

**PEER REVIEWED AQUATIC BIODIVERSITY IMPACT ASSESSMENT**

**THE PROPOSED CITRUSDAL HOUSING DEVELOPMENT AND ASSOCIATED  
INFRASTRUCTURE ON ERVEN 3677, 3680 AND 3617 AND RESERVOIR ON FARM  
NR: RE/4/555 (NEXT TO EXISTING RESERVOIR, CITRUSDAL**



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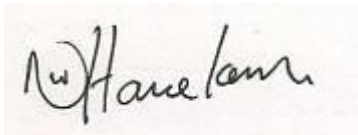
**March 2026**

## 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**

Signature of the EAP/ Specialist:

**25 March 2026**

Date:

**Enviro-EAP (Pty) Ltd**

Name of company (if applicable):

<b>COMPLIANCE WITH THE DEPARTMENT OF ENVIRONMENTAL AFFAIRS SCREENING TOOL</b>	<b>ADDRESSED IN SPECIALIST REPORT</b>
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 development.

### **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 and Zoological 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<sup>1</sup> provides the criteria for the reporting of requirements for the assessment and reporting of impacts on aquatic biodiversity for activities requiring environmental authorisation.

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1 Published in Government Notice No. 648 GOVERNMENT GAZETTE 4542110 MAY 2019. This gazette is also available free online at [www.gpwonline.co.za](http://www.gpwonline.co.za)

## 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.
- 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 plant species within this region is between August and end October months, but for aquatic biodiversity it is the winters months in this region. However, proven methodology is used to assess the Freshwater Ecological features and this can be done throughout the year. The sampling and analysis of the site during summer is an optimum season in terms of Aquatic Biodiversity Assessment (23 October 2024), provides suitable data and results to present an informed decision on the local freshwater ecology. Although in summer and no rainfall, water flow in the stream and channels was present and the EIS and PES of the streams and channels could still be determined making use of the methodologies as described below.

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.
- PES: WET-Health Version 2 (Macfarlane *et al.*, 2020) is a tool designed to assess the health or integrity of a wetland. Wetland health is defined as a measure of the deviation of wetland structure and function from the wetland's natural reference condition. This technique attempts to assess hydrological, geomorphological, water quality and vegetation health in four separate modules. The modules are then combined to determine the overall Present Ecological State (PES) of the wetland.
- 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. 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<sup>2</sup> 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

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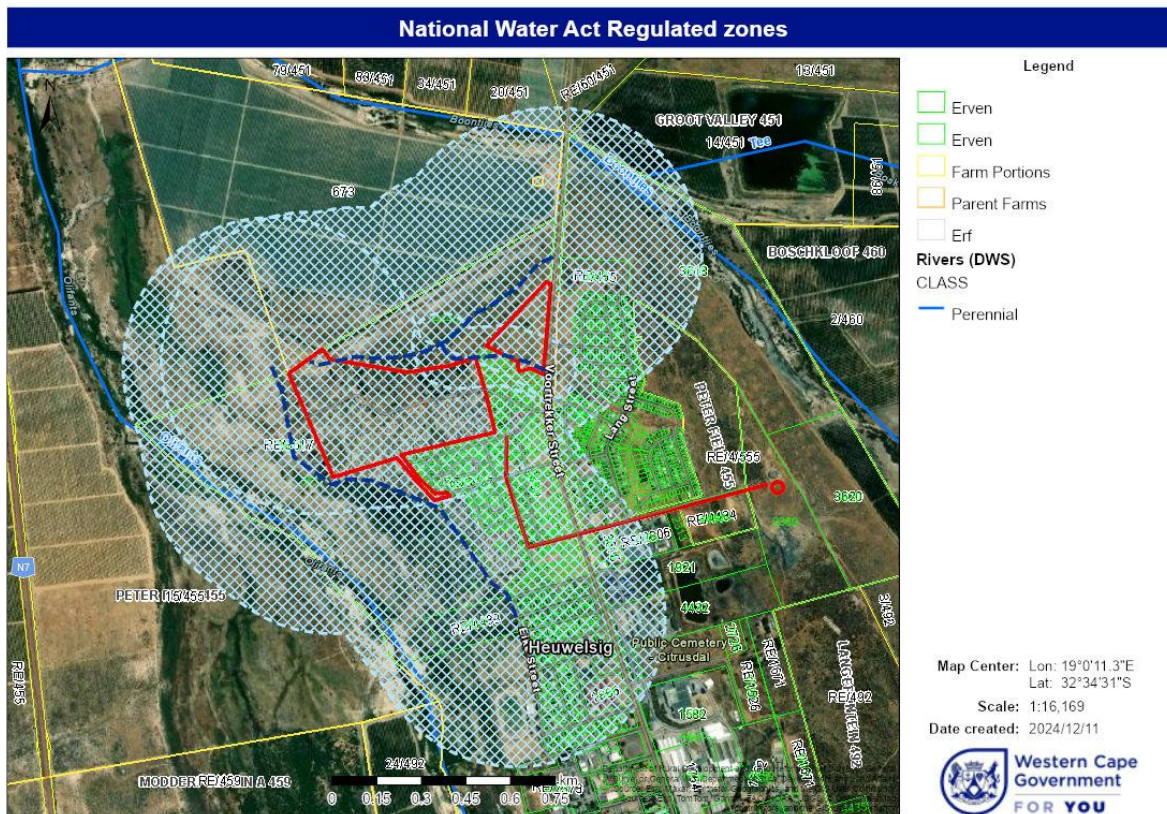
<sup>2</sup> For the purpose of this document, “reach” is broadly defined as “a specified segment of a stream’s path” ([www.wwnorton.com/college/geo/earth2/glossary/r.htm](http://www.wwnorton.com/college/geo/earth2/glossary/r.htm)).

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 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. Blue dotted polygon represents the 100m and 500m regulated buffer area. Blue dotted line represents mapped streams and delineated wetland edges. Solid red line polygon represents proposed development site area.

### 1.5.1.1. Ecological Importance and Sensitivity (EIS)

The Ecological Importance and Sensitivity (EIS) of riparian areas is an expression of the importance of the aquatic resource for the maintenance of biological diversity and ecological functioning on a local scale to a more broader scale; whilst Ecological Sensitivity (or fragility) refers to a system’s ability to resist disturbance and its capability to recover from disturbance once it has occurred (Kleynhans & Louw, 2007). The list of the EIS categories and rating scheme used in the assessment tool are shown in Table 1 and Table 2 respectively.

**Table 1:** List of the EIS categories used in the assessment tool (Kleynhans & Louw, 2007)

EISC	General description	Range of median
Very high	Quaternaries/delineations that are considered to be unique on a national and international level based on unique biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) are usually very sensitive to flow modifications and have no or only a small capacity for use.	>3-4
High	Quaternaries/delineations that are considered to be unique on a national scale based on their biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) may be	>2-≤3

	sensitive to flow modifications but in some cases may have substantial capacity for use.	
Moderate	Quaternaries/delineations that are considered to be unique on a provincial or local scale due to biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) are not usually very sensitive to flow modifications and often have substantial capacity for use.	>1-≤2
Low/ marginal	Quaternaries/delineations which are not unique on any scale. These rivers (in terms of biota and habitat) are generally not very sensitive to flow modifications and usually have substantial capacity for use.	≤1

**Table 2:** Rating scheme used for the assessment of riparian EIS (Kleynhans & Louw, 2007)

Score	Channel Type	Conservation context			Vegetation and Habitat Integrity	Connectivity	Threat status of Vegetation Type
		Non-FEPA river	No status	None/ Excluded			
0	Ephemeral Stream	Non-FEPA river	No status	None/ Excluded	No natural remaining	None	No Status
1	Stream non-perennial		Upstream management area	Available	Very poor	Very poor	Least threatened
2	Stream-perennial flow		Rehab FEPA		Poor	Low	Vulnerable
3	Minor river-non-perennial flow		Fish corridor	Earmarked for conservation	Moderately modified	Moderate	Near Threatened
4	Minor river-perennial flow		Fish support area		Largely natural	High	Endangered
5	Major river-perennial flow	FEPA river	River FEPA	Protected	Unmodified / natural habitat	Very high	Critically Endangered

### 1.5.1.2. National Freshwater Ecosystem Priority Areas (NFEPAs; 2011)

The National Freshwater Ecosystem Priority Areas (NFEPAs) 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 NFEPAs project aimed to identify a national network of freshwater conservation areas and to explore institutional mechanisms for their implementation.

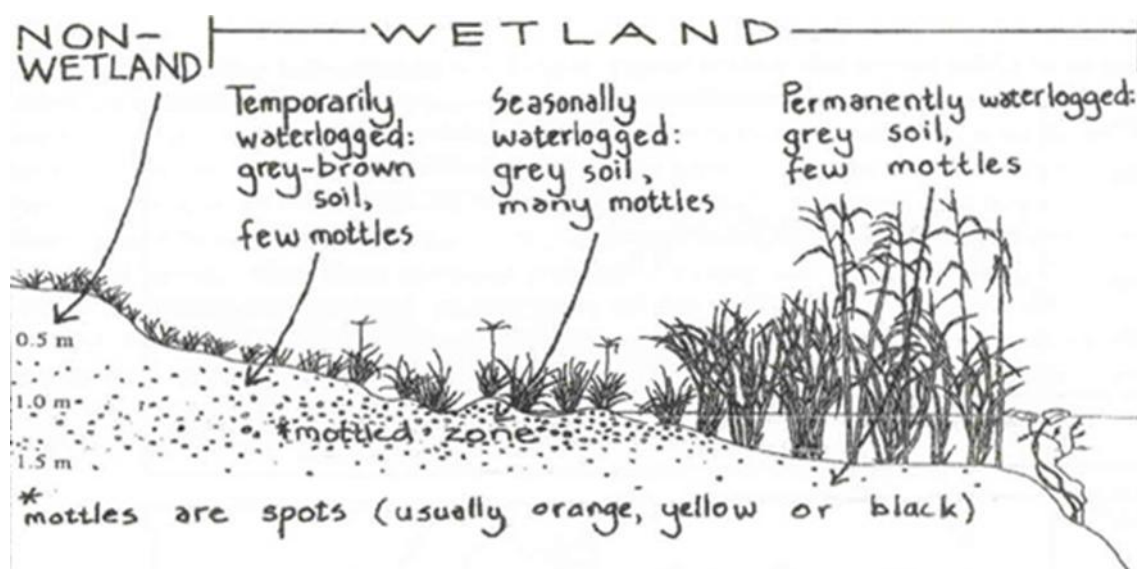
NFEPAs takes forward the implementation of the Cross-Sector Policy Objectives for Inland Water Conservation. It also builds on the river component of the National Spatial

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 feature present in the vicinity of the proposed development.

### 1.5.1.3. Wetland and Freshwater Ecological Features Delineation


The wetland delineation process uses four wetland indicators to provide an estimate of the extent of a wetland. They are: landscape position (must be flat or depressed), vegetation (must be hydrophilic), soil form (must compliment an existing wetland type) and soil wetness (water table must be within 50cm of profile).




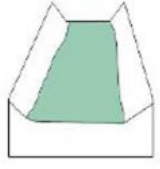
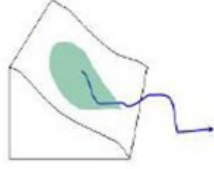


**Figure 2:** Wetland illustration

The guideline document, “A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas”, as published by DWAF (2005) was followed for the delineation of the wetland areas<sup>3</sup> (if present). According to the delineation procedure, the wetlands were delineated by considering the following wetland indicators: terrain unit indicator; soil form indicator; soil wetness indicator; and vegetation indicator.

**Table 3:** Wetland hydro-geomorphic types typically supporting inland wetlands in South Africa

Hydro-geomorphic types	Description	Source of water maintaining wetland <sup>1</sup>	
		Surface	Sub-surface
Floodplain 	Valley bottom areas with a well-defined stream channel gently sloped and characterized by floodplain features and the alluvial transport and deposition of sediment, usually leading to a net accumulation of sediment. Water inputs from main channel and from adjacent	***	*

<sup>3</sup> Department of Water Affairs and Forestry. (2005b). *A practical field procedure for identification and delineation of wetland and riparian areas*. DWAF, Pretoria.

	slopes.		
<p>Valley bottom with a channel</p> 	Valley bottom areas with a well-defined stream channel but lacking characteristic floodplain features. May be gently sloped and characterized by the net accumulation of alluvial deposits or may have steeper slopes and be characterized by the net loss of sediment. Water inputs from main channel and from adjacent slopes.	***	*/ ***
<p>Valley bottom without a channel</p> 	Valley bottom areas with no clearly defined stream channel usually gently sloped and characterized by alluvial sediment deposition, generally leading to a net accumulation of sediment. Water inputs mainly from channel entering the wetland and from adjacent slopes.	***	*/ ***
<p>Hillslope seepage linked to stream channel</p> 	Slopes on hillsides, characterized by the colluvial movement of materials. Water inputs are mainly from sub-surface flow and outflow is usually via a well-defined stream channel connecting the area directly to a stream channel.	*	***
<p>Isolated hillslope seepage</p> 	Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs mainly from sub-surface flow and outflow either very limited or through diffuse sub-surface and/or surface flow but with no direct surface water connection to a stream channel.	*	***
<p>Depression (includes Pans)</p> 	A basin shaped area with a closed elevation contour that allows for the accumulation of surface water (i.e. it is inward draining). It may also receive sub-surface water. An outlet is usually absent, and therefore this type is usually isolated from the stream channel network.	*/ ***	*/ ***

<sup>1</sup> Precipitation is an important water source and evapotranspiration is important.

Water source: \* Contribution usually small

\*\*\* Contribution usually large

\*/ \*\*\* Contribution may be small or important depending on the local circumstances

#### 1.5.1.4. Rapid Habitat Assessment

The Rapid Habitat Assessment Method (RHAM) is a simplified approach to measure and estimate habitat conditions according to cross sections through broadly defined morphological units (Kleynhans & Louw, 2007). The RHAM methodology consists of a

series of steps. The methodology allows for a set cross sections of various Geomorphic Habitat Unit (GHU) to be monitored temporally, and for the biotic results to be interpreted more specifically with regards to habitat potential and availability in the GHUs of the reach.

**Data interpretation and Thresholds of Probable Concern (TPC)**

For each of the water quality indicators (other than visible biotic response), the following rating system is used:

- 0 = natural / no impact
- 1 = small impact
- 2 = moderate impact
- 3 = large impact
- 4 = serious impact
- 5 = extreme impact

TPCs are set according to the EIS of the site. If a TPC is exceeded, a management intervention is required. The management action to be undertaken is determined by the indicator exceeded and its significance to the water quality impact on the ecological state of the site.

Low or Moderate EIS: Should any indicator be 2 and lower, i.e. a no impact, small or moderate impact, no management intervention should be initiated.

High EIS: Should any indicator exceed 2, i.e. a large to extreme impact, a management intervention should be initiated, e.g. move up to the next level of monitoring, more frequent biomonitoring, more frequent assessments of that site, or identification of the cause.

**1.5.1.5. 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.

**The Present Ecological Status categories (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

**1.5.1.6. Department of Water and Sanitation (DWS) Resource Quality Information Services (RQIS), Present Ecological State / Ecological Importance and Sensitivity (PES/EIS) Database (2014)**

The information obtained from these assessments/databases was used as first level desktop assessments for purposes of ecological reserve determination and for Ecological Water Resource Monitoring (EWRM).

**1.5.1.7. RISK ASSESSMENT KEY (General Authorisation in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998) for water uses as defined in Section 21(c) or Section 21(i) (Gazette No. 49833, Notice 4167, 8 December 2023): Section 21 c and i water use Risk Assessment Protocol)**

<b>TABLE 4 – IMPORTANCE OF AFFECTED WATERCOURSE/S</b>	
What is the overall importance of the watercourse/s, based on the criteria and guidelines provided below?*	
(If no formal assessment of EI / EIS / Wetland Importance has been completed, assign rating according to criterion below that results in the highest score)	
<p><b>Low or Very Low EI / EIS / Wetland Importance rating; <u>OR</u>,</b>            If EI/EIS has not been determined, Low rating based on presence of:</p> <ul style="list-style-type: none"> <li>- no areas identified to be of conservation importance (i.e. OESA at most); and/or</li> <li>- only species/habitats of Least Concern on the IUCN Red List or on a regional/national Red List (including freshwater ecosystem types of Least Concern in terms of the NBA); and/or</li> <li>- only species which are common and widespread and/or habitats of low conservation interest; and/or</li> <li>- highly degraded habitat of extremely small size</li> </ul>	<b>Low / Very low = 2</b>
<p><b>Medium EI / EIS / Wetland Importance rating; <u>OR</u>,</b>            If EI/EIS has not been determined, Moderate rating based on presence of:</p> <ul style="list-style-type: none"> <li>- CESAs; and/or</li> <li>- species/habitats listed as VU or NT on the IUCN Red List or on a regional/national Red List (including VU/NT freshwater ecosystem types in terms of the NBA); and/or</li> <li>- functionality as an important ecological corridor or buffer area</li> </ul>	<b>Moderate = 3</b>
<p><b>High EI / EIS / Wetland Importance rating; <u>OR</u>,</b>            If EI/EIS has not been determined, High rating based on presence of:</p> <ul style="list-style-type: none"> <li>- CBA2; and/or</li> <li>- species or degraded habitats (in poor condition) listed as EN or CR on the IUCN Red List or on a regional/national Red List (including EN/CR freshwater ecosystem types in terms of the NBA)</li> </ul>	<b>High = 4</b>

<p><b>Very high EI / EIS / Wetland Importance rating; OR,</b>          If EI/EIS has not been determined, Very high rating based on presence of:          -CBA1; and/or          - FEPA; and/or          - species or intact habitats (in fair or good condition) listed as EN or CR on the IUCN Red List or on a regional/national Red List (including EN/CR freshwater ecosystem types in terms of the NBA); and/or          - KBA or IBA or Ramsar site</p>	<p><b>Very high = 5</b></p>
<p>* EI=Ecological Importance; EIS=Ecological Importance &amp; Sensitivity; OESA=Other Ecological Support Areas; IUCN=International Union for Conservation of Nature; CESA=Critical Ecological Support Area; NBA=National Biodiversity Assessment; VU=Vulnerable; NT=Near Threatened; EN=Endangered; CR=Critically Endangered; CBA=Critical Biodiversity Area; FEPA=Freshwater Ecosystem Priority Area; KBA=Key Biodiversity Area; IBA=Important Bird Area.</p>	

<b>TABLE 5- INTENSITY OF IMPACT</b>	
What is the intensity of the impact on the resource quality (hydrology, water quality, geomorphology, biota)?	
<b>Negative Impacts</b>	
Negligible / non-harmful; no change in PES	0
Very low / potentially harmful; negligible deterioration in PES (<5% change)	+1
Low / slightly harmful; minor deterioration in PES (<10% change)	+2
Medium / moderately harmful; moderate deterioration in PES (>10% change)	+3
High / severely harmful; large deterioration in PES (by one class or more)	+4
Very high / critically harmful; critical deterioration in PES (to E/F or F class)	+5
<b>Positive Impacts</b>	
Negligible; no change in PES	0
Very low / potentially beneficial; negligible improvement in PES (<5% change)	-1
Low / slightly beneficial; minor improvement in PES (<10% change)	-2
Medium / moderately beneficial; moderate improvement in PES (>10% change)	-3
Highly beneficial; large improvement in PES (by one class or more) and/or increase in protection status	-4
Very highly beneficial; improvement to near-natural state (A or A/B class) and/or major increase in protection status	-5
<b>NOTE: Positive Impacts must be given a negative Intensity Score</b>	
<b>*PES of affected watercourses must be considered when scoring Impact Intensity</b>	

<b>TABLE 6 – SPATIAL SCALE (EXTENT) OF IMPACT</b>	
How big is the area that the activity is impacting on, <b>relative to the size of the impacted watercourses?</b>	
Very small portion of watercourse/s impacted (<10% of extent)	1
Moderate portion of watercourse/s impacted (10-60% of extent)	2
Large portion of watercourse/s impacted (60-80%)	3
Most or all of watercourse/s impacted (>80%)	4
Impacts extend into watercourses located well beyond the footprint of the activities	5

<b>TABLE 7 – DURATION OF IMPACT</b>	
How long does the activity impact on the resource quality?	
Transient (One day to one month)	1
Short-term (a few months to 5 years) OR repeated infrequently (e.g. annually) for one day to one month	2
Medium-term (5 – 15 years)	3
Long-term (ceases with operational life)	4

Permanent	5
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<b>TABLE 8 – LIKELIHOOD OF THE IMPACT</b>	
What is the probability that the activity will impact on the resource quality?	
Improbable / Unlikely	20%
Low probability	40%
Medium probability	60%
Highly probable	80%
Definite / Unknown	100%

<b>TABLE 9: RISK RATING CLASSES</b>		
<b>RATING</b>	<b>CLASS</b>	<b>MANAGEMENT DESCRIPTION</b>
<b>1 – 29</b>	<b>(L) Low Risk OR (+) Positive (+ +) Highly positive</b>	Acceptable as is or with proposed mitigation measures. Impact to watercourses and resource quality small and easily mitigated, or positive.
<b>30 – 60</b>	<b>(M) Moderate Risk</b>	Risk and impact on watercourses are notable and require mitigation measures on a higher level, which costs more and require specialist input. Licence required.
<b>61 – 100</b>	<b>(H) High Risk</b>	Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve. Licence required.
<b>A low risk class must be obtained for all activities to be considered for a GA</b>		

<b>TABLE 10: CALCULATIONS AND MAXIMUM VALUES</b>	
Intensity = Maximum Intensity Score (negative value for positive impact) X 2	MAX = 10
Severity = Intensity + Spatial Scale + Duration (<Intensity - Spatial Scale - Duration> for positive impact)	MAX = 20 (MIN = -20 for +ve impacts)
Consequence = Severity X Importance rating	MAX = 100
Significance/Risk = Consequence X (Likelihood / 100)	MAX = 100

## 1.6. Assumptions and limitations

The ground-truthing, site survey and delineation of the freshwater resource assessment thereof are confined to a single site visit undertaken 23 October 2024, 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:

- 1:50 000 topographic mapping sourced from the Surveyor General's office;
- Aerial imagery sourced from Google Earth.
- Aerial imagery sourced from ESRI.
- Dayaram, A., Harris, L., Grobler, B. A., van der Merwe, S., Rebelo, A. G., Powrie, L. W., Vlok, J. H. J., Desmet, P., Qabaqaba, M., Hlahane, K. M., & Skowno, A. L. (2018). Vegetation Map of South Africa, Lesotho and Swaziland 2018: A description of changes since 2006. *Bothalia*, 49(1), a2452. [https://doi.org/10.4102/ abc.v49i1.2452](https://doi.org/10.4102/abc.v49i1.2452)
- National Wetlands Map Version 5 (CSIR, 2018), Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2018 (NPAES).
- CapeNature. 2024. 2023 Western Cape Biodiversity Spatial Plan and Guidelines Overview V2.0. Unpublished Report.

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 survey was conducted on 23 October 2024. The survey was 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. The presence of wetlands or pans and rivers 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 Water Act (Act 36 of 1998)

### ***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 development area of the recommended site is within 500m from wetlands and rivers (NWA regulated zones). No infrastructure will be constructed inside the wetland areas. The mapped non-perennial river was channelled and in poor ecological conditions and the development will be resulting in the infilling of this earth channel channelled non-perennial river.

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**

Citrusdal Housing Development on remainder of Erf 3677, 3680 and RE 3617, Citrusdal. The development will consist of:

**Phase B: Erf 3677 with a total development footprint of ±3.3282ha**

13 Residential zone zone 2 erven with an average erf size: ±120m<sup>2</sup>

2 General Residential Zone 2 erven

3 Business Zone 2 erven

3 Open Space Zone I erf

1 Transport Zone I erven

1 Transport Zone II erven

**Phase C: Erf 3617 with a total development footprint of ±9.4478 ha**

163 Residential Zone 2 erven Average erf size: ±120m<sup>2</sup>

223 Residential Zone 2 erven Average erf size: ±120m<sup>2</sup> - 2 families per erf

9 Open Space Zone 1 erven

1 Community Zone 2 (church) erf

1 Community Zone 1 (crèche) erf

1 Community Zone 1 (community center) erf

1 Local Business Zone 2 erven

Transport Zone 2 erven

**Erf 3617 with a total development footprint of ±10.1596 ha**

117 Residential Zone 2 erven Average erf size: ±120m<sup>2</sup>

317 Residential Zone 2 erven Average erf size: ±120m<sup>2</sup> - 2 families per erf

5 Open Space Zone 1 erven

Transport Zone 2 erven

with a development footprint of ±22.9367ha.

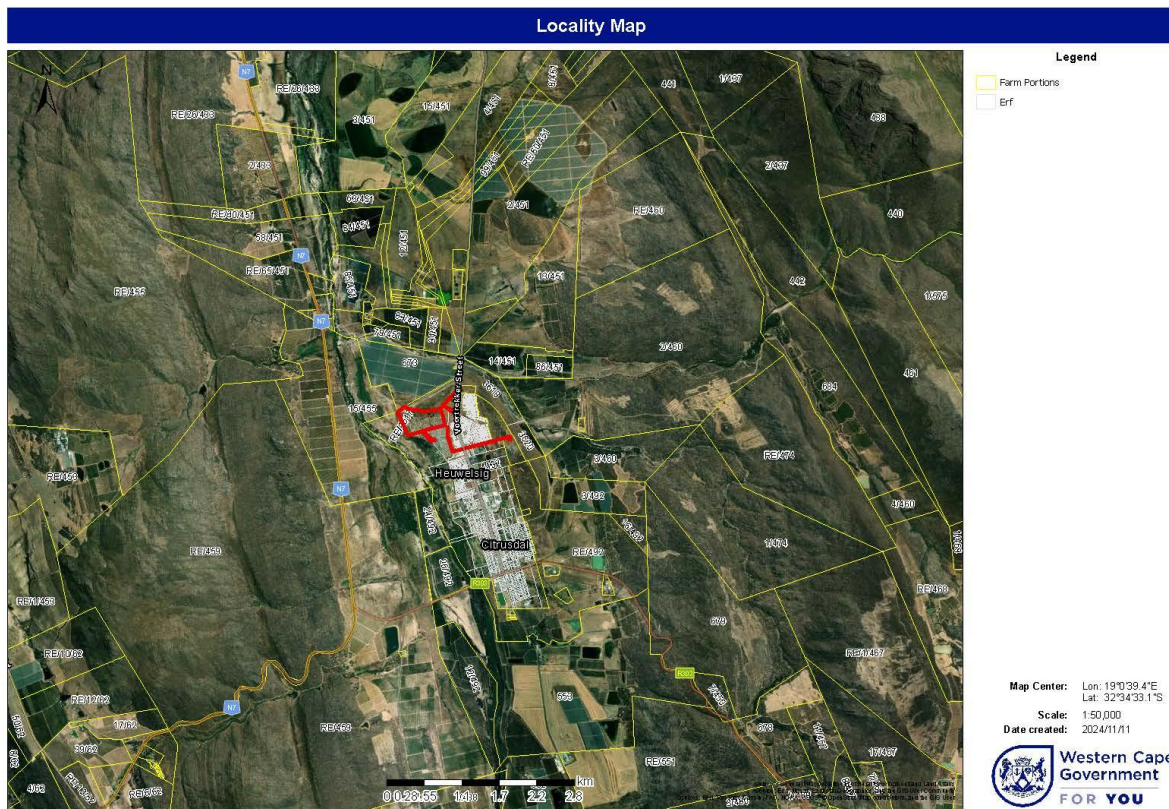
Expanding reservoir by constructing a 3 ML reservoir next to existing on a portion of the remainder of Farm number 555, portion 4, Citrusdal

### **4. DESCRIPTION OF THE AFFECTED ENVIRONMENT.**

#### **4.1. Locality**

The adjoining subject erven are situated in the north of Citrusdal to the west of Voortrekker Street (MR00539) and Fynbos Avenue. Erf 3617 partially borders the northern urban edge. As per the Cederberg Municipality Spatial Development Framework, the proposed development is located within Citrusdal's land use

development zone A. It should be noted that the proposed development does not overlay the full extent of the referred erven.



Source: Cape Farm Mapper  
**Figure 3:** Locality Map

## 4.2. Topography

The site has a gentle slope, draining from the east towards the North West and south west at an average slope of 2.5%.

## 4.3. Geology and Soils

### Soil Types

Symbol: CA

Class: Soils with a strong texture contrast

Description: Soils with a marked clay accumulation, strongly structured and a non-reddish colour. In addition one or more of vertic, melanic and plinthic soils may be present

Depth:  $\geq 750$  mm

Clay:  $< 15\%$

Source: CapeFarmMapper dated 14 January 2024

## 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;

E10F, in which the proposed site falls, is a quaternary catchment of the Breede Olifants Management Area. Three aquatic biodiversity features were applicable to the study area,

namely 1. The identified one channeled non-perennial river which flows into the tributary of the Olifants River, 2. The channeled and dammed tributary of the Olifants river with its flood plain north of the development site, and 3. The perennial Olifants River with associated wetlands and floodplains was the only aquatic biodiversity features applicable to this study. The 1:100 year flood line and the mapped and delineated wetlands mapped as constrains is located outside the development area. The delineated wetlands are all located within the 1:100 year flood line and no development area.



**Figure 4:** Delineation of Wetlands and Riparian Areas”, as published by DWAF (2005) was followed for the delineation of the wetland areas<sup>4</sup>

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.

The Western Cape’s Biodiversity Spatial Plan (WCBSP) identified the following applicable to the site:

Critical Biodiversity Areas

Category 1: CBA: Aquatic

Category 2: CBA: Wetland

Definition: Areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.

<sup>4</sup> Department of Water Affairs and Forestry. (2005b). *A practical field procedure for identification and delineation of wetland and riparian areas*. DWAF, Pretoria.

**Objective:** Maintain in a natural or near-natural state, with no further loss of natural habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.

#### Ecological Support Areas

**Feature:** Water Source, Water Recharge

**Category 1:** ESA: Terrestrial

**Definition:** Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs, and are often vital for delivering ecosystem services.

**Objective:** Maintain in a functional, near-natural state. Some habitat loss is acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.

#### Ecological Support Areas (Restore)

**Feature:** River, Wetland, Watercourse

**Category 1:** ESA2: Restore from other land use

**Definition:** Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs, and are often vital for delivering ecosystem services.

**Objective:** Restore and/or manage to minimize impact on ecological processes and ecological infrastructure functioning, especially soil and water-related services, and to allow for faunal movement.

#### **Reservoir site**

Critical Biodiversity Areas

**Category 1:** CBA: Terrestrial

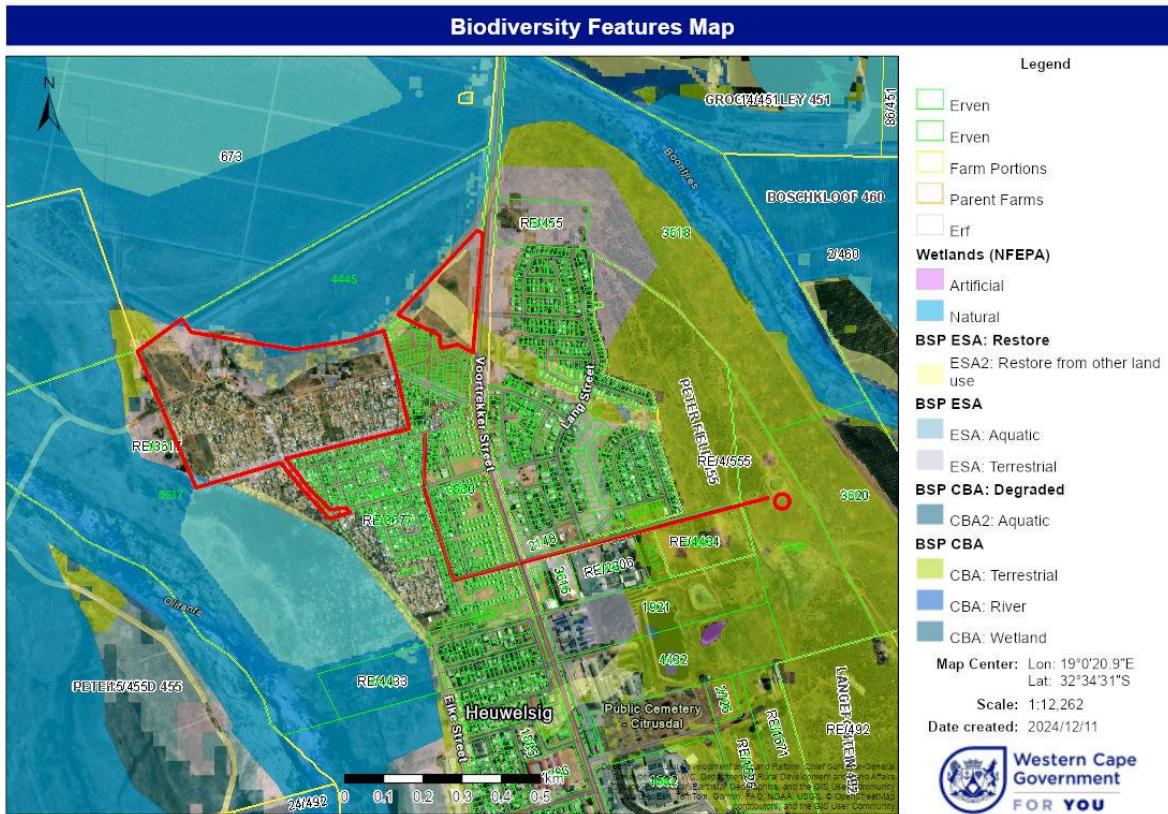
**Category 2:** CBA: Terrestrial

**Definition:** Areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.

**Objective:** Maintain in a natural or near-natural state, with no further loss of natural habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.

NFEPA wetlands was mapped associated with the Olifants river and its flood plain to the west of the site and the tributary of the Olifants River and its flood plain to the north of the development site. The wetlands associated with the tributary of the Olifants River is in poor ecological state and almost nonexistent due to historical channel of river and farming activities. The wetlands associated with the floodplain of the Olifants River water quality is very poor as a result of squatter activities on it. These wetlands must be rehabilitated by removing squatters and infrastructure and putting services in place to manage effluent generated and to prevent it from flowing into the wetlands. Waste and litter will have to be removed. Squatter activities must be policed to prevent squatters from entering and occupying these areas. If infrastructure and waste is removed, and effluent stopped from flowing into the wetlands, then the wetland will rehabilitate itself over time.

The historical information indicated one non-perennial stream which does not exist as the stream have been channelised many years ago when the area was development was incorrectly map as an ESA. The tributary to the north of the site was also channeled and impact as a result of farming activities and altered.



**Figure 5: Biodiversity Mapped features and NFEPA Map**



**Photograph 1: Ecological condition of the wetland associated with the Olifants river floodplain and outside the development.**



**Photograph 2:** Ecological condition of the Olifants river floodplain.



**Photograph 3:** Ecological condition and water quality of the Olifants river floodplain.



**Photograph 4:** Ecological condition of the wetland associated with the Olifants river floodplain and outside the development.



**Photograph 5:** Ecological condition of the wetland associated with the tributary of the Olifants river on the northern edge and outside the development.



**Photograph 6:** Ecological condition of the wetland associated with the tributary of the Olifants river on the northern edge and outside the development.



**Photograph 7:** Ecological condition of the channelled non-perennial river.



**Photograph 8:** Ecological condition of the channelled non-perennial river.

The information gathered from the site survey does not differ from the Environmental Screen report. The development of the site as per the proposed development will have a **low negative** impact on aquatic biodiversity due to the transformed nature of the site. High negative impacts have already occurred and can continue to occur if management and mitigation measures are not implemented.

#### **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 which would have occurred within the area as Citrusdal Shale Renosterveld (Critically Endangered Ecosystem Status) and Leipoldtville Sand Fynbos (Endangered Ecosystem Status). The site and vegetation is however degraded and impacted and does not represent any of these vegetation types and vegetation structures due to historical disturbances as a result of farming and construction activities of the existing reservoir.

#### **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**

NFEPA wetlands were mapped associated with the Olifants river and its flood plain to the west of the site and the tributary of the Olifants River and its flood plain to the north of the development site. The wetlands associated with the tributary of the Olifants River is in poor ecological state and almost nonexistent due to historical channel of river and farming activities. The wetlands associated with the floodplain of the Olifants River water quality is very poor as a result of squatter activities on it. These wetlands must be

rehabilitated by removing squatters and infrastructure and putting services in place to manage effluent generated and to prevent it from flowing into the wetlands. Waste and litter will have to be removed. Squatter activities must be policed to prevent squatters from entering and occupying these areas. If infrastructure and waste is removed, and effluent stopped from flowing into the wetlands, then the wetland will rehabilitate itself over time. The historical information indicated one non-perennial stream which does not exist as the stream have been channelised many years ago when the area was development was incorrectly map as an ESA. The tributary to the north of the site was also channeled and impact as a result of farming activities and altered.

**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 biodiversity features on the development area are in poor ecological state and channeled.

**PRESENT ECOLOGICAL STATE (PES)**

**Table 11: Results of PES assessments for the potentially affected aquatic ecosystems on the study area.**

Criteria	Both channeled Non-Perennial Rivers	
	Score	Confidence
<b>INSTREAM</b>		
Water abstraction	14	H
Flow Modification	13	H
Bed modification	13	H
Channel modification	13	H
Water Quality	14	H
Inundation	10	H
Presence of exotic macrophytes	9	H
Presence of exotic fauna	8	H
Presence of solid waste	9	H
<b>RIPARIAN</b>		H
Vegetation removal	13	H
Alien encroachment	12	H
Bank erosion	0	H
Water abstraction	12	H
Flow modifications	12	H
Channel modifications	12	H
Inundation	13	H

FINAL PES SCORES & CATEGORIES	Non-perennial river
<b>Instream</b>	2%
	<b>PES Category F</b>
<b>Riparian</b>	14%
	<b>PES Category F</b>

Criteria	Olifants Perennial Rivers	
	Score	Confidence
<b>INSTREAM</b>		
Water abstraction	6	H
Flow Modification	0	H
Bed modification	0	H
Channel modification	0	H
Water Quality	0	H
Inundation	0	H
Presence of exotic macrophytes	0	H
Presence of exotic fauna	0	H
Presence of solid waste	4	H
<b>RIPARIAN</b>		H
Vegetation removal	0	H
Alien encroachment	0	H
Bank erosion	0	H
Water abstraction	4	H
Flow modifications	0	H
Channel modifications	0	H
Water Quality	4	H
Inundation	0	H
FINAL PES SCORES & CATEGORIES	Non-perennial river	
<b>Instream</b>	90%	
	<b>PES Category A</b>	
<b>Riparian</b>	92%	
	<b>PES Category A</b>	

## ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS)

The result of the **EIS** assessments that were completed for the affected watercourse is presented in Table 12.

**Table 12: Results of the EIS assessment**

Channel type	0	Both channelled Non-Perennial Rivers
Conservation context	5	NFEPA River
Vegetation and habitat Integrity	0	Modified in river
Connectivity	5	Connected
Threat Status of Vegetation Type	4	Vegetation has least threatened conservation status
<b>EIS Category</b>	<b>2.8</b>	<b>High</b>

Channel type	5	Olifants Perennial Rivers
Conservation context	5	NFEPA River
Vegetation and habitat Integrity	5	Modified in river
Connectivity	5	Connected
Threat Status of Vegetation Type	4	Vegetation has least threatened conservation status
<b>EIS Category</b>	<b>4.8</b>	<b>Very High</b>

## RESULTS OF THE PES AND EIS

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.

### **Non-perennial Rivers which is a tributary of the Olifants river.**

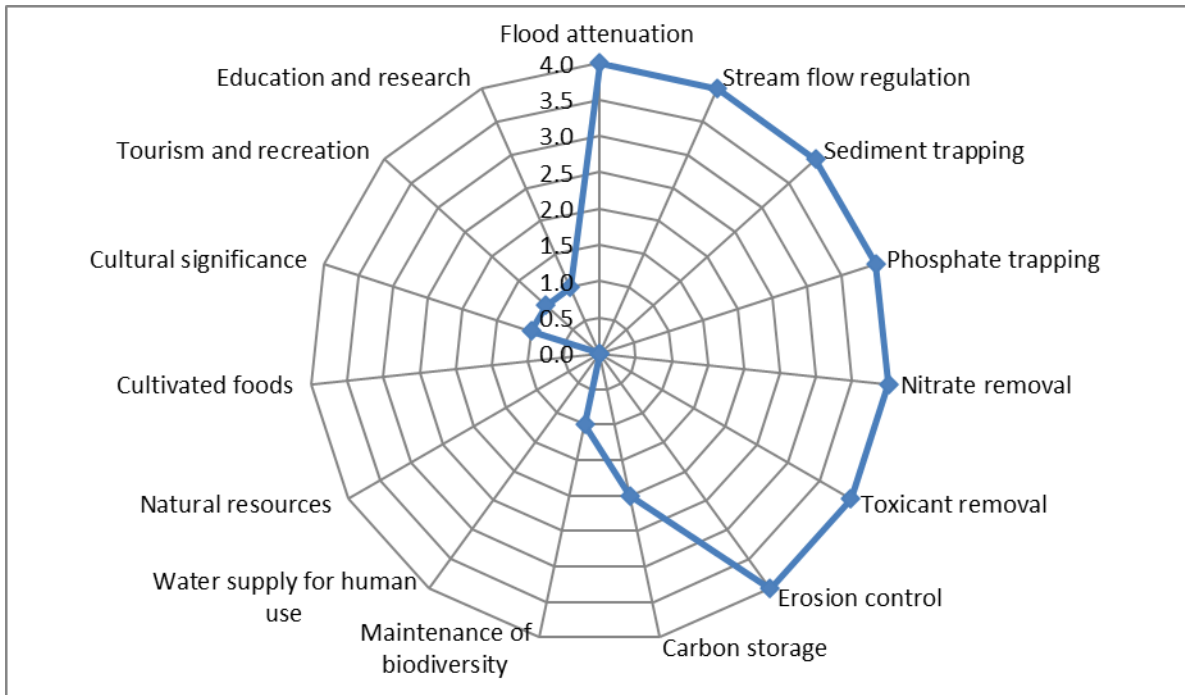
Modifications have reached a critical level and the lotic system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.

### **Olifants River**

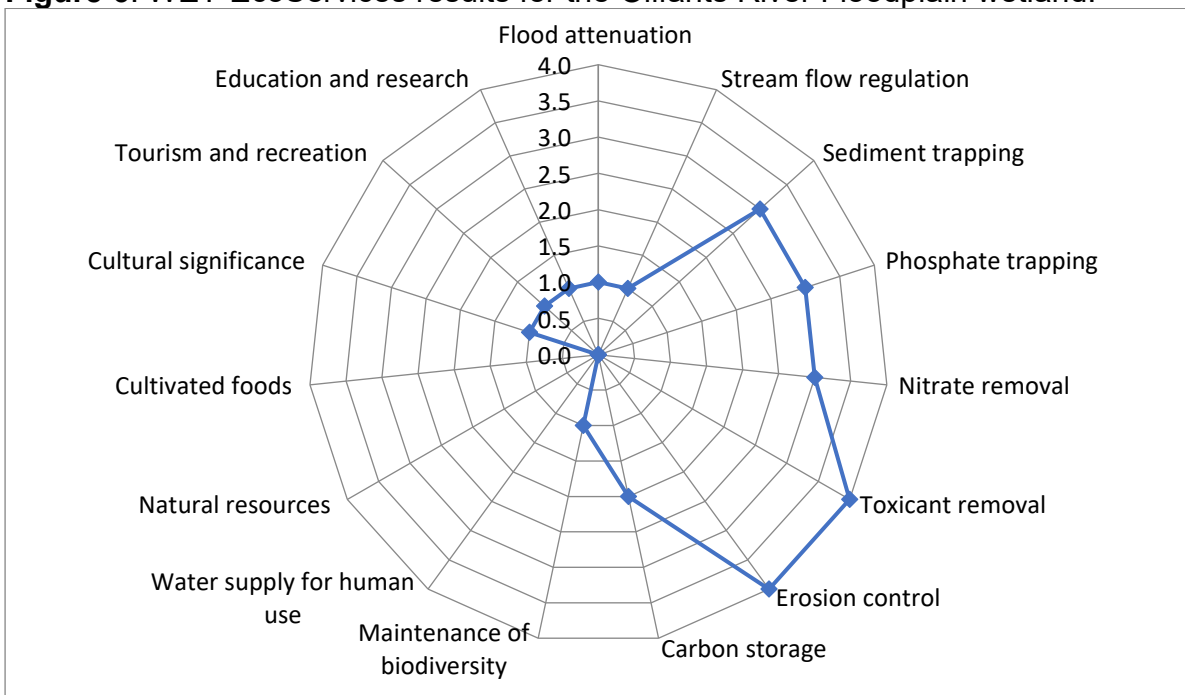
Unmodified, natural.

## **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.



**Figure 6:** WET-EcoServices results for the Olifants River Floodplain wetland.



**Figure 7:** WET-EcoServices results for the Olifants River Floodplain wetland.

Table 13: WET-EcoServices results for the Olifants River floodplain wetland.

Wetland Ecosystem Services		
		Current
Indirect Benefits	Flood attenuation	4
	Streamflow regulation	4
	Sediment trapping	4
	Phosphate removal	4
	Nitrate removal	4
	Toxicant removal	4
	Erosion control	4
	Carbon storage	2
	Direct Benefits	Maintenance of biodiversity
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	30
	Average	2 (Intermediate)

Table 14: WET-EcoServices results for the non-perennial northern 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
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)
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Table 15: 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 Olifants River Floodplain wetland is a Category C and the Non-perennial river wetland north of the development Category D and given the intermediate EIS the REC for the Olifants River Floodplain wetland remains a Category C and for the Non-perennial river wetland north of the development Category D. Therefore, it is not considered acceptable for any future development to cause any further deterioration in the PES.

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

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.

**Non-perennial Rivers which is a tributary of the Olifants river.**

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.

**Olifants River**

Unmodified, natural.

Wetland PES summary				
<b>Wetland Name</b>	Non-perennial northern wetland			
<b>Assessment Unit</b>				
<b>HGM Type</b>	Flood plain with flushing			
<b>PES Assessment</b>	<b>Hydrology</b>	<b>Geomorphology</b>	<b>Water Quality</b>	<b>Vegetation</b>
<b>Impact Score</b>	6	6	3	3
<b>PES Score (%)</b>	35%	35%	60%	55%
<b>Ecological Category</b>	E	E	C	C
<b>Trajectory of change</b>	↓	↓	↓	↓

<b>Confidence (revised results)</b>	Medium	Medium	Medium	Medium
<b>Combined Impact Score</b>	4.6			
<b>Combined PES Score (%)</b>	45%			
<b>Combined Ecological Category</b>	D			

<b>Wetland PES summary</b>				
<b>Wetland Name</b>	Olifants River floodplain wetland			
<b>Assessment Unit</b>				
<b>HGM Type</b>	Flood plain with flushing			
<b>PES Assessment</b>	<b>Hydrology</b>	<b>Geomorphology</b>	<b>Water Quality</b>	<b>Vegetation</b>
<b>Impact Score</b>	0.5	2	8	3
<b>PES Score (%)</b>	90%	65%	5%	55%
<b>Ecological Category</b>	A	C	F	C
<b>Trajectory of change</b>	↓	↓	↓	↓
<b>Confidence (revised results)</b>	Medium	Medium	Medium	Medium
<b>Combined Impact Score</b>	3			
<b>Combined PES Score (%)</b>	70%			
<b>Combined Ecological Category</b>	C			

Tables above present the impact scores for hydrology, geomorphology, water quality and vegetation condition and the trajectory of change for the identified wetlands.

The key aspects to note from the PES assessment are as follows:

- The net effect on hydrology as result of changes to water input characteristics from the catchment is negligible as there are no on-site water usage or major discharges from point or diffuse sources. Reduced catchment roughness, while being notable does not result in significantly increased flood peaks due to the wetland type.
- In terms of water distribution and retention patterns within the wetland, the Olifants River floodplain wetland will not be affected. However, the non-perennial river wetland mapped north of the development has been modified as a result of the channel of the non-perennial rivers that feed this wetland. The geomorphic state of the wetlands is slightly modified as a result of historical agricultural activities and squatters who invaded the area.
- In terms of vegetation, the slightly modified as a result of historical agricultural activities and squatters who invaded the area.

- Hydrology, geomorphology and vegetation are predicted to continue on a downward trajectory (i.e. an increasingly impacted condition in the future) as the catchment continues to become transformed and the indigenous vegetation occurring within the wetland inevitably becomes out-competed by the pioneer/alien species which are introduced as a result of development in the surroundings.

### **Rapid Habitat Assessment Only for the non-perennial tributaries**

#### **Description of the site**

Table 16: Results of the Rapid Habitat Assessment

<b>Geomorphic zone</b>	Western Folded Mountains
<b>Geomorphic Habitat Unit (GHU) characterisation</b>	Alluvial run
<b>Valley shape</b>	Deepened U Shape
<b>Channel shape</b>	Steep valley
<b>Longitudinal connectivity at low flows (time of survey)</b>	Unrestricted passage
<b>Types of bars present</b>	Bars around obstructions
<b>Bank shape</b>	Concave
<b>Bank slope</b>	Steep
<b>Bed compaction</b>	Packed, unarmoured
<b>Sediment matrix</b>	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 17 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, existing dam block flow	5
Animal farming	Yes	5
Artificial covering	Channelled and cultivated land.	5
Bed: material disturbance/removal	Historical agricultural disturbances downstream. Residential and road crossing the non-perennial river.	5
Bed: stabilization (e.g. concrete)	None	NA
Buildings	None	NA

MODIFICATION	COMMENT	RATING
Channel Straightening	Historical agricultural disturbances.	5
Construction activities	Roads	5
Crossings low water (immediately upstream or downstream)	Roads upstream and downstream. Residential development and stormwater dam upstream.	5
Dams (immediately upstream or downstream)	Yes	NA
Dry land farming	Yes	NA
Erosion	Moderate	3
Forestry	None	NA
Invasive alien vegetation	None	NA
Irrigation	None	NA
Mining	None	NA
Off-channel dams	None	NA
Recreation	None	NA
Riparian vegetation removal	Agricultural activities in the area.	5
Roads	Up and Downstream	5
Rubbish dumping	Yes	5
Runoff/effluent	Captured in existing dam	NA
Trampling	Area use for grazing of livestock.	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 0.2m

### ***Velocity***

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

### ***Substrate***

Sediment. Low compaction (2).

### ***Cover***

Disturbed and old cultivated 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 18).

Table 18: 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 19). 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 19: 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 20). 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 20: 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 21) 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 21: Non-perennial river water quality indicator (clarity) recorded for the river reach affected

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 22).

Table 22: 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 23). 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 23: 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 24). A more detailed water quality assessment will need to be conducted immediately, including toxicity testing of

in-stream water.

Table 24: 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.**

No alternative area is required. The proposed development site is appropriate and will not affect the status of the aquatic biodiversity features identified on site as a result of its location outside the 1:100 year flood line area. The buffer in between the development and wetland is sufficient. However, high negative impacts have already occurred and can continue to occur if management and mitigation measures are not implemented.

**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 its location outside the 1:100 year flood line area and delineated wetlands, provided that the management and mitigation measures are adhered to. High negative impacts have already occurred and can continue to occur if management and mitigation measures are not implemented.

**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 its location outside the 1:100 year flood line area and delineated wetlands, provided that the management and mitigation measures are adhered to. High negative impacts have already occurred and can continue to occur if management and mitigation measures are not implemented.

**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);**

The proposed development will not impact fixed and dynamic ecological processes which operate within or across the site. It will not alter the hydrological functioning at a landscape level and across the site and will not lead to changes to flood regimes. The development is located outside the 1:100 year flood line. Stormwater from site will be controlled and release into the existing hydrological systems. Waste management control is however very important to prevent water quality impacts.

**(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;**

Refer to separate risk matrix. The risk is assessed to be high and a license to protect especially the Olifants River is recommended. Sewerage line or development infrastructure will cross and impact on the channelled 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. In fact, it will improve water quality. Currently squatters are on the edge and in the wetland areas and solid waste and effluent is affecting the water quality. The proposed development will provide housing and opportunities to move the squatters away from the wetland and Olifants River floodplain and connect them to services. This will improve the water quality. If management and mitigation measures are implemented as per the EMP and waste and effluent management is properly conducted, then the development will have a positive impact on the Olifants River and associated wetlands.

***(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 of the development site 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 / intensity (e.g. 5000 L – 10 000L)	4	Toxic (e.g. diesel & Sodium Hydroxide)	4	Bio-physical and/or social functions and/or processes might be considerably altered or enhanced / potentially irreversible	4	Current environmental component(s) are in a natural state. Environmentally sensitive environment / receptor (endangered species / habitats etc.).	4

Source								Receptor			
Duration of impact	Score	Extent	Score	Volume / Quantity / Intensity	Score	Toxicity / Destruction Effect	Score	Reversibility	Score	Sensitivity of environmental component	Score
				or 8Ha–12Ha)							
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.

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

<b>Development Construction</b>	<b>Geographical and Physical Impacts</b>
<b>PLANNING, DESIGN AND DEVELOPMENT PHASE</b>	
Potential impact and risk:	<b>Soil erosion and dust</b>
Nature of impact:	<b>Disturbance to soil which is caused during the construction may lead to erosion of the site and surrounds.</b>
Extent and duration of impact:	<b>Extent 1 (footprint) &amp; Duration 1</b>
Magnitude:	<b>2</b>
Consequence of impact or risk:	<b>Clearing and excavation activities can result in erosion and dust.</b>
Probability of occurrence:	<b>2 (I)</b>
Degree to which the impact may cause irreplaceable loss of resources:	<b>2 (PR)</b>
Degree to which the impact can be reversed:	<b>PR</b>
Indirect impacts:	<b>Disturbance to surface area can result in erosion and dust generation</b>
Cumulative impact prior to mitigation:	<b>Exposing soil may lead to erosion and dust generation if not mitigated.</b>
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	<b>8 - Low</b>
Degree to which the impact can be avoided:	<b>High</b>
Degree to which the impact can be managed:	<b>High</b>
Degree to which the impact can be mitigated:	<b>1 (CM)</b>
Proposed mitigation:	<ul style="list-style-type: none"> <li>• <b>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.</b></li> <li>• <b>Monitor construction areas frequently for signs of erosion and if signs of erosion are detected implement repair and preventative measures immediately.</b></li> <li>• <b>Strict compliance with the EMPr.</b></li> </ul>
Residual impacts:	<b>It is not anticipated that the impact will be high if the mitigation measures are adhered to.</b>
Cumulative impact post mitigation:	<b>It is not anticipated that the impact will be high if the mitigation measures are adhered to.</b>

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

<b>Development Construction</b>	<b>Biological Aspect Impacts</b>
<b>PLANNING, DESIGN AND DEVELOPMENT PHASE</b>	
<b>Potential impact and risk:</b>	<b>Loss of freshwater ecological habitat</b>
Nature of impact:	<b>The aquatic biodiversity features on the property will not be impacted on as the development is outside the 1:100 year flood line areas and delineated wetlands.</b>
Extent and duration of impact:	<b>Extent 1 (footprint) &amp; Duration 1</b>
Magnitude:	<b>2</b>
Consequence of impact or risk:	<b>Clearing and excavation activities can result in erosion and dust.</b>
Probability of occurrence:	<b>2 (I)</b>
Degree to which the impact may cause irreplaceable loss of resources:	<b>2 (PR)</b>
Degree to which the impact can be reversed:	<b>PR</b>
Indirect impacts:	<b>Disturbance to surface area can result in erosion and dust generation</b>
Cumulative impact prior to mitigation:	<b>Exposing soil may lead to erosion and dust generation if not mitigated.</b>
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	<b>8 - Low</b>
Degree to which the impact can be avoided:	<b>High</b>
Degree to which the impact can be managed:	<b>High</b>
Degree to which the impact can be mitigated:	<b>1 (CM)</b>
Proposed mitigation:	<ul style="list-style-type: none"> <li>• <b>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.</b></li> <li>• <b>Monitor construction areas frequently for signs of erosion and if signs of erosion are detected implement repair and preventative measures immediately.</b></li> <li>• <b>Strict compliance with the EMPr.</b></li> </ul>
Residual impacts:	<b>It is not anticipated that the impact will be high if the mitigation measures are adhered to.</b>
Cumulative impact post mitigation:	<b>It is not anticipated that the impact will be high if the mitigation measures are adhered to.</b>

Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	<b>Low</b>
<b>OPERATIONAL PHASE</b>	
<b>Potential impact and risk:</b>	<b>Loss of freshwater ecological habitat</b>
Nature of impact:	<p><b>NFEPA wetlands was mapped associated with the Olifants river and its flood plain to the west of the site and the tributary of the Olifants River and its flood plain to the north of the development site. The wetlands associated with the tributary of the Olifants River is in poor ecological state and almost nonexistent due to historical channel of river and farming activities. The wetlands associated with the floodplain of the Olifants River water quality is very poor as a result of squatter activities on it.</b></p> <p><b>The historical information indicated one non-perennial stream which does not exists as the stream have been channelised many years ago when the area was development was incorrectly map as an ESA. The tributary to the north of the site was also channeled and impact as a result of farming activities and altered.</b></p> <p><b>The information gathered from the site survey does not differs from the Environmental Screen report. The development of the site as per the proposed development will have a low negative impact on aquatic biodiversity due to the transformed nature of the site. High negative impacts has already occur and can continue to occur if management and mitigation measures are not implemented.</b></p>
Extent and duration of impact:	<b>Extent 1 (footprint) &amp; Duration 1</b>
Magnitude:	<b>2</b>
Consequence of impact or risk:	<b>Clearing and excavation activities can result in erosion and dust.</b>
Probability of occurrence:	<b>2 (I)</b>
Degree to which the impact may cause irreplaceable loss of resources:	<b>2 (PR)</b>
Degree to which the impact can be reversed:	<b>PR</b>

Indirect impacts:	<b>Disturbance to surface area can result in erosion and dust generation</b>
Cumulative impact prior to mitigation:	<b>Exposing soil may lead to erosion and dust generation if not mitigated.</b>
Significance rating of impact prior to mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	<b>High</b>
Degree to which the impact can be avoided:	<b>High</b>
Degree to which the impact can be managed:	<b>High</b>
Degree to which the impact can be mitigated:	<b>1 (CM)</b>
Proposed mitigation:	<b>These wetlands must be rehabilitated by removing squatters and infrastructure and putting services in place to manage effluent generated and to prevent it from flowing into the wetlands. Waste and litter will have to be removed. Squatter activities must be policed to prevent squatters from entering and occupying these areas. If infrastructure and waste is removed, and effluent stopped from flowing into the wetlands, then the wetland will rehabilitate itself over time.</b>
Residual impacts:	<b>It is not anticipated that the impact will be high if the mitigation measures are adhered to.</b>
Cumulative impact post mitigation:	<b>It is not anticipated that the impact will be high if the mitigation measures are adhered to.</b>
Significance rating of impact after mitigation (e.g. Low, Medium, Medium-High, High, or Very-High)	<b>Low</b>
<b>DECOMMISSIONING AND CLOSURE PHASE</b>	
<b>Potential impact and risk:</b>	<b>Loss of freshwater ecological habitat</b>
Nature of impact:	<b>Not Applicable.</b>

### ***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.

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.

### **Non-perennial Rivers which is a tributary of the Olifants river.**

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.

### **Olifants River**

Unmodified, natural.

The EIS was calculated for the importance of ecosystem services provided and the result points to very high importance and sensitivity.

NFEPA wetlands was mapped associated with the Olifants river and its flood plain to the west of the site and the tributary of the Olifants River and its flood plain to the north of the development site. The wetlands associated with the tributary of the Olifants River is in poor ecological state and almost nonexistent due to historical channel of river and farming activities. The wetlands associated with the floodplain of the Olifants River water quality is very poor as a result of squatter activities on it. These wetlands must be rehabilitated by removing squatters and infrastructure and putting services in place to manage effluent generated and to prevent it from flowing into the wetlands. Waste and litter will have to be removed. Squatter activities must be policed to prevent squatters from entering and occupying these areas. If infrastructure and waste is removed, and effluent stopped from flowing into the wetlands, then the wetland will rehabilitate itself over time.

The historical information indicated one non-perennial stream which does not exist as the stream have been channelised many years ago when the area was development was incorrectly map as an ESA. The tributary to the north of the site was also channeled and impact as a result of farming activities and altered.

The information gathered from the site survey does not differs from the Environmental Screen report. The development of the site as per the proposed development will have a **low negative** impact on aquatic biodiversity due to the transformed nature of the site. High negative impacts have already occur and can continue to occur if management and mitigation measures are not implemented.

## 8. REFERENCES

CapeNature. 2024. 2023 Western Cape Biodiversity Spatial Plan and Guidelines Overview V2.0. Unpublished Report.

Driver, Nel, Snaddon, Murray, Roux, Hill (2011). Implementation Manual for Freshwater Ecosystem Priority Areas. Draft Report for the Water Research Commission.

DWAF, 2009. Rapid Habitat Assessment Model Manual. Report no RDM/Nat/00/CON/0707. Authors: D Louw & CJ Kleynhans Submitted by Water for Africa.

KEMPER, N. 1999: Intermediate habitat integrity assessment for use in the rapid and intermediate assessments. IWR Environmental.

Kleynhans C.J., Thirion C. and Moolman J. 2005. *A Level 1 Ecoregion Classification System for South Africa, Lesotho and Swaziland*. Report No. N/0000/00/REQ0104. Resource Quality Services, Department of Water Affairs and Forestry, Pretoria  
Kleynhans CJ, Louw MD. 2007. Module A: EcoClassification and EcoStatus determination in River EcoClassification: Manual for EcoStatus Determination (version 2). Joint Water Research Commission and Department of Water Affairs and Forestry report. WRC Report No.

Kleynhans CJ, Mackenzie J, Louw MD. 2007. Module F: Riparian Vegetation Response Assessment Index in River Eco Classification: Manual for EcoStatus Determination (version 2). Joint Water Research Commission and DWA and Forestry report.

Dayaram, A., Harris, L., Grobler, B. A., van der Merwe, S., Rebelo, A. G., Powrie, L. W., Vlok, J. H. J., Desmet, P., Qabaqaba, M., Hlahane, K. M., & Skowno, A. L. (2018). Vegetation Map of South Africa, Lesotho and Swaziland 2018: A description of changes since 2006. *Bothalia*, 49(1), a2452. <https://doi.org/10.4102/abc.v49i1.2452>

SANBI Biodiversity GIS 2016. <http://bgis.sanbi.org/WCBF14/additional.asp>

## APPENDIX A SPECIALIST CV

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### CURRICULUM VITAE – NICOLAAS WILLEM HANEKOM

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**Profession:** Environmental Scientist and Environmental Assessment Practitioner

**Date of Birth:** 01/02/1967

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### BIOGRAPHICAL SKETCH

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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.

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.

<b>Areas of specialisation:</b>	<ul style="list-style-type: none"> <li>• Ecosystem (terrestrial and aquatic) monitoring and assessments</li> <li>• Design of monitoring programmes for ecosystems (terrestrial and aquatic)</li> <li>• Environmental Impact Assessments</li> <li>• River classification and environmental water requirements</li> <li>• Wetlands Delineation</li> <li>• River and Wetlands management</li> <li>• Water Use Authorization Applications</li> <li>• Water quality management</li> <li>• River Health Assessments</li> </ul>
<b>Countries of Work Experience:</b>	South Africa (Northern Cape, Western Cape, Free State, Mpumalanga, Gauteng)

<p><b>Employment Record</b></p>	<ul style="list-style-type: none"> <li>• Student at Bontebok National Park (1992)</li> <li>• Assistant Reserve Manager at Gariiep Dam Nature Reserve, Free State (1993 - 1998)</li> <li>• Reserve Manager, Conservation Services Manager for Western Cape Nature Conservation Board (1998 - 2006)</li> <li>• External Lecturer at Cape Peninsula University of Technology (2003 - 2005)</li> <li>• Director: Environmental Management at Cape Lowlands Environmental Services (2006 – 2010)</li> <li>• Director, Environmental Management and lead Environmental Impact Assessment Practitioner at Eco Impact (Pty) Ltd (2010 – to August 2019)</li> <li>• Director, Environmental Management and lead Environmental Impact Assessment Practitioner at Enviro-EAP (Pty) Ltd (September 2019 – to date)</li> </ul>
<p><b>Professional membership, accreditations and courses</b></p>	<ul style="list-style-type: none"> <li>• South African Council for Natural Scientists Professions Pri.Sci.Nat (Ecological Science)</li> <li>• Riparian vegetation identification and health assessment. Internal Western Cape Nature Conservation short course presented by Dr C Boucher (Stellenbosch University) in 2000.</li> <li>• 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.</li> <li>• 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).</li> </ul>
<p><b>Summary of experience</b></p>	<p>1992: South African National Parks. Student at Bontebok National Park with management and monitoring actions related to the Breede River.</p> <p>1993 -1998: Free State Nature Conservation. Ecological management and monitoring actions related to the Gariiep Dam, Orange and Caledon Rivers.</p> <p>1998 -2006: CapeNature. Ecological management and monitoring actions related to the Berg River Estuary, Verlorenvlei, Lamberts bay’s Jackalsvlei, Wadriift 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.</p> <p>2006 to date: Cape Lowland Environmental Services, Eco Impact Legal Consultant and Enviro-EAP. Ecological (Freshwater and aquatic) Specialist input, assessment, monitoring and reports.</p>

<p><b>Publications and assessment reports</b></p>	<p>Just to name a few. Was involved in many Ecological Assessments, monitoring and inputs in EIA applications.</p> <ul style="list-style-type: none"> <li>• 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.</li> <li>• Cape Solar Energy Electricity Generation Facility. Farm 187/3 &amp; 187/13 Kenhardt. Biodiversity And Ecological Baseline Survey. January 2011. (Included Terrestrial and aquatic ecological assessments and water use authorization applications)</li> <li>• Prieska Photovoltaic 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)</li> <li>• Witteklip Erf 123 Extension, Vredenburg. Biodiversity Baseline Survey. Updated - October 2012 (Included Terrestrial and aquatic ecological assessments and water use authorization applications)</li> <li>• 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.</li> <li>• Freshwater Impact Assessment Laingsburg Flood Damage Repairs &amp; Storm Water Infrastructure. 18 February 2016.</li> <li>• 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)</li> <li>• 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)</li> <li>• 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).</li> <li>• Water Use Authorization Application Risk Matrix Prepared For: Witzenberg Municipality Sand Mine Farm 1 Prince Alfred</li> </ul>
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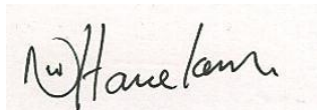
	<p>Hamlet. 28 March 2017. (Freshwater ecological inputs in EIA process and Water Use Registration).</p> <ul style="list-style-type: none"><li>• Proposed Hartmanshoop Agri Vegetation Clearing Project and Irrigation on Erf 686, Laingsburg. 12 August 2017. (Freshwater ecological inputs in Water Use Registration).</li><li>• 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).</li></ul>
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## CERTIFICATION

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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