating surface water flows, while providing a series of differing wetland habitats, which form part of a wetland network within the region.

It would therefore seem based on the site visit and information contained in the specialist ecological report in, that the impacts assessed for the aquatic systems after mitigation, would be **LOW**. This is dependent on the proposed recommendations, contained in that report and in this study being upheld. This project would thus present a **LOW risk to the aquatic environment**.

The crossing and any new structures being placed within 500m of the wetland areas or 32 m from any water course, although posing a low risk to the aquatic environment, would require approximately 8 Section 21 c & I water use license applications. This process will however be taken forward with the Department of Water Affairs and the layout and technical details will be assessed with regard the potential impacts by this department. Should DWA then feel that the applications pose a great risk to the aquatic environment, and then they may request that the layout be altered.

Further recommendations and monitoring guidelines include:

- Stormwater should be managed using suitable structures such as swales, gabions and rock rip-wrap so that any run-off from the development site is attenuated prior to discharge. Silt and sedimentation should be kept to a minimum, through the use of the above mentioned structures by also ensuring that all structures don't create any form of erosion.
- Vegetation clearing should occur in parallel with the construction progress to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment.
- Only indigenous plant species must be used in the re-vegetation process. The species list mentioned in this and terrestrial vegetation study should be used a guide
- All construction materials including fuels and oil should be stored in demarcated areas that are contained within berms / bunds to avoid spread of any contamination into wetland or rivers. Washing and cleaning of equipment should also be done in berms or bunds, in order to trap any cement and prevent excessive soil erosion. These sites must be re-vegetated after construction has been completed. Mechanical plant and bowsers must not be refuelled or serviced within or directly adjacent to any river channel. It is therefore suggested that all construction camps, lay down areas, batching plants or areas and any stores should be more than 50m from any demarcated wetland or riverine area
- It is also advised that an Environmental Control Officer, with a good understanding of the local flora be appointed during the construction phase. The ECO should be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas, using selected species detailed in this and the terrestrial vegetation report. All alien plant re-growth must be monitored and should it occur these plants should be eradicated. Where any works (e.g. storm water control measures) near a wetland or river is required specific attention should be paid to the immediate re-vegetation of cleared areas to prevent future erosion of sedimentation issues.
- All relevant buffers mentioned in this report should be included into future designs and later engineering diagrams.

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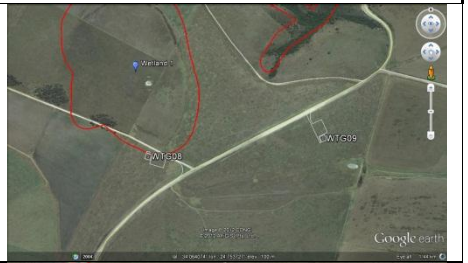
# Appendix 13.1: Results of IHI classification, condition and conservation importance assessment.

| Wetland # | Wetland type (HGM Unit Level 4 B-D) | Inundation periodicity (Level 5) | Dominant hydrodynamics | Condition (Present Ecological State Score) | Sensitivity & Conservation importance | Comment | Aerial photo |
|---|---|---|---|---|---|---|---|
| 1 | Endorheic Depression without channel inflow | Intermittent | Vertical & bidirectional | C | Medium | Grassy depression containing hygrophilous species |  |
| 2 | un-channelled river valley | Intermittent | Vertical & bidirectional | C | HIGH | Halophytic depression within channel forming a unique catchment within the region |  |

# Appendix 13.2: Specialist report details

This report has been prepared as per the requirements of the Environmental Impact Assessment Regulations and the National Environmental Management Act (Act 107 of 1998), any subsequent amendments and any relevant National and / or Provincial Policies related to biodiversity assessments.

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I, **Dr. Brian Michael Colloty** declare that this report has been prepared independently of any influence or prejudice as may be specified by the National Department of Environmental Affairs

Signed:… ……………… Date:…14 September 2012…………

| | |
|---|---|
| Document Title: | Banna Ba Bifu Wetland and Aquatic Impact Assessment |
| For: | WKN Windcurrent SA (Pty) Ltd |
| Author: | Dr Brian Colloty |
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