PEER REVIEW AQUATIC BIODIVERSITY IMPACT ASSESSMENT

CLANWILLIAM HOUSING DEVELOPMENT AND WWTW EXPANSION ON A PORTION OF REMAINDER OF ERF 279, CLANWILLIAM

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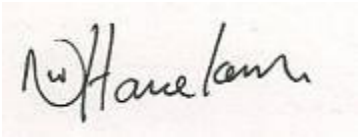
APRIL 2026

DECLARATION OF THE SPECIALIST

Note: Duplicate this section where there is more than one specialist.

I **Nicolaas Willem Hanekom**, as the appointed Specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that:

- In terms of the general requirement to be independent:
  - other than fair remuneration for work performed in terms of this application, have no business, financial, personal or other interest in the development proposal or application and that there are no circumstances that may compromise my objectivity; or
- In terms of the remainder of the general requirements for a specialist, have throughout this EIA process met all of the requirements;
- I have disclosed to the applicant, the EAP, the Review EAP (if applicable), the Department and I&APs all material information that has or may have the potential to influence the decision of the Department or the objectivity of any Report, plan or document prepared or to be prepared as part of the application; and
- I am aware that a false declaration is an offence in terms of Regulation 48 of the EIA Regulations.



Nicolaas Hanekom
Pri.Sci.Nat (Ecology) 004415 **6 April 2026**
Signature of the ~~EAP~~/ Specialist: Date:

Enviro-EAP (Pty) Ltd
Name of company (if applicable):

COMPLIANCE WITH THE DEPARTMENT OF ENVIRONMENTAL AFFAIRS SCREENING TOOL	ADDRESSED IN SPECIALIST REPORT
Contact details and curriculum vitae of the specialist including SACNASP registration number and field of expertise and their curriculum vitae	Page 1
A signed statement of independence by the specialist	Page 2 of report
Duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment. The assessment must be undertaken on the preferred site and within the proposed development footprint.	Section 1.8 and 4
A description of the methodology used to undertake the impact assessment and site inspection, including equipment and modelling used where relevant	Section 1.5
A description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations	Section 1.6
A description of the aquatic biodiversity and ecosystems on the site, including; (a) aquatic ecosystem types; and (b) presence of aquatic species, and composition of aquatic species communities, their habitat, distribution and movement patterns;	Section 4
the threat status of the ecosystem and species as identified by the screening tool	Section 4
an indication of the national and provincial priority status of the aquatic ecosystem	Section 4
a description of the ecological importance and sensitivity of the aquatic ecosystem	Section 4
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	Section 4
Areas not suitable for development, to be avoided during construction and operation (where relevant)	Section 5
Additional environmental impacts expected from the proposed development based on those already evident on the site and a discussion on the cumulative impacts	Section 6
Impact management actions and impact management outcomes proposed by the specialist for inclusion in the EMPr	Section 6

A motivation where the development footprint identified as per section 2.3 in this Table were not considered stating reasons why these were not being considered	Section 1 and 7
A reasoned opinion, based on the findings of the specialist assessment, regarding the acceptability or not of the development and if the development should receive approval or not, and any conditions to which the statement is subjected	Section 7

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1. INTRODUCTION AND METHODOLOGY

The Department of Environmental Affairs screening report from the national web based environmental screening tool reported a “very high sensitivity for Aquatic Biodiversity” sensitivity. An aquatic biodiversity impact assessment was conducted. This report presents the findings of the Aquatic Biodiversity Impact Assessment that was prepared by Nicolaas Hanekom as part of the EIA for the proposed for the proposed development application. Given the findings of the peer review it is EnviroSwift’s opinion that the detailed ecological assessment and impact/risk assessments should focus on the unchannelled valley bottom wetland that is located in the central part of the site and that drains towards the Jan Dissels River.

1.1. Background & Competency

Nicolaas Hanekom is a registered Professional Natural Scientist in the ecological science field with the South African Council for Natural Scientific Professions (“SACNASP”), Pri Sci Nat (Reg. No. 004415) Ecological Science (Pri.Sci.Nat); Aquatic Science & Conservation Science (Cand.Sci.Nat) and a qualified registered Environmental Assessment Practitioner (“EAP”) who holds a Masters Technologiae, Nature Conservation (“Vegetation Ecology and Biodiversity Assessment”) degree from the Cape Peninsula University of Technology (Refer to Appendix A, CV). Nicolaas Hanekom is suitably qualified SACNASP registered specialist.

1.2. Conditions Relating to this Report

The findings, results, observations, conclusions and recommendations given in this report are based on the author’s best scientific and professional knowledge as well as available information and knowledge of the area. Nicolaas Hanekom reserves the right to modify aspects of the report including the recommendations if and when new information may become available from on-going research or further work in this field, pertaining to this assessment.

This report may not be altered or added to without the prior written consent of the author. This restraint also refers to electronic copies of this report which are supplied as sub portion of other reports, including main reports. Similarly, any recommendations, statements, or conclusions drawn from or based on this report must specifically refer to this report. If such comments form part of a main report for

this investigation, the report must be included in its entirety as an appendix or separate section to the main report.

1.3. Scope and Objectives

The assessments entailed both a literature review of the region, as well as on site evaluations, during which specific primary data will be collected and evaluated. In addition, the identification of key ecological features will be undertaken allowing for the interpretation of the prevailing habitat form and associated processes.
All data collected in the field and during the literature review will be evaluated and interpreted in order to provide an understanding of the nature of the prevailing environment at a landscape and habitat level. In addition, specific evaluation of data relating to habitat form and structure will be undertaken, aiding in the identification of bio-physical anomalies within the prevailing environment. Such variance may be considered to be indicative of differing habitat forms, which under consideration, may be of higher order ecological value in relation of the prevailing environment.

The protocol[1] provides the criteria for the reporting of requirements for the assessment and reporting of impacts on aquatic biodiversity for activities requiring environmental authorisation.

General Information

An applicant intending to undertake an activity identified in the Scope of this Protocol, on a site identified as being of “very high sensitivity” for Aquatic biodiversity on the national web based environmental screening tool must submit an Aquatic Biodiversity Impact Assessment Report. However, where the information gathered from the Initial Site Sensitivity Verification and the specialist assessment differs from the designation of “very high” aquatic biodiversity sensitivity from the national web based environmental screening tool and it is found to be of a “low” sensitivity, then an aquatic biodiversity impact assessment is not required. Should this apply, an Aquatic Biodiversity Compliance Statement is to be provided.

1.4. Terms of Reference

- The assessment must be undertaken by a suitably qualified and SACNASP registered specialist, within the preferred development site and on the preferred development footprint.

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1 Published in Government Notice No. 648GOVERNMENT GAZETTE 4542110 MAY 2019.This gazette is also available free online at www.gpwonline.co.za

- Description of the preferred development site -The following aspects as a minimum must be considered in the baseline description:
  - A description of the aquatic biodiversity and ecosystems on the site, Including: a. Aquatic ecosystem types; b. Presence of aquatic species and composition of aquatic species communities, their habitat, distribution and movement patterns;
  - Threat status, according to the national web based environmental screening tool of the species and ecosystems, including Listed Ecosystems, as well as locally important habitat types identified;
  - National and Provincial priority status of the aquatic ecosystem (i.e. is this a wetland or river Freshwater Ecosystem Priority Area (FEPA), a FEPA sub catchment, a Strategic Water Source Area (SWSA), a priority estuary, whether or not they are free-flowing rivers, wetland clusters, etc., a CBA or an ESA; including for all a description of the criteria for their given status; and
  - Development footprint means the area within the site on which the development will take place and includes all ancillary developments for example roads and power lines which require vegetation clearance or which will be disturbed and for which the application has been submitted.
  - A description of the Ecological Importance and Sensitivity of the aquatic ecosystem including:
    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.);
    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, flow regime (surface and groundwater).

- Identify any alternative development footprints within the preferred development site which would be of a “low” sensitivity as identified by the national web based environmental screening tool and verified through the Initial Site Sensitivity Verification;

- Assessment of impacts -a detailed assessment of the potential impact(s) of the proposed development on the following very high sensitivity areas/ features:
  - Is the development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal.
  - Is the development consistent with maintaining the Resource Quality Objectives for the aquatic ecosystems present;
  - How will the development impact on fixed and dynamic ecological processes that operate within or across the site, including:

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); and b. Change in the sediment regime (e.g. sand movement, meandering river mouth/estuary, changing flooding or sedimentation patterns) of the aquatic ecosystem and its sub-catchment;
c. The extent of the modification in relation to the overall aquatic ecosystem (i.e. 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.). d. Assessment of the risks associated with water use/s and related activities.

- How will the development impact on the functionality of the aquatic feature, including: a. Base flows (e.g. too little/too much water in terms of characteristics and requirements of system);
  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)
  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).
  e. Fragmentation (e.g. road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal). The loss or degradation of all or part of any unique or important features (e.g. waterfalls, springs, oxbow lakes, meandering or braided channels, peat soils, etc.) associated with or within the aquatic ecosystem.
- How will the development impact on the functionality of the aquatic feature, including: a. 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).
  b. Change in the hydrogeomorphic typing of the aquatic ecosystem (e.g. change from an unchannelled valley-bottom wetland to a channelled valley-bottom wetland).
  c. Quality of water (e.g. due to increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication).
  d. Fragmentation (e.g. road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal).

e. The loss or degradation of all or part of any unique or important features (e.g. waterfalls, springs, oxbow lakes, meandering or braided channels, peat soils, etc.) associated with or within the aquatic ecosystem.

- How will the development impact on key ecosystem regulating and supporting services especially:

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.

- How will the 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.
- In addition to the above, where applicable, impacts to the frequency of estuary mouth closure should be considered, in relation to: a. Size of the estuary; b. Availability of sediment; c. Wave action in the mouth; d. Protection of the mouth; e. Beach slope; f. Volume of mean annual runoff (MAR); g. Extent of saline intrusion (especially relevant to permanently open systems).
- A motivation must be provided if there were development footprints identified that were identified as having a “low” biodiversity sensitivity and were not considered appropriate.

- The findings of the Aquatic Biodiversity Impact Assessment must be written up in an Aquatic Biodiversity Impact Assessment Report. This report must contain as a minimum the following information:
  - Contact details and curriculum vitae of the specialist including SACNASP registration number and field of expertise and their curriculum vitae;
  - A signed statement of independence by the specialist;
  - The duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;
  - The methodology used to undertake the impact assessment and site inspection, including equipment and modelling used, where relevant;
  - A description of the assumptions made and any uncertainties or gaps in knowledge or data as well as a statement of the timing and intensity of site inspection observations;
  - Areas not suitable for development, to be avoided during construction and operation (where relevant);
  - Additional environmental impacts expected from the proposed development based on those already evident on the site and a discussion on the cumulative impacts;
  - A suitable construction and operational buffer for the aquatic ecosystem, using the accepted protocol;
  - Impact management actions and impact management outcomes proposed by the specialist for inclusion in the EMPr;
  - A motivation where the development footprint identified were not considered stating reasons why these were not being not considered; and

- A reasoned opinion, based on the finding of the specialist assessment, regarding the acceptability or not, of the development and if the development should receive approval, and any conditions to which the statement is subjected.

- The findings of the Aquatic Biodiversity Impact Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report, including the mitigation and monitoring measures as identified, which must be incorporated into the EMPr. A signed copy of the Assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.

1.5. Approach and Methodology

A literature review and desktop analysis were undertaken prior to the field investigation, utilizing various sources including the South African National Biodiversity Institute (SANBI) data and other relevant sources. Recent and historical aerial imagery of the site was reviewed in order to identify points for investigation during the field survey. Utilising the above information, a field investigation was undertaken whereby:

- Sites of geomorphological or topographic variance were identified and subjected to an evaluation of species present within transects established across the selected site.
- Species were identified and collated.
- Additional random sample points were selected from other sites surrounding the proposed impacted areas for comparative purposes.
- Any additional species of significance, not identified within the sample sites were also noted.

As explained below, the ideal period for the assessment of terrestrial habitat within this region is between August and end October months, but for aquatic biodiversity it is the winters months in this region. The sampling and analysis of the site during spring and winter is an optimum season in terms of Aquatic Biodiversity Assessment (6 October 2019 and 28 July 2023) and 26 September 2025 during EnviroSwift peer review site visit, provides suitable data and results to present an informed decision on the local freshwater ecology.

All data was collated and subjected to evaluation using methods in order to:

- Give consideration to the overall structure of habitat within the subject site.
- Identify any habitat anomalies that may be identified in such analysis.
- Allow for the interpretation of such data in order to prioritise and evaluate habitat form and structure within the study area.

1.5.1. FRESHWATER ECOLOGICAL ASSESSMENT SITES AND SITE SELECTION

The sites were visually assessed. Several methods (refer to below) were used to assess the risks to the freshwater ecology at the project area.

The objective is to demarcate and delineate river reaches[2] following a hierarchical approach according to the following considerations:

- **Broad natural physical reaches** that constitute the river from its source downstream. These reaches are the result of the various drivers of the system under reference conditions, viz. Hydrology, Geomorphology and Physico-chemical attributes. It follows that the biota responded and adapted to these reference conditions (i.e., the broad natural habitat template) in a dynamic way depending on natural climatic variation. The boundaries between different broad natural reaches are not necessarily crisp and clear. However, where marked and rapid changes occur due to geology (e.g. geomorphology and physico-chemical changes) and hydrology (e.g. large tributaries or a change in climate) these boundaries may be easy to identify.
- **Smaller natural reaches** may be distinguished within these large reaches. Depending on the characteristics of the biological group and taxa considered, the distribution of biota will broadly coincide with the demarcation of the natural reaches. However, depending on the attributes (e.g. preferences and intolerances) of the biota they may be limited to smaller natural reaches within the broad natural physical reaches. These will result in so-called biological habitat segments (e.g. fish habitat segments, Kleynhans 1999).
- Superimposed on these natural reaches are the changes brought about by anthropogenic activities. These activities may result in a homogenous impact throughout the length of a broad natural reach or their impact may be heterogeneous and result in smaller distinguishable sub-reaches. Physical driver changes as well as biological change agents (e.g. alien biota) may be involved.

Reference conditions (in terms of natural reaches, drivers and biota) need to be considered as these provide the natural evolutionary setting that indicates the resilience of the system to various forms of modification and stress. However, pragmatic considerations that come into the picture include anthropogenic changes to the system that are within the medium and long term not likely to change. These may include modifications to the system such as impoundments, agricultural, urbanization and forestry. Such modifications brings about changes in the natural reach characteristics in terms of the system drivers and biota and indicates changed reaches that needs particular consideration in order to manage them accordingly inter alia, ecological importance and sensitivity, Present Ecological State (PES), the

[2] For the purpose of this document, "reach" is broadly defined as "a specified segment of a stream's path" (www.wwnorton.com/college/geo/earth2/glossary/r.htm).

recommended category and sustainability. This rationale also therefore enables the setting of resource quality objectives, ecological specifications and monitoring objectives and specifications.

The freshwater delineations as presented in this report are regarded as the best based on the site conditions present at the time of the assessment.

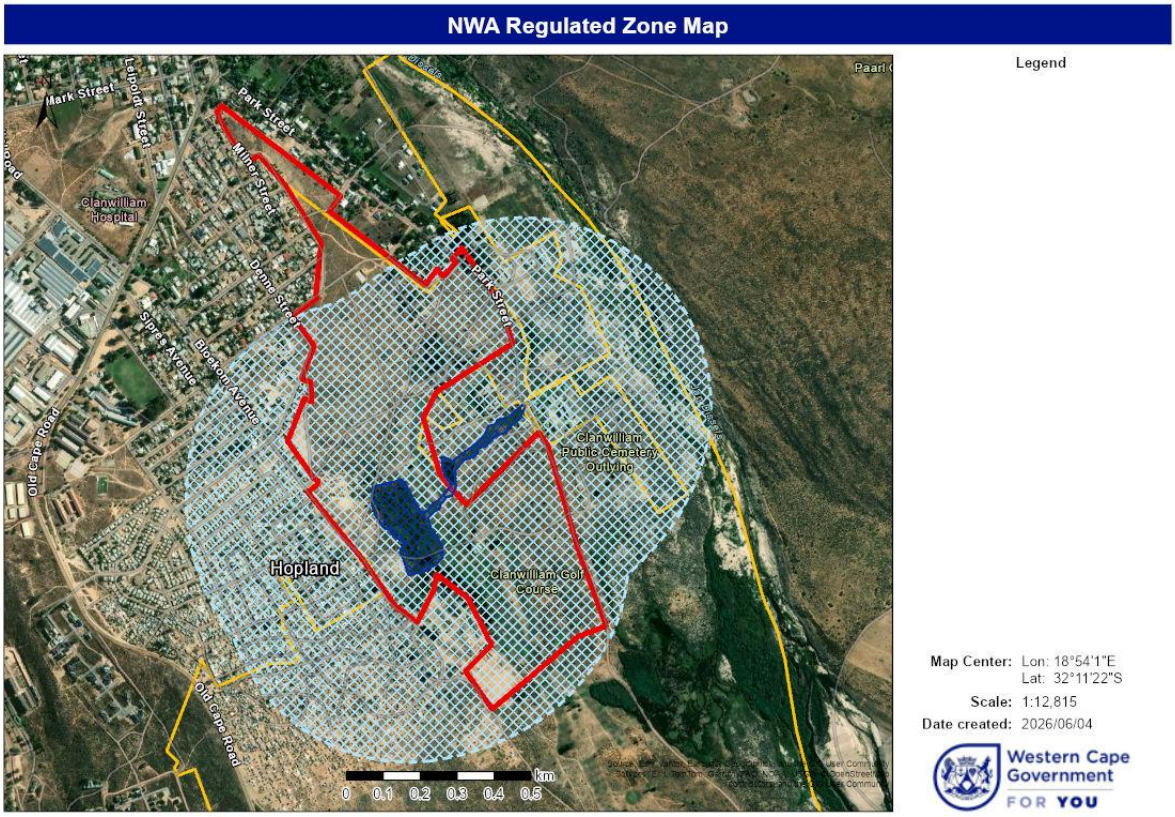


Figure 1: The water uses falling within the regulated zones that require authorization in terms of the National Water Act. Light Blue dotted polygon represents the 500m regulated buffer area.

1.5.1.1.1. Ecological Importance and Sensitivity (EIS)

The EIS method applied to wetlands is based on the assessment tool developed by Rountree et. al, (2014) and is 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 and Sanitation (DWS) and thus enabling consistent assessment approaches across water resource types.

1.5.1.1.2. National Freshwater Ecosystem Priority Areas (NFEPA; 2011)

The National Freshwater Ecosystem Priority Areas (NFEPA) project was a partnership and collaborative process led by the CSIR with the South African National Biodiversity Institute (SANBI), Department of Water Affairs (DWA), the Water Research Commission (WRC), WWF South Africa, as well as expertise from South African National Parks (SANParks), the South African Institute for Aquatic Biodiversity (SAIAB) and Department of Environmental Affairs and Tourism (DEAT). The project was originally conceived in 2006 and the project proposal was submitted to the WRC in July 2007. An inception meeting took place in August 2008 to introduce the aims of the project to relevant stakeholders from the freshwater science, governance and management sectors. The NFEPA project aimed to identify a national network of freshwater conservation areas and to explore institutional mechanisms for their implementation.

NFEPA takes forward the implementation of the Cross-Sector Policy Objectives for Inland Water Conservation. It also builds on the river component of the National Spatial Biodiversity Assessment (NSBA) 2004 and will feed directly into the NBA (National Biodiversity Assessment) 2010.

The NFEPA database was searched in terms of conservation status of rivers, wetland habitat and wetland features present in the vicinity of the proposed development.

1.5.1.1.3. Determining the Present Ecological Status (PES)

The overall approach is to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a Present Ecological Status (PES) score. This takes the form of assessing the spatial extent of impact of individual activities/occurrences and then separately assessing the intensity of impact of each activity in the affected area. The extent and intensity are then combined to determine an overall magnitude of impact.

PES categories as defined in WET-Health Vers. 2 (Macfarlane et al., 2020).

Impact Category	**Description**	**Impact Score Range**	**PES**
None	Unmodified, natural	0 to 0.9	A
Small	Largely Natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1.0 to 1.9	B

Moderate	Moderately Modified. A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.	2.0 to 3.9	C
Large	Largely Modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4.0 to 5.9	D
Serious	Seriously Modified. The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognizable.	6.0 to 7.9	E
Critical	Critical Modification. The modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8.0 to 10	F

1.5.1.1.4. RISK ASSESSMENT KEY (Referenced from DWD 2015 publication: Section 21 c and i water use Risk Assessment Protocol)

Negative Rating

TABLE 1 - SEVERITY How severe does the aspects impact on the environment and resource quality characteristics (flow regime, water quality, geomorphology, biota, habitat)?	
Insignificant / non-harmful	1
Small / potentially harmful	2
Significant / slightly harmful	3
Great / harmful	4
Disastrous / extremely harmful and/or wetland(s) involved	5
Total severity score calculation – (Flow Regime) + (Physico&Chemical) + (Habitat) + (Biota) =? x 25 = ?/100 = Total Severity Score	
Where "or wetland(s) are involved" it means that the activity is located within the delineated boundary of any wetland. The score of 5 is only compulsory for the significant rating	

TABLE 2 – SPATIAL SCALE How big is the area that the aspect is impacting on?	
Area specific (at impact site)	1
Whole site (entire surface right)	2
Regional / neighbouring areas (downstream within quaternary catchment)	3
National (impacting beyond seconday catchment or provinces)	4

Global (impacting beyond SA boundary)	5

TABLE 3 – DURATION How long does the aspect impact on the environment and resource quality?	
One day to one month, PES, EIS and/or REC not impacted	1
One month to one year, PES, EIS and/or REC impacted but no change in status	2
One year to 10 years, PES, EIS and/or REC impacted to a lower status but can be improved over this period through mitigation	3
Life of the activity, PES, EIS and/or REC permanently lowered	4
More than life of the organisation/facility, PES and EIS scores, a E or F	5

TABLE 4 – FREQUENCY OF THE ACTIVITY How often do you do the specific activity?	
Annually or less	1
6 monthly	2
Monthly	3
Weekly	4
Daily	5

TABLE 5 – FREQUENCY OF THE INCIDENT/IMPACT How often does the activity impact on the environment?	
Almost never / almost impossible / >20%	1
Very seldom / highly unlikely / >40%	2
Infrequent / unlikely / seldom / >60%	3
Often / regularly / likely / possible / >80%	4
Daily / highly likely / definitely / >100%	5

TABLE 6 – LEGAL ISSUES How is the activity governed by legislation?	
No legislation	1
Fully covered by legislation (wetlands are legally governed)	5
Located within the regulated areas	

TABLE 7 – DETECTION How quickly can the impacts/risks of the activity be observed on the environment (water resource quality characteristics), people and property?	
Immediately	1
Without much effort	2

Need some effort	3
Remote and difficult to observe	4
Covered	5

TABLE 8: RATING CLASSES		
RATING	**CLASS**	**MANAGEMENT DESCRIPTION**
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated. Wetlands may be excluded.
56 – 169	M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and require specialist input. Wetlands are excluded.
170 – 300	(H) High Risk	Always involves wetlands. Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve.

A low risk class must be obtained for all activities to be considered for a GA

TABLE 9: CALCULATIONS
Consequence = Severity + Spatial Scale + Duration
Likelihood=Frequency of Activity + Frequency of Incident +Legal Issues + Detection
Significance \Risk= Consequence X Likelihood

1.6. Assumptions and limitations

The ground-truthing, site survey and delineation of the freshwater resource assessment thereof are confined to two site visit undertaken on 6 October 2019 and 28 July 2023, as identified within the EIA application. All freshwater resources identified within the investigation area were delineated in fulfilment of Regulation GN509 of the National Water Act, 1998 (Act 36 of 1998) using desktop methods described above, including the use of topographic maps, historical and current digital satellite imagery and aerial photographs and were ground-truthed.

All areas surrounding the development have undergone significant changes (such as infilling, agricultural activities, road crossings and channelization at places) which have altered the geomorphic characteristics, hydrological regime and vegetation composition. The freshwater resource delineations as presented in this report are regarded as the best based on the site conditions present, as observed during the site assessment. The results obtained are, however, considered sufficiently accurate

to allow planning and decision making to take place.

Freshwater resources and terrestrial zones create transitional areas where an ecotone is formed as vegetation species change from terrestrial to obligate/facultative species. Within this transition zone, some variation of opinion on the freshwater resource boundaries may occur. However, if the best practice and latest methods are followed, all assessors should get largely similar results. With ecology being dynamic and complex, certain aspects (some of which may be important) may have been overlooked. However, the delineations as provided in this report are deemed appropriately accurate to guide any future development plans.

1.7. Source of Information

This assessment was undertaken utilising:

- The South African National Vegetation Map (Mucina and Rutherford, 2018) has been updated and the current version is dated 2024. Note however that the applicable terrestrial vegetation type is still indicated as Citrusdal Vygieveld, with no change in the ecosystem status (Least Threatened) in the current gazetted ecosystem threat status (Government Gazette No. 47526 of November 2022).
- The currently applicable database for wetlands is the National Wetlands Map Vers. 5 (NWM5) (CSIR, 2018).
- For rivers and drainage lines, the NGI Rivers database (available on Cape Farm Mapper) were used. The NGI Rivers database identifies a non-perennial drainage line which arises in the central portion of Site 1 and flows in a north-easterly direction towards the Jan Dissels River, approximately 150m from the boundary of Site 1.
- The CapeNature Spatial Biodiversity Plan (WCBSP, 2023).

In addition, use was made of the following data:

- Wetland and riparian habitat Geographic Information System (GIS) data sourced from the National Freshwater Ecological Priority Area Programme of South African National Biodiversity Institute (SANBI);
- SANBI veld types data; and
- Literature as referenced

1.8. Site Visit

The site surveys were conducted on 6 October 2019 and 28 July 2023. The surveys were conducted in an ideal period for the assessment of aquatic biodiversity within this region. The sampling and analysis techniques used provided suitable data and results to present an informed decision on the local aquatic biodiversity and ecology. During the site visit, the different biodiversity features, habitat, vegetation and landscape units present were identified and recorded in the field. Walk-through-surveys were conducted of representative habitats and areas of interest and all

plant and animal species observed were recorded. Searches for listed and protected plant species at the site were conducted and the location of all listed plant species observed was recorded (if present). Active searches for reptiles and amphibians were also conducted within habitats likely to harbour or be important for such species. The presence of sensitive habitats such as wetlands or pans and unique edaphic environments, such as rocky outcrops or quartz patches, were noted in the field if present and recorded and mapped using satellite imagery of the site.

2. APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

The proposed development within the study site is considered to elicit a requirement for possible compliance with the following legislation applicable to this assessment.

- The National Environmental Management: Biodiversity Act (Act 10 of 2004)
- The National Water Act (Act 36 of 1998)
- The National Forest Act (Act 84 of 1998)
- Invasive species are controlled by the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) - Alien and Invasive Species (AIS) Regulations which became law on 1 October 2014

The potential applicability of the abovementioned acts to the subject site is provided below:

The National Environmental Management: Biodiversity Act (Act 10 of 2004)
This Act serves to control the disturbance and land utilisation within certain habitats, as well as the planting and control of certain exotic species. The proposed development, taking place in the identified environment, may not necessitate any particular application for a change in land use from an aquatic and terrestrial biodiversity and ecological perspective. However, the effective disturbance and removal of species identified above, as well as possible other species (i.e. Threatened or Protected Species (TOPS) species), will require specific permission from the applicable authorities. In addition, the planting and management of exotic plant species on site, if and where required, will be governed by the Alien and Invasive Species (AIS) regulations, which were gazetted in 2014. These regulations compel landowners to manage exotic weeds on land under their jurisdiction and control.

The National Water Act (Act 36 of 1998)
The National Water Act controls activities in and around water resources, as well as the general management of water resources, including abstraction of groundwater and disposal of water. Authorisation for activities impacting on the land other than the current landuse, up to 500 m from a defined (water source) wetland system and

100m from a defined water sources (river) will require an application for a Water Use Licence from the Department of Water and Sanitation.

The National Forest Act (Act 84 of 1998)
The National Forest Act (Act 84 of 1998) governs the removal, disturbance, cutting or damage and destruction of identified “protected trees”. No listed species were encountered or recorded on site and an application for the “clearing of a *natural forest*”, as defined within the Act, will not be required on the site in question.

Invasive species are controlled by the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) - Alien and Invasive Species (AIS) Regulations which became law on 1 October 2014.
This Act is not applicable to the project as no such plants arise within or adjacent to the project area. Notably most listed alien invasive species are propagated and driven by the disturbance of land during and following construction.

As the recommended sites are not within a protected area, the various regulations within the NEM Protected Areas Act are not applicable to this site. It is also noted that the site does not fall within any expansion area in terms of a conservation strategy for the Western Cape.

3. DESCRIPTION OF PROJECT ASPECTS RELEVANT TO AQUATIC BIODIVERSITY FEATURES

Cederberg Municipality for the Clanwilliam Housing Development in two areas and WWTW expansion on a portion of remainder of Erf 279, Clanwilliam to develop:
Area 1: CLANWILLIAM HOUSING IRDP PROJECT
- 126 Single Residential Zone 1 erven - Average erf size: ±208m²
- 692 Single Residential Zone 2 erven - Average erf size: ±150m²
- 13 Open Space Zone 1 erven
- 5 Community Zone II (church) erven
- 1 Community Zone I (crèche) erven
- 1 Community Zone I (school) erf
- 1 Community Zone I (community center) erf
- 1 Community Zone III (clinic) erf
- 3 Local Business Zone II erven
- 2 Authority & Utility Zone erf
- Transport Zone II erven

With a total development footprint of ±29.3883 ha

Area 2: CLANWILLIAM HOUSING UISP PROJECT
- 457 Single Residential Zone II erven - Average erf size: ±120m²

- 3 Open Space Zone I erven
- 2 Community Zone II (church) erven
- 2 Community Zone I (crèche) erven
- 1 Local Business Zone II erven
- Transport Zone II erven

With a total development footprint of ±19.7680ha

Expansion of the WWTW footprint by approximately 0.5ha to expand the WWTW infrastructure to treat less than 2000 cubic meters of effluent per day.

With a total Development footprint of ±49.6ha

Water Services
The existing water reticulation system of the Cederville reservoir water distribution zone has insufficient capacity to accommodate the proposed development.

Network upgrade
- Item 1 – 190m x 200mm diameter; replace existing 160mm pipe
- Item 2 – 90m x 160m diameter; replace existing 75mm pipe
- Item 3 – 285m x 160mm diameter internal water pipes
- Item 4 – 550mm x 160mm diameter internal water pipes
- CCIW2.1 – 220m x 315mm new supply pipe
- CCIW2.2 – 320m x 315mm; replace existing 75mm pipe
- CCIW2.3 – 260m x 315mm; replace existing 75mm pipe
- CCIW2.6 – 190m x 110mm new supply pipe

Reservoir
- CCIW.B1: 3 000 kL additional storage capacity for Cederville reservoir site
- CCIW.B12: 90 m x 315 mm Ø New feeder pipe to Cederville no. 2 reservoir
- CCIW.B16: 90 m x 315 mm Ø link pipe between Cederville no. 1 & 2 reservoirs
- CCIW.B17: 5 m x 160 mm Ø inter-connection pipe between 2x bulk pipes

Sewer Services
- CCIS6.1 – 380 m x 450 mm Ø Upgrade existing 150 mm Ø outfall sewer
- CCIS6.2 – 950 m x 200 mm Ø Upgrade existing 160 mm Ø outfall sewer
- CCIS6.3 – 475 m x 525 mm Ø Upgrade existing 150 mm Ø bulk sewer
- CCIS2.2 – 370 m x 200 mm Ø Upgrade existing 150 mm Ø outfall sewer
- CCIS2.3 – Upgrade capacity of Milner Street PS to 55 L/s
- CCIS2.4 – 780 m x 315 mm Ø Upgrade existing 200 mm Ø rising main
- CCIS4.1 – 260 m x 200 mm Ø New outfall sewer
- CCIS4.2 – 270 m x 250 mm Ø New outfall sewer
- CCIS4.3 – 350 m x 200 mm Ø New outfall sewer

- CCIS4.4 – New 20 L/s Future PS Cl2
- CCIS4.5 – 1 005 m x 160 mm Ø New rising main

For the development of Area A the following upgrades are required:
- Master plan items CCIS6.2 & CCIS6.3 to reinforce the capacity of the existing gravity system
- between the proposed development and the Clanwilliam WWTP.
- Link services items CCIS4.1 & CCIS4.2 to connect the internal sewer network of the development area to future PS Cl2, and
- Future PS Cl2 (master plan item CCIS4.4) and rising main (master plan item CCIS4.5) to service the larger drainage area.
- A small portion of the development drains towards the existing Milner Street PS, which discharges into the Clanwilliam Gravity drainage areas. The bulk sewer downstream of the Milner Street PS is at capacity and should be upgraded (master plan items CCIS6.1 & CCIS6.3).
- The existing Milner Street PS drainage area has spare capacity to accommodate the erven within development area A which drains towards the Milner Street PS. In the sewer master plan for Clanwilliam upgrading of the Milner Street PS and accommodating rising main is however proposed (refer to master plan items CCIS2.3 & CCIS2.4), as well as upgrading of the main outfall sewer gravitating toward the Milner Street PS (refer to master plan item CCIS2.2). It can be considered to upgrade the PS, rising main and outfall sewer (master plan items CCIS2.2, CCIS2.3 & CCIS2.4) as part of the construction of the development as these items runs through the development area.

For the development of Area B the following upgrades are required:
- Link services items CCIS4.2 & CCIS4.3 to connect the internal sewer network of the development area to future PS Cl2, and
- Future PS Cl2 (master plan item CCIS4.4) and rising main (master plan item CCIS4.5) to service the larger drainage area.

Stormwater
An underground piped stormwater system will be provided to accommodate for the minor storm events (up to RI 1: 5 years). The major storm events will be accommodated within the street reserves. Stormwater run-off will be channelled to the existing Jan Dissels River flowing to the east of the proposed development using existing non-perennial river after it was detained and controlled released on an open space erf specifically created for stormwater control inside the development. Six other outlets on the eastern side will be constructed where stormwater pipe outlets will release stormwater next to roads and infrastructure. The degraded wetland on the western side and north of the WWTW with its greater open space area will be used to collect the existing stormwater released from the development on the western edge and other generated stormwater on the development. Building rubble

and litter, as well as alien invasive trees will be controlled and eradicated from this area.

Roads
Access to the proposed development will be provided from the existing Bloekom Avenue, south of the proposed development, Denne and Buitekant Street to the west and from Oranje, Protea and Viooltjie Streets to the north. The internal roads (main access road 16m wide and other internal roads 10m wide) will consist of surfaced streets.

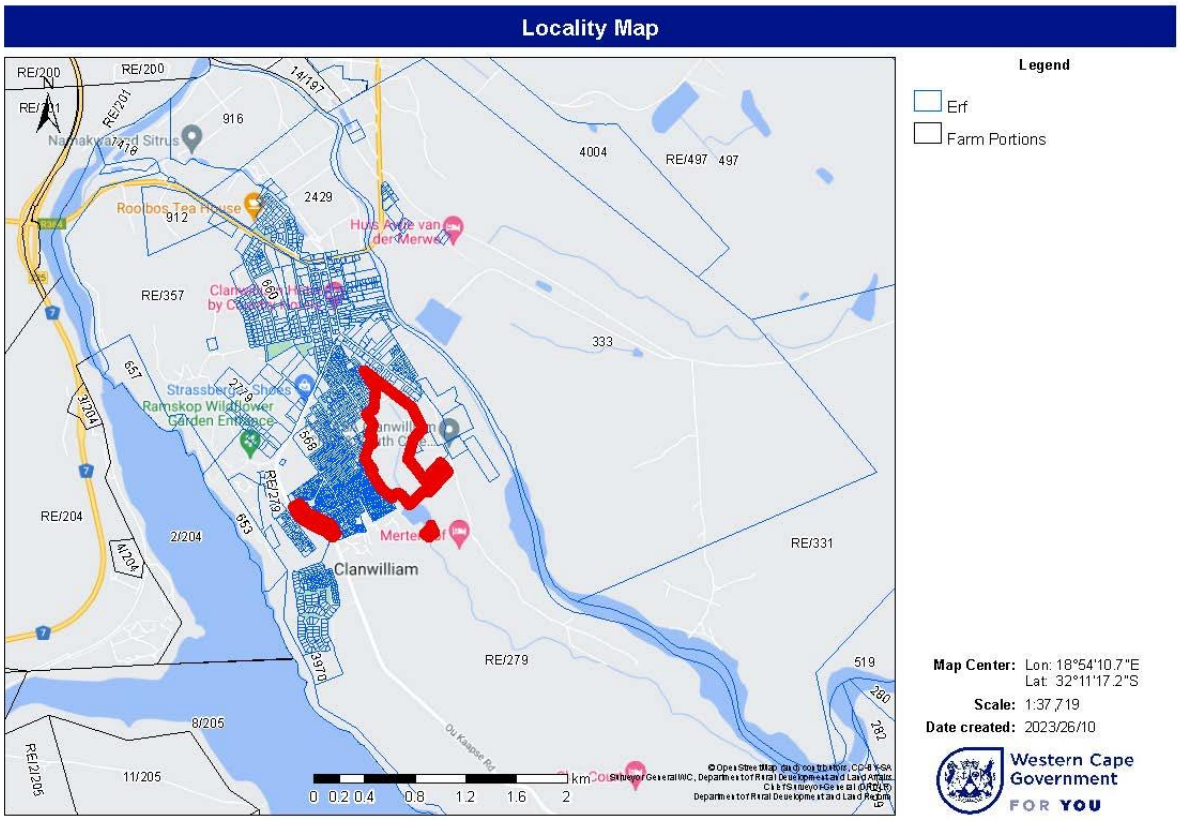
Figure 2: Site Development Plan

4. DESCRIPTION OF THE AFFECTED ENVIRONMENT.

4.1. Locality

Clanwilliam is situated in the West Coast District Municipality of the Western Cape Province. The town falls under the jurisdiction of the Cederberg Local Municipality for
local government purposes. Clanwilliam is the largest town in the Cederberg Municipality. Clanwilliam is situated at an elevation of 100 meters above mean sea level, between the western slopes of the Cederberg mountains and the east bank of

the Olifants River, which is impounded nearby by the Clanwilliam Dam. It is situated at the foot of the Cedarberg Range where the Jan Dissels River flows into the broad Olifants River. Clanwilliam is located just off the N7 national road, which runs from Cape Town to the Namibian border. Clanwilliam is 230 kilometres from Cape Town by road.



Source: Cape Farm Mapper
Figure 3: Locality Map

4.2. Topography

All three site has a low to moderate slope. Some steep slope areas are present on the south eastern section, but these areas is excluded from the development area.

4.3. Geology and Soils

Land Type: Ia196
Soil: Miscellaneous land classes, undifferentiated deep deposits
Geology: Alluvium and colluvium with mainly quartzitic sandstone of the Table Mountain Group and shale, siltstone and sandstone of the Bokkeveld Group.
Source: CapeFarmMapper dated 26 October 2023

4.4. A description of the aquatic biodiversity and ecosystems on the site, including; (a) aquatic ecosystem types; and (b) presence of aquatic species, and composition of aquatic species communities, their habitat, distribution and movement patterns;

The proposed development sites are located on the east of the Olifants River and west of the Jan Dissels River within the E10J quaternary catchment area. A non-perennial stream originally flowed from east to west into the Jan Dissels River. The golf course was however built through the water course and blocked the flow resulting in poor to no ecological features present in the current water course. A section of this water course does still exist west of the proposed development, but as mentioned above is in a poor ecological state. Furthermore, the existing road also blocked the water course lower down resulting in impacts on the hydrology and flow towards the Jan Dissels river. Stormwater outlets between the existing housing and golf course was blocked by the golf course.

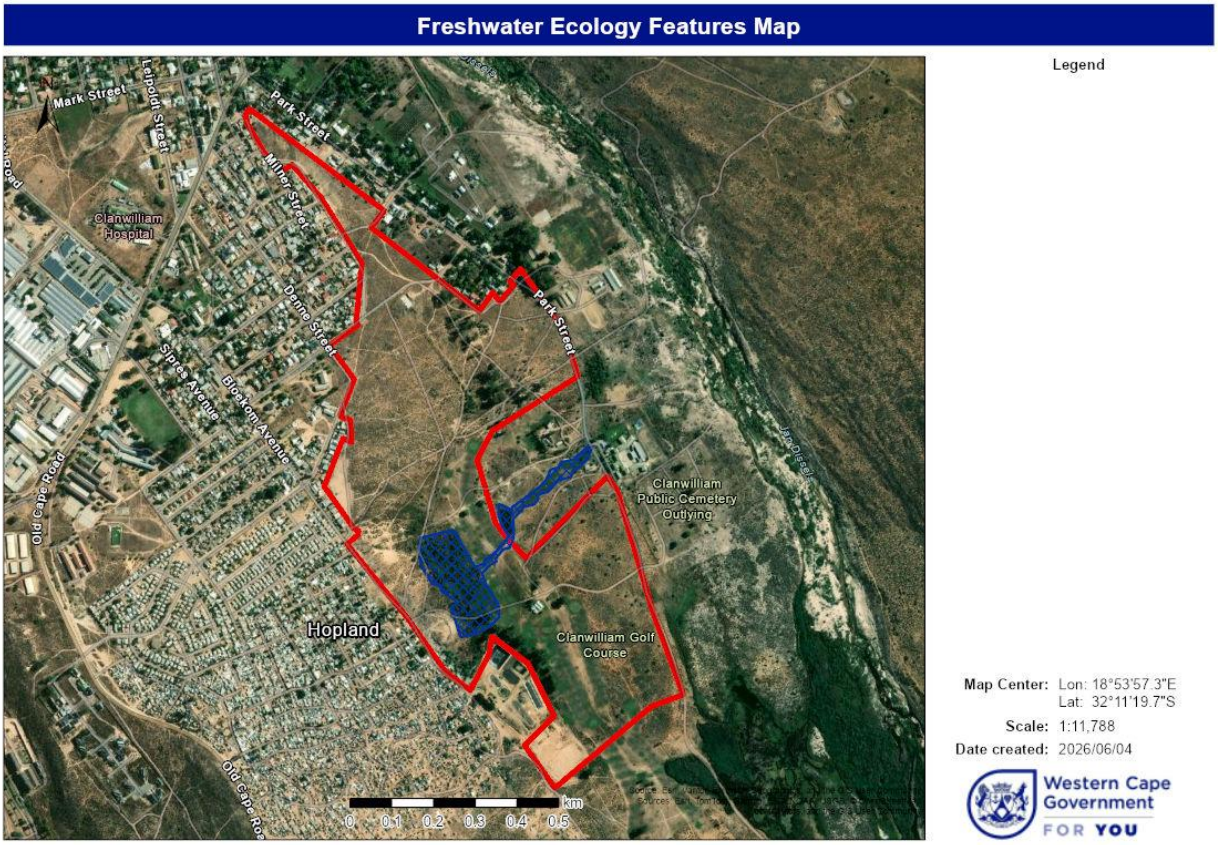


Figure 4: Freshwater Ecological Features Mapped

Two sets of conservation mapping results are of relevance to the national and provincial identification of the biodiversity conservation importance that has been attributed to the freshwater features in the study area. The Western Cape's

Biodiversity Spatial Plan (WCBSP) that contains Critical Biodiversity Areas (CBA) which is a product of the Provincial Fine Scale mapping process, as well as the National Freshwater Ecosystem Priority Areas (FEPA) map. FEPAs are intended to provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources.

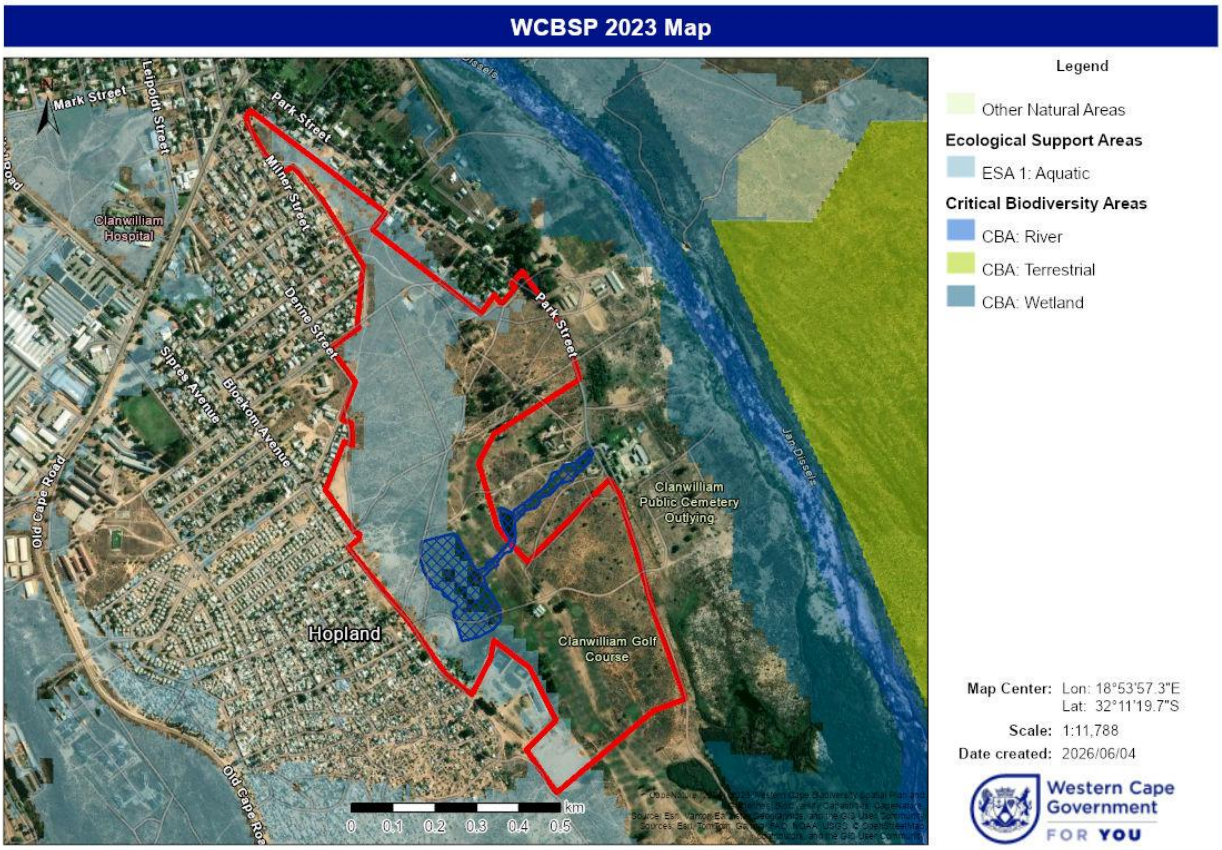


Figure 5: Western Cape Biodiversity Spatial Plan Mapped

No NFEPA was mapped in the impacted area.

The ESA mapped was however incorrectly mapped as a result of existing town of Clanwilliam.

Photograph 1: Stormwater outlet from existing residential area.

Photograph 2: Wetland that has developed as a result of the stormwater release and blocking of the non-perennial river by the golf course.

Photograph 3: Ecological condition of the non-perennial river downstream of the golf course.

The information gathered from the site survey does differs from the Environmental Screen report. The development of the site as per the proposed Site Development Plan would have a **low negative** impact.

4.5. The threat status of the ecosystem and species as identified by the screening tool

The National Vegetation Map of South Africa (2018) identifies the natural vegetation occurring within the area as Citrusdal Vygieveld, with a Least Threatened ecosystem status. The proposed construction and housing on west site and expansion of WWTW will however be on transformed areas impacted by existing WWTW infrastructure and squatters and not impact on any indigenous vegetation. The eastern housing site will impact on indigenous vegetation, but the impact will be of medium significance and no Species of Conservation Concern was recorded at the time of the site surveys.

4.6. 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); and

The aquatic feature (an unchannelled valley bottom wetland) is ecologically and hydrologically connected to the Jan Dissels River and its associated wetlands as there are no physical boundaries preventing connectivity. While the golf course has impacted on the connectivity by directing flow through a subterranean piped culvert, there is still opportunity for ecological connectivity across the fairway and through the culvert (aquatic species could disperse from the upper wetland portion to the downstream portion and on towards the Jan Dissels River). The wetland continues to support several ecological processes (flood attenuation, streamflow regulation, sediment trapping, nutrient assimilation, erosion control and habitat for biota) despite its state of degradation.

No Freshwater Ecosystem Priority Area (FEPA) areas was mapped on the site. This confirmed the low impact. The degraded non-perennial river was the only aquatic biodiversity features delineated in the study area, except for the wetland that formed as a result of the blocking of the stormwater runoff by the golf course.

4.7. A description of the ecological importance and sensitivity of the aquatic ecosystem including:
(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

The aquatic feature (an unchannelled valley bottom wetland) is ecologically and hydrologically connected to the Jan Dissels River and its associated wetlands as there are no physical boundaries preventing connectivity. While the golf course has impacted on the connectivity by directing flow through a subterranean piped culvert, there is still opportunity for ecological connectivity across the fairway and through the culvert (aquatic species could disperse from the upper wetland portion to the downstream portion and on towards the Jan Dissels River). The wetland continues to support several ecological processes (flood attenuation, streamflow regulation, sediment trapping, nutrient assimilation, erosion control and habitat for biota) despite its state of degradation.

PRESENT ECOLOGICAL STATE (PES)

Table 10: Results of PES assessments for the potentially affected aquatic ecosystems on the study area.

Criteria	Valley Bottom Wetland	
	Score	**Confidence**
INSTREAM		
Water abstraction	0	H
Flow Modification	13	H
Bed modification	13	H
Channel modification	13	H
Water Quality	8	H
Inundation	2	H
Presence of exotic macrophytes	4	H
Presence of exotic fauna	0	H
Presence of solid waste	0	H
RIPARIAN		
Vegetation removal	13	H
Alien encroachment	12	H
Bank erosion	5	H
Water abstraction	0	H
Flow modifications	13	H
Water quality	2	H
Channel modifications	11	H
Inundation	12	H
FINAL PES SCORES & CATEGORIES	Valley Bottom Wetland	
Instream	53	
	PES Category D	
Riparian	55	
	PES Category D	

The result of the PES assessments that were completed for the aquatic ecosystem that could potentially be affected by the proposed development is reflected in table above. Largely modified. A large loss of natural habitat, biota and basic ecosystem functions have occurred.

ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS)

Ecological Assessment of the Wetlands

The WET-Ecoservices tool was applied to the wetlands as shown in Figures above. The rating of the ecosystem services provided by the wetland was calculated to be intermediate.

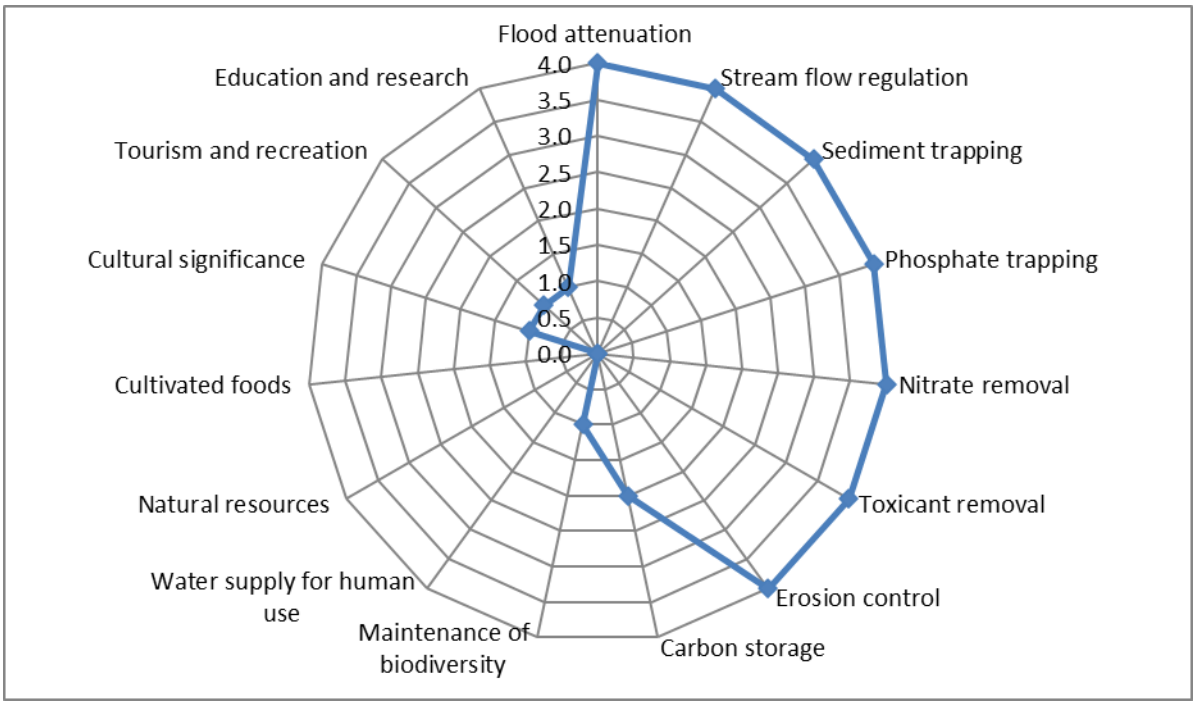


Table 11: WET-EcoServices results for the valley bottom wetland.

Wetland Ecosystem Services		
		Current
Indirect Benefits	Flood attenuation	1
	Streamflow regulation	1
	Sediment trapping	3
	Phosphate removal	3
	Nitrate removal	3
	Toxicant removal	4
	Erosion control	4
	Carbon storage	2
Direct Benefits	Maintenance of biodiversity	1
	Water supply for direct human use	0

	Harvestable natural resources	0
	Provision of cultivated foods	0
	Cultural significance	1
	Tourism, recreation, scenic value	1
	Education and research	1
	Total	25
	Average	1.6 (Intermediate)

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

Recommended Ecological Category

The EIS category of the wetlands was determined to be Intermediate. This EIS category means that the wetland is not ecologically important at any scale. The current PES of the wetland is a Category D and given the intermediate 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.

RESULTS OF THE PES AND EIS

The EIS category of the wetlands was determined to be Intermediate. The current PES of the wetland is a Category D. Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.

(b) the historic ecological condition (reference) as well as present ecological state of rivers (in-stream, riparian and floodplain habitat), wetlands and/or

The historic ecological condition of the freshwater ecological features is unknown because the agricultural and construction impacts are present for many years. 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 in the non-perennial rivers which resulted in impacting the Present

Ecological Status (PES).

No Freshwater Ecosystem Priority Area (FEPA) was mapped in the development area, which confirmed the low impact. The non-perennial rivers were the only aquatic biodiversity features delineated in the study area.

Rapid Habitat Assessment

Description of the site

Table 13: Results of the Rapid Habitat Assessment

Geomorphic zone	Western Folded Mountains
Geomorphic Habitat Unit (GHU) characterisation	Alluvial run
Valley shape	U Shape
Channel shape	Low valley
Longitudinal connectivity at low flows (time of survey)	Unrestricted passage
Types of bars present	None
Bank shape	Concave
Bank slope	Low
Bed compaction	Sand
Sediment matrix	Open framework

Local Disturbances at the site

The information relates to the Index of Habitat Integrity (IHI) information that is collated to derive the IHI ratings (Kleynhans *et al.* 2008). However, the IHI evaluations of impacts are applicable to the Management Resource Unit (MRU) and not to the site per se. This information required here is applicable to the site and only serves as a record to identify any additional local disturbances or changes. The IHI for the MRU is a requirement as part of the baseline for Ecological Water Resources Monitoring (EWRM) and therefore does not have to be addressed here.

Table 14 identify the disturbance, to provide a comment regarding the disturbance, and to provide a rating (1 – 5). The rating is an evaluation of the extent and severity of the disturbance with 5 relating to a severe disturbance applicable to most of the site. The focus area is the channel condition and the riparian zone as well as any disturbances immediately outside of the riparian zone which impacts on the site.

MODIFICATION	COMMENT	RATING
Abstraction (run of river)	Not connected.	5
Animal farming	No	5

MODIFICATION	COMMENT	RATING
Artificial covering	Cannel and golf course	5
Bed: material disturbance/removal	Golf course and road crossing the non-perennial river.	5
Bed: stabilization (e.g. concrete)	None	NA
Buildings	Down stream	NA
Channel Straightening	Historical golf course and land use disturbances.	5
Construction activities	Roads	5
Crossings low water (immediately upstream or downstream)	Golf course upstream and road downstream	5
Dams (immediately upstream or downstream)	No	NA
Dry land farming	No	NA
Erosion	Moderate	3
Forestry	None	NA
Invasive alien vegetation	None	NA
Irrigation	None	NA
Mining	None	NA
Off-channel dams	None	NA
Recreation	Golf course	NA
Riparian vegetation removal	Golf course	5
Roads	Downstream	5
Rubbish dumping	From existing residential	5
Runoff/effluent	Yes, from existing WWTW	NA
Trampling	Area impact by human activities.	5
Weirs (immediately upstream or downstream)	None	NA

Geomorphic Habitat Unit (GHU)
Run (RN): Water moving with a relatively smooth, unbroken surface. Low turbulence. (FAST SHALLOW AND OR FAST DEEP). Similar to a glide

Depth
Approximately 1m

Velocity
The velocity is judged to be slow considering the characteristics of the bed and banks.

Substrate
Sediment. Low compaction (2).

Cover
Mostly denuded. Indigenous vegetation.

Anthropogenic activities
Anthropogenic activities have impacts on in-stream water quality and obvious sources of activities that can result in impaired in-stream water quality (Table 15).

Table 15: Non-perennial river anthropogenic activities recorded for the river reach affected

ANTHROPOGENIC ACTIVITIES	RATING					
	0	1	2	3	4	5
Ploughing along banks	x					
Sand-mining	x					
Cattle watering or crossing point	x					
Abstraction point	x					
Discharge point						x
Chemical spill, e.g. abandoned pesticide containers, spillage from pumps, vehicle accidents	x					
Car washing	x					
Laundry washing	x					
In-stream building activities	x					
Litter					x	
Dump site	x					
Other (List, e.g. weir immediately upstream).	x					

Odour
The type of odour that is present at the site, if any (Table 16). NOTE WHETHER ODOURS ARE ASSOCIATED WITH THE SEDIMENT IN THE RIPARIAN ZONE. The following odours must be identified: a. Sewage, b. Cattle, e.g. cattle-watering point, c. Chemical, e.g. chlorine or pesticides, d. Anaerobic, e.g. hydrogen sulphide (or “rotten egg” smell normally associated with sediments) and e. Other: describe if possible

Table 16: Non-perennial river water quality indicator recorded for the river reach affected

WATER QUALITY INDICATOR	RATING						
	NA	0	1	2	3	4	5
Odour type 1 – Sewage	x						
Odour type 2 – Cattle	x						
Odour type 3 – Chemical	x						

Odour type 4 – Anaerobic	x						
Odour type 5 – Other	x						

Colour

The colour of the water column at the site, if discoloured (Table 17). The following colours can be identified: a. Brown-black, indicating humics or low pH. DO NOT SCORE IF NATURAL, E.G. WESTERN CAPE STREAMS, b. Milky, indicating possible chemical pollution, c. Green, indicating algal growth in the water column and probable eutrophication, d. Orange, indicating presence of iron-oxidizing bacteria or acid mine drainage. NOTE THAT THIS IS NOT TURBIDITY and e. Other: describe if possible

Table 17**:** Non-perennial river water quality indicator (colour) recorded for the river reach affected.

WATER QUALITY INDICATOR	RATING						
	NA	0	1	2	3	4	5
Colour type 1 – Brown-black	x						
Colour type 2 – Milky	x						
Colour type 3 – Green	x						
Colour type 4 – Orange	x						
Colour type 5 – Other	x						

Clarity

Turbidity can be described as the following levels of clarity (Table 18) if a turbidity meter, turbidity tube or Secchi disk is not available to conduct a quantitative measurement. 0: no turbidity in the water column, 1: slightly turbid, 2: moderately turbid,3: largely turbid,4: seriously turbid and 5: extremely turbid or opaque throughout the site.

Table 18**:** Non-perennial river water quality indicator (clarity) recorded for the river reach affected. No water flow in river at time of survey.

WATER QUALITY INDICATOR	RATING					
	0	1	2	3	4	5
Clarity	X					

Water surface and riparian bank and vegetation clues

The presence of deposits on the surface of the water and riparian banks or vegetation may be indicative of potential water quality impairment (Table 19).

Table 19**:** Non-perennial river surface water quality indicator recorded for the river reach affected.

SURFACE WATER QUALITY INDICATOR	RATING						
	NA	0	1	2	3	4	5
Scum (e.g. from elevated organics)	x						
Foam (e.g. detergent use)	x						
Purple / oily sheen (e.g. diesel + oils)	x						
Visible salt deposits on banks and vegetation	x						
Other	x						

Extent of algal growth on rocks

The presence of algal growth on rocks, i.e. periphyton, may indicate eutrophication or elevated nutrients in the water column (Table 20). It is important to compare these indicators to the natural state as some rivers may have naturally high nutrient levels due to geological and other factors. 0: no periphyton growth on rocks, 1: slight periphyton growth, 2: moderate growth, 3: large periphyton growth, 4: serious periphyton growth and 5: extreme coverage of rocks.

Table 20**:** Extent of algal growth on rocks recorded for the river reach affected

WATER QUALITY INDICATOR	RATING					
	0	1	2	3	4	5
Extent of algal growth on rocks	x					

Visible biotic response

Any visible biotic responses displayed by megafauna, e.g. fish kills, should be noted and will require an immediate management action (Table 21). A more detailed water quality assessment will need to be conducted immediately, including toxicity testing of in-stream water.

Table 21**:** Visible biotic response recorded for the river reach affected

VISIBLE BIOTIC RESPONSE	RATING						
	NA	0	1	2	3	4	5
Visible fish kill	x						
Visible other species (note species)	x						

4.8. 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.

The site development plan was amended to allow for continued recreational activities in the non-perennial river course at the golf course and the wetland was kept open to act as stormwater detention pond.

4.9. 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:

4.9.1. is the proposed development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal?

Yes. It will not affect the status of the aquatic biodiversity features identified as a result of existing disturbances to the non-perennial river.

4.9.2. is the proposed development consistent with maintaining the resource quality objectives for the aquatic ecosystems present?

Yes. It will not affect the status of the aquatic biodiversity features identified as a result of existing disturbances to the non-perennial river.

4.9.3. 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);

It will not affect the status of the aquatic biodiversity features identified as a result of existing disturbances to the non-perennial river. It will not result in hydrology changes.

(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);

The proposed development will not result in changes to the sediment regime of the aquatic ecosystem and its sub-catchment.

(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

The extent of the overall aquatic ecosystem will not be modification.

(d) to what extent will the risks associated with water uses and related activities change;

This Risk Matrix is for the Water Use Authorization Application for the development. Activities trigger water use registration that impacts on the regulated zones. This Risk Matrix assists DWS to determine where the proposed development triggers a Water Use License Authorization (WULA) or Water Use General Authorisation (WUGA). The risk assessment is based on the Department of Water and Sanitation 2015 publication: Section 21c and i water use Risk Assessment Protocol in Government Gazette no. 40229 dated 26 August 2016.

Risk Assessment Matrix - Total Severity Score with Mitigation

					Severity								
No	**Phases**	**Activity**	**Aspect**	**Impact**	**Flow Regime**		**Physico &Chemical (Water Quality)**		**Habitat (Geomorph + Vegetation**		**Biota**		**Total Severity Score**
1	Construction phase	Housing impacts on non-perennial rivers.	Housing impacts on non-perennial rivers.	Development impacts on non-perennial rivers. Impacts on the flow and change the hydrology of the non-perennial river systems.	1- The hydrological impacts on aquatic ecosystems, associated with proposed development will not be impacted or affect.		1- Water quality not be affected by the proposed development, provided that erosion control is in place and buffer areas intact and the WWTW final effluent treatment parameters is in specification.		1- The non-perennial rivers are modified. The PES result for the watercourse is category D.		1- The EIS was calculated for the importance of ecosystem services provided and the result points to low importance and sensitivity.		1
2	Operational Phase	Housing impacts on non-perennial rivers.	Housing impacts on non-perennial rivers.	Development impacts on non-perennial rivers. Impacts on the flow and change the hydrology of the non-perennial river systems.	1- The hydrological impacts on aquatic ecosystems, associated with proposed development will not be impacted or affect.		1- Water quality not be affected by the proposed development, provided that erosion control is in place and buffer areas intact and the WWTW final effluent treatment parameters is in specification.		1- The non-perennial rivers are modified. The PES result for the watercourse is category D.		1- The EIS was calculated for the importance of ecosystem services provided and the result points to low importance and sensitivity.		1

Risk Assessment Matrix – Final Risk Rating

No.	Severity	Spatial scale	Duration		Consequence		Frequency of activity	Frequency of impact	Legal issues	Detection		Likelihood	Significance	Risk Rating
1	1	1	1		3		1	1	5	1		16	48	Low
2	1	1	1		3		1	1	5	1		16	48	Low

Risk Assessment Matrix – Confidence Level and Proposed Post Control/Mitigation Measures

No.	Risk Rating	Confidence level	Control measures	Borderline LOW – MODERATE Rating Classes	PES and EIS of Watercourses
1	48 Low	90%	None	Low- unchanged	Refer to above
2	48 Low	90%	None	Low- unchanged	Refer to above

Recommendations in Terms of Water Use Application Requirements
The overall risk rating of potential Impacts on the applicable river is rated as low negative as a result of the poor ecological state of the non-perennial river.

4.9.4. ***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);

Base flows will not be altered.

(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);

No changes in quantity of water including change in the hydrological regime or hydroperiod of the aquatic ecosystem will occur.

(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);

No change in the hydrogeomorphic typing of the aquatic ecosystem will occur.

(d) quality of water (e.g. due to increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication);

The proposed development will not affect the quality of the water. Provided that the WWTW treated effluent meets the parameters.

(e) fragmentation (e.g. road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal); and

The proposed development will not result in further fragmentation.

(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.);

The loss or degradation of all or part of any unique or important features associated with or within the aquatic ecosystem will not occur as a result of the proposed development.

4.10. how will the proposed development impact on key ecosystems regulating and supporting services especially:

(a) flood attenuation;

None required.

(b) streamflow regulation;

None required.

(c) sediment trapping;

None required.

5. SITE SENSITIVITY ASSESSMENT

The ecological sensitivity is rated as low.

6. IMPACT ASSESSMENT

6.1. Assessment & Significance Criteria

The assessment criteria used in the assessment are drawn from the EIA Regulations, published by the Department of Environmental Affairs and Tourism (April 1998) in terms of the Environmental Conservation Act No. 73 of 1989, in terms of the National Environmental Management: Biodiversity Act (2004) as well as Brownlie (2005).

6.2. Assessment of Potential Impacts

The impacts identified are assessed below, before and after mitigation as well as during construction.

The impact assessment which follows is based on the site sensitivity and any deviations from the site sensitivity map as provided may invalidate the results of the assessment.

6.3. Risk Assessment Criteria

Step 1: Determine the **PROBABILITY** of the impact by calculating the average between the Frequency of the Aspect, the Availability of a pathway to the receptor and the availability of the receptor (thus: Sum of the three column scores below ÷ 3)

Frequency of Aspect / Unwanted Event	Score	Availability of pathway from the source to the receptor	Score	Availability of receptor	Score
Never known to have happened, but may happen	1	A pathway to allow for the impact to occur is never available	1	The receptor is never available	1
Known to happen in industry	2	A pathway to allow for the impact to occur is almost never available	2	The receptor is almost never available	2
< once a year	3	A pathway to allow for the impact to occur is sometimes available	3	The receptor is sometimes available	3
Once per year to up to once per month	4	A pathway to allow for the impact to occur is almost always available	4	The receptor is almost always available	4
Once a month - Continuous	5	A pathway to allow for the impact to occur is always available	5	The receptor is always available	5

Step 2: Determine the **MAGNITUDE** of the impact by calculating the average of the factors below (thus: Sum of all six column ratings below ÷ 6)

Source								Receptor			
Duration of impact	**Score**	**Extent**	**Score**	**Volume / Quantity / Intensity**	**Score**	**Toxicity / Destruction Effect**	**Score**	**Reversibility**	**Score**	**Sensitivity of environmental component**	**Score**
Lasting days to a month	1	Effect limited to the site. (metres);	1	Very small quantities / volumes / intensity (e.g. < 50L or < 1Ha)	1	Nontoxic (e.g. water) / Very low potential to create damage or destruction to the environment	1	Bio-physical and/or social functions and/or processes will remain unaltered.	1	Current environmental component(s) are largely disturbed from the natural state. Receptor of low significance / sensitivity	1
Lasting 1 month to 1 year	2	Effect limited to the activity and its immediate surroundings. (tens of metres)	2	Small quantities / volumes / intensity (e.g. 50L to 210L or 1Ha to 5Ha)	2	Slightly toxic / Harmful (e.g. diluted brine) / Low potential to create damage or destruction to the environment	2	Bio-physical and/or social functions and/or processes might be negligibly altered or enhanced / Still reversible	2	Current environmental component(s) are moderately disturbed from the natural state. No environmentally sensitive components.	2
Lasting 1 – 5 years	3	Impacts on extended area beyond site boundary (hundreds of metres)	3	Moderate quantities / volumes / intensity (e.g. > 210 L < 5000L or 5 – 8Ha)	3	Moderately toxic (e.g. slimes) Potential to create damage or destruction to the environment	3	Bio-physical and/or social functions and/or processes might be notably altered or enhanced / Partially reversible	3	Current environmental component(s) are a mix of disturbed and undisturbed areas. Area with some environmental sensitivity (scarce / valuable environment etc.).	3
Lasting 5 years to Life of Organisation	4	Impact on local scale / adjacent sites (km's)	4	Very large quantities / volumes	4	Toxic (e.g. diesel & Sodium Hydroxide)	4	Bio-physical and/or social functions and/or processes	4	Current environmental component(s) are in a natural state. Environmentally sensitive environment /	4

Source								Receptor			
Duration of impact	**Score**	**Extent**	**Score**	**Volume / Quantity / Intensity**	**Score**	**Toxicity / Destruction Effect**	**Score**	**Reversibility**	**Score**	**Sensitivity of environmental component**	**Score**
				/ intensity (e.g. 5000 L – 10 000L or 8Ha– 12Ha)				might be considerably altered or enhanced / potentially irreversible		receptor (endangered species / habitats etc.).	
Beyond life of Organization / Permanent impacts	5	Extends widely (nationally or globally)	5	Very large quantities / volumes / intensity (e.g. > 10 000 L or > 12Ha)	5	Highly toxic (e.g. arsenic or TCE)	5	Bio-physical and/or social functions and/or processes might be severely/substantially altered or enhanced / Irreversible	5	Current environmental component(s) are in a pristine natural state. Highly Sensitive area (endangered species, wetlands, protected habitats etc.)	5

Step 3: Determine the **SEVERITY** of the impact by plotting the averages that were obtained above for Probability and Magnitude in the table below.

ENVIRONMENTAL IMPACT RATING / PRIORITY					
	MAGNITUDE				
PROBABILITY	**1 Minor**	**2 Low**	**3 Medium**	**4 High**	**5 Major**
5 Almost Certain	Low	Medium	High	High	High
4 Likely	Low	Medium	High	High	High
3 Possible	Low	Medium	Medium	High	High
2 Unlikely	Low	Low	Medium	Medium	High
1 Rare	Low	Low	Low	Medium	Medium

Development Construction	**Geographical and Physical Impacts**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Soil erosion and dust**
Nature of impact:	**Disturbance to soil which is caused during the construction may lead to erosion of the site and surrounds.**
Extent and duration of impact:	**Extent 1 (footprint) & Duration 1**
Magnitude:	**2**
Consequence of impact or risk:	**Clearing and excavation activities can result in erosion and dust.**
Probability of occurrence:	**2 (I)**
Degree to which the impact may cause irreplaceable loss of resources:	**2 (PR)**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**Disturbance to surface area can result in erosion and dust generation**
Cumulative impact prior to mitigation:	**Exposing soil may lead to erosion and dust generation if not mitigated.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**8 - Low**
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:	**1 (CM)**
Proposed mitigation:	**Access to roads and other areas must be controlled to avoid disturbance of areas outside the development footprint. Personnel should be restricted to the immediate clearing areas only.** **Monitor construction areas frequently for signs of erosion and if signs of erosion are detected implement repair and preventative measures immediately.** **Strict compliance with the EMPr.**
Residual impacts:	**It is not anticipated that the impact will be high if the mitigation measures are adhered to.**
Cumulative impact post mitigation:	**It is not anticipated that the impact will be high if the mitigation measures are adhered to.**

Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
OPERATIONAL PHASE	
Potential impact and risk:	**Soil erosion and dust**
Nature of impact:	**None. Area will be developed**
Extent and duration of impact:	**None. Area will be developed**
Magnitude:	**None. Area will be developed**
Consequence of impact or risk:	**None. Area will be developed**
Probability of occurrence:	**None. Area will be developed**
Degree to which the impact may cause irreplaceable loss of resources:	**None. Area will be developed**
Degree to which the impact can be reversed:	**None. Area will be developed**
Indirect impacts:	**None. Area will be developed**
Cumulative impact prior to mitigation:	**None. Area will be developed**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**None. Area will be developed**
Degree to which the impact can be avoided:	**None. Area will be developed**
Degree to which the impact can be managed:	**None. Area will be developed**
Degree to which the impact can be mitigated:	**None. Area will be developed**
Proposed mitigation:	**None. Area will be developed**
Residual impacts:	**None. Area will be developed**
Cumulative impact post mitigation:	**None. Area will be developed**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**None. Area will be developed**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Soil erosion and dust**
Nature of impact:	**Similar to that in the development phase.**

Development Construction	**Biological Aspect Impacts**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Loss of freshwater ecological habitat**
Nature of impact:	**No alternative development footprints are required. The development is appropriate and will not affect the status of the aquatic biodiversity features identified on site as a result of existing disturbances to the valley bottom wetland.**
Extent and duration of impact:	**Extent 1 (footprint) & Duration 1**
Magnitude:	**2**
Consequence of impact or risk:	**Clearing and excavation activities can result in erosion and dust.**
Probability of occurrence:	**2 (I)**
Degree to which the impact may cause irreplaceable loss of resources:	**2 (PR)**
Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**Disturbance to surface area can result in erosion and dust generation**
Cumulative impact prior to mitigation:	**Exposing soil may lead to erosion and dust generation if not mitigated.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**8 - Low**
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:	**1 (CM)**
Proposed mitigation:	**Access to roads and other areas must be controlled to avoid disturbance of areas outside the development footprint. Personnel should be restricted to the immediate clearing areas only.** **Monitor construction areas frequently for signs of erosion and if signs of erosion are detected**

	implement repair and preventative measures immediately. **Rehabilitation of the wetland by attending to alien invasive plant clearing and removal of litter and building rubble in site wetland and creating of buffer around wetland of at least 15m, except for the GAP housing portion on the north and north east of the wetland.** **Creating of stormwater detention after culvert before stormwater is released into the existing drainage line and valley bottom wetland releasing stormwater on site into the Jan Dissels River.** **Rehabilitation of the existing stormwater pond by reshaping it and removal of alien invasive plants in the upper section of the valley bottom wetland and drainage line where into the discharged stormwater from the bigger wetland will be discharged before detained in on site stormwater pond on specially created open space erf in the development footprint.** **Strict compliance with the EMPr.**
Residual impacts:	**It is not anticipated that the impact will be high if the mitigation measures are adhered to.**
Cumulative impact post mitigation:	**It is not anticipated that the impact will be high if the mitigation measures are adhered to.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
OPERATIONAL PHASE	
Potential impact and risk:	**Loss of freshwater ecological habitat**
Nature of impact:	**The wetland is already degraded and the proposed development will not result in further degradations.**
Extent and duration of impact:	**Extent 1 (footprint) & Duration 1**
Magnitude:	**2**
Consequence of impact or risk:	**Clearing and excavation activities can result in erosion and dust.**
Probability of occurrence:	**2 (I)**
Degree to which the impact may cause irreplaceable loss of resources:	**2 (PR)**

Degree to which the impact can be reversed:	**PR**
Indirect impacts:	**Disturbance to surface area can result in erosion and dust generation**
Cumulative impact prior to mitigation:	**Exposing soil may lead to erosion and dust generation if not mitigated.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**8 - Low**
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:	**1 (CM)**
Proposed mitigation:	**Ongoing alien invasive plant control and clearing and litter removal.**
Residual impacts:	**It is not anticipated that the impact will be high if the mitigation measures are adhered to.**
Cumulative impact post mitigation:	**It is not anticipated that the impact will be high if the mitigation measures are adhered to.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Loss of freshwater ecological habitat**
Nature of impact:	**Not Applicable.**

Impact of the irrigation and release of the treated effluent into the Jan Dissels River

According to the Cederberg Local Municipality REFURBISHMENT AND UPGRADE OF CLANWILLIAM WWTP. Technical Report (34459-REP002), the Clanwilliam WWTP is currently operating at 94% of its rated design capacity.
Based on measured flows, the plant is currently receiving an average of 2 257m^3/day, and has a stated design capacity of 2 400m^3/day.
Using historical analysis results, the current organic load of the Clanwilliam WWTP is 1 187kg COD/day measured as O_2. Given that the plant has a design load of only 971kg COD/day, it is clear why the plant is battling with compliance.
Analysis of the Treated Effluent water quality analysis results of the previous 15 months, shows that the Clanwilliam WWTP has not complied with any of the General

Limit Value requirements in this period. The following parameters are of serious concern:
- Faecal Coliform counts,
- Total Suspended Solids concentration,
- Chemical Oxygen Demand concentration, and
- Ammonia concentrations

Upgrading and expanding the WWTW will ensure compliance with Special Limit Value standards.

Faecal Coliforms results in health impact. Irrigation will help as Faecal Coliforms is break down by UV and being exposed to UV during irrigation will help. However, an overload of Faecal Coliforms in both irrigation areas and Jan Dissels River will result in serious long term health issues.

Poor quality Total Suspended Solids concentrations and Chemical Oxygen Demand disrupt the delicate balance of freshwater ecosystems. Toxic substances and oxygen depletion resulting from wastewater contamination harm aquatic plants, fish, and other organisms, leading to a loss of biodiversity and ecosystem collapse. Habitats like wetlands, which provide crucial ecological services, can be severely affected. Irrigation will help to filter and improve Total Suspended Solids concentrations and Chemical Oxygen Demand before it seeps into the Jan Dissels River.

Ammonia concentrations lead to Nutrient Overloading and Eutrophication. When released into freshwater systems, these nutrients act as fertilizers, triggering algal blooms and other symptoms of nutrient pollution. Dense algal blooms can deplete dissolved oxygen concentrations through their decomposition by bacteria, leading to oxygen-deprived conditions harmful to aquatic life, particularly fish populations. Irrigation will help to filter and improve Ammonia concentrations before it seeps into the Jan Dissels River.

The Clanwilliam WWTP discharges its effluent to the Jan Dissels River. Although the Jan Dissels River is not currently a Listed River, requiring discharge of Treated Effluent to meet the Special Limit Values, it is a tributary of the Olifants River, which is a Listed River.

The Cederberg Municipality is desirous to construct an additional 1 158 subeconomic houses at Clanwilliam to address a serious housing need of the community. If this project is not executed, the existing WWTP will NOT be able to deal with the additional flow from the proposed housing project. Temporary works was already constructed to improve the utilization of the Clanwilliam WWTP capacity in off-peak periods, thereby freeing up limited capacity for the short-term. It made it possible to treat an additional 500m^3 per day in this manner over the short-term, but will not be sustainable for the longer term. Hence the reason for the expansion of the WWTW as per the activity description.

Development Construction	**Construction of WWTW**
PLANNING, DESIGN AND DEVELOPMENT PHASE	
Potential impact and risk:	**Poor quality treated effluent, resulting from overloaded, poorly maintained, or inefficient wastewater treatment works (WWTWs), has a severe and multifaceted impact on the environment. It acts as a major point source of pollution, introducing pathogens, excess nutrients, chemicals, and heavy metals into receiving water bodies**
Nature of impact:	**Construction and upgrades to WWTW can lead to poor water quality.**
Extent and duration of impact:	**Extent (footprint) & Duration temporary**
Magnitude:	**Moderate**
Consequence of impact or risk:	**Construction and upgrades to WWTW can lead to poor water quality.**
Probability of occurrence:	**Likely**
Degree to which the impact may cause irreplaceable loss of resources:	**High**
Degree to which the impact can be reversed:	**High**
Indirect impacts:	**Construction and upgrades to WWTW can lead to poor water quality.**
Cumulative impact prior to mitigation:	**Construction and upgrades to WWTW can lead to poor water quality.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Medium**
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**
Proposed mitigation:	**Preserve drainage line as much as possible** **Preserve buffer zones as much as possible** **Prevent loose soil and sediments from moving down the drainage line along with storm water**
Residual impacts:	**It is not anticipated that the impact will be high if the mitigation measures are adhered to.**

Cumulative impact post mitigation:	**It is not anticipated that the impact will be high if the mitigation measures are adhered to.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
OPERATIONAL PHASE	
Potential impact and risk:	**Loss of freshwater ecological habitat**
Nature of impact:	**Poor quality treated effluent affecting the Aquatic Biodiversity features**
Extent and duration of impact:	**Longterm**
Magnitude:	**Very high**
Consequence of impact or risk:	**Untreated sewage ending up in the aquatic environment** **Treated effluent into the aquatic environment** **Leaky pipes and conduits**
Probability of occurrence:	**Likely**
Degree to which the impact may cause irreplaceable loss of resources:	**Very High**
Degree to which the impact can be reversed:	**High**
Indirect impacts:	**Untreated sewage ending up in the aquatic environment** **Treated effluent into the aquatic environment** **Leaky pipes and conduits**
Cumulative impact prior to mitigation:	**High Water quality currently does not meet the standards.**
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Very High**
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**
Proposed mitigation:	**Upgrade and expansion of WWTW** **Establish containment capacity for mishaps and spills**

	Maintain the WWTWs **Maintain pipelines** **Montor effluent quality.** **Make analytical results public** **Keep surrounding environment tidy**
Residual impacts:	**It is not anticipated that the impact will be high if the mitigation measures are adhered to.**
Cumulative impact post mitigation:	**It is not anticipated that the impact will be high if the mitigation measures are adhered to.**
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	**Low**
DECOMMISSIONING AND CLOSURE PHASE	
Potential impact and risk:	**Loss of freshwater ecological habitat**
Nature of impact:	**Not Applicable.**

Cumulative Impacts

Cumulative impacts arise from the combined presence of several similar developments within an area which affect aquatic biodiversity and ecological processes operating at broader scales or which each have a small impact which becomes significant when combined. There are other developments that also represents a source of disturbance and habitat loss, which when combined with the proposed development would result in some cumulative impact. However, when taken in context of the broader landscape, the cumulative impacts are not likely to be highly significant given the aquatic biodiversity features of the area.

7. CONCLUSION AND RECOMMENDATIONS

Enviro-EAP (Pty) Ltd was appointed to undertake a Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) analysis of the freshwater and riparian resources.

A site development plan layout amendment is required. The valley bottom wetland east of the development and golf course must be protected by a 15m wide buffer. In order to achieve this, the layout must be amended and the sewerage pipeline and pump station associated with an access road must be removed from the Site Development Plan in order to protect it. This will ensure that the development is appropriate and will not affect the status of the aquatic biodiversity features identified on site as a result of existing disturbances to the non-perennial river. Rehabilitation of the wetland by attending to alien invasive plant clearing and removal of litter and building rubble inside the wetland and creating of buffer around wetland of at least 15m, except for the GAP housing portion on the north and northeast of the wetland

will protect the one wetland mapped. Creating stormwater detention after culvert before stormwater is released into the existing drainage line and valley bottom wetland releasing stormwater on site into the Jan Dissels River will protect the downstream valley bottom wetland. Rehabilitation of the existing stormwater pond by reshaping it and removal of alien invasive plants in the upper section of the valley bottom wetland and drainage line where into the discharged stormwater from the bigger wetland will be discharged before detained in on site stormwater pond on specially created open space erf in the development footprint will protect the valley bottom wetland and stormwater discharged into the Jan Dissels river.

No Freshwater Ecosystem Priority Area (FEPA) was mapped which confirmed the low impact.

The peer review has identified a number of short-comings in terms of alignment with best practice in the field of aquatic biodiversity assessment. These are what EnviroSwift believes to be an incorrect classification of the on-site aquatic feature as a drainage line whereas it is in fact a wetland. This was corrected in this peer review report and as identified assessed as a valley bottom wetland. When assessed in terms of compliance with the gazetted Protocol for Aquatic Biodiversity Assessment the report is found to have the following critical flaws:

- Drawings such as an SDP that show the extent of the development and whether any aquatic features are being retained were absent in the Enviro-EAP Aquatic Biodiversity Assessment report. This was corrected and included as figure 2.
- Failure to consult the WCBSP (2023) as this would have confirmed the provincial biodiversity conservation importance of the downstream, receiving aquatic features (indicated as an Aquatic CBA). When the report was drafted, the 2017 WCBSP was applicable. It was however updated in this report to the 2023 version and the Aquatic ESA mapped on the assessment area was corrected in this report.
- Lack of proof of the methods used to classify and delineate the on-site freshwater features such as auger results. Had auger samples been taken within the feature, the lack of evidence of alluvial processes would have been identified and the feature correctly identified as a wetland. The auger sampling and delineations done by EnviroSwift was used to update this peer reviewed report.
- Failure to recommend the minimum buffer width; and. The recommended 15m buffer, except for the GAP housing areas in north and north east of the wetland was accommodated in the SDP. Furthermore, the SDP was amended and the road, stormwater pipe and sewerage pipeline on the downstream wetland east of the golf course was removed from the site development plan. An open space erf was created in the layout to accommodate a stormwater detention pond before stormwater is discharged into this wetland system. A 15 buffer area is therefore not required in this section as the development infrastructure and roads was removed from the preferred layout.
- Failure to present a reasoned authorisation opinion based on a thorough evaluation of the assessment criteria that comprises an Aquatic Biodiversity Assessment. This was corrected in the updated peer review report.

8. REFERENCES

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APPENDIX A
SPECIALIST CV

CURRICULUM VITAE – NICOLAAS WILLEM HANEKOM

Profession: Environmental Scientist and Environmental Assessment Practitioner

Date of Birth: 01/02/1967

BIOGRAPHICAL SKETCH

Nicolaas Hanekom is a qualified Environmental Assessment Practitioner (”EAP”) who holds a Masters Technologiae, Nature Conservation (“Vegetation Ecology and

Biodiversity Assessment") degree from the Cape Peninsula University of Technology. Nicolaas is certified in terms of section 20(3)(a) of the Natural Scientific Professions Act, 2003 (Act 27 of 2003), as a Professional Natural Scientist Ecological Science (Pri.Sci.Nat); Aquatic Science & Conservation Science (Cand.Sci.Nat), Registration Number: 004415. He further qualified in Environmental Management Systems ISO 14001:2004, at the Centre for Environmental Management, North-West University, as well as Environmental Management Systems ISO 14001:2004 Audit: Internal Auditors Course to ISO 19011:2003 level, from the Centre for Environmental Management, North-West University qualifying him to execute audits to ISO/SANS environmental compliance and EMS standards.

He has also completed the suite of Greener Governance courses with certificates in;

- An Overview of Environmental Management at the Local Government Level, Centre for Environmental Management, North-West University;
- Greener Governance for Local Authorities, Centre for Environmental Management, North-West University;
- Tools for Integrated Environmental Management and Governance, Centre for Environmental Management, North-West University.

He further attended and obtained a certificate on Integrated Protected Area Planning at the Centre for Environmental Development, University of Kwa Zulu Natal and a certificate in Project Management (Theory and Practical), through CS Holdings. Nicolaas has lectured in two subjects at the Cape Peninsula University of Technology. He has 26 years of environmental planning experience, working for Free State and Western Cape departments of environmental affairs, where he reviewed and commented on development (EIA) applications, in the West Coast Region.

He has, as practising EAP been responsible for many environmental impact assessments and EIA applications, waste license and atmospheric emission license applications.

He has also been involved in the implementation of several environmental management systems. He has engaged successfully with various clients as set out below.

Areas of specialisation:	Ecosystem (terrestrial and aquatic) monitoring and assessments Design of monitoring programmes for ecosystems (terrestrial and aquatic) Environmental Impact Assessments River classification and environmental water requirements Wetlands Delineation River and Wetlands management

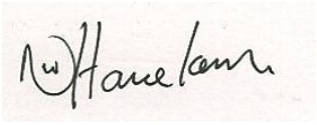
	Water Use Authorization Applications Water quality management River Health Assessments
Countries of Work Experience:	South Africa (Northern Cape, Western Cape, Free State, Mpumalanga, Gauteng)
Employment Record	Student at Bontebok National Park (1992) Assistant Reserve Manager at Gariep Dam Nature Reserve, Free State (1993 - 1998) Reserve Manager, Conservation Services Manager for Western Cape Nature Conservation Board (1998 - 2006) External Lecturer at Cape Peninsula University of Technology (2003 - 2005) Director: Environmental Management at Cape Lowlands Environmental Services (2006 – 2010) Director, Environmental Management and lead Environmental Impact Assessment Practitioner at Eco Impact (Pty) Ltd (2010 – to August 2019) Director, Environmental Management and lead Environmental Impact Assessment Practitioner at Enviro-EAP (Pty) Ltd (September 2019 – to date)
Professional membership, accreditations and courses	South African Council for Natural Scientists Professions Pri.Sci.Nat (Ecological Science) Riparian vegetation identification and health assessment. Internal Western Cape Nature Conservation short course presented by Dr C Boucher (Stellenbosch University) in 2000. SASS5 Aquatic Biomonitoring Training Course. 2 to 5 September 2013. Ground Truth Water and Environmental Engineering consultancy in partnership with the Department of Water Affairs. Workshop on “Section 21(c) and (i) Water Use Training: Understanding Watercourses and Managing Impacts to their Characteristics”. 10 May 2017. Presented by Dr Wietsche Roets of the Department of Water and Sanitation (Sub-Directorate: Instream Water Use).
Summary of experience	1992: South African National Parks. Student at Bontebok National Park with management and monitoring actions related to the Breede River. 1993 -1998: Free State Nature Conservation. Ecological management and monitoring actions related to the Gariep Dam, Orange and Caledon Rivers. 1998 -2006: CapeNature. Ecological management and monitoring actions related to the Berg River Estuary, Verlorenvlei, Lamberts bay’s Jackalsvlei, Wadrift Soutpanne, Oliphant’s River mouth, Rocherpan Nature Reserve, etc.

	Review and assessment of EIA applications, inclusive of Freshwater ecology. Did some site visits with Department of Water Affairs and Forestry (Hester Lyons) to confirm the presence of aquatic ecological features during EIA water use registration applications. 2006 to date: Cape Lowland Environmental Services, Eco Impact Legal Consultant and Enviro-EAP. Ecological (Freshwater and aquatic) Specialist input, assessment, monitoring and reports.
Publications and assessment reports	Just to name a few. Was involved in many Ecological Assessments, monitoring and inputs in EIA applications. Elandskloof Farm 475 Citrusdal Biodiversity Baseline Survey. August 2010. This Biodiversity Assessment Covering Terrestrial and Aquatic Aspects to Inform Decisions Regarding The Proposed Elandskloof Weir Flood Damage Project On Farm 475, In The Citrusdal Area. Cape Solar Energy Electricity Generation Facility. Farm 187/3 & 187/13 Kenhardt. Biodiversity And Ecological Baseline Survey. January 2011. (Included Terrestrial and aquatic ecological assessments and water use authorization applications) Prieska Photvoltaic Power Generation Project. Prieska Commonage Northern Cape. Biodiversity And Ecological Baseline Survey. July 2011. (Included Terrestrial and aquatic ecological assessments and water use authorization applications) Witteklip Erf 123 Extension, Vredenburg. Biodiversity Baseline Survey. Updated - October 2012 (Included Terrestrial and aquatic ecological assessments and water use authorization applications) Baseline Biodiversity Survey And Wetland Delineation for ECCA Holdings: Cape Bentonite Mine on Erf 1412 Near Heidelberg. Prepared for: Shangoni Management Services Pry (Ltd). October 2014. Freshwater Impact Assessment Laingsburg Flood Damage Repairs & Storm Water Infrastructure. 18 February 2016. Ecological Assessment for Swartland Municipality - Upgrades To Voortrekker/Bokomo Road And Voortrekker/Rozenburg Road Intersections and Upgrade to the Diep River Bridge, Malmesbury on A Portion Of Erf 327, Malmesbury (Road) Erf 1530, Diep River Bridge Crossing, and Erf 1528, Property South of Diep River where Road Widening and Turning Circle Will Be Constructed. March 2016. (Freshwater Ecology Inputs and Water Use Registration) Freshwater Impact Assessment. McGregor Bridge, Robertson Bridge and Willem Nels River Maintenance Management Plan.

	24 June 2016. (Freshwater Ecology assessment and input as well as Water Use Registration) Water Use Authorization Application Risk Matrix. Orange Grove Trust Vegetation Clearing and Agricultural Development on Portion 4 of Farm Glen Heatlie No 316, Worcester. 12 June 2017. (Freshwater ecological inputs in EIA process and Water Use Registration). Water Use Authorization Application Risk Matrix Prepared For: Witzenberg Municipality Sand Mine Farm 1 Prince Alfred Hamlet. 28 March 2017. (Freshwater ecological inputs in EIA process and Water Use Registration). Proposed Hartmanshoop Agri Vegetation Clearing Project and Irrigation on Erf 686, Laingsburg. 12 August 2017. (Freshwater ecological inputs in Water Use Registration). County Fair: Hocraft Abattoir And Rendering Facility Waste Water Treatment Works "CF Hocraft WWTW" Mosselbank River Second Quarter 2018 Biomonitoring Report. June 2018. (Done quarterly biomonitoring for the last three years).

CERTIFICATION

I, the undersigned, certify that to the best of my knowledge and belief, these data correctly describe my qualifications, my experience, and me.



Nicolaas Hanekom Pri Sci Nat (Ecology).
Registration number 004415