Aquatic Biodiversity Impact Assessment

Erf 878 Riebeek-Kasteel, Western Cape

For: Lornay Environmental Consulting

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Report Information

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Executive Summary

The owner of Erf 878 Riebeek Kasteel, located in the Swartland local Municipality, is proposing the establishment of a mixed-use development on the property that will include a residential zone, retirement village, business zone, community zone and a park. The site is bordered to the north and east by a residential area, to the west by the R311 road and to the south by agricultural lands (permanent orchards). Land use on the site currently consists of old agricultural fields, a perimeter gravel road, a circular gravel road in the southern portion and areas of natural vegetation. Along the western boundary, there is a cutout where a restaurant is located along the R311. This restaurant is situated on a separate site and is not part of the proposed development site, which extends around it.

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, 2025). The reason given is the location of the site within the Boland Strategic Water Source Area (SWSA) Surface Water. Furthermore, a fountain is known to be located on the site, and desktop resources indicate that a portion of the Krom River runs along the northern boundary.

Delta Ecology was contracted to undertake an aquatic biodiversity impact assessment of the proposed development site. The aim of this assessment is to (1) determine whether the mapped watercourses are present on the site, and if so, determine the current ecological state and ecological importance / sensitivity of the watercourses present, (2) to assess the potential impact of the proposed development on the mapped and confirmed watercourses and (3) to provide recommendations for impact mitigation.

Following the aquatic biodiversity assessment of the proposed site on the 20th of February 2025, the Krom River was confirmed to intersect the northern boundary of the proposed development site (**Figure i**). In addition, two seep wetland systems were identified onsite, both of which are sustained by groundwater emergence in the form of springs (**Figure i**). Seep wetland 1 historically would have extended to the east, downslope of the site, but the development of roads and residential areas has resulted in canalisation of this flow.

Several patches of artificial seepage dominated by *Pennisetum clandestinum* (kikuyu grass) were observed, primarily along the western boundary. These artificially created seepage areas will not be assessed as they lack a natural reference state, do not exhibit ecological importance or sensitivity, and do not fulfil any significant ecosystem services.

Figure i: At Risk Watercourses on Erf 878.

Given the confirmed presence of onsite watercourses 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 watercourses were assessed using current best practice assessment methodologies to determine the Present Ecological State (PES), Index of Habitat Integrity (IHI), Ecological Importance and Sensitivity (EIS), the contribution to Wetland Ecosystem Services (WES), and Recommended Ecological Category (REC) metrics. The results of these assessments are as follows:

Table i: Results of the watercourse status quo assessment.

	PES	EIS	WES (Highest)	REC
Seep Wetland 1	E	Moderate	Moderately High	D
Seep Wetland 2	E	Moderate	Moderate	D
Krom River	E	Marginal/Low	-	N/A

Three alternative layouts were considered for the proposed development on the site. 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 (RAM) prescribed by GN4167 of 2023. The seven potential aquatic impacts were assessed first without, and then with, application of mitigation measures, for the three proposed Alternatives.

The six potential aquatic impacts identified were assessed first without and then with application of mitigation measures. Five out of six of the post-mitigation scores fell within the within the "Low" impact categories. Ordinarily, wetland loss would fall within the 'high' category, but the limited area of wetland loss (+- 0.5 Ha) and the degraded nature of the wetland areas to be lost, has reduced the impact significance to a 'Medium' category.

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 watercourses due to onsite and adjacent land uses – and would therefore still result in negative impact to the delineated watercourses.

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

Mitigation and management measures are proposed in Section 7 of this report. The key recommendations include:

- The loss of the seriously degraded Seep Wetland 2, along with the loss of portions of Seep Wetland 1, should be compensated for by rehabilitating the Remnant Seep Wetland 1. It should be noted that the Offset Calculator needs to be completed and should the rehabilitation of the remnant Seep Wetland 1 not compensate for the loss, additional onsite or offsite wetland areas may need to be considered.
- Throughflow of water from the Remnant Seep Wetland 1 downslope must be achieved, ideally in the form of earthen swales vegetated with indigenous wetland vegetation, connecting to the Krom River downstream to ensure habitat connectivity.
- No untreated stormwater should enter the Remnant Seep Wetland 1 or "Offset" wetland area. Allowance must be made for stormwater to be treated in a vegetated detention pond and/or a substantial vegetated swale before release into the Krom River or Remnant Seep Wetland 1.
- Avoid encroachment into the remnant Seep Wetland 1 and the Krom River during construction and operational phases. These two areas should be set aside as a No Go for construction and operational phases.
- A 20 m buffer area, consisting of indigenous vegetation, should be implemented around the remnant Seep Wetland 1; and a 10 m buffer around the Krom River (aboveground). The portions of the buffer areas that are located outside of the demarcated construction footprint should be designated as a No-Go area.
- The Krom River section that occurs within the site should be rehabilitated, as per a River Maintenance and Management Plan.
- Municipal water supply should be used if possible. 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.

- It is recommended that a groundwater impact assessment is conducted during the Water Use License Application (WULA) process.

Alternative 1 and 2 both included a service station within proximity to Seep 1, while Alternative 1 also included a wedding venue on top of the hillock on the site. Alternative 3, which excludes the fuel station located close to Seep 1 is preferred from an aquatic perspective.

It is therefore the opinion of the specialist that the proposed development can be approved subject to implementation of the mitigation measures listed in this report.

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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 878 Riebeek Kasteel, located in the Swartland local Municipality, is proposing the establishment of a mixed use development on the property that will include a residential zone, retirement village, business zone, community zone and a park (**Figure 1-1** and **Figure 1-2**). The site is bordered to the north and east by a residential area, to the west by the R311 road and to the south by agricultural lands (permanent orchards). Land use on the site currently consists of old agricultural fields currently being used for grazing of springbok, a perimeter gravel road, a circular gravel road in the southern portion and areas of natural vegetation. Along the western boundary, there is a cutout where a restaurant is located along the R311. This restaurant is situated on a separate site and is not part of the proposed development site, which extends around it.

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, 2025). The reason given is the location of the site within the Boland Strategic Water Source Area (SWSA) Surface Water. Furthermore, a fountain is known to be located on the site, and desktop resources indicate that a portion of the Krom River runs along the northern boundary.

Delta Ecology was contracted to undertake an aquatic biodiversity impact assessment of the proposed development site. The aim of this assessment is to (1) determine whether the mapped watercourses are present on the site, and if so, determine the current ecological state and ecological importance / sensitivity of the watercourses present, (2) to assess the potential impact of the proposed development on the mapped and confirmed watercourses and (3) to provide recommendations for impact mitigation.

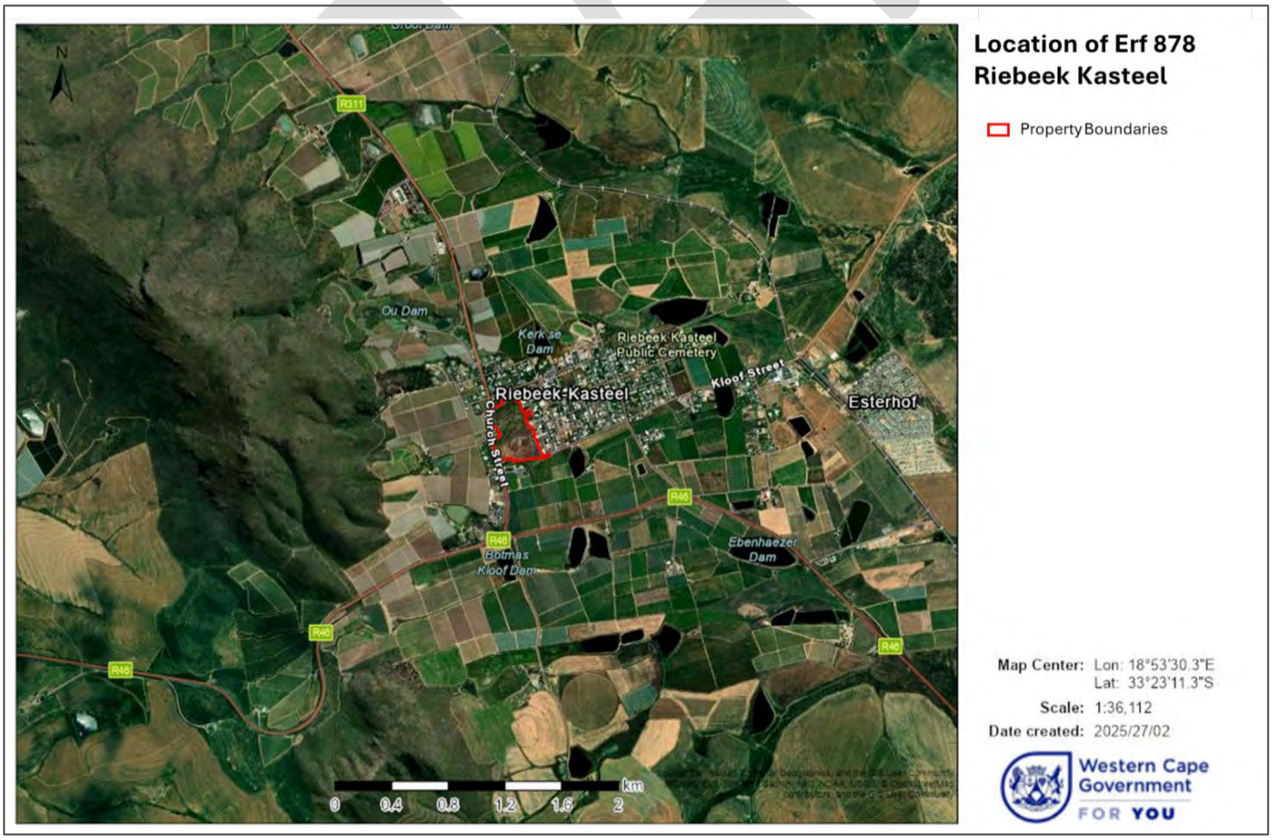

Figure 1-1: Location of the proposed development site, Erf 878, Riebeek-Kasteel.

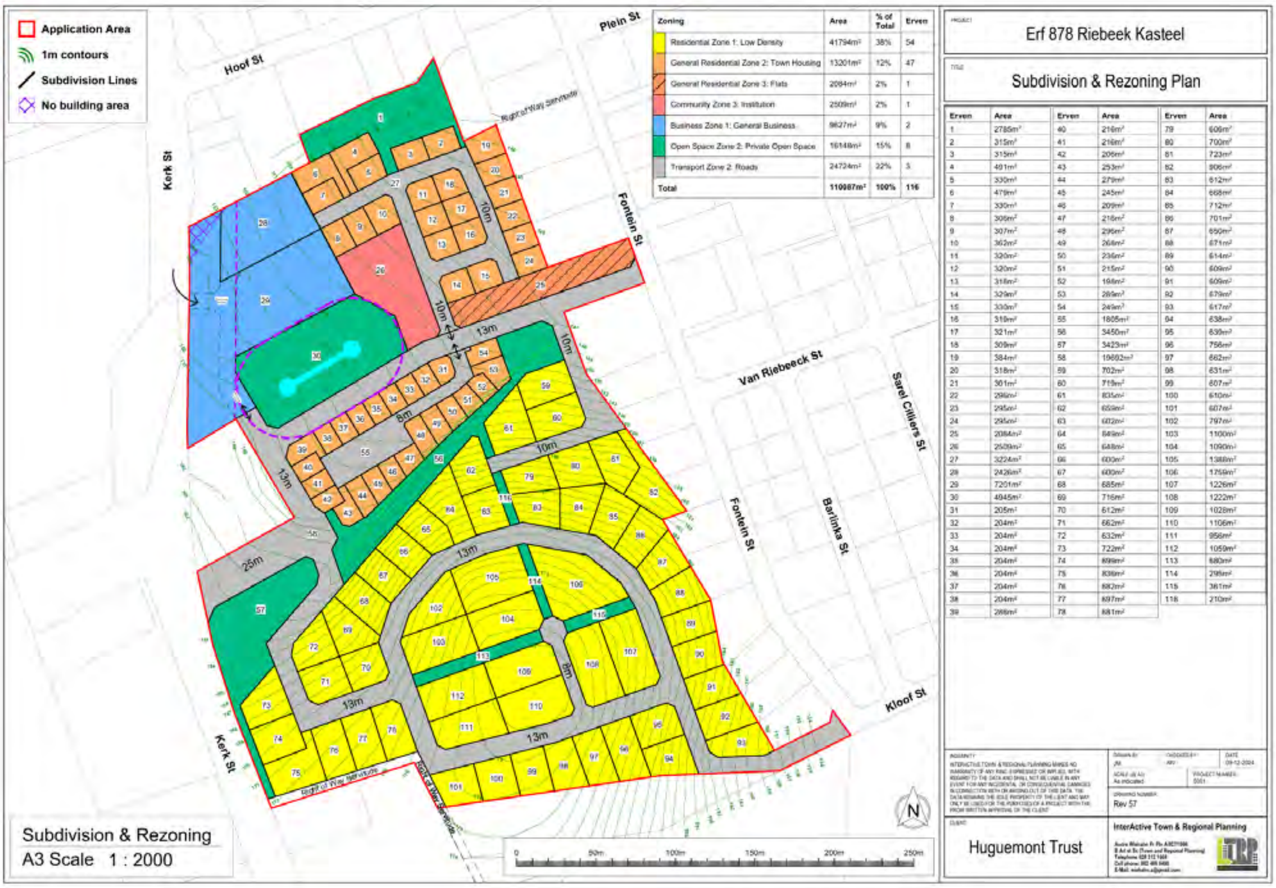

Figure 1-2: Proposed Preferred Spatial Development Plan.

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 Department of Water and Sanitation (DWS) 100 m regulated area of surrounding rivers/streams, and the 500 m regulated area of wetlands.
- A site assessment to confirm potential aquatic biodiversity constraints within the proposed site.
- Delineation of all watercourses deemed to be "at-risk" 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:
    - o General site description;
    - o Site sensitivity verification;
    - o Determination of the Present Ecological State (PES), Index of Habitat Integrity (IHI), Ecological Importance and Sensitivity (EIS), the contribution to Wetland Ecosystem Services (WES), Recommended Ecological Category (REC), and buffer areas (if applicable);
    - o Assessment of potential aquatic biodiversity impacts of the proposed development on the at-risk watercourses;

  - Application of the RAM stipulated by GN 4167 of 2023 promulgated in terms of the NWA (Act 36 of 1998) to determine the risk of the proposed development activities on the delineated 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:

- A single site visit was conducted on the 20th of February 2025 during the dry summer season. This does not cover the complete seasonal variation in conditions experienced on the site. However, the presence of hydrological and soil indicators was sufficient for the delineation and evaluation of the onsite watercourses.
- The watercourses on the site have formed as a result of strong surface-groundwater interactions and historic aerial imagery indicates that this is a dynamic system. As a result, delineating a precise boundary with certainty is challenging, as the system's extent may vary under different hydrogeological conditions. The current delineation is considered to be the most accurate delineation extent at the time of the site assessment, given the conditions on the site at the time of the site assessment, also considering the seriously disturbed nature of the site (ploughing, canalization, vegetation clearing, and Stormwater Management (SW)).
- The watercourse edge was delineated using a Garmin handheld GPSMAP 66i 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.
- The information provided by the client forms the basis of the planning and layouts discussed.
- Formal vegetation sampling was not done by the specialist, however general observations pertaining to vegetation were recorded based on onsite visual observations. Furthermore, only dominant, and noteworthy plant species were recorded. Thus, the vegetation information provided has limitations for true botanical applications.
- Deriving a 100% factual report based on field collecting and observations can only be done over several years and seasons to account for fluctuating environmental conditions, species' seasonality, and migrations. Since environmental impact studies deal with dynamic natural systems, additional information may come to light at a later stage.
- Description of the depth of the regional water table and geohydrological and hydro pedological processes falls outside the scope of the current assessment.
- Flood line calculations fall outside the scope of the current assessment.
- A Species of Conservation Concern (SCC) scan, fauna and flora assessments were not included in the current study.
- Watercourse delineation plotted digitally may be offset by at least five meters to either side. Furthermore, it is important to note that, during the course of converting spatial data to final drawings, several steps in the process may affect the accuracy of areas delineated in the current report. It is therefore suggested that the no-go area identified in the current report

be pegged in the field in collaboration with the surveyor for precise boundaries. The scale at which maps and drawings are presented in the current report may become distorted should they be reproduced by, for example, photocopying and printing.

- The current delineation provided in this assessment and the calculation of buffer zones does not consider climate change or future changes to watercourses resulting from increasing catchment transformation.

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

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, 2025). The classification trigger is the location of the site within a Strategic Water Source Area (SWSA) for surface water (Boland).

The 2023 Western Cape Biodiversity Spatial Plan (WCBSP) (CapeNature, 2024) indicates the absence of aquatic Critical Biodiversity Areas (CBA's) indicated within the proposed development site or within 500 m from the site. The proposed development site is located over a minor fractured aquifer with yields of 0.5 - 2.0 l/s (DWS, 2012).

The Department of Rural Development and Land Reform (DRDLR) National Geo-spatial Information (NGI) river line vector data indicates a non-perennial drainage line, the Krom River, that intersects the northern portion of the proposed development site. No additional mapped watercourses are indicated to coincide with the site.

The National Freshwater Ecological Priority Areas (NFEPA) (CSIR, 2011) indicates two natural Channelled Valley-Bottom (CVB) wetlands within the 500 m wetland Zone of Regulation (ZoR). These wetlands are situated along the periphery of two farm dams—one to the northeast and the other to the southeast of the site. Additionally, the National Wetland Map 5 (NWM5) indicates the presence of a depression wetland along the periphery of the southeastern dam. These mapped wetlands are separated hydrologically from the proposed development by roads, Stormwater (SW) channels, and agricultural activities, therefore they will not be impacted upon.

During the site visit undertaken on the 20th of February 2025, the Krom River was confirmed to intersect the northern boundary of the proposed development site. In addition, two seep wetland systems were identified onsite, both of which are sustained by groundwater emergence in the form of springs. Given the confirmed presence of a drainage line along the northern boundary as well as two groundwater fed seep wetlands within the site, the site as a whole was determined to be of "Very High" aquatic sensitivity as per the screening tool.

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).

3 Methodology

The methodology used in this aquatic biodiversity impact assessment report, including a desktop background assessment, a site visit, 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 South African National Biodiversity Institute (SANBI) (2024) National Vegetation Map (NVM);
- The SANBI 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 WCBSP (CapeNature, 2024).

3.2 Watercourse Delineation

Watercourses were identified and delineated using the method described in the Manual for the Identification and Delineation of Wetlands and Riparian Areas for field-based delineation (DWAF, 2008). This method is the accepted best practice method for delineating watercourses in South Africa and its use is required by GN 509. For wetlands, 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 presence of **aquatic vegetation communities**.
3. 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 most 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 the presence of redoximorphic and other hydromorphic soil features. Aquatic vegetation communities were identified using the DWAF, 2008 classification of wetland plant species and descriptions of communities, along with auxiliary information (Van Ginkel *et al.*, 2011). Wetland plant species classification categories are as follows:

- Obligate species (occurring in wetlands >99% of the time – usually in the permanent or seasonal zone).
- Facultative Positive species (67 to 99% of the population occurs within wetlands – typically in the seasonal and temporary zones with the 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 the 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 the 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).

Riparian areas were identified using the method described in the DWAF, (2008) Updated Manual for the Identification and Delineation of Wetlands and riparian Areas. This method is the accepted best practice method for identifying and delineating riparian areas in South Africa and its use is required by GN 509. The method makes use of four key field indicators (refer to **Box 2**):

Box 2. Four indicators of riparian areas as described in DWAF (2008)

1. The **position in the landscape** – riparian areas are only likely to develop on valley bottom landscape units.
2. The **soil form** – Riparian areas are often (but not always) associated with alluvial soils and recently deposited material.
3. **Topography** associated with riparian areas – riparian areas may have clearly identifiable banks associated with alluvial deposited material adjacent to the active channel.
4. The presence of **aquatic vegetation communities.**

The identification of riparian areas relies heavily on vegetative indicators. Using vegetation, the outer boundary of a riparian area can be defined as the point where a distinctive change occurs in the:

- species composition relative to the adjacent terrestrial area; and
- physical structure, such as vigour or robustness of growth forms of species similar to that of adjacent terrestrial areas. Growth form refers to the health, compactness, crowding, size, structure and/or numbers of individual plants.

In addition to indicators of structural differences in vegetation, indicator species themselves can be used to denote riparian areas. Riparian plant species classification categories are as follows:

- Obligate riparian species occur almost exclusively in the riparian zone (> 90% probability)
- Preferential riparian species are preferentially, but not exclusively, found in the riparian zone (>75% probability). Preferential riparian species may harden to drought conditions but will always indicate sites with increased moisture availability.

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**.

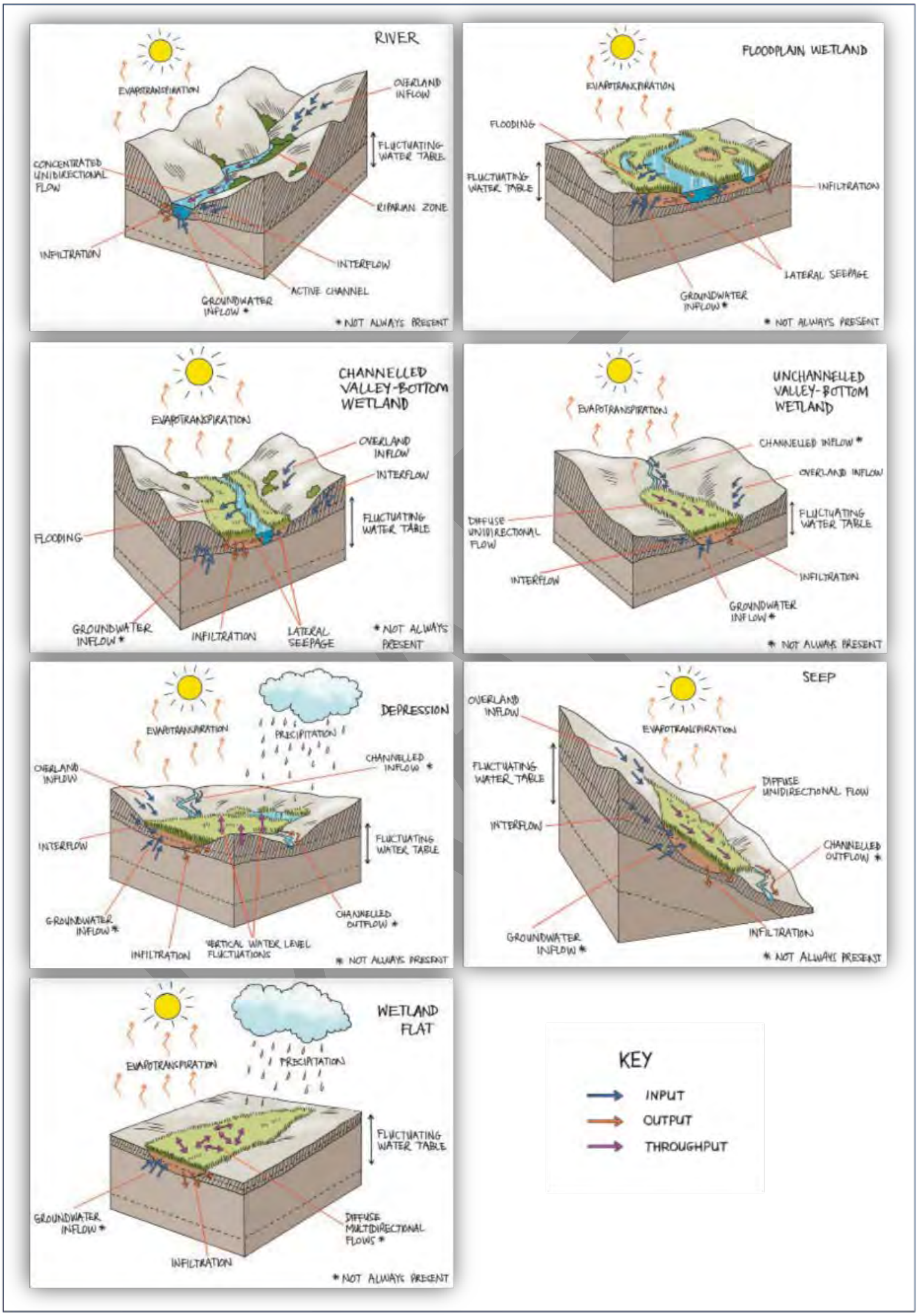

Figure 3-1: Wetland Hydrogeomorphic Types as defined in the Classification System for Wetlands and Other Aquatic Ecosystems in South Africa (Ollis *et al.,* 2013).

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 Habitat Integrity Assessment

The Index of Habitat Integrity (IHI) assessment is a tool used to assess the habitat integrity of a river based on the intensity and extent of anthropogenic disturbances that impact both the instream and riparian habitat. The assessment of habitat integrity is based on an interpretation of the deviation from the reference condition (Kleynhans *et al.*, 2008). The disturbances assessed include abiotic factors such as water abstraction, weirs, dams, pollution and the dumping or rubble and biotic factors such as the presence of alien plants and aquatic animals which modify habitat (Kleynhans, 1996). These changes are all related and interpreted in terms of modification of the drivers of the system, namely hydrology, geomorphology, and physico-chemical conditions and how these changes would impact on the natural riverine habitats. The severity of each of these impacts is assessed, using scores as a measure of impact (**Table 3-2**). Descriptions of each criterion are provided to assist with the assessment (**Table 3-3**).

Table 3-2: Scoring procedures used to determine the Index of Habitat Integrity

IMPACT CLASS	DESCRIPTION	SCORE
None	No discernible impact or the modification is in such a way that it has no impact on habitat quality, diversity, size and variability.	0
Small	The modification is limited to very few localities and the impact on habitat quality, diversity, size, and variability is limited.	1 – 5
Moderate	The modification is present at a small number of localities and the impact on habitat quality, diversity, size, and variability are fairly limited.	6 - 10
Large	The modification is generally present with a clearly detrimental impact on habitat quality, diversity, size, and variability. Large areas are, however, not affected.	11 -15
Serious	The modification is frequently present and the habitat quality, diversity, size and variability in almost the whole of the defined area affected. Only small areas are not influenced.	16 – 20
Critical	The modification is present overall with a high intensity. The habitat quality, diversity, size and variability in almost the whole of the defined section are influenced detrimentally.	21 – 25

Table 3-3: Descriptions of criteria used in the IHI assessments

CRITERION	DESCRIPTION (KLEYNHANS, 1996)
Water abstraction	Direct abstraction from within the specified river/river reach as well as upstream (including tributaries) must be considered (excludes indirect abstraction by for example exotic vegetation). The presence of any of the following can be used as an indication of abstraction: cultivated lands, water pumps, canals, pipelines, cities, towns, settlements, mines, impoundments, weirs, industries. Water abstraction has a direct impact on habitat type, abundance, and size; is implicated in flow, bed, channel and water quality characteristics; and riparian vegetation may be influenced by a decrease in water quantity.
Extent of inundation	Destruction of instream habitat (e.g. riffle, rapid) and riparian zone habitat through submerging with water by, for example, construction of an in-channel impoundment such as a dam or weir. Leads to a reduction in habitat available to aquatic fauna and may obstruct movement of aquatic fauna; influences water quality and sediment transport.

CRITERION	DESCRIPTION (KLEYNHANS, 1996)
Water quality	The following aspects should be considered: untreated sewage, urban and industrial runoff, agricultural runoff, mining effluent, effects of impoundments. Ranking may be based on direct measurements or indirectly via observation of agricultural activities, human settlements, and industrial activities in the area. Water quality is aggravated by a decrease in the volume of water during low or no flow conditions.
Flow modification	This relates to the consequence of abstraction or regulation by impoundments. Changes in temporal and spatial characteristics of flow such as an increase in duration of low flow season can have an impact on habitat attributes, resulting in low availability of certain habitat types or water at the start of the breeding, flowering, or growing season.
Bed modification	This is regarded as the result of increased input of sediment from the catchment or a decrease in the ability of the river to transport sediment. The effect is a reduction in the quality of habitat for biota. Indirect indications of sedimentation are stream bank and catchment erosion. Purposeful alteration of the stream bed, e.g. the removal of rapids for navigation is also included. Extensive algal growth is also considered to be bed modification.
Channel modification	This may be the result of a change in flow which alters channel characteristics causing a change in instream and riparian habitat. Purposeful channel modification to improve drainage is also included.
Presence of exotic aquatic fauna	The disturbance of the stream bottom during exotic fish feeding may influence, for example, the water quality and lead to increased turbidity. This leads to a change in habitat quality.
Presence of exotic macrophytes	Exotic macrophytes may alter habitat by obstruction of flow and may influence water quality. Consider the extent of infestation over instream area by exotic macrophytes, the species involved and its invasive abilities.
Solid Waste disposal	The amount and type of waste present in and on the banks of a river (e.g. litter, building rubble) is an obvious indicator of external influences on stream and a general indication of the misuse and mismanagement of the river.
Decrease of indigenous vegetation from the riparian zone	This refers to physical removal of indigenous vegetation for farming, firewood, and overgrazing. Impairment of the riparian buffer zone may lead to movement of sediment and other catchment runoff products (e.g. nutrients) into the river.
Exotic vegetation encroachment	This excludes natural vegetation due to vigorous growth, causing bank instability and decreasing the buffering function of the riparian zone. Encroachment of exotic vegetation leads to changes in the quality and proportion of natural allochthonous organic matter input and diversity of the riparian zone habitat is reduced.
Bank erosion	A decrease in bank stability will cause sedimentation and possible collapse of the riverbank resulting in a loss or modification of both instream and riparian habitats. Increased erosion can be the result of natural vegetation removal, overgrazing or encroachment of exotic vegetation.

The score that has been allocated to an impact is then moderated by a weighting system, devised by Kleynhans (1996). Assignment of weights is based on the perceived relative threat of the impact to the habitat integrity of a riverine ecosystem. The total score for each impact is equal to the assigned score multiplied by the weight of that impact (**Table 3-4**).

Table 3-4: Weights assigned to each criterion

INSTREAM CRITERION	WGT	RIPARIAN ZONE CRITERION	WGT
Water abstraction	14	Water abstraction	13
Extent of inundation	10	Extent of inundation	11
Water quality	14	Water quality	13
Flow modification	7	Flow modification	7
Bed modification	13	Channel modification	12
Channel modification	13	Indigenous vegetation removal	13
Presence of exotic macrophytes	9	Exotic vegetation encroachment	12
Presence of exotic fauna	8	Bank erosion	14
Solid waste disposal	6		

Based on the relative weights of the criteria, the impacts of each criterion are estimated as follows:

Rating for the criterion /maximum value (25) x the weight (percent).

The estimated impacts of all criteria calculated in this way are summed, expressed as a percentage, and subtracted from 100 to arrive at a present status score for the instream and riparian components, respectively. The Index of Habitat Integrity scores (%) for the instream and riparian zone components are then used to place these two components into a specific class. These classes are indicated in **Table 3-5**. The assessment method in determining the severity of modifications to habitat integrity is a largely field-based site assessment, supplemented with information from aerial photographs (google earth images).

Table 3-5: IHI classes and their description

CLASS	DESCRIPTION	SCORE (%)
A	Unmodified, natural.	90 – 100
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place, but the assumption is that ecosystem functioning is essentially unchanged.	80 - 89
C	Moderately modified. A loss or change in natural habitat and biota has occurred, but basic ecosystem functioning appears predominately unchanged.	60 – 79
D	Largely modified. A loss of natural habitat and biota and a reduction in basic ecosystem functioning is assumed to have occurred.	40 – 59
E	Seriously modified. The loss of natural habitat, biota and ecosystem functioning is extensive.	20 – 39
F	Modifications have reached a critical level and there has been an almost complete loss of natural habitat and biota. In the worst cases, the basic ecosystem functioning has been destroyed.	0 - 19

3.6 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 3-6**.

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 3-6: 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.

3.7 Wetland EIS Assessment

The 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 3-7**.

Table 3-7: 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

3.8 River EIS Assessment

The EIS was determined for the onsite streams using an adapted version of the Duthie *et al.*, 1999, methodology. The EIS is a rapid scoring system designed to identify the EIS of floodplains to disturbances across multiple scales (i.e., catchment to international scales). In this case, it has been adapted for application to "Ecological importance" of a water resource is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales. "Ecological sensitivity" refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred (Duthie *et al.*, 1999). A series of determinants for EIS are assessed on a scale of 0 to 4, where 0 indicates "None" and 4 indicates "Very high importance" and the median of the determinants indicates the EIS category for the watercourse (**Table 3-8**). Weighting of the relative importance of the various determinants of ecological importance and sensitivity was not proposed. However, the relative confidence of each rating should be estimated based on a scale of four categories where 1 indicated "Marginal/low confidence" and 4 indicated "Very High confidence". The median score for the biotic and habitat determinants can be interpreted and translated into an EMC, however for the purposes of this assessment, the Recommended Ecological Category (REC) methodology as described in Rountree et al., (2013) was utilized (see **Section 3.9** below).

Table 3-8: Ecological Importance and Sensitivity Categories (DWAF, 1999).

EIS CATEGORY	RANGE OF MEDIAN	RECOMMENDED ECOLOGICAL MANAGEMENT CLASS
Very high Watercourses that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these watercourses is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of other major rivers.	>3 and <=4	A
High Watercourses that are considered to be ecologically important and sensitive. The biodiversity of these watercourses may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of other major rivers.	>2 and <=3	B
Moderate Watercourses that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these watercourses is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of other major rivers.	>1 and <=2	C
Low/marginal Watercourses that are not ecologically important and sensitive at any scale. The biodiversity of these watercourses is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of other major rivers.	>0 and <=1	D

3.9 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.

3.10 Buffer Determination

The Buffer Zone Tool (Macfarlane & Bredin, 2017) is a rapid, excel based, scoring tool designed to determine an appropriate buffer around rivers, wetlands and estuaries.

The tool offers two levels of assessment:

1. A desktop-based assessment and
2. A detailed rapid field-based assessment.

All three watercourse types (river, wetland, and estuary) can be assessed using the desktop-based assessment tool. When a field-based assessment is undertaken, different tools are available for each watercourse type. In this case, a field-based assessment was undertaken.

3.11 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 4167 of 2023 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 development site comprises varying topography with a hill located in the southern portion of the site (**Figure 4-1**). The highest point of the area is the hilltop located along the southern boundary, approximately 174 meters above mean sea level (AMSL), while the lowest point, in the northeastern corner at approximately 146 meters AMSL.The mean annual rainfall received in the area is 679 mm, mostly during the winter months with the highest mean rainfall occurring in May-August and the lowest mean rainfall occurring in November-February (Schultz, 2009) (**Table 4-1**).

The soils in this are dominated by Glenrosa and/or Mispah soil forms, although other soils may occur. Lime is generally rare or absent in the landscape. The geology onsite consists of greywacke and phyllite of the Moorreesburg Formation and sporadic quartz schist with phyllite beds of the Klipplaat Formation, both from the Malmesbury Group. The soil types and descriptions map developed by the Department of Agriculture, Forestry and Fisheries (DAFF) indicates that this region is characterised by soils with limited pedological development. Soils are usually shallow over hard or weathering rock and have a high clay content (>= 15% and < 35%) (**Table 4-1**). The combination of shallow soils with high clay content predisposes the site to the formation of perched flat/depressional and hillslope seep wetland under the right conditions.

According to the National Vegetation Map (SANBI, 2024), the natural vegetation in this area consists of Swartland Shale Renosterveld which is listed as Critically Endangered (CR) (**Table 4-1 & Figure 4-1**). According to the NFEPA (CSIR, 2011) spatial dataset, this area corresponds to the wetland vegetation type West Coast Shale Renosterveld (**Table 4-1**), which where Seep wetlands are present, is listed as Critically Endangered (CR) with Zero Protection.

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

Site attribute	Description	Data source
Eco-region	South Western Coastal Belt	Department of Water Affairs Level 1 Ecoregions (Department of Water and Sanitation, 2011)
Terrestrial Vegetation Type(s)	Swartland Shale Renosterveld (CR)	National Vegetation Map of South Africa, 2024 (SANBI, 2024)
Dominant Geology and Soils	The geology of this region comprises predominantly greywacke and phyllite of the Moorreesburg Formation and sporadic quartz schist with phyllite beds of the Klipplaat Formation, both from the Malmesbury Group. This region has primarily Glenrosa and/or Mispah soil forms (although other soils may occur) and lime is generally rare or absent.	Soil descriptions for the Western Cape. (ENPAT, 2021)
Soil Erodibility Factor (K)	0.51 (High Erodibility)	SA Atlas of Climatology and Agrohydrology (Schultz, 2009)
Soil depth	>= 450 mm and < 750 mm	Soil types and descriptions for the Western Cape, Department of Agriculture, Forestry and Fisheries (DAFF, 2021)
Clay %	>= 15% and < 35%	
Mean Annual Precipitation (mm)	679 mm	SA Atlas of Climatology and Agrohydrology (Schultz, 2009)
Rainfall seasonality	Winter rainfall	
Mean Annual Temperature (°C)	17,7 °C	
Water Management Area	Breede - Olifants WMA	Water Management Areas (DWAF, 2011)
Quaternary Catchment	G10F	South African Quaternary Catchments Database (Schulze et al., 2007)
Wetland Vegetation Group (for wetlands within the applicable terrestrial vegetation type)	West Coast Shale Renosterveld (CR)	NFEPA Wetland Vegetation Types (SANBI, 2011)

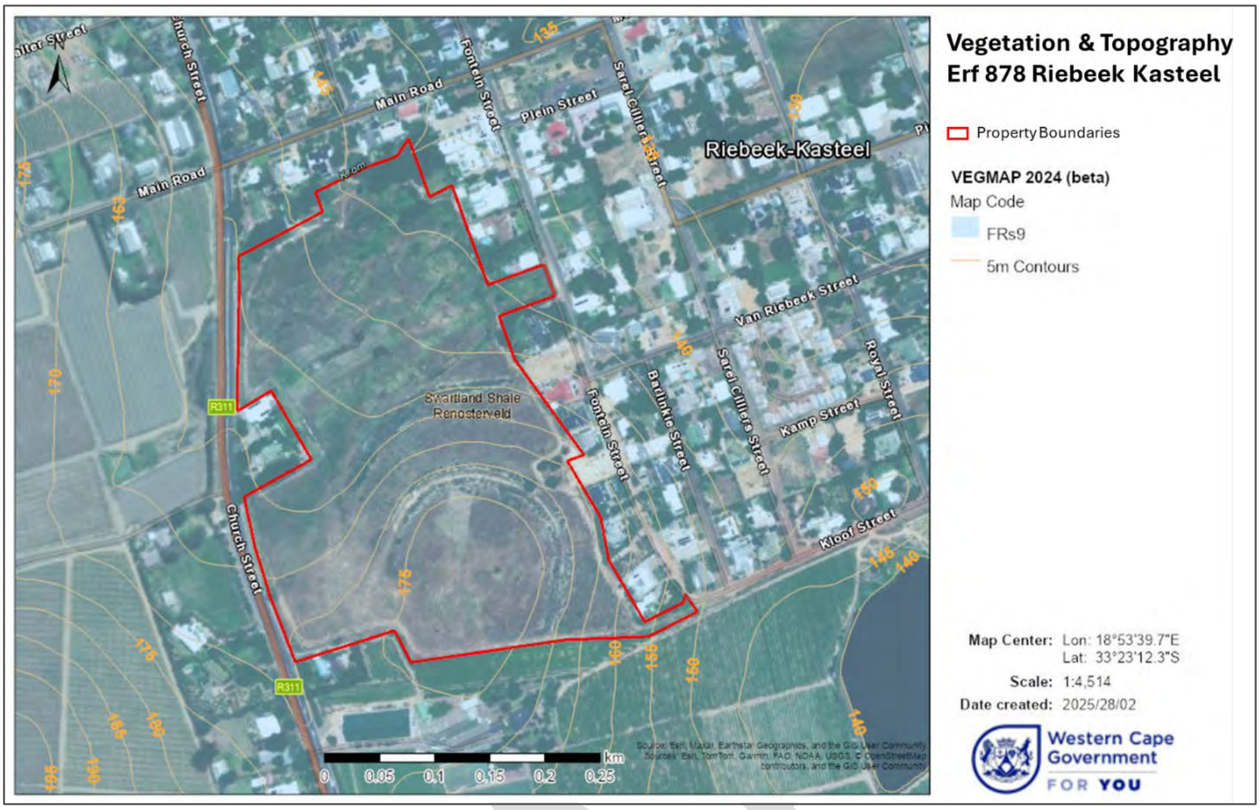

Figure 4-1: Vegetation and Topography Map (SANBI, 2024).

4.2 Biodiversity Planning Context

The site under evaluation is located within the Breede-Olifants WMA, quaternary catchment G10F. The applicable sub-quaternary catchment is not demarcated as a Fish or River Freshwater Support Area (CSIR, 2011). The proposed development site is however located within the Boland Strategic Water Source Area for surface water (SANBI, 2021). The regional setting, in terms of the Level 1 DWA (now Department of Water and Sanitation) Ecoregions, is within the Southwestern Coastal Belt (**Table 4-1**).

The Department of Rural Development and Land Reform (DRDLR) National Geo-spatial Information (NGI) river line vector data indicates a non-perennial drainage line, the Krom River, that intersects the northern portion of the proposed development site (**Figure 4-2 & Figure 4-3**). No additional watercourses are indicated to coincide with the site.

The National Freshwater Ecological Priority Areas (NFEPA) (CSIR, 2011) indicates two natural channelled valley-bottom wetlands within the 500 m wetland Zone of Regulation (ZoR) (**Figure 4-2**). These wetlands are situated along the periphery of two farm dams—one to the northeast and the other to the southeast of the site. Additionally, the National Wetland Map 5 (NWM5) indicates the presence of a depression wetland along the periphery of the southeastern dam (**Figure 4-3**). These mapped wetlands are separated hydrologically from the proposed development by roads, Stormwater (SW) channels, and agricultural activities, therefore they will not be impacted upon. No drainage lines are present within the 100 m Drainage Line ZoR from the site (**Figure 4-2 & Figure 4-3**).

The 2023 WCBSP (CapeNature, 2024) indicates the absence of aquatic CBAs indicated within the proposed development site or within 500 m from the site (**Figure 4-4**). The proposed development site is located over a minor fractured aquifer with yields of 0.5 - 2.0 l/s (DWS, 2012).

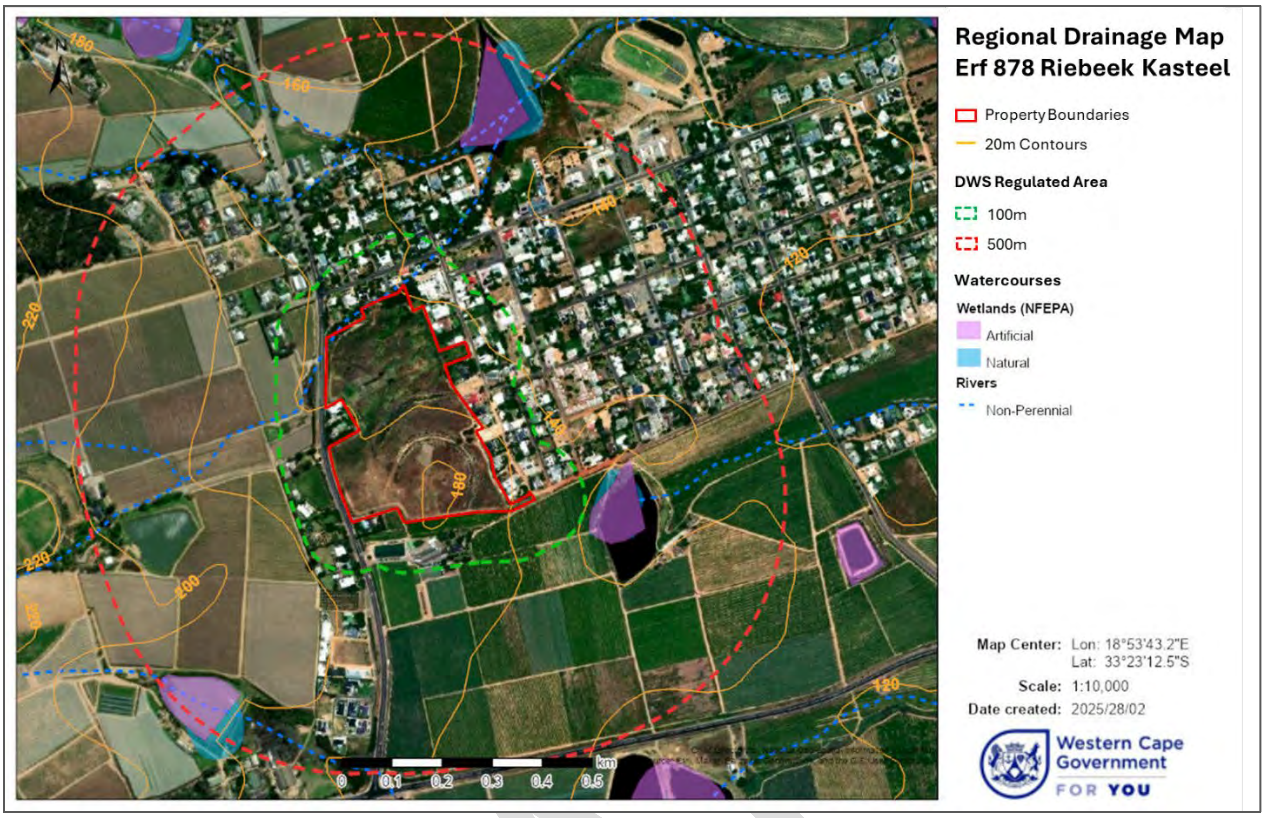

Figure 4-2: Regional Drainage Map - NGI Rivers (DRDLR 2017) and NFEPA Wetlands (CSIR 2011).

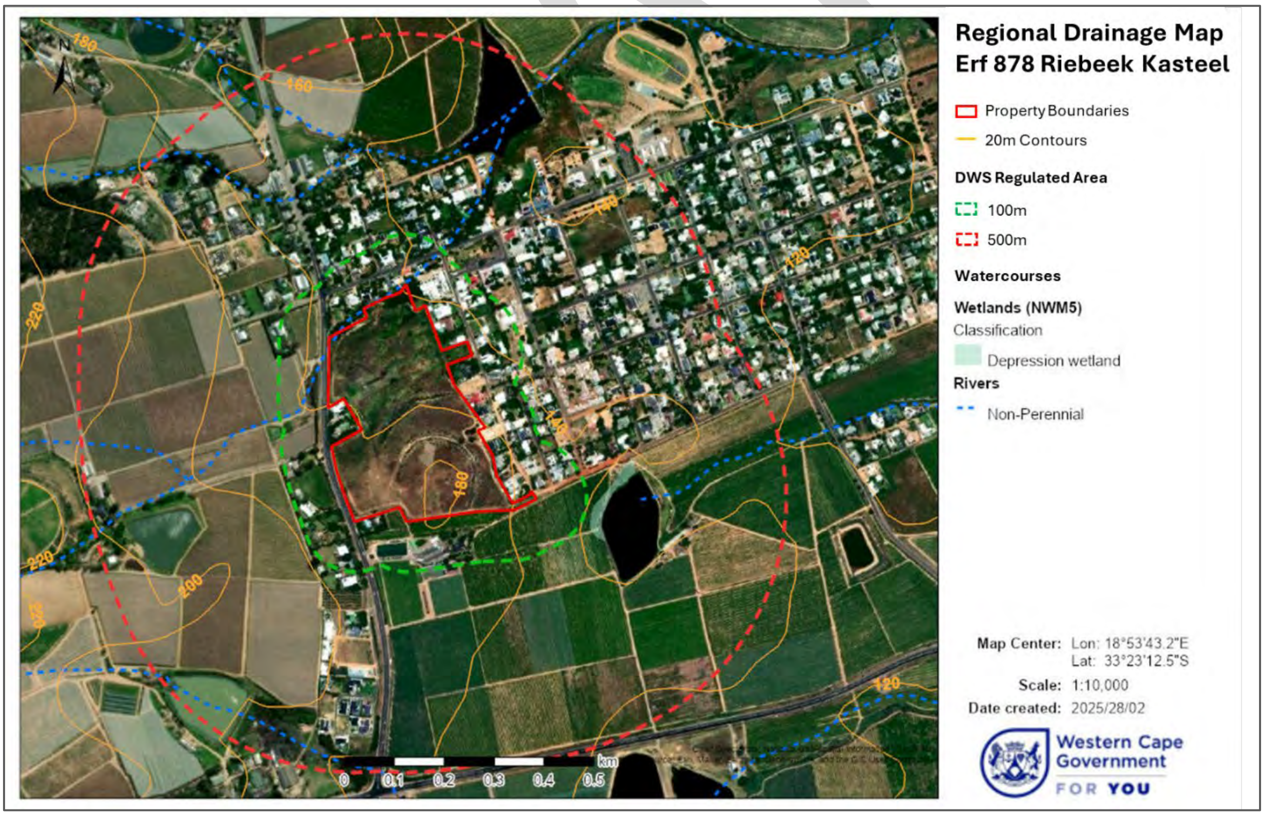

Figure 4-3: Regional Drainage Map - NGI Rivers (DRDLR 2017) and NWM5 Wetlands (SANBI, 2018).

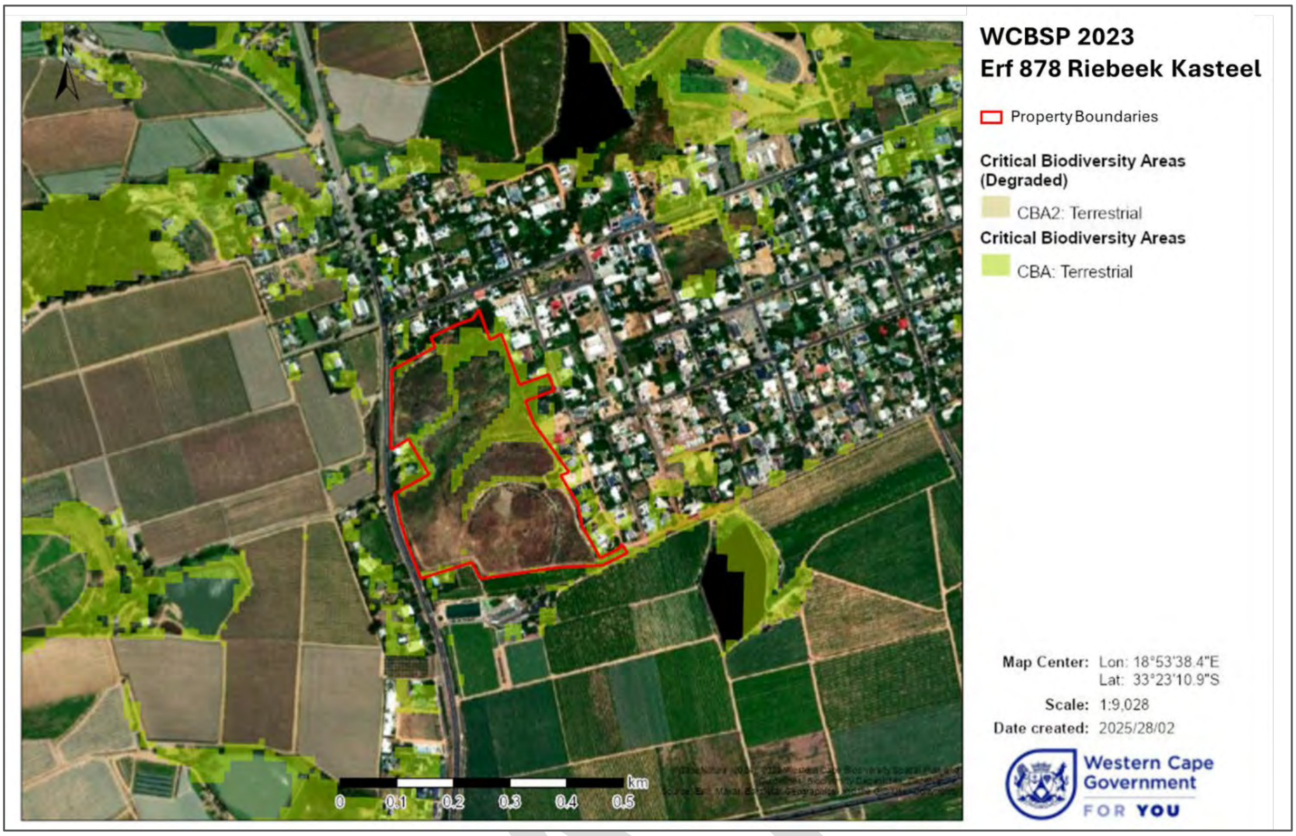

Figure 4-4: 2023 Western Cape Biodiversity Spatial Plan (CapeNature 2024)

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 model predicts no change in climate classification, with the site remaining in the Csa zone—temperate with dry, hot summers—under both current and future scenarios (**Figure 4-5**).

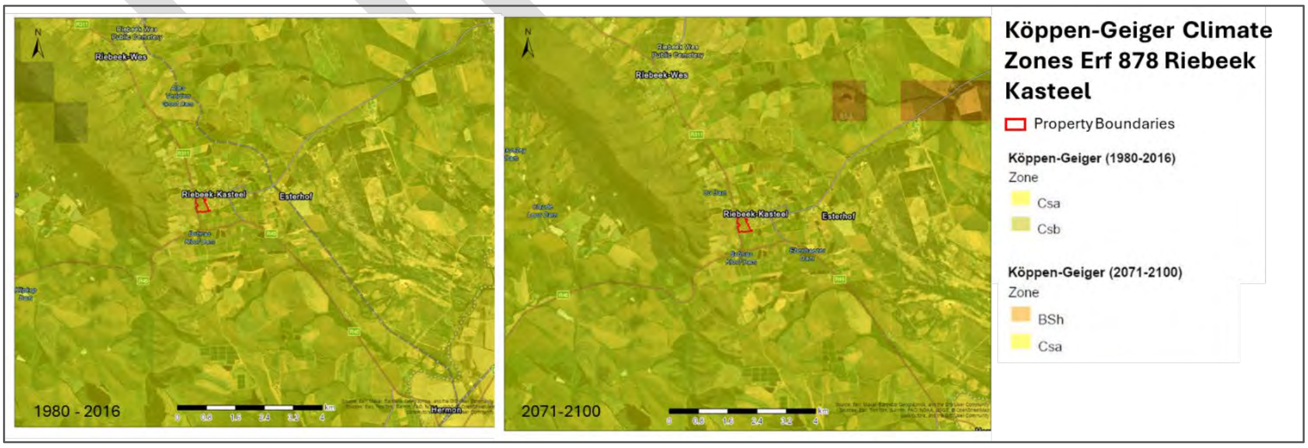

Figure 4-5: Beck *et al.* (2018) Köppen-Geiger climate zones for present day and for the close of the century.

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 seep wetlands associated with the site are seriously degraded in nature. Construction is unlikely to lead to a significant release of carbon into the atmosphere. No further assessment of potential climate impact is necessary.

5 Watercourse Status Quo Assessment

A site assessment was conducted on the 20th of February 2025 during the dry summer season for the Western Cape. The southern section of the site was confirmed to be terrestrial and features a hill. In contrast, the northern section consists of relatively flat, gently sloping land with notable surface-groundwater interactions.

Key onsite hydrological features identified and delineated include two seep wetlands, both sustained by groundwater emergence from associated springs in the northern portion of the site (**Figure 5-1**). Additionally, the non-perennial Krom River traverses the northern boundary (**Figure 5-1**). Several patches of artificial seepage dominated by *Pennisetum clandestinum* (kikuyu grass) were observed, primarily along the western boundary (**Figure 5-1 & Figure 5-2**). Field observations, corroborated by aerial imagery, suggest that these artificial seepage areas have likely developed due to agricultural irrigation and stormwater enhancement. These artificially created seepage areas will not be assessed as they lack a natural reference state, do not exhibit ecological importance or sensitivity, and do not fulfil any significant ecosystem services.

The onsite seep wetlands have formed as a result of strong surface-groundwater interactions and historic aerial imagery indicates that this is a dynamic system (**Figure 5-3**). Wetland delineation therefore required a combination of field-based methods and analysis of historical satellite imagery. It should however be noted that delineating a precise boundary, in particular for the seepage below the well point (Seep 1), with 100% certainty is challenging, as the system's extent may vary under different hydrogeological conditions.

Figure 5-1: Watercourse Delineation Map

Table 5-1: Classification of the onsite watercourses.

Factor	Wetland 1	Wetland 2	Drainage Line
System	Inland	Inland	Inland
Ecoregion	South Western Coastal Belt	South Western Coastal Belt	South Western Coastal Belt
Landscape Setting	Lowland	Lowland	Lowland
Hydrogeomorphic type	Seep	Seep	Drainage line
Drainage	Groundwater	Groundwater	Rainfall and Interflow
Seasonality	Permanent – Seasonal/temporary	Permanent - Seasonal/temporary	Seasonal
Anthropogenic influence	Excavation, drainage, alien invasive vegetation	Excavation, drainage, vegetation clearing, alien invasive vegetation, and infilling	Excavation, canalisation, alien invasive vegetation, and infilling

Vegetation	West Coast Shale Renosterveld (CR)	West Coast Shale Renosterveld (CR)	West Coast Shale Renosterveld (CR)
Geology	Greywacke and phyllite of the Moorreesburg Formation and sporadic quartz schist with phyllite beds of the Klipplaat Formation, both from the Malmesbury Group.		
Substrate	Terrestrial soils were a dry and sandy while wetland soils varied from dark, low-chroma, organic soils indicative of anaerobic wetland conditions to dry sandy soils exhibiting mottling.		
Salinity	Fresh		

Figure 5-2: Area of artificial seepage dominated by *P. clandestinum* adjacent to the neighbouring restaurant. This area has likely developed as a result of artificial stormwater enhancement and irrigation runoff from the restaurant garden.

Figure 5-3: Aeiral imagery of the proposed development site from 1972 - 2017 showing shifts in wetness indicators in the northern portion of the site over time

5.1 Seep Wetland 1

Seep Wetland 1, the larger of the two seep wetlands, is located in the northern portion of the site (**Figure 5-1**). A primary groundwater emergence point was identified within this wetland, which has been formalized into a well-like structure (**Figure 5-4**), likely developed to facilitate the provision of water for agricultural purposes. A channel has been excavated westward from the well, revealing additional points of groundwater emergence along its course (**Figure 5-5**).

Despite the site visit occurring during the dry summer season, water was visibly present on the surface in the central portion of the wetland, confirming its reliance on groundwater inputs. The soils in this area were waterlogged and exhibited dark, low-chroma, organic characteristics indicative of anaerobic wetland conditions (**Figure 5-6**). Vegetation in this permanent zone was dominated by *Typha capensis* (Bulrush), with additional species such as *Juncus effusus* (Soft Rush), *Zantedeschia aethiopica* (Arum Lily), and a single *Syzygium guineense* (Water Pear Tree) present (**Figure 5-7 & Figure 5-8**).

Downslope seepage is evident based on the distribution of wetland-associated vegetation, soil characteristics, and the presence of flow paths. The seasonal and temporary zones of the seep wetland are dominated by various grass species, including *Pennisetum clandestinum* (kikuyu grass). Identification of additional grass species was limited due to the dry season (**Figure 5-9**). A patch of *Seriphium plumosum* (silver stoebe) and areas containing *Pennisetum setaceum* (Fountain Grass) were also noted (**Figure 5-10**). Despite the seasonal dryness observed in the vegetation, soil samples exhibited periodic mottling, confirming seasonal wetland conditions and supporting delineation efforts (**Figure 5-11**).

Seep Wetland 1 appeared to extend beyond the site boundary historically. Historic aerial imagery indicates that the wetland likely extended across the current perimeter road prior to its construction. The continued presence of water in this area is evident from erosion features observed across the road and along road verges, indicating ongoing hydrological connectivity, now directed to the Krom River downstream (by the road, residential area, and canalisation) (**Figure 5-12 Figure 5-13**).

Figure 5-4: A well has been developed within Seep Wetland 1

Figure 5-5: A channel has been excavated from the central well in Seep Wetland 1 leading westwards. This has revealed additional points of perched groundwater as indicated by the presence of *T. Capensis.*

Figure 5-6: Dark, low-chroma, organic soil sampled from within the central portion of Seep Wetland 1.

Figure 5-7: Permanent wetland zone within Seep Wetland 1 dominated by *T.* Capensis. A single S. guineense can be seen in the background.

Figure 5-8: *J.effusus* present within Seep Wetland 1.

Figure 5-9: *P. clandestinum* (kikuyu grass) and additional grass species dominating Seep Wetland 1. Identification of additional grass species was limited due to the dry season

Figure 5-10: A patch of *S. plumosum* within Seep Wetland 1. *P. setaceum* is also present and *T. Capensis* can be seen in the bottom right corner.

Figure 5-11: Periodic mottling indicative of wetland conditions detected within Seep Wetland 1. Mottles are encircled in red.

Figure 5-12: A SW canal dominated by *T.Capensis* located to the east of the proposed development site boundary.

Figure 5-13: Preferential flow path crossing the perimeter road along the eastern boundary. This flow path extends from the portion of Seep Wetland 1 located west of the road.

5.1.1 WET-Health

The Macfarlane *et al.* (2020) WET-Health Version 2.0 assessment for the Seep Wetland 1 produced an overall Present Ecological State (PES) score within category E (**Table 5-2**). This indicates that the wetland was in a seriously modified condition at the time of the assessment. Historical canalization efforts, likely undertaken to drain the area for agricultural use, have altered the natural hydrology of the wetland. The wetland area has been cleared, ploughed and likely irrigated in the past, largely/seriously impacting the wetland's vegetation, water quality, hydrology and geomorphology from its natural reference condition.

Table 5-2: Outcome of the WET-Health Assessment for the delineated hillslope seep wetland.

PES Assessment	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	6.1	5.5	5.4	7.0
PES Score (%)	39%	45%	46%	30%
Ecological Category	E	D	D	E
Trajectory of change	↓	↓	↓	↓
Confidence (revised results)	Not rated	Not rated	Not rated	Not rated
Combined Impact Score	6.0			
Combined PES Score (%)	40%			
Combined Ecological Category	E			
Hectare Equivalents	0.3 Ha			

5.1.2 EIS & WET-EcoServices

Seep Wetland 1 achieved a median score of 2.0 which falls within the "Moderate" EIS category (**Table 5-3**). Seeps are known to provide moderate levels of streamflow regulation, nitrate removal and toxicant removal, however the level of disturbance in the seep, lowers the importance of these ecosystem services (**Table 5-4**). As Seep 1 is known to be used as a water source for the public, this wetland provides moderately high important provisioning services, in the form of water for human use (**Table 5-4**).

Table 5-3: Results of the EIS assessment for Seep 1.

Ecological Importance and Sensitivity	Seep 1	Reason
	0.33	
Presence and status of Red Data species:	0	Botanical assessment did not note SCC. Unlikely given the degree of disturbance.
Populations of unique species/uncommonly large populations of wetland species:	0	None noted, unlikely to occur given disturbance.
Migration/breeding/feeding sites: (Importance of the unit for migration, breeding sites and/or feeding):	1	Possibility to be a breeding site for hardy amphibians.
Landscape Scale (Median)	**1.60**	
Protection status of the wetland: (National (4), Provincial/Private (3), municipal (1 or 2), public area (0 or 1)	0	The wetland is located within a privately owned property and is not protected.
Protection status of the vegetation type: (SANBI guidance on the protection status of the surrounding vegetation)	4	West Coast Shale Renosterveld (CR) WetVeg type, however vegetation within the wetland at present is disturbed.
Regional context of the ecological integrity: (Assessment of the PES (habitat integrity), especially in light of regional utilisation)	0	PES – E.
Size and rarity of the wetland type/s present: (Identification and rarity assessment of wetland types)	2	CR status indicates rarity, but degraded status has left only common, tolerant elements of the ecosystem intact. The

Ecological Importance and Sensitivity	Seep 1	Reason
		spring present elevates this score.
Diversity of habitat types: (Assessment of the variety of wetland types present within a site)	2	One wetland type present in a seriously modified ecological condition; however, representation of permanent and seasonal – temporary zones provide a limited diversity of habitat types.
Sensitivity of the Wetland (Median)	**1.00**	
Sensitivity to changes in floods: (Floodplains at 4; valley bottoms 2 or 3; pans and seeps 0 or 1)	1	The degraded seep is not sensitive to flooding.
Sensitivity to changes in low flows/dry season: (Unchanneled VB's probably most sensitive)	1	Seep is not sensitive to changes in low flow due to groundwater inputs.
Sensitivity to changes in water quality: (Especially natural low nutrient waters – lower nutrients likely to be more sensitive)	1	The seep wetland's immediate surrounding land use is agricultural and residential which has likely impacted the water quality over the years.
Ecological Importance and Sensitivity Score	**1.6**	
Ecological Importance and Sensitivity Category	**Moderate**	

Table 5-4: The outcome of the ecosystem services assessment for Seep Wetland 1.

		Present State			
ECOSYSTEM SERVICE		Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	0.7	1.1	0.0	Very Low
	Stream flow regulation	1.8	0.3	0.4	Very Low
	Sediment trapping	0.9	0.2	0.0	Very Low

	Erosion control	2.6	1.0	1.6	Moderately Low
	Phosphate assimilation	0.9	0.2	0.0	Very Low
	Nitrate assimilation	0.8	0.3	0.0	Very Low
	Toxicant assimilation	0.9	0.3	0.0	Very Low
	Carbon storage	1.5	2.7	1.4	Moderately Low
	Biodiversity maintenance	1.9	2.0	1.4	Moderately Low
PROVISIONING SERVICES	Water for human use	3.0	2.3	2.7	Moderately High
	Harvestable resources	1.0	0.0	0.0	Very Low
	Food for livestock	2.3	0.7	1.1	Low
	Cultivated foods	2.1	0.0	0.6	Very Low
CULTURAL SERVICES	Tourism and Recreation	1.3	1.3	0.5	Very Low
	Education and Research	1.8	0.0	0.3	Very Low
	Cultural and Spiritual	3.0	0.0	1.5	Moderately Low

5.2 Seep Wetland 2

Seep Wetland 2 is located in the northeastern corner of the site and is also groundwater-fed. Similar to Seep Wetland 1, water was visibly present at the surface and the soils in its central wet area exhibited dark, low-chroma, organic characteristics indicative of anaerobic wetland conditions. The wetland comprises a combination of *T. capensis*, *J. effusus*, *P. clandestinum*, *Cynodon dactylon* (Bermuda grass), *Cyperus polystachyos* (bunchy sedge), and *Sesbania* spp (**Figure 5-14** & **Figure 5-15**).

5.2.1 WET-Health

The Macfarlane *et al*. (2020) WET-Health Version 2.0 assessment for the Seep Wetland 1 produced an overall Present Ecological State (PES) score within category E (**Table 5-5**). This indicates that the wetland was in a seriously modified condition at the time of the assessment. Historic aerial imagery suggests that an attempt was made to infill this wetland in the beginning of 2017. However, by December 2017, the seep had re-emerged. A road was developed near the seep in 2019, and by 2021, the seep appeared to follow the shape of the road (**Figure 5-16**). The infilling from road development likely created a hard boundary, confining seepage to areas above the road. The reappearance of the wetland following the infilling confirms the persistence of groundwater interaction at this point. Additionally, some canalization has been undertaken in this seep, likely as an effort to manage or redirect water flow.

Figure 5-14: Seep Wetland 2 is situated in the northeastern corner of the site. The foreground is dominated by *C. dactylon* grasses, followed by *T. capensis* and a *Sesbania* spp. (small trees). In the background, *P. alba* trees are visible on the left, while *P. australis* is present on the right.

Figure 5-15: Seep Wetland 2 comprises dense areas of *C. polystachyos* (bunchy sedge) which can be seen just in front of the *Sesbania* spp (small tree) in this photo.

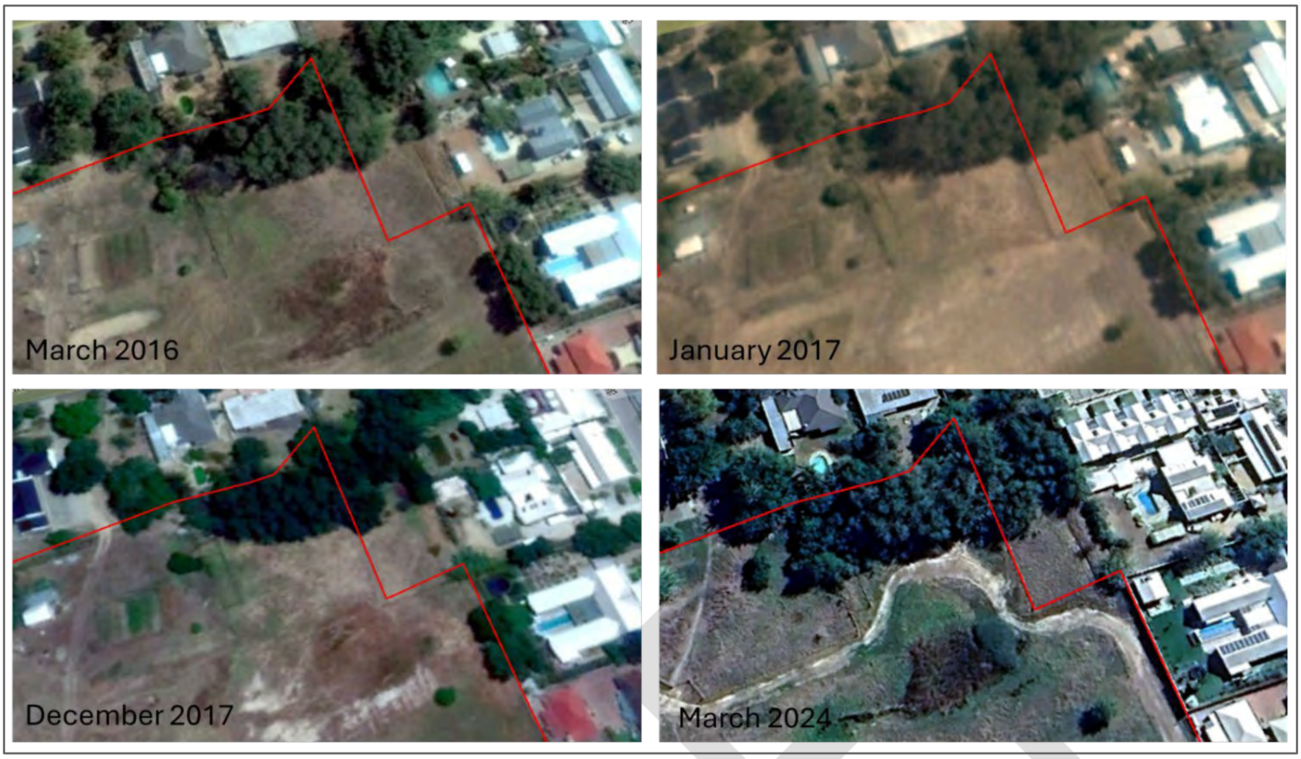

Figure 5-16: Aerial imagery of Seep Wetland 1 from 2016-2024 showing changes over time in response to disturbance

Table 5-5: Outcome of the WET-Health Assessment for the delineated hillslope seep wetland.

PES Assessment	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	6.1	6.4	5.4	7.0
PES Score (%)	39%	36%	46%	30%
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	0.0 Ha			

5.2.2 EIS & WET-EcoServices

Seep Wetland 2 achieved a median score of 2.0 which falls within the "Moderate" EIS category (**Table 5-6**). Seeps are known to provide moderate levels of streamflow regulation, nitrate removal and toxicant removal, however the level of disturbance in the seep, lowers the importance of these ecosystem services (**Table 5-7**). As the seep provides a perennial supply of water (groundwater input), this wetland provides moderate important provisioning services, in the form of water for human use.

Table 5-6: Results of the EIS assessment for Seep 2.

Ecological Importance and Sensitivity	Seep 1	Reason
	0.33	
Presence and status of Red Data species:	0	Botanical assessment did not note SCC. Unlikely given the degree of disturbance.
Populations of unique species/uncommonly large populations of wetland species:	0	None noted, unlikely to occur given disturbance.
Migration/breeding/feeding sites: (Importance of the unit for migration, breeding sites and/or feeding):	1	Possibility to be a breeding site for hardy amphibians.
Landscape Scale (Median)	**1.60**	
Protection status of the wetland: (National (4), Provincial/Private (3), municipal (1 or 2), public area (0 or 1)	0	The wetland is located within a privately owned property and is not protected.
Protection status of the vegetation type: (SANBI guidance on the protection status of the surrounding vegetation)	4	West Coast Shale Renosterveld (CR) WetVeg type, however vegetation within the wetland at present is disturbed.
Regional context of the ecological integrity: (Assessment of the PES (habitat integrity), especially in light of regional utilisation)	0	PES – E.
Size and rarity of the wetland type/s present: (Identification and rarity assessment of wetland types)	2	CR status indicates rarity, but degraded status has left only common, tolerant elements of the ecosystem intact. The spring present elevates this score.
Diversity of habitat types: (Assessment of the variety of wetland types present within a site)	2	One wetland type present in a seriously modified ecological condition; however, representation of permanent and

Ecological Importance and Sensitivity	Seep 1	Reason
		seasonal – temporary zones provide a limited diversity of habitat types.
Sensitivity of the Wetland (Median)	**1.00**	
Sensitivity to changes in floods: (Floodplains at 4; valley bottoms 2 or 3; pans and seeps 0 or 1)	1	The degraded seep is not sensitive to flooding.
Sensitivity to changes in low flows/dry season: (Unchanneled VB's probably most sensitive)	1	Seep is not sensitive to changes in low flow due to groundwater inputs.
Sensitivity to changes in water quality: (Especially natural low nutrient waters – lower nutrients likely to be more sensitive)	1	The seep wetland's immediate surrounding land use is agricultural and residential which has likely impacted the water quality over the years.
Ecological Importance and Sensitivity Score	**1.6**	
Ecological Importance and Sensitivity Category	**Moderate**	

Table 5-7: The outcome of the ecosystem services assessment for the delineated hillslope seep wetland.

	ECOSYSTEM SERVICE	Present State			
		Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	0.7	1.1	0.0	Very Low
	Stream flow regulation	2.0	0.3	0.7	Very Low
	Sediment trapping	1.1	0.2	0.0	Very Low
	Erosion control	2.6	0.8	1.5	Moderately Low
	Phosphate assimilation	1.1	0.2	0.0	Very Low
	Nitrate assimilation	1.2	0.3	0.0	Very Low
	Toxicant assimilation	1.2	0.3	0.0	Very Low
	Carbon storage	1.7	2.7	1.5	Moderately Low

	Biodiversity maintenance	1.2	2.0	0.7	Very Low
PROVISIONING SERVICES	Water for human use	2.4	2.0	1.9	Moderate
	Harvestable resources	1.5	0.0	0.0	Very Low
	Food for livestock	1.5	1.0	0.5	Very Low
	Cultivated foods	1.7	0.0	0.2	Very Low
CULTURAL SERVICES	Tourism and Recreation	1.3	1.3	0.5	Very Low
	Education and Research	1.8	0.0	0.3	Very Low
	Cultural and Spiritual	3.0	0.0	1.5	Moderately Low

5.3 Krom River

The Krom River indicated by desktop resources to traverse the northern boundary of the proposed development site was confirmed onsite. This drainage line is distinct from the onsite springs and seep wetlands. The river originates in the Kasteelberg Nature Reserve mountains to the west of the site and flows through an agricultural landscape before reaching the site (**Figure 5-1**). The drainage line receives surface inflow primarily from overland drainage originating in the upstream catchment and stormwater flows from the R311.

5.3.1 IHI Assessment

This stretch of the Krom River is deemed to be seriously modified in terms of riparian and instream habitat (**Table 5-8**). With the development of agricultural lands, the natural drainage line to the west of the road was channelized. It now crosses the road via an artificial stormwater channel before entering the northwestern boundary of the site. This channel has been severely modified and degraded, with clear signs of erosion (**Figure 5-17**). After flowing through the artificial stormwater channel, the Krom River is diverted underground via a pipeline for approximately 120 meters along the northern boundary of the site before re-emerging as a drainage line in a more natural, albeit significantly degraded, state (**Figure 5-18**). The original riparian vegetation has been severely compromised. Presently, portions of the river are overgrown with *Phragmites australis* (common reed) (**Figure 5-19**), which has replaced the expected natural riparian zone. Occasional *Searsia* shrubs were observed, along with *Populus alba* (white poplar) (**Figure 5-20**) and ornamental plant species such as oak trees (*Quercus* spp.) and *Schinus terebinthifolia* (Brazilian Pepper) trees. Where understorey vegetation is present, it comprises primarily *C. dactylon*. A pump installation was also observed immediately upstream of where the river transitions from its underground flow into the more natural channel (**Figure 5-21**).

Figure 5-17: Point at which the Krom River enters the proposed development site by means of a degraded stormwater channel. Bank stabilisation measures have collapsed and are currently blocking the stormwater pipeline.

Figure 5-18: Point at which the Krom River emerges from the underground pipeline in the northern portion of the site. Rubble has been used for infill and bank stabilisation.

Figure 5-19: The Krom River is overgrown with *P. australis* and the riparian channel is severely modified and eroded.

Figure 5-20: Portion of the Krom River downstream in the northern portion of the proposed development site. The riparian vegetation at this point comprises primarily *P.alba* trees.

Figure 5-21: Pump installation noted upstream of the point where Krom River emerges from the underground pipe.

Table 5-8: IHI Score Rating Results.

INSTREAM CRITERIA	Score	Weighting	RIPARIAN CRITERIA	Score	Weighting
Water abstraction	5	18	Water abstraction	5	12
Extent of inundation	8	8	Extent of inundation	5	5
Water quality	20	15	Water quality	18	12
Flow modification	22	18	Flow modification	18	12
Bed modification	22	18	Channel modification	18	12
Channel modification	24	15	Indigenous vegetation removal	24	12
Exotic vegetation encroachment	0	8	Exotic vegetation encroachment	6	8
Presence of exotic fauna	0	0	Bank erosion	6	10
Solid waste disposal	0	15			
Instream Habitat Integrity Score (PES)	**29**		**Riparian Habitat Integrity Score**	**29**	
Integrity Category	**E**			**E**	

5.3.2 EIS Assessment

The EIS method described in the "Resource Directed Measures for Protection of Water Resources" (Duthie et al. 1999) was used to assess the delineated stretch of the Krom River. This resulted in an overall "Low/marginal" EIS rating category for the river (**Table 5-9**).

Table 5-9: Score sheet for determining the EIS of the relevant section of the non-perennial drainage line.

Determinant	Score (0-4)	Confidence (1-4)
PRIMARY DETERMINANTS		
Rare and endangered Species	0	3
Populations of unique Species	0	3
Species/taxon richness*	1	3
Diversity of habitat types or features*	2	4
Migration route/breeding and feeding site for riverine species: Importance in terms of the link it provides for biological functioning.	2	3
Sensitivity to changes in the natural hydrological regime*: Determined by the size of the feature, available habitat types and frequency of flood events.	2	3
Sensitivity to water quality changes*: Determined by the size of the feature, available habitat types and frequency of flood events.	1	3
Energy dissipation and particulate/element removal: Roughness coefficient/Storage capacity and size.	1	3
MODIFYING DETERMINANTS		
Protected status: Ramsar Site, National Park, Wilderness area and Nature Reserve.	0	4
Ecological integrity: Degree of change of the flood regime, water quality and habitat from reference conditions.	0	4
TOTAL	9	33
MEDIAN	1	3

Determinant	Score (0-4)	Confidence (1-4)
OVERALL EIS	**Marginal/Low**	**High**

Score guideline Very high = 4; High = 3, Moderate = 2; Marginal/Low = 1; None = 0
Confidence rating Very high confidence = 4; High confidence = 3; Moderate confidence = 2; Marginal/low confidence = 1
* a rating of zero is not appropriate in this context.

5.4 Recommended Ecological Category

According to the Rountree et al. (2013) method for determining REC, the management objective for any PES Categories E or F are considered unsuitable and always require rehabilitation to a PES Category D.

5.5 Buffer Determination

An appropriate buffer has been determined using the method described in the Buffer Zone Guidelines for Rivers, Wetlands and Estuaries (Macfarlane and Bredin, 2016). A 20 m buffer area should be implemented around the remnant Seep Wetland 1; and a 15 m buffer around the Krom River (where the river is aboveground).

It is noted that the complete avoidance of the buffer areas will not be possible, as the proposed development will encroach into the suggested buffer zones. It is recommended that all non-essential construction and operational related activities must be strictly prohibited within the buffers (e.g. construction camps, laydown areas, mixing of cement, stockpiling of soils, ablution facilities etc).

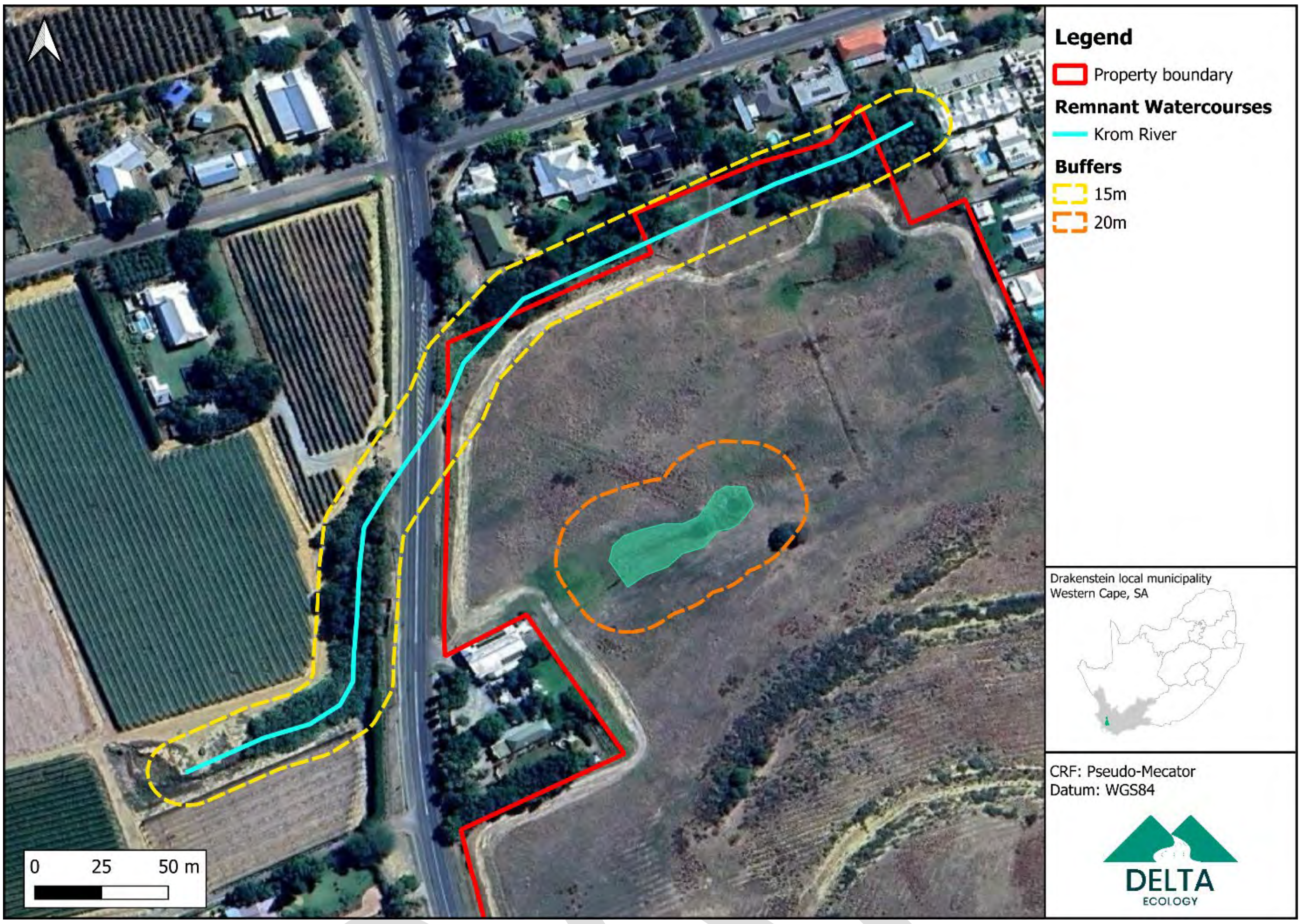

Figure 5-22: Remnant watercourses with respective buffer areas.

6 Aquatic Impact Identification

The proposed project entails the establishment of a mixed-use development on the property that will include a residential zone, retirement village, business zone, community zone and a park

Three alternatives (**Annexure 4**) are proposed as detailed below:

Alternative A1

This alternative was designed as an initial development layout submitted in the form of a pre-BAR to initiate the process of public participation and solicit input on issues, comments and impacts from initially identified I&APs, ratepayers and environmental groups, as well as organs of state. This proposal included service station on Business Zone 1 as well as a wedding venue on top of the hillock on Erf 878 as a visual feature and underestimated the importance of the sight line across the property from Church Street as one enters Riebeek Kasteel. This underestimation may have two aspects to it; one from entering the town from the south by vehicle and a different one from entering the town from the south on foot.

In a number of on-site tests that we ran with newcomers to Riebeek Kasteel via Church Street, the general consensus was that a motorist foreign to the town focussed mainly on the roadway of Church Street as it was downhill and that the church on the far hill was screened by The Barn before the vista suddenly opened up when passing Erf 878.

Driving from the north to the south down Church Street one is also confronted with a downhill slope that tends to maintain focus on the road ahead and there is no awareness of the church on the hill behind.

When on foot as a pedestrian entering the town on foot from the south, all became aware of the church on the far hill. This awareness was ascribed to the slow speed of approach and the ample time to take in the detail of the surrounding vistas.

Be it as it may, the comment of visual and heritage specialists regarding the inappropriateness of the wedding venue and church steeple with concomitant cypress trees on Riebeek Hill were taken to heart and removed from the design of the Alternative A2. There was also no consideration yet for the density of residential dwellings on top of Riebeek Hill and the grid-block type layout of the old residential areas of Riebeek Kasteel.

Alternative A2

This alternative with specialist input in architectural design and some rudimentary visual and heritage input in the exploratory phase of meeting the Heritage Western Cape requirements. Specialist input to meet the requirements that a heritage Impact Assessment with specific reference to townscape analysis, visual impact assessment and heritage design indicators as well as an overall assessment of the impact on heritage resources, were not yet fully implemented.

The Alternative A2 resulted in the removal of the proposed wedding venue and small church steeple as a visual focal point on the top of Riebeek Hill. This was replaced with ~25 single storey residential dwellings on top of Riebeek Hill, but still no consideration yet for the density of residential dwellings on top of Riebeek Hill and the grid-block type layout of the old residential areas of Riebeek Kasteel. The visual sight corridor from Church Street across the middle of Erf 878 to the old church steeple on the distant ridge to the northeast was cleaned up. The economic impact with the increased number of residential dwellings were also more positive according to the proponent. This was because the economic benefit would be realised over a shorter period of time with the sale of the ~23 erven, than with the economic benefit of a wedding venue that would accrue over a longer period of time with rentals.

However, in the meantime, discussions were held with people knowledgeable in the field of HIA and specialist studies were embarked upon as inputs to the heritage impact assessment as stipulated by Heritage Western Cape in their letter of 4 June 2021. The outcome of these discussions and specialist studies was that the design layout was once again changed to culminate in Alternative A3.

Alternative A3

This layout was developed after extensive specialist input as requested by Heritage Western Cape be sought to meet the requirements that a heritage Impact Assessment with specific reference to townscape analysis, visual impact assessment and heritage design indicators as well as an overall assessment of the impact on heritage resources, were fully implemented. This resulted in the design of the Alternative A3 layout that also became the preferred alternative.

The preferred Alternative A3 differed from the Alternative A2 layout in that the grid-block layout in the older part of the Riebeek Kasteel was replicated as far as possible on Erf 878. Riebeek Hill topography did present somewhat of a problem due to the configuration of the landform and requirement that the stormwater and other underground services had to be placed in the road reserves.

The biggest difference between the non-preferred Alternative A2 and the preferred Alternative A3 lies in the drastic reduction of the number of erven on top of Riebeek Hill from 23 to 11, a reduction of 12 residential erven. The general sizes of the 23 erven layout ranged from 600-750m^2 and that for the 11 erven layout generally from 1000-1400m^2 in the same surface area. This Alternative A3 layout constitutes in general terms roughly half the number of erven with double the size as opposed to non-preferred Alternative A2.

At present the proposed development area (as a whole) coincides with approximately 0.6 Ha of seriously degraded hillslope seep wetland. The permanent zone of Seep Wetland 1 (an area of 0.13 Ha) will be set aside, along with a 20 m buffer, as private open space.

The potential impacts to the seeps as a result of the proposed development are listed below:

<u>Construction Phase</u>

1. Areas of the onsite seep wetland (approximately 0.5 Ha) will be lost as a result of the proposed development.
2. Alteration of the flow regime of onsite remnant watercourses during construction of the proposed development.
3. Water quality impairment due to increased sediment input and erosion during construction of the proposed development.
4. Water quality impairment due to potential spillage, or release of potentially contaminated runoff during construction of the proposed development.

<u>Operational Phase</u>

5. Alteration of the flow regime, sedimentation, and erosion of the remnant watercourses once the Eco-Lifestyle estate is complete, due to potential flow diversion or increase in storm flows.
6. Water quality impairment due to the release of potentially contaminated stormwater (hydrocarbons) into the onsite watercourses.

7 Mitigation and Management Measures

The following mitigation and management measures are proposed for the development in order to ensure that there is no nett loss to aquatic ecosystem functionality, and to ensure that impact to the remnant watercourses is minimized:

- The loss of the seriously degraded Seep Wetland 2, along with the loss of portions of Seep Wetland 1, should be compensated for by rehabilitating the Remnant Seep Wetland 1. It should be noted that the Offset Calculator needs to be completed and should the rehabilitation of the remnant Seep Wetland 1 not compensate for the loss, additional onsite or offsite wetland areas may need to be considered.
- Throughflow of water from the Remnant Seep Wetland 1 downslope must be achieved, ideally in the form of earthen swales vegetated with indigenous wetland vegetation, connecting to the Krom River downstream to ensure habitat connectivity.
- Avoid encroachment into the remnant Seep Wetland 1 and the Krom River during construction and operational phases. These two areas should be set aside as a No Go for construction and operational phases.
- A 20 m buffer area should be implemented around the remnant Seep Wetland 1; and a 10 m buffer around the Krom River (aboveground). The portions of the buffer areas that are located outside of the demarcated construction footprint should be designated as a No-Go area.
- The buffer areas surrounding the remnant watercourses (Seep wetland 1 and Krom River) should be landscaped and consist of indigenous vegetation.
- The buffer areas should be regularly monitored (once a month) to ensure that the vegetation is healthy; and that no Alien Invasive Plant Species colonize this area as well as within the watercourses.
- The Krom River section that occurs within the site should be rehabilitated, as per a River Maintenance and Management Plan.
- It is recommended that a groundwater impact assessment is conducted during the WULA.
- Effective stormwater management should be implemented, which ensures that sediment laden stormwater flow from the construction area, particularly during storm events, does not enter downslope remnant watercourses. A regular monitoring system should be set up by the Environmental Control Officer (ECO) which ensures that if sedimentation does occur downslope, remediation measures are implemented.
- No stormwater runoff should flow directly into the downslope aquatic environment. Flow dissipaters should be constructed to reduce the velocity of flow which should be released as diffuse as opposed to channelled flow.
- No untreated stormwater should enter the Remnant Seep Wetland 1 or “Offset” wetland area. Allowance must be made for stormwater to be treated in a vegetated detention pond and/or a substantial vegetated swale before release into the Krom River or prior to release into the Remnant Seep Wetland 1.

- Stormwater/erosion/sediment control measures are to remain in place until construction has been completed, and operational storm water management infrastructure is in place and operating correctly.
- Sheet runoff from hardened surfaces must be intercepted and the treatment and infiltration of runoff must be promoted.
- Sediment traps should be incorporated into stormwater drains / swales upstream of discharge points.
- Monitor the proposed development and adjacent remnant watercourses for erosion and sedimentation after heavy rainfall events. Any erosion noted must be immediately addressed. Rehabilitation measures may include the removal of accumulated sediment by hand, filling of erosion gullies and rills, the stabilisation of gullies with silt fences, riprap, and the revegetation of stabilised areas.
- Stormwater systems will require ongoing maintenance. Any build-up of silt or debris within stormwater drains or swales will need to be cleared to ensure the continued functioning of the systems.
- Any damage to stormwater infrastructure, and any flaws identified in the functionality of stormwater infrastructure, must be rectified immediately.
- Incorporate measures into the stormwater design to trap solid waste, debris and sediment carried by stormwater. Measures may include the use of curb inlet drain grates and debris baskets/bags.
- Stormwater generated from areas with a higher risk of contamination such as parking areas and roads must receive basic filtering and treatment prior to its release into surrounding areas. Treatment methods may include sand filter traps and oil-water separators which will require maintenance.
- Stormwater systems must be monitored and maintained into perpetuity and collections of debris and solid waste removed from grates and baskets. The developer must confirm who will be responsible for this monitoring and maintenance as well as their roles.
- Municipal water supply should be used if possible. 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.
- 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 (or as per Engineering guidelines / specifications).
- Construct sewage pipelines in accordance with the relevant SANS / SABS specifications.
- Design the pipelines to accommodate the operating and surge pressures.
- Provide surge protection e.g air valves.
- Allow for scour valves along pipelines in order to ensure sewage pipelines can be emptied in a controlled manner if required.
- Allow for surcharge containment and emergency storage of 2 hours of peak flow at manholes located within areas upslope of the remnant watercourses.

Containment/emergency storage may include a concrete box or earthen bund surrounding the manholes. The backup storage capacity of manholes may also be improved by raising the manholes by one meter.

- The sewage system must be monitored and maintained into perpetuity. The developer must confirm who will be responsible for this monitoring and maintenance as well as their roles.
- Undertake initial clearing in the early dry season (November to January) if possible.
- Locate site camps, laydown areas, stockpile areas, construction material, equipment storage areas, vehicle parking areas, bunded vehicle servicing areas and re-fuelling areas in designated areas of already hardened surface or disturbed areas located outside of the No Go areas (remnant watercourses and buffers). These areas should preferably be located on level ground in a previously disturbed area of vegetation approved by the ECO. Cut and fill must be avoided where possible during the set-up of the construction site camp.
- Any dumping / littering within the No Go areas is strictly prohibited. Spoil material must be appropriately disposed of at a registered waste disposal facility.
- Topsoils and subsoils removed from the construction footprint must be stored separately at the designated stockpile area for future rehabilitation.
- Vegetation clearance should be restricted to the relevant development components and indigenous vegetation cover should be maintained as far as practically possible.
- Vegetation which is considered suitable for rehabilitation activities after construction (such as indigenous grasses and other herbaceous species) should be carefully removed from the construction footprint and stored at an appropriate facility for use in later rehabilitation activities.
- An ECO must inspect the construction footprint on a weekly basis and must take immediate measures to address unforeseen disturbances to the remnant watercourses and buffers. Any disturbed / compacted areas falling outside of the demarcated construction footprint must be immediately rehabilitated. Depending on the extent of damage the method of rehabilitation may require input from an aquatic specialist / suitably qualified contractor.
- Erosion should be monitored for and addressed immediately, especially after rainfall events. Implement erosion control measures if / where required. Examples of erosion control measures may include:

- Covering steep/unstable/erosion prone areas with geotextiles.
- Covering areas prone to erosion with brush packing, straw bales, mulch.
- Stabilizing cleared/disturbed areas susceptible to erosion with sandbags.

- Constructing silt fences / traps in areas prone to erosion, to retain sediment-laden runoff. Silt fences must be adequately maintained. Furthermore, the farm manager must monitor sediment fences / traps after every heavy rainfall event and any sediment that has accumulated must be removed by hand.
- Fuel, chemicals, and other hazardous substances should preferably be stored offsite, or as far away as possible from the no-go areas. These substances must be stored in suitable

secure weather-proof containers with impermeable and bunded floors to limit pilferage, spillage into the environment, flooding, or storm damage.

- All construction machinery and vehicles used within the site should be regularly serviced.
- Inspect all storage facilities, vehicles, and machinery daily for the early detection of deterioration or leaks and strictly prohibit the use of any vehicles or machinery from which leakage has been detected.
- Mixing and transferring of chemicals or hazardous substances must take place outside of the remnant watercourses and its associated buffer area, and must take place on drip trays, shutter boards or other impermeable surfaces.
- Drip trays must be utilised at all fuel dispensing areas.
- Vehicles and machinery should preferably be cleaned off site. Should cleaning be required on site it must only take place within designated areas outside of remnant watercourses and its associated buffer areas and should only occur on bunded areas with a water/oil/grease separator.
- Dispose of used oils, wash water from cement and other pollutants at an appropriate licensed landfill site.
- Avoid the use of infill material or construction material with pollution / leaching potential. Where possible, in situ earthen materials must be used during construction in order to reduce the risk of leachate from imported materials contaminating the remnant watercourses.
- Concrete should preferably be imported as "ready-mix" concrete from a local supplier. Should onsite concrete mixing be required it must not be done on exposed soils. Concrete must be mixed on an impermeable surface in an area of low environmental sensitivity identified by the ECO outside of the no-go area. Surplus or waste concrete must be sent back to the supplier who will dispose of it.
- Construct temporary bunds around areas where cement is to be cast in situ.
- Clean up any spillages immediately with the use of a chemical spill kit and dispose of contaminated material at an appropriately registered facility.
- Dispose of concrete and cement-related mortars in an environmental sensitive manner (can be toxic to aquatic life). Disposal of any of these waste materials into the stormwater system or the remnant watercourses is strictly prohibited.
- Washout must not be discharged into the no-go area or the stormwater system. A washout area should be designated, and wash water should be treated on-site.
- Provide portable toilets where work is being undertaken (1 toilet per 10 construction workers). These toilets must be located within an area designated by the ECO outside of the no-go areas, should preferably be located on level ground, and must be regularly serviced and maintained.
- Provide an adequate number of bins on site and encourage construction personnel to dispose of their waste responsibly.

- Waste generated by construction personnel must be removed from the site and disposed of at a registered waste disposal facility on a weekly basis.
- In line with the NEMBA, all AIPS listed under the amended AIPS Lists (DEFF: GN1003, 2020) must either be removed or controlled on land under the management of the proponent. An AIPS control plan must therefore be compiled which includes measures to control and prevent the proliferation of AIPS during the construction phase.
- Residents, or tenants, should be made aware of the Wetland Offset or Remnant Seep Wetland 1 within the site. Should any pollution events occur, such as spills of petrol, etc. the spread to the wetland area should be prevented, by applying / covering with absorbent materials. In no circumstance should pollutants enter the SW system or the remnant watercourses on site.

8 Impact Assessment

This section should be read in conjunction with **Section 7** of this report for recommended mitigation and management measures, to be implemented during construction and operation of the proposed mixed-use development.

The six potential aquatic impacts identified in Section 7 were assessed first without and then with application of mitigation measures. Five out of six of the post-mitigation scores fell within the within the “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 (+- 0.5 Ha) and the degraded nature of the wetland areas to be lost, 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 watercourses due to onsite and adjacent land uses – and would therefore still result in negative impact to the delineated watercourses. No indirect impacts were noted.

Alternative 1 and 2 both included a service station within proximity to Seep 1, while Alternative 1 also included a wedding venue on top of the hillock on the site. Alternative 3, which excludes the fuel station located close to Seep 1 is preferred from an aquatic perspective, as this alternative leads to a reduced potential risk of contamination of remnant Seep 1 during the operational phase.

8.1 Construction Phase: All 3 Alternatives

Table 8-1: Assessment results for Impact 1

Impact 1: Wetland Loss				
Description		At present the proposed development area (as a whole) coincides with approximately 0.6 Ha of seriously degraded hillslope seep wetland. The permanent zone of Seep Wetland 1 (an area of 0.13 Ha) will be set aside, along with a 20 m buffer, as private open space.		
Mitigation Measures		Refer to Section 7		
	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				
Description		**Site clearance, infilling and compaction in the catchment area of the watercourses may result in alteration of the flow regime.**		
Mitigation Measures		**Refer to Section 7**		
	Impact Without Mitigation		**Impact With Mitigation**	
Consequence				
Intensity of Impact	3	Medium / Harmful	2	Low / Slightly Harmful
Duration of Impact	5	Beyond 20 years / Permanent	2	1 month to 1 year
Extent / spatial scale of impact	1	Limited to local catchment	1	Limited to project site
Reversibility	3	Moderate cost / Moderate likelihood of success	2	Low cost / Moderately high likelihood of success
Loss of irreplaceable resources	2	Low	1	None
Cumulative Impact	2	Low	1	Very 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	5	Definite	3	Possible
Impact Significance				
Consequence	2.45	Low	1.54	Low
Probability	5	Very High	2	Low
Impact Significance	**2.96**	**Medium**	**1.63**	**Low**

Table 8-3: Assessment results for Impact 3

Impact 2: Erosion and Sedimentation				
Description	The removal of vegetation and stripping of soils from the construction footprint will result in the exposure of soils to erosive elements. An increase in stormwater runoff and velocities from exposed and compacted areas, particularly during peak rainfall periods, may result in the formation of erosion gullies and rills in the downslope watercourses. In addition, destabilisation of soils during the removal of vegetation and excavation activities, as well as the stockpiling of soils may result in an increase in the runoff of sediment laden stormwater into the downslope watercourses from the construction footprint, particularly during the rainy season.			
Mitigation Measures	Refer to Section 7			
	Impact Without Mitigation		**Impact With Mitigation**	
Factor		-		-
Consequence				
Intensity of Impact	3	Medium / Harmful	2	Low / Slightly Harmful
Duration of Impact	5	Beyond 20 years / Permanent	2	1 month to 1 year
Extent / spatial scale of impact	1	Limited to local catchment	1	Limited to project site
Reversibility	3	Moderate cost / Moderate likelihood of success	2	Low cost / Moderately high likelihood of success
Loss of irreplaceable resources	2	Low	1	None
Cumulative Impact	2	Low	1	Very 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	5	Definite	3	Possible
Impact Significance				
Consequence	2.45	Low	1.54	Low
Probability	5	Very High	2	Low
Impact Significance	**2.96**	**Medium**	**1.63**	**Low**

Table 8-4: Assessment results for Impact 4

Impact 4: Water quality impairment				
Description	The movement of construction vehicles and the use of machinery during construction increases the possibility of the contamination of the watercourses by hydrocarbons, oils and grease which may leak from the vehicles / machinery or spill during poor dispensing practices and enter the watercourses directly, or indirectly with stormwater runoff. There is also a possibility that the watercourses will be contaminated by the runoff/spillage of cement and other construction related materials from the construction footprint. Contamination of the watercourses by sewage may occur as a result of leakages from portable chemical toilet facilities, or the informal use of surrounding areas by workers. Additional impacts to the watercourses as a result of the disposal of solid waste (including litter and building material) may also occur.			
Mitigation Measures	Refer to Section 7			
	Impact Without Mitigation		**Impact With Mitigation**	
Factor		-		-
Consequence				
Intensity of Impact	3	Medium / Harmful	2	Low / Slightly harmful
Duration of Impact	2	1 month to 1 year	2	1 month to 1 year
Extent / spatial scale of impact	1	Limited to project site	1	Limited to project site
Reversibility	3	Moderate cost / Moderate likelihood of success	2	Low cost / Moderately high likelihood of success
Loss of irreplaceable resources	2	Low	1	None
Cumulative Impact	1	Very Low	1	Very Low
Probability				
Frequency of the Activity	4	Monthly to annually	3	1 to 5 years
Likelihood of the Incident / Impact occurring	3	Possible	2	Unlikely

Impact Significance				
Consequence	2.09	Low	1.54	Very Low
Probability	3.5	Medium	2.5	Low
Impact Significance	**2.37**	**Low**	**1.7**	**Low**

8.2 Operational Phase: Alternative 1 & 2

Table 8-5: Assessment results for Impact 5

Impact 5: Altered flow regime and erosion				
Description	An increase in stormwater runoff volumes and velocities from the bare / hardened surfaces associated with the proposed development, or from areas left bare as a result of construction related activities may result in channel and headcut erosion as well as sedimentation of the remnant watercourses.			
Mitigation Measures	Refer to Section 7			
	Impact Without Mitigation		Impact With Mitigation	
Factor		-		-
Consequence				
Intensity of Impact	3	Medium / Harmful	2	Low/ Slightly Harmful
Duration of Impact	5	Beyond 20 years / Permanent	5	Beyond 20 years / Permanent
Extent / spatial scale of impact	2	Local catchment	1	Limited to project site
Reversibility	3	Moderate cost / Moderate likelihood of success	2	Low cost rehabilitation / Moderately high likelihood of success
Loss of irreplaceable resources	2	Low	1	Very Low
Cumulative Impact	2	Low	1	Very Low
Probability				
Frequency of the Activity	5	Weekly to monthly	5	Weekly to monthly
Likelihood of the Incident / Impact occurring	5	Definite	4	Likely

Impact Significance				
Consequence	2.73	Medium	1.82	Low
Probability	5	Very High	4.5	High
Impact Significance	**3.18**	**Medium**	**2.30**	**Low**

Table 8-6: Assessment results for Impact 5

Impact 6: Water quality impairment				
Description	**The water quality of the remnant watercourses may be impacted as a result of the runoff of contaminated stormwater from the proposed fuel station.** **Additionally, the water quality of the remnant watercourses may be impacted as a result of the runoff of contaminated stormwater from the urban surface of the proposed development. Contaminants may include hydrocarbons, detergents, fertilizers and heavy minerals. However, with the inclusion of stormwater design measures which allow for the infiltration and treatment of stormwater this impact can be greatly reduced.** **With a housing/commercial development there is also a long-term risk that the remnant watercourses may be impacted on as a result of sewage surcharge or as a result of the leakage of sewage from poorly maintained pipes, manholes or sewage pumps.**			
Mitigation Measures	**Refer to Section 7**			
	Impact Without Mitigation		**Impact With Mitigation**	
Factor		-		-
Consequence				
Intensity of Impact	3	Medium / Harmful	2	Low / Slightly harmful
Duration of Impact	2	1 month to 1 year	2	1 month to 1 year
Extent / spatial scale of impact	1	Limited to project site	1	Limited to project site
Reversibility	3	Moderate cost / Moderate likelihood of success	3	Moderate cost / Moderate likelihood of success
Loss of irreplaceable resources	2	Low	2	Low
Cumulative Impact	2	Low	2	Low
Probability				
Frequency of the Activity	4	Monthly to annually	4	Monthly to annually

Likelihood of the Incident / Impact occurring	3	Possible	3	Possible
Impact Significance				
Consequence	2.18	Low	1.81	Low
Probability	3.5	Medium	3.5	Medium
Impact Significance	**2,45**	**Low**	**2.15**	**Low**

8.3 Operational Phase: Alternative 3

Table 8-7: Assessment results for Impact 5

Impact 5: Altered flow regime and erosion				
Description	**An increase in stormwater runoff volumes and velocities from the bare / hardened surfaces associated with the proposed development, or from areas left bare as a result of construction related activities may result in channel and headcut erosion as well as sedimentation of the remnant watercourses.**			
Mitigation Measures	**Refer to Section 7**			
	Impact Without Mitigation		**Impact With Mitigation**	
Factor		-		-
Consequence				
Intensity of Impact	3	Medium / Harmful	2	Low/ Slightly Harmful
Duration of Impact	5	Beyond 20 years / Permanent	5	Beyond 20 years / Permanent
Extent / spatial scale of impact	2	Local catchment	1	Limited to project site
Reversibility	3	Moderate cost / Moderate likelihood of success	2	Low cost rehabilitation / Moderately high likelihood of success
Loss of irreplaceable resources	2	Low	1	Very Low
Cumulative Impact	2	Low	1	Very Low
Probability				
Frequency of the Activity	5	Weekly to monthly	5	Weekly to monthly

Likelihood of the Incident / Impact occurring	5	Definite	4	Likely
Impact Significance				
Consequence	2.73	Medium	1.82	Low
Probability	5	Very High	4.5	High
Impact Significance	**3.18**	**Medium**	**2.30**	**Low**

Table 8-8: Assessment results for Impact 5

Impact 6: Water quality impairment				
Description	**The water quality of the remnant watercourses may be impacted as a result of the runoff of contaminated stormwater from the urban surface of the proposed development. Contaminants may include hydrocarbons, detergents, fertilizers and heavy minerals. However, with the inclusion of stormwater design measures which allow for the infiltration and treatment of stormwater this impact can be greatly reduced.** **With a housing/commercial development there is also a long-term risk that the remnant watercourses may be impacted on as a result of sewage surcharge or as a result of the leakage of sewage from poorly maintained pipes, manholes or sewage pumps.**			
Mitigation Measures	**Refer to Section 7**			
	Impact Without Mitigation		**Impact With Mitigation**	
Factor		-		-
Consequence				
Intensity of Impact	2	Low / Slightly Harmful	2	Low / Slightly harmful
Duration of Impact	2	1 month to 1 year	2	1 month to 1 year
Extent / spatial scale of impact	1	Limited to project site	1	Limited to project site
Reversibility	3	Moderate cost / Moderate likelihood of success	2	Low cost / Moderately high likelihood of success
Loss of irreplaceable resources	2	Low	1	None
Cumulative Impact	2	Low	1	Very Low
Probability				

Frequency of the Activity	4	Monthly to annually	3	1 to 5 years
Likelihood of the Incident / Impact occurring	3	Possible	2	Unlikely
Impact Significance				
Consequence	2.18	Low	1.54	Very Low
Probability	3.5	Medium	2.5	Low
Impact Significance	**2,45**	**Low**	**1.7**	**Low**

8.4 No-Go Scenario

Table 8-9: 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**

9 Risk Assessment

The Risk Assessment Matrix prescribed by GN 4167 of 2023 (**Annexure 3**) was applied to the proposed project with the following outcomes:

1. The risk associated with wetland loss, was found to be within the Moderate - Risk category.
    - The delineated seep areas have a PES score in the E category (Seriously Modified), exhibits Moderate EIS and offers Moderate ecosystem services.
    - The historical wetland vegetation type is CR, although the vegetation currently on the site is considered highly degraded.
    - There is limited hydrological connection to downstream watercourses due to the seriously impacted hydrological, and geomorphology components of the seep; as well as the residential (including SW infrastructures) land use downstream.
2. Risks 2 -6 were all found to fall within the Low-Risk category. The key factors included:
    - With the implementation of appropriate mitigation / management measures, the risks can be largely reduced / minimized onsite.
    - Of importance is that the remnant watercourses will be set aside as No-Go areas, and a buffer area will be designated within which limited activities – specifically naturally vegetated (indigenous species) gardens/landscaped open space, please refer to **Section 7**).

10 Conclusion and Recommendations

This report sets out the results from a desktop analysis, as well as a field assessment conducted on the 20th of February 2025, to assess the potential aquatic impacts associated with the proposed mixed-use development on Erf 878 Riebeek Kasteel.

Following the aquatic biodiversity assessment, the Krom River was confirmed to intersect the northern boundary of the proposed development site. In addition, two seep wetland systems were identified onsite, both of which are sustained by groundwater emergence in the form of springs. Seep wetland 1 historically would have extended to the east, downslope of the site, but the development of roads and residential areas has resulted in canalisation of this flow.

Several patches of artificial seepage dominated by *Pennisetum clandestinum* (kikuyu grass) were observed, primarily along the western boundary. These artificially created seepage areas will not be assessed as they lack a natural reference state, do not exhibit ecological importance or sensitivity, and do not fulfil any significant ecosystem services.

Given the confirmed presence of onsite watercourses 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 watercourses were assessed using current best practice assessment methodologies to determine the Present Ecological State (PES), Index of Habitat Integrity (IHI), Ecological Importance and Sensitivity (EIS), the contribution to Wetland Ecosystem Services (WES), and Recommended Ecological Category (REC) metrics. The results of these assessments are as follows:

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

	PES	EIS	WES (Highest)	REC
Seep Wetland 1	E	Moderate	Moderately High	D
Seep Wetland 2	E	Moderate	Moderate	D
Krom River	E	Marginal/Low	-	N/A

Three alternative layouts were considered for the proposed development on the site. 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 (RAM) prescribed by GN4167 of 2023. The six potential aquatic impacts were assessed first without, and then with, application of mitigation measures, for the three proposed Alternatives.

The six potential aquatic impacts identified were assessed first without and then with application of mitigation measures. Five out of six of the post-mitigation scores fell within the within the "Low" impact categories. Ordinarily, wetland loss would fall within the 'high' category, but the limited area of wetland loss (+- 0.5 Ha) and the degraded nature of the wetland areas to be lost, has reduced the impact significance to a 'moderate or medium" category.

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 watercourses due to onsite and adjacent land uses – and would therefore still result in negative impact to the delineated watercourses.

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

Mitigation and management measures are proposed in Section 7 of this report. The key recommendations include:

- The loss of the seriously degraded Seep Wetland 2, along with the loss of portions of Seep Wetland 1, should be compensated for by rehabilitating the Remnant Seep Wetland 1. It should be noted that the Offset Calculator needs to be completed and should the rehabilitation of the remnant Seep Wetland 1 not compensate for the loss, additional onsite or offsite wetland areas may need to be considered.
- Throughflow of water from the Remnant Seep Wetland 1 downslope must be achieved, ideally in the form of earthen swales vegetated with indigenous wetland vegetation, connecting to the Krom River downstream to ensure habitat connectivity.
- No untreated stormwater should enter the Remnant Seep Wetland 1 or "Offset" wetland area. Allowance must be made for stormwater to be treated in a vegetated detention pond and/or a substantial vegetated swale before release into the Krom River or Remnant Seep Wetland 1.
- Avoid encroachment into the remnant Seep Wetland 1 and the Krom River during construction and operational phases. These two areas should be set aside as a No Go for construction and operational phases.
- A 20 m buffer area, consisting of indigenous vegetation, should be implemented around the remnant Seep Wetland 1; and a 10 m buffer around the Krom River (aboveground). The portions of the buffer areas that are located outside of the demarcated construction footprint should be designated as a No-Go area.
- The Krom River section that occurs within the site should be rehabilitated, as per a River Maintenance and Management Plan.
- Municipal water supply should be used if possible. 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.
- It is recommended that a groundwater impact assessment is conducted during the WULA.

Alternative 1 and 2 both included a service station within proximity to Seep 1, while Alternative 1 also included a wedding venue on top of the hillock on the site. Alternative 3, which excludes the fuel station located close to Seep 1 is preferred from an aquatic perspective.

It is therefore the opinion of the specialist that the proposed development can be approved subject to implementation of the mitigation measures listed in this report.

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