WETLAND ASSESSMENT

PES, EIS, REC

Riverside View Ext 84

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Applicant Name	**Steyn City Properties (Pty) Ltd**

	Name	Signature	Date
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Amendments on Document

Date	Report Reference Number		Description of Amendment
2020/02/25	-	21637_WPES_1	Updated Report with wetland assessment for EIA & WULA applications

DECLARATION OF INDEPENDENCE

Specialist Name	Mr. D. Botha
Declaration of Independence	I declare, as a specialist appointed in terms of the National Environmental Management Act (Act No 108 of 1998) and the associated 2014 Environmental Impact Assessment (EIA) Regulations, that: • I act as the independent specialist in this application; • I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant; • I declare that there are no circumstances that may compromise my objectivity in performing such work; • I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity; • I will comply with the Act, Regulations and all other applicable legislation; • I have no, and will not engage in, conflicting interests in the undertaking of the activity; • I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority; • All the particulars furnished by me in this form are true and correct; and • I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.
Signature	
Date	2020/02/25

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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. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and Prism Environmental Management Services and its staff reserve the right to modify aspects of the report including the recommendations if and when new information becomes available from ongoing research or further work in this field, or pertaining to this investigation.

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EXECUTIVE SUMMARY

Prism Environmental Management Services was requested by **Steyn City Properties (Pty) Ltd** to undertake a wetland assessment to delineate the wetland and to determine the Present Ecological State (PES), the Ecological Importance and Sensitivity (EIS) and the Recommended Ecological Classification (REC) for the proposed development of **Riverside View Ext 84.** This, specifically to inform the Environmental Impact Assessment (EIA) and Water Use License Application (WULA) for the said development.

The proposed development is located on portion 124 and 185 of the Farm Diepsloot 388 JR in the City of Johannesburg, Gauteng Province (here after referred to as the study site/s). The study site measures approximately 29,3ha. The study site is located in quaternary catchment A21C in the Limpopo Water Management Area (WMA 1). The study area falls within the Grassland Biome (Biome 06), the Highveld Level-1 Ecoregion (Ecoregion 11) (Kleynhans et al., 2005).

The field investigations concluded that one natural wetland system was identified in the study area.

The following Hydrogeomorphic wetland was identified during the site evaluation:

- RSV84_UCVB – Unchanneled Valley Bottom Wetland at the head of the catchment, draining towards the North.

Table 1-1: Findings and Conclusion

<table>
<tr><th>Study</th><th colspan="11">Findings and Conclusions</th></tr>
<tr><td rowspan="15">Wetland Assessment</td><td colspan="11">The proposed development site is affected by a wetland and associated conservation buffer area.</td></tr>
<tr><td colspan="11">The wetland and buffer area will be impacted by the development. The infrastructure installations and connections to the external services will impact on the wetland.</td></tr>
<tr><td colspan="11">The wetland buffer area could be used to assist with storm water management and flow management at the transitional point leading from the development and infrastructure installations into the wetland and buffer area.</td></tr>
<tr><td colspan="11">Specific attention to stormwater management and influx of water leading from the development into the wetland areas must be focussed on.</td></tr>
<tr><td colspan="11">Careful design and interdisciplinary consultation between the professional team would be required. Interflows and sheet flow must be managed at the contact points.</td></tr>
<tr><td rowspan="2">Wetland</td><td rowspan="2">Wetland HGM</td><td colspan="2">Wetland</td><td colspan="2">32m Buffer</td><td colspan="2">PES</td><td colspan="2">EIS</td><td>REC</td></tr>
<tr><td>On site</td><td>Linked to external services</td><td>On site</td><td>Linked to external services</td><td>Category</td><td>Trajectory of change</td><td>Category</td><td>Trajectory of change</td><td>Category</td></tr>
<tr><td>RSV84_UCVB</td><td>UCVB</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>E - Highly Modified</td><td>↓</td><td>C - Moderate</td><td>↓</td><td>D - Largely modified.</td></tr>
<tr><td colspan="2" rowspan="3">Recommended Monitoring Requirements</td><td colspan="2">Wetland Assessment</td><td colspan="2">Wetland Specialist</td><td colspan="4">Monthly Visual Inspections</td></tr>
<tr><td colspan="2">Environmental Control Officers</td><td colspan="2">ECO</td><td colspan="4">Bi-Weekly Visual Inspections</td></tr>
<tr><td colspan="2">Closure Audit</td><td colspan="2">Wetland Specialist</td><td colspan="4">Closure Audit</td></tr>
</table>

Concluded from the results presented in this document, the construction activities will in all likelihood impact on the wetland system but can be mitigated to satisfactory standards if all mitigatory actions are implemented with due care. It is key to preserve water quality and supply to the downstream aquatic resources.

The rehabilitation of the wetland is vital to recover some ecological function. The wetland drivers must be enhanced as part of the rehabilitation of the affected areas. In respect of the construction phase, it is important to ensure that the required erosion protection measures linked to the wetland intersection sections be carefully designed and installed.

The project can be supported, should all the mitigation measures be implemented and monitored against to ensure compliance and protection of the aquatic resource.

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1 INTRODUCTION

Prism Environmental Management Services was requested by **Steyn City Properties (Pty) Ltd** to undertake a wetland assessment to delineate the wetland and to determine the Present Ecological State (PES), the Ecological Importance and Sensitivity (EIS) and the Recommended Ecological Classification (REC) for the proposed development of **Riverside View Ext 84.** This, specifically to inform the Environmental Impact Assessment (EIA) and Water Use License Application (WULA) for the said development.

1.1 Project Description

Steyn City Properties (Pty) Ltd is intending to develop a mixed-use township on portion 124 and 185 of the Farm Diepsloot 388 JR in the City of Johannesburg, Gauteng, to be known as Riverside View Ext 84. The development will be zoned for mixed-use to include, but not be limited to, Special: Place of Instruction, Residential dwelling units, Residential buildings, Storage, Offices, including ancillary uses such as restaurants and shop. The site extends from North to South along the Provincial R511 Road (William Nicol Drive) and falls under jurisdiction of the City of Johannesburg (CoJ).

In addition, the proposed development also involves the provision of all necessary services to the development including water, sanitation, stormwater and internal roads.

1.1.1 Study Site Location

The proposed development is located on portion 124 and 185 of the Farm Diepsloot 388 JR in the City of Johannesburg, Gauteng Province (*here after referred to as the study site/s*) (Figure 1.2) (Figure 1.3). The study site measures approximately 29,3ha. The study site is located in quaternary catchment A21C in the Limpopo Water Management Area (WMA 1), (Figure 1.4). The study area falls within the Grassland Biome (Biome 06), the Highveld Level-1 Ecoregion (Ecoregion 11) (Kleynhans *et al.*, 2005) (Figure 1.5).

1.2 Scope and Purpose

The aim of this study was to undertake a wetland assessment to delineate the wetland and to determine the Present Ecological State (PES), the Ecological Importance and Sensitivity (EIS) and the Recommended Ecological Classification (REC) for the proposed development. This, specifically to inform the Environmental Impact Assessment (EIA) and Water Use License Application (WULA) for the said development.

1.3 Overview of Specialist

Prism EMS has conducted the required wetland specialist assessment and delineation of the wetlands on site to inform the Environmental Impact Assessment (EIA) and Water Use License Application (WULA). The team under lead of Mr. D. Botha has conducted the assessment. The details of the team are tabularised in Table 1-1.

Table 1-1: Details of Specialist

Specialist	Mr. D. Botha – Wetland Specialist
Company:	Prism EMS
Qualifications:	M.A. Environmental Management B.A. Hons. Geography & Environmental Management, B.A. Humanities Post Higher Education Diploma Wetland and Wetland Delineation *(DWAF Accredited Short Course)* Soil Classification and Wetland Delineation – Short Course – *Terrasoil Science* Tools for Wetland Assessment – *Rhodes University* SASS5 Aquatic Biomonitoring Training – *Department of Water Affairs, Ground Truth* Wetland Plant Taxonomy – *Water Research Commission* Hydropedology and Wetland Functioning – *Water Business Academy / Terra Soil Science*
Experience:	17 Years
Affiliation/ Registration	South African Council for Natural Scientific Professions (SACNASP) registered Scientist | Pr.Sci.Nat. (119979) Registered Member of Environmental Assessment Practitioners Association of South Africa (EAPASA)(2019/1209) Member of the International Association for Impact Assessors (IAIAsa) (1653) Member of the Gauteng Wetland Forum Member of the South African Wetland Society
Address:	12A Beacon Road, Poortview, Johannesburg
Tel:	087 985 0951
Fax:	086 601 4800
Email:	dewet@prismems.co.za

Designation	**Name**	**Qualification**	**Professional Registration**	**Role**
Specialist Team				
Ecologist	A.E. van Wyk	B.Sc. Environmental and Biological Sciences B.Sc. Hons. Environmental and Biological Sciences (in progress) 5 Years' Experience	Cand.Sci.Nat (pending)	Field Assistant
Aquatic Specialist	Mr. P. Singh	MSc Aquatic Health (Cum Laude) BSc.Hons (Biodiversity & Conservation) BSc (Bot & Zoo) Rand Water Water Purification of Drinking Water – *Rand Water Vereeniging* Ecotoxicity Test Methods and Validation - *Golder Associates Research Laboratory* 7 Years' Experience	Pr. Sci. Nat. (116822)	Peer Review

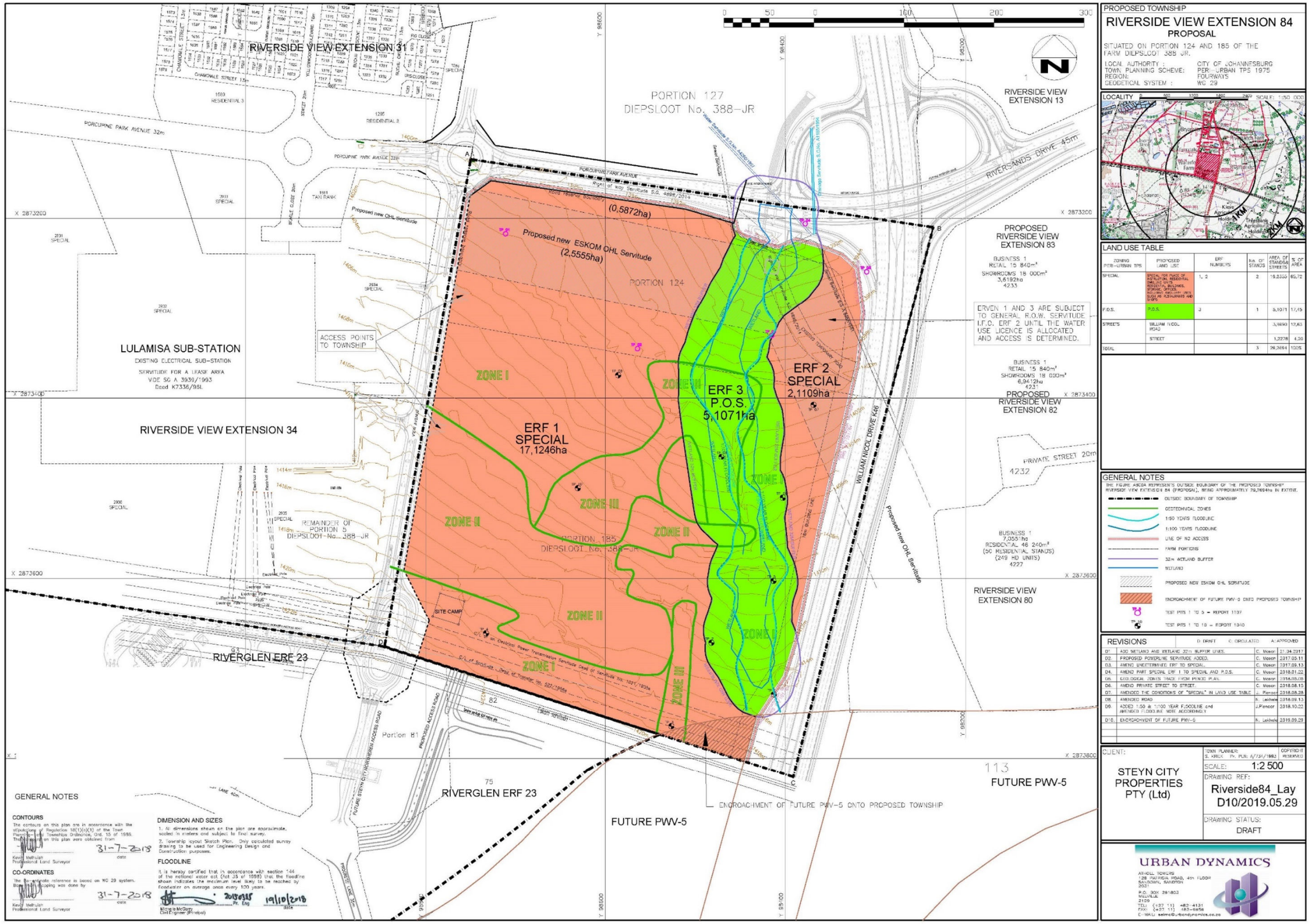


Figure 1.1: Proposed Layout.

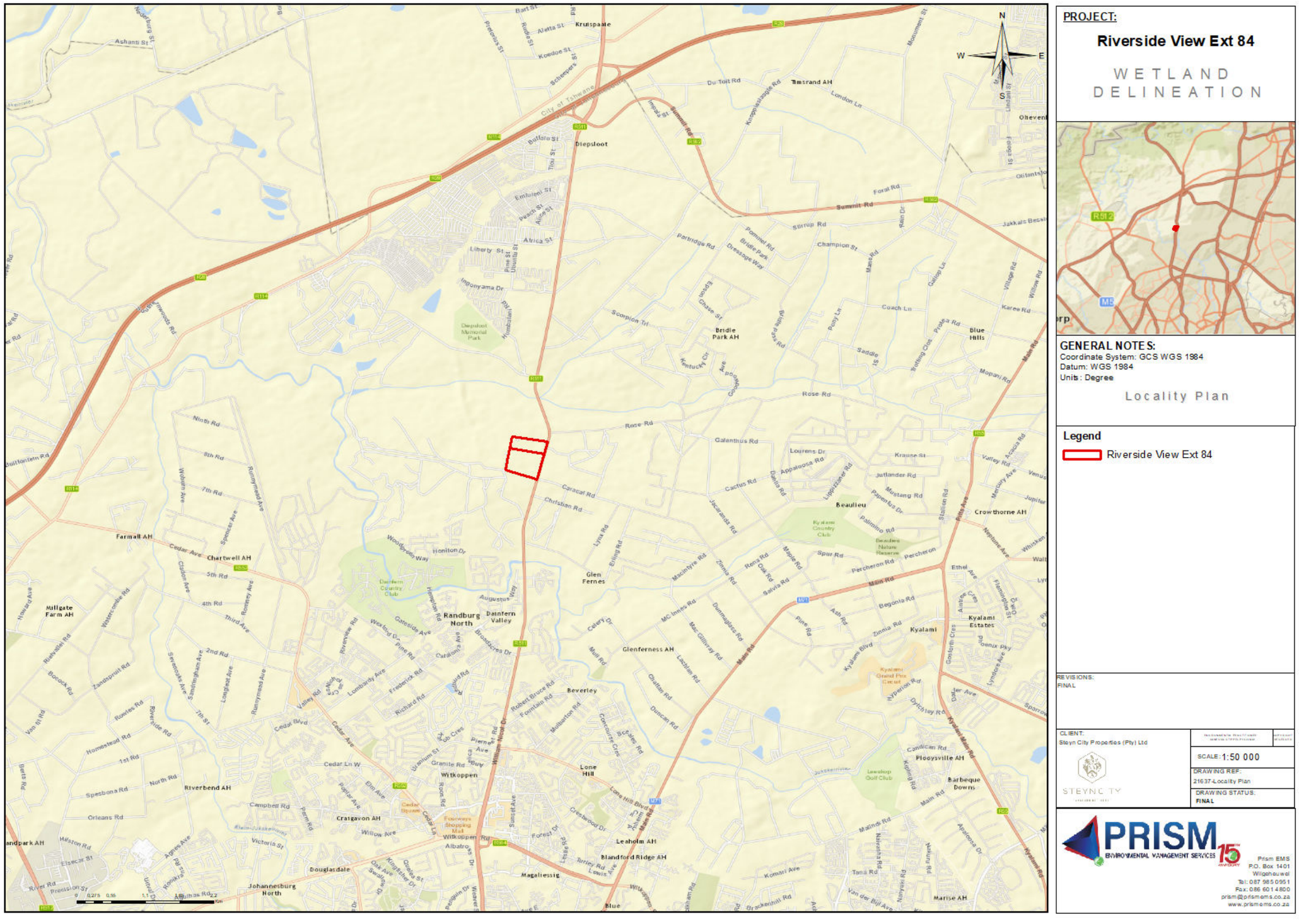
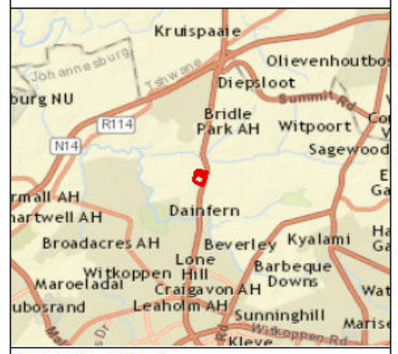


Figure 1.2: Locality Plan.

PROJECT:

Riverside View Ext 84

WETLAND DELINEATION



GENERAL NOTES:
Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree

Study Area

Legend

Riverside View Ext 84

REVISIONS:
FINAL

CLIENT:
Steyn City Properties (Pty) Ltd

STEYN CITY

SCALE: 1:10 000

DRAWING REF:
21637-Study Area

DRAWING STATUS:
FINAL

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Figure 1.3: Map of the survey area.

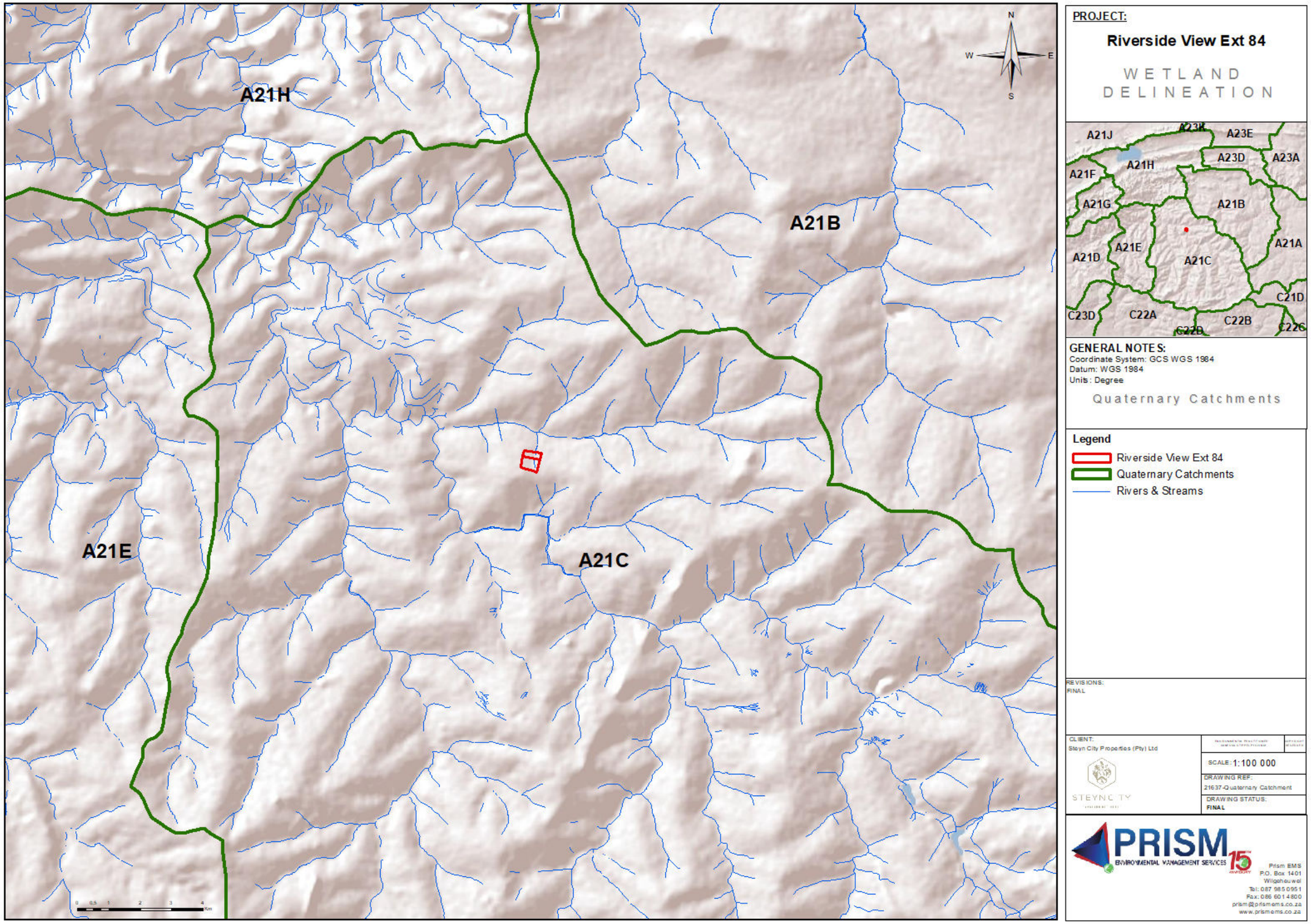

Figure 1.4: Map of the Catchment Areas.

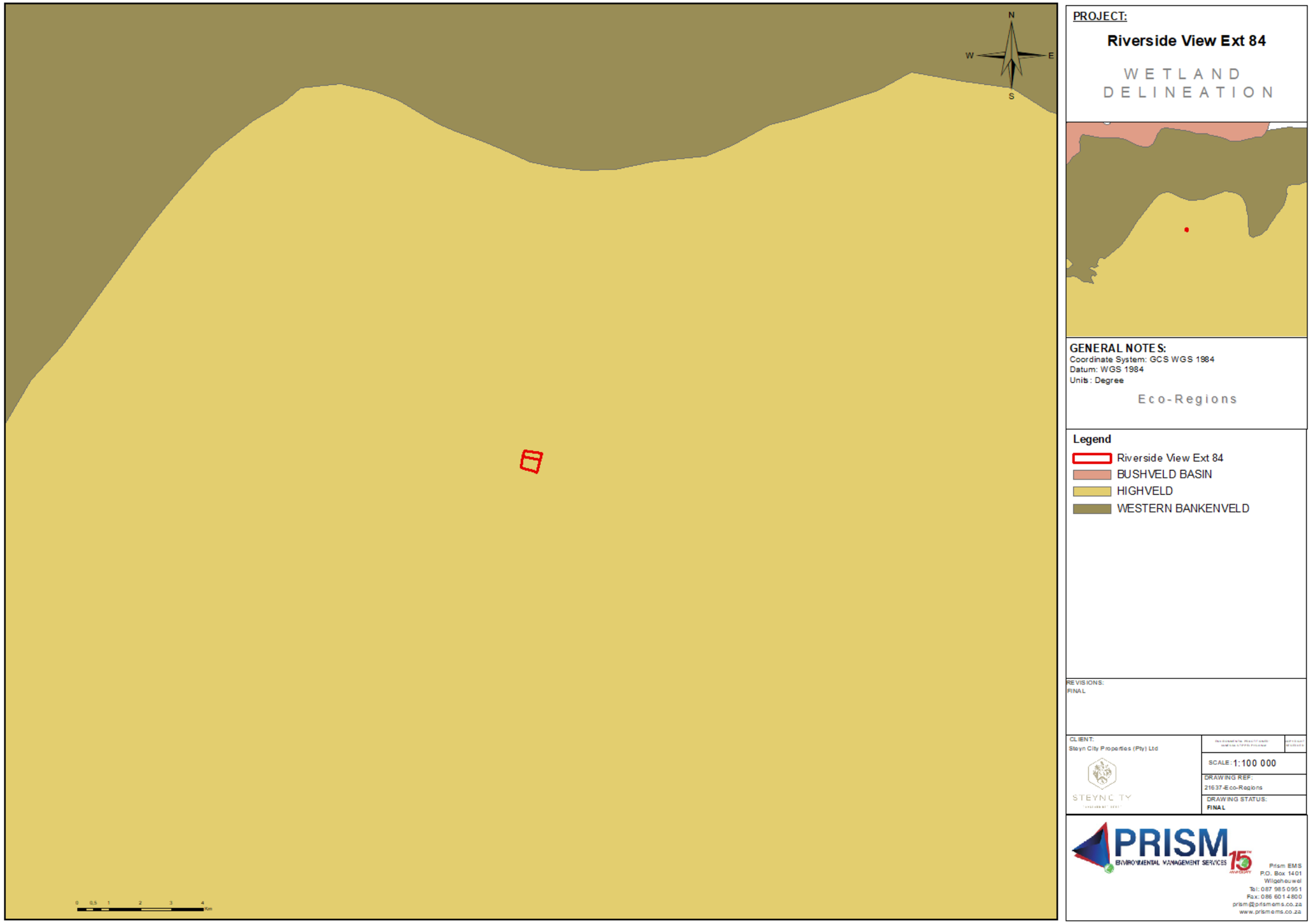

Figure 1.5: Map of the study sites Eco-Regions (DWAF; 2005).

2 REPORT OUTLINE

Appendix 6 of GN 982 of 4 December 2014 provides the requirements for specialist reports undertaken as part of the environmental authorisation process. In line with this, Table 2-1 provides an overview of Appendix 6 together with information on how these requirements have been met.

Table 2-1. Specialist Report Requirements.

Requirement from Appendix 6 of GN 982 of 4 December 2014	Chapter
(a) Details of - (i) the specialist who prepared the report; and (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae	Chapter 1.3
(b) Declaration that the specialist is independent in a form as may be specified by the competent authority	*Declaration of Independence*
(c) Indication of the scope of, and the purpose for which, the report was prepared	Chapter 1.2
(d) Date and season of the site investigation and the relevance of the season to the outcome of the assessment	Chapter 4.1
(e) Description of the methodology adopted in preparing the report or carrying out the specialised process	Chapter 4.
(f) Specific identified sensitivity of the site related to the activity and its associated structures and infrastructure	Chapter 6
(g) Identification of any areas to be avoided, including buffers	Chapter 6
(h) Map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers	Chapter 6
(I) Description of any assumptions made and any uncertainties or gaps in knowledge	Chapter 5
(j) Description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment	Chapter 6 Chapter 1
(k) Mitigation measures for inclusion in the EMPr	Chapter 8.1
(I) Conditions for inclusion in the environmental authorisation	Chapter 8.1
(m) Monitoring requirements for inclusion in the EMPr or environmental authorisation	Chapter 8.1
(n) Reasoned opinion - (i) as to whether the proposed activity or portions thereof should be authorised; and	Chapter 8

Requirement from Appendix 6 of GN 982 of 4 December 2014	Chapter
(ii)if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	
(o) Description of any consultation process that was undertaken during the course of preparing the specialist report	Chapter 4.7
(p) A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
(q) Any other information requested by the competent authority	N/A

3 LEGISLATION AND GUIDELINES

The generic term 'wetland' is used worldwide and includes specific ecosystems such as bogs, coastal lakes, estuaries, fens, floodplains, mangroves, marshes, mires, moors, pans, peatlands, seeps, sloughs, springs, swamps, vlei and wet meadows (Mays, 1996; DWAF, 2005). Regardless of the local name given to wetlands, the driving force of all wetlands is the interplay between land and water, and the consequent characteristics that reflect both (Cowan, 1999). Any part of the landscape where water accumulates for long enough and often enough to influence the plants, animals and soils occurring in that area, is referred to as a wetland (DWAF, 2005). Wetlands comprise approximately 6% (8.5 km^2 x 103) of the world's land surface and are found in every climate from the tropics to the frozen tundra (Mays, 1996).

Several definitions for wetland and wetland areas exist. Two of the most common wetland definitions used in South Africa is the National Water Act (NWA) (Act 36 of 1998) and the Ramsar definition are provided below:

National Water Act, 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."*

South Africa, being a contracting party to Ramsar, also uses the definition accepted by the convention. Article 1.1 of the convention defines wetlands as (Cowan, 1999; Koester, 1989):

> *"Areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters*."

Wetlands are defined as those areas that have water on the surface or within the root zone for long enough periods throughout the year to allow for the development of anaerobic conditions. These conditions create unique soil conditions (hydric soils) and support vegetation adapted to these flood conditions.

Hydric soils develop a grey or sometimes greenish or blue-grey colour, as a result of the chemical reduction of iron (gleying). Hydric soils that are seasonally flooded are characterised by the formation of mottles, which are relatively insoluble, enabling them to remain in the soil long after it has been drained. Consequently, it is possible to identify wetland areas on the basis of soil colour, using a standard colour chart, as matrix hue and chroma decrease, while mottle hue and chroma initially increase and then decrease the more saturated the soils become Table 3-1.

Table 3-1: Relationship between degree of wetness (wetland zone), soil-physiochemistry and vegetation (Kotze *et al*., 1994).

Degree of wetness			
	Temporary	**Seasonal**	**Permanent / Semi-permanent**
Soil Depth (0cm – 10cm)	Matrix chroma: 1-3 Few / no mottles Low / intermediate OM Non-sulphuric	Matrix chroma: 0-2 Many mottles Intermediate OM Seldom sulphuric	Matrix chroma: 0-1 Few / no mottles High OM Often sulphuric
Soil Depth (40cm – 50cm)	Few / many mottles Matrix chroma: 0-2	Many mottles Matrix chroma: 0-2	No / few mottles Matrix chroma: 0-1
Vegetation	Predominantly grass species	Predominantly sedges and grasses	Predominantly reeds and sedges

Vegetation distribution within wetlands is related to the flooding regime. Terrestrial plants are not tolerant of flooding within the root zone for periods long enough to cause anaerobic conditions, and are thus found on drier soil conditions. The distribution of wetland plants is related to their tolerance of different flooding conditions, and their distribution within a system can be used as an indication of the wetness of an area.

Typically, indicators of soil wetness based on soil morphology correspond closely with vegetation distribution, since hydrology affects soils and vegetation in systematic and predictable ways. However, in systems where the hydrological regime has been modified due to human activities, vegetation distribution will not vary systematically with soil morphology. The response of vegetation to alteration of

hydrological conditions is rapid (months / years), whereas the response of soil morphology to such alteration is slow (centuries). Therefore, lowering of the water table or reduction of surface flows, may lead to rapid establishment of terrestrial vegetation, whereas the soil morphology will retain indicators of wetness for a lengthy period. Soil morphology forms the basis of wetland delineation nationally, following international protocols, mainly because it provides a long-term indication of the "natural" hydrological regime. However, soil morphology cannot be considered to necessarily reflect the current hydrological conditions of the site where the hydrological regime has been altered, and in such circumstances vegetation provides the best indication of the distribution of wetlands as it best reflects current hydrological conditions (Figure 3.1).

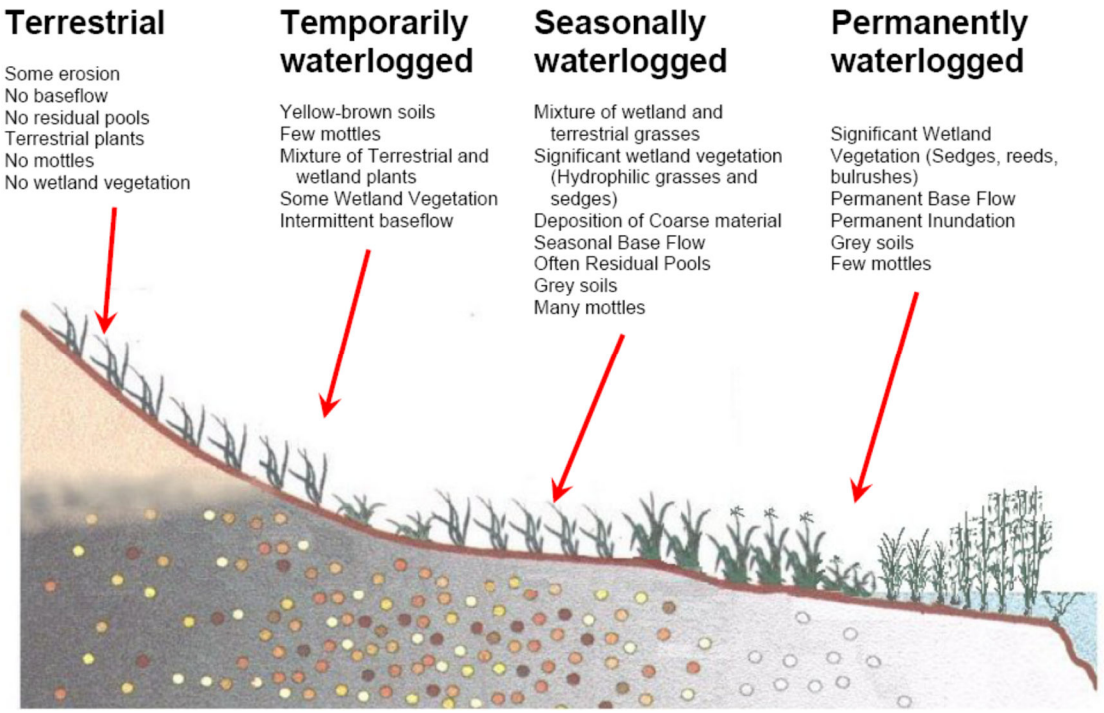

Figure 3.1: Cross section through a wetland, indicating how the soil wetness and vegetation indicators change along a gradient of decreasing wetness, from the middle to the edge of the wetland. (Reproduced by Sivest from Kotze (1996), DWAF Guidelines).

Wetland vegetation is adapted to shallow water table conditions. Due to water availability and rich alluvial soils, wetland areas are usually very productive. Tree growth rate is high and the vegetation under the trees is usually lush and includes a wide variety of shrubs, grasses and wildflowers.

3.2 EIA Applicable Legislation

3.2.1 National Environmental Management Act (Act No. 107 of 1998) (NEMA)

The proposed development triggers a number of activities in terms of NEMA. These are listed in Table 3-2.

Table 3-2: Listed Activities in terms of NEMA

Government Notice Number	Activity and Listing Number	Description
GN 983 of 4 December 2014 (as amended)	Activity 19 (i), Listing Notice 1	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse; but excluding where such infilling, depositing, dredging, excavation, removal or moving — (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies; (d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or (e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.
GN 984 of 4 December 2014 (as amended)	Activity 15, Listing Notice 2	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for — (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.
GN 985 of 4 December 2014 (as amended)	Activity 4, Listing Notice 3	The development of a road wider than 4 metres with a reserve less than 13,5 metres.
GN 985 of 4 December 2014 (as amended)	Activity 12, Listing Notice 3	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan

Government Notice Number	Activity and Listing Number	Description
GN 985 of 4 December 2014 (as amended)	Activity 14, Listing Notice 3	The development of— (i)dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or (ii)infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs—(a)within a watercourse; (b)in front of a development setback; or (c)if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.

3.3 WULA Applicable Legislation

3.3.1 National Water Act (Act No 36 of 1998) (NWA)

The NWA is the primary regulatory legislation; controlling and managing the use of water resources as well as the pollution thereof and is implemented and enforced by the Department of Water and Sanitation (DWS[1]). Section 21 of the NWA lists water uses that must be licensed unless it is listed in the schedule (existing lawful use) and/or is permissible under a general authorisation, or if a responsible authority waives the need for a Water Use Licence.

The following listed water uses that require a Water Use License according to Section 21 of the NWA are triggered for the proposed project:

- Section 21(c): impeding or diverting the flow of water in a watercourse
- Section 21 (i): altering the bed, banks, course or characteristics of a watercourse.

A Water Use Licence Application (WULA) will be undertaken.

[1] Previously referred to as the Department of Water Affairs

4 METHODOLOGY

4.1 Wetland Assessment

4.1.1 Desktop Assessment

A preliminary delineation of the Wetland boundary was undertaken using aerial photograph interpretation. Historical records and reports were consulted. The Department of Water and Sanitation (DWS) database was also consulted to obtain historical data for the study area. The National Wetland Map version 5 (NWM5) as presented by South African National Biodiversity Institute (SANBI) was also scrutinised (Van Deventer *et al*, 2019). Historical data and official approvals were also consulted during the assessment.

4.1.2 Field Investigation

The field investigation was undertaken during January 2020 to assess and corroborate the delineated Wetland zones present on the survey area.

The field procedure for the wetland delineation was conducted according to the Guidelines for delineating the boundaries of a wetland set out by the Department of Water Affairs and Forestry (DWAF 2005/8). Due to the transitional nature of wetland boundaries, the different wetland zones are often not clearly apparent. However, the wetland edge can be determined accurately. The delineations are based on scientifically defensible criteria and are aimed at providing a tool to facilitate the decision-making process regarding the assessment of the significance of impacts that may be associated with the proposed developments.

The wetlands were delineated by considering the following wetland indicators (DWAF 2005/8):

- Terrain unit indicator helps identifying those parts of the landscape where wetlands are most likely to occur. Wetlands occupy characteristic positions in the landscape and can occur on the following terrain units: crest, midslope, footslope, and valley bottom;
- Soil wetness indicator identifies the morphological signatures developed in the soil profile as a result of prolonged and frequent saturation; and
- The vegetation indicator identifies hydrophytic vegetation associated with frequently saturated soils.

The following procedure was followed during the delineation of the wetland boundaries and zones:

- A desktop delineation of the larger wetland area was undertaken using satellite imagery of the study site;
- Areas for verification were identified; and
- Identified areas were then assessed in the field with boundaries being recorded using a GPS.

4.1.3 Mapping

Mapping of the wetland boundaries was done by computerised processing utilising GPS tools, mobile applications and GIS modelling.

4.2 Wetland Classification

SANBI's "Further development of a proposed National Classification System for South Africa" was used to verify the classification of the wetlands within the study area (SANBI, 2009). The wetlands were classified up to level four, which includes the system, regional setting, landscape unit and hydrogeomorphic unit.

Table 4-1: Wetland classification level 1 - 4.

Level 1: System	Level 2: Regional setting	Level 3: Landscape unit	Level 4: Hydrogeomorphic (HGM) unit			
Connectivity to open ocean	Ecoregion	Landscape setting	HGM type	Longitudinal zonation / landform	Drainage - outflow	Drainage - inflow
			A	B	C	D
INLAND	DWAF Level 1 Ecoregions	SLOPE	Channel (river)	Mountain headwater stream	Not applicable	Not applicable
				Mountain stream	Not applicable	Not applicable
				Transitional river	Not applicable	Not applicable
				Rejuvenated bedrock fall	Not applicable	Not applicable
			Hillslope seep	Not applicable	With channel inflow	Not applicable
					Without channel inflow	Not applicable
			Depression	Not applicable	Exorheic	With channel inflow
						Without channel inflow
					Endorheic	With channel inflow
						Without channel inflow
					dammed	With channel inflow
						Without channel inflow
		VALLEY FLOOR	Channel (river)	Mountain stream	Not applicable	Not applicable
				Transitional river	Not applicable	Not applicable
				Rejuvenated bedrock fall	Not applicable	Not applicable
				Upper foothill river	Not applicable	Not applicable
				Lower foothill river	Not applicable	Not applicable
				Lowland river	Not applicable	Not applicable
				Rejuvenated foothill river	Not applicable	Not applicable
				Upland floodplain river	Not applicable	Not applicable
				Valley-bottom depression	Not applicable	Not applicable

Level 1: System	Level 2: Regional setting	Level 3: Landscape unit	Level 4: Hydrogeomorphic (HGM) unit			
			Channelled valley-bottom wetland	Valley-bottom flat	Not applicable	Not applicable
			Unchannelled valley-bottom wetland	Valley-bottom depression	Not applicable	Not applicable
				Valley-bottom flat	Not applicable	Not applicable
			Floodplain wetland	Floodplain depression	Not applicable	Not applicable
				Floodplain flat	Not applicable	Not applicable
			Depression	Not applicable	Exorheic	With channel inflow
						Without channel inflow
					Endorheic	With channel inflow
						Without channel inflow
					dammed	With channel inflow
						Without channel inflow
			Valleyhead seep	Not applicable	Not applicable	Not applicable
		PLAIN	Channel (river)	Lowland river	Not applicable	Not applicable
				Upland floodplain river	Not applicable	Not applicable
			Floodplain wetland	Floodplain depression	Not applicable	Not applicable
				Floodplain flat	Not applicable	Not applicable
			Unchannelled valley-bottom wetland	Valley-bottom depression	Not applicable	Not applicable
				Valley-bottom flat	Not applicable	Not applicable
			Depression	Not applicable	Exorheic	With channel inflow
						Without channel inflow
					Endorheic	With channel inflow
						Without channel inflow
			Flat	Not applicable	Not applicable	Not applicable
		BENCH (Hilltop/saddle/shelf)	Depression	Not applicable	Exorheic	With channel inflow
						Without channel inflow
					Endorheic	With channel inflow
						Without channel inflow
			Flat	Not applicable	Not applicable	Not applicable

The Hydrogeomorphic wetland units identified will be describe individually as per Marneweck and Batchelor (Marneweck & Batchelor; 2002).

4.3 Present Ecological Status (PES) assessment

WET-Health assists in assessing the health of wetlands using indicators based on geomorphology, hydrology and vegetation. WET-Health is tailored specifically for South African conditions and has wide

application, including assessing the Present Ecological State of a wetland for purposes of Ecological Reserve determination in terms of the National Water Act, and for environmental impact assessments WET-Health (Macfarlane *et al*, 2008). A level 1 wetland assessment was undertaken to determine the PES of the wetland system.

The PES assessment is concluded by following a 5 step process:

1. Divide the wetland into HGM units
2. Assess hydrological health of the wetland
3. Assess geomorphological health
4. Assess vegetation health of the wetland
5. Represent the health scores for the overall wetland

Table 4-2: Outline of steps involved in the Level 1 assessment (Macfarlane *et al*, 2008).

Step 1	**Divide the wetland into HGM units**
↓	
Step 2	**Assess hydrological health of the wetland**
• Step 2A	Evaluate changes to water input characteristics from the catchment
• Step 2B	Evaluate changes to water distribution and retention patterns with the wetland
• Step 2C	Determine the hydrological State of the wetland based on integrating scores from individual HGM Units
• Step 2D	Determine the overall Present Hydrological State of the wetland based on integrating scores from individual HGM Units
• Step 2E	Assess the anticipated trajectory of change of the wetland hydrology
↓	
Step 3	**Assess geomorphological health**
• Step 3A	Determine the Present Geomorphic State of the Individual HGM units
• Step 3B	Determine the overall Present Geomorphic State of the wetland based on integrating scores from individual HGM Units
• Step 3C	Assess the anticipated trajectory of change of the geomorphology of the overall wetland
↓	
Step 4	**Assess vegetation health of the wetland**
• Step 4A	Familiarisation with the general structure and composition of wetland vegetation in the area
• Step 4B	Identify and estimate the extent of disturbance classes
• Step 4C	Assess the changes to vegetation composition in each class, and integrate these for the overall HGM Unit
• Step 4D	Determine the overall Present Vegetation State based on integrating scores from individual HGM Units
• Step 4E	Assess the anticipated trajectory of change of wetland vegetation
↓	
Step 5	**Represent the health scores for the overall wetland**

The Present Ecological State (PES) categories are given in Table 4-3.

Table 4-3: PES categories (Macfarlane *et al*, 2008).

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

The determination of the probable Trajectory of Change of the wetland is also evaluated. This is rated and presented as indicated in Table 4-4.

Table 4-4: Trajectory of Change classes, scores and symbols used to represent anticipated changes to wetland integrity (Macfarlane *et al*, 2008).

Trajectory class	Description	Change score	Class Range	Symbol
Improve markedly	Condition is likely to improve substantially over the next five years	2	1.1 to 2.0	↑↑
Improve	Condition is likely to improve over the next 5 years	1	0.3 to 1.0	↑
Remain stable	Condition is likely to remain stable over the next 5 years	0	-0.2 to +0.2	→
Deterioration slight	Condition is likely to deteriorate slightly over the next 5 years	-1	-0.3 to -1.0	↓
Deterioration substantial	Condition is likely to deteriorate substantially over the next 5 years	-2	-1.1 to -2.0	↓↓

4.4 Wetland Ecological Importance and Sensitivity (EIS)

The ecological importance and sensitivity assessment were conducted according to the guidelines as discussed by DWAF (1999). DWAF defines "ecological importance" of a water resource as an expression of its importance to the maintenance of ecological diversity and function on local and wider scales. "Ecological sensitivity", according to DWAF (1999), refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred. The Ecological Importance and Sensitivity (EIS) analysis provides a guideline for the determination of the Ecological Management Class (EMC).

In the method outlined by DWAF (1999) a series of determinants for EIS are assessed for the wetlands on a scale of 0 to 4 (Table 4-5), where 0 indicates no importance and 4 indicates very high importance. The median of the determinants is used to determine the EIS and EMC of the wetland unit (Table 4-6).

Table 4-5: Score sheet for the determination of ecological importance and sensitivity (DWAF, 1999).

Determinant	Score	Confidence
Primary determinants		
Rare and endangered species		
Species / taxon richness		
Diversity of Habitat types or features		
Migration route / breeding and feeding site for wetland species		
Sensitivity to changes in the natural hydrological regime		
Sensitivity to water quality changes		
Flood storage, energy dissipation and particulate / element removal		
Modifying determinants		
Protected status		
Ecological integrity		

Score guideline: 4 = Very High; 3 = High; 2 = Moderate; 1 = Marginal / Low; 0 = None. Confidence rating: 4 = Very High Confidence; 3 = High Confidence; 2 = Moderate Confidence; 1 = Marginal / Low Confidence.

Table 4-6: Ecological Importance and Sensitivity (EIS) categories and the interpretation of median scores for biotic and habitat determinants (DWAF, 1999).

Range of Median	EIS Category	Category Description	Ecological Management Class
>3 and ≤4	**Very High**	Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these wetlands 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.	**A**
>2 and ≤3	**High**	Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water in major rivers.	**B**
>1 and ≤2	**Moderate**	Wetlands that are to be considered 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.	**C**
>0 and ≤1	**Low/ Marginal**	Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these wetlands 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.	**D**

4.5 Recommended Ecological Category (REC)

"A high management class relates to the flow that will ensure a high degree of sustainability and a low risk of ecosystem failure. A low management class will ensure marginal maintenance of sustainability, but carries a higher risk of ecosystem failure." (DWAF, 1999).

The Recommended Ecological Category (REC) is determined based on the results obtained from the Present Ecological State (PES), reference conditions and Ecological Importance and Sensitivity (EIS) of the aquatic resource. This is then followed by realistic recommendations, mitigation, and rehabilitation measures to achieve the desired REC.

A system may receive the same class for the PES, as the REC if the system is deemed to be in good condition, and therefore must stay in good condition. Otherwise, an appropriate REC should be

assigned in order to prevent any further degradation as well as to enhance the PES of the riparian system (Table 4-7).

Table 4-7: Recommended Ecological Category (REC) classes.

Class (% of total)	Description
A	Unmodified, natural.
B	Largely natural with few modifications.
C	Moderately modified.
D	Largely modified.

4.6 Impact Assessment Methodology

As standardized impact assessment methodology was utilized to determine the impacts associated with the proposed installation. A summary of this methodology is provided below.

The **significance** of an impact is defined as the combination of the **consequence** of the impact occurring and the **probability** that the impact will occur. The nature and type of impact may be direct or indirect and may also be positive or negative, refer to Table 4-8: below for the specific definitions.

Table 4-8: Nature and type of impact.

	Nature and Type of Impact:		
IMPACT	**Direct**	Impacts that are caused directly by the activity and generally occur at the same time and place as the activity	✓/✖
	Indirect	Indirect or induced changes that may occur as a result of the activity. These include all impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity	✓/✖
	Cumulative	Those impacts associated with the activity which add to, or interact synergistically with existing impacts of past or existing activities, and include direct or indirect impacts which accumulate over time and space	✓/✖
	Positive	Impacts affect the environment in such a way that natural, cultural and / or social functions and processes will benefit significantly, and includes neutral impacts (those that are not considered to be negative	✓
	Negative	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes will be comprised	✖

Table 4-9 presents the defined criteria used to determine the **consequence** of the impact occurring which incorporates the extent, duration and intensity (severity) of the impact.

Table 4-9: Consequence of the Impact occurring.

CONSEQUENCE			
	Extent of Impact:		
	Site	Impact is limited to the site and immediate surroundings, within the study site boundary or property (immobile impacts)	
	Neighbouring	Impact extends across the site boundary to adjacent properties (mobile impacts)	
	Local	Impact occurs within a 5km radius of the site	
	Regional	Impact occurs within a provincial boundary	
	National	Impact occurs across one or more provincial boundaries	
	Duration of Impact:		
	Incidental	The impact will cease almost immediately (within weeks) if the activity is stopped, or may occur during isolated or sporadic incidences	
	Short-term	The impact is limited to the construction phase, or the impact will cease within 1 - 2 years if the activity is stopped	
	Medium-term	The impact will cease within 5 years if the activity is stopped	
	Long-term	The impact will cease after the operational life of the activity, either by natural processes or by human intervention	
	Permanent	Where mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient	
	Intensity or Severity of Impact:		
	Low	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are not affected	
	Low-Medium	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are modified insignificantly	
	Medium	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are altered	
	Medium-High	Impacts affect the environment in such a way that natural, cultural and / or social functions and processes are severely altered	
	High	Impacts affect the environment in such a way that natural, cultural and / or social functions and processes will permanently cease	

The probability of the impact occurring is the likelihood of the impacts actually occurring, and is determined based on the classification provided in Table 4-10.

Table 4-10: Probability and confidence of impact prediction.

PROBABILITY			
	Probability of Potential Impact Occurrence:		
	Improbable	The possibility of the impact materialising is very low either because of design or historic experience	
	Possible	The possibility of the impact materialising is low either because of design or historic experience	
	Likely	There is a possibility that the impact will occur	
	Highly Likely	There is a distinct possibility that the impact will occur	
	Definite	The impact will occur regardless of any prevention measures	

The significance of the impact is determined by considering the consequence and probability without taking into account any mitigation or management measures and is then ranked according to the ratings listed in Table 4-11.

Table 4-11: Significance rating of the impact.

SIGNIFICANCE	Significance Ratings:	
	Low	Neither environmental nor social and cultural receptors will be adversely affected by the impact. Management measures are usually not provided for low impacts
	Low-Medium	Management measures are usually encouraged to ensure that the impacts remain of Low-Medium significance. Management measures may be proposed to ensure that the significance ranking remains low-medium
	Medium	Natural, cultural and/or social functions and processes are altered by the activities, and management measures must be provided to reduce the significance rating
	Medium-High	Natural, cultural and/or social functions and processes are altered significantly by the activities, although management measures may still be feasible
	High	Natural, cultural, and/or social functions and processes are adversely affected by the activities. The precautionary approach will be adopted for all high significant impacts and all possible measures must be taken to reduce the impact

The level of confidence associated with the impact prediction is also considered as low, medium or high (Table 4-12:).

Table 4-12: Level of confidence of the impact prediction.

CONFIDENCE	Level of Confidence in the Impact Prediction:		
	Low	Less than 40% sure of impact prediction due to gaps in specialist knowledge and/or availability of information	
	Medium	Between 40 and 70% sure of impact prediction due to limited specialist knowledge and/or availability of information	
	High	Greater than 70% sure of impact prediction due to outcome of specialist knowledge and/or availability of information	

Once significance rating has been determined for each impact, management and mitigation measures must be determined for all impacts that have a significance ranking of Medium and higher in order to attempt to reduce the level of significance that the impact may reflect.

The EIA Regulations, 2014 specifically require a description is provided of the degree to which these impacts:

- can be reversed;
- may cause irreplaceable loss of resources; and
- can be avoided, managed or mitigated.

Based on the proposed mitigation measures, the mitigation efficiency is also determined (Table 4-13) whereby the initial significance is re-evaluated and ranked again to effect a significance that incorporates the mitigation based on its effectiveness. The overall significance is then re-ranked and a final significance rating is determined.

Table 4-13: Mitigation efficiency.

MITIGATION EFFICIENCY	Mitigation Efficiency	
	None	Not applicable
	Very Low	Where the significance rating stays the same, but where mitigation will reduce the intensity of the impact. Positive impacts will remain the same
	Low	Where the significance rating reduces by one level, after mitigation
	Medium	Where the significance rating reduces by two levels, after mitigation
	High	Where the significance rating reduces by three levels, after mitigation
	Very High	Where the significance rating reduces by more than three levels, after mitigation

The reversibility is directly proportional to the "Loss of Resource" where no loss of resource is experienced, the impact is completely reversible; where a substantial "Loss of resource" is experienced there is a medium degree of reversibility; and an irreversible impact relates to a complete loss of resources, i.e. irreplaceable (Table 4-14).

Table 4-14: Degree of reversibility and loss of resources.

DEGREE REVERSABILITY & LOSS OF RESOURCES	Loss of Resources:	
	No Loss	No loss of social, cultural and/or ecological resource(s) are experienced. Positive impacts will not experience resource loss
	Partial	The activity results in an insignificant or partial loss of social, cultural and/or ecological resource(s)
	Substantial	The activity results in a significant loss of social, cultural and/or ecological resource(s)
	Irreplaceable	The activity results in the complete and irreplaceable social, cultural and/or ecological loss of resource(s)
	Reversibility:	
	Irreversible	Impacts on natural, cultural and/or social functions and processes are irreversible to the pre-impacted state in such a way that the application of resources will not cause any degree of reversibility
	Medium Degree	Impacts on natural, cultural and/or social functions and processes are partially reversible to the pre-impacted state if less than 50% resources are applied
	High Degree	Impacts on natural, cultural and/or social functions and processes are partially reversible to the pre-impacted state if more than 50% resources are applied
	Reversible	Impacts on natural, cultural and/or social functions and processes are fully reversible to the pre-impacted state if adequate resources are applied

4.7 Consultation Process

Consultation as part of the overall environmental authorization process is being undertaken by Prism EMS (EAP). Prism EMS, wetland specialist consulted with:

- The EAP
- Department of Water and Sanitation (DWS)
- The Professional Team

5 ASSUMPTIONS, GAPS AND LIMITATIONS

The study was limited to a snapshot view during a few site visits. The field investigations were undertaken during July 2014, to assess and delineate the Wetland zones present on the survey area. Further field assessments were conducted during October 2018 and January 2020 corroborate the delineated Wetland zones present on the survey area and to inform the development planning. Weather conditions during the survey were favourable for recordings. The delineations were recorded by hand held GPS.

It must be noted that, during the process of converting spatial data to final output drawings, several steps are followed that may affect the accuracy of areas delineated. Due care has been taken to preserve accuracy. Printing or other forms of reproduction may also distort the scale indicated in maps. It is therefore suggested that the wetland areas identified in this report be pegged in the field in collaboration with the surveyor for precise boundaries.

It is unlikely that more surveys would alter the outcome of this study radically.

6 RESULTS AND FINDINGS

6.1 Wetland Delineation

6.1.1 Desktop Assessment

During the desktop investigation, one (1) possible area where wetlands could occur was identified on or in close proximity to the study site that would be affected by the proposed development activities. The National Wetland Map version 5 (NWM5) as presented by SANBI was also scrutinised and one wetland area was identified (refer to Figure 6.4) on or in close proximity to the study site that could be affected by the proposed activities. The wetland as indicated by the NWM5 wetland layers were further investigated on site.

6.1.2 Field Assessment

The field investigations were undertaken during July 2014, to assess and delineate the Wetland zones present on the survey area. Further field assessments were conducted during October 2018 and January 2020 corroborate the delineated Wetland zones present on the survey area and to inform the development planning.

The field investigations concluded that one natural wetland unit could be recorded as per the DWAF, 2005 guidelines (Figure 6.7)

6.1.2.1 Wetland Indicators

6.1.2.1.1 Terrain Unit Indicator

Terrain unit indicator helps identify those parts of the landscape where wetlands are most likely to occur. Wetlands occupy characteristic positions in the landscape and can occur on the following terrain units:

- crest,
- midslope,
- footslope, and
- valley bottom.

The wetlands identified were also assessed in respect to its location in the landscape. The wetland found:

- RSV84_UCVB was found on a plain at the head of the catchment, draining towards the North.

Refer to Figure 6.1 indicating the terrain and contour plan.
Refer to Table 6-1 and section 4.2 Wetland Classification for the classification of the terrain unit.

Table 6-1: Wetland Classification

Level 1: System	**Level 2: Regional setting**	**Level 3: Landscape unit**	**Level 4: Hydrogeomorphic (HGM) unit**	
Connectivity to open ocean	**Ecoregion**	**Landscape setting**	**HGM type**	**Longitudinal zonation / landform**
			A	**B**
INLAND	Highveld Level-1 Ecoregion (Ecoregion 11)	PLAIN	Unchanneled valley-bottom wetland	Valley-bottom flat

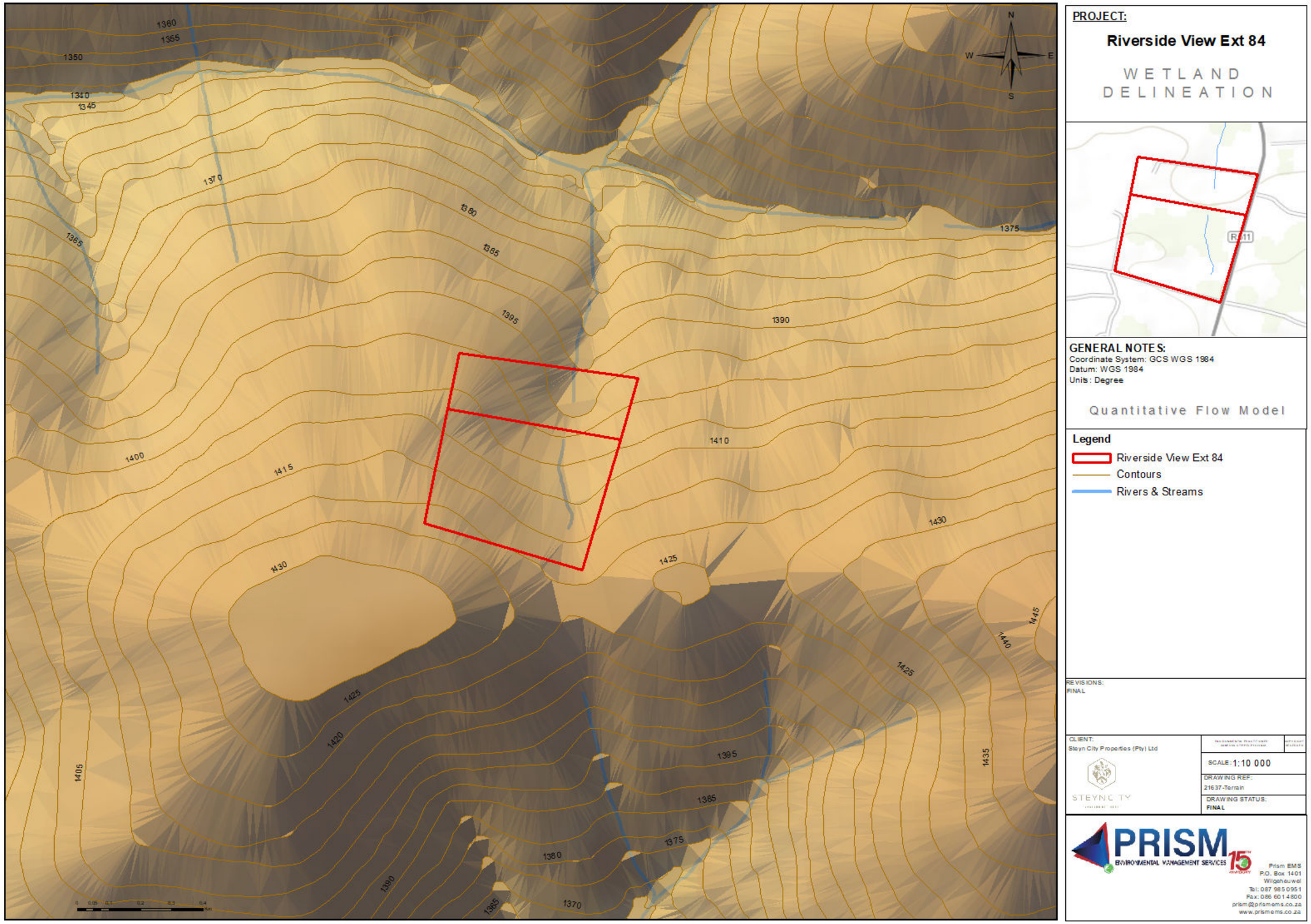

Figure 6.1: Terrain Unit Analysis – 5m Contours. (National Geo-spatial Information; 2016)

6.1.2.1.2 Soil Form and Soil Wetness Indicator

Soil erodibility in hydrologically transformed environments contributes to the difficulties to precisely determining wetland boundaries. This investigation focussed on the delineation of the wetland features based on soil hydro-morphology and landscape hydrology as observed in the catchment and on the site.

Soils were found to be of a low clay content in general. Mostly sandy soils were present especially in the top 250mm. The wetland seasonal and permanent zones reflected clayey soils. Typical halfway house granite geological formation and associated soils were observed (Figure 6.2).

Figure 6.2: Soil samples.

6.1.2.1.3 Vegetation Indicator

Upon the assessment of the area, the various wetland vegetation components were assessed and recorded. Dominant species were characterised as either wetland species or terrestrial species. Hydrophytic vegetation species were observed. Predominantly grass, rushes and sedge species were recorded. This unit was predominantly utilised to delineate the wetland.

Figure 6.3: Wetland vegetation.

Table 6-2: Wetland indicator species noted during the assessment.

Riparian / Wetland vegetation	
Pycreus species	*Fuirena Species*
Paspalum species	*Imperata cylindrica*
Andropogan species	*Cyperus species*
Berkheya radula	*Leersia hexandra*

**Not all species listed, only most common indicators*

6.1.3 Mapping

Figure 6.4 indicates the National Wetland Map version 5 (NWM5) as presented by SANBI (Van Deventer *et al.,* 2019). NWM5 indicates one wetland to the west of the study site.

Figure 6.5 illustrates the Flow Accumulation Model that indicates the accumulation of water in the wetland system.

Figure 6.6 illustrates the Quantitative Flow Model that indicates the flow quantitively through the wetland system.

Figure 6.7 serves to conceptually present the location of the wetland that could be affected by the proposed development activities on the site.

Figure 6.8 presents the conservation buffer zones that are applicable and should be considered during the development to ensure appropriate mitigation and management of the activities.

A 32m buffer was applied to the wetland that is in line with the National Environmental Management Act (NEMA) listed activities and Gauteng biodiversity and mapping requirements. This wetland is largely disturbed due to historical impacts and is of low ecological importance. Rehabilitation of the wetland and buffer areas will be required. This conservation buffer should be utilised as the control area and will be adequate to assist with management and mitigation during the construction and operation phase.

Also, refer to the associated digital files presenting the wetland boundaries to allow for further planning of the layout of the proposed activity.

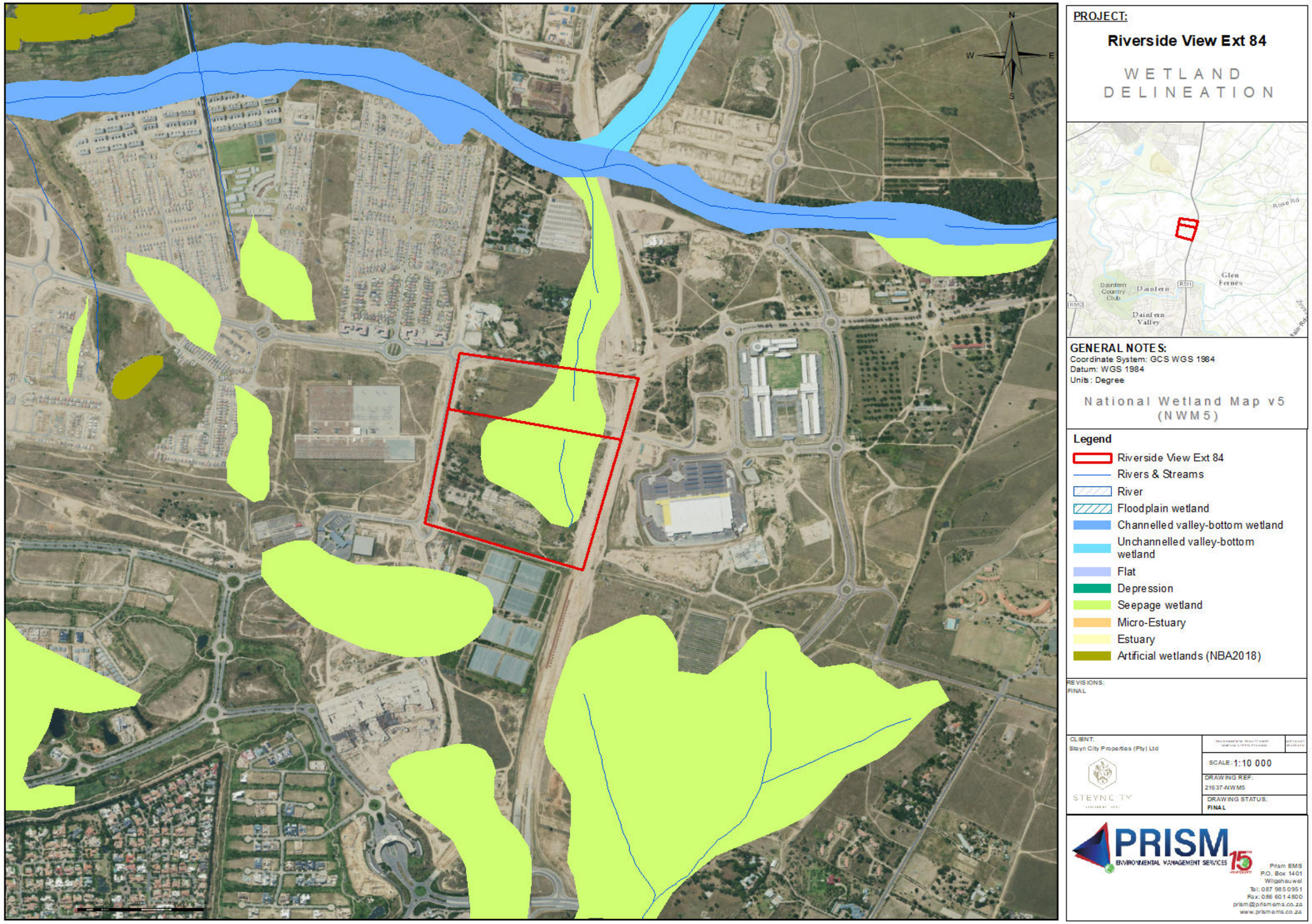

Figure 6.4: National Wetland Map version 5 (NWM5) (Van Deventer *et al.*, 2019).

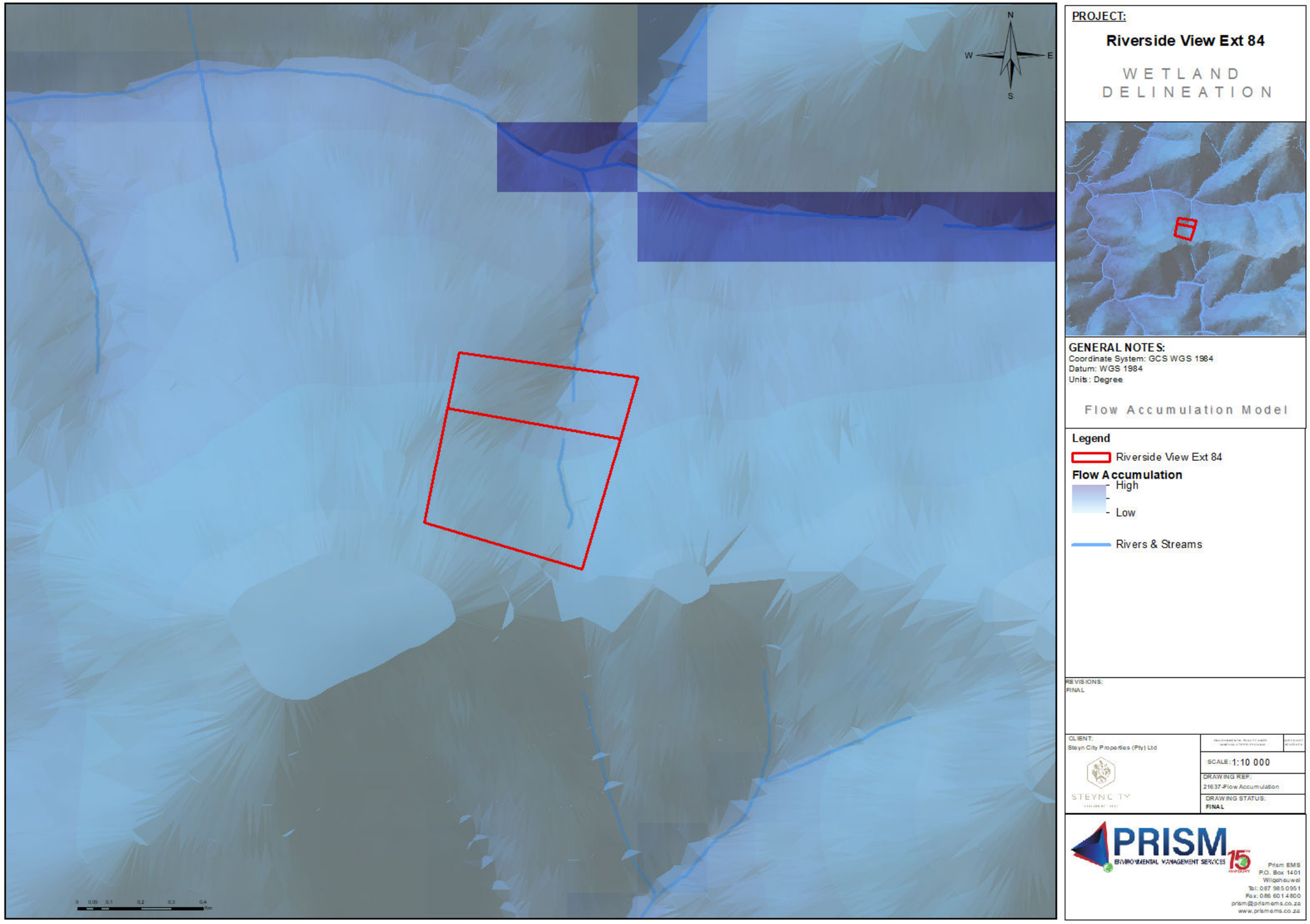

Figure 6.5: Flow Accumulation Model.

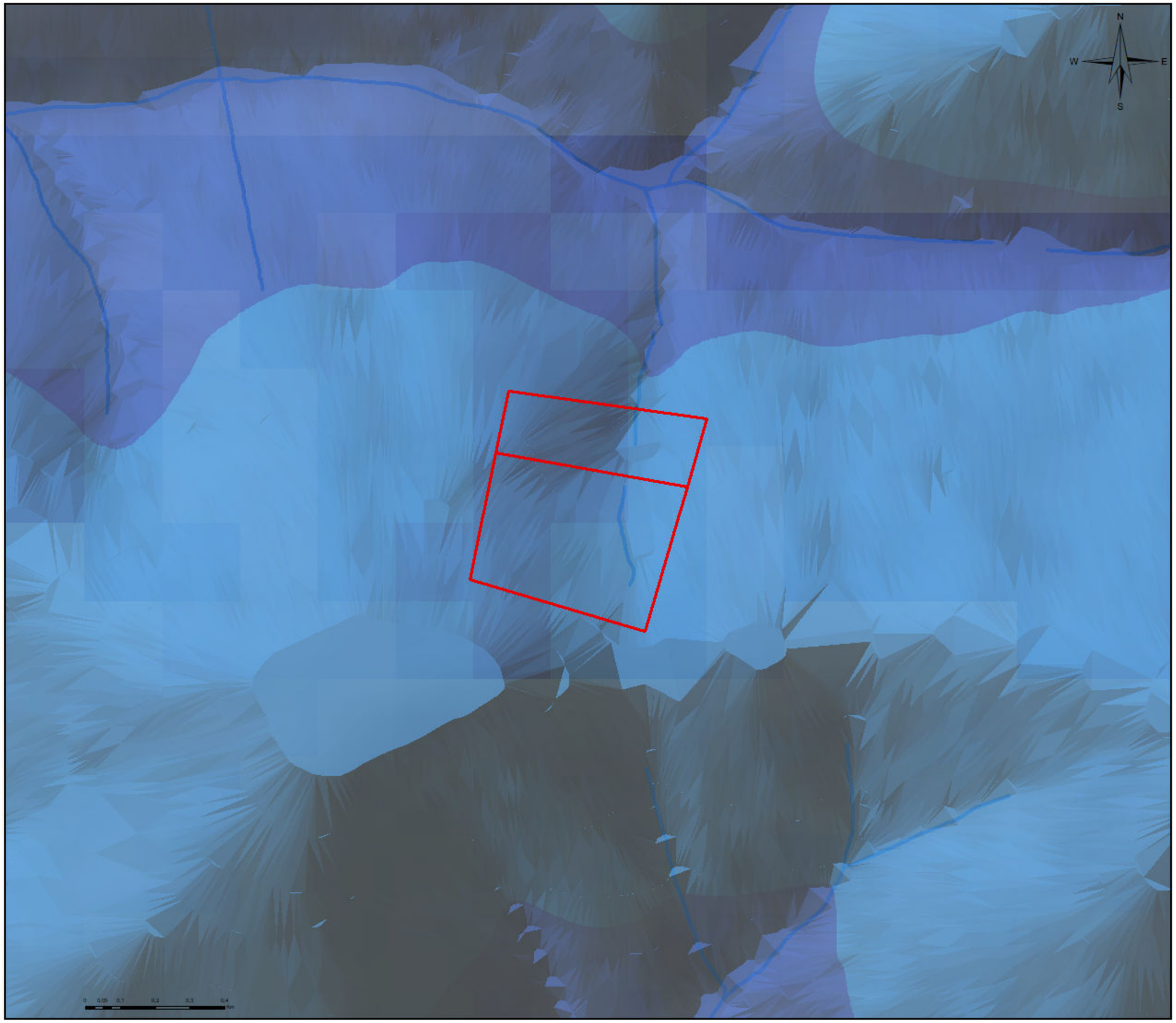

Figure 6.6: Quantitative Flow Model.

Figure 6.7: Wetland Delineation.

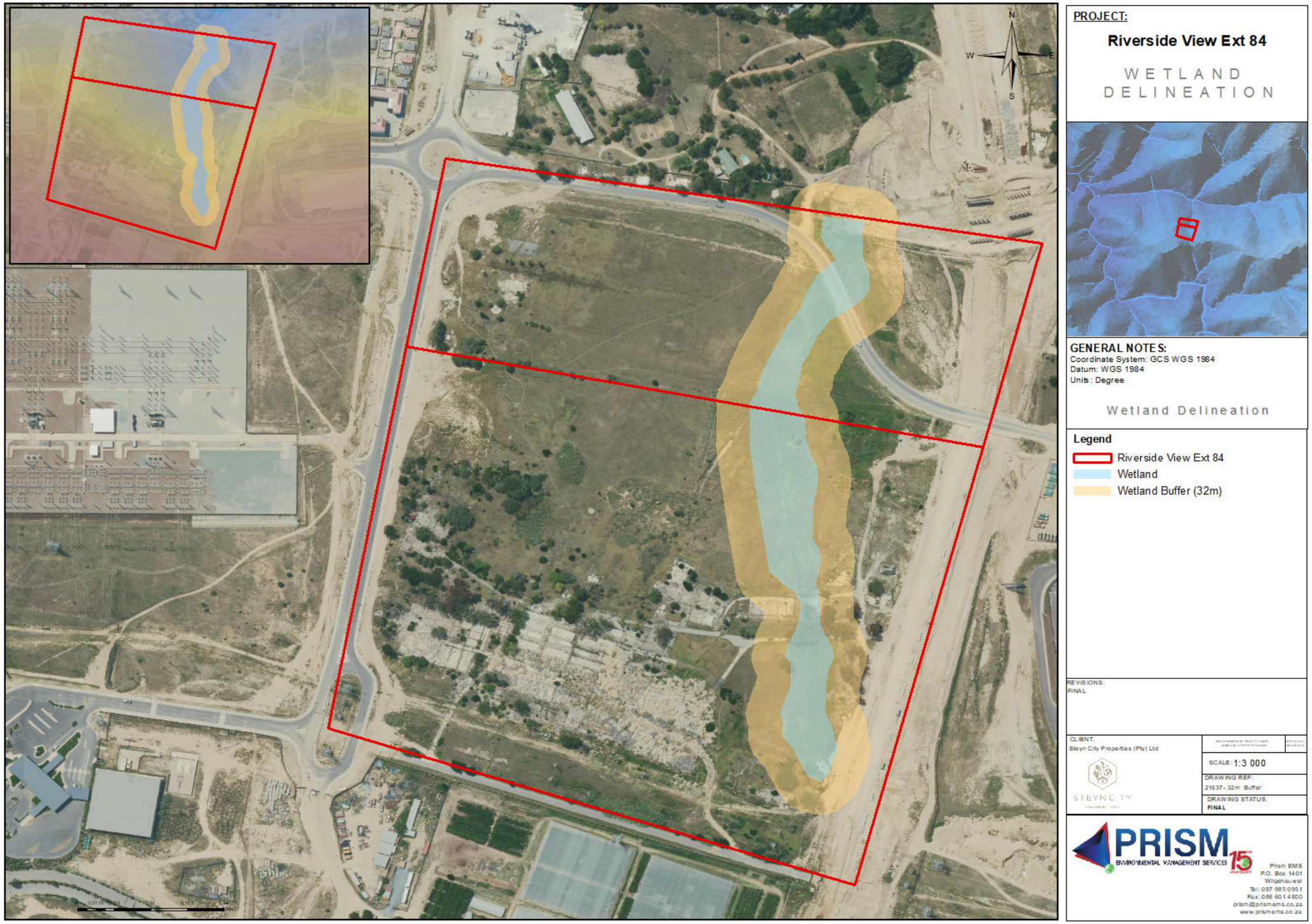

Figure 6.8: Wetland Buffer Zones.

6.2 Wetland Classification

SANBI's classification for wetlands was used to classify the wetland units within the study area (SANBI, 2009). The wetland units were classified up to level four, which includes the system, regional setting, landscape unit and Hydrogeomorphic (HGM) unit. Figure 6.9 conceptually present the HGM units (Marneweck and Batchelor, 2002).

One natural wetland entity was identified during the field investigation.

The following Hydrogeomorphic wetlands were identified during the site evaluation:

- RSV84_UCVB – Unchanneled Valley Bottom Wetland at the head of the catchment, draining towards the North.

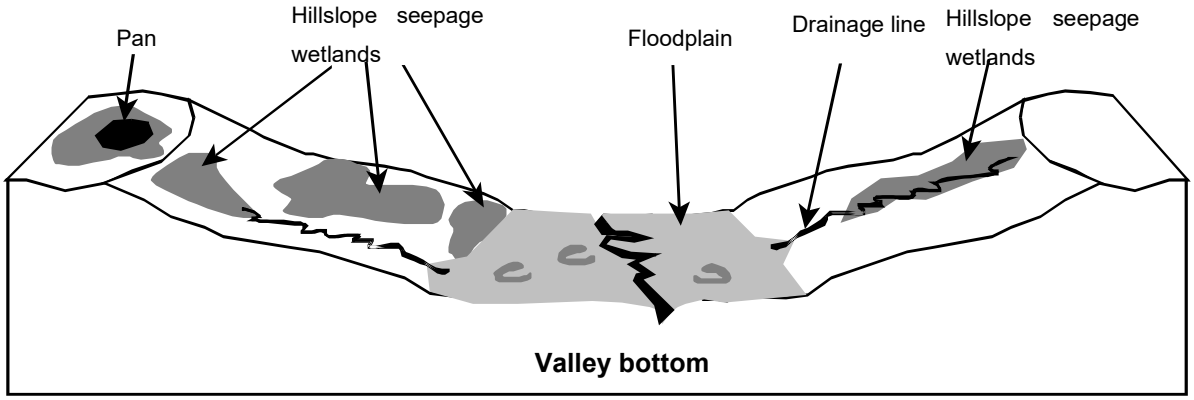

Figure 6.9: Wetland hydrogeomorphic (HGM) classification (Marneweck and Batchelor, 2002).

6.2.1 Unchanneled Valley Bottom Wetland

One Unchanneled Valley Bottom Wetland Unit at the head of the catchment was identified in the study area. Figure 6.10 diagrammatically illustrates the HGM unit.

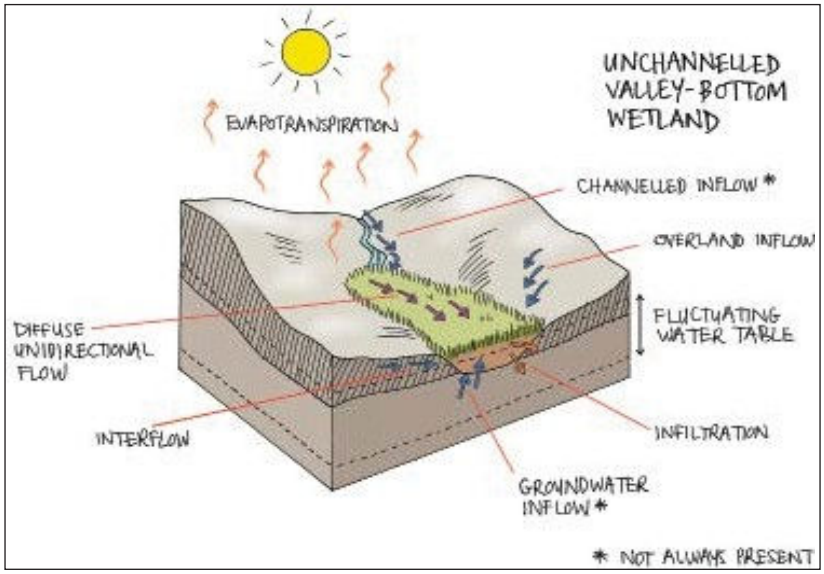

Figure 6.10: Unchanneled Valley Bottom Wetland (SANBI; 2013)

6.2.2 Wetland Unit classification

SANBI's "Further development of a proposed National Classification System for South Africa" was used to verify the classification of the wetlands within the study area (SANBI, 2009). The wetlands were classified up to level four, which includes the system, regional setting, landscape unit and hydrogeomorphic unit (Table 4-1).

The wetland was classified as per Table 6-3.

Table 6-3: Wetland Units classification

Unit	System	Regional setting	Landscape unit	Hydrogeomorphic unit
RSV84_UCVB	Inland	Highveld	Plain	Unchanneled Valley Bottom Wetland

6.3 Present Ecological Status (PES)

A level 1 WET-health wetland assessment was undertaken to determine the PES of the wetland system.

6.3.1 RSV84_UCVB – Unchanneled Valley Bottom Wetland

RSV84_UCVB was found to be highly modified. The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable (Table 6-4). This wetland system is impacted by historical activities both in the catchment as well as directly on the wetland system where the impacts are continues. It forms part of a larger wetland system. The trajectory of change for the wetland ecological status is predicted that conditions are likely to deteriorate slightly over the next 5 years without major intervention (Table 6-5).

Table 6-4: PES – RSV84_UCVB

Description	Combined impact score	PES Category
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	E

Table 6-5: Trajectory of change of RSV84_UCVB

Trajectory class	Description	Change score	Class Range	Symbol
Deterioration slightly	Condition is likely to deteriorate slightly over the next 5 years	-1	-0.3 to -1.0	↓

6.4 Ecological Importance and Sensitivity (EIS)

The ecological importance and sensitivity assessment were conducted according to the guidelines as discussed by DWAF (1999). DWAF defines "ecological importance" of a water resource as an expression of its importance to the maintenance of ecological diversity and function on local and wider scales. "Ecological sensitivity", according to DWAF (1999), refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred. The Ecological Importance and Sensitivity (EIS) analysis provides a guideline for the determination of the Ecological Management Class (EMC).

6.4.1 RSV84_UCVB – Unchanneled Valley Bottom Wetland

The RSV84_UCVB, Unchanneled Valley Bottom Wetland is considered ecologically important and sensitive on a local scale. The biodiversity of this wetland is generally not sensitive to flow and habitat modifications. It plays a small role in moderating the quantity and quality of water of major rivers. The system drains into further downstream wetland and streams before reaching major rivers. The Ecological Importance and Sensitivity (EIS) for this system is thus considered to be Moderate (Refer to Table 6-6).

Table 6-6: EIS - RSV84_UCVB

Score	EIS Category	Category Description	Ecological Management Class
Score =1,67 ***Range (>1 and <=2)***	**Moderate**	Wetlands that are to be considered ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands 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.	**C**

6.5 Recommended Ecological Category (REC)

The Recommended Ecological Category (REC) is determined based on the results obtained from the Present Ecological State (PES), reference conditions and Ecological Importance and Sensitivity (EIS) of the aquatic resource. This is then followed by realistic recommendations, mitigation, and rehabilitation measures to achieve the desired REC.

6.5.1 RSV84_UCVB – REC

The wetland will be impacted to some extent by the proposed development activities. This impact will be localised and at the transitional point leading from the development and infrastructure installations into the wetland and buffer area. It will in all likelihood regress slightly in terms of its current Ecological Category if not managed in specific during the construction period. Stormwater management for the

site is required in specific the construction phase. This will mitigate the impact on the wetlands. Rehabilitation of the impacts and maintenance of the system will further mitigate the impacts and could improve the sustainability of the system. It is thus rated that the Recommended Ecological Category (REC) should fall into:

- Category D for RSV84_UCVB (Table 6-7).

Table 6-7:: REC

Wetland Unit	Class (% of total)	Description
RSV84_UCVB	**D**	Largely modified.

7 IMPACT ASSESSMENT

	IMPACTS			CONSEQUENCE			PROBABILITY	RANKING WITHOUT MITIGATION	CONFIDENCE	IMPLEMENTATION OF MANAGEMENT MEASURES		RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE	
	Type	Description	Nature	Extent (A)	Duration (B)	Intensity (C)	Probability (P)	Significance (A + B + C) X P	Confidence	Mitigation and/or Management Measures	Mitigation Effectiveness	Significance	Loss of Resources	Reversibility
CONSTRUCTION PHASE														
Wetland	Direct	Water quality	Negative	*Neighbouring*	*Incidental*	*Low-Medium*	*Likely*	*Low*	*High*	Stock piling outside the wetland area, stormwater management, dry season construction, filtration.	*High*	*Low*	*No Loss*	*Reversible*
	Direct	Flow Regime	Negative	*Local*	*Short-term*	*Low-Medium*	*Highly Likely*	*Low-Medium*	*High*	Stock piling outside the wetland area, stormwater management, dry season construction, filtration.	*High*	*Low*	*No Loss*	*Reversible*
	Direct	Habitat	Negative	*Site*	*Medium-term*	*Low-Medium*	*Likely*	*Low*	*High*	Stock piling outside the wetland area, minimal ingress and egress.	*High*	*Low*	*No Loss*	*Reversible*
	Indirect	Biota	Negative	*Neighbouring*	*Medium-term*	*Medium*	*Likely*	*Low*	*High*	Stock piling outside the wetland area, minimal ingress and egress.	*High*	*Low*	*No Loss*	*Reversible*
	Direct	Geomorphology	Negative	*Neighbouring*	*Medium-term*	*Low-Medium*	*Highly Likely*	*Low-Medium*	*High*	Stormwater management design and erosion control measures.	*High*	*Low*	*No Loss*	*Reversible*
OPERATIONAL PHASE														
Wetland	Direct	Water quality	Negative	*Neighbouring*	*Incidental*	*Low-Medium*	*Possible*	*Low*	*High*	Rehabilitation of construction impacted area, continuous monitoring. Storm water management.	*High*	*Low*	*No Loss*	*Reversible*
	Direct	Flow Regime	Negative	*Neighbouring*	*Incidental*	*Low-Medium*	*Possible*	*Low*	*Medium*	Rehabilitation of construction impacted area, continuous monitoring and maintenance. Storm water management.	*High*	*Low*	*No Loss*	*Reversible*
	Direct	Habitat	Negative	*Site*	*Incidental*	*Low-Medium*	*Improbable*	*Low*	*High*	Rehabilitation of construction impacted area, continuous monitoring, storm water management.	*High*	*Low*	*No Loss*	*Reversible*
	Indirect	Biota	Negative	*Neighbouring*	*Incidental*	*Low-Medium*	*Possible*	*Low*	*High*	Rehabilitation of construction impacted area, continuous monitoring, storm water management.	*High*	*Low*	*No Loss*	*Reversible*
	Direct	Geomorphology	Negative	*Site*	*Incidental*	*Low*	*Improbable*	*Low*	*High*	Rehabilitation of construction impacted area.	*High*	*Low*	*No Loss*	*Reversible*

8 REASONED OPINION AND RECOMMENDATIONS

The Wetland identified is highly transformed and impacted by historical and ongoing anthropogenic activities. The Present Ecological Status (PES) for the wetland scored in the lower ranges for the Unchanneled Valley Bottom Wetland. The Ecological Importance and Sensitivity (EIS) falls in the low range and has little functionality in respect of bio-diversity conservation. The Recommended Ecological Category (REC) for the wetlands were categorised as moderate. It will thus require some rehabilitation to enhance the ecological function of the system. The wetland is not considered to be sensitive and of any major importance.

For this reason, it can be supported that the development may go-ahead if the required buffers are maintained and the resource drivers preserved. The rehabilitation of the wetland is vital to recover some ecological function. The wetland drivers must be enhanced as part of the rehabilitation of the affected areas. In respect of the construction phase, it is important to ensure that the required erosion protection measures linked to the crossing sections be carefully designed and installed. It is further important to carefully design the storm water outlet structures to assist with dispersed flow release into the wetland. This should be designed to mimic the natural sheet flow into the wetland and avoid concentrated flow patterns into the wetland area.

The project can be supported, should all the mitigation measures be implemented and monitored against to ensure compliance.

8.1 Mitigation and Monitoring Requirements

Monitoring programmes can measure the success of mitigation implementations, monitor unforeseen impacts, and can be used as a feedback system to adjust or correct management of the wetlands.

The following are recommended:

- It should be attempted to enhance the current wetland function.
    - Wetland drivers should be protected as far as possible.
    - Water quality preservation is key. Silt protection measure to be implemented in consultation with the wetland specialist (ECO).
- Mitigation measures for the proposed development activities should be implemented, managed and monitored according to:
    - The following wetland ecosystem impact assessment conclusions, based on the results of the baseline survey:
        - Runoff from the construction areas may result in contamination of wetland and downstream aquatic habitat;
        - On site storm water management must be implemented.
    - The following impacts may result in changes to the soil structure:
        - Heavy construction vehicles moving within the wetland areas;

- Ingress and Egress must be managed to minimise impacts in respect of compaction of the wetland soils.
- Single entry and exit points must be established.
- These areas must be scarified as part of the rehabilitation plan.

▪ Stock piling;
- Stock piling must be located outside the delineated wetland and buffer boundaries.

▪ Spills from machinery;
- To be managed as per the Environmental Management Programme (EMPr).

▪ The mixing of concrete;
- To be managed as per the Environmental Management Programme (EMPr) outside of the demarcated buffer areas with no flow into the control area.

o The following aspects may result in reduction of ecosystem habitat integrity:
▪ Dust and sediment runoff from construction activities;
▪ Diesel and oil spill from equipment and machinery; and
▪ Higher and faster water flow from the site that could cause soil erosion.

o The following aspects may result in sedimentation of the associated aquatic systems:
▪ Sedimentation due to increase runoff and dispensed soil particles and runoff from the affected areas; and
▪ Increase in the velocity of the runoff from the exposed soil, due to construction.

o The proposed activities must be initiated and constructed in such a way to prevent the reduction of natural water flow into the wetland and downstream which, in essence, is the driving factor in terms of water provision.
▪ An approved stormwater management plan must be implemented.
▪ Velocity dissipation structures and sheet flow structures (such as reno mattresses) must also be installed to prevent water flowing through culverts to gain velocity and be released uncontrolled.
▪ Dispersed flow must be attained post formal structures.
▪ Sheet flow must be promoted to mimic natural flow patterns.

➢ The wetland integrity should be improved during the rehabilitation phase. This may entail the following:
o Removal of alien and invasive plant species during the construction and operational phases.
o Stabilisation of gullies and drainage lines to prevent erosion.
o Implementation of topsoil management (stockpiling, topography shaping) and erosion control (berms, geotextiling, silt fences, hay bales and gabion structures).
o Re-vegetation with indigenous plant species.

9 CONCLUSION

The field investigations concluded that one natural wetland system was identified in the study area.

The following Hydrogeomorphic wetland was identified during the site evaluation:

- RSV84_UCVB – Unchanneled Valley Bottom Wetland at the head of the catchment, draining towards the North.

The wetland recorded was assessed and the following results were attained:

- The wetland attained a low overall PES (Present Ecological State)
    - RSV84_UCVB was found to be highly modified. The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable. This wetland system is impacted by historical activities both in the catchment as well as directly on the wetland system where the impacts are continues. It forms part of a larger wetland system. The trajectory of change for the wetland ecological status is predicted that conditions are likely to deteriorate slightly over the next 5 years without major intervention.
- The wetland attained a Moderate Ecological Importance and Sensitivity (EIS) score.
    - The RSV84_UCVB, Unchanneled Valley Bottom Wetland is considered ecologically important and sensitive on a local scale. The biodiversity of this wetland is generally not sensitive to flow and habitat modifications. It plays a small role in moderating the quantity and quality of water of major rivers. The system drains into further downstream wetland and streams before reaching major rivers. The Ecological Importance and Sensitivity (EIS) for this system is thus considered to be Moderate.
- The wetland Recommended Ecological Classification (REC) classification was rated as:
    - The wetland will be impacted to some extent by the proposed development activities. This impact will be localised and at the transitional point leading from the development and infrastructure installations into the wetland and buffer area. It will in all likelihood regress slightly in terms of its current Ecological Category if not managed in specific during the construction period. Stormwater management for the site is required in specific the construction phase. This will mitigate the impact on the wetlands. Rehabilitation of the impacts and maintenance of the system will further mitigate the impacts and could improve the sustainability of the system. It is thus rated that the Recommended Ecological Category (REC) should fall into:
        - Category D for RSV84_UCVB

Table 9-1: Findings and Conclusion

<table>
<tr><th>Study</th><th colspan="10">Findings and Conclusions</th></tr>
<tr><td rowspan="11">Wetland Assessment</td><td colspan="10">The proposed development site is affected by a wetland and associated conservation buffer area.</td></tr>
<tr><td colspan="10">The wetland and buffer area will be impacted by the development. The infrastructure installations and connections to the external services will impact on the wetland.</td></tr>
<tr><td colspan="10">The wetland buffer area could be used to assist with storm water management and flow management at the transitional point leading from the development and infrastructure installations into the wetland and buffer area.</td></tr>
<tr><td colspan="10">Specific attention to stormwater management and influx of water leading from the development into the wetland areas must be focussed on.</td></tr>
<tr><td colspan="10">Careful design and interdisciplinary consultation between the professional team would be required. Interflows and sheet flow must be managed at the contact points.</td></tr>
<tr><td>Wetland</td><td>Wetland HGM</td><td colspan="2">Wetland</td><td colspan="2">32m Buffer</td><td colspan="2">PES</td><td colspan="2">EIS</td><td>REC</td></tr>
<tr><td rowspan="2">RSV84_UCVB</td><td rowspan="2">UCVB</td><td>On site</td><td>Linked to external services</td><td>On site</td><td>Linked to external services</td><td>Category</td><td>Trajectory of change</td><td>Category</td><td>Trajectory of change</td><td>Category</td></tr>
<tr><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td><td>E - Highly Modified</td><td>↓</td><td>C - Moderate</td><td>↓</td><td>D - Largely modified.</td></tr>
<tr><td colspan="2" rowspan="3">Recommended Monitoring Requirements</td><td colspan="2">Wetland Assessment</td><td colspan="2">Wetland Specialist</td><td colspan="3">Monthly Visual Inspections</td></tr>
<tr><td colspan="2">Environmental Control Officers</td><td colspan="2">ECO</td><td colspan="3">Bi-Weekly Visual Inspections</td></tr>
<tr><td colspan="2">Closure Audit</td><td colspan="2">Wetland Specialist</td><td colspan="3">Closure Audit</td></tr>
</table>

Concluded from the results presented in this document, the construction activities will in all likelihood impact on the wetland system but can be mitigated to satisfactory standards if all mitigatory actions are implemented with due care. It is key to preserve water quality and supply to the downstream aquatic resources.

The rehabilitation of the wetland is vital to recover some ecological function. The wetland drivers must be enhanced as part of the rehabilitation of the affected areas. In respect of the construction phase, it is important to ensure that the required erosion protection measures linked to the wetland intersection sections be carefully designed and installed.

The project can be supported, should all the mitigation measures be implemented and monitored against to ensure compliance and protection of the aquatic resource.

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