# Camden I Solar, Wind and Hydrogen/Ammonia Energy Projects

# EIA PHASE AQUATIC IMPACT ASSESSMENT

**FOR**

**ENERTRAG South Africa (Pty) Ltd**

**BY**


**EnviroSci (Pty) Ltd**

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## DATE

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**REVISION** 1

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**ACRONYMS**

| | |
|---|---|
| BESS | Battery Energy Storage System |
| CARA | Conservation of Agricultural Resources Act |
| CBA | Critical Biodiversity Area |
| CSIR | Council for Scientific and Industrial Research |
| DFFE | Department of Forestry, Fisheries and Environment |
| DWAF | Department of Water Affairs and Forestry, now DWS |
| DWS | Department of Water and Sanitation formerly the Department of Water Affairs (DWA) |
| EA | Environmental Authorisation |
| EIA | Environmental Impact Assessment |
| EIS | Ecological Importance and Sensitivity |
| ESA | Ecological Support Area |
| GA | General Authorisation (WUA type) |
| GIS | Geographic Information System |
| HGM | Hydrogeomorphic |
| IHI | Integrated Habitat Index |
| IUCN | International Union of Conservation of Nature |
| NAEMP | *National Aquatic* Ecological Monitoring Program |
| NEMA | National Environmental Management Act (Act 107 of 1998). |
| NFEPA | National Freshwater Ecosystem Priority Atlas (Nel *et al*., 2011). |
| NWA | National Water Act (Act 36 of 1998) |
| NWCS | National Wetland Classification System |
| O&M | Operations and Maintenance |
| OHL | Overhead Line – transmission line cable that is not buried |
| ORC | Off Road Cable – underground or overhead transmission cable not within a road reserve |
| PES | Present Ecological State |
| PV | Photovoltaic |
| SANBI | South African National Biodiversity Institute |
| SCC | Species of Special Concern |
| SQ | Subquaternary Catchment |
| ToR | Terms of Reference |
| WRC | Water Research Commission |
| WUA | Water Use Authorisation |
| WUL | Water Use License |
| WULA | Water Use License Application |

**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. This also includes the minimum requirements as stipulated in the National Water Act (Act 36 of 1998), as amended in Water Use Licence Application and Appeals Regulations, 2017 Government Notice R267 in Government Gazette 40713 dated 24 March 2017, which includes the minimum requirements for a Wetland Delineation/ Aquatic Report.

**Report prepared by**: Dr. Brian Colloty Pr.Sci.Nat. (Ecology) / Member SAEIES and Wetland Society of South Africa.

**Expertise / Field of Study**: BSc (Hons) Zoology, MSc Botany (Rivers), Ph.D Botany Conservation Importance rating, and has worked as an independent consulting specialist from 1996 to present.

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 and or Department of Water and Sanitation

Signed:… ………………………………………… Date:…24 May 2022…………

**NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) AND ENVIRONMENTAL IMPACT REGULATIONS, 2014 (AS AMENDED) - REQUIREMENTS FOR SPECIALIST REPORTS (APPENDIX 6)**

| Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6 | Section of Report |
|---|---|
| 1. (1) A specialist report prepared in terms of these Regulations must contain-<br>a) details of-<br>i. the specialist who prepared the report; and<br>ii. the expertise of that specialist to compile a specialist report including a curriculum vitae; | Appendix 1 CV |
| b) a declaration that the specialist is independent in a form as may be specified by the competent authority; | Attached to Report |
| c) an indication of the scope of, and the purpose for which, the report was prepared; | Section 2 of this report |
| (cA) an indication of the quality and age of base data used for the specialist report; | Section 1 & 5 |
| (cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change; | Section 6, 7, & 8 |
| d) the date and season of the site investigation and the relevance of the season to the outcome of the assessment; | Section 1 5 |
| e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used; | Section 4 |
| f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives; | Section 7 |
| g) an identification of any areas to be avoided, including buffers; | Section 7 |
| h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers; | Section 7 & 8 |
| i) a description of any assumptions made and any uncertainties or gaps in knowledge; | Section 1.2 |
| j) a description of the findings and potential implications of such findings on the impact of the proposed activity, (including identified alternatives on the environment) or activities; | Section 5 -9 |
| k) any mitigation measures for inclusion in the EMPr; | Section 5 - 9 |
| l) any conditions for inclusion in the environmental authorisation; | Section 9 |

| | |
|---|---|
| m) any monitoring requirements for inclusion in the EMPr or environmental authorisation; | Section 8 |
| n) a reasoned opinion-<br>i. (as to) whether the proposed activity, activities or portions thereof should be authorised;<br>(iA) regarding the acceptability of the proposed activity or activities; and<br>ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan; | Section 9 |
| o) a description of any consultation process that was undertaken during the course of preparing the specialist report; | N/A |
| p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and | N/A |
| q) any other information requested by the competent authority. | N/A |
| 2) Where a government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply. | Yes - Appendix 2 |

# 1 Introduction

ENERTRAG South Africa (Pty) Ltd via separate SPVs, proposes to establish a wind, solar and green hydrogen and ammonia facilities on the following Farms; Mooiplaats 290 Portion 14, Uitkomst 292 Portions 2 and 10, Klipfontein 442 Portions 0, 1 and 3, Langverwacht 293 Portion 3, Welgelegen 322 Portions 1 and 2 and Klipbank 295 Portion 3, adjacent the Camden Power Station, in the Gert Sibande District Municipality, Mpumalanga Province. These projects will also include the establishment of various substations and grid connections, also assessed in this report.

ENERTRAG South Africa (Pty) Ltd ("the proponent") has appointed EnviroSci (Pty) Ltd to conduct an aquatic assessment for the proposed project. This being the EIA Phase Assessment of the properties (Figure 1) in question, thus assessing the potential impacts of the projects and to determine if the various No-Go areas provided in the initial phases of the project have been avoided and to provide additional mitigations as needed in this phase of the assessment. This is in line with comments received from both MDARDLEA and DFFE, in that in this assessment the latest layout is now being assessed against the receiving environment, after several design iterations have passed to minimise or avoid any impacts within the aquatic environment. This will then be followed up with a micrositing exercise once the final engineering designs are developed. The final determination of the actual crossing points coordinates will then be available, which is required by DWS in the Water Use Authorisation process, based on the final / exact footprint.

The regulatory requirements are also discussed with regard the National Water Act and NEMA in Section 4 of this report. While The PROTOCOL FOR SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR THE ENVIRONMENTAL IMPACTS ON AQUATIC BIODIVERSITY (Government Gazette 43110, 20 March 2020), superseding the Appendix 6 NEMA requirements, was also adhered to. This report thus meets the criteria to fulfil a Specialist Assessment Report as portions of the proposed development are located near areas rated as ***Very High*** sensitivity as per the DFFE Screening Tool (See Screening Verification Statement – Appendix 2).

The site is situated in the Eastern Highveld Grassland and Amersfoort Highveld Clay Grassland vegetation units, along the banks of unknown tributaries of the Vaal River. The Eastern Highveld Grassland is listed as a Threatened Ecosystem under NEMA.

The area is characterised by rolling hills and valleys, interspersed with pans / depressions that are located in the higher lying portions of the catchment areas. The study area has however been transformed by mining, road / rail networks and agriculture, thus it is important to identify any remaining aquatic and wetland features that still contain value within the landscape.

The findings of this report were supported by baseline data collected over several site visits spanning a number of years, for other mining and rail network expansion projects, coupled to a 6 day of site specific visit (August 2020 & March 2021). This assessment adheres to criteria contained in the DWAF 2005 / 2008 delineation manuals and the Wetland / Riverine Classification System. The site specific survey was conducted in winter (August 2020), and will be followed up with a summer survey (March 2021) that to collected more species related info for plants / animals, especially for those that may be listed or protected.

Several important national and provincial scale conservation plans were also considered, with the results of those studies where relevant being included in this report. Most conservation plans are produced at a high level, so it is important to verify or ground truth the actual status of the study area. Groundtruthing of aquatic resources in the project area was also important as the information was critical for the identification and mapping of important habitat where protected or endangered species are known to occur within the region.

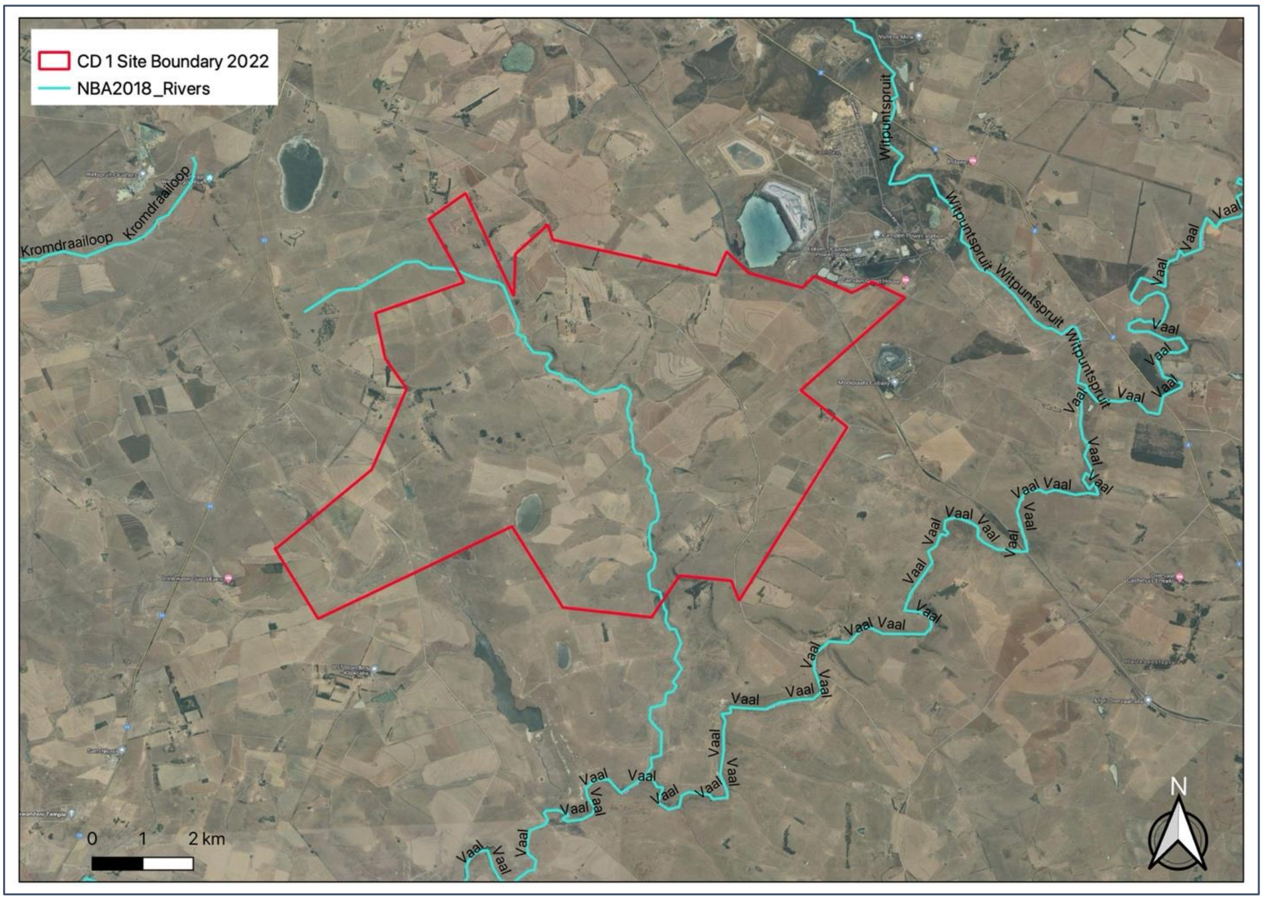

**Figure 1: The site boundary in relation to the surrounding mainstem Vaal River**

## 1.1 Aims and objectives

The aim of this report is to provide a summary of the aquatic baseline and identify any No-Go areas as well as conduct an impact assessment of the layouts being proposed. The report also makes recommendations with regard to further management and mitigation, to further reduce, avoid or mitigate the potential impacts and ultimately ensure the responsible and sustainable use of South Africa's aquatic resources.

Certain aspects of the development could trigger the need for Section 21, Water Use License Applications (WULAs) (or general authorisation [GA] applications) such as river crossings or any activities within 500m of a wetland or 100m of a watercourse. Once the final layout receives Environmental Authorisation, these applications must then be submitted to the Department of Water and Sanitation (DWS).

Information regarding the state and function of the observed water bodies, including suitable no-go buffers areas were also provided.

## 1.2 Assumptions and Limitations

To obtain a comprehensive understanding of the dynamics of both the flora and fauna of communities within a study site, 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 through replication. However, due to time constraints these long-term studies are not feasible and are thus mostly based on instantaneous sampling.

Therefore, due to the scope of the work presented in this report, a long-term investigation of the proposed site was not possible and as such not perceived as part of the Terms of Reference – EIA Phase. However, a concerted effort was made to sample and assess as much of the potential site, as well as make use of any supporting literature, species distribution data and aerial photography. This limitation is common to many impact assessment type studies, but the findings are deemed adequate for the purposes of decision-making support regarding project acceptability in this Phase, unless otherwise stated.

It should be emphasised that information, as presented in this document, only has reference to the study area as indicated on the accompanying maps inclusive of any of the associated accesses, pipelines and grid corridors. Therefore, this information cannot be applied to any other area without detailed investigation.

# 2 Terms of Reference

The proposed methods used in this assessment have been developed with the renewable industry in mind, coupled to the minimum requirements stipulated by DFFE and the Department of Water and Sanitation. These have been successful in assessing the direct, indirect and cumulative impacts of 165 renewable energy projects (2010 – 2022), of which 18 have been constructed.

Specific reference with regard the Mpumalanga Department: Agriculture, Rural Development, Land and Environmental Affairs, minimum requirements for Biodiversity Assessment, but for the purposes of defining project layouts, the following was adhered to as supplied by the client for the EIA phase (this report):

**Scoping phase (COMPLETED)**

The Consultant shall undertake a surface water and aquatic biodiversity site sensitivity screening that will include the following:

- Desktop analysis
- Site investigation (comprehensive enough to inform both phases)
- Compilation of one draft and one final site screening / sensitivity report for the project which adheres to the following (this list is not exhaustive):
    - The Initial Site Sensitivity Verification reporting requirements for environmental themes set out in Government Gazette No. 43110 which was promulgated on 20 March 2020 in terms of section 24(5)(a) and (h) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA).
    - Identification and mapping of any discrepancies with the environmental sensitivity as identified on the national web based environmental screening tool.
    - Identification of sensitive areas to be avoided (including corresponding spatial data) and the determination of the respective buffers (if applicable) for each site.
- Initial recommendations for the layout and allowable development footprint from a surface water and aquatic biodiversity perspective (including corresponding spatial data).
- Recommendations regarding the scope and timeframe for further assessment.

**EIA phase (This report)**

- Identified and assessed the potential impacts of the proposed project using the revised project layout and description, based on a supplied impact assessment methodology , including cumulative impacts and for construction, operation and decommissioning phases. Also assess the potential impact of the “no go” alternative.
- Provided recommendations and mitigations regarding project related impacts for inclusion into the Environmental Management Program (EMPr).
- Supplied the client with geo-referenced GIS shape files of the wetland / riverine areas and associated buffers to be used in the finalisation of the project layout and management of the project going forward.

# 3 Relevant legislation, policy and permit requirements

The following is pertinent to this study:

- Section 24 of The Constitution of the Republic of South Africa (1996);
- Agenda 21 – Action plan for sustainable development of the Department of Environmental Affairs and Tourism (DEAT) 1998;
- 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);
- Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002);
- National Forest Act (No. 84 of 1998); and
- National Heritage Resources Act (No. 25 of 1999) – could apply if cultural use or heritage is linked to any aquatic resources

NEMA and the CARA identify and categorise invasive plants together with associated obligations on the land owner. Several Category 1 & 2 invasive plants were observed in several areas of the site under investigation.

Based on an assessment of the proposed activities (Table 1) and past engagement with DWS, the following Water Use Authorisations may be required based on the following thresholds as listed in the following Government Notices, however ultimately the Department of Water and Sanitation (DWS) must determine if a General Authorisation (GA) or full WULA will be required during the pre-application process as it relates to the following, bearing in mind that this will only be conducted once a final project scope is known:

- **DWS Notice 538 of 2016, 2 September in GG 40243**– Section 21 a water uses relating to the Abstraction of water, where water is abstracted from a watercourse or groundwater as defined in the Act.
- **Government Notice 509 in GG 40229 of 26 August 2016 –** Section 21 c & I water uses relating to the Impeding or diverting the flow of water in a watercourse and or altering the bed, banks, course or characteristics of a watercourse.
- **Government Notice 665, 6 September 2013 in GG 36820** Section 21g relating to disposing of waste in a manner that may detrimentally impact on a water source which includes temporary storage of domestic wastewater i.e. conservancy tanks under Section 37 of the notice.

**Table 1: Water Use Activities**

| | Water Use Activity | Applicable to this development proposal |
|---|---|---|
| S21(a) | Taking water from a water resource | Yes, if water is abstracted from new and or existing boreholes or from a watercourse or dam (surface water) as defined in the National Water Act. |
| S21(b) | Storing water | Only if water is stored within a channel dam. The use of tanks and reservoirs is thus advised as these don't require a license if filled with water that is already licensed. |
| S21(c) | Impeding or diverting the flow of water in a watercourse | If any works (permanent or temporary) are located within a watercourse or within 500m of a wetland boundary or 100m from a water course then a GA process can potentially be followed if the DWS Risk Assessment Matrix indicates that all impacts with mitigation are LOW. Where the DWS Risk Assessment Matrix indicates risks of Moderate or greater, a Water Use Licence process is required. |
| S21(d) | Engaging in a stream flow reduction activity | Not applicable |
| S21(e) | Engaging in a controlled activity | Not applicable |
| S21(f) | Discharging waste or water containing waste into a water resource through a pipe, canal, sewer or other conduit | Not applicable |
| S21(g) | Disposing of waste in a manner which may detrimentally impact on a water resource | Typically, the conservancy tanks at construction camps and then O/M buildings require a license (GA if volumes are below 5000 $m^3$) under GNR 1091, 6 September 2013 |
| S21(h) | Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process | Not applicable |
| S21(i) | Altering the bed, banks, course or characteristics of a watercourse | If any works (permanent or temporary) are located within a watercourse or within 500m of a wetland boundary or 100m from a water course then a GA process can potentially be followed if the DWS Risk Assessment Matrix indicates that all impacts with mitigation are LOW. Where the DWS Risk Assessment Matrix indicates risks of Moderate or greater, a Water Use Licence process is required. |

| | Water Use Activity | Applicable to this development proposal |
|---|---|---|
| S21(j) | Removing, discharging or disposing of water found underground for the continuation of an activity or for the safety of persons | Not applicable |
| S21(k) | Using water for recreational purposes | Not applicable |

### 3.1 Wetland and riverine buffer policy

Currently there are no formalised riverine or wetland buffer distances provided by the provincial authorities and as such the buffer model as described Macfarlane & Bredin (2017) for wetlands, rivers and estuaries was used.

These buffer models are based on the condition of the waterbody, the state of the remainder of the site, coupled to the type of development, as wells as the proposed alteration of hydrological flows. Based then on the information known for the site the buffer model provided the following:

Riverine Floodplains with Riparian Vegetation or wetland areas

- Construction period: 95 m
- Operation period: 80 m
- Final: 95 m

Valley Bottom Wetlands (channelled and Unchanneled)

- Construction period: 65 m
- Operation period: 56 m
- Final: 65 m

Endorheic Pans / Depressions

- Construction period: 105 m
- Operation period: 80 m
- Final: 105 m

Seep wetlands

- Construction period: 58 m
- Operation period: 62 m
- Final: 62 m

Minor watercourse with no wetland / riparian zones

- Construction period: 35 m
- Operation period: 24 m
- Final: 35 m

Artificial dams / mining voids or workings were not buffered.

Note that during consultation in the Scoping phase the local environmental authorities (i.e. MTPA) recommended that all wetlands be buffered by 100m, which was then incorporated into the layout designs.

# 4 Methodology

This study followed the approaches of several national guidelines with regards to wetland assessment. These have been modified by the author, to provide a relevant mechanism of assessing the present state of the study area aquatic systems, applicable to the specific environment and, in a clear and objective manner, identify and assess the potential impacts associated with the proposed development site based on information collected within the relevant farm portions.

Current water resource classification systems make use of the Hydrogeomorphic (HGM) approach, and for this reason, the National Wetland Classification System (NWCS) approach will be used in this study. This has been defined in the report Classification Systems for Wetlands and other Aquatic Ecosystems in South Africa (Ollis *et al*., 2013).

It is also important to understand the legal definition of a wetland, the means of assessing wetland conservation and importance and also the relevant legislation aimed at protecting wetlands. These aspects will be discussed in greater depth in this section of the report, as they form the basis of the study approach to assessing wetland impacts.

For reference the following definitions are as follows:

- **Drainage line**: A drainage line is a lower category or order of watercourse that does not have a clearly defined bed or bank. It carries water only during or immediately after periods of heavy rainfall i.e. non-perennial, and riparian vegetation may not be present.
- **Perennial and non-perennial:** Perennial systems contain flow or standing water for all or a large proportion of any given year, while non-perennial systems are episodic or ephemeral and thus contains flows for short periods, such as a few hours or days in the case of drainage lines.
- **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).
- **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).
- **Water course**: as per the National Water Act means -

(a) a river or spring;

(b) a natural channel in which water flows regularly or intermittently;

(c) a wetland, lake or dam into which, or from which, water flows; and

(d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks

### 4.1 Waterbody classification systems

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. **Coupled to this was the inclusion of other criteria within the classification systems to differentiate between river, riparian and wetland systems, as well as natural versus artificial waterbodies.**

The South African National Biodiversity Institute (SANBI) in collaboration with several specialists and stakeholders developed the newly revised and now accepted National Wetland Classification Systems (NWCS) (Ollis *et al*., 2013). 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 (Ollis *et al*., 2013).

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 the wetland classifications 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. All 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 and Sanitation (DWS). The Ecological Reserve of a wetland or river is used by DWS to assess the water resource allocations when assessing WULAs

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 or any other activity that qualifies as a water use.

**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.

### 4.2 Wetland definition

Although the National Wetland Classification System (NWCS) (Ollis *et al*., 2013) is used to classify wetland types it is still necessary to understand the definition of a wetland. 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 as the 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 (Ollis *et al*., 2013):

*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 latter as a watercourse (Ollis *et al*., 2013). Table 1 below provides a comparison of the various wetlands included within the main sources of wetland definitions 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 NWA, 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 (Ollis *et al.*, 2013).

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 50 cm 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 and rivers.*

**Table 2: Comparison of ecosystems considered to be 'wetlands' as defined by the proposed NWCS, the NWA and ecosystems 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 described 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[3] areas that are not permanently / periodically inundated or saturated with water within 50 cm of the surface | NO | NO | YES[3] |

*[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 and would be considered riparian wetlands, as 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.*

### 4.3 National Wetland Classification System method

Due to the nature of the wetlands and watercourses observed, it was determined that the accepted NWCS should be adopted. This classification approach has integrated aspects of the HGM approach used in the WET-Health system as well as the widely accepted eco-classification approach used for rivers.

The NWCS (Ollis *et al*., 2013) 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 (Ollis *et al.,* 2013).

The classification system used in this study is thus based on Ollis *et al*. (2013) and is summarised below:

The NWCS has a six-tiered hierarchical structure, with four spatially nested primary levels of classification (Figure 2). The hierarchical system firstly distinguishes between Marine, Estuarine and Inland ecosystems (**Level 1**), based on the degree of connectivity the particular system 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:

- Landform – shape and localised setting of wetland
- Hydrological characteristics – nature of water movement into, through and out of the wetland
- 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 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 six descriptors to characterise the wetland types based on 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:

- Geology;
- Natural vs. Artificial;
- Vegetation cover type;
- Substratum;
- Salinity; and
- Acidity or Alkalinity

It should be noted that where sub-categories exist within the above descriptors, hierarchical systems are employed, and these are thus nested in relation to each other.
The HGM unit (Level 4) is the focal point of the NWCS, with the upper levels (Figure 3 Figure – 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.

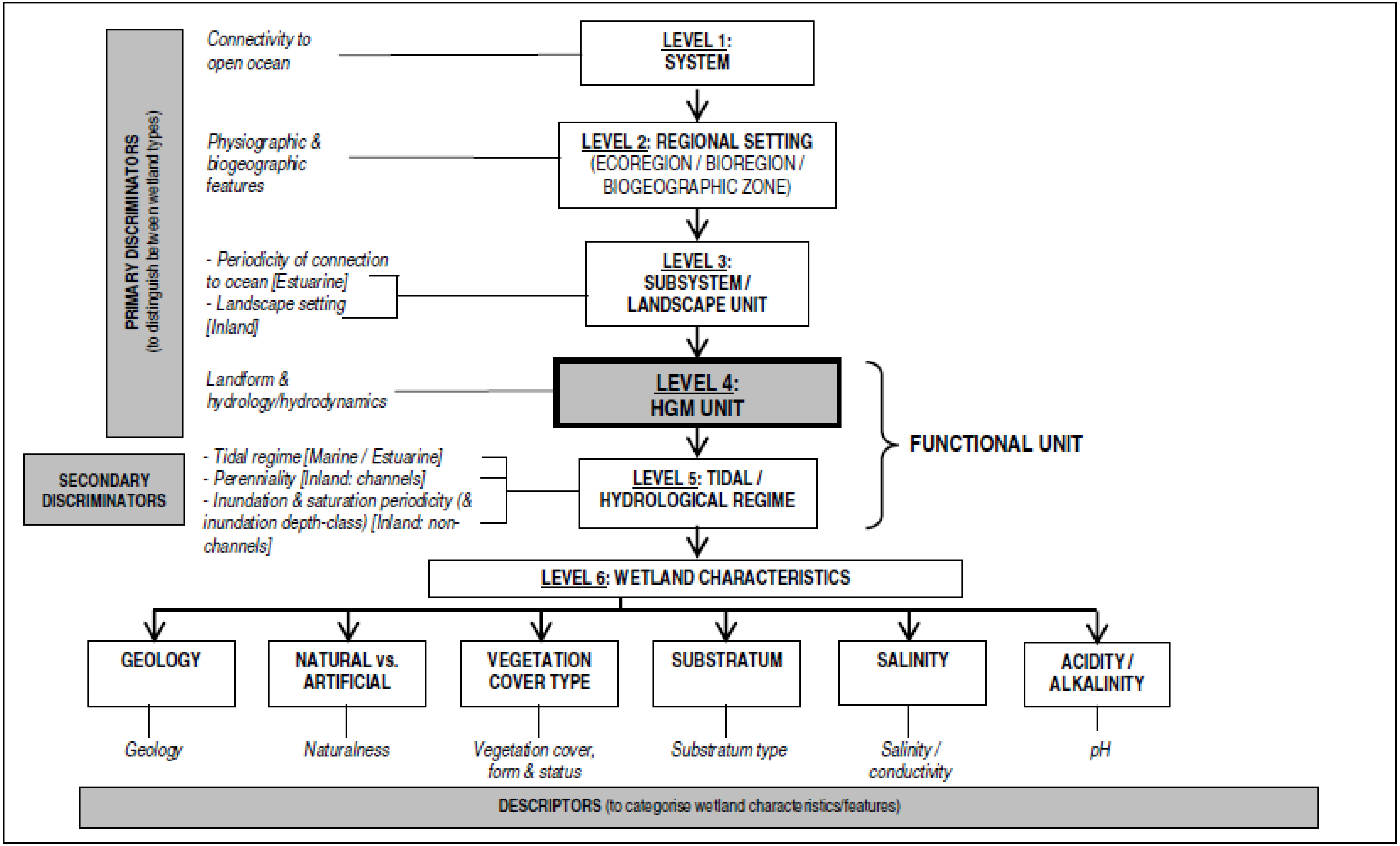


**Figure 2: Basic structure of the NWCS, showing how 'primary discriminators' are applied up to Level 4 to classify Hydrogeomorphic (HGM) Units, with 'secondary discriminators' applied at Level 5 to classify the tidal/hydrological regime, and 'descriptors' applied**

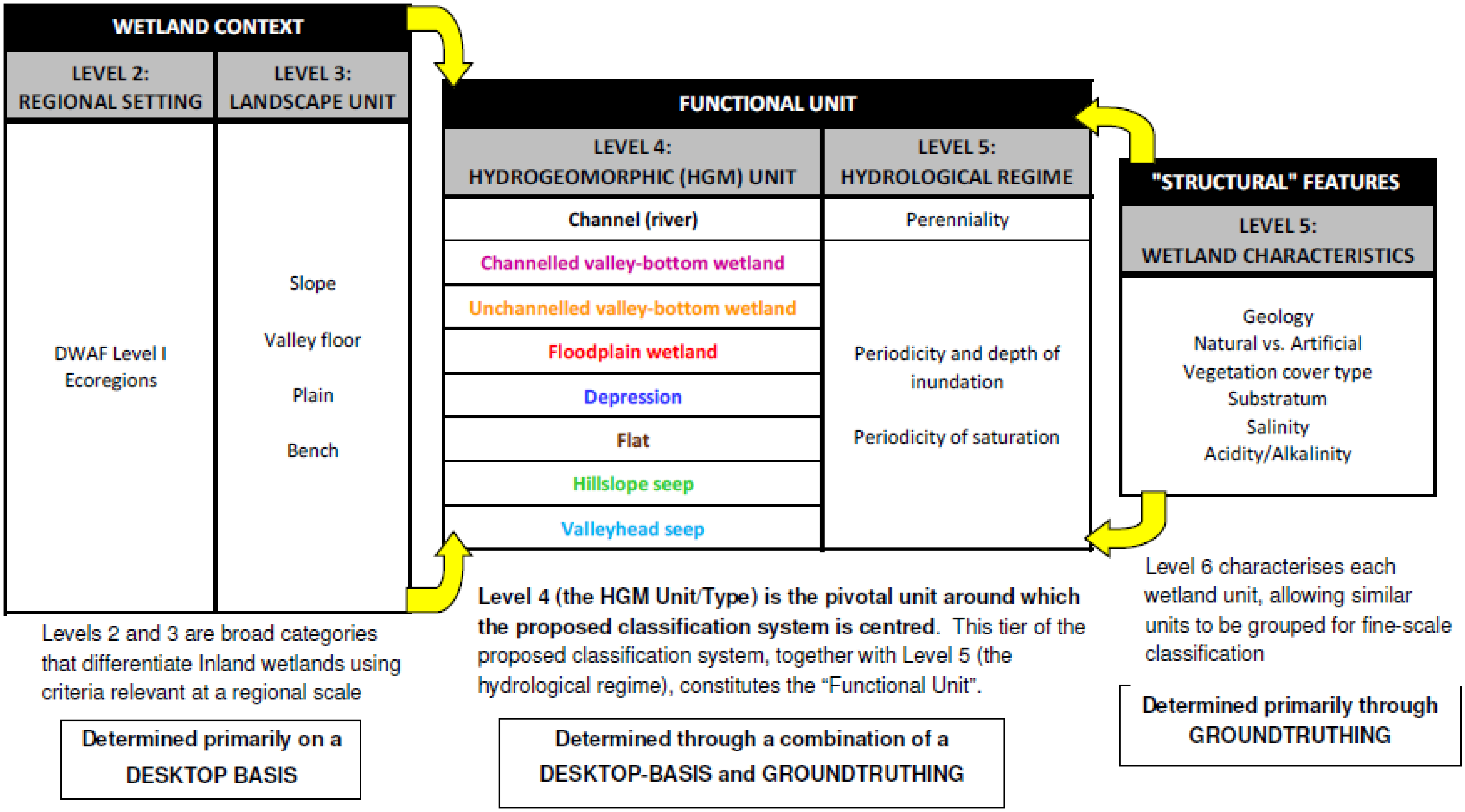


**Figure 3: Illustration of the conceptual relationship of HGM Units (at Level 4) with higher and lower levels (relative sizes of the boxes show the increasing spatial resolution and level of detail from the higher to the lower levels) for Inland Systems (from Ollis *et al*., 2013)**

### 4.4 Waterbody condition

To assess the 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 ) and provide a score of the PES 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 with the degraded state of the wetlands in the study area, indicated that 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 3: 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 land use 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 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 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 DWA's River EcoStatus models which are currently used for the assessment of PES in riverine environments.

### 4.5 Aquatic ecosystem 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:

- 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.

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  below 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 4: Summary of direct and indirect ecoservices provided by wetlands from Kotze *et al*., 2008**

<table>
<tr><td rowspan="14">Ecosystem services supplied by wetlands</td><td rowspan="8">Indirect benefits</td><td rowspan="7">Hydro-geochemical benefits</td><td colspan="2">Flood attenuation</td></tr>
<tr><td colspan="2">Stream flow regulation</td></tr>
<tr><td rowspan="5">Water quality enhancement benefits</td><td>Sediment trapping</td></tr>
<tr><td>Phosphate assimilation</td></tr>
<tr><td>Nitrate assimilation</td></tr>
<tr><td>Toxicant assimilation</td></tr>
<tr><td>Erosion control</td></tr>
<tr><td colspan="2">Carbon storage</td></tr>
<tr><td colspan="3">Biodiversity maintenance</td></tr>
<tr><td rowspan="6">Direct benefits</td><td colspan="3">Provision of water for human use</td></tr>
<tr><td colspan="3">Provision of harvestable resources[2]</td></tr>
<tr><td colspan="3">Provision of cultivated foods</td></tr>
<tr><td colspan="3">Cultural significance</td></tr>
<tr><td colspan="3">Tourism and recreation</td></tr>
<tr><td colspan="3">Education and research</td></tr>
</table>

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

- Habitat uniqueness;
- Species of conservation concern;
- Habitat fragmentation or rather, continuity or intactness with regards to ecological corridors; and
- 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 (SCC) was observed, in which case it would receive a HIGH rating. Any system 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. Natural wetlands or Wetlands that resemble some form of the past landscape but receive a LOW conservation importance rating could be included into stormwater management features and should not be developed to retain the function of any ecological corridors.

# 5 Description of the affected environment

The study area was dominated by a variety of aquatic features associated with catchments and rivers, and were characterised as follows as per their respective Hydrogeomorphic classes:

- Mainstem Rivers: Floodplain dominated systems with oxbow wetlands (Plate 1). A few reaches did contain very narrow riparian zones, consisting mostly of a single row of willow trees associated with the unknown tributary of the Vaal River
- Valley Bottom Wetlands (Channelled and Unchannelled) (Plate 2)
- Endorheic pans (Plate 3)
- Seep wetlands (Plate 4)
- One minor watercourses (Plate 5) , that was previously part of a wetland systems, but now contains severe head cut and has eroded into a channel / watercourse.

Notably, most of the aquatic features and unknown tributary of the Vaal River within the study area are located within the riverine valleys and upper catchment areas (pans) within the C11B Quinary Catchment (Vaal River) of the Highveld Ecoregion in the Vaal Water Management Area (Figure 4).

The Department of Environment Fisheries and Forestry identified the aquatic environment for the study area as having a Very High Sensitivity, based on the fact the following criteria are present within the site or the associated catchment, namely:

- Presence of Wetlands
- Aquatic Critical Biodiversity Areas (CBA)
- Freshwater Ecosystem Priority Area quinary catchments (NFEPA)
- Wetland clusters
- Eastern Highveld Grassland a listed Threatened Ecosystem under NEMA.

The presence of these Very High Sensitivity features, although to a finer mapping scale were confirmed during this assessment (See Appendix 2 for Verification Statement).

The study area is however not located within an International Bird Area (IBA) or a Strategic Water Resource Area.

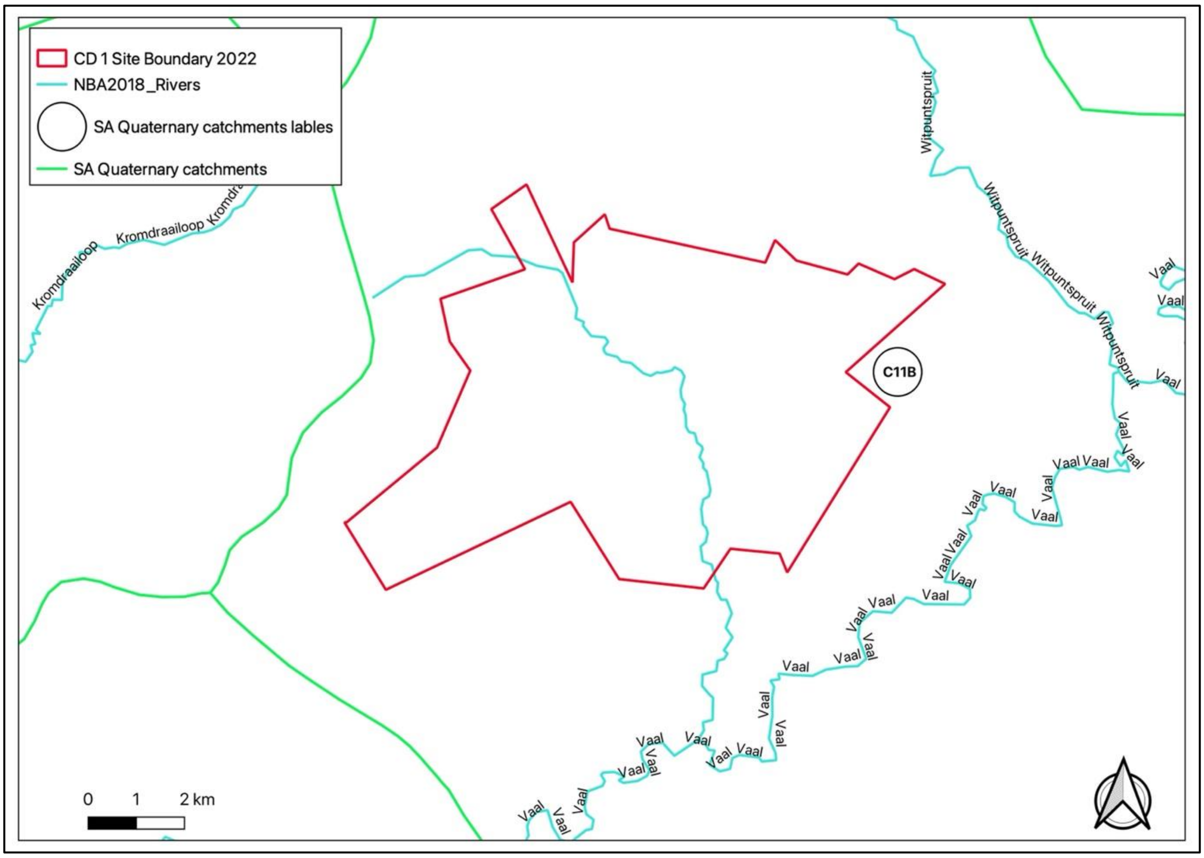


**Figure 4: Project locality map indicating the various quaternary catchments and mainstem rivers (Source DWS and NGI) within the study area boundary**

**Plate 1: Wetlands associated with the unknown tributary that bisects the study area**

**Plate 2: Channelled Valley Bottom wetland**

**Plate 3: Endorheic Pan, one of three such large systems within the study area**

**Plate 4: A medium sized seep wetland within the central portion of the site**

**Plate 5: A view of a minor water course, with a view of an earth wall farm dam upstream**

The ground-truthed delineations were then compared to current wetland inventories (Figure 5) (van Deventer *et al*., 2020), 1: 50 000 topocadastral surveys mapping data and the site observations. These inventories include wetland spatial data based on landcover 2007 data, previous assessments and wetland information retained by the Provincial authorities, combined into one database that formed part of the updated National Spatial Biodiversity Assessment, 2018.

A baseline map was then developed and refined using the August 2020 and March 2021 survey data, noting that due to the complex nature of the topography and geology, the features were digitised at a scale of 1:4000 (Figure 6).

Coupled to the aquatic delineations, information was collected on potential species that could occur within the wetlands and water courses, especially any areas that would contain open water for long periods and or conservation worthy species (Listed or Protected). For the most part those that were observed are terrestrial in nature and thus listed in the ecological report.

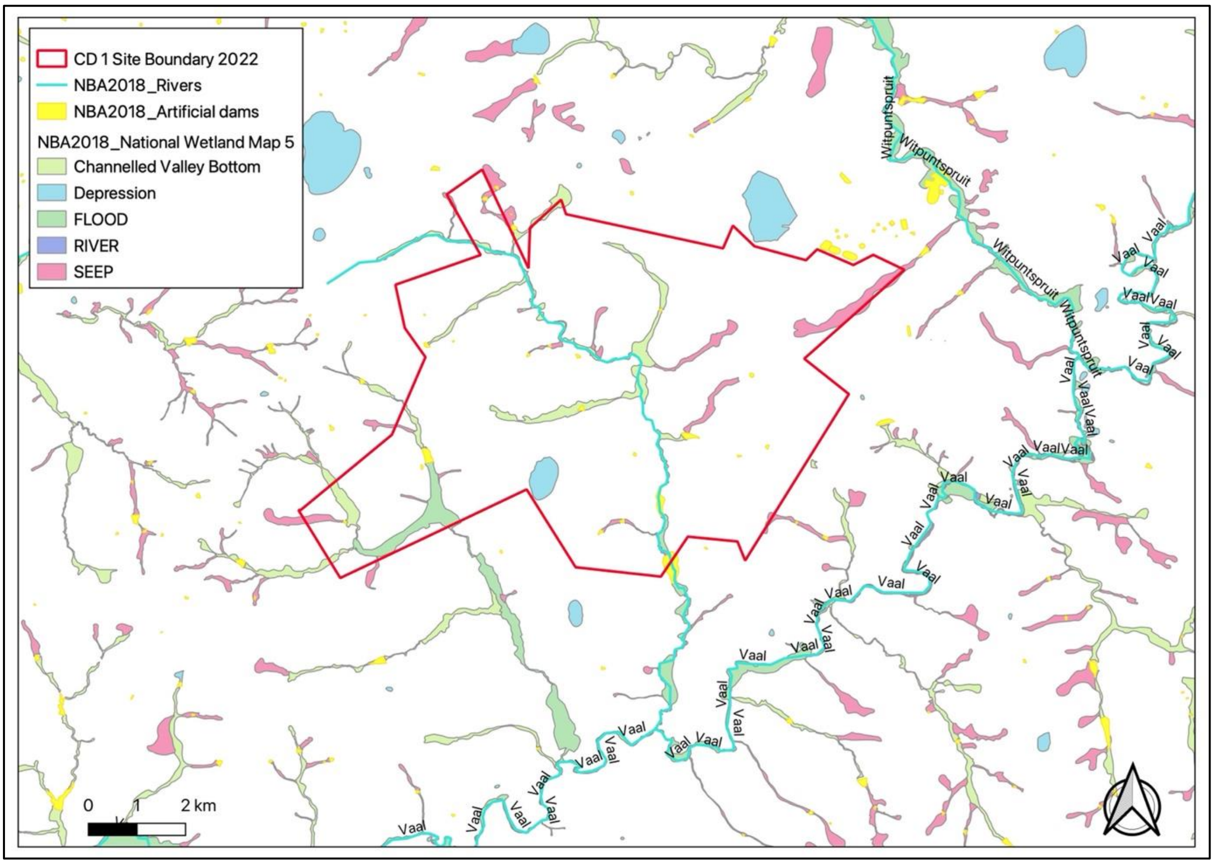


**Figure 5: National Wetland Inventory wetlands and waterbodies (van Deventer *et al.*, 2020)**

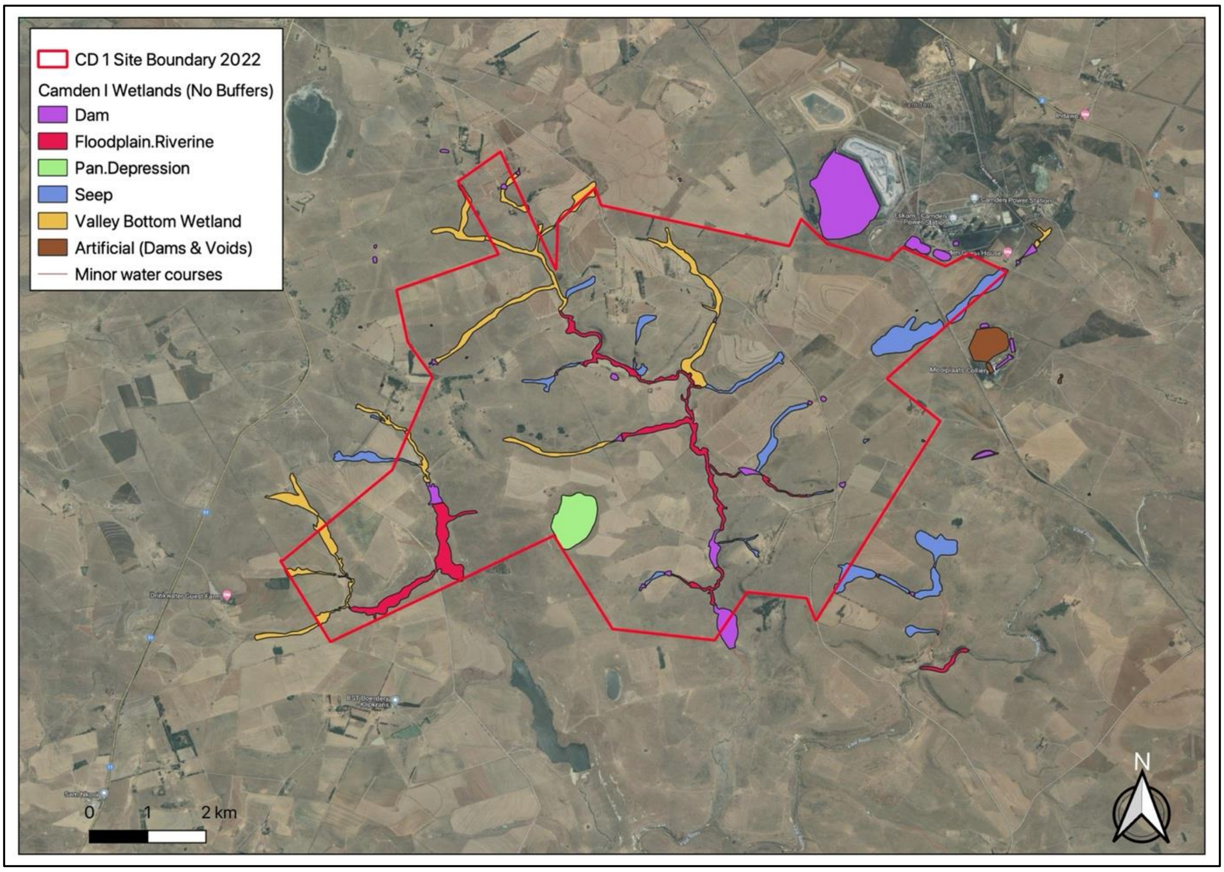


**Figure 6: Wetlands delineated in this assessment based on groundtruthing information collected**

# 6 Present Ecological State and conservation importance

The Present Ecological State (PES) of a river, watercourse or wetland represents the extent to which it has changed from the reference or near pristine condition (Category A) towards a highly impacted system where there has been an extensive loss of natural habit and biota, as well as ecosystem functioning (Category E).

The PES scores have been revised for the country and based on the new models, aspects of functional importance as well as direct and indirect impacts have been included (DWS, 2014). The new PES system incorporates Ecological Importance (EI) and Ecological Sensitivity (ES) separately as opposed to Ecological Importance and Sensitivity (EIS) in the old model, although the new model is still heavily centred on rating rivers using broad fish, invertebrate, riparian vegetation and water quality indicators. The Recommended Ecological Category (REC) is still contained within the new models, with the default REC being B, when little or no information is available to assess the system or when only one of the above-mentioned parameters are assessed or the overall PES is rated between a C or D.

All of the systems assessed by DWS (2014) on a Subquaternary level within the study area were rated as PES = C or Moderately Modified and PES = D or Largely Modified. While these were also rated as High in terms of Ecological Sensitivity and Ecological Importance respectively.

Based on the information collected during the field investigations, these ratings are verified and upheld for the riverine / wetland systems. The natural wetlands were however rated independently and achieved PES scores of C and D, while the EIS was rated as HIGH. The High EIS rating for both natural water courses and wetlands, is further substantiated by the fact that the affected catchments are included in both the National

Freshwater Priority Atlas and the provincial Biodiversity Spatial Plan Critical Biodiversity Area spatial layers (Figure 7 and 8). These areas are also highlighted as important ecological support areas along the Vaal River.

Overall, these catchment areas and subsequent rivers / watercourses are largely functional with localised impacts in some areas, which include the following:

- Erosion and sedimentation associated with road crossings;
- Impeded water flow due to several in channel farm dams; and
- Sedimentation and scour of channels due to undersized culverts within present day road crossings.

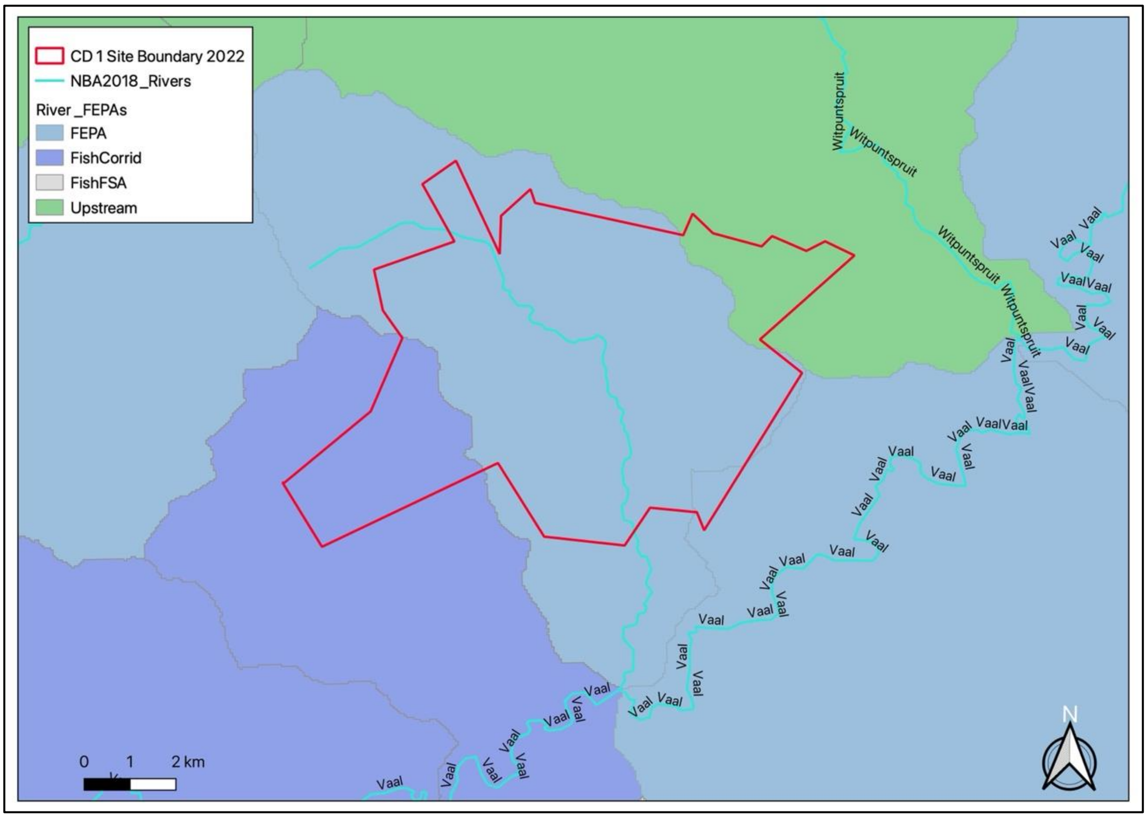


**Figure 7: The Freshwater Ecosystem Priority Areas for the study site (Nel *et al,* 2011)**

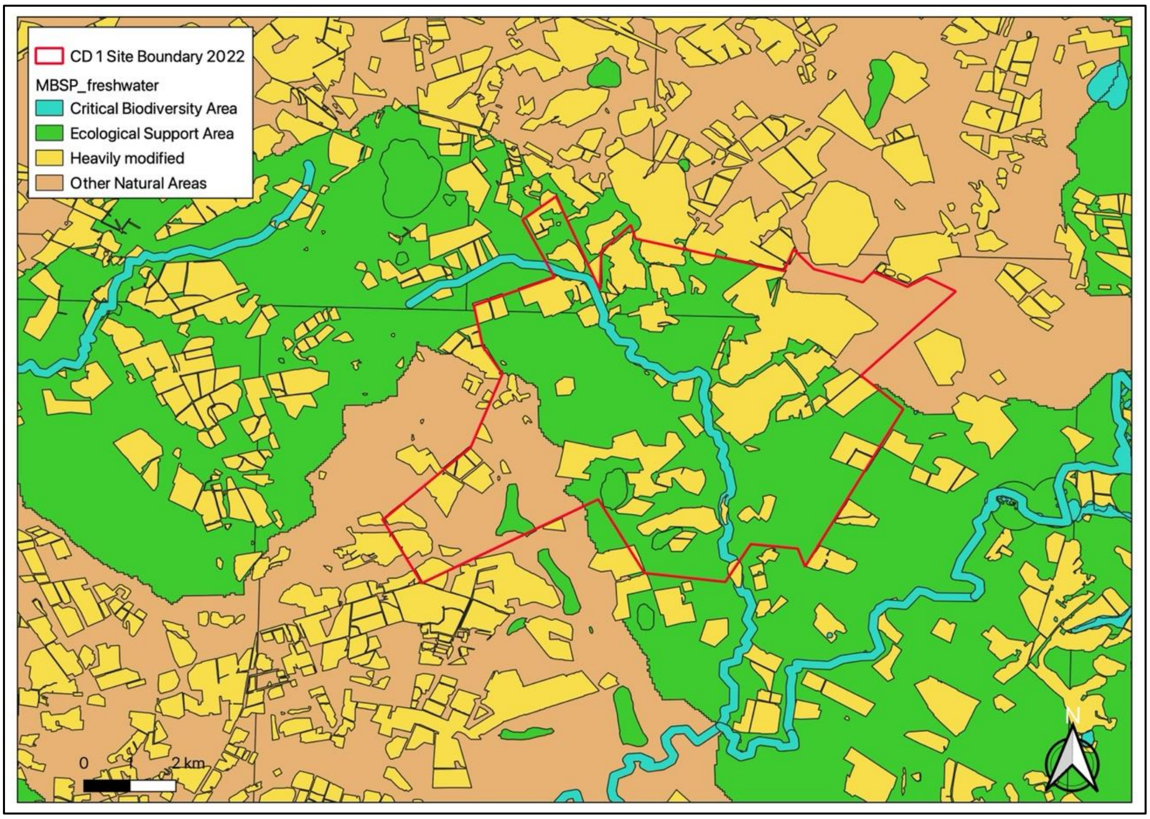


**Figure 8: The freshwater Critical Biodiversity Areas as per the Mpumalanga Biodiversity Spatial Plan (Nel *et al,* 2011) issued 2014**

# 7 Site Sensitivity

Using the baseline description and field data while considering the current disturbances and site characteristics, the following features were identified, then categorised into one of a number pre-determined sensitivity categories to provide specific no go areas and/or guide the layout planning and design processes of the respective facilities, and the grid and pipeline corridors assessed. Aquatic sensitivity mapping categorises feature or areas (with their buffers) into the following categories that were used by all specialists on the project to ensure consistency:

| | |
|---|---|
| No Go | Legislated "no go" areas or setbacks and areas or features that are considered of such significance that impacting them may be regarded as fatal flaw or strongly influence the project impact significance profile Therefore areas or features that are considered to have a high sensitivity or where project infrastructure would be highly constrained and should be avoided as far as possible. Infrastructure located in these areas are likely to drive up impact significance ratings and mitigations |
| Medium | Buffer areas and or areas that are deemed to be of medium sensitivity but should still be avoided while also minimising the impacts and or the need for additional Water Use Authorisation |
| Low | Areas of low sensitivity or constraints, such as artificial systems |
| Neutral | Unconstrained areas (left blank in mapping) |

Table 5 below provides an overview of the sensitivity of various aquatic features (with buffers distances included) as it relates to the main project component types for the project. The features are shown spatially in Figure 9 below. The sensitivity ratings of No go, Medium and Low were determined through an assessment of the aquatic habitat sensitivity and related constraints. However, these No-Go areas (with buffers) relate in general terms to the project and there are areas where encroachment on these areas would occur (i.e. existing road crossings within wetlands, or where gridlines or water pipeline infrastructure could span these areas) but this is considered acceptable since these areas have already been impacted.

These proposed constraints / buffers do not include bird and or bat specialist buffers / constraints as theirs buffers along aquatic features are at times far larger around aquatic features, than those required for the known aquatic species within this region.

**Table 5: Results of the sensitivity rating / constraints assessment**

<table>
<tr><th>Development Component</th><th>Waterbody type</th><th>Sensitivity rating of the respective waterbody type against the development type and the required buffer</th><th>Sensitivity rating override, if an impact such as a road already occurs within the proposed footprint</th></tr>
<tr><td rowspan="5">WTG / PV panel areas</td><td>Riverine Floodplains with Riparian Vegetation or wetland areas</td><td>No-Go with 95m buffer</td><td></td></tr>
<tr><td>Valley Bottom Wetlands</td><td>No-Go with 65m buffer</td><td></td></tr>
<tr><td>Endorheic Pans</td><td>No-Go with 105m buffer</td><td></td></tr>
<tr><td>Seepage Wetlands</td><td>No-Go with 62m buffer</td><td></td></tr>
<tr><td>Artificial dams or mine works</td><td></td><td></td></tr>
<tr><td rowspan="5">Buildings / Substations & BESS inclusive of any temporary construction areas/camps</td><td>Riverine Floodplains with Riparian Vegetation or wetland areas</td><td>No-Go with 95m buffer</td><td></td></tr>
<tr><td>Valley Bottom Wetlands</td><td>No-Go with 65m buffer</td><td></td></tr>
<tr><td>Endorheic Pans</td><td>No-Go with 105m buffer</td><td></td></tr>
<tr><td>Seepage Wetlands</td><td>No-Go with 62m buffer</td><td></td></tr>
<tr><td>Artificial dams or mine works</td><td></td><td></td></tr>
<tr><td rowspan="5">Roads, underground cables, pipelines & Hardstands</td><td>Riverine Floodplains with Riparian Vegetation or wetland areas</td><td>No-Go with 95m buffer</td><td rowspan="4">Moderate if an existing crossing / road or impact is already present, that must then be included in the potential road or crossing network. However if the road or pipeline network can’t be aligned with existing impacted areas, then any such crossings must be evaluated prior to construction on a case by case basis, by the aquatic specialist, preferably with the engineers and a site visit.</td></tr>
<tr><td>Valley Bottom Wetlands</td><td>No-Go with 65m buffer</td></tr>
<tr><td>Endorheic Pans</td><td>No-Go with 105m buffer</td></tr>
<tr><td>Seepage Wetlands</td><td>No-Go with 62m buffer</td></tr>
<tr><td>Artificial dams or mine works</td><td></td><td></td></tr>
<tr><td rowspan="5">Overhead Lines</td><td>Riverine Floodplains with Riparian Vegetation or wetland areas</td><td colspan="2" rowspan="5">Assumption is that the overhead lines could span these areas, but the towers/pylons should adhere to the buffer distances as indicated as far as possible. Where areas are too large to span (buffers) then these tower positions must be evaluated on a case by case basis prior to construction.</td></tr>
<tr><td>Valley Bottom Wetlands</td></tr>
<tr><td>Endorheic Pans</td></tr>
<tr><td>Seepage Wetlands</td></tr>
<tr><td>Artificial dams or mine works</td></tr>
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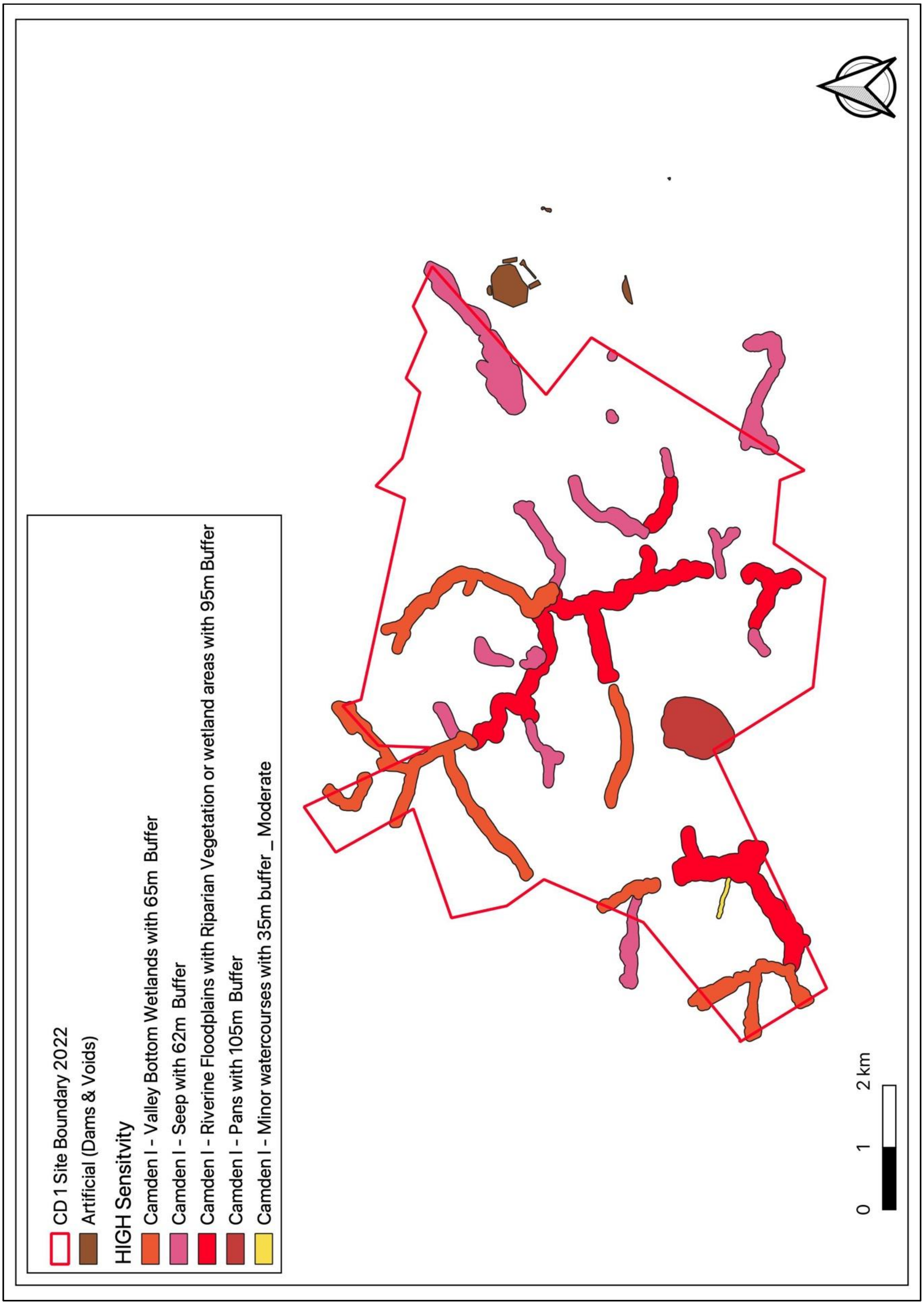


**Figure 9: The delineated waterbodies inclusive of the respective buffer distances**

# 8 Impact identification

During the EIA phase of the assessment the following potential impacts were assessed for each of the proposed projects and the proposed layouts (inclusive of grid and pipeline corridors), with the Aquatic Biodiversity Assessment Protocol in mind:

| **Aquatic Biodiversity Assessment Protocol Impacts found applicable to this project** | **Impacts assessed that will be assessed** |
|---|---|
| Faunal and vegetation communities inhabiting the site | Impact 1 and 2 |
| Fragmentation (physical loss of ecological connectivity and or CBA corridors) | Impact 1 and 2 |
| Changes in numbers and density of species | Impact 1 and 2 |
| Water quality changes (increase in sediment, organic loads, chemicals or eutrophication | Impact 3 |
| Hydrological regime or Hydroperiod changes (Quantity changes such as abstraction or diversion) | Impact 4 |
| Streamflow regulation | Impact 2 |
| Erosion control | Impact 5 |
| No-Go Impact | Impact 6 |
| Cumulative Impacts | Impact 7 |

As highlighted above the following impacts on the aquatic environment have been identified and will be assessed in greater detail as follows, as well as separately the No-Go and Cumulative impacts:

**Construction & Decommissioning Phases**

- Impact 1: Loss of Very High Sensitivity systems, namely the wetlands through physical disturbance, the proposed layout has avoided these systems (Figure 9) with the exception of one of the buffer areas near the southern entrance
- Impact 2: Damage or loss of any remaining riparian and riverine waterbodies in the construction phase
- Impact 3: Potential impact on localised surface water quality
- Impact 4: Impact on habitat change and fragmentation related to hydrological regime changes

**Operational phase**

- Impact 5: Impact on aquatic systems through the possible increase in surface water runoff on form and function - Increase in sedimentation and erosion.

These impacts will be assessed against various mitigations, that typically include the following:

- Presenting a layout that avoids all sensitive habitats that were rated as HIGH, with the exception of making use of areas that are already disturbed e.g. upgrade road crossings.

- Where these crossings are upgraded the following must be considered:
  - The final design should take cognisance of typical baseflows and should not create any impedance of flows
  - Natural river levels upstream and downstream of the site should be maintained, thus allowing for continuity within the riverbed, i.e. not create any obstruction limiting any fauna from moving up or downstream.
  - Vehicle movement within the watercourse should be limited to the works area to prevent undue any compaction of soils
  - Bed and bank erosion protection should be included in the designs to prevent bank instability and sedimentation.
- With regard the prevention of water quality changes to the aquatic environment the following must be monitored / implemented:
  - Chemicals used for construction must be stored safely on site and surrounded by bunds.
  - Chemical storage containers must be regularly inspected so that any leaks are detected early.
  - Littering and contamination of water sources during construction must be prevented by effective construction camp management.
  - Emergency plans must be in place in case of spillages onto road surfaces and water courses.
  - No stockpiling should take place within the delineated extent of a water course.
  - All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds.
  - Stockpiles must be located away from river channels.
  - The construction camp and necessary ablution facilities meant for construction workers must be beyond the proposed buffers.
- A stormwater management plan must be developed in the prior to the construction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. Effective stormwater management will include effective stabilisation (gabions and Reno mattresses) of exposed soil and the re-vegetation of any disturbed riverbanks. The effectiveness of the stormwater / energy dissipation structures will then be inspected on an annual basis and maintained / improved as required during this the operational phase, especially where any erosion or sedimentation has become evident in the operational phase.

The following projects were assessed as follows with the above in mind against the observed aquatic environment:

- Camden I WEF – WEF + BESS + 132 Grid Connection and Substation (including alternatives)
- Camden I SEF – SEF + BESS + 132 Grid Connection and Substation (including alternatives)
- Camden I Green Energy – Green Hydrogen & Ammonia facility + BESS + Onsite Substation & 132kV Grid connection to collector substation + water pipeline (including alternatives)
- Camden 400kV Grid Connection (LILO or direct line), collector substation and expansion works at Camden HV Substation (including alternatives)

## 8.1 Camden I WEF – WEF + BESS and Substation (including alternatives)

With regard the proposed WEF, BESS and associated substation options, the proposed construction laydown areas (Figure 10): the overall layout has avoided the delineated systems inclusive of the calculated buffers and the recommended 100m buffer. The only exception being the required road crossings (black lines – Figure 10) that have been specifically designed to use existing tracks and or roads (i.e. areas that are already impacted). Only the most southern road entrance is located within a buffer area, but not aligned with a previous disturbance and this should be micro-sited prior to construction to an adjacent existing farm track or outside the buffer area if possible. Table 6 below indicates the resultant impact assessment should these recommendations be approved, although **no preference** is given to the camps or substations as these have all the potential to avoid the aquatic environments encountered.

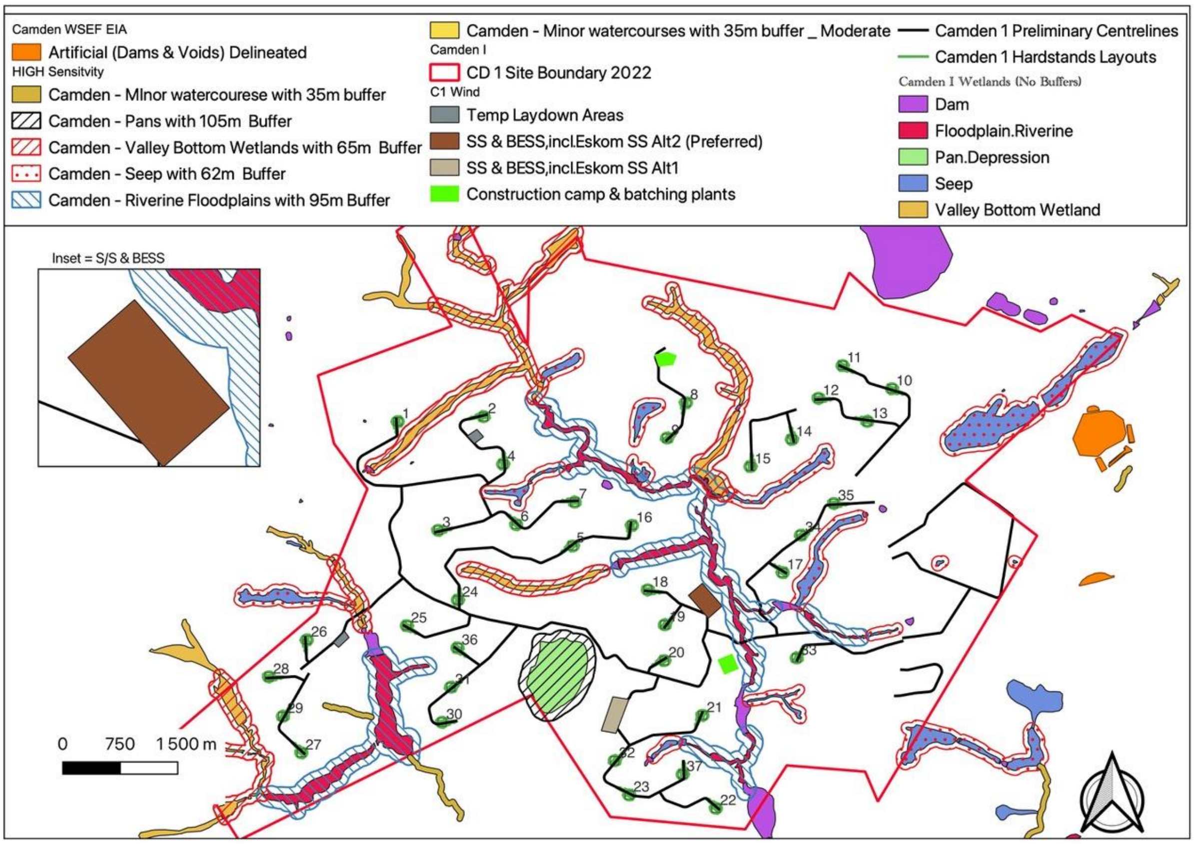


**Figure 10: Camden 1 Wind Energy Facility, BESS and associated substations (including alternatives) in relation to buffered aquatic systems delineated in this assessment**

**Table 6: Impact summary for the proposed Camden 1 WEF, BESS and Substations**

| Impact number | Aspect | Description | Stage | Character | Ease of Mitigation | Pre-Mitigation | | | | | | | Post-Mitigation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (M+ | E+ | R+ | D)x | P= | S | Rating | (M+ | E+ | R+ | D)x | P= | S | Rating |
| **Impact 1:** | Loss of Very High Sensitivity Systems | Loss of Very High Sensitivity systems, namely the wetlands through physical disturbance, the proposed layout has avoided these systems (Figure 10) with the exception of one of the buffer areas near the southern entrance | Construction | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |
| **Impact 2:** | Damage or loss of riparian and or riverine systems and disturbance of these waterbodies in the construction phase | The physical removal of riparian zones within watercourses, however this would be localised as the number of watercourses is of moderate sensitivity and located in areas with minimal vegetation (riparian) and/ or previously disturbed areas. | Construction | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Impact 3:** | Potential impact on water quality | During both construction and, to a limited degree, the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities, as well as maintenance activities, could be washed downslope via the watercourses. | Construction | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |
| **Impact 4:** | Impact on habitat change and fragmentation related to hydrological regimes | Increase in hard surface areas, and roads that require stormwater management will increase through the concentration of surface water flows that could result in localised changes to flows (volume) that would result in form and function changes within the aquatic systems, which are currently ephemeral, i.e. aquatic vegetation species composition changes, which then results in | Construction | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | habitat change / loss. | | | | | | | | | | | | | | | | | |
| | | | | | Significance | N3 - Moderate | | | | | | | N2 - Low | | | | | | |

**OPERATIONAL**

| Impact number | Receptor | Description | Stage | Character | Ease of Mitigation | Pre-Mitigation | | | | | | | Post-Mitigation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (M+ | E+ | R+ | D)x | P= | S | | (M+ | E+ | R+ | D)x | P= | S | |
| **Impact 1:** | Impact on aquatic systems through possible increase in surface water run-off on the form an function which could also lead to erosion and or sedimentation if no adequate stormwater management is provided for | An increase in hard surface areas, and or roads that require stormwater management increases runoff from a site through the concentration of surface water flows. These higher volume flows, with increased velocity can result in downstream erosion and sedimentation if not managed. | Operational | Negative | Moderate | 2 | 4 | 5 | 4 | 2 | **30** | **N2** | 1 | 2 | 2 | 2 | 2 | **14** | **N1** |
| | | | | | **Significance** | **N2 - Low** | | | | | | | **N1 - Very Low** | | | | | | |

**CUMULATIVE**

| Impact number | Receptor | Description | Stage | Character | Ease of Mitigation | Pre-Mitigation | | | | | | | Post-Mitigation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (M+ | E+ | R+ | D)x | P= | S | | (M+ | E+ | R+ | D)x | P= | S | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Impact 1:** | In the assessment of this project, any similar projects were assessed (e.g Camden II & Ummbila Emoyeni Wind Energy Facility) | | Cumulative | Negative | Moderate | 2 | 2 | 2 | 2 | 2 | **16** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |

Proposed Mitigations and EMPr Recommendations

- All alien plant re-growth must be monitored as per the Alien Plant Management Plan and should these alien plants reoccur these plants should be re-eradicated. The scale of the development does however not warrant the use of a Landscape Architect and / or Landscape Contractor.
- It is further recommended that a comprehensive rehabilitation / monitoring plan be implemented from the project onset i.e. during the preconstruction phase, to ensure a net benefit to the environment within all areas that will remain undisturbed.
- Vegetation clearing should occur in a phased manner in accordance with the construction programme 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. Suitable dust and erosion control mitigation measures should be included in the EMP to mitigate these impacts.
- A stormwater management plan must be developed in the preconstruction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. The stormwater control systems must be inspected on an annual basis to ensure these are functional. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil and the re-vegetation of any disturbed riverbanks.
- No runoff may be discharged or directed into the Pans, as these are not tolerant of excessive / regular volumes of water and would then change in nature and attributes. Suitable measures must be implemented to prevent such runoff, i.e. stormwater detention pond (or similar appropriate measure).
- Strict use and management of all hazardous materials used on site.
- Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.) within demarcated / bunded areas
- Containment of all contaminated water by means of careful run-off management on site, as per the specifications provided in the stormwater management plan.
- Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility. These must be situated outside of any delineated watercourses and pans/depressions or the buffers provided.
- Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Environmental Management Plan (EMPr) for the project and strictly enforced in the applicable phase/s.
- In the instances where facility roads are required on the present road / track crossings already installed by local landowners / public works entities, install properly sized culverts with erosion protection measures.

## 8.2 Camden I WEF – Eskom portion of Substations and 132kV powerline options

With regard the proposed Eskom substation areas and 132Kv powerline options (Figure 11): the overall layout has avoided the delineated systems inclusive of the calculated buffers and the recommended 100m buffer. Table 7 below indicates the resultant impact assessment should these recommendations be approved, although **no preference** is given to the 132kV line and or substations as these have all the potential to avoid the aquatic environments encountered. This is however based on the assumption that the grid connection towers are also placed outside of any of the delineated aquatic zones including buffers, no access tracks are located in these areas and the overhead cables span these.

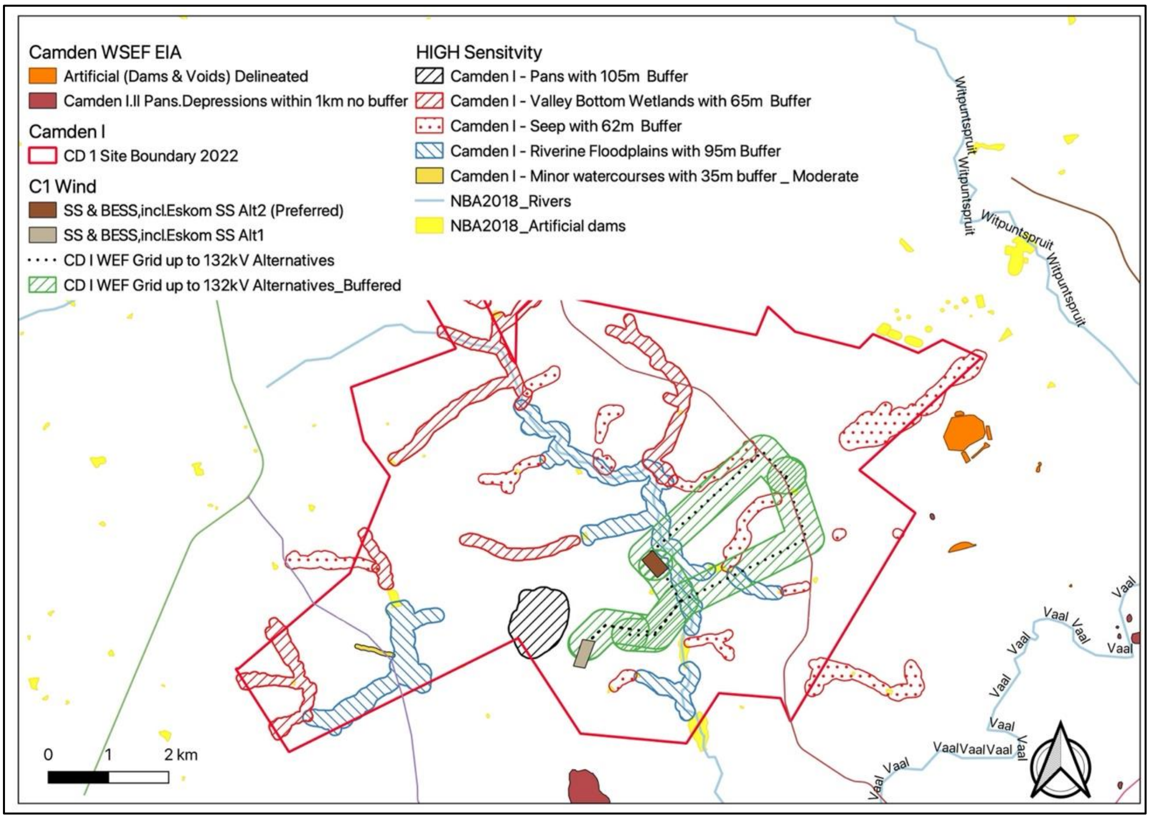


**Figure 11: Camden 1 Wind Energy Facility associated 132kV Grid and Eskom substation (including alternatives) in relation to buffered aquatic systems delineated in this assessment**

## Table 7: Impact summary for the proposed Camden 1 WEF, Eskom portion of Substations & 132kV powerline options

| Impact number | Aspect | Description | Stage | Character | Ease of Mitigation | Pre-Mitigation | | | | | | | Post-Mitigation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (M+ | E+ | R+ | D)x | P= | S | Rating | (M+ | E+ | R+ | D)x | P= | S | Rating |
| **Impact 1:** | Loss of Very High Sensitivity Systems | Loss of Very High Sensitivity systems, namely the wetlands through physical disturbance, the proposed layout has avoided these systems (Figure 11) although the powerline options will need to span the riverine floodplain areas | Construction | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |
| **Impact 2:** | Damage or loss of riparian and or riverine systems and disturbance of these waterbodies in the construction phase | The physical removal of riparian zones within watercourses, however these areas will be spanned by the powerlines and avoided by the substation options | Construction | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Impact 3:** | Potential impact on water quality | During both construction and, to a limited degree, the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities, as well as maintenance activities, could be washed downslope via the watercourses. | Construction | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |
| **Impact 4:** | Impact on habitat change and fragmentation related to hydrological regimes | Increase in hard surface areas, and roads that require stormwater management will increase through the concentration of surface water flows that could result in localised changes to flows (volume) that would result in form and function changes within the aquatic systems, which are currently ephemeral, i.e. aquatic vegetation species composition changes, which then results in | Construction | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | habitat change / loss. | | | | | | | | | | | | | | | | | |
| | | | | | Significance | N3 - Moderate | | | | | | | N2 - Low | | | | | | |

**OPERATIONAL**

| Impact number | Receptor | Description | Stage | Character | Ease of Mitigation | Pre-Mitigation | | | | | | | Post-Mitigation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (M+ | E+ | R+ | D)x | P= | S | | (M+ | E+ | R+ | D)x | P= | S | |
| **Impact 1:** | Impact on aquatic systems through possible increase in surface water run-off on the form an function which could also lead to erosion and or sedimentation if no adequate stormwater management is provided for | An increase in hard surface areas, such as the substations, that require stormwater management increases runoff from a site through the concentration of surface water flows. These higher volume flows, with increased velocity can result in downstream erosion and sedimentation if not managed. | Operational | Negative | Moderate | 2 | 4 | 5 | 4 | 2 | **30** | **N2** | 1 | 2 | 2 | 2 | 2 | **14** | **N1** |
| | | | | | **Significance** | **N2 - Low** | | | | | | | **N1 - Very Low** | | | | | | |

**CUMULATIVE**

| Impact number | Receptor | Description | Stage | Character | Ease of Mitigation | Pre-Mitigation | | | | | | | Post-Mitigation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (M+ | E+ | R+ | D)x | P= | S | | (M+ | E+ | R+ | D)x | P= | S | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Impact 1:** | In the assessment of this project, any similar projects were assessed (e.g Camden II and Ummbila Emoyeni Wind Energy Facility) | | Cumulative | Negative | Moderate | 2 | 2 | 2 | 2 | 2 | **16** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |

Proposed Mitigations and EMPr Recommendations

- All alien plant re-growth must be monitored as per the Alien Plant Management Plan and should these alien plants reoccur these plants should be re-eradicated. The scale of the development does however not warrant the use of a Landscape Architect and / or Landscape Contractor.
- It is further recommended that a comprehensive rehabilitation / monitoring plan be implemented from the project onset i.e. during the preconstruction phase, to ensure a net benefit to the environment within all areas that will remain undisturbed.
- Vegetation clearing should occur in a phased manner in accordance with the construction programme 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. Suitable dust and erosion control mitigation measures should be included in the EMP to mitigate these impacts.
- A stormwater management plan must be developed in the preconstruction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. The stormwater control systems must be inspected on an annual basis to ensure these are functional. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil and the re-vegetation of any disturbed riverbanks.
- No runoff may be discharged or directed into the Pans, as these are not tolerant of excessive / regular volumes of water and would then change in nature and attributes. Suitable measures must be implemented to prevent such runoff, i.e. stormwater detention pond (or similar appropriate measure).
- Strict use and management of all hazardous materials used on site.
- Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.) within demarcated / bunded areas
- Containment of all contaminated water by means of careful run-off management on site, as per the specifications provided in the stormwater management plan.
- Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility. These must be situated outside of any delineated watercourses and pans/depressions or the buffers provided.
- Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Environmental Management Plan (EMPr) for the project and strictly enforced in the applicable phase/s.
- In the instances where facility roads are required on the present road / track crossings already installed by local landowners / public works entities, install properly sized culverts with erosion protection measures.

### 8.3 Camden I SEF – SEF + BESS + Substation (including alternatives)

With regard the proposed Solar Energy Facility, BESS substation options including alternatives, the proposed construction laydown areas (Figure 12), the overall layout has avoided the delineated systems inclusive of the calculated buffers and the recommended 100m buffer. Table 8 below indicates the resultant impact assessment should these recommendations be approved, **although no preference** is given to the camps or substations as these have all the potential to avoid the aquatic environments encountered. Further it is recommended that the small depression that is surrounded by the PV plant won't affect the hydrology of this system, and that it should not be used as a stormwater detention pond.

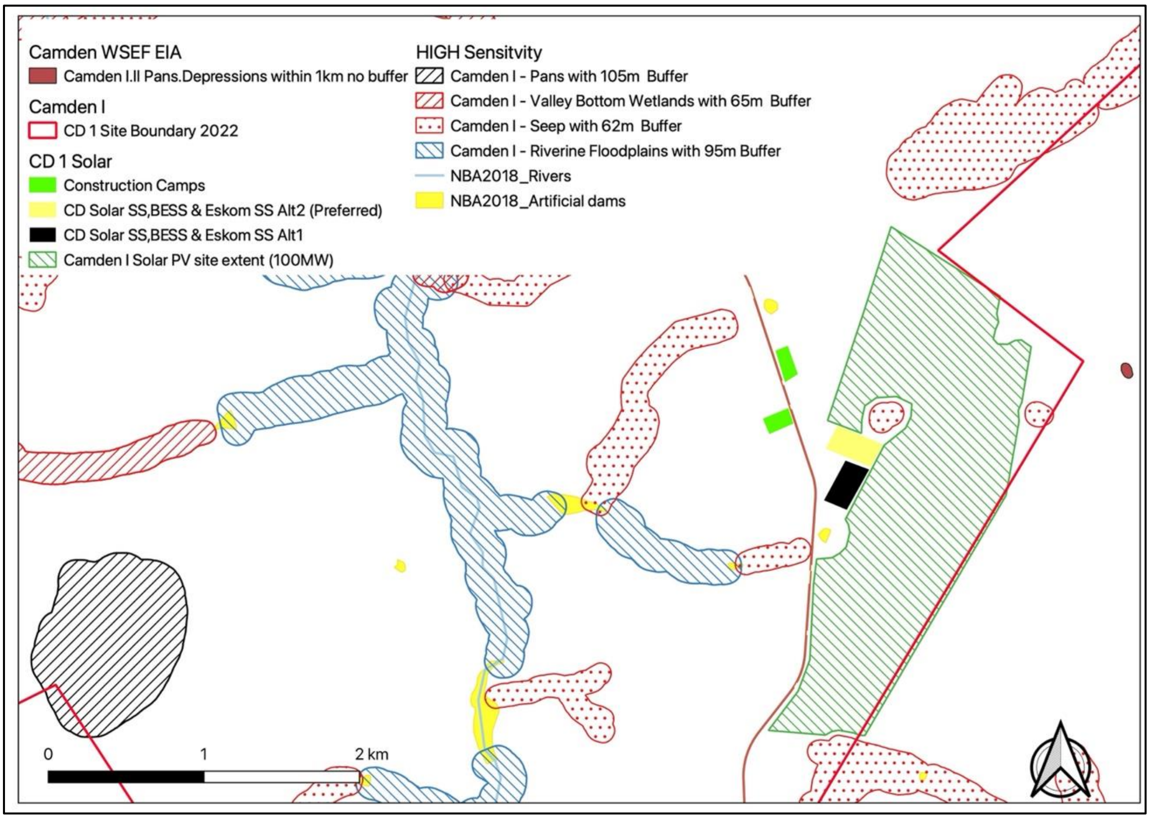


**Figure 12: Camden 1 Solar Energy Facility, BESS and associated substation including alternatives in relation to buffered aquatic systems delineated in this assessment**

## Table 8: Impact summary for the proposed Camden 1 SEF, BESS and substation options

| Impact number | Aspect | Description | Stage | Character | Ease of Mitigation | Pre-Mitigation | | | | | | | Post-Mitigation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (M+ | E+ | R+ | D)x | P= | S | Rating | (M+ | E+ | R+ | D)x | P= | S | Rating |
| **Impact 1:** | Loss of Very High Sensitivity Systems | Loss of Very High Sensitivity systems, namely the wetlands through physical disturbance, the proposed layout has avoided these systems (Figure 12) | Construction | Negative | Moderate | 2 | 2 | 2 | 2 | 2 | **16** | **N2** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N2 - Low** | | | | | | | **N2 - Low** | | | | | | |
| **Impact 2:** | Damage or loss of riparian and or riverine systems and disturbance of these waterbodies in the construction phase | The physical removal of riparian zones within watercourses, will not occur as these areas will be voided based on the assumption that the PV facility will be accessed via the existing road | Construction | Negative | Moderate | 2 | 2 | 2 | 2 | 2 | **16** | **N2** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N2 - Low** | | | | | | | **N2 - Low** | | | | | | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Impact 3:** | Potential impact on water quality | During both construction and, to a limited degree, the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities, as well as maintenance activities, could be washed downslope via the watercourses. | Construction | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |
| **Impact 4:** | Impact on habitat change and fragmentation related to hydrological regimes | Increase in hard surface areas, and roads that require stormwater management will increase the concentration of surface water flows that could result in localised changes to flows (volume) that would | Construction | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | result in form and function changes within the aquatic systems, which are currently ephemeral, i.e. aquatic vegetation species composition changes, which then results in habitat change / loss. | | | | | | | | | | | | | | | | | |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |

**OPERATIONAL**

| **Impact number** | **Receptor** | **Description** | **Stage** | **Character** | **Ease of Mitigation** | **Pre-Mitigation** | | | | | | | **Post-Mitigation** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **(M+** | **E+** | **R+** | **D)x** | **P=** | **S** | | **(M+** | **E+** | **R+** | **D)x** | **P=** | **S** | |
| **Impact 1:** | Impact on aquatic systems through possible increase in surface water run-off on the form and function which could also lead to erosion and or sedimentation if no adequate stormwater management is provided for | An increase in hard surface areas, and or roads that require stormwater management increases runoff from a site through the concentration of surface water flows. These higher volume flows, with increased velocity can result in downstream erosion and sedimentation if not managed. | Operational | Negative | Moderate | 2 | 4 | 5 | 4 | 2 | **30** | **N2** | 1 | 2 | 2 | 2 | 2 | **14** | **N1** |
| | | | | | **Significance** | **N2 - Low** | | | | | | | **N1 - Very Low** | | | | | | |

**CUMULATIVE**

| | **Receptor** | **Description** | **Stage** | **Character** | | **Pre-Mitigation** | | **Post-Mitigation** | |
|---|---|---|---|---|---|---|---|---|---|

| Impact number | | | | | Ease of Mitigation | (M+ | E+ | R+ | D)x | P= | S | | (M+ | E+ | R+ | D)x | P= | S | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Impact 1:** | In the assessment of this project, any similar projects were assessed (e.g Camden II and Ummbila Emoyeni Wind Energy Facility) | | Cumulative | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |

Proposed Mitigations and EMPr Recommendations

- All alien plant re-growth must be monitored as per the Alien Plant Management Plan and should these alien plants reoccur these plants should be re-eradicated. The scale of the development does however not warrant the use of a Landscape Architect and / or Landscape Contractor.
- It is further recommended that a comprehensive rehabilitation / monitoring plan be implemented from the project onset i.e. during the preconstruction phase, to ensure a net benefit to the environment within all areas that will remain undisturbed.
- Vegetation clearing should occur in a phased manner in accordance with the construction programme 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. Suitable dust and erosion control mitigation measures should be included in the EMP to mitigate these impacts.
- A stormwater management plan must be developed in the preconstruction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. The stormwater control systems must be inspected on an annual basis to ensure these are functional. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil and the re-vegetation of any disturbed riverbanks.
- No runoff may be discharged or directed into the Pans, as these are not tolerant of excessive / regular volumes of water and would then change in nature and attributes. Suitable measures must be implemented to prevent such runoff, i.e. stormwater detention pond (or similar appropriate measure).
- Strict use and management of all hazardous materials used on site.
- Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.) within demarcated / bunded areas
- Containment of all contaminated water by means of careful run-off management on site, as per the specifications provided in the stormwater management plan.
- Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility. These must be situated outside of any delineated watercourses and pans/depressions or the buffers provided.
- Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Environmental Management Plan (EMPr) for the project and strictly enforced in the applicable phase/s.
- In the instances where facility roads are required on the present road / track crossings already installed by local landowners / public works entities, install properly sized culverts with erosion protection measures

## 8.4 Camden I SEF –132kV Grid Connection and Eskom portion of Substation (including alternatives)

With regard the proposed 132kV powerline and Eskom portion of the substation options including alternatives (Figure 13), the overall layout has avoided the delineated systems inclusive of the calculated buffers and the recommended 100m buffer. Table 9 below indicates the resultant impact assessment should these recommendations be approved, **although no preference** is given to the up to 132kV line and camps or substations as these have all the potential to avoid the aquatic environments encountered. This is however based on the assumption that the grid connection towers are also placed outside of any of the delineated aquatic zones including buffers, no access tracks are located in these areas and the overhead cables span these.

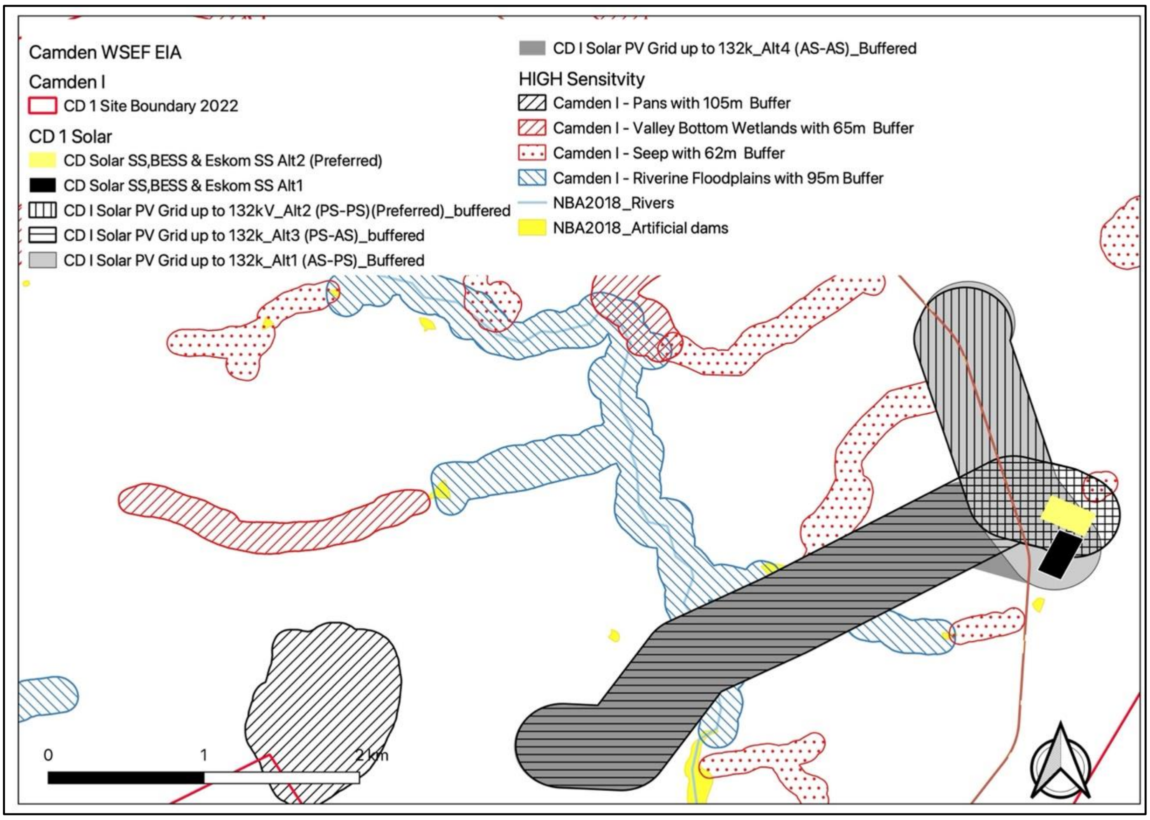


**Figure 13: Camden 1 Solar Energy Facility, associated 132kV Grid and Eskom portion of substation including alternatives in relation to buffered aquatic systems delineated in this assessment**

## Table 9: Impact summary for the proposed Camden 1 SEF, BESS and 132kV Grid

| Impact number | Aspect | Description | Stage | Character | Ease of Mitigation | Pre-Mitigation | | | | | | | Post-Mitigation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (M+ | E+ | R+ | D)x | P= | S | Rating | (M+ | E+ | R+ | D)x | P= | S | Rating |
| **Impact 1:** | Loss of Very High Sensitivity Systems | Loss of Very High Sensitivity systems, namely the wetlands through physical disturbance, the proposed layout has avoided these systems (Figure 13) although some of floodplain areas will need to be spanned by the 132kV grid options | Construction | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |
| **Impact 2:** | Damage or loss of riparian and or riverine systems and disturbance of these waterbodies in the construction phase | The physical removal of riparian zones within watercourses, however this would be localised as the number of watercourses is of moderate sensitivity and located in areas with minimal vegetation (riparian) and/ or previously disturbed areas, based on the assumption | Construction | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | that the powerline will span these areas and no grid access tracks will be created within these areas | | | | | | | | | | | | | | | | | |
| | | | | | **Significance** | **N3 - Moderatea** | | | | | | | **N2 - Low** | | | | | | |
| **Impact 3:** | Potential impact on water quality | During both construction and, to a limited degree, the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities, as well as maintenance activities, could be washed downslope via the watercourses. | Construction | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Impact 4:** | Impact on habitat change and fragmentation related to hydrological regimes | Increase in hard surface areas, and roads that require stormwater management will increase the concentration of surface water flows that could result in localised changes to flows (volume) that would result in form and function changes within the aquatic systems, which are currently ephemeral, i.e. aquatic vegetation species composition changes, which then results in habitat change / loss. | Construction | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | **Significance** | **N3 - Moderate** | | | | | | | | **N2 - Low** | | | | | | |
| **OPERATIONAL** | | | | | | | | | | | | | | | | | | | |
| **Impact number** | **Receptor** | **Description** | **Stage** | **Character** | **Ease of Mitigation** | **Pre-Mitigation** | | | | | | | **Post-Mitigation** | | | | | | |
| | | | | | | **(M+** | **E+** | **R+** | **D)x** | **P=** | **S** | | **(M+** | **E+** | **R+** | **D)x** | **P=** | **S** | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Impact 1:** | Impact on aquatic systems through possible increase in surface water run-off on the form and function which could also lead to erosion and or sedimentation if no adequate stormwater management is provided for | An increase in hard surface areas, and or roads that require stormwater management increases runoff from a site through the concentration of surface water flows. These higher volume flows, with increased velocity can result in downstream erosion and sedimentation if not managed. | Operational | Negative | Moderate | 2 | 4 | 5 | 4 | 2 | **30** | **N2** | 1 | 2 | 2 | 2 | 2 | **14** | **N1** |
| | | | | | **Significance** | **N2 - Low** | | | | | | | **N1 - Very Low** | | | | | | |
| **CUMULATIVE** | | | | | | | | | | | | | | | | | | | |
| **Impact number** | **Receptor** | **Description** | **Stage** | **Character** | **Ease of Mitigation** | **Pre-Mitigation** | | | | | | | **Post-Mitigation** | | | | | | |
| | | | | | | **(M+** | **E+** | **R+** | **D)x** | **P=** | **S** | | **(M+** | **E+** | **R+** | **D)x** | **P=** | **S** | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Impact 1:** | In the assessment of this project, any similar projects were assessed (e.g Camden II and Ummbila Emoyeni Wind Energy Facility) | | Cumulative | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |

Proposed Mitigations and EMPr Recommendations

- All alien plant re-growth must be monitored as per the Alien Plant Management Plan and should these alien plants reoccur these plants should be re-eradicated. The scale of the development does however not warrant the use of a Landscape Architect and / or Landscape Contractor.
- It is further recommended that a comprehensive rehabilitation / monitoring plan be implemented from the project onset i.e. during the preconstruction phase, to ensure a net benefit to the environment within all areas that will remain undisturbed.
- Vegetation clearing should occur in a phased manner in accordance with the construction programme 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. Suitable dust and erosion control mitigation measures should be included in the EMP to mitigate these impacts.
- A stormwater management plan must be developed in the preconstruction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. The stormwater control systems must be inspected on an annual basis to ensure these are functional. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil and the re-vegetation of any disturbed riverbanks.
- No runoff may be discharged or directed into the Pans, as these are not tolerant of excessive / regular volumes of water and would then change in nature and attributes. Suitable measures must be implemented to prevent such runoff, i.e. stormwater detention pond (or similar appropriate measure).
- Strict use and management of all hazardous materials used on site.
- Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.) within demarcated / bunded areas
- Containment of all contaminated water by means of careful run-off management on site, as per the specifications provided in the stormwater management plan.
- Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility. These must be situated outside of any delineated watercourses and pans/depressions or the buffers provided.
- Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Environmental Management Plan (EMPr) for the project and strictly enforced in the applicable phase/s.
- In the instances where facility roads are required on the present road / track crossings already installed by local landowners / public works entities, install properly sized culverts with erosion protection measures

### 8.5 Camden I Green Energy – Green Hydrogen & Ammonia facility + BESS + Onsite Substation & 132kV Grid connection to collector substation + water pipeline (including alternatives)

With regard the proposed Green Hydrogen and Ammonia Facility, BESS and associated up to 132kV grid and substation options (Figure 14) as well as water pipeline, the overall layout (including all alternatives) has avoided the delineated systems inclusive of the calculated buffers and the recommended 100m buffer. Table 10 below indicates the resultant impact assessment should these recommendations be approved, however no direct impacts are anticipated as all aquatic systems have been avoided. Further no preference is given to any of the options due to the above reasons, based on the assumption that Very High Sensitivity areas will be avoided or must be spanned (see mitigation caveat).

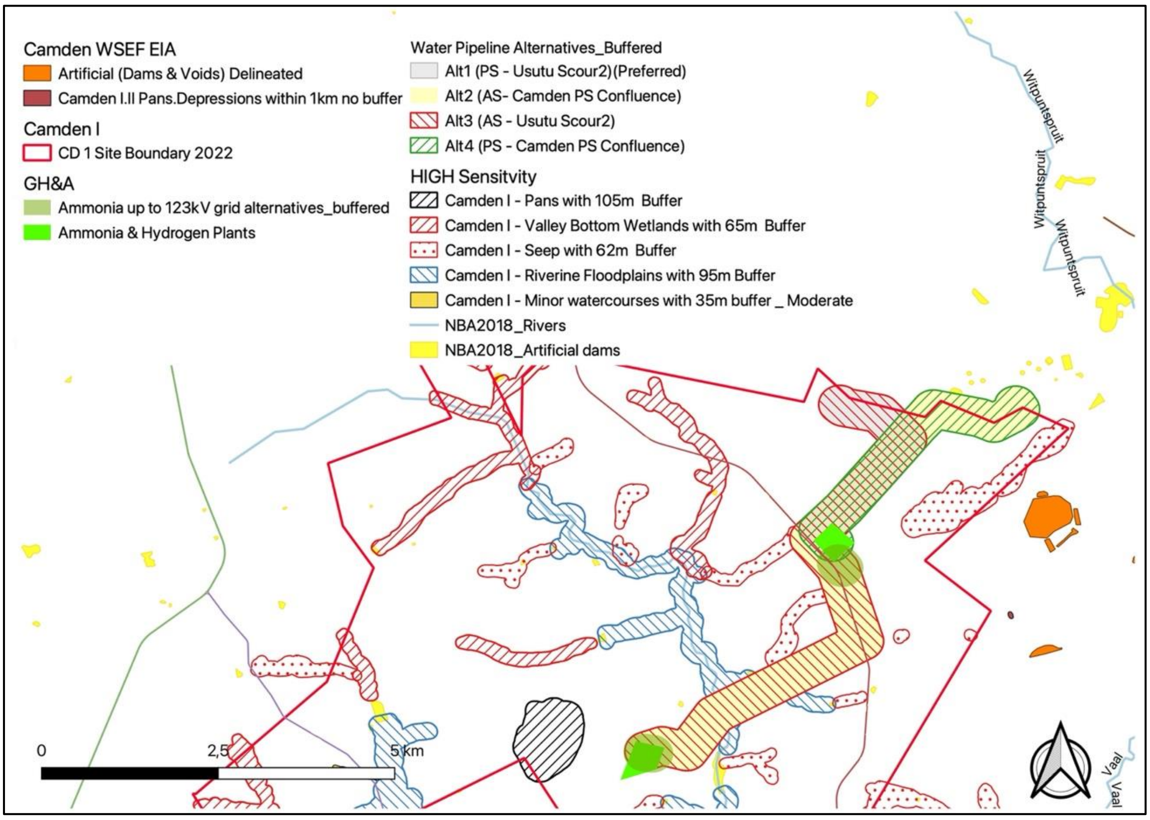


**Figure 14: Camden 1 Green Hydrogen, BESS, up to 132kV Grid and substation as well as water pipeline infrastructure including alternatives, in relation to buffered aquatic systems delineated in this assessment**

**Table 10: Impact summary for the proposed Camden 1 Green Hydrogen facility, BESS and 132kV Grid**

| Impact number | Aspect | Description | Stage | Character | Ease of Mitigation | Pre-Mitigation | | | | | | | Post-Mitigation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (M+ | E+ | R+ | D)x | P= | S | Rating | (M+ | E+ | R+ | D)x | P= | S | Rating |
| **Impact 1:** | Loss of Very High Sensitivity Systems | Loss of Very High Sensitivity systems, namely the wetlands through physical disturbance, the proposed layout has avoided these systems and with the assumption that the water pipelines with span any of the aquatic systems shown in Figure 14 | Construction | Negative | Moderate | 2 | 2 | 2 | 2 | 2 | **16** | **N2** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N2 - Low** | | | | | | | **N2 - Low** | | | | | | |
| **Impact 2:** | Damage or loss of riparian and or riverine systems and disturbance of these waterbodies in the construction phase | The physical removal of riparian zones within watercourses, will not occur as these areas will be voided based on the assumption that the facilities have avoided the aquatic systems and accessed via the existing road, while the associated pipelines must | Construction | Negative | Moderate | 2 | 2 | 2 | 2 | 2 | **16** | **N2** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | span these areas. | | | | | | | | | | | | | | | | | |
| | | | | | **Significance** | **N2 - Low** | | | | | | | **N2 - Low** | | | | | | |
| **Impact 3:** | Potential impact on water quality | During both construction and, to a limited degree, the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities, as well as maintenance activities, could be washed downslope via the watercourses. | Construction | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Impact 4:** | Impact on habitat change and fragmentation related to hydrological regimes | Increase in hard surface areas, and roads that require stormwater management will increase the concentration of surface water flows that could result in localised changes to flows (volume) that would result in form and function changes within the aquatic systems, which are currently ephemeral, i.e. aquatic vegetation species composition changes, which then results in habitat change / loss. | Construction | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |
| **OPERATIONAL** | | | | | | | | | | | | | | | | | | | |
| **Impact number** | **Receptor** | **Description** | **Stage** | **Character** | **Ease of Mitigation** | **Pre-Mitigation** | | | | | | | **Post-Mitigation** | | | | | | |
| | | | | | | **(M+** | **E+** | **R+** | **D)x** | **P=** | **S** | | **(M+** | **E+** | **R+** | **D)x** | **P=** | **S** | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Impact 1:** | Impact on aquatic systems through possible increase in surface water run-off on the form and function which could also lead to erosion and or sedimentation if no adequate stormwater management is provided for | An increase in hard surface areas, and or roads that require stormwater management increases runoff from a site through the concentration of surface water flows. These higher volume flows, with increased velocity can result in downstream erosion and sedimentation if not managed. | Operational | Negative | Moderate | 2 | 4 | 5 | 4 | 2 | **30** | **N2** | 1 | 2 | 2 | 2 | 2 | **14** | **N1** |
| | | | | | **Significance** | **N2 - Low** | | | | | | | **N1 - Very Low** | | | | | | |
| **CUMULATIVE** | | | | | | | | | | | | | | | | | | | |
| **Impact number** | **Receptor** | **Description** | **Stage** | **Character** | **Ease of Mitigation** | **Pre-Mitigation** | | | | | | | **Post-Mitigation** | | | | | | |
| | | | | | | **(M+** | **E+** | **R+** | **D)x** | **P=** | **S** | | **(M+** | **E+** | **R+** | **D)x** | **P=** | **S** | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Impact 1:** | In the assessment of this project, any similar projects were assessed (e.g Camden II and Ummbila Emoyeni Wind Energy Facility) | | Cumulative | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |

Proposed Mitigations and EMPr Recommendations

- The most significant form of mitigation would be to select development options that avoided all aquatic features that were rated with a Very High sensitivity, which will be proposed by the layout based on information contained in this report. Further any of the proposed pipelines should span any of the aquatic systems encountered, and if this is not possible then these should be placed underground using directional drilling to avoid any impacts to the associated watercourses / floodplains.
- All alien plant re-growth must be monitored and should these alien plants reoccur these plants should be re-eradicated. The scale of the development does however not warrant the use of a Landscape Architect and / or Landscape Contractor.
- It is further recommended that a comprehensive rehabilitation / monitoring plan be implemented from the project onset i.e. during the detailed design phase prior to construction, to ensure a net benefit to the environment within all areas that will remain undisturbed.
- Vegetation clearing should occur in a phased manner in accordance with the construction programme 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. Suitable dust and erosion control mitigation measures should be included in the EMP to mitigate these impacts.
- A stormwater management plan must be developed in the preconstruction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. The stormwater control systems must be inspected on an annual basis to ensure these are functional. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil and the re-vegetation of any disturbed riverbanks.
- No runoff may be discharged or directed into the Pans, as these are not tolerant of excessive / regular volumes of water and would then change in nature and attributes, i.e. stormwater detention pond.
- Strict use and management of all hazardous materials used on site.
- Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.) within demarcated / bunded areas
- Containment of all contaminated water by means of careful run-off management on site.
- Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility. These must be situated outside of any delineated watercourses and pans/depressions or the buffers shown.
- Strict control of the behaviour of construction workers.
- Appropriate waste management.
- Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Construction Environmental Management Plan (EMPr) for the project and strictly enforced.
- Install properly sized culverts with erosion protection measures at the present road / track crossings where already installed by local landowners / public works entities.

## 8.6 Camden 400kV Grid Connection (LILO or direct line), collector substation and expansion works at Camden HV Substation (including alternatives)

With regard the proposed 400kV grid connection, collector substation and the expansion of the HV substation (Figure 15), the overall layout has avoided the delineated systems inclusive of the calculated buffers and the recommended 100m buffer. Table 11 below indicates the resultant impact assessment should these recommendations be approved, although **no preference** is given to the grid routes or substations as these have all the potential to avoid the aquatic environments encountered. This is however based on the assumption that the grid connection towers are also placed outside of any of the delineated aquatic zones including buffers, no access tracks are located in these areas and the overhead cables span these.

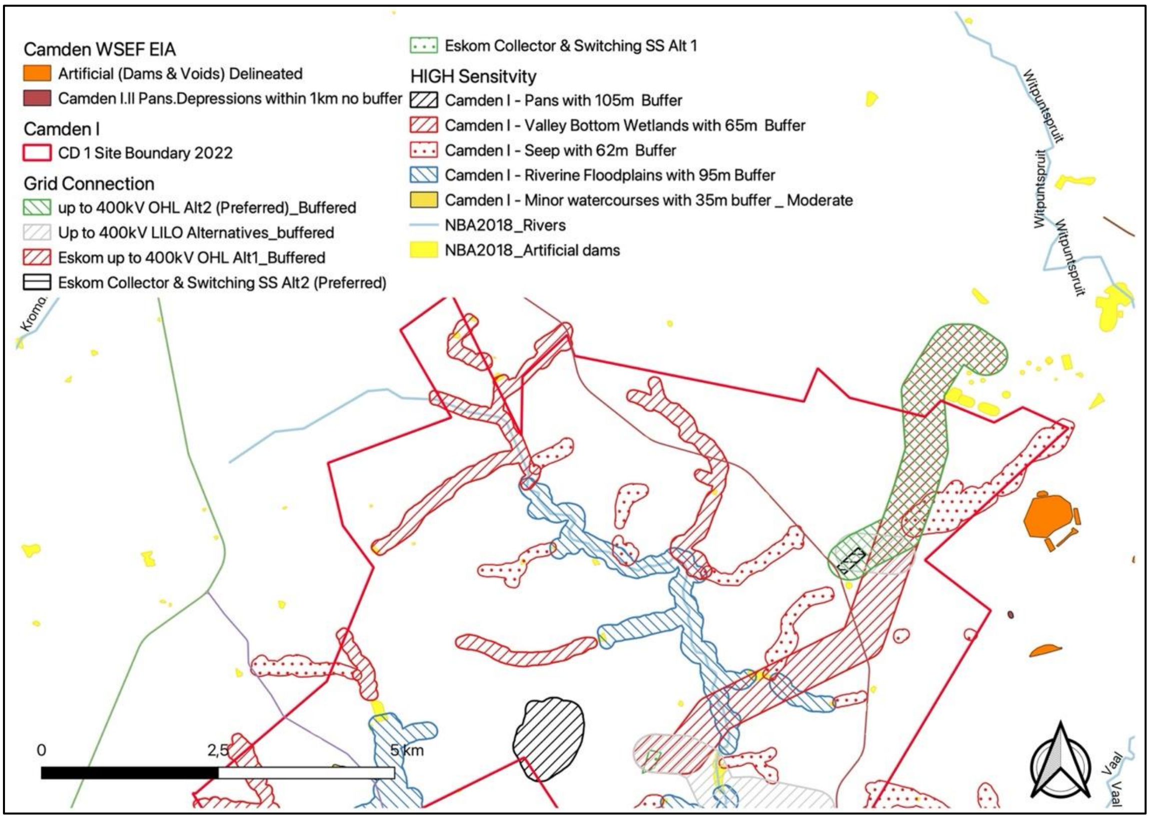


**Figure 15: Camden 1 up to 400kV grid connection, collector substation and the expansion of the HV substation in relation to buffered aquatic systems delineated in this assessment**

**Table 11: Impact summary for the proposed up to 400kV grid connection, collector substation and the expansion of the HV substation**

| Impact number | Aspect | Description | Stage | Character | Ease of Mitigation | Pre-Mitigation | | | | | | | Post-Mitigation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | (M+ | E+ | R+ | D)x | P= | S | Rating | (M+ | E+ | R+ | D)x | P= | S | Rating |
| **Impact 1:** | Loss of Very High Sensitivity Systems | Loss of Very High Sensitivity systems, namely the wetlands through physical disturbance, the proposed layout has avoided these systems (Figure 13) although some of floodplain areas will need to be spanned by the grid options | Construction | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | **Significance** | **N2 - Low** | | | | | | |
| **Impact 2:** | Damage or loss of riparian and or riverine systems and disturbance of these waterbodies in the construction phase | The physical removal of riparian zones within watercourses, however this would be localised as the number of watercourses is of moderate sensitivity and located in areas with minimal vegetation (riparian) and/ or previously disturbed areas, based | Construction | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | on the assumption that the powerline will span these areas and no grid access tracks will be created within these areas | | | | | | | | | | | | | | | | | |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |
| **Impact 3:** | Potential impact on water quality | During both construction and, to a limited degree, the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities, as well as maintenance activities, could be washed downslope via the watercourses. | Construction | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Impact 4:** | Impact on habitat change and fragmentation related to hydrological regimes | Increase in hard surface areas, and roads that require stormwater management will increase through the concentration of surface water flows that could result in localised changes to flows (volume) that would result in form and function changes within the aquatic systems, which are currently ephemeral, i.e. aquatic vegetation species composition changes, which then results in habitat change / loss. | Construction | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |
| **OPERATIONAL** | | | | | | | | | | | | | | | | | | | |
| **Impact number** | **Receptor** | **Description** | **Stage** | **Character** | **Ease of Mitigation** | **Pre-Mitigation** | | | | | | | **Post-Mitigation** | | | | | | |
| | | | | | | **(M+** | **E+** | **R+** | **D)x** | **P=** | **S** | | **(M+** | **E+** | **R+** | **D)x** | **P=** | **S** | |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Impact 1:** | Impact on aquatic systems through possible increase in surface water run-off on the form an function which could also lead to erosion and or sedimentation if no adequate stormwater management is provided for | An increase in hard surface areas, and or roads that require stormwater management increases runoff from a site through the concentration of surface water flows. These higher volume flows, with increased velocity can result in downstream erosion and sedimentation if not managed. | Operational | Negative | Moderate | 2 | 4 | 5 | 4 | 2 | **30** | **N2** | 1 | 2 | 2 | 2 | 2 | **14** | **N1** |
| | | | | | **Significance** | **N2 - Low** | | | | | | | **N1 - Very Low** | | | | | |
| **CUMULATIVE** | | | | | | | | | | | | | | | | | | |
| **Impact number** | **Receptor** | **Description** | **Stage** | **Character** | **Ease of Mitigation** | **Pre-Mitigation** | | | | | | | **Post-Mitigation** | | | | | |
| | | | | | | **(M+** | **E+** | **R+** | **D)x** | **P=** | **S** | | **(M+** | **E+** | **R+** | **D)x** | **P=** | **S** | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Impact 1:** | In the assessment of this project, any similar projects were assessed (e.g Camden II and Ummbila Emoyeni Wind Energy Facility) | | Cumulative | Negative | Moderate | 4 | 4 | 5 | 4 | 2 | **34** | **N3** | 2 | 2 | 2 | 2 | 2 | **16** | **N2** |
| | | | | | **Significance** | **N3 - Moderate** | | | | | | | **N2 - Low** | | | | | | |

Proposed Mitigations and EMPr Recommendations

- All alien plant re-growth must be monitored as per the Alien Plant Management Plan and should these alien plants reoccur these plants should be re-eradicated. The scale of the development does however not warrant the use of a Landscape Architect and / or Landscape Contractor.
- It is further recommended that a comprehensive rehabilitation / monitoring plan be implemented from the project onset i.e. during the preconstruction phase, to ensure a net benefit to the environment within all areas that will remain undisturbed.
- Vegetation clearing should occur in a phased manner in accordance with the construction programme 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. Suitable dust and erosion control mitigation measures should be included in the EMP to mitigate these impacts.
- A stormwater management plan must be developed in the preconstruction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. The stormwater control systems must be inspected on an annual basis to ensure these are functional. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil and the re-vegetation of any disturbed riverbanks.
- No runoff may be discharged or directed into the Pans, as these are not tolerant of excessive / regular volumes of water and would then change in nature and attributes. Suitable measures must be implemented to prevent such runoff, i.e. stormwater detention pond (or similar appropriate measure).
- Strict use and management of all hazardous materials used on site.
- Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.) within demarcated / bunded areas
- Containment of all contaminated water by means of careful run-off management on site, as per the specifications provided in the stormwater management plan.
- Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility. These must be situated outside of any delineated watercourses and pans/depressions or the buffers provided.
- Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Environmental Management Plan (EMPr) for the project and strictly enforced in the applicable phase/s.
- In the instances where facility roads are required on the present road / track crossings already installed by local landowners / public works entities, install properly sized culverts with erosion protection measures

# 9 Conclusion and Recommendations

During this assessment, several sensitive aquatic habitats were observed and are shown in the maps provided in this report. Noteworthy areas, that should be avoided, include the main riverine systems with wetlands, valley bottom wetlands, seeps and the endorheic pans. The only exception being where existing crossings may be used and/or upgraded that intersect valley bottom wetlands and riverine systems. This applies to the Wind Energy Facility in particular where the proposed roads will either avoid aquatic systems or utilise impacts areas. However the water pipeline for the Ammonia plant will need to span a riverine floodplain area, where it is recommended that this pipe line is placed underground using directional drilling techniques if possible. All grid connections / powerlines must span aquatic systems and while no new access tracks along these grid corridors must be created within aquatic systems

The current layouts have, to a large degree, avoided these sensitive features and buffer areas, greatly reducing the potential overall impact and risk to Aquatic resources. The overall and cumulative impacts, as assessed, are linked to instances where complete avoidance was not possible, or the nature of the activities involve a potential risk to aquatic resources even at great distance. Overall, it is expected that the impact on the aquatic environment would be **Low (-) post mitigation and with the assumptions listed above.** Cumulative impacts were assessed based on the various assumptions, recommendation as well as impacts assessed for other projects within 30km that include Camden II and the Ummbila Emoyeni Wind Energy Facility. The latter was based on a review of those specialist studies.

Based on the findings of this study, the specialist finds no reason to withhold to an authorisation of any of the proposed activities for the various projects, assuming that key mitigations measures are implemented. Lastly no preference is provided with regard any of the grid connections, as it assumed based on the characteristics of the site, that all the aquatic systems could be spanned or avoided, while making use of existing tracks, only. This also applies to the various substation / construction and laydown positioning as none of these have a direct impact on the aquatic environment are anticipated for each of the projects. However due consideration must be given to the installation of the water pipeline as mentioned above to try and minimize any impacts, and this must be done in consultation with the specialist during the micrositing process. This must be coupled to a detailed monitoring plan must be developed prior to the construction phase.

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# 11 Appendix 1 – Copy of Specialist CV

**CURRICULUM VITAE**
**Dr Brian Michael Colloty**
**7212215031083**

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Pari Park
Port Elizabeth, 6070
b.colloty@gmail.com
083 498 3299

Profession: Ecologist & Environmental Assessment Practitioner (Pr. Sci. Nat. 400268/07)
Member of the South African Wetland Society
Specialisation: Ecology and conservation importance rating of inland habitats, wetlands, rivers & estuaries
Years experience: 25 years

**SKILLS BASE AND CORE COMPETENCIES**

- 25 years experience in environmental sensitivity and conservation assessment of aquatic and terrestrial systems inclusive of Index of Habitat Integrity (IHI), WET Tools, Riparian Vegetation Response Assessment Index (VEGRAI) for Reserve Determinations, estuarine and wetland delineation throughout Africa. Experience also includes biodiversity and ecological assessments with regard sensitive fauna and flora, within the marine, coastal and inland environments. Countries include Mozambique, Kenya, Namibia, Central African Republic, Zambia, Eritrea, Mauritius, Madagascar, Angola, Ghana, Guinea-Bissau and Sierra Leone. Current projects also span all nine provinces in South Africa.
- 15 years experience in the coordination and management of multi-disciplinary teams, such as specialist teams for small to large scale EIAs and environmental monitoring programmes, throughout Africa and inclusive of marine, coastal and inland systems. This includes project and budget management, specialist team management, client and stakeholder engagement and project reporting.
- GIS mapping and sensitivity analysis

**TERTIARY EDUCATION**

- 1994: B Sc Degree (Botany & Zoology) - NMU
- 1995: B Sc Hon (Zoology) - NMU
- 1996: M Sc (Botany - Rivers) - NMU
- 2000: Ph D (Botany – Estuaries & Mangroves) – NMU

**EMPLOYMENT HISTORY**

- 1996 – 2000 Researcher at Nelson Mandela University – SAB institute for Coastal Research & Management. Funded by the WRC to develop estuarine importance rating methods for South African Estuaries
- 2001 – January 2003 Training development officer AVK SA (reason for leaving – sought work back in the environmental field rather than engineering sector)
- February 2003- June 2005 Project manager & Ecologist for Strategic Environmental Focus (Pretoria) – (reason for leaving – sought work related more to experience in the coastal environment)
- July 2005 – June 2009 Principal Environmental Consultant Coastal & Environmental Services (reason for leaving – company restructuring)
- June 2009 – August 2018 Owner / Ecologist of Scherman Colloty & Associates cc
- August 2018 Owner / Ecologist - EnviroSci (Pty) Ltd

**SELECTED RELEVANT PROJECT EXPERIENCE**

**World Bank IFC Standards**

- Kenmare Mining Pilivilli, Mozambique - wetland (mangroves, peatlands and estuarine) assessment and biodiversity offset analysis - current
- Botswana South Africa 400kv transmission line (400km) biodiversity assessment on behalf of Aurecon - current
- Farim phosphate mine and port development, Guinea Bissau – biodiversity and estuarine assessment on behalf of Knight Piesold Canada – 2016.
- Tema LNG offshore pipeline EIA – marine and estuarine assessment for Quantum Power (2015).
- Colluli Potash South Boulder, Eritrea, SEIA marine baseline and hydrodynamic surveys co-ordinator and coastal vegetation specialist (coastal lagoon and marine) (on-going).
- Wetland, estuarine and riverine assessment for Addax Biofeuls Sierra Leone, Makeni for Coastal & Environmental Services: 2009
- ESHIA Project manager and long-term marine monitoring phase coordinator with regards the dredge works required in Luanda bay, Angola. Monitoring included water quality and biological changes in the bay and at the offshore disposal outfall site, 2005-2011

**South African**

- Plant and animal search and rescue for the Karusa and Soetwater Wind Farms on behalf of Enel Green Power, Current
- Plant and animal search and rescue for the Nxuba, Oyster Bay and Garob Wind Farms on behalf of Enel Green Power, 2018 - 2019
- Plant and Animal Search and Rescue for the Port of Ngqura, Transnet Landside infrastructure Project, with development and management of on site nursery, Current
- Plant and Animal Search and Rescue for the Port of Ngqura, OTGC Tank Farm Project (2019)
- Plant search and rescue, for NMBM (Driftsands sewer, Glen Hurd Drive), Department of Social Development (Military veterans housing, Despatch) and Nxuba Wind Farm, - current
- Wetland specialist appointed to update the Eastern Cape Biodiversity Conservation Plan, for the Province on behalf of EOH CES appointment by SANBI – current. This includes updating the National Wetland Inventory for the province, submitting the new data to CSIR/SANBI.
- CDC IDZ Alien eradication plans for three renewable projects Coega Wind Farm, Sonop Wind Farm and Coega PV, on behalf of JG Afrika (2016 – 2017).
- Nelson Mandela Bay Municipality Baakens River Integrated Wetland Assessment (Inclusive of Rehabilitation and Monitoring Plans) for CEN IEM Unit - Current
- Rangers Biomass Gasification Project (Uitenhage), biodiversity and wetland assessment and wetland rehabilitation / monitoring plans for CEM IEM Unit – 2017
- Gibson Bay Wind Farm implementation of the wetland management plan during the construction and operation of the wind farm (includes surface / groundwater as well wetland rehabilitation & monitoring plan) on behalf of Enel Green Power - 2018
- Gibson Bay Wind Farm 133kV Transmission Line wetland management plan during the construction of the transmission line (includes wetland rehabilitation & monitoring plan) on behalf of Eskom – 2016.
- Tsitsikamma Community Wind Farm implementation of the wetland management plan during the construction of the wind farm (includes surface / biomonitoring, as well wetland rehabilitation & monitoring plan) on behalf of Cennergi – completed May 2016.
- Alicedale bulk sewer pipeline for Cacadu District, wetland and water quality assessment, 2016
- Mogalakwena 33kv transmission line in the Limpopo Province, on behlaf of Aurecon, 2016
- Cape St Francis WWTW expansion wetland and passive treatment system for the Kouga Municipality, 2015
- Macindane bulk water and sewer pipelines wetland and wetland rehabilitation plan 2015
- Eskom Prieska to Copperton 132kV transmission line aquatic assessment, Northern Cape on behalf of Savannah Environmental 2015.
- Joe Slovo sewer pipeline upgrade wetland assessment for Nelson Mandela Bay Municipality 2014
- Cape Recife Waste Water Treatment Works expansion and pipeline aquatic assessment for Nelson Mandela Bay Municipality 2013
- Pola park bulk sewer line upgrade aquatic assessment for Nelson Mandela Bay Municipality 2013
- Transnet Freight Rail – Swazi Rail Link (Current) wetland and ecological assessment on behalf of Aurecon for the proposed rail upgrade from Ermelo to Richards Bay
- Eskom Transmission wetland and ecological assessment for the proposed transmission line between Pietermaritzburg and Richards Bay on behalf of Aurecon (2012).
- Port Durnford Exarro Sands biodiversity assessment for the proposed mineral sands mine on behalf of Exxaro (2009)
- Fairbreeze Mine Exxaro (Mtunzini) wetland assessment on behalf of Strategic Environmental Services (2007).
- Wetland assessment for Richards Bay Minerals (2013) – Zulti North haul road on behalf of RBM.
- Biodiversity and aquatic assessments for 118 renewable projects in the past 9 years in the Western, Eastern, Northern Cape, KwaZulu-Natal and Free State provinces. Clients included RES-SA, Red Cap, ACED Renewables, Mainstream Renewable, GDF Suez, Globeleq, ENEL, Abengoa amongst others. Particular aquatic sensitivity assessment and Water Use License Applications on behalf of Mainstream Renewable Energy (8 wind farms and 3 PV facilities.), Cennergi / Exxaro (2 Wind farms), WKN Wind current (2 wind farms & 2 PV facilities), ACED (6 wind farms) and Windlab (3 Wind farms) were also conducted. Several of these projects also required the assessment of the proposed transmission lines and switching stations, which were conducted on behalf of Eskom.
- Vegetation assessments on the Great Brak rivers for Department of Water and Sanitation, 2006 and the Gouritz Water Management Area (2014)
- Proposed FibreCo fibre optic cable vegetation assessment along the PE to George, George to Graaf Reinet, PE to Colesburg, and East London to Bloemfontein on behalf of SRK (2013-2015).

# 12 Appendix 2: Site verification report, as per the DFFE Screening Tool guideline

<u>Site verification report – Aquatic Ecology</u>

Government Notice No. 645, dated 10 May 2019, includes the requirement that an Initial Site Sensitivity Verification Report must be produced for a development footprint. As per Part 1, Section 2.3, the outcome of the Initial Site Verification must be recorded in the form of a report that-

(a) Confirms or disputes the current use of the land and environmental sensitivity as identified by the national web based environmental screening tool;

(b) Contains a motivation and evidence of either the verified or different use of the land and environmental sensitivity;

(c) Is submitted together with the relevant reports prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

This report has been produced specifically to consider the aquatic ecology theme and addresses the content requirements of (a) and (b) above. The report will be appended to the respective specialist study included in the Scoping and EIA Reports produced for the projects.

<u>Site sensitivity based on the aquatic biodiversity theme included in the Screening Tool and specialist assessment</u>

Based on the DEFF Screening Tool, the site contains areas of very high sensitivity due to the presence of CBAs and rivers. The remaining area within the development footprint is deemed to be of low sensitivity (Figure 1).

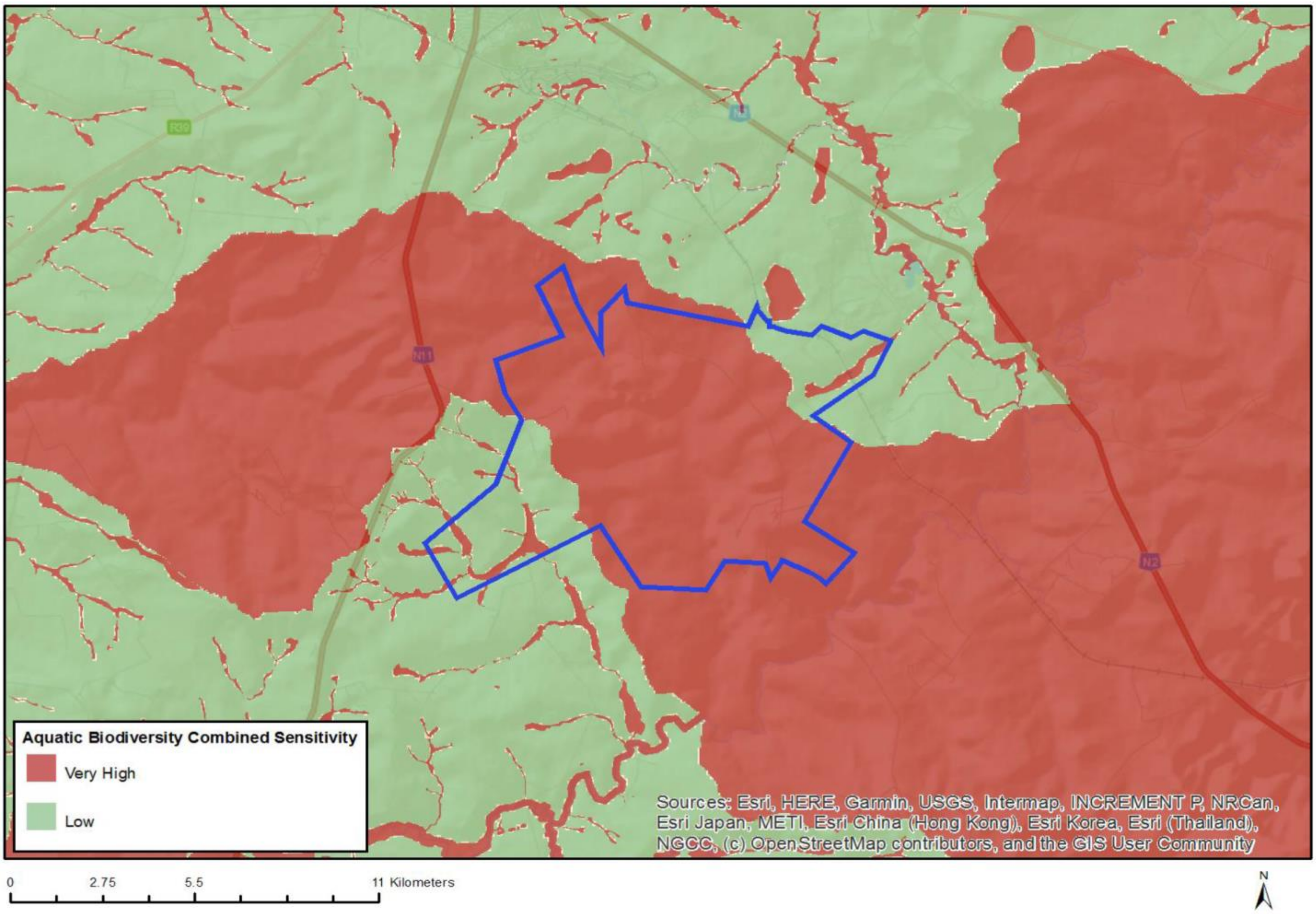


**Figure 1. DEFF Screening Tool outcome for the aquatic biodiversity theme**

Based on the above outcomes, the specialist **agrees with** the environmental sensitivities identified on site. The findings have been informed by a site visit undertaken by Dr Brian Colloty in August 2020.

Figure 2 below shows the sensitivity map produced following the desktop assessment as well as a groundtruthing exercises, with mapping of the observed features at a finer scale.

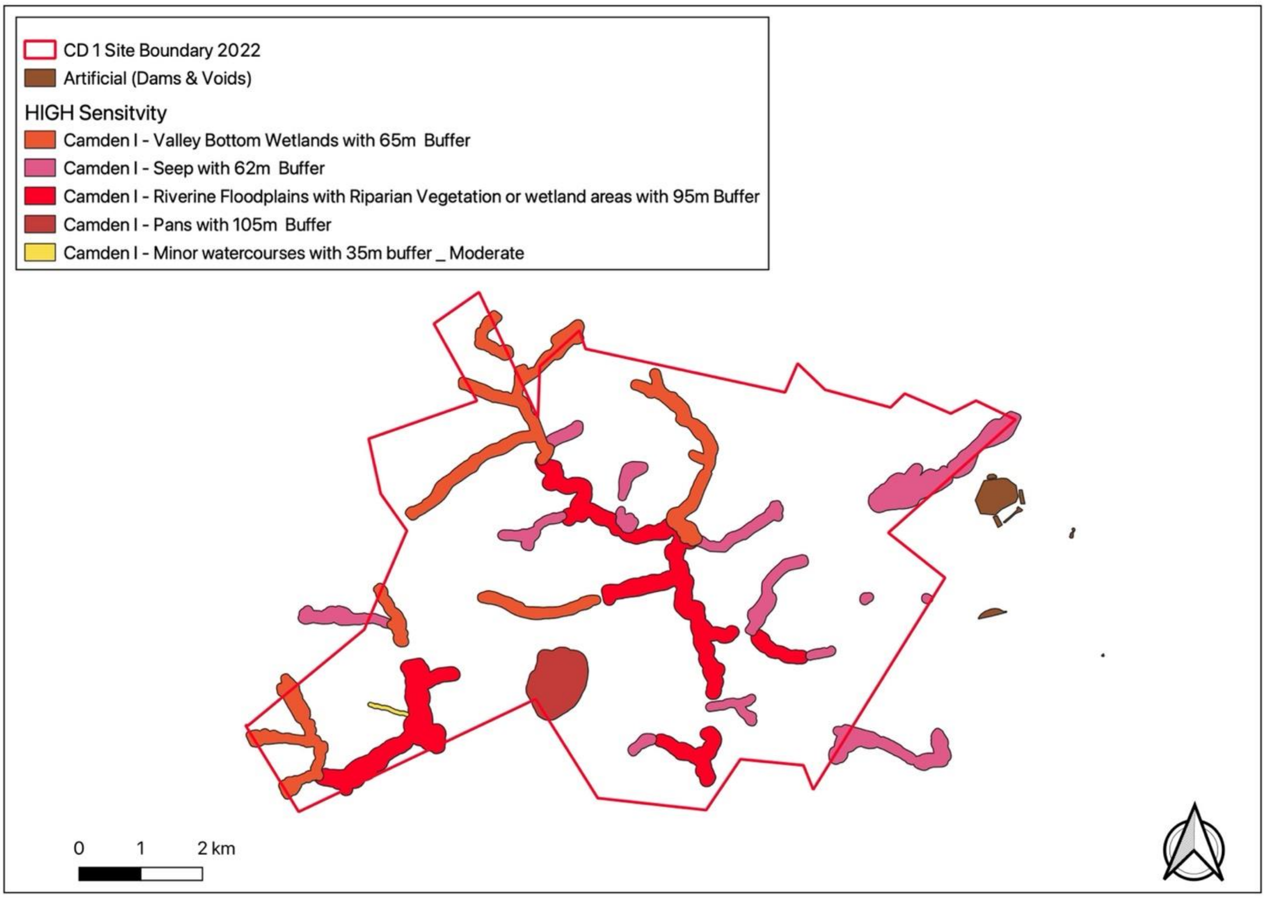


Figure 2. Environmental sensitivity map produced by the aquatic specialist

<u>Motivation of the outcomes of the sensitivity map and key conclusions</u>

In conclusion, the DEA Screening Tool identified two sensitivity ratings within the development footprint, namely, very high and low. Although there is some overlap with the findings on site and the Screening Tool's outcome, the development footprint contains various sensitivities (very high, and Moderate) that were identified following the undertaking of the site visit and spatial input considerations.

The environmental sensitivity input received from the aquatic ecology specialist will be taken forward and considered within the Scoping and EIA process and the impact to these areas assessed. Appropriate layout and development restrictions were implemented within the development footprint to ensure that the impact to aquatic ecology is deemed acceptable by the aquatic ecologist.