AQUATIC BIODIVERSITY COMPLIANCE STATEMENT AND RISK ASSESSMENT

DEVELOPMENT OF AN ADDITIONAL POULTRY REARING FACILITY ON THE REMAINDER OF FARM GROOTVLEI NO. 225, CALEDON

April 2025

PHS Consulting | olivia@phsconsulting.co.za | +27 76 849 5969

REPORT INFORMATION

DOCUMENT NAME:	Aquatic Biodiversity Compliance Statement and Risk Assessment, Farm Grootvlei RE/225, Caledon
NUMBER OF PAGES:	36
AUTHOR:	Olivia Brunings (SACNASP: 154065 - Candidate)
REVIEWER:	Kimberley van Zyl (SACNASP: 117097)

SPECIALIST DETAILS

Specialist Details | Olivia Brunings	
Company Name	PHS Consulting
Address	P.O Box 1752, Hermanus, 7200
Email	olivia@phsconsulting.co.za
Telephone	076 849 5969
Highest Qualification	BSc. Conservation Ecology (Stellenbosch University)
SACNASP Reg. No.	154065 (Candidate)
Area of Specialisation	Ecology

Olivia Brunings is an ecologist with a BSc in Conservation Ecology from the University of Stellenbosch. During the course of her studies and internship experiences, she has gained valuable and informed insight into the functioning of natural and socio-ecological systems, including aquatic ecology, as well as many key research, monitoring and assessment skills. Olivia has substantial work experience in the aquatic ecology sector and has conducted aquatic specialist work in the agricultural, residential development, renewable energy, resort development and biodiversity conservation sectors.

Specialist Details | Kimberley Perry	
Company Name	Delta Ecology
Physical address	20 Wessels Road, Kenilworth, Cape Town 7708
Email Address	Kimberley@deltaecologists.com
Telephone	078 275 8815
Highest Qualification	MSc. Water Resource Management (University of Pretoria)
SACNASP Reg. No.	117097
Area of Specialisation	Ecology

Kimberley van Zyl is an ecologist and environmental scientist with over 9 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.

TABLE OF CONTENTS

1. INTRODUCTION

1.1. Project Background

The owner of farm Remainder (RE) of 225 Grootvlei in Caledon is undertaking a Basic Assessment (BA) Process as required by the National Environmental Management Act (NEMA) (Act 107 of 1998) for the establishment of an additional poultry rearing facility on the property. The proposed development includes the construction of ten new chicken houses with free-range grazing areas, staff housing, ablution facilities supported by a septic tank system, an office, a loading bay, a shaving shed, a water treatment facility, a generator room, internal access routes, and a biosecurity access control point.

Farm RE/225, Grootvlei, Caledon is approximately 317ha in extent and is located approximately 15 kilometres northeast of Caledon and approximately 3 kilometres north of the N2 with access via a dirt road (Figure 1). A preferred development site, located in the northeast of the property, has been identified for the proposed facility (Figure 2). This location was selected based on factors such as existing access routes, prevailing wind directions, topography and biosecurity requirements. Environmental sensitivities will also be considered before finalizing the development footprint.

Desktop resources indicate that the proposed development site is located within the 500 m regulated area of several freshwater features. Due to potential aquatic biodiversity constraints, PHS Consulting was appointed to conduct an Aquatic Biodiversity Compliance Statement and Risk Assessment for the proposed development.

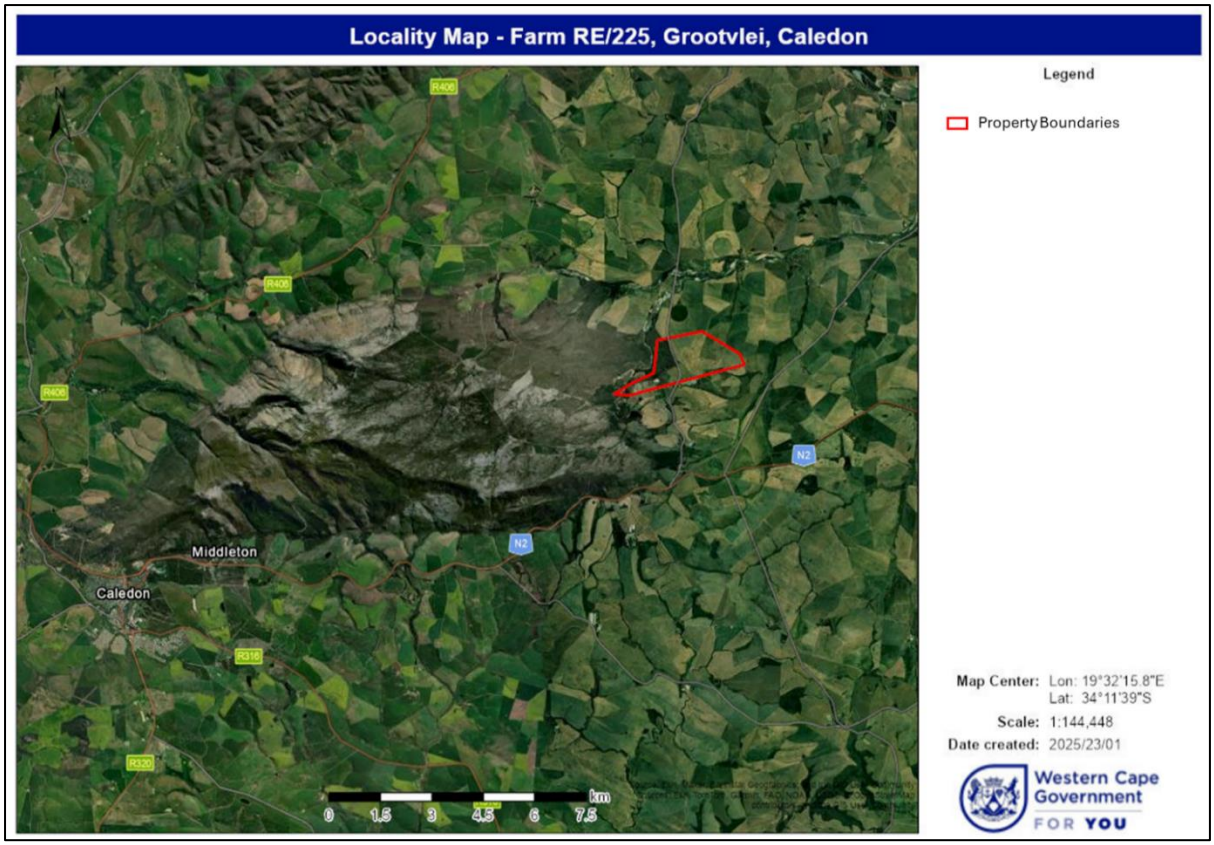

Figure 1: Location of Farm RE/225, Grootvlei, Caledon

Figure 2: Location of the proposed development site within Farm RE/225, Grootvlei, Caledon

1.2. Terms of Reference

The terms of reference agreed upon for this assessment include:

- A desktop background assessment to identify potential aquatic biodiversity constraints within the proposed site and surrounds. The desktop assessment included a 100 m Zone of Regulation (ZoR) to cover activities within the regulated proximity of rivers/streams, and 500 m ZoR to cover activities within the 500 m regulated proximity of wetlands.
- A site assessment to confirm potential aquatic biodiversity constraints associated with the proposed development.
- Delineation of all watercourses that may intersect with or be affected by the proposed development activities using a combination of site-based and desktop methodologies as appropriate.
- Application the Risk Assessment Matrix (RAM) as stipulated by Notice No 4167 of GG 49833, 2023 promulgated in terms of the National Water Act (Act 36 of 1998) to the proposed development (if applicable).
- Drafting of an Aquatic Biodiversity Compliance Statement or Aquatic Biodiversity Specialist Assessment as outlined in GN320 of 2020 based on the verification of the sensitivity of the site and potential development impacts including the following:
    - General site description.
    - Site sensitivity verification.
    - Description of the drivers and key components of all watercourses that are likely to be impacted upon by the proposed development.
    - Results of the DWS RAM (if applicable).
    - Clarification of the legislative implications and authorisation processes required for various development scenarios; and
    - Aquatic biodiversity mitigation and management recommendations.

1.3. Limitations and Assumptions

The following limitations and assumptions apply to this assessment:

- Findings, recommendations, and conclusions provided in this report are based on the authors' best scientific and professional knowledge and information available at the time of report compilation.
- A single site assessment was undertaken on the 7th of February 2025. The timing of the visit falls within the dry, summer season for the Western Cape. This assessment does not cover complete seasonal variation in conditions at the site, however historical aerial imagery (Google Earth and NGI), and topographic data from CD: NGIcould be used as an estimate of watercourse indicators which was deemed adequate for the purpose of this assessment.
- Long-term cultivation onsite has significantly transformed the natural vegetation and soils within the property, potentially obscuring historic freshwater features. As such, watercourses were delineated using

a combination of field surveys, aerial imagery from Google Earth and National Geo-spatial Information (NGI), and topographic data from CD: NGI to ensure the highest possible accuracy. The specialists are of the opinion that the natural onsite watercourses as indicated in this report have adequately been identified and assessed for the purpose of the development and this report.

- Infield watercourse delineation was undertaken by means of a Garmin eTrex 20 GPS. This GPS has an expected accuracy of 3m at the 90th percentile. At certain key localities a weighted point averaging function was used to improve accuracy.

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 screening.

1.4. Use of this report

This report reflects the professional judgement of its author, and, as such the full and unedited contents of this report should be submitted in applications to the relevant authorities for the proposed development outlined herein. Any summary of the findings should only be produced with the approval of the author.

2. SITE SENSITIVITY VERIFICATION

According to the national web-based environmental screening tool report (DFFE, 2025), the proposed development site has a "Low" Combined Aquatic Biodiversity Theme Sensitivity. A desktop review and a field assessment on 7 February 2025 confirmed the site's "Low" sensitivity classification.

The 2023 Western Cape Biodiversity Spatial Plan (WCBSP) does not indicate any mapped Critical Biodiversity Areas (CBA) or Ecological Support Areas (ESA) located within the proposed development site. A terrestrial CBA is indicated southwest of the proposed development footprint; however, it appears that this area coincides with a farm dam, and it is therefore likely incorrectly mapped.

The river line data from the 1:50,000 topographic maps of the Western Cape (Chief Directorate: NGI) indicates a non-perennial drainage line approximately 32m south/southeast of the proposed development site. Both the National Wetland Map 5 (NWM5) and the National Freshwater Priority Areas (NFEPA) maps identify a wetland in this area, with NWM5 classifying it as a Channelled Valley-Bottom (CVB) Wetland and NFEPA as a valleyhead seep/bench flat wetland. The same desktop resources indicate another non-perennial drainage line with associated wetland conditions approximately 330m northwest of the proposed development site. The NWM5 classifies it as a channelled valley-bottom wetland, while the NFEPA identifies it as a bench flat wetland. Additionally, NFEPA maps an artificial bench flat wetland approximately 32m southwest of the site, aligning with a farm dam. No freshwater features were identified within the proposed development site.

A site visit confirmed the presence of the farm dam to the southwest, a non-perennial drainage line to the northwest and a valley bottom wetland feature to the southeast of the proposed development site. The farm dam is artificially and will therefore not be further assessed. The northwest drainage line is located over 300m away and topographically separated from the proposed development site. As such it will not be impacted or be

at risk by/of the proposed development. The valley bottom wetland feature identified and delineated to the southeast of the proposed development site is located approximately 80m from the proposed development site and has been severally degraded by long-term cultivation. Adherence to the mitigation measures outlined in this report will prevent significant impact to this watercourse.

The Initial Site Sensitivity Verification, based on both desktop and field assessments (conducted on 7 February 2025), therefore confirms a "Low" aquatic sensitivity for the proposed development site. An Aquatic Biodiversity Compliance Statement must be submitted during the BA process, as set out by the NEMA (Act No. 107 of 1998) Regulations of 2020 (as amended) (GN R. 320 of 2020).

3. METHODOLOGY

The methodology used in this screening and risk assessment, including a desktop background assessment, onsite watercourse delineation and watercourse classification, is outlined in the subsections below.

3.1. Desktop Assessment

A review of desktop resources was undertaken to determine the nature of the proposed site, the presence of watercourses in the vicinity, and the significance of the site in terms of biodiversity planning. The desktop resources consulted included the following:

- Topographical and hydrological information from the Chief Directorate: National Geo-spatial Information (DALRRD)
- The South African Atlas of Climatology and Agrohydrology (2009);
- Geological information from the Council for Geoscience;
- Groundwater information from the Department of Water and Sanitation;
- The South African National Biodiversity Institute (SANBI) National Vegetation Map (Vegmap 2024 Beta)
- The National Wetlands Map Version 5 (NWM5 – CSIR 2018);
- The National Freshwater Ecological Priority Areas (NFEPA – CSIR, 2011) wetland, wetland vegetation group classification, river, and FEPA datasets;
- The Western Cape Biodiversity Spatial Plan (WCBSP) (CapeNature, 2023);
- Broad Soils Classification (ENPAT).

3.2. Site Survey

Watercourse delineation was undertaken using a combination of desktop and onsite methods.

Wetlands and riparian areas were identified using the method described in the Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas DWAF, (2008). These methods are the accepted best practice for identifying and delineating wetland and riparian areas in South Africa and its use is required by GN 509. The method makes use of four key field indicators for both wetlands (refer to **Box 1**) and riparian areas (refer to **Box 2**).

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.

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.

Decades of cultivation have extensively altered the study area such that no natural vegetation or soil forms were present for delineation purposes. Consequently, watercourses were identified primarily through topographic features, position in the landscape and hydrological indicators using field surveys, aerial imagery (Google Earth and NGI), and topographic data from CD: NGI to maximise accuracy. The specialists are of the opinion that the natural onsite watercourses as indicated in this report have adequately been identified and delineated for the purpose of this assessment.

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 watercourses types based on their hydrogeomorphic characteristics. This classification system categorises watercourses into 7 distinct hydrogeomorphic units described in Figure 3 below:

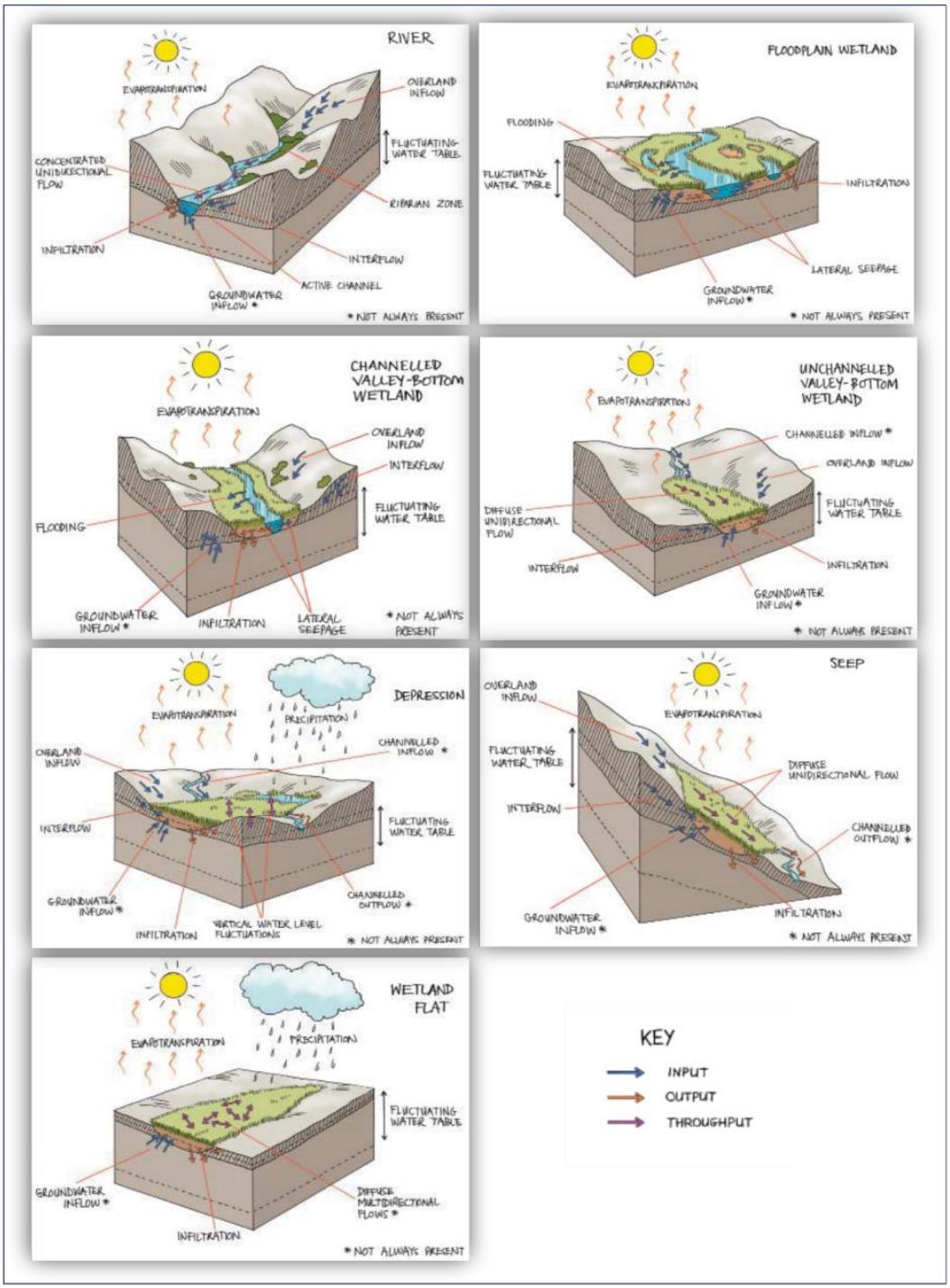

Figure 3: Wetland Hydrogeomorphic Types as defined in the Classification System for Wetlands and Other Aquatic Ecosystems in South Africa (Ollis et al., 2013).

3.4. Present Ecological State Assessment

WET-Health Version 2 (Macfarlane et al., 2020) is a modular tool designed to evaluate and assess the 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 Error! Reference source not found. 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 1: Present Ecological Status Categories Scores as defined in WET-Health Version 2 (Macfarlane et al., 2020).

Ecological Category	Description	Impact Score	PES Score (%)
A	Unmodified, natural.	0-0.9	90-00
B	Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1-1.9	80-89
C	Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact.	2-3.9	60-79
D	Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4-5.9	40-59
E	Seriously modified. The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6-7.9	20-39
F	Critically modified. Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8-10	0-19

3.5. Ecosystem Service Assessment

WET-EcoServices Version 2 (Kotze et al., 2021) 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 2.

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

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

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

3.6. Ecological Importance and Sensitivity Assessment

The Ecological Importance and Sensitivity (EIS) method (Rountree et al., 2013) is a rapid scoring system designed to identify the ecological importance and sensitivity of wetlands to disturbances across multiple scales (i.e., catchment to international scales). The full EIS method integrates three important components, namely, ecological importance and sensitivity, hydro-functional importance, and basic socio-economic importance. The hydro-functional and socio-cultural benefits were however assessed using the updated WET-EcoServices assessment methodology and these two components were therefore omitted from this EIS assessment. The EIS score ranges from 0-4, and it provides an index for prioritisation and management of water resources. The EIS categories are presented in Ecological Importance and Sensitivity Categories (DWAF, 1999).Table 3**.**

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

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

3.7. 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, field-based assessments were undertaken.

3.8. Risk Assessment

The Risk Assessment Matrix as stipulated by Notice No 4167 of GG 49833, 2023 promulgated in terms of the National Water Act (Act 36 of 1998) was used to assess the proposed development activities.

4. DESKTOP ASSESSMENT

A review of desktop resources was undertaken. A summary of key desktop information relevant to this assessment is provided below.

4.1. Biophysical Context

The proposed development site slopes from approximately 315 masl in the east to 304 masl in the west with an average gradient of 3 - 10% across the site (Figure 5). The mean annual rainfall received in the area is 411 mm, mostly during the winter months with the highest mean rainfall occurring in April – September and the lowest mean rainfall occurring in October-March (Schulze et al., 2007).

According to the Council for Geoscience geological map (ENPAT), the study area is predominantly comprised of Glenrosa and/or Mispah soil forms, though other soil types may also be present. Lime is generally absent or rare in upland soils but is commonly found in low-lying areas. The soils in this area have limited pedological development, are derived from and underlain of shale with subordinate sandstone from the Bokkeveld Group (Table 4).

The soil types and descriptions map developed by the Department of Agriculture, Forestry and Fisheries (DAFF) obtained from CapeFarmMapper ver.3.2.9., indicates that the study area comprises shallow soils, on hard or weathering rock, with or without intermittent diverse soils. Lime is generally present in part or most of the landscape (Table 4).

The proposed development site is situated within an agriculturally dominated landscape on a working farm. According to the SANBI Vegetation Map (SANBI, 2024), the site would have originally supported Western Ruens Shale Renosterveld terrestrial vegetation (DEFF, 2022). The NFEPA (CSIR, 2011) spatial dataset indicates that this area corresponds to the wetland vegetation type East Coast Shale Renosterveld (Figure 5Error! Reference source not found.), which where CVB wetlands are present, is listed as Critically Endangered (CR) and Hardly Protected (HP). However, aerial imagery from the CD: NGI database indicates that the entirety of the proposed development site and its 500m regulated area has been under cultivation since before 1983 and as such no natural vegetation remains.

The general biophysical characteristics of the proposed site are summarised in Table 4 below.

Table 4: General characteristics of the proposed site.

Site attribute	Description	Data source

Eco-region	Southern Coastal Belt	Department of Water Affairs Level 1 Ecoregions (Department of Water and Sanitation, 2011)
Bio-region	East Coast Renosterveld	National Vegetation Map, Vegmap 2024 Beta (SANBI 2024)
Terrestrial Vegetation Type	Western Ruens Shale Renosterveld (CR – NP)	National Vegetation Map, Vegmap 2024 Beta (SANBI 2024) Government Gazette of Threatened Ecosystems (DFFE, 2022)
Dominant Geology and Soils	The geology of the proposed development site is primarily composed of shale with subordinate sandstone from the Bokkeveld Group. The overlying soil is characterized by limited pedological development, typically shallow and occurring on hard or weathering rock, with or without intermittent variations. The site is predominantly composed of Glenrosa and/or Mispah soil forms, though other soil types may also be present. Lime is generally absent or rare in upland soils but is commonly found in low-lying areas.	Broad Soils Classification(ENPAT, n.d.), Soil types and descriptions for the Western Cape (DAFF, n.d.) and Land types (AgriculturalResearchCouncil, n.d.)
Soil Erodibility Factor (K)	0.53 (High Erodibility)	SA Atlas of Climatology and Agrohydrology (Schultz, 2009)
Soil Depth & Clay Percentage (%)	< 450 mm <15%	Soil types and descriptions for the Western Cape, Department of Agriculture, Forestry and Fisheries (DAFF, n.d.)
Mean Annual Precipitation (mm)	411 mm	SA Atlas of Climatology and Agrohydrology (Schultz, 2009)
Rainfall seasonality	Winter rainfall	
Mean Annual Temperature (°C)	17.1°C	
Water Management Area	Breede-Olifants WMA	Water Management Areas (DWS 2023)
Quaternary Catchment	H60G	South African Quaternary Catchments Database (Schulze et al., 2007)
Wetland Vegetation Group (for wetlands within the	East Coast Shale Renosterveld (CR - HP)	NFEPA Wetland Vegetation Types (SANBI, 2011)

applicable terrestrial vegetation type)		

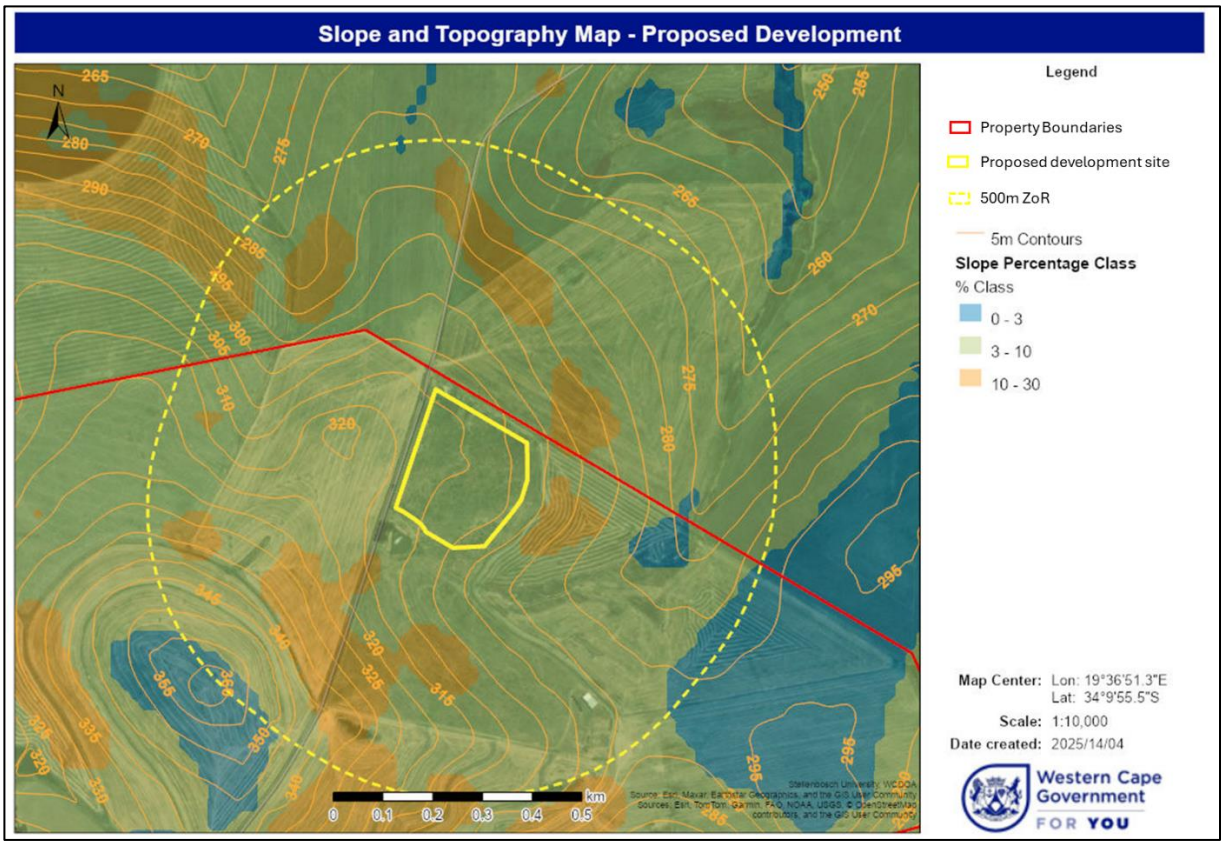

Figure 4: Slope and Topography Map.

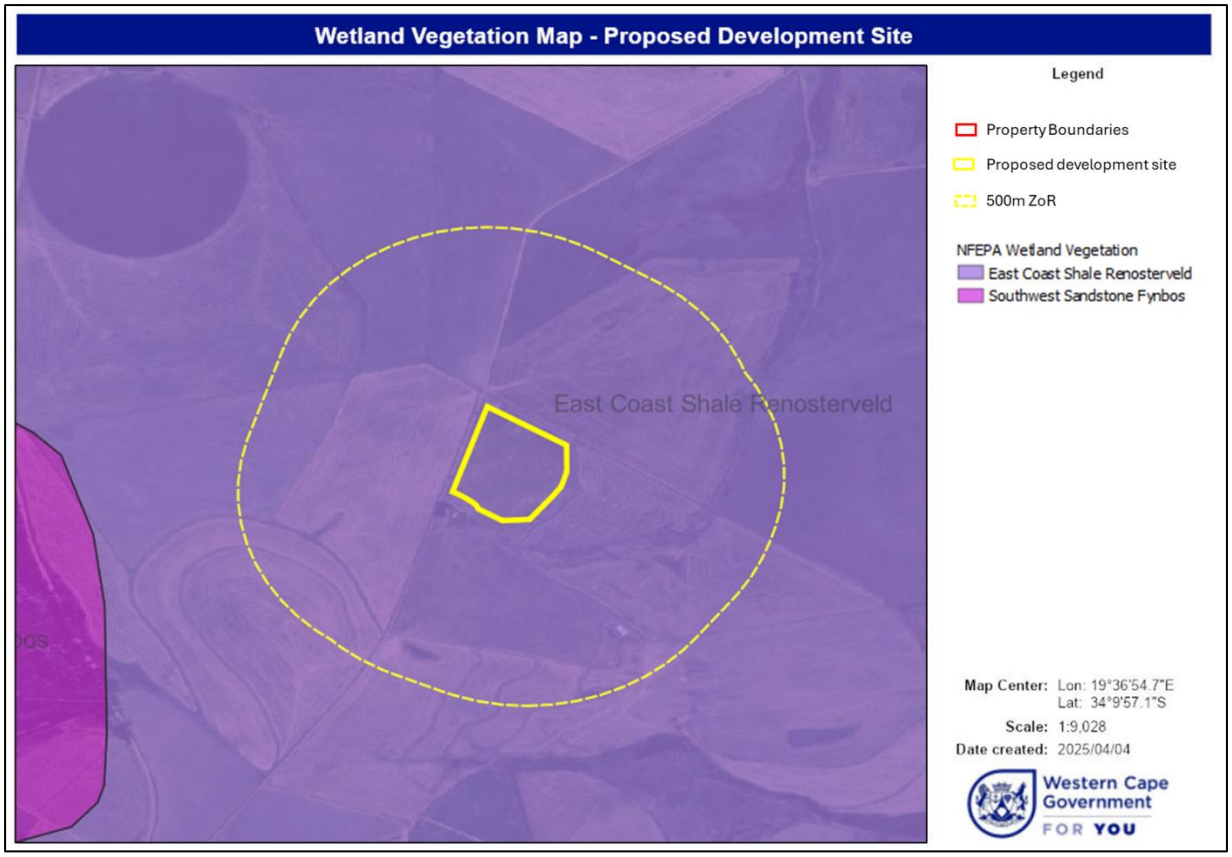

Figure 5: Wetland Vegetation Map.

4.2. Biodiversity Planning Context

The site under evaluation is located within the Breede-Olifants Water Management Area (DWS, 2023), quaternary catchment H60G. The FEPA recognised Kwartel River, runs approximately 1,7 km north of the proposed development area (NFEPA, 2011), however the sub-quaternary (SQ) catchment is not demarcated as a River Freshwater Priority Area (FEPA) (CSIR, 2011). The sub-quaternary catchment is a median priority for wetland rehabilitation with a rank score of 310. The regional setting, in terms of the Level 1 Department of Water Affairs (DWA) (now Department of Water and Sanitation) Ecoregions, is within the Southern Coastal Belt (Table 4).

Based on the 2023 WCBSP, the proposed development site does not coincide with any Critical Biodiversity Areas (CBA) or Ecological Support Areas (ESA) (Figure 6). A terrestrial CBA is indicated southwest of the proposed development footprint; however, it appears that this area coincides with a farm dam, and it is therefore likely incorrectly mapped.

According to river line vector data of the 1:50 000 topography maps for the Western Cape produced by the Chief Directorate: NGI (DALRRD), there is a mapped non-perennial drainage line located approximately 32m downslope to the south/southeast of the proposed development area (Figure 7 & Figure 8). Both the NWM5 (Figure 7) and the NFEPA wetland map (Figure 8) also indicate the presence of a wetland system in this area

(approximately 35m from the proposed development site). The NWM5 classifies this wetland as a channelled valley-bottom wetland, whereas the NFEPA map identifies it as a valleyhead seep/bench flat wetland.

Additionally, another non-perennial drainage line and associated wetland conditions is identified just over 300m northwest of the proposed development area (Figure 7 & Figure 8). The NWM5 classifies this wetland as a channelled valley-bottom wetland (Figure 7), whereas the NFEPA map identifies it as a bench flat wetland (Figure 8). The NFEPA wetland map also indicates an artificial bench flat wetland to the southwest of the proposed development area (Figure 8 & Figure 7). This mapped area coincides with a farm dam.

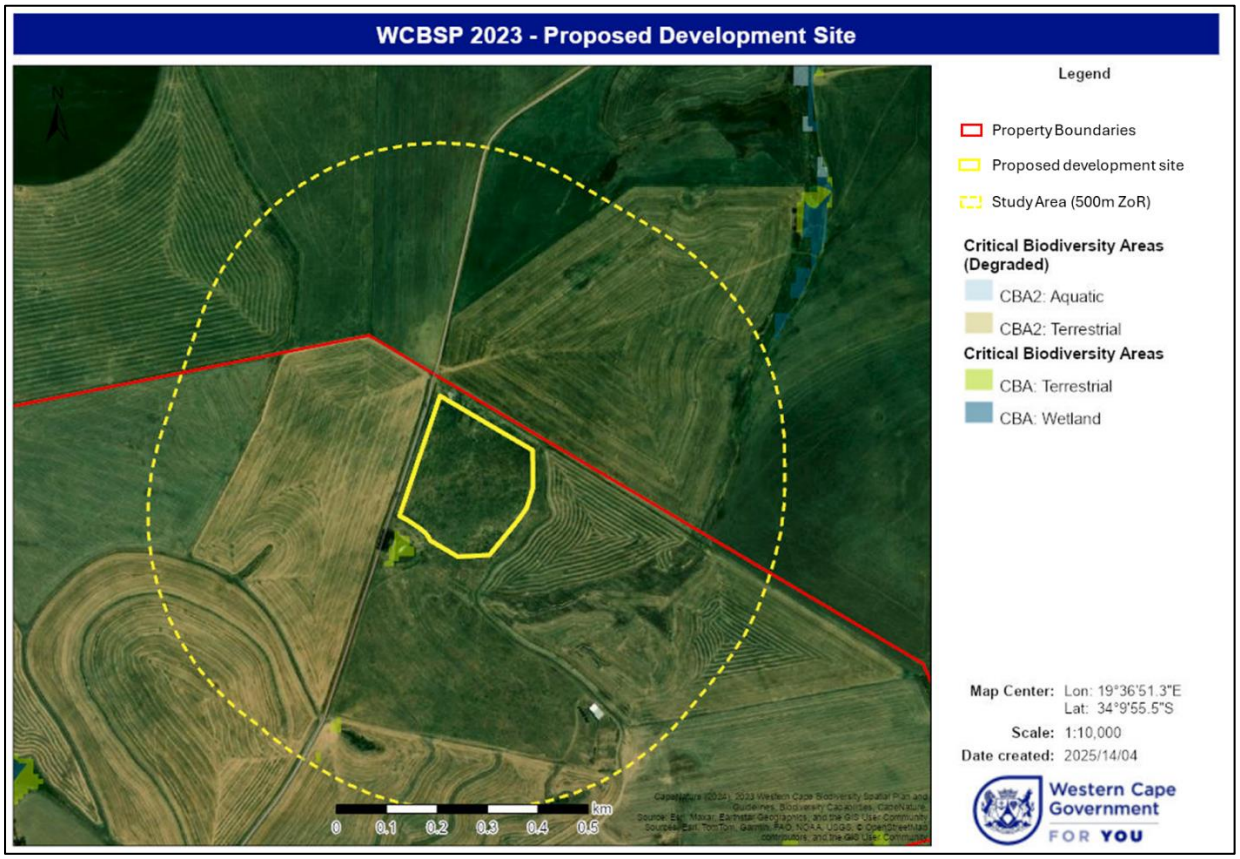

Figure 6: Critical Biodiversity Areas and Ecological Support Areas Map (CapeNature, 2023)

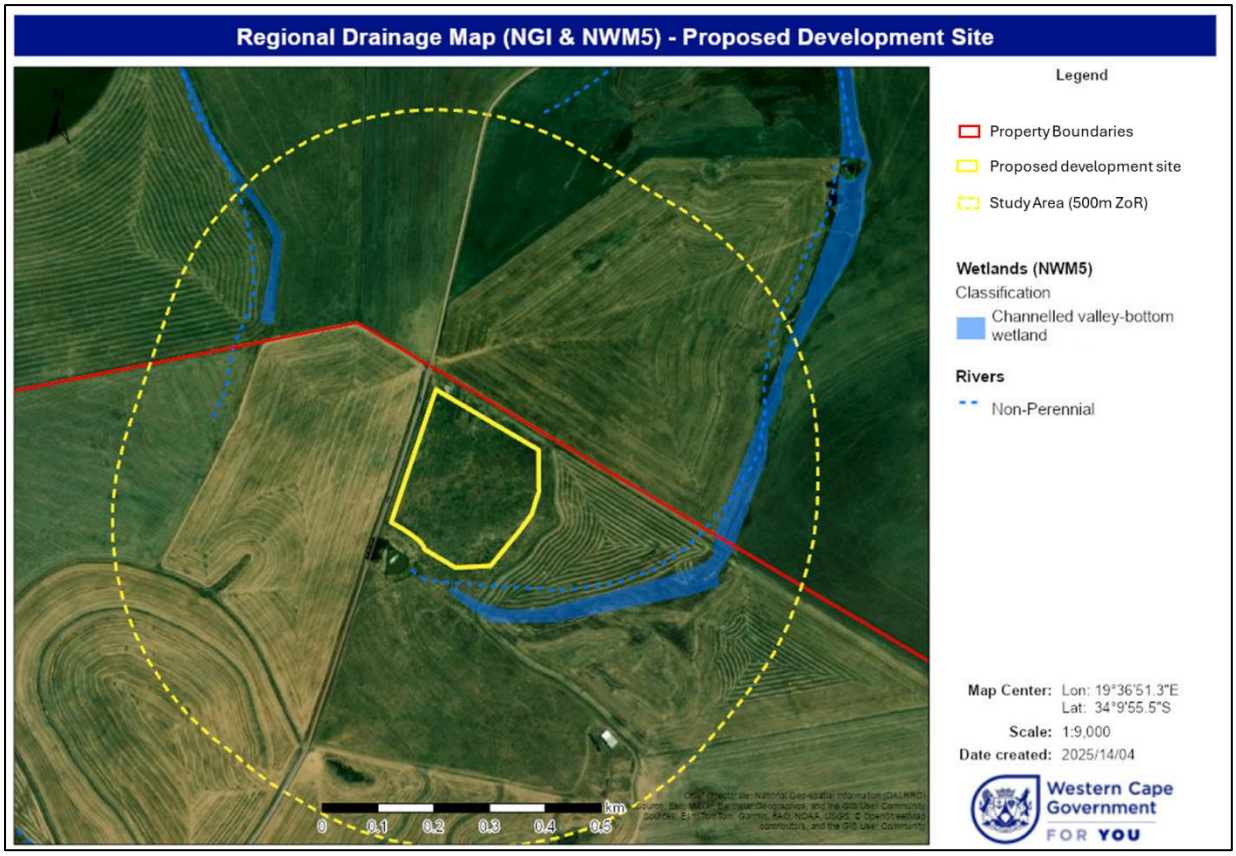

Figure 7: Regional drainage map (NGI & NWM5) of the study area.

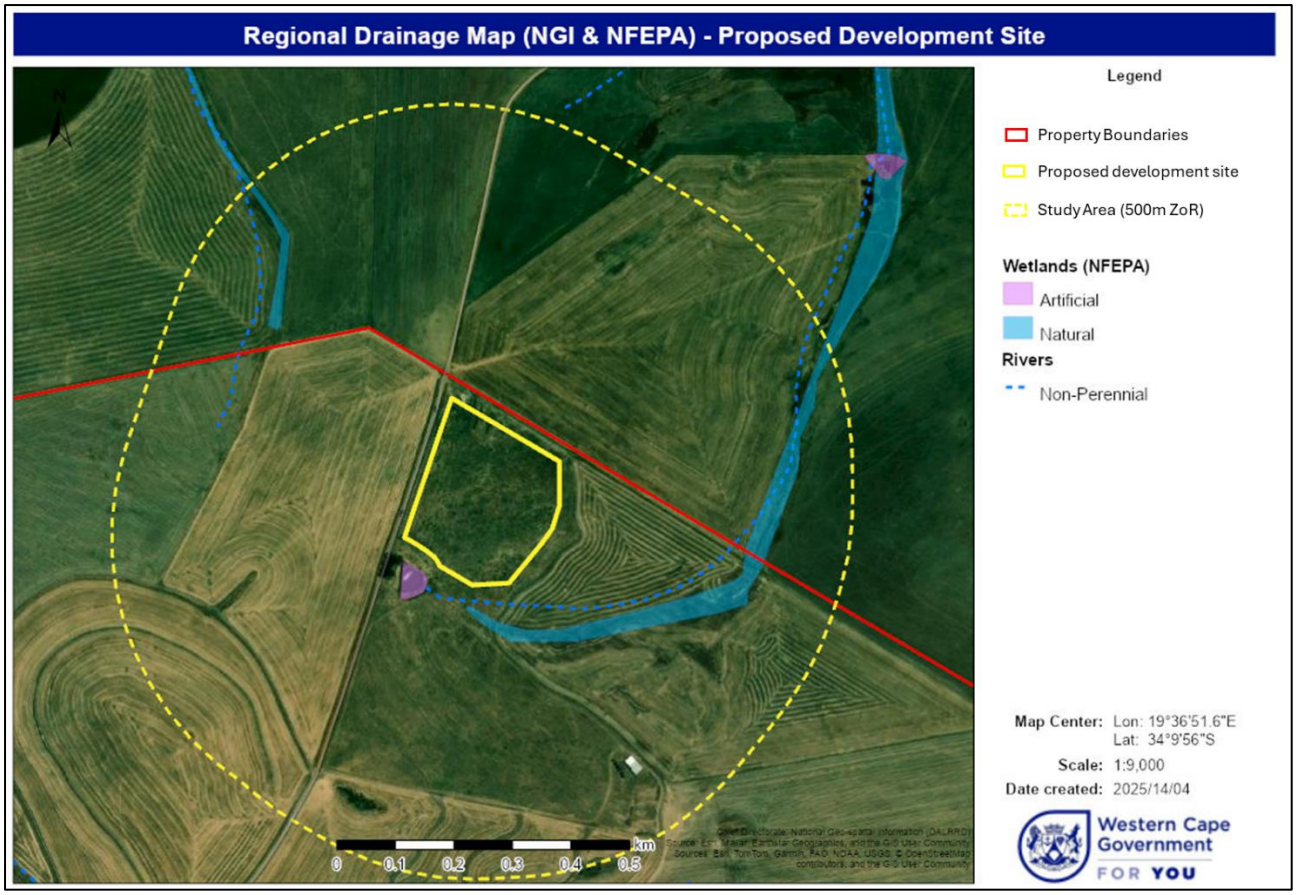

Figure 8: Regional drainage map (NGI & NFEPA) of the study area.

5. SITE DESCRIPTION

The proposed development site is situated approximately 17 km northeast of Caledon, within the boundaries of RE/225, Grootvlei. The site is located on a working farm in a predominantly agricultural landscape. A site visit was conducted on the 7th of February 2025 during the hot, dry summer season. Watercourse delineations within 500m from the proposed development site are presented in Figure 9 below.

There is currently no formal infrastructure present within the proposed development footprint, which is accessed via an existing dirt road running through the farm. No watercourses were identified within the proposed development area. An dam was confirmed to the southwest of the proposed development (Figure 9 & Figure 10). This dam is artificial, off-stream, and therefore falls outside the scope of this assessment.

A non-perennial drainage line identified during the desktop assessment to the northwest of the proposed development site was confirmed during the site visit (Figure 9 & Figure 11). This feature is located more than 300 meters from the proposed development footprint and is topographically separated from it by a small hill. No signs of wetland conditions were observed along the drainage line. As it lies outside the 100 m riparian regulated area in terms of the National Water Act (NWA), this feature is not considered further in the current assessment.

A degraded valley bottom wetland system was identified approximately 80 m southeast and downslope of the proposed development site (Figure 9 & Figure 12). This feature is situated within a gently sloped valley bottom that trends in a northeasterly direction (Figure 13). The wetland lies entirely within an actively cultivated field that appears to be used for grain production. At the time of the site visit, the field was in between cultivation cycles, comprising dried grain stalks and opportunistic weed species. No natural or wetland vegetation remains (Figure 14).

The soils in the wetland area have been severely compacted by repeated ploughing and agricultural activity, making soil sampling difficult. When samples were successfully obtained, they were dry, loosely structured, and immediately fell from the auger—providing limited diagnostic value. No active channel was observed, likely due to the loss of geomorphic features through regular cultivation (Figure 14). However, aerial imagery indicates that a channel is intermittently present, suggesting that under more natural conditions, the system would likely function as a channelled valley bottom (CVB) wetland (Figure 15).

Although no visible wetland indicators were present during the site visit, both historical (Figure 16) and more recent aerial imagery (Figure 15 & Figure 17) reveal hydrological signatures indicative of a diffuse aquatic feature. The local topography, along with desktop evidence of diffuse hydrological signatures and channelled flow support the classification of the feature as a degraded CVB wetland.

Just north of the site boundary, the valley bottom wetland system transitions into a defined channel, which flows northward as a tributary of the Kwartel River (Figure 9 & Figure 17). The portion of the downstream channel immediately northeast of the property boundary has been artificially modified and does not appear to exhibit wetland characteristics. While it remains uncertain whether the shift to a channelled system is the result of natural topographic constriction or anthropogenic deepening and alteration, the presence of channelised outflow is supported by both the local topography and patterns observed in historical and recent aerial imagery (Figure 15 - Figure 17).

The delineated CVB wetland and its catchment have undergone significant anthropogenic modification, including vegetation clearance, soil compaction, ploughing, and altered drainage regimes. These disturbances have severely degraded the wetland's hydrological, ecological, and geomorphic functions. In the specialist's opinion, the system has lost virtually all ecological functionality. Nonetheless, aerial imagery continues to show hydrological markers, suggesting that some hydrological function remains, particularly in conveying flow downstream during the wet season.

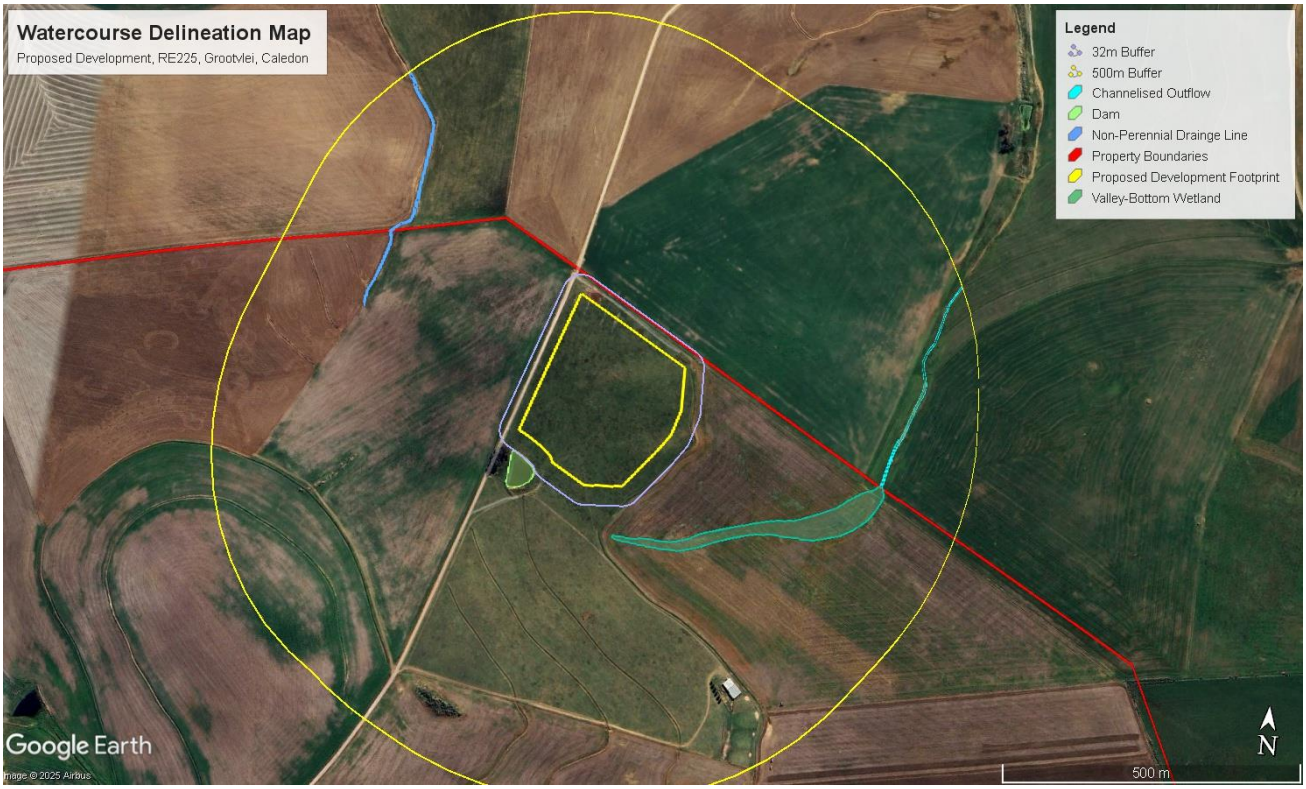

Figure 9: Watercourse Delineation Map: Proposed development on RE/225, Grootvlei Caledon.

Figure 10: Dam located to the southeast of the proposed development site.

Figure 11: Non perennial drainage line located approximately 330m northeast of the proposed development site.

Figure 12: CVB Wetland located approximately 100m southwest of the proposed development site.

Figure 13: The delineated CVB Wetland is located within a gently sloped valley and trends northeast.

Figure 14: The CVB wetland is located within an actively cultivated agricultural field. No natural or wetland vegetation remains. At the time of the site visit, the field was in between cultivation cycles, comprising dried grain stalks and opportunistic weed species.

Figure 15: Aerial imagery from 2010, 2014, 2017, and 2021 illustrates evidence of surface flow through the system and suggests the likely presence of a channel during at least some periods.

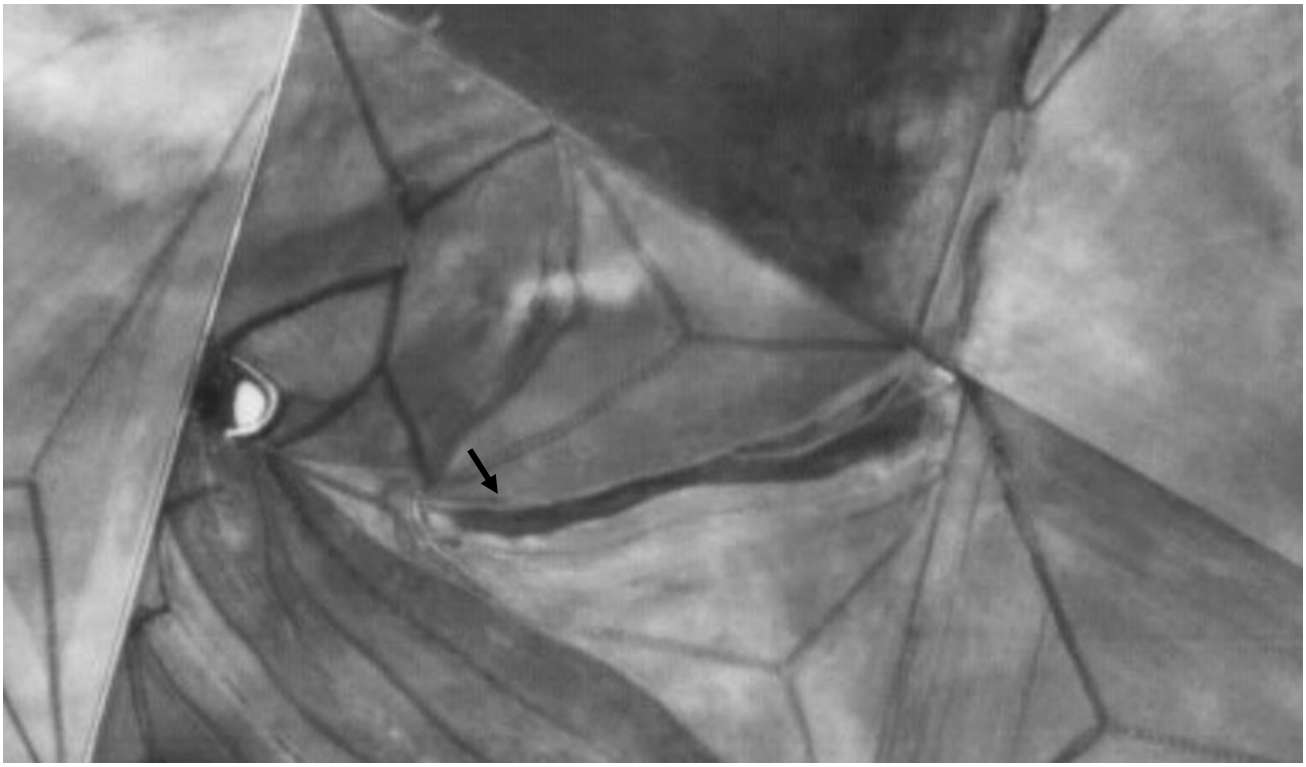

Figure 16: Historic aerial imagery from 1983 showing hydrological markers indicative of flow movement through the area.

Figure 17: 2023 Aerial imagery showing hydrological markers indicative of flow movement through the area.

Table 5: Classification of the onsite wetland.

Factor	Wetland
System	Inland
Ecoregion	Southern Coastal Belt
Landscape Setting	Valley-Floor
Hydrogeomorphic type	Channelled valley bottom
Drainage	Rainfall and Interflow
Seasonality	Seasonal / Temporary
Anthropogenic influence	Vegetation clearing, soil disturbance, ploughing, soil compaction, grain cultivation.
Vegetation	East Coast Shale Renosterveld (CR - HP)
Geology	The geology of the proposed development site is primarily composed of shale with subordinate sandstone from the Bokkeveld Group. The overlying soil is characterized by limited pedological development, typically shallow and occurring on hard or weathering rock, with or without intermittent variations. The site is predominantly composed of Glenrosa and/or Mispah soil forms, though other soil types may also be present. Lime is generally absent or rare in upland soils but is commonly found in low-lying areas.
Substrate	Soils were hard, dry, uniform and sandy.
Salinity	Fresh

6. WETLAND STATUS QUO ASSESSMENT

6.1. Present Ecological State

The Macfarlane et al. (2020) WET-Health Version 2.0 assessment for the CVB wetland produced an overall Present Ecological State (PES) score within category E (Table 6). This indicates that the wetland was in a seriously modified condition at the time of the assessment. The definitions of the ecological categories are presented in Table 1.

The key factors that influenced the scoring are as follows: The hydrology and water quality components have been severely impacted due to extensive agricultural modification within the catchment including extensive ploughing and soil compaction, which have disrupted natural infiltration and surface water movement. The absence of vegetative buffers and potential input of agrochemicals further contribute to reduced water quality. The geomorphology of the system has been disrupted by repeated mechanical disturbance from crop cultivation and ploughing within both the wetland and its surrounding catchment, leading to the loss of natural surface features. The vegetation component is in a critically modified state due to the complete removal of indigenous and wetland-associated vegetation due to active cultivation. The current land use and level of disturbance leave little potential for natural vegetation recovery.

Table 6: Outcome of the WET-Health Assessment for the CVB Wetland

Final (adjusted) Scores				
PES Assessment	**Hydrology**	**Geomorphology**	**Water Quality**	**Vegetation**
Impact Score	7,0	5,7	7,0	10,0
PES Score (%)	30%	43%	30%	0%
Ecological Category	**E**	**D**	**E**	**F**
Trajectory of change	↓	↓	↓	↓
Confidence (revised results)	Not rated	Not rated	Not rated	Not rated
Combined Impact Score	7,3			
Combined PES Score (%)	27%			
Combined Ecological Category	**E**			
Hectare Equivalents	0,3 Ha			

6.2. Ecosystem Services

The CVB wetland's contribution to ecosystem services was assessed using the WET-EcoServices Version 2 methodology. The method includes the assessment of sixteen potential ecosystem services including both direct and indirect human benefits. Importance scores for the CVB wetland were predominantly rated as "Very Low" across all ecosystem service categories, with the exception of cultivated food provision, which scored "Moderate" (Table 7). The score categories and their descriptions are provided in Table 2**.** The highly degraded condition of

the wetland—particularly the loss of natural vegetation, altered hydrology, and disturbed soil structure—greatly limits its capacity to deliver most regulating, provisioning, and cultural ecosystem services. However, the current land use and seasonal conditions support ongoing agricultural activity, particularly the cultivation of food crops, which is the only remaining notable service provided by the system.

Table 7: Outcome of the ecosystem services assessment for the CVB wetland

		Present State			
ECOSYSTEM SERVICE		Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	0.8	0.2	0.0	Very Low
	Stream flow regulation	2.0	0.3	0.7	Very Low
	Sediment trapping	1.1	2.0	0.6	Very Low
	Erosion control	1.1	1.3	0.3	Very Low
	Phosphate assimilation	1.1	1.5	0.3	Very Low
	Nitrate assimilation	1.0	1.5	0.3	Very Low
	Toxicant assimilation	1.1	1.0	0.1	Very Low
	Carbon storage	0.6	0.0	0.0	Very Low
	Biodiversity maintenance	0.5	2.5	0.2	Very Low
PROVISIONING SERVICES	Water for human use	0.6	0.0	0.0	Very Low
	Harvestable resources	0.0	0.0	0.0	Very Low
	Food for livestock	0.0	0.0	0.0	Very Low
	Cultivated foods	2.9	1.3	2.1	Moderate
CULTURAL SERVICES	Tourism and Recreation	0.0	0.0	0.0	Very Low
	Education and Research	0.0	0.0	0.0	Very Low
	Cultural and Spiritual	0.0	0.0	0.0	Very Low

6.3. Ecological Importance and Sensitivity

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

The CVB wetland achieved a median score of 1.0 which falls within the "Low" category. The results of the assessment and the reasoning behind the scores are presented in Table 8.

Table 8: Results of the EIS assessment

Ecological Importance and Sensitivity	CVB	Reason
Biodiversity Support (mean)	**1.00**	
Presence and status of Red Data species:	1	The wetland is actively cultivated, and no natural vegetation remains. It is unlikely that SCC would occur in this wetland although some faunal species may move through the area.
Populations of unique species/uncommonly large populations of wetland species:	0	The wetland is actively cultivated, no natural wetland species were noted.
Migration/breeding/feeding sites: (Importance of the unit for migration, breeding sites and/or feeding):	2	Potential corridor for faunal movement
Landscape Scale (mean)	**1.00**	
Protection status of the wetland: (National (4), Provincial/Private (3), municipal (1 or 2), public area (0 or 1)	2	The wetlands are located within a privately owned property yet have been cultivated.
Protection status of the vegetation type: (SANBI guidance on the protection status of the surrounding vegetation)	2	The CVB wetland is associated with East Coast Shale Renosterveld (CR – HP) however this vegetation type is no longer represented on the site, and it is unlikely that rehabilitation would be successful.
Regional context of the ecological integrity: (Assessment of the PES (habitat integrity), especially in light of regional utilisation)	0	PES – E for the CVB
Size and rarity of the wetland type/s present: (Identification and rarity assessment of wetland types)	1	CR status indicates slight rarity, but severely degraded status has left negligible elements of the ecosystem intact.
Diversity of habitat types: (Assessment of the variety of wetland types present within a site)	0	The CVB wetland is severely degraded with no diversity of habitat as the entire wetland is actively cultivated.

Ecological Importance and Sensitivity	CVB	Reason
Sensitivity of the Wetland (mean)	**1.33**	
Sensitivity to changes in floods: (Floodplains at 4; valley bottoms 2 or 3; pans and seeps 0 or 1)	2	The degraded CVB may be slightly sensitive to flooding as no actively growing vegetation is currently present and erosion may therefore occur.
Sensitivity to changes in low flows/dry season: (Unchanneled VB's probably most sensitive)	1	The degraded CVB is seasonal / temporary in zonation and may be minimally sensitive to changes in flows
Sensitivity to changes in water quality: (Especially natural low nutrient waters – lower nutrients likely to be more sensitive)	1	The degraded CVB is minimally sensitive to changes in water quality as water quality has already been significantly impacted.
Ecological Importance and Sensitivity Score	**1,11**	
Ecological Importance and Sensitivity Category	**LOW**	

6.4. Buffer Determination

An appropriate buffer of 28m for the CVB wetland system has been determined using the method described in the Buffer Zone Guidelines for Rivers, Wetlands and Estuaries (Macfarlane and Bredin, 2016).

7. POTENTIAL AQUATIC IMPACTS / RISKS

In this study, the watercourses present within the proposed development site were assessed to determine their Present Ecological State (PES) (Wetlands)/Habitat Integrity (IHI) (Drainage Lines), Ecological Importance and Sensitivity (EIS), and contribution to Wetland Ecosystem Services (WES). The proposed project entails the establishment of a poultry rearing facility within a portion of RE/225, Grootvlei, Caledon (Figure 2). No watercourses were found to coincide with the proposed development footprint, however a CVB wetland was delineated approximately 80m southeast and downslope of the proposed development site. The potential impacts to the CVB wetland as a result of the proposed development are listed below:

Construction Phase

- Increased sedimentation due to vegetation clearance, earthworks, and soil disturbance upslope, potentially leading to sediment runoff into the wetland during rainfall events.
- Altered surface water flow patterns within the catchment due to compaction of soils and the creation of hardened surfaces
- Water quality impairment due to increased sediment input, potential spillage, or release of potentially contaminated runoff into the CVB wetland during construction

Operational Phase

- Water quality impairment due to the release of potentially contaminated stormwater (nutrient enriched, cleaning chemicals).
- Changes in hydrological regime due to increased impervious surfaces (e.g., roofing and hardstandings), potentially reducing infiltration and increasing overland flow into the wetland.

8. RISK ASSESSMENT

The Risk Assessment Matrix as stipulated by Notice No 4167 of GG 49833, 2023 promulgated in terms of the National Water Act (Act 36 of 1998) was applied to the project with the following outcomes (refer Table 9):

1. All of the potential risks associated with the construction and operation of the proposed development were found to be within the Low-Risk category.
    - The delineated CVB wetland has a PES score in the E category (Seriously Modified), exhibits Low / Marginal EIS and offers Moderate ecosystem services.
    - The CVB wetland is located more than 80 m away from the proposed development and therefore is unlikely to be directly impacted.
    - With the implementation of the suggested mitigation and management measures, the indirect impacts or risks to the wetland are Low / negligible.

Table 9: Risk Assessment Matrix

PROJECT: Grootvlei Poultry Rearing Facility

RISK ASSESSMENT MATRIX for Section 21 (c) and (i) Water Use activities - Version 2.1.1

Name of Assessor: Kimberley van Zyl **Signature:**

SACNASP Registration Number: Pr. Nat. Sci. Reg. No.117097 (Ecological Science)

Date of assessment: 11-Apr-25

Risk to be scored for all relevant phases of the project (**factoring in specified control measures**). MUST BE COMPLETED BY SACNASP PROFESSIONAL MEMBER REGISTERED IN AN APPROPRIATE FIELD OF EXPERTISE.

Phase	Activity	Impact	Potentially affected watercourses			Intensity of Impact on Resource Quality					Overall Intensity (max = 10)	Spatial scale (max = 5)	Duration (max = 5)	Severity (max = 20)	Importance rating (max = 5)	Consequence (max = 100)	Likelihood (Probability) of impact	Significance (max = 100)	Risk Rating	Confidence level
						Abiotic Habitat (Drivers)			Biota (Responses)											
			Name/s	PES	Overall Watercourse Importance	Hydrology	Water Quality	Geomorph	Vegetation	Fauna										
CONSTRUCTION	<1> Site Preparation and construction, i.e. clearing, preparation, and infill of foreign material (soil & concrete), associated with the proposed poultry rearing facility within the catchment of the CVBW, leading to: -Increased sedimentation due to vegetation clearance, earthworks, and soil disturbance upslope, potentially leading to sediment runoff into the wetland during rainfall events. -Altered surface water flow patterns within the catchment due to compaction of soils and the creation of hardened surfaces -Water quality impairment due to increased sediment input, potential spillage, or release of potentially contaminated runoff into the CVB wetland during construction.	<1a>Increased sedimentation	CVBW	E	Moderate	1	2	1	1	0	4	1	2	7	3	21	20%	4.2	L	High
		<1b>Altered flow regime	CVBW	E	Moderate	2	1	1	1	0	4	1	2	7	3	21	20%	4.2	L	High
		<1c>Water quality impairement	CVBW	E	Moderate	1	2	1	1	0	4	1	2	7	3	21	20%	4.2	L	High
OPERATIONAL	<2>Operational use of the poultry rearing facility within the catchment of the CVBW leading to: -Water quality impairment due to the release of potentially contaminated stormwater (nutrient enriched, cleaning chemicals). -Changes in hydrological regime due to increased impervious surfaces (e.g., roofing and hardstandings), potentially reducing infiltration and increasing overland flow into the wetland.	<1a>Water quality impairement	CVBW	E	Moderate	0	2	1	1	0	4	1	4	9	3	27	20%	5.4	L	High
		<1b>Altered flow regime	CVBW	E	Moderate	2	1	0	1	0	4	1	4	9	3	27	20%	5.4	L	High

8.1. Proposed Mitigation and Management Measures

The majority of potential impacts or risks to the CVB wetland can be mitigated, and avoided, with the demarcation of the CVB wetland and buffer area as a No-Go area along with the management of stormwater flow from the proposed Poultry Rearing Facility. The following mitigation measures are required to ensure that the impact on aquatic diversity is sufficiently limited:

- The CVB wetland and buffer area should be demarcated as a No-Go area for the development.
- No polluted stormwater should discharge into the CVB wetland during both the construction and operational phase of the development. Stormwater management must ensure that no runoff or treated wastewater (WW), which will impair the water quality and lead to increased sedimentation, may enter the onsite wetland.
- As far as possible, areas cleared during construction should be revegetated.
- Bunded, impervious areas must be designated by an ECO for temporary toilets, stockpiles, vehicle parking / servicing areas, and for pouring / mixing of concrete / cement, paint, and chemicals (as applicable). These areas should be more than 32 m away from any delineated watercourse.
- Clean up any spillages immediately with the use of a chemical spill kit and dispose of contaminated material at an appropriately registered facility.
- Inspect all 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.
- Construction/maintenance vehicles should be regularly serviced.
- Mixing and transferring of chemicals or hazardous substances must take place outside of the No Go area, and must take place on drip trays, shutter boards or other impermeable surfaces.
- Drip trays must be utilised at all fuel dispensing areas, as applicable.
- 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 the watercourse and its associated buffer area 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.
- 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 / EAP outside of the no-go areas. 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.
- 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 No Go areas is strictly prohibited.
- Washout must not be discharged into the no-go area. 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 workers). These toilets must be located within an area designated by the ECO outside of the no-go area and should preferably be located on level ground. Portable toilets 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 development area and disposed of at a registered waste disposal facility on a weekly basis.
- Prohibit the dumping of excavated material, building materials or removed vegetation within the watercourses or their associated buffer areas. Spoil material must be appropriately disposed of at a registered waste disposal facility.
- Clear and remove any rubble or litter that may have been accidentally deposited into the watercourse and associated buffer area as a result of construction activities and dispose of at an appropriate registered facility.
- Undertake construction related activities during the dry season when flow within the watercourse is at its lowest.
- Implement erosion control measures where required. Examples of erosion control measures 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 ECO / site manager must monitor sediment fences / traps after every heavy rainfall event and any sediment that has accumulated must be removed by hand.

9. CONCLUSION & RECOMMENTATION

This report presents the findings of an Aquatic Biodiversity Compliance Statement and Risk Assessment undertaken to evaluate potential aquatic biodiversity risks associated with the proposed development of a poultry rearing facility on Portion RE/225 of Grootvlei Farm, located near Caledon. The proposed development footprint was confirmed to be entirely terrestrial and does not intersect with any delineated aquatic features.

During the site assessment two watercourses were identified within 500 m of the proposed development. The closest is a channelled valley bottom (CVB) wetland system situated approximately 80 m southeast and downslope from the proposed development. This watercourse forms part of a broader drainage network that contributes to a tributary of the Kwartel River. The second is a non-perennial drainage line located over 300 m to the north of the site, topographically separated by a small hill. As the non-perennial drainage line lies outside of the 100 m riparian buffer specified under the National Water Act and displays no observable wetland indicators it was considered beyond the scope of this assessment.

The proposed development site was confirmed to have a Low Aquatic Sensitivity and is located outside the extent of any delineated aquatic feature. No watercourses or wetlands were identified within the 32 m regulated area defined by the National Environmental Management Act (NEMA, Act 107 of 1998), and as such, the development is unlikely to trigger any NEMA-listed activities—provided construction remains outside this buffer and does not involve the removal, deposition, or disturbance of sediment within a watercourse. However, the delineated CVB wetland lies within the 500 m regulated zone for wetlands in terms of the National Water Act (NWA, Act 36 of 1998) and was therefore assessed in greater detail as part of this study.

The delineated CVB wetland has been substantially impacted by historical and ongoing anthropogenic disturbances, including vegetation clearance, ploughing, soil compaction, and modification of natural flow regimes. These factors have significantly reduced the wetland's ecological integrity and functionality. The WET-Health assessment categorised the wetlands Present Ecological State as Category E indicating it is seriously modified. Despite this, some hydrological function persists, particularly in flow conveyance, as evidenced by topographic patterns and historical aerial imagery.

The Risk Assessment Matrix (RAM), as prescribed by Notice No. 4167 of 2023 under the NWA (Act 36 of 1998), was applied to evaluate the potential risks associated with the proposed development. The assessment concluded that with implementation of the mitigation measures outlined in this report, the activities fall within the Low-Risk category, indicating that a General Authorisation (GA) in terms of Section 21(c) and 21(i) water uses is applicable.

Based on the findings of this assessment, it is concluded that the proposed poultry rearing facility may be authorised from an aquatic biodiversity perspective, provided that the recommended mitigation and management measures are strictly adhered to. A Water Use Authorisation, in the form of a General Authorisation registration, must be secured in compliance with the applicable provisions of the NWA.

REFERENCES

AgriculturalResearchCouncil. (n.d.). Land Types. *CapeFarmMapper Ver.3.2.9*.

CapeNature. (2023). *Western Cape Biodiversity Spatial Plan 2023*.

DAFF. (n.d.). Soil types and descriptions for the Western Cape. *CapeFarmMapper Ver.3.2.9*.

DEFF. (2023). *National Web-based Environmental Screening Tool*.

DEFF, D. of E. F. and F. (2022). The revised national list of ecosystems that are threatend and in need of protection. *Government Gazette*. http://www.greengazette.co.za/pages/national-gazette-37230-of-17-january-2014-vol-583_20140117-GGN-37230-003

Department of Water and Sanitation. (2011). *Ecoregions (Level 1) for South Africa [Data Set]*.

DWAF. (2008). Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas. *Department of Environmental Affairs*. www.dwaf.gov.za

DWS. (2023). *Water Management Areas*.

ENPAT. (n.d.). Soil descriptions for the Western Cape. *CapeFarmMapper Ver.3.2.9*.

NFEPA. (2011). National Freshwater Priority Area. *CSIR*.

Ollis, D., Snaddon, K., Job, N., & Mbona, N. (2013). *Classification System for Wetlands and Other Aquatic Ecosystems in South Africa*.

SANBI. (2011). *NFEPA Wetland Vegetation*. https://bgis.sanbi.org

SANBI. (2024). *National Vegetation Map (Vegmap 2024 Beta)*.

Schultz. (2009). *South African Atlas of Climatology and Agrohydrology*.

Schulze, R., Hallowes, L., Horan, M., Lumsden, T., Pike, A., & Thornton-Dibb, S., Warburton, M. (2007). South African Quaternary Catchments Database. In *South African Atlas Of Climatology And Agrohydrology. WRC Report 1489/1/06, Section 2.3.*

Van Ginkel, C. E., Glen, R. P., Gordon-Gray, K. D., Cilliers, C. J., Muasya, M., & van Deventer, P. P. (2011). Easy identification of some South African wetland plants (Grasses, Restios, Sedges, Rushes, Bulrushes, Eriocaulons and Yellow-eyed grasses). In *Water Research Commission*.

ANNEXURE 1: ECOSYSTEM SERVICES

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

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

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