PROPOSED ERF 10301 INDUSTRIAL PARK, WELLS ESTATE MOTHERWELL GQEBERHA

AQUATIC & TERRESTRIAL ECOLOGY IMPACT ASSESSMENT – IMPACT ASSESSMENT PHASE

FOR

PHS Consulting (Pty) Ltd

BY

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DATE

1 October 2025

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ACRONYMS

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
PES	Present Ecological State
RTU	Recognisable Taxonomic Unit
SANBI	South African National Biodiversity Institute
SCC	Species of Conservation Concern
SEI	Site Ecological Importance
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 (EIA) Regulations 2014 (as amended) 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 Forestry, Fisheries and Environment and or Department of Water and Sanitation

Signed:… ……………………………………………… Date:…1 October 2025…………

1 Introduction

EnviroSci (Pty) Ltd was appointed by PHS Consulting Ltd on behalf Equities Property Fund Limited, as an independent specialist to undertake the aquatic and terrestrial ecological impact assessment of the proposed Wells Estate Industrial Park, near Motherwell, Gqeberha (Figure 1).

This document reports on results obtained in a survey of the regional literature and observations made during a site visit conducted on the 4 August 2025. However, this report is also supported by information and observation collected from various other surveys conducted by the lead author from 1996 to 2025 for various EIAs and or search and rescue related projects within the surrounding area, including the adjacent Shoprite Checkers Distribution Centre.

The main objective of this report is to assess the potential impact of the proposed development areas based on the presence of any sensitive terrestrial and aquatic habitats (refer to terms of reference in Section 2), noting that the habitat sensitivity information was provided to the development team, which resulted in a Preferred layout, that will avoid areas that were rated as Very High sensitivity.

The regulatory requirements are also discussed with regard to the National Water Act (Act No. 36 of 1998) (NWA) and National Environmental Management Act, 1998 (Act 107 of 1998), as amended (NEMA) in Section 3 of this report. While The PROTOCOL FOR SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR THE ENVIRONMENTAL IMPACTS ON 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 Department of Forestry, Fisheries and Environment (DFFE) Screening Tool (See Screening Verification Statement – Appendix 2), in particular those highlighted in the Aquatic Theme. The Animal and Plant sensitivities were rated as **High and Medium sensitivity,** respectively. While the Terrestrial Theme was rated as Low.

1.1 Project Locality & description

The overall study area is shown in Figure 1, which was assessed to determine the environmental baseline in order to assess potential impacts related to the project layout. The site is zoned Industrial Zone 1 and the proposed development will border on the R102 and M Kaulela Street.

The current project description is as follows:

The primary land-use of the development will be Warehousing with ancillary Offices. Six zones within the property will be established made up of a combination of warehousing/ offices and these will be surrounded by roads, parking, service infrastructure and open spaces. The total development footprint is ± 66 792 m^2. Refer to the SDP in Figure 9 below.

Access to the site will be from M Kaulela Street. The internal distribution road will be 11m wide from kerb to kerb consisting of two 4m wide lanes and two 1.5m wide yellow shoulders, with paved walkways on both sides. The main entrance off M Kaulela Street will be four lanes through a security checkpoint. The guardhouse will be set back from the street to allow for stacking of trucks.

Stormwater run-off will be concentrated to low points in the parking areas and marshalling yards, from where the minor portion of runoff will be conveyed via a conventional underground system. The internal roads, marshalling yards, parking areas and channels will act as overland flow routes for major storm events. A new stormwater connection from the existing stormwater canal to the south of the property (crossing the R102 to the site) will be constructed. The pipe route is across municipal land, and it is recommended that the culvert be laid within an 8m wide servitude along the south-western boundary of ERF 8741 (Shoprite Checkers DC).

Two stormwater attenuation facilities/dams will be constructed on the southwestern and south-eastern boundaries, respectively. The attenuation dams will act as dry detention basins, with a combined extended storage available to effectively attenuate up to a 1: 50-year post development flood, to 1:5-year pre-development flood levels. These facilities will effectively manage and convey stormwater run-off of up to 1:100-year rainfall events to minimize the risk of flooding of internal and downstream properties. A minimum combined storage volume of 2038m^3 is required. The attenuation dam outlets will be connected to the existing stormwater channel to the south-east of the site, via the new proposed culvert.

Due to the flatness of the area, each of the six zones will have its own sewer collection sump and pump station lifting the sewer and discharging into the existing main sewer pump station. The internal sewer network for the individual sites will consist of a 160mm diameter uPVC Class 34 pipe network and round precast fibre cement manholes.

The proposed internal water reticulation network will consist of a 160mm diameter metered connection splitting into two separate lines: a 160mm diameter uPVC Class 16 for fire and a 110mm diameter uPVC Class 12 for potable water.

Figure 1: A map indicating the study area (regional context – top) and site related detail such as stormwater pipeline connections (below) where the blue line = the existing stormwater canal

1.2 Aims and objectives

The aim of this report is to provide a summary of the aquatic and terrestrial ecological baseline and identify any No-Go areas. The report also assesses the significance of potential impacts on aquatic and terrestrial ecology within the project footprint and 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 and terrestrial ecological resources.

1.3 Assumptions and Limitations

In order to obtain a comprehensive understanding of the dynamics of both the flora and fauna of both the terrestrial and aquatic 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. Due to time constraints, these long-term studies are not always feasible and are mostly based on instantaneous sampling. However EnviroSci has been involved in a number of projects related to the study area spanning the period 1996 to present, which also includes detailed search and rescue efforts for construction projects underway in the region, thus possess a detailed understanding of the species assemblages, habitat functions and Species of Special Concern habitat preferences in the region.

It should be emphasised that information, as presented in this document, only has reference to the study area as indicated on the accompanying maps. Therefore, this information cannot be applied to any other areas without detailed investigation.

2 Terms of Reference

EnviroSci Pty. Ltd. endeavours to provide a report that will include the following aspects:

- Identify, map (vegetation types, locations of species of conservation concern and conservation value / sensitivity map) and describe the flora present on site that could be affected by the proposed Project, based on a field survey and available literature;
- Provide a broad description of the existing environment in terms of its fauna (focusing on vertebrates, but with cognition of invertebrates of conservation concern), based on a field survey and available literature;
- Identify and describe sensitive faunal habitats within the study area;
- Comment on the conservation status and ecological importance of species on a local, regional, and national scale;
- Identify any species of special concern viz. species with conservation status, endemic to the area or threatened species that exist or may exist on site;
- Provide a conservation importance rating of the vegetation on site (in local, regional, and national terms);
- Incorporate the relevant requirements of the Terrestrial Plant and Animal Species Protocols;

- Investigate ecological / biodiversity processes that could be affected (positively and/or negatively) by the proposed Project;
- Provide guidance for the requirement of a permit in terms of the National Environmental Management: Biodiversity Act, 2004 (No. 10 of 2004) to remove or destroy threatened or protected species;
- Assess the significance of the loss of vegetation, faunal species, and impact on ecological / biodiversity processes as a result of the implementation of the proposed Project; and
- Identify practicable mitigation measures to reduce any negative impacts to the indigenous vegetation (including species and techniques that could potentially be used for rehabilitation purposes) and indicate how these could be implemented in the construction and management of the proposed project.

This was then carried out as follows:

Part 1 - Aquatic / Wetland assessment

(A detailed methodology is included in Appendix 3)

- Initiated the assessment with a review of the available information for the region and the proposed project, and a review of the proposed project in relation to any conservation plans or assessments known for the area, e.g. Critical Biodiversity Area maps, National Waterbody Inventory etc. This included the relevant DFFE Screening Tool data in preparation for the site assessments.
- Determined the Present Ecological State (PES) of any waterbodies incl. wetlands, estimating their biodiversity, and conservation importance with regard to ecosystem services during the site visit using recognised PES and Ecological Importance and Sensitivity (EIS) assessment methods to determine the state, importance, and sensitivity of the respective wetland / watercourse systems.
- Prepared a map demarcating the respective watercourses or wetlands, i.e. the waterbody, its respective catchment and other areas within a 500m radius of the study area. This demonstrated, from a holistic point of view the connectivity between the site and the surrounding regions, i.e. the hydrological zone of influence while classifying the hydrogeomorphic type of the respective watercourses / wetlands in relation to present land-use and their current state. The maps depicting demarcated waterbodies were delineated to a scale of 1:10 000, following the methodology described by the DWS, together with an estimation of their functionality, Habitat Integrity (IHI), Wet-Ecoservices (Wet-Health) and Socio-Cultural Importance of the delineated systems, whichever is relevant to the systems
- Recommended buffer zones using the Macfarlane & Bredin, 2017 approach to indicate any No-go / Sensitive areas around any delineated aquatic zones supported by any relevant legislation, e.g. any bioregional plans, conservation guidelines or best practice.
- Assessed the potential impacts, based on a supplied methodology, including cumulative impacts and for pre-construction, construction, operations and decommissioning phases.
- Provided mitigations regarding project related impacts, including engineering services that could negatively affect demarcated wetland or water course areas.

- Supplied the client with geo-referenced GIS shape files of the wetland / riverine areas with buffers.
- Provided an opinion with regard the DFFE screening tool as set out in the respective protocols.

Part 2 - Terrestrial Assessment

A desktop and literature review of the area under investigation was conducted to collate as much information as possible prior to any detailed fieldwork. The purpose of the desktop assessment was to rank relevant areas according to their ecological sensitivity and to identify areas of ecological risk prior to the site visit.

Other relevant literature for e.g. iNaturalist, South African Biodiversity Information Facility, relevant Red Data books, ordinances and all systematic bioregional / conservation plans, as well as past assessments in the region were also consulted. Fieldwork was limited to visual sightings by means of transect walks and plot-based sampling, while particular attention was also be paid to the occurrence of Red Data species or Protected species. The DFFE Biodiversity Assessment Protocols were regarded as follows:

<u>Vegetation units</u> was sampled by means of the following techniques:

- Data collection was plot-based and in the form of vegetation samples within selected reference areas to categorise the various vegetation units; and
- Results from the data analysis described the dominant and typical species occurring on the site(s), and included:
  - Threatened, endemic or rare species, with an indication of the relative functionality and conservation importance of the specific community in the area under investigation;
  - Invasive or exotic species present and localities in the area; and
  - The functional and conservation importance of all vegetation communities in the investigation area.

<u>Mammals</u> & Birds were sampled by means of the following techniques:

- Fieldwork included visual sightings by means of transect walks to evaluate the presence of mammal taxa. During the site visit, specific attention will be given to signs (droppings, burrows, vocalisations, etc.) of taxa and the presence of suitable habitat;
- A full list of species observed and expected to occur was also prepared; and
- Specific reference was made to the occurrence of Red Data species.

<u>Herpetofauna</u> (reptiles & amphibians) were sampled by means of the following techniques:

- Visual observations;
- Active searching techniques; and
- Vocalisations (for amphibians).

Invertebrates were sampled by means of the following techniques:

- Random linear transects using standard handnets while focussing on specific indicator groups; and
- All taxa caught, were identified to species level if appropriate literature is available (as in the case of butterflies), otherwise the concept known as RTU's (Recognisable Taxonomic Units) or morphospecies were applied.

The presence of conservation important taxa was verified by intensive searching of likely habitat types or burrows. Additional information of the faunal community residing in the area of investigation was sourced from distributional data/records (both recent and historical), relevant literature, the private sector and other atlas projects.

Habitat areas (based on the species compositions of the vegetation analysis, topography, habitat degradation, and soils) were then ranked into High / No-Go, Medium, or Low classes in terms of their significance based on the Ecological Sensitivity and Conservation Importance. A sensitivity and habitat map (including buffer zones if applicable) was produced based on the above information. This was combined with the aquatic sensitivity map to provide context when discussing the DFFE Screening Tool sensitivity ratings, i.e. confirm or refute. A wider area was surveyed as part of this assessment in order to provide a broader view of sensitive habitats in the area. The sensitivity map was used to refine its proposed project footprint (see Figure 9).

This report also includes the following items:

- Provides mitigation measures regarding project related impacts, including engineering services that could negatively affect demarcated wetland or watercourse areas.
- Provides mitigation measures regarding project related impacts, including engineering services that could negatively affect any terrestrial sensitive areas.
- Provides impact assessment of the project on the aquatic and terrestrial environment.
- Provides a list of species that will require any permits related to relocation/destruction, as needed.

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;
- Agenda 21 – Action plan for sustainable development of the Department of Environmental Affairs and Tourism (DEAT) 1998;
- NEMA, 1998 (Act No. 107 of 1998) inclusive of all amendments, as well as the NEM: Biodiversity Act 2004 (Act No. 10 of 2004) (NEMBA) ;
- NWA, 1998 (Act No. 36 of 1998);
- Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA);
- 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 (Alien Invasive Species, 2020) and the CARA identify and categorise invasive plants together with associated obligations on the land owner. Several Category 1 & 2 invasive plants were observed covering large portions of the site under investigation.

4 Description of the affected environment

4.1 Vegetation Description

Based on the updated Mucina and Rutherford (2006) Vegetation Map (Veg Map) of South Africa released with the 2018 National Spatial Biodiversity Atlas (NSBA), and again revised in 2024, the spatial data indicates the study area (Figure 2) is located within Grassridge Bontveld (AT39).

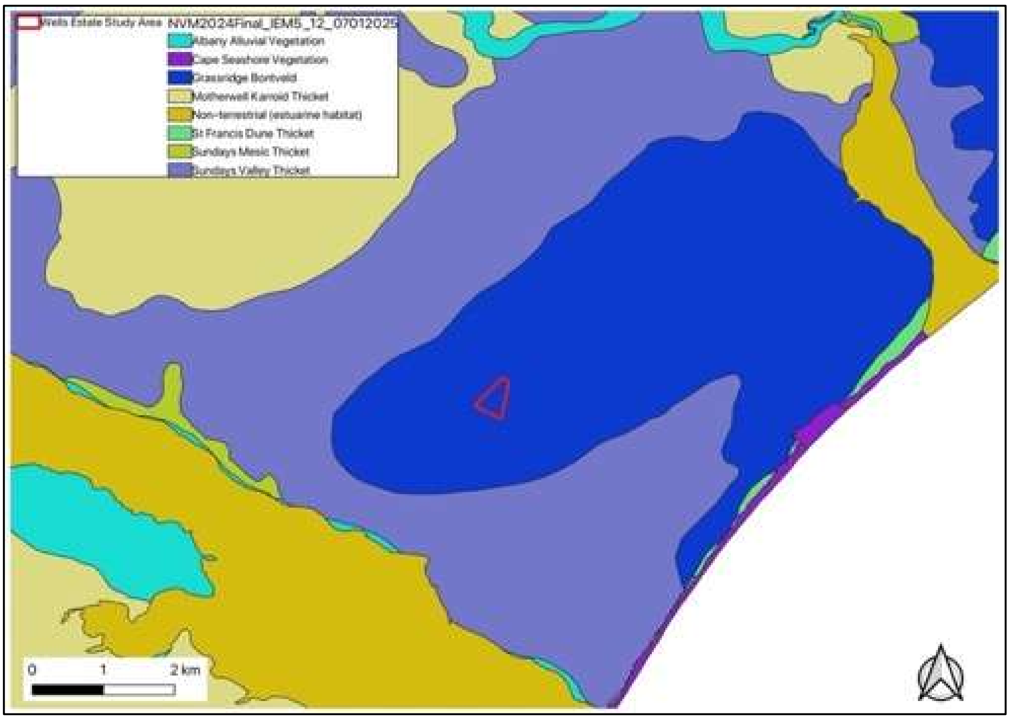

Figure 2: The vegetation units as shown in NSBA Veg map data (Spatial data version 2024)

Based on the Nelson Mandela Bay Municipality (NMBM) Bioregional Conservation Plan (SRK Consulting, 2014), a fine-scale bioregional conservation assessment and plan for the study area, the spatial information also confirms the site is located Grassridge Bontveld.

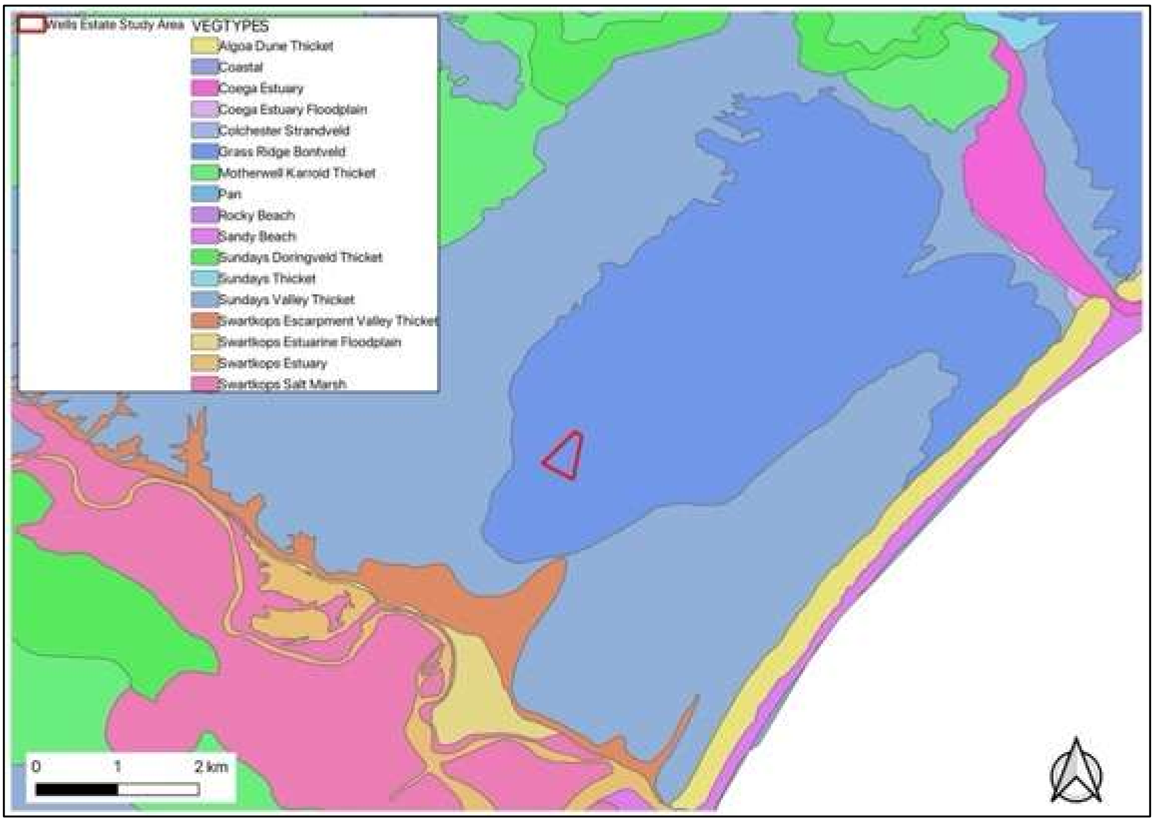

Figure 3: NMBM Bioregional Plan (SRK, 2014), vegetation types and habitats

<u>Grassridge Bontveld</u> (= NSBA 2018 / 2024 Grassridge Bontveld)

Grassridge Bontveld occurs on shallower, gravelly clayey soil and extends from the Coega Estuary to the Swartkops Estuary where it transitions into Sundays Valley Thicket vegetation (Figure 3). Grassridge Bontveld vegetation, restricted to the karst landscape created in the underlying limestone, consists of scattered, low bushclumps of Thicket species, in a matrix of open grassland which contains species characteristic of Fynbos, Grassland and Succulent Karoo vegetation types. Bushclumps are dominated by *Aloe africana*, *Chrysanthemoides monilifera, Colpoon compressum*, *Euclea undulata*, *Pterocelastrus tricuspidatus* and *Sideroxylon inerme*. The grassy matrix in Grassridge Bontveld is dominated by *Cynodon dactylon*, *Eustachys paspaloides*, *Themeda triandra*, *Ficinia truncata*, *Acmadenia obtusata*, *Disparago ericoides*, *Euryops ericifolius*, *Gazania krebsiana*, *Gibbaria scabra*, *Jamesbrittenia microphylla*, *Lobostemon trigonus*, *Monsonia emarginata*, *Nylandtia spinosa*, *Osteospermum imbricatum* and *Pteronia incana*. These grassy / fynbos areas also included high number of the small Euphorbia species (*E. globosa, & E.* obesa), *Pachypodium bispinosum* and *P. succulentum* and *Fockea gracilis* plants all of which are protected (Plate 1 – 3).

The proposed site is located within this vegetation type and thus all of these species listed above were observed with small isolated areas, with only one small clump (thicket / grassland mosaic) remaining (4% of the site). The remainder of the site (96%), is heavily grazed by goats and cattle, used for illegal dumping of covered by alien *Acacia cyclops, Acacia longifolia, Acacia saligna, Lantana* *camara and Opuntia ficus-indica* (Plate 4). What is concerning is that at time of the survey the local community was clearing the site of both indigenous and alien vegetation in an attempt to increase the grazing value of the site (Plate 5 & 6).

Plate 1: A view of the remaining Grassridge Bontveld area located on the northern boundary of the site

Plate 2: Several listed species occur within the Bontveld area and include species such as *Euphorbia meloformis* (Near Threatened) or local endemics such as *Pelargonium reniform*

Plate 3: Several of these plants (*Euphorbia procumbens*) remain throughout the study area, even in the disturbed portions and should be relocated to the proposed Bontveld open space area

Plate 4: A view of the western portions of the site, covered by alien tree species

Plate 5: The eastern portion of the site, with building rubble and cleared bush in the background

Plate 6: Central portion of the site, with building rubble with significant amounts of old asbestos

From a conservation perspective the vegetation type/habitat listed in the NMBM Bioregional Plan (SRK Consulting, 2014) as follows;

- Vulnerable (Grassridge Bontveld (90% remained[1]), It should be noted that this bioregional plan was promulgated under the National Environmental Management: Biodiversity Act (10/2004): Publishing of the Final Bioregional Plan for the NMBM, March 2014 GN No. 3362.

On 18 November 2022 a revised list of threatened ecosystems in need of protection was published in terms of the National Environmental Management, Biodiversity Act (NEMBA), (Act No 10 of 2004) (based on vegetation types in the Vegmap, 2006, as amended). Should a vegetation type or ecosystem be listed, actions in terms of NEM:BA are triggered. **None of those ecosystems observed within the study area are listed in terms of this Act, i.e. the remaining extent of the observed Grassridge Bontveld is listed as Least Concern (Figure 4).**

[1] % remained based on the observations made in 2014 as shown in the NMBM Bioregional Plan and not based on current habitat loss estimates

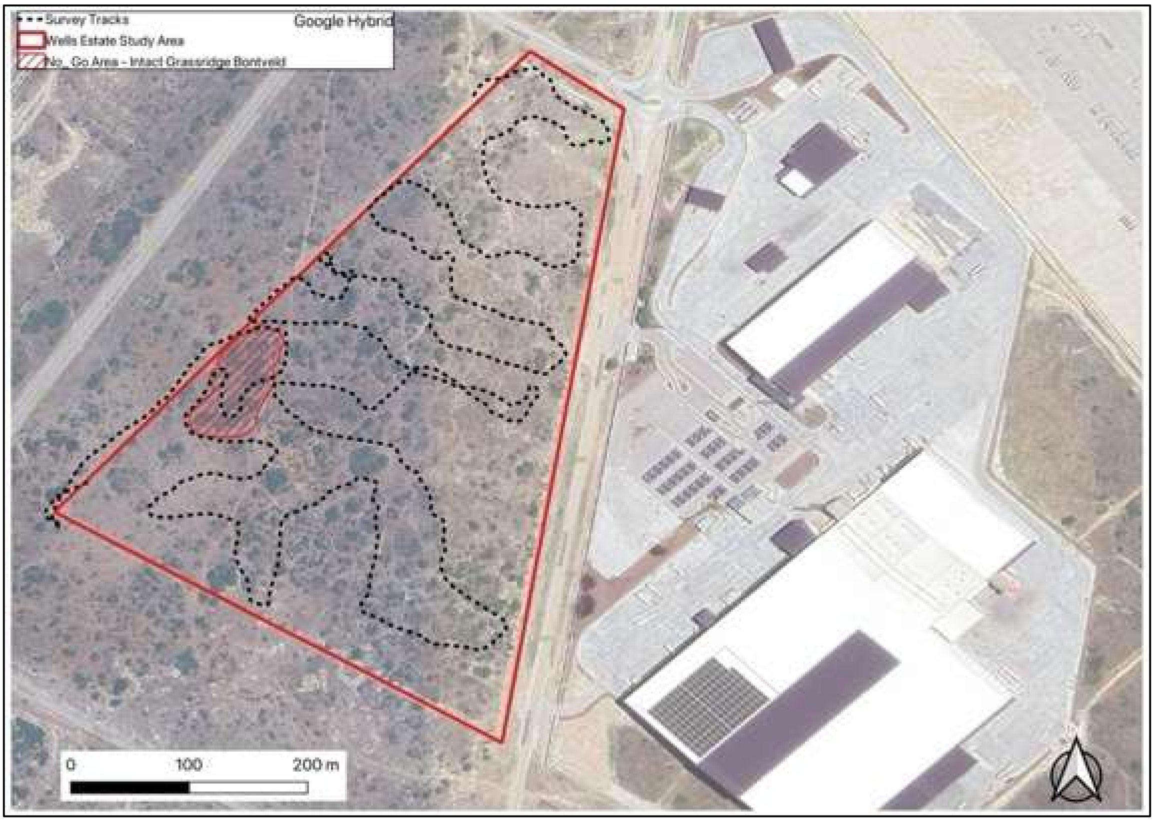

Figure 4: The results of the ecological sensitivity assessment, with the No-Go area shown. Note this is an older image for the site, and areas that were similar to this Bontveld area have been cleared

4.2 Vegetation importance and plant Species of Special Concern

Several important plant species are known to occur within the region as these are listed by SANBI under the Threatened Species Programme using the International Union for Conservation of Nature or IUCN (Red data list) criteria. These are shown in Table 1 below and any such plant Species of Special Concern were actively searched for during the survey. The highest density of the listed species are always found within the Grassridge Bontveld areas, and in particular along the edges of the bush clumps (Plate 1 - 4).

Several plant species are also listed in the Provincial Nature Conservation Ordinance (PNCO) of 1974, the National Forest Act (Act No. 84 of 1998). These species of special concern will require permits from the relevant provincial departments if any individuals are to be removed, translocated or trimmed according to the relevant legislation including the National Forestry Act (No. 84 of 1998) (Department of Forestry, Fisheries and the Environment) and the Provincial Nature Conservation Ordinance (Eastern Cape Department of Economic Development, Environmental Affairs and Tourism – Permit Administration) (Table 1).

Table 1: Protected plant species observed in the study area under the SANBI Threatened Species Programme and Provincial Nature Conservation Ordinance

Family	Species	Threat status (SANBI IUCN)	Protected status (PNCO 1974, NFA 1998)	Life form
AMARYLLIDACEAE	*Boophone disticha* (L.f.) Herb.	Declining	Protected	Geophyte
AMARYLLIDACEAE	*Haemanthus coccineus* L.	LC	Protected	Geophyte
APOCYNACEAE	*Pachypodium bispinosum* (L.f.) A.DC.	LC	Protected	Succulent
ASPHODELACEAE	*Aloe africana* Mill.	LC	Protected	Succulent
ASTERACEAE	*Euryops ericifolius* (Bél.) B.Nord.	EN		Dwarf shrub
CRASSULACEAE	*Crassula perfoliata* L. var. *coccinea* (Sweet) G.D.Rowley	LC	Protected	Succulent
CRASSULACEAE	*Crassula perfoliata* L. var. *minor* (Haw.) G.D.Rowley	LC	Protected	Succulent
EUPHORBIACEAE	*Euphorbia procumbens* Mill.	LC	Protected	Succulent
EUPHORBIACEAE	*Euphorbia globosa*.	LC	Protected	Succulent
EUPHORBIACEAE	*Euphorbia ledienii* A.Berger var. *ledienii*	LC	Protected	Succulent
EUPHORBIACEAE	*Euphorbia meloformis* Aiton subsp. *meloformis*	NT	Protected	Succulent
FABACEAE	*Indigofera tomentosa* Eckl. & Zeyh.	NT		Herb
GERANIACEAE	*Pelargonium reniforme* Curtis subsp. *reniforme*	DDD		Dwarf shrub, geophyte
IRIDACEAE	*Babiana sambucina* (Jacq.) Ker Gawl. subsp. *sambucina*	LC	Protected	Geophyte
IRIDACEAE	*Freesia corymbosa* (Burm.f.) N.E.Br.	LC	Protected	Geophyte
IRIDACEAE	*Tritonia gladiolaris* (Lam.) Goldblatt & J.C.Manning	LC	Protected	Geophyte
AIZOACEAE	*Aptenia haeckeliana* (A.Berger) Bittrich ex Gerbaulet	LC	Protected	Succulent
AIZOACEAE	*Delosperma echinatum* (Lam.) Schwantes	LC	Protected	Succulent
AIZOACEAE	*Glottiphyllum longum* (Haw.) N.E.Br.	LC	Protected	Succulent
AIZOACEAE	*Rhombophyllum rhomboideum* (Salm-Dyck) Schwantes	EN	Protected	Succulent
AIZOACEAE	*Ruschia cymbifolia* (Haw.) L.Bolus	LC	Protected	Succulent
ORCHIDACEAE	*Acrolophia capensis* (P.J.Bergius) Fourc.	LC	Protected	Geophyte
RUTACEAE	*Agathosma stenopetala* (Steud.) Steud.	VU		Dwarf shrub
SAPOTACEAE	*Sideroxylon inerme* L. subsp. *inerme*	LC	Protected (NFA)	Tree

The survey also included searching for any species listed in the DFFE Screening Tool (Table 2) with this listed as having a Medium Sensitivity, however this is supersede by any threat status for species listed in Table 1 above.

Table 2: Plant species listed by the DFFE Screening Tool, noting some may not be listed by name, while those in bold were observed on site

Rhombophyllum rhomboideum	***Rapanea gilliana***	*Cotyledon adscendens*
Syncarpha recurvata	Sensitive species 91	*Justica orchioides subsp. orhioides*
Selago zeyheri	*Zygophyllum divaricatum*	

4.3 Aquatic Environment

The study area is located within the South Eastern Coastal Belt Ecoregion according to Kleynhans *et al.,* (2009). This indicates that the expected waterbodies are associated with coastal land forms, which could include coastal plateaus or benches, coastal mountain ranges or steep river valleys, fed by relatively small catchments.

4.3.1 Surface water hydrology, rivers and watercourses

No rivers or connected watercourses are anticipated within the study area, i.e. no concentrated surface flows are linked directly to any mainstem rivers within the greater region (Figure 5). Thus the site is dominated by a coastal bench / plateaus which is underlain by calcrete formations of the Algoa Group (Alexandria Formation), within the M30B quaternary catchment of the Coega River (Figure 5). Two canals are located between 200 and 500m from the site, and these drain the Motherwell area of stormwater into the Swartkops Estuary (Figure 5).

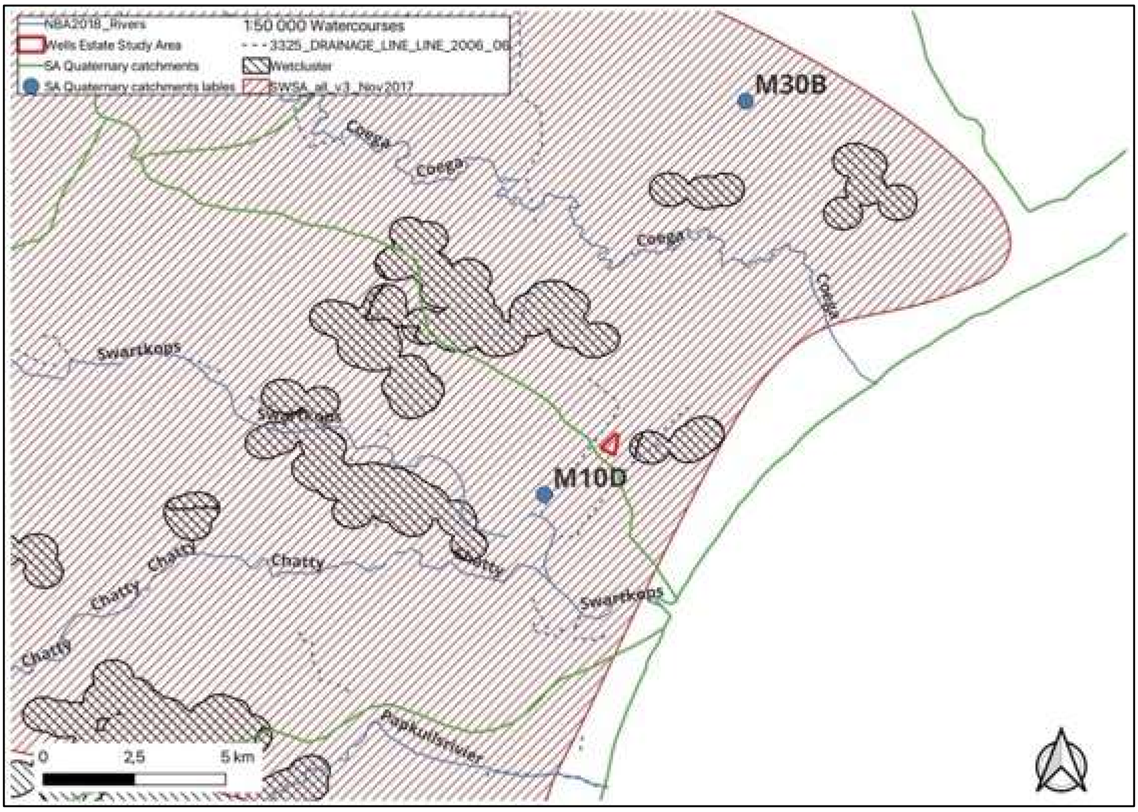

Figure 5: Project locality map indicating the various quaternary catchments, watercourses and mainstem rivers (Source DWS and NGI) within the study area boundary

At a finer scale, the National Freshwater Ecosystem Priority Areas atlas (NFEPA) (Nel *et al.*, 2011) indicated that the regional setting is mostly described in the form of wetland associated vegetation within the study region and dominated by aquatic ecosystems linked with the Albany Thicket Bontveld and Albany Thicket Valley vegetation units (noting vegetation terminology in the NFEPA is generic and not specific to actual vegetation types). The proposed site (Figure 5), is not located within any Wetland Cluster as shown in the NSBA (2018) spatial information. These are areas with a high density of wetlands such as Valley Bottom systems. Figure 5 however indicates that the proposed site is located within the Coega Table Mountain Sandstone Groundwater Strategic Water Resource Area.

A Strategic Water Source Area (SWSA) is one where the water that is supplied is of national importance for water security (Le Maitre *et al.* 2018). Surface water SWSAs are found in areas with high rainfall and produce most of the runoff. Groundwater SWSAs have high groundwater recharge and are located where the groundwater forms a nationally important resource. There are 22 national-level SWSAs for surface water (SWSA-sw) and 37 for groundwater (SWSA-gw). The SWSA-gw cover 9% of the area of South Africa, account for 15% of the recharge, 46% of the groundwater used by agriculture and 47% of the groundwater used by industry.

4.3.2 Wetlands

The South African Inventory of Inland Aquatic Ecosystems (SAIIAE) geodatabase offers a collection of data layers pertaining to ecosystem types and pressures for both rivers and inland wetlands. This includes the South African National Wetland Map 5 (NWM5) for inland wetlands and estuaries, associated with river line data and many other data sets within the 2018 SAIIAE. The NWM5 also indicates the estuarine functional zone and wetland ecosystems identified within the broader study area (Figure 6). One wetland was indicated within 500m of the proposed, namely an Endorheic Pan / Depression.

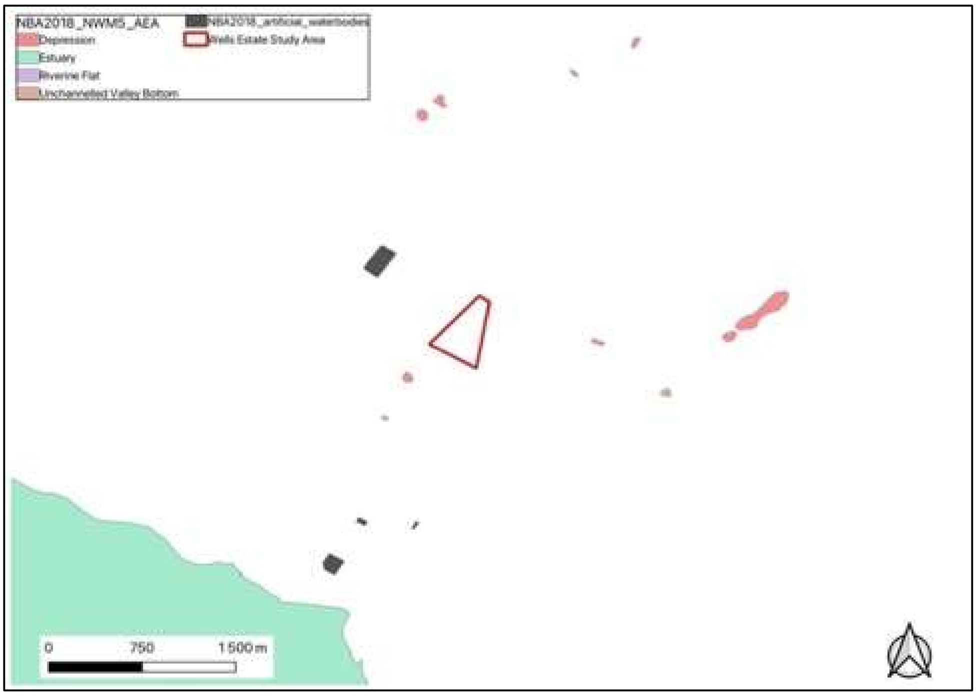

Figure 6: Potential wetlands assessed in this study area which includes the Estuarine Functional Zone and several pans/depressions

A depression is a wetland ecosystem with closed or near-closed elevation contours, increasing in depth from the perimeter to a central area within which water typically accumulates. Depressions may be round-bottomed or flat-bottomed (referred to as pans) (Ford and Williams, 1989). Most depressions occur either where the water table intercepts the land surface (such as on coastal plains along the South African coastline), or in semi-arid settings where a lack of sufficient water inputs prevents areas where water accumulates from forming a connection with the open drainage network (Ollis *et al.,* 2013). The soils are, however, typical of ephemeral systems and show signs of gleying, and or iron nodules indicating periods of inundation when soils are saturated and anaerobic conditions occur (Plate 7).

There are three requirements for the formation of a pan:

1) an arid / semi -arid environment,
2) a substratum that is susceptible to easy weathering (karst), and contains a high proportion of leachable salts, and
3) a mechanism for the disruption of drainage, such as tectonic activity or windblown sands blocking rivers.

Surfaces that are predisposed to pan formation are typically low-angled, which encourages ponding and limits drainage development. Pans form either by dissolution of the surface of underlying bedrock, called solution pans, or by the collapse of underlying caves within bedrock, called collapse pans (Marker, 1988).

Solution pans are formed on limestone and dolomite outcrops and are an example of karst topography, where a landscape feature is formed from the dissolution of permeable rocks. Rainwater is not able to drain through limestone, and thus begins to dissolve the carbonate rock on which it lies (Goff *et al.,* 2016). Pans obtain their distinctive circular shape by growing laterally, rather than downward. This is outward growth is due to an accumulation of sediment within the pan, which inhibits dissolution on the floor while concentrating it on the edges of the pan. Once a solution pan is established, the centripetal focus of flow, and corrosion, will encourage its further development. Further dissolution will occur due to the greater biogenic CO^2 production in the thick soils that accumulate in the bottoms of pans. Such soils may stay damper longer because of drainage accumulation, thus the duration of active corrosion may also increase.

Climate is a major control of the development of solution pans, as high temperatures accelerate chemical reactions, and water is required to induce these reactions. In Southern Africa, for instance, where precipitation is relatively low, little solution can be expected. Pans differ from area to area in terms of vegetation cover, soil depth, and karst density. Vegetation growth, for instance, can increase the amount of CO^2 in the soil, making the water more acidic, which is crucial to the solution process.

In Southern Africa, pan distribution corresponds to rock and sediment types, with most pans found on the Kalahari sands, and the Dwyka tillites and Ecca shales of the Karoo Supergroup. South African pans are subject to seasonal aridity and variability in precipitation, which affects vegetation growth and CO^2 production (Marker, 2012). This results in lower rates of solution than in areas where rainfall is more evenly distributed. Soil-covered karst is typical of the region as the limestone often contains impurities in the form of silica, or because the carbonates are inter-bedded with insoluble layers.

The coastal pans of the Eastern Cape Province occur on the sandy limestone outcrops of the Alexandria Formation. This is one of Southern Africa’s seven karst regions. The karst is most pronounced between the Sundays and the Great Fish Rivers, although small pans are found outside of this area (Marker, 2012). This limestone consists generally of a thin 0.5 to 1m basal beach pebble conglomerate, overlain by 1 to 3m of lithified marine limestone grading upwards into less lithified beach and aeolian limestone. The deposit becomes thinner inland and to the east reaching a maximum thickness of 180m in the southwest and overlies planed Palaeozoic strata. The area is essentially a fluviokarst (a karst landscape where there is evidence of past or present fluvial activity) with a high density of shallow solution pans where the limestone is thin overlying impermeable Palaeozoic strata, which restricts infiltration. In contrast, the thick limestone overlying Mesozoic sandstones of the southern Cape coast form deep funnel depressions.

Pans are generally classified as being endorheic (inward draining, with no surface outflow), although some are exorheic (outward draining) (Marker, 1988) Water drains from an endorheic depression by means of evaporation and infiltration only, whereas water can exit an exorheic depression as concentrated or diffuse surface flow, or as subsurface flow. Due to the inward draining of endorheic pans, they are able to capture runoff, and thus they reduce the volume of surface water that would otherwise reach the stream system and contribute to storm flows. The opportunity for attenuating floods however is limited by their position in the landscape, which is generally isolated from stream channels.

Solution pans play an important role in the connections between the karst surface and karst underground. They are thought to develop local geologies, hydrologies as well as local climates, depending on the size of the pan. Pans also form a specific soil type, affecting the vegetation type found within the pan. Karst environments, particularly pans are fragile and are more vulnerable to damage compared with other natural systems (Anica and Mojca, 2010). This is due to the nature of the karst hydrological system. For example, once thin soils are lost, their replacement time is very long, as there are only small quantities of insoluble residues in karst rocks that might form the inorganic basis of a new soil cover. Karsts are highly vulnerable to overuse and misuse, and requires specialist knowledge to manage properly, and can be extremely difficult to restore once damaged (Anica and Mojca, 2010). The World Commission on Protected Areas of the International Union for the Conservation of Nature and Natural Resources (IUCN) has drawn up guidelines for the protection of caves and karst that should be followed in order to avoid the destruction of these important features (Semlitsch and Bodie, 1998).

Vegetation associated with the pans observed within the study area was dominated by three key habitats, the central floor of the pan, if not inundated is typically covered by grasses, sedges, and or a variety of perennial forbs (Plate 8). The open area is then either encircled with either thicket elements, mostly Grassridge Bontveld, typically dominated by *Searsia, Sideroxylon, Euclea* and *Pterocelastrus* species (Plate 8).

Plate 7: One of the soil cores taken from the top 30cm of a depression indicating characteristics of water inundation (saturation) and the oxidation when drying out (iron oxides)

Plate 8: The pan / depression surrounded by thicket elements (Grassiridge Bontveld) observed within 500m of the site

4.3.3 Delineated wetlands

Figure 7 delineates the wetlands assessed in this study, with Table 3 presenting a summary of the wetland classification, PES and EIS Scores of the wetland unit assessed that are within 500m of the study area boundary.

Figure 7: Wetlands delineated in this study area within 500m of proposed project footprint

Table 3: Summary table of the wetland classification and Present Ecological State and Ecological Importance and Sensitivity Scores

Wetland	PES	EIS	Level 1 System	Level 2 Regional Setting	Level 2 Landscape Unit	Level 4 Hydrogeomorphic Unit				Level 5 Hydrological Regime		Level 6 Wetland Characteristics
						HGM Type	Longitudinal zonation / landform	Drainage outflow	Drainage inflow	5A Perennial / non perennial / unknown	5B Saturation periodicity	
			Connectivity to Ocean	Eco-region	Landscape Setting	A	B	C	D	Seasonal / Intermittent / Unknown	Permanent / Seasonal / Intermittent / Unknown/	Geology / Natural or Artificial/ Vegetation / Substratum
Pan / depression	C	High	Inland	South Coastal Belt	Bench	Pan / depression	-	-	Surface runoff	Intermittent	Intermittent	Bontveld associates of the Albany Thicket

4.4 Terrestrial Fauna

The faunal assessment was firstly based on known distribution records, past assessments, and expertise, then supported by field observations. Table 4 lists the relevant faunal groups, their likelihood of occurring within the study area, together with their associated habitat and conservation status. The majority of species listed as well as observed with a conservation status were found in association with the rocky outcrops or the Bontveld areas. Most of the species that are likely to occur were observed during the Search and Rescue programme during the construction of the adjacent Checkers Distribution Centre (DC) site. Although the DC site was less degraded than the study area, with more available habitat, species may still occur

The majority of these species were listed by the PNCO, while the species listed by the DFFE Screening Tool were all rated as of Medium Sensitivity (Table 5). DFFE also listed several bird species however these are all birds of prey and will move from the site should they occur.

Table 4: List of species recorded or likely to occur in the general study area, together with the conservation status. ***Key =: Y = Observed; U = Unconfirmed, but within the distribution range; 2022 = observed.***

Taxon	Common Name	RDB/SSC	Presence
Amphibians			
Amietophrynus pardalis	Eastern Leopard Toad	PNCO, IUCN LC	U
Amietophrynus rangeri	Raucous Toad	PNCO, IUCN LC	U
Breviceps adspersus pentheri	Penther's Rain Frog	PNCO, IUCN LC	U
Cacosternum boettgeri	Common caco	PNCO, IUCN LC	U
Cacosternum nanum	Bronze Caco	PNCO, IUCN LC	U
Hyperolius marmoratus	Painted Reed Frog	PNCO, IUCN LC	U
Kassina senegalensis	Bubbling Kassina	PNCO, IUCN LC	U
Semnodactylus wealii	Rattling Frog	PNCO, IUCN LC	U
Strongylopus fasciatus	Striped Stream Frog	PNCO, IUCN LC	U
Strongylopus grayii	Clicking Stream Frog	PNCO, IUCN LC	U
Tomopterna delalandii	Cape Sand Frog	PNCO, IUCN LC	U
Vandijkophrynus angusticeps	Cape sand Toad	PNCO, IUCN LC	U
Xenopus laevis	Common Platanna	PNCO, IUCN LC	U
Reptiles			
Acontias gracilicauda	Thin tailed legless skink	PNCO, IUCN LC	U
Acontias lineicauda	Algoa legless skink	PNCO, IUCN NT	Y
Acontias meleagris orientalis	Eastern legless skink	PNCO, IUCNLC	U
Acontias percivali tasmani	Tasman's legless skink	PNCO, IUCN LC	U
Agama atra	Southern rock agama	PNCO, IUCN LC	Y
Aspidelapse lubricus	Cape coral snake	PNCO, IUCN LC	U
Bitis arietans	Puff adder	PNCO, IUCN LC	Y
Bradypodion ventrale	Southern Dwarf Chameleon	PNCO, IUCN LC, CITIES 2	U
Causus rhombeatus	Night adder	PNCO, IUCN LC	U
Chersina angulata	Angulate tortoise	PNCO, IUCN LC, CITIES 2	Y
Cordylus cordylus	Cape girdled lizard	PNCO, IUCN LC,	U

Taxon	Common Name	RDB/SSC	Presence
		CITIES 2	
Cordylus tasmani	Tasman's girdled lizard	CITES 2 ,PNCO, IUCN VU	U
Crotaphopeltis hotamboeia	Herald snake	PNCO, IUCN LC	Y
Dasypeltis scabra	Rhombic egg eater	PNCO, IUCN LC	U
Hemachatus haemachatus	Rinkhals	PNCO, IUCN LC	Y
Hemidactylus mabouia	Tropical house gecko	PNCO, IUCN LC	U
Lamprophis aurora	Aurora house snake	PNCO, IUCN LC	U
Lamprophis capensis	Brown house snake	PNCO, IUCN LC	U
Lamprophis fuscus	Yellow bellied house snake	PNCO, IUCN NT	U
Lamprophis inornatus	Olive house snake	PNCO, IUCN LC	U
Lycodonomorphus rufulus	Brown water snake	PNCO, IUCN LC	U
Naja nivea	Cape cobra	PNCO, IUCN LC	Y
Nucras intertexta	Spotted Sandveld Lizard	PNCO	U
Pelomedusa subrufa	Marsh terrapin	PNCO, IUCN LC	U
Philothamnus natalensis occidentalus	Natal green snake	PNCO, IUCN LC	U
Psammophis notostictus	Karroo whip snake	PNCO, IUCN LC	U
Psammophylax rhombeatus	Rhombic skaapsteker	PNCO, IUCN LC	U
Pseudaspis cana	Mole snake	PNCO, IUCN LC	U
Stigmochelys pardalis	Leopard Tortoise	PNCO, IUCN LC CITIES 2	Y
Trachylepis capensis	Cape skink	PNCO, IUCN LC	Y
Trachylepis homalcephala	Red sided skink	PNCO, IUCN LC	U
Trachylepis varia varie	Variable skink	PNCO, IUCN LC	U
Varanus albigularis	Rock Monitor	PNCO, IUCN LC CITIES 2	U
Varanus niloticus	Water Monitor	PNCO, IUCN LC CITIES 2	U
Mammals			
Amblysomus corriae	Fynbos golden mole	PNCO, IUCN NT	U
Amblysomus hittentotus	Hottentot Golden Mole	PNCO, IUCN DD	U
Aonyx capensis	African clawless otter	PNCO, IUCN LC	U
Atilax paludinosus	Marsh mongoose	PNCO, IUCN LC	U
Caracal caracal	Caracal	PNCO, IUCN LC	U
Cercopithecus pygerythrus	Vervet monkey	PNCO, IUCN LC	Y
Chlorotalpa duthieae	Duthie's golden mole	PNCO, IUCN LC	U
Crocidura cyanea	Reddish-Grey Musk Shrew	PNCO, IUCN DD	U
Crocidura flavescens	Greater red musk shrew	PNCO, IUCN LC	U
Cryptomys hottentotus	African mole rat	PNCO, IUCN LC	Y
Cynictis penicillata	Yellow mongoose	PNCO, IUCN LC	Y
Dendromus melanotis	Grey climbing mouse	PNCO, IUCN LC	U
Dendromus mesomelas	Brant's climbing mouse	PNCO, IUCN LC	U
Felis cattus	Domestic cat	Alien	Y
Felis silvestris	African wild cat	PNCO, IUCN LC	U
Galerella pulverulenta	Cape grey mongoose	PNCO, IUCN LC	U
Genetta genetta	Small spotted genet	PNCO, IUCN LC	U
Genetta tigrina	Large spotted genet	PNCO, IUCN LC	U
Georychus capensis	Cape mole rat	PNCO, IUCN LC	U
Graphiurus murinus	Woodland dormouse	PNCO, IUCN LC	U
Graphiurus ocularis	Spectacled dormouse	PNCO, IUCN LC	U

Taxon	Common Name	RDB/SSC	Presence
Herpestes ichneumon	Large grey mongoose	PNCO, IUCN LC	U
Hystrix africaeaustralis	Cape porcupine	PNCO, IUCN LC	U
Ictonyx striatus	Striped pole cat	PNCO, IUCN LC	U
Lepus saxatilis	Scrub hare	PNCO, IUCN LC	Y
Macroscelides proboscideus	Round eared elephant shrew	PNCO, IUCN LC	U
Mastomys natalensis	Natal multimammate mouse	PNCO, IUCN LC	U
Mellivora capensis	Honey badger	PNCO, IUCN CITES 3 NT	U
Micaelamys namaquensis	Namaqua rock mouse	LC	U
Mus minutoides	Pygmy mouse	LC	U
Mus musculus	House mouse	Alien	U
Myosorex varius	Forest Shrew	PNCO, IUCN DD	U
Neoromicia capensis	Cape serotine bat	PNCO, IUCN LC	U
Nycteris thebaica	Egyptian slit faced bat	PNCO, IUCN LC	U
Orycteropus afer	Aardvark	PNCO, IUCN LC	U
Otocyon megalotis	Bat eared fox	PNCO, IUCN LC	U
Otomys irroratus	Vlei rat	PNCO, IUCN LC	Y
Otomys unisulcatus	Bush vlei rat	PNCO, IUCN LC	U
Panthera pardus	Leopard	PNCO, IUCN LC	U
Papio cynocephalus ursinus	Chacma baboon	PNCO, IUCN LC	U
Philantomba monticola	Blue duiker	PNCO, IUCN CITES2 VU	U
Poecilogale albinucha	African striped weasel	PNCO, IUCN VU	U
Potamochoerus larvatus	Bush pig	PNCO, IUCN LC	U
Raphicerus campestris	Steenbok	PNCO, IUCNLC	U
Raphicerus melanotis	Grysbok	PNCO, IUCNLC	U
Rattus rattus	House rat	PNCO, IUCN LC	U
Rhabdomys pumilio	Four striped grass mouse	PNCO, IUCN LC	Y
Saccostomus campestris	Pouched mouse	PNCO, IUCNLC	U
Suncus infinitesimus	Least dwarf shrew	PNCO, IUCN E	U
Sylvicapra grimmia	Common duiker	PNCO, IUCN LC	U
Tragelaphus scriptus	Bush buck	PNCO, IUCN LC	U
Vulpes chama	Cape Fox	PNCO, IUCN LC	U

Table 5: DFFE Screening Tool listed species

Sensitivity	Feature(s)
High	Aves-Circus ranivorus
High	Aves-Circus maurus
High	Aves-Afrotis afra
Medium	Aves-Neotis denhami
Medium	Sensitive species 5
Medium	Mammalia-Chlorotalpa duthieae
Medium	Sensitive species 8
Medium	Invertebrate-Aneuryphymus montanus

5 Spatial Conservation and Management Plans

Several spatial conservation planning tools have considered the study area (SRK 2014 & ECBCP 2019) Figure 7 highlights the Aquatic Critical Biodiversity Areas (CBAs) as defined in the Eastern Cape Biodiversity Conservation Plan or ECBCP (2019), in which the spatial data indicates that none of the project components are located within any type of CBA, however the pans / depressions were shown as Aquatic CBA Type 1. The site is not located within any National Freshwater Ecosystem Priority Atlas areas (NFEPAs).

The NMBM Conservation Plan (SRK 2014) exists as a promulgated Municipal wide fine scale Conservation Assessment and Plan (SRK, 2014) (Figure 8). Thus this plan overrides the Provincial ECBCP (2019) in terms of the terrestrial components only. Due to current and proposed future land uses for the study area, no Terrestrial CBAs indicated within the site.

In summation, the site thus has no direct connection with any of the aquatic resources shown as well as Critical Terrestrial habitats due to the fragmentation and or degradation of the surrounding areas.

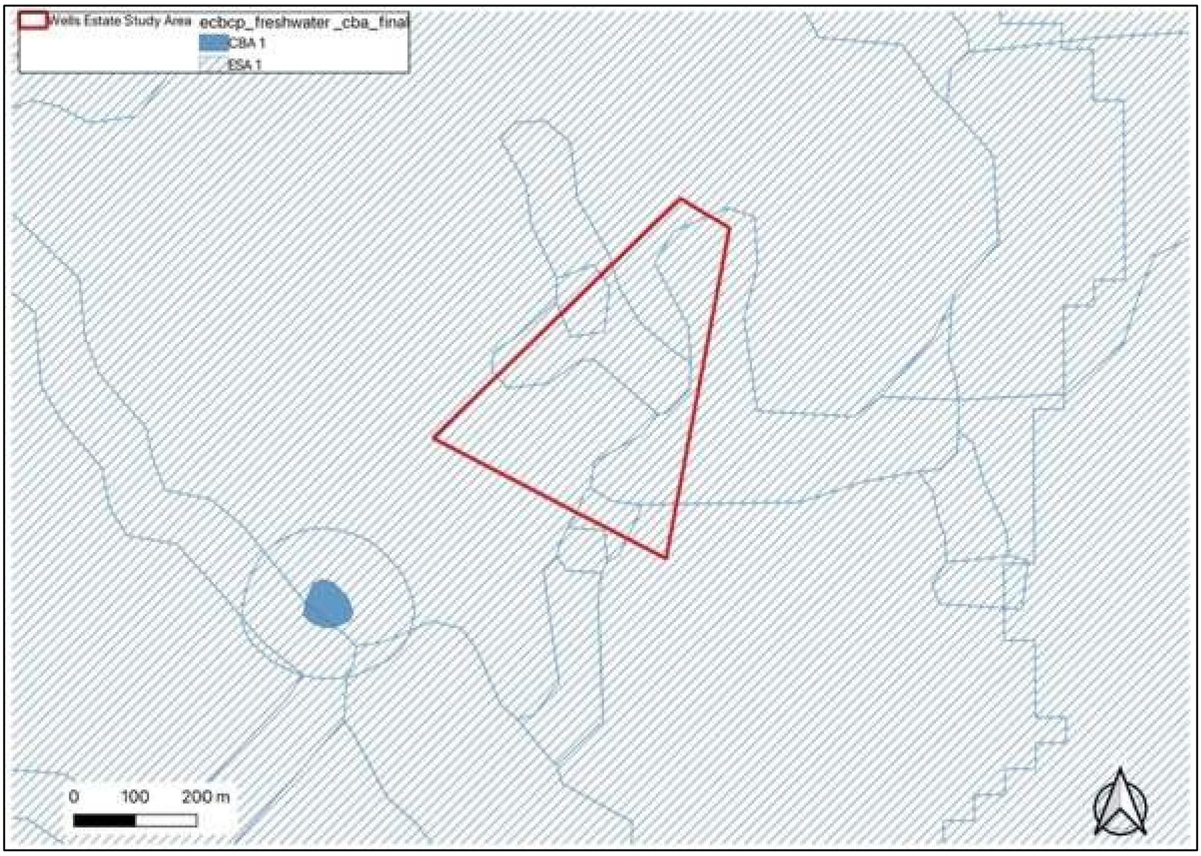

Figure 7: A map illustrating the various Aquatic CBA's described in the ECBCP (2019)

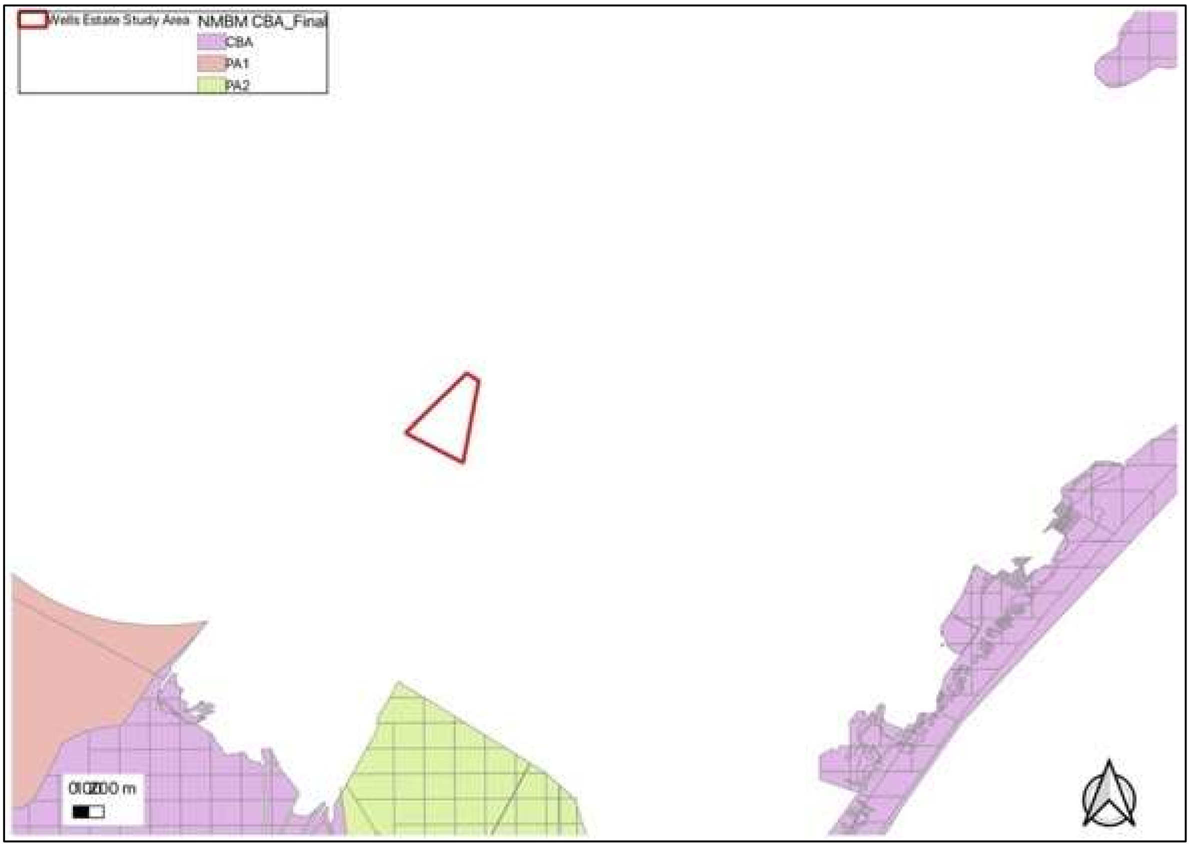

Figure 8: A map illustrating the various NMBM CAP (SRK, 2014) final CBA map

6 Ecological Sensitivity Assessment

Based on the findings of this study, the various habitats (vegetation & wetlands) were ranked in terms of their sensitivity to development. Typically this is carried out using the following criteria, listed in order of importance, i.e., the habitat or vegetation unit:

- Contained Species of Special Concern (SSC);
- Habitat was protected under a form of legislation;
- Exhibited a high degree of biodiversity;
- Exhibited a limited degree of degradation;
- A unique habitat that is not well represented within the region; and
- Provided an important ecosystem role or support system, e.g., ecological corridor.

This approach has been formalised via the Species Environmental Impact Assessment Guidelines in support of the Terrestrial Plant and Animal Species protocols (July 2023)

The guidelines provide detail for implementing relevant species protocols and in particular a method to determine the Site Ecological Importance (SEI).

The SEI protocol used in this assessment provides a species and habitat ranking approach to assessing the importance and thus indirectly the sensitivity of a particular site. This was adapted from SANBI, 2020 Ver 3.1 2022. Table 6 indicates the Sensitivity Ratings, while Table 7 indicates the results and Figure 9 summarises the results spatially.

Note SEI is calculated as follows based on Section 8 of SANBI (2022):

Site Ecological Importance = Biodiversity Importance (BI) + Receptor Resilience (RR)

Where BI = Conservation Importance (CI) + Functional Integrity (FI)

Table 6: Species and habitat sensitivity ratings definitions

Sensitivity Rating	Description
Very High	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not accept- able/not possible (i.e. last remaining populations of species, last remaining good condition patches of ecosystems/ unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted; limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very Low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

Table 7: Site Sensitivity rating results

Habitat Type	Description	Conservation Status & Importance	Functional Integrity	SEI	Development Constraints
Wetlands - Endorheic Pans	The small depression mostly associated with the Bontveld vegetation units, and are unique within the environment due their association with the limestone geology found within the region and are formed through karst dissolution of the underlying calcrete.	Very High and High, due to being limited to this region of South Africa and the associated vegetation type	High - Present Ecological State of these systems were rated as Largely Natural as only a small number of the pans have been disturbed over time	Very High	None, as the catchment of this system is well away from the site, and disconnected by current road infrastructure. Only the 500m regulated area applies
Grassridge Bontveld	This vegetation unit is limited to the limestone geology of the region, and is listed as Vulnerable in the NMBM BSP. Species assemblages are also unique to this vegetation unit, and Species observed / known to occur are mostly protected (PNCO/NFA). This vegetation unit is composed of a matrix of small thicket bush clumps surrounded by grasslands. Several unique animal species such as the Coega Copper (Butterfly) and Albany adder are also found in this vegetation type.	Very High as limited areas of this vegetation type are under conservation coupled to the high levels / numbers of protected / listed species associated with Grassridge Bontveld	Moderate - High as the majority of the site containing this vegetation unit is largely intact, with disturbance and loss occurring due to (linear structures (roads) and grazing.	Very High	One intact unit was observed and is included in the proposed layout as a No-go area, i.e. included as Open Space area and any relocated plants will be moved into this area
Degraded or Secondary areas	Remaining disturbed area of the site with illegal dumping, alien vegetation or cleared bush	Low	Low	Low	None

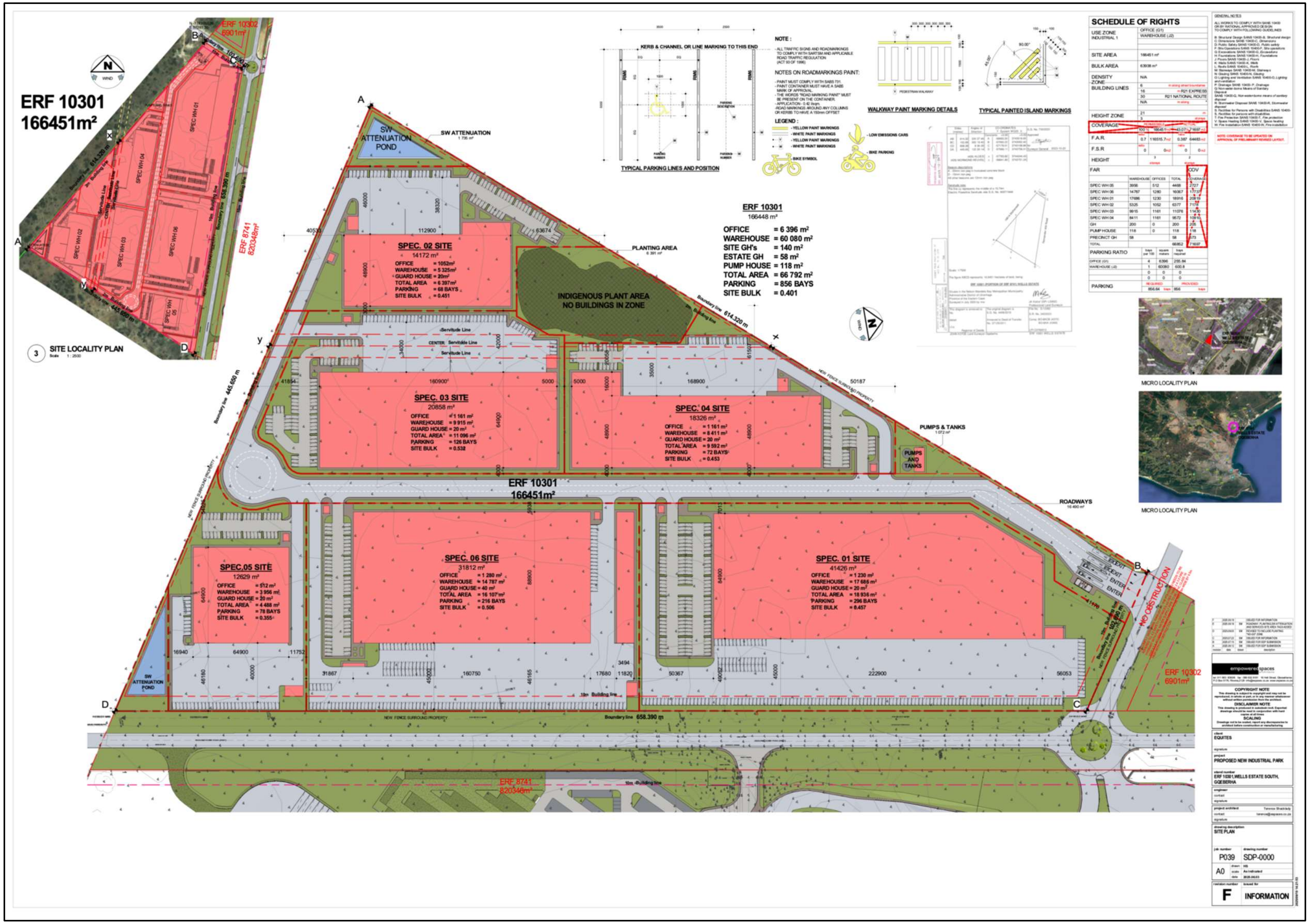

Figure 9: A map illustrating the Preferred layout where the sensitive habitat has been avoided and the remaining areas = LOW as they currently have disturbance such as road or support infrastructure servitudes

7 Assessment of Impacts and Identification of Management Actions

During this investigation it was found that the greatest number of potential impacts would only occur within the terrestrial environment.

With regard to the decommissioning phase, this was not assessed as the impacts would remain the same as that shown in the operational phase. This is due to the lack of irreversibility of the impacts due to the nature of the soils, topography and vegetation having a low rehabilitation potential.

7.1 No-Go Option

With regard the No-Go option it is assumed that the site would continue to degrade due to the prevalence of alien encroachment, bush clearing and grazing. This would continue into the long-term with a High intensity that would impact on the regional scale due to loss of important habitat. Little in the way of mitigation could be proposed due to the social needs of the surrounding residents and their requirement for grazing areas.

7.2 Terrestrial Impacts

7.2.1 Impact 1: Loss of vegetation and in particular species / habitats that are listed as Vulnerable

Impact 1	Loss of vegetation and in particular species / habitats that are listed as Vulnerable

Issue	The clearance of vegetation and destruction of habitats, especially those that are listed as Vulnerable.	
Description of Impact		
During construction, clearing of the development areas, and associated infrastructure will be required. However, in line with the mitigation hierarchy, this has resulted in the revision of the proposed layout to avoid any Very High Sensitivity areas. The preferred layout as shown In Figure 9 was evaluated and based on the results of this assessment the development area will be located within Low sensitivity area		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Construction	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Medium	Low
Duration	Long-term	Long-term
Extent	Local	Local
Consequence	Medium	Low
Probability	Definite	Probable
Significance	Medium -	Low -
Degree to which impact can be reversed	Medium	

Degree to which impact may cause irreplaceable loss of resources	Medium	
Degree to which impact can be mitigated	Low-	
Mitigation actions		
The following measures are recommended:	• All temporary works areas (laydowns and camps), where possible, must be placed in previously disturbed areas within the site, including any temporary access roads or storage areas, e.g. in areas where alien vegetation is dense and could be cleared for this purpose. • Comply with search and rescue specifications as per the issued permits. • The revegetation of any temporary sites, as well as any previously degraded areas, must begin from the onset of the project, with the involvement of a botanist to assist with the revegetation specifications in particular the remaining open space areas • Alien vegetation management must be initiated at the beginning of the construction period.	
Monitoring		
The following monitoring is recommended:	• Regeneration of alien vegetation must be monitored once all areas have been cleared, forming part of a long term alien vegetation management plan within any remaining open space areas	
Cumulative impacts		
Nature of cumulative impacts	Additional loss of sensitive vegetation / habitats related to other development within the region, most of which will result in additional clearing of Bonteveld areas.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	High -	Medium -

7.2.2 Impact 2: Loss and/or Fragmentation of Faunal Habitat

Impact 2	Loss of any connected habitats that may result in disturbance of any faunal habitats or important corridors

Issue	Vegetation clearing activities will result in the loss and / or fragmentation of critical corridors that connect faunal habitats	
Description of Impact		
During construction, clearing of the development areas, faunal will also be disturbed and or result in loss of habitat and movement corridors. However this impact is expected to be limited as most of the faunal communities present are mobile or for the most part the habitat is already disturbed or disconnected		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Construction	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Medium	Low
Duration	Long-term	Long-term
Extent	Local	Local
Consequence	Medium	Low
Probability	Definite	Probable
Significance	Medium -	Low -
Degree to which impact can be reversed	Medium	
Degree to which impact may cause irreplaceable loss of resources	Medium	
Degree to which impact can be mitigated	Low -	
Mitigation actions		
The following measures are recommended:	• Any protected or listed species that are mentioned in this report, must be relocated with the requisite permits in place.	
Monitoring		
The following monitoring is recommended:	• The revegetation of any temporary sites, as well as any previously degraded areas, must begin from the onset of the project, with the involvement of a botanist to assist with the revegetation specifications in particular the remaining open space areas • Alien vegetation management must be initiated at the beginning of the construction period.	
Cumulative impacts		
Nature of cumulative impacts	Additional loss of sensitive vegetation / habitats related to other development within the region, most of which will result in additional clearing of Bontveld areas.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	High -	Medium

7.2.3 Impact 3: The potential spread of alien vegetation

Impact 3	The potential spread of alien vegetation

Issue	Several Alien Invasive Species were found present on the site, and included the following species: • *Acacia longifolia* • *Acacia cyclops* • *Opuntia ficus-indica* These species in particular have the ability to alter vegetation units and drive down habitat complexity and species diversity.	
Description of Impact		
• Biodiversity Loss: Alien species, particularly aggressive invaders like Acacia and Prickly Pear, often outcompete indigenous species for resources, such as light, water, and nutrients, leading to a decline in indigenous plant diversity. This results in a reduction in biodiversity, as indigenous plants, which provide food and shelter for a range of local fauna, are displaced by non-indigenous species that may not support the same wildlife populations. The loss of indigenous plants can also disrupt local pollination systems and food webs, affecting a wide range of species. • Ecosystem Functionality Disruption: The introduction and spread of alien species can disrupt key ecological processes, such as water infiltration, nutrient cycling, and soil stabilisation. Invasive plants often have different water and nutrient requirements compared to native vegetation, leading to altered soil properties and reduced soil health. This impacts ecosystem functions like water purification and carbon sequestration, which are critical for mitigating climate change and maintaining environmental balance. • Habitat Degradation and Fragmentation: Alien species can cause further habitat fragmentation by altering the structure of existing ecosystems. As these invaders spread, they create barriers for indigenous wildlife, limiting their movement and access to resources. This fragmentation can lead to isolated populations, reducing genetic diversity and increasing the vulnerability of species to environmental stressors, disease, and predation. Over time, this isolation can lead to local extinctions of species that are dependent on intact, healthy habitats. • Increased Vulnerability to Other Environmental Threats: Areas dominated by alien vegetation are often less resilient to other environmental threats, such as drought, fire, and climate change. For example, many invasive species are more fire-prone than indigenous vegetation, increasing the risk of wildfires and further destabilizing the ecosystem. Additionally, the increased presence of alien species may reduce the natural resilience of the ecosystem to recover from other disturbances.		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Construction	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Medium	Low
Duration	Long-term	Long-term
Extent	Local	Local
Consequence	Medium	Low
Probability	Definite	Probable
Significance	Medium -	Low -
Degree to which impact can be reversed	Medium	
Degree to which impact may cause irreplaceable loss of resources	Medium	
Degree to which impact can be mitigated	Low -	
Mitigation actions		

The following measures are recommended:	• All temporary works areas (laydowns and camps)should, where possible, only be placed in previously disturbed areas within the site, and this includes any temporary access roads or storage areas. • The revegetation of any temporary sites, as well as any previously degraded areas, must begin from the onset of the project, with the involvement of a botanist to assist with the revegetation specifications in particular the remaining open space areas • Alien vegetation management must be initiated at the beginning of the construction period	
Monitoring		
The following monitoring is recommended:	• Regeneration of alien vegetation must be monitored once all areas have been cleared, forming part of a long term alien vegetation management plan especially for any remaining opens space areas	
Cumulative impacts		
Nature of cumulative impacts	Additional loss of sensitive vegetation / habitats related to other development within the area, most of which will result in additional clearing of Bontveld areas.	
Rating of cumulative impacts	**Without Mitigation**	**With Mitigation**
	High -	Medium-

7.3 Aquatic Ecosystems

The proposed development has avoided all aquatic systems.

7.3.1 Impact 4: Loss of wetland habitat and any functional corridors

Impact 4	**Loss of wetland habitat and any functional corridors**

Issue	The proposed layout will avoid any important wetland features
Description of Impact	
The potential loss of wetland habitat and any associated functional corridors during the construction can lead to a range of environmental and ecological impacts. The loss of these habitats can have far-reaching consequences, both within the immediate project area and in surrounding ecosystems. These ecosystems play an essential role in maintaining local biodiversity and water cycles. However, the proposed development poses risks to the integrity of these systems. The following are key consequences of the potential loss or disturbance of wetland habitat and functional corridors: • Biodiversity Loss: Wetlands, particularly pans and depressions, provides for an important habitat for a variety of specialised plant and animal species, including aquatic and semi-aquatic species. Disturbances such as vegetation clearing, soil compaction, and changes in water flow can destroy or degrade these habitats. This leads to the decline or local extinction of species that depend on these wetlands, including rare or threatened species. • Aquatic Species Vulnerability: Many of the species in these areas are adapted to specific hydrological conditions. Changes in water flow, water quality, or depth could disrupt critical life cycles such as feeding, breeding, and migration, affecting the health of aquatic communities.	

- Invasive Species Introduction: Disturbance during construction can create opportunities for invasive species to infiltrate these areas. These invaders often outcompete indigenous species, altering the ecological balance and further degrading the wetland ecosystem.
- Hydrological Disruption: Wetlands and pans are important in regulating water flow and maintaining groundwater recharge. Disturbance from construction activities could disrupt natural water accumulation and drainage, leading to changes in hydrology. This could result in reduced water availability and the breakdown of the ecosystem services these wetlands provide, such as flood mitigation and groundwater replenishment.
- Ecosystem Service Loss: Wetlands provide numerous ecosystem services that benefit both the natural environment and surrounding human populations. These services include water purification, carbon sequestration, and soil stabilization. Any degradation or loss of wetland habitats would impair these services, potentially leading to poorer water quality, increased carbon emissions, and reduced soil stability, which would negatively affect local biodiversity and water resources.
- Wildlife Habitat Fragmentation: Wetlands are critical habitat corridors that support movement and migration for various species. The fragmentation of wetland areas through development can isolate populations, making species more vulnerable to inbreeding, extinction, or reduced resilience to environmental changes. The destruction or alteration of wetland corridors may further exacerbate the challenges faced by wildlife, as they rely on these habitats for movement, breeding, and feeding.
- Impact on Soil Integrity and Water Quality: The soils in wetland depressions are typically indicative of ephemeral systems and show signs of periodic inundation, gleying, and iron nodules—important markers of soil saturation and anaerobic conditions. Construction activities that affect these soils could compromise their integrity, leading to reduced filtration capacity, increased sedimentation, and a higher risk of contamination of the surrounding water systems. This would disrupt the natural water purification processes and reduce the overall health of the wetland ecosystem.

The study area hydrology is characterised by localised ephemeral surface water flows, and several pans and depressions were identified. These depressions are critical wetland ecosystems, where water typically accumulates in a central area.

The Ecological Importance and Sensitivity of the pans within 500m of the project area (i.e. its importance to the maintenance of ecologic diversity and function) are considered High.

Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Construction	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Medium	Medium
Duration	Long-term	Medium-Term
Extent	Local	Local
Consequence	Medium	Low
Probability	Definite	Possible
Significance	Medium -	Very Low -
Degree to which impact can be reversed	Medium	
Degree to which impact may cause irreplaceable loss of resources	Medium	
Degree to which impact can be mitigated	Low -	
Mitigation actions		
The following measures are recommended:	• The preferred site plan will avoid the wetland and its catchment thus not direct mitigations are required	
Monitoring		

The following monitoring is recommended:	• Any concentrated runoff and or erosion where observed must be rectified with the appropriate stormwater management measures, e.g. gabions, reno mattresses or energy dissipators, and not be discharged into any natural wetland features	
Cumulative impacts		
Nature of cumulative impacts	Additional loss of sensitive vegetation / habitats related to other development within the area, most of which will result in additional clearing of wetland areas.	
Rating of cumulative impacts	**With Mitigation**	**With Mitigation**
	High -	Medium-

7.3.2 Impact 5: Changes to the hydrological regime and increased potential for erosion

Impact 5	**Changes to the hydrological regime and increased potential for erosion**

Description of Impact		
Any hard surfaces created by the project, that will generate stormwater runoff have the ability to impact the current hydrological regime and thus create erosion through the concentration of flows. Construction activities may result in significant alterations to the local hydrological regime and an increased risk of erosion. These impacts are particularly relevant in areas where wetlands, pans, or other sensitive ecosystems are present. Changes to the natural flow and drainage patterns can have cascading effects on both the terrestrial and aquatic environments. • Habitat Degradation: Pans and depressions often depend on specific hydrological conditions, including seasonal water inputs and natural drainage patterns, to sustain their ecological integrity. Disturbances caused by construction activities, such as vegetation clearing, soil compaction, and alterations to surface water flows, may disrupt these conditions. Changes to the hydrological regime, such as reduced water infiltration or increased runoff, could lead to the drying out of these systems or prolonged inundation. These disruptions would degrade the habitat quality, affecting the flora and fauna that rely on these wetlands for survival. • Erosion and Sedimentation: Construction activities in or near wetland ecosystems often disturb the soil, exposing it to erosion by wind and water. Increased runoff from altered landscapes can exacerbate soil erosion, resulting in sedimentation of nearby wetlands and water bodies. Sediment accumulation in pans can smother aquatic habitats, reduce water quality, and disrupt the breeding and feeding patterns of wetland-dependent species. Over time, excessive sedimentation may alter the physical structure of these ecosystems, diminishing their ability to function as natural water storage and filtration systems.		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Construction	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Very Low	Medium
Duration	Long-term	Medium-Term
Extent	Local	Local
Consequence	Low	Low
Probability	Probable	Possible

Significance	Low -	Very Low -
Degree to which impact can be reversed	Medium	
Degree to which impact may cause irreplaceable loss of resources	Medium	
Degree to which impact can be mitigated	High -	
Mitigation actions		
The following measures are recommended:	• The preferred option is recommended as all aquatic systems can be avoided. • No stormwater discharged may be directed to delineated aquatic zone. • A construction and operational stormwater management plan must be developed post EA, detailing the structures and actions that must be installed to prevent the increase of surface water flows directly into any natural systems. • Effective stormwater management must include measures to slow, spread and deplete the energy of concentrated flows thorough effective stabilisation (gabions and Reno mattresses) and the re-vegetation of any disturbed areas	
Monitoring		
The following monitoring is recommended:	• Stormwater systems must be inspected on an annual basis to ensure these are functional. • Any concentrated runoff and or erosion where observed must be rectified with the appropriate stormwater management measures, e.g. gabions, reno mattresses or energy dissipators	
Cumulative impacts		
Nature of cumulative impacts	Additional loss of sensitive vegetation / habitats related to other development within the region, most of which will result in additional clearing of wetland areas.	
Rating of cumulative impacts	**With Mitigation**	**With Mitigation**
	High -	Medium-

7.3.3 Impact 6: Changes to water quality

Impact 6	Changes to the water quality

Issue	The construction and operation of the proposed development have the potential to alter the water quality of nearby aquatic systems, including wetland pans, and associated groundwater resources. The introduction of pollutants, sediments, and other contaminants into aquatic systems can degrade water quality, negatively impacting both ecological and human systems dependent on these resources.	
Description of Impact		
The construction and operation of the proposed development have the potential to alter the water quality of nearby aquatic systems, including wetlands, pans, and associated groundwater resources. The introduction of pollutants, sediments, and other contaminants into aquatic systems can degrade water quality, negatively impacting both ecological and human systems dependent on these resources. These areas are integral to the regional hydrological and ecological functions, and alterations to their water quality can lead to the following consequences: The quality of water in the ephemeral systems, including depressions and pans, within the study area is critical for maintaining biodiversity and ecosystem functions. Alterations to water quality, whether from increased sedimentation, nutrient enrichment, or pollutants associated with construction activities, can lead to a range of negative consequences. The degradation of water quality can result in the loss of sensitive aquatic species, which are adapted to the fluctuating conditions typical of these systems. Increased nutrient loading, for example, can trigger algal blooms, reducing oxygen levels and suffocating aquatic organisms. Furthermore, changes in water chemistry or the introduction of pollutants can directly impact aquatic life, including fish, amphibians, and invertebrates, disrupting the delicate balance of these ecosystems. Poor water quality can also hinder key ecosystem functions. Wetlands and pans play a vital role in water filtration and groundwater recharge. The decline in water quality due to increased runoff or pollution can impair these natural processes, reducing water availability and affecting the health of surrounding ecosystems. These systems also act as natural flood buffers, absorbing excess water during rainfall events. However, reduced water quality can compromise this flood mitigation role, increasing the vulnerability of the surrounding areas to flooding. For migratory and resident birds, the quality of water in these wetlands is essential for feeding, breeding, and survival. Degraded water quality, particularly through the accumulation of pollutants or altered salinity, can diminish food availability and disrupt breeding cycles, leading to a decline in bird populations. Changes in water quality threaten the viability of these wetlands as habitats for a wide range of species. This degradation can result in habitat fragmentation, reducing connectivity between wetland ecosystems and further contributing to biodiversity loss. Consequently, maintaining water quality is critical not only for protecting the species that depend on these wetlands but also for preserving the broader ecological integrity of the region.		
Type of Impact	Indirect	
Nature of Impact	Negative	
Phases	Construction	
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	Medium	Low
Duration	Long-term	Medium-Term
Extent	Local	Local
Consequence	Medium	Low
Probability	Probable	Possible
Significance	Medium	Very Low -
Degree to which impact can be reversed	Medium	

Degree to which impact may cause irreplaceable loss of resources	Medium	
Degree to which impact can be mitigated	Medium-	
Mitigation actions		
The following measures are recommended:	• All construction materials including fuels and oil should be stored in demarcated areas that are contained within berms / bunds to avoid spread of any contamination. • Washing and cleaning of equipment should also be done in berms or bunds, in order to trap any cement and prevent excessive soil erosion. Mechanical plant and bowsers must not be refuelled or serviced within or directly adjacent to any channel. It is therefore suggested that all construction camps, lay down areas, batching plants or areas and any stores should be located further than a temporary 85 m from a watercourse and wetland. 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; • Develop and implement emergency plans in case of any spillages; • 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 a water course, wetland or buffers and all stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds;	
Monitoring		
The following monitoring is recommended:	• The revegetation of any temporary sites as well as any previously degraded areas must begin from the onset of the project, with the involvement of a botanist to assist with the revegetation specifications • Stormwater systems must be inspected on an annual basis to ensure these are functional. • Any concentrated runoff and or erosion where observed must be rectified with the appropriate stormwater management measures, e.g. gabions, reno mattresses or energy dissipators	
Cumulative impacts		
Nature of cumulative impacts	Additional loss of sensitive vegetation / habitats related to other development within the region, most of which will result in additional clearing of wetland areas.	
Rating of cumulative impacts	**With Mitigation**	**With Mitigation**
	High -	Medium-

8 Conclusion and Recommendations

The results indicated that several important habitats are located within the proposed development site and for the most part, the areas rated with the highest sensitivity have been avoided within the preferred layout. The project has thus made use of as many previously disturbed / developed areas as possible.

Therefore, with the mitigations, the overall significances of the impacts were rated as VERY LOW to LOW and the ecological specialist has no objection to the project approval. This based on the assumption that any protected or listed species that still remain will be relocated to the proposed open space area.

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10 Appendix 1 – Copy of Specialist CV

CURRICULUM VITAE

Dr Brian Michael Colloty

Profession : Ecologist (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: 29 years

SKILLS BASE AND CORE COMPETENCIES

- 29 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 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 51ehalf 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 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).

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

Prior to commencing with the Biodiversity Specialist Assessment in accordance with the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Biodiversity (Government Notice 320, dated 20 March 2020), a site sensitivity verification was undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tool (Screening Tool).

The details of the site sensitivity verification are noted below:

Date of Site Visit	4 August 2025
Specialist Name	Dr Brian Colloty
Professional Registration Number	400268/07
Specialist Affiliation / Company	EnviroSci (Pty) Ltd

Government Notice No. 320, dated 20 March 2020, 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-

1. Confirms or disputes the current use of the land and environmental sensitivity as identified by the national web based environmental screening tool;
2. Contains a motivation and evidence of either the verified or different use of the land and environmental sensitivity;
3. 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 biodiversity themes and addresses the content requirements of (a) and (b) above. The report will be appended to the respective specialist study included in the Environmental Authorisation Reports produced for the project.

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

Photo record is contained in the above report.

Based on the DFFE Screening Tool using the aquatic biodiversity theme, the site contains areas of very high sensitivity due to the presence of an Ecological Support Area (Figure 1).

Sensitivity	Feature(s)
Very High	ESA 1

Figure 1. DFFE Screening Tool outcome for the aquatic biodiversity theme

Based on the DFFE Screening Tool – using the Terrestrial Biodiversity Theme, Low sensitivity (Figure 2).

Sensitivity	Feature(s)
Low	Low Sensitivity

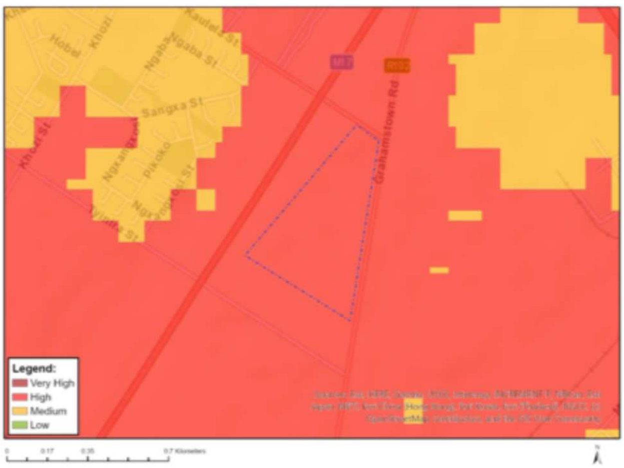
Figure 2. DFFE Screening Tool outcome for the terrestrial biodiversity theme

Based on the DFFE Screening Tool – using the Plant Species Theme, the site contains area of Low & Medium sensitivity as a result of the occurrence of sensitive species (Figure 3).

Sensitivity	Feature(s)
Medium	Rhombophyllum rhomboideum
Medium	Selago zeyheri
Medium	Rapanea gilliana
Medium	Syncarpha recurvata
Medium	Sensitive species 91
Medium	Zygophyllum divaricatum
Medium	Cotyledon adscendens
Medium	Justicia orchioides subsp. orchioides

Figure 3. DFFE Screening Tool outcome for the plant species theme

Based on the DFFE Screening Tool – using the Animal Species Theme, the site contains areas of high (all bird species) sensitivity, while the remainder are rated as Medium (Birds, Insects and mammals) (Figure 4)



Sensitivity	Feature(s)
High	Aves-Circus ranivorus
High	Aves-Circus maurus
High	Aves-Afrotis afra
Medium	Aves-Neotis denhami
Medium	Sensitive species 5
Medium	Mammalia-Chlorotalpa duthieae
Medium	Sensitive species 8
Medium	Invertebrate-Aneuryphymus montanus

Figure 4. DFFE Screening Tool outcome for the animal species theme

Based on the above outcomes, the specialist **disagress with** the environmental sensitivities identified on site. The findings have been informed by a site visit undertaken by Dr Brian Colloty in 4 August 2025.

Motivation of the outcomes of the sensitivity map and key conclusions

In conclusion, the DFFE Screening Tool identified several sensitivity ratings. Although there is some overlap with the findings on site and the Screening Tool's outcome, the development footprint does still contain Very High sensitivities related to the Plant and Terrestrial Themes, while the aquatic would be seen as Low, as opposed to Very High that were identified following the undertaking of the site visit and spatial input considerations.

The environmental sensitivity input received from the ecology specialist was then taken forward and considered within the 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 on the respective terrestrial and aquatic environments are deemed acceptable by the ecologist.

12 Appendix 3 - Aquatic Assessment 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. It is also important to understands 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

12.1 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.
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.

12.2 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 1: 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.

12.3 National Wetland Classification System method

Due to the nature of the wetlands and watercourses observed, it was determined that the newly 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.

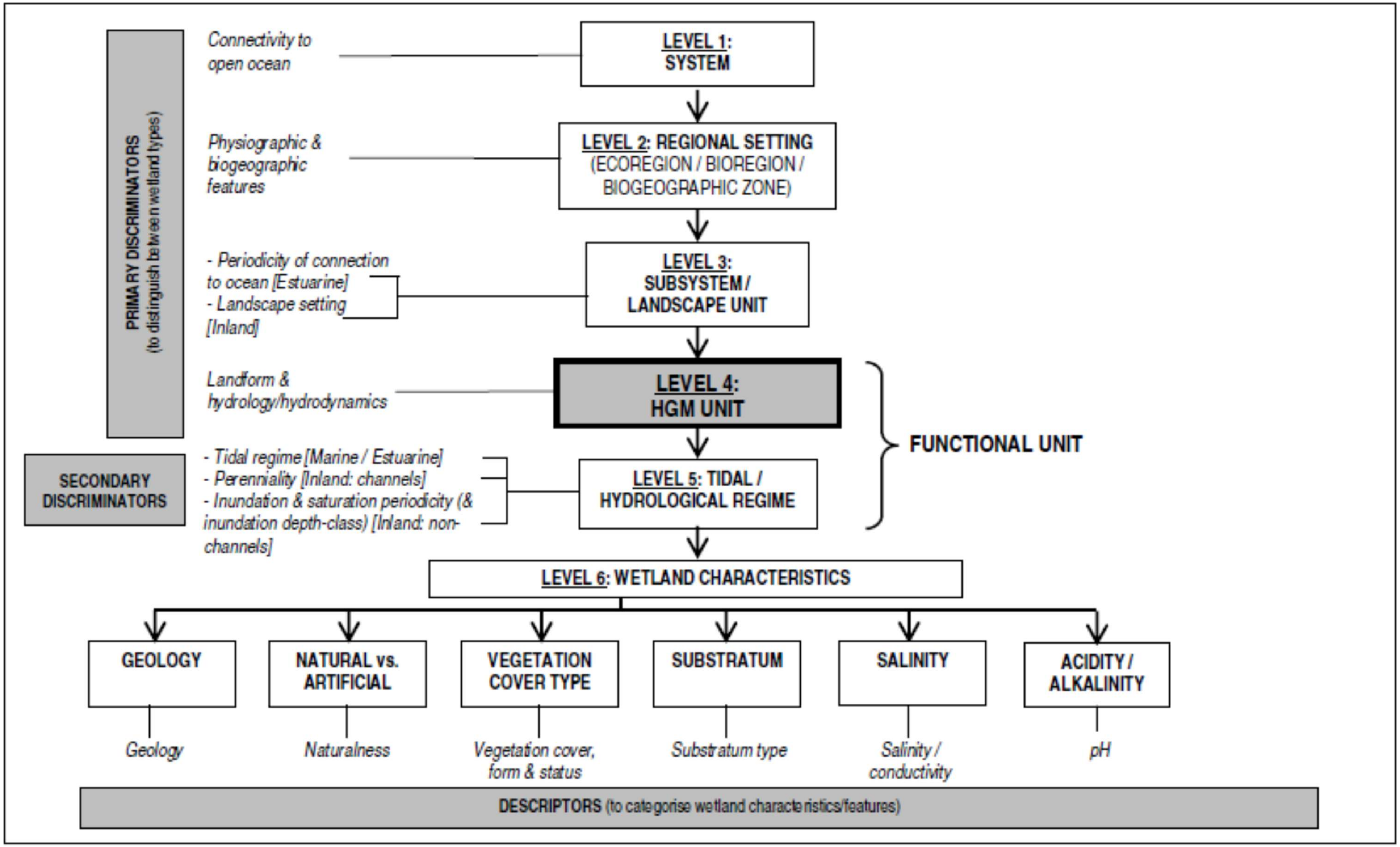


Figure 2: Basic structure of the NWCS, showing how 'primary discriminators' are applied up to Level 4 to classify Hydrogeomorphic (HGM) Units, with 'secondary discriminators' applied at Level 5 to classify the tidal/hydrological regime, and 'descriptors' applied

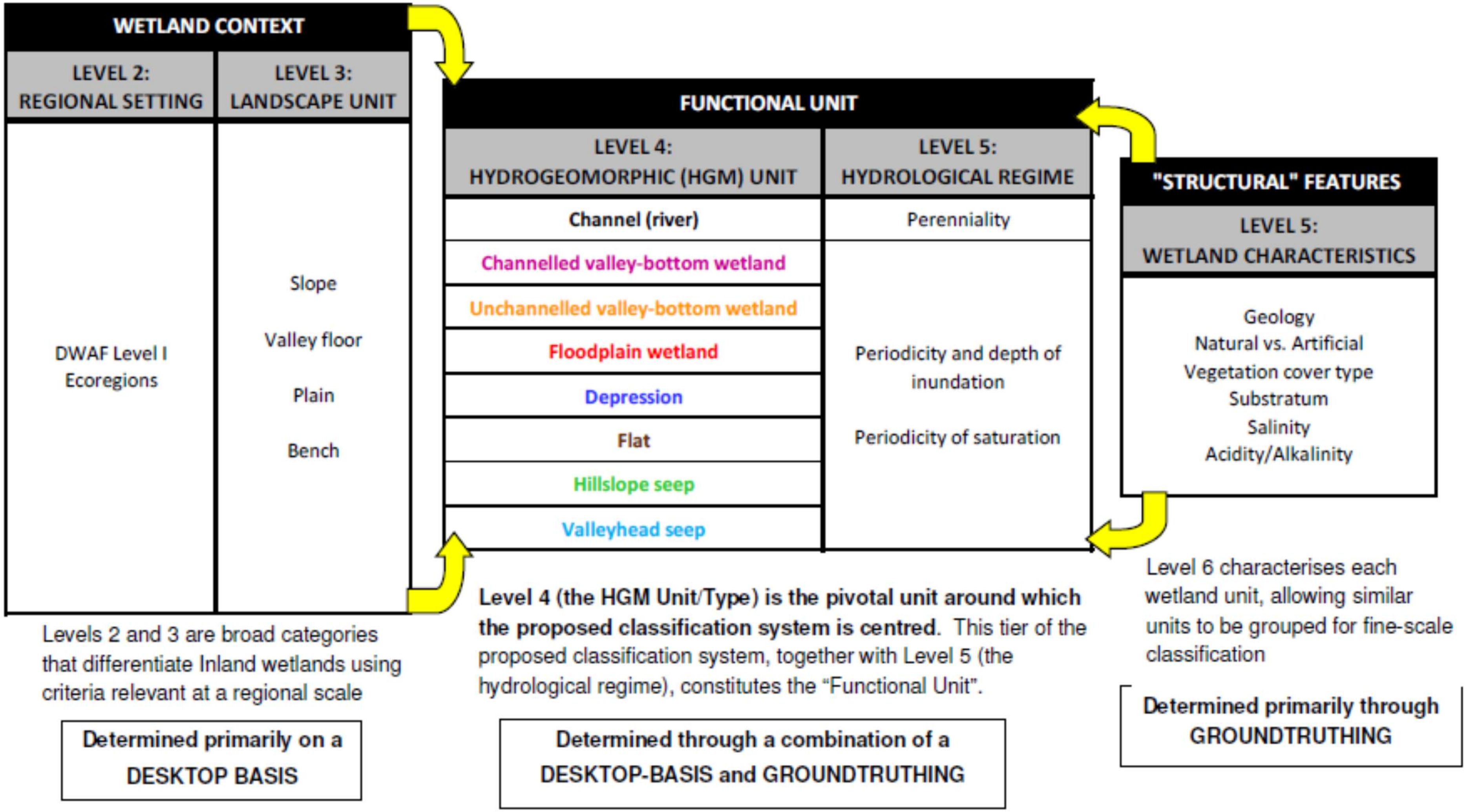


Figure 3: Illustration of the conceptual relationship of HGM Units (at Level 4) with higher and lower levels (relative sizes of the boxes show the increasing spatial resolution and level of detail from the higher to the lower levels) for Inland Systems (from Ollis *et al.*, 2013)

12.4 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 2: 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.

12.5 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 3: Summary of direct and indirect ecoservices provided by wetlands from Kotze *et al*., 2008

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

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 in stormwater management features and should not be developed to retain the function of any ecological corridors.

13 Appendix 3 – Signed declaration