FRESHWATER ASSESSMENT FOR THE PROPOSED ESTABLISHMENT OF AVOCADO ORCHARDS ON PORTION 4 AND 8 OF 55 AND REMAINING PORTION OF 57, KLEINBOS

Final Report

Prepared for Cape EAPrac

By

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Confluent Environmental

DECLARATION OF SPECIALIST INDEPENDANCE

- I consider myself bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP);
- At the time of conducting the study and compiling this report I did not have any interest, hidden or otherwise, in the proposed development that this study has reference to, except for financial compensation for work done in a professional capacity;
- Work performed for this study was done in an objective manner. Even if this study results in views and findings that are not favourable to the client/applicant, I will not be affected in any manner by the outcome of any environmental process of which this report may form a part, other than being members of the general public;
- I declare that there are no circumstances that may compromise my objectivity in performing this specialist investigation. I do not necessarily object to or endorse any proposed developments, but aim to present facts, findings and recommendations based on relevant professional experience and scientific data;
- I do not have any influence over decisions made by the governing authorities;
- I undertake to disclose all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by a competent authority to such a relevant authority and the applicant;
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- All the particulars furnished by me in this document are true and correct.

Specialist: Dr. James Dabrowski (Ph.D., Pr.Sci.Nat. Water Resources)

Date: 25 February 2021

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. INTRODUCTION

Confluent Environmental was appointed by Cape EAPrac to undertake a freshwater assessment on Portions 4 and 8 of Farm 55, and the remaining portion of Farm 57, Kleinbos, in terms of Section 24G of the National Environmental Management Act (NEMA; Act No. 107 of 1998). Large areas of land were cleared on these properties to plant avocado orchards. The site has been classified as having **Very High** aquatic biodiversity by the Department of Environmental Affairs screening tool and also occurs within a radius of 500 m from nearby wetland areas.

The scope of work for this report is framed by the legislative requirements of the National Environmental Management Act (NEMA) and the National Water Act (NWA).

1.1 National Environmental Management Act

According to the protocols specified in GN 1540 (Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in Terms of Sections 24(5)(A) and (H) and 44 of the National Environmental Management Act, 1998, when Applying for Environmental Authorisation), assessment and reporting requirements for aquatic biodiversity are associated with a level of environmental sensitivity identified by the national web-based environmental screening tool (screening tool). An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being of:

- **Very High** sensitivity for aquatic biodiversity, must submit an Aquatic Biodiversity Specialist Assessment; or
- **Low** sensitivity for aquatic biodiversity, must submit an Aquatic Biodiversity Compliance Statement.

According to the protocol, prior to commencing with a specialist assessment a site sensitivity verification must be undertaken to confirm the sensitivity of the site as indicated by the screening tool:

- Where the information gathered from the site sensitivity verification differs from the screening tool designation of **Very High** aquatic biodiversity sensitivity, and it is found to be of a **Low** sensitivity, an Aquatic Biodiversity Compliance Statement must be submitted.
- Similarly, where the information gathered from the site sensitivity verification differs from the screening tool designation of **Low** aquatic biodiversity sensitivity, and it is found to be of a **Very High** sensitivity, an Aquatic Biodiversity Specialist Assessment must be submitted.

1.2 National Water Act (NWA, 1998)

No activity may take place within a watercourse unless it is authorised by the Department of Water and Sanitation (DWS). According to Section 21 (c) and (i) of the National Water Act, a water use authorisation is required for any activities that impede or divert the flow of water in a watercourse or alter the bed, banks, course or characteristics of a watercourse. The regulated area of a watercourse for section 21(c) or (i) of the Act water uses means:

a) The outer edge of the 1 in 100-year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;

b) In the absence of a determined 1 in 100-year flood line or riparian area the area within 100m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench (subject to compliance to section 144 of the Act); or

c) A 500 m radius from the delineated boundary (extent) of any wetland or pan.

Any water use activities that do occur within the regulated area of a watercourse must be assessed using the DWS Risk Assessment Matrix (GN 509) to determine whether activities may be generally authorised (**Low** Risk according to the Risk Assessment Matrix) or require a Water Use License (WUL) (**Medium** or **High** Risk according to the Risk Assessment Matrix).

For the purposes of this assessment, a wetland area is defined according to the NWA (Act No. 36 of 1998):

"Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil".

Wetlands must therefore have one or more of the following attributes to meet the NWA wetland definition (DWAF, 2005):

- A high water table that results in the saturation at or near the surface, leading to anaerobic conditions developing in the top 50 cm of the soil;
- Wetland or hydromorphic soils that display characteristics resulting from prolonged saturation, i.e. mottling or grey soils; and
- The presence of, at least occasionally, hydrophilic plants, i.e. hydrophytes (water loving plants).

1.3 Scope of Work

- To undertake a desktop analysis and site inspection to verify the sensitivity of aquatic biodiversity as **Very High** or **Low**;
- Compile an Aquatic Biodiversity Compliance Statement or Aquatic Biodiversity Specialist Assessment based on the verification of the sensitivity of the site; and
- Verify whether the site falls within the regulated area of any watercourses and compile the required DWS Risk Assessment to determine water use authorisation requirements.

2. APPROACH

The following rationale was adopted to determine the sensitivity of aquatic biodiversity within the footprint of the site:

- The properties were flagged as being of Very High sensitivity for the following reasons:
    - An aquatic CBA wetland was indicated to occur on Portion 4 of Farm 55 and RE/57; and

  - The properties fall within a Strategic Water Source Area (SWSA), which are areas associated with high relief that supply a disproportionate amount of mean annual runoff to a geographical region of interest.
- A site visit was therefore undertaken to verify the presence of the CBA wetland and any other watercourses located within the three properties;
- In the event that watercourses are confirmed to fall within the footprint of the cleared area then the site sensitivity is confirmed as **Very High** and a full specialist freshwater assessment is required; and
- In the event that no watercourses are identified within the footprint of the cleared area, the site sensitivity is confirmed as **Low** and an Aquatic Compliance statement is required.

The determination of the site sensitivity relied upon the following approaches:

- Interrogation of available desktop resources including:
  - DWS spatial layers;
  - National Freshwater Ecosystem Priority Areas (NFEPA) spatial layers (Nel et al., 2011);
  - National Wetland Map 5 and Confidence Map (CSIR, 2018); and
  - Western Cape Biodiversity and Spatial Plan (WCBSP) for Mossel Bay (CapeNature, 2017).
- A site visit was undertaken on the 3rd of February 2021, during which time the following activities were undertaken:
  - Identification and classification of watercourses within the footprint of the cleared area and within 500m of the cleared area according to methods detailed in Ollis et al. (2013);
  - Soil augering to confirm the presence of soil indicators (DWAF, 2005) that may indicate the presence of a wetland (if applicable); and
  - Identification of hydrophilic plant species that may indicate the presence of wetland plant species (if applicable).

3. LIMITATIONS AND ASSUMPTIONS

- Extensive earth moving and clearing of vegetation has occurred on each of the three properties in preparation for the establishment of avocado orchards. This could possibly have buried or obscured any watercourses (i.e. drainage lines and wetlands), particularly ephemeral or seasonal watercourses that may have been present prior to the activity. Additionally, the natural contours that often indicate the presence of natural drainage areas and watercourses may have been altered. These factors make it difficult to reliably confirm the presence of any freshwater features post vegetation clearing. This assessment had to therefore rely heavily on historical satellite and aerial imagery to confirm the presence of wetlands prior to clearing of vegetation.

4. DESKTOP SURVEY

The site falls within Primary Catchment K (Kromme) and in quaternary catchment K10E. The WCBSP and NFEPA wetland maps both identify a wetland flat occurring on top of the flat escarpment area on Portion 4 of 55 and the RE/57 (Figure 1) which partly overlaps with the

footprint of the cleared area. The wetland is indicated to occur on the edge of the flat escarpment and falls away down the northern steep slopes of the mountain, in the direction of the Moordkuil River to the north. It is important to note here that wetlands featured within the WCBSP were derived from the NFEPA wetlands layer which was the most recent and reliable source of information at the time the WCBSP for Mossel Bay was developed.

Figure 1: Map illustrating aquatic and terrestrial areas of conservation importance in relation to the property boundaries and cleared areas.

The most recent National Wetland Map (version 5) for South Africa (CSIR, 2018) does not indicate the presence of the wetland indicated by the NFEPA (and WCBSP) layer (Figure 2). Seep wetlands are indicated to occur on the eastern most extent of RE/57. These wetlands however occur on steep slopes and fall well outside the area that has been cleared. The most recent wetland and rivers geospatial databases therefore do not identify any freshwater features that fall within the footprint of the cleared areas.

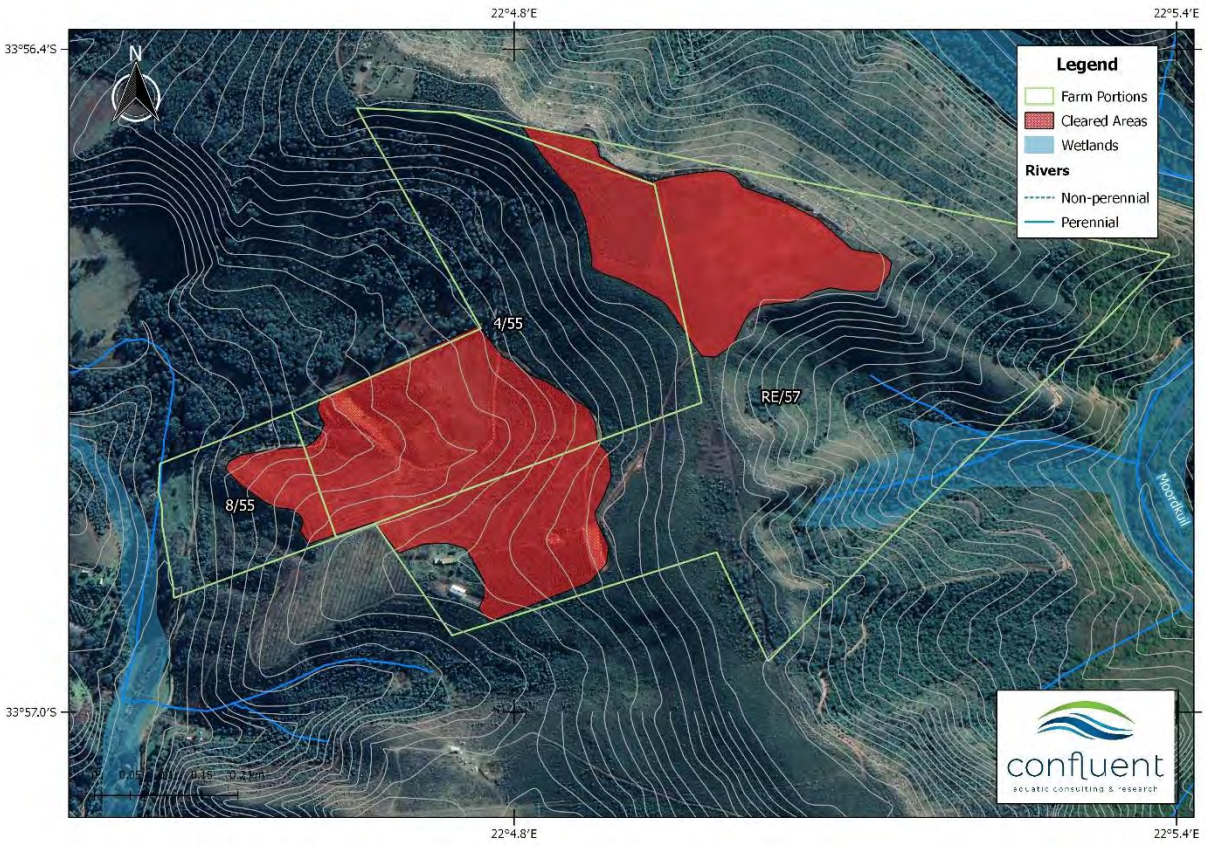

Figure 2: Location of wetlands according to the latest National Wetland Map, Version 5 (CSIR, 2018)

4.1 Historical Imagery

Historical imagery (Figure 3) does not indicate the presence of wetland features indicated in Figure 1. The plateau on RE/57 and 4/55 was previously dominated by dense stands of trees (presumably Black Wattle) and do not show any clear signs of wetland features (which would typically be indicated by a change in vegetation type relative to the immediate surrounding area). The historical imagery did not indicate any other additional watercourses within the boundaries of the three properties (apart from small dams located on 4/55 and RE/57).

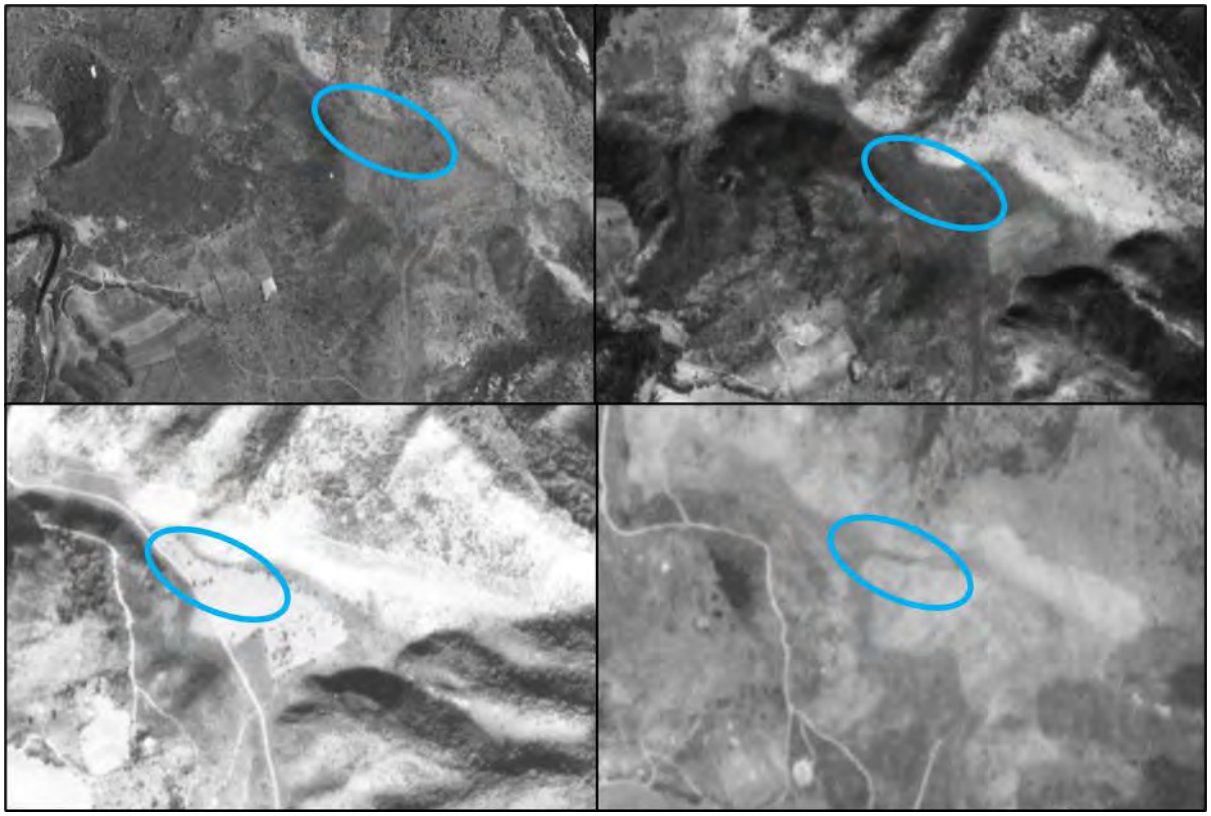

Figure 3: Historical aerial photographs indicating the location of the wetland identified in in the WCBSP and NFEPA spatial layers.

4.2 Strategic Water Source Areas (SWSAs)

Strategic Water Source Areas (SWSAs) are defined as areas of land that either:

a) Supply a disproportionate (i.e. relatively large) quantity of mean annual surface water runoff in relation to their size and so are considered nationally important; or

b) Have high groundwater recharge and where the groundwater forms a nationally important resource; or

c) Areas that meet both criteria (a) and (b).

The properties that form the focus of this study occur within the Outeniqua SWSA (Figure 4) which is considered to be of national importance. The SWSAs are vital for water and food security in South Africa and also provide the water used to sustain the economy. Given this context, management and implementation guidelines have been developed with the objective of facilitating and supporting well-informed and proactive land management, land-use and development planning in these nationally important and critical areas (Le Maitre, et al., 2018). The primary principle behind this objective is to protect the quantity and quality of the water they produce by maintaining or improving their condition. With respect to agriculture, the main impacts that affect watercourses are inputs of fertilisers and agro-chemicals, soil erosion and associated sediment input and destabilisation of the bed and banks of watercourses because of the failure to maintain uncultivated buffer strips along the banks of watercourse.

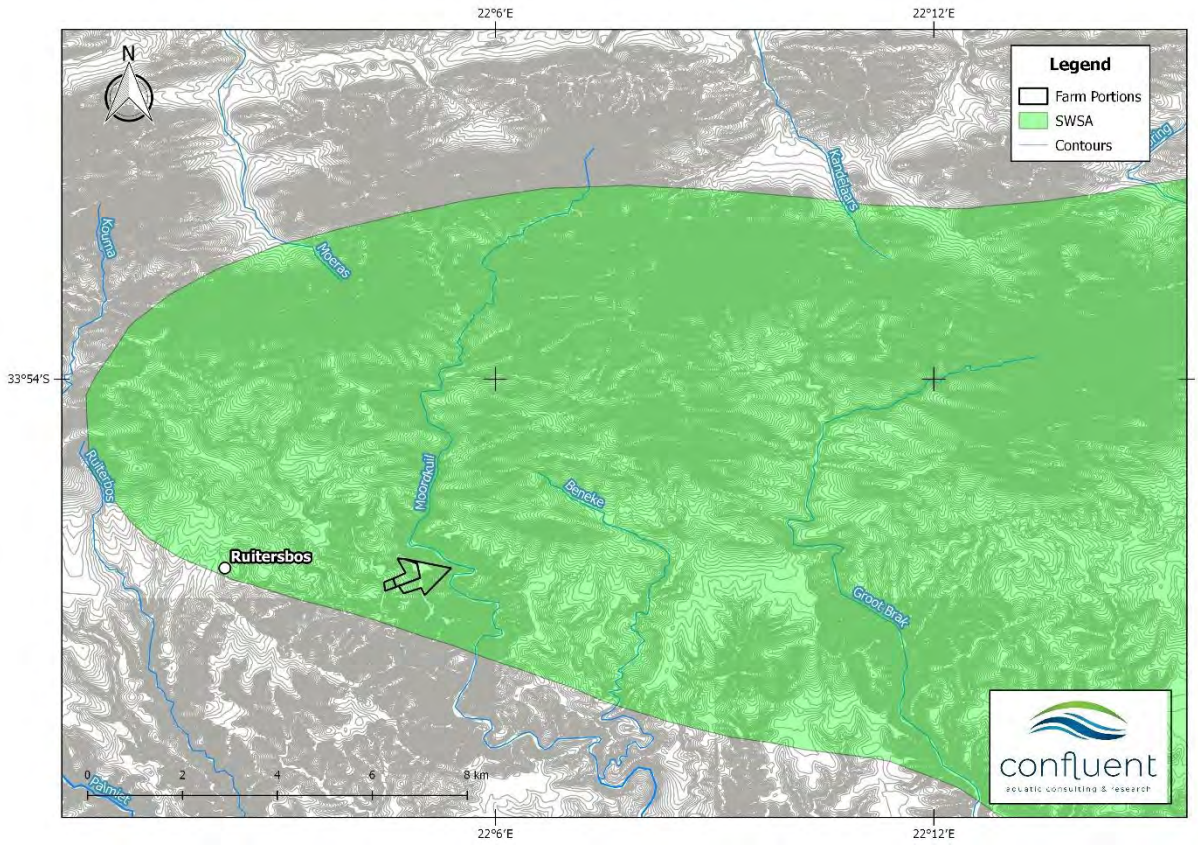

Figure 4: Location of the site relative to SWSAs.

5. SITE VISIT

5.1 Baseline Description of Freshwater Features

5.1.1 Wetlands

The area in which the CBA wetland is indicated to occur is characterised by a flat hilltop bench (or plateau) which drops off steeply into the river valleys below. The entire area had been cleared of trees which had been scraped to the edge of the perimeter of the plateau (Figure 5). The area was experiencing regrowth of vegetation which was dominated by pioneer weed species, grasses and numerous wattle saplings. No hydrophilic plant species indicative of wetland conditions were observed and no reliable soil cores could be obtained due to the rocky nature of the soil profile. The regrowing vegetation was relatively uniform throughout the plateau. The plateau is flat and there were no topographical features indicative of wetland formation present. The steep topography of a large section of the area indicated as a wetland is also not consistent with a wetland flat which is typically situated on a hilltop bench with little to no gradient across the entire wetland area. Site observations are therefore in agreement with the most recent wetland inventory map for South Africa which does not indicate the presence of any wetland situated on the hilltop bench plateau of 4/55 and RE/57 (Figure 2). The entire plateau is however an important area of drainage into wetlands and watercourses that drain towards the Moordkuil River to the north. Given the location of the properties in a SWSA, it is therefore important that proposed orchards are not located too close to the edge of this escarpment so as to prevent erosion of the escarpment area and degradation of watercourses and wetlands in the valleys below.

The site visit did confirm the presence of a seepage wetland towards the eastern extent of RE/57 (Figure 2). This wetland is located well outside of the area that had been cleared and falls at a significantly lower elevation in the valley below the plateau.

Figure 5: Photograph illustrating cleared vegetation scraped to the edge of the plateau on Portion 4/55 and RE/57.

5.1.2 Rivers & Drainage Lines

Contours result in a natural area of drainage that runs to the south of the main road through 4/55, below a newly constructed dam (Figure 6). The area in Figure 5 was delineated by drawing a 15 m buffer either side of the lowest path along the drainage. The area was completely cleared of vegetation (Figure 7) but has now become revegetated over time (Figure 8). This drainage crosses the road (via a culvert) and eventually becomes a more discernible non-perennial watercourse, that flows into the perennial Leeukloof River. This drainage area upstream of the road has been accentuated by the clearing of vegetation and earth moving which has resulted in relatively steep slopes either side of the drainage. The steep slopes (parts of which are not well vegetated) either side of the drainage do however present an erosion risk to watercourses located further downstream. Apart from a possible difference in elevation between the northern and southern sides of the drainage, historical images do not show any clear indications of the presence of a natural watercourse at this location (Figure 7). These images neither confirm the absence or presence of a watercourse prior to the clearing of vegetation. Other than the obvious contours, the area of drainage upstream of the road did not show any clear indications of being a watercourse (i.e. there was no discernible channel or bed or banks characteristic of a non-perennial river/stream that receives intermittent flow) – this four years after the clearing took place. The drainage area is choked with vegetation and does therefore not appear to receive regular flow in its current state. While the historical presence of a watercourse cannot be confirmed, this area does form an important part of the

catchment area of downstream watercourses and it is therefore important that this area is managed and impacts mitigated so as to prevent erosion and degradation of downstream watercourses. This is particularly important in light of the fact that the area falls within a SWSA.

Figure 6: Map indicating area of drainage upstream of a non-perennial watercourse.

Figure 7: Time series of drainage area before, during and after vegetation clearing.

Figure 8: View of drainage area from up-(left) and down-(right) slope.

5.1.3 Artificial Freshwater Features

Artificial freshwater features include a constructed drainage canal that runs parallel to the main road that traverses Portion 4 of 55 and discharges into a dam constructed towards the western most corner of Portion 4 of 55. The purpose of the canal is to drain surface runoff from the road and also to intercept runoff from the upper slopes of the catchment and divert it into the dam for storage. The canal was eroded in sections and extensive signs of gulley erosion was also visible at the inlet into the dam. Apart from the dam located on 4/55 another small dam is located on RE/57. Both dams are artificial and are not natural freshwater features.

Figure 9: Map indicating artificial freshwater features identified within property boundaries.

6. AQUATIC BIODIVERSITY COMPLIANCE STATEMENT

Based on the results of the desktop review and the site survey, and taking the limitations of the study into account, the sensitivity of aquatic biodiversity of the proposed development is regarded as **Low**. The main factors influencing the statement include the following:

- No freshwater features were identified within the footprint of the cleared area during the site visit; and
- No obvious freshwater features could be identified in recent geospatial databases or historical imagery of the site.

Areas of drainage that eventually do flow into discernible watercourse are however present. These areas (as indicated in Section 5.1.2) must be revegetated and buffered to minimise disturbance and erosion. Furthermore, parts of the cleared area on Portion 4 of 55 and RE/57 are located on a broad plateau that drops off steeply down into the river valley below. This

area is likely to be susceptible to erosion which needs to be carefully managed. Mitigation measures listed under Section 6.1 must therefore be implemented to ensure that impacts to freshwater features are avoided.

6.1 Mitigation Measures

As no watercourses have been directly impacted by the clearing of vegetation a detailed specialist report and impact assessment is not required. There are however some areas that do need to be managed and mitigated, which relate primarily to the management and prevention of erosion along steep gradients in close proximity to watercourses. These include the following:

- Orchards must not be established within the drainage area indicated in Figure 6. The delineated area provides sufficient protection for the steep embankments and an additional buffer (approximately 10 – 15 m) beyond the top of the embankments;
- Exposed sections of embankments in the drainage area indicated in Figure 6 must be revegetated with an indigenous fynbos reclamation mix;
- The culvert at bottom of the drainage area must be cleared and erosion protection placed at the outlet;
- Orchards must be withdrawn from 15 m away from the edge of the plateau on Portion 4 of 55 and RE/57 to avoid erosion and deterioration of watercourses in the Moordkuil River valley below. This 15 m area must be treated as a buffer which should be rehabilitated and revegetated to provide protection to watercourses located down the steep slopes of the escarpment;
- The drainage area and buffer around the orchards established on the plateau must be routinely monitored for erosion; and
- Tree rows for newly established orchards must be planted parallel to contour lines to minimise soil loss and erosion from the proposed orchard areas.

7. DWS RISK ASSESSMENT

While no watercourses fall within the footprint of the development there are two wetland areas that fall within 500 m of the property. According to the NWA, the establishment of orchards is therefore considered a Section 21 (c) and (i) water use. A seep grading into a channelled valley-bottom wetland is located to the east of the plateau (as indicated in Figure 2 and Figure 10). This wetland is situated at a lower elevation than the plateau which falls away steeply along its perimeter. The upper part of this wetland is in a relatively natural state but becomes increasingly invaded by black wattle further downstream in the channelled section of the wetland.

Figure 10: Photograph of the wetland seep against the steep slopes below the plateau.

In addition, the section of the Leeukloof River adjacent to Portion 8 of 55 is indicated as a channelled-valley bottom wetland by the latest national wetland map layer (Figure 2). The site visit confirmed that sections of the Leeukloof River do indeed grade into a channelled-valley bottom wetland characterised by wetland habitat and temporary floodplain on the eastern side of the river channel (Figure 11). The river channel runs through wetland areas that are characterised by several wetland plant species including *Centella asiatica*, *Juncus effusus*, *Juncus oxycarpus*, *Isolepis prolifera* and *Pycreus polystachos*. This wetland has been impacted by several activities, most notably invasion by alien invasive vegetation (*Eucalyptus* sp. and *Acacia mearnsii*), increased abstraction (by invasive vegetation and farming). The high intensity of invasive plant species, together with the relatively high concentration of agriculture within the catchment area (and associated abstraction) most likely results in reduced base flows, which is the most severe hydrological impact. There was little sign of increased sediment deposition, although erosion and incision of the river channel due to invasive tree species was evident. Water quality is likely to be relatively unimpacted due to its position high up in the catchment, with low concentrations of nutrients and pesticides from farming activities likely.

Figure 11: Channelled-valley bottom wetland in the Leeukloof River.

The Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) of each wetland is summarised in Table 1 and Table 2, respectively (see the appendix for detailed methods to determine the PES and EIS). The risk assessment matrix (Based on DWS 2015 publication: Section 21 (c) and (i) water use Risk Assessment Protocol) was implemented to assess risks for each activity associated with the construction and operational phase of establishing avocado orchards. The first stage of the risk assessment is the identification of environmental activities, aspects and impacts. This is supported by the identification of receptors and resources, which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. The definitions and methodology applied in the impact assessment are provided in the appendix of this report. The layout of the proposed orchards will take place well outside of the delineated area of each wetland type and therefore poses a negligible risk to the PES and EIS of each wetland. Pre-cautionary mitigation measures (including those stipulated in Section 6.1 above) have however been stipulated to ensure that construction (Table 3) and operational (Table 4) phase activities do not negatively impact on theses wetlands as well as drainage areas that flow into watercourses.

Table 1: Present Ecological State of wetlands occurring within 500 m of proposed avocado orchards.

	Channelled-Valley Bottom Wetland[1]	Seep Wetland[2]
Hydrology	53 %	90 %
Geomorphology	60 %	90 %
Water Quality	73 %	
Vegetation	65 %	86 %
Overall PES	**C (62 %) – Moderately Modified**	**A/B (89 %) – Near Natural**

[1] PES determined using WET-IHI method
[2] PES determined using Wet-Health method.

Table 2: Assessment of the Ecological Importance and Sensitivity (EIS) for the channelled valley-bottom and seep wetlands.

Criteria	Channelled Valley Bottom		Seep	
Presence of Rare & Endangered Species	**2**	Moderate - More than one species/taxon judged to be rare or endangered on a local scale.	**2**	Moderate - More than one species/taxon judged to be rare or endangered on a local scale.
Populations of Unique Species	**2**	Moderate - More than one population (or taxon) judged to be unique on a local scale.	**2**	Moderate - More than one population (or taxon) judged to be unique on a local scale.
Intolerant Biota	**4**	Very High - A very high proportion of biota is expected to be dependent on permanent water flow	**1**	Low - Low dependence on permanent flow - sporadic and seasonal flow events expected to be sufficient.
Species/Taxon Richness	**2**	Moderate - High richness at a local scale.	**1**	Low - Richness, unlikely to be important at any scale.
Diversity of Habitat Types or Features	**2**	Moderate - Although small, the wetland provides a diversity of habitat types at a local scale.	**1**	Low - Low diversity of habitat types
Refuge Value of Habitat Types	**2**	Moderate - provides refugia to biota during periods of environmental stress at a local scale.	**2**	Moderate - provides refugia to biota during periods of environmental stress at a local scale.
Sensitivity to Flow	**3**	High - Habitat types sensitive to reduced flows and floods	**2**	Low - habitat types rarely sensitive to flow decreases or increases.
Sensitivity to Water Quality	**3**	High - Sensitive due to riverine characteristics and small size.	**1**	Low - habitat and biota not sensitive to fluctuations in water quality
Migration Route or Breeding and Feeding Site for Wetland Species	**3**	High - Important link in terms of connectivity for the survival of biota upstream and downstream and is sensitive to modification	**1**	Low - Minor importance in terms of connectivity for the survival of biota upstream and downstream
Protection Status	**2**	Low - The stream delineation is present within an area important for the conservation of ecological diversity on a provincial scale.	**2**	Low - The stream delineation is present within an area important for the conservation of ecological diversity on a provincial scale.
Ecological Importance & Sensitivity	**2**	**Moderate**	**1.5**	**Moderate**

Table 3: Construction phase risk matrix

Phase	Activity	Aspect	Impact	Flow Regime	Water Quality	Habitat	Biota		Severity	Spatial scale	Duration		Consequence		Frequency of activity	Frequency of impact	Legal Issues	Detection		Likelihood	Significance	Risk Rating	Confidence level	Control Measures	PES & EIS
CONSTRUCTION & LAYOUT	Clearing of vegetation to establish orchards	Exposure of soil to erosion	Increased turbidity and sedimentation of aquatic habitats	1	1	1	1		1	2	1		4		1	2	5	2		10	40	Low	95	•Clearing activities should, as far as is possible, be scheduled for the dry season or when the probability of rainfall is low. • Clearing must not take place within designated buffer areas. •15 m buffer area between orchards and the edge of the escarpment on Portion 4 of 55 and RE/57 •Buffer areas to be revegetated.	See Section 7
		Spills and leakage of hydro-carbons and other pollutants	Toxicity to instream aquatic biota	1	1	1	1		1	1	1		3		1	2	5	2		10	30	Low	95	• Construction vehicles and machinery to be serviced routinely and checked daily for oil and fuel leaks; •Re-fuelling, maintenance and parking of vehicles and machinery must take place outside of designated buffer areas.	

Table 4: Operational phase risk matrix.

Phases	Activity	Aspect	Impact	Flow Regime	Water Quality	Habitat	Biota		Severity	Spatial scale	Duration		Consequence		Frequency of activity	Frequency of impact	Legal Issues	Detection		Likelihood	Significance	Risk Rating	Confidence level	Control Measures	PES & EIS
OPERATIONAL PHASE	Cultivation of avocado orchards	Erosion of fields	Increased turbidity and sedimentation of wetlands	1	1	1	1		1	1	1		3		1	1	5	1		8	24	Low	95	• Orchard rows must be planted along natural contours. •Cover crop must be established within orchard rows to minimise soil erosion. •All buffer areas to be designated as no-go areas	See Section 7
		Runoff of pesticides and fertilizers	Toxicity to aquatic biota	1	1	2	1		1	1	1		3		1	1	5	2		9	27	Low	95	• Orchard rows must be planted along natural contours. •Cover crop must be established within orchard rows to minimise soil erosion.	

Risks were assessed assuming the full implementation of recommended mitigation measures. Risk ratings for all activities fall within a **Low Risk** class and are unlikely to result in a deterioration in the PES or EIS of the wetland. The level of confidence associated with this assessment is very high. Given the low impact associated with all activities highlighted in this report, and according to Government Notice 509 of August 2016 (RSA, 2016) of the National Water Act, the proposed establishment of orchards on Portions 4 and 8 of Farm 55, and the remaining portion of Farm 57, Kleinbos, is Generally Authorised and does not require a Water Use License.

8. CONCLUSION

Based on a detailed analysis of historical imagery and other geospatial datasets, the area cleared for the establishment of avocado orchards is associated with a **Low** aquatic sensitivity (no natural watercourses are located within the footprint of the cleared area). This aquatic compliance statement report is therefore sufficient to meet the NEMA environmental authorisation requirements for aquatic biodiversity. This statement does however acknowledge that the establishment of orchards is located in a SWSA, characterised by high elevation and on or near to steep gradients (particularly in RE/57), which could potentially negatively affect watercourses located at lower elevations. For this reason, mitigation measures listed under Section 6.1 must be implemented as part of the Environmental Management Plan (EMP).

According to the National Water Act, the area proposed for the establishment of orchards does fall within the regulated area of a watercourse (i.e. within 500m of nearby wetlands) and is therefore considered a Section 21 (c) and (i) water use. The risk of construction and operational phase activities associated with the establishment of orchards is however **Low**. The water use therefore does not require a WUL and can be generally authorised (assuming the full implementation of mitigation measures listed in Tables 3 and 4).

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APPENDIX 1 – WETLAND-IHI METHOD

The Wetland Index of Habitat Integrity (WETLAND-IHI) model (DWAF, 2007) is composed of four modules. The "Hydrology", "Geomorphology" and "Water Quality" modules all assess the contemporary driving processes behind wetland formation and maintenance. The last module, "Vegetation Alteration", provides an indication of the intensity of human land-use activities on the wetland surface itself and how these may have modified the condition of the wetland. The integration of the scores from these 4 modules provides an overall Present Ecological State (PES) score for the wetland system being examined (Table 5).

Table 5: Wetland-IHI classes and descriptions

Integrity Class	Description	IHI Score (%)
A	Unmodified, natural.	> 90
B	Largely natural with few modifications. The flow regime has been only slightly modified and pollution is limited to sediment. A small change in natural habitats may have taken place. However, the ecosystem functions are essentially unchanged.	80 – 90
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	60 – 79
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	40 – 59
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.	20 – 39
F	Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.	0 - 19

Reference:

Department of Water Affairs and Forestry (DWAF) (2007). Manual for the assessment of a Wetland Index of Habitat Integrity for South African floodplain and channelled valley bottom wetland types by M. Rountree (ed); C.P. Todd, C. J. Kleynhans, A. L. Batchelor, M. D. Louw, D. Kotze, D. Walters, S. Schroeder, P. Illgner, M. Uys. and G.C. Marneweck. Report no. N/0000/00/WEI/0407. Resource Quality Services, Department of Water Affairs and Forestry, Pretoria, South Africa

APPENDIX 2 – WET-HEALTH METHOD

Desktop and field data were captured in GIS software and used to populate the Level 1 WET-Health tool (Macfarlane et al., 2008) which was used to derive the PES of the wetland HGM units. The magnitude of observed impacts on the hydrological, geomorphological and vegetation components of the wetland were calculated and combined as per the tool to provide a measure of the overall condition of the wetland on a scale from 1-10. Resultant scores were then used to assign the wetland into one of six PES categories as shown in Table 6 below.

Table 6: Wetland Present Ecological State categories and impact descriptions.

Ecological Category	Description	Impact Score
A	Unmodified, natural.	0 – 0.9
B	Largely natural with few modifications / in good health. A small change in natural habitats and biota may have taken place but the ecosystem functions are still predominantly unchanged.	1 – 1.9
C	Moderately modified / fair condition. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	2 – 3.9
D	Largely modified / poor condition. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	4 – 5.9
E	Seriously modified / very poor condition. The loss of natural habitat, biota and basic ecosystem functions is extensive.	6 – 7.9
F	Critically modified / totally transformed. Modifications have reached a critical level and the lotic system has been modified completely with an almost complete loss of natural habitat and biota.	8 – 10

Reference

Macfarlane, D., Kotze, D., Ellery, W., Walters, D., Koopman, V., Goodman, P. and Goge, M. 2007. *WET-Health: A technique for rapidly assessing wetland health. Wetland Management Series.* Water Research Commission Report TT 340/09.

APPENDIX 3 – EIS METHOD

The ecological importance of a water resource is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales (Duthie, 1999). Ecological sensitivity refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred (Duthie, 1999). The Ecological Importance and sensitivity (EIS) provides a guideline for determination of the Ecological Management Class (EMC).

The DWA-recommended method for the determination of the EIS of a wetland considers the following ecological aspects (Duthie, 1999):

- **Biodiversity support:**
    - Presence of Red Data species;
    - Presence of unique instream and riparian biota;
    - Use of the ecosystem for migration, breeding or feeding.
- **Importance in the larger landscape:**
    - Protection status of the wetland;
    - Protection status of the vegetation type;
    - Regional context regarding ecological integrity;
    - Size and rarity of the wetland types present;
    - Diversity of habitat types within the wetland.
- **Sensitivity of the wetland:**
    - Sensitivity of wetland to changes in flooding regime;
    - Sensitivity of wetland to changes in low flow regime, and
    - Sensitivity to water quality changes.

Each criterion is scored between 0 and 4, and the average of each subset of scores is used to derive an EIS score for each of the three components listed above. The average score for all determinants was then used to derive an overall EIS category for the wetland. Due to the absence of biotic data for this assessment, scores were conservatively assigned for any criteria dealing with the wetland biota – where available, other research data were used.

Table 7: Ecological importance and sensitivity categories. Interpretation of average scores for biotic and habitat determinants.

Ecological Importance and Sensitivity Category (EIS)	Range of Median	Recommended Ecological Management Class
Very high: Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these floodplains is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers.	>3 and <=4	A
High: Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these floodplains may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.	>2 and <=3	B
Moderate: Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these floodplains is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.	>1 and <=2	C
Low/marginal: Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these floodplains is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	>0 and <=1	D

Reference:

Duthie, A. (1999). IER (Floodplain Wetlands) Determining the Ecological Importance and Sensitivity (EIS) and Ecological Management Class (EMC). Resource Directed Measures for Protection of Water Resources: Wetland Ecosystems. Department of Water Affairs and Forestry.

APPENDIX 4 – DWS RISK ASSESSMENT METHODOLOGY

Definitions:

- An activity is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or infrastructure that is possessed by an organisation;
- An aspect is an 'element of an organizations activities, products and services which can interact with the environment'. The interaction of an aspect with the environment may result in an impact;
- Environmental impacts are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity;
- Resources are components of the biophysical environment and include the flow regime, water quality, habitat and biota of the affected watercourse; and
- Severity refers to the degree of change to the status of each of the receptors (Table 8). An overall severity score is calculated as the average of all scores receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards.
- Spatial extent refers to the geographical scale of the impact (Table 9).
- Duration refers to the length of time over which the stressor will cause a change in the resource or receptor (Table 10).
- Frequency of activity refers to how often the proposed activity will take place (Table 11).
- Frequency of impact refers to the frequency with which a stressor (aspect) will impact on the resource (Table 12).

Method:

The significance of the impact is then assessed by rating each variable numerically according to the defined criteria (refer to the table below). The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The severity, spatial scope and duration of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 15. The frequency of the activity, impact, legal issues and the detection of the impact together comprise the likelihood of the impact occurring and can obtain a maximum value of 20. The values for likelihood and consequence of the impact are then read off a significance rating matrix and are used to determine whether mitigation is necessary. In accordance with the method stipulated in the risk assessment key, all impacts for flow regime, water quality, habitat and biota were scored as a 5 (i.e. average Severity score of 5) as all activities will occur within the delineated boundary of the wetland.

Table 8: Scores used to rate the impact of the aspect on resource quality (flow regime, water quality, geomorphology, biota and habitat)

Insignificant / non-harmful	1
Small / potentially harmful	2
Significant / slightly harmful	3
Great / harmful	4
Disastrous / extremely harmful and/or wetland(s) involved	5
Where "or wetland(s) are involved" it means that the activity is located within the delineated boundary of any wetland.	

Table 9: Scores used to rate the spatial scale that the aspect is impacting on.

Area specific (at impact site)	1
Whole site (entire surface right)	2
Regional / neighbouring areas (downstream within quaternary catchment)	3
National (impacting beyond secondary catchment or provinces)	4
Global (impacting beyond SA boundary)	5

Table 10: Scores used to rate the duration of the aspects impact on resource quality

One day to one month, PES, EIS and/or REC not impacted	1
One month to one year, PES, EIS and/or REC impacted but no change in status	2
One year to 10 years, PES, EIS and/or REC impacted to a lower status but can be improved over this period through mitigation	3
Life of the activity, PES, EIS and/or REC permanently lowered	4
More than life of the organisation/facility, PES and EIS scores, a E or F	5

Table 11: Scores used to rate the frequency of the activity

Annually or less	1
Bi-annually	2
Monthly	3
Weekly	4
Daily	5

Table 12: Scores used to rate the frequency of the activity's impact on resource quality

Almost never / almost impossible / >20%	1
Very seldom / highly unlikely / >40%	2
Infrequent / unlikely / seldom / >60%	3
Often / regularly / likely / possible / >80%	4
Daily / highly likely / definitely / >100%	5

Table 13: Scores used to rate the extent to which the activity is governed by legislation

No legislation	1
Fully covered by legislation (wetlands are legally governed)	5

Table 14: Scores used to rate the ability to identify and react to impacts of the activity on resource quality, people and property.

Immediately	1
Without much effort	2
Need some effort	3
Remote and difficult to observe	4
Covered	5

Table 15: Rating classes

RATING	CLASS	MANAGEMENT DESCRIPTION
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated.
56 – 169	(M) Moderate Risk	Risk and impact on watercourses are notable and require mitigation measures on a higher level, which costs more and require specialist input. Licence required.
170 – 300	(H) High Risk	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.

Table 16: Calculations used to determine the risk of the activity to water resource quality

Consequence = Severity + Spatial Scale + Duration
Likelihood = Frequency of Activity + Frequency of Incident + Legal Issues + Detection
Significance\Risk = Consequence x Likelihood