Aquatic Biodiversity Impact Assessment

Erf 438 Stanford, Western Cape

For: Lornay Environmental Consulting

March 2024

DELTA ECOLOGY

Report Information

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Executive Summary

The owner of Erf 438, Standford, Overstrand Local Municipality, is proposing the establishment of a residential "Eco-Lifestyle" estate on the property that will be known as the Stanford Green. The site is bordered to the north by the R326 road, to the west by the R43 road, to the south by a small industrial area and to the east by natural vegetation and fallow agricultural fields. Land use on the site currently consists of a gravel access road which enters the northwest of the site from the R43, several residential buildings, and agricultural grass lawns. The Mill Stream, a small tributary of the Klein River, runs across the western corner of the Erf.

According to the national web-based environmental screening tool report generated for the proposed site, the Combined Aquatic Biodiversity Theme Sensitivity is classified as "Very High" (DFFE, 2023). Delta Ecology was initially appointed by Lornay Environmental Consulting to clarify aquatic biodiversity constraints on the property related to the Mill Stream and any other relevant watercourses. Following the aquatic biodiversity screening assessment of the proposed site by Joshua Gericke on the 25th of July 2023, a hillslope seep wetland and two natural Unchanneled Valley-Bottom (UVB) wetlands coinciding with the non-perennial drainage were confirmed and delineated onsite (Gericke, 2023). All three aquatic systems extend across the 500 m regulated proximity of the Erf, but no other watercourses were noted in this area.

Given the confirmed presence of onsite wetlands which are likely to be impacted by the proposed development, the site was determined to be of "Very High" aquatic sensitivity. If the specialist determines that the Aquatic Biodiversity sensitivity of the site is "Very High", the GN320 of 2020 requires that a full aquatic biodiversity impact assessment must be submitted as set out by the National Environmental Management Act (NEMA) (Act No. 107 of 1998) Regulations of 2020 (as amended) (GN R. 320 of 2020).

In this impact assessment, the delineated UVB and hillslope seep wetlands were assessed using current best practice assessment methodologies to determine the PES, EIS, WES, and REC metrics. The results of these assessments are as follows:

Table i: Results of the wetland status quo assessment.

	PES	EIS	WES (Highest)	REC
Mill Stream UVB Wetland	C	High	High	B
Tributary UVB Wetland	C	High	Moderate	B
Hillslope Seep Wetland	E	Moderate	Moderately Low	D

Although the condition of the onsite UVB wetlands was moderately disturbed, the high to moderately high EIS and WES scores indicate that these wetlands are sensitive and important in terms of conservation planning or provision of ecosystem services. The hillslope seep wetland is seriously disturbed, and of moderate to low importance in terms of conservation planning or provision of ecosystem services.

Aquatic biodiversity impacts associated with the development were identified and assessed using both an impact assessment methodology compliant with NEMA requirements and the Risk Assessment Matrix prescribed by GN509 of 2016.

The results of the assessment of wetland loss along with four additional impacts during the construction and operational phases, given implementation of the listed mitigation measures, are summarised in **Table ii.**

Table ii: Summary of impact/risk assessment results (with mitigation).

	Rating	Risk Class	Applicable to	Mitigation Measures
Construction Phase				
Impact 1: Wetland Loss	Medium	Moderate	Hillslope Seep	Refer to **Table 8-1**.
Impact 2: Altered flow	Low	Low	UVBWs	Refer to **Table 8-2**.
Impact 3: Water Quality Impairment	Very Low	Low	UVBWs	Refer to **Table 8-3**.
Operational Phase				
Impact 4: Altered flow	Low	Low	UVBWs	Refer to **Table 8-4**.
Impact 5: Water quality impairment	Very Low	Low	UVBWs	Refer to **Table 8-5**.
"No Go" Scenario	Low	Not Assessed	Hillslope seep & UVBWs	Refer to **Table 8-6**.

Four out of five of the post-mitigation scores fell within the within the "Low" to "Very Low" impact categories. Wetland loss received the highest impact significance score, which fell within the 'Medium' category. Ordinarily, wetland loss would fall within the 'high' category, but the limited area of wetland loss (0,87 Ha) and the degraded nature of the wetland has reduced the impact significance.

Although it is unknown whether the development area would be further developed in future, it is assumed that the site would remain as is. The No-Go option would result in the continuation of impact to the wetlands due to onsite and adjacent land uses – and would therefore still result in negative impact to the delineated wetlands.

The Moderate risk rating confirms that a Water Use Licence will be required for this project due to the encroachment into the onsite seep wetland.

The key recommendations therefore are:

- Avoid encroachment into the delineated UVBWs during construction and operational phases.
- Avoid encroachment into the 32 m buffer area around each wetland, apart from limited activities – specifically indigenous gardens and pools (recommended to be non-chlorinated eco pools, please refer to **Section 8.4.2**.).
- Tie into mainline sewage if possible or use fully contained conservancy tanks serviced by truck. No sewage treatment, irrigation or soak-aways should be contemplated.
- Allowance must be made for stormwater to be treated in a vegetated detention pond and/or a substantial vegetated swale before release into the UVBWs.

- Municipal water supply should be used if possible. If not, groundwater abstraction would be preferable to wetland abstraction.

The following mitigation measures have been adopted from the Rebelo *et al.* 2004 Biodiversity management plan for the Endangered (EN) Western Leopard Toad *Sclerophrys pantherinus*. It is essential that these measures are implemented with the aim to minimize the impact of urban development (specifically habitat fragmentation, obstacles to toads' movements, and road mortalities) on the EN species:

- It is recommended that a suitably qualified Environmental Control Officer (ECO) is appointed during the construction phase to ensure that recommendations as per this report, and other specialist reports, are implemented.
- Toad-friendly curbs stones should be installed i.e. small curbs stones that are less than 50 mm tall, or half road gutters which provide passageways for toads. These can be implemented throughout the estate or at intervals of 50 m.
- An appropriate road reserve should be implemented for internal access roads within the estate to facilitate the movement of toads.
- Boundary walls and fences should be permeable to toads. Integrate toad holes of at least 100 mm diameter, spaced every 20 meters, and not exceeding 300 mm in length at ground level. Alternatively open gutters can be a suitable option.
- Stormwater systems should be designed with suitably spaced escape areas, allowing toads to escape. These escape areas should be positioned at intervals of at least 50 m.
- The estate should install non-chlorinated eco pools, ideally with a "beach pool" design with gently sloping sides emulating the natural bank of a wetland allowing toads to enter and exit the pool freely. Alternatively, if a pool design with high sides is installed, incorporate escape pathways such as toad ladders, toad friendly steps, or floating vegetated platforms anchored to the side of the pool.
- To prevent road mortalities, Western Leopard Toad signage should be erected and a speed limit within the eco estate should be implemented and strictly adhered to.
- Toad friendly gardens should be created, when it is not the toads breeding season (late July to September with the main breeding month being August), they inhabit suburban gardens. Natural vegetation should be planted to create ideal toad habitat.

It is therefore the opinion of the specialist that the proposed development should be approved subject to application of the mitigation measures listed in this report, as well as the implementation of a suitable Wetland Offset, Rehabilitation and Management Plan.

Table of Contents

List of Figures

List of Tables

Specialist Details

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Kimberley van Zyl is an ecologist and environmental scientist with over 7 years' experience in the environmental management field. She holds a MSc. degree in Water Resource Management from the University of Pretoria and her professional affiliations include the South African Council for Natural Scientific Professions (SACNASP) and the Southern African Society of Aquatic Scientists (SASAqS). Kimberley's work experience has exposed her to a range of projects across various business sectors such as mining, agriculture, and construction, as well as the public sector.

A signed statement of independence will be provided as a separate document.

1 Introduction

The owner of Erf 438, Standford, Overstrand Local Municipality, is proposing the establishment of a residential "Eco-Lifestyle" estate on the property that will be known as the Stanford Green (**Figure 1-1** and **Figure 1-2**). The site is bordered to the north by the R326 road, to the west by the R43 road, to the south by a small industrial area and to the east by natural vegetation and fallow agricultural fields. Land use on the site currently consists of a gravel access road which enters the northwest of the site from the R43, several residential buildings, and agricultural grass lawns. The Mill Stream, a small tributary of the Klein River, runs across the western corner of the Erf.

According to the national web-based environmental screening tool report generated for the proposed site, the Combined Aquatic Biodiversity Theme Sensitivity is classified as "Very High" (DFFE, 2023). Delta Ecology was initially appointed by Lornay Environmental Consulting to clarify aquatic biodiversity constraints on the property related to the Mill Stream and any other relevant watercourses.

Following the aquatic biodiversity screening assessment of the proposed site by Joshua Gericke on the 25th of July 2023, a hillslope seep wetland and two natural Unchanneled Valley-Bottom (UVB) wetlands coinciding with the non-perennial drainage were confirmed and delineated onsite (Gericke, 2023). All three aquatic systems extend across the 500 m regulated proximity of the Erf, but no other watercourses were noted in this area.

Given the confirmed presence of onsite wetlands which are likely to be impacted by the proposed development, the site was determined to be of "Very High" aquatic sensitivity. If the specialist determines that the Aquatic Biodiversity sensitivity of the site is "Very High", the GN320 of 2020 requires that a full aquatic biodiversity impact assessment must be submitted as set out by the National Environmental Management Act (NEMA) (Act No. 107 of 1998) Regulations of 2020 (as amended) (GN R. 320 of 2020).

The aim of this aquatic biodiversity impact assessment is to (1) determine the Present Ecological State (PES) and ecological importance of the wetland systems present, (2) to assess the potential impact of the proposed development on the mapped and confirmed wetlands, and (3) to provide recommendations for impact mitigation.

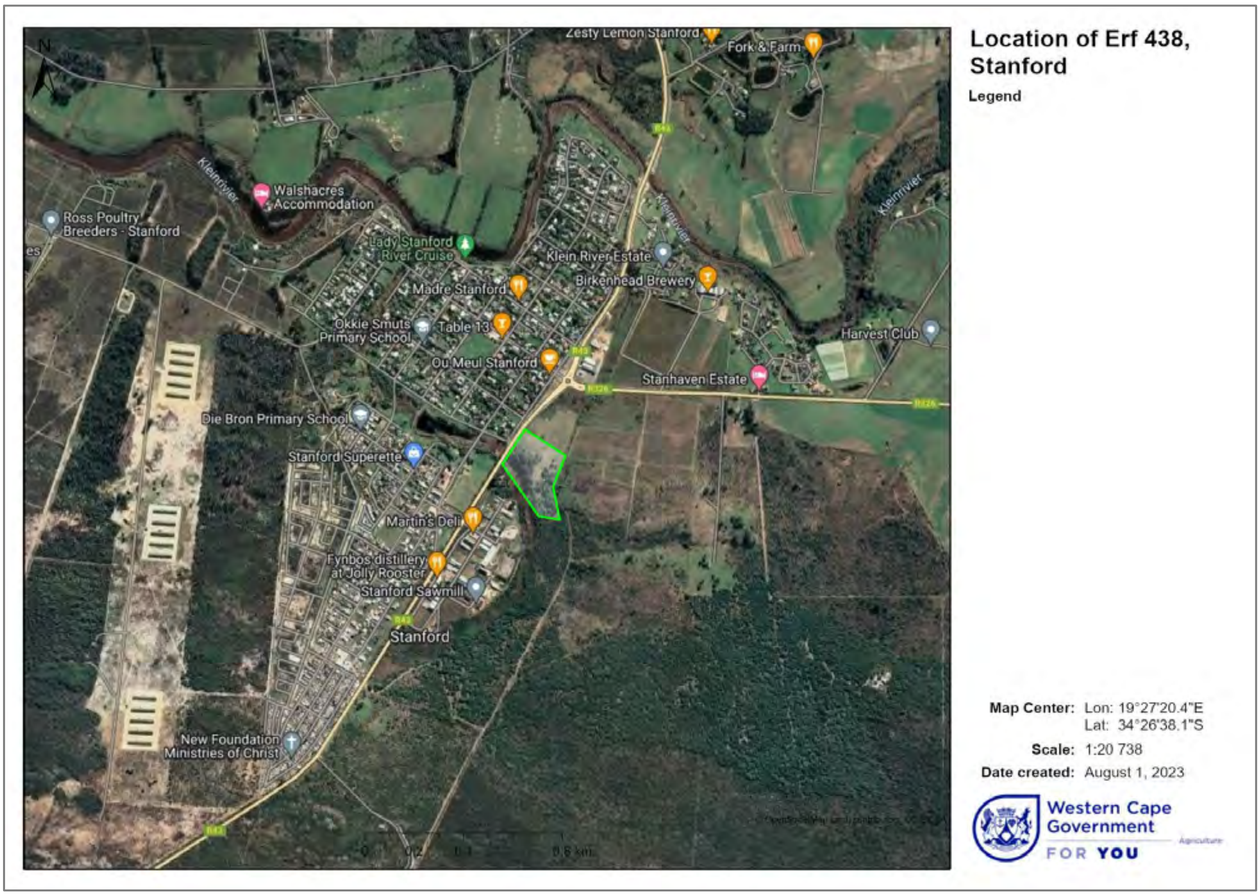

Figure 1-1: Location of the proposed development site, Erf 438, Standford.

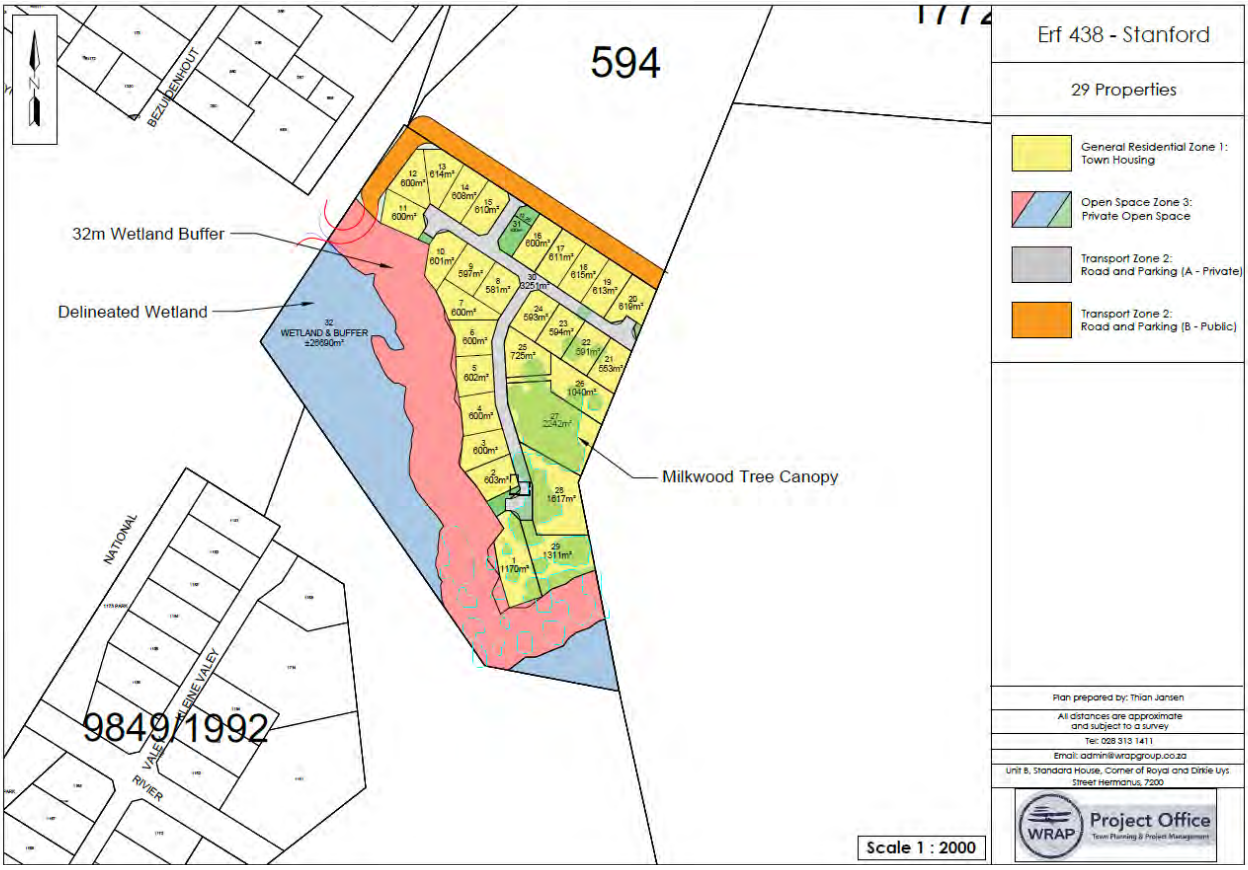

Figure 1-2: Preferred development plan for the site.

1.1 Terms of Reference

The terms of reference agreed upon for this aquatic biodiversity assessment include:

- A desktop background assessment to identify potential aquatic biodiversity constraints within the proposed site, as well as within the 100 m regulated proximity for rivers/streams, and the 500 m regulated proximity for wetlands.
- A site assessment to confirm potential aquatic biodiversity constraints within the proposed site.
- Delineation of all watercourses within the proposed site using a combination of site-based and desktop methodologies as appropriate.
- Verification of the aquatic site sensitivity as either "Very High" or "Low".
- Drafting of an aquatic biodiversity impact assessment report including the following:
    - General site description;
    - Site sensitivity verification;
    - Determination of the Present Ecological State (PES), Ecological Importance and Sensitivity (EIS) and the contribution to Wetland Ecosystem Services (WES);
    - Assessment of potential aquatic biodiversity impacts of the proposed development on the onsite watercourses;
    - Application of the Risk Assessment matrix stipulated by GN509 of 2016 promulgated in terms of the National Water Act (Act 36 of 1998) to determine the risk of the proposed development activities on the delineated onsite watercourses;
    - Provision of mitigation measures to reduce aquatic biodiversity impact as far as possible.

1.2 Limitations and Assumptions

The following limitations and assumptions apply to the assessment:

- Site visits were conducted on the 25th of July 2023 during the winter rainfall season, along with the 1st of March 2024 during the summer dry season. This does not cover the complete seasonal variation in conditions experienced onsite. This will however not have an impact on the assessment outcome since hydrology and soil indicators were present and adequate for the delineation and assessment of the onsite watercourses.
- The agricultural portion of the site was highly disturbed, compacted and heavily irrigated. This combination of factors can cause wetland soil indicators and vegetation communities to form artificially and delineation of natural wetland in this area was therefore difficult.
- Watercourses were delineated using a Garmin E-trex 20 handheld GPS with an expected accuracy of 3 m or less at the 95% confidence interval. In the opinion of the specialist, this limitation is of no material significance to the assessment and all aquatic biodiversity constraints have been adequately identified. Accuracy can be improved by working in conjunction with a land surveyor at a later date if required for precise placement of infrastructure.

Notwithstanding the above limitations, the specialist is of the opinion that the aquatic biodiversity constraints for the site have been adequately identified for the purposes of this aquatic biodiversity assessment.

2 Site Sensitivity Verification

The national web-based environmental screening tool considers any development site that contains a wetland to be of "Very High" sensitivity in terms of the Combined Aquatic Biodiversity Theme Sensitivity (DEFF, 2021). According to the national web-based environmental screening tool report generated for the site, the Combined Aquatic Biodiversity Theme Sensitivity is classified as "Very High" (DFFE, 2023). The classification trigger is the location of an Aquatic Ecological Support Area 1 (ESA) and a floodplain wetland within the site.

As per the National Environmental Management Act (NEMA) (Act No. 107 of 1998) Regulations of 2020 (as amended) (GN R. 320 of 2020), prior to initiation of specialist assessments, the current land use, and the potential environmental sensitivity of the site - as identified by the national web-based environmental screening tool - must be confirmed by undertaking an Initial Site Sensitivity Verification. This Initial Site Sensitivity Verification aims to confirm or dispute the current use of the land and environmental sensitivity as identified by the national web based environmental screening tool.

The proposed site is underlain by the Overberg Regional Aquifer. The Department of Rural Development and Land Reform (DRDLR) National Geo-spatial Information (NGI) river line vector data indicates two non-perennial drainage lines that intersect the proposed site across the southern and western corners and converge just south of the site. The National Wetlands Map Version 5 (NWM5) (SANBI, 2018) wetland layer indicates a floodplain wetland coinciding with the non-perennial drainage lines. The National Freshwater Ecological Priority Areas (NFEPA) (CSIR, 2011) maps this wetland as a Channelled Valley-Bottom wetland (CVBW). Both aquatic systems extend across the 500 m regulated proximity of the Erf, but no other watercourses were noted in this area.

Following the aquatic biodiversity screening assessment, the presence of three wetlands within the proposed development site was confirmed (Gericke, 2023). A hillslope seep was located to north, a small tributary to the southeast and the Mill Stream to the southwest (Gericke, 2023). The wetland associated with the Mill Stream is a locally significant feature, providing a variety of ecosystem goods and services. A Concept Master Plan for the proposed Mill Stream Village Park and Greenway has been drafted for the Overstrand Municipality to maximise recreational, historical, and ecological value of the stream and its associated wetlands. The overall site sensitivity was therefore found to be "Very High".

According to GN R. 320 of 2020, if the specialist determines that the Aquatic Biodiversity sensitivity of the site is "Very High", then a full Aquatic Biodiversity Impact Assessment must be compiled as part of the Basic Assessment (BA) process.

3 Methodology

The methodology used in this aquatic biodiversity impact assessment report, including a desktop background assessment, two site visits, and the delineation and classification of the watercourse(s) associated with the proposed development site, is outlined in the subsections below.

3.1 Desktop Assessment

A brief review of desktop resources was undertaken to determine the nature of the proposed project area, the presence of watercourses in the vicinity and the significance of the proposed sites in terms of biodiversity planning. The following desktop resources were consulted:

- Topographical information from the National Geographical Information Service (NGI);
- The South African Atlas of Climatology and Agrohydrology (1997, 2007 and 2009);
- Geological information from the Council for Geoscience;
- The SANBI (2018) National Vegetation Map (NVM);
- The South African National Biodiversity Institute National Wetlands Map 5 (NWM5 – SANBI, 2018);
- The National Freshwater Ecological Priority Areas (NFEPA – CSIR, 2011) wetland, wetland vegetation group classification, river and FEPA datasets;
- The Chief Directorate: National Geo-spatial Information (DRDLR) River's dataset; and the
- The Western Cape Biodiversity Spatial Plan (WCBSP, 2017).

3.2 Wetland Delineation

The wetland boundaries were delineated at the outer edge of the wetland temporary zone using the method described in the DWAF, (2008) Manual for the Identification and Delineation of Wetlands and Riparian Areas. This method is the accepted best practice method for delineating wetlands in South Africa and its use is required by GN 509. The method makes use of four key field indicators to guide the delineation process (refer to **Box 1**):

Box 1 Four indicators of wetland presence as described in DWAF (2008):

1. The **position in the landscape** – Identifies parts of the landscape where wetlands are more likely to occur.
2. The **soil form** – Wetlands are generally associated with certain soil types.
3. The presence of **aquatic vegetation communities**.
4. The presence of **hydromorphic soil features**, which are morphological signatures that appear in soils with prolonged periods of saturation (associated with anaerobic conditions). Key hydromorphic features include:
    a. Mottling – Formation of clumps of iron oxide within the soil matrix in the form of orange, yellow, black or reddish-brown speckling. Mottling occurs in moist soils and reaches maximum density in the centre of the seasonal zone with sparse mottling in the temporary zone and no mottling in the permanent zone.
    b. Gleying – Shift in soil colour from the terrestrial baseline towards a blue, green or grey colour and an overall reduction in soil chroma. This phenomenon is normally difficult to identify in the temporary zone, noticeable in the seasonal zone and most significant in the permanent zone.
    c. Organic Surface Layers – surface layers with very high organic content that typically occur in the wetland seasonal and permanent zones.
    d. Organic Streaking – Streaks of organic matter within the soil column which may be present in all zones, but particularly the temporary and seasonal zones.

Soil samples were taken for inspection by hand augering to determine soil form and presence of redoximorphic soil features using a hand auger. While characteristic aquatic vegetation communities were absent from the onsite wetland, predominant indigenous tree species present within the onsite wetland were identified using various desktop resources. Plant species that occur in wetlands are classified as follows:

- Obligate species (occurring in wetlands >99% of the time – usually in permanent or seasonal zone)
- Facultative Positive species (67 to 99% of the population occurs within wetlands – typically in the seasonal and temporary zones with remaining 1 to 33% in the adjacent area on the wetland periphery)
- Facultative Species (33 – 67% of the population occurs within wetlands – usually in seasonal or temporary zones with remaining 67 – 33% in the adjacent area on the wetland periphery)
- Facultative Negative Species (1 – 33% of the population occurs within wetlands – usually in the temporary zone with remaining 99 to 67% in the adjacent area on the wetland periphery)
- Wetland Cosmopolitan Species (No specific affinity for wetlands and colonise wetland and terrestrial areas)

3.3 Watercourse Classification

The (Ollis *et al.*, 2013) Classification System for Wetlands and Other Aquatic Ecosystems in South Africa, as used in this assessment, is a tiered structured classification system that provides a uniform description of wetland types based on their hydrogeomorphic characteristics. This classification system categorises wetlands into 7 distinct hydrogeomorphic units described in **Figure 3-1**.

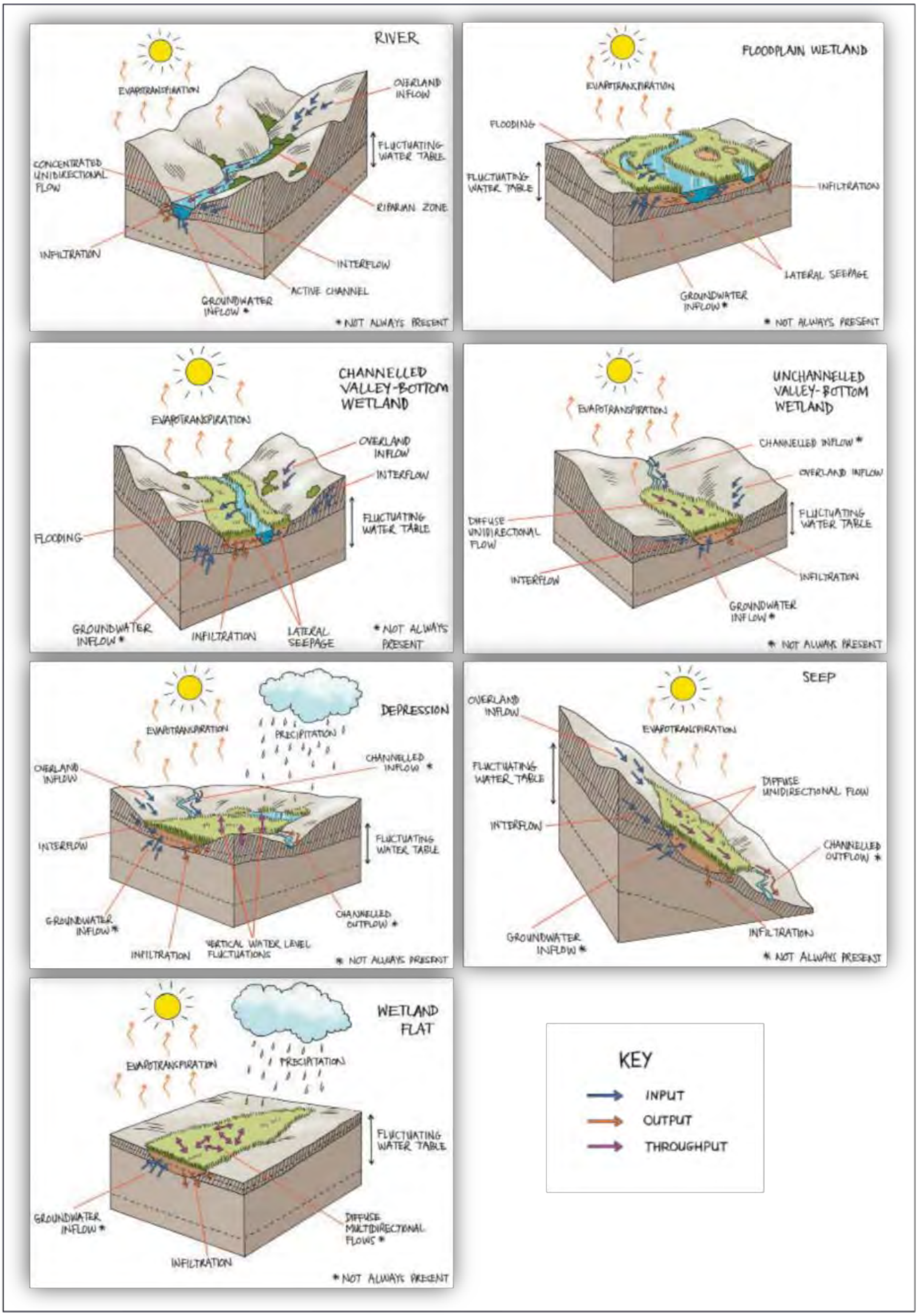

Figure 3-1: Wetland Hydrogeomorphic Types as defined in the Classification System for Wetlands and Other Aquatic Ecosystems in South Africa (Ollis *et al.*, 2013).

3.4 Present Ecological State Assessment

WET-Health Version 2 (Macfarlane *et al*. 2020) is a modular tool designed to evaluate and assess the Present Ecological State (PES) of wetland hydrogeomorphic units based on the degree to which the wetland has deviated from its natural reference condition. The tool accounts for four inter-related components that influence wetland health. These consist of three core drivers of wetland change namely hydrology, geomorphology, and water quality, along with vegetation as a responding variable. A separate PES score is derived for each of these components, which are then combined into a single PES score for the wetland hydrogeomorphic unit. The scores for each component and the overall score fall into one of six Ecological Categories defined in **Table 3-1** below.

The tool offers three levels of assessment:

1. Level 1A, a low-resolution desktop-based assessment;
2. Level 1B, a high-resolution desktop-based assessment; and
3. Level 2, a detailed rapid field-based assessment.

Level 1A is applied to provincial and national scale assessments of many wetlands, while Level 1B is applied to catchment scale assessments or to rapid individual assessments. The Level 2 assessment incorporates information from a direct onsite assessment of the wetland and its catchment and adds detail by separately assessing the various disturbance units within the wetland. The level 2 PES assessment was applied in this case.

Table 3-1: PES Categories Scores as defined WET-Health Version 2 (Macfarlane *et al*., 2020).

Ecological Category	Description	Impact Score	PES Score (%)
A	Unmodified, natural.	0-0.9	90-00
B	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	80-89
C	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	60-79
D	Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4-5.9	40-59
E	Seriously modified. 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	20-39
F	Critically modified. 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	0-19

3.5 Ecosystem Service Assessment

WET-EcoServices Version 2 (Kotze *et al.* 2020) is a structured and rapid field-based evaluation tool designed to assess the wetlands ecosystem services based on its Hydrogeomorphic (HGM) unit. The tool accounts for 16 ecosystem services which are derived from regulating (e.g., flood attenuation), provisioning (e.g., water supply), supporting (e.g., biodiversity maintenance), and cultural (e.g., tourism and recreation) services (refer to **Annexure 1**). The tool evaluates the scale of ecosystem services supplied (in terms of a score out of 4 per service) relative to other wetlands and furthermore compares the scale of service supply to the demand for each service. The scores are divided into seven categories as per **Table 3-2**.

The tool offers two levels of assessment, namely Level 1 (a rapid desktop assessment) and Level 2 (a detailed field-based indicator assessment). Level 1 is designed for conducting rapid desktop assessments of many wetlands across provincial and national scales. Ratings are assigned based on the Hydrogeomorphic unit of the wetland. Level 2 is designed for conducting robust in-field assessments of ecosystem services for respective wetland types. The level 2 Ecosystem Service assessment was applied in this case.

Table 3-2: Ecosystem Services Importance Categories Scores as defined in WET-EcoServices Version 2 (Kotze *et al.* 2020).

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.

3.6 Ecological Importance and Sensitivity Assessment

The Ecological Importance and Sensitivity (EIS) method (Rountree *et al.* 2013) is a rapid scoring system designed to identify the ecological importance and sensitivity of wetlands to disturbances across multiple scales (i.e., catchment to international scales). The full EIS method integrates three important components, namely, ecological importance and sensitivity, hydro-functional importance, and basic socio-economic importance. The hydro-functional and socio-cultural benefits were however assessed using the updated WET-EcoServices assessment methodology and these two components were therefore omitted from this EIS assessment. The EIS score ranges from 0-4, and it provides an index for prioritisation and management of water resources. The EIS categories are presented in **Table 3-3**.

Table 3-3: Ecological Importance and Sensitivity Categories (DWAF, 1999).

EIS Category	Description	Range of Median
Very high	Ecologically important and sensitive on a national or even international level. These river systems and their biota are usually very sensitive to flow and habitat modifications and provide only a small capacity for use.	>3 and <=4
High	Ecologically important and sensitive on a regional or national scale. These river systems may be sensitive to flow and habitat modifications.	>2 and <=3
Moderate	Watercourses that are considered to be ecologically important and sensitive on a provincial or local scale. The biota of these watercourses is not usually sensitive to flow and habitat modifications.	>1 and <=2
Low/marginal	Watercourses that are not ecologically important and sensitive at any scale. The biota within these watercourses is not sensitive to flow and habitat modifications.	>0 and <=1

3.7 Recommended Ecological Category

The method for determining the Recommended Ecological Category (REC) for water resources is described in Rountree *et al*. (2013). The objective of the REC is to define the management objective for wetlands and does so in accordance with the following rules:

- A wetland within PES Category A (unmodified) cannot be rehabilitated. The management objective will therefore always be to maintain the existing PES Category.
- A wetland within PES Category B, C or D with a "Low-marginal" or "Moderate" EIS score must also be maintained in the pre-development PES category.
- A wetland within PES Category B, C or D with a "High" or "Very High" EIS score must, where practically possible, be rehabilitated to a PES category that is one higher than the pre-development category. E.g. a wetland with a pre-development PES score of C and a "High" EIS score must be rehabilitated to a PES category B. Where this is not practically possible, maintenance of the pre-development PES category will be the management objective.
- PES Categories E or F are considered unsuitable and always require rehabilitation to a PES Category D.

3.8 Impact and Risk Assessment

The impact assessment utilised the Delta Ecology impact assessment methodology as specified in **Annexure 2**. The risk assessment utilised the methodology and risk matrix specified in GN. 509 of 2016 for the purpose.

4 Desktop Assessment

A brief review of desktop resources was undertaken during the aquatic biodiversity assessment. A summary of key desktop information relevant to this assessment is provided below.

4.1 Biophysical & Biodiversity Planning Context

The proposed site has relatively shallow soils, underlain by mudstone, siltstone, shale, and feldspathic sandstone (**Table 4-1**) which predisposes the site to the formation of perched flat/depressional and hillslope seep wetlands under the right conditions. Rainfall is moderately low for the Overstrand area however, which will limit the formation of wetlands to a degree. The terrestrial vegetation within the site is predominantly Critically Endangered (CR), Poorly Protected (PP) Agulhas Limestone Fynbos, although the northern corner is indicated as Endangered (EN), Poorly Protected (PP) Elim Ferricrete Fynbos (**Figure 4-1**). Wetlands within these terrestrial vegetation types are associated with the South Coast Limestone Fynbos (LC – WP) and the Southwest Ferricrete Fynbos (CR – PP).

In terms of the Western Cape Biodiversity Spatial Plan (WCBSP 2017), the Mill Stream corridor is designated partly as ESA1 (Aquatic) and partly as ESA2 (Degraded) which could be aquatic or terrestrial. The catchment has not been designated as significant in terms of the National Freshwater Ecosystem Priority Areas (NFEPA 2011) designations.

The general characteristics of the proposed site are summarised in **Table 4-1**.

Table 4-1: General characteristics of the proposed site.

Site attribute	Description	Data source
Eco-region	Southern Coastal Belt	Department of Water Affairs Level 1 Ecoregions (Department of Water and Sanitation, 2011)
Terrestrial Vegetation Type(s)	1) Agulhas Limestone Fynbos (CR-PP) 2) Elim Ferricrete Fynbos (EN-PP)	National Vegetation Map of South Africa, 2018 (SANBI, 2018)
Dominant Geology and Soils	Mudstone, siltstone, shale and feldspathic sandstone of the Gydo Formation, Bokkeveld Group, partly covered by alluvial and colluvial sand.	Soil descriptions for the Western Cape. (ENPAT, 2021)
Soil Erodibility Factor (K)	0.63 (High Erodibility)	SA Atlas of Climatology and Agrohydrology (Schultz, 2009)
Soil depth and clay %	>= 450 mm and < 750 mm & <15%	Soil types and descriptions for the Western Cape, Department of Agriculture, Forestry and Fisheries (DAFF, 2021)

Mean Annual Precipitation (mm)	545 mm	SA Atlas of Climatology and Agrohydrology (Schultz, 2009)
Rainfall seasonality	Winter rainfall	
Mean Annual Temperature (°C)	17 °C	
Water Management Area	Breede - Olifants WMA	Water Management Areas (DWAF, 2011)
Quaternary Catchment	G40L	South African Quaternary Catchments Database (Schulze et al., 2007)
Wetland Vegetation Group (for wetlands within the applicable terrestrial vegetation type)	1) South Coast Limestone Fynbos (LC – WP) 2) Southwest Ferricrete Fynbos (CR – PP)	NFEPA Wetland Vegetation Types (SANBI, 2011)

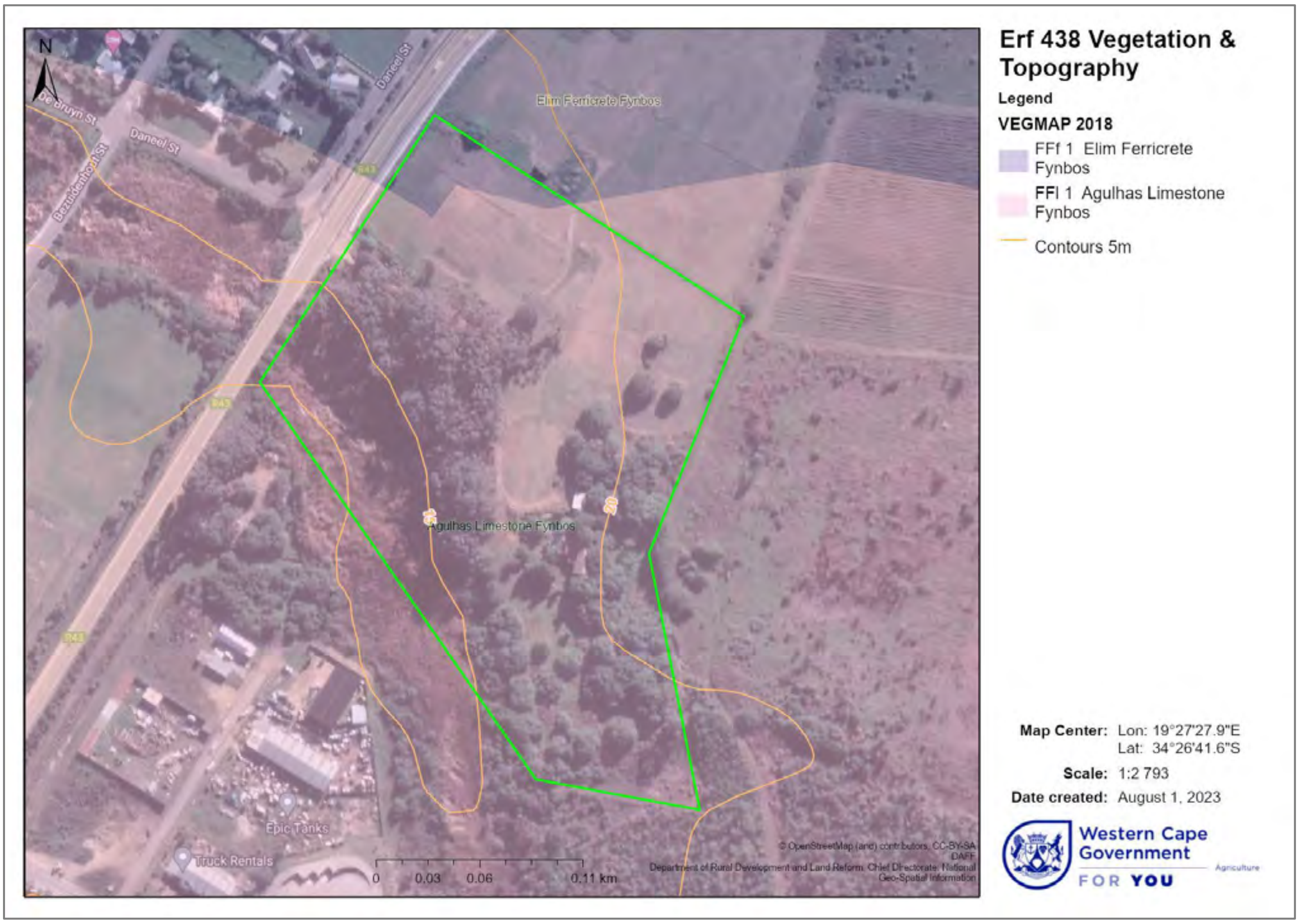

Figure 4-1: Vegetation and Topography Map (SANBI, 2018).

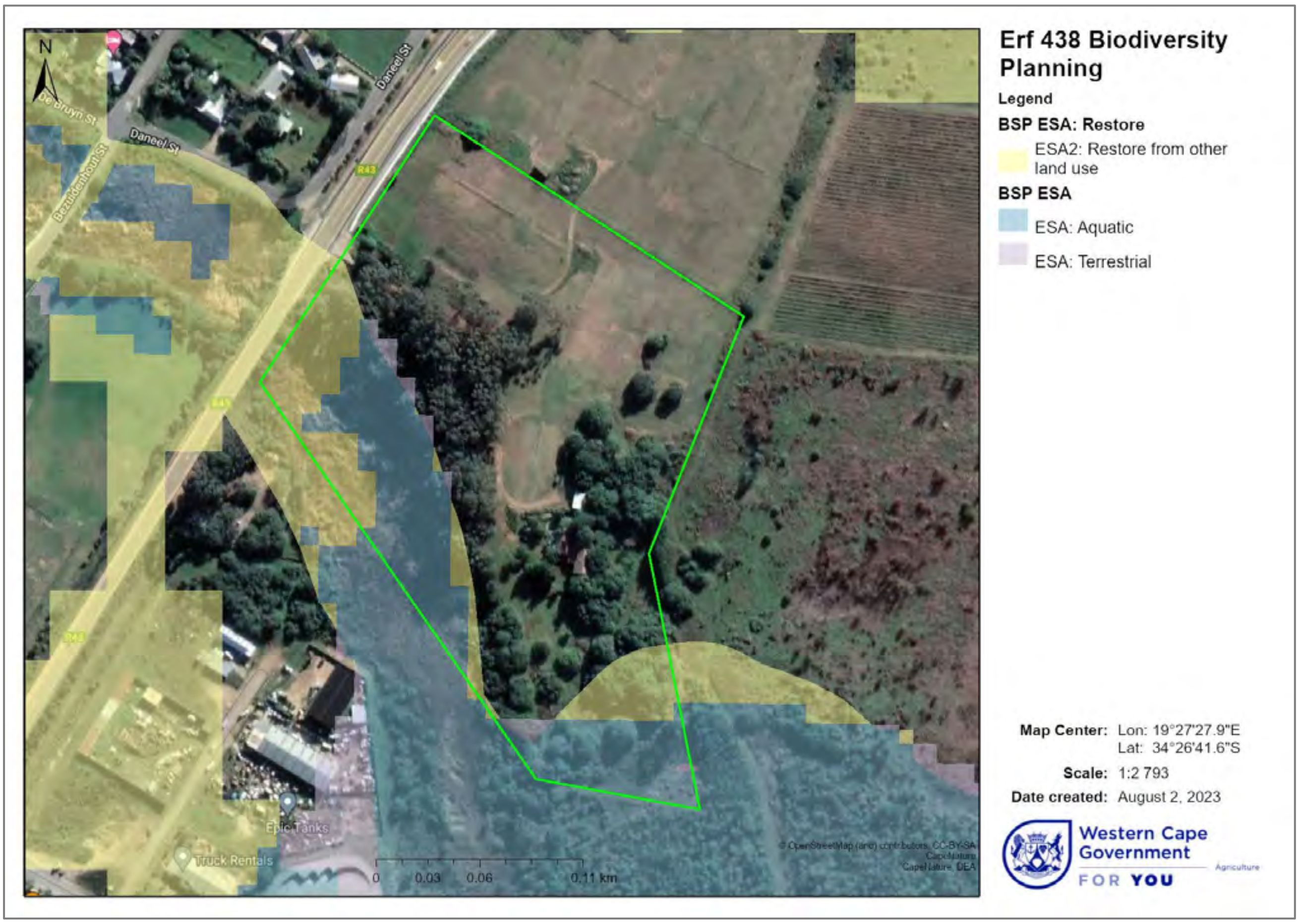

Figure 4-2: Southern and western portions of the site, have been designated as Ecological Support Areas (ESAs), mainly of the ESA1 (Aquatic) and ESA2 (Degraded) designation.

4.2 Water Resources

The proposed site is underlain by the Overberg Regional Aquifer. The Department of Rural Development and Land Reform (DRDLR) National Geo-spatial Information (NGI) river line vector data indicates two non-perennial drainage lines that intersect the proposed site across the southern and western corners and confluence just south of the site (**Figure 4-3**). The National Wetlands Map Version 5 (NWM5) (SANBI, 2018) wetland layer indicates a floodplain wetland coinciding with the non-perennial drainage lines. The National Freshwater Ecological Priority Areas (NFEPA) (CSIR, 2011) maps this wetland as a Channelled Valley-Bottom wetland (CVBW) (**Figure 4-3**). Both aquatic systems extend across the 500 m regulated proximity of the Erf, but no other watercourses were noted in this area (**Figure 4-4**).

Figure 4-3: Regional Drainage Map (NGI Rivers, NWM5 Wetlands and NFEPA Wetlands).

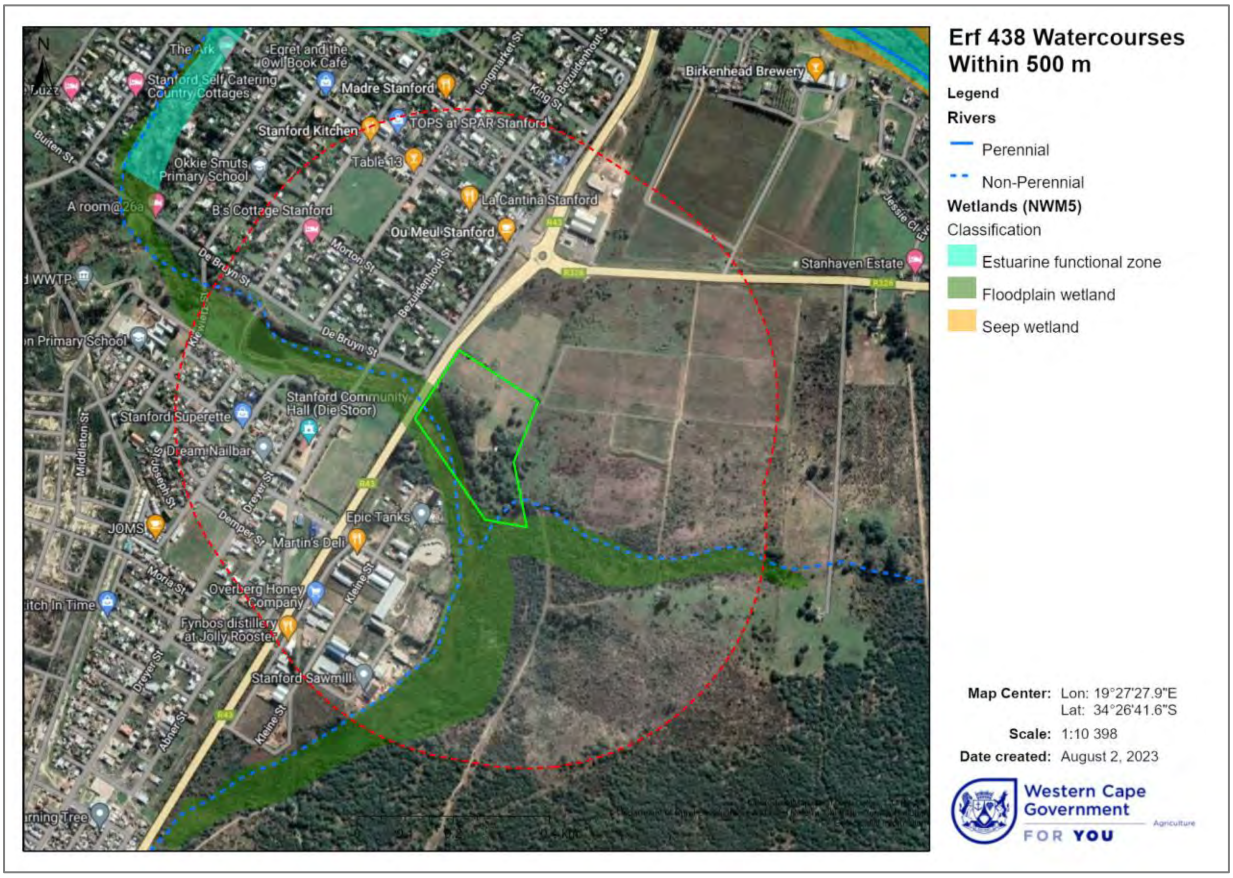

Figure 4-4: CBAs and ESAs (WCBSP, 2017).

4.3 Climate Change Perspective

The Beck *et al.* (2018) 1 km^2 climate model which utilises the Köppen-Geiger climate classifications to represent measured present and predicted future climate scenarios was consulted to determine the expected climatic shift by the end of the present century at the project location. The project site is predicted to shift from the Bsk Cold semi-arid climate zone to the BSh Arid, steppe, hot climate zone (**Figure 4-5**).

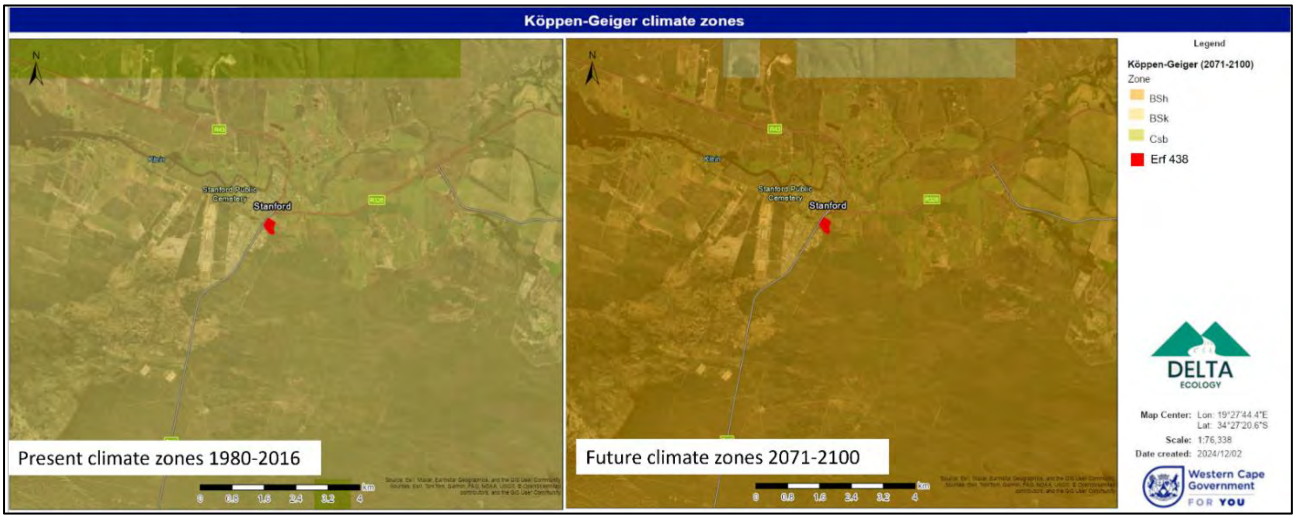

Figure 4-5: Beck *et al.* (2018) Köppen-Geiger climate zones for present day and for the close of the century.

The Western Cape Climate Response Strategy (DEADP, 2014) acts as a provincial level strategy modelled on the NCCRP. The strategy sets out the priorities for the Western Cape with regards to climate change adaptation and mitigation. The overarching intention of the strategy is to reduce climate vulnerability and increase adaptive capacity within the Western Cape in a manner that contributes to the attainment of the province's socio-economic and environmental goals.

Wetlands are a key factor in determining climate resilience due to the nature of ecosystem services offered. Streamflow regulation is important for maintaining baseflow of perennial rivers during climate-change induced droughts. During increased intensity rainfall events, attenuation and sediment trapping services reduce the risk of flooding downslope/stream. Furthermore, peat wetlands trap substantial carbon, reducing the impact anthropogenic carbon emissions. Conversely, peat removal or disturbance can release substantial volumes of carbon thereby increasing climate change impacts.

The wetlands in question do not contain peat. The UVBWs associated with the site are moderately degraded in nature, while the seep is seriously degraded. Construction within the UVBW wetlands will be avoided – as per the preferred layout, and therefore is unlikely to lead to a significant release of carbon into the atmosphere. No further assessment of potential climate impact is necessary.

5 Site Description

A site visit was undertaken on the 25th of July 2023 during the winter season, as well as on the 1st of March in the summer season. Rainfall prior to the site assessment in July 2023 had been unusually heavy for over a month beforehand, and an exceptionally heavy rainfall event had occurred less than a week prior.

Infrastructure is clustered in a node just east of the centre of the site and included a single farm dwelling adjacent to a small nursery/operational area and equipment store for agricultural operations. A single gravel access road connects the infrastructure node with the adjacent R43 road along a north-westerly axis.

The northeastern portion of the site is used to grow grass for sale as roll-on lawn. Much of the area has been compacted to promote surface-water retention and non-native soil has been introduced in some areas, either to promote compaction or as a by-product of historical road construction. The lawn areas are heavily irrigated in the dry months and this, combined with compaction, has created artificial wetland soil indicators and vegetation communities (along with surface water during fieldwork) which made wetland delineation in this area difficult. Furthermore, the agricultural activities (lawn and vineyards) on the upslope adjacent farms to the north and northeast likely produce substantial artificial increases in runoff of both irrigation and rainwater. Wetland delineation therefore required a combination of field-based methods (with particular focus on the uncompacted margins and pockets) and analysis of historical satellite imagery.

The southeastern portion of the site was dominated by mature *Sideroxylon inerme subsp. inerme* (milkwood) thicket with *Olea Europaea subsp. africana* also present in significant numbers. The Mill Stream wetland along the western edge of the site was dominated by *Phragmites australis* and *Typha capensis* reedbeds. The small tributary wetland that crosses the southern corner of the site exhibited a moderately diverse wetland community dominated by *Carex clavata*, *Ficinia elatior*, *Orphium frutescence* and *Stenotaphrum secundatum*. The wetland has been recently cleared of alien invasive species (*Acacia saligna*) and is recovering well. The adjacent property is still densely invaded, and the species will remain in the seedbank for many years.

The Mill Stream wetland is classed by desktop resources as a floodplain wetland (NWM5) and a CVBW (NFEPA). However, no defined stream channel was noted during the assessment, so overtopping is unlikely to be a significant water source. Lateral flow from the adjacent shallow slopes (particularly subsurface flow) is likely to make up a large portion of the hydrological supply, which is more consistent with the unchanneled valley bottom (UVB) wetland classification. The area just upstream of the R43 road bridge has been excavated historically and the farm draws its non-potable water from this resource. Reed growth in the excavated area is regularly cleared. The Mill Stream wetland exhibits primarily permanent and temporary zone hydrology. The area between the Mill Stream wetland and the adjacent access road is occupied primarily by mature alien *Eucalyptus* trees.

The small tributary wetland also did not have a channel and was consistent with the UVB wetland classification. It exhibited primarily seasonal and temporary zonation.

Terrestrial soils were a damp uniform brown sandy loam, while wetland soils were waterlogged and exhibited gleying. Limited mottling was noted due partially to the high concentration of quarzitic sand in the soil matrix which does not contain significant iron, and partly because the seasonal zone was entirely waterlogged to the degree that soils could not be held in the auger for photography. Only occasional temporary zone mottles were noted. Wetland soils were examined for the presence of peat. Typical peat characteristics such as high organic matter content, spongey texture, and distinct odour were not observed within the soil samples.

In the agricultural area, the artificially compacted soils often exhibited surface water from the recent rain, but deeper augering revealed dry soils just under the surface with no redoximorphic or other hydromorphic soil features. Some areas were noted however where the soil was waterlogged throughout, that exhibited hydromorphic soil features and that were associated with disturbance-tolerant wetland vegetation and a substantial hillslope seep system of natural origins was identified.

The three watercourses have been subject to impacts from land use changes within their catchment, which include the expansion of an industrial area, the planting of agricultural fields and the conversion of the hillslope seep wetland to a roll-on grass farm (**Figure 5-10** and **Figure 5-11**).

Of the three wetland systems, the small tributary was in the best condition and the most sensitive, followed by the Mill Stream that was less sensitive and exhibited greater impact, but with substantial importance for the local community. The hillslope seep that was delineated in the agricultural area was by far the most impacted and of the least value. It exhibited little wetland habitat and seriously impacted hydrology and geomorphology.

Figures 5-1 to **5-8** provide an overview of the site and its vegetation and soils, and the resulting wetland delineation is provided in **Figure 5-9**.

Figure 5-1: Compacted areas used for growing roll-on lawn.

Figure 5-2: A portion of the hillslope seep where it flows onto the compacted lawn area.

Figure 5-3: A portion of the hillslope seep near the R43.

Figure 5-4: A portion of the hillslope seep near the access road and Mill Stream wetland.

Figure 5-5: Tributary wetland flowing left to right across the track. Note the brush pile to the right from recent invasive species clearing.

Figure 5-6: Vegetation typical of the tributary wetland.

Figure 5-7: Brown, uniform soils typical of the terrestrial parts of the site.

Figure 5-8: Saturated wetland soils exhibiting gleying.

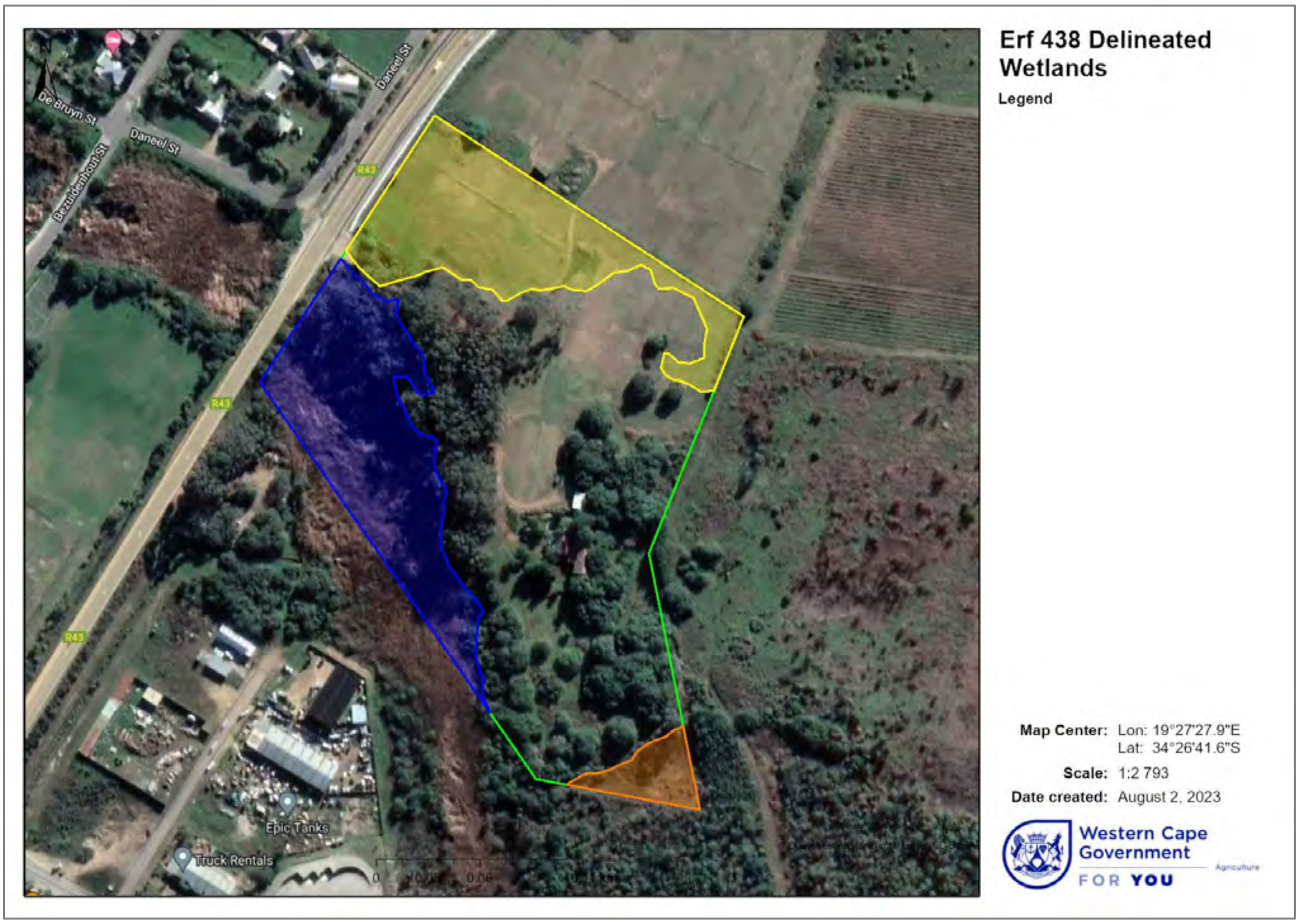

Figure 5-9: Wetlands delineated within Erf 438. The Mill Stream is in blue, the tributary in orange and the hillslope seep is in yellow.

Figure 5-10: Historical image from 2003, Erf 438 outlined in green.

Figure 5-11: Image from 2023, illustrating the changes within and surrounding Erf 438 (outlined in green).

Table 5-1: Classification of the onsite wetlands.

Factor	Wetland	Wetland	Wetland
System	Inland	Inland	Inland
Ecoregion	Southern Coastal Belt	Southern Coastal Belt	Southern Coastal Belt
Landscape Setting	Valley-Floor	Valley-Floor	Valley-Floor
Hydrogeomorphic type	Unchanneled valley bottom	Unchanneled valley bottom	Hillslope
Drainage	Rainfall and Interflow	Rainfall and Interflow	Rainfall and Interflow
Seasonality	Permanent – Seasonal/temporary	Seasonal/temporary	Seasonal/temporary
Anthropogenic influence	Excavation, vegetation clearing, alien invasive vegetation, and infilling	Vegetation clearing, and alien invasive vegetation	Excavation, vegetation clearing, alien invasive vegetation, and infilling
Vegetation	South Coast Limestone Fynbos (EN – PP)	South Coast Limestone Fynbos (EN – PP)	Southwest Ferricrete Fynbos (VU – WP)
Geology	Mudstone, siltstone, shale and feldspathic sandstone of the Gydo Formation, Bokkeveld Group, partly covered by alluvial and colluvial sand.		
Substrate	Terrestrial soils were a damp uniform brown sandy loam, while wetland soils were waterlogged and exhibited gleying.		
Salinity	Fresh		

6 Wetland Status Quo Assessment

In this study, the wetlands present within the proposed development site were assessed to determine their Present Ecological State (PES), Ecological Importance and Sensitivity (EIS), and contribution to Wetland Ecosystem Services (WES). These metrics were used to determine the management objective expressed in terms of the Recommended Ecological Category (REC).

6.1 Present Ecological State

The Macfarlane *et al.* (2020) WET-Health Version 2.0 assessment for the hillslope seep wetland produced an overall Present Ecological State (PES) score within category E (**Table 6-1**). This indicates that the wetland was in a seriously modified condition at the time of the assessment. The WET-Health Version 2.0 assessment for both UVB wetlands produced an overall Present Ecological State (PES) score within category C (**Table 6-2** and **Table 6-3**). This indicates that the wetlands were in a moderately modified condition at the time of the assessment.

The assessment results for the wetlands are presented in **Table 6-1**-**Table 6-3** and the definitions of the ecological categories are presented in **Table 6-4**. The key factors that influenced the scoring are summarised below.

<u>The hillslope seep wetland</u>

Hydrology

- The natural flow regime of the hillslope seep wetland has been altered as a result of onsite disturbances such as the compaction of soil, historical vegetation clearing and infilling, and catchment hardening associated with the dirt track onsite.
- Intensive irrigation of the grass lawns during dry months increases surface water flow during these months within the wetland. Compaction of the soil within the wetland reduces infiltration rates, and promotes runoff, altering natural drainage patterns.
- The gravel track for vehicles concentrates flow along its path and alters the wetlands natural flow regime.
- Furthermore, the agricultural activities (lawn and vineyards) on the upslope adjacent farms to the north and northeast likely produce substantial artificially increased runoff (both irrigation and rainwater).

Vegetation

- The majority of the hillslope seep wetland had been cleared of natural vegetation and currently is used to grow grass for sale as roll-on lawn. Some disturbance tolerant wetland species were present; however, their extent was limited.
- No species of conservation concern were noted.

Geomorphology

- The geomorphology of the hillslope seep wetland was largely modified by ploughing, the compaction of soil, and non-native soil has been introduced in some areas.
- Ploughing and canalisation has resulted in disturbance to the wetland's natural geomorphic state.
- Compaction of soil alters the natural geomorphology of the wetlands, potentially reducing natural features like depressions and altering surface flow patterns.
- Introduction of non-native soil and compaction may lead to changes in natural sediment transport dynamics and erosion processes within the wetlands.

Water Quality

- The water quality within the hillslope seep wetland has been disturbed because of the compaction of soil, and the introduction of non-native soil in some areas.
- Runoff from agricultural activities in adjacent farms can introduce contaminants from fertilizers, pesticides, and other agricultural inputs into the wetlands, affecting water quality.
- It is likely that runoff entering the wetland through the stormwater outlet in the northwest corner is polluted by the surrounding catchment area for example, runoff from roads is likely to contain contaminants such as laterite, oil, fuel, rubber from car tires and other pollutants.

The Mill Stream UVB wetland

Hydrology

- The Mill Stream wetland lacks a defined stream channel, it is likely that the wetland receives water primarily from lateral flow originating from adjacent shallow slopes, including subsurface flow.
- The natural flow regime of the UVB Wetland has been altered as a result of excavation upstream of the R43 road bridge, along with the R43 road bridge, both of which affect the wetland's natural water flow patterns.
- The hydrology of the UVBW has been impacted by the surrounding catchment land use, such as the presence of the small industrial area in the wetland's immediate catchment, and the lawn grass farm. Urban land use such as industrial areas and tarred roads have resulted in flow diversion and catchment hardening which is associated with increased runoff and storm peak flows.

Vegetation

- The Mill Stream wetland along the western edge of the site was dominated by *Phragmites australis* and *Typha capensis* reedbeds. The southeastern portion of the site was dominated by mature *Sideroxylon inerme* subsp. *inerme* (milkwood) thicket with *Olea Europaea* subsp. *africana* also present in significant numbers. *Sideroxylon inerme* subsp. *inerme* (milkwood) is a protected tree and may not be damaged or removed.

Geomorphology

- The geomorphology of the UVB wetland was largely modified by the excavation of the depressional / dam area in the centre of the site.

Water Quality

- The water quality within the UVB wetland has been impaired because of the *Eucalyptus* plants located immediately adjacent to the wetland areas. Decomposing *Eucalyptus* spp. leaves release oils and polyphenols that are not native to the system, influencing soil chemical characteristics and nutrient content.
- Agricultural activities such as fertiliser and pesticide use results in contaminated runoff which enters the wetland area and degrades water quality.
- The water quality within the wetland is likely to be impacted by the small industrial area immediately upstream of the wetland.

The tributary UVB wetland

Hydrology

- The tributary wetland lacks a defined stream channel, it is likely that the wetland receives water primarily from lateral flow originating from adjacent shallow slopes, including subsurface flow.
- A small farm dam is located approximately 2 km upstream of the site and several dirt tracks run through the wetland area, resulting in altered flow regimes within the wetland.

Vegetation

- The small tributary wetland exhibits a moderately diverse wetland community dominated by native species such as *Carex clavata*, *Ficinia elatior*, *Orphium frutescence*, and *Stenotaphrum secundatum*. The wetland has been cleared recently of alien invasive species (*Acacia saligna*) and is recovering well. However, the adjacent property is still densely invaded and poses a threat to the long-term recovery and stability of the wetland vegetation. No species of conservation concern were noted.

Geomorphology

- The construction of dirt tracks, along with the recent clearance of invasive species may have altered the geomorphology of the wetland as removing vegetation can destabilise soil.

Water Quality

- Agricultural activities are located within the wetland's catchment. Agricultural activities such as fertiliser and pesticide use results in contaminated runoff which likely enters the wetland area and degrades water quality.
- Recent clearance of alien invasive species (*Acacia saligna*) from the small tributary wetland suggests an improvement in water quality, as invasive species can negatively impact water quality through processes such as nutrient uptake and alteration of habitat structure.

Table 6-1: Outcome of the WET-Health Assessment for the delineated hillslope seep wetland.

Final (adjusted) Scores				
PES Assessment	**Hydrology**	**Geomorphology**	**Water Quality**	**Vegetation**
Impact Score	6.4	7.3	5.1	6.0
PES Score (%)	36%	27%	49%	40%
Ecological Category	**E**	**E**	**D**	**E**
Trajectory of change	↓	↓	↓	↓
Confidence (revised results)	Not rated	Not rated	Not rated	Not rated
Combined Impact Score	6.2			
Combined PES Score (%)	38%			
Combined Ecological Category	**E**			
Hectare Equivalents	0.4 Ha			

Table 6-2: Outcome of the WET-Health Assessment for the delineated Mill stream UVB wetland.

PES Assessment	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	3.7	4.1	5.1	3.2
PES Score (%)	63%	60%	49%	68%
Ecological Category	**C**	**D**	**D**	**C**
Trajectory of change	↓	↓	↓	↓
Confidence (revised results)	Not rated	Not rated	Not rated	Not rated
Combined Impact Score	4.0			
Combined PES Score (%)	60%			
Combined Ecological Category	**C**			
Hectare Equivalents	0.6 Ha			

Table 6-3: Outcome of the WET-Health Assessment for the delineated tributary UVB wetland.

Final (adjusted) Scores				
PES Assessment	**Hydrology**	**Geomorphology**	**Water Quality**	**Vegetation**
Impact Score	2.7	2.2	2.0	2.0
PES Score (%)	73%	78%	80%	80%
Ecological Category	**C**	**C**	**C**	**C**
Trajectory of change	↓	↓	↓	↓
Confidence (revised results)	Not rated	Not rated	Not rated	Not rated
Combined Impact Score	2.3			
Combined PES Score (%)	77%			
Combined Ecological Category	**C**			
Hectare Equivalents	0.1 Ha			

Table 6-4: Descriptions and definitions of the impact scores.

ECOLOGICAL CATEGORY	DESCRIPTION	IMPACT SCORE*	PES SCORE (%)*
A	Unmodified, natural.	0-0.9	90-00
B	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	80-89
C	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	60-79
D	Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4-5.9	40-59
E	Seriously modified. The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural	6-7.9	20-39

ECOLOGICAL CATEGORY	DESCRIPTION	IMPACT SCORE*	PES SCORE (%)*
	habitat features are still recognizable.		
F	Critically modified. 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	0-19

6.2 Ecosystem Services

The hillslope seep wetland and the UVB wetland's contribution to ecosystem services was assessed using the WET-EcoServices Version 2 methodology. The method includes the assessment of sixteen potential ecosystem services including both direct and indirect human benefits.

Importance scores for the hillslope seep were all within the "Very Low" to "Moderately Low" categories. Importance scores for the Mill stream UVB wetland were mainly within the "Very Low" to "Moderately Low" categories. Exceptions include phosphate assimilation, biodiversity maintenance and harvestable resources which fell between "Moderate" to "Moderately High" category, additionally sediment trapping, nitrate assimilation and toxicant assimilation fell within the "High" category. Importance scores for the tibutary UVB wetland were mainly within the "Very Low" to "Moderately Low" category. Exceptions include nitrate assimilation, toxicant assimilation and biodiversity maintenance which fell within the "Moderate" catergory.

The assessment results are summarised in **Table 6-5** to **Table 6-7**. The score categories and their descriptions are provided in **Table 6-8**. The reasoning behind the ecosystem services scores obtained for the hillslope seep wetland and the UVB wetlands are summarised below:

- In terms of regulatory and supporting services, the hillslope seep wetland could supply an amount of sediment trapping, phosphate assimilation, nitrate assimilation and toxicant assimilation services; however this is limited due to the seriously degraded nature of the wetland. The demand particularly toxicant removal is moderate due to the surrounding roads / residential land use. For the regulating services such as flood attenuation, stream flow regulation and erosion control, both the supply and demand is limited. Therefore the significance is very Low to Low.
- The hillslope seep wetland received an importance score within the "Very Low" range for the supply of Biodiversity Maintenance. This is due to the degraded nature of the onsite wetland, and the lack of threatened species.
- The hillslope seep received a score within the "Very Low" importance range for Carbon Storage supply. There is a global demand for storage of carbon, thereby reducing total atmoshpheric greenhouse gas concentrations. However, there was a lack of organic soil which provides a direct indicator of carbon storage.
- Direct human use of the water from the hillslope seep wetland was not observed during the site visit. Therefore the net importance score for this service in onsite wetlands is "Very Low".
- No harvestable resources i.e. availability of sedges, reeds, and/or grasses for craft production and/or thatching were noted within the hillslope seep wetland.

- The hillslope seep wetland is not used for tourism or recreation, education or research purposes (beyond this wetland study) and has no known cultural or spiritual uses. These scores were all considered to be of "Very Low" significance.
- The UVBWs provide a high to moderately high level of sediment trapping, phosphate assimilation, and toxicant assimilation services due to their gentle gradient, ability to diffuse low and peak flows, and permanent wetness. There is demand for these services due to the industrial / agricultural landuse within the immediate surrounding catchment area.
- The demand for Biodiversity Maintanence is moderate, due to both UVBWs being connected to the NFEPA designated Klein River Estuary. In addition, the wetlands are located within a vegetation type that is Endangered (EN). Thus, the importance of this ecosystem service supplied by the UVBs relative to that supplied by other wetlands is Moderate.
- There are harvestable resources present in the UVBWs including sedges, *Typha capensis* and *Phragmites australis*. The wetland areas could potentially be used for cultivated foods as seen from previous agricultural activities in the area (however this is not the intended purpose of the development area). The low demand results in an overall importance score of "Low" to "Very Low" for these three ecosystem services.
- There is some demand for tourism and recreation as the larger aquatic system that these wetlands are a part of is utilized for these purposes, however the UVB wetlands only make up a small portion of this system. Similarly, the wetlands could supply cultural or spiritual ecosystem services to an extent, likely due their aesthetically pleasing characteristics, however the demand is low as the property is privately owned with limited access to the public and therefore the importance of these ecosystem services is Very Low.

Table 6-5: The outcome of the ecosystem services assessment for the delineated hillslope seep wetland.

		Present State			
ECOSYSTEM SERVICE		Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	0.9	0.2	0.0	Very Low
	Stream flow regulation	2.0	0.7	0.8	Low
	Sediment trapping	2.0	1.0	1.0	Low
	Erosion control	1.5	1.3	0.7	Very Low
	Phosphate assimilation	1.6	1.0	0.6	Very Low
	Nitrate assimilation	1.8	1.0	0.8	Very Low
	Toxicant assimilation	1.9	2.0	1.4	Moderately Low
	Carbon storage	0.7	2.7	0.5	Very Low
	Biodiversity maintenance	0.3	1.5	0.0	Very Low
PROVISIONING SERVICES	Water for human use	0.0	1.0	0.0	Very Low
	Harvestable resources	2.0	1.0	1.0	Low

	Food for livestock	2.3	0.0	0.8	Very Low
	Cultivated foods	1.8	0.3	0.5	Very Low
CULTURAL SERVICES	Tourism and Recreation	0.0	0.0	0.0	Very Low
	Education and Research	0.3	0.0	0.0	Very Low
	Cultural and Spiritual	0.0	0.0	0.0	Very Low

Table 6-6: The outcome of the ecosystem services assessment for the delineated Mill Stream UVB wetland.

		Present State			
ECOSYSTEM SERVICE		Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	1,6	0,3	0,3	Very Low
	Stream flow regulation	2,3	0,7	1,2	Low
	Sediment trapping	3,5	2,0	3,0	High
	Erosion control	2,8	0,4	1,5	Moderately Low
	Phosphate assimilation	2,9	2,0	2,4	Moderately High
	Nitrate assimilation	3,3	2,0	2,8	High
	Toxicant assimilation	3,4	2,0	2,9	High
	Carbon storage	1,8	2,7	1,6	Moderately Low
	Biodiversity maintenance	2,0	2,5	1,8	Moderate
PROVISIONING SERVICES	Water for human use	1,0	0,7	0,0	Very Low
	Harvestable resources	3,5	0,0	2,0	Moderate
	Food for livestock	1,0	0,0	0,0	Very Low
	Cultivated foods	1,4	0,3	0,0	Very Low
CULTURAL SERVICES	Tourism and Recreation	0,4	2,0	0,0	Very Low
	Education and Research	0,5	0,3	0,0	Very Low
	Cultural and Spiritual	2,0	0,0	0,5	Very Low

Table 6-7: The outcome of the ecosystem services assessment for the delineated tributary UVB wetland.

		Present State			
ECOSYSTEM SERVICE		Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	1,5	0,3	0,1	Very Low
	Stream flow regulation	1,7	0,7	0,5	Very Low
	Sediment trapping	2,6	2,0	2,1	Moderate
	Erosion control	2,8	0,6	1,6	Moderately Low
	Phosphate assimilation	2,1	2,0	1,6	Moderately Low
	Nitrate assimilation	2,4	2,0	1,9	Moderate
	Toxicant assimilation	2,4	2,0	1,9	Moderate
	Carbon storage	1,4	2,7	1,2	Low
	Biodiversity maintenance	2,5	2,5	2,2	Moderate
PROVISIONING SERVICES	Water for human use	0,4	0,3	0,0	Very Low
	Harvestable resources	2,0	0,0	0,5	Very Low
	Food for livestock	2,0	0,0	0,5	Very Low
	Cultivated foods	2,3	0,3	1,0	Low
CULTURAL SERVICES	Tourism and Recreation	0,4	2,0	0,0	Very Low
	Education and Research	0,5	0,0	0,0	Very Low
	Cultural and Spiritual	2,0	0,0	0,5	Very Low

Table 6-8: Score categories and descriptions.

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.

6.3 Ecological Importance and Sensitivity

The EIS method used to assess the wetland was based on the Rountree *et al*. 2013 method. Hydro-functional importance and direct human benefits were assessed using the updated and more detailed 2020 WET-EcoServices method and these sections were therefore omitted from the EIS assessment.

The hillslope seep wetland achieved a median score of 2.0 which falls within the "Moderate" category, while the UVB wetlands achieved a median score of 3.0 which falls within the "High" category. The results of the assessment and the reasoning behind the scores are presented in **Table 6-9**.

Table 6-9: Results of the EIS assessment.

Ecological Importance and Sensitivity	Hillslope Seep	Mill stream UVBW	Tributary UVBW	Reason
	2.00	**3.00**	**2.67**	
Presence and status of Red Data species:	2	3	3	SCC may be present within the tributary UVBW & Mill stream UVBW as the Endangered Western Leopard Toad (*Sclerophrys pantherinus*) has been noted in this system.
Populations of unique species/uncommonly large populations of wetland species:	2	3	2	Mill stream is noted to contain *Sclerophrys pantherinus*, considered to be a unique spp., however it is unknown the number of individuals present.
Migration/breeding/feeding sites: (Importance of the unit for migration, breeding sites and/or feeding):	2	3	3	Mill stream is noted to contain *Sclerophrys pantherinus*, given the dense stands of Typha onsite, it is likely that the Mill Stream UVBW is a

Ecological Importance and Sensitivity	Hillslope Seep	Mill stream UVBW	Tributary UVBW	Reason
				breeding site for this spp.
Landscape Scale (Median)	**1.60**	**2.00**	**2.00**	
Protection status of the wetland: (National (4), Provincial/Private (3), municipal (1 or 2), public area (0 or 1)	3	3	3	The wetlands are located within a privately owned property.
Protection status of the vegetation type: (SANBI guidance on the protection status of the surrounding vegetation)	2	0	0	The UVBWs are associated with South Coast Limestone Fynbos (LC – WP). Although the seep is associated with Southwest Ferricrete Fynbos (CR – PP) NFEPA (2011) WetVeg type; this vegetation type is no longer represented on the site.
Regional context of the ecological integrity: (Assessment of the PES (habitat integrity), especially in light of regional utilisation)	0	2	2	PES – E for the seep. PES – C for the Mill stream UVBW. PES – C for the Trib. UVBW.
Size and rarity of the wetland type/s present: (Identification and rarity assessment of wetland types)	1	3	3	Seep - CR status indicates slight rarity, but degraded status has left only common, tolerant elements of the ecosystem intact. UVBWs – considered to be relatively large (entire system) and relatively rare.
Diversity of habitat types: (Assessment of the variety of wetland types present within a site)	2	2	2	Two wetland types present in a moderately to seriously modified ecological condition; representation of permanent and seasonal – temporary zones provide a limited

Ecological Importance and Sensitivity	**Hillslope Seep**	**Mill stream UVBW**	**Tributary UVBW**	**Reason**
				diversity of habitat types.
Sensitivity of the Wetland (Median)	**-**	**2.33**	**3.00**	
Sensitivity to changes in floods: (Floodplains at 4; valley bottoms 2 or 3; pans and seeps 0 or 1)	0	3	3	The UVBWs may be sensitive to flooding. The degraded seep is not sensitive to flooding.
Sensitivity to changes in low flows/dry season: (Unchanneled VB's probably most sensitive)	0	3	4	Although UVBW's are naturally very sensitive to changes in low flows/dry season; the Mill stream wetland is augmented by SW flow from adjacent residential areas.
Sensitivity to changes in water quality: (Especially natural low nutrient waters – lower nutrients likely to be more sensitive)	0	1	2	The seep & Mill stream UVB wetland's immediate surrounding land use is residential which has likely impacted the water quality over the years; the Trib. UVBW is likely more sensitive than the other two wetlands.
Ecological Importance and Sensitivity Score	**2.0**	**3.0**	**3.0**	
Ecological Importance and Sensitivity Category	**Moderate**	**High**	**High**	

6.4 Recommended Ecological Category

According to the Rountree *et al.* (2013) method for determining REC, the management objective for any wetland within the PES Category B, C or D with a "High" or "Very High" EIS score must, where practically possible, be rehabilitated to a PES category that is one higher than the pre-development category. Where this is not practically possible, maintenance of the pre-development PES category will be the management objective.

In this case, the two UVBWs have a PES of C, with a High EIS score, so the management objective should be to improve the condition of the wetland to a category B if feasible. Any planned rehabilitation should therefore target this category. Additionally, the seep has a PES Category of E and therefore is considered unsuitable and requires rehabilitation to a PES Category D.

7 Aquatic Impact Identification

The proposed project entails the establishment of a residential "Eco-Lifestyle" estate on Erf 438, Stanford, that will be known as the Stanford Green (**Figure 1-2**).

At present the proposed development area (as a whole) coincides with approximately 0.87 Ha of the seriously degraded hillslope seep wetland (**Figure 7-1**). The two delineated UVBWs are set aside, along with a 32 m buffer, as private open space.

The potential impacts to the seep and UVBWs as a result of the proposed development are listed below:

Construction Phase

1. Areas of the onsite seep (approximately 0.87 Ha) will be lost as a result of the private road construction, and residential housing.
2. Alteration of the flow regime of the UVBWs during construction of the Eco-Lifestyle estate.
3. Water quality impairment due to increased sediment input, potential spillage, or release of potentially contaminated runoff into the UVBWs during construction of the Eco-Lifestyle estate.

Operational Phase

4. Alteration of the flow regime of the UVBWs once the Eco-Lifestyle estate is complete, due to potential flow diversion / increase in storm flows.
5. Water quality impairment due to the release of potentially contaminated stormwater (hydrocarbons) into the UVBWs.

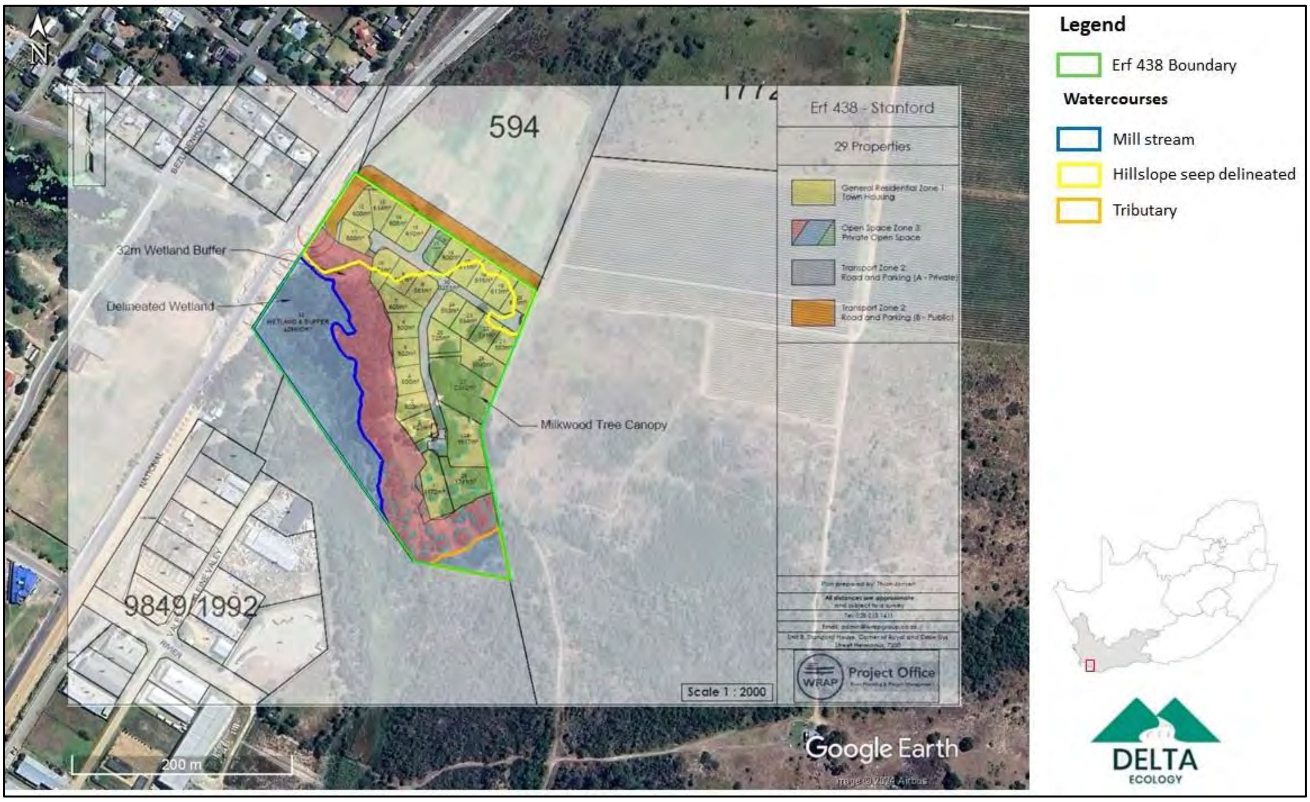

Figure 7-1: Preferred development plan for the site overlain with the delineated onsite watercourses.

8 Impact Assessment

The five potential aquatic impacts identified in Section 7 were assessed first without and then with application of mitigation measures. Four out of the five of the post-mitigation scores fell within the "Low" to "Very Low" impact categories post mitigation. Wetland loss received the highest impact significance score, which fell within the "Medium" category. The "no go" scenario was assessed and found to be of "Low" impact significance as this scenario would result in continuation of existing impacts to the onsite wetlands due to the onsite disturbance (alien invasive vegetation) and adjacent land uses. No indirect impacts were noted.

8.1 Construction Phase

Table 8-1: Assessment results for Impact 1

Impact 1: Wetland Loss in the delineated hillslope seep				
Description		**At present the proposed development area (as a whole) coincides with approximately 0.87 Ha of the seep. The seep has a PES score in the E category (Seriously Modified) and exhibits Moderate EIS. The wetland vegetation type is CR, although the fynbos onsite is considered highly degraded. There is also limited hydrological connection to the downstream Mill stream UVBW due to the seriously impacted hydrological, and geomorphology.**		
Mitigation Measures		**There is no mitigation for wetland loss. It is however recommended that the onsite UVBWs are maintained / protected in perpetuity as a wetland offset area for the loss of the onsite seep wetland. The alien invasive vegetation (specifically *Eucalyptus spp.*) present within the UVBW wetland areas must be removed and replanted with indigenous wetland vegetation. A suitable Rehabilitation and Management Plan should be drafted for the UVB wetlands onsite.**		
	Impact Without Mitigation		**Impact With Mitigation**	
Consequence				
Intensity of Impact	4	High / Very Harmful	0	Not Applicable
Duration of Impact	5	Beyond 20 years / Permanent	0	Not Applicable
Extent / spatial scale of impact	1	Limited to project site	0	Not Applicable
Reversibility	4	High cost / Low likelihood of success	0	Not Applicable
Loss of irreplaceable resources	2	Low	0	Not Applicable
Cumulative Impact	3	Medium	0	Not Applicable
Probability				
Frequency of the Activity	1	Once off activity / less than once in 20 years	0	Not Applicable

Likelihood of the Incident / Impact occurring	5	Definite	0	Not Applicable
Impact Significance				
Consequence	3,00	Medium	0,00	Not Applicable
Probability	5.00	Very High	0,00	Not Applicable
Impact Significance	**3,40**	**Medium**	**0,00**	**Not Applicable**

Table 8-2: Assessment results for Impact 2

Impact 2: Altered flow regime within the delineated UVBWs				
Description		**Site clearance, infilling and compaction in the catchment area of the UVBWs may result in alteration of the flow regime of the UVBWs.**		
Mitigation Measures		**The significance of this impact can be largely mitigated by establishing a 32 m buffer area around the UVBW wetland areas; and by ensuring that runoff / SW generated onsite flows into the wetland areas through an appropriately designed broad, vegetated earth swale. The alien invasive vegetation (specifically *Eucalyptus spp.*) present within the UVBW wetland areas must be removed and replanted with indigenous wetland vegetation. A suitable Rehabilitation and Management Plan should be drafted for the UVB wetlands onsite.**		
	Impact Without Mitigation		**Impact With Mitigation**	
Consequence				
Intensity of Impact	3	Medium / Harmful	3	Medium / Harmful
Duration of Impact	5	Beyond 20 years / Permanent	5	Beyond 20 years / Permanent
Extent / spatial scale of impact	1	Limited to project site	1	Limited to project site
Reversibility	2	Low-cost rehabilitation / Moderately high likelihood of success	2	Low-cost rehabilitation / Moderately high likelihood of success
Loss of irreplaceable resources	1	None	1	None
Cumulative Impact	2	Low	2	Low
Probability				

Frequency of the Activity	1	Once off activity / less than once in 20 years	1	Once off activity / less than once in 20 years
Likelihood of the Incident / Impact occurring	4	Likely	2	Unlikely
Impact Significance				
Consequence	2,27	Medium	2,27	Medium
Probability	2.50	Very High	1,50	Low
Impact Significance	**2,316**	**Low**	**2,12**	**Low**

Table 8-3: Assessment results for Impact 3

Impact 3: Water Quality Impairment within the UVBWs				
Description		**Accidentally spilled cement, construction chemicals, sewage from temporary toilets or petrochemicals from construction vehicles may find their way into the UVBWs.**		
Mitigation Measures		**The significance of this impact can be largely mitigated by demarcating the UVBWs as No-Go areas during construction. Bunded, impervious areas that are more than 32 m away from the UVBW must be designated by an Environmental Control Officer for temporary toilets, vehicle parking/servicing areas, and for pouring and mixing of concrete/cement, paint, and chemicals. It is essential that no pollutants are allowed to filtrate/run into the UVBWs due to the presence of the EN *Sclerophrys pantherinus* within the site. Construction workers / employees should be notified of the importance of this species to ensure that no toads are killed and that the UVBWs remain as No-go areas.**		
	Impact Without Mitigation		**Impact With Mitigation**	
Consequence				
Intensity of Impact	3	Medium / Harmful	1	Very Low / Non-harmful
Duration of Impact	1	Up to 1 month	1	Up to 1 month
Extent / spatial scale of impact	1	Limited to project site	1	Limited to project site
Reversibility	1	Passive restoration / High likelihood of success	1	Passive restoration / High likelihood of success

Loss of irreplaceable resources	1	None	1	None
Cumulative Impact	1	None	1	None
Probability				
Frequency of the Activity	1	Once off activity / less than once in 20 years	1	Once off activity / less than once in 20 years
Likelihood of the Incident / Impact occurring	3	Possible	2	Unlikely
Impact Significance				
Consequence	1,72	Low	1,00	Very Low
Probability	2,00	Low	1,50	Very Low
Impact Significance	**1,77**	**Low**	**1,10**	**Very Low**

8.2 Operational Phase

Table 8-4: Assessment results for Impact 4

Impact 4: Altered flow regime within the UVB wetlands				
Description		**Site clearance, infilling and compaction may result in alteration of the flow regime for the onsite UVBWs.**		
Mitigation Measures		**The significance of this impact can be largely mitigated by establishing a 32 m buffer area around the UVBW wetland areas; and by ensuring that runoff / SW generated onsite flows into the wetland areas through an appropriately designed broad, vegetated earth swale. The alien invasive vegetation present within the UVBW wetland areas must be removed and replanted with indigenous wetland vegetation. Additionally, a suitable Rehabilitation and Management Plan should be drafted for the onsite UVB wetlands.**		
	Impact Without Mitigation		**Impact With Mitigation**	
Consequence				
Intensity of Impact	3	Medium / Harmful	3	Medium / Harmful
Duration of Impact	5	Beyond 20 years / Permanent	5	Beyond 20 years / Permanent

Extent / spatial scale of impact	1	Limited to project site	1	Limited to project site
Reversibility	2	Low-cost rehabilitation / Moderately high likelihood of success	2	Low-cost rehabilitation / Moderately high likelihood of success
Loss of irreplaceable resources	1	None	1	None
Cumulative Impact	2	Low	2	Low
Probability				
Frequency of the Activity	1	Once off activity / less than once in 20 years	1	Once off activity / less than once in 20 years
Likelihood of the Incident / Impact occurring	4	Likely	2	Unlikely
Impact Significance				
Consequence	2,27	Medium	2,27	Medium
Probability	2.50	Very High	1,50	Low
Impact Significance	**2,316**	**Low**	**2,12**	**Low**

Table 8-5: Assessment results for Impact 5

Impact 5: Water quality impairment of the UVBWs		
Description		**Pollutants may enter the onsite wetlands via stormwater or sewage leaks (although highly unlikely).**
Mitigation Measures		**The significance of this impact can be largely mitigated by establishing a 32 m buffer area around the UVBW wetland areas; and by ensuring that runoff / SW generated onsite flows into the wetland areas through an appropriately designed broad, vegetated earth swale. Tie into mainline sewage if at all possible or use fully contained conservancy tanks serviced by truck. No sewage treatment, irrigation or soak-aways should be contemplated.** **Repair all sewage leaks as soon as reasonably possible after detection. Inspection of all sewage pipes should be conducted by a plumber once every 10 years.**

		Residents should be made aware of the presence of EN *Sclerophrys pantherinus* within the site. Should any pollution events occur, such as spills of petrol, etc. the spread to the UVBWs should be prevented, by applying / covering with absorbent materials. In no circumstance should pollutants enter the SW system or the UVBWs.		
	Impact Without Mitigation		**Impact With Mitigation**	
Consequence				
Intensity of Impact	3	Medium / Harmful	1	Very Low / Non-harmful
Duration of Impact	1	Up to 1 month	1	Up to 1 month
Extent / spatial scale of impact	1	Limited to project site	1	Limited to project site
Reversibility	1	Passive restoration / High likelihood of success	1	Passive restoration / High likelihood of success
Loss of irreplaceable resources	1	None	1	None
Cumulative Impact	1	None	1	None
Probability				
Frequency of the Activity	1	Once off activity / less than once in 20 years	1	Once off activity / less than once in 20 years
Likelihood of the Incident / Impact occurring	3	Possible	2	Unlikely
Impact Significance				
Consequence	1,72	Low	1,00	Very Low
Probability	2,00	Low	1,50	Very Low
Impact Significance	**1,77**	**Low**	**1,10**	**Very Low**

8.3 No-Go Scenario

Table 8-6: Assessment results for the "No Go" Scenario

"No Go" Scenario				
Description		Although it is unknown whether the site would be further developed in future, it is assumed that the area would remain as is, which is in a disturbed condition. The No-Go option would result in the continuation of impact to the onsite wetlands due to current onsite and adjacent land uses – and would therefore still result in negative impact to the wetlands onsite.		
Mitigation Measures		None		
	Impact Without Mitigation		**Impact With Mitigation**	
Consequence				
Intensity of Impact	2	Low / Slightly Harmful	0	Not Applicable
Duration of Impact	5	Beyond 20 years / Permanent	0	Not Applicable
Extent / spatial scale of impact	1	Limited to project site	0	Not Applicable
Reversibility	1	Passive restoration / High likelihood of success	0	Not Applicable
Loss of irreplaceable resources	1	None	0	Not Applicable
Cumulative Impact	1	Very Low	0	Not Applicable
Probability				
Frequency of the Activity	1	Once off activity / less than once in 20 years	0	Not Applicable
Likelihood of the Incident / Impact occurring	3	Possible	0	Not Applicable
Impact Significance				
Consequence	1,72	Low	0,00	Not Applicable
Probability	2	Low	0,00	Not Applicable

Impact Significance	**1,78**	**Low**	**0,00**	**Not Applicable**

8.4 Endangered Western Leopard Toad

The Endangered Western Leopard Toad (*Sclerophrys pantherinus*) is present within the site. There is potential for the proposed development to negatively impact the Western Leopard Toad, and its habitat. Negative impacts primarily stem from habitat fragmentation, obstacles to toads' movements, and road mortalities.

Figure 8-1: Image of the EN Western Leopard Toad © Serban Proches.

8.4.1 Threats to toads from the proposed development

- Steep curb stones: The presence of steep curb stones acts as an impermeable barrier, trapping the toads and heightening the risk of mortality from cars. Moreover, the curb stones can act as a channel to stormwater drains which act as a one-way trap for toads generally resulting in death for the toads.
- Boundary walls and fences: The erection of boundary walls and fences further contributes to habitat fragmentation, acting as an impermeable barrier for toads restricting their access to habitat.

- Seep pool sides: The design of seep sides within pools presents a threat to toads. Pools can prevent toads from escaping, this leads to exhaustion and drowning. Additionally, prolonged exposure to chlorine is fatal for toads.
- High sided stormwater drains: The high sides of stormwater drains can trap toads, resulting in high levels of mortality rates as they cannot escape from the drains.

8.4.2 Proposed Mitigation measures

The following mitigation measures have been adopted from the Rebelo *et al.* 2004 Biodiversity management plan for the Western Leopard Toad *Sclerophrys pantherinus*. It is essential that these measures are implemented with the aim to minimize the impact of urban development (specifically habitat fragmentation, obstacles to toads' movements, and road mortalities) on the species:

- It is recommended that a suitably qualified Environmental Control Officer (ECO) is appointed during the construction phase to ensure that recommendations as per this report, and other specialist reports, are implemented.
- Toad-friendly curbs stones should be installed i.e. small curbs stones that are less than 50 mm tall, or half road gutters which provide passageways for toads. These can be implemented throughout the estate or at intervals of 50 m.
- An appropriate road reserve should be implemented for internal access roads within the estate to facilitate the movement of toads.
- Boundary walls and fences should be permeable to toads. Integrate toad holes of at least 100 mm diameter, spaced every 20 meters, and not exceeding 300 mm in length at ground level. Alternatively open gutters can be a suitable option.
- Stormwater systems should be designed with suitably spaced escape areas, allowing toads to escape. These escape areas should be positioned at intervals of at least 50 m.
- The estate should install non-chlorinated eco pools, ideally with a "beach pool" design with gently sloping sides emulating the natural bank of a wetland allowing toads to enter and exit the pool freely. Alternatively, if a pool design with high sides is installed, incorporate escape pathways such as toad ladders, toad friendly steps, or floating vegetated platforms anchored to the side of the pool.
- To prevent road mortalities, Western Leopard Toad signage should be erected and a speed limit within the eco estate should be implemented and strictly adhered to.
- Toad friendly gardens should be created, when it is not the toads breeding season (late July to September with the main breeding month being August), they inhabit suburban gardens. Natural vegetation should be planted to create ideal toad habitat.

By implementing these mitigation measures, the adverse impacts of urban development on the Western Leopard Toad population can be effectively mitigated, contributing to the essential conservation of these toads.

9 Risk Assessment

The Risk Assessment Matrix prescribed by GN 509 of 2016 (**Annexure 3**) was applied to the proposed project with the following outcomes:

1. The risk associated with Impact 1 (wetland loss), was found to be within the Moderate - Risk category.
   - The delineated hillslope seep has a PES score in the E category (Seriously Modified), exhibits Moderate EIS and offers Moderately Low ecosystem services.
   - The historical wetland vegetation type is CR, although the fynbos onsite is considered highly degraded.
   - There is limited hydrological connection to the downstream Mill stream UVBW due to the seriously impacted hydrological, and geomorphology components of the seep.
2. The risks associated with Impacts 2-5 were all found to fall within the Low-Risk category. The key factors included:
   - With the implementation of appropriate mitigation / management measures, the risk of the impacts can be largely reduced / minimized onsite.
   - Of importance is that the UVBWs will be set aside as No-Go areas, and a buffer area of 32 m will be designated within which limited activities – specifically naturally vegetated (indigenous species) gardens and pools (recommended to be non-chlorinated eco pools, please refer to **Section 8.4.2**.).

10 Conclusion and Recommendations

This report sets out the results from a desktop analysis, as well as two field assessments conducted on the 25th of July 2023 and the 1st of March 2024, to assess the potential aquatic impacts associated with the proposed development of a residential eco-estate on Erf 438, Standford, Western Cape. Three wetlands were identified within the proposed site, including the Mill Stream wetland (classified as a UVBW), a small tributary thereof (also a UVBW) and a hillslope seep wetland within the onsite farmed area.

In this impact assessment, the delineated onsite wetlands were assessed using current best practice assessment methodologies to determine the PES, EIS, WES, and REC metrics. The results of these assessments are as follows:

Table 10-1: Results of the wetland status quo assessment.

	PES	EIS	WES (Highest)	REC
Mill Stream UVB Wetland	C	High	High	B
Tributary UVB Wetland	C	High	Moderate	B
Hillslope Seep Wetland	E	Moderate	Moderately Low	D

Although the condition of the onsite UVB wetlands was moderately disturbed, the high to moderately high EIS and WES scores indicate that these wetlands are sensitive and important in terms of conservation planning or provision of ecosystem services. The hillslope seep wetland is seriously disturbed, and of moderate to low importance in terms of conservation planning or provision of ecosystem services.

Aquatic biodiversity impacts associated with the development were identified and assessed using both an impact assessment methodology compliant with NEMA requirements and the Risk Assessment Matrix prescribed by GN509 of 2016. The results of the assessment of wetland loss along with four additional impacts during the construction and operational phases, given implementation of the listed mitigation measures, are summarised in **Table 10-2.**

Table 10-2: Summary of impact/risk assessment results (with mitigation).

	Rating	Risk Class	Applicable to	Mitigation Measures
Construction Phase				
Impact 1: Wetland Loss	Medium	Moderate	Hillslope Seep	Refer to **Table 8-1**.
Impact 2: Altered flow	Low	Low	UVBWs	Refer to **Table 8-2**.
Impact 3: Water Quality Impairment	Very Low	Low	UVBWs	Refer to **Table 8-3**.
Operational Phase				
Impact 4: Altered flow	Low	Low	UVBWs	Refer to **Table 8-4**.
Impact 5: Water quality impairment	Very Low	Low	UVBWs	Refer to **Table 8-5**.
"No Go" Scenario	Low	Not Assessed	Hillslope seep & UVBWs	Refer to **Table 8-6**.

Four out of five of the post-mitigation scores fell within the within the "Low" to "Very Low" impact categories. Wetland loss received the highest impact significance score, which fell within the 'Medium' category. Ordinarily, wetland loss would fall within the 'high' category, but the limited area of wetland loss (0,87 Ha) and the degraded nature of the wetland has reduced the impact significance.

Although it is unknown whether the development area would be further developed in future, it is assumed that the site would remain as is. The No-Go option would result in the continuation of impact to the wetlands due to onsite and adjacent land uses – and would therefore still result in negative impact to the delineated wetlands.

The Moderate risk rating confirms that a Water Use Licence will be required for this project due to the encroachment into the onsite seep wetland.

The key recommendations therefore are:

- Avoid encroachment into the delineated UVBWs during construction and operational phases.

- Avoid encroachment into the 32 m buffer area around each wetland, apart from limited activities – specifically indigenous gardens and pools (recommended to be non-chlorinated eco pools, please refer to **Section 8.4.2**.).
- Tie into mainline sewage if possible or use fully contained conservancy tanks serviced by truck. No sewage treatment, irrigation or soak-aways should be contemplated.
- Allowance must be made for stormwater to be treated in a vegetated detention pond and/or a substantial vegetated swale before release into the UVBWs.
- Municipal water supply should be used if possible. If not, groundwater abstraction would be preferable to wetland abstraction.

The following mitigation measures have been adopted from the Rebelo *et al.* 2004 Biodiversity management plan for the Western Leopard Toad *Sclerophrys pantherinus*. It is essential that these proposed mitigation measures are implemented with the aim to minimize the impact of urban development (specifically habitat fragmentation, obstacles to toads' movements, and road mortalities) on the species:

- It is recommended that a suitably qualified Environmental Control Officer (ECO) is appointed during the construction phase to ensure that recommendations as per this report, and other specialist reports, are implemented.
- Toad-friendly curbs stones should be installed i.e. small curbs stones that are less than 50 mm tall, or half road gutters which provide passageways for toads. These can be implemented throughout the estate or at intervals of 50 m.
- An appropriate road reserve should be implemented for internal access roads within the estate to facilitate the movement of toads.
- Boundary walls and fences should be permeable to toads. Integrate toad holes of at least 100 mm diameter, spaced every 20 meters, and not exceeding 300 mm in length at ground level. Alternatively open gutters can be a suitable option.
- Stormwater systems should be designed with suitably spaced escape areas, allowing toads to escape. These escape areas should be positioned at intervals of at least 50 m.
- The estate should install non-chlorinated eco pools, ideally with a "beach pool" design with gently sloping sides emulating the natural bank of a wetland allowing toads to enter and exit the pool freely. Alternatively, if a pool design with high sides is installed, incorporate escape pathways such as toad ladders, toad friendly steps, or floating vegetated platforms anchored to the side of the pool.
- To prevent road mortalities, Western Leopard Toad signage should be erected and a speed limit within the eco estate should be implemented and strictly adhered to.
- Toad friendly gardens should be created, when it is not the toads breeding season (late July to September with the main breeding month being August), they inhabit suburban gardens. Natural vegetation should be planted to create ideal toad habitat.

It is therefore the opinion of the specialist that the proposed development should be approved subject to application of the mitigation measures listed in this report, as well as the implementation of a suitable Wetland Offset, Rehabilitation and Management Plan.

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Annexure 1: Ecosystem Services

Table A1: Ecosystem Services included in the WET-EcoServices v.2 (Extracted from Kotze *et al.*, (2020)).

Services contributing to indirect benefits	Regulating and supporting services	Flood attenuation		The spreading out and slowing down of floodwaters in the wetland/riparian area, thereby reducing the severity of floods downstream (Adamus et al. 1987; MEA 2005)
		Streamflow regulation		Sustaining streamflow during low flow periods (McInnes and Everard 2017)
		Water quality enhancement services	Sediment trapping	The trapping and retention in the wetland/riparian area of sediment carried by runoff water (Adamus et al. 1987)
			Phosphate assimilation	Removal by the wetland/riparian area of phosphates carried by runoff water, thereby enhancing water quality (O'Geen et al. 2010)
			Nitrate assimilation	Removal by the wetland/riparian area of nitrates carried by runoff water, thereby enhancing water quality (O'Geen et al. 2010)
			Toxicant assimilation	Removal by the wetland/riparian area of toxicants (e.g. metals, biocides and salts) carried by runoff water, thereby enhancing water quality (O'Geen et al. 2010)
			Erosion control	Controlling of erosion at the wetland/riparian area, principally through the protection provided by vegetation (MEA 2005).
		Carbon storage		The trapping of carbon by the wetland/riparian area, principally as soil organic matter (Kumar et al. 2017)
	Biodiversity maintenance[1]			Through the provision of habitat and maintenance of natural process by the wetland/riparian area, a contribution is made to maintaining biodiversity (Liquete et al. 2016)
Services contributing to direct benefits	Provisioning services	Provision of water for human use		The provision of water which is taken directly from the wetland/riparian area for domestic, agriculture or other purposes (Kumar et al. 2017)
		Provision of harvestable resources		The provision of natural resources from the wetland/riparian area - including craft plants, fish, wood, etc. (McInnes and Everard 2017)
		Food for livestock		The provision of grazing for livestock (McInnes and Everard 2017)
		Provision of cultivated foods		The provision of cultivated foods from within the wetland/riparian area (McInnes and Everard 2017)
	Cultural (non-material) services	Cultural and spiritual experience		Places of special cultural significance in the wetland/riparian area - e.g. for baptisms or gathering of culturally significant plants (McInnes and Everard 2017)
		Tourism and recreation		Sites of value for tourism and recreation in the wetland/riparian area, often associated with scenic beauty and abundant birdlife (McInnes and Everard 2017)[2]
		Education and research		Sites of value in the wetland/riparian area for education or research (McInnes and Everard 2017)

[1]It is recognized that biodiversity maintenance is not an ecosystem service in the strict sense (Liquete *et al.* 2016) and is framed in less anthropocentric terms than all the other services, but it underpins many other services and is widely acknowledged as having high value to society broadly, even in the absence of any local or downstream beneficiaries.

[2]WET-EcoServices focuses on recreational services which are specifically nature-based, e.g., bird watching. It does not account specifically for recreational services from wetland/riparian areas that have been converted into sports grounds, children's playgrounds, or other built infrastructure.

Annexure 2: Impact Assessment Methodology

Impact assessment methodologies are based on qualitative ratings of the various factors and represent a standardised method for presenting a substantiated specialist opinion regarding the significance of a particular class of impact. Delta Ecology has developed a rapid numerical impact assessment methodology, applied in this report, that incorporates a range of factors commonly assessed to which numerical values from 1 to 5 are assigned to each rating category. Six primary factors are used to determine Consequence and two primary factors are used to determine Probability. These two secondary factors are used to determine Impact Significance for each identified impact. Consequence, Probability and Impact Significance are determined by a set of formulae which incorporate weightings for each primary and secondary factor.

The weightings for each factor were determined by application of the formulae to over 50 pre-existing ecological impact assessments. These assessments employed other methodologies and were accepted by the relevant environmental authorities. These assessments were primarily from reports drafted by Delta Ecology staff during previous employment, but also included unrelated ecological impact assessments freely available on the internet. The weighting system has therefore been derived as a means of real-world formula calibration rather than by logic alone. The final methodology achieves impact significance ratings that are consistently in line with industry standards.

Key elements of the approach include a detailed description of the nature of the impact and of the proposed mitigation measures, assessment of each factor for both the "with mitigation" and "without mitigation" scenarios and includes the provision of a rationale for each rating where appropriate. The resulting impact significance ratings may be adjusted if necessary, in accordance with specialist opinion, given adequate motivation for the deviation from the standard methodology.

The various factors, formulae and weightings are provided in the table below:

Scoring of impacts			
Factor	**Weighting**	**Score**	**Description/Rating**
Consequence	**8**		
Intensity	4	1	Very Low / Non-harmful
		2	Low / Slightly Harmful
		3	Medium / Harmful
		4	High / Very Harmful
		5	Very High / Disastrous
Duration	1	1	Up to 1 month
		2	1 month to 1 year
		3	One year to 5 years
		4	5 to 20 years
		5	Beyond 20 years / Permanent
Spatial scale/extent	3	1	Limited to project site
		2	Limited to local catchment
		3	Multiple local catchments

		4	Limited to quaternary catchment
		5	Regional, National, International
Reversibility	1	1	Passive restoration / High likelihood of success
		2	Low cost rehabilitation / Moderately high likelihood of success
		3	Moderate cost / Moderate likelihood of success
		4	High cost / Low likelihood of success
		5	Very high cost / Very low likelihood of success
Loss of irreplaceable resources	1	1	None
		2	Low
		3	Medium
		4	High
		5	Very High
Cumulative Impact	1	1	Very Low
		2	Low
		3	Medium
		4	High
		5	Very High
Probability	**2**		
Frequency of the activity	1	1	Once off activity / less than once in 20 years
		2	5 to 20 years
		3	1 to 5 years
		4	Monthly to annually
		5	Weekly to Monthly
Likelihood of the Incident / Impact occuring	1	1	Highly unlikely
		2	Unlikely
		3	Possible
		4	Likely
		5	Definite
Consequence = (Intensity x 4) + Duration + (Extent x 3) + Reversibility + Loss of Irreplaceable Resources + Cumulative Impact) / 11			
Probability = (Frequency + Probability) / 2 OR = 5 where likelihood is definite			
Impact Significance = (Consequence x 8) + (Likelihood x 2) / 10			
Impact Significance Categories			
0 - 1.5		Very Low	
1.6 - 2.5		Low	
2.6 - 3.5		Medium	
3.6 - 4.5		High	
4.5 and above		Very High	

Annexure 3: DWS RISK ASSESSMENT

Project Phase	Aspect	Impact	Flow Regime	Physico & Chemical (Water Quality)	Habitat (Geomorphic +Vegetation)	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures	Borderline LOW MODERATE Rating Classes	Type Watercourse	PES and EIS of Watercourse
Construction Phase	Vegetation clearing, infilling and compaction (establishment of a residential "Eco-Lifestyle" estate) within 0.87 Ha of onsite seep wetland.	Wetland Loss	3	3	3	2	2,75	1	5	8,75	5	3	5	3	**16**	**140**	M	Refer to Section 8 (Table 8-1)	N/A	Mill Stream UVBW & Tributary UVBW	Seep: PES – E (Seriously Modified) and EIS - Moderate UVBWs: PES – C (Moderately Modified) and EIS - High
	Vegetation clearing, infilling and compaction (establishment of a residential "Eco-Lifestyle" estate) within the catchment area of the UVBWs.	Flow Alteration	3	1	1	1	1.5	1	3	5.5	1	3	5	1	10	**55**	L	Refer to Section 8 (Table 8-2)	N/A		
	Establishment of a residential "Eco-Lifestyle" estate within the within the catchment area of the UVBWs.	Water Quality Impairment	1	3	1	1	1.5	1	3	5.5	1	3	5	1	10	**55**	L	Refer to Section 8 (Table 8-3)	N/A		
Operational Phase	Vegetation clearing, infilling and compaction (establishment of a residential "Eco-Lifestyle" estate) within the catchment area of the UVBWs.	Flow Alteration	3	1	1	1	1.5	1	3	5.5	1	3	5	1	10	**55**	L	Refer to Section 8 (Table 8-4)	N/A		
	Establishment of a residential "Eco-Lifestyle" estate within the within the catchment area of the UVBWs.	Water Quality Impairment	1	3	1	1	1.5	1	3	5.5	1	3	5	1	10	**55**	L	Refer to Section 8 (Table 8-5)	N/A		

RISK MATRIX (Based on DWS 2015 publication: Section 21 C and I water use Risk Assessment Protocol):
NAME and REGISTRATION No of SACNASP Professional member: K. van Zyl Reg no. 117097

Date: 13 March 2024