Preliminary Freshwater Assessment:

Louw's Bos, Farm RE/502, Stellenbosch, Western Cape

Prepared for:

Stellenbosch Municipality

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Executive Summary

Stellenbosch Municipality proposes establishment of a memorial park of approximately 160ha on Louw's Bos Farm RE/502 (refer to Figure 1 for location), Stellenbosch and EnviroSwift Western Cape has been appointed to undertake a specialist assessment of the freshwater features within the farm to inform the Basic Assessment and Water Use Authorisation application for the proposed development. Farm RE/502 is a large tract of land owned by Stellenbosch Municipality and is divided into two portions, North and South separated by a narrow portion of Farm 557. The applicant's preferred layout falls within Farm RE/502 South, while an alternative layout falls within Farm RE/502 North.

Existing agricultural activities are prevalent on both Farm RE/502 and primarily consist of pasture for grazing of cattle and limited viticulture. The alternative layout falls on Farm RE/502 North which includes the Stellenbosch airfield and an equestrian centre in the north eastern parts and the proposed layout would fall to the west thereof. Annandale Road transects the northern portion Farm RE/502 South. The preferred layout of the development on Farm RE/502 South is presented in Figure 2. An alternative layout for Farm RE/502 North has not yet been drafted, but the infrastructure and activities involved would be similar to that detailed in the proposed layout for the Louw's Bos South. The proposed layout of the development is not final and this report will therefore inform the final layout and is therefore subject to change in accordance with the final layout.

The proposed memorial park development will include the following:

- Construction of hardened infrastructure including a chapel, office, columbarium, public toilets, an access road and hardened pathways;
- Installation of graves;
- Landscaping of the cemetery and of a parkland including a small forest and informal parkland of mixed fynbos vegetation and indigenous trees for shade and screening where appropriate with cleared, unmade pathways in between.

Desktop Assessment

Farm RE/502 lies within the Berg Water Management Area (WMA), the Lower Berg Sub-WMA and the G22H quaternary catchment. It is characterised by Critically Endangered Swartland Granite Renosterveld and Swartland Silcrete Renosterveld terrestrial vegetation type (Mucina and Rutherford, 2009, updated 2012); and Critically Endangered wetland vegetation types: West Coast Granite Renosterveld and West Coast Silcrete Renosterveld.

The National Freshwater Ecological Priority Areas (NFEPA, 2011) project's indicates the presence of a number of artificial and natural wetlands, namely channelled and unchanneled valley bottom wetlands as well as bench flat wetlands, within and adjacent to the study area. The National Geospatial Information Service (NGI) indicates the Bonterivier, a non-perennial river north-north east of Farm RE/502 South and south-south west of Farm RE/502 North. Smaller non-perennial drainage lines extend into both RE/502, North and South, from Bonterivier.

The Western Cape Biodiversity Spatial Plan (2017) highlights large tracts of Aquatic Type 2 Ecological Support Areas (ESA's 2) within, as well as along, the northern boundary of Farm RE/502 South. ESA's Type 2 are also prevalent within, as well as along, the southern and northern boundary of Farm RE/502 North.

Freshwater Assessment Results

Hand augering of Farm RE/502 was conducted to determine the presence or absence of hydromorphic soil indicators, and therefore the hydrological temporary wetland boundary. Hydromorphic features including mottling, leaching and organic streaking were found in areas on Farm RE/502 correlating with the Aquatic Type 1 ESA's indicated by the WCBSP (2017). In addition to soil indicators, several wetland obligate plant species were found.

The resultant wetland delineations for Farm RE/502 North and South are presented below:

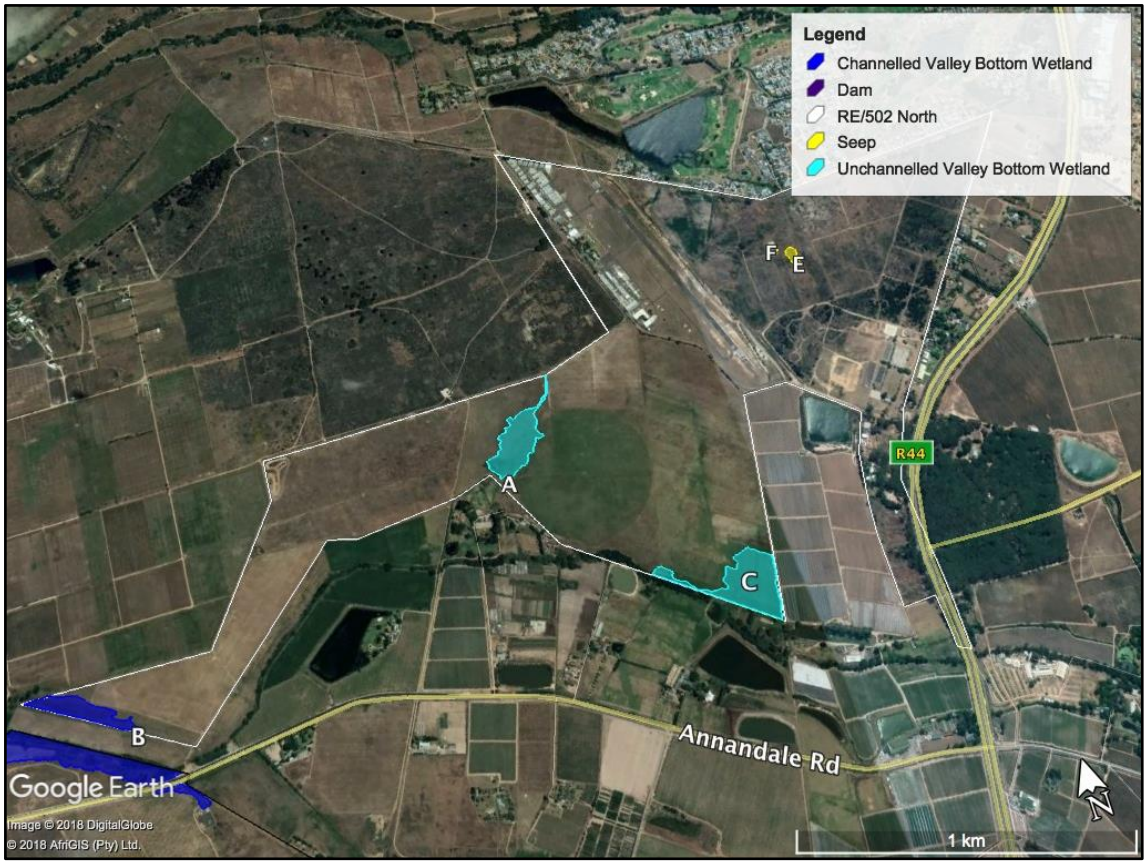

Figure A: Wetland delineations on Farm RE/502 North.

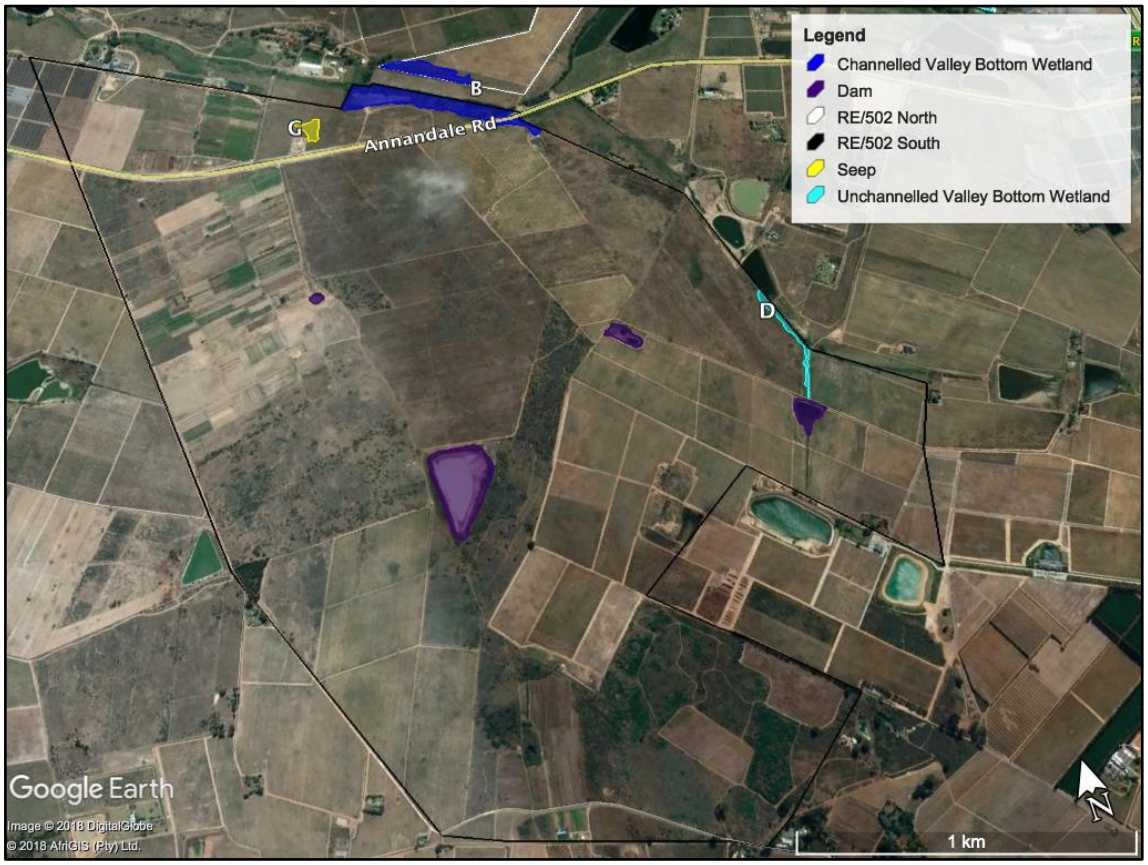

Figure B: Wetland delineations on Farm RE/502 South.

Wetlands A, C, and D were classified as unchanneled valley bottom wetlands, Wetland B was classified as a channelled valley bottom wetland, and Wetland E, F, and G were classified as seeps. In addition, four dams were delineated on Farm RE/502.

Only Wetlands A, B, and C were included in the assessment however as it is the opinion of the specialist that only watercourses are likely to be impacted by the two proposed development layouts. All other watercourses identified are separated from the proposed development by topography or by existing hydrological barriers such as roads.

Wetland A and C were determined by means of appropriate methods to have a Present Ecological State (PES) within Category C, and Wetland B has a PES within Category D. All three wetlands had a 'High' Ecological Importance and Sensitivity (EIS) and was found to provide ecosystem services primarily in the categories of Phosphate, Nitrate, and Toxicant removal.

Impact Assessment

Four impacts were assessed given the information presently available for the preferred layout on Farm RE/502 South and the alternative layout on Farm RE/502 North, with and without essential mitigation measures applied. The results are presented in the table below:

Table A: Impact assessment results

Impact 1: Impact on the flow regime					
Construction Phase					
No Construction Phase Impacts Identified					
Operational Phase					
Preferred Layout: Without mitigation	Very Low	Local	Long term	High	Very Low (+ve)
Preferred Layout: With mitigation	Low	Local	Long term	High	Low (+ve)
Alternative Layout: Without mitigation	Low	Local	Long term	High	Low (+ve)
Alternative Layout: With mitigation	Medium	Local	Long term	High	Medium (+ve)
Impact 2: Impact on Water Quality					
Alternatives	**Intensity**	**Extent**	**Duration**	**Probability of impact occurring**	**Significance**
Construction Phase					
Preferred Layout: Without mitigation	Very Low	Local	Short term	Medium	Very Low (-ve)
Preferred Layout: With mitigation	Very Low	Local	Short term	Medium	Very Low (+ve)
Alternative Layout: Without mitigation	Medium	Local	Short term	High	Medium (-ve)
Alternative Layout: With mitigation	Very Low	Local	Short term	High	Very Low (-ve)
Operational Phase					
Preferred Layout: Without mitigation	Very Low	Local	Long term	High	Very Low (+ve)
Preferred Layout: With mitigation	Low	Local	Long term	High	Low (+ve)
Alternative Layout: Without mitigation	Low	Local	Long term	High	Low (-ve)
Alternative Layout: With mitigation	Very Low	Local	Long term	High	Very Low (-ve)
Impact 3: Impact on Wetland Habitat					
Alternatives	**Intensity**	**Extent**	**Duration**	**Probability of impact occurring**	**Significance**

Construction Phase					
Preferred Layout: Without mitigation	Very Low	Local	Short term	Medium	Very Low (+ve)
Preferred Layout: With mitigation	Low	Local	Short term	Medium	Very Low (+ve)
Alternative Layout: Without mitigation	Very Low	Local	Short term	Medium	Very Low (-ve)
Alternative Layout: With mitigation	Very Low	Local	Short term	Medium	Very Low (+ve)
Operational Phase					
Preferred Layout: Without mitigation	Very Low	Local	Long term	Medium	Very Low (+ve)
Preferred Layout: With mitigation	Very Low	Local	Long term	Medium	Very Low (+ve)
Alternative Layout: Without mitigation	Low	Local	Long term	Medium	Very Low (-ve)
Alternative Layout: With mitigation	Very Low	Local	Long term	Medium	Very Low (+ve)
Impact 4: Impact on Biota					
Alternatives	**Intensity**	**Extent**	**Duration**	**Probability of impact occurring**	**Significance**
Construction Phase					
Preferred Layout: Without mitigation	Very Low	Local	Short term	Medium	Very Low (+ve)
Preferred Layout: With mitigation	Low	Local	Short term	Medium	Very Low (+ve)
Alternative Layout: Without mitigation	Low	Local	Short term	Medium	Very Low (-ve)
Alternative Layout: With mitigation	Very Low	Local	Short term	Medium	Very Low (+ve)
Operational Phase					
Preferred Layout: Without mitigation	Very Low	Local	Long term	Medium	Very Low (+ve)
Preferred Layout: With mitigation	Low	Local	Long term	Medium	Low (+ve)
Alternative Layout: Without mitigation	Low	Local	Long term	Medium	Low (-ve)
Alternative Layout: With mitigation	Very Low	Local	Long term	Medium	Very Low (-ve)

No cumulative or indirect impacts were identified.

Conclusion and Recommendation

Impacts were assessed and it was found that, after mitigation, all potential impacts of both layouts were in the Low Negative category or better, with many impacts representing an improvement over the current situation in the Low and Very Low Positive categories. The preferred layout represents the scenario with the lowest overall negative impact and the highest overall positive impact and represents a significant improvement on the “no go” scenario. It is therefore recommended that the proposed development be implemented in accordance with the preferred layout and that the necessary environmental and water use authorisations be granted.

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Disclaimer

EnviroSwift (Pty) Ltd has exercised all due care in the reviewing of all available information. The wetland enhancement recommendations provided are entirely reliant on the accuracy and completeness of the provided specialist studies as well as professional judgement. EnviroSwift (Pty) Ltd does not accept responsibility for any errors or omissions in the assessment and therefore does not accept any consequential liability arising from commercial decisions made, which are based on the information contained in this report. Opinions presented in this report apply to conditions/site conditions applicable at time of review and those conditions which are reasonably foreseeable.

Glossary[1]

Alluvial soil: A deposit of sand, mud, etc. formed by flowing water, or the sedimentary matter deposited thus within recent times, especially in the valleys of large rivers.

Biodiversity: The number and variety of living organisms on earth, the millions of plants, animals and micro-organisms, the genes they contain, the evolutionary history and potential they encompass and the ecosystems, ecological processes and landscape of which they are integral parts.

Buffer: A strip of land surrounding a wetland or riparian area in which activities are controlled or restricted, in order to reduce the impact of adjacent land uses on the wetland or riparian area.

Catchment: The area contributing to runoff at a particular point in a river system.

Chroma: The relative purity of the spectral colour which decreases with increasing greyness.

Critical Biodiversity Areas: Areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services.

Delineation (of a wetland): To determine the boundary of a wetland based on soil, vegetation and/or hydrological indicators.

Ecoregion: A recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterise that region.

Ephemeral stream: A stream that has transitory or short-lived flow.

Groundwater: Subsurface water in the saturated zone below the water table.

Habitat: The natural home of species of plants or animals.

Hue (of colour): The dominant spectral colour.

Hydromorphic soil: A soil that, in its undrained condition, is saturated or flooded long enough to develop anaerobic conditions favouring the growth and regeneration

[1] As provided by DWA (2005) and WRC Report No. TT 434/09.

of hydrophytic vegetation (vegetation adapted to living in anaerobic soils).

Hydrology: The study of the occurrence, distribution and movement of water over, on and under the land surface.

Hydrophytes: Also called obligate wetland plants - plants that are physiologically bound to water where at least part of the generative cycle takes place in the water or on the surface.

Halophytes: Salt tolerant plants.

Helophytes: Also called facultative wetland plants - essentially terrestrial plants of which the photosynthetically active parts tolerate long periods of submergence or floating on water.

Indicator species: A species whose presence in an ecosystem is indicative of particular conditions (such as saline soils or acidic waters).

Intermittent flow: Flows only for short periods.

Macrophyte: A large plant - in wetland studies usually a large plant growing in shallow water or waterlogged soils.

Perennial: Permanent - persisting from year to year.

Riparian area delineation: The determination and marking of the boundary of the riparian area.

Riparian habitat: Includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterized by alluvial soils (deposited by the current river system) and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent areas.

Shrub: A shrub is a small to medium-sized woody plant.

Temporary zone: The zone that is alternately inundated and exposed.

Terrain unit morphological classes: Areas of the land surface with homogenous form and slope.

Watercourse (NWA):

(a) A river or spring;
(b) A natural channel in which water flows regularly or intermediately;
(c) A wetland, lake or dam into which or from which water flows; and
(d) Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse.

Water table: The upper surface of groundwater or that level below which the soil is saturated with water. The water table feeds base flow to the river channel network when the river channel is in contact with the water table.

Wetland: An area of marsh, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed ten metres.

Acronyms

CCT	City of Cape Town
CBA	Critical Biodiversity Area
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EIS	Ecological Importance and Sensitivity
FEPA	Freshwater Ecological Support Area
GPS	Global Positioning System
HGM	Hydrogeomorphic
IHI	Index of Habitat Integrity
IHIA	Intermediate Habitat Integrity Assessment
MAP	Mean Annual Participation

NEMA National Environmental Management Act
NFEPA National Freshwater Ecosystem Priority Areas
NWA National Water Act
OESA Other Ecological Support Area
PES Present Ecological State
QDS Quarter Degree Square
REC Recommended Ecological Category
SANBI South African National Biodiversity Institute
Sub-WMA Sub - Water Management Area
VEGRAI Riparian Vegetation Response Assessment Index
WCBF Western Cape Biodiversity Framework
WMA Water Management Area
WUL Water Use Licence

Specialist Details and Experience

Joshua Gericke (Pr.Sci.Nat. 117997)

Joshua holds a Bachelor of Science Honours degree in Environmental Management from the University of Cape Town and graduated in 2008. He has completed several short courses in freshwater, estuarine and coastal resource management and in identification of freshwater and marine fish, birds and plants. He has more than 8 years of experience in management of freshwater, estuarine and coastal systems with the City of Cape Town. He has also consulted periodically on topics related to freshwater, estuarine and coastal ecology and management since 2010, and in 2017 began consulting full time.

Jocelyn Anderson (Cand.Sci.Nat. Registration pending)

Jocelyn graduated from the University of Cape Town with a Bachelor of Science degree in Applied Biology, and Ecology & Evolution. She later went on to complete her honours in Environmental Management from the University of South Africa. Jocelyn has just over two years of experience working in the nature conservation field where she has honed her bird and plant identification skills. Jocelyn began consulting part-time in the beginning of 2018 and has working experience in wetland assessments, wetland delineations, and risk assessments.

Natasha van de Haar (Pr.Sci.Nat. 400229)

Natasha is a registered Professional Natural Scientist (Pr.Sci.Nat) with the South African Council for Natural Scientific Professions (SACNASP). She also holds a Masters Degree in Science (M.Sc.) in the field of Botany. Over the course of Natasha's career, she completed a number of floral identification short courses and also obtained a certificate of competence for wetland assessments from Rhodes University. She is also a member of the South African Wetland Society, Botanical Society of SA as well as the Western Cape Wetlands Forum.

Her career kicked off as a field ecologist in 2009, focusing on floral biodiversity and ecological functioning, with special mention of wetland ecology and functioning within South Africa (all provinces). She further worked as a specialist project member in Mauritius, Lesotho and Ghana. During the course of her career she obtained extensive experience in conducting terrestrial as well as wetland related surveys in the mining, residential and infrastructure development industries as well as development of several alternative energy facilities. Natasha also gained experience in Biodiversity Offset Initiatives as well as RDL/protected plant permit applications. Presently her main focus is wetland assessments including delineation as well as present ecological state and function assessments.

1 Introduction

1.1 Project Background

EnviroSwift Western Cape has been appointed to undertake a specialist freshwater assessment of the freshwater features on Louw's Bos Farm RE/502 in Stellenbosch, Western Cape (refer to Figure 1 for location). The freshwater assessment is required to inform the Basic Assessment process undertaken in terms of the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) regulations (GN326 of 2017) and the application for a water use authorisation in terms of Section 21 of the National Water Act (NWA, 1998).

Stellenbosch Municipality proposes establishment of a memorial park of approximately 160ha on Louw's Bos, the remaining extent of Farm 502, Stellenbosch. Farm RE/502 is a large tract of land owned by Stellenbosch Municipality and is divided into two portions, North and South. The applicant's preferred layout falls within Farm RE/502 South, while an alternative layout falls within Farm RE/502 North.

Existing agricultural activities are prevalent on both Farm RE/502. Agricultural activities include viticulture as well as cattle farming. The alternative site, Farm RE/502 North, includes the Stellenbosch Aerodome and an equestrian centre in the north eastern parts and the proposed layout would fall to the west thereof. Annandale Road intersects Farm RE/502 South. The proposed layout of the development for Farm RE/502 South (see Figure 2) has been provided. An alternative layout for Farm RE/502 North has not yet been drafted, but the infrastructure and activities involved would be similar to that detailed in the proposed layout for the Louw's Bos South. The proposed layout of the development is not final and this report will therefore inform the final layout and is therefore subject to change in accordance with the final layout.

The proposed memorial park development will include the following:

- Construction of hardened infrastructure including a chapel, office, columbarium, public toilets, an access road and hardened pathways;
- Installation of graves;
- Landscaping of the cemetery and of a parkland including a small forest and informal parkland of mixed fynbos vegetation and indigenous trees for shade and screening where appropriate with cleared, unmade pathways in between.

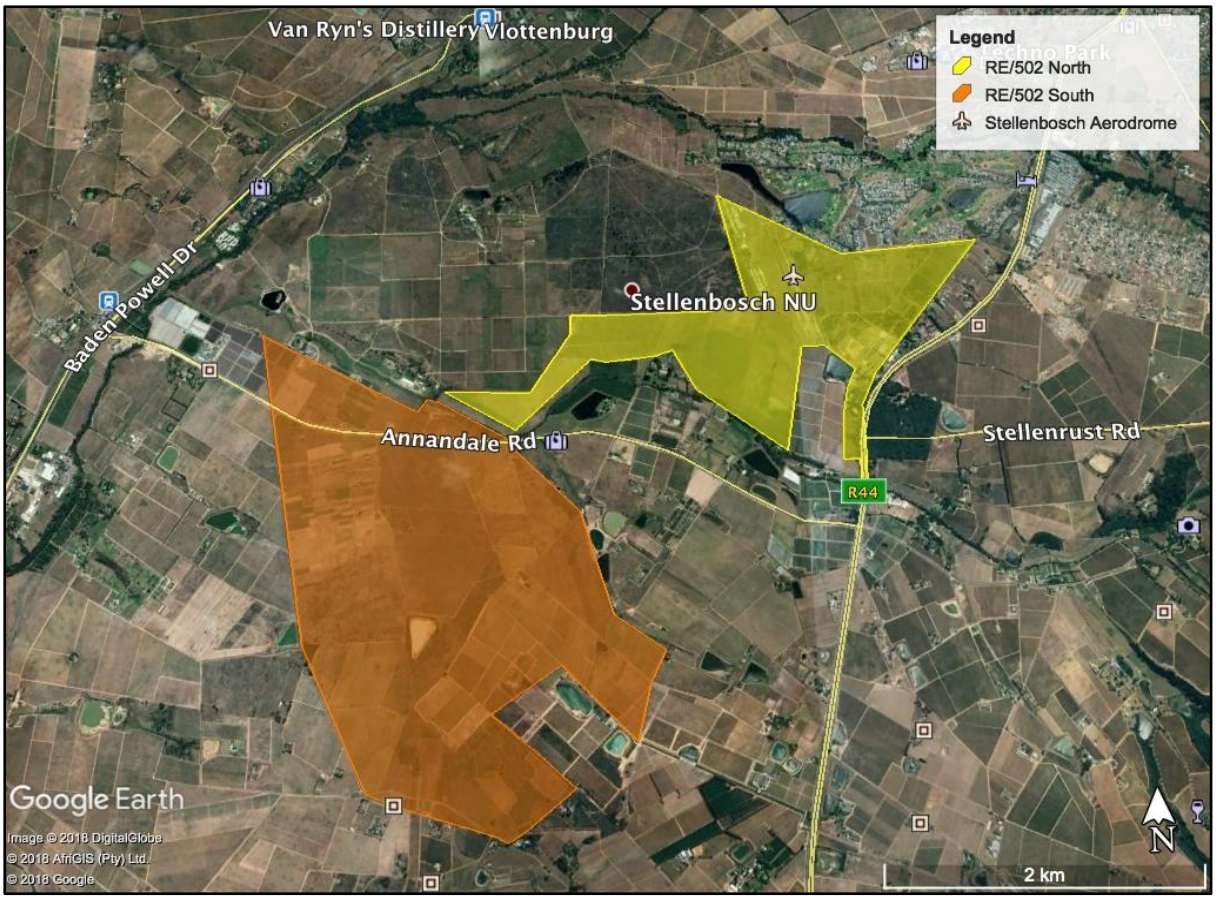

Figure 1: Louw's Bos, Farm RE/502 North and South in relation to its surroundings.

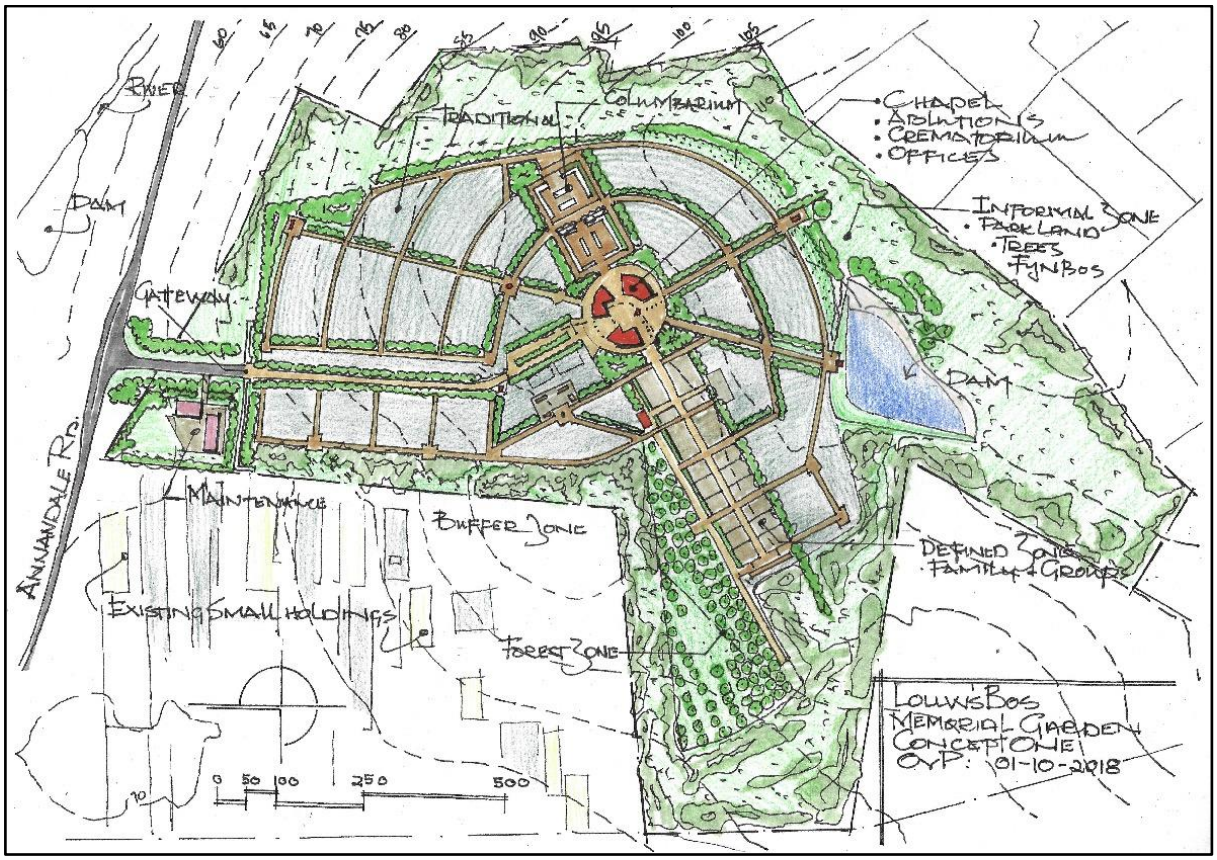

Figure 2: Louw's Bos Concept Draft on Farm RE/502 South.

1.2 Scope of Work

The scope of work which informs this assessment includes:

- Assessment of relevant background information including the National Freshwater Ecological Database (NFEPA, 2011), the Western Cape Biodiversity Spatial Plan (WCBSP, 2017), the National Geospatial Information (NGI) Service topographical maps and vector data, and pertinent academic resources;

- A site assessment including delineation of the wetland boundary nearest the proposed development in accordance with best practice guidelines such as (Department of Water Affairs and Forestry - DWAF, 2008) and Job, et. al. (2009);

- Assessment of the Present Ecological State (PES), Ecological Importance and Sensitivity (EIS) and wetland ecosystem services according to appropriate methods;

- Assessment of freshwater impacts and potential mitigation measures; and

- Clarification of the potential freshwater legislative constraints applicable to the development.

1.3 Limitations and Assumptions

The following limitations apply to this study.

- Only natural watercourses and dams associated with the proposed development within Farm RE/502 were identified and delineated during the field survey. Agricultural drainage channels were specifically excluded from the assessment where they were deemed to be of entirely unnatural origins and where they are not associated with natural watercourses or dams.
- Only watercourses that in the opinion of the specialist may be impacted significantly by the proposed development given the information available at the time of the assessment were assessed.
- A Garmin E-Trex 20 GPS was used to delineate any wetlands identified on the site and accuracy is therefore limited to the stated accuracy of the GPS of approximately 3m. All effort is made to improve on the stated accuracy including the use of the waypoint averaging function at the most critical points. It is however the opinion of the specialist that this limitation is of no material significance and that the freshwater constraints have been adequately identified.
- This study is limited to the upper 50cm of soil in accordance with the Updated Manual for Identification and Delineation of Wetland and Riparian Areas (Department of Water Affairs and Forestry - DWAF, 2008) and the Application of the DWAF (2008) Method to Wetland Soils of Western Cape (Job *et. al.* 2009).
- A single site assessment was conducted on 2 November 2018 during early Summer. Therefore, comments on hydrology are limited.
- The area has undergone extensive transformation for agricultural purposes; therefore, it is the opinion of the specialist that the site can be considered a difficult case due to the degree of disturbance and the lack of natural vegetation.

1.4 Legislation

1.4.1 National Water Act (36 of 1998)

The purpose of the NWA is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways which take into account amongst other factors -
(g) protecting aquatic and associated ecosystems and their biological diversity; and
(h) reducing and preventing pollution and degradation of water resources.

In order to understand and interpret the Act correctly, the following definitions are applicable to this project:
``**pollution''** means the direct or indirect alteration of the physical, chemical or biological properties of a water resource;
``**protection",** in relation to a water resource, means -
(a) maintenance of the quality of the water resource to the extent that the water resource may be used in an ecologically sustainable way;
(b) prevention of the degradation of the water resource; and
(c) the rehabilitation of the water resource;
``**resource quality''** means the quality of all the aspects of a water resource including -
(a) the quantity, pattern, timing, water level and assurance of instream flow;
(b) the water quality, including the physical, chemical and biological characteristics of the water;
(c) the character and condition of the instream and riparian habitat; and
(d) the characteristics, condition and distribution of the aquatic biota;
"watercourse'' means -
(a) a river or spring;
(b) a natural channel in which water flows regularly or intermittently;
(c) a wetland, lake or dam into which, or from which, water flows; and
(d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks; and
``**water resource''** includes a watercourse, surface water, estuary, or aquifer.

The NWA deals with pollution prevention, and in particular the situation where pollution of a water resource occurs or might occur as a result of activities on land. The person who owns, controls, occupies or uses the land in question is responsible for taking measures to prevent pollution of water resources. The measures may include measures to -
(a) cease, modify or control any act or process causing the pollution;
(b) comply with any prescribed waste standard or management practice;
(c) contain or prevent the movement of pollutants;
(d) eliminate any source of the pollution;
(e) remedy the effects of the pollution; and
(f) remedy the effects of any disturbance to the bed and banks of a watercourse.

Water use is defined broadly, and includes taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation. In general a water use must be licensed unless it is listed in Schedule I, is an existing lawful use, is permissible under a general authorisation, or if a responsible authority waives the need for a licence.

1.4.2 General Notice 509 (2016) of the NWA

According to GN509 of 2016 the extent of a watercourse means:
a) a river, spring or natural channel in which water flows regularly or intermittently "within the outer edge of the 1 in 100 year floodline or riparian habitat measured from the middle of the watercourse from both banks", and for b) wetlands and pans "within a 500 m radius from the boundary (temporary zone) of any wetland or pan" (when the temporary zone is not present then the seasonal zone is delineated as the wetland boundary), and for c) lakes and dams "purchase line plus a buffer of 50 m".

According to the GN509 a General Authorisation (GA) may be acquired for the use of water in terms of section 21 c and i within the extent of a watercourse where the Risk Class as determined by the new Risk Assessment Matrix is Low.

1.4.3 National Environmental Management Act (107 of 1998)

The NEMA states the following:

“Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.”

The Act also makes special mention of the importance of the protection of wetlands:
“Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.”

2 Method of Assessment

2.1 Desktop Assessment

The scope of work includes a desktop assessment using available national and provincial databases including the Western Cape Biodiversity Spatial Plan (WCBSP, 2017), the National Freshwater Ecosystem Priority Areas project (NFEPA, 2011) and maps and vector data form the National Geospatial Information (NGI) directorate.

The Western Cape Biodiversity Spatial Plan (2017) categorises natural features into Protected Areas (PAs), Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs), and Other Natural Areas (ONAs), which are defined in the plan as follows:

Table 1: WCBSP category definitions and management objectives.

MAP CATEGORY	DEFINITION	DESIRED MANAGEMENT OBJECTIVE	SUB-CATEGORY
Protected Area	Areas that are proclaimed as protected areas under national or provincial legislation.	Must be kept in a natural state, with a management plan focused on maintaining or improving the state of biodiversity. A benchmark for biodiversity.	n/a
Critical Biodiversity Area 1	Areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.	Maintain in a natural or near-natural state, with no further loss of habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.	CBA: River CBA: Estuary CBA: Wetland CBA: Forest CBA: Terrestrial
Critical Biodiversity Area 2	Areas in a degraded or secondary condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.	Maintain in a functional, natural or near-natural state, with no further loss of natural habitat. These areas should be rehabilitated.	CBA: Degraded
Ecological Support Area 1	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs, and are often vital for delivering ecosystem services.	Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.	ESA: Foredune ESA: Forest ESA: Climate Adaptation Corridor ESA: Coastal Resource Protection ESA: Endangered Ecosystem ESA: River ESA: Estuary ESA: Wetland ESA: Watercourse Protection ESA: Water Source Protection ESA: Water Recharge Protection
Ecological Support Area 2	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs, and are often vital for delivering ecosystem services.	Restore and/or manage to minimise impact on ecological infrastructure functioning; especially soil and water-related services.	ESA: Restore from NN
ONA: Natural to Near-Natural	Areas that have not been identified as a priority in the current systematic biodiversity plan, but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions. Although they have not been prioritised for biodiversity, they are still an important part of the natural ecosystem.	Minimise habitat and species loss and ensure ecosystem functionality through strategic landscape planning. Offers flexibility in permissible land uses, but some authorisation may still be required for high-impact land uses.	ONA: Natural to Near-Natural ONA: Degraded
No Natural Remaining	Areas that have been modified by human activity to the extent that they are no longer natural, and do not contribute to biodiversity targets. These areas may still provide limited biodiversity and ecological infrastructure functions, even if they are never prioritised for conservation action.	Manage in a biodiversity-sensitive manner, aiming to maximise ecological functionality. Offers the most flexibility regarding potential land uses, but some authorisation may still be required for high-impact land uses.	No Natural Remaining

2.2 Watercourse Identification and Delineation

A field survey was undertaken on the 2nd of November 2018.

For the purpose of the identification of water resources, the definition as provided by the NWA (Act no. 36, 1998) was used to guide the site assessment. The NWA defines a water resource as a watercourse, surface water, estuary or aquifer, of which the latter two are not applicable to this assessment due to an estuary being associated with the sea and, in line with best practice guidelines, wetland and riparian assessments only include the assessment of the first 50 cm from the soil surface, therefore aquifers are excluded. In addition, reference to a watercourse as provided above includes, where relevant, its bed and banks.

In order to establish if the watercourses in question can be classified as 'wetland habitat' or 'river habitat', the definitions as drafted by the NWA (Act no. 36, 1998)[2] were taken into consideration:

- A 'wetland' is land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil; and
- 'Riparian' habitat includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterized by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent areas'.

Freshwater habitat was identified with the use of the definitions provided above and the delineation took place according to the method supplied by DWAF (2005, updated 2008). Several indicators are prescribed in the watercourse delineation guideline to facilitate the delineation of either the temporary wetland zone or the rivers riparian zone.

Indicators used to determine the boundary of the wetland temporary zone include:

1) The position in the landscape;
2) The type of soil form;
3) The presence of wetland vegetation species; and
4) The presence of redoximorphic soil features, which are morphological signatures that appear in soils with prolonged periods of saturation.

Indicators used to determine the boundary of the riparian zone include:

1) Landscape position;
2) Alluvial soils and recently deposited material;
3) Topography associated with riparian areas; and
4) Vegetation associated with riparian areas.

[2] The definitions as provided by the NWA (Act No. 36 of 1998) are the only legislated definitions of wetlands in South Africa.

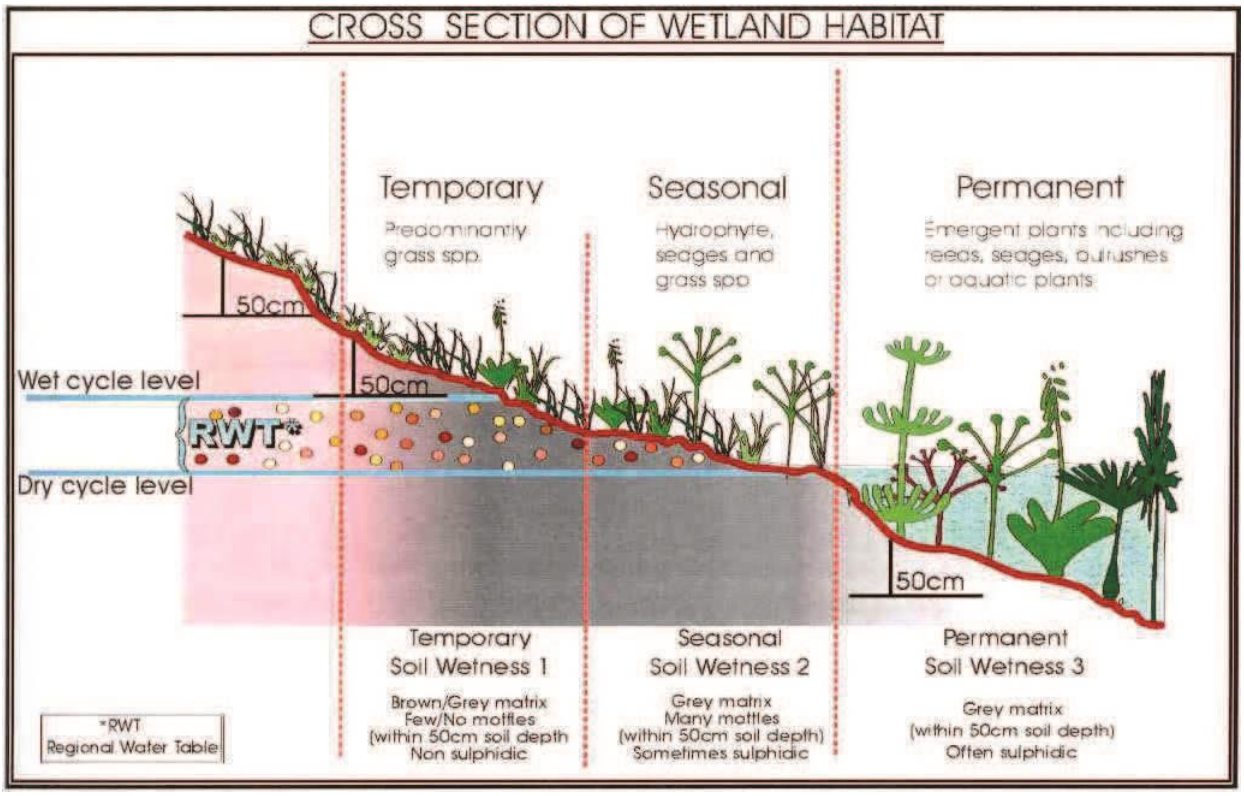

Figure 3: Cross section through a wetland (after DWAF, 2005).

Table 2: Vegetation characteristics used in the delineation of wetlands (after DWAF, 2005).

Terrestrial / Non wetland	Temporary	Seasonal	Permanent / Semi-permanent
Dominated by plant species which occur extensively in non-wetland areas; hydrophytic[3] species may be present in very low abundance	Predominantly grass species; mixture of species which occur extensively in non-wetland areas and hydrophytic plant species which are restricted largely to wetland areas	Hydrophytic sedge and grass species which are restricted to wetland areas	Dominated by emergent plants, including reeds, sedges and bulrushes or floating or submerged aquatic plants

[3] Plants that are physiologically bound to water where at least part of the generative cycle takes place in the water or on the surface.

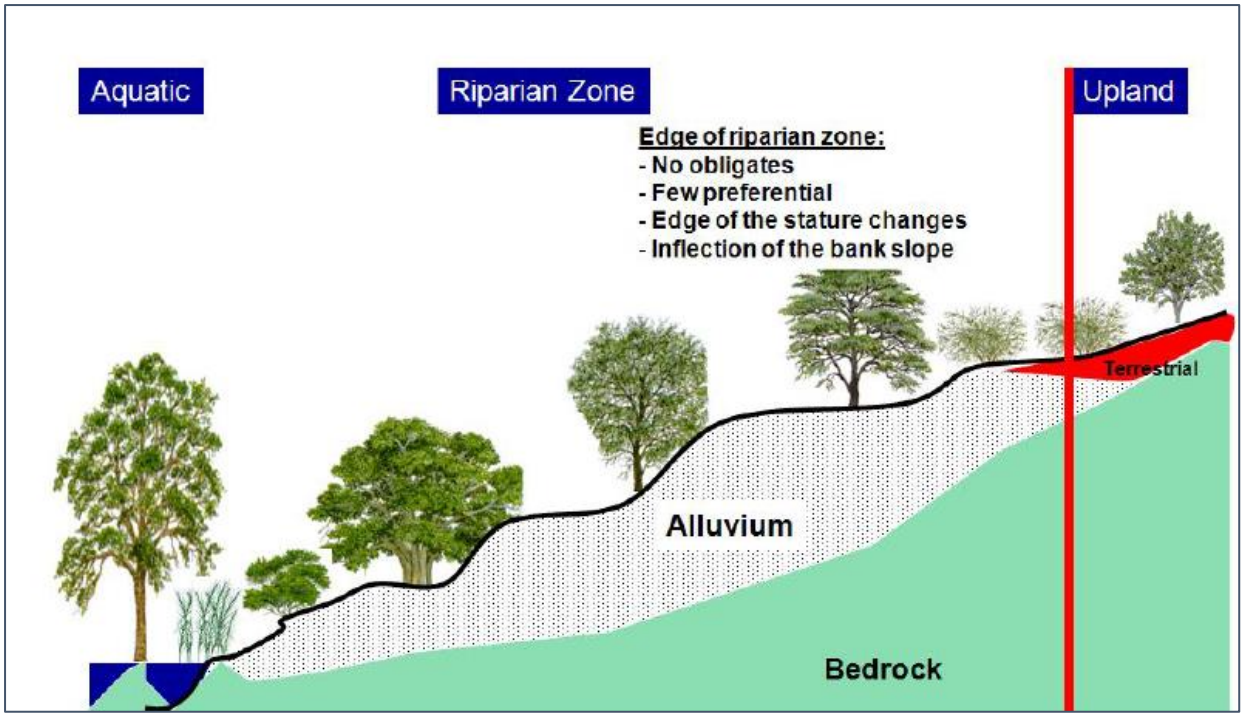

Figure 4: A schematic diagram illustrating the edge of the riparian zone on one bank of a large river (DWA, 2008).

2.3 Freshwater Feature Classification

Ecosystems included within the 'Classification System for Wetlands and other Aquatic Ecosystems in South Africa' (hereafter referred to as 'the Classification System') developed by Ollis *et. al*., (2013) encompass those that the Ramsar Convention defines, rather broadly, as 'wetlands', namely areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres (cited by Ramsar Convention Secretariat, 2011). The inland component of the Classification System has a six-tiered structure presented in the figure below.

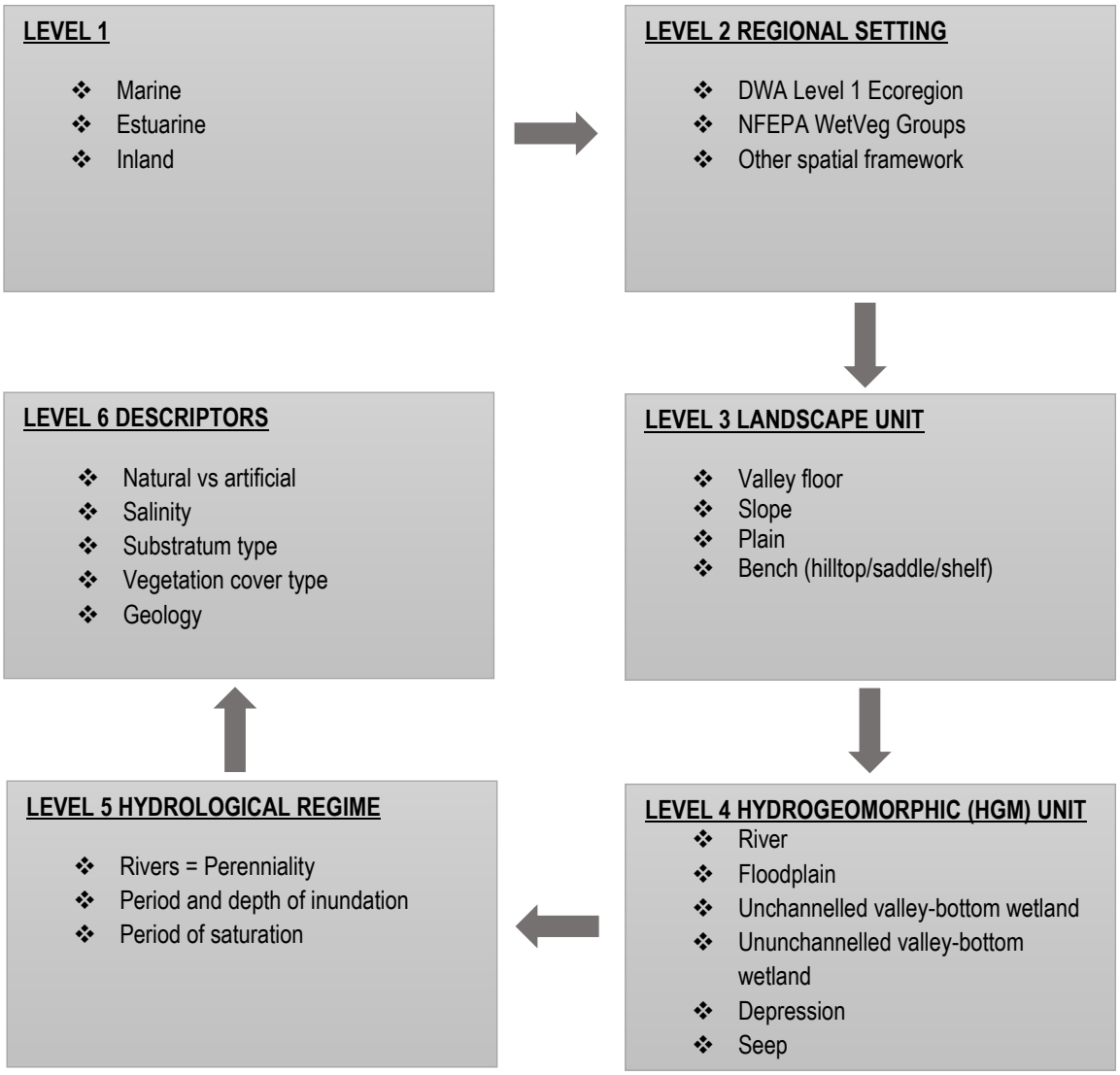

Figure 5: Classification System for wetlands and other aquatic ecosystems in South Africa.

2.4 Ecosystem Services

WET-EcoServices (Kotze *et. al.* 2007) was designed for inland palustrine wetlands and has been developed to help assess 15 key goods and services that individual wetlands provide in order to allow for more informed planning and decision making. Central to WET-EcoServices is the characterisation of Hydrogeomorphic (HGM) units by which the wetland can be divided into units of a similar character. The rationale behind characterising the HGM units of a wetland is that areas belonging to the same HGM type and falling within a similar geological and climatic setting are likely to have a similar structure and exhibit similar processes.

In addition, WET-EcoServices allows for the assessment of potential and actual ecosystem service outcomes of rehabilitation projects by applying the assessment to 'with rehabilitation' and 'without rehabilitation' situations and comparing the difference between the two.

2.5 Present Ecological State (PES)

WET-Health (Macfarlane, 2007) is a tool designed to assess the health or integrity of a wetland. Wetland health is defined as a measure of the deviation of wetland structure and function from the wetland's

natural reference condition. This technique attempts to assess hydrological, geomorphological and vegetation health in three separate modules. The modules may then be combined to determine an overall PES for the wetland. A Level 1 WET-Health assessment was undertaken as part of this assessment.

Description	Combined impact score	PES Category
Unmodified, natural.	0-0.9	A
Largely natural with few modifications. A slight change in ecosystem processes is discernable and a small loss of natural habitats and biota may have taken place.	1-1.9	B
Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact	2-3.9	C
Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4-5.9	D
The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6-7.9	E
Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8 - 10	F

2.6 Ecological Importance and Sensitivity (EIS)

The EIS method applied to wetlands is based on the assessment tool developed by Rountree et. al (2014) and was used to determine the ecological importance and sensitivity of wetlands, incorporating the traditionally examined criteria used in EIS assessments of other water resources by the Department of Water Affairs (DWA) and thus enabling consistent assessment approaches across water resource types.

Hydro-functional importance and basic human needs have been assessed as part of the WET-EcoServices and were therefore excluded. In the method a series of determinants are assessed on a scale of 0 to 4, where “0” indicates no importance and “4” indicates very high importance.

2.7 Recommended Ecological Category (REC)

The Recommended Ecological Category (REC) is determined by the PES score as well as importance and/or sensitivity. Water resources which have a PES falling within an E or F ecological category are deemed unsustainable. In such cases the REC must automatically be increased to a D. Where the PES is determined to be within an A, B, C or D ecological category, the EIS components must be evaluated to determine if any of the aspects of importance and sensitivity are high or very high. If this is the case, the feasibility of increasing the PES (particularly if the PES is in a low C or D category) should be evaluated and either set at the same ecological category or higher depending on feasibility. This is recommended to enable important and/or sensitive water resources to maintain their functionality and continue to provide the goods and services for the environment and society.

2.8 Impact Assessment

A method of assessment summary is provided below; the detailed method is provided in Appendix 1.

The following criteria were taken into consideration when determining the impact of the proposed activities:

- The nature of the impact i.e. positive, negative, direct, indirect;
- The extent and location of the impact;
- The duration of the impact i.e. short term, long term, intermittent or continuous;
- The magnitude/intensity of the impact i.e. high, medium, low; and
- The likelihood or probability of the impact occurring.

Mitigation measures were subsequently identified and recommended for all impacts to reduce the overall impact significance to an acceptable level, where and if possible. Mitigation measures were aimed to ensure that:

- More environmentally sound designs / layouts / technologies, etc., are investigated and implemented, if feasible;
- Environmental benefits of a proposed activity are enhanced;
- Negative impacts are avoided, minimised or remedied; and
- Residual negative impacts are within acceptable levels.

3 Results

3.1 Desktop Assessment

3.1.1 Regional Setting

The remaining extent of Farm RE/502 is situated within the South Western Coastal Belt Ecoregion the main attributes of which are listed in

Table 3 below. It is furthermore within the Berg Water Management Area (WMA), the Lower Berg Sub-WMA and the G22H quaternary catchment (NFEPA, 2011 and Kleinhans, 2005).

Table 3: Main attributes of the South Western Coastal Belt Ecoregion (Kleinhans, 2005)

Main Attributes	South Western Coastal Belt
Terrain Morphology: Broad division (dominant types in bold) (Primary)	Plains; Low Relief; **Plains Moderate Relief**; Closed Hills; Mountains; Moderate and High Relief.
Vegetation types (dominant types in bold) (Secondary)	Sand Plain Fynbos; Mountain Fynbos; **West Coast Renosterveld;** Dune Thicket; Strandveld Succulent Karoo
Altitude (m a.m.s.l) (Primary)	0-300; 300-900 limited
Mean annual precipitation (mm) (modifying)	0 to 1500
Coefficient of Variation (% of annual precipitation)	<20 to 40
Rainfall concentration index	30 to 60
Rainfall seasonality	Winter
Mean annual temp. (°C)	10 to 20
Mean daily max. temp. (°C): February	24 to 32
Mean daily max. temp. (°C): July	12 to 20
Mean daily min. temp. (°C): February	12 to 18
Mean daily min temp. (°C): July	4 to 10
Median annual simulated runoff (mm) for quaternary catchment	<5; 20 to >250

3.1.2 Local Setting

Remaining extent of Farm 502 is situated on the outskirts of the town of Stellenbosch. The area is nestled below the Hottentots Holland Mountain Catchment Area on a gentle gradient with a slope of between 0-10%. It exhibits moderate temperature and rainfall conditions that are typical of the South Western Coastal Belt Ecoregion.

The applicable terrestrial vegetation type is predominantly Swartland Granite Renosterveld with patches of Swartland Silcrete Renosterveld, both listed as Critically Endangered according to the Western Cape Biodiversity Spatial Plan (refer to Figure 7). The National Freshwater Ecological Priority Areas (NFEPA, 2011) project's applicable Wetland Vegetation type is West Coast Granite Renosterveld and West Coast Silcrete Renosterveld (Figure 8), listed as Critically Endangered.

The local soil structure consists of undifferentiated soils with a marked clay accumulation, underlain by the Cape Granite suite. Additionally, soils may occasional include Quaternary quartz sand of the Springfontein Formation and alluvium, refer to Figure 9 (Cape Farm Mapper, 2018). Quartzitic sands, if encountered, are not expected to mottle readily (Job et. al., 2009).

The Western Cape Biodiversity Spatial Plan (2017) indicates patches of Type 1 Critical Biodiversity Areas (CBA's) in Farm RE/502 North and South; as well as a large swath of Type 2 CBA's in the north-eastern portion of Farm RE/502 North (refer to Figure 12 and Figure 13).

The main attributes of the farm are summarised in Table 4 below and in the figures that follow.

Table 4: Main attributes applicable to Farm RE/502 according to Cape Farm Mapper (2018).

Main Attributes	Farm RE/502, Stellenbosch
Terrain:	Slopes of between 0° and 3°.
Geology:	Cape Granite
Soils:	Forms: Plinthic catena, undifferentiated. Depth: 450 to 750mm Clay: 15% Erodibility: High
Vegetation types:	Swartland Granite Renosterveld and Swartland Silcrete Renosterveld. Refer to Figure 7.
Wetland vegetation types:	West Coast Granite Renosterveld and West Coast Silcrete Renosterveld. Refer to Figure 8
Altitude:	80 to 100m above mean sea level.
Mean annual precipitation:	666 mm
Mean annual temp:	16.5°C
Mean daily max. temp: February	27.6°C
Mean daily max. temp: July	17°C
Mean daily min. temp: February	15.2°C
Mean daily min temp: July	7°C
Median annual runoff	120.51 mm/annum

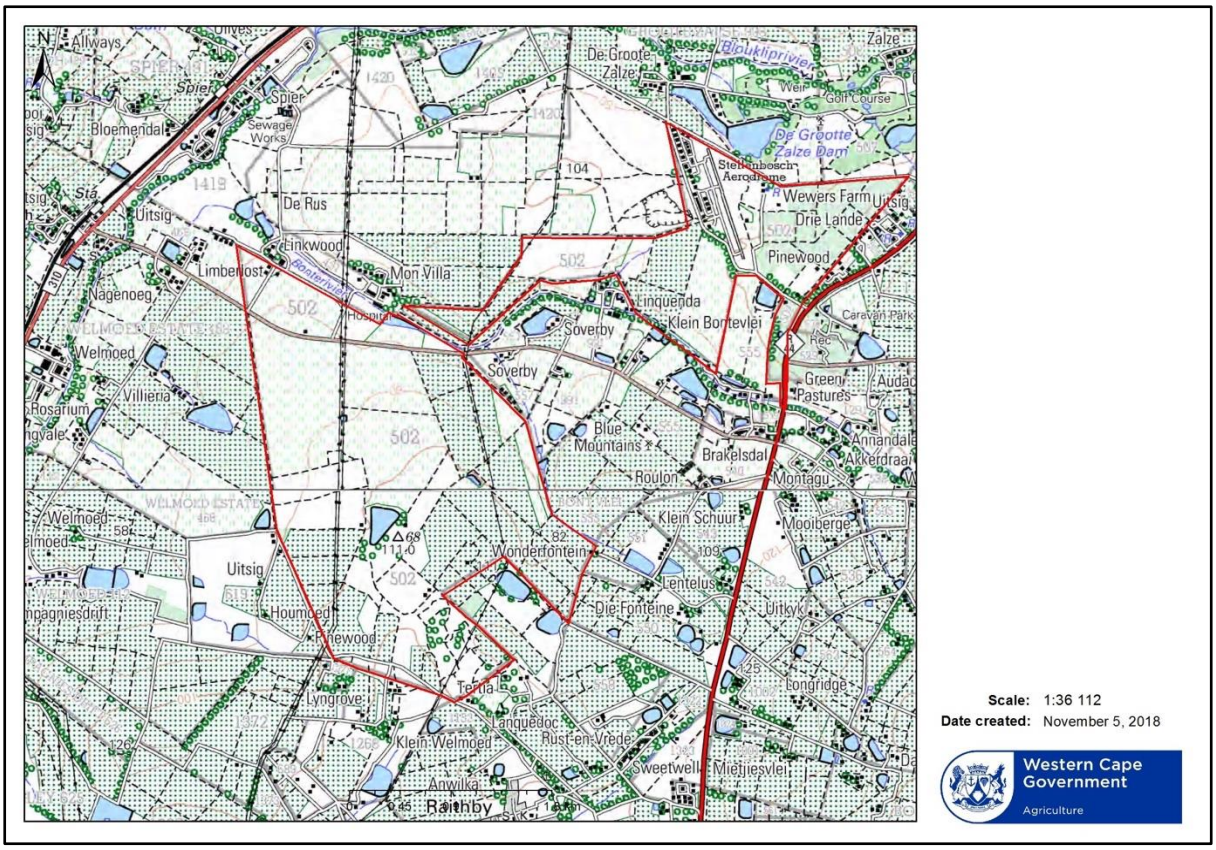

Figure 6: Topo-cadastral Map of Farm RE/502 North and South (Cape Farm Mapper, 2018).

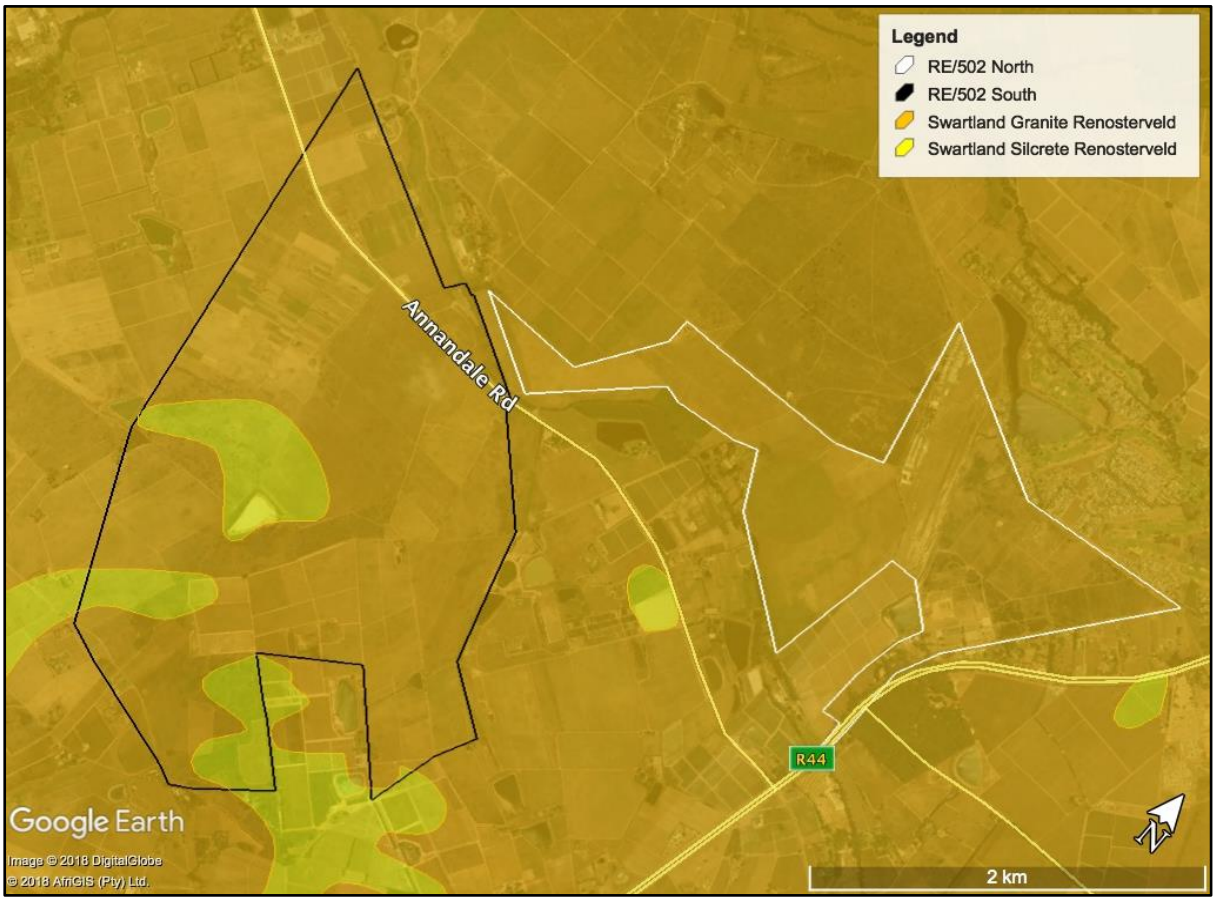

Figure 7: Terrestrial vegetation types according to Mucina and Rutherford (2009, updated 2012).

Figure 8: Wetland vegetation types according to NFEPA (2011).

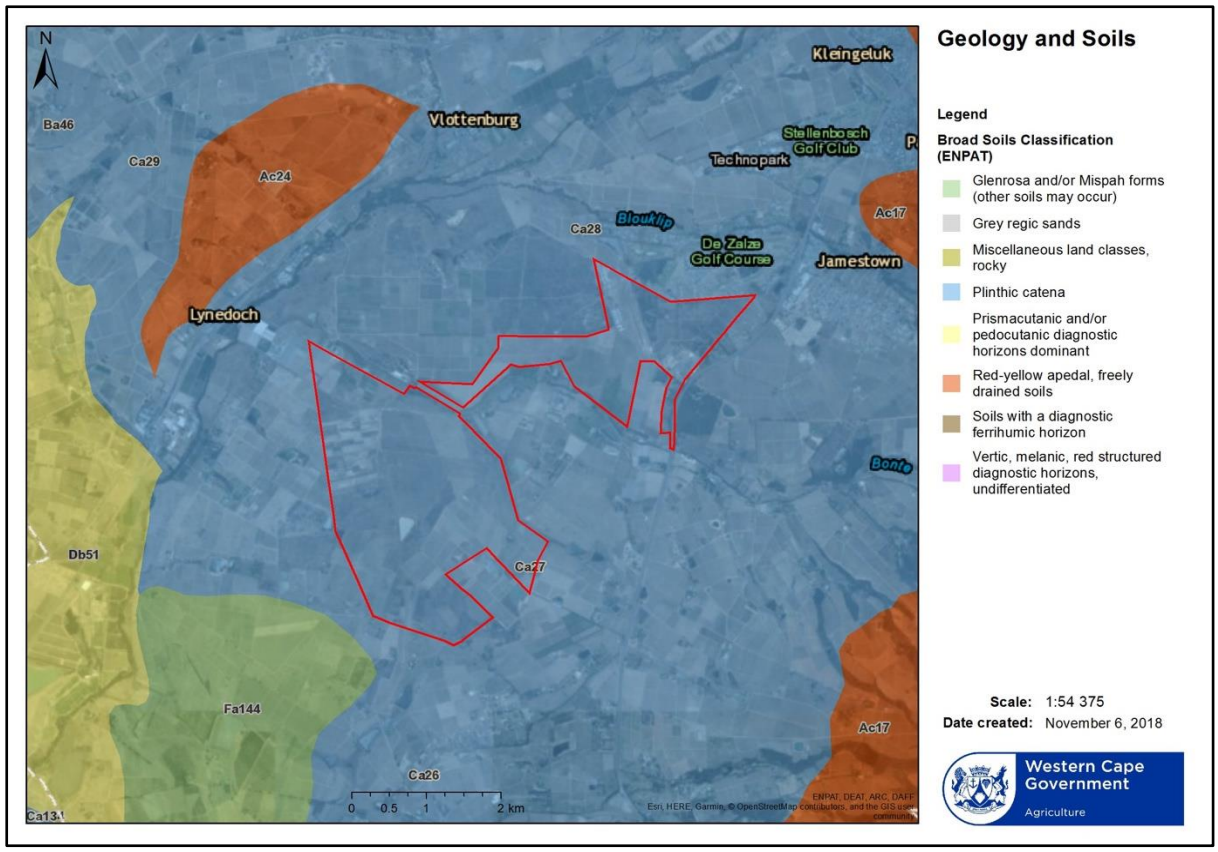

Figure 9: Geology and soils (Cape Farm Mapper, 2018).

3.1.3 Watercourses Within 500m

The National Water Act (NWA) defines a regulated area of 500m around wetlands, within which risks to these wetlands must be considered. Additionally, the NWA requires that risks to rivers, streams and drainage lines are also considered within a regulated area defined by the 1:100-year floodline. Floodlines are not available in this case, so all known rivers, streams, drainage lines and wetlands, within 500m of Louw's Bos, Farm RE/502, according to the available desktop resources, are presented below.

The National Freshwater Ecological Priority Areas (NFEPA, 2011) project indicates the presence of a number of artificial and natural wetlands, namely channelled and unchanneled valley bottom wetlands as well as artificial bench flat wetlands, within and adjacent to the study area. In addition, the National Geospatial Information Service (NGI) indicates many of these artificial bench flat wetlands as dams. The NGI also indicates the Bonterivier, a non-perennial river north-north east of Farm RE/502 South and south-south west of Farm RE/502 North. Smaller non-perennial drainage lines extend into both RE/502, North and South, from Bonterivier (refer to Figure 10 and Figure 11).

The Western Cape Biodiversity Spatial Plan (2017) highlight large tracts of Aquatic Type 2 Ecological Support Areas (ESA's 2) within, as well as along, the northern boundary of Farm RE/502 South (refer to Figure 13). ESA's Type 2 are also prevalent within, as well as along, the southern and northern boundary of Farm RE/502 North (refer to Figure 12).

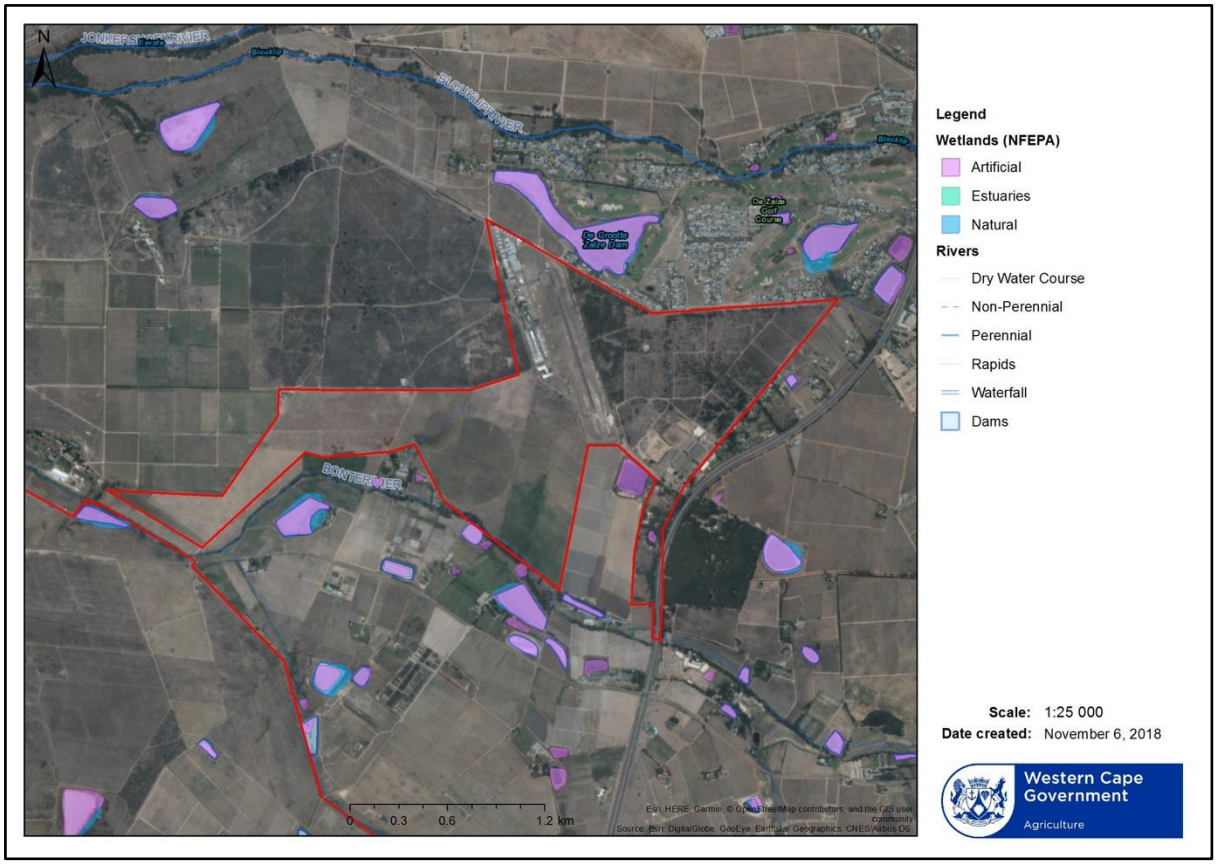

Figure 10: NFEPA (2011) and the National Geospatial Information Service (NGI) rivers and dams of Farm RE/502 North.

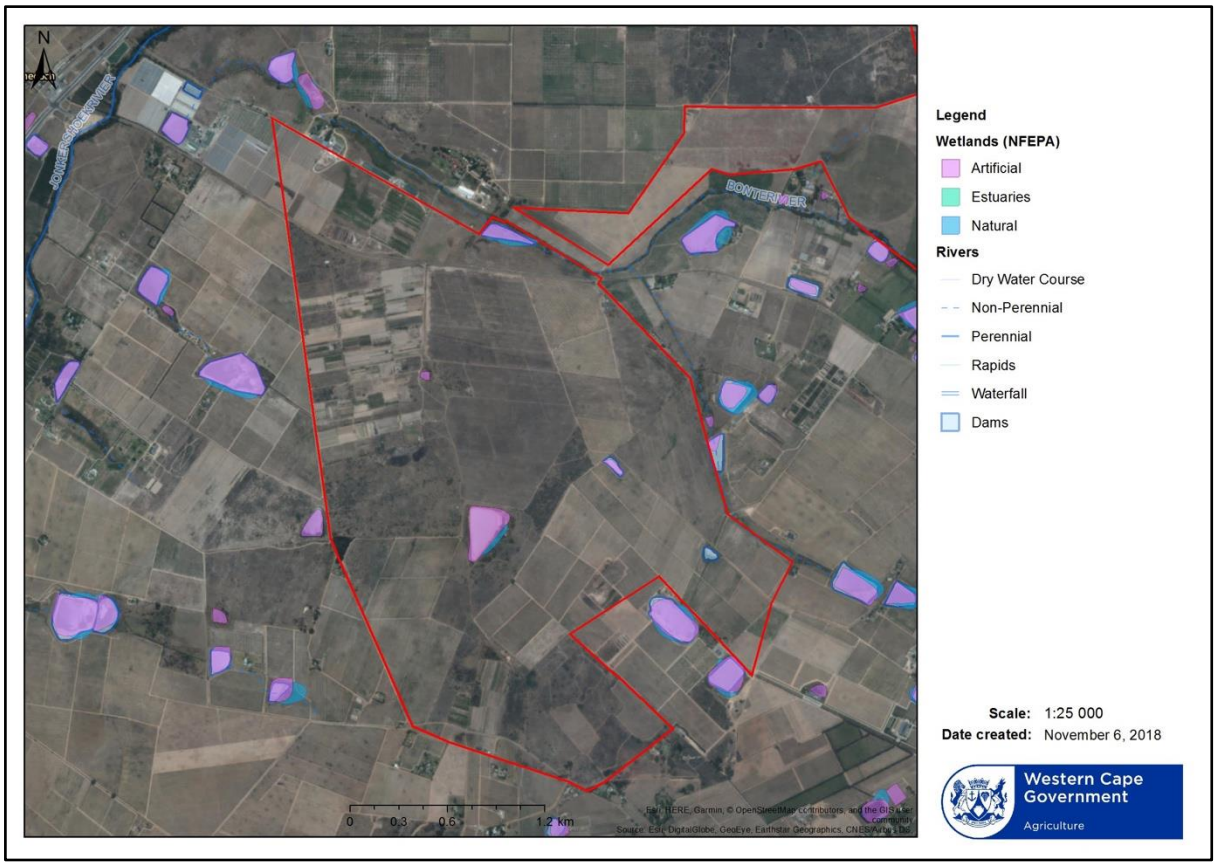

Figure 11: NFEPA (2011) and the National Geospatial Information Service (NGI) rivers and dams of Farm RE/502 South.

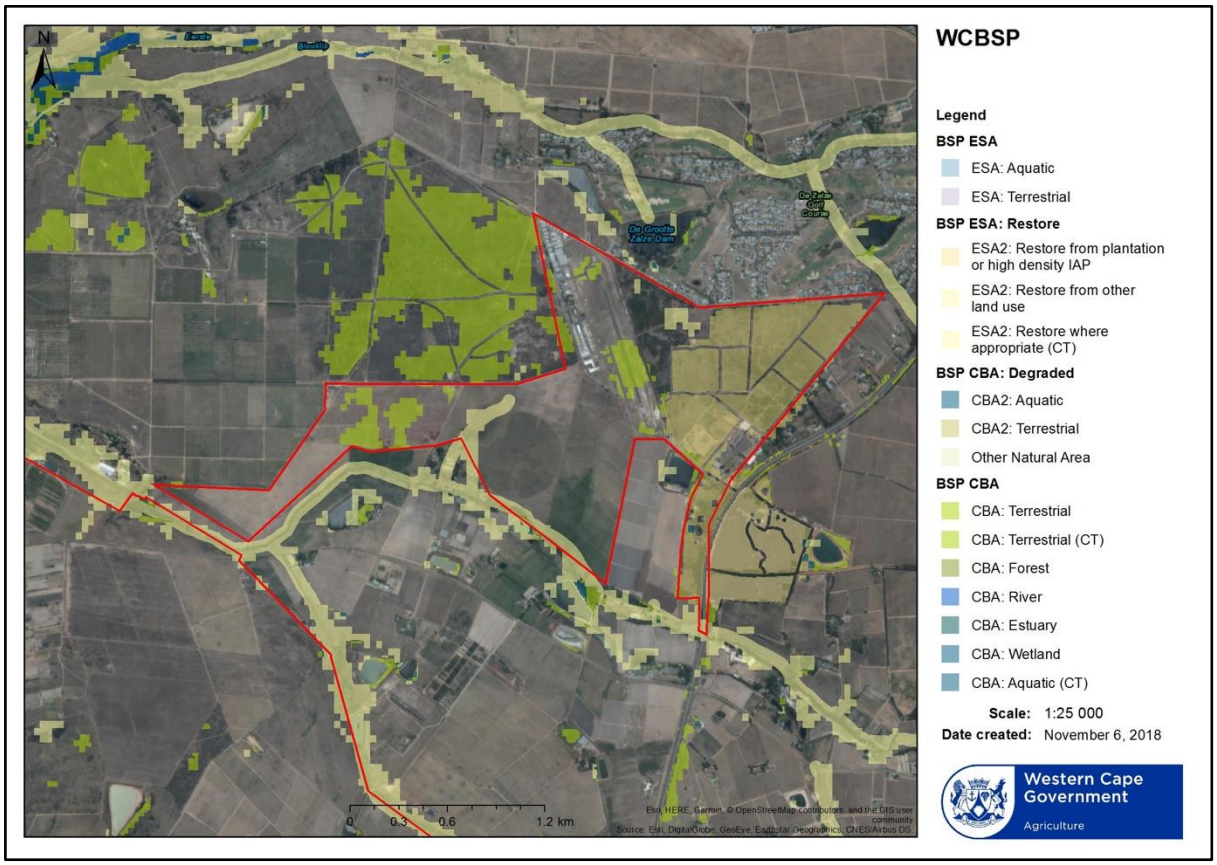

Figure 12: The Western Cape Biodiversity Spatial Plan of Farm RE/502 North (2017).

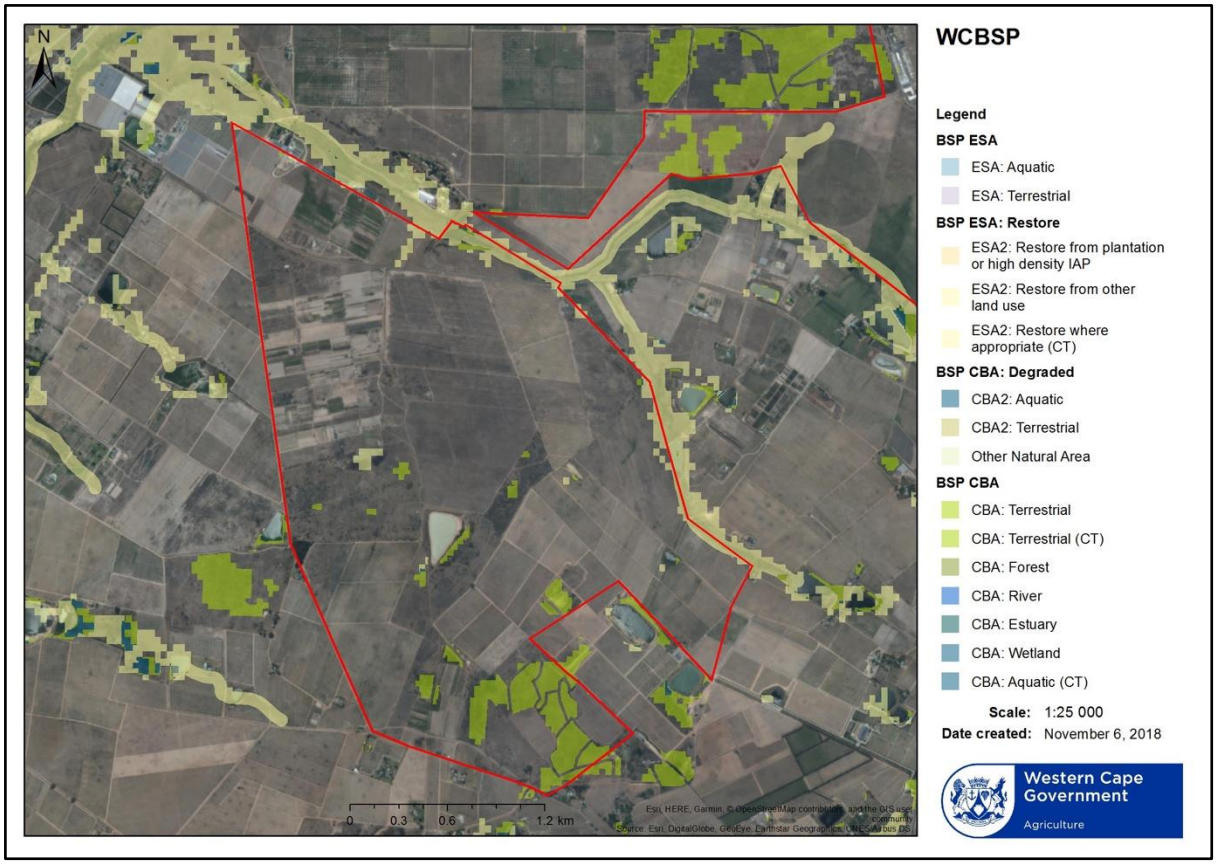

Figure 13: The Western Cape Biodiversity Spatial Plan of Farm RE/502 South (2017).

3.2 Site Assessment

3.2.1 Soil

Hand augering was conducted within the watercourse boundaries defined by the WCBSP (2017). All watercourses that were identified were found to exhibit hydromorphic soil indicators indicative of wetland conditions. Where wetland conditions were confirmed, augering was then conducted to locate and determine the outer boundary of the wetland.

Soils encountered in terrestrial areas were typical of terrestrial conditions and presented as brown, uniform, and sandy with little organic matter. Terrestrial soil samples would not stay in the open auger head and were uniform and brown within the upper 50cm.

Soils sampled in wetland areas were found to be grey and sandy. Leaching, organic streaking and mottling was observed in soils sampled in wetland areas (refer to Figure 14 and Figure 15). Alluvial soils were encountered in some of the wetland soil samples augered in Farm RE/502 North (refer to Figure 15).

Figure 14: Mottling soils indicated by blue circles.

Figure 15: Sandy alluvial soils (left) and mottling, indicated by blue circles (right).

3.2.2 Vegetation

Vegetation within Farm RE/502 North and South was largely disturbed as a result of agricultural activities. Farm RE/502 was dominated by open pastures, wheat fields, and vineyards. Alien invasive species were encountered on site, predominantly on RE/502 South.

Where wetland soils were present, vegetation was dominated by *Restio quadratus*, Pycreus polystachyos (refer to Figure 16), *Juncus krausii*, *Pennisetum macrourum*, *Isolepis prolifera*, *Zantedeschia aethiopica*, *Typha capensis* (refer to Figure 16), *Phragmites australis*, and *Cyperus thunbergii* in varying combination within the wetlands identified. The alien invasive *Arundo donax* was encountered frequently within the Bonterevier.

All of these species are known to occur in wetlands and the latter nine are listed as wetland obligate in either Appendix C of DWAF (2008) or in van Ginkel et. al. (2011).

Figure 16: *Pycreus polystachyos* (blue) (left) and *Typha capensis* (right).

Figure 17: View of wetland vegetation and grazing pastures, upstream and downstream on Farm RE/502 North.

3.3 Watercourse Delineation

A site-based delineation of freshwater features was undertaken on 2 November 2018. The method supplied by DWAF (2005, updated 2008) for delineation of wetlands was followed as all watercourses identified were found to be wetlands. The presence of mottling, gleying, leaching, elevated organic content, hydrophytic vegetation, and soil hydrology within the upper 50cm of the soil were all used in varying combinations as indicators of wetland conditions.

All natural freshwater features, as well as artificial wetland conditions associated with farm dams were delineated. Agricultural drainage channels that in the opinion of the specialist were of entirely artificial origins were excluded from the delineation, unless their presence influenced or impacted upon a natural watercourse or dam, but none were found to.

Delineated wetlands throughout most of Farm RE/502 were in line with the WCBSP (2017). Three wetland seeps were delineated on Farm RE/502; two north-east of the aerodrome on RE/502 North, and one north-north west of Annandale Road on RE/502 South; labelled E, F, and G. Unchanneled

valley bottom wetlands were delineated, one south of Annandale Road RE/502 South and two within the south-south west portion of RE/502 North; labelled A, C, and D. A channelled valley bottom wetland was delineated directly south and north of Annandale Road on Farm RE/502, labelled B. It was only delineated within RE/502 North and South as per the terms of reference, and not within Farm 557, Stellenbosch that separates RE/502 North and South at this point. The delineation is therefore fragmented, but in reality represents two portions of a single system (refer to Figure 18 and Figure 19). Therefore, although fragmented, wetland B was assessed as one HGM unit.

A small wetland indicated by the WCBSP (2017) within Farm RE/502 South to be present between the large central dam and the smallholdings to the northwest was not found despite an extensive search of the area indicated. Four dams and surrounding wetland habitat were however delineated on Farm RE/502 South (refer to Figure 19).

Dams, and wetlands labelled: D, E, F, and G, were not included in the assessment as they would not, in the opinion of the specialist, be impacted by the proposed development given the layout information presently available, due to the, topography and hydrological barriers such as Annandale Road. Therefore, wetlands A, B, and C were the only watercourses included in the assessment. Surface water was only present within the impounded portion of Wetland A and within the Bonterivier (Wetland B).

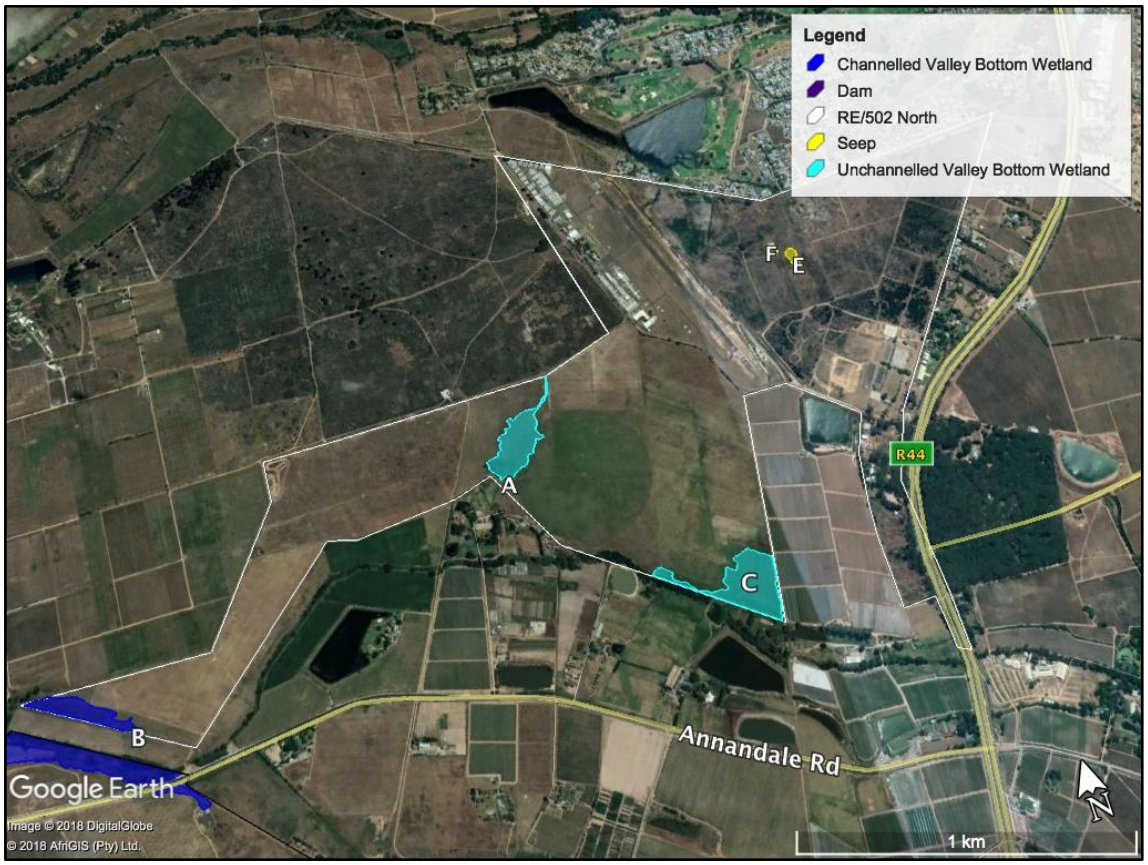

Figure 18: Wetland delineations on Farm RE/502 North.

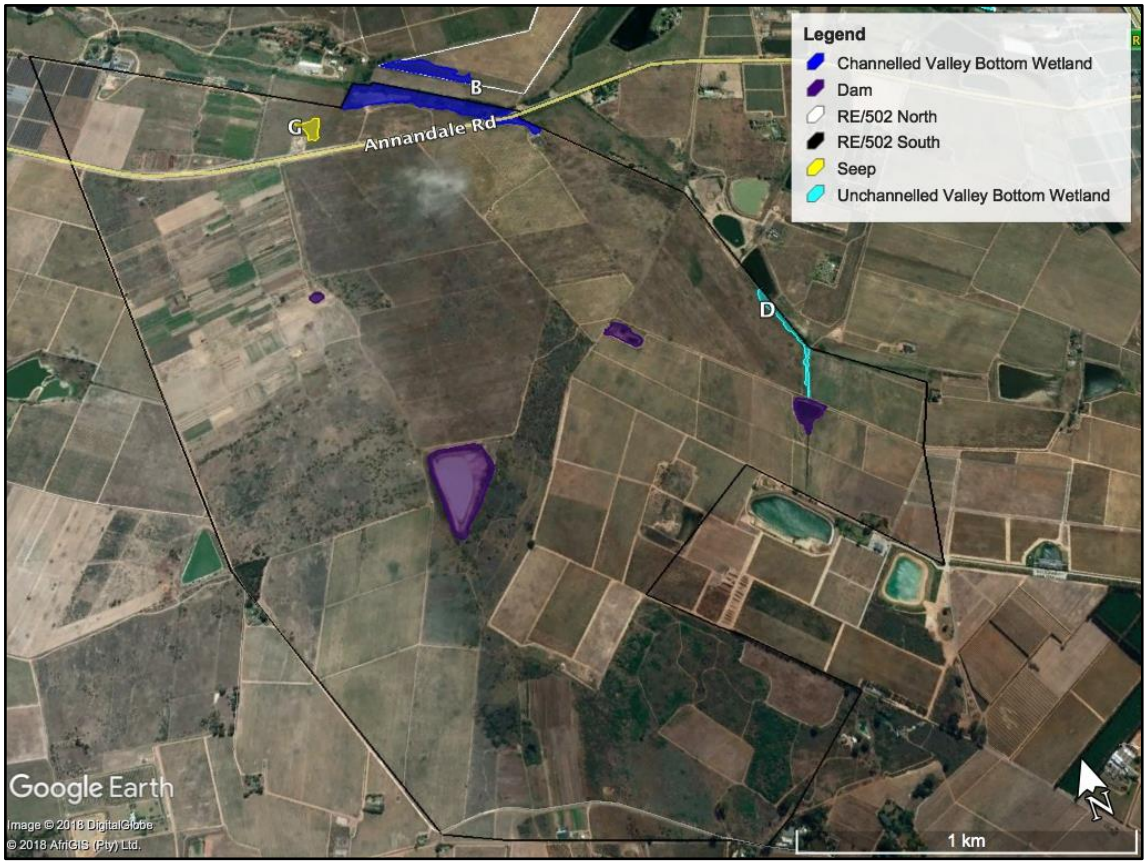

Figure 19: Wetland delineations on Farm RE/502 South.

3.4 Freshwater Feature Classification

The study area falls within the South Western Coastal Belt Ecoregion, the Berg Water Management Area (WMA) and the Lower Berg sub-Water Management Area (sub-WMA) as defined by NFEPA (2011). The table below summarise the results from **Level 3** through to **Level 6** of the wetland and aquatic ecosystem classification user manual (Ollis *et. al.* 2013). All potentially impacted watercourses are represented in the table.

Table 5: Level 3, 4, 5 and 6 of the wetland and aquatic ecosystem classification

Level 3 (Landscape Setting)	**Valley floor**: the base of the valley, situated between two distinct valley side slopes, where alluvial or fluvial processes typically dominate.
Level 4 (Hydrogeomorphic unit)	**Unchannelled valley-bottom wetland**: a valley-bottom wetland without a river channel running through it. **Channelled valley-bottom wetland:** a valley-bottom wetland with a river channel running through it.
Level 5 (Hydrological regime)	**Permanently inundated**: with surface water present throughout the year, in most years. **Seasonally inundated**: with surface water present for extended periods during the wet season/s (generally between 3 to 9 months duration) but drying up annually, either to complete dryness or to saturation.
Level 6 (Descriptors)	**Natural**: existing in, or produced by nature; not made or caused by humankind.

3.5 Ecosystem Services

The WET-EcoServices tool (Kotze et. al., 2007) was applied to the two unchannelled valley bottom wetlands (A abnd C) and the channelled valley bottom wetland (B) found within Farm RE/502 in its present, predevelopment state.

Fifteen Ecosystem Services were assessed and the results are presented in Figure 20 and in Table 7. Brief explanations of the most noteworthy results are provided below:

- The wetlands, specifically A and C, are of increased importance in terms of the assimilation of phosphates, nitrates and toxicants due to the extent to which the catchment of the wetland is cultivated;
- Erosion control and stream flow regulation services were also elevated in accordance with the wetland types.
- Disturbance of soils as a result of surrounding cultivation activities increases the importance of the three wetlands in terms of the sediment trapping.

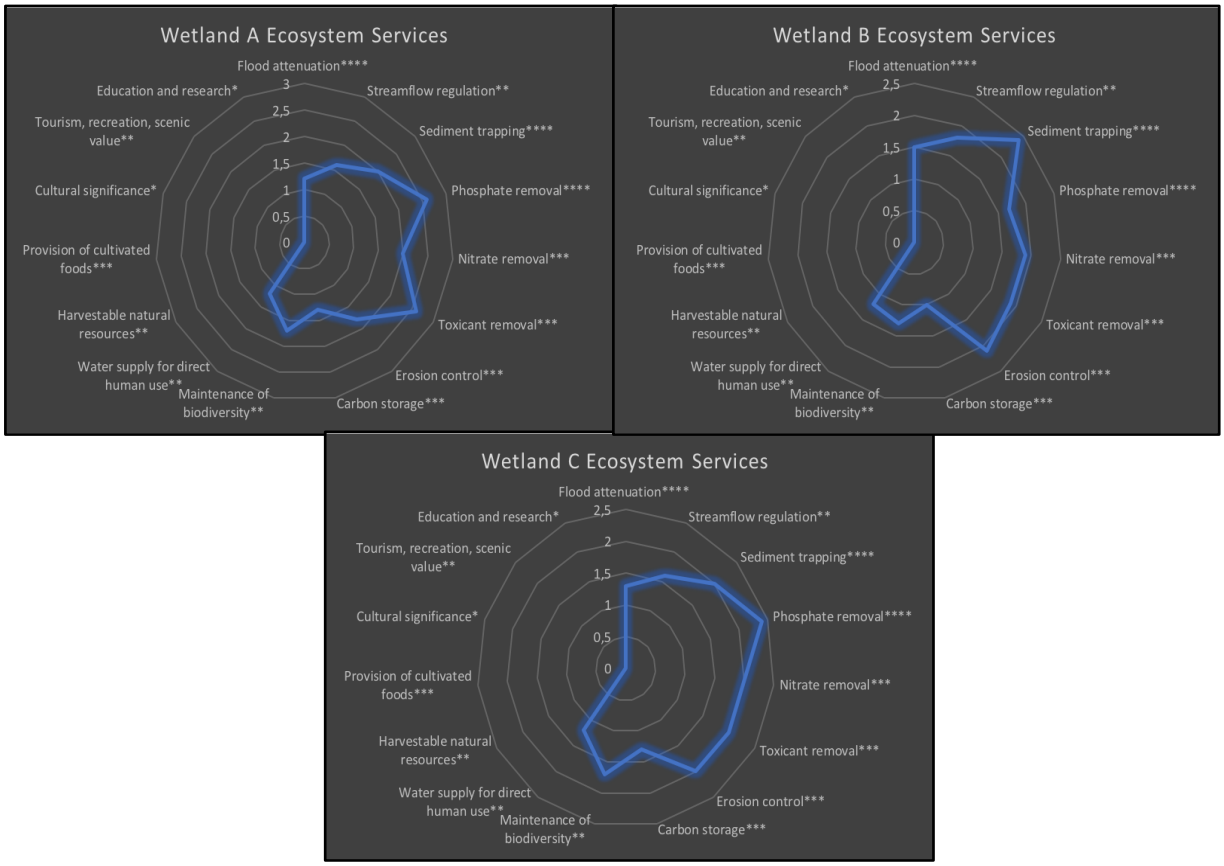

Figure 20: Spider diagrams indicating the range of ecosystem services provided by Wetland A, B, and C.

Table 6: Classes for determining the likely extent to which a benefit is being supplied based on the overall score for that benefit (after Kotze *et al*., 2007).

Score (range 0 – 4)	<0.5	0.5-1.2	1.3-2.0	2.1-2.8	>2.8
Rating of the likely extent to which a benefit is being supplied	**Low**	**Moderately Low**	**Intermediate**	**Moderately High**	**High**

Table 7: WET-EcoServices results table for wetland A, B, and C indicating scores pre-development.

Wetland Ecosystem Services			
Indirect Benefits (regulating and supporting benefits)	**Wetland A**	**Wetland B**	**Wetland C**
Flood attenuation****	1.2	1.5	1.3
Streamflow regulation**	1.6	1.8	1.6
Sediment trapping****	2	2.4	2
Phosphate removal****	2.6	1.7	2.4
Nitrate removal***	2	1.9	2
Toxicant removal***	2.6	1.9	2
Erosion control***	1.8	2.1	2
Carbon storage***	1.3	1	1.3
Direct Benefits			
Maintenance of biodiversity**	1.7	1.3	1.7
Water supply for direct human use**	1.2	1.2	1.2
Harvestable natural resources**	0	0	0
Provision of cultivated foods***	0	0	0
Cultural significance*	0	0	0
Tourism, recreation, scenic value**	0	0	0
Education and research*	0	0	0

Size is seldom important *; Size is usually moderately important**; Size is usually very important***; Size is always very important****

3.6 Present Ecological State

WET-Health is a measure of the similarity of a wetland to a natural or reference condition. This technique attempts to assess hydrological, geomorphological and vegetation health in three separate modules. The probable trajectory of change is also considered. A level 1 WET-Health tool was applied to wetlands A, B, and C in its present, predevelopment state. The key reasoning behind the WET-Health assessments are summarised below:

- Wetland A exhibited moderate gully erosion within the upper half thereof likely due to increased storm peak flows related to decreased surface roughness within the surrounding pasture and in the portion of the catchment upstream that has been severely invaded by *Acacia saligna* and *Acacia mearnsii*, resulting in reduced surface roughness at ground level. The outflow at the downstream boundary has been artificially constricted to protect houses constructed on an adjacent property resulting in unnatural permanent wetland conditions within approximately 5% of the HGM unit. The wetland exhibited few alien invasive species and relatively good habitat conditions in the half not affected by gully erosion.
- Wetland B exhibited relatively severe degradation in the form of geomorphological changes where roads and bridges have been constructed over or near it. It is also subjected to abstraction upstream and to transformation of much of the large catchment for agricultural purposes. This has likely resulted water quality impairment and severe changes in hydrology.
- Wetland C has been subjected to severe grazing and wetland habitat has been severely degraded in terms of plant species diversity and vegetation cover. The flow regime has been impacted by the reduced surface roughness within the pasture that dominates the catchment.

The findings of the assessment are as follows:

Table 8: WET-Health results table for Wetland A.

	Hydrology	Geomorphology	Vegetation
Impact category – without development	D	C	C
Ecological trajectory – without development	→	↓	↓

Table 9: WET-Health results table for Wetland B.

	Hydrology	Geomorphology	Vegetation
Impact category – without development	E	C	E
Ecological trajectory – without development	→	↓	↓

Table 10: WET-Health results table for Wetland C.

	Hydrology	Geomorphology	Vegetation
Impact category – without development	C	B	E
Ecological trajectory – without development	→	↓	↓

→ State is likely to remain stable over the next 5 years.
↓ State is likely to deteriorate slightly over the next 5 years.
↓↓ State is expected to deteriorate substantially over the next 5 years.

The overall wetland health scores[4] calculated for wetland A, B and C in their present state are as follows:

- Wetland A and C: Category C – Moderately modified: A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact.
- Wetland B: Category D – Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.

3.7 Ecological Importance and Sensitivity

The EIS method applied to wetlands is based on the assessment tool developed by Rountree et. al. (2014). The assessment was conducted for wetlands A, B, and C in its present, predevelopment state.

The key aspects considered during this EIS assessment are summarised below:

- It is likely, given the Critically Endangered conservation status of the West Coast Granite Renosterveld and West Coast Silcrete Renosterveld vegetation types applicable to the three wetlands indicates that species presently considered to be of conservation concern once inhabited these wetlands. None were identified and most have likely been lost due to the degraded nature of the three wetlands, but some may remain. The likelihood of finding species of conservation concern would be within Wetland A as it has been subjected to least ecological degradation.
- The wetlands are not formally protected, however, the West Coast Granite Renosterveld, and West Coast Silcrete Renosterveld wetland vegetation group is critically endangered within the region and all three have been recognised as important within the WCBSP.
- The three wetlands have a low diversity of habitat types within the portions assessed.

Wetland A, B, and C's EIS scored were found to be identical, despite significant differences in scoring for individual categories. A score of three was calculated which fall within the "high" EIS category.

[4] (hydrology score) x 3 + (geomorphology score) x 2 + (vegetation score) x 2 / 7 = overall wetland health

Table 11: Results of the EIS Assessment for Wetland A, B, and C

	Wetland A		**Wetland B**		**Wetland C**	
ECOLOGICAL IMPORTANCE AND SENSITIVITY	Score (0-4)	Confidence (1-5)	Score (0-4)	Confidence (1-5)	Score (0-4)	Confidence (1-5)
Biodiversity support						
Presence of Red Data species: Endangered or rare Red Data species present	2	1	1	1	1	1
Populations of unique species: Uncommonly large populations of wetland species	0	1	0	1	0	1
Migration/breeding/feeding sites: Importance of the unit for migration, breeding site and/or feeding	1	2	1	2	1	2
Landscape scale						
Protection status of the wetland: National (4), Provincial, private (3), municipal (1 or 2), public area (0-1)	1	5	1	5	1	5
Protection status of the vegetation type: SANBI guidance on the protection status of the surrounding vegetation	4	5	4	5	4	5
Regional context of the ecological integrity: Assessment of the PES (habitat integrity), especially in light of regional utilisation	3	4	2	4	3	4
Size and rarity of the wetland type/s present: Identification and rarity assessment of the wetland types	4	4	4	4	4	4
Diversity of habitat types: Assessment of the variety of wetland types present within a site	4	4	4	4	4	4
Sensitivity of the wetland						
Sensitivity to changes in floods: Floodplains at 4; valley bottoms 2 or3; pans and seeps 0 or 1	3	4	3	4	3	2
Sensitivity to changes in low flows/dry season: Unchannelled VB's probably most sensitive	5	4	3	4	3	2
Sensitivity to changes in water quality: Esp natural low nutrient waters – lower nutrients likely to be more sensitive	3	3	3	3	3	3
ECOLOGICAL IMPORTANCE AND SENSITIVITY	3	4	3	4	3	3

Table 12: Description of EIS Results

EIS Category definitions	Range of EIS score
Very high: Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these systems is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers	>3 and <=4
High: Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these systems may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.	>2 and <=3
Moderate: Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these systems is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.	>1 and <=2
Low/marginal: Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these systems is ubiquitous and not sensitive to flow and habitat modificatcions. They play an insignificant role in moderating the quantity and quality of water of major rivers.	>0 and <=1

3.8 Recommended Ecological Category (REC)

The two unchanneled valley bottom wetlands, Wetlands A and C, were found to fall within a PES Category C; and the channelled valley bottom wetland, Wetland B was found to fall within a PES Category D (refer to section 3.6). Wetland A, B, and C are considered to be of an identical EIS within the 'high' Category.

The REC for Wetland C would therefore be an increase in category to a C and this would be achievable through alien clearing and improved farming practices throughout the extensive catchment. It is unlikely that Wetland B, currently rated toward the bottom of Category C, would achieve an increase in PES category without a significant change in land-use within the wetland and within large portions of the catchment. The REC for Wetland B is therefore for it to remain within a Category C. Wetland A however could achieve an increase in PES category by means of active erosion control or a positive change in land-use within the wetland and pasture immediately surrounding the wetland. Implementation of the proposed alternative layout for the development, given implementation of the essential mitigation measures indicated in Section 4 below, would likely be sufficient positive change for an increase in PES category for this wetland. The REC for Wetland A is therefore a Category B.

3.9 Buffer Determination

Application of the best practice method for determination of the minimum effective buffer for each wetland found that a buffer of 15m was appropriate (refer to Figure 21).

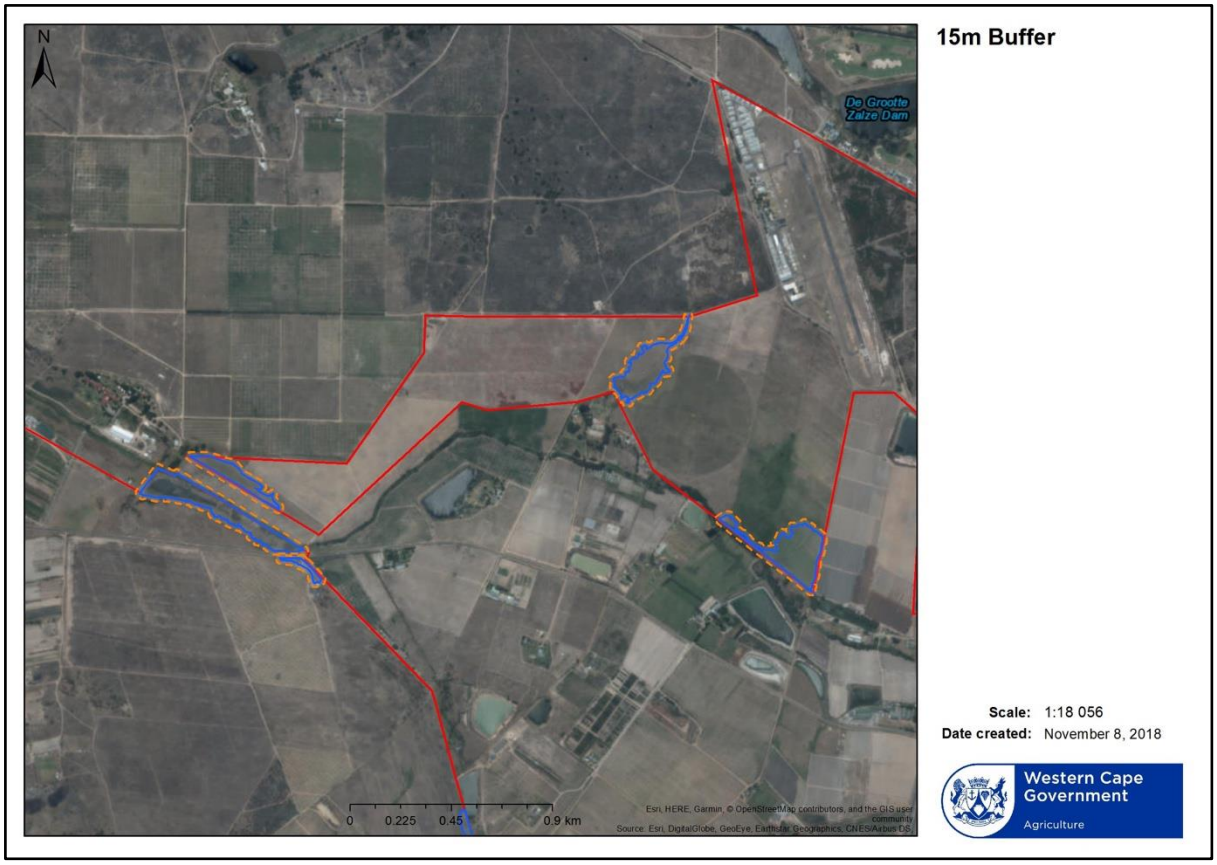

Figure 21: Minimum effective buffer of 15m applied to assessed wetlands.

4 Assessment of Impacts

4.1 Activity Description

Development of the proposed memorial park would involve construction of extensive hard infrastructure, installation of limited sewage infrastructure, approximately 50 hectares of graves and landscaping of an extensive parkland including planting of indigenous trees and fynbos, watering and use of fertiliser and possibly herbicides. Within Farm RE/502 South (preferred layout), these activities would take place upslope of a portion of the Bonterivier channelled valley bottom wetland system including the part of the portion labelled Wetland B. The impacts for the preferred layout indicated below therefore apply to this entire portion of the Bonterivier. Within Farm RE/502 North (alternative layout), the proposed development would fall upslope of both banks of Wetland A, the wetland complex labelled Wetland C, and a long stretch of the Bonterivier channelled valley bottom wetland all the way from the Wetland B to the confluence with Wetland C, most of which falls outside of the property. The potential impacts related to the alternative layout would apply equally to all three of these wetlands, except where otherwise noted below. The only construction within a wetland would be required within Wetland A where a boardwalk would be required to cross the wetland.

4.2 Direct Impacts

Authorisation of the following water use[5] will be required for the proposed development:

(i) altering the bed, banks, course or characteristics of a watercourse.

[5] As listed within Section 21 of the NWA.

It is a requirement of the WUL application process that potential impact on the following characteristics be determined:

- Impact on the flow regime;
- Impact on the water quality;
- Impact on biota – the animal and plant life of a particular region or habitat;
- Impact on wetland and riparian habitat.

These four potential direct impacts therefore formed the foundation of the impact assessment and no additional potential impacts were identified.

4.2.1 Impact 1 – Impact on the flow regime

4.2.1.1 Construction Phase

No construction phase impacts on flow regime were identified.

4.2.1.2 Operational Phase

The proposed development involves construction of hard infrastructure that will likely increase runoff within affected catchments and storm peak flows within watercourses downslope. This is likely to cause or increase erosion and change the position of the hydrological zones within the impacted wetlands. Wetlands A, B and C are likely to be impacted in this manner. The impact will be largely similar for the two alternatives, with potentially the most significant impact being to Wetland A due to its likely proximity to proposed infrastructure within the alternative layout. It is however possible given implementation of the below mitigation measures to reduce the potential impact significantly.

Watering of the landscaped areas within the various wetland catchments with water taken from existing irrigation dams would augment the current water volumes during the summertime dry period which may cause a shift in wetland zonation and seasonality, depending on the scale. This impact may also be reduced considerably through mitigation.

The increase in surface roughness throughout the surrounding parkland area, but particularly in the less formal areas where denser fynbos shrublands are established would serve as inherent mitigation against increased runoff from the other factors discussed above.

It should be noted that the lack of surface roughness within the pasture that currently occupies both Farm RE/502 sites presently results in significantly increased runoff and increased storm peak flows beyond that of the proposed development.

Essential Mitigation Measures

The following mitigation measures are considered essential:

- Harvest rainwater from the entire area of the roofs of all buildings for use in irrigation;
- Establish a 15m buffer around each wetland within which
- Arrest stormwater originating within the proposed development by means of a topographically flat, vegetated swale along the slope contour downslope of the hardened infrastructure, but upslope of any wetland potentially at risk. Excavate the swale to a depth of 1.5m, width of 2m and length such that all surface runoff from the proposed infrastructure is intercepted. Vegetate the swale with vegetation indigenous to the applicable vegetation type. It should be noted that it is not practical to construct a swale between the proposed development and Wetland A within Farm RE/502 North, (alternative layout);
- Construct the swale within the proposed parkland area. Do not water downslope of the swale;
- Given implementation of the preferred layout: establish a vegetated buffer of at least 15m in width upslope of Wetland B and along the entire length of the property boundary adjacent to the potentially impacted portion of the Bonterivier wetland on the adjacent property on the southern side of the wetland.

- Given implementation the alternative layout: establish vegetated buffers of at least 15m in width along boundary of Wetland B and C and along the entire property boundary between the two wetlands. Establish a similar buffer of at least 40m on both sides of Wetland A as it does not have the benefit of a swale upslope.
- Plant plants indigenous to the applicable terrestrial vegetation type at a density of at least 4 per m^2 in any buffer zones established. The buffer zones may be incorporated into the proposed parkland.

4.2.1.3 Results

Impact 1: Impact on the flow regime					
Construction Phase					
No Impacts Identified					
Operational Phase					
Preferred Layout: Without mitigation	Very Low	Local	Long term	High	Very Low (+ve)
Preferred Layout: With mitigation	Low	Local	Long term	High	Low (+ve)
Alternative Layout: Without mitigation	Low	Local	Long term	High	Low (+ve)
Alternative Layout: With mitigation	Medium	Local	Long term	High	Medium (+ve)

4.2.2 Impact 2: Impact on Water Quality

4.2.2.1 Construction Phase

Construction of brick and mortar and other hard infrastructure involves the use of various chemicals including cement, sulphuric acid, paint, paint thinners and petrochemicals associated with construction vehicles all of which may spill and be carried by runoff into the wetlands downslope thereby impacting water quality. Site clearing and preparation may also leave large areas of exposed sand available for erosion which may significantly increase the sediment load in the runoff entering the wetlands downslope. Compost, and fertiliser used in landscaping of the parkland area and elsewhere may increase the nutrient load in runoff potentially leading to eutrophication of the wetland (if in high volume) and herbicide used in alien clearing of the site may also impact runoff quality significantly.

It should be noted however that runoff from the pastures the presently occupy the site would likely contain significant nutrient and likely also herbicide on a significantly larger scale than would be introduced by the proposed construction activities. Present runoff also likely contains significant sediment since

Essential Mitigation Measures

- Ensure that all construction chemicals are mixed and poured within the construction footprint on a bunded surface designated for this purpose by an Environmental Control Officer (ECO).
- Ensure that all construction vehicles remain within the construction footprint and are parked and serviced on a bunded surface designated for this purpose by an ECO or at an appropriate location offsite.
- Construct a vegetated swale and establish buffer zones as described in 4.2.1.2 above either below or within the parkland.
- Place compost and fertilizer within the holes dug for planting when landscaping.
- Use herbicide only for direct stump treatment of acacias and other woody alien invasive species. Control invasive annuals by hand-pulling.
- Conduct site clearing in November to reduce the likelihood of erosion of exposed sediments.
- Install sediment fences at the boundary of all cleared areas to retain sediment.

4.2.2.2 Operational Phase

Routine use of compost and fertilizer in the more formal landscaped areas and the presence of laterite roads and pathways (if used) would result in increased nutrient load (particularly phosphates and nitrates) in runoff. Laterite roads and pathways would also increase the nutrient load in runoff. The presence of graves may increase the nutrient load within groundwater that likely enters downslope wetlands. Herbicides may also be used for continued control of alien invasive species and may enter the wetland via runoff. Runoff from roads and parking lots may will likely contain limited volumes of oil and petrochemicals. Erosion from graves and unmade or laterite roads and pathways would add to the sediment load within runoff. Concrete leaches hydroxyl ions which would raise the pH of runoff and groundwater and may therefore increase the pH of soil and water within the wetland.

It should be noted however that the present land use as a pasture and for a portion of Farm RE/502 North (alternative layout) as cropland is presently subjected to broad scale use of fertilizers and herbicides (particularly within the cropland) likely results in a greater volume of input of fertiliser and herbicide into the wetlands downslope than the proposed development would. No terracing or other runoff retention measures have been implemented within the present pastures and runoff is likely to carry more sediment under present conditions than after the proposed development. There is however currently negligible concrete within Farm RE/502 North and South and the pH may therefore increase significantly post development.

The impact of elevated pH is limited however as the wetland systems are all open systems and the hydroxyl ions will therefore not collect within the systems over time. The greatest impact would likely be to Wetland A within Farm RE/502 North (alternative layout) due to its closer proximity to the proposed infrastructure.

Essential Mitigation Measures

- Dig fertilizer and compost into the soil whenever used to minimised nutrient load in runoff.
- Construct a vegetated swale and establish buffer zones as described in 4.2.1.2 above.
- Maintain the capacity of the vegetated swale to assimilate nitrates, phosphates and toxicants by harvesting all wetland vegetation present within the swale once in 10 years and disposing of it at a landfill site.
- Confine all vehicles to roads and parking lots.
- Do not use laterite in the construction of roads and pathways.
- Use herbicide only for direct stump treatment of acacias and other woody alien invasive species. Control invasive annuals by hand-pulling.

4.2.2.3 Results

Impact 2: Impact on Water Quality					
Alternatives	**Intensity**	**Extent**	**Duration**	**Probability of impact occurring**	**Significance**
Construction Phase					
Preferred Layout: Without mitigation	Very Low	Local	Short term	Medium	Very Low (-ve)
Preferred Layout: With mitigation	Very Low	Local	Short term	Medium	Very Low (+ve)
Alternative Layout: Without mitigation	Medium	Local	Short term	High	Medium (-ve)
Alternative Layout: With mitigation	Very Low	Local	Short term	High	Very Low (-ve)
Operational Phase					
Preferred Layout: Without mitigation	Very Low	Local	Long term	High	Very Low (+ve)
Preferred Layout: With mitigation	Low	Local	Long term	High	Low (+ve)
Alternative Layout: Without mitigation	Low	Local	Long term	High	Low (-ve)
Alternative Layout: With mitigation	Very Low	Local	Long term	High	Very Low (-ve)

4.2.3 Impact 3: Wetland Habitat

4.2.3.1 Construction Phase

The impact on wetland habitat is largely limited to impacts associated with changes in water quality and hydrology. Increased runoff may cause erosion and/or deposition within the wetlands which may impact on habitat by exposing plant roots or burying stems and leaves within localised areas. The presence of herbicide may directly kills select plant species. Significantly elevated nutrient loads within the wetland would encourage dominance of alien invasive species and hardy indigenous species, thereby reducing overall habitat diversity.

The only additional impacts would be in the form of wind-blown litter from the construction site that may smother plants and entangle or be ingested by wildlife.

Essential Mitigation Measures

Since the impact on wetland habitat is caused largely by changes in hydrology and water quality, mitigation is addressed under the applicable sections above. Windblown litter can however be mitigated against by implementing the following:

- Ensure that all contractors are aware of a 'no-littering' policy while on the construction site.
- Inspect the proposed development site weekly and remove all litter.
- Inspect wetlands within the property monthly and remove all litter.

4.2.3.2 Operational Phase

The impact of changes in water quality and hydrology on wetland habitat would be largely similar in the operational phase to that of the construction phase assessed above. The only significant exceptions would be the large volume of concrete and the large number of graves present within proposed development area. Windblown litter may also be a concern in the operational phase.

Essential Mitigation

- Implement a "no bins" policy within the proposed site and do not provide bins.
- Ensure that all visitors are aware of a "no-littering" and "no bins" policy while within the memorial park by erecting signage at all entrances.
- Inspect the memorial park weekly and remove all litter.
- Inspect wetlands within the property monthly and remove all litter.

4.2.3.3 Results

Impact 3: Impact on Wetland Habitat					
Alternatives	**Intensity**	**Extent**	**Duration**	**Probability of impact occurring**	**Significance**
Construction Phase					
Preferred Layout: Without mitigation	Very Low	Local	Short term	Medium	Very Low (+ve)
Preferred Layout: With mitigation	Low	Local	Short term	Medium	Very Low (+ve)
Alternative Layout: Without mitigation	Very Low	Local	Short term	Medium	Very Low (-ve)
Alternative Layout: With mitigation	Very Low	Local	Short term	Medium	Very Low (+ve)
Operational Phase					
Preferred Layout: Without mitigation	Very Low	Local	Long term	Medium	Very Low (+ve)
Preferred Layout:	Very Low	Local	Long term	Medium	Very Low (+ve)

With mitigation					
Alternative Layout: Without mitigation	Low	Local	Long term	Medium	Very Low (-ve)
Alternative Layout: With mitigation	Very Low	Local	Long term	Medium	Very Low (+ve)

4.2.4 Impact 4: Impact on Biota

4.2.4.1 Construction Phase

Potential impact on biota during the construction phase would be largely limited to the impact of changes in water quality and habitat. Plants, invertebrates and amphibians would be the most affected. All construction-related changes are likely to be positive however.

The only other possible impact would be in the form of illegal harvesting, trapping and hunting often associated with natural areas adjacent to construction sites, which would be negative if it occurred. The risk of this impact occurring increases with proximity to the construction are.

Essential Mitigation Measures

- Ensure that all contractors are informed that no harvesting of plants, trapping or hunting of wildlife is allowed within the wetland areas, and establish an appropriate fine for the contracting company should any employees be found engaging in these activities.

4.2.4.2 Operational Phase

The potential impact on biota during the operational phase would be limited to the secondary impact of changes in water quality and habitat. Both are likely to improve over the current situation, with the exception of the potential increase in pH, the likely impact of which is limited however.

4.2.4.3 Results

Impact 4: Impact on Biota					
Alternatives	**Intensity**	**Extent**	**Duration**	**Probability of impact occurring**	**Significance**
Construction Phase					
Preferred Layout: Without mitigation	Very Low	Local	Short term	Medium	Very Low (+ve)
Preferred Layout: With mitigation	Low	Local	Short term	Medium	Very Low (+ve)
Alternative Layout: Without mitigation	Low	Local	Short term	Medium	Very Low (-ve)
Alternative Layout: With mitigation	Very Low	Local	Short term	Medium	Very Low (+ve)
Operational Phase					
Preferred Layout: Without mitigation	Very Low	Local	Long term	Medium	Very Low (+ve)
Preferred Layout: With mitigation	Low	Local	Long term	Medium	Low (+ve)
Alternative Layout: Without mitigation	Low	Local	Long term	Medium	Low (-ve)
Alternative Layout: With mitigation	Very Low	Local	Long term	Medium	Very Low (-ve)

4.3 'No Go' Scenario

The 'No Go' scenario would result in a stable PES for Wetlands B and C, but Wetland A would likely degrade slowly over time due to ongoing erosion.

4.4 Indirect Impacts

No indirect impacts were identified.

4.5 Cumulative Impacts

No cumulative impacts were identified.

5 Conclusion and Recommendation

Watercourses within the Farm RE/502 North and South were identified and natural watercourses delineated. A single wetland (the Bonterivier) was identified as potentially being impacted by the proposed development given the preferred layout within Farm RE/502 South, and two wetlands were identified that would potentially be impacted by the proposed development given the alternative layout on Farm RE/502 North, in addition to potential impacts on the Bonterivier system.

Each of the three wetlands were evaluated by best practice methods to determine current EIS, PES and ecosystem services. Their EIS scores were identical and the range of ecosystem services provided by the wetlands was largely similar. The PES score of Wetland A was found to be the highest being within the upper range of Category C, with Wetland C within the lower end of Category C and Wetland B was found to be most impacted with a score towards the lower end of Category D. An REC category of C is recommended for all three wetlands. Application of the best practice method for determination of an appropriate minimum buffer found that a buffer of 15m would be appropriate for all three wetlands.

An impact assessment was conducted, and it was found that, after mitigation, all potential impacts of both layouts were in the Low Negative category or better, with many impacts representing an improvement over the current situation. The preferred layout represents the scenario with the lowest overall negative impact and the highest overall positive impact and represents a significant improvement on the "no go" scenario. It is therefore recommended that the proposed development be implemented in accordance with the preferred layout and that the necessary environmental and water use authorisations be granted.

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Appendix 1 – Impact Assessment Criteria[6]

The criteria used to determine impact consequence are presented in the tables below.

Table 1**: Description of criteria considered when assessing potential impacts.**

CRITERIA	DESCRIPTION OF ELEMENTS THAT ARE CENTRAL TO EACH ISSUE	
Extent of the impact	SITE SPECIFIC	Site specific/Local: Extends only as far as the activity
	LOCAL	Limited to the site and its immediate surroundings
	REGIONAL	Regional/Provincial: Will have an impact on the region/province
	NATIONAL	National: Will have an impact on a national scale – particularly if an ecosystem or species of national significance is affected
Duration of impact	SHORT TERM	Construction phase
	MEDIUM TERM	Operational phase
	LONG TERM	Where the impact will cease after the operational or working life of the activity, either due to natural processes or by human intervention
	PERMANENT	Where mitigation or moderation by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient or temporary
Intensity of impact	VERY LOW INTENSITY	Natural, cultural and social functions and processes are not affected
	LOW INTENSITY	Affects the environment in such a way that natural, cultural and social functions and processes continue, although in a slightly modified way
	MEDIUM INTENSITY	Affects the environment in such a way that natural, cultural and social functions and processes continue, although in a modified way
	HIGH INTENSITY	Natural, cultural or social functions or processes are altered to the extent that they will temporarily or permanently cease
Probability of impact occurring	LOW	Improbable
	MEDIUM	Probable
	HIGH	Highly probable
	DEFINITE	Impact will occur regardless of any prevention methods
Determination of significance		
	LOW	The impacts will have a minor or insignificant influence on the watercourse.
	MEDIUM	The impacts will have a moderate influence on the watercourse. The impact can be ameliorated (lessened or improved) by a modification in the project design or implementation of effective mitigation measures.
	HIGH	The impacts will have a high influence on the watercourse. The impact can be ameliorated (lessened or improved) by a modification in the project design or implementation of effective mitigation measures. Should have an influence on decision, unless it is mitigated
	VERY HIGH	The impacts will have a major influence on the watercourse. The impacts could have the no-go implications on portions of the development regardless of any mitigation measures that could be implemented. Influence decision, regardless of any possible mitigation.

SIGNIFICANCE RATING	LIST OF CRITERIA USED IN ASSIGNING A SPECIFIC SIGNIFICANCE RATING		
	INTENSITY	**EXTENT**	**DURATION**
Very High	High	National	Permanent / Long Term

[6] Adapted from SRK Impact assessment methodology

SIGNIFICANCE RATING	LIST OF CRITERIA USED IN ASSIGNING A SPECIFIC SIGNIFICANCE RATING		
	INTENSITY	**EXTENT**	**DURATION**
	High	Regional	Permanent / Long Term
	Medium	National / Regional	Permanent
High Significance	High	Regional	Medium Term
	High	National	Short Term
	High	Local	Long Term / Permanent
	Medium	National	Medium Term
	Medium	Regional	Long Term
Medium Significance	High	Local	Medium Term
	Medium	Local	Permanent
	High	Regional	Short Term
	Medium	National	Short Term
	Medium	Regional	Medium Term
	Medium	Local	Long Term / Permanent
	Low	National	Medium Term
	Low	Regional	Long Term
Low Significance	High	Local	Short term
	Medium	Local	Short Term / Medium Term
	Medium	Regional	Short Term
	Low	National	Short Term
	Low	Regional	Medium Term
	Low	Local / Site specific	Long Term
	Low	Local	Permanent
Very Low Significance	Very Low	Local	Long Term / Permanent
	Low	Local	Short term
	Low	Site specific	Medium / Short Term
	Very low	Site specific / Local	Short Term