



# Proposed Erica Transmission Substation, Philippi, Cape Town.

## Aquatic Biodiversity Assessment Report

May 2022 Update January 2023

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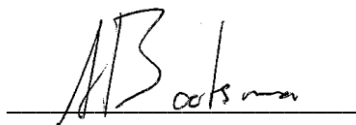
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## EXECUTIVE SUMMARY

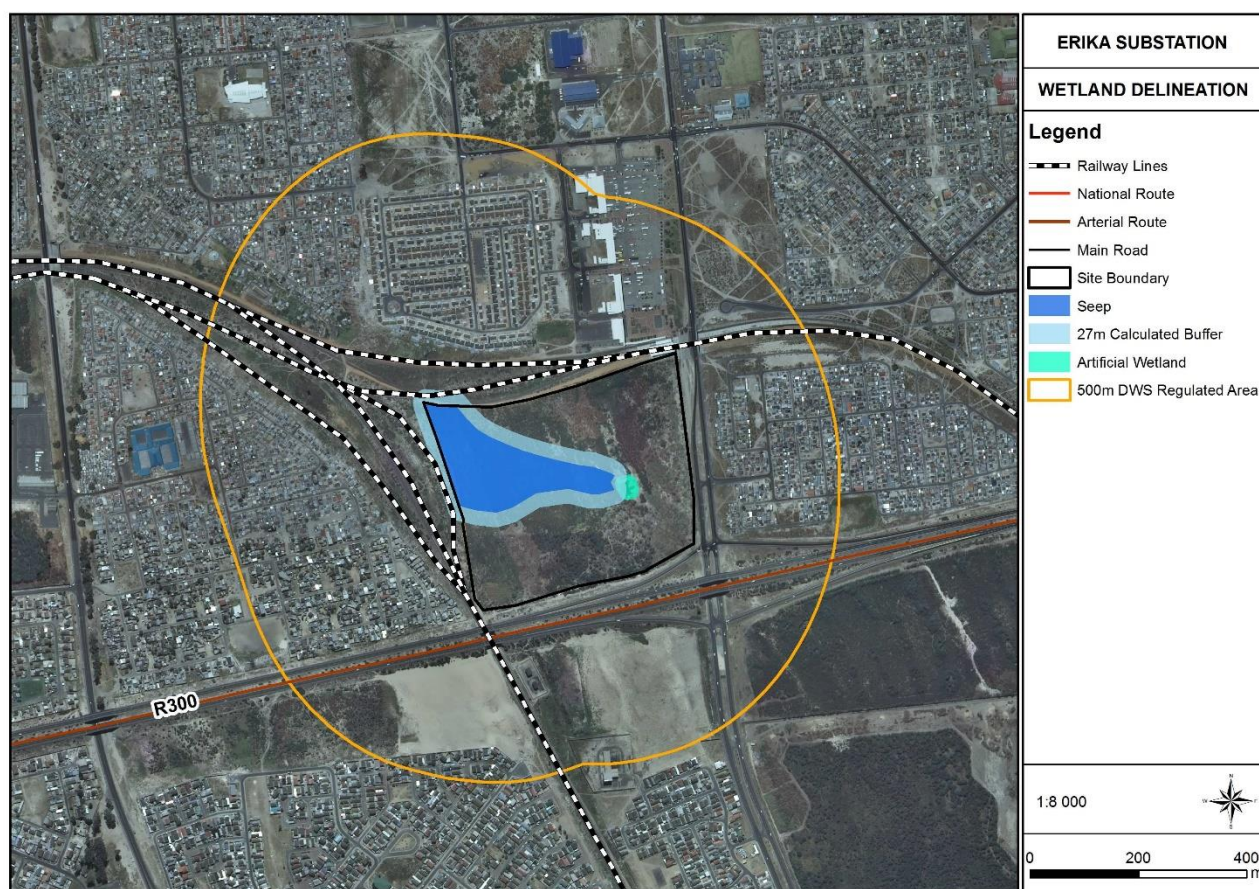
Limosella Consulting was appointed to assess the site earmarked for the proposed Erica Substation in terms of sensitive aquatic features. The proposed Erica substation and associated lines projects are considered critical for the continued security of the electricity supply within the City of Cape Town. The Western Cape is comprised of three Customer Load Networks (CLNs), namely: Peninsula, Outeniqua and West Coast. The project area falls within the Cape Peninsula CLN. The Peninsula CLN is the main load centre in the province, consuming approximately 67% of the load.

The terms of reference for the current study were as follows:

- Delineate the wetland and riparian areas to inform the placement of infrastructure;
- Classify the watercourse according to the system proposed in the national wetlands inventory if relevant,
- Undertake functional and integrity assessment of wetlands and riparian areas as specified in General Notice 267 of 24 March 2017;
- Assess the aquatic instream parameters of the potentially affected watercourses, including SASS5 and Ichthyofauna assessments if relevant;
- Undertake an impact assessment as specified in Appendix 6 of the NEMA 2014 regulations, as amended and GN320, March 2020;
- Undertake a Risk Assessment as specified in General Notice 267 of 24 March 2017;
- Recommend suitable buffer zones, both generic (as required in GDARD, 2014) and scientific as specified in General Notice 267 of 24 March 2017, following Macfarlane *et al.* 2015; and
- Discuss appropriate mitigation and management procedures relevant to the conserving wetland areas on the site as specified in Appendix 6 of the NEMA 2014 regulations, as amended and GN320, March 2020.

The soil-based wetland assessment conducted by Soil Advisory Services reflected a seepage wetland (with an area of 3.11 ha) with an artificial permanent zone where diggings have resulted in a pit that fills with water from the high groundwater table. Calculated buffer zones following MacFarlane *et al.*, 2015 resulted in a construction phase buffer zone of 15m and an operational phase buffer zone of 27m. The project phases are awarded different buffer zones since the potential impact and mitigation measures for each phase are different. Generally, the larger buffer zone is reflected relative to the layout (MacFarlane *et al.*, 2015). The figure below reflects the delineated wetland, its recommended 27 buffer zone and the 500m DWS regulated area. The DWS regulated area is a zone within which activities that may affect watercourses should be assessed for authorisation from the DWS.





The 2023 new layout follows the mitigation hierarchy from the correct top-down approach where the majority of the wetland is avoided and impacts minimised. Although the construction of a substation and access roads adjacent to the wetland and its buffer zone are likely to change water flow characteristics in the catchment of the wetland, the layout changes to outside the wetland edge and the protection awarded to the wetland by limiting dumping, littering, further excavation and infilling, as well as the potential for continued control of alien invasive plants and revegetation with indigenous species can improve the Ecological Category of this wetland.

The important factors relevant to Environmental Authorisation for the project are summarised in the Table below:

	Quaternary Catchment and WMA areas	Important Rivers within 500 m		
	G22D, #9, Berg-Olifants WMA	The Kuils River lies approximately 5.5km east of the site  The source of the Vyekraal River lies approximately 5.4km northwest of the site.		
Classification (SANBI, 2013)	Seepage wetland			
Wetland Integrity	<b>VEGRAI/ QHI: E: Seriously modified.</b> The loss of natural habitat, biota and basic ecosystem functions is extensive. <b>EIS: Moderate.</b> Watercourses in this category are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water in major rivers <b>ES:</b> Scores reflect the rural setting of the watercourse with the highest values recorded for the services of Cultural Spiritual and Cultivated Food (High and Moderately High). Scores for Biodiversity Maintenance were Moderate and the regulating and supporting services Sediment Trapping and assimilation of Toxicants scored Moderately Low. <b>Recommended Ecological Management Category: D</b> <b><i>Water quality and instream aquatic biota were not assessed</i></b>			
Calculated buffer zones following MacFarlane et al., 2015	Construction phase buffer zone - 15m Operational phase buffer zone - 27m			
DWS Regulated Area	500m around the wetland. This area indicates where potential impacts to the watercourse should be assessed to indicate which DWS authorisation process should be followed, General Authorisation, or Water Use Licence Application			
NEMA 2014 Impact Assessment	The impact scores for the following aspects are relevant to the operational phase:		Without Mitigation	With Mitigation
	Impacts to hydrological function at a landscape level	Construction	M	L
		Operation	M	L
	Changes to sediment regimes	Construction	M	L
		Operation	M	L
	Establishment of alien plants	Construction	M	L
		Operation	M	L
	Loss of wetland habitat	Construction	M	L
		Operation	M	L
	Pollution of regional watercourses	Construction	M	L
Operation		L	L	



<b>DWS 2016 Risk Assessment</b>	The expected risk score for the proposed substation located adjacent to the wetland and buffer zone fall in the <b>Low</b> category. Although the infrastructure will affect water flow in the catchment of the wetland, the protection awarded to the wetland by limiting dumping, littering, further excavation and infilling, as well as the potential for continued control of alien invasive plants and revegetation with indigenous species can improve the Ecological Category of this wetland (refer to recommendations in Section 3.4). This activity may be authorised through a General Authorisation.
<b>Does the specialist support the development?</b>	Yes. Although the catchment will be significantly altered, an opportunity exists to improve the integrity of the wetland through active rehabilitation, managing alien invasive vegetation and preventing further degradation.





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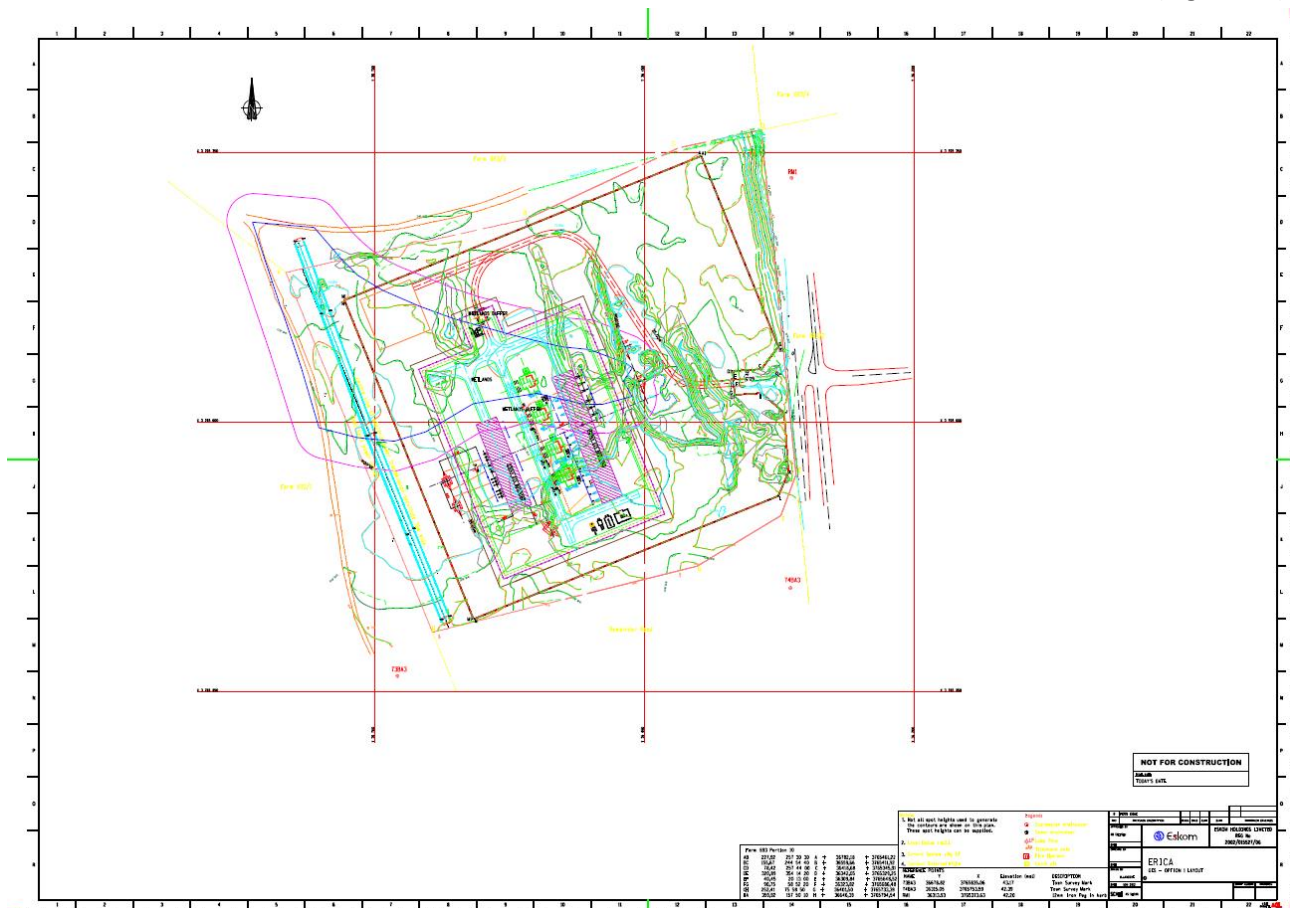


## 1 INTRODUCTION

Limosella Consulting was appointed to assess the site earmarked for the proposed Erica Transmission Substation in terms of sensitive aquatic features. A site assessment was undertaken on the 8<sup>th</sup> of March, 2022, an update was done based on a new proposed layout in January 2023.

### 1.1 Project Description

The initial proposed transmission substation layout reflects the substation that encroaches on a large section of the wetland and an associated buffer zone with site access from the east (Figure 1).



**Figure 1: The design of the proposed layout of the transmission substation relative to the delineated wetland and buffer zone (in pink) – Initial Design (2022)**

#### 1.1.1 Reoriented substation plan to avoid the larger portion of the wetland delineation [2023 Update – Verbatim (Eskom, 2023)]

Wetland studies in early 2022 confirmed the presence of a wetland on the Erica site and delineated a buffer zone. The largest portion of the erf unaffected by the wetland was the southern portion of the site. At this stage Eskom had several options:

- Relocation of the substation to avoid the wetland.
- Relocation of the substation to minimise the impact on the wetland
- Keep the substation in the optimal design position and manage the wetland via the use of offsets and rehabilitation – Eskom's experience on the Pinotage Substation site has cautioned the team away

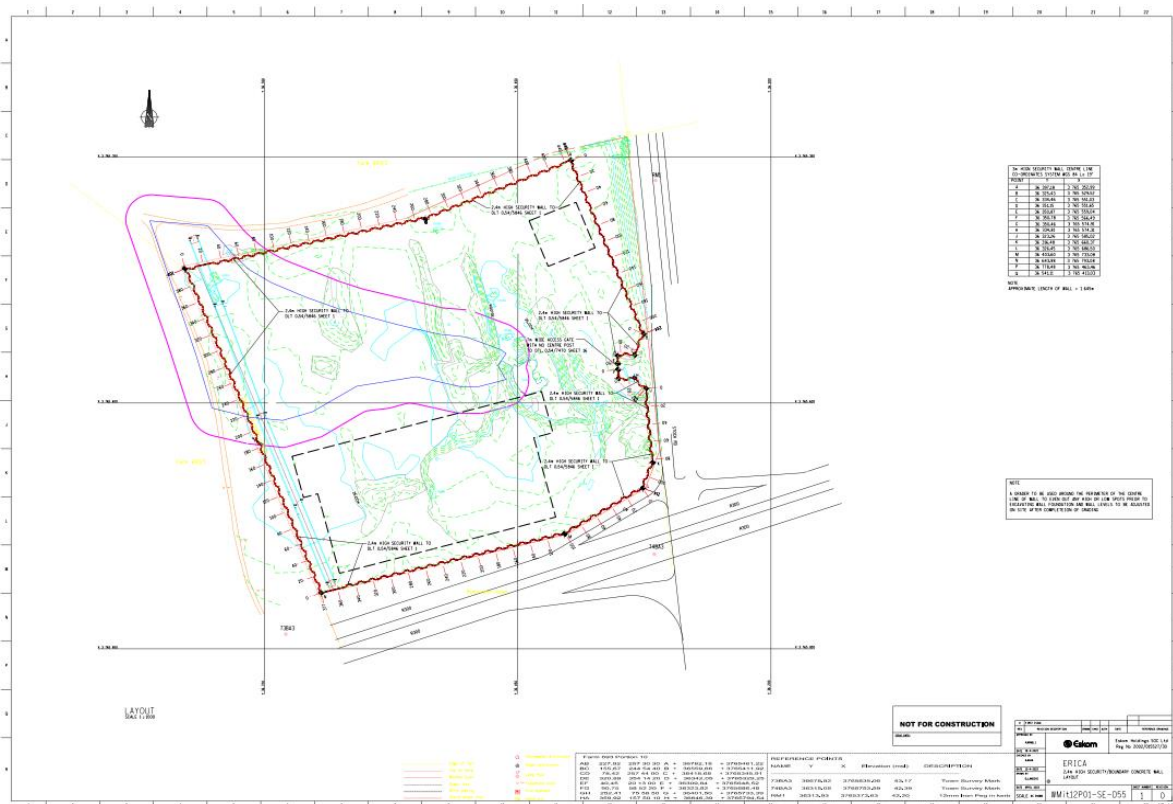


from selecting this approach given the complexities of time and cost involved in managing this option.

Eskom repositioned the GIS substation layout on the southern portion of the site to avoid the bulk of the wetland area. The access road needs to be carefully planned to manage the heavy vehicle access to the site for the delivery and future maintenance of the anticipated four large 500MVA transformers. This requires the use of the Eskom / Rotran Nicolas Girder Beam multiaxial trailer that has to be manoeuvred onto site for the transformer delivery and maintenance activities. The substation reorientation still resulted in a need to significantly manage and provide for off-sets for the wetland. Off-site off sets would pose a significant challenge to Eskom given the need to manage land areas in perpetuity, thus distracting from our core business.

### 1.1.2 Change to a double storey plan

In order to further conserve or avoid the wetland, the design was developed into a double story GIS transmission substation. The double story structure allowed the substation to fit onto a reduced surface area, south of the wetland. The final design can be found in the Erica: Site Development plan [Drg number: WMit12P01-SE-D39] and shown in Figure 2 below. Due to the reduction in the footprint of the substation, the connecting lines to the 132kV were optimally considered to use power cables as opposed to the overhead line. The proposed layout now only falls on a very small section of the buffer zone.





**Figure 2: GIS design layout with reduced footprint (two separate GIS Buildings):**

## 1.2 Terms of Reference

The terms of reference for the current study were as follows:

- Delineate the wetland and riparian areas to inform the development layout;
- Classify the watercourse according to the system proposed in the national wetlands inventory if relevant,
- Undertake functional and integrity assessment of wetlands and riparian areas as specified in General Notice 267 of 24 March 2017;
- Assess the aquatic instream parameters of the potentially affected watercourses, including SASS5 and Ichthyofauna assessments if relevant;
- Undertake a Risk Assessment as specified in General Notice 267 of 24 March 2017;
- Recommend suitable buffer zones, both generic (as required in GDARD, 2014) and scientific as specified in General Notice 267 of 24 March 2017, following Macfarlane *et al.*, 2015; and
- Discuss appropriate mitigation and management procedures relevant to the conserving wetland areas on the site as specified in Appendix 6 of the NEMA 2014 regulations, as amended and GN320, March 2020.

### 1.3 Assumptions and Limitations

- The disturbed nature of the site decreased the reliability of wetland indicators, hence the reliance on a soil based wetland assessment by a specialist in that field;
- Floodline calculations fall outside the scope of the current assessment.
- A Red Data scan, fauna and flora, and aquatic assessments were not included in the current study
- No aquatic baseline assessment was conducted since no habitat for a SASS or FRAI assessment was present.

### 1.4 Definitions and Legal Framework

This section outlines the definitions, key legislative requirements and guiding principles of the watercourse assessment.

The National Water Act, 1998 (Act No. 36 of 1998) [NWA] provides for Constitutional water demands including pollution prevention, ecological and resource conservation and sustainable utilisation. In terms of this Act, all water resources are the property of the State and are regulated by the Department of Water and Sanitation (DWS). The NWA sets out a range of water use related principles that are to be applied by DWS when taking decisions that significantly affect a water resource. The NWA defines a water resource as including a watercourse, surface water, estuary or aquifer. A watercourse includes a river or spring; a natural channel in which water flows regularly or intermittently; a wetland, lake, pan or dam, into which or from which water flows; any collection of water that the Minister may declare to be a watercourse; and were relevant its beds and banks.

The NWA defines a wetland as “land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.” In addition to water at or near the surface, other distinguishing indicators of wetlands include hydromorphic soils and vegetation adapted to or tolerant of saturated soils (DWA, 2005).

Riparian habitat often times performs important ecological and hydrological functions, some similar to those performed by wetlands (DWA, 2005). Riparian habitat is also the accepted indicator used to delineate the extent of a river’s footprint (DWA, 2005). It is defined by the NWA as follows: “Riparian habitat includes the physical structure and associated vegetation of the areas associated with a watercourse, which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas”.

Water uses for which authorisation must be obtained from DWS are indicated in Section 21 of the NWA. Section 21 (c) and (i) is applicable to any activity related to a watercourse:

Section 21(c): Impeding or diverting the flow of water in a watercourse; and

Section 21(i): Altering the bed, banks, course or characteristics of a watercourse.

Authorisations related to wetlands are regulated by Government Notice 509 of 2016 regarding Section 21(c) and (i). This notice grants General Authorisation (GA) for the above water uses should the Risk



Assessment matrix (DWS, 2016) reflect a Low score. Activities that obtain a Medium or High-risk score requires authorisation through a Water Use Licence (WUL) from the Department.

Conditions for impeding or diverting the flow of water or altering the bed, banks, course or characteristics of a watercourse (Section 21(c) and (i) activities) include:

9. (3) (b). The water user must ensure that the selection of a site for establishing any impeding or diverting the flow or altering the bed, banks, course or characteristics of a watercourse works:

(i) is not located on a bend in the watercourse;

(ii) avoid high gradient areas, unstable slopes, actively eroding banks, interflow zones, springs, and seeps.

In addition to the above, the proponent must also comply with the provisions of the following relevant national legislation, conventions and regulations applicable to wetlands and riparian zones:

- Convention on Wetlands of International Importance - the Ramsar Convention and the South African Wetlands Conservation Programme (SAWCP).
- National Environmental Management Act, 1998 (Act No. 107 of 1998) [NEMA].
- National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004).
- National Environment Management Protected Areas Act, 2003 (Act No. 57 of 2003).
- Regulations GN R.982, R.983, R. 984 and R.985 of 2014, promulgated under NEMA.
- Conservation of Agriculture Resources Act, 1983 (Act 43 of 1983).
- Regulations and Guidelines on Water Use under the NWA.
- South African Water Quality Guidelines under the NWA.
- Mineral and Petroleum Resources Development Act, 2002 (Act No. 287 of 2002).
- GN 982 of 2017 NEMA EIA regulations
- GN 267 (Regulations Regarding the Procedural Requirements for Water Use Licence Applications and Appeals)
- GN 320 (Procedures for Assessment and Minimum Criteria for Reporting on Environmental Themes in Terms Of 24(5)a and (h) and 44 of the National Environmental Management Act, 1998, when Applying for Environmental Authorisation

## 1.5 Locality of the study site

The study site is located within the Philippi township, approximately 16km south of Cape Town International Airport, in Cape Town, in the Western Cape Province. The R300 lies directly south of the site. The central coordinates of the site are 34° 01' 1.5'' S and 18° 36' 12.4'' E. (Figure 3).





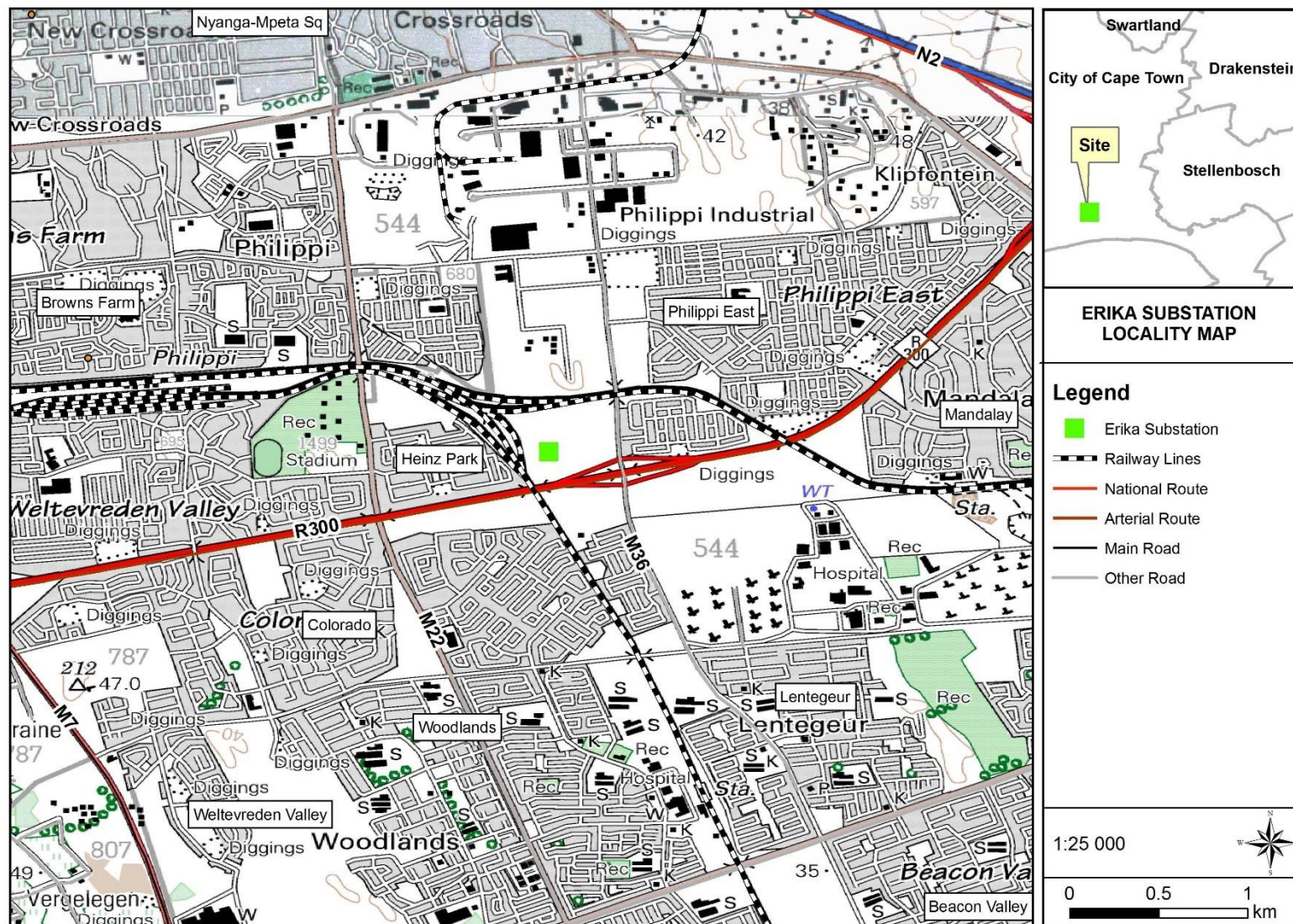


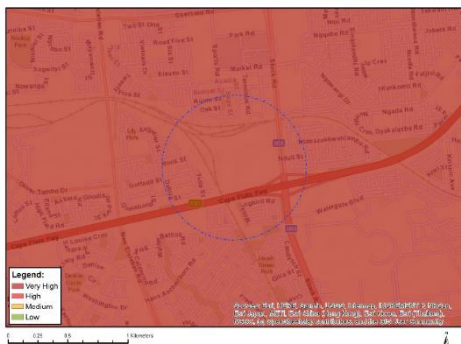
Figure 3: Locality Map



## 1.6 Description of the Receiving Environment

A review of available literature and spatial data formed the basis of a characterisation of the biophysical environment in its theoretically undisturbed state and consequently an analysis of the degree of impact to the ecology of the study site in its current state. Table 1 below provides a summary of the important aspects.

**Table 1: A summary of relevant site information obtained from a review of available spatial data**

National Screening Tool ( <a href="https://screening.environment.gov.za/screeningtool">https://screening.environment.gov.za/screeningtool</a> )	
	<p>The study area is located within a Very High Aquatic Biodiversity Region. The high sensitivity is related to the location of the site in a Strategic Water Resource Area</p>
General Description (Mucina & Rutherford, 2006)	
<b>GPS Coordinates</b>	34° 1'1.50"S and 18°36'12.40"E
<b>Topography</b>	Flat to slightly undulating landscape (mainly dune fields), covered by tall, evergreen, hard-leaved shrubland with abundant grasses and annual herbs in gaps.
<b>Climate</b>	Exclusive winter-rainfall area with a MAP ranging between 350mm in the North and 560mm in the South. Strong north-westerly winds and cool temperatures accompany the winter rains. Frost occurs very infrequently. Mean daily maximum and minimum temperatures are 26.7°C and 7.5°C for February and July, respectively. During the summer winds are mostly southerly and south-easterly.
<b>Broad Vegetation Units</b>	FS 6 – Cape Flats Dune Strandveld
<b>Conservation Status</b>	Endangered
Hydrology	
<b>Strategic Water Resource Area (Le Maitre <i>et al.</i>, 2018)</b>	The study area and surroundings are located within the Cape Peninsula and Cape Flats Strategic Water Resource Area. This SWRA is considered important based on its high groundwater recharge. It covers an area of approximately 599 km <sup>2</sup> of which 60% is urbanised, including 13% informal settlements and 11% industrial areas. Therefore, this SWRA is at high risk for contamination, especially due to high groundwater vulnerability.



<b>Important Rivers (CDSM, 1996) (Figure 4)</b>	<p>The Kuils River lies approximately 5.5km east of the site</p> <p>The source of the Vyekraal River lies approximately 5.4km northwest of the site.</p>
<b>Quaternary Catchment</b>	G22D
<b>Water Management Area (Government Gazette, 16 September 2016)</b>	<p>#9 Berg-Olifants WMA. Major rivers include:</p> <ul style="list-style-type: none"> <li>• Berg,</li> <li>• Diep,</li> <li>• Steenbras,</li> <li>• Olifants,</li> <li>• Doorn,</li> <li>• Krom,</li> <li>• Sand,</li> <li>• Sout.</li> </ul>
<b>River Status DWAF (2014)</b> <a href="http://www.dwa.gov.za/iwqs/rhp/eco/peseismodel.aspx">http://www.dwa.gov.za/iwqs/rhp/eco/peseismodel.aspx</a>	<p>Reach 9207 (Kuils River)</p> <p>(PES=E) (EI=Moderate) (ES=High)</p>
<b>Wetland Ecosystem Type</b>	Western Strandveld
<b>NFEPA Wetlands</b>	No NFEPA wetlands are located within the study area.
<b>Geology and soils (Mucina and Rutherford, 2006)</b>	
<b>Geology</b>	The geology in this area is Sedimentary, mainly built of Tertiary to Recent calcareous sand of marine origin and overlying metasediments of the Tygerberg Formation.
<b>Soils</b>	<ul style="list-style-type: none"> <li>• The majority is located on land type Ha, with a dominance of approximately 50%.</li> <li>• Land types Hb and Ga are also present, but plays less significant roles.</li> <li>• Outcrops of Sandveld Group limestone are evident on the False Bay Coast.</li> </ul>
<b>Western-Cape Conservation Plan (C-Plan) (Cape Nature, 2018)</b>	
<b>Western-Cape Conservation Plan (C-Plan) (Figure 5)</b>	The site is not located within a Critical Biodiversity Area. An area with more sensitive biodiversity is located approximately 500 m south-east of the site.







Figure 4: Regional hydrological features relative to the study site.







Figure 5: Biodiversity Network Classification.



## 2 METHODOLOGY

Following the initial scoping phase assessment that highlighted wetland or riparian boundaries to be ground-truthed in the field, soil sampling on-site informed a fine-scale delineation. Since the site is located in an area known for difficulty in the interpretation of soil wetland indicators, a soil specialist with experience in soil-based wetland delineations familiar with the area was tasked to undertake the delineation. The technical note submitted by Soil Advisory Services is included in Appendix A.

Functional and integrity assessments were conducted to indicate the baseline status of the wetland identified. In the current study the wetland area was assessed using, WET-Health (Macfarlane *et al.*, 2020), EIS and WetEcoServices, (Kotze *et al.*, 2020). The assessment of potential impacts is followed by the DWS 2016 Risk Assessment.

To ease the legibility of the report, details regarding the methods used in each phase of the wetland assessment are presented in Appendix C.

## 3 RESULTS

### 3.1 Land Use, Cover and Ecological State

The study site is undeveloped. It is surrounded by high-density development on either side. Local communities utilise the site for initiation ceremonies and possibly other social gatherings. The vacant site is not connected visibly to any watercourses or natural areas. Although the Driftsands Nature Reserve lies approximately 4km to the northeast of the site, roads and infrastructure prevent any connectivity between these areas.

#### 3.1.1 Wetland/Riparian Classification and Delineation

The soil-based wetland assessment conducted by Soil Advisory Services reflected a seepage wetland (with an area of 3.11 ha) with an artificial permanent zone where diggings have resulted in a pit that fills with water from the high groundwater table. The wetland can also be classified as a “Flat”. This type of wetland forms in areas with weakly developed drainage patterns and flat topography, rainfall may not drain off the landscape very quickly, if at all, due to the low relief. In such areas (commonly characterized by aeolian deposits or recent sea floor exposures). The wet season water table may rise close to, or above, the soil surface, creating extensive areas of shallow inundation or saturated soils. In these circumstances, the seasonal or permanently high groundwater table creates the conditions for wetland formation (Ollis *et al.*, 2013).

The characteristics of the wetland are described in detail in Appendix A. Calculated buffer zones following MacFarlane *et al.*, 2015 resulted in a construction phase buffer zone of 15m and an operational phase buffer zone of 27m. The project phases are awarded different buffer zones since the potential impact and mitigation measures for each phase are different. Generally, the larger buffer zone is reflected relative to the layout (MacFarlane *et al.*, 2015). Figure 6 reflects the delineated wetland, its recommended 27 buffer zone and the 500m DWS regulated area. Figure 7 indicates the layout of the new (2023) proposed substation in relation to the wetland and the operational phase buffer zone of 27 m, it should be noted that it falls outside of the construction phase buffer zone of 15 m. It should be noted that the reoriented layout of the substation has drastically reduced the footprint and impact area on the wetland.







Figure 6: Delineated watercourses, their associated buffer zones and the DWS regulated area relative to the study site.







### 3.2 Watercourse Functional Assessment

The seepage wetland identified on the study site is impacted by the railway line that lies to the north and east of the site. Berms supporting the railway essentially cut off the wetland conditions that would naturally extend to the east of the site. Furthermore, high-density residential development in either direction has transformed historic wetland conditions and has changed the catchment's hydrological characteristics. Excavation and soil dumped on the soil, likely associated with road building have significantly altered the geomorphological characteristics of the wetland, with the creation of an artificial permanent wet zone and barriers to surface water flows. **The vegetation composition of the wetland is dominated by alien invasive species and pioneer plants.** Although water quality was not assessed, it is likely to reflect runoff from the roads, stormwater and ineffective sewage infrastructure from the adjacent township. A suite of assessment methods was utilised to determine the integrity and sensitivity of the wetland potentially affected by the proposed Erica substation (Table 2).

**Table 2: Summary of the methodologies used to determine function and integrity scores for the watercourses within 500m of the study site.**

Assessment methods
Present Ecological Status (PES) - WetHealth Version 2 (Kotze <i>et al.</i> , 2020)
Environmental Importance and Sensitivity category (EIS) (Kotze <i>et al.</i> , 2020)
WetEcosystem Services V2 (ES) (Kotze <i>et al.</i> , 2020)
Recommended Ecological Category (REC) Rountree <i>et al.</i> , (2013)

#### 3.2.1 Present Ecological Status (PES) - WetHealth Version 2 (Kotze *et al.*, 2020).

A PES assessment measures the change of a wetland's characteristics from its theoretical reference condition. Although it is not possible to accurately determine the reference condition for the wetland (that is the condition it was in before any disturbance), a well-known wetland in the same Quaternary Catchment, approximately 8.5km to the west of the site, is Rondevlei. The vegetation characteristics and hydrological zonation of Rondevlei are considered to be a reasonably suitable reference against which to measure changes that have occurred to the wetland on the proposed Erica substation site.

A level 1B WetHealth assessment was done for the seepage wetland potentially affected by the Erica Substation. This assessment requires a classification of Disturbance units in the wetland's topographic catchment as well as a 200m buffer around the wetland. Disturbance units are also classified within the wetland itself. Disturbance units identified for this particular site include:

- Severely degraded land;
- High-density built-up areas;
- Commercial development; and
- Artificial ponds.

Identification of the topographic catchment (145Ha in extent) was complicated by the generally flat landscape modified by roads, local depressions, the railway line and so many other landscape modifications.



The combined PES score obtained for the wetland was 39% which falls into the **Low** Ecological Category E (Table 3). In this class the change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable (Macfarlane *et al.*, 2020).

**Table 3: Summary of the results of the WetHealth (Version 2) assessment conducted for the seepage wetland**

	Wetland PES Summary			
Wetland name	Erica Substation			
Assessment Unit	-			
HGM type	Seep			
Wetland area (Ha)	3.3 Ha			
Final (adjusted) Scores				
PES Assessment	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	5.1	6.6	6.0	7.0
PES Score (%)	49%	34%	40%	30%
Ecological Category	D	E	E	E
Trajectory of change	↓	↓	↓	↓
Confidence (revised results)	Medium	Medium	Medium	Medium
Combined Impact Score	6.1			
Combined PES Score (%)	39%			
Combined Ecological Category	E			
Hectare Equivalents	1.3 Ha			

### 3.2.2 Ecosystem Services (ES) - WET-EcoServices Version 2

A summary of the assessment of ecosystem services of the wetland is presented in Table 4 below. Scores reflect the setting of the wetland in a high-density, low-income residential area and the disturbed nature of the vegetation and soils. The local community utilise the site in initiation ceremonies and this escalates the score for Cultural services. The wetland is isolated from the Kuils River (although the high water table does result in some hydrological connectivity) and lies in a very flat area. Regulating and Supporting services are therefore also low. The highest scores are achieved for Cultural and Spiritual services (High), Nitrate and Toxicant Assimilation (both Moderate).



**Table 4: Summary of the Ecosystem Services scores obtained for the wetland in its current state (Kotze, *et al.*, 2020)**

		Present State			
ECOSYSTEM SERVICE		Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	0.6	1.0	0.0	Very Low
	Stream flow regulation	1.7	1.0	0.7	Very Low
	Sediment trapping	2.1	1.0	1.1	Low
	Erosion control	0.4	0.5	0.0	Very Low
	Phosphate assimilation	1.5	3.0	1.5	Moderately Low
	Nitrate assimilation	2.0	3.0	2.0	Moderate
	Toxicant assimilation	2.3	2.0	1.8	Moderate
	Carbon storage	0.9	0.5	0.0	Very Low
	Biodiversity maintenance	0.0	1.0	0.0	Very Low
PROVISIONING SERVICES	Water for human use	0.0	0.0	0.0	Very Low
	Harvestable resources	0.5	0.0	0.0	Very Low
	Food for livestock	0.0	0.0	0.0	Very Low
	Cultivated foods	2.5	0.0	1.0	Low
CULTURAL SERVICES	Tourism and Recreation	0.0	0.0	0.0	Very Low
	Education and Research	0.0	0.0	0.0	Very Low
	Cultural and Spiritual	4.0	1.0	3.0	High

### 3.2.3 Ecological Importance and Sensitivity (EIS/EI)

Integrating the following ecosystem service scores to determine the ecological importance (EI) category for the wetland as proposed in Kotze *et al.*, (2020) reflects a score of 1.4 – **Moderate** EI category:

- Biodiversity maintenance importance: 2.5
- Regulating services importance: 1.0
- Provisioning and cultural services importance: 0.8



Wetlands in this category are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water in major rivers (DWAF, 1999).

### 3.2.4 Recommended Ecological Category (REC)

Following Rountree *et al.*, (2013) and taking into consideration the above scores, the REC score is the same as the PES score, **D**.

### 3.2.5 Summary of Findings

Table 5 provides a summary of the results recorded for the three watercourses within 500m of the study site.

**Table 5: Summary of scores obtained for the seepage wetland on the study site**

<b>Perennial Hex River, Dorpspruit and Unnamed tributary</b>	<p><b>VEGRAI/ QHI: E: Seriously modified.</b> The loss of natural habitat, biota and basic ecosystem functions is extensive.</p> <p><b>EIS: Moderate.</b> Watercourses in this category are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water in major rivers</p> <p><b>ES:</b> Scores reflect the rural setting of the watercourse with the highest values recorded for the services of Cultural Spiritual and Cultivated Food (High and Moderately High). Scores for Biodiversity Maintenance were Moderate and the regulating and supporting services Sediment Trapping and assimilation of Toxicants scored Moderately Low.</p> <p><b>Recommended Ecological Management Category: D</b></p> <p><b><i>Water quality and instream aquatic biota were not assessed</i></b></p>
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### 3.3 Impacts and Mitigations

The seepage wetland discussed in this report is in a highly modified state and, because of the shallow water table and sandy soils, is very responsive to changes in its catchment. Although the new layout of the substation falls predominantly outside of the wetland and buffer zone with only a small section of the operational phase being encroached by the substation footprint, construction of a substation immediately south of the wetland will falter its catchment and drainage patterns, although several positive aspects are also relevant. Since the wetland will be closed to the public and will be included in a management plan for the substation and grounds, no further littering, excavation or infilling will occur. Furthermore, the management of alien vegetation can be sustainably undertaken and indigenous vegetation can be maintained in the long-term. Given that the layout largely avoids the wetland and its buffer zone, the protection that the substation will award the wetland counts in its favour. Rehabilitation and maintenance of the wetland can ensure a positive change to its integrity.

The impact and risk assessments below are focused on the impact of the substation since the impacts of the boundary wall associated with the site are discussed in a separate report. The NEMA Impact Assessment and DWS Risk Assessments below provide scores for the qualification of impacts to be considered during the authorisation process.

Rehabilitation and monitoring actions relevant to correcting construction phase disturbance associated with the boundary wall are discussed in Section 3.4.

#### 3.3.1 NEMA (2014) Impact Assessment

The potential impacts discussed according to the NEMA 2014 regulations (Table 6 to Table 10) are presented below.

**Table 6: Changes in water flow regime impact ratings**

<b>Nature:</b> Impacts on hydrological functioning at a landscape level and across the site which can arise from changes to flood regimes (e.g. suppression of floods, loss of flood attenuation capacity, unseasonal flooding or destruction of floodplain processes) as well as the extent of the modification in relation to the overall aquatic ecosystem (i.e. at the source, upstream or downstream portion, in the temporary, seasonal, permanent zone of a wetland, in the riparian zone or within the channel of a watercourse, etc.). Changes to base flow and hydroperiod.		
<b>ACTIVITY:</b> The sources of this impact include the excavation of wetland soils, compaction of soil, the removal of vegetation, surface water redirection of water during construction activities, and changed water flow patterns during the operational phase		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>CONSTRUCTION PHASE</b>		
<b>Probability</b>	Probable (3)	Probable (3)



<b>Duration</b>	Long term (4)	Short term (2)
<b>Extent</b>	Regional (3)	Local (2)
<b>Magnitude</b>	Moderate (6)	Low (4)
<b>Significance</b>	<b>39 (moderate)</b>	<b>24 (low)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>OPERATIONAL PHASE</b>		
<b>Probability</b>	Probable (3)	Probable (3)
<b>Duration</b>	Long term (4)	Medium term (3)
<b>Extent</b>	Regional (3)	Limited to Local Area (2)
<b>Magnitude</b>	Moderate (6)	Low (4)
<b>Significance</b>	<b>39 (moderate)</b>	<b>27 (low)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>Reversibility</b>	Low	Low
<b>Irreplaceable loss of resources?</b>	High	Low
<b>Can impacts be mitigated?</b>	Yes	
<b>Mitigation:</b> <ul style="list-style-type: none"><li>• Areas not absolutely necessary for construction should be demarcated as no-go areas;</li><li>• Rehabilitate areas disturbed by construction;</li><li>• Monitor for success of rehabilitation and potential permanent changes to the integrity of the wetland resulting from altered hydrology and implement corrective action accordingly.</li></ul>		
<b>Cumulative impacts:</b> Construction activities will result in moderate cumulative impact to the water courses within the local catchments.		
<b>Residual Risks:</b> Moderate residual risks are associated with sealed surfaces in the immediate wetland catchment during the operational phase.		



**Table 7: Changes in sediment entering and exiting the system impact ratings**

<b>Nature:</b> Changes in sediment entering and exiting the system.		
<b>Activity:</b> Changing the amount of sediment entering water resources and the associated change in turbidity (increasing or decreasing the amount). Construction and operational activities will result in earthworks and soil disturbance as well as the removal of natural vegetation. This could result in the loss of topsoil, sedimentation of the watercourse and an increase in the turbidity of the water. Possible sources of the impacts include: <ul style="list-style-type: none"> <li>• Earthwork activities during construction</li> <li>• Clearing of surface vegetation will expose the soils, which in rainy events would wash through the watercourse, causing sedimentation. In addition, indigenous vegetation communities are unlikely to colonise eroded soils successfully and seeds from proximate alien invasive trees can spread easily into these eroded soil.</li> <li>• Disturbance of soil surface</li> <li>• Disturbance of slopes through creation of roads and tracks adjacent to, or across the watercourse</li> </ul>		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>CONSTRUCTION PHASE</b>		
<b>Probability</b>	Probable (4)	Possible (3)
<b>Duration</b>	Short term (2)	Short term (2)
<b>Extent</b>	Limited to Local Area (2)	Limited to Local Area (2)
<b>Magnitude</b>	Moderate (6)	Low (4)
<b>Significance</b>	<b>40 (moderate)</b>	<b>24 (low)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>OPERATIONAL PHASE</b>		
<b>Probability</b>	Probable (3)	Probable (3)
<b>Duration</b>	Medium term (3)	Medium term (3)
<b>Extent</b>	Regional (3)	Regional (3)
<b>Magnitude</b>	Moderate (6)	Low (4)
<b>Significance</b>	<b>36 (moderate)</b>	<b>30 (low)</b>
<b>Status (positive or negative)</b>	Negative	Positive
<b>Reversibility</b>	Low	Na



<b>Irreplaceable loss of resources?</b>	Low	Low
<b>Can impacts be mitigated?</b>	Yes	
<b>Mitigation:</b> <ul style="list-style-type: none"><li>• Consider the various methods and equipment available and select whichever method(s) will have the least impact on watercourses.</li><li>• Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction/earthworks in that area.</li><li>• Remove only the vegetation where essential for construction and do not allow any disturbance to the adjoining natural vegetation cover.</li><li>• Rehabilitation of damage during construction must be implemented immediately upon completion of construction.</li><li>• Cordon off areas that are under rehabilitation as no-go areas using danger tape and steel droppers. If necessary, these areas should be fenced off to prevent vehicular and pedestrian access.</li><li>• Implementation of best management practices</li><li>• Monitoring should be done to ensure that sediment pollution is timeously addressed</li></ul>		
<b>Cumulative impacts:</b> Expected to be low since the wetland is not directly linked to downstream watercourses.		
<b>Residual Risks:</b> Expected to be limited during the construction activities provided that the mitigation measures are implemented correctly and effectively and rehabilitation of the site is undertaken where necessary.		





**Table 8: Introduction and spread of alien vegetation impact ratings.**

<b>Nature:</b> Introduction and spread of alien vegetation.		
<b>Activity:</b> The moving of soil and vegetation resulting in opportunistic invasions after disturbance and the introduction of seed in building materials and vehicles. Invasions of alien plants can impact hydrology, by reducing the quantity of water entering a watercourse, and outcompeting natural vegetation, decreasing the natural biodiversity. Once in a system, alien invasive plants can spread through the catchment. If allowed to seed before control measures are implemented alien plants can easily colonise and impact downstream watercourses.		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>CONSTRUCTION PHASE</b>		
<b>Probability</b>	Highly probable (4)	Probable (3)
<b>Duration</b>	Long-term (4)	Medium-term (3)
<b>Extent</b>	Regional (3)	Limited to Local Area (2)
<b>Magnitude</b>	Moderate (6)	Low (4)
<b>Significance</b>	<b>52 (moderate)</b>	<b>27 (low)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>OPERATIONAL PHASE</b>		
<b>Probability</b>	Probable (3)	Probable (3)
<b>Duration</b>	Medium-term (3)	Medium-term (3)
<b>Extent</b>	Regional (3)	Regional (3)
<b>Magnitude</b>	Low (4)	Low (4)
<b>Significance</b>	<b>30 (moderate)</b>	<b>30 (low)</b>
<b>Status (positive or negative)</b>	Negative	<b>Positive</b>
<b>Reversibility</b>	Low	Moderate
<b>Irreplaceable loss of resources?</b>	Low	Low
<b>Can impacts be mitigated?</b>	Yes	



<p><b>Mitigation:</b></p> <ul style="list-style-type: none"> <li>• Prioritise removal of Category 1 species, according to the CARA legislation before construction commences or as set out in an Alien Plant Management Plan.</li> <li>• Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction/earthworks in that area and returning it where possible afterwards.</li> <li>• Monitor the establishment of alien invasive species within the areas affected by the construction and maintenance and take immediate corrective action where invasive species are observed to establish.</li> <li>• Rehabilitate or revegetate disturbed areas</li> <li>• Include ongoing alien vegetation management in the maintenance plan for the substation</li> </ul>
<p><b>Cumulative impacts:</b> Expected to be moderate to high. Construction in areas with a high density of alien vegetation is at risk of further spreading aliens. However, in a small wetland such as on the study site, alien vegetation can be successfully managed through a dedicated Alien Plant Management Plan</p>
<p><b>Residual Risks:</b> Expected to be limited provided that the mitigation measures are implemented correctly, and effective rehabilitation of the site is undertaken where necessary.</p>

**Table 9: Loss and disturbance of watercourse habitat and fringe vegetation impact ratings.**

<b>Nature:</b> Loss and disturbance of wetland habitat and fringe vegetation		
<b>Activity:</b> Loss and disturbance of wetland habitat and fringe vegetation due to direct development in the wetland, including changes in grazing, fire regime and habitat fragmentation.		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>CONSTRUCTION PHASE</b>		
<b>Probability</b>	Definite (5)	Probable (3)
<b>Duration</b>	Short-term (2)	Temporary (1)
<b>Extent</b>	Limited to Local Area (2)	Limited to Local Area (2)
<b>Magnitude</b>	Moderate (6)	Low (4)
<b>Significance</b>	<b>50 (moderate)</b>	<b>21 (low)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>OPERATIONAL PHASE</b>		
<b>Probability</b>	Highly probable (4)	Improbable (1)
<b>Duration</b>	Long-term (4)	Medium-term (3)
<b>Extent</b>	Limited to Local Area (2)	Limited to the Site (1)



Magnitude	Moderate (6)	Low (4)
Significance	48 (Moderate)	8 (low)
Status (positive or negative)	Negative	Positive
Reversibility	Low	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	Yes	
<b>Mitigation:</b> <ul style="list-style-type: none"><li>• Other than the approved and authorized structure, no other development or maintenance infrastructure is allowed within the delineated watercourse or associated buffer zones.</li><li>• Demarcate the watercourse areas and buffer zones to limit disturbance, and clearly mark these areas as no-go areas</li><li>• Implement effective Alien Plant Control</li><li>• Implement a rehabilitation plan that includes revegetation with indigenous species (refer to Section 3.4)</li><li>• Operational activities should not impact on rehabilitated or naturally vegetated areas</li></ul>		
<b>Cumulative impacts:</b> Expected to be moderate. Opportunities exist for successful rehabilitation		
<b>Residual Risks:</b> Expected to be limited provided that the mitigation measures are implemented correctly, and effective rehabilitation of the site is undertaken where necessary.		



**Table 10: Changes in water quality due to foreign materials and increased nutrients impact ratings.**

<b>Nature:</b> Changes in water quality due to foreign materials and increased nutrients.		
<b>Activity:</b> Construction activities may result in the discharge of solvents and other industrial chemicals, leakage of fuel/oil from vehicles resulting in the loss of sensitive biota in the wetlands/rivers and a reduction in wetland function. During the operational phase, probable sewage spills will impact on downslope watercourses by lowering water quality.		
	<b>Without mitigation</b>	<b>With mitigation</b>
<b>CONSTRUCTION PHASE</b>		
<b>Probability</b>	Highly Probable (4)	Probable (3)
<b>Duration</b>	Short-term (2)	Temporary (1)
<b>Extent</b>	Limited to Local Area (2)	Limited to Local Area (2)
<b>Magnitude</b>	High (8)	Low (4)
<b>Significance</b>	<b>48 (moderate)</b>	<b>21 (low)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>OPERATIONAL PHASE</b>		
<b>Probability</b>	Possible (2)	Possible (2)
<b>Duration</b>	Long-term (4)	Medium-term (3)
<b>Extent</b>	Regional (3)	Regional (3)
<b>Magnitude</b>	Moderate (6)	Low (4)
<b>Significance</b>	<b>26 (low)</b>	<b>20 (low)</b>
<b>Status (positive or negative)</b>	Negative	Negative
<b>Reversibility</b>	Low	Moderate
<b>Irreplaceable loss of resources?</b>	Low	Low
<b>Can impacts be mitigated?</b>	Yes	



<p><b>Mitigation:</b></p> <ul style="list-style-type: none"> <li>• Implement best practice throughout the construction phase.</li> <li>• After construction, the land must be cleared of rubbish, surplus materials, and equipment, and all parts of the land shall be left in a condition as close as possible to that before use.</li> <li>• Maintenance of construction vehicles/equipment should not take place within the watercourse or watercourse buffer.</li> </ul>
<p><b>Cumulative impacts:</b> Expected to be low.</p>
<p><b>Residual Risks:</b> Expected to be low</p>

### 3.3.2 DWS 2016 Risk Assessment

An extract from the Risk Matrix spreadsheet presented in Table 11 below shows that the expected risk score for the proposed substation located adjacent to the wetland and buffer zone fall in the **Low** category. Although the infrastructure will affect water flow in the catchment of the wetland, the protection awarded to the wetland by limiting dumping, littering, further excavation and infilling, as well as the potential for continued control of alien invasive plants and revegetation with indigenous species can improve the Ecological Category of this wetland (refer to recommendations in Section 3.4). This activity may be authorised through a General Authorisation.





**Table 11: The severity score derived from the DWS (2016) risk assessment matrix for the proposed Erika Transmission Substation****RISK MATRIX** (Based on DWS 2016 publication: Section 21 c and I water use Risk Assessment Protocol): Erica Transmission Substation, Philippi, Cape Town

NAME and REGISTRATION No of SACNASP Professional member: A Bootsma SACNASP # 400222/09

Phases	Activity	Aspect	Impact	Severity								Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Confidence level	Control Measures	Borderline LOW MODERATE Rating Classes	PES AND EIS OF WATERCOURSE
				Flow Regime	Physico & Chemical (Water Quality)	Habitat (Geomorph+Vegetation)	Biota	Severity	Spatial scale	Duration	Consequence											
C	Construction phase of the proposed substation and access roads adjacent to the wetland	Preparation for construction, including vegetation clearing, access roads and crew camps	Temporary disturbance of soil and vegetation	1	1	2	1	1	1	1	3	1	1	5	2	9	29	L	80%	<ul style="list-style-type: none"><li>During the detailed design phase, the footprint and design of structures should aim to have the least impact on habitat quality and hydrology of the watercourse.</li><li>Design should take into account soil properties, slopes and runoff energy.</li><li>Implement Best Practice with regards to concrete mixing on site and control of waste and pollution</li><li>Implement an Alien Plant Control Plan</li><li>Demonstrate adherence to the Mitigation Hierarchy</li><li>Implement a rehabilitation plan to correct any unintended damage to wetland soil or vegetation</li></ul>	N	PES: E, EIS: Low REC:D Not expected to change
		Earthwork activities including earthworks adjacent to a wetland		3	2	2	1	2	1	1	4	1	4	5	2	12	48	L	80%		N	
		Storm Water Management		2	2	1	1	2	1	2	5	2	1	5	2	10	45	L	80%		N	
O	Operation of the substation and access roads	Day to day presence of the substation adjacent to the wetland and buffer zone	<b>Protection from further deterioration and active rehabilitation may have a positive impact and increase the integrity of the wetland.</b> Potential negative impacts include changes to hydrology of the catchment	2	1	1	1	1	1	2	4	4	1	5	2	12	51	L	80%	<ul style="list-style-type: none"><li>Proposed modification of the wetland should aim to retain ecological and hydrological function of the current wetland.</li><li>Demonstrate adherence to the Mitigation Hierarchy</li><li>During the detailed design phase the footprint and design of structures should aim to have the least impact on habitat quality and hydrology of the wetland</li><li>Control of alien invasive plants should form part of the maintenance plan for the proposed development</li><li>Maintenance activities should follow best practice</li></ul>	N	PES: E, EIS: Low REC:D. <b>Modification of the wetland can improve its Ecological Category</b>
		Maintenance of infrastructure		1	1	1	1	1	1	1	3	1	1	5	2	9	27	L	80%		N	



### 3.4 Mitigation Hierarchy

The key principles outlined in the National Framework for Biodiversity Offsets, adapted to wetlands are as follows (Macfarlane *et al*, 2014):

1. **Adherence to the Mitigation Hierarchy:** Development impacts should first be avoided and minimised using all cost-effective and reasonable prevention, mitigation and rehabilitation measures, and that offsets should only be considered to address significant residual impacts after other steps have been exhausted.
2. **Limits to what can and should be offset:** Wetland offsets are relevant where environmental assessment processes identify negative residual impacts of 'medium' or 'high' significance on biodiversity and associated ecosystem services. Activities resulting in impacts of 'low' significance may not require offsets. Impacts on biodiversity and associated ecosystem services with 'very high' significance may not be able to be remedied or offset.
3. **Take an ecosystem approach:** This approach promotes the integrated management of land, water and natural capital to achieve conservation and sustainable use of all-natural resources.
4. **Catchment context:** Wetland offsets should be designed and implemented in the context of the broader landscape. In general offset, policies tend to favour offset locations close to the impact site so that benefits associated with offset activities accrue to the area affected by the proposed development. However, it should be shown that this is appropriate for the particular offset proposed.
5. **No net loss:** This overarching principle implies that losses due to project impacts and wetland offset gains need to balance out. This is assessed using an accounting system that explicitly calculates losses and gains. This means:
  - a. Offsets need to secure sufficient improved conditions or protection of wetlands to fully offset the remaining residual impact on biodiversity, ecosystem services or water resources. Offsets should achieve the effective 'no net loss' through the improved condition of other wetlands (i.e. rehabilitation activities which result in the project having an overall neutral effect and/or improved protection.
  - b. Ensuring that offsets make an 'on the ground' contribution to biodiversity and/or water resource objectives. Offsets should improve the condition and function of natural habitats and ensure the protection of priority areas.
  - c. Offsets should target all values (pattern, process/function, and ecosystem services, including water resource objectives.

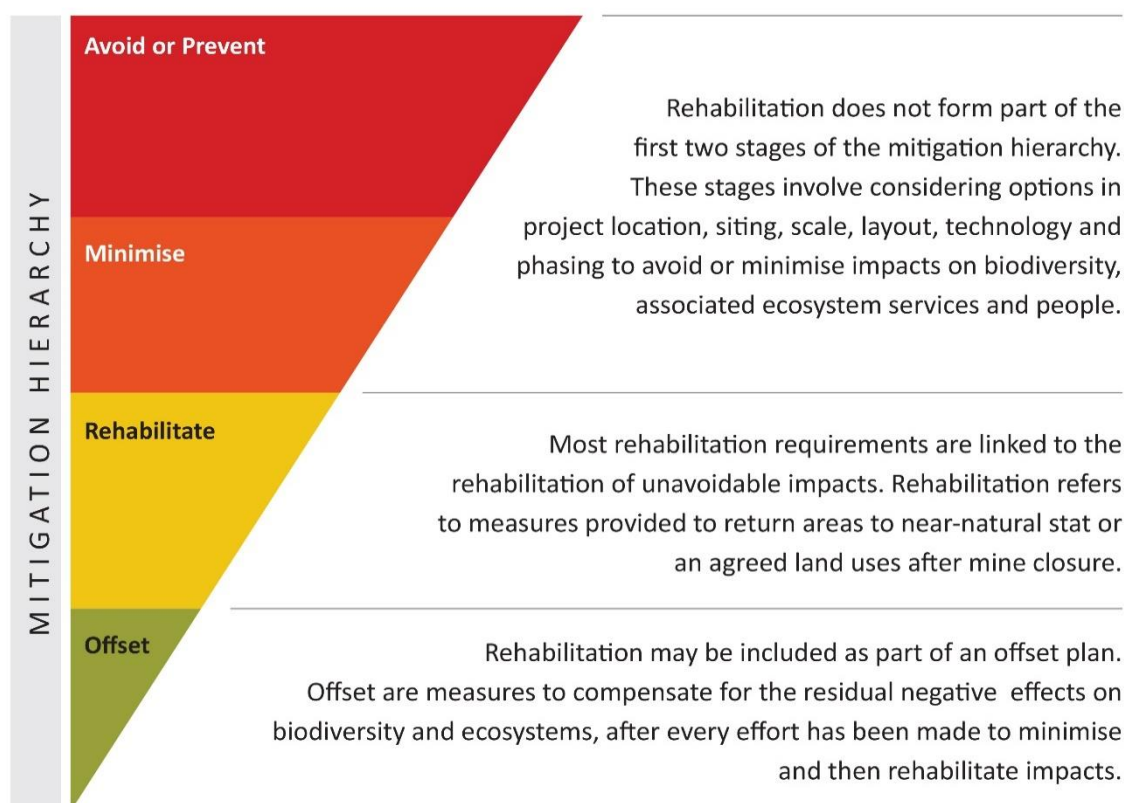


- d. Offset policies favour like-for-like offsets although out-of-kind (especially trading up to areas of higher significance) should be considered in circumstances where this provides greater benefits.
  - e. Offsets should be established prior to project impacts and need to be addressed as part of the environmental authorization process.
6. **The 'size' of an offset** should be determined taking into account risks and uncertainties about the success or performance of planned offset measures
7. **Additional conservation outcomes:** Offsets need to be a new contribution to conservation outcomes, i.e. over and above that which would have occurred without the offset in place and they should not consist of activities that are already required by law.
8. **Enduring conservation outcomes:** Offsets should be established in perpetuity, or at least as long as the residual impact lasts.
9. **Stakeholder participation:** Offsets should be designed and implemented in a transparent way.

#### **3.4.1 Mitigation Hierarchy Related to the Erica Substation**

In terms of the initial design layout of the wetland, the only viable options available were Rehabilitation and Offset. However, with the new layout the top-down approach was used (Figure 8), where the majority of the wetland and buffer zone is now avoided, and the new proposed layout then further minimises the expected impacts. Although the infrastructure will affect water flow in the catchment of the wetland, the protection awarded to the wetland by limiting dumping, littering, further excavation and infilling, as well as the potential for continued control of alien invasive plants and revegetation with indigenous species can improve the Ecological Category of this wetland with rehabilitation measures described in this report.





**Figure 8: Wetland Mitigation Hierarchy.**

### 3.5 Rehabilitation and Monitoring

Rehabilitation refers to the reinstatement of the temporarily disturbed areas affected by the construction or due to construction-related activities, to a state that resembles the conditions before the disturbances.

The nature of the wetland provides opportunities for effective rehabilitation since the shallow water table and sandy soil ensure a dependable baseflow. An improvement to the vegetation status of the wetland through control of alien species and planting with indigenous plants is therefore a realistic aim. The Rondevlei wetland in Pelikan Park, at approximately 34° 3'45.05"S and 18°29'48.61"E, also falls within Quarternary Catchment G22D, the same catchment as the Erica Substation. This wetland may serve as an appropriate reference site against which to measure the success of rehabilitation. Rehabilitation actions are presented in Table 12.

Monitoring refers to the repetitive and continued observation, measurement and evaluation of environmental criteria to follow changes over a period of time and to assess the efficiency of control measures. The monitoring plan aims to establish whether rehabilitation was successful and whether the design of openings in the boundary wall have a negative impact on the wetland in the long-term. Monitoring actions are summarised in

Table 13 below.

Problems such as failed re-vegetation and erosion should be remediated as soon as it is recorded in the monitoring process. Corrective action should be taken and can include the re-initiation of rehabilitation in severe cases or by correction of the problem (e.g. mend broken fences). If problems arise due to the implementation of the changed water flow characteristics that was not pre-empted in this plan, an engineer and wetland specialist should be consulted as soon as possible.

It is recommended that fixed point photography is used to monitor vegetation and soil stability. This involves taking pictures of the areas monitored from the same point during each monitoring event. The images can be compared and serves as a record of the success of rehabilitation or the failure thereof.





**Table 12: Rehabilitation actions**

Activity	Rehabilitation	Timeframe  Since the construction of the boundary wall is considered an emergency, these timeframes may not be feasible and should be considered as a guideline
Site preparation	<ul style="list-style-type: none"> <li>• Compacted and disturbed areas must be shaped to natural forms as set out in the Landscape Plan. In general cut and fill slopes and other shaped areas must not exceed 1:3 (v:h) ratio.</li> <li>• All alien vegetation should be removed from the site. Alien plant management should be an ongoing activity since seeds from alien plants is established in the soil seed bank. An Alien Plant Management Plan should be devised for the</li> <li>• Manual / mechanical removal of alien plants is preferred to chemical control</li> <li>• Plan the sequence of areas to be cleared</li> <li>• Indigenous vegetation must be cut to just above ground level and stockpiled for use in brush packing and seeding.</li> <li>• Areas where indigenous grass clump growth are unaffected by resloping activities should be preserved in order to stabilise the banks.</li> <li>• Topsoil dumped on the immediate site can be used for filling areas for resloping.</li> <li>• The use of fertiliser should be avoided. Nutrient deficiencies are not expected to be present on the site.</li> <li>• Soils must be moist for revegetation activities.</li> <li>• Badly damaged areas should be fenced in to allow for rehabilitation to take place without further impacts on these areas</li> </ul>	<ul style="list-style-type: none"> <li>• Before the onset of the rainy season</li> </ul>
Resloping	<ul style="list-style-type: none"> <li>• In order to promote vegetation growth and establishment, the slope angle must be a maximum of 1(V):3(H).</li> <li>• Slope reshaping must follow the natural slope and topography of the surrounding undisturbed area and wetland to the east of the artificial channel.</li> </ul>	<ul style="list-style-type: none"> <li>• As soon as possible after completion of earthworks</li> </ul>



Activity	Rehabilitation	<b>Timeframe</b> Since the construction of the boundary wall is considered an emergency, these timeframes may not be feasible and should be considered as a guideline
	<ul style="list-style-type: none"> <li>• Areas for resloping must be ripped or loosened to a depth of 150mm to prepare soils for revegetation and allow water penetration into the soils.</li> <li>• Ripping must be done manually with hand tools.</li> <li>• No vehicles are permitted in the area in order to prevent further disturbance to the wetland.</li> <li>• Ripping must be done during the late dry season to prevent erosion and collapse of the banks.</li> <li>• Slope stabilization should be considered for areas where erosion or scouring is identified as a risk. Materials used for stabilization should be biodegradable over 2 years (for example hessian or GeoJute sheets). These textiles should be placed vertically on the slopes and overlap at the edges. They can be fastened with wooden stakes at 1m intervals.</li> </ul>	
Revegetation	<ul style="list-style-type: none"> <li>• Prior to revegetation, all new planting areas must be ripped/ scarified to a depth of approximately 150mm, preferably using hand-held equipment.</li> <li>• Indigenous plants specialised to growing in temporary or seasonal wetland zones should be sourced, for revegetation. Appropriate seed mixes can be obtained from specialist suppliers.</li> <li>• Where local vegetation was removed during site clearing and stored for revegetation, these plants can be used</li> <li>• Once complete, the seeded area must be watered and patted down gently.</li> <li>• Indigenous vegetation removed from the area must be applied over the seeded area as mulch.</li> <li>• A minimum grass/sedge cover of 80% to be obtained within all reseeded areas and planted species must be strong and healthy after the first growing season.</li> </ul>	<ul style="list-style-type: none"> <li>• Directly after resloping</li> </ul>



**Table 13: Monitoring actions**

Variables	Methods	Monitoring Frequency	Indicator	Corrective Action
Hydrology of the watercourse	<ul style="list-style-type: none"> <li>On-site inspection</li> </ul>	<ul style="list-style-type: none"> <li>After rehabilitation</li> <li>Seasonal for the first three years and rapidly after heavy rainfall</li> <li>Thereafter during routine inspections</li> <li>OR as per the monitoring requirements stipulated in the Water Use License.</li> </ul>	<ul style="list-style-type: none"> <li>The size of the wetland has not decreased in area</li> <li>Hydrological zonation (temporary, seasonal and permanent wetland zones are maintained (in other words, no deep flooding occurs)</li> </ul>	<ul style="list-style-type: none"> <li>Revisit the design of drainage openings</li> </ul>
Vegetation cover	<ul style="list-style-type: none"> <li>On-site inspection</li> <li>Assess landscape functionality</li> <li>Monitor species cover abundance and ensure that natural species cover increase (compare to benchmark undisturbed sites prior to construction)</li> <li>Fixed point photography</li> </ul>	<ul style="list-style-type: none"> <li>After re-vegetation</li> <li>Seasonal for the first three years and rapidly after heavy rainfall</li> <li>Thereafter during routine inspections</li> </ul>	<ul style="list-style-type: none"> <li>Spreading and distribution of dominant plant species in specified wet zones</li> <li>During rehabilitation, a vegetation basal cover on stream banks of at least 15% shall be maintained at all times. Note that basal cover refers to the rooting point of the plant into the soil and not leaf cover.</li> </ul>	<ul style="list-style-type: none"> <li>If natural re-vegetation does not occur replanting of indigenous plants should be done at sites of concern</li> <li>If re-vegetation is not successful at the end of 3 years, develop and implement (in consultation with an ecologist) a remedial re-vegetation plan to actively re-vegetate the disturbed area. Continue re-vegetation efforts until riparian re-vegetation is successful</li> </ul>



Variables	Methods	Monitoring Frequency	Indicator	Corrective Action
				<ul style="list-style-type: none"> <li>If rehabilitation is successful at the end of 3 years, report on the status of the vegetation (e.g. using photographic record) and if maintenance activities might have disturbed the area again</li> </ul>
Plant species composition	<ul style="list-style-type: none"> <li>Fixed transect to determine the species composition</li> </ul>	<ul style="list-style-type: none"> <li>Seasonal for the first three years and rapidly after heavy rainfall</li> <li>Thereafter during routine inspections</li> </ul>	<ul style="list-style-type: none"> <li>Presence/absence of species in specified wet areas.</li> </ul>	<ul style="list-style-type: none"> <li>Replanting of indigenous plants should be done at sites where basal cover is less than 15%. Note that basal cover refers to the rooting point of the plant into the soil and not leaf cover.</li> <li>If exotic plants have colonised the area the exotic plants should be removed.</li> </ul>
Alien Invasive Plant Species	<ul style="list-style-type: none"> <li>Monitor the emergence of alien invasive plant species in or around rehabilitated areas</li> <li>On-site inspection</li> <li>Fixed point photography</li> </ul>	<ul style="list-style-type: none"> <li>After construction</li> <li>After re-vegetation</li> <li>Seasonal for the first three years and rapidly after heavy rainfall</li> <li>Thereafter during routine inspections</li> </ul>	<ul style="list-style-type: none"> <li>Establishment of alien invasive plant species in rehabilitated areas or in watercourses</li> </ul>	<ul style="list-style-type: none"> <li>Remove emergent invasive vegetation from the rehabilitated footprint and servitude as soon as it becomes apparent</li> <li>Manual labour is preferred above chemical or manual removal.</li> <li>Do not use herbicides or pesticides in or within 200 meters of a watercourse</li> </ul>



### 3.6 CONCLUSION

The seepage wetland identified on the study site is impacted by the railway line that lies to the north and east of the site. Berms supporting the railway essentially cut off the wetland conditions that would naturally extend to the east of the site. Furthermore, high density residential development to either direction has transformed historic wetland conditions and have changed the catchment's hydrological characteristics. Excavation and soil dumped on the study area, likely associated with road building have significantly altered geomorphological characteristics of the wetland, with the creation of an artificial permanent wet zone and barriers to surface water flows. The vegetation composition of the wetland is dominated by alien invasive species and pioneer plants. Although water quality was not assessed, it is likely to reflect runoff from the roads, stormwater and ineffective sewage infrastructure from the adjacent township.

Construction of a substation and access roads adjacent to the wetland and its buffer zone are likely to change water flow characteristics in the catchment of the wetland. However, the layout changes to outside the wetland edge and the protection awarded to the wetland by limiting dumping, littering, further excavation and infilling, as well as the potential for continued control of alien invasive plants and revegetation with indigenous species can improve the Ecological Category of this wetland.

The important factors relevant to Environmental Authorisation for the project are summarised in Table 14 below:

**Table 14: Summary of findings**

	Quaternary Catchment and WMA areas	Important Rivers within 500 m
	G22D, #9, Berg-Olifants WMA	<p>The Kuils River lies approximately 5.5km east of the site</p> <p>The source of the Vyeakraal River lies approximately 5.4km northwest of the site.</p>
<b>Classification (SANBI, 2013)</b>	Seepage wetland	
<b>Wetland Integrity</b>	<p><b>VEGRAI/ QHI: E: Seriously modified.</b> The loss of natural habitat, biota and basic ecosystem functions is extensive.</p> <p><b>EIS: Moderate.</b> Watercourses in this category are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water in major rivers</p> <p><b>ES:</b> Scores reflect the rural setting of the watercourse with the highest values recorded for the services Cultural and Spiritual and Cultivated Food (High and Moderately High). Scores for Biodiversity Maintenance was Moderate and the regulating and supporting services Sediment Trapping and assimilation of Toxicants scored Moderately Low.</p> <p><b>Recommended Ecological Management Category: D</b></p> <p><b>Water quality and instream aquatic biota were not assessed</b></p>	
<b>Calculated buffer zones following MacFarlane et al., 2015</b>	<p>Construction phase buffer zone - 15m</p> <p>Operational phase buffer zone - 27m</p>	





DWS Regulated Area	500m around the wetland. This area indicates where potential impacts to the watercourse should be assessed to indicate which DWS authorisation process should be followed, General Authorisation, or Water Use Licence Application			
NEMA 2014 Impact Assessment	The impact scores for the following aspects are relevant to the operational phase:		Without Mitigation	With Mitigation
	Impacts to hydrological function at a landscape level	Construction	M	L
		Operation	M	L
	Changes to sediment regimes	Construction	M	L
		Operation	M	L
	Establishment of alien plants	Construction	M	L
		Operation	M	L
	Loss of wetland habitat	Construction	M	L
		Operation	M	L
	Pollution of regional watercourses	Construction	M	L
Operation		L	L	
DWS 2016 Risk Assessment	The expected risk score for the proposed substation located adjacent to the wetland and buffer zone fall in the <b>Low</b> category. Although the infrastructure will affect water flow in the catchment of the wetland, the protection awarded to the wetland by limiting dumping, littering, further excavation and infilling, as well as the potential for continued control of alien invasive plants and revegetation with indigenous species can improve the Ecological Category of this wetland (refer to recommendations in Section 3.4). This activity may be authorised through a General Authorisation.			
Does the specialist support the development?	Yes. Although the catchment will be significantly altered, an opportunity exists to improve the integrity of the wetland by active rehabilitation, managing alien invasive vegetation and preventing further degradation.			



## 4 REFERENCES

- Department of Water Affairs (2008): Updated Manual for the Identification and Delineation of Wetlands and Riparian areas.
- Department of Water Affairs (2010). National Water Act, 1998 (Act No 36 of 1998) S21(c) & (i) Water Uses. Version: February 2010. Training Manual.
- Department of Water Affairs and Forestry (1999). Resource Directed Measures for Protection of Water Resources. Volume 4. Wetland Ecosystems Version 1.0. Pretoria
- Department of Water Affairs and Forestry (2008). Updated Manual for the identification and delineation of wetlands and riparian areas. Department of Water affairs and Forestry. Pretoria. South Africa Second Edition. September 2008.
- Department of Water Affairs and Sanitation (2015) Risk-based Water Use Authorisation Approach and Delegation Protocol for Section 21(c) and (i), Edition 02
- Kleynhans, C.J. (1999): A procedure for the determination of the determination of the ecological reserve for the purpose of the national water balance model for South African Rivers. Institute for Water Quality Studies Department of Water Affairs and Forestry, Pretoria.
- Kotze D C, (1999): A system for supporting wetland management decisions. Ph.D. thesis. School of Applied Environmental Sciences, University of Natal, Pietermaritzburg.
- Kotze D.C., Marneweck, G.C., Batchelor, A.L., Lindley, D.S. and Collins, N.B. (2005). WET-EcoServices: A technique for rapidly assessing ecosystem services supplied by wetlands
- Lesekha Consulting (2019). Plan of Study and Draft Scoping Report for the Proposed Clearance of 210.6353 Hectares of Indigenous Vegetation for the Establishment of Popo Molefe Township on Paardekraal Farm no. 279 JQ within the Rustenburg Local Municipality,
- IN THE NORTH WEST PROVINCE Macfarlane D.M., Kotze D.C., Ellery W.N., Walters D, Koopman V, Goodman P and Goge C. (2008). WET-Health: A technique for rapidly assessing wetland health. Water Research Commission, Pretoria. WRC Rport TT340/08 February 2008
- Macfarlane D.M., Teixeira-Leite A., Goodman P., Bate G and Colvin C. (2010) Draft Report on the Development of a Method and Model for Buffer Zone Determination. Water Research Commission project K5/1789. The Institute of Natural Resources and its Associates
- Mucina L., & Rutherford M. C. (2006). Vegetation Map of South Africa, Lesotho and Swaziland, 1:1 000 000 scale sheet maps. South African National Biodiversity Institute., Pretoria.
- Nel, J.L., Murray, K.M., Maherry, A.M., Petersen, C.P., Roux, D.J., Driver, A., Hill, L., Van Deventer, H., Funke, N., Swartz, E.R., Smith-Adao, L.B., Mbona, N., Downsborough, L. & Nienaber, S. 2011. Technical Report for the Freshwater Ecosystem Priority Areas Project. WRC Report No. 1801/2/11. Water Research Commission, Pretoria.



Schultze R.E. (1997). South African Atlas of Agrohydrology and Climatology. Water Research Commission, Pretoria, Report TT82/96



## APPENDIX A: Soil Advisory Wetland Delineation



**SOIL ADVISORY SERVICES**  
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### TECHNICAL NOTE

Attention: Antoinette Bootsma  
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Date: 16 Mar 2022

Project ref: SAS20220223

#### 1. INTRODUCTION

Soil Advisory Services was requested by Limosella Consulting to undertake a wetland delineation based on the soil form and soil wetness characteristics of the land intended for the Erica substation, located near Mitchells Plain in the Western Cape province. For the study, a literature review, followed by a reconnaissance level soil survey and wetland delineation was done. The purpose of the soil survey was to I) determine the dominant soil forms; II) establish the degree of wetness in the soil profiles; and III) verify certain of the soil properties described in the Geotechnical report for the site. The survey was conducted on 8 March 2022, during the dry season.

This technical note details the relevant environmental aspects, general site observations and results of the soil-based wetland delineation for the land intended for the Erica substation.

#### 2. ENVIRONMENTAL SETTING

##### 2.1. Regional soils

A reconnaissance survey at a scale of 1:250 000 was conducted in South Africa in the early 1970's in order to compile inventories of the natural resources of South Africa in terms of soil, climate and terrain. The survey reflects the dominant soils in each land type by percentage. The land type information is not a substitute for a detailed soil map but gives a very good indication of where certain soil patterns are located. The land type memoirs and associated map of 3318 Cape Town (Land type Survey Staff, 1976-2006) indicates that the site lies within the Ha7 land type unit. Land type unit Ha "accommodate areas in which deep grey sands of the Fernwood form are a prominent feature". The dominant soil forms expected in the land type unit Ha7 are Fernwood (85 %), Longlands (10%) and Mispah (5%).

##### 2.2. Terrain

The soils of land type unit Ha7 are distributed in various terrain positions: 10% crest, 50% midslope, 35% footslope and 5% valley bottom. The terrain form sketch (as extracted from the landtype memoir) is shown in **Error! Reference source not found.** below. The topography of the site is also described as undulating in the geotechnical assessment report (JG Afrika, 2020). This feature was also observed during the soil survey.

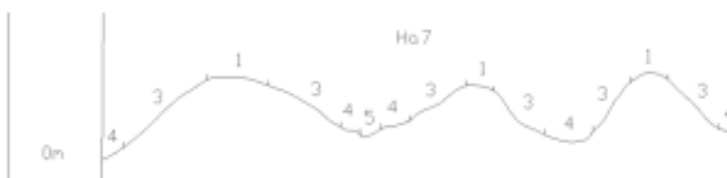


Figure 1. Terrain form sketch of the Ha7 land type unit (extracted from the Land type memoir)



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### 2.3. Geology

The geology represented in the Ha7 land type unit is mainly Quaternary calcareous coastal dune sand of the Witzand Formation (made up of Aeolian deposited soils) as well as Quaternary limestone and calcrete of the Langebaan Formation. According to the geotechnical assessment conducted at the site, groundwater seepage was encountered in most of the evaluated test pits (except for TP1, TP11 and TP13) at an average depth of 1m (JG Afrika, 2020)

### 2.4. National wetland classification

Two seepage wetland systems, located on the western portion of the project site, are indicated on the National Wetland Map (van Deventer et al., 2019). The wetlands cover an extent of approximately 3.6 ha. These types of wetlands are understood to be recharged by precipitation and regional groundwater, with outflows being evapotranspiration and discharge into the regional groundwater water. The wetland water level is an indication of the regional groundwater level.

## 3. FINDINGS

### 3.1. General observations

The site was accessed from Stock Road along the eastern portion of the project site. The site terrain condition appears disturbed, with ridges and various disturbed excavated (dug out) portions, likely used as a borrow pit during road construction (Figure 2). The largest of such an excavated area has formed a pond-like area, which was also noticeable on the aerial image of the site. Also, immediately noticeable in the more central portions of the site are the burnt circular areas, which appear to have been temporary shelters (Figure 4). Large portions of the site covered in Port Jackson (*Acacia saligna*) shrubs, with grasses and other low growing species occurring in wetter soil conditions (Figure 3, Figure 4). In the central portion of the site, large calcrete boulders were also noted (Figure 5).



Figure 2. left) Historical excavated "borrow pit" area. right) uneven terrain, with ridges



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Figure 3. left) Grasses near pond area of historical excavated "borrow pit" area. right) dried algal growth with "succulent-type" / samphire like plants growth on surface along pond area.



Figure 4. Burnt circular areas of temporary shelters





### DRAFT TECHNICAL NOTE



Figure 5. Calcrete boulders in central portion of site

#### 3.2. Soil-based wetland delineation

Soil auger observations and descriptions were done at seven locations across the site. These were focused within the seepage wetland zones as delineated in the National Wetland Map (NWM) and the soils in the vicinity of the excavated pond/borrow pit area. Certain of the observations were on the boundary of these seepage zones to verify the extent of the NWM wetland areas (Figure 6).

At each observation point, soil was augered to a maximum depth of 1.2 m, unless impenetrable calcrete material was encountered. The soil physical properties (horizon thickness, texture class, Munsell colour and signs of wetness, and depth to water table) were recorded and the soil form and family pedologically classified according to the South African Soil Classification System (SCWG, 2018). The geotechnical test pit logs and photographs were carefully studied and used to pedologically classify the soil forms and families for the areas covered during the geotechnical survey.

The soils generally have a grey to very dark grey (2.5 Y 3/1), sandy loam to sandy orthic topsoil horizon, overlying a light grey to white (2.5 Y 7/1 to 2.5 Y 8/1) sandy albic subsoil. In some areas the albic horizon is not thick, and a calcrete layer was encountered. The soils classify as the Fernwood (Fw 1110) and the Iswepe (Is1110) soil forms. The borrow pit/pondlike area was mapped as the Cullinan soil form (Cu1). A portion of the soils surround the pondlike area, contain fill material (as was noted in the geotechnical test pit logs for TP1, TP11 and TP13). These areas were classified as Witbank soils (Wb1100). A summary of the soil descriptions and classification is presented in Table 1. The predicted soil map for the study area, based on the soil survey information and geotechnical logs, is presented in Figure 7.



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The draft Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas wetland delineation (hereafter referred to as the Manual), made available in 2008, references the 2<sup>nd</sup> edition of the South African soil classification system. This edition of the soil classification system, had no specific classification for topsoil orthic horizons over albic horizons overlying hard rock (Iswepe soil form), as was observed in certain soil auger holes and test pits. The hydromorphic properties of the albic horizon overlying the calcrete in the Iswepe form, were however similar to the albic features noted in the Fernwood soil forms (orthic/albic) identified. Soil water flow in the albic horizon is understood to be predominantly lateral based on identified hydromorphic properties, which indicate temporal buildup of water on the soil/bedrock interface, resulting in a slow discharge laterally. Therefore, hydrogeologically these soil forms behave similar as interflow soils. In the case of aeolian derived Fernwood soils (and Iswepe soils), as identified on the site, a separate set of criteria are considered for the delineation of temporary wetland zones in the manual (DWAF, 2008). Using these criteria and the depth to groundwater noted during the survey as well as from the geotechnical test pit logs, a soil-based wetland delineation was done. The delineated wetland zones are shown in Figure 8. The temporary wetland zone extends from the pond area towards the northwestern portion of the site. The historic borrow pit area, which is now more pondlike, is most likely an area where the shallow groundwater level is. This area was categorized as a permanent wetland zone.

**DRAFT TECHNICAL NOTE**



Figure 6. Soil observation points and National Wetland Delineation



**DRAFT TECHNICAL NOTE**



Figure 7. Predicted soil map of project area

**DRAFT TECHNICAL NOTE**



Figure 8. Soil-based wetland delineation of project area



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Table 1. Soil descriptions used for wetland delineation

Pedological descriptions of soil observation points								Soil properties associated with the temporary zone of wetness in riparian and wetland habitats on sandy coastal aquifers						Soil based wetland classification
Observation point	Horizon	Depth(cm)	Description	Diagnostic horizon	Soil form	Water table / Signs of wetness (cmbgl)	Map unit	Dark topsoil	Extremely high OC (> 7%)	Plant residue accumulation	Low bulk density	Peaty character	Vertical cracking in dry state	Potential permanent OR temporary zone
Borrow pit / Pond area			Large, exposed, excavation not backfilled	Technosol	Cullinan		Cu1							Artificial Permanent zone
ESS AH1	A/E	0 – 50	Dry; light brownish grey 10YR 6/2; loose, fine sand	Orthic / Albic	Fernwood	ND	Fw 1110	no	no	no	yes	no	no	no
	E	50+	Augerhole collapsed	Albic										
ESS AH2	A/E	0 – 20	Moist; grey 2.5Y 5/1; loose, coarse sand, common algal film on surface	Orthic / Albic (*)	Witbank	20 cm	Wb1000	no	no	no	yes	no	no	Artificial Permanent zone
	E	20 - 50	Wet; pale brown 2.5Y 8/2; loose, coarse sand, water table at 20cm below ground level	Albic (*)										
ESS AH3	A/E	0 – 30	Moist; dark grey 2.5Y 4/1; loose, fine sand	Orthic / Albic	Fernwood	45 cm	Fw 1110	yes	no	slight	yes	no	no	Yes, watertable < 50 cm
	E	30 - 50+	Wet; grey 2.5Y 6/1; loose, fine sand, water table at 45 cm below ground level	Albic										
ESS AH4	A	0 - 20/40	Moist; light brownish grey 2.5Y 6/2; loose, coarse sand	Orthic	Fernwood	80 cm	Fw 1110	no	no	no	yes	no	no	no
	E1	20/40 - 80	Moist; light brownish grey 2.5Y 6/2; loose, coarse sand, with slight reddish stained sand grains	Albic										
	E2	80 - 120	Wet; very pale brown 10YR 7/3; loose, coarse sand, with slight reddish stained sand grains	Albic										
ESS AH7	A	0 – 45/50	Moist; very dark grey 2.5Y 3/1; loose to friable, medium to coarse sandy loam, abrupt transition to E horizon	Orthic	Iswepe	45/50 cm	Is1110	yes	no	slight	yes	no	no	Yes, watertable < 50 cm
	E	45/50 - 63	Wet; grey 2.5Y 5/1; loose, coarse sand, abrupt transition to R	Albic										
	R	63+	Calcrete	Hard rock										
ESS AH8	A1	0 – 25	Moist; very dark grey 2.5Y 3/1; loose, coarse sand	Orthic	Iswepe*	40/45 cm	Is1110	yes	no	no	yes	no	no	Yes, watertable < 50 cm
	A2	25 – 40/45	Moist; dark grey 2.5Y 4/1; loose, coarse sand, abrupt transition to R	Orthic										
	R	40/45+	Calcrete	Hard rock										
ESS AH9	A	0 – 28/30	Moist; very dark grey 2.5Y 3/1; loose to friable, medium to coarse sandy loam, abrupt transition to E horizon	Orthic	Iswepe	ND	Is1110	yes	no	no	yes	no	no	Likely
	E	28/30 - 54	Moist; grey 2.5Y 5/1; loose, coarse sand, abrupt transition to R	Albic										
	R	54+	Calcrete	Hard rock										

Note: Refer to appendix A for photographs of soils



## DRAFT TECHNICAL NOTE

### 4. CONCLUSIONS

The purpose of the study was to use the soil characteristics to identify the presence of wetlands within the project site. Given the degree of land disturbance on the site, the soil form and wetness indicators were considered more appropriate than the vegetation and terrain wetland indicators, for the wetland delineation at the project site.

Based on the soil form and wetness characteristics, a temporary wetland area which covers approximately 3ha of the project site, was delineated. The historic borrow pit area, was classified as an artificial permanent wetland. Both wetland areas are understood to be recharged by the regional groundwater and precipitation. The wetlands are however within an already modified catchment, with the functionality of the wetlands subsequently altered, from the natural state. The functional assessment of the wetlands (to be conducted by Limosella) will highlight the degree of modification of the wetlands.

### 5. STUDY ASSUMPTIONS & LIMITATIONS

The following limitations are relevant to this document:

- Relevant information relating to the project such as general site arrangement maps and historic reports was made available to Soil Advisory Services by Limosella and was used in the information review and overall assessment.
- The methodologies and procedures applied in this study are generally followed in the broader soil science and hydropedology assessment community.
- The presented findings in this document are based on the author's current understanding of the project and the level of information available at the time of the assessment and can be adjusted if additional information becomes available.

### 6. REFERENCES

Department of Water Affairs and Forestry (DWAF). 2005. A practical field procedure for identification and delineation of wetlands and riparian areas, Edition 1 September 2005

DWAF. 2008. Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas, prepared by M. Rountree, A. L. Batchelor, J. MacKenzie and D. Hoare. Report no. XXXXXXXXXX. Stream Flow Reduction Activities, Department of Water Affairs and Forestry, Pretoria, South Africa.

JG Afrika. 2020. Erica Substation Detailed Geotechnical Report prepared for Eskom. JGA Ref: 5400/02, authored by P. Mvuyana and C. Canahal

Land Type Survey Staff. 1976-2006. Land type Survey Database. ARC-ISCW, Pretoria.

Soil Classification Working Group (SCWG). 2018. Soil Classification: A natural and anthropogenic system for South Africa. ARC-Institute for Soil, Climate and Water, Pretoria.

Van Deventer, Heidi & Van Niekerk, Lara & Adams, Janine & Dinale, Millcent & Gangat, Ridhwannah & Lamberth, Stephen & Lotter, Mervyn & Mbona, Namhla & MacKay, Fiona & Nel, Jeanne & Ramjukadh, Carla-Louise & Skowno, Andrew & Weerts, Steven. 2019. National Wetland Map 5 – An improved spatial extent and representation of inland aquatic and estuarine ecosystems in South Africa. 10.1101/640441.





**DRAFT TECHNICAL NOTE**

**Appendix A - Photograph log**

ES-AH 1



ES-AH2



ES-AH3





**DRAFT TECHNICAL NOTE**

ES-AH4



ES-AH7



ES-AH8



**DRAFT TECHNICAL NOTE**

ES-AH9



## **APPENDIX B: Requirements for Aquatic Biodiversity Assessments**

The NEMA regulations of 2014 (as amended) specify required information to be included in specialist reports. Table 15 presents a summary of these requirements following GNR982 as amended by GN326. In March 2020, the Department of Environmental Affairs issued General Notice 320 set out requirements of the EIA Screening Tool Protocols for the Assessment and Reporting of Environmental Themes including Aquatic Biodiversity. These specifications overlap somewhat with the 2014 EIA regulations as amended (GN 982 as amended by GN326).



Table 16 presents a summary of the requirements of this protocol with notes on sections of the report applicable to each aspect.

**Table 15: Legislative report requirements GNR982**

<b>GNR982 as amended by GN326</b>	<b>Report Section</b>
(1) A specialist report prepared in terms of these Regulations must contain—	
(a) details of—	
(i) the specialist who prepared the report; and	Page 4
(ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Appendix D
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Pages 2
(c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.2
(cA) an indication of the quality and age of base data used for the specialist report;	Section 1.6, Table 1
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 3
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 1
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 2 and Appendix A and C
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 3. Alternative wall designs were investigated but the layout remained the same
(g) an identification of any areas to be avoided, including buffers;	Section 3
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 3, the boundary wall is located on the site boundary
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.3
j) a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 3, summarised in Section 4



(k) any mitigation measures for inclusion in the EMPr;	Section 3.3 and 3.4
(l) any conditions for inclusion in the environmental authorisation;	Section 4
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 3.4
(n) a reasoned opinion—	
(i) whether the proposed activity, activities or portions thereof should be authorised;	Section 4
(iA) regarding the acceptability of the proposed activity or activities; and	Section 4
(ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 4
(o) a description of any consultation process that was undertaken during the course of preparing the specialist report;	Not Applicable
(p) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Not Applicable
(q) any other information requested by the competent authority.	Not Applicable
(2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	Not Applicable



**Table 16: Content of Specialist report GN320**

Requirement	Section
2.3.1. a description of the aquatic biodiversity and ecosystems on the site, including;  (a) aquatic ecosystem types; and  (b) presence of aquatic species, and composition of aquatic species communities, their habitat, distribution and movement patterns;	Section 3
2.3.2. the threat status of the ecosystem and species as identified by the screening tool;	Section 1.6, Table 1
2.3.3. an indication of the national and provincial priority status of the aquatic ecosystem, including a description of the criteria for the given status (i.e. if the site includes a wetland or a river freshwater ecosystem priority area or sub catchment, a strategic water source area, a priority estuary, whether or not they are free-flowing rivers, wetland clusters, a critical biodiversity or ecologically sensitivity area); and	Section 1.6, Table 1
2.3.4. a description of the ecological importance and sensitivity of the aquatic ecosystem including:	Section 3
(a) the description (spatially, if possible) of the ecosystem processes that operate in relation to the aquatic ecosystems on and immediately adjacent to the site (e.g. movement of surface and subsurface water, recharge, discharge, sediment transport, etc.); and	Section 3
(b) the historic ecological condition (reference) as well as present ecological state of rivers (in- stream, riparian and floodplain habitat), wetlands and/or estuaries in terms of possible changes to the channel and flow regime (surface and groundwater).	Section 3
2.4. The assessment must identify alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification and which were not considered appropriate.	The nature of the boundary wall, locates the footprint on the site boundary
2.5. Related to impacts, a detailed assessment of the potential impacts of the proposed development on the following aspects must be undertaken to answer the following questions:	Section 3.3
2.5.1. Is the proposed development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal?	Section 3
2.5.2. is the proposed development consistent with maintaining the resource quality objectives for the aquatic ecosystems present?	Section 3





2.5.3. how will the proposed development impact on fixed and dynamic ecological processes that operate within or across the site? This must include:	Section 3.3
(a) impacts on hydrological functioning at a landscape level and across the site which can arise from changes to flood regimes (e.g., suppression of floods, loss of flood attenuation capacity, unseasonal flooding or destruction of floodplain processes);	Section 3.3, Table 6
(b) will the proposed development change the sediment regime of the aquatic ecosystem and its sub-catchment (e.g. sand movement, meandering river mouth or estuary, flooding or sedimentation patterns);	Section 3.3, Table 7
(c) what will the extent of the modification in relation to the overall aquatic ecosystem be (e.g. at the source, upstream or downstream portion, in the temporary   seasonal   permanent zone of a wetland, in the riparian zone or within the channel of a watercourse, etc.); and	Section 3.3, Table 6, 9
(d) to what extent will the risks associated with water uses and related activities change;	Section 3.3, Table 11
2.5.4. how will the proposed development impact on the functioning of the aquatic feature? This must include:	
(a) base flows (e.g., too little or too much water in terms of characteristics and requirements of the system);	Section 3.3, Table 6
(b) quantity of water including change in the hydrological regime or hydroperiod of the aquatic ecosystem (e.g., seasonal to temporary or permanent; impact of over-abstraction or instream or off stream impoundment of a wetland or river);	Section 3.3, Table 6
(c) change in the hydrogeomorphic typing of the aquatic ecosystem (e.g., change from an unchanneled valley-bottom wetland to a channelled valley-bottom wetland);	Section 3.3, Table 6
(d) quality of water (e.g. due to increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication);	Section 3.3, Table 10
(e) fragmentation (e.g. road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal); and	Section 3.3, 9
(f) the loss or degradation of all or part of any unique or important features associated with or within the aquatic ecosystem (e.g. waterfalls, springs, oxbow lakes, meandering or braided channels, peat soils, etc.);	Not present
2.5.5. how will the proposed development impact on key ecosystems regulating and supporting services especially:  (a) flood attenuation;  (b) streamflow regulation;	Section 3.3, Tables 6 to 10



<p>(c) sediment trapping;</p> <p>(d) phosphate assimilation;</p> <p>(e) nitrate assimilation;</p> <p>(f) toxicant assimilation;</p> <p>(g) erosion control; and</p> <p>(h) carbon storage?</p>	
<p>2.5.6. how will the proposed development impact community composition (numbers and density of species) and integrity (condition, viability, predator - prey ratios, dispersal rates, etc.) of the faunal and vegetation communities inhabiting the site?</p>	<p>Section 3.3, Tables 6 to 10. Also refer to the rehabilitation suggestions in Section 3.4</p>
<p>2.6. In addition to the above, where applicable, impacts to the frequency of estuary mouth closure should be considered, in relation to:</p> <p>(a) size of the estuary;</p> <p>(b) availability of sediment;</p> <p>(c) wave action in the mouth;</p> <p>(d) protection of the mouth;</p> <p>(e) beach slope;</p> <p>(f) volume of mean annual runoff; and</p> <p>(g) extent of saline intrusion (especially relevant to permanently open systems).</p>	<p>Not applicable</p>



## APPENDIX C: Detailed methodology

### Watercourse Delineation

The wetland delineation followed a soil-based assessment undertaken by a soil specialist as set out in Appendix A above.

### Watercourse Classification

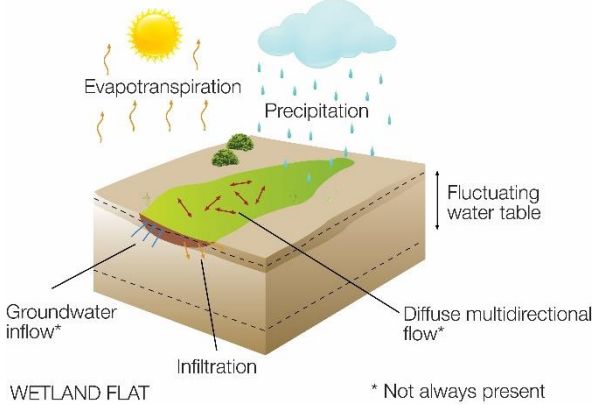
The classification system developed for the National Wetlands Inventory is based on the principles of the hydro-geomorphic (HGM) approach to wetland classification (SANBI, 2013). The current wetland study follows the same approach by classifying wetlands in terms of a functional unit in line with a level three category recognised in the classification system proposed in SANBI (2013). HGM units take into consideration factors that determine the nature of water movement into, through and out of the wetland system. In general, HGM units encompass three key elements (Kotze *et al*, 2005):

- Geomorphic setting - This refers to the landform, its position in the landscape and how it evolved (e.g. through the deposition of river borne sediment);
- Water source - There are usually several sources, although their relative contributions will vary amongst wetlands, including precipitation, groundwater flow, stream flow, etc.; and
- Hydrodynamics - This refers to how water moves through the wetland.

The classification of wetland areas found within the study site and/or within 500 m of the study site (adapted from Brinson, 1993; Kotze, 1999, Marneweck and Batchelor, 2002 and DWAF, 2005) are as follows (Table 17):



**Table 17: Wetland Types and descriptions**

Wetland Type:	Description:
<p><b>Flat Wetland</b></p>  <p>Evapotranspiration</p> <p>Precipitation</p> <p>Fluctuating water table</p> <p>Groundwater inflow*</p> <p>Infiltration</p> <p>Diffuse multidirectional flow*</p> <p>WETLAND FLAT</p> <p>* Not always present</p>	<p>In areas with weakly developed drainage patterns and flat topography, rainfall may not drain off the landscape very quickly, if at all, due to the low relief. In such areas (commonly characterized by aeolian deposits or recent sea floor exposures) the wet season water table may rise close to, or above, the soil surface, creating extensive areas of shallow inundation or saturated soils. In these circumstances the seasonal or permanently high groundwater table creates the conditions for wetland formation.</p>

### Buffer Zones and Regulated Areas

A buffer zone is defined as a strip of land surrounding a wetland or riparian area in which activities are controlled or restricted (DWAF, 2005). A development has several impacts on the surrounding environment and on a watercourse. The development changes habitats, the ecological environment, infiltration rate, amount of runoff and runoff intensity of the site, and therefore the water regime of the entire site. An increased volume of stormwater runoff, peak discharges, and frequency and severity of flooding is, therefore, often characteristic of transformed catchments. The buffer zone identified in this report serves to highlight an ecologically sensitive area in which activities should be conducted with this sensitivity in mind.

Buffer zones have been shown to perform a wide range of functions and have therefore been widely proposed as a standard measure to protect water resources and their associated biodiversity. These include (i) maintaining basic hydrological processes; (ii) reducing impacts on water resources from upstream activities and adjoining land uses; (iii) providing habitat for various aspects of biodiversity. Buffer zones are therefore proposed as a standard mitigation measure to reduce impacts of land uses / activities planned adjacent to water resources. Although buffer zones can be effective in addressing diffuse source pollution in storm water run-off, they should typically be seen as part of a treatment train designed to address storm water impacts (MacFarlane & Brendin, 2017).

Authorisation from the DWS requires calculation of a site-specific buffer zone (General Notice 267 of 24 March 2017), following Macfarlane *et al* 2015. This Excel-based tool calculates the best suited buffer for each wetland or section of a wetland based on numerous on-site observations. The resulting buffer zone can thus have large differences depending on the current state of the wetland as well as the nature of the proposed development. Developments with a high-risk factor such as mining are likely to have a larger buffer area compared to a residential development with a lower risk factor.

Figure 9 images represent the buffer zone setback for the watercourse types discussed in this report.

*It should be noted that the buffer calculation tool does not take into account the effects of climate change or cumulative impacts to flood flows resulting from transformed catchments. Therefore, a conservative approach to the application of buffer zones is encouraged.*





**Figure 9: A represent the buffer zone setback for the wetland area discussed in this report**

Regulated areas are zones within which authorisation is required. The DWS specify a 500m regulated area around all wetlands and 100m around all riparian zones (unless the floodline or a detailed delineation is available) within which development must be authorised from their department. Development within 32m of the edge of the watercourse triggers the requirement for authorisation under the National Environmental Management Act (NEMA): Environmental Impact Assessment (EIA) Regulations of 2014 (GNR 326) as amended.

### **Watercourse Functionality, Status and Sensitivity**

Watercourse functionality is defined as a measure of the deviation of structure and function from its natural reference condition. The natural reference condition is based on a theoretical undisturbed state extrapolated from an understanding of undisturbed regional vegetation and hydrological conditions.

The allocations of scores in the functional and integrity assessment are somewhat subjective and are thus vulnerable to the interpretation of the specialist. With the exception of the assessment of water quality and invertebrates, collection of empirical data is precluded at this level of investigation due to project constraints including time and budget. Water quality values, species richness and abundance indices, surface and groundwater volumes, amongst others, should ideally be used rather than a subjective scoring system such as is presented here.

The functional assessment methodologies presented below take into consideration subjective recorded impacts to determine the scores attributed to each functional Hydrogeomorphic (HGM) unit. Following the calculation of PES and EC scores, a Recommended Ecological Category can be obtained. This score reflects an auditable management or rehabilitation target to be achieved by the proposed project. The sections below provide a brief description of each method.

### **Present Ecological Status (PES) – WET-Health**

A summary of the three components of the WET-Health Namely Hydrological; Geomorphological and Vegetation Health assessment for the wetlands found on site is described in Table 18. A Level 1 assessment was used in this report. Level 1 assessment is used in situations where limited time and/or resources are available.



**Table 18: Health categories used by WET-Health for describing the integrity of wetlands (Macfarlane *et al*, 2020)**

Description	Impact Score Range	PES Score	Summary
Unmodified, natural.	0.0.9	A	Very High
Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1-1.9	B	High
Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact.	2-3.9	C	Moderate
Largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4-5.9	D	Moderate
The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6-7.9	E	Low
Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8.10	F	Very Low

A summary of the change class, description and symbols used to evaluate wetland health are summarised in Table 19.

**Table 19: Trajectory class, change scores and symbols used to evaluate Trajectory of Change to wetland health (Macfarlane *et al*, 2020)**

Change Class	Description	Symbol
Improve	Condition is likely to improve over the over the next 5 years	(↑)
Remain stable	Condition is likely to remain stable over the next 5 years	(→)
Slowly deteriorate	Condition is likely to deteriorate slightly over the next 5 years	(↓)
Rapidly deteriorate	Substantial deterioration of condition is expected over the next 5 years	(↓↓)

### **Ecosystem Services (ES)**

The Department of Water and Sanitation authorisations related to wetlands are regulated by Government Notice 267 published in the Government Gazette 40713 of 24 March 2017 regarding Section 21(c) and (i). Page 196 of this notice provides a detailed terms of reference for wetland assessment reports and includes



the requirement that the ecological integrity and function of wetlands be addressed.

WET-EcoServices Version 2 (Kotze, *et al.*, 2020) includes 16 different ecosystem services, which were selected for their specific relevance to the South African situation:

- Flood attenuation
- Streamflow regulation
- Sediment trapping
- Phosphate assimilation
- Nitrate assimilation
- Toxicant assimilation
- Erosion control
- Carbon storage
- Biodiversity maintenance
- Provision of water for human use
- Provision of harvestable resources
- Food for livestock
- Provision of cultivated foods
- Cultural and spiritual experience
- Tourism and recreation
- Education and research

Table 20 and Table 21 describe the categories for integrating scores for supply and demand of ecosystem services and their overall importance.

**Table 20:** Integrating the scores for ecosystem supply and demand into an overall importance score.

Integrating scores for supply & demand to obtain an overall importance score						
		Supply				
		Very Low	Low	Moderate	High	Very High
Demand		0	1	2	3	4
Very Low	0	0.0	0.0	0.5	1.5	2.5
Low	1	0.0	0.0	1.0	2.0	3.0
Moderate	2	0.0	0.5	1.5	2.5	3.5
High	3	0.0	1.0	2.0	3.0	4.0
Very High	4	0.5	1.5	2.5	3.5	4.0





**Table 21:** Categories used for reporting the overall importance of ecosystem services.

Importance Category		Description
Very Low	0-0.79	The importance of services supplied is very low relative to that supplied by other wetlands.
Low	0.8 – 1.29	The importance of services supplied is low relative to that supplied by other wetlands.
Moderately-Low	1.3 – 1.69	The importance of services supplied is moderately-low relative to that supplied by other wetlands.
Moderate	1.7 – 2.29	The importance of services supplied is moderate relative to that supplied by other wetlands.
Moderately-High	2.3 – 2.69	The importance of services supplied is moderately-high relative to that supplied by other wetlands.
High	2.7 – 3.19	The importance of services supplied is high relative to that supplied by other wetlands.
Very High	3.2 - 4.0	The importance of services supplied is very high relative to that supplied by other wetlands.

**Ecological Importance and Sensitivity (EIS)**

The Ecological Importance and Sensitivity (EIS) score forms part of a larger assessment called the Wetland Importance and Sensitivity scoring system which also addresses hydrological importance and direct human benefits relevant to a HGM unit. Both PES and EIS form part of a larger reserve determination process documented by the Department of Water and Sanitation. Table 22 summarises the categories relevant to this assessment.

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

- Ecological Importance in terms of ecosystems and biodiversity such as species diversity and abundance.
- Ecological functions including groundwater recharge, provision of specialised habitat and dispersal corridors.
- Basic human needs including subsistence farming and water use.



It is important to note that Specific recommendations for integrating the WET-EcoServices outputs into the wetland EIS assessment have been documented. These include grouping of ecosystem service scores into broad categories which would then be integrated into an overall ecological importance (EI) score (Kotze *et al.*, 2020):

- **Biodiversity maintenance importance:** This is the importance score derived from the biodiversity maintenance component of WET-EcoServices.
- **Regulating services importance:** This would be calculated as the maximum score of all the importance scores for regulating services considered in WET-EcoServices.
- **Provisioning and cultural services importance:** This would be calculated as the maximum score of all the importance scores for provisioning and cultural services considered in WET-EcoServices.

**Table 22: Environmental Importance and Sensitivity rating scale used for the estimation of EIS scores (DWAF, 1999)**

Ecological Importance and Sensitivity Categories	Rating
<b>Very High</b> Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water in major rivers	>3 and ≤4
<b>High</b> Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers	>2 and ≤3
<b>Moderate</b> Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water in major rivers	>1 and ≤2
<b>Low/Marginal</b> Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water in major rivers	>0 and ≤1

### **Recommended Ecological Category (REC)**

The REC is determined by the Present Ecological State of the water resource and the importance and/or sensitivity of the water resource. Water resources which have Present Ecological State categories in an E or F ecological category are deemed unsustainable by the DHWS. In such cases the REC must automatically be increased to a D.



Where the PES is in the A, B, C, D or E the EIS components must be checked to determine if any of the aspects of importance and sensitivity (Ecological Importance; Hydrological Functions and Direct Human Benefits) are high or very high. If this is the case, the feasibility of increasing the PES (particularly if the PES is in a low C or D category) should be evaluated. This is recommended to enable important and/or sensitive wetland water resources to maintain their functionality and continue to provide the goods and services for the environment and society.

If (Table 23):

- PES is in an E or F category:  
The REC should be set at least a D, since E and F EC's are considered unsustainable.
  - The PES category is in an A, B, C or D category, AND the EIS criteria are low or moderate OR the EIS criteria are high or even very high, but it is not feasible or practicable for the PES to be improved:
- The REC is set at the current PES.
  - The PES category is in a B, C or D category, AND the EIS criteria are high or very high AND it is feasible or practicable for the PES to be improved:
- The REC is set at least one Ecological Category higher than the current PES." (Rountree *et al*, 2013).

**Table 23: Generic Matrix for the determination of REC and RMO for water resources**

			EIS			
			Very high	High	Moderate	Low
PES	A	Pristine/Natural	A Maintain	A Maintain	A Maintain	A Maintain
	B	Largely Natural	A Improve	A/B Improve	B Maintain	B Maintain
	C	Good - Fair	B Improve	B/C Improve	C Maintain	C Maintain
	D	Poor	C Improve	C/D Improve	D Maintain	D Maintain
	E/F	Very Poor	D Improve	E/F Improve	E/F Maintain	E/F Maintain



## Impact Assessments

### NEMA (2014) Impact Ratings with reference to aquatic aspects specified in GN320 of March 2020

As required by the 2014 NEMA regulations, impact assessment should provide quantified scores indicating the expected impact, including the cumulative impact of a proposed activity. This assessment follows the format presented below. The impact assessment score below are calculated using the following parameters:

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



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

- $S = (E + D + M)P$
- S = Significance weighting
- E = Extent
- D = Duration
- M = Magnitude
- P = Probability

The **significance weightings** for each potential impact will be determined as follows (Table 24):

**Table 24: Significance Weightings**

Points	Significant Weighting	Discussion
< 30 points	Low	This impact would not have a direct influence on the decision to develop in the area.
31-60 points	Medium	The impact could influence the decision to develop in the area unless it is effectively mitigated.
> 60 points	High	The impact must have an influence on the decision process to develop in the area.

#### **DWS (2016) Impact Register and Risk Assessment**

Section 21(c) and (i) water uses (Impeding or diverting flow and/or impacts to the bed and banks of watercourses) are non-consumptive and their impacts more difficult to detect and manage. They are also generally difficult to clearly quantify. However, if left undetected these impacts can significantly change various attributes and characteristics of a watercourse, and water resources, especially if left unmanaged and uncontrolled.

Risk-based management has value in providing an indication of the potential for delegating certain categories of water use “risks” to DWS regional offices (RO) or Catchment Management Agencies (CMA). Risk categories obtained through this assessment serve as a guideline to establish the appropriate channel of authorisation of these water uses. The DWS has therefore developed a risk assessment matrix to assist in quantifying expected impacts. The scores obtained in this assessment are useful in evaluating how the proposed activities should be authorised.

The formula used to derive a risk score is as follows:

$$\text{RISK} = \text{CONSEQUENCE} \times \text{LIKELIHOOD}$$



**CONSEQUENCE** = SEVERITY + SPATIAL SCALE + DURATION

**LIKELIHOOD** = FREQUENCY OF THE ACTIVITY + FREQUENCY OF THE IMPACT + LEGAL ISSUES + DETECTION

Table 25 below provides a description of the classes into which scores are sorted, and their implication for authorization.

**Table 25: An extract from DWS (2016) indicating the risk scores and classes as well as the implication for the appropriate authorization process**

1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated.
56 – 169	M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and require specialist input.
170 – 300	(H) High Risk	Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve. Licence





## APPENDIX D: Abbreviated CVs of participating specialists

### CURRICULUM VITAE (CV) OF ANTOINETTE BOOTSMA 2021

Director and Senior Wetland Specialist at Limosella Consulting since 2009.

16 Years experience as an ecologist

#### Professional Affiliations:

*Professional Natural Scientist (SACNASP) # 400222-09 Botany and Ecology*

*South African Wetland Society # NA6RY2FP*

*Grassland Society of South Africa*

**Highest Qualification - M.SC** (Environmental Science), University of South Africa, 2017. *Awarded with distinction*. Project Title: Natural mechanisms of erosion prevention and stabilization in a Marakele peatland; implications for conservation management

**Latest Publication** - A.A. Boostma, S. Elshehawi, A.P. Grootjans, P.L Grundling, S. Khosa, M. Butler, L. Brown, P. Schot. 2019. Anthropogenic disturbances of natural ecohydrological processes in the Matlabas mountain mire, South Africa. South African Journal of Science Volume 115 | Number 5/6, May/June 2019, P1 to 8

#### • **Summary of relevant skills:**

- Management of projects in terms of specialist input, including quotations, planning, technical review, submission of reports and invoicing;
- Fine scale wetland delineations and functional assessments;
- Strategic wetland assessments and open space management and planning;
- General Rehabilitation, Monitoring and Mitigation assessments.
- Implementation of wetland assessment tools including the DWS (2016) Risk Assessment, Present Ecological Status (PES) Macfarlane et al, (2007), Ecological Importance and Sensitivity (EIS) (DWAf, 1999), Recommended Ecological Category (REC) Rountree et al (2013), Riparian Vegetation Response Assessment Index (VEGRAI) (Kleynhans et al, 2007) and QHI (Quick Habitat Integrity)



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**Short list of projects to demonstrate experience:**

- More than 90 external peer reviews as part of mentorship programs for companies including Galago Environmental Consultants, Lidwala Consulting Engineers, Bokamoso Environmental Consultants, Gibb, 2009 ongoing
  - Wetland specialist input into the City of Tshwane Open Space Framework, 2019
  - Wetland specialist input into the North West Environmental Outlook, 2018
  - Wetland specialist input into the Gauteng Environmental Outlook, 2017
  - Wetland specialist input into the Open Space Management Framework for Kyalami and Ruimsig, City of Johannesburg, 2016
  - Kangra Maquasa East and Maquasa West and Nooitgesien Mine, Mpumalanga Province: Rehabilitation and Monitoring Assessment. June 2018
  - Mbuyelo Coal Welstand Reserve Amendment: Wetland assessment. June 2017
  - Proposed mining right to mine on portion of the remaining extent of the farm Dingwell No. 276 JT, Barberton Magisterial District, in Mpumalanga Province: Wetland Delineation and Assessment. January 2017
  - Fine scale wetland specialist input including General Rehabilitation Plan into the ESKOM Bravo Integration Project 3, 4, 5 and Kyalami – Midrand Strengthening, December 2017
  - Fine scale wetland specialist input including General Rehabilitation Plan into 3 Eskom Projects to lay underground power cables in Gauteng; Craighall to Sandton, Croyden to Germiston and Randburg, November 2017
  - Dama Colliery, Near Utrecht, KwaZulu-Natal Province: Preliminary Wetland Delineation& Functional Assessment Report. February 2015
  - Harmony Gold Mining co Ltd's Evander Operations Property Area, Mpumalanga Province: Wetland Delineation and Functional Assessment. February 2011
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