ANNEXURE G 3: SPECIALIST REPORT – Freshwater Impact

Detailed Freshwater Ecological Assessment:

Proposed installation of external services entailing stream crossings for the proposed urban development on Portion 28 of the Farm Welmoed Estate No. 468, Stellenbosch, Western Cape

Prepared for:

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Executive Summary

Background

Uniqon Developers (Pty) Ltd propose to develop an urban node comprising a mix of land uses on Portion 28 of the Farm Welmoed Estate No. 468, Stellenbosch. While the development of the urban node itself will not pose a risk to any freshwater ecosystems, the external services and in particular a new water supply pipeline and a new sewerage pipeline, would cross watercourses which would be impacted. Accordingly, a detailed freshwater ecological assessment that meets both the requirements of the NEMA EIA Regulations (2014, as amended) and the National Water Act, Act 36 of 1998 (NWA) is required. Virdus Works Environmental (Pty) Ltd, the Environmental Assessment Practitioner (EAP) appointed by the developer, has appointed EnviroSwift Western Cape (EnviroSwift) to undertake the required detailed freshwater ecological specialist assessment.

Desktop Assessment

The NGI topo-cadastral map identifies several drainage lines in the surrounding area. The proposed water pipeline would cross two separate non-perennial drainage lines with the northern-most drainage line indicated to discharge into the perennial Jonkershoek River approximately 1,7 km south east of the crossing point and the southern-most drainage line indicated to end at an impoundment approximately 150m to the east of the crossing point. The proposed sewerage pipeline would cross the Sand River immediately south of Baden Powell Drive (within the Baden Powell Road Reserve). The Sand River discharges into the perennial Jonkershoek River approximately 600m south west from the crossing point.

The National Wetlands Map Version 5 (CSIR, 2018) indicates no wetlands within the regulated zone of the two new pipelines. The NFEPA wetlands layer indicates numerous artificial wetlands (mostly irrigation dams) but no natural wetlands within the regulated zone of either pipeline.

All of the affected watercourses have been identified as restorable ESAs (i.e. ESA2) in the WCBSP (2017). In addition, small parts of the Jonkershoek River immediately downstream of its confluence with the Sand River have been identified as Aquatic CBAs.

Site Description

Site 1: 'Clean' watercourse water pipeline crossing

The so-called 'clean' watercourse originates approximately 250m to the north-west of the proposed crossing site in a small valley surrounded by vineyards and has been impounded at its source. The proposed crossing point is also a historic vehicular crossing point although at the time of the site visit recent flooding (presumably the 2024 floods that affected most of the Western Cape) had caused severe erosion of the farm road leading towards the crossing point and use of the crossing point appears to have ceased.

The vegetation associated with the watercourse immediately upstream of the proposed crossing point is dominated by *Typha capensis* (bullrush) which occurs in an area of flatter topography of approximately 300 square metres. Downstream of the proposed crossing point until a second impoundment some 180m to the south east, the watercourse flows through a slight to moderately sloping area where the watercourse is characterised by relatively dense macrophytes dominated by alien invasive species such as *Acacia longifolia* and *Populus canescens* (grey poplar). *Rubus* sp. (bramble) as well as *Pennisetum clandestinum* are also evident as examples of invasive herbs and grasses. Indigenous macrophytes are also present and included *Olea europaea* subs. *africana* (wild olive). Also present in this portion of the watercourse were unidentifiable indigenous sedges, *T. capensis* and *Zantedeschia aethiopica* (arum lily). The effects of livestock grazing within the watercourse were clearly evident and was the reason why the sedges could not be identified.

The soil auger sample obtained from the Typha-dominated area immediately upstream of the proposed crossing point exhibited a high degree of soil wetness, a low chroma and also a high level of organic material which is typical of the wetland permanent zone. Trickle flow was present at the crossing point and given the presence of *T. capensis* immediately upstream and also downstream of the crossing point

suggests that the watercourse is characterised by permanently saturated soils.

Site 2: 'Landfill' watercourse water pipeline crossing

The watercourse at Site 2 has been historically used as a landfill and, while there was recent evidence of efforts to rehabilitate the watercourse, solid waste deposits were still clearly evident. The watercourse has been impounded at its source approximately 150m upstream from the proposed crossing point and ends in a second impoundment approximately 150m downstream from the proposed crossing point. The portion upstream from the proposed crossing point is significantly less impacted than the lower portion which exhibits evidence of significant earthworks and vegetation removal, presumably as a result of the rehabilitation efforts.

The area surrounding the proposed crossing point was entirely devoid of vegetation while the area upstream of the proposed crossing point, and surrounding the upstream impoundment, was characterised by a stand of relatively dense macrophytes dominated by the invasive alien *Acacia melanoxylon* (Blackwood) and the indigenous *Olea europaea* subs. *Africana* (wild olive). Also present within the HGM unit immediately upstream of the proposed crossing point was a stand of *Phragmites australis* (common reed).

Auger samples within the vicinity of the proposed crossing point did not reveal any wetland characteristics and, while these were inconclusive due to the extent of soil disturbance in the area, alluvial characteristics were evident in the excavated materials. Evidence of flow was completely absent during the site investigation thereby confirming the ephemeral nature of flow in the watercourse.

Site 3: Sewerage pipeline crossing of the Sand River

The proposed sewerage pipeline crossing of the Sand River is located in the road reserve of the R310 ('Baden Powell Drive'). This area is currently subjected to extensive transformation due to the current upgrading of the R310 in the vicinity of Vlottenberg. The result is that the Sand River now discharges from a new culvert beneath the R310 into a newly created, trapezoidal, earthen channel prior to its discharge beneath a railway line after which it continues as a relatively intact system.

The portion of the Sand River in the vicinity of the proposed sewerage pipeline crossing point is almost entirely devoid of vegetation due to the recent extensive earthworks. A few individual plants had however survived including *Cyperus textilis* and *T. capensis*. A few specimens of the highly invasive *A. saligna* were also evident in the immediate surroundings.

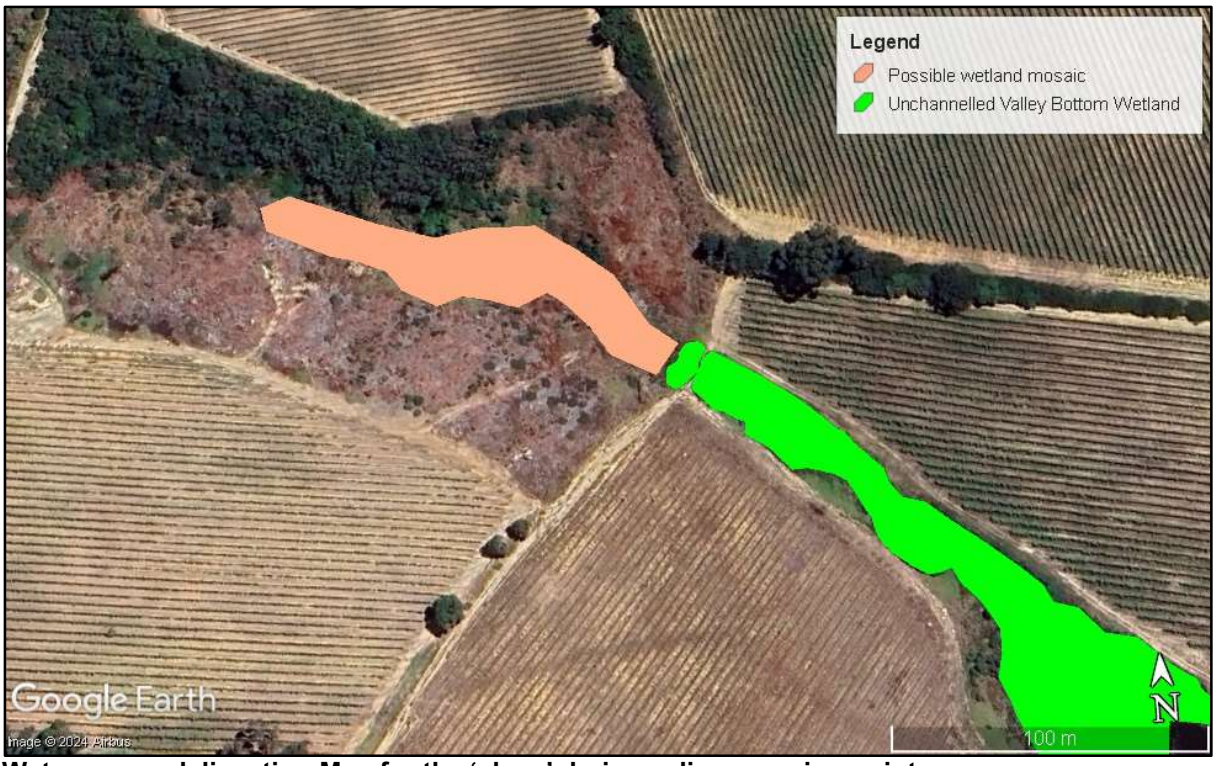
Auger samples revealed no conclusive evidence of wetland versus allivial systems which would allow for a conclusive determination of the classification of the watercourse as a wetland versus a drainage line or stream due to the extreme levels of recent soil disturbance.

Watercourse Classification and Delineation

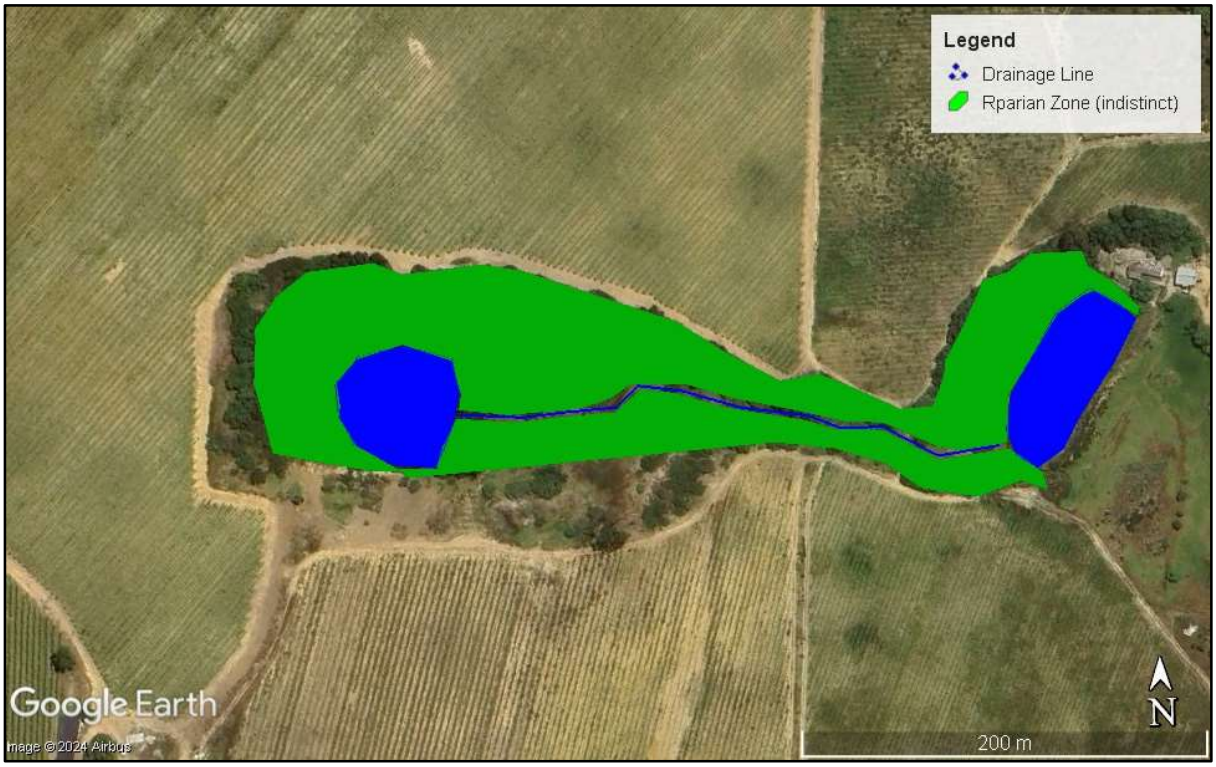
In terms of wetland and aquatic ecosystem classification user manual (Ollis *et. al.* 2013) the various watercourses affected by the proposed external services installations are classified as follows:

- 'Clean' watercourse: Unchannelled Valley Bottom Wetland;
- 'Landfill' watercourse: Non-perennial drainage line; and
- 'Sand' River: Non-perennial drainage line.

The watercourse delineations for each of the crossing points are presented in the following three figures.



Watercourse delineation Map for the 'clean' drainage line crossing point



Watercourse delineation Map for the 'landfill' drainage line crossing point

Watercourse delineation Map for the Sand River at the proposed sewerage pipeline crossing point. The yellow line indicates the approximate position of the proposed sewerage pipeline.

Freshwater Assessment Results

The application of the ecological assessment indices (WET-EcoServices, WET-Health/IHIA and EIS); resulted in the following for each of the affected watercourses (see Table below).

Watercourse	WET-Ecoservices	PES	EIS
Unchannelled Valley Bottom Wetland ('clean' watercourse)	Intermediate	Category "D" (Largely Modified)	Marginal/low
'Landfill' drainage line	N/A	Category "D" (Largely Modified)	Marginal/low
Sand River	N/A	Category "D" (Largely Modified)	Marginal/low

Impact Assessment

Given the nature of the proposed activity, which effectively entails vegetation clearing and trench excavations across the watercourses followed by backfilling and re-compaction, the development/construction phase impacts are limited to the alteration of flow regime, erosion and sedimentation and biota loss with erosion and sedimentation rated to be the only potential impact of MEDIUM (-ve) significance unmitigated with the remaining potential impacts to be LOW (-ve) unmitigated. This impact significance rating for erosion and sedimentation is largely attributed to the fact that excavations within and near watercourses inevitably results in sediment plumes and erosion due to the destabilisation of soils which can be transported downstream and off-site thereby resulting in a REGIONAL impact extent.

For the operational phase it is only the consequences of damaged and leaking pipelines that can cause potentially significant flow regime and water quality impacts, with the latter limited to the sewerage pipeline crossing of the Sand River only. The impact significance rating for these two operational phase impacts without mitigation was MEDIUM (-ve) as a result of the REGIONAL extent of both impacts (i.e. they are predicted to extend off-site) and LONG TERM duration (due to the fact that without regular leak inspections any leaks would go undetected for a long period of time.

Practicable mitigation measures have been recommended to minimise and manage all the identified potential impacts to ensure that all impacts are reduced to either LOW or VERY LOW (-ve) significance ratings. The construction phase impacts could be partly avoided through ensuring that the stream crossings take place in the dry summer period and also through the appointment of an ECO to oversee the actions of the Contractor and ensure that the recommended mitigation measures (presumably incorporated into a Construction EMP) are implemented. During the operational phase the use of Kevlar sleeves and the requirement for routine pipeline inspection for early leak detection would similarly minimise the impacts to VERY LOW (-ve) significances.

No Go alternative

The current trends of habitat degradation, primarily erosion and sedimentation due to the agricultural land use which has reduced catchment roughness and alien vegetation encroachment, would continue into the foreseeable future. As such the long-term prognosis for the three affected watercourses is that they would eventually deteriorate to reach a lower PES Category within the foreseeable future. Given that the unchannelled valley bottom wetland associated with the 'clean' watercourse is not recognised as being of conservation significance (i.e. no aquatic or terrestrial CBAs or ESAs are associated with the wetland) and that no wetlands of conservation importance are situated downstream of the wetland, this deterioration in the condition of the wetland has limited regional significance for this particular watercourse. A similar scenario would apply to the 'landfill' watercourse, however the Sand River discharges into the Jonkershoek River a short distance downstream from the proposed crossing point and parts of this river near to the proposed crossing point has been identified as comprising Aquatic CBAs. The Sand River therefore needs to be managed to ensure that it continues to provide the ecosystem services necessary to sustain the downstream Aquatic CBAs.

Overall, taking the above into consideration and in particular the lost-opportunity cost associated with the opportunity to rehabilitate the 'landfill' drainage line, the "No-Go" alternative is rated to be associated with a LOW (-ve) impact significance.

Conclusion & Recommendations

Given that a number of practicable mitigation measures can be enforced and that these would render most of the potential impacts to have a VERY LOW (-ve) impact significance with only one of the identified impacts (development/construction phase erosion and sedimentation) being rated to have a LOW (-ve) impact significance with mitigation, the proposed installation of the external services is supported from a freshwater ecological perspective. This is conditional on the recommended mitigation measures being implemented.

While not an essential mitigation measure and therefore not conditional upon the approval of the proposed development, the project provides an opportunity to rehabilitate the 'landfill' watercourse immediately upstream of the proposed crossing point where solid waste is still evident and earthworks have left area devoid of vegetation and exposed to erosion. What would be required would be removal of the remaining components of the waste body (this could be done by hand) and then the reshaping of the banks of the drainage line to approximate the natural terrain units followed be revegetation. A seed mix including *Cynodon dactylon* and other indigenous grasses as well as the planting of several *Olea capensis* seedlings would be sufficient for revegetation purposes.

Risk Assessment

Given that all of the activities are associated with a LOW risk rating the proposed development qualifies for a General Authorisation (GA) as far as the Section 21 (c) and (i) water uses are concerned.

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Disclaimer

EnviroSwift Western Cape has exercised all due care in the reviewing of all available information and the delineation of the watercourse boundaries. The accuracy of the results and conclusions from the assessment are entirely reliant on the accuracy and completeness of available desktop information, site conditions at the time of the assessment and professional judgment. EnviroSwift Western Cape 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 drainage lines.
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 drainage line 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.
Non-perennial 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 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.

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

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 drainage line 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 drainage line 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 drainage line channel network when the drainage line 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

BMP	Best Management Practice
CCT	City of Cape Town
CBA	Critical Biodiversity Area
CSIR	Council for Scientific and Industrial Research
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EIA	Environmental Impact Assessment
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
REC	Recommended Ecological Category
SANBI	South African National Biodiversity Institute

Sub-WMA Sub - Water Management Area
SUDS Sustainable Urban Drainage Systems
WCBF Western Cape Biodiversity Framework
WMA Water Management Area
WUL Water Use Licence
WWTW Wastewater Treatment Works

Specialist Details and Experience

Nick Steytler (Pr.Sci.Nat. 400029)

Nick Steytler is a registered Professional Natural Scientist (Pr.Sci.Nat.) with the South African Council for Natural Scientific Professions (SACNASP) and is also a certified Environmental Assessment Practitioner (EAP) with over 20 years' experience in the field of environmental management. He holds a Masters of Science (MSc.) degree in the field of Entomology (University of KwaZulu-Natal, Pietermaritzburg campus). His employment record includes several years with the Institute of Natural Resources in KwaZulu-Natal where he worked within their Natural Resource Management Programme and then with SRK Consulting in Cape Town where he worked as an Environmental Scientist in the field of environmental management (i.e. undertaking Environmental Impact Assessment [EIA] and the like). After leaving SRK in 2007, Nick founded KHULA Environmental Consultants which has been consulting for over 15 years in environmental management sector in the Western Cape. In developing his expertise as a freshwater specialist, he initially worked in the capacity of an associate to EnviroSwift Western Cape (WC) and then took over the company in 2020. He now undertakes all wetland specialist work in the Western, Southern, Eastern and Northern Cape and is supported by Louise Santanna, Director of EnviroSwift KwaZulu-Natal.

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1 Introduction

1.1 Project Background

Uniqon Developers (Pty) Ltd proposes the development of an urban node on Portion 28 of the Farm Welmoed Estate No. 468, Stellenbosch (see Figure 1 for location plan). Virdus Works Environmental (Pty) Ltd, the Environmental Assessment Practitioner (EAP) appointed by the developer, has appointed EnviroSwift Western Cape (EnviroSwift) to undertake a detailed freshwater ecological specialist assessment given that the external services, in particular a new water supply pipeline and a new sewerage pipeline, cross watercourses which would be potentially impacted as a result of the proposed development. Accordingly, a detailed freshwater ecological assessment that meets both the requirements of the NEMA EIA Regulations (2014, as amended) and the National Water Act, Act 36 of 1998 (NWA) are required.

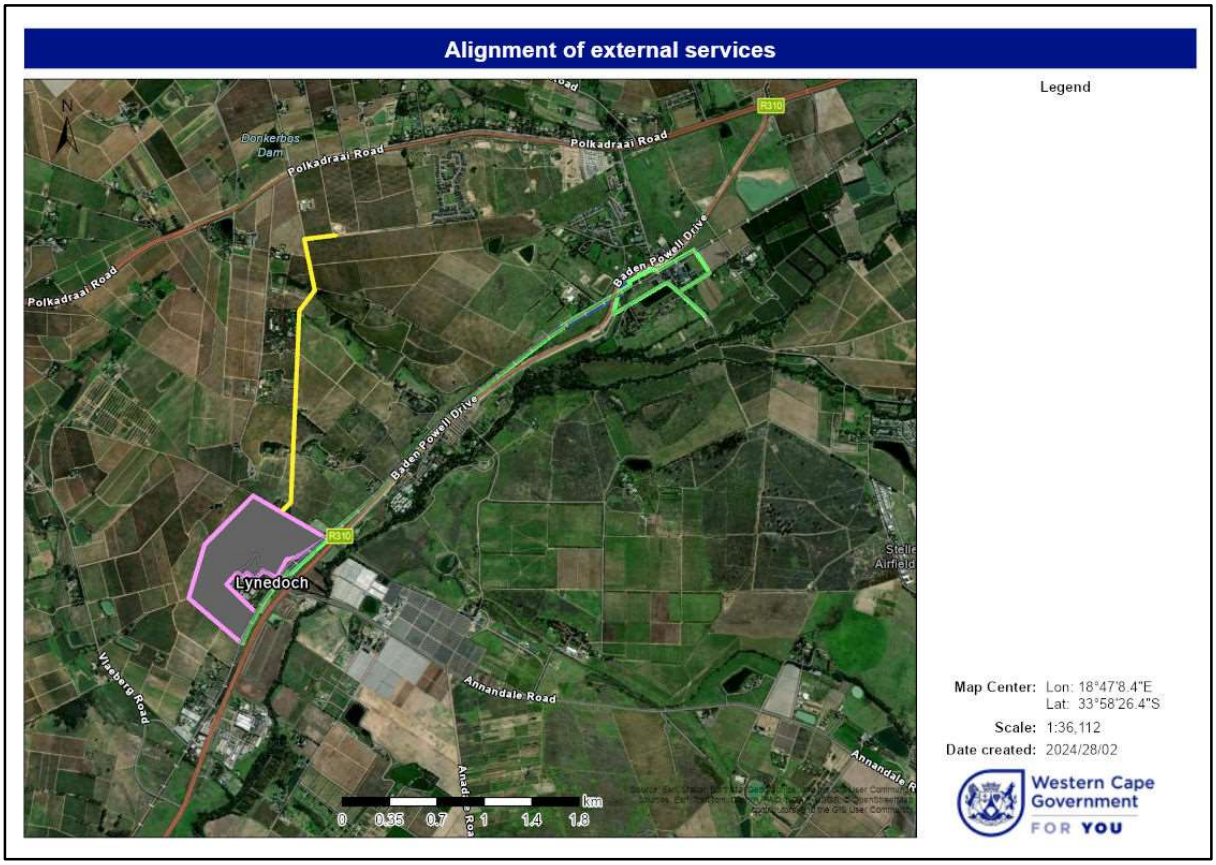

Figure 1: Location of the proposed development shown as a pink polygon and the water supply pipeline as a yellow line and the sewerage pipeline as a green line.

1.2 Scope of Work

The scope of work for a detailed freshwater ecological study is as follows:

- Assessment of relevant background information including the National Freshwater Ecological Database (NFEPA, 2011), the National Wetlands Map Version 5 (CSIR, 2018), 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 identification of on-site wetlands and drainage lines and the delineation of the wetland temporary boundary and any riparian zones associated with drainage lines in accordance with best practice methods (refer to methods section);

- Assessment of the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) of the directly affected wetlands and the Intermediate Habitat Integrity Assessment (IHIA) method and EIS for the directly affected drainage lines according to best practice methods (refer to methods section);

- Identification of the Section 21 (c) and (i) activities;

- Assessment of the significance of the identified potentially significant impacts and identification of practicable mitigation measures;

- Completion of the Department of Water & Sanitation (DWS) Risk Assessment Matrix to determine the level of risk posed to the directly affected watercourses and the relevant level of Water Use application;

1.3 Limitations and Assumptions

The following limitations apply to this study:

- A site visit was undertaken on 27 February 2024 in order to identify and delineate watercourses within and immediately adjacent to the proposed pipeline crossings (3 in total). This is not the ideal time of the year to determine hydrology as it is the driest time of the year. This is not considered a material limitation as flow was observed in two of the watercourses. Based on the precautionary principle the third watercourse which showed no evidence of flow was deemed to be ephemeral.
- The EAP, Virdus Works Environmental, provided the Terms of Reference (ToR) for this study and specifically indicated that only the external services and, in particular, two watercourse crossing points for the proposed water supply pipeline and a third crossing point for a proposed sewerage pipeline were the only aspects of the proposed development which required freshwater specialist assessment. As such this study has only focussed on the three crossing points and the watercourses directly affected by the proposed pipeline crossings.
- Regarding the delineation of wetlands and riparian areas near to these crossings, the determination of the wetland and riparian edges have been based on accepted best-practise methods as per 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). The upstream and downstream portions beyond the sphere of direct influence have been delineated based on desktop methods, *inter alia* Google Earth aerial imagery which shows the riparian vegetation edge. This is considered appropriate given the nature of the proposed activity which entails pipeline crossings which have a minimal sphere of direct influence and do not entail wetland loss as the topsoil is typically reinstated after the pipelines have been laid.
- In determining the current extent of the wetland the methods used were 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); and
- The current extent of the site's wetlands and riparian areas has been delineated using a Garmin Etrex 20 with an expected accuracy of 3 to 5 metres. It is however the opinion of the specialist that this limitation is of no material significance and that the freshwater-related impacts have been adequately identified;
- At the time of the site visit both the 'landfill' watercourse and the Sand River at their respective proposed crossing points were subject to extensive disturbance which had resulted in the almost complete removal of instream and riparian vegetation as well as earthworks which had completely altered the bed and banks of these two drainage lines. While these two systems are expected to recover the current assessment is based on their current status as it is not possible to predict the rate of recovery and also when the external services will be installed.

1.4 Overview of Applicable Legislation

1.4.1 National Water Act (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 drainage line 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.

Notice No. 4167 of Government Gazette No. 49833 (December 2023) promulgated in terms of the NWA makes allowance for a regulated area around all watercourses within which the risk of an activity in terms of water uses (c) and (i) under section 21 of the Act must be assessed. The stipulated regulated areas include everything within 500m of the boundary of wetland, and everything within 100m or the 1:100 year flood-line (whichever is the greater distance) of a river, stream or drainage line.

The Department of Water and Sanitation (DWS) applies a “no net loss” policy to wetlands. Therefore, should the proposed development result in the loss of any wetland habitat or function, the loss must be compensated by means of an offset scheme in order to secure the required water use licence. Significant loss of riparian habitat may also require compensation by means of an offset in order for the application to be successful. An offset scheme may entail rehabilitation and management of another

portion of wetland or riparian habitat within the applicable property; or if this is not feasible or adequate, it may entail purchase, rehabilitation and management (in perpetuity) of another wetland or riparian property. Rehabilitation, purchase of an additional property (if necessary) and management of the offset may be costly processes. Note that the proposed pipeline crossings would, however, **not** cause wetland loss and so offsets do not apply in this case.

Applicable activities for the proposed development relate to Section 21 (c) and (i), for which registration under a GA is allowable for low risk activities, and a Risk Assessment Matrix has been completed in this regard, with the resultant risks being determined as 'low' for the proposed pipeline crossings. Therefore, the proposed pipeline crossings should qualify for a GA registration.

1.4.2 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."

Environmental Impact Assessment (EIA) Regulations have been promulgated under NEMA since 2006[2] which list activities that may be detrimental to the environment and that require prior Environmental Authorisation. The Regulations specify the level of EIA (either a Basic Assessment or a full Scoping and EIA process) that needs to be undertaken in order to obtain the required Environmental Authorisation.

Environmental Impact Assessment (EIA) Regulations have been promulgated under NEMA since 2006[3] which list activities that may be detrimental to the environment and that require prior Environmental Authorisation. The appointed EAP, Virdus Works Environmental, has confirmed that the proposed development does require prior environmental authorisation in terms of the NEMA EIA Regulations (2014, as amended) as listed activities are applicable.

In accordance with the *Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for environmental authorisation*[4] when the site sensitivities are VERY HIGH, HIGH or MODERATE for any particular specialist theme then the applicable protocol for specialist assessment must be applied. In terms of NEMA, wetlands and drainage lines fall under the identified theme of Aquatic Biodiversity. In this case the Screening Tool identified the site as having a VERY HIGH sensitivity for the aquatic biodiversity theme and accordingly the current study must meet the minimum reporting criteria as per the gazetted protocol for Aquatic Biodiversity Assessment. In undertaking this detailed Freshwater Ecological Assessment, EnviroSwift has addressed the minimum reporting criteria that are applicable as indicated in Table 1.

[2] The Regulations were amended in 2010 and in 2014, and again in 2017.

[3] Regulations were promulgated in 2006, 2010 and 2014 and amended in 2017.

[4] Gazetted on 20 March 2020 (GN No. R320) and which came into effect in May 2020

Table 1: Compliance with the reporting requirements as per the Protocol for Aquatic Biodiversity Assessments

No.	Reporting Requirements as per the Protocol for Aquatic Biodiversity Specialist Assessments	Compliance of current report
1	The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects:	
1.1	a description of the aquatic biodiversity and ecosystems on the site, including;	See Section 3.
	(a) aquatic ecosystem types; and	See Section 3.
	(b) presence of aquatic species, and composition of aquatic species communities, their habitat, distribution and movement patterns	See Section 3.
1.2	the threat status of the ecosystem and species as identified by the Screening Tool	Ecosystem threat status is presented in Section 3.1.1. No aquatic species were identified as requiring assessment by the Screening Tool.
1.3	an indication of the national and provincial priority status of the aquatic ecosystem, including a description of the criteria for the given status (i.e. if the site includes a wetland or a river freshwater ecosystem priority area or sub catchment, a strategic water source area, a priority estuary, whether or not they are free -flowing rivers, wetland clusters, a critical biodiversity or ecologically sensitivity area)	See Section 3.1. where the presence of CBAs and ESAs are described as identified in the WCBSP (2017).
1.4	a description of the Ecological Importance and Sensitivity (EIS) of the aquatic ecosystem including:	See Section 3.4 where the EIS method based on the assessment tool developed by Rountree *et. al.* (2013) is applied to the large hillslope seep and Section 3.5 where it is applied to the 3 minor seeps.
	(a) the description (spatially, if possible) of the ecosystem processes that operate in relation to the aquatic ecosystems on and immediately adjacent to the site (e.g. movement of surface and subsurface water, recharge, discharge, sediment transport, etc.); and	See Section 3.4 where the WET-Health method (Macfarlane, 2007) is presented and where the pre-development PES is determined for the Unchannelled Valley Bottom Wetland and Section 3.5 & 3.6 for the two affected drainage lines.
	(b) the historic ecological condition (reference) as well as Present Ecological State (PES) of rivers (in- stream, riparian and floodplain habitat), wetlands and/or estuaries in terms of possible changes to the channel and flow regime (surface and groundwater).	The pre-development PES is assessed using the WET-Health method (Macfarlane, 2007) and is presented in Section 3.4.2 for the Unchannelled Valley Bottom Wetland and 3.5.1 & 3.6.1 for the two affected drainage lines.
2	The assessment must identify alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification and which were not considered appropriate.	No alternative scheme is being assessed.
3	Related to impacts, a detailed assessment of the potential impacts of the proposed development on the following aspects must be undertaken to answer the following questions:	See Section 4 for Impact Assessment.
3.1	Is the proposed development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal?	See Section 5 for key findings and recommendations.
3.2	Is the proposed development consistent with maintaining the resource quality objectives for the aquatic ecosystems present?	No resource quality objectives have been established for the aquatic ecosystems present.
3.3	How will the proposed development impact on fixed and dynamic ecological processes that operate within or across the site? This must include:	
	(a) impacts on hydrological functioning at a landscape level and across the site which can arise from changes to flood regimes (e.g. suppression of floods, loss of flood attenuation capacity, unseasonal flooding or destruction of floodplain processes);	Impacts on flood regime are addressed in Section 4.2.

No.	**Reporting Requirements as per the Protocol for Aquatic Biodiversity Specialist Assessments**	**Compliance of current report**
	(b) will the proposed development change the sediment regime of the aquatic ecosystem and its sub -catchment (e.g. sand movement, meandering river mouth or estuary, flooding or sedimentation patterns);	Erosion and sedimentation are addressed in Section 4.2.
	(c) what will the extent of the modification in relation to the overall aquatic ecosystem be (e.g. at the source, upstream or downstream portion, in the temporary / seasonal / permanent zone of a wetland, in the riparian zone or within the channel of a watercourse, etc.); and	See Section 4 where the potential impacts of the proposed development are assessed.
	(d) to what extent will the risks associated with water uses and related activities change	See Section 6 for Risk Assessment.
3.4	How will the proposed development impact on the functioning of the aquatic feature? This must include:	
	(a) base flows (e.g. too little or too much water in terms of characteristics and requirements of the system);	See Section 4.2.
	(b) quantity of water including change in the hydrological regime or hydroperiod of the aquatic ecosystem (e.g. seasonal to temporary or permanent; impact of over -abstraction or instream or off stream impoundment of a wetland or river);	See Section 4.2.
	(c) change in the hydrogeomorphic typing of the aquatic ecosystem (e.g. change from an unchannelled valley- bottom wetland to a channelled valley -bottom wetland); (d) quality of water (e.g. due to increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication);	See Section 4.2.
	(e) fragmentation (e.g. road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal); and	While the proposed water supply pipeline would cross an Unchannelled Valley Bottom Wetland the construction method results in no wetland fragmentation as the soils are backfilled and the compacted.
	(f) the loss or degradation of all or part of any unique or important features associated with or within the aquatic ecosystem (e.g. waterfalls, springs, oxbow lakes, meandering or braided channels, peat soils, etc.);	N/A as no such unique or important features present on the site.
3.5	How will the proposed development impact on key ecosystems regulating and supporting services especially:	See Section 4.
	(a) flood attenuation;	
	(b) streamflow regulation;	
	(c) sediment trapping;	
	(d) phosphate assimilation;	
	(e) nitrate assimilation;	
	(f) toxicant assimilation;	
	(g) erosion control; and	
	(h) carbon storage?	
3.6	How will the proposed development impact community composition (numbers and density of species) and integrity (condition, viability, predator - prey ratios, dispersal rates, etc.) of the faunal and vegetation communities inhabiting the site?	This has not been identified as a potential impact given the fact that disturbance caused by the construction method is only temporary and of relatively low intensity.
No.	**Minimum information requirements for an Aquatic Biodiversity Specialist Assessment Report**	
1	contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae	Contact details, SACNASP registration number and field of expertise provided in cover pages and preface of the report. CV provided as Appendix 2.
2	a signed statement of independence by the specialist	Statement of Independence provided as Appendix 3.
3	a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment	See Section 1.3.

No.	**Reporting Requirements as per the Protocol for Aquatic Biodiversity Specialist Assessments**	**Compliance of current report**
4	the methodology used to undertake the site inspection and the specialist assessment, including equipment and modelling used, where relevant	See Section 1.3 and Section 2.
5	a description of the assumptions made, any uncertainties or gaps in knowledge or data	See Section 1.3.
6	the location of areas not suitable for development, which are to be avoided during construction and operation, where relevant	No such areas were identified.
7	additional environmental impacts expected from the proposed development	See Section 4.2
8	any direct, indirect and cumulative impacts of the proposed development on site	See Sections 4.2, 4.4 and 4.5, respectively.
9	the degree to which impacts and risks can be mitigated, reversed and can cause loss of irreplaceable resources	See Section 4.2
10	a suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies	Buffers are not applicable given the nature of the proposed development.
11	proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr)	See Section 4.2 and Section 5
12	a motivation must be provided if there were development footprints identified as per requirement No. 2 above that were identified as having a "low" aquatic biodiversity sensitivity and that were not considered appropriate	N/A
13	a substantiated statement, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed development and if the proposed development should receive approval or not	See Section 5.
14	any conditions to which this statement is subjected	See Section 5.

Method of Assessment

1.5 Overview

The methods used in this freshwater specialist study entailed the following:

1. A desktop assessment to determine the conservation importance of the affected watercourses;
2. Site assessment to identify the site's watercourses and delineate their current extent;
3. An assessment of the current ecological status and value of the site's wetlands using recognised classification systems and indices based on the information collected during the desktop assessment and site assessment;
4. An impact assessment where the potential impacts (and benefits) caused by the proposed development are identified based on the desktop assessment and the site assessment, assessed in terms of their significance and the identification of mitigation and/or management measures to minimise the potentially significant negative impacts and enhance potential benefits; and
5. A Risk Assessment as required in terms of Notice No. 4167 of Government Gazette 49833 of December 2023.

These methods are discussed in more detail in the following sections.

1.6 Desktop Assessment

The scope of work includes a desktop assessment using available national and provincial databases including the National Wetlands Map 5 (CSIR, 2018), the NFEPA (2011), the Western Cape Biodiversity Spatial Plan (WCBSP, 2017) and maps and vector data form the National Geospatial Information (NGI) directorate.

The WCBSP 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 (see Table 2):

Table 2: 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

1.7 Watercourse Identification and Delineation

For the purpose of the identification of water resources, the definition as provided by the NWA (Act 36 of 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 the following:

- An estuary is associated with the sea and are therefore excluded from freshwater assessments; and
- Given that wetland and riparian assessments only include the assessment of hydrology in the first 50 cm from the soil surface, aquifers, being significantly deeper, 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 at risk of being impacted can be classified as 'wetland habitat' or 'drainage line or riparian habitat', the definitions as drafted by the NWA (Act No. 36, 1998)[5] 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 wetland delineation guideline to facilitate the delineation of the temporary wetland 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.

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

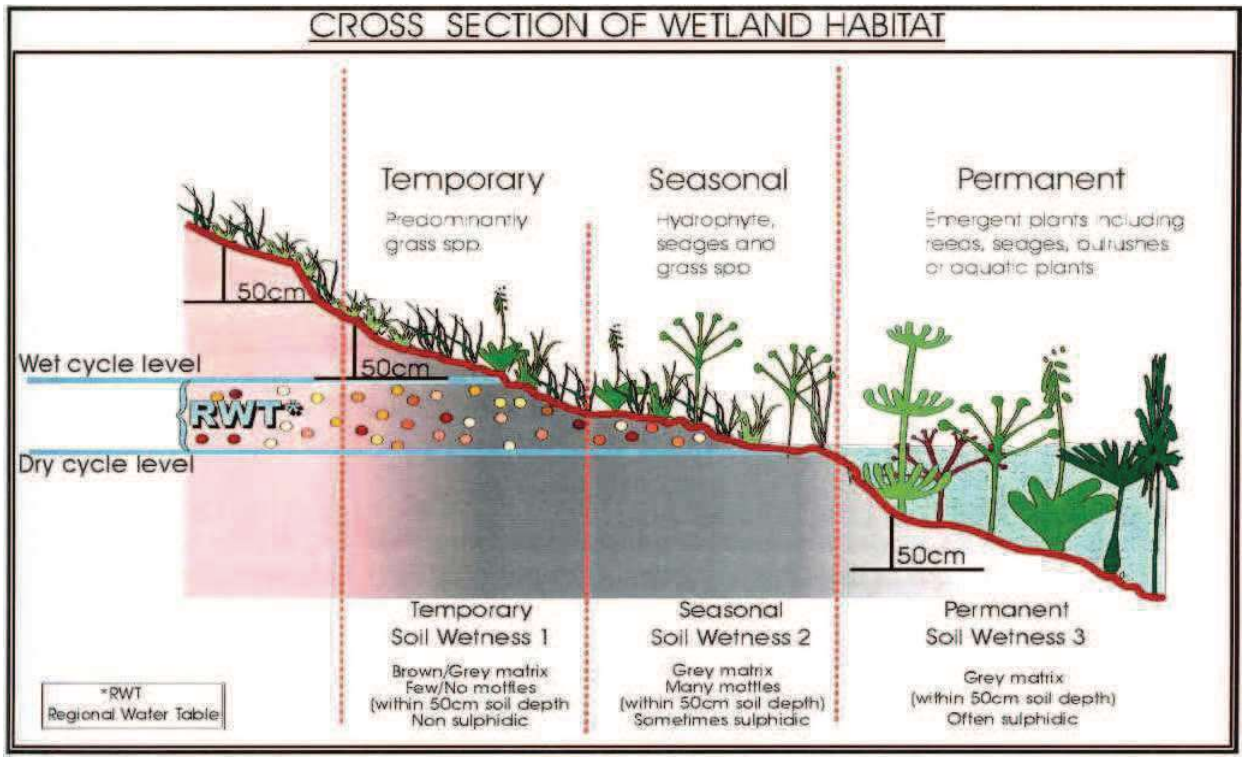

Figure 2: Cross section through a wetland (after DWAF, 2005).

Table 3: 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[6] 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

1.8 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 Figure 3 below.

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

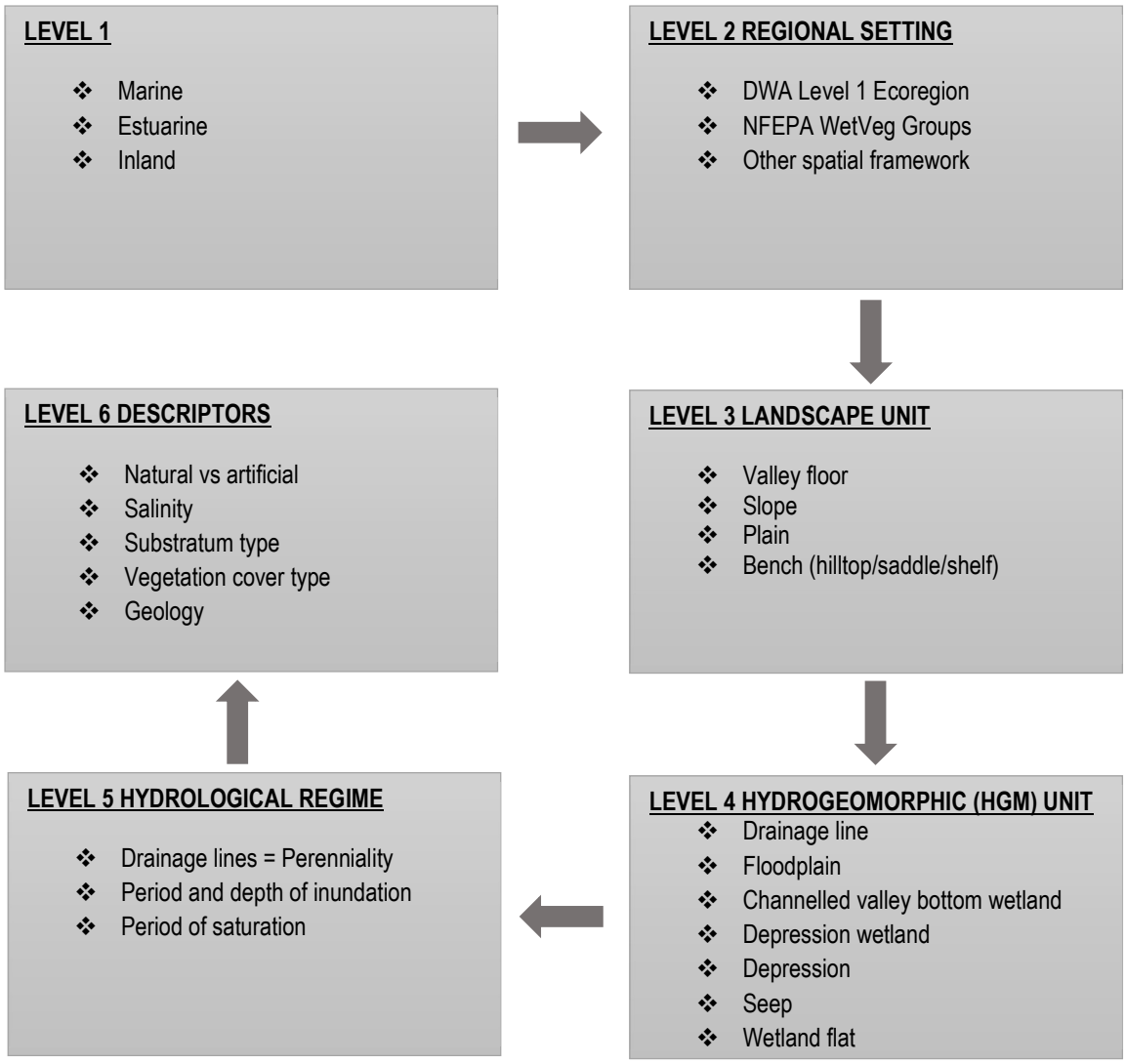

Figure 3: Classification System for wetlands and other aquatic ecosystems in South Africa.

1.9 Ecological Assessment Methodology for Wetlands

1.9.1 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.

1.9.2 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 the overall Present Ecological State (PES) of the wetland. A Level 1 WET-Health assessment was undertaken as part of this assessment.

Table 4: PES categories as defined in WET-Health (Macfarlane, 2007).

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

1.9.3 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.

1.9.4 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.

1.9.5 Buffer Requirements

The buffer zone tool for the determination of the minimum effective wetland buffer (Macfarlane *et al*., 2014) is typically used to calculate the minimum buffer. The tool requires various inputs including the PES. As such the tool can only be applied after a detailed ecological assessment of the watercourses in question have been undertaken. In this case, due to the nature of the proposed activity which entails pipeline crossings of watercourses means that application of the buffer zone tool serves no purpose.

1.10 Ecological Assessment Methodology for Drainage Lines

1.10.1 Present Ecological State (PES)

The drainage line Intermediate Habitat Integrity Assessment (IHIA) method (Kemper, 1999) is used to determine the PES of drainage lines. The drainage line IHIA is based on two components of the watercourse, the riparian zone and the instream channel. Assessments are made separately for both aspects, but data for the riparian zone is primarily interpreted in terms of the potential impact on the instream component. The method involves the rating of the perceived modification of nine instream criteria and eight riparian criteria against a set scoring guideline. The final score is derived by calculating the average scores, which places the final score in one of the categories listed in Table 4 below.

Table 5: Intermediate Habitat Integrity Assessment (IHIA) categories (From Kemper, 1999).

Category	Description	Score (% of total)
A	Unmodified, natural.	90-100
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.	80-90
C	Moderately modified. A loss and change of natural habitat and biota have occurred but the basic ecosystem functions are still predominantly unchanged.	60-79
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	40-59
E	The loss of natural habitat, biota and basic ecosystem functions is extensive.	20-39
F	Modifications have reached a critical level and the lotic system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.	0

1.10.2 Ecological Importance and Sensitivity

The EIS method applied to drainage lines is based on the approach adopted by the DWA as detailed in the document “Resource Directed Measures for Protection of Water Resources” (1999). 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. The EIS score also provides guidance on the recommended ecological category of the watercourse assessed.

1.10.3 Recommended Ecological Category (REC)

The Recommended Ecological Category (REC) is determined by the PES score as well as importance and/or sensitivity. Drainage lines 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 drainage lines to maintain their functionality and continue to provide the goods and services for the environment and society.

1.11 Impact Assessment

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

The following criteria were taken into consideration when determining the significance of potential impacts associated with the proposed development:

- The nature of the potential impact i.e. positive, negative, direct, indirect;
- The extent and location of the potential impact;
- The duration of the potential impact i.e. short term, medium term, permanent;
- The intensity (or magnitude) of the potential impact i.e. low, medium, high; and
- The likelihood or probability of the potential impact having occurred.

Mitigation measures were subsequently identified and recommended for the identified potential impacts with the purpose of reducing the overall impact significance to an acceptable level, where and if possible (the resultant impact significance is determined and provided in the impact rating tables). Mitigation measures were aimed to ensure that:

- Alternative and more environmentally sound designs / layouts / technologies, etc., are implemented, if feasible;
- Environmental benefits of the proposed development are enhanced;
- Negative impacts are avoided, minimised or remedied; and
- Residual negative impacts are kept within acceptable levels.

This method of assessment was applied to the proposed development (only the preferred alignment as provided by the EAP) and the No-Go alternative in accordance with accepted best-practise methods.

Results

1.12 Desktop Assessment

1.12.1 Ecological Setting

The study area lies in the Southwestern Coastal Belt ecoregion (Kleynhans *et al*, 2005), the main features of which are summarised in Table 5 which is adapted from Cape Farm Mapper website (https://gis.elsenburg.com/apps/cfm/). Local climatic, topographic and soil conditions for the study area are shown in Table 6, which is also adapted from the Cape Farm Mapper website. The study area is furthermore within the Berg Water Management Area (WMA), the Greater Cape Town Sub-WMA and the G22H quaternary catchment.

According to Mucina and Rutherford (2006, updated 2012 & 2018), the proposed site is located within the Swartland Granite Renosterveld which is listed as Endangered (E) according to the Government Gazette No. 47526 of November 2022. The NFEPA wetland vegetation database (2011) does not identify any wetland vegetation type for the proposed site and immediate surrounds but does identify a small patch of West Coast Silcrete Renosterveld to the north of the Polkadraai Reservoir (also referred to as the Skilpadvlei Reservoir) which is the proposed source of the water supply for the proposed urban development. This patch of West Coast Silcrete Renosterveld will not be affected in any way by the proposed installation of the external services.

The underlying geology of the area consists of granite and deposits of weathering products of granite of the Kuils River-Helderberg Pluton, Cape Granite Suite and occasional Quaternary quartz sand of the Springfontein Formation and alluvium. Soils are of a moderate depth and show a marked accumulation of clay. The above average clay content, mid soil depth, mediocre rainfall indicates that in areas of flat topography wetland conditions are expected to be associated with depressions and drainage lines whereas in the steeper sloping areas wetland conditions would be expected to be associated with areas of seepage as well as drainage lines.

Table 6: Overview of the South Western Coastal Belt Ecoregion (adapted from Kleynhans et al, 2005)

Main Attributes	South Western Coastal Belt Ecoregion
Geology	Granite, quartzitic sandstone, quartzite, conglomerate, slate
Vegetation	Sand Plain Fynbos; Mountain Fynbos; West Coast Renosterveld; Dune Thicket; Strandveld Succulent Karoo
Landscape	Closed hills; mountains; moderate and high relief
Mean altitude	300-900m AMSL

Table 7: Local climate, topography and soil conditions (adapted from Cape Farm Mapper, 2022)

Parameters	Local Conditions
Mean annual precipitation (mm)	630 mm
Mean annual runoff (mm/annum)	140 mm/annum
Mean annual temperature (°C)	16.1°C
Elevation (m above mean sea level)	30 – 150 m
Slope classification (%)	0 – 30 %
Soil characteristics	Soils with a marked clay accumulation, strongly structured and a non-reddish colour. In addition, one or more of vertic, melanic and plinthic soils may be present.
Soil depth (mm)	>= 450 mm and < 750 mm
Soil clay content (%)	< 15%

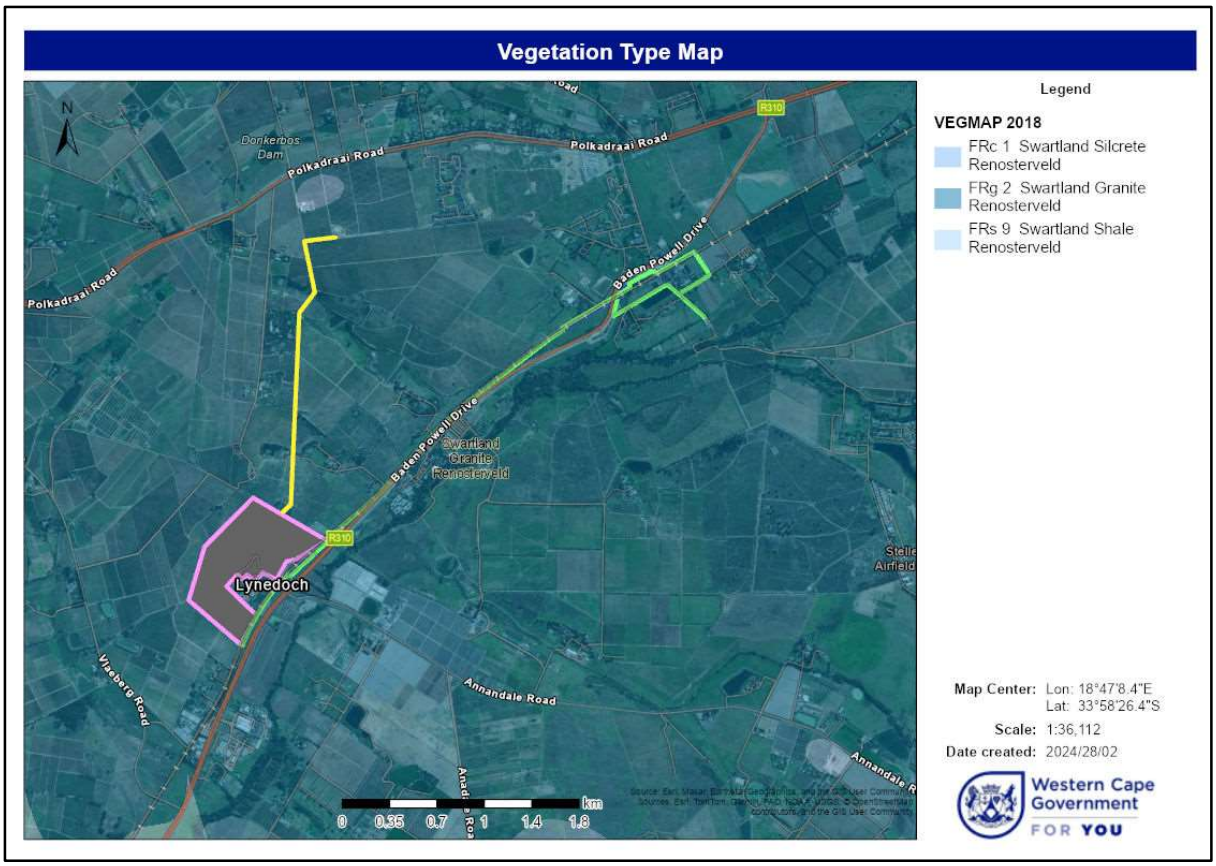

Figure 4: Terrestrial vegetation type of the proposed site (Mucina & Rutherford, 2006, updated 2018). The proposed urban node is indicated as purple polygon, the new water pipeline as a yellow line and the new sewerage pipeline as a green line.

Figure 5: Wetland Vegetation Type according to NFEPA (2011). The green polygon indicates the extent of West Coast Silcrete Renosterveld. The yellow line indicates the proposed alignment of the water supply pipeline from the reservoir towards the proposed urban development.

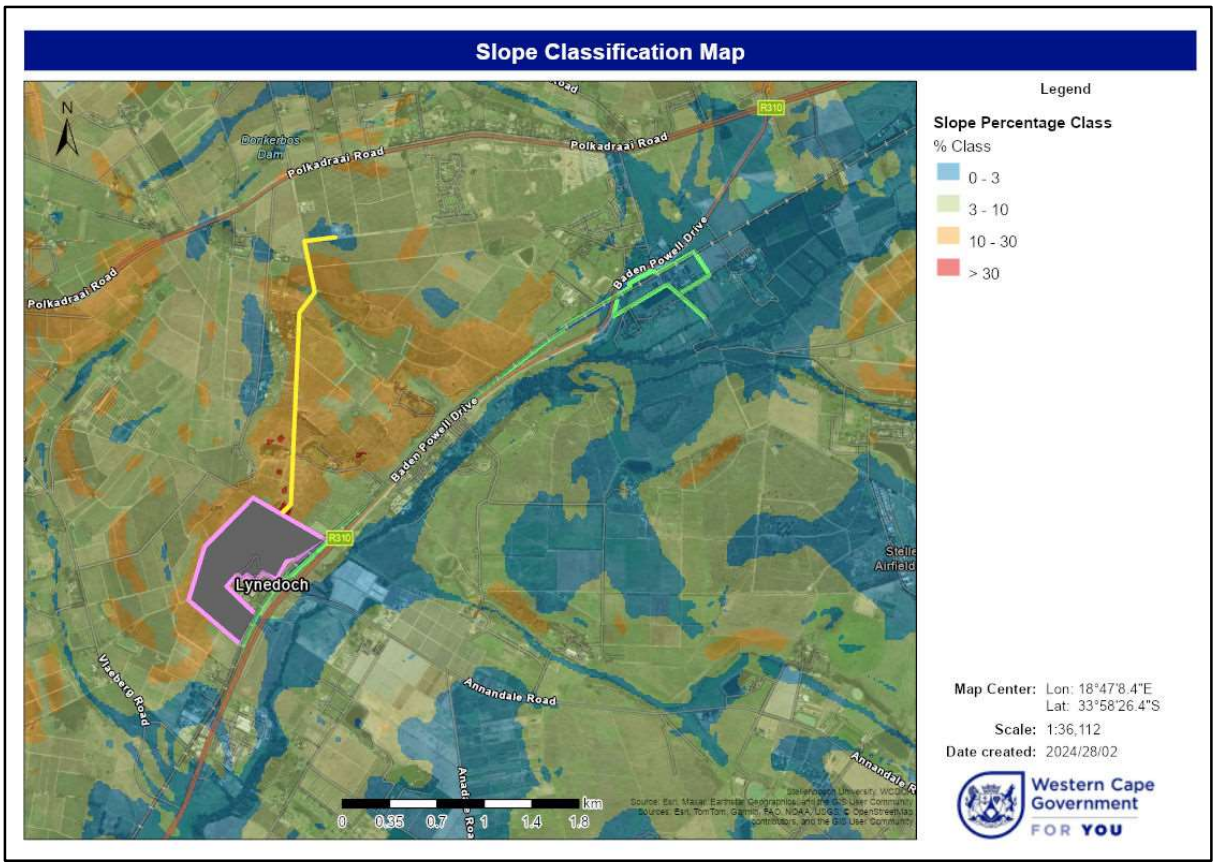

Figure 6: Slope expressed as a percentage of the vertical, such that horizontal is 0% and vertical is 100%. The slope of the proposed site is between 0 and 5% (Cape Farm Mapper, 2022). The proposed urban node is indicated as purple polygon, the new water pipeline as a yellow line and the new sewerage pipeline as a green line.

1.12.2 Watercourses within the Study Area and within the Regulated Zone

The National Geospatial Information (NGI) Service (Cape Farm Mapper, 2022) and the National Wetlands Map 5 (CSIR, 2018) were consulted to determine the presence of watercourses within 500m of the proposed site, in accordance with the regulated zone for wetlands as defined by the NWA (1998).

The NGI topo-cadastral map identifies several drainage lines in the surrounding area (see Figure 6). The proposed water pipeline would cross two separate non-perennial drainage lines with the northern-most drainage line indicated to discharge into the perennial Jonkershoek River approximately 1,7 km south east of the crossing point and the southern-most drainage line indicated to end at an impoundment approximately 150m to the east of the crossing point.

The proposed sewerage pipeline would cross the Sand River immediately south of Baden Powell Drive (within the Baden Powell Road Reserve). The Sand River discharges into the perennial Jonkershoek River approximately 600m south west from the crossing point.

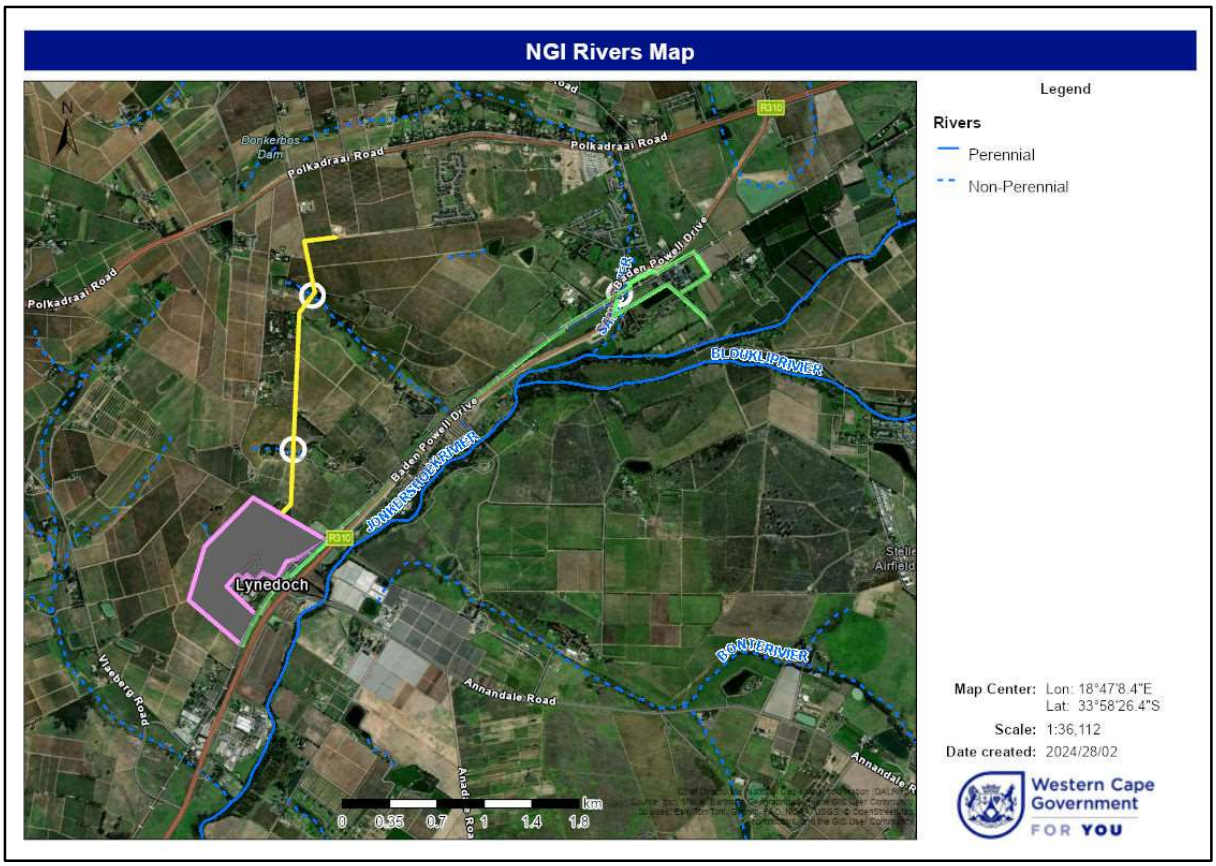

Figure 7: NGI Rivers Map (Cape Farm Mapper, 2024). The proposed urban node is indicated as purple polygon, the new water pipeline as a yellow line and the new sewerage pipeline as a green line.

The National Wetlands Map Version 5 (CSIR, 2018) indicates no wetlands within the regulated zone of the two new pipelines (see Figure 7). The NFEPA wetlands layer indicates numerous artificial wetlands (mostly irrigation dams) but no natural wetlands within the regulated zone of either pipeline (see Figure 8).

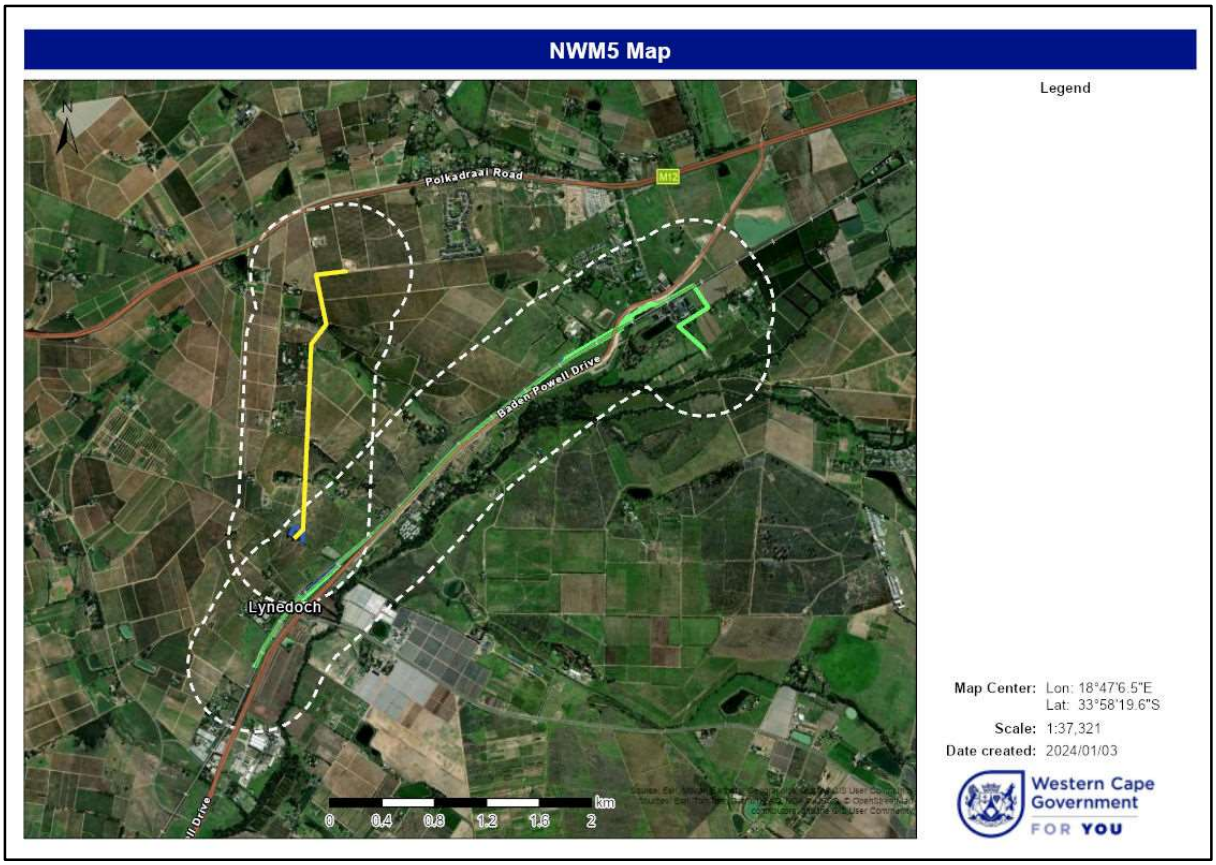

Figure 8: Wetlands within 500m of the site according to the National Wetlands Map Ver 5 (CSIR, 2018).

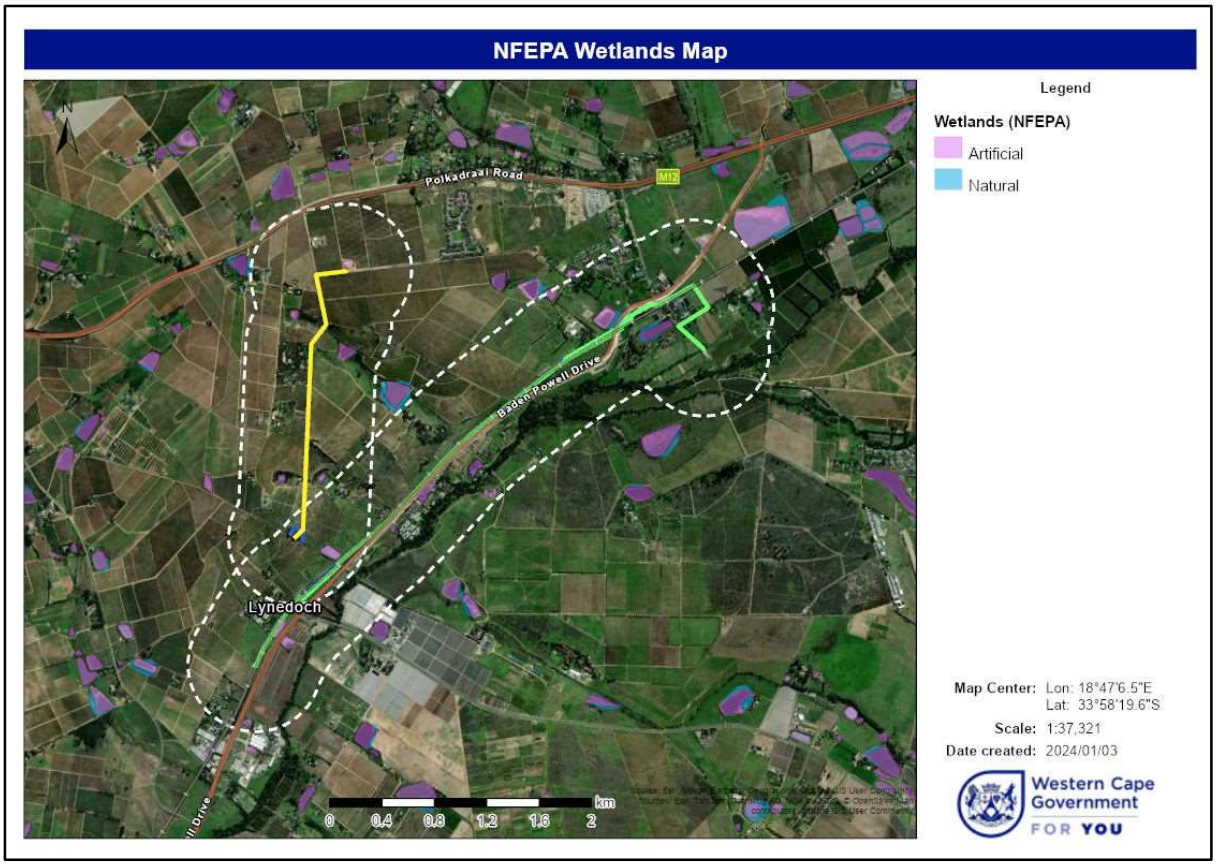

Figure 9: Wetlands within 500m of the site according to the NFEPA wetlands layer (2011).

The WCBSP (2017) identifies areas of conservation importance Protected Areas, Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs). All of the affected non-perennial drainage lines have been identified as restorable ESAs (i.e. ESA2 - see Figure 10). In addition, small parts of the Jonkershoek River immediately downstream of its confluence with the Sand River have been identified as Aquatic CBAs.

Restorable ESAs are regarded as areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of CBAs, and are often vital for delivering ecosystem services. Restorable ESAs should be restored and/or manage to minimise impacts on ecological processes and ecological infrastructure functioning, especially soil and water-related services, and to allow for faunal movement.

CBAs are areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure. CBAs should be maintained in a natural or near-natural state, with no further loss of natural habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate in CBAs.

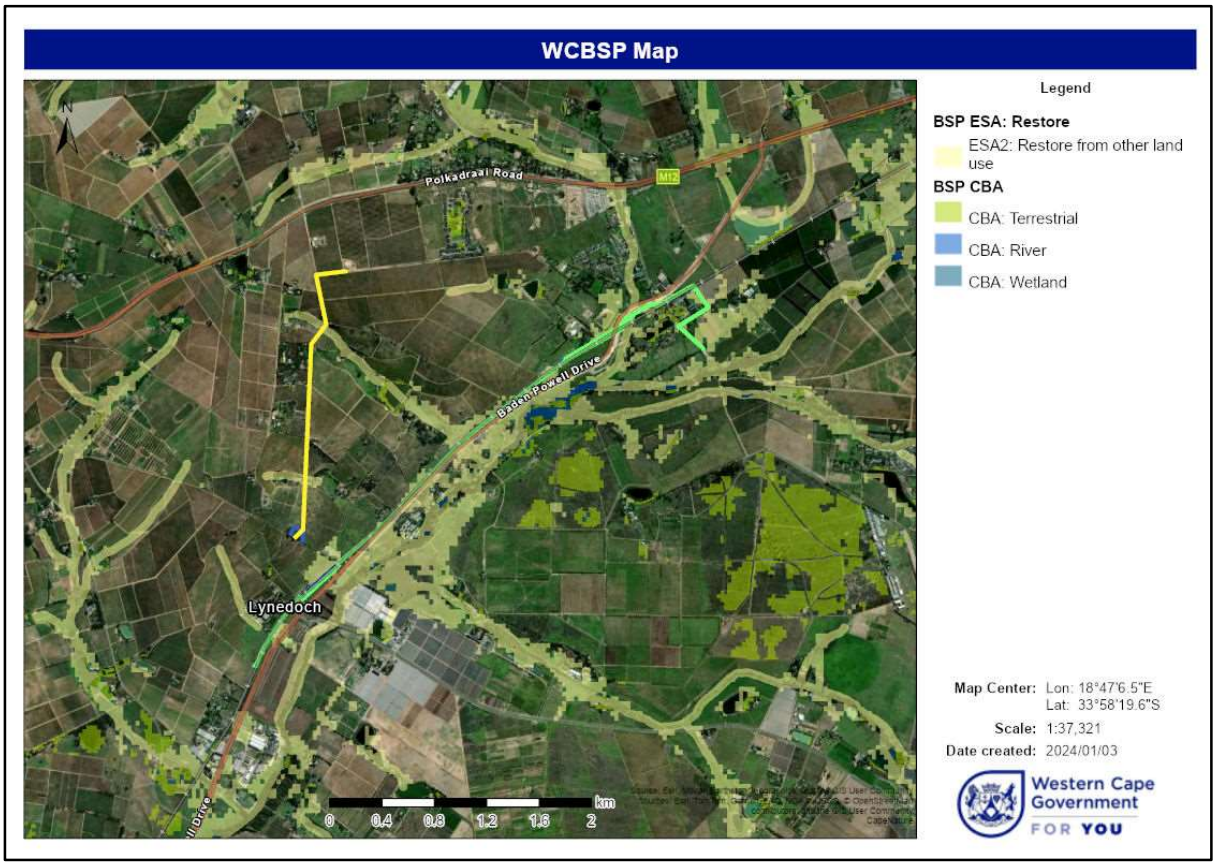

Figure 10: Conservation Importance Map (WCBSP, 2017).

1.13 Site Investigation

1.13.1 Site Description

Given that the Virdus Works Environmental instructed EnviroSwift to assess three identified crossing points of the two pipelines only, the site visit focussed only on these areas (see Figure 11). Each crossing point is described separately below.

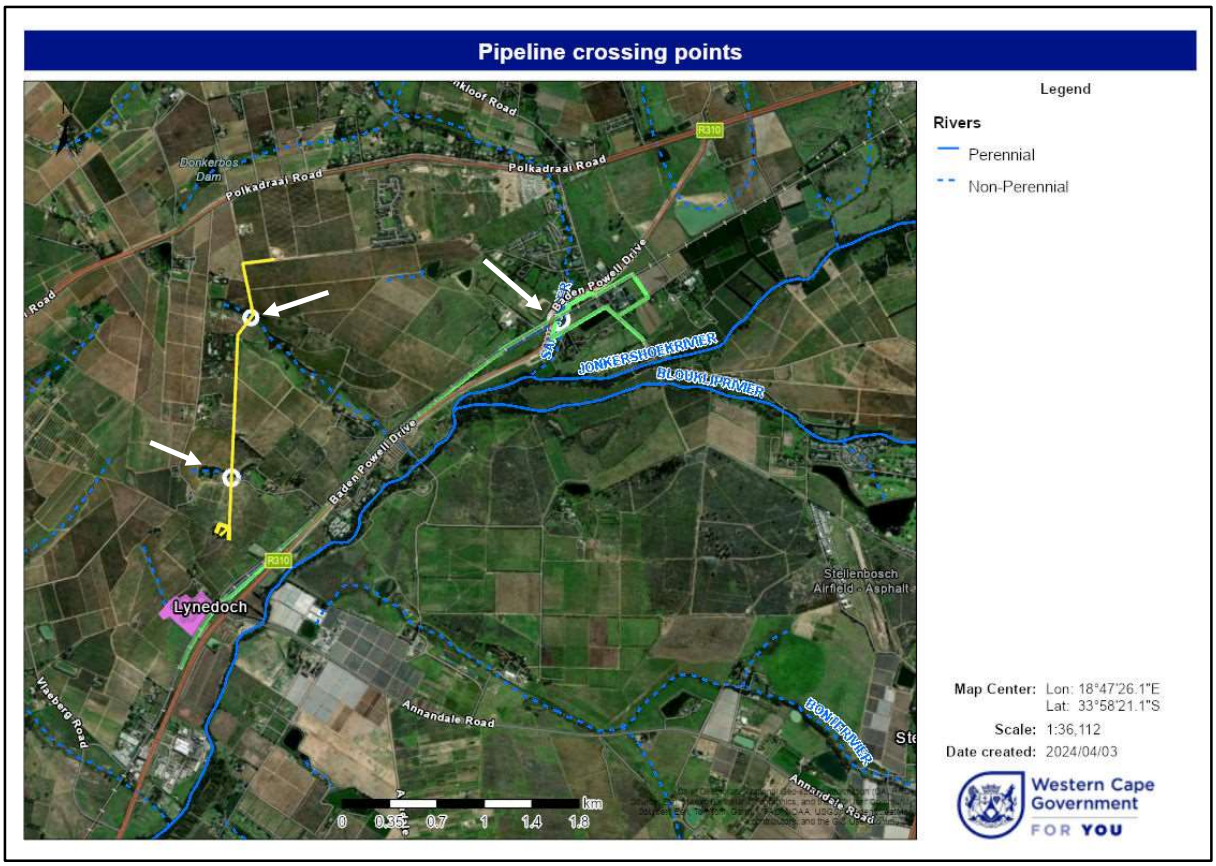

Figure 11: Pipeline crossings Map (Cape Farm Mapper, 2024). The white arrows indicate the crossing points.

Site 1: 'Clean' watercourse water pipeline crossing

The first water pipeline crossing visited was indicated as the 'clean' watercourse crossing for the reason that the watercourse was in the least impacted state of the three watercourses to be crossed by external infrastructure. The watercourse originates approximately 250m to the north-west of the proposed crossing site in a small valley surrounded by vineyards and has been impounded at its source. The proposed crossing point is also a historic vehicular crossing point although at the time of the site visit recent flooding (presumably the 2024 floods that affected most of the Western Cape) had caused severe erosion of the farm road leading towards the crossing point and use of the crossing point appears to have ceased.

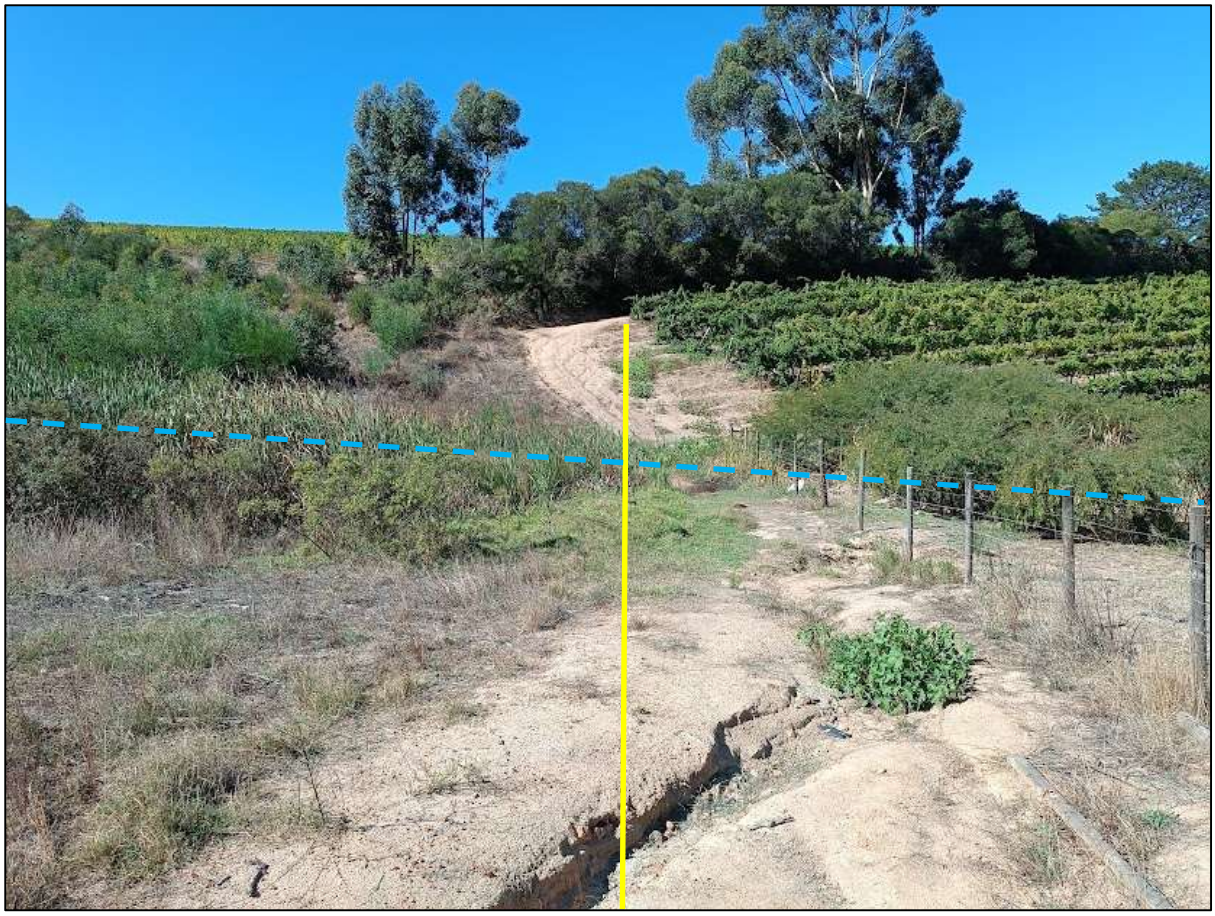

Figure 12: Photograph of the proposed water pipeline crossing of the 'clean' watercourse. The approximate alignment of the pipeline is indicated as a yellow line and the watercourse as a blue stippled line. Note the erosion of the farm road in the foreground

Site 2: 'Landfill' watercourse water pipeline crossing

The second water pipeline crossing visited was referred to as the 'landfill' watercourse crossing due to the watercourse having been used historically as a farm landfill. While there was recent evidence of efforts to remove the waste material from the watercourse, solid waste deposits were still clearly evident. The watercourse has been impounded at its source approximately 150m upstream from the proposed crossing point and ends in a second impoundment approximately 150m downstream from the proposed crossing point. The portion upstream from the proposed crossing point is significantly less impacted than the lower portion which exhibits evidence of significant earthworks and vegetation removal, presumably as a result of the rehabilitation efforts. The proposed water pipeline would cross in this lower, severely impacted portion as shown in Figure 12.

Figure 13: Photograph of the 'landfill' watercourse crossing site. The approximate alignment of the pipeline is indicated as a yellow line and the watercourse as a blue stippled line.

Site 3: Sewerage pipeline crossing of the Sand River

The proposed sewerage pipeline crossing of the Sand River is located in the road reserve of the R310 ('Baden Powell Drive'). This area is currently subjected to extensive transformation due to the current upgrading of the R310 in the vicinity of Vlottenberg. The result is that the Sand River now discharges from a new culvert beneath the R310 into a newly created, trapezoidal, earthen channel prior to its discharge beneath a railway line after which it continues as a relatively intact system. The proposed sewerage pipeline would cross this newly shaped channel as shown in Figure 13.

Figure 14: Photograph of the Sand River crossing site. The approximate alignment of the pipeline is indicated as a yellow line and the watercourse as a blue stippled line. Note the newly shaped banks and the extensive clearance of vegetation as well as the railway bridge located approximately 30m downstream of the proposed crossing point.

1.13.2 Vegetation

The vegetation associated with freshwater habitat present in the vicinity of each of the crossings is described separately in the following sections.

Site 1: 'Clean' watercourse water pipeline crossing

The vegetation associated with the watercourse immediately upstream of the proposed crossing point is dominated by *Typha capensis* (bullrush) which occurs in an area of flatter topography of approximately 300 square metres. Further upstream up until its source which is marked by an impoundment, the watercourse flows through a moderately sloping valley with smaller patches of *T. capensis* and flanking areas dominated by alien invasive species including *Acacia longifolia* and *Pennisetum clandestinum*. Downstream of the proposed crossing point until a second impoundment some 180m to the south east, the watercourse flows through a slight to moderately sloping area where the watercourse is characterised by relatively dense macrophytes dominated by alien invasive species such as *A. longifolia* and *Populus canescens* (grey poplar) as depicted in Figure 15. *Rubus* sp. (bramble) as well as *Pennisetum clandestinum* are also evident as examples of invasive herbs and grasses. Indigenous macrophytes are also present and included *Olea europaea* subs. *africana* (wild olive) and another prevalent yet unidentifiable species. Also present in this portion of the watercourse were unidentifiable indigenous sedges, *T. capensis* and *Zantedeschia aethiopica* (arum lily). Evidence of livestock grazing exists in the form of hoof prints in the muddy areas with several sedges having been eaten back, hence not being identifiable.

Figure 15: Photograph of the portion of the 'clean' watercourse immediately downstream of the proposed crossing point.

Site 2: 'Landfill' watercourse water pipeline crossing

While the proposed crossing point was entirely devoid of vegetation the area, upstream of the proposed crossing point and surrounding the upstream impoundment was a stand of relatively dense macrophytes dominated by the invasive alien *Acacia melanoxylon* (Blackwood) and the indigenous *Olea europaea* subs. *Africana* (wild olive). Also present within the HGM unit immediately upstream of the proposed crossing point was a stand of *Phragmites australis* (common reed) as shown in Figure 16. The only other alien invasive identified within close proximity to the drainage line was *Acacia saligna* (Port Jackson willow) which occurred in low numbers in the area surrounding the area used as a landfill.

Downstream of the area devoid of vegetation and subjected to recent earthworks is an impoundment which is dominated by *T. capensis* (see Figure 17). This impoundment is indicated as the end-point of the watercourse according to the NGI Rivers database (see Figure 6). During the site visit no clear overflow channel was identifiable at the impoundment and there was no evidence of a clear drainage channel downstream of the impoundment which supports the online NGI rivers map which indicates that the watercourse ends at the second impoundment.

Figure 16: Photograph of the portion of the 'landfill' watercourse immediately upstream of the proposed crossing point. Note the presence of solid waste and the small stand of *Phragmites australis* (common reed).

Figure 17: Photograph of the portion of the 'landfill' watercourse downstream of the proposed crossing point. Note the presence of *Typha capensis* which is present within an impounded portion of the watercourse. This impoundment marks the end of the drainage line according to the NGI database.

Site 3: Sewerage pipeline crossing of the Sand River

The portion of the Sand River in the vicinity of the proposed sewerage pipeline crossing point is almost entirely devoid of vegetation due to the recent extensive earthworks (see Figure 14). A few individual plants had however survived including *Cyperus textilis* (see Figure 18) and *T. capensis*. A few specimens of the highly invasive *A. saligna* were also evident in the immediate surroundings.

Figure 18: Photograph of one of the few surviving plants within the recently channelised portion of the Sand River. The species photographed is *Cyperus textilis*.

1.13.3 Soils and Hydrology

The soils and the nature of the hydrological regime of the watercourses in the vicinity of each of the crossings is described separately in the following sections.

Site 1: 'Clean' watercourse water pipeline crossing

The soil auger sample obtained from the Typha-dominated area immediately upstream of the proposed crossing point exhibited a high degree of soil wetness, a low chroma and also a high level of organic material which is typical of the wetland permanent zone (see Figure 19).

Trickle flow was present at the crossing point and given the presence of *T. capensis* immediately upstream and also downstream of the crossing point suggests that the watercourse is characterised by permanently saturated soils as *T. capensis* requires permanent levels of soil saturation in order to thrive.

Figure 19:. Photograph of the soil augered from within the areas dominated by *T. capensis* located immediately upstream and downstream of the proposed water pipeline crossing point.

Site 2: 'Landfill' drainage line water pipeline crossing

Auger samples within the vicinity of the proposed crossing point did not reveal any wetland characteristics and, while these were inconclusive due to the extent of soil disturbance in the area, did present alluvial characteristics which were evident in the excavated materials. Evidence of flow was completely absent during the site investigation confirming the ephemeral nature of flow in the watercourse.

Site 3: Sewerage pipeline crossing of the Sand River

Auger samples taken within close proximity to the proposed crossing point did not reveal any wetland or alluvial characteristics which was most likely due to the extent of earthworks and the channelisation of the watercourse. It is accordingly not possible to determine whether this portion of the watercourse historically existed as a wetland or an alluvial system (i.e. stream / drainage line). Flow was evident as trickle flow which, given the time of the site assessment in the driest time of the year, suggests that flow may be perennial (i.e. the Sand River downstream of the R310 could well be a perennial system). The presence of *T. capensis*, albeit in very low numbers, would support this conclusion as *T. capensis* is known to be associated with permanent levels of soil saturation.

1.13.4 Watercourse Delineation

The findings of the wetland delineation are presented below according to each of the proposed crossing points.

Site 1: 'Clean' watercourse

The area immediately upstream of the proposed crossing point to the downstream impoundment was mapped as an unchannelled valley bottom wetland based on a combination of soil characteristics and vegetation, which included wetland obligate and facultative species, as described in Sections 3.2.2 and 3.2.3. The area upstream of the crossing point was not ground-truthed as this area will not be impacted by the proposed pipeline crossing due to it being upslope of the crossing point. This area was identified

as comprising a mosaic of Typha-dominated wetland habitat based on Google Earth aerial imagery. The results of the wetland delineation are presented in Figure 20.

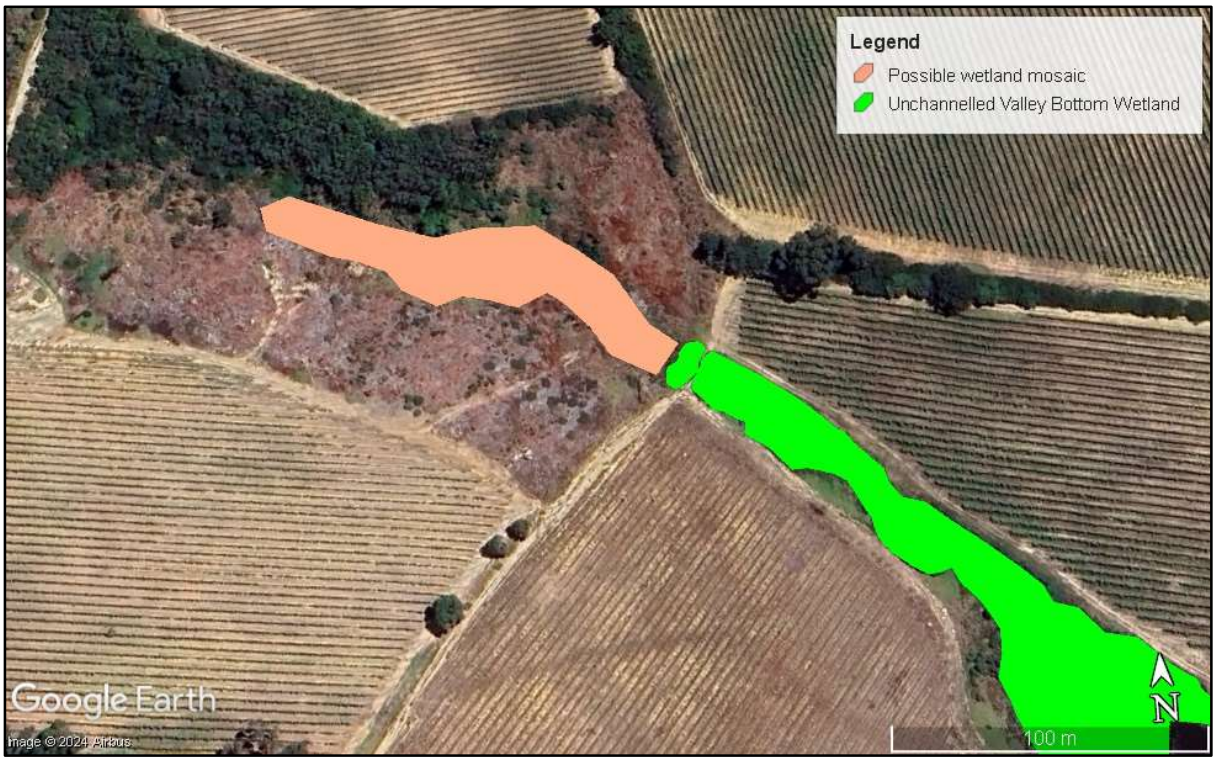

Figure 20: Watercourse delineation Map for the 'clean' drainage line crossing point.

Site 2: 'Landfill' watercourse water pipeline crossing

While soils could not be conclusively determined to exhibit wetland or alluvial characteristics due to the extensive earthworks that had taken place in the vicinity of the proposed crossing point, the watercourse is determined to comprise a non-perennial drainage line. The extent of riparian vegetation was difficult to confirm as the indigenous tree species dominant in this area (*O. capensis* and *Acacia melanoxylon*) comprised species common to terrestrial conditions and not exclusive to riparian areas.

Figure 21: Watercourse delineation Map for the 'landfill' drainage line crossing point.

Site 3: Sewerage pipeline crossing of the Sand River

Auger samples revealed no conclusive evidence of groundwater versus allivial ecosystem drivers which would allow for a conclusive determination of the classification of the watercourse as a wetland versus a drainage line or stream due to the extreme levels of soils disturbance. Given that the watercourse is mapped as a drainage line in the NGI Rivers database and also the WCBSP (2017) did not identify any CBA wetlands but rather CBA rivers, the watercourse classification as a non-perennial drainage line will be used for the purposes of this assessment.

Figure 22: Watercourse delineation Map for the Sand River at the proposed sewerage pipeline crossing point. The blue line indicates the alignment of the Sand River and the yellow line the approximate position of the proposed sewerage pipeline. Note the extent of earthworks immediately south of the R310.

1.14 Watercourse Classification

In terms of wetland and aquatic ecosystem classification user manual (Ollis *et. al.* 2013) the various watercourses affected by the proposed external services installations are classified as follows:

- 'Clean' watercourse: Unchannelled Valley Bottom Wetland;
- 'Landfill' watercourse: Non-perennial Drainage Line; and
- 'Sand' River: Non-perennial Drainage Line.

Tables 8 - 10 summarises the results from **Level 3** through to **Level 6** of the wetland and aquatic ecosystem classification user manual (Ollis *et. al.* 2013) applied to each of the affected watercourses.

Table 8: Level 3, 4, 5 and 6 of the wetland and aquatic ecosystem classification for the 'clean' watercourse.

Level 3 (Landscape Setting)	**Valley Floor:** the base of a 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 drainage line channel running through it.
Level 5 (Hydrological regime)	**Non-perennial:** does not contain surface water continuously throughout the year, although pools may persist.
Level 6 (Descriptors)	**Natural:** may be impacted, or even realigned, but of natural origins.

Table 9: Level 3, 4, 5 and 6 of the wetland and aquatic ecosystem classification for the 'landfill' watercourse.

Level 3 (Landscape Setting)	**Valley Floor:** the base of a valley, situated between two distinct valley side-slopes, where alluvial or fluvial processes typically dominate.
Level 4 (Hydrogeomorphic unit)	**Drainage line:** a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water.
Level 5 (Hydrological regime)	**Non-perennial:** does not contain surface water continuously throughout the year, although pools may persist.
Level 6 (Descriptors)	**Natural:** may be impacted, or even realigned, but of natural origins.

Table 10: Level 3, 4, 5 and 6 of the wetland and aquatic ecosystem classification for the Sand River.

Level 3 (Landscape Setting)	**Valley Floor:** the base of a valley, situated between two distinct valley side-slopes, where alluvial or fluvial processes typically dominate.
Level 4 (Hydrogeomorphic unit)	***Not possible to determine due to extensive soil disturbance but based on the available online databases is considered to be a drainage line.***
Level 5 (Hydrological regime)	**Non-perennial:** does not contain surface water continuously throughout the year, although pools may persist.
Level 6 (Descriptors)	**Natural:** may be impacted, or even realigned, but of natural origins.

1.15 Ecological Assessment of the Unchannelled Valley Bottom associated with the 'clean' watercourse

1.15.1 Ecosystem Services

The WET-Ecoservices tool was applied to the unchannelled valley bottom wetland which would be crossed by the proposed water supply pipeline as shown in Figure 20 and comprised the assessment of 15 Ecosystem Services (see Figure 23). The rating of the ecosystem services provided by the wetland was calculated to be 1,4 which means that it was found to be in the **Intermediate** category (see Tables 11 & 12).

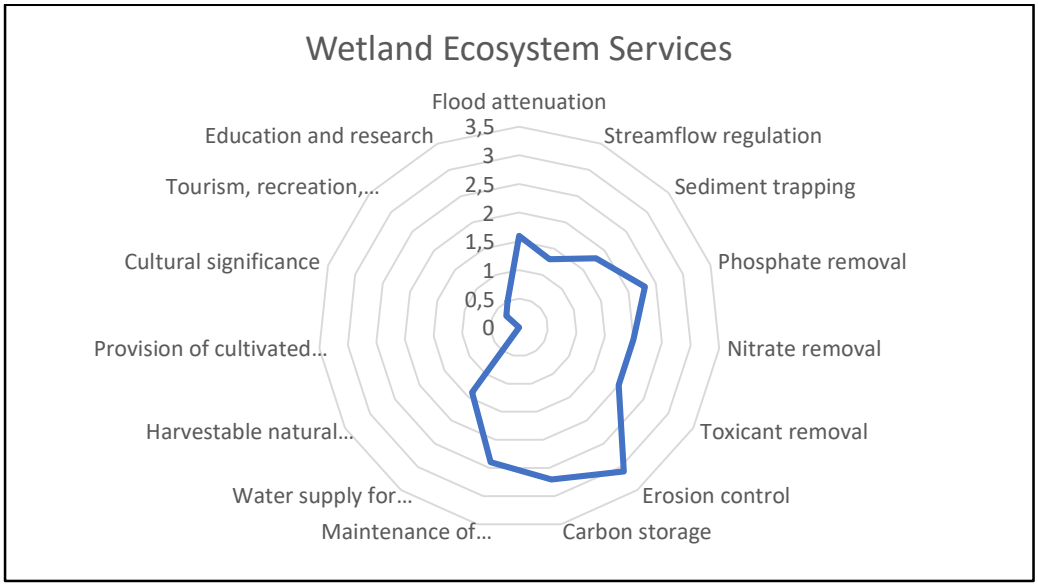

Figure 23: WET-EcoServices results for the on-site unchannelled valley bottom wetland.

Table 11: WET-EcoServices results.

Wetland Ecosystem Services		
		Current
Indirect Benefits	Flood attenuation	1,6
	Streamflow regulation	1,3
	Sediment trapping	1,8
	Phosphate removal	2,3
	Nitrate removal	2
	Toxicant removal	2
	Erosion control	3,1
	Carbon storage	2,7
Direct Benefits	Maintenance of biodiversity	2,4
	Water supply for direct human use	1,4
	Harvestable natural resources	0
	Provision of cultivated foods	0
	Cultural significance	0
	Tourism, recreation, scenic value	0,3
	Education and research	0,5
	Total	21,4
	Average	1,4

Table 12: WET-EcoServices categories.

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**

The most noteworthy findings are as follows:

- Of the 15 Ecosystem Services assessed, the wetland was found to be most effective in providing indirect services of erosion control which was the only service to obtain a score in the High range. Several factors contribute to this including the extent of vegetation cover and associated roughness of the HGM unit, the moderate slope of the catchment and the moderate to high run-off intensity and erodibility of the soil. These factors coupled with the lack of on-site evidence of erosion and lack of disturbance of the soil within the HGM unit suggest that the wetland is currently performing this role effectively.
- The wetland also achieved a significant score, albeit not in the high range for carbon storage and maintenance of biodiversity. Regarding the former, this score can be attributed to the fact that most of wetland comprises permanent and temporary zones and the lack of evidence of physical disturbance of the wetland's soils which would have led to desiccation and associated loss of carbon. Regarding the latter, this can be attributed mostly to the threat status (Endangered) of the applicable terrestrial vegetation type (West Coast Shale Renosterveld), as well as the extent of indigenous vegetation.

- The direct services of phosphate removal also scored in the Moderate-high range. This is primarily attributed to the full hydrological zonation with the greater extent of the wetland comprising permanently and seasonally saturated zones and the vegetated character of the wetland (comprising a variety of indigenous and exotic species which increases the wetlands' ability to provide these services, coupled with the catchment land use in the catchment (primarily vineyard cultivation) which contribute to above-normal sources of phosphates. Nitrate and toxicant, while not scoring in the Moderate-high range also showed notable potential with regards to performing these ecological services.
- In terms of the other indirect services of flood attenuation, streamflow regulation and sediment trapping, the relatively small size of the wetland relative to its catchment, the slight slope of the HGM unit and the extent of the permanent and temporary zones, all of which contribute to a relatively low retention period within the wetland, and the lack of any important wetlands downstream, limit the capacity of the wetland to provide these services.
- The only notable direct ecosystem service performed by the wetland is that of maintenance of biodiversity which was found to be Moderate-high.
- The wetland serves virtually no direct socio-economic and cultural benefits, but water is harvested for irrigation further upstream and downstream of the wetland.

1.15.2 Present Ecological State

Table 13 presents the impact scores for hydrology, geomorphology and vegetation condition and the trajectory of change for the unchannelled valley bottom wetland.

Table 13: WET-health assessment results for the unchannelled valley bottom wetland.

	Ha	Extent (%)	Hydrology		Geomorphology		Vegetation	
			Impact Score	Change Score	Impact Score	Change Score	Impact Score	Change Score
UVBW	0,03	100	**7,5**	**-1,0**	**4,2**	**-1,0**	**3,8**	**-1,0**
PES Category			**E**	↓	**D**	↓	**C**	↓

The overall PES for the off-site channelled valley bottom wetland was calculated to be 5,5 which falls within a **Category D ("Largely modified")**. This means that a large change in ecosystem processes and loss of natural habitat and biota has occurred. The key aspects to note from the PES assessment are as follows:

- The slight decrease in water input levels is attributed to the vineyards which makes up the majority of the catchment and the unconfirmed possibility that some of the water in the impoundment near the watercourses source is abstracted for irrigation. There is no source that would increase water inputs in the catchment. Flood peaks are expected to have increased as a result of the transformation of most of the catchment into vineyards.
- In terms of water distribution and retention patterns within the wetland, the wetland has been seriously modified as a result of the downstream and upstream effects of two impoundments (one near the watercourse's source approximately 200m upstream from the wetland and the other at the downstream end) and the inundation of the wetland by the downstream impoundment. The infilling of soil and rubble to create the vehicular crossing at the proposed crossing point of the wetland also contributes to this impacted state.
- The geomorphic state of the wetland has been moderately altered as a result of all of the above-mentioned factors including the upstream impoundment, the vehicular crossing and the catchment land use (predominantly vineyard cultivation).
- In terms of vegetation, approximately 20% of the wetland has been invaded by alien macrophytes including *P. canescens* and other exotic macrophytes as well as *Rubus* sp. (bramble) and the invasive *P. clandestinum* (kikuyu grass). The presence of *T. capensis* (regarded as indigenous) is indicative of elevated levels of nutrients, presumably fertilizers and pesticides applied in the catchment and therefore the extent rating for untransformed areas was excluded as the vegetation,

while being predominantly indigenous is not characteristic of the wetland in its reference condition (i.e. *T. capensis* would not have occurred in the wetland).
- Hydrology, geomorphology and vegetation are predicted to continue on a downward trajectory (i.e. an increasingly impacted condition in the future) as the catchment continues to become transformed and the indigenous vegetation occurring within the wetland continues to become out-competed by the alien invasive species.

1.15.3 Ecological Importance and Sensitivity

The EIS method applied to unchannelled valley bottom wetland is based on the assessment tool developed by Rountree *et. al.* (2013). Overall, the wetland was found to be of **low/marginal** EIS. The key aspects considered during the EIS assessment of the on-site wetland are presented in Table 14 and are as summarised as follows:

- The wetland is assessed as being of low/marginal importance for biodiversity support for the following reasons:
    - The wetland is not known nor is it likely to support any endangered or rare biota or populations of unique species, despite falling within the historical distribution of an Endangered (E) terrestrial vegetation type (West Coast Shale Renosterveld).
    - It is not known nor is it likely to be an important site for species migration, breeding and/or feeding and no such species were observed utilising the site in these ways during the site inspection.
    - The wetland is not recognised in the WCBSP (2017) as being of any importance from an aquatic biodiversity conservation perspective.
    - At the landscape scale the wetland has no protection status, has a PES of D (Largely modified), is not considered to be a wetland of any significant size or rarity and there are no known important wetlands further downstream.
- In terms of sensitivity the wetland is regarded as being moderately sensitive to changes in floods and changes in low-flow, owing primarily to its classification as a channelled valley bottom wetland, and is also sensitive to changes in water quality due to the low nutrient levels in the general area's freshwater systems (in their unimpacted, reference condition).

Table 14: EIS Results for the unchannelled valley bottom wetland.

ECOLOGICAL IMPORTANCE AND SENSITIVITY	Score (0-4)	Confidence (1-5)	Motivation
Biodiversity support			
Presence of Red Data species: Endangered or rare Red Data species present	1	3	Unlikely despite Endangered Vegetation Types (terrestrial).
Populations of unique species: Uncommonly large populations of wetland species	1	3	Limited possibility of unique species / large populations occurring.
Migration/breeding/feeding sites: Importance of the unit for migration, breeding site and/or feeding	1	4	Small wetland, transformed catchment therefore unlikely to be important site but does provide ecological connectivity.
Landscape scale			
Protection status of the wetland: National (4), Provincial, private (3), municipal (1 or 2), public area (0-1)	0	5	Not protected and not identified as being of any aquatic biodiversity importance.
Protection status of the vegetation type: SANBI guidance on the protection status of the surrounding vegetation	3	5	Poorly protected.
Regional context of the ecological integrity: Assessment of the PES (habitat integrity), especially in light of regional utilisation	1	5	PES D (largely modified) and no regional utilisation.
Size and rarity of the wetland type/s present: Identification and rarity assessment of the wetland types	2	4	Small wetland and moderate rarity due to poor protection status.
Diversity of habitat types: Assessment of the variety of wetland types present within a site	2	4	Only unchannelled valley bottom wetland with impoundments.
Sensitivity of the wetland			
Sensitivity to changes in floods: Floodplains at 4; valley bottoms 2 or3; pans and seeps 0 or 1	3	4	Valley bottom without a channel
Sensitivity to changes in low flows/dry season: (Unchannelled VBW's probably most sensitive)	3	4	Valley bottom without a channel
Sensitivity to changes in water quality: Esp. natural low nutrient waters – lower nutrients likely to be more sensitive	2	4	Changes in water quality has caused dominance by *T. capensis*.
ECOLOGICAL IMPORTANCE AND SENSITIVITY	Median value	**1**	

The EIS assessment determined that the EIS of the channelled valley bottom wetland was **Low/marginal**. This rating for the wetland means that the wetland is not ecologically important and sensitive at any scale. The biodiversity of these systems is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major drainage lines (see Table 15).

Table 15: EIS Category definitions.

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 drainage lines	>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 drainage lines.	>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 drainage lines.	>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 modifications. They play an insignificant role in moderating the quantity and quality of water of major drainage lines.	>0 and <=1

1.15.4 Recommended Ecological Category

The EIS category of the wetland was determined to be **Low/marginal**. This EIS category means that the wetland is not ecologically important at any scale. The current PES of the wetland is a **Category D** (see Section 3.4.2) and given the low/marginal EIS the REC for the wetland remains a Category D. Therefore, it is not considered acceptable for any future development to cause any further deterioration in the PES.

1.16 Ecological Assessment of the 'landfill' non-perennial drainage line

Table 16 presents the Impact Scores for a number of riparian zone health criteria for the 'landfill' non-perennial drainage line from its source up to the downstream impoundment which is indicated in the NGI Rivers database to comprise the full length of the drainage line. Due to the ephemeral nature of the flow (zero flow was observed during the site investigation on 27 February 2024) the watercourse does not contain any instream habitat. As such it was considered appropriate to only assess the riparian component in order to determine the ecological health of the drainage line.

Table 16: Results of the Intermediate Habitat Integrity Assessment for the 'landfill' non-perennial drainage line.

	Impact Score, Post-development	Weight	IHI Score, Post-development
Instream criteria			
N/A			
Riparian zone criteria			
Indigenous vegetation removal	15	13	7,8
Exotic vegetation encroachment	13	12	6,24
Bank erosion	10	14	5,6
Channel modification	16	12	7,68
Water abstraction	6	13	3,12
Inundation	8	11	3,52
Flow modification	10	12	4,8
Water quality	10	13	5,2
Provisional Riparian Zone Habitat Integrity Score			56,04
Overall Habitat Integrity			**56.04**
PES Score			**"D"**

The 'landfill' non-perennial drainage line has been determined to have a PES of Category D ("Largely Modified") which means that a large loss of natural habitat, biota and basic ecosystem functions has

occurred. Channel modification and vegetation removal as a result of efforts to rehabilitate the portion of the drainage line used as a landfill are the most significant determinants of habitat modification. Also having a significant impact on the riparian habitat is the encroachment of exotic vegetation, bank erosion which has been exacerbated as a result of the removal of riparian vegetation, flow modification as a result of utilisation of water from the impoundment at the drainage line's source a short distance upstream and water quality impairment as a result of the waste body, all of which has not been removed.

1.16.1 Ecological Importance and Sensitivity

Table 17 presents the results of the EIS Assessment of the 'landfill' non-perennial drainage line.

Table 17: Results of Ecological Importance and Sensitivity (EIS) Assessment for the 'landfill' non-perennial drainage line.

ECOLOGICAL IMPORTANCE AND SENSITIVITY	Score (0-4)	Confidence (1-5)
Primary Determinants		
Presence of rare and endangered species	0	2
Populations of unique species	0	2
Species/taxon Richness	1	4
Diversity of habitat types and features	1	4
Migration/breeding/feeding site for drainage line species: Importance in terms of the link it provides for biological functioning	1	4
Sensitivity to changes in the natural hydrological regime*: Determined by the size of the feature, available habitat types and frequency of flood events.	1	4
Sensitivity to water quality changes*: Determined by the size of the feature, available habitat types and frequency of flood events	2	4
Energy dissipation and particulate/element removal: Roughness coefficient/Storage capacity and size.	2	4
Modifying Determinants		
Protected status: Ramsar Site, National Park, Wilderness area and Nature Reserve.	0	4
Ecological integrity: Degree of change of the flood regime, water quality and habitat from reference conditions.	1	4
TOTAL	9	
MEDIAN	**1**	
OVERALL EIS	**Marginal/low**	

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

The overall EIS for the 'landfill' non-perennial drainage line and its riparian zone was determined to be **Marginal/low**. This is due to all the primary and modifying determinants being scored low, with the only exception being the primary determinants of sensitivity to water quality changes and energy dissipation and particulate/element removal which scored moderate. The former can be attributed to the relatively low nutrient levels in the region's watercourses in their reference condition and the latter which can be attributed to the roughness coefficient and remaining riparian vegetation.

1.16.2 Recommended Ecological Category

The PES has been determined to be a "D" ecological category and therefore the EIS components need to be evaluated to determine if any of the aspects of importance and sensitivity are high or very high. Given that the EIS category was determined to be **Marginal/low,** which means that the 'landfill' drainage line is not ecologically important and sensitive at any scale, and none of the EIS components scored above moderate, it is not considered necessary to increase the PES. It is also not possible to increase the PES of the watercourse above a Category D without effective rehabilitation of the landfill. The Recommended Ecological Category for the remaining non-perennial drainage lines is therefore a Category D.

1.17 Ecological Assessment of the Sand River

Table 18 presents the Impact Scores for a both instream and riparian zone health criteria for the portion of the Sand River that lies within the road reserve of the R310 and is the location of the proposed sewerage pipeline crossing.

Table 18: Results of the Intermediate Habitat Integrity Assessment for the Sand River.

	Impact Score, Post-development	Weight	IHI Score, Post-development
Instream criteria			
Water abstraction	0	14	0
Flow modification	10	13	5,2
Bed modification	25	13	13
Channel modification	25	13	13
Water quality	8	14	4,48
Inundation	0	10	0
Exotic macrophytes	5	9	1,8
Exotic fauna	0	8	0
Solid waste disposal	5	6	1,2
Provisional Instream Habitat Integrity Score			61,32
Riparian zone criteria			
Indigenous vegetation removal	25	13	13
Exotic vegetation encroachment	10	12	4,8
Bank erosion	15	14	8,4
Channel modification	25	12	12
Water abstraction	0	13	0
Inundation	0	11	0
Flow modification	8	12	3,84
Water quality	8	13	4,16
Provisional Riparian Zone Habitat Integrity Score			53,8
Overall Habitat Integrity			**57,56**
PES Score			**"D"**

The applicable portion of the Sand River has been determined to have a PES of Category D ("Highly Modified") which means that a large loss of natural habitat, biota and basic ecosystem functions has occurred. The river bed and channel has been totally modified as a result of the straightening and channelisation of the river from the culvert beneath the R310 up until the railway bridge and both accordingly received the highest possible score for the degree of modification. These complete modifications are by far the most significant causes of habitat degradation of both the instream and riparian components. Secondarily, bank erosion is also having a significant impact on the riparian component which is currently exacerbated by the lack of riparian vegetation removed as a result of recent earthmoving activities which resulted in the channelisation of the river. The remaining criteria received relatively low scores either because of lack of evidence during the site visit which focussed only on the portion of the Sand River located within the southern road reserve of the R310. There is evidence of upstream impoundments and water quality impairment is likely given catchment land uses and the recent construction activities which would have exacerbated sedimentation and possibly resulted in the discharge of cementitious materials. While exotic vegetation encroachment in the riparian zone was partial it is likely that in time this would increase greatly as the opportunity for alien invasive encroachment is high given the recent complete removal of vegetation riparian and instream vegetation as a result of the recent earthworks so this score would increase dramatically over the coming months as the seed banks germinate.

1.17.1 Ecological Importance and Sensitivity

Table 19 presents the results of the EIS Assessment of the Sand River.

Table 19: Results of Ecological Importance and Sensitivity (EIS) Assessment for the Sand River.

ECOLOGICAL IMPORTANCE AND SENSITIVITY	Score (0-4)	Confidence (1-5)
Primary Determinants		
Presence of rare and endangered species:	0	3
Populations of unique species:	0	3
Species/taxon Richness	1	4
Diversity of habitat types and features	0	4
Migration/breeding/feeding site for riverine species: Importance in terms of the link it provides for biological functioning	1	4
Sensitivity to changes in the natural hydrological regime*: Determined by the size of the feature, available habitat types and frequency of flood events.	2	4
Sensitivity to water quality changes*: Determined by the size of the feature, available habitat types and frequency of flood events	2	4
Energy dissipation and particulate/element removal: Roughness coefficient/Storage capacity and size.	0	4
Modifying Determinants		
Protected status: Ramsar Site, National Park, Wilderness area and Nature Reserve.	2	4
Ecological integrity: Degree of change of the flood regime, water quality and habitat from reference conditions.	1	4
TOTAL	8	
MEDIAN	1	
OVERALL EIS	**Marginal/low**	

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

The overall EIS for the Sand River and its associated riparian zones was determined to be **Marginal/low**. While several determinants scored 0, the drainage line discharges into the Jonkershoek River a short distance downstream of the proposed crossing site, parts of which have been identified as aquatic CBAs. As such despite the drainage line currently presenting no aquatic or riparian habitat it still has importance from a biodiversity conservation perspective.

1.17.2 Recommended Ecological Category

The PES has been determined to be a "D" ecological category and therefore the EIS components need to be evaluated to determine if any of the aspects of importance and sensitivity are high or very high. For the Sand River none of the aspects of importance and sensitivity are high or very high. Also, given that the EIS category was determined to be **Marginal/low,** which means that the drainage line is not ecologically important and sensitive at any scale, it is therefore not considered necessary to increase the PES. The REC for the portion of the Sand River is therefore a Category "D". It must be recognised however that the instream and riparian communities will become established over the next year or so and accordingly the PES would probably improve to a Category "C".

Assessment of Impacts

1.18 Activity Description & Impact Identification

1.18.1 Description of the Proposed Development

The proposed long-term phased development on Portion 28 of Farm 468 Stellenbosch entails rezoning of the property to a subdivisional area that provides for mixed uses, including, but not limited to:

- multi-unit housing zone for medium and high-density residential units, inclusive of a retirement

village, blocks of flats, group housing, townhouses, inclusionary housing, private roads, and renewable energy structures;
- private open space zone for conservation of the natural features, access and circulation, and open spaces;
- transport facilities zone for transport purposes (goods and passengers);
- public roads and parking zone for public roads and streets;
- local business zone for the establishment of a small retail outlet, restaurant, medical consulting rooms, and offices to support an integrated self-sustaining community;
- community zone for the establishment of a place of assembly, place of worship, day care facilities, place of education, indoor and other sporting, and related facilities amongst others to complement the existing facilities and functions of the Sustainability Institute and Lynedoch Village; and
- utility services zone for the accommodation of private infrastructure and utility services as required for the proposed development.

Services Infrastructure:
- Potable and fire water: It is proposed that bulk services are constructed in order to supply the development with both domestic and fire water. The Skilpadvlei (also referred to as the Polkadraai Reservoir) and Faure reservoirs have sufficient spare capacity to accommodate the development. A 160mm connection will be made from the Skilpadvlei Reservoir and a 200mm connection from the Faure Reservoir. It is the new proposed 160mm pipeline connection from the Skilpadvlei Reservoir to the site that crosses two of the three affected drainage lines under assessment in this detailed ecological assessment.
- Sewerage: The GLS capacity report confirmed that there is sufficient capacity available at the Blaauwklippen pump station, however a new sewerage pipeline of 160mm diameter is required in order to convey sewerage to the Blaauwklippen pump station. It is this new sewerage pipeline that would cross the Sand River within the Road Reserve of the R310 near Vlottenberg which is being assessed in this detailed freshwater ecological assessment. The internal network will consist of 160mm Class 34 uPVC pipes connected to a new 12 l/s pump station with a 200mm Class 34 uPVC collector pipe.

The proposed layout of the development is shown in Figure 24.

1.18.2 Alternatives under Assessment

No alternatives are being assessed other than the ‘No-Go’ alternative (see Section 4.3).

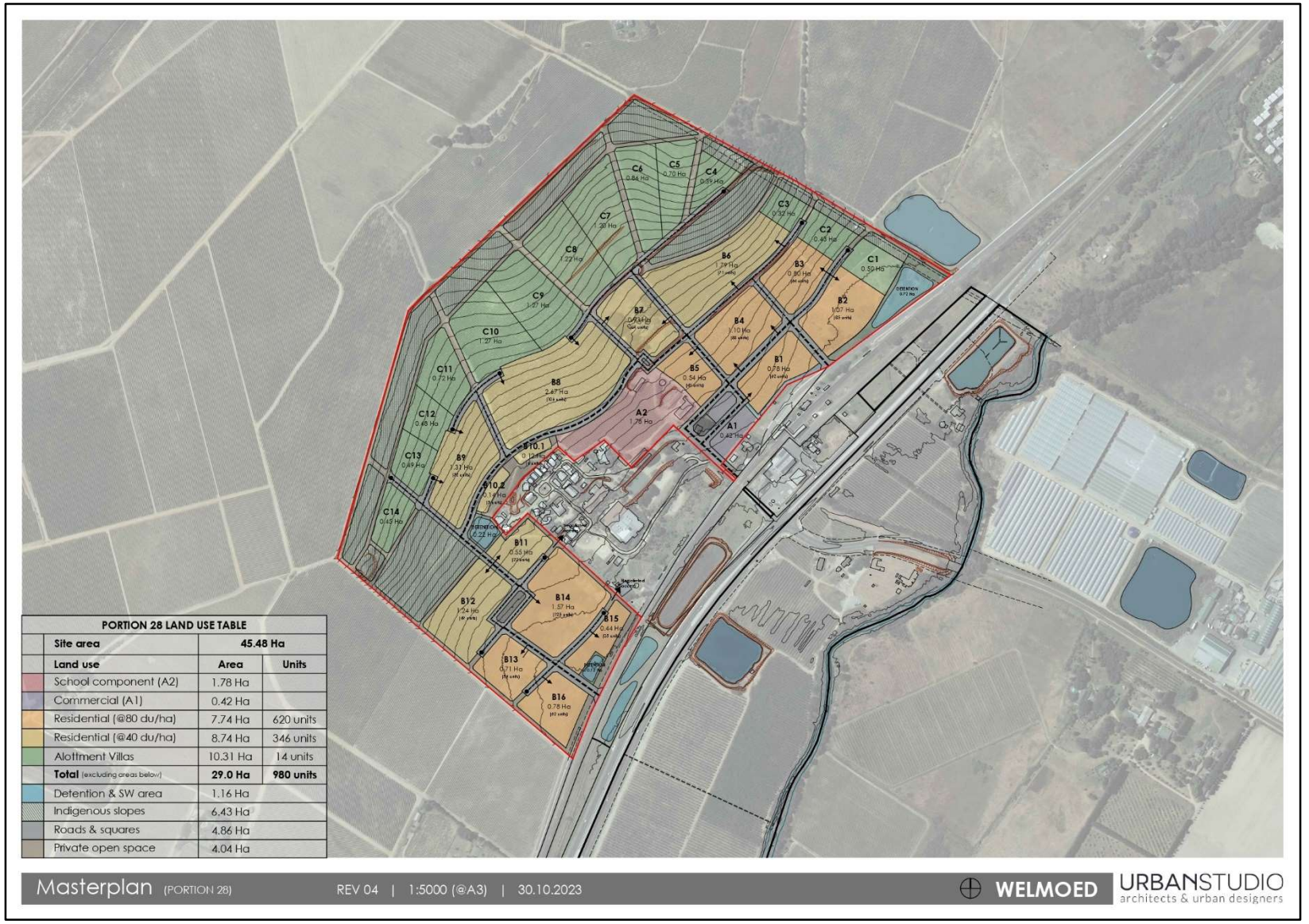

Figure 24: Proposed layout of the proposed residential development.

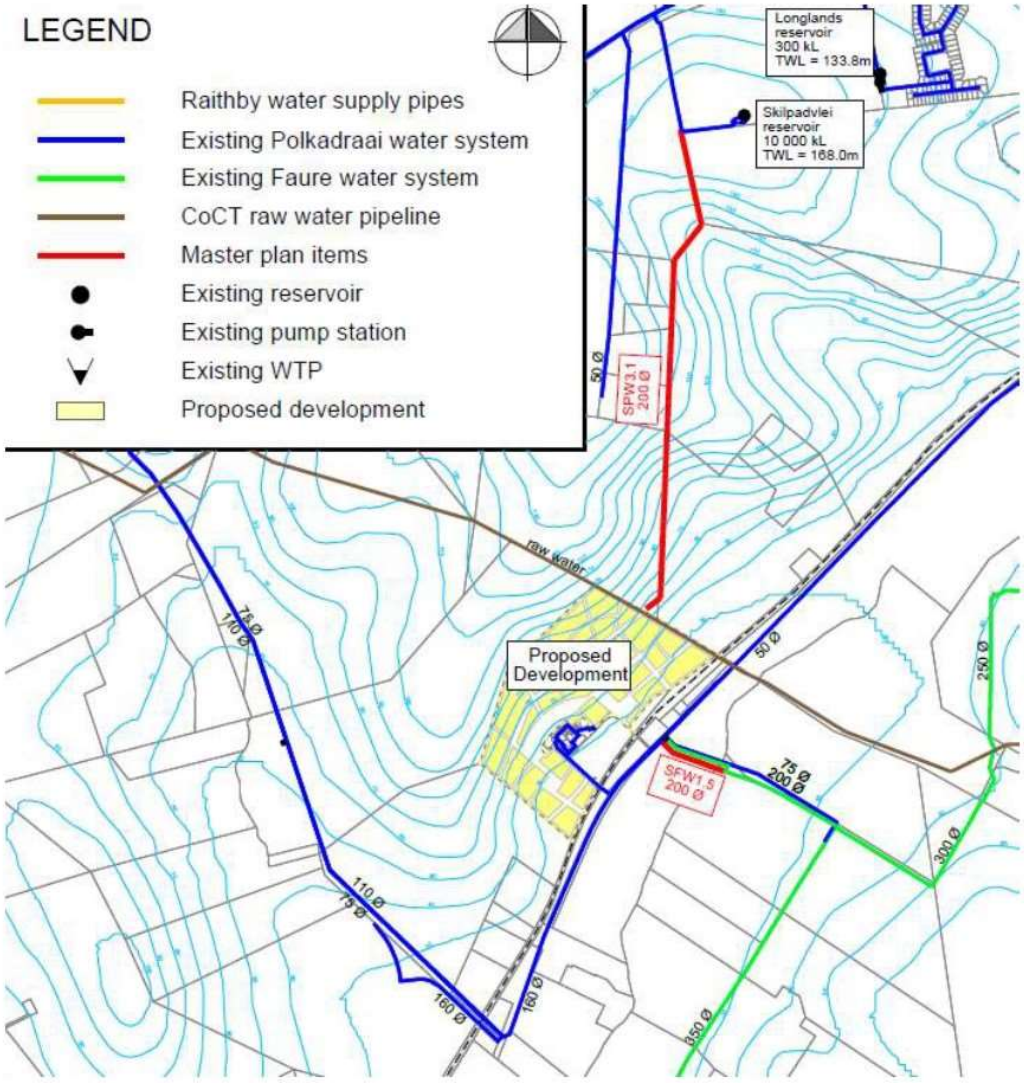

Figure 2: Existing water reticulation services

Figure 25: Existing and proposed potable water supply (Courtesy of UDS Africa, 2023). The red line indicates the proposed new water supply pipeline.

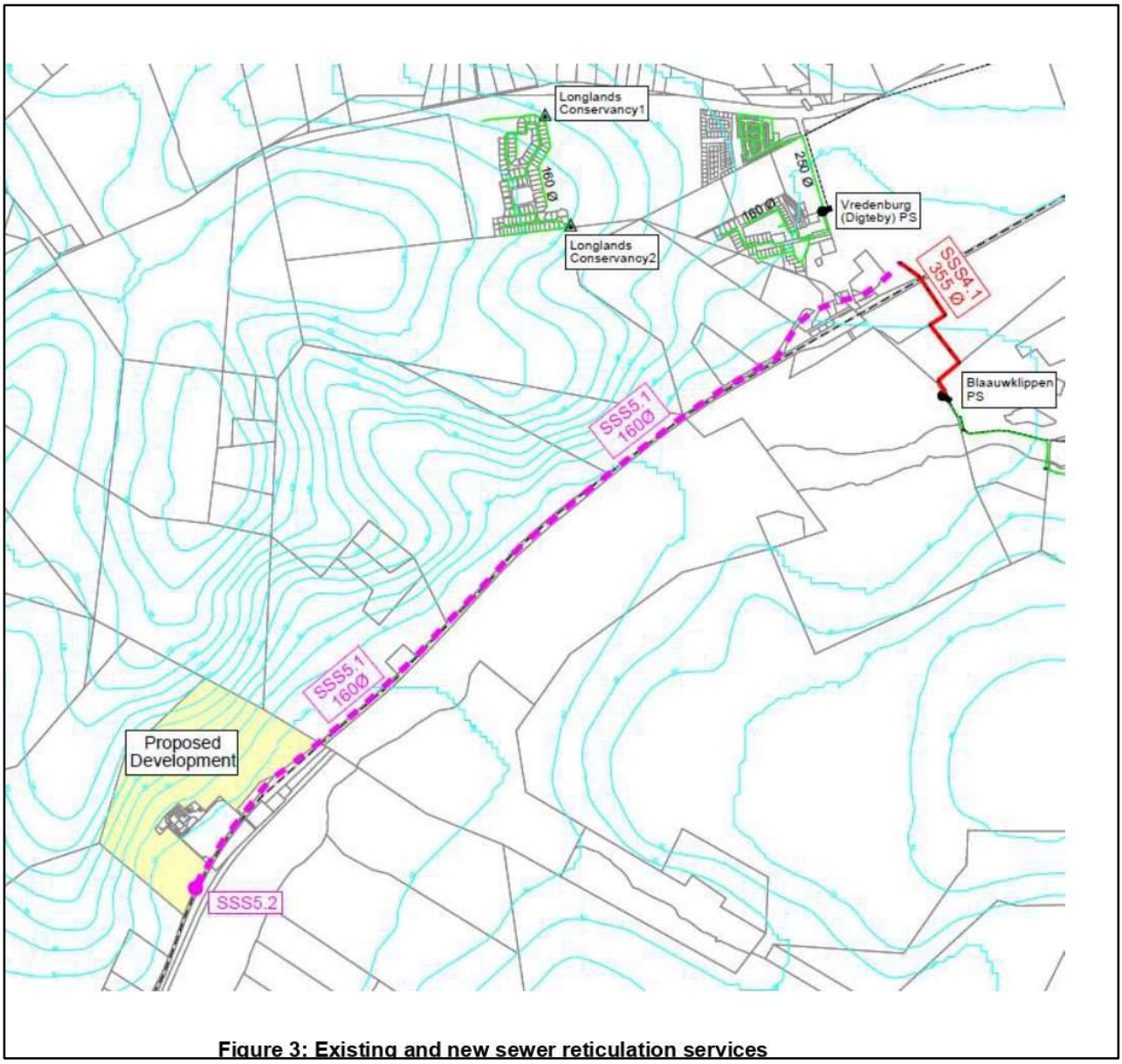

Figure 3: Existing and new sewer reticulation services

Figure 26: Existing and proposed sewerage reticulation (Courtesy of UDS Africa, 2023). The purple line indicates the alignment of the proposed sewerage pipeline.

1.18.3 Identification of potential freshwater ecological impacts associated with the proposed development

Based on the project description provided in Sections 4.1.1 and 4.1.2, the following potentially significant, direct freshwater ecological impacts have been identified per phase of the proposed installation of external services *viz-a-viz* the water supply and sewerage pipelines:

Planning, design and development/construction phase

- **Alteration of flow regime**: Reduced catchment roughness resulting from the clearing of vegetation causes an increase in run-off and an increase in flood peaks in receiving watercourses. In this case vegetation clearing would only cause an alteration of the flow regime in the unchannelled valley bottom wetland associated with the 'clean' watercourse as the other two crossing points are currently devoid of vegetation (i.e. no vegetation clearance will take place);
- **Increased erosion and sedimentation**: The exposure of soils to erosion associated with site

clearing, excavations and/or infilling would increase the erosive potential and, if coupled with rainfall, would result in sediment being deposited into the receiving watercourses. Trench excavations across flowing stream channels would cause unavoidable sedimentation as the flow would cause a sediment plume, the extent of which would be dependent on the extent of flow (greater the flow the greater the plume) and also the duration of excavations as following backfilling and compaction, the plume would eventually abate.;

- **Water quality impairment:** The possible release of contaminants such as cement and other building materials / chemicals into the receiving watercourses. In addition, potential accidental spills of chemicals and fuel may also result in contamination of the receiving watercourses; and
- **Biota loss:** The indiscriminate driving of vehicles and construction machinery through and near watercourses as well as the inappropriate placement of materials can lead to biota loss. Similarly, should raw chemicals enter the receiving watercourses then biota that are sensitive to water quality impacts may either move away or in extreme circumstances may suffer mortalities.

Operational phase

The operational phase is effectively limited to the operation of a potable water supply pipeline and a sewerage pipeline (with a pumpstation) and is likely to generate the following impacts on the receiving watercourses:

- **Alteration of natural flow regime**: Any persistent leaks from any of the pipelines would increase water inputs into the wetland. This could have significant secondary impacts associated with the transformation of non-perennial systems to perennial systems with associated changes in biota assemblages; and
- **Water quality impairment:** Any leaks from the sewerage pipeline near the proposed crossing point on the Sand River would result in water quality impacts as a result of raw sewage discharges into the Sand River. This could have significant secondary impacts associated with eutrophication including changes in biota assemblages with species adapted to higher nutrient loads proliferating near the point of discharge.

1.19 Potential Direct Impacts associated with the proposed installation of external services

1.19.1 Operational Phase

Impact 1 — Alteration of Flow Regime

Vegetation cover performs flood attenuation functions by slowing down run-off and promoting infiltration. This has the effect of reducing flood peaks and flows into and within the receiving watercourses. The installation of the external services would only involve the clearing of vegetation at the ‘clean’ watercourse crossing point and also within a relatively narrow construction corridor of a few metres. While this is still likely to result in an increase in runoff from the cleared areas and associated increase in storm peak flow velocities due to the reduced surface roughness, the intensity of this impact is LOW due to the narrow construction corridor and the relatively low catchment roughness of the wider catchment of the ‘clean’ which is dominated by vineyards. Ordinarily flow regime impacts extend beyond the site (i.e. would be rated to have a REGIONAL extent) but in this case it is the specialist’s opinion that due to the LOW intensity the potential impact would not extend off-site.

The impact significance for the alteration of the natural flow regime, primarily as a result of the LOW intensity rating and LOCAL extent (due to it potentially impacting an off-site wetland) is rated as LOW (-ve) unmitigated. The alteration of flow caused by site clearing can be largely avoided if site clearing is undertaken during the summer, low rainfall season. Alternatively partial mitigation is possible through ECO intervention and timeous revegetation of cleared areas in close proximity to the affected watercourses (in this case only the ‘clean’ watercourse.

Table 20: Impact significance rating for the alteration of the natural flow regime (development phase).

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent of impact:	LOCAL	LOCAL
Duration of impact	MEDIUM TERM	SHORT TERM
Consequence of impact or risk:	NEGATIVE	NEGATIVE
Intensity	LOW	LOW
Probability of occurrence:	PROBABLE	IMPROBABLE
Indirect impacts:	N/A	N/A
Cumulative impacts	HIGH	HIGH
Significance rating of impact	LOW (-ve)	VERY LOW (-ve)
Degree to which the impact may cause irreplaceable loss of resources:	LOW	
Degree to which the impact can be reversed:	IRREVERSIBLE	
Degree to which the impact can be avoided:	HIGH	
Degree to which the impact can be managed:	HIGH	
Degree to which the impact can be mitigated:	HIGH	
Residual impacts:	VERY LOW (-ve)	

Essential mitigation measures:

- Avoid the impact as far as is practically possible by undertaking the watercourse crossings (vegetation clearing and trench excavations) during the dry summer season, where possible;
- If installation of the external services cannot be undertaken prior to the onset of the winter rainy season then the Environmental Control Officer (ECO) must advise on measures to ensure that run-off from cleared areas is contained and encouraged to infiltrate rather than discharge directly into the downstream watercourses;
- Timeously revegetate areas cleared by construction activities near the watercourse crossing points with suitable indigenous plants.

Impact 2 – Increased erosion and sedimentation

The exposure of soils resulting from site clearing and/or excavations and/or infilling within and immediately upslope of watercourses would increase the rates of erosion and sedimentation (the deposition of sediment into the watercourses). During vegetation clearing and/or excavations, soils would be destabilised thereby becoming more prone to erosion. This would not apply to the 'landfill' watercourse in the summer, dry season as there is no run-off or flow in the watercourse at this time as was evident during the site visit. Also, both the bed and banks of the 'landfill' watercourse and the Sand River at their respective crossing are currently devoid of vegetation and therefore already exposed to erosion so the added impact of site clearing in preparation for the trench excavations across the channels are negligible at these two sites

Erosion and sedimentation are expected to be HIGHLY PROBABLE during the rainy season when the trench excavations across the channels would cause sediment plumes which would be carried downstream and when any soils immediately upslope of the watercourses are exposed and eroded by rainfall with the result that sediment would deposited into the downstream receiving watercourses. Ameliorating the significance of the potential impact is the fact that the topography at the crossing point of the 'clean' watercourse and surrounds is slight to moderately sloping (between 3 – 10%) and the Sand River is slightly sloping which moderates run-off velocity and therefore moderated the erosive potential. Conversely, the moderate to high run-off intensity and erodibility of the areas soils exacerbates the significance of the potential impact. Given that sediment would be carried downstream and off-site should the site preparation and excavations take place in the winter rainfall period, the impact unmitigated is rated to have a REGIONAL extent rating with the intensity rated to be MEDIUM given the current levels of spoil disturbance at two of the crossing points, namely the 'landfill' watercourse and the Sand River crossing points. Overall, the impact significance of erosion and sedimentation was rated to be MEDIUM (-ve) without mitigation and LOW (-ve) if the proposed

mitigation measures, which include stormwater, erosion and sediment control measures, are implemented.

Table 21: Impact significance rating for erosion and sedimentation (development phase).

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent of impact:	REGIONAL	LOCAL
Duration of impact	MEDIUM TERM	SHORT TERM
Consequence of impact or risk:	NEGATIVE	NEGATIVE
Intensity	MEDIUM	MEDIUM
Probability of occurrence:	HIGHLY PROBABLE	PROBABLE
Indirect impacts:	N/A	N/A
Cumulative impacts	HIGH	HIGH
Significance rating of impact	MEDIUM (-ve)	LOW (-ve)
Degree to which the impact may cause irreplaceable loss of resources:	LOW	
Degree to which the impact can be reversed:	REVERSIBLE (sediment can be removed from the system and eroded areas stabilised)	
Degree to which the impact can be avoided:	LOW (trench excavations across flowing watercourses unavoidably causes sediment plumes)	
Degree to which the impact can be managed:	MEDIUM	
Degree to which the impact can be mitigated:	MEDIUM	
Residual impacts:	LOW (-ve)	

Essential mitigation measures:

- Avoid the impact as far as is practically possible by undertaking the watercourse crossings (vegetation clearing and trench excavations) during the dry summer season, where possible;
- If the installation of the external services cannot be undertaken prior to the onset of the winter rainy season then the ECO must advise on measures to ensure that sediment plumes from the trench excavation are contained and run-off from cleared areas upslope of the watercourses is contained and encouraged to infiltrate rather than discharge directly into the receiving watercourses;
- Formulate and implement a Development/Construction phase EMP which includes the following specifications:
    - No stockpiles may be located within 30m of the crossing point;
    - The ECO shall designate the site for stockpiling (note this should preferably take place at the Construction Camp but an alternative site can be identified closer to the crossing site, but no closer than 30m, in consultation with the ECO);
    - Protect soil stockpiles, if required, from erosion using a tarp or erosion blankets;
    - Implement erosion control measures in order to prevent erosion and sedimentation of the receiving watercourses as required by the ECO. For example. strategically place straw bales or sediment fences/traps, to divert stormwater away from areas susceptible to erosion etc.);
    - Any sediment contaminated runoff should be contained and allowed to settle before being discharged. The settled-out sediment collected in this manner should be cleared manually as needed and removed from site;
    - The ECO shall check erosion control measures weekly to ensure these are still intact (and cleared of sediment in accordance with the recommendations above) as needed;
    - The ECO shall check the site for erosion damage and sedimentation after every heavy rainfall event. Should erosion or sedimentation be noted, immediate corrective measures must be undertaken; and
    - Ensure that any area within 50m of the crossing point that is damaged as a result of construction activities is suitably and timeously rehabilitated to the satisfaction of the ECO.
- Any areas that need to be cleared in close proximity to the crossing points because they contain listed alien invasive species or are cleared for any other purpose must be revegetated timeously with appropriate indigenous vegetation.

Impact 3 – Water quality impairment

There is a high probability that unmanaged the receiving watercourses would become contaminated as a result of the use of construction materials including cement, paints and solvents which would enter the downstream watercourses via run-off from the construction areas. In addition, the operation of vehicles and machinery might present unchecked and accidental leaks and spillages which in turn would also lead to contamination. Discharge of any wash-water into the surrounding environment would also contaminate run-off which in turn would enter and contaminate the receiving watercourses.

The impact is rated to have a REGIONAL extent due the strong possibility that any contaminants would be transported off-site. This probability is reduced somewhat due to the presence of impoundments in the receiving watercourses which would trap contaminants to some degree. This extent rating (REGIONAL) results in the impact significance rating of MEDIUM (-ve) without mitigation. With management and mitigation that would have the effect of containing the extent of the impact to within the proposed site, the impact significance would be reduced to VERY LOW (-ve).

Table 22: Impact significance rating for water quality impairment (development phase).

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent of impact:	REGIONAL	LOCAL
Duration of impact	MEDIUM TERM	SHORT TERM
Consequence of impact or risk:	NEGATIVE	NEGATIVE
Intensity	MEDIUM	LOW
Probability of occurrence:	HIGHLY PROBABLE	PROBABLE
Indirect impacts:	N/A	N/A
Cumulative impacts	HIGH	HIGH
Significance rating of impact	MEDIUM (-ve)	VERY LOW (-ve)
Degree to which the impact may cause irreplaceable loss of resources:	LOW	
Degree to which the impact can be reversed:	IRREVERSIBLE	
Degree to which the impact can be avoided:	MEDIUM	
Degree to which the impact can be managed:	MEDIUM	
Degree to which the impact can be mitigated:	MEDIUM	
Residual impacts:	VERY LOW (-ve)	

Essential mitigation measures:

- Formulate and implement an EMP for the development/construction phase which includes the following specifications:
    - Where cement is mixed in a cement mixer ensure that the cement mixer operates at all times within a bunded area with an impermeable base;
    - Where cement is mixed by hand, ensure that the cement is mixed at all times in impermeable containers or in a bunded area with an impermeable base;
    - All wet and dry cement deposits outside the contained areas are to be cleaned at the end of each day and disposed of off-site as rubble;
    - Store fuel, chemicals and other hazardous substances in suitable secure weather-proof containers with impermeable and bunded floors to limit pilferage, spillage into the environment, flooding or storm damage and to be located at least 100m from any wetland;
    - Inspect all storage facilities and vehicles daily for the early detection of deterioration or leaks;
    - Clean up any spillages (e.g. concrete, oil, fuel), immediately. Remove contaminated soil and dispose of it appropriately;
    - Dispose of used oils, wash water from cement and other pollutants at an appropriate licensed landfill site. Disposal of any of these waste materials into any watercourse is strictly prohibited;

- Dispose of concrete and cement-related mortars in an environmental sensitive manner (as this can be toxic to aquatic life). Washout may not be discharged into any watercourse;
- Provide an adequate number of portable toilets where work is being undertaken. These toilets must be located at least 30m from the watercourse and must be serviced regularly in order to prevent leakage/spillage;
- All contaminated soil removed from the site by excavator or hand is to be immediately placed in a skip (i.e. no stockpiling of contaminated soil on-site);
- All skips containing waste shall be immediately transported to landfill for disposal when the skip becomes full;
- Any skips containing solid waste at the end of the day shall be covered to prevent wind from blowing the waste away; and
- Receipts for the safe disposal of solid waste shall be kept on record by the Contractor.

Impact 4 – Loss of Biota

Construction activities within and/or in close proximity to watercourses inevitably cause biota loss, primarily biota mortality as a result of being crushed by vehicles or through the indiscriminate placement of machinery and/or construction materials. In the event that spilled fuels and chemicals, oil leaks from construction machinery and cement from batching operations contaminate the receiving watercourses then biota loss may also take place or in the very least biota sensitive to water quality changes would be displaced. This is primarily applicable to the 'clean' watercourse as the other two watercourses are largely devoid of any instream or riparian habitat at their respective crossing points. While the affected watercourses are not expected to provide habitat for any threatened species, the region's watercourses are known to be low in nutrients and therefore the biota inhabiting these systems are regarded to be sensitive to changes in water quality.

Given the small scale of the construction project it is PROBABLE that only localised and very limited (i.e. LOW impact intensity) biota loss may take place. Accordingly, the impact is rated to be of LOW (-ve) significance without mitigation. The impact can be partially mitigated by restricting construction vehicles and machinery to designated areas and through ensuring that no construction materials are stored within 20m of the receiving watercourses.

Results

Table 23: Impact significance rating for loss of biota (development phase).

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent of impact:	LOCAL	LOCAL
Duration of impact	SHORT TERM	SHORT TERM
Consequence of impact or risk:	NEGATIVE	NEGATIVE
Intensity	LOW	LOW
Probability of occurrence:	HIGHLY PROBABLE	PROBABLE
Indirect impacts:	N/A	N/A
Cumulative impacts	HIGH	HIGH
Significance rating of impact	LOW (-ve)	VERY LOW (-ve)
Degree to which the impact may cause irreplaceable loss of resources:	LOW	
Degree to which the impact can be reversed:	IRREVERSIBLE	
Degree to which the impact can be avoided:	MEDIUM	
Degree to which the impact can be managed:	MEDIUM	
Degree to which the impact can be mitigated:	MEDIUM	
Residual impacts:	VERY LOW (-ve)	

Essential mitigation measures:

- Clearly demarcate the edge of the 'clean' watercourse (*viz-a-viz* the unchannelled valley bottom wetland) for a distance of 20m either side of the crossing point using weather-proof markers for the full duration of the construction phase;
- Any part of the wetland upstream and downstream of the marked-off portion of the wetland must be off-limits to construction workers, vehicles and machinery unless authorised by the ECO); and
- Construction material stockpiles should be kept at least 20m from the wetland edge.

Table 24: Summary of development phase impacts.

Alternatives	Extent	Duration	Intensity	Probability of impact occurring	Significance
Alteration of natural flow regime					
Without mitigation	LOCAL	MEDIUM TERM	LOW	HIGHLY PROB.	LOW (-ve)
With mitigation	LOCAL	SHORT TERM	LOW	IMPROBABLE	VERY LOW (-ve)
Increased erosion and sedimentation					
Without mitigation	REGIONAL	MEDIUM TERM	MEDIUM	HIGHLY PROB.	MEDIUM (-VE)
With mitigation	LOCAL	SHORT TERM	MEDIUM	PROBABLE	LOW (-ve)
Water quality impairment					
Without mitigation	REGIONAL	MEDIUM TERM	MEDIUM	HIGHLY PROB.	MEDIUM (-ve)
With mitigation	LOCAL	SHORT TERM	LOW	PROBABLE	VERY LOW (-ve)
Biota loss					
Without mitigation	LOCAL	SHORT TERM	LOW	HIGHLY PROB.	LOW (-ve)
With mitigation	LOCAL	SHORT TERM	LOW	PROBABLE	VERY LOW (-ve)

1.19.2 Operational Phase

Impact 1 – Alteration of flow regime

Any persistent leaks from any of the pipelines (potable water supply or sewerage) would increase water inputs into the wetland. This could have significant secondary impacts associated with the transformation of non-perennial systems to perennial systems with associated changes in biota assemblages. The intensity of the impact is rated as LOW due to the likelihood that volumes leaked would not be significant and limited to trickle flow. The extent would be REGIONAL as flow in the affected watercourses would be affected downstream and off-site. The presence of impoundments in the 'clean' and 'landfill' watercourses would, on the other hand, contain the extent of the impact to some degree. The impact significance for the alteration of flow regime is, therefore, rated as MEDIUM (negative) without mitigation. Mitigation would be in the form of ensuring that the proposed pipelines do not leak. This can be achieved through the insertion of a Kevlar sleave for the portion of the pipeline that crosses the watercourse and through routine inspection and maintenance. This would result in the impact significance being reduced to VERY LOW (negative).

Table 25: Impact significance rating for alteration of flow regime (operational phase).

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent of impact:	REGIONAL	REGIONAL
Duration of impact	LONG TERM	SHORT TERM
Consequence of impact or risk:	NEGATIVE	NEGATIVE
Intensity	LOW	LOW
Probability of occurrence:	PROBABLE	IMPROBABLE
Indirect impacts:	N/A	N/A
Cumulative impacts	HIGH	HIGH
Significance rating of impact	MEDIUM (-ve)	VERY LOW (-ve)
Degree to which the impact may cause irreplaceable loss of resources:	LOW	
Degree to which the impact can be reversed:	REVERSIBLE	
Degree to which the impact can be avoided:	LOW	
Degree to which the impact can be managed:	MEDIUM	
Degree to which the impact can be mitigated:	MEDIUM	
Residual impacts:	VERY LOW (-ve)	

Essential mitigation measures:

- Ensure that all pipelines within the 1:50 year floodlines of the watercourses are lined with an internal Kevlar or similar sleave;
- Inspect the water supply and sewerage pipelines within the 1:50 year floodlines of the affected watercourses annually and repair / address leaks timeously.

Impact 2 – Water Quality Impairment

Give that a sewerage pipeline is proposed to cross the Sand River within the road reserve of the R310 (Baden Powell Drive) there is a risk that raw effluent would be discharged into the Sand River in the event that the pipeline is damaged and/or due to lack of maintenance, leaks. Any raw sewerage leaked into the watercourse would be carried downstream from the crossing point and therefore the potential impact would be REGIONAL in extent. The overall intensity is however rated to be LOW, primarily due to the likelihood that the volumes leaked would be low. The overall likelihood would be PROBABLE (taking into account the HIGH PROBABILITY that if a leak occurred contamination of the watercourse would take place and the IMPROBABILITY of the pipeline being damaged and leaking in the first place). Accordingly, the potential impact of water quality impairment during the operational phase would have a significance rating of MEDIUM (-ve) unmitigated.

In mitigation of the operational phase impact of water quality impairment is the requirement for routine monitoring the sewerage infrastructure for early leak detection and repair. A further measure would be to ensure that the pipeline is lined with Kevlar or similar material to maximise its strength. With mitigation, the impact significance rating would be reduced to VERY LOW (-ve).

Table 26: Impact significance rating for water quality impairment (operational phase) for the preferred alternative.

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent of impact:	REGIONAL	REGIONAL
Duration of impact	LONG TERM	SHORT TERM
Consequence of impact or risk:	NEGATIVE	NEGATIVE
Intensity	LOW	LOW
Probability of occurrence:	PROBABLE	IMPROBABLE
Indirect impacts:	N/A	N/A
Cumulative impacts	HIGH	HIGH
Significance rating of impact	MEDIUM (-ve)	VERY LOW (-ve)
Degree to which the impact may cause irreplaceable loss of resources:	LOW	
Degree to which the impact can be reversed:	IRREVERSIBLE (once contamination has occurred the effects of contamination cannot be reversed)	
Degree to which the impact can be avoided:	LOW	
Degree to which the impact can be managed:	MEDIUM	
Degree to which the impact can be mitigated:	MEDIUM	
Residual impacts:	VERY LOW (-ve)	

Essential mitigation measures:

- Ensure that all new sewerage pipelines within the 1:50 year floodline of the Sand River are lined with an internal Kevlar or similar sleave;
- Inspect all sewerage infrastructure within the 1:50 year floodline annually and repair / address leaks timeously.

Table 27: Summary of impact assessment results for the operational phase.

Alternatives	Extent	Duration	Intensity	Probability of impact occurring	Significance
Alteration of natural flow regime					
Without mitigation	REGIONAL	LONG TERM	LOW	PROBABLE	MEDIUM (-ve)
With mitigation	REGIONAL	SHORT TERM	LOW	IMPROBABLE	VERY LOW (-ve)
Water quality impairment					
Without mitigation	REGIONAL	LONG TERM	LOW	PROBABLE	MEDIUM (-ve)
With mitigation	REGIONAL	SHORT TERM	LOW	IMPROBABLE	VERY LOW (-ve)

1.20 'No-Go' Scenario

The 'No-Go' alternative implies that no development would take place and therefore there would be no requirement to install services including pipelines crossing watercourses. Accordingly, one would expect there to be no freshwater ecological impacts associated with the No-Go alternative. However, the current trends of habitat degradation, primarily erosion and sedimentation due to the agricultural land use which has reduced catchment roughness and alien vegetation encroachment, would continue into the foreseeable future. While it is legally obligatory for the landowners to eradicate certain listed alien invasive species (e.g. *Acacia saligna, Acacia melanoxylon* and *Acacia longifolia,* all prevalent in the area), there is no evidence of this taking place. The use of one of the watercourses as a landfill is also likely to continue whereas should the proposed development be approved then an opportunity exists to remove the remaining waste material and facilitate rehabilitation of the drainage line.

Accordingly the long-term prognosis for the three affected watercourse is that they would eventually deteriorate to reach a lower PES Category within the foreseeable future. Given that the unchannelled valley bottom wetland associated with the 'clean' watercourse is not recognised as being of

conservation significance (i.e. no aquatic or terrestrial CBAs or ESAs are associated with the wetland) and that no wetlands of conservation importance are situated downstream of the wetland, this deterioration in the condition of the wetland has limited regional significance for this particular watercourse. A similar scenario would apply to the 'landfill' watercourse. However, the Sand River discharges into the Jonkershoek River a short distance downstream from the proposed crossing point and parts of this river near to the proposed crossing point have been identified as comprising Aquatic CBAs. The Sand River therefore needs to be managed to ensure that it continues to provide the ecosystem services necessary to sustain the downstream Aquatic CBAs.

Overall, taking the above into consideration the "No-Go" alternative is rated to be associated with a LOW (-ve) impact significance rating (see Table 28).

Table 28: Impact significance rating for all impacts associated with the No-Go alternative.

CRITERIA	WITHOUT MITIGATION	WITH MITIGATION
Extent of impact:	LOCAL	N/A to the No-Go alternative
Duration of impact	LONG TERM	
Consequence of impact or risk:	NEGATIVE	
Intensity	LOW	
Probability of occurrence:	PROBABLE	
Indirect impacts:	N/A	
Cumulative impacts	HIGH	
Significance rating of impact	LOW (-ve)	
Degree to which the impact may cause irreplaceable loss of resources:	LOW	
Degree to which the impact can be reversed:	REVERSIBLE (habitat degradation can be reversed through rehabilitation)	
Degree to which the impact can be avoided:	LOW (continued environmental degradation is an inevitable trend for biodiversity in agricultural and peri-urban areas due primarily to significant edge effects)	
Degree to which the impact can be managed:	MEDIUM (while landowners could undertake measures to manage ongoing degradation this has not occurred, presumably due to a lack of resources)	
Degree to which the impact can be mitigated:	MEDIUM (while landowners could undertake measures to mitigate ongoing degradation this has not occurred, presumably due to a lack of resources)	
Residual impacts:	LOW (-ve)	

1.21 Indirect Impacts

No indirect impacts were identified or considered probable, provided the suggested mitigation measures of the direct impacts are implemented and adhered to.

1.22 Cumulative Impacts

Cumulative impacts result from the incremental impact of an activity on freshwater ecosystems within a greater catchment, ecoregion and vegetation group when added to the impacts of other past, present or reasonably foreseeable future activities.

Loss of wetland habitat in the Southwestern Coastal Belt Ecoregion as a result of urban development has been extensive and can be regarded as a highly significant cumulative impact. This is evident from the NFEPA (2011) which has assigned a Critically Endangered (CR) and Endangered (E) threat status' to the majority of wetland types in the Ecoregions various wetland vegetation types. Given that the proposed development would not entail any loss of wetland habitat, the proposed development would not contribute to this highly significant cumulative impact. Also, through implementing the recommended development/construction phase mitigation measures that aim to ensure that the flow regime, water quality impairment (chemical contamination and sediment loading) and biota loss is minimised, the proposed development would have a negligible cumulative effect.

2 Key Findings and Recommendations

2.1 Key Findings

The provision of services, in particular the supply of potable water and the external sewerage reticulation, for the proposed development of Welmoed Estate at Lynedoch in the Stellenbosch municipal area requires that watercourses are crossed. The EAP, Virdus Environmental, identified the following three crossing points:

1. 'Clean' watercourse crossing point (water supply pipeline);
2. 'Landfill' watercourse crossing point (water supply pipeline); and
3. Sand River crossing point within the R310 road reserve (sewerage pipeline).

EnviroSwift conducted a site investigation on 27 February 2024 to classify and delineate the watercourses. The result so the site investigations confirmed that the 'clean' watercourse comprised an unchannelled valley bottom wetland and the two remaining watercourses to be drainage lines driven by alluvial processes. The Sand River is possibly a perennial system despite being mapped on the NGI Rivers database as non-perennial and at the time of the site visit was in a severe state of disturbance as a result from extensive earthworks associated with the current upgrading of the R310 at Vlottenburg. The 'landfill' drainage line was confirmed to be non-perennial as zero flow was evident and the severe disturbance as result of it being used as a landfill was confirmed.

While the NFEPA (2011) does not identify any applicable wetland vegetation types for the crossing points, the surrounding terrestrial vegetation type, Swartland Granite Renosterveld, is listed as being Endangered, indicating the likelihood that the aquatic habitat associated with wetlands and rivers / drainage lines is also threatened and in need of protection. Consultation of the WCBSP (2017) confirmed that each of the affected watercourses are identified as Restorable ESAs and that small parts of the Jonkershoek River immediately downstream of its confluence with the Sand River and near to the proposed crossing point comprise Aquatic CBAs. What this means is that all three affected watercourses need to be managed so that they continue to provide ecosystem services to support the functioning of the Aquatic CBAs and accordingly their ecological status should not be compromised.

The application of the ecological assessment indices (WET-EcoServices, WET-Health/IHIA and EIS); resulted in the following for each of the affected watercourses (see Table 29).

Table 29: Results of the detailed ecological assessment of the three watercourses.

Watercourse	WET-Ecoservices	PES	EIS
Unchannelled Valley Bottom Wetland ('clean' watercourse)	Intermediate	Category "D" (Largely Modified)	Marginal/low
'Landfill' drainage line	N/A	Category "D" (Largely Modified)	Marginal/low
Sand River	N/A	Category "D" (Largely Modified)	Marginal/low

Given the nature of the proposed activity, which effectively entails vegetation clearing and trench excavations across the watercourses followed by backfilling and re-compaction, the development/construction phase impacts are limited to the alteration of flow regime, erosion and sedimentation and biota loss with erosion and sedimentation rated to be the only potential impact of MEDIUM (-ve) significance unmitigated with the remaining potential impacts to be LOW (-ve) unmitigated. This impact significance rating for erosion and sedimentation is largely attributed to the fact that excavations within and near watercourses inevitably results in sediment plumes and erosion due to the destabilisation of soils which can be transported downstream and off-site thereby resulting in a REGIONAL impact extent.

For the operational phase it is only the consequences of damaged and leaking pipelines that can cause potentially significant flow regime and water quality impacts, with the latter limited to the sewerage pipeline crossing of the Sand River only. The impact significance rating for these two operational phase

impacts without mitigation was MEDIUM (-ve) as a result of the REGIONAL extent of both impacts (i.e. they are predicted to extend off-site) and LONG TERM duration (due to the fact that without regular leak inspections any leaks would go undetected for a long period of time.

Practicable mitigation measures have been recommended to minimise and manage all the identified potential impacts to ensure that all impacts are reduced to either LOW or VERY LOW (-ve) significance ratings. The construction phase impacts could be partly avoided through ensuring that the stream crossings take place in the dry summer period and also through the appointment of an ECO to oversee the actions of the Contractor and ensure that the recommended mitigation measures (presumably incorporated into a Construction EMP) are implemented. During the operational phase the use of Kevlar sleeves and the requirement for routine pipeline inspection for early leak detection would similarly minimise the impacts to VERY LOW (-ve) significances.

2.2 Authorisation Opinion

The proposed installation of the external services is found to be associated with a number of potentially significant freshwater ecological impacts that unmitigated would result in the proposed development not being supported from a freshwater ecological perspective. However, given that a number of practicable mitigation measures can be enforced and that these would render most of the potential impacts to have a VERY LOW (-ve) impact significance with only one of the identified impacts (development/construction phase erosion and sedimentation) being rated to have a LOW (-ve) impact significance with mitigation, the proposed installation of the external services is supported. This is conditional on the recommended mitigation measures being implemented.

While not an essential mitigation measure and therefore not conditional upon the approval of the proposed development, the project provides an opportunity to rehabilitate the ‘landfill’ watercourse immediately upstream of the proposed crossing point where solid waste is still evident and earthworks have left area devoid of vegetation and exposed to erosion. What would be required would be removal of the remaining components of the waste body (this could be done by hand) and then the reshaping of the banks of the drainage line to approximate the natural terrain units followed be revegetation. A seed mix including *Cynodon dactylon* and other indigenous grasses as well as the planting of several *Olea capensis* seedlings would be sufficient for revegetation purposes.

Should no development take place, then there would be no impact to the freshwater ecosystems associated with the proposed development. Ongoing degradation of the ‘clean’ and ‘landfill’ watercourses would continue whereas the Sand River, post the upgrading of the R310, would improve as natural vegetation becomes established within the channel and on the banks thereby providing habitat as well as ecological services such as bank stabilisation, flood attenuation and nutrient assimilation. However, given that the proposed development presents an opportunity to rehabilitate the ‘landfill’ watercourse there would be a lost opportunity cost associated with the No-Go alternative.

2.3 Conclusion and Recommendations

The proposed installation of external services, in particular the proposed water supply pipeline from the Skilpadvlei reservoir to the proposed site of the urban development at Lynedoch and the proposed sewerage pipeline to the Blaauwklippen Pumpstation, will entail crossings at three points on three different watercourses. Given that two of the watercourses have been subjected to extensive earthworks recently, the sensitivity of these two freshwater systems to ecological impacts is reduced to the extent that most impacts are rated to be LOW (-ve) without mitigation. The third watercourse, referred to as the ‘clean’ watercourse, while having relatively intact vegetation and limited biophysical disturbance has been determined to have been subject to severe hydrological impacts associated with the presence of impoundments as well as significant geomorphological impacts. The sensitivity of this watercourse to the activities associated with the pipeline installation are also reflected in the LOW (-ve) impact ratings for most of the identified impacts. Accordingly, the timing of the project is appropriate as the disturbance caused by the proposed pipeline crossings is negligible compared to the recent and current disturbance witnessed at the ‘landfill’ watercourse and the Sand River.

Most of the identified impacts are mitigable and a number of practicable mitigation measures have been recommended as follows:

Essential mitigation measures to address alteration of flow regime during the development/construction phase:

- Avoid the impact as far as is practically possible by undertaking the watercourse crossings (vegetation clearing and trench excavations) during the dry summer season, where possible;
- If installation of the external services cannot be undertaken prior to the onset of the winter rainy season then the Environmental Control Officer (ECO) must advise on measures to ensure that run-off from cleared areas is contained and encouraged to infiltrate rather than discharge directly into the downstream watercourses;
- Timeously revegetate areas cleared by construction activities near the watercourse crossing points with suitable indigenous plants.

Essential mitigation measures to address the development/construction phase impact of erosion and sedimentation:

- Avoid the impact as far as is practically possible by undertaking the watercourse crossings (vegetation clearing and trench excavations) during the dry summer season, where possible;
- If the installation of the external services cannot be undertaken prior to the onset of the winter rainy season then the ECO must advise on measures to ensure that sediment plumes from the trench excavation are contained and run-off from cleared areas upslope of the watercourses is contained and encouraged to infiltrate rather than discharge directly into the receiving watercourses;
- Formulate and implement a Development/Construction phase EMP which includes the following specifications:
    - No stockpiles may be located within 30m of the crossing point;
    - The ECO shall designate the site for stockpiling (note this should preferably take place at the Construction Camp but an alternative site can be identified closer to the crossing site, but no closer than 30m, in consultation with the ECO);
    - Protect soil stockpiles, if required, from erosion using a tarp or erosion blankets;
    - Implement erosion control measures in order to prevent erosion and sedimentation of the receiving watercourses as required by the ECO. For example. strategically place straw bales or sediment fences/traps, to divert stormwater away from areas susceptible to erosion etc.);
    - Any sediment contaminated runoff should be contained and allowed to settle before being discharged. The settled-out sediment collected in this manner should be cleared manually as needed and removed from site;
    - The ECO shall check erosion control measures weekly to ensure these are still intact (and cleared of sediment in accordance with the recommendations above) as needed;
    - The ECO shall check the site for erosion damage and sedimentation after every heavy rainfall event. Should erosion or sedimentation be noted, immediate corrective measures must be undertaken; and
    - Ensure that any area within 50m of the crossing point that is damaged as a result of construction activities is suitably and timeously rehabilitated to the satisfaction of the ECO.
- Any areas that need to be cleared in close proximity to the crossing points because they contain listed alien invasive species or are cleared for any other purpose must be revegetated timeously with appropriate indigenous vegetation.

Essential mitigation measures to reduce water quality impairment associated with construction activities:

- Formulate and implement an EMP for the development/construction phase which includes the following specifications:
    - Where cement is mixed in a cement mixer ensure that the cement mixer operates at all times within a bunded area with an impermeable base;
    - Where cement is mixed by hand, ensure that the cement is mixed at all times in impermeable containers or in a bunded area with an impermeable base;
    - All wet and dry cement deposits outside the contained areas are to be cleaned at the end of each day and disposed of off-site as rubble;

- Store fuel, chemicals and other hazardous substances in suitable secure weather-proof containers with impermeable and bunded floors to limit pilferage, spillage into the environment, flooding or storm damage and to be located at least 100m from any wetland;
- Inspect all storage facilities and vehicles daily for the early detection of deterioration or leaks;
- Clean up any spillages (e.g. concrete, oil, fuel), immediately. Remove contaminated soil and dispose of it appropriately;
- Dispose of used oils, wash water from cement and other pollutants at an appropriate licensed landfill site. Disposal of any of these waste materials into any watercourse is strictly prohibited;
- Dispose of concrete and cement-related mortars in an environmental sensitive manner (as this can be toxic to aquatic life). Washout may not be discharged into any watercourse;
- Provide an adequate number of portable toilets where work is being undertaken. These toilets must be located at least 30m from the watercourse and must be serviced regularly in order to prevent leakage/spillage;
- All contaminated soil removed from the site by excavator or hand is to be immediately placed in a skip (i.e. no stockpiling of contaminated soil on-site);
- All skips containing waste shall be immediately transported to landfill for disposal when the skip becomes full;
- Any skips containing solid waste at the end of the day shall be covered to prevent wind from blowing the waste away; and
- Receipts for the safe disposal of solid waste shall be kept on record by the Contractor.

Essential mitigation measures to minimise biota loss associated with construction activities:

- Clearly demarcate the edge of the 'clean' watercourse (*viz-a-viz* the unchannelled valley bottom wetland) for a distance of 20m either side of the crossing point using weather-proof markers for the full duration of the construction phase;
- Any part of the wetland upstream and downstream of the marked-off portion of the wetland must be off-limits to construction workers, vehicles and machinery unless authorised by the ECO); and
- Construction material stockpiles should be kept at least 20m from the wetland edge.

Essential mitigation measures to address the alteration of flow regime during the operational phase:

- Ensure that all pipelines within the 1:50 year floodlines of the watercourses are lined with an internal Kevlar or similar sleave;
- Inspect the water supply and sewerage pipelines within the 1:50 year floodlines of the affected watercourses annually and repair / address leaks timeously.

Essential mitigation measures to address water quality impairment during the operational phase (both alternatives):

- Ensure that all new sewerage pipelines within the 1:50 year floodline of the Sand River are lined with an internal Kevlar or similar sleave;
- Inspect all sewerage infrastructure within the 1:50 year floodline annually and repair / address leaks timeously.

On the basis of the assessment of the potentially significant freshwater ecological impacts associated with the pipeline crossings alone the development proposal is supported. The added opportunity to rehabilitate the 'landfill' watercourse immediately upstream of the proposed crossing point, if acceptable to the developer, provides further motivation for supporting the proposed development from a freshwater ecological perspective.

Risk Assessment

The approach taken in completing the Risk Assessment Matrix is summarised below:

- The assessment is based on the assumption that the recommended mitigation measures will be effectively implemented and as such the risk assessment reflects the "with mitigation" scenario. It

has also been assumed that the developer will not elect to rehabilitate the 'landfill' watercourse as the developer was not the responsible party and the rehabilitation of this watercourse is not considered an essential mitigation measure.

- All of the activities potentially generating negative impacts were found to be associated with a LOW risk class.
- Most of the identified negative impacts are limited to the impact site or are site-specific with the exception of the increased erosion and sedimentation associated with the installation of the pipeline and the operational phase impacts of alteration of flow regime and water quality impairment associated with potential failure and leaks.
- All the identified construction phase-related impacts have been rated as having a short term duration whereas the operational phase impacts have been rated as having a long term duration as it is uncertain whether the leaks would be detected timeously.
- All the identified construction phase-related impacts have been rated as having a probability of 60% of occurring with the exception of erosion and sedimentation which is rated as having a 100% chance of occurring. All the identified operational phase-related impacts are rated as having a probability of 20% as it is unlikely yet probable that leaks will occur.
- The confidence rating for the risk assessment is Medium for all identified impacts.

Given that all of the activities are associated with a LOW risk rating the proposed development qualifies for a General Authorisation (GA) as far as the Section 21 (c) and (i) water uses are concerned.

Please refer to the Risk Assessment Matrix provided in Appendix 4 for further detail.

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Appendix 1 – Impact Assessment Methodology[7]

Impact Rating Methodology

The methodology used in this EIA process to assess and rate the significance of potential impacts is outlined in this section.

The significance of an impact is defined as a combination of the consequence of the impact occurring and the probability that the impact will occur.

The criteria used to determine impact consequence are presented in Table 1 below.

Table 1: Criteria used to determine the Consequence of the Impact

Rating	Definition of Rating	Score
A. Extent– the area over which the impact will be experienced		
None		0
Local	Confined to project or study area or part thereof (e.g. site)	1
Regional	The region, which may be defined in various ways, e.g. cadastral, catchment, topographic	2
(Inter) national	Nationally or beyond	3
B. Intensity– the magnitude of the impact in relation to the sensitivity of the receiving environment		
None		0
Low	Natural and/or social functions and processes are negligibly altered	1
Medium	Natural and/or social functions and processes continue albeit in a modified way	2
High	Natural and/or social functions or processes are severely altered	3
C. Duration– the time frame for which the impact will be experienced		
None		0
Short-term	Up to 2 years	1
Medium-term	2 to 15 years	2
Long-term	More than 15 years	3

The combined score of these three criteria corresponds to a Consequence Rating, as set out in Table 2:

Table 2: Method used to determine the Consequence Score

Combined Score (A+B+C)	0 – 2	3 – 4	5	6	7	8 – 9
Consequence Rating	Not significant	Very low	Low	Medium	High	Very high

Once the consequence is derived, the probability of the impact occurring will be considered, using the probability classifications presented in Table 3.

[7] Adapted from SRK Impact assessment methodology

Table 3: Probability Classification

Probability of impact – the likelihood of the impact occurring	
Improbable	< 40% chance of occurring
Possible	40% - 70% chance of occurring
Probable	> 70% - 90% chance of occurring
Definite	> 90% chance of occurring

The overall significance of the individual impacts will be determined by considering consequence and probability using the rating system prescribed in Table 4.

Table 4: Impact Significance Ratings

Significance Rating	**Consequence**		**Probability**
Insignificant	Very Low	&	Improbable
	Very Low	&	Possible
Very Low	Very Low	&	Probable
	Very Low	&	Definite
	Low	&	Improbable
	Low	&	Possible
Low	Low	&	Probable
	Low	&	Definite
	Medium	&	Improbable
	Medium	&	Possible
Medium	Medium	&	Probable
	Medium	&	Definite
	High	&	Improbable
	High	&	Possible
High	High	&	Probable
	High	&	Definite
	Very High	&	Improbable
	Very High	&	Possible
Very High	Very High	&	Probable
	Very High	&	Definite

Finally, the impacts will also be considered in terms of their status (positive or negative impact) and the confidence in the ascribed impact significance rating. The prescribed system for considering impacts status and confidence (in assessment) is laid out in Table 5.

Table 5: Impact status and confidence classification

Status of impact	
Indication whether the impact is adverse (negative) or beneficial (positive).	+ ve (positive – a 'benefit')
	– ve (negative – a 'cost')
	Neutral
Confidence of assessment	
The degree of confidence in predictions based on available information, EAP's judgment and/or specialist knowledge.	Low
	Medium
	High

The impact significance rating should be considered by the authority in their decision-making process based on the implications of ratings described below:

- **Insignificant:** the potential impact is negligible and will not have an influence on the decision regarding the proposed activity/development.
- **Very Low:** the potential impact should not have any meaningful influence on the decision regarding the proposed activity/development.
- **Low:** the potential impact may not have any meaningful influence on the decision regarding the proposed activity/development.
- **Medium:** the potential impact should influence the decision regarding the proposed activity/development.
- **High:** the potential impact will affect the decision regarding the proposed activity/development.
- **Very High:** The proposed activity should only be approved under special circumstances.

In the EIA practicable mitigation measures will be recommended and impacts rated in the prescribed way both without and with the assumed effective implementation of mitigation measures.

Appendix 2 – CV of the Specialist

Curriculum Vitae
of
NICHOLAS STEYTLER
Director – EnviroSwift Western Cape

CONTACT DETAILS	
Address	32 Rameron Road, Imhoffs Gift, Kommetjie 7975
Email	Nick@enviroswift.co.za
Cell	082-322 4074

PERSONAL INFO	
Full Names	Nicholas Sean Steytler
Date of Birth	28 March 1970
Nationality	South African
Languages	English, Afrikaans, isiZulu (fair)
Identity Number	7003285202088

ACADEMIC QUALIFICATIONS		
BSc	University of Natal (Pmb)	1990
BSc Honours (Zoology & Entomology) ***Cum Laude***	University of Natal (Pmb)	1991
MSc (Entomology)	University of Natal (Pmb)	1994

PUBLICATIONS

Steytler, NS and Samways, 1995. MJ. Biotope selection by adult male dragonflies (Odonata) at an artificial lake created for insect conservation in South Africa. Biological Conservation Volume 72 Issue 3, December 1995, Pages 381 – 386.

Samways, MJ and Steytler, NS. 1996. Dragonfly (Odonata) distribution patterns in urban and forest landscapes, and recommendations for riparian management. Biological Conservation Volume 78 Issue 3, December 1996, Pages 279 – 288.

MEMBERSHIP OF PROFESSIONAL ASSOCIATIONS

Registered Environmental Scientist (Pr Sci Nat 400029/02)

Member of IAIA SA

FIELDS OF EXPERTISE	**Years experience**
Integrated Environmental Management	25 years +
Natural Resource Management Planning	25 years +
Freshwater Ecological Specialist Studies	5 years +

EMPLOYMENT HISTORY
2019 – present: EnviroSwift Western Cape. Director / owner
2007 – present: KHULA Environmental Consultants. Director / owner
2005 – 2009: DJ Environmental Consultants. Associate Consultant.
2000 – 2005: SRK Consulting, Cape Town, Environmental Department. Senior Environmental Scientist.
1996 – 2000: Institute of Natural Resources, Pietermaritzburg. Associate Researcher: Natural Resources Management Programme.
WORK EXPERIENCE (note IEM and Public Participation experience not listed below)
Freshwater ecological specialist studies:
Freshwater ecological impact assessment for external services for Welmoed Urban Node, Stellenbosch (2024)
Freshwater screening study for proposed solar PV facilities on the Remainder of Portion 5 of the Farm Rietvallei No. 167, Montagu (2023)
Amendments to freshwater specialist reports submitted in support of the applications for environmental approval for the Calcutta Cemetery, Farm 29 Stellenbosch (2023)
Freshwater screening study for the proposed development of Erf 325 Atlantis, City of Cape Town, Western Cape (2023)
Freshwater screening study for the proposed development of solar PV facilities on Farms 788-6 and 792-RE, Philippi, City of Cape Town (2023)
Freshwater screening study for the Proposed development of solar PV facilities on Erven 551 and 553, Schaapkraal, City of Cape Town (2023)
Freshwater ecological impact assessment for the proposed expansion of the Rusty Gate Mountain Retreat, Greyton (2023)
Freshwater screening study of the proposed redevelopment of portions of Stikland Hospital, Erf 6300 Stikland, Bellville (2023)
Freshwater ecological specialist review & assessment for the proposed amendment to the scope of the authorised extension of Erica Drive, Belhar, City of Cape Town (2023)
Freshwater Screening study for the proposed telecommunications base station on Portion 20 of the Farm Matroosberge No. 57, De Doorns (2023)
Freshwater ecological impact assessment for the proposed subdivision of Erf 10546 Hout Bay (2023)
Freshwater screening study for the proposed expansion of Louwville township, Vredenburg (2023)
Freshwater ecological impact assessment for the residential development of Erf 178092 Newlands, City of Cape Town (2023)
Freshwater screening study for Erf 2068 Somerset West, City of Cape Town (2023)
Freshwater screening study for Portion 3 of Farm 1025 Wemmershoek, Stellenbosch Municipality (2023)
Freshwater ecological impact assessment for a new Wastewater Treatment Works for Matjiesfontein, Laingsburg Municipality (2023)
Freshwater ecological impact assessment for the development of tourism accommodation facilities at the Farm Hemelrand, Hemel en Aarde Valley, Overstrand Municipality (2023)
Freshwater screening study for residential development at Oude Bosch, Hermanus Lagoon, Overstrand Municipality (2022)
Freshwater ecological impact assessment for a proposed shopping centre at Erf 666 Hout Bay, City of Cape Town (2022)
Freshwater screening study for the proposed formalisation of the Valhalla Park informal settlement, Cape Flats, City of Cape Town (2022)
Freshwater screening study for a proposed telecommunications mast, Overhex, Breede Valley Winelands Municipality (2022)
Freshwater ecological impact assessment for the proposed expansion of the Leopard Rock residential estate, Onrusrivier, Overstrand Municipality (2022)
Freshwater screening study for the proposed low cost housing development at Wolwerivier, City of Cape Town (2022)
Freshwater ecological impact assessment for the proposed low cost housing development of Erf 148 Philadelphia, City of Cape Town (2022)
Freshwater screening study of Erf 10932 Constantia, City of Cape Town (2022)
Freshwater screening study of Erf 49 Faure, City of Cape Town (2021)
Freshwater screening study for a proposed concrete factory on the Remainder of the Farm Bultfontyn 128, near Middelburg in the Eastern Cape (2021)
Freshwater ecological impact assessment for the proposed expansion of vineyards at Mountain Rose Farm, Hemel en Aarde Valley, Overstrand Municipality (2022)
Freshwater ecological impact assessment for unlawful agricultural expansion at Plennegy Farm, Oudtshoorn, Western Cape (2021)
Freshwater screening study for the development of erven 41 and 59, Knole Park, City of Cape Town (2021)
Freshwater ecological impact assessment for proposed truck stop on Portion of Erf 10229, Beaufort West, Western Cape (2021)

Freshwater screening study for the proposed redevelopment of the Mowbray Golf Course, Pinelands, City of Cape Town (2021)
Provision of rehabilitation specifications for the unlawful excavation of a trench in a non-perennial drainage line at the Farm Vergelegen, Robertson, Western Cape (2021)
Freshwater ecological impact assessment for unlawful agricultural expansion at Samber Farms, Riversdale, Western Cape (2021)
Freshwater ecological impact assessment for proposed expansion of an in-stream irrigation dam at Farm Hartebeest Kuil, George, Western Cape (2021)
Freshwater screening study for the proposed residential development of Erf 208 Bishopscourt, City of Cape Town (2021)
Freshwater screening study for the proposed agricultural processing facility, Maqinqi communal area, Port St. Johns Municipality, Eastern Cape (2021)
Freshwater ecological impact assessment for the proposed agricultural expansion at the Farm Vergelegen, Robertson, Western Cape (2021)
Freshwater ecological impact assessment for a proposed residential development in Plattekloof, City of Cape Town (2021)
Freshwater ecological screening study for the proposed sewerage pipeline for Schulz Vlei development, Philippi, City of Cape Town (2021)
Freshwater ecological impact assessment for the proposed development of an agro-industrial facility, Wemmershoek, Western Cape (2021)
Freshwater ecological screening study for a proposed filling station in Eerste River, City of Cape Town (2020)
Freshwater ecological impact assessment for an unlawfully constructed tourist accommodation facility, Tulbagh, Western Cape (2020)
Freshwater ecological screening study and risk assessment for additions and alterations to an existing residential dwelling, Breede River, Western Cape (2020)
Freshwater ecological screening study for a proposed truck depot and filling station, Paarl, Western Cape (2020)
Freshwater ecological screening study for a proposed phosphate mine, Saldanha, Western Cape (2020)
Freshwater ecological screening study for a single residential development at Oppi Berg, Ceres, Western Cape (2020)
Freshwater ecological screening study for a proposed industrial area expansion, Bredasdorp, Overberg, Western Cape (2020)
Freshwater ecological impact assessment for proposed Canola plant at Erf 15711 Wellington, Drakenstein Municipality (2020)
Freshwater ecological impact assessment for single residential development of Ptn 13 of Farm 563 Kleinmond (2020)
Freshwater ecological impact assessment for new IRT bus depot, Wynberg, City of Cape Town (2019)
Freshwater ecological screening study for Blackheath Printers, Blackheath, City of Cape Town (2019)
Freshwater ecological screening study for La Motte residential extension, Franschoek (2019)
Freshwater ecological impact assessment for Vloedbos Resort, Overberg (2019)
Freshwater ecological screening study for Erf 3660 Hout Bay, City of Cape Town (2019)
Freshwater ecological screening study for Erf 2145 Constantia, City of Cape Town (2019)
Freshwater ecological impact assessment for low-cost housing development in Khayelitsha (2019)
Freshwater ecological impact assessment for Kommetjie Vineyards Estate, City of Cape Town (2018)
Freshwater ecological screening study for Remainder Erf 177887 Ottery, City of Cape Town (2018)
Environmental Planning and Natural Resources Management:
Preparation of an Invasive Alien Plant Clearing Plan for Erf 6289 Hout Bay, City of Cape Town (2021)
Preparation of an Invasive Alien Plant Clearing Plan for Shamballah Tea House, Cape Point, City of Cape Town (2019)
Preparation of an Invasive Alien Plant Clearing Plan for Imhoff Farm, Southern Peninsula, City of Cape Town (2018)
Preparation of a River Maintenance Management Plan for the Jakkals River, Elgin, Theewaterskloof Municipality (2018)
Preparation of a River Maintenance Management Plan for wetlands associated with the Bottelary River, Hazendal Wine Farm, Stellenbosch (2017)
Preparation of an Alien Plant Clearing Programme for the Farm Wildschutsbrand, Cape Point (2017).
Preparation of an Alien Plant Clearing Programme for Lalapanzi Farm, Cape Point (2017).
Preparation of a River Maintenance Management Plan for the Dawidskraal River, Bettys Bay, Overstrand (2016)
Preparation of a Site Rehabilitation and Management Plan for wetlands at Kraaifontein Shooting club, Northern Cape Metro (2015)
Preparation of a Wetland Maintenance and Management Plan for De Goede Hoop Estate, Noordhoek, South Peninsula (2014)
Application for Off-Road Vehicle Regulations licence for boat launching facility, Oceana Power Boat Club slipway, V&A Waterfront (2014)
Preparation of a Maintenance Management Plan for the Silvermine River, Clovelly Country Club, South Peninsula (2014)
Preparation of a Maintenance Management Plan for the rehabilitation and maintenance of an unnamed stream and associated infrastructure, Klein Constantia Winefarm, Cape Metropole (2014)
Environmental Screening for the proposed redevelopment of the Tygerberg Hospital, Northern Cape Metropole (2014)

Establishment of a Permanent Coastal Development Setback Line for the V&A Waterfront, City of Cape Town (2014)
Preparation of a Maintenance Management Plan for the ongoing maintenance of the access road to the West Coast Rock Lobster holding facility, Witsand Island, Scarborough, City of Cape Town (2013)
Preparation of a Maintenance Management Plan for the Kromboom River, Erf 117459 Lansdowne, Cape Metropole (2013)
Preparation of a Rehabilitation Plan for the remediation of unlawful infilling of a wetland at Lalapanzi Farm, Cape Point (2012)
Preparation of a Rehabilitation Plan for the remediation of unlawful construction of a parking area at Erf 935 Noordhoek Farm Village, City of Cape Town (2012)
Preparation of a rehabilitation plan for the closure of the Retreat Filling Station, City of Cape Town (2012)
Khayeltisha Wetlands Park – Park Delineation and Management Review, City of Cape Town (2010)
Preparation of the Coast & Estuaries Theme for the 1st review of Eastern Cape State of the Environment Report (2009)
Preparation of 2010 FIFA World Cup Greening Business Plan for Polokwane, Limpopo Province (2008)
Preparation of 2010 FIFA World Cup Greening Business Plan for Rustenburg, North West Province (2008)
Revision of the Table Mountain National Park Conservation Development Framework, City of Cape Town (2006)
Comparative Evaluation of alternative venues for the 2010 FIFA World Cup Stadium, City of Cape Town (2006)
Preparation of a Strategic Management Framework for the Kogelberg Biosphere Reserve, Overberg (2005 – 2006)
Preparation of concept document and proposal to undertake a SADC regional market survey of the indigenous fibre trade, SADC Region (2006)
Strategic Planning of Cemeteries in the Drakenstein Municipality (2006)
Environmental assessment of overnight sites for the Hoerikwaggo Trails, Table Mountain National Park, Western Cape (2005)
Preparation of the Year 1 State of the Environment Report for the Western Cape (2005)
Preparation of a Water Resources Management Strategy for Mozambique (2004)
Due Diligence Study for the proposed Mozaq Limitada Prawn Farm, Mozambique (2003)
Preparation of the Culemborg Development Framework, City of Cape Town (2001)
Restoration Planning of the Bokramspruit River, Kommetjie, City of Cape Town (2001)
Management and Maintenance Planning of the Dwars River, Ceres (2001)
Preparation of the Garden Route Spatial Development Framework, Southern Cape (2001)
Strategic Planning of the information needs of a Medicinal Plants Network in the SADC region (1999)
Research to determine potential commercial products from the Wild - Medicinal Plants component, South Africa (1999)
Economic Evaluation of the Cultivation of Nine Species of Medicinal Plants Indigenous to South Africa (1998)
Faunal specialist study for the proposed N2 by-pass, Natal Drakensberg, KwaZulu-Natal (1997).
Freshwater specialist study for the proposed construction of a bridge over the Msunduzi River, Voortrekker Highschool, Pietermaritzburg (1997)
Strategic Planning of a proposed community based indigenous forest management project, Eastern Cape (1998)
Preparation of a decision support manual for community-based urban riparian systems management (RIPARI-MAN) (1998)
Preparation of an Integrated Catchment Management Plan for the Msunduzi River Catchment, Pietermaritzburg (1997)
Development of Flood Response Strategies for the Msunduzi River Catchment, Pietermaritzburg (1997)
Evaluating community-based wildlife management projects in the SADC region as part of the international project by IIED / IUCN called “Evaluating Eden” (1996)

Appendix 3 – Declaration of Independence

I, Nick Steytler, as the appointed independent specialist, in terms of the 2014 EIA Regulations (as amended), hereby declare that:

I act as the independent specialist in this application;

I perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;

I regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 (as amended) and any specific environmental management Act;

I declare that there are no circumstances that may compromise my objectivity in performing such work;

I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;

I will comply with the Act, Regulations and all other applicable legislation;

I have no, and will not engage in, conflicting interests in the undertaking of the activity; I have no vested interest in the proposed activity proceeding;

I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;

I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;

I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;

All the particulars furnished by me in this specialist input/study are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Name of Specialist: Nick Steytler

Date: 09/09/2022

Appendix 4 – Risk Assessment Matrix

PROJECT: **Welmoed Estate - external services**

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

Name of Assessor: Nick Steyter **Signature:**

SACNASP Registration Number: 400029/02

Date of assessment: 22-Mar-24

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	Site preparation and trench excavations	Alteration of Flow Regime	All watercourses	D	Low / Very low	2	0	1	2	1	4	2	2	8	2	16	60%	9,6	L	Medium
		Erosion and sedimentation	All watercourses	D	Low / Very low	0	2	2	1	1	4	5	2	11	2	22	80%	17,6	L	Medium
		Water quality impairment	All watercourses	D	Low / Very low	0	2	0	2	1	4	2	2	8	2	16	60%	9,6	L	Medium
	Driving of construction machinery and storage of construction materials	Biota loss	All watercourses	D	Low / Very low	0	0	0	2	3	6	2	2	10	2	20	100%	20	L	Medium
		<2b>									0			0	none	#VALUE!		#VALUE!	#VALUE!	
		<2c>									0			0	none	#VALUE!		#VALUE!	#VALUE!	
	<3>	<3a>									0			0	none	#VALUE!		#VALUE!	#VALUE!	
		<3b>									0			0	none	#VALUE!		#VALUE!	#VALUE!	
		<3c>									0			0	none	#VALUE!		#VALUE!	#VALUE!	
OPERATIONAL	Failure / damage to water supply pipeline	Alteration of flow regime	All watercourses	D	Low / Very low	2	2	0	2	1	4	5	4	13	2	26	20%	5,2	L	Medium
		Water quality impairment	All watercourses	D	Low / Very low	-1	1	0	1	0	2	5	4	11	2	22	20%	4,4	L	Medium
		<1c>									0			0	none	#VALUE!		#VALUE!	#VALUE!	
	Failure / damage to sewerage pipeline	Alteration of flow regime	All watercourses	D	Low / Very low	2	2	0	2	1	4	5	4	13	2	26	20%	5,2	L	Medium
		Water quality impairment	All watercourses	D	Low / Very low	2	3	0	2	1	6	5	4	15	2	30	20%	6	L	Medium
		<2c>									0			0	none	#VALUE!		#VALUE!	#VALUE!	
	<3>	<3a>									0			0	none	#VALUE!		#VALUE!	#VALUE!	
		<3b>									0			0	none	#VALUE!		#VALUE!	#VALUE!	
		<3c>									0			0	none	#VALUE!		#VALUE!	#VALUE!	

END OF REPORT