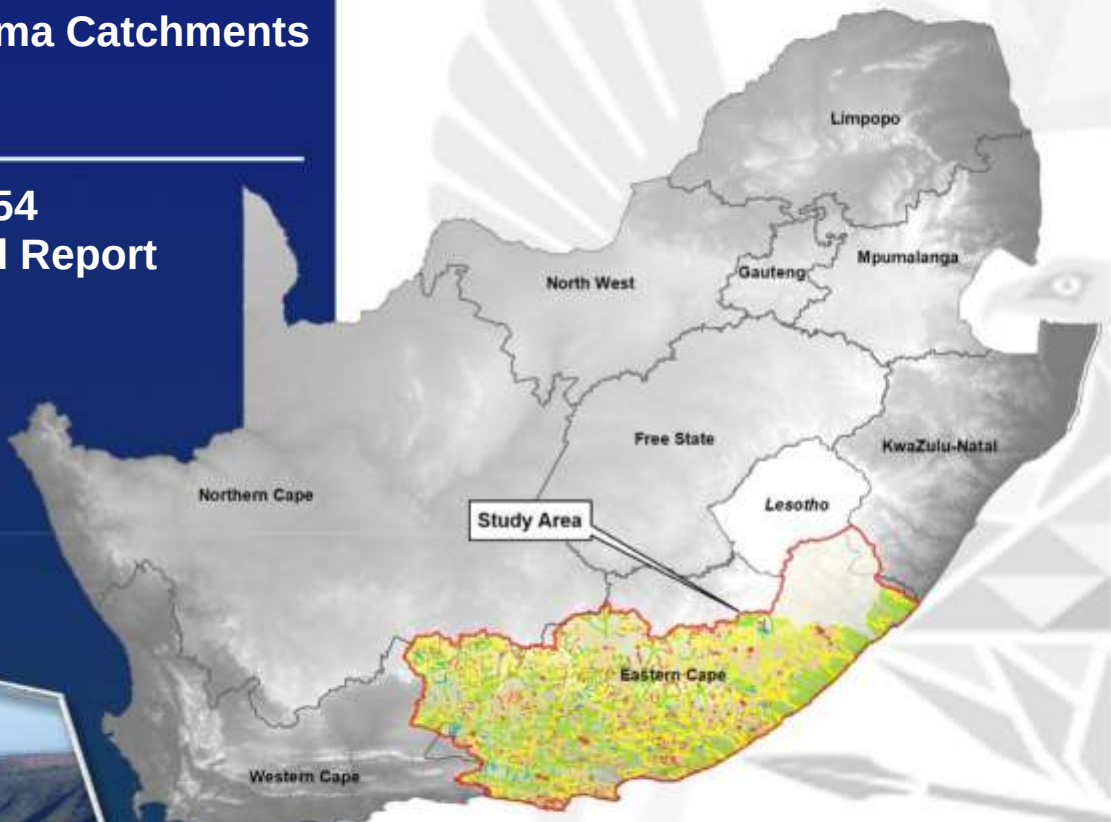
DEPARTMENT OF WATER AND SANITATION

Determination of Water Resource Classes, Reserve and the Resource Quality Objectives in the Keiskamma and Fish to Tsitsikamma Catchments

WP11354
Final Wetland Report



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LIST OF ACRONYMS

Acronym	Explanation
BAS	Best Attainable State
BHN	Basic Human Needs
CD: WEM	Chief Directorate: Water Ecosystems Management
DWA	Department of Water Affairs
DWS	Department of Water and Sanitation
EIS	Ecological Importance and Sensitivity
EWR	Ecological Water Requirements
HGM	Hydrogeomorphic Unit
IAP	Invasive Alien Plant
IUA	Integrated Unit of Analysis
MAP	Mean Annual Precipitation
NFEPA	National Freshwater Ecosystem Priority Areas
NWA	National Water Act
NWM5	National Wetland Map 5
PES	Present Ecological State
PET	Potential Evapotranspiration
RDM	Resource Directed Measures
REC	Recommended Ecological Category
RQO	Resource Quality Objectives
SWSAs	Strategic Water Source Areas
WMA	Water Management Area
WRCS	Water Resource Classification System
WRU	Wetland Resource Unit

1. INTRODUCTION

The National Water Act, 1998 (No. 36 of 1998) (NWA) is founded on the principle that National Government has overall responsibility for and authority over water resource management for the benefit of the public without affecting the functioning of water resource systems. To achieve this objective, Chapter 3 of the NWA provides for the protection of water resources through the implementation of Resource Directed Measures (RDM). These measures are protection-based and include Water Resource Classification, determination of the Reserve and setting the associated Resource Quality Objectives (RQOs). These measures collectively aim to ensure that a balance is reached between the need to protect and sustain water resources, while allowing economic development.

The provision of water required for the maintenance of the natural functionality of the ecosystem and provision of Basic Human Needs (BHN) is the only right to water in the National Water Act (No. 36 of 1998) (NWA). The other water users from a strategic use, who are second in line to other water users, are subject to formal gazetted General Authorization and water use authorization as per Section 21 of the NWA.

The Chief Directorate: Water Ecosystems Management (CD: WEM) of the Department of Water and Sanitation (DWS), has initiated a study for the determination of Water Resource Classes, Reserve, and associated Resource Quality Objectives (RQOs) for the identified water resources in the Keiskamma, Fish to Tsitsikamma catchments.

The water resource components included in this report are **wetland ecosystems** (as per the Hydrogeomorphic (HGM) Units categorisation). The process of determining Reserves for designated wetlands involves establishing Ecological Water Requirements (EWRs) for those connected to rivers and/or groundwater resources, following the guidelines of the Decision Support System (DSS). In cases where wetlands lack such connections, the Reserve will be defined by specifying Ecological Specifications to align with the determined Resource Quality Objectives (RQOs). This will form part of Step 6 of the integrated steps for Classification, Reserve and RQOs will be guided by the “Development of Procedures to operationalise Resource Directed Measures (DWS, 2017). Furthermore, will be included within the RQO, numerical limits and confidence Report (Deliverable 4.3.34), developed for the identified water resources, in the subsequent phases of the project.

1.1 Study motivation

The Keiskamma and Fish to Tsitsikamma catchments within the Mzimvubu to Tsitsikamma Water Management Area (WMA7) are amongst the listed water-stressed catchments in South Africa. This study area is important for conservation and has recognised protected areas, natural heritage, cultural and historical sites that require protection. As several rivers and estuaries are within these catchments with no major impacts, it is vital that their ecological integrity is retained.

However, water use, from surface as well as groundwater resources, for agricultural and other land use activities are high, especially in the more arid catchments, impacting on the availability of water resources for the protection of the aquatic ecosystems. Industrial practices and domestic water use are on the rise in some of these catchments, especially around the major towns and cities. Water transfers from adjacent Water Management Areas (WMA) and within the study area and numerous storage dams changes the flow patterns, impacting on the aquatic biota. Furthermore, various water

use license applications and increasing land use impacts in the catchments (forestry, farming, eradication of alien vegetation, wastewater treatment works) are increasing.

Therefore, measures including the classification of water resources, quantification of the Reserve for rivers, wetlands and groundwater resources and setting of RQOs for all identified significant water resources is required to ensure ecological sustainability within these catchments. Furthermore, in some cases specific Ecological Specifications will be set for wetlands as mentioned above. This will ultimately assist the DWS in managing and protecting of the water resources in the study area in an integrated manner, as well as making informed decisions regarding the authorisation of future water use and the magnitude of the impacts of proposed developments.

Overall, the goal of this study is to provide information that is legally defensible and that the Recommended Ecological Category (REC) is identified with RQOs being set for priority wetland ecosystems alongside the studies being undertaken for the river, estuary, and groundwater components, which will be gazetted and thus legally binding.

1.2 Overarching study objective

The main objectives of the overarching study are to determine, where applicable, (i) Water Resource Classes, (ii) the Reserve and (iii) associated Resource Quality Objectives (RQOs) and (iv) gazetting of these for the identified water resources in the Keiskamma and Fish to Tsitsikamma catchment area that would facilitate sustainable use of the water resources while maintaining the required ecological integrity. All the water resource components, including rivers, wetlands, estuaries, and groundwater will be considered during this study and where applicable, integration between these components will be undertaken. Furthermore, the determination of the Water Resource Classes, the Reserves and setting RQOs will depend on the integration of several disciplines in respect of water resources protection (i.e., instream and riparian health and Source Directed Control) that includes the needs of the water users present in the catchment area. This will be done through a consultative process with continual communication and liaison by involving the various stakeholders in the study area. Skills development and transfer through a number of workshops, training days, in-field surveys and day-to-day management of the study will be undertaken as part of the capacity building requirements of the DWS.

The key aims of this study are thus to (i) co-ordinate the implementation of the Water Resource Classification System (WRCS) through the published Regulation 810 (Department of Water Affairs, September 2010) and (ii) following the various methodologies for the determination of the relevant Reserves and setting the RQOs as prescribed by the DWS. The integrated procedure as developed to Operationalise Resource Directed Measures (DWS, 2017) will be used to guide the overall process for this study. The study team understands that this study is linked to previous Reserve determination studies and other water resource management initiatives within the study area. Linking and integration with current parallel studies, including the development of a reconciliation strategy for the management of the water resources in the study area will be undertaken as part of this study.

The Water Resource Classes and associated RQOs will assist as input information when assessing potential authorisation of future water uses, provide guidance on the operation and management of the system and the evaluation of the impacts of the present and proposed developments, in the form of operational scenario evaluation. Furthermore, taking the economic, social, and ecological goals

to be attained, and considering and specifying the risks of non-compliance, with meeting of the Recommended Ecological Category (REC) and the potential loss of social and economic water use.

1.3 Purpose of this report

The purpose of this report is to summarise the data, information, approaches followed and results for the selected WRUs for the Keiskamma, Fish to Tsitsikamma project area to provide input for the determination of the Water Resource Classes and specification of RQOs. The approach for the WRUs incorporated Steps 3, 5 and 7 as shown in **Figure 1-1** below. The ecological specifications and Ecological Water Requirements (EWR) will be determined for priority rivers, estuaries, groundwater, and WRUs in subsequent phases of the project. As such, only selected aspects of Step 4 were included in the approach for the wetland component for this study. Where information from previous Reserve determinations for wetlands are available, these results will be used and the EWR will be quantified. However, recommendations for the need for quantification of the EWRs for specific priority wetlands and where integration between groundwater, rivers, estuaries and/or wetlands are crucial, will be made. Furthermore, preliminary ecological specifications have been provided for, which include the preliminary management and mitigation measures and monitoring recommendations for each priority wetland within this report. These will be summarised as ecological specifications in the RQO, numerical limits and confidence Report, as well as included within the gazette template (Deliverable 4.3.27).

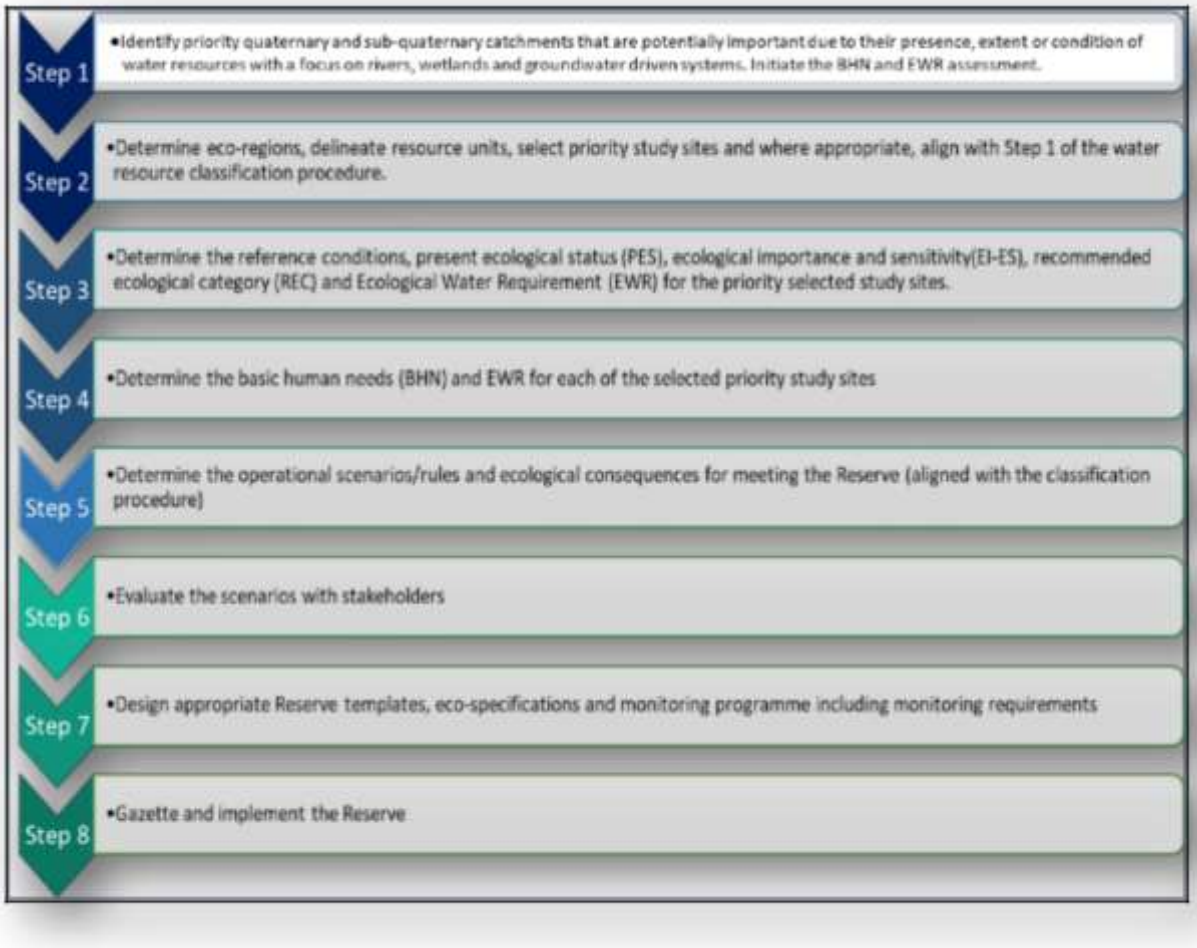


Figure 1-1 Integrated steps for the determination of the Reserve (DWS, 2017)

2. STUDY AREA

The study area forms part of the Mzimvubu to Tsitsikamma WMA (WMA7) as indicated in **Table 2-1** and **Figure 2-1**. The water resources of the Mzimvubu catchment (T31 – T36) were not included as part of the study area, as the catchments have been gazetted based on a Reserve study undertaken in 2022. Secondary catchments T40 (Mtamvuna) and T50 (Mzimkhulu) form part of WMA4, and therefore were also excluded from this study.

Table 2-1 Main catchments and rivers in the study area

Catchment	Major Rivers
K80	Tsitsikamma and small coastal rivers
K90	Krom and small coastal rivers
L10 - L90	Gamtoos with main tributaries Groot, Baviaanskloof and Kouga
M10 - M30	Koega, Swartkops and small coastal rivers
N10 - N40	Sundays
P10 - P40	Kowie, Kariega, Boesmans and small coastal rivers
Q10 - Q90	Fish River with main tributaries of Little Fish, Koonap and Kat
R10 - R50	Keiskamma and small coastal rivers
S10 - S70	Great Kei River with main tributaries of Klipplaats, Indwe, White Kei, and Black Kei
T10	Mbashe
T20	Mthatha
T60	Small coastal rivers (Mtentu, Msikaba, and Mzintlava)
T70	Small coastal rivers (Mtakatye and Mngazi)
T80 & T90	Small coastal rivers

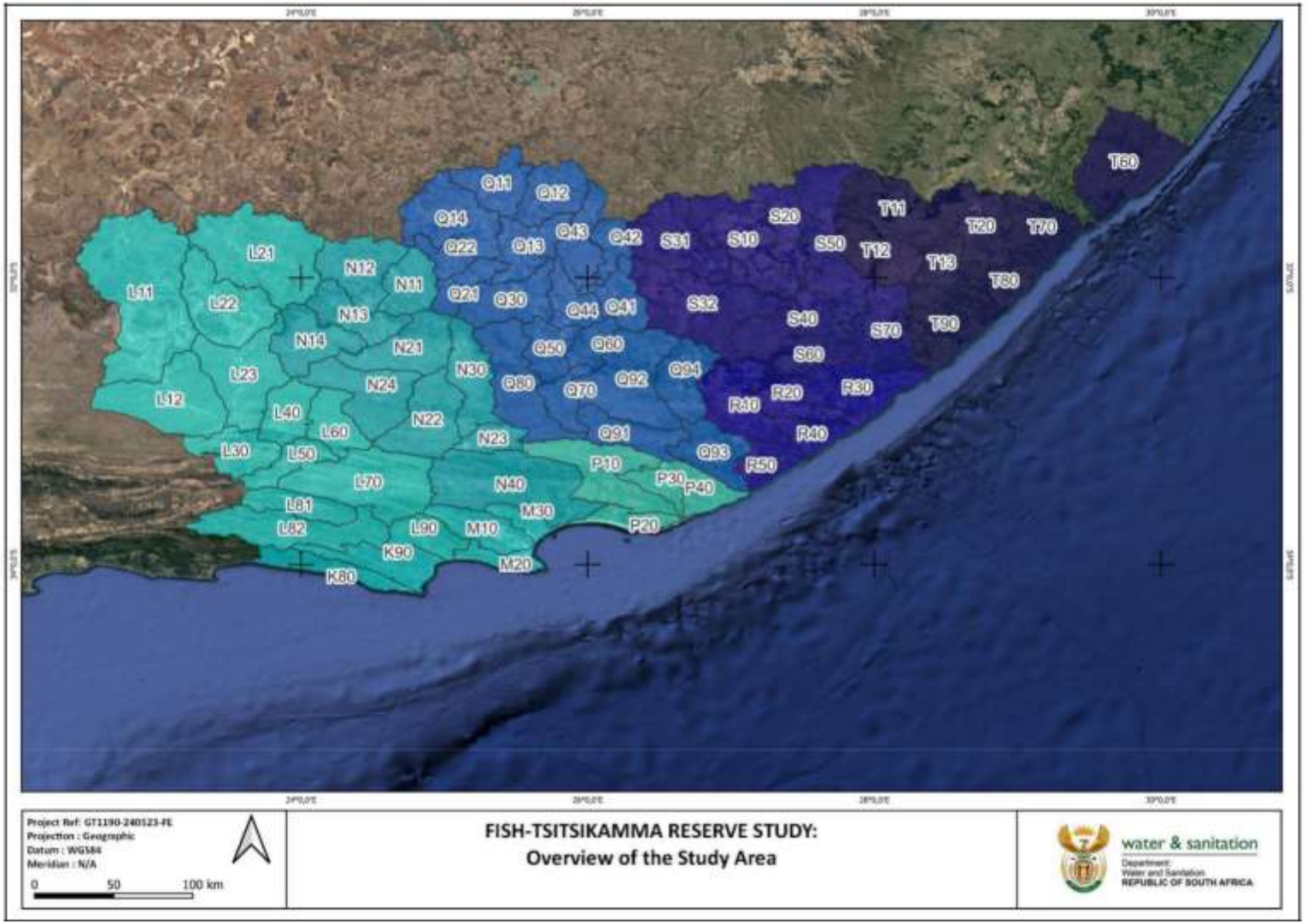


Figure 2-1 Overview of the greater study area

2.1 Wetlands

There are 12 sub-catchments within the overall study area, of which the Kei, Mbashe, Tsitsikamma and Fish hold the largest areas of known wetlands **(Table 2-2)**.

Table 2-2 Area[1] of wetland per sub-catchment

Catchment	Sub-catchment	Primary catchment	Hectares	%
Fish to Keiskamma	Gamtoos	L	1274	4.2
	Sundays	N	899	3.0
	Fish	Q	3,296	10.9
	Tsitsikamma	K	3,236	10.7
	Algoa	M	2,357	7.8
	Bushmans	P	634	2.1
Mzimvubu to Keiskamma	Kei	S	9,329	30.9
	Amatola	R	1,827	6.1
	Mbashe	T	4,304	14.3
	Mtata	T	1,102	3.7
	Wild Coast	T	1,913	6.3
Grand Total			30,171	100

[1]Area of wetland was determined based on National Wetland Map 5 (NWM5), but supplemented with additional information for the Gamtoos, Sundays and Wild Coast, where a high level of under-mapping was confirmed.

2.2 A Few Key Trends Across the Sub-catchments

A suite of trends across various catchments were identified, influencing the overall study. These have been briefly described below. For a detailed description of the trends refer to the Wetland Eco-categorisation Report (DWS 2023, Report ref: WEM/WMA7/00/CON/RDM/1323 report).

Wetland occurrence in relation to SWSAs: Strategic Water Source Areas (SWSAs): SWRAs have been identified within all the relevant study area sub-areas. Overall, surface SWSAs dominate the more eastern, coastal reaches of the study site, whilst the groundwater SWSAs were noted more inland, along the north-western study area boundary, with scattered areas along the coastal sub-WMAs **(Figure 2-2)**. Especially in the case of the surface water SWSAs, the occurrence of wetlands within these areas was notably higher than those areas that were not considered important SWSAs.

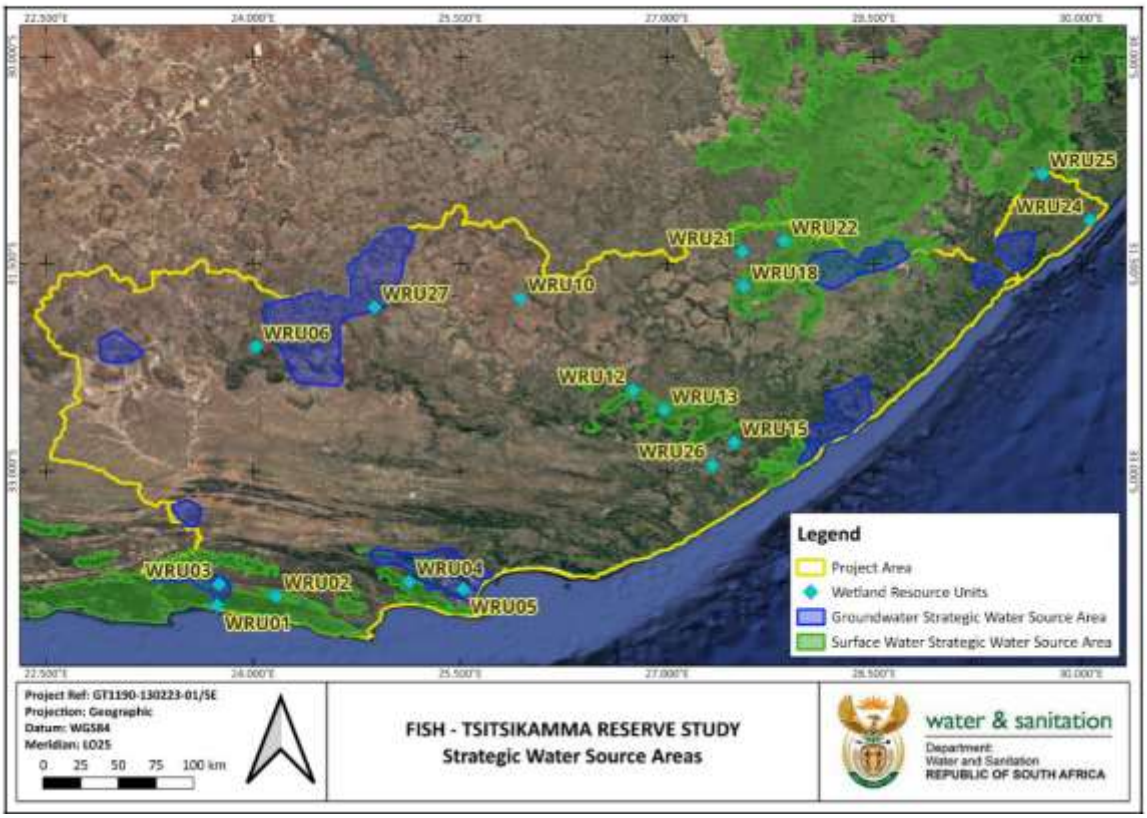


Figure 2-2 Distribution of SWSA's and WRU's across the studty area

Wetland occurrence in relation to the Mean Annual Precipitation (MAP): The hinterland of the overall study area extends from predominantly dry (MAP<400 mm) in the west to becoming progressively less dry as one moves eastwards, where MAP is generally >800 mm **(Figure 2-3)**. Such a wide gradient has important implications for wetland occurrence given that hydrology is a primary driver of wetlands. It is therefore not surprising that in the dry western sub-catchments (i.e., the **Gamtoos and Sundays** catchments) the total extent of wetlands is relatively low, but more to the east (i.e., the **Fish** sub-catchment) it increases noticeably, further increasing in the next major sub-catchment (i.e., the **Kei**). The coastal areas of the study area show a different pattern to the hinterland, with the MAP being relatively high in the west (**Tsitsikamma**), declining in the **Algoa** and **Bushmans** sub-catchments then increasing again thereafter. Thus, it is not surprising that the **Tsitsikamma** sub-catchment**,** where, although confined to a narrow coastal strip, has a relatively high wetland extent compared to the overall extent of this area. Some of the eastern sub-catchments, while having wetland extents that are higher than in the western hinterland, are lower than expected, given the high MAP and topography which is not very steep.

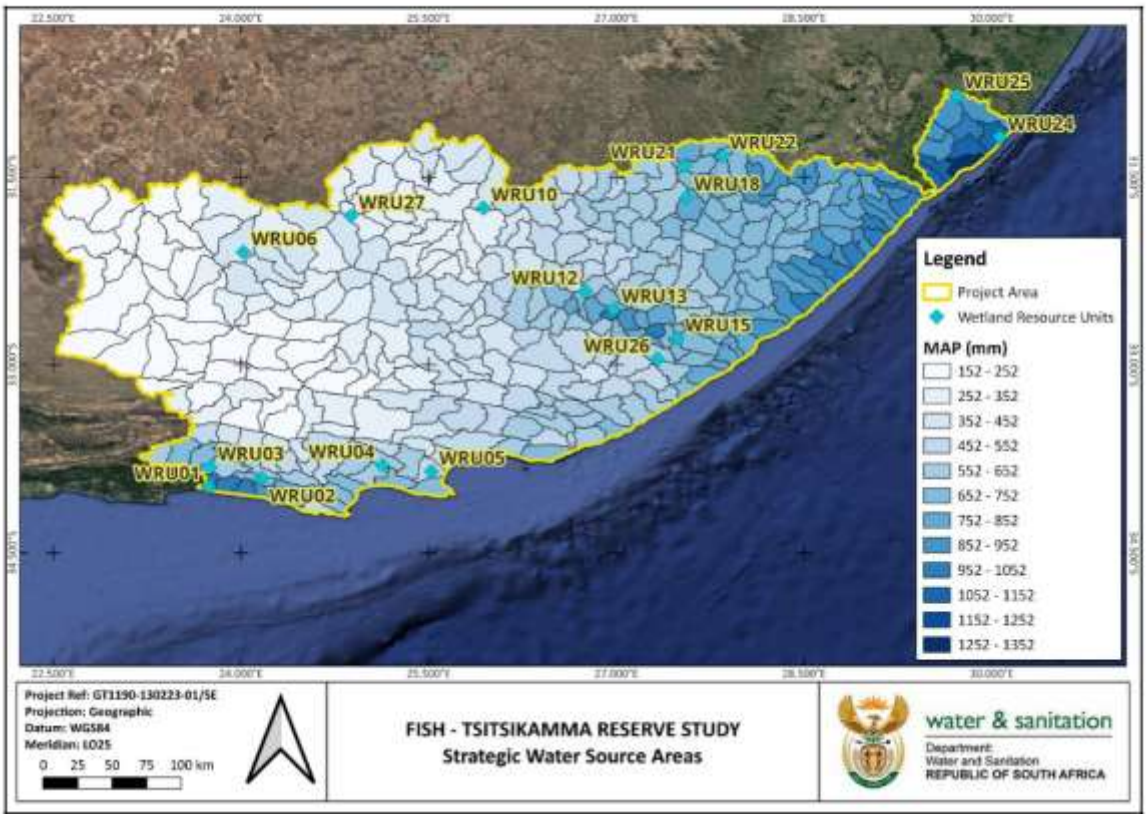


Figure 2-3 MAP distribution across the study area in relation to the final WRUs

Extent of wetlands compared with the Mzimvubu: It is interesting to note that the total extent of wetlands in the combined 12 sub-catchments (30,171ha) is considerably less than the 50,971 ha of wetlands in a single nearby sub-catchment, the gazetted Mzimvubu catchment. This is possibly owing to a lack of the very broad, gently sloped valley bottoms which are widespread in the Mzimvubu catchment and support some very large floodplain/valley bottom wetlands, largely absent from the study area. This is also a result of the MAP being substantially higher in the Mzimvubu sub-catchment than the average MAP across the 12 sub-catchments in the study area.

Present ecological state (PES) in relation to land-use and the aridity gradient: The greatest proportion of wetlands in a D, E and F category were found in the Tsitsikamma sub-catchment, where high impact, land-uses associated with cultivation and plantation forestry are extensive, followed by Algoa sub-catchment, where high impact urban/industrial land-uses are extensive. Field verified assessments such as Hugo (2011) and Tuswa (2016) suggest that the general land cover-based proxies used to derive the PES categories of wetlands in these sub-catchments are reasonable. Wetlands were least impacted in the three major arid to semi-arid sub-catchments (i.e., Gamtoos, Sundays and Fish), where most wetlands are placed in an A or B (natural to largely natural) Category. While this may be a reasonable approximation, it should be acknowledged that certain impacts are poorly represented in the DFFE (2020) land-cover map used for the assessment, particularly those within areas mapped as natural vegetation, e.g., overgrazing by livestock.

3. WETLAND RESOURCE UNIT ASSESSMENT: SUMMARY OF RESULTS

Sixteen (16) wetland resource units were selected for the Keiskamma and Fish to Tsitsikamma catchments and were visited as part of the field survey by the project team **(Figure 3-1)** and assessed for their PES, Ecological Importance and Sensitivity (EIS), and REC[1]. **Table 3-1** provides an overview of the priority 1[2] and 2[3] resource units for wetlands in the study area. It should be noted that the systems listed in the table include only those that were assessed.

Table 3-1 Identified combined Priority 1 and 2 wetland resource units in the study area

IUA	IUA Description	RU No.	Quaternary catchment(s)
IUA_K01	Tsitsikamma and headwaters of Kromme to Kromme Dam	W_RU01	K80A
		W_RU02	K90A
IUA_KL01	Kromme from Kromme Dam to estuary and Gamtoos	No priority wetlands identified for this study.	
IUA_L01	Kouga to Kouga Dam, Baviaanskloof	W_RU03	L82D
IUA_M01	M primary catchment	W_RU05	M10D
		W_RU04	M10B
IUA_LN01	Groot to Kouga confluence, Upper Sundays to Darlington Dam	W_RU06	L21D
IUA_N01	Sundays downstream Darlington Dam	No priority wetlands identified for this study.	
IUA_P01	P primary catchment	No priority wetlands identified for this study.	
IUA_Q01	Upper Fish	W_RU27	Q22A
IUA_Q02	Great Fish	W_RU10	Q43A, Q43B
IUA_Q03	Koonap and Kat	No priority wetlands identified for this study.	
IUA_R01	Keiskamma	No priority wetlands identified for this study.	
IUA_R02	Buffalo/ Nahoon	W_RU15	R20E
		W_RU26	R20D
IUA_S01	Upper Great Kei	W_RU18	S50E
		W_RU21	S50C
IUA_S02	Black Kei	W_RU13	S32D
		W_RU12	S32E
IUA_S03	Lower Great Kei	No priority wetlands identified for this study.	
IUA_T01	Upper Mbashe, Upper Mthatha	W_RU22	T11A
IUA_T02	Lower Mbashe	No priority wetlands identified for this study.	

[1] Refer to the Wetland Eco-categorisation Report (DWS 2023, Report ref: WEM/WMA7/00/CON/RDM/1323 report) report for a detailed outline of the methodology adopted for the study.

[2] Priority 1, where rivers and estuaries will be assessed on an intermediate level and detailed considerations for wetlands and groundwater. RQOs will also be determined for the selected sub-components (DWS 2022: Report Ref: WEM/WMA7/00/CON/RDM/0422).

[3] Priority 2, with rapid assessments for rivers and estuaries and less detailed studies for the wetlands and groundwater (desktop with limited field verifications). Some of these will also be used as hydro and/ or biophisical nodes at the outlets of RUs or IUAs or where specific protection considerations are required (DWS 2022: Report Ref: WEM/WMA7/00/CON/RDM/0422).

IUA	IUA Description	RU No.	Quaternary catchment(s)
IUA_T03	Lower Mthatha	No priority wetlands identified for this study.	
IUA_T04	Pondoland coastal	W_RU24	T60D
		W_RU25	T60B

The WRUs systems varied in terms of their type, integrity, functionality, and size, however, these systems were all regarded as important, even though in some instances their integrity was compromised. In many instances the EIS score reflected was better than the PES, which was often related to the demand for a specific service e.g., water quality enhancement, and/or due to the presence of a red data species, whilst the integrity of the system is greatly reduced to the suite of catchment and in-system related impacts **(Table 3-2)**.

The proposed RECs for the various systems were derived using the Rountree et al. (2013) method, which considers the wetlands PES, EIS and whether a proposed REC category is feasible and/or practical[4]. Thus, the REC is generally based on attainable management activities that can be adopted within the system and/or associated 200m buffer zone. However, in some instances addressing the overarching impacts on the systems is unattainable due to historical activities which cannot be feasibly reversed e.g., damming of a portion of the system; and therefore, these systems are largely locked in their current state of integrity. Although REC scores have been presented for these systems, these may potentially be unattainable due to the current nature of these systems and prohibitive costs, either direct or indirect, of addressing the identified impacts. Should the REC be unattainable, the Best Attainable State (BAS) will be prescribed in subsequent steps of the overarching study as part of the RQO process. Intensive management and/or rehabilitation measures have generally not been prescribed for any of the systems, as in many instances it can be onerous on the landowners/users and therefore, these are not adopted. Several impacts on the systems can, in theory, be easily reversed e.g., surcharging manholes; and thereby contribute to an improved overall PES of the system. **Figure 3-2** and **Figure 3-3** provide a visual overview of the WRUs PES categories, whilst **Figure 3-4** and **Figure 3-5** depicts the proposed REC categories. From this, and **Table 3-2**, it is evident that for the majority of the systems, the REC exceeds the PES, which can only be achieved through adopting suitable management and maintenance activities within the wetlands and associated catchments.

There are systems such as the Xolobeni wetland (WRU24) for which intensive rehabilitation activities have been proposed, as the erosional feature within the system is threatening the water supply to the surrounding community. A substantial number of persons are reliant on this system for water, and should the system become further degraded, water supply will be a massive problem. Although the majority of the proposed management/mitigation measures are considered to be achievable, they would be subject to partnerships being established between the various government departments and the landowners. Such partnerships provide both partners with the opportunity to achieve the set goals – ensuring our water resources are protected and preserved for future generations to come.

[4] Rountree et al. (2013) make allowances for the REC to be set at the current PES should it be impractical to improve the system's integrity (refer to page 18-19).

The outcomes of the sixteen wetlands within the study area are summarised in the following sections, including preliminary management and mitigation measures, and monitoring requirements have been presented.

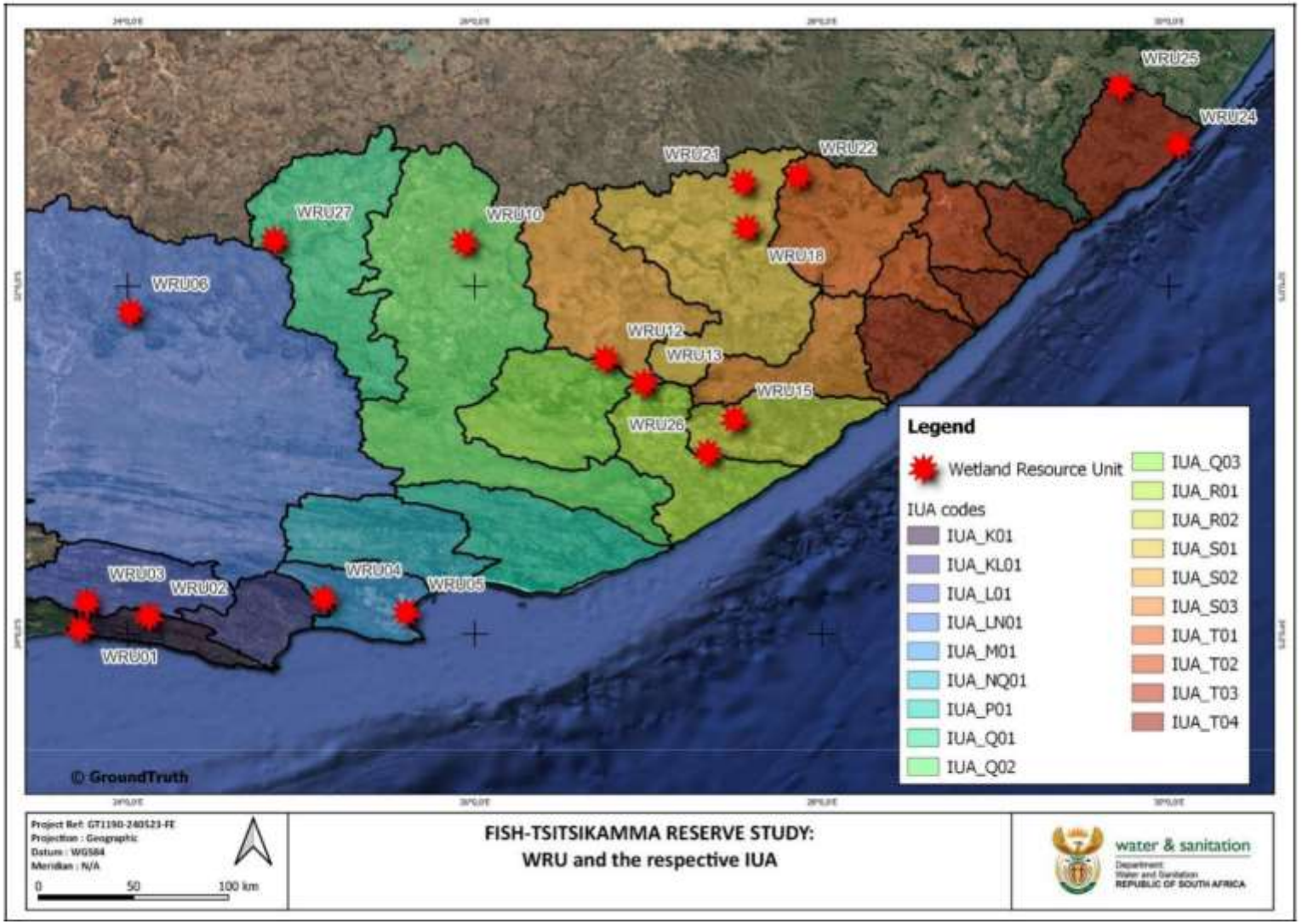


Figure 3-1 Overview of the wetland resource units selected

Table 3-2 Summary of the respective WRUs identified within the Integrated Unit of Analysis (IUAs)

IUA	WRU	Wetland Name	HGM Type	SWSA (Y/N)	PES	EIS	Key ecosystem services provided	REC
K01	WRU01	Lottering	Valley-bottom/Seep	Y	C (Moderate)	B (High)	Carbon (C) storage, Biodiversity, Streamflow regulation	C
		Slang	Valley-bottom/Seep	Y	B (Largely natural)	A (Very High)	Biodiversity,Carbon storage, Streamflow regulation	B
	WRU02	Kromme	Unchannelled valley-bottom	Y	A (Natural)	A (Very High)	Biodiversity, C storage, Streamflow regulation, flood attenuation	A
L01	WRU03	Krakeel	Valley-bottom	Y	D (Largely modified)	A (Very High)	Water quality enhancement, Biodiversity, Water supply	C / D
M01	WRU04	Longmore	Valley-bottom	Y	C (Moderate)	A (Very High)	Biodiversity, Streamflow regulation, Sediment trapping	B / C
	WRU05	Chatty River	Floodplain	Y	D (Largely modified)	A (Very High)	Biodiversity, water quality enhancement, sediment trapping	C
			Channelled valley-bottom	Y	D (Largely modified)	A (Very High)	Biodiversity, water quality enhancement, sediment trapping	C
LN01	WRU06	Sneeuberg West	Seep	N	B (Largely natural)	B (High)	Grazing, Water supply, Biodiversity	B
			Valley-bottom	N	C (Moderate)	B (High)	Grazing, Water supply, Biodiversity	C
LN01	WRU27	Loodsberg	Hillslope Seep	Y	B (Largely natural)	B (High)	Grazing, Water supply, Biodiversity	B
			Valley-bottom	Y	C (Moderate)	B (High)	Grazing, Water supply, Flood attenuation, Biodiversity	C
Q02	WRU10	Dagbreek	Valley-bottom	N	B (Largely natural)	B (High)	Sediment trapping, Erosion control, Biodiversity,	A / B

IUA	WRU	Wetland Name	HGM Type	SWSA (Y/N)	PES	EIS	Key ecosystem services provided	REC
R02	WRU15	eDrayini	Floodplain	N	C (Moderate)	B (High)	Grazing, Flood attenuation, Biodiversity	C
	WRU26	KwaMasele	Valley-bottom/Seep	N	C (Moderate)	B (High)	Biodiversity, Grazing, Flood attenuation	C
S01	WRU18	Cala	Valley-bottom	Y	C (Moderate)	B (High)	Streamflow regulation, Water supply, Sediment trapping	B
			Hillslope Seep	Y	C (Moderate)	B (High)	Streamflow regulation, Sediment trapping, Harvestable resources	B
	WRU21	Mbokotwa	Floodplain	N	D (Largely modified)	A (Very High)	Water quality enhancement, Water supply, Biodiversity	C / D
S02	WRU12	Cairns	Unchannelled valley-bottom /Seep	Y	B (Largely natural)	A (Very High)	Biodiversity, Grazing, Streamflow regulation	B
	WRU13	Hogsback	Hillslope Seep	Y	C (Moderate)	A (Very High)	Biodiversity, Streamflow regulation, Grazing, Erosion control	B / C
			Hillslope Seep (degraded)	Y	D (Largely modified)	B (High)	Grazing, Erosion control, Water quality enhancement	D
			Channelled valley-bottom	Y	C (Moderate)	B (High)	Biodiversity, Flood attenuation, Grazing, Erosion control	B / C
			Floodplain	Y	C (Moderate)	B (High)	Biodiversity, Erosion control, Sediment trapping, Grazing	B / C
T01	WRU22	Elliot/Khowa	Hillslope Seep (Tributaries))	N	D (Largely modified)	C (Moderate)	Streamflow regulation, Grazing	C / D

IUA	WRU	Wetland Name	HGM Type	SWSA (Y/N)	PES	EIS	Key ecosystem services provided	REC
			Floodplain (east)	N	D (Largely modified)	A (Very High)	Flood attenuation, Streamflow regulation, Biodiversity	C / D
			Channelled valley-bottom (west)	N	D (Largely modified)	A (Very High)	Water quality enhancement, Grazing, Flood attenuation	C
			Floodplain (upper)	N	E (Seriously modified)	A (Very High)	Biodiversity, Water quality enhancement, flood attenuation	D
			Floodplain (lower)	N	C (Moderate)	A (Very High)	Biodiversity, Flood attenuation, Water quality enhancement	B
T04	WRU24	Sikombe	Channelled valley-bottom	Y	B (Largely natural)	B (High)	Biodiversity, C storage, Streamflow regulation	B
		Xolobeni	Channelled valley-bottom	Y	C (Moderate)	B (High)	Water supply, C storage, Streamflow regulation	B
	WRU25	Ludeke Halt	Seep/Valley-bottom	Y	D (Largely modified)	B (High)	Subsistence use, Grazing, Streamflow regulation	C / D

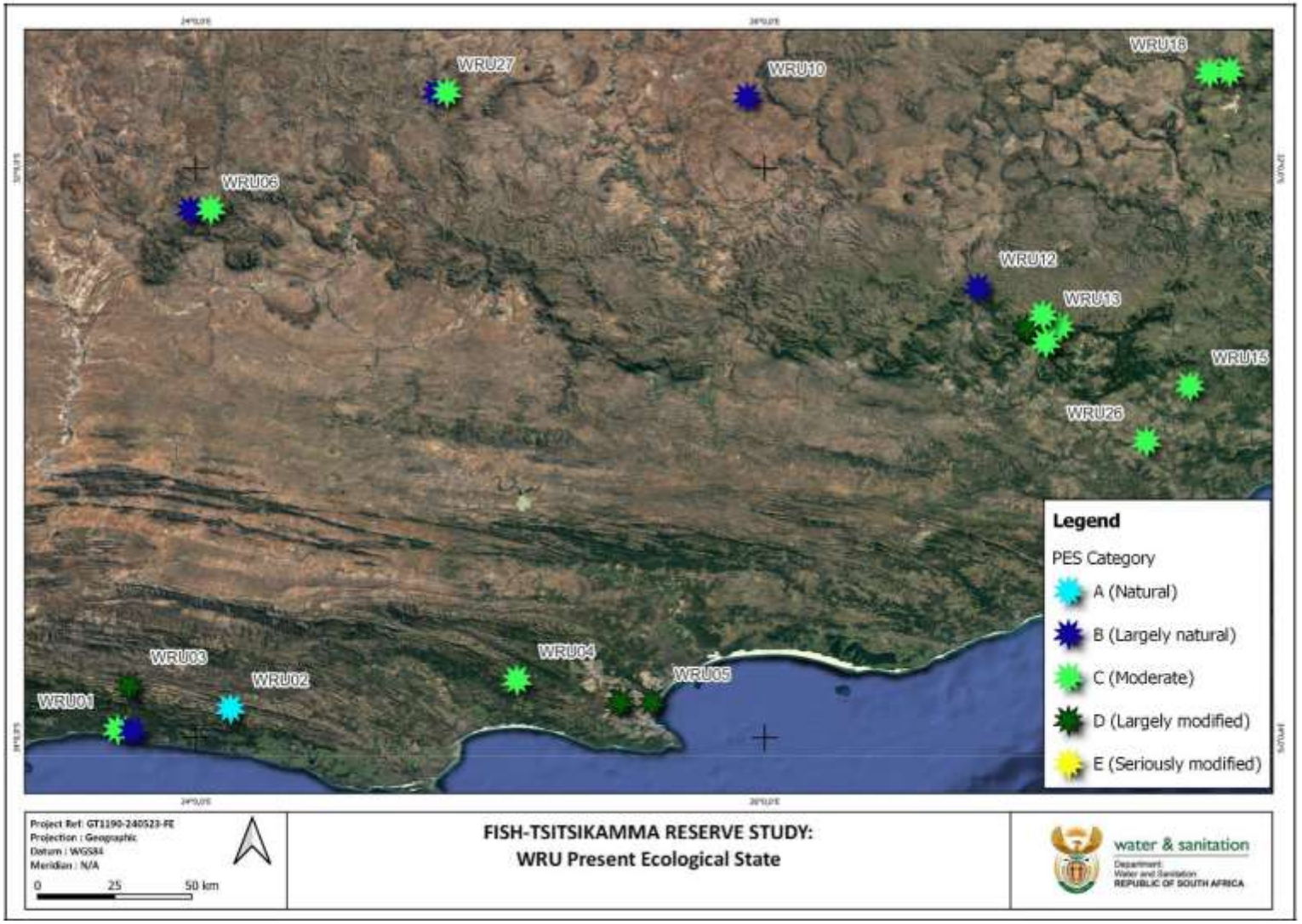


Figure 3-2 Overview of the PES categories for WRU01, WRU02, WRU03, WRU04, WRU05, WRU06, WRU10, WRU12, WRU13, WRU15, WRU18, WRU26, WRU27

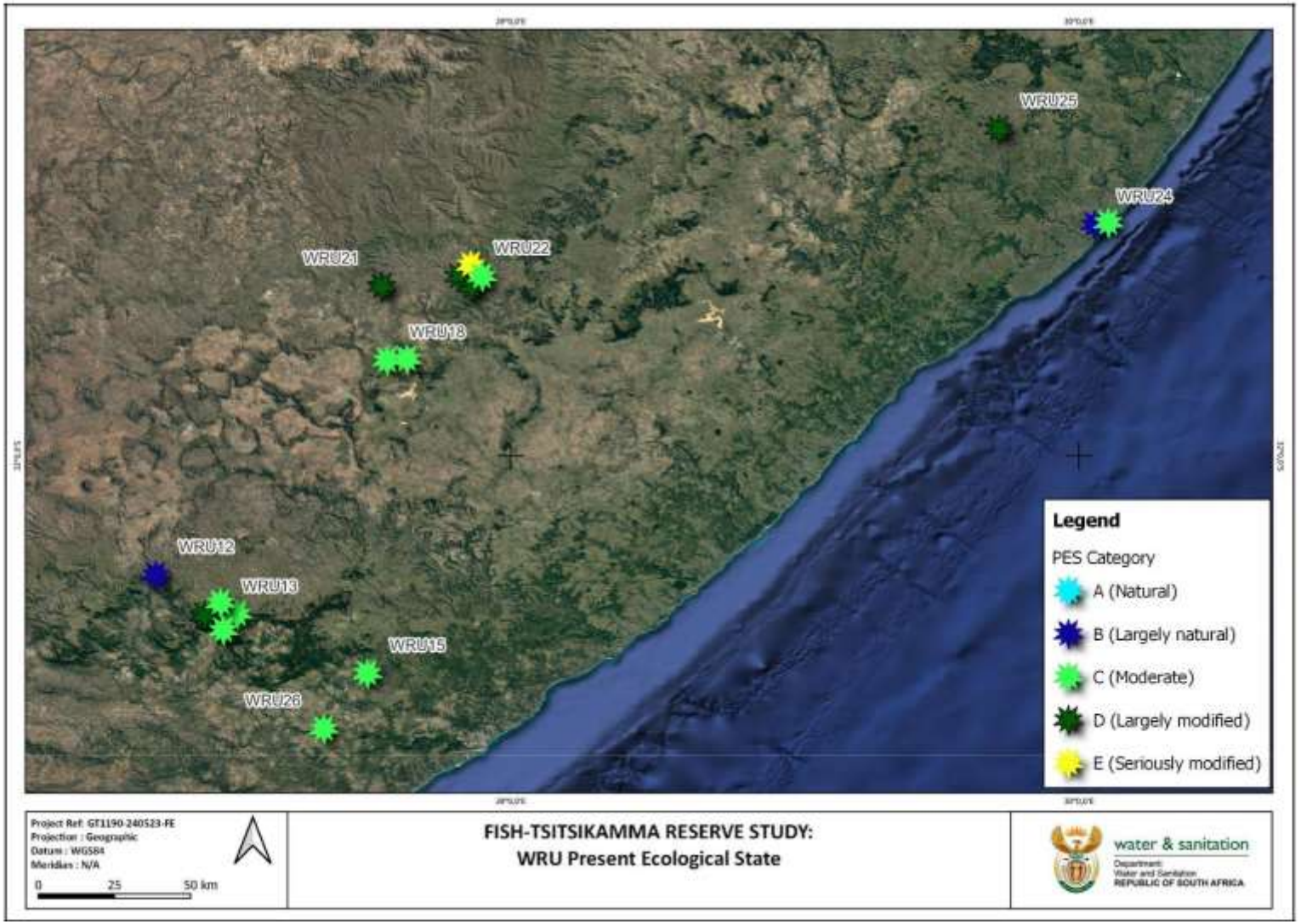


Figure 3-3 Overview of the PES categories for WRU12, WRU13, WRU15, WRU18, WRU21, WRU22, WRU24, WRU25, WRU26

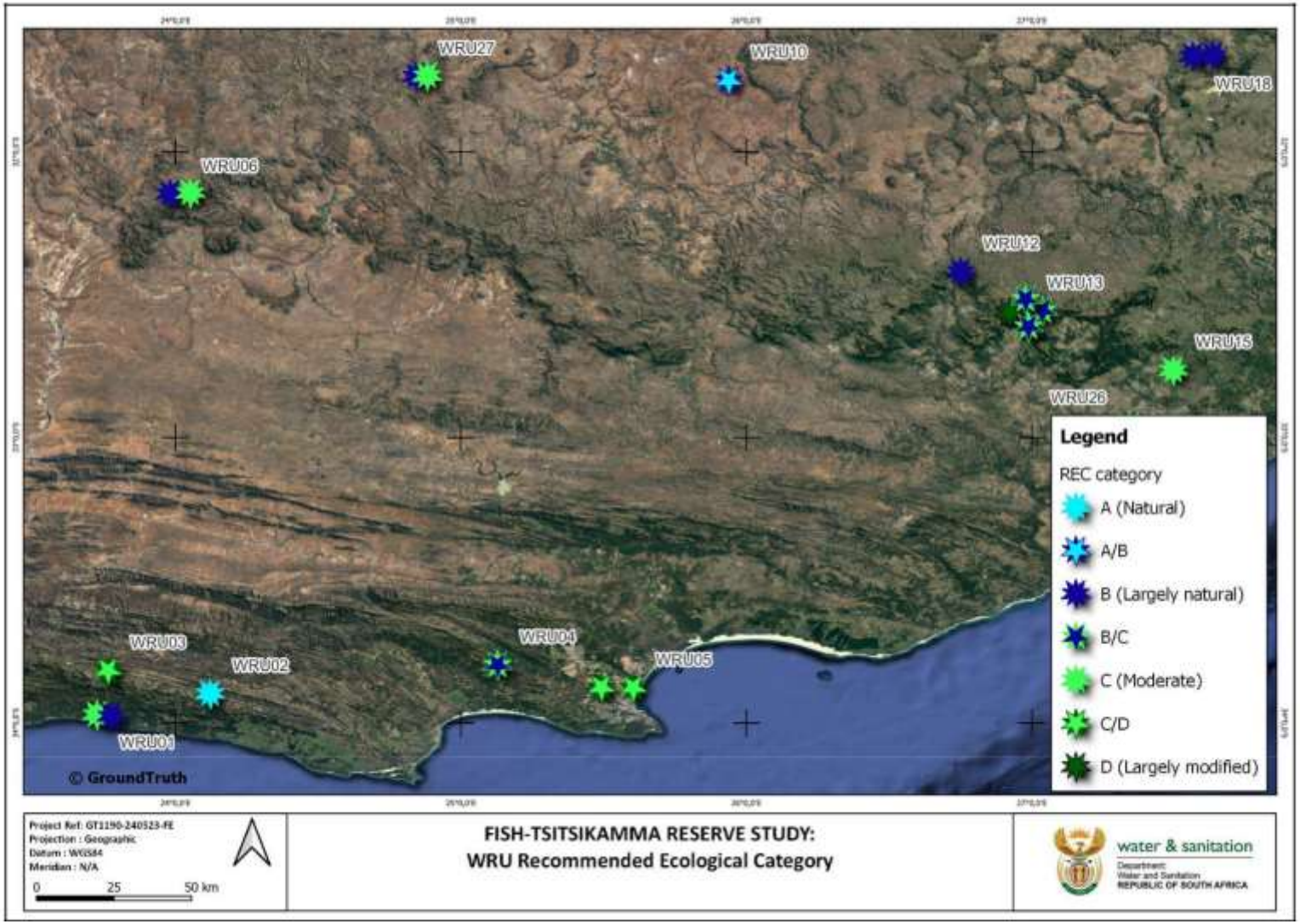


Figure 3-4 Overview of the Recommended Ecological Categories for WRU01, WRU02, WRU03, WRU04, WRU05, WRU06, WRU10, WRU12, WRU13, WRU15, WRU18, WRU26, WRU27

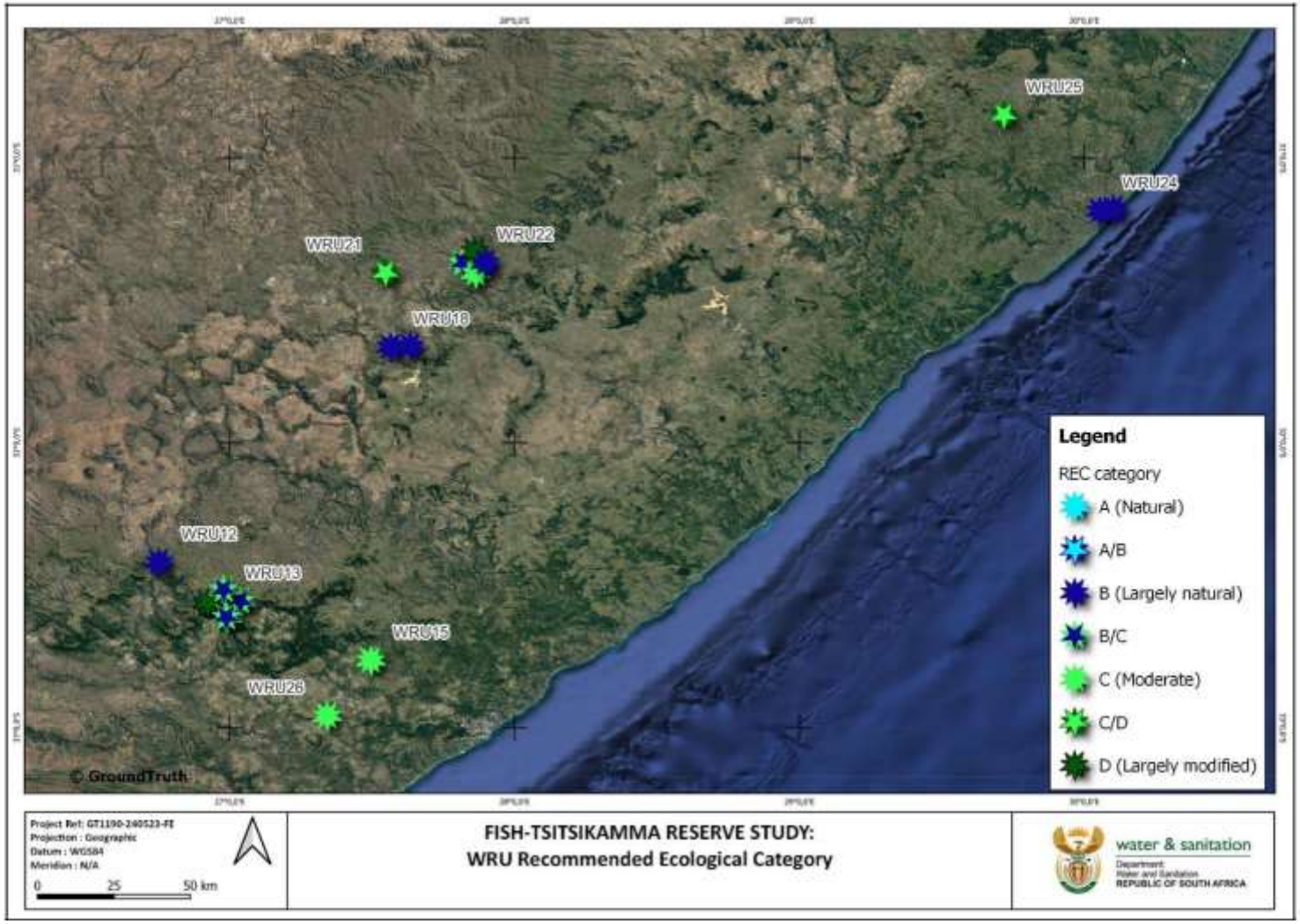


Figure 3-5 Overview of the Recommended Ecological Categories for WRU12, WRU13, WRU15, WRU18, WRU21, WRU22, WRU24, WRU25, WRU26

The following sections provides a description and assessment results for all the WRUs within the IUAs. The PES, EIS and REC results are based on the following categories and scores.

Category	PES Description	PES Score (%)	EIS Description	Range of EIS Score
A	Natural	90-100	Very High	≥3.5
B	Largely natural	80-89	High	>2.5 and <3.5
C	Moderate	60-79	Moderate	>1.5 and ≤2.5
D	Largely modified	40-59	Low/Marginal	>0.5 and ≤1.5
E	Seriously modified	20-39	None	≤0.5
F	Critically modified	0-20	-	-

Additionally, the projected trajectory of change over the next five (5) years, linked to the PES assessment, is based on the following key:

- ↑↑= large improvement,
- ↑= slight improvement,
- →= remains the same,
- ↓= slight decline, and
- ↓↓= large decline.

3.1 IUA_K01: Tsitsikamma and Headwaters of Kromme and Kromme Dam

Table 3-3 Summary of wetland information for IUA_K01

IUA Description	Tsitsikamma and headwaters of Kromme to Kromme Dam
HGM unit type	Total of 189 wetlands mapped; Channelled Valley Bottom Wetlands: 50% Depression Wetlands: 8% Hillslope Seep Wetlands: 16% Unchannelled Valley Bottom Wetlands: 26%
PES per HGM unit type	Channelled Valley Bottom Wetlands - A/B: 16%; C: 40%; D/E/F: 44%. Depression Wetlands - A/B: 36%; C: 21%; D/E/F: 43%. Hillslope Seep Wetlands - A/B: 8%; C: 44%; D/E/F: 48%. Unchannelled Valley Bottom Wetlands - A/B: 15%; C: 20%; D/E/F: 65%.
FEPA Wetlands[5]	A single FEPA wetland is present in IUA_K01 – namely the Kromme wetland.
WRU	WRU01 and WRU02

[5] It should be noted that only FEPA wetlands that overlap spatially with the National Wetland Map 5 will be recorded here as it is recognised that there are some inherent problems with the National Freshwater Ecosystem Priority Areas (NFEPA) wetland coverage. Therefore, only those FEPA wetlands that have been 'confirmed' by the National Wetland Map 5 will be recorded here.

3.1.1 WRU 01 – Tsitsikamma Plains Wetland Complex

Factor	Comment
WRUNumber(Quaternary Catchment)	WRU 01 (K80A)
Site Coordinates	33°58'11.87"S, 23°43'28.43"E
HGM Unit Type(s)	Hillslope seepage, Channelled and Unchanneled valley-bottom wetlands
Vegetation types	Eastern Fynbos-Renosterveld Sandstone Fynbos
Threat Status	**UNCHANNELLED VALLEY-BOTTOM**: CRITICALLY ENDANGERED, **CHANNELLED VALLEY-BOTTOM**: CRITICALLY ENDANGERED, **SEEP**: ENDANGERED
Strategic Water Source Area	Yes (Tsitsikamma)

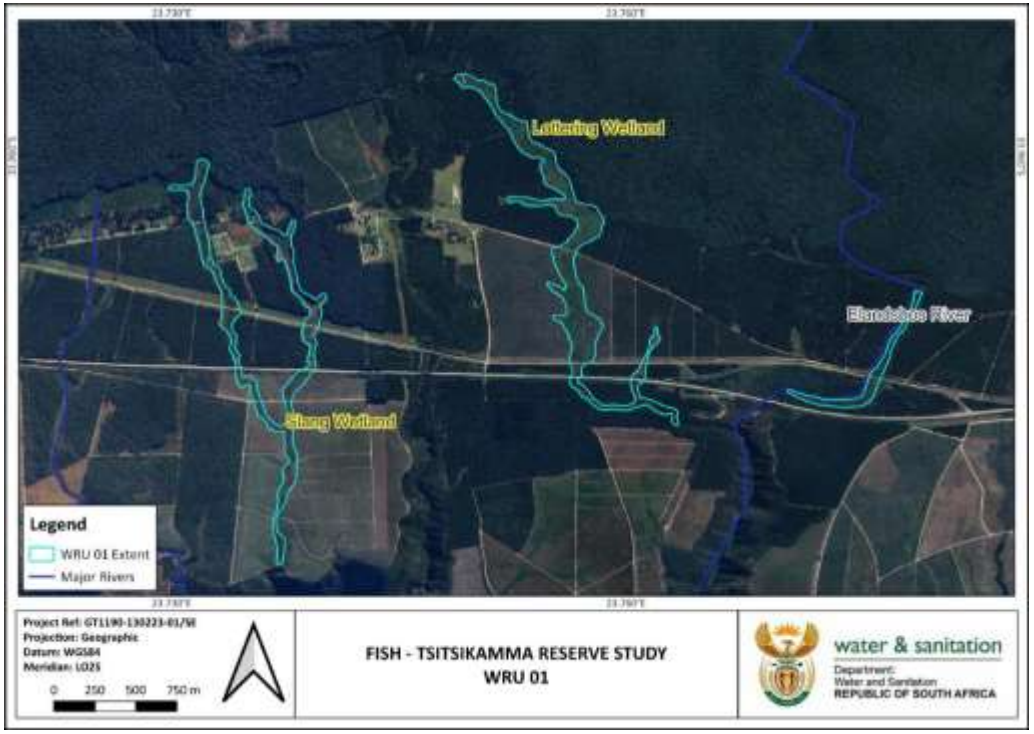
Factor	Comment
Overview Map	

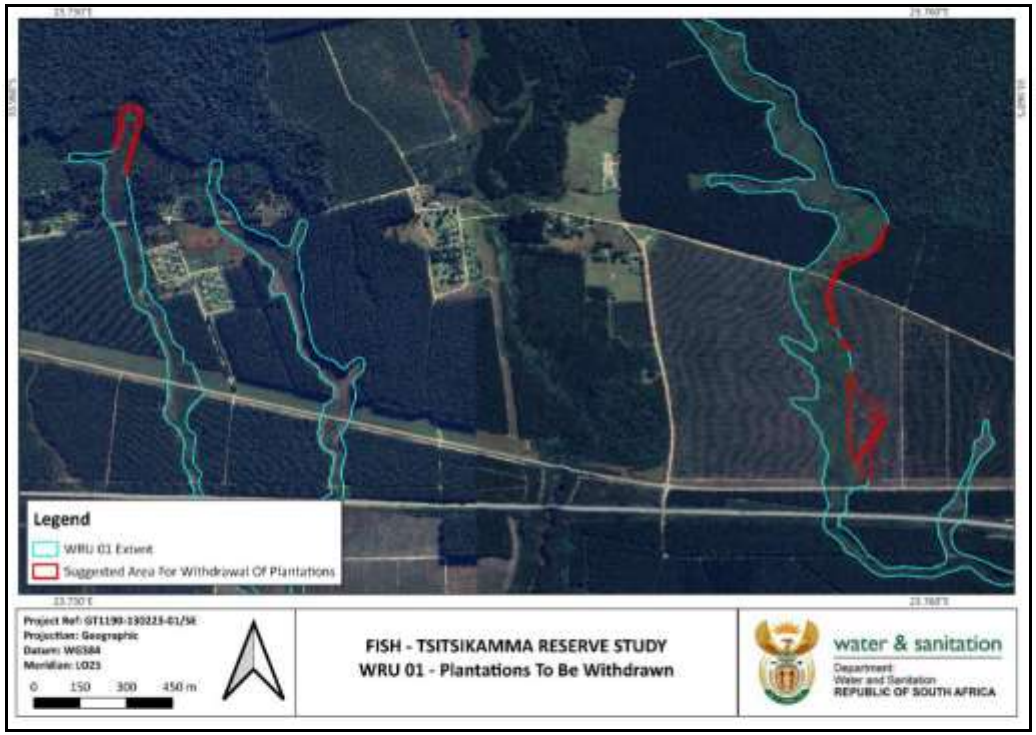
Figure 3-6 Overview of the Tsitsikamma wetland plains. The wetland on the left being the Slang wetland and the wetlands on the right forming the Lottering Wetland Complex

PES

PES Summary	Lottering	Slang	Main Impacts
Combined Impact Score	2.9	1.8	• Plantations in the catchments of both wetlands\
Combined PES Score (%)	71%	82%	• Alien invasive plants
Combined Ecological Category	**C→**	**B→**	

<table>
<tr><th>Factor</th><th>Comment</th></tr>
<tr><td>EIS</td><td>
<table>
<tr><th></th><th colspan="2">Importance</th></tr>
<tr><th></th><th>Lottering</th><th>Slang</th></tr>
<tr><td>Ecological Importance & Sensitivity</td><td>3.3</td><td>3.5</td></tr>
<tr><td>Hydro-Functional Importance</td><td>3.2</td><td>3.0</td></tr>
<tr><td>Direct Human Benefits</td><td>1.2</td><td>1.3</td></tr>
<tr><td>Overall Importance and Sensitivity Score</td><td>3.3</td><td>3.5</td></tr>
<tr><td>Overall Importance and Sensitivity Category</td><td>B</td><td>A</td></tr>
</table>
</td></tr>
<tr><td>REC/BAS</td><td>
<table>
<tr><th></th><th>Lottering Wetland</th><th>Slang Wetland</th></tr>
<tr><td>REC</td><td>C</td><td>B</td></tr>
</table>
</td></tr>
<tr><td>Preliminary management and mitigation measures</td><td>Given that the trajectory of change in ecological state is projected to decline, ecological specifications will be required to maintain the PES in the face of key factors contributing to the projected decline.
Natural areas within the wetlands must be prevented from declining any further in extent especially given their critical role as ecological links in the landscape. This will require proactively addressing factors which threaten to impinge on these natural areas (see the three items below).
There must be no further expansion of tree plantations or other impinging land-uses into the remaining natural areas of the wetlands. While the conversion of the intact wetland appears to have been very limited in the last approximately two decades, further conversion remains a latent future threat to the wetland.
Prevent any further expansion of Invasive Alien Plant (IAP) infestations in the wetlands. IAPs appear to have been generally well controlled in most of the Lottering and Slang wetlands. Nevertheless, a few localized dense infestations remain together with scatted low densities in the remaining areas. If not effectively controlled, IAPs constitute the largest current threat to the remaining intact areas of wetland. Therefore, a long-term control plan with repeated follow ups must continue to be followed.
Maintain an appropriate fire regime for the wetlands. The wetlands are characterized by fire dependent herbaceous vegetation, which evolved under a regime of periodic fires. A fire interval of 9-12 years is recommended to meet: (1) the ecological requirements of the native flora and fauna, notably that of the re-seeding native species (e.g. Leucadendron conicum) and dragonflies; and (2) assist in controlling alien and indigenous invasive species (notably forest precursor species which, in the absence of fire, have the potential to outcompete the native vegetation).</td></tr>
</table>

Factor	Comment
	There must be no further reductions in water inflows to the wetlands. While being foundational to the existence of the wetlands, this is recognized as being very difficult to determine with any confidence unless the resolution of the hydrology component of the assessment is greatly increased (see Monitoring section). **There must be no further canalization/furrowing/diversion of the remaining intact areas of the wetlands.** Although currently very limited, these onsite modifications are recognized as having potentially important impacts on the distribution and retention of water in the wetland. **There must be no further deterioration in the water quality component of the PES in the wetlands.** Although water quality impacts are currently limited, this may potentially change with a shift in land-use/landcover, e.g. if the small human settlement adjacent to Lottering wetland were to expand in extent. **Strategic withdrawal of some minor tree plantation areas impinging on the wetland.** At a few localized areas, tree plantations were noted impinging into and immediately adjacent to the wetlands **(Figure 3-7)**. Given the ecological and hydrological impacts of these trees, they need to be withdrawn. **Explore options for further expanding the buffer width of the wetlands.** This expansion would reflect positively in terms of the PES of the wetlands and their contributions as ecological links and to maintaining biodiversity generally. It is recognized that this may not be practical given that it would further reduce the productive area for commercial forestry. However, it has been previously proposed that some of the narrower wetlands (which are already severely compromised and ecologically much less important than wide and relatively intact wetlands such as the Lottering and Slang wetlands) could potentially be planted up for commercial forestry as a trade-off for the expansion of the natural buffer around wider and more intact wetlands (Hugo 2011). It is recommended that such trade-offs be considered and, if appropriate, actively pursued with the relevant parties.

Factor	Comment
	 **Figure 3-7 Key localized areas where tree plantations were noted impinging into and immediately adjacent to the wetlands and are recommended to be withdrawn**
Monitoring Recommendations	A minimum requirement for monitoring is, every 3-5 years, to repeat the WET-Health Level 1B assessment carried out in this baseline assessment, which was based primarily on land-cover types in the wetland and the areas of influence in its catchment. This recommended monitoring comprises desktop detection of land-cover change, but with approximately 8 hours of field verification for each wetland. During the baseline assessment, the focus was on the upper portions of both the Lottering and the Slang wetlands, but for ongoing monitoring, the lower portions also need to be covered. In addition, IAP extent and the

Factor	Comment
	burning regime must be monitored and reviewed annually. Should resources be available, the following are recommended to further increase the resolution of assessment: • Monitor key taxa, including an assessment every 3-5 years of: (1) the abundance and age-class structure of *Leucadendron conicum*; and (2) dragonfly species composition and richness. Both monitoring protocols could be undertaken by a suitably skilled citizen scientist. • Describe in much more detail the inflows, throughflows and outflows of the wetland and how these have been anthropogenically modified. This would likely be best achieved with hydrological modelling and/or a hydro-pedological assessment, as well as accessing relevant available data, e.g., borehole level data and any direct measures of water use/abstraction. Although this would require additional specialist expertise and would add considerably more time and resources to the assessment, it would greatly increase the resolution of the hydrological component of the assessment.

3.1.2 WRU 02 – Kromme Wetland

Factor	Comment
WRUNumber(Quaternary Catchment)	WRU 02 (K90A)
Site Coordinates	33°53'47.52"S, 24°07'16.30"E
HGM Unit Type(s)	Channelled and Unchanneled valley-bottom wetlands
Vegetation types	Eastern Fynbos-Renosterveld Shale Renosterveld
Threat Status	**UNCHANNELLED VALLEY-BOTTOM**: CRITICALLY ENDANGERED
Strategic Water Source Area	Partially (Tsitsikamma)

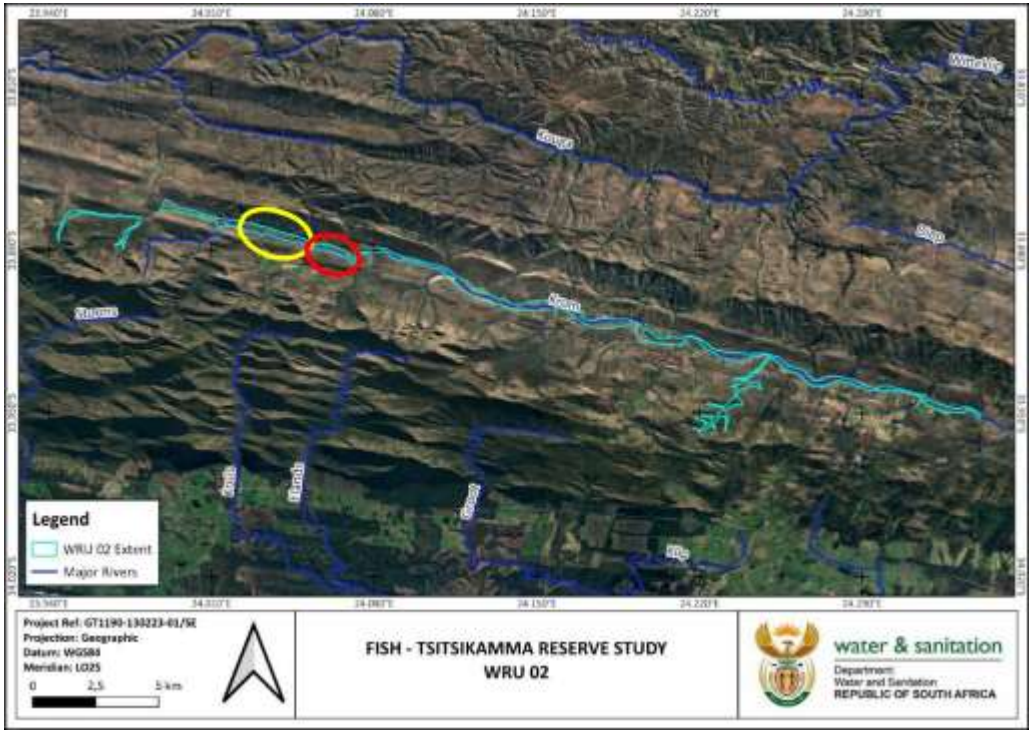
Factor	Comment
Overview Map	

Figure 3-8 Overview of the Kromme wetland complex. The yellow oval indicates the Krugersland wetland and the red oval indicates the Kompanjiesdrif wetland.

PES

PES Summary	Kromme	Main impacts
Combined Impact Score	1.0	• Minor infilling associated with R62 road and small farm road • Alien invasive plants
Combined PES Score (%)	90%	
Combined Ecological Category	**A→**	

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<tr><td>Hydro-Functional Importance</td><td>3.4</td></tr>
<tr><td>Direct Human Benefits</td><td>1.2</td></tr>
<tr><td>Overall Importance and Sensitivity Score</td><td>3.7</td></tr>
<tr><td>Overall Importance and Sensitivity Category</td><td>A</td></tr>
</table>
</td></tr>
<tr><td>REC/BAS</td><td>
<table>
<tr><th></th><th>Kromme</th></tr>
<tr><td>REC</td><td>A</td></tr>
</table>
</td></tr>
<tr><td>Preliminary management and mitigation measures</td><td>Given that the trajectory of change in ecological state is projected to maintain itself, ecological specifications will be required to maintain the PES in the face of key factors contributing to the projected decline.
Natural areas within the wetlands must be prevented from declining any further in extent especially given their critical role as ecological links in the landscape. This will require proactively addressing factors which threaten to impinge on these natural areas (see the three items below).
There must be no further expansion of agricultural activities or other impinging land-uses into the remaining natural areas of the wetlands. While the conversion of the intact wetland appears to have been very limited in the last approximately two decades, further conversion remains a latent future threat to the wetland.
Prevent any further expansion of IAP infestations in the wetlands. IAPs appear to have been generally well controlled in most of the Krugersland and Kompanjiesdrif wetlands. Nevertheless, a few localized dense infestations remain together with scatted low densities in the remaining areas. If not effectively controlled, IAPs constitute the largest current threat to the remaining intact areas of wetland. Therefore, a long-term control plan with repeated follow ups must continue to be followed.
Maintain an appropriate fire regime for the wetlands. According to Boucher & Withers (2004) Prionium serratum (Palmiet) can proliferate after being burnt. However, the sprouting success of Palmiet is severely decreased when shaded out by larger unburnt plants such as IAP species like Acacia mearnsii which is the predominant invader in WRU 02. As such, it is recommended that an infrequent burning regime is maintained in these wetlands (9-12 years), but all mature IAP species must be cleared prior to burning. Additionally, Palmiet wetlands can be susceptible to accelerated erosion when burnt (van Eck, 2022). Therefore, it is important that these planned burns are undertaken in the dry season to allow for the recovery of the Palmiet prior to rainfall events.</td></tr>
</table>

Factor	Comment
	There must be no further reductions in water inflows to the wetlands. While being foundational to the existence of the wetlands, this is recognized as being very difficult to determine with any confidence unless the resolution of the hydrology component of the assessment is greatly increased (see Monitoring section). **There must be no further deterioration in the water quality component of the PES score in the wetlands.** Although water quality impacts are currently limited, this may potentially change with a shift in land-use/landcover, e.g. if additional agricultural activities were to be implemented adjacent to or upstream of the wetland.
Monitoring Recommendations	A minimum requirement for monitoring is, every 3-5 years, to repeat the WET-Health Level 1B assessment carried out in this baseline assessment, which was based primarily on land-cover types in the wetland and the areas of influence in its catchment. This recommended monitoring comprises desktop detection of land-cover change, but with approximately 8 hours of field verification for each wetland. In addition, IAP extent and the burning regime must be monitored and reviewed annually.

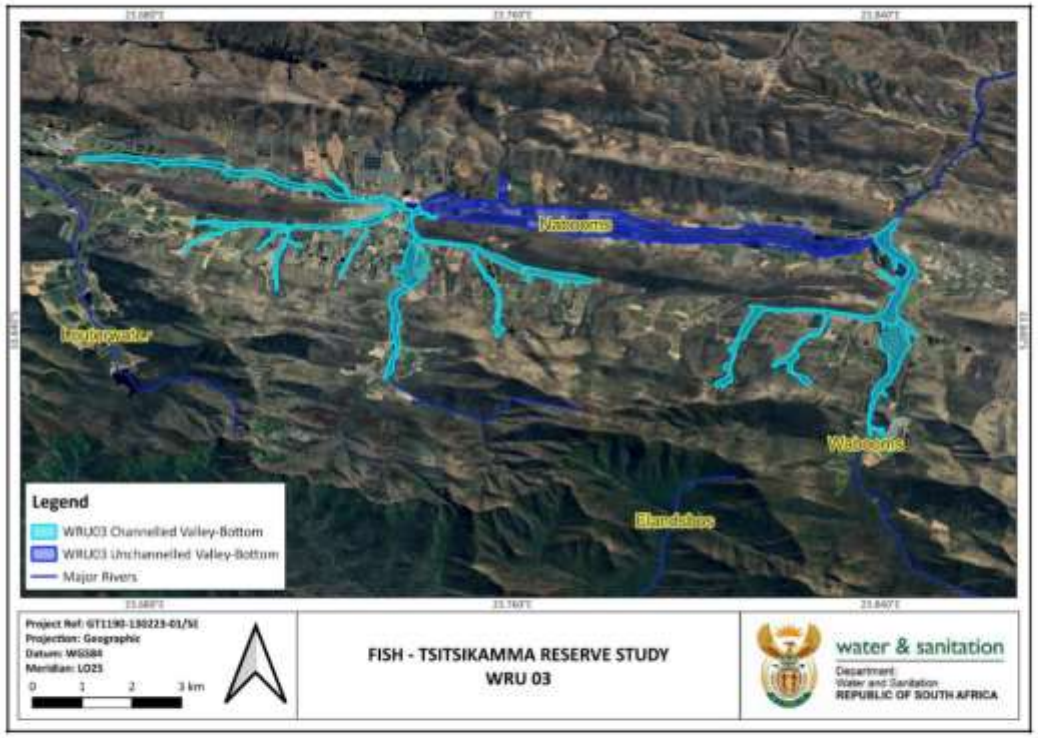
3.2 IUA_L01: Kouga to Kouga Dam, Baviaanskloof

Table 3-4 Summary of wetland information for IUA_L01

IUA Description	Kouga to Kouga Dam, Baviaanskloof
HGM unit type	Total of 38 wetlands mapped; Channelled Valley Bottom Wetlands: 65% Depression Wetlands: 26% Hillslope Seep Wetlands: 6% Unchannelled Valley Bottom Wetlands: 3%
PES per HGM unit type	Channelled Valley Bottom Wetlands - A/B: 80%; C: 4%; D/E/F: 16%. Depression Wetlands - A/B: 90%; D/E/F: 10%. Hillslope Seep Wetlands - A/B: 50%; C: 50%. Unchannelled Valley Bottom Wetlands - A/B: 100%.
FEPA Wetlands	N/A
WRU	WRU03

3.2.1 WRU 03 – Krakeel Wetland Complex

Factor	Comment
WRUNumber(Quaternary Catchment)	WRU 03 (L82D)
Site Coordinates	33°48'56.51"S, 23°45'49.03"E
HGM Unit Type(s)	Channelled and Unchanneled Valley-bottom Wetlands
Vegetation types	Eastern Fynbos-Renosterveld Sandstone Fynbos, Eastern Fynbos-Renosterveld Shale Renosterveld
Threat Status	**UNCHANNELLED VALLEY-BOTTOM**: CRITICALLY ENDANGERED, **CHANNELLED VALLEY-BOTTOM**: ENDANGERED
Strategic Water Source Area	Yes (Tsitsikamma and Upper Keurbooms)

Factor	Comment
Overview Map	 **Figure 3-9 Overview of the Krakeel wetland complex.**
PES	See table below

PES Summary	Krakeel	Main impacts
Combined Impact Score	4.6	• Channelisation of the UCVB portions • Extensive dams within the wetlands • Agriculture in the catchment • Extensive agriculture within the wetland • Invasion of alien invasive plant species
Combined PES Score (%)	54%	
Combined Ecological Category	**D**	

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<tr><td>Hydro-Functional Importance</td><td>3.2</td></tr>
<tr><td>Direct Human Benefits</td><td>2.1</td></tr>
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<tr><td>REC/BAS</td><td>
<table>
<tr><th></th><th colspan="2">Krakeel</th></tr>
<tr><td>REC</td><td>C /</td><td>D</td></tr>
</table>
</td></tr>
<tr><td>Preliminary management and mitigation measures</td><td>
Natural areas within the wetland must be prevented from declining any further in extent given that the cumulative loss of natural wetland is high locally and for wetlands in the broader landscape. This will require proactively addressing factors which threaten to impinge on these natural areas (see the two items below).
There must be no further expansion of cultivation, dams or other impinging land-uses into the remaining natural areas of the wetland. While the conversion of the intact wetland areas to cultivated lands or dams appears to have been very limited in the last approximately two decades, further expansion of cultivation in particular into the wetland remains a future threat to the wetland.
Any further expansion of dense infestations of IAPs into the remaining natural areas of the wetland must be prevented through prioritized action (see the two items below). The expansion of dense infestations of IAPs in the wetland have continued to impinge on natural wetland, even within the last decade, and if not effectively controlled, constitutes the wetland’s largest current threat.
The highest priority action for IAPs is the control of the scattered young IAPs present in the natural vegetation. These plants have the potential to rapidly mature and develop into dense infestations, and require a long-term control plan with repeated follow ups.
There must be no further reductions in water inflows to the wetland. This is recognized as being very difficult to determine with any confidence unless the resolution of the hydrology component of the assessment is greatly increased (see Monitoring section).
The must be no further canalization/furrowing/diversion of the remaining intact areas of the wetland. These onsite modifications are recognized as having potentially important impacts on the distribution and retention of water in the wetland,
</td></tr>
</table>

Factor	Comment
	and would generally be detected with the WET-Health Level 1B assessment, preferably with at least an 8-hr field verification (see Monitoring section). **There must be no further deterioration in the water quality component of the PES score in the wetland.**
Monitoring Recommendations	A minimum requirement for monitoring is, every 3-5 years, to repeat the WET-Health Level 1B assessment carried out in this baseline assessment, which was based primarily on land-cover types in the wetland and the areas of influence in its catchment. This recommended monitoring comprises desktop detection of land-cover change, but with approximately 8 hours of field verification for each wetland. In addition, IAP extent must be monitored and reviewed at least biennially. Should resources be available, to further increase the resolution of assessment, the inflows, throughflows and outflows of the wetland and how these have been anthropogenically modified should be described in much more detail. This would likely be best achieved with hydrological modelling and/or a hydro-pedological assessment, as well as accessing relevant available data, e.g., borehole level data and any direct measures of water use/abstraction. Although this would require additional specialist expertise and would add considerably more time and resources to the assessment, it would greatly increase the resolution of the hydrological component of the assessment.

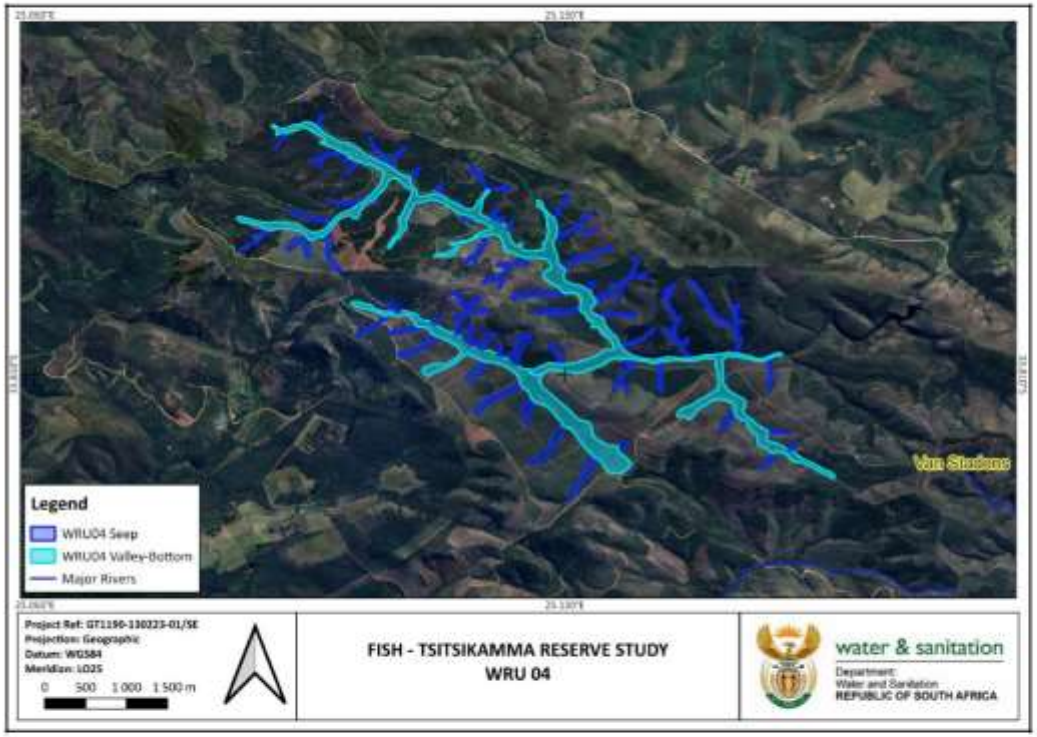
3.3 IUA_M01: M Primary Catchment

Table 3-5 Summary of wetland information for IUA_M01

IUA Description	M primary catchment
HGM unit type	Total of 1337 wetlands mapped. Channelled Valley Bottom Wetlands: 8% Depression Wetlands: 40% Floodplain Wetlands: 1% Hillslope Seep Wetlands: 26% Unchannelled Valley Bottom Wetlands: 7% Wetland Flat Wetlands: 18%
PES per HGM unit type	Channelled Valley Bottom Wetlands - A/B: 21%; C: 43%; D/E/F: 36%. Depression Wetlands - A/B: 40%; C: 16%; D/E/F: 47%. Floodplain Wetlands - A/B: 17%; C: 8%; D/E/F: 75%. Hillslope Seep Wetlands - A/B: 21%; C: 24%; D/E/F: 55%. Unchannelled Valley Bottom Wetlands - A/B: 26%; C: 33%; D/E/F: 41%. Wetland Flat Wetlands - A/B: 29%; C: 16%; D/E/F: 55%.
FEPA Wetlands	A small number of FEPA wetlands have been mapped in IUA_M01, most of which are isolated depression wetlands which are considered important from a biodiversity conservation point of view.
WRU	WRU 04 (Longmore Wetlands) and WRU 05 (Chatty River Wetlands)

3.3.1 WRU 04 – Longmore Wetland Complex

Factor	Comment
WRUNumber(Quaternary Catchment)	WRU 04 (M10B)
Site Coordinates	33°53'47.52"S, 25°07'42.80"E
HGM Unit Type(s)	Channelled and Unchanneled Valley-bottom Wetlands
Vegetation types	Eastern Fynbos-Renosterveld Sandstone Fynbos
Threat Status	**UNCHANNELLED VALLEY-BOTTOM**: CRITICALLY ENDANGERED, **CHANNELLED VALLEY-BOTTOM**: ENDANGERED
Strategic Water Source Area	Yes (Tsitsikamma)

Factor	Comment
Overview Map	 **Figure 3-10 Overview of the Longmore wetland complex.**
PES	See table below

PES Summary	Longmore	Main impacts
Combined Impact Score	2.4	• Plantations within the catchment • Alien invasive plants • Multiple headcut erosion points
Combined PES Score (%)	76%	
Combined Ecological Category	**C→**	

<table>
<tr><th>Factor</th><th>Comment</th></tr>
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<tr><td>Direct Human Benefits</td><td>1.3</td></tr>
<tr><td>Overall Importance and Sensitivity Score</td><td>3.8</td></tr>
<tr><td>Overall Importance and Sensitivity Category</td><td>A</td></tr>
</table>
</td></tr>
<tr><td>REC/BAS</td><td>The results of the cost-benefit analysis undertaken by Prime Africa (2023a) indicated three possible scenarios for the Longmore systems which are described in Prime Africa (2023a). Scenario 1 is the maintenance of the status quo and would not require any additional costs, but would mean that the wetland systems will be maintained in their current C PES category. Scenario 2 would include the removal of approximately 200ha of planted trees to increase the PES to a B/C category which would result in a R39 – R46 million asset value loss to MTO. Scenario 3 would include the complete withdrawal of MTO from the management of the Longmore Wetland catchment, meaning that the local authorities would be responsible for the management of the land, which would include the need to clear the extensive IAPs likely to colonize the areas withdrawn from plantations. The appropriate maintenance of fire regimes and alien plants that are currently being well executed by MTO would fall to the local authorities. This would require that the local authority dedicate significant administrative and financial resources towards the management of the Longmore wetland. Given the estimated asset value loss to MTO in Scenario 2 and the anticipated financial and administrative burden to the local authority in Scenario 3, Scenario 1 was selected as the preferred approach. Hence a BAS of a C has been set for the Longmore wetlands, which would require MTO to continue their current management of the wetlands.
<table>
<tr><th></th><th>Longmore</th></tr>
<tr><td>REC</td><td>B / C</td></tr>
<tr><td>BAS</td><td>C</td></tr>
</table>
</td></tr>
<tr><td>Preliminary management and mitigation measures</td><td>Natural areas within the wetlands must be prevented from declining in extent. This will require proactively addressing factors which threaten to impinge on these natural areas (see the three items below).</td></tr>
</table>

Factor	Comment
	There must be no expansion of tree plantations or other impinging land-uses into the remaining natural areas of the wetlands. While the extent of tree plantations in the wetland has declined since 2005 to a situation where they now occupy <1% of the wetland, future conversion remains a latent threat to the wetland. **Prevent any further expansion of IAP infestations in the wetland and its buffer.** If not effectively controlled, IAPs constitute the largest current threat to the remaining intact areas of wetland. Therefore, a long-term control plan with repeated follow ups must continue to be followed. The current level of infestation of IAPs in the wetland and most of its buffer is encouragingly low. Nonetheless, IAPs remain a key threat to the wetland, especially given its context in a catchment with extensive tree plantations. A key priority is in the lowermost portion of the wetland, where the *C. longifolia* is concentrated and where there is an abundance of IAPs, especially pine trees, on the steep northern slopes adjacent to the wetland. Given the potential impacts of these IAPs on this especially important and sensitive area of the wetland, they should be cleared as soon as possible. **Maintain an appropriate fire regime for the wetland.** An appropriate fire interval for the wetland is required which meets the dual needs to: (1) accord with the ecological requirements of the native flora, notably that of the re-seeding native species (e.g., *Leucadendron conicum*); and (2) assist in controlling alien and indigenous invasive species, notably the Keurboom (*Virgilia divaricata*) **(Box 1)**. **Erosion threatening the wetland needs to be effectively controlled.** Although the two erosion headcuts in the main body of the wetland have not actively advanced much over the last few decades, they remain a potential threat to the wetland. In particular, if the erosion headcut at the outflow of the lowermost valley bottom portion of the wetland were to advance, it is likely to result in direct habitat loss and desiccation of the lateral wetland areas favoured by the critically endangered Vanstadensberg honeybush tea The lower headcut is also of higher priority in terms of avoided sedimentation of the downstream storage dam. **There must be no further reductions in water inflows to the wetlands.** While being foundational to the existence of the wetlands, this is recognized as being very difficult to determine with any confidence unless the resolution of the hydrology component of the assessment is greatly increased (see Monitoring section). **There must be no further canalization/furrowing/diversion of the remaining intact areas of the wetlands.** Although currently very limited, these onsite modifications are recognized as having potentially important impacts on the distribution and retention of water in the wetland.

Factor	Comment
	Explore options for further expanding the buffer width of the wetlands. Although the buffer around the wetland has been considerably expanded since 2005[6] and is now wider than that of many other wetlands in fynbos landscapes dominated by tree plantations (e.g., on the Tsitsikamma plains), there may be opportunities for further expansion of the buffer in some locations. **Box 1:** A fire regime for the Longmore wetland designed to meet the ecological requirements of the native flora and to control invasive species In terms of native re-seeders (i.e. plant species which do not re-sprout after fire but rely on re-seeding), the fire interval needs to be long enough to allow plants to grow and set seed before the arrival of the next fire. A notable re-seeder is the near threatened *Leucadendron conicum*. To be safe, the re-seeding plants should be given at least three years of seed production before the next fire. Based on the fact that *Leucadendron conicum* plants which had grown up since the fire of 2017 were observed in 2022 already producing seeds, it is anticipated that an 8-year fire interval would generally be adequate and is the recommended target for management, with <8 years and >10 years set as the Thresholds of potential concern around this. It is further recommended that in addition to the standard monitoring of IAPs in the wetland, the distribution and extent of keurboom clumps should also be monitored. At the same time, it would appear that the fire interval should not be so long so as to allow forest precursor species, notably the Keurboom (*Virgilia divaricata*), to develop dense clumps, as has occurred in some locations in the wetland (Figure 3-32). The keurboom's establishment in the wetland appears likely to be favoured by anthropogenic factors, possibly including: (1) the level of wetness in the wetland (now reduced as a result of tree plantations in the wetland's catchment) no longer limiting the establishment and expansion of keurboom as much as it did historically; (2) an altered fire regime; and (3) increased

[6] Following the major fire in 2005, >110 ha of tree plantation were withdrawn from the wetland buffer and margins, which has greatly increased the level to which the wetland is currently buffered. Some of the withdrawn areas still have plantation trees growing in them which need to be removed. In some cases these will be removed when scheduled to be harvested in the next few years but in other cases will need to be removed as part of the IAP control programme.

Factor	Comment
	atmospheric CO_2 favouring vigorously-growing nitrogen-fixing species such as keurboom. In the medium to long term, native vegetation is outcompeted within the clumps, which also have the potential to expand over time. Depending on the circumstances, the clumps may to some extent resist fires, further aiding in the transformation of fire-dependent fynbos wetland vegetation (characterized by restios, shrubs, sedges and grasses) into indigenous forest. If this transformation is allowed to progress far, the consequences would be potentially serious for the native wetland vegetation, including the Vanstadensberg honeybush tea and other the Red-listed species, and for biodiversity generally.
Monitoring Recommendations	The minimum requirements for monitoring: • Every 3-5 years, to repeat the WET-Health Level 1B assessment carried out in this baseline assessment, which was based primarily on land-cover types in the wetland and the areas of influence in its catchment. This recommended monitoring comprises desktop detection of land-cover change, but with approximately 8 hours of field verification for each wetland. • IAP extent of IAPs and the burning regime must be monitored and reviewed at least biennially. • The population of *C. longifolia* monitored at least every three years. • The extent of *V. divaricata* monitored at least every 5 years. Should resources be available, the following are recommended to further increase the resolution of assessment: • A detailed assessment of the ecological requirements of *C. longifolia* in terms of hydroperiod, edaphic requirements and burning regime. • Monitor additional key taxa, including an assessment every 3-5 years, including the abundance and age-class structure of *Leucadendron conicum*. • Describe in much more detail the inflows, throughflows and outflows of the wetland and how these have been anthropogenically modified. This would likely be best achieved with hydrological modelling and/or a hydro-pedological assessment, as well as accessing relevant available data, e.g. borehole level data and any direct measures of water use/abstraction. Although this would require additional specialist expertise and would add considerably more time and resources to the assessment, it would greatly increase the resolution of the hydrological component of the assessment.

3.3.2 WRU 05 – Chatty River Wetland Complex

Factor	Comment
WRUNumber(Quaternary Catchment)	WRU 05 (M10D)
Site Coordinates	33°50'49.95"S, 25°07'42.80"E
HGM Unit Type(s)	Floodplain and Channelled Valley-bottom Wetlands
Vegetation types	Albany Thicket Valley
Threat Status	**FLOODPLAIN**: CRITICALLY ENDANGERED **CHANNELLED VALLEY-BOTTOM**: CRITICALLY ENDANGERED
Strategic Water Source Area	Yes (Coega TMG Aquifer)

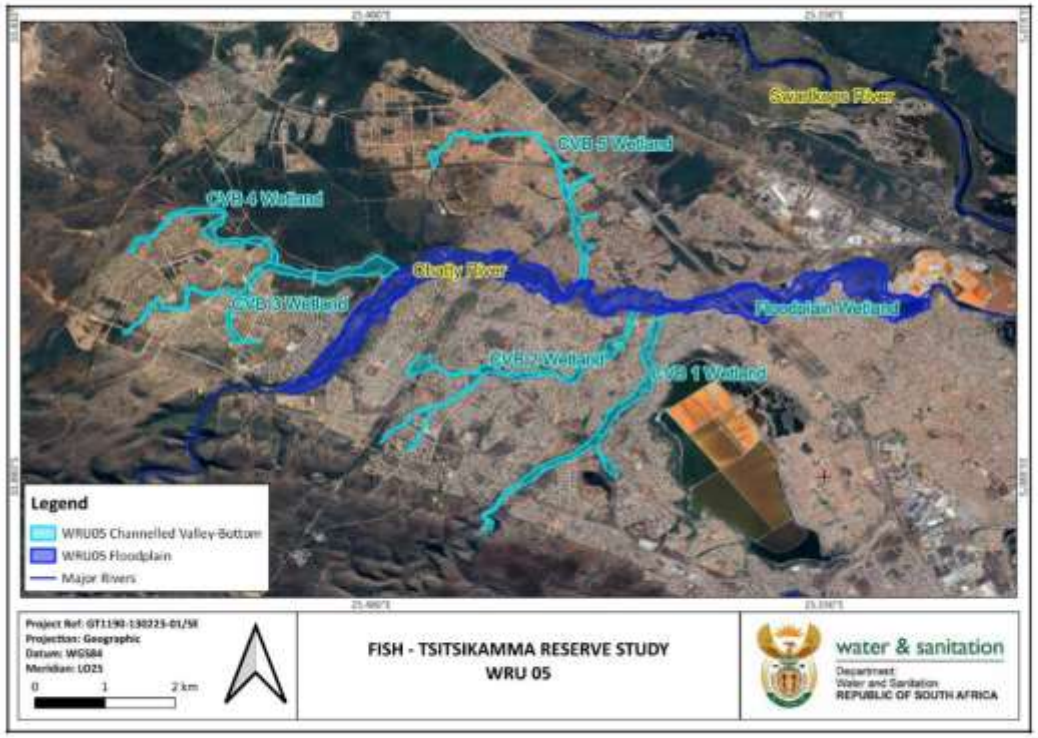
Factor	Comment
Overview Map	

Figure 3-11 Overview of the Chatty River wetland systems

PES

PES Summary	Floodplain	Channelled Valley-Bottom	Main impacts
Combined Impact Score	5.0	5.1	• Highly urbanised catchment and immediate buffer zone • Extensive infilling and sediment deposits in some Hydrogeomorphic Unit (HGM) units • Channel incision and canalisation • Polluted water inputs from urban catchment
Combined PES Score (%)	50%	49%	
Combined Ecological Category	**D ↓**	**D ↓**	

EIS

	Importance	
	Floodplain	Channelled Valley-Bottom
Ecological Importance & Sensitivity	3.5	3.2
Hydro-Functional Importance	3.5	3.5
Direct Human Benefits	1.2	1.1
Overall Importance and Sensitivity Score	**3.5**	**3.5**
Overall Importance and Sensitivity Category	**A**	**A**

REC/BAS

The results of a qualitative cost benefit undertaken by Prime Africa (2023b) indicate that the costs associated with improving the PES category of the Chatty River wetlands will be prohibitive and may require that established communities are forcibly removed in order to open up parts of the catchments of these wetlands. However, according to Prime Africa (2023b), it will be financially feasible to maintain the current PES category and perhaps marginally improve the PES, despite there being an assortment of costs associated with maintaining the status quo of the wetland. The management and mitigation measures included in the following section should be incorporated into a wetland management plan embedded in the open space planning mandate of the Nelson Mandela Bay Municipality. One of the main contributing factors to the current PES category is the presence of multiple overflowing manholes and raw sewage flowing into the wetlands. If these issues were dealt with, the PES of the Chatty River systems would improve. It is unlikely that the PES category will move into a C category, but it will approach a high D category. As such a BAS is set for the Chatty River wetland systems to be maintained at their current PES, but to be improved from the current low D category to a high D category. It should be noted that if none of the recommended management actions below are implemented, it is likely that the condition of the wetlands will deteriorate over time as indicated by the anticipated trajectory of change.

	<table><tr><th></th><th colspan="2">Floodplain</th><th colspan="2">Channelled Valley-Bottom</th></tr><tr><td>REC</td><td colspan="2">C</td><td colspan="2">C</td></tr><tr><td>BAS</td><td>C /</td><td>D</td><td>C /</td><td>D</td></tr></table>
Preliminary management and mitigation measures	**Natural areas within the wetlands must be prevented from declining in extent**. This will require proactively addressing factors which threaten to impinge on these natural areas (see the two items below). **There must be no expansion of residential or infrastructural developments such as sport fields, schools, industrial parks etc. or other impinging land-uses into the remaining natural areas of the wetlands.** While the extent of informal settlements within the wetlands have declined since 2006 (due to their removal between 2006 and 2009), the extent of other infrastructure such as sports fields have increased in the wetlands since 2006. No further expansion of large-scale infrastructure should be permitted. It is acknowledged that smaller-scale infrastructure such as roads and pipelines may need to be constructed within the wetlands. However, every effort should be made to tie new infrastructure into existing disturbances within the wetland. New developments should only be permitted under extenuating circumstances. **Erosion and sedimentation threatening the wetlands need to be effectively controlled.** Although multiple erosion headcuts were observed both in the floodplain and the channelled valley-bottom wetlands, all but one of them appeared to be relatively stable and have not advanced in the last two decades. However, with increasing climate variability and further urbanisation of the catchments of these wetlands, these erosion headcuts remain a potential threat to the wetlands in the Chatty River WRU. Furthermore, large areas of exposed soil and sediment deposits were observed in a number of the channelled valley-bottom wetlands which have a negative impact on the hydrology, geomorphology and vegetation health scores of the wetland. An example of a large area of exposed soil is shown in **Figure 3-12** below.

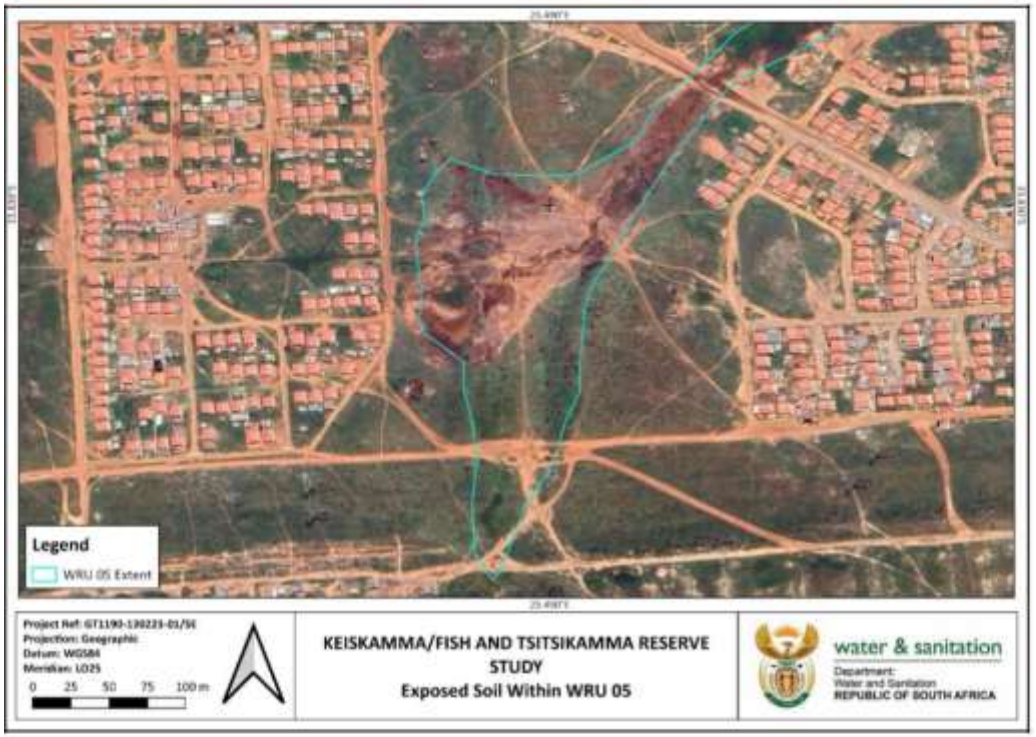


Figure 3-12 The head of the CVB 5 wetland with a large portion of the head of the wetland being unvegetated, which could result in sedimentation in the downstream portions of the wetland.

Prevent any further expansion of IAP infestations in the wetland and its buffer. While IAPs do not currently constitute a significant threat to the integrity of the wetland, the constant disturbances associated with the surrounding and within wetland land uses can provide ideal conditions for the proliferation of IAPs. The wetlands are already characterised by extensive populations of disturbance tolerant indigenous plant species, but the density of IAPs is currently encouragingly low for a wetland located in such a disturbed environment. It will be important for the IAP population to be maintained at its current density.

Maintain an intact buffer area for any future developments occurring along the floodplain wetland. The north-western edge of the floodplain wetland is the only remaining portion of the WRU that does not have urban areas within the 200m buffer zone **(Figure 3-13)**. All further development in this area must be undertaken with an appropriate buffer zone study, and the appropriate buffer distance must be maintained for future developments in this area.

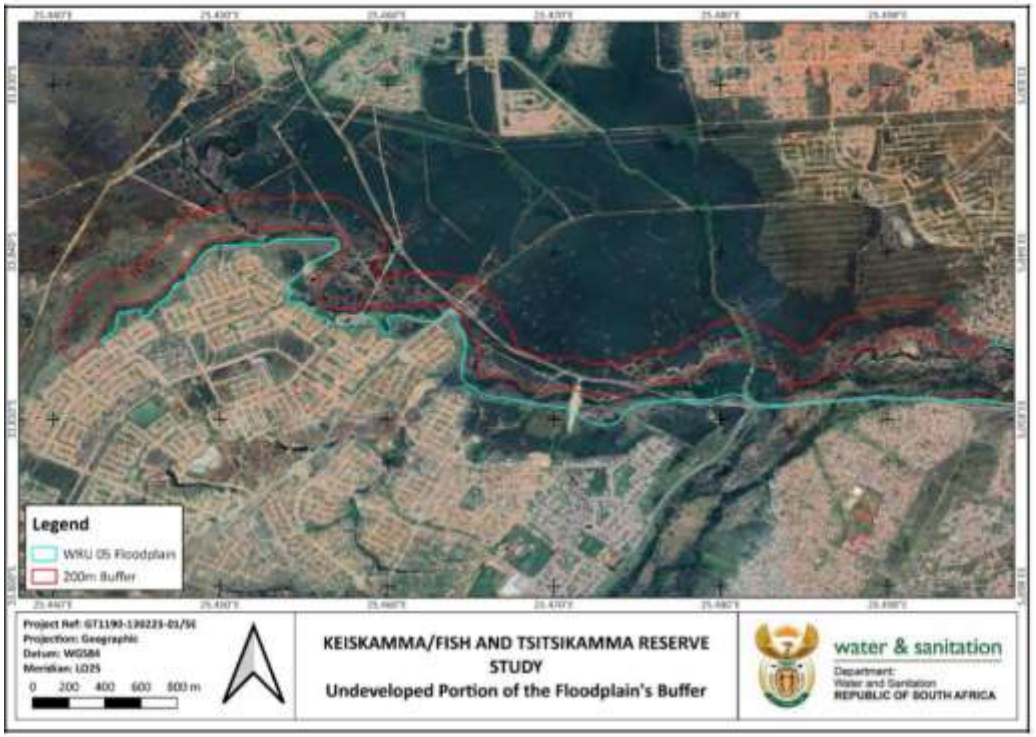


Figure 3-13 Remaining portion of intact buffer along the floodplain wetland.

Factors that contribute to a decline in the water quality in the wetlands must be mitigated against. Possibility to explore within wetland rehabilitation options as well as ecological infrastructure in the buffer and catchments around the wetlands. Currently, the water quality PES is the most impacted component of wetland health in both the floodplain and channelled valley-bottom wetlands. The nature of the surrounding land uses (i.e. urban residential, urban commercial, urban informal, moderately degraded land) are such that they inherently contribute to a decline in the water quality of downstream wetland systems. While it is acknowledged that these land uses cannot be changed, it is possible to mitigate against some of the factors that contribute to declining water quality. Currently, surcharging sewer manholes are the primary driver of the poor water quality in all of the wetlands along with poor quality stormwater discharges into the wetlands. Appropriate maintenance and management of the sewage infrastructure in the areas surrounding the WRU must be implemented, and an early warning system must be set up to prevent the long-term discharge of raw sewage into the wetlands. The presence of litter and trash in the stormwater systems surrounding and within the wetlands was ubiquitous across all HGM units, and appropriate refuse collection and clean up

initiatives must be implemented in order to reduce the volume of rubbish that enters the wetlands. The importance of these interventions are amplified by the presence of the internationally important Swartkops Estuary directly downstream of these systems. Furthermore, the resilience of the WRU could be improved through the implementation ecological infrastructure interventions and sustainable urban drainage systems. Ecological infrastructure is recognised as playing a crucial role in socio-economic development while highlighting the importance of maintaining, managing, and restoring ecosystems (GroundTruth, 2020). Ecological infrastructure is being increasingly applied in many urban and rural contexts to add buffering space and resilience to ecosystems.

Create a Chatty Wetland Management Plan. The above management and mitigation measures should be expanded upon and included in an official wetland monitoring plan which can govern the management of these important wetlands.

Monitoring Recommendations

The minimum requirements for monitoring:

- Every 3-5 years, to repeat the WET-Health Level 1B assessment carried out in this baseline assessment, which was based primarily on land-cover types in the wetland and the areas of influence in its catchment. This recommended monitoring comprises desktop detection of land-cover change, but with approximately 8 hours of field verification for each wetland.

Should resources be available, the following are recommended to further increase the resolution of assessment:

- A bi-annual water quality testing program must be set up to test the water quality of each wetland. A monitoring point must be set up at the toe of each wetland such that a water quality reading can be collected for each wetland. Suggested locations for these water quality samples are included in the table **Figure 3-14** below.
- Describe in much more detail the inflows, throughflows and outflows of the wetland and how these have been anthropogenically modified. This would likely be best achieved with hydrological modelling and/or a hydro-pedological assessment, as well as accessing relevant available data, e.g. borehole level data and any direct measures of water use/abstraction. Although this would require additional specialist expertise and would add considerably more time and resources to the assessment, it would greatly increase the resolution of the hydrological component of the assessment.

The table below provides suggested monitoring locations for a bi-annual water quality monitoring program. Each point is located at the toe of each wetland within the WRU.

WRU 05 Unit	Latitude	Longitude
FP 1	33°50’56.4” S	25°33’32.4” E
CVB 1	33°51’18.0” S	25°31’26.4” E
CVB 2	33°51’25.2” S	25°31’12.0” E
CVB 3	33°50’56.4” S	25°29’13.2” E
CVB 4	33°50’52.8” S	25°27’46.8” E
CVB 5	33°51’00.0” S	25°30’46.8” E

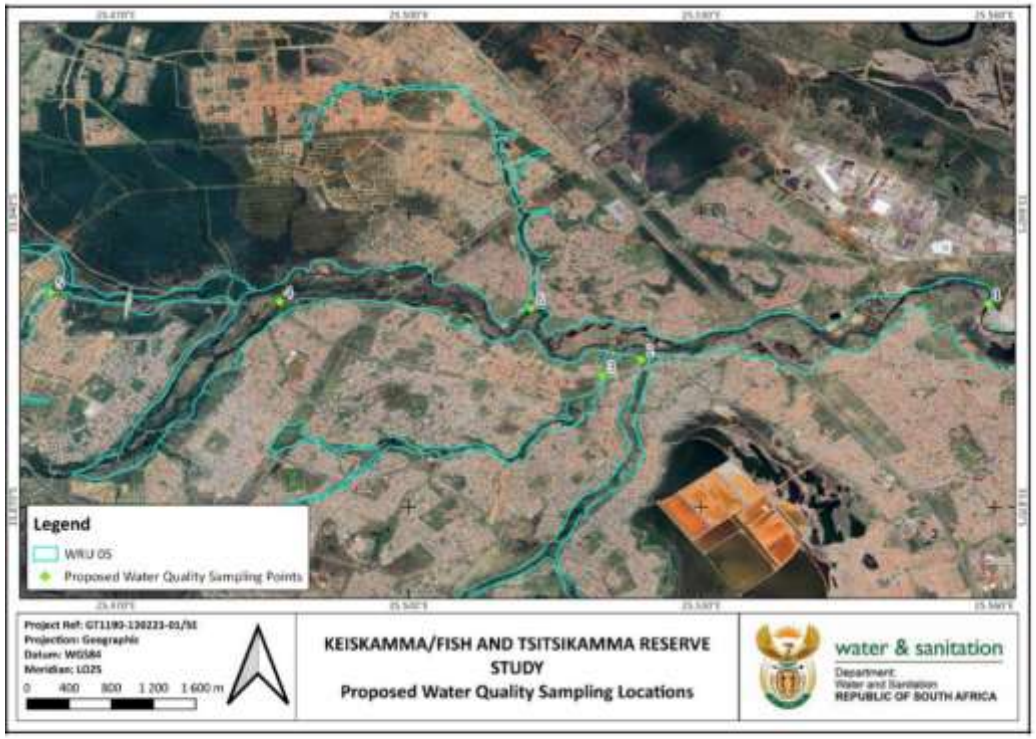


Figure 3-14 Suggested monitoring locations for a bi-annual water quality monitoring program. Each point is located at the toe of each wetland within the WRU.

3.4 IUA_LN01: Groot to Kouga confluence, Upper Sundays to Darlington Dam

Table 3-6 Summary of wetland information for IUA_LN01

IUA Description	Groot to Kouga confluence, Upper Sundays to Darlington Dam
HGM unit type	Total of 524 wetlands mapped; Channelled Valley Bottom Wetlands: 43% Depression Wetlands: 29% Hillslope Seep Wetlands: 8% Unchannelled Valley Bottom Wetlands: 15% Wetland Flat Wetlands: 5%
PES per HGM unit type	Channelled Valley Bottom Wetlands - A/B: 66%; C: 14%; D/E/F: 20%. Depression Wetlands - A/B: 80%; C: 5%; D/E/F: 15%. Hillslope Seep Wetlands - A/B: 48%; C: 45% D/E/F: 7%. Unchannelled Valley Bottom Wetlands - A/B: 76%; C: 19% D/E/F: 5%. Wetland Flat Wetlands - A/B: 79%; C: 17%; D/E/F: 4%.
FEPA Wetlands	A small number of FEPA wetlands have been mapped in IUA_LN01 – most of which are valley bottom wetlands.
WRU	WRU 06

3.4.1 WRU 06 – Sneeuberg West

Factor	Comment
WRUNumber(Quaternary Catchment)	WRU 06 (L21D)
Site Coordinates	32°05'56.31"S, 24°01'17.69"E
HGM Unit Type(s)	Hillslope seeps, Channelled and Unchannelled Valley-bottom Wetlands
Vegetation types	Upper Nama Karoo
Threat Status	**SEEP:** CRITICALLY ENDANGERED, **CHANNELLED VALLEY-BOTTOM**: ENDANGERED, **UNCHANNELLED VALLEY-BOTTOM**: VULNERABLE
Strategic Water Source Area	No

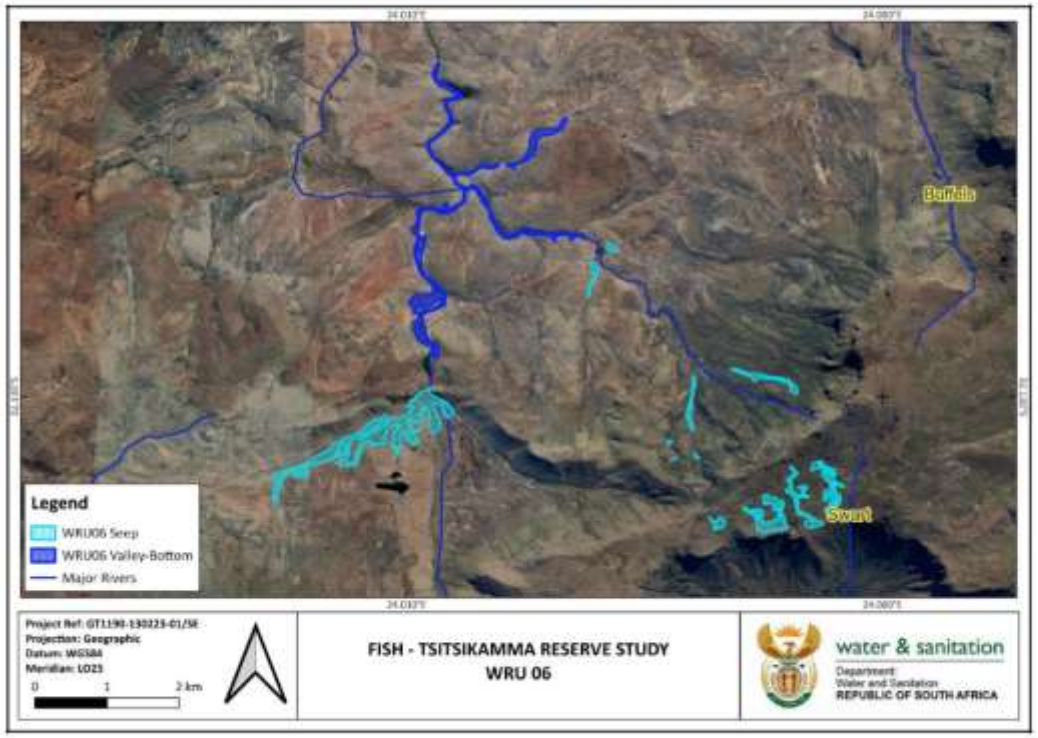
Factor	Comment
Overview Map	

Figure 3-15 The Sneeuberg West wetland RU

<table>
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<tr><td>PES</td><td>
<table>
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<tr><td>Combined Impact Score</td><td>1.1</td><td>2.4</td><td rowspan="4">• Deep flooding by dams within the wetlands
• Incised channel in valley-bottom wetland
• Cultivation within the wetland
• Encroachment of alien invasive plants</td></tr>
<tr><td>Combined PES Score (%)</td><td>89%</td><td>76%</td></tr>
<tr><td>Combined Ecological Category</td><td>B →</td><td>C →</td></tr>
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</td></tr>
<tr><td>EIS</td><td>
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<tr><th></th><th>Importance</th></tr>
<tr><td>Ecological Importance & Sensitivity</td><td>3.0</td></tr>
<tr><td>Hydro-Functional Importance</td><td>2.5</td></tr>
<tr><td>Direct Human Benefits</td><td>2.3</td></tr>
<tr><td>Overall Importance and Sensitivity Score</td><td>3.0</td></tr>
<tr><td>Overall Importance and Sensitivity Category</td><td>B</td></tr>
</table>
</td></tr>
<tr><td>REC/BAS</td><td>
<table>
<tr><th></th><th>Seepage Wetlands</th><th>Valley-Bottom Wetlands</th></tr>
<tr><td>REC</td><td>B</td><td>C</td></tr>
</table>
</td></tr>
<tr><td>Preliminary management and mitigation measures</td><td>Natural areas within the wetlands must be prevented from declining in extent. This will require proactively addressing factors which threaten to impinge on these natural areas (see the three items below).
Manage the level of grazing by livestock within the wetland and associated catchment area. Although current livestock grazing appears generally not to be negatively impacting the wetlands greatly, it has the potential to do so in the future if not well managed, especially given that livestock grazing has been identified as an important contributer to historical degradation of the Sneeuberg area more generally (Keay-Bright and Boardman 2007).
There must be no further expansion of agricultural activities or other impinging land-uses into the remaining natural areas of the wetlands. While the conversion of the intact wetland areas to cultivated lands appears to have been very limited in the last approximately two decades, further expansion of cultivaiton into the wetland remains an important future threat to the wetland.</td></tr>
</table>

Factor	Comment
	Prevent any further expansion of IAP infestations in the wetlands. Although Invasive alien plant extent in the wetland appears not to have increased greatly in the last few decades, IAPs consitute a major threat to the remaining intact areas of wetland. **There must be no further reductions in water inflows to the wetlands.** Given their climatic context, it is anticipated that several of the wetlands in the RU, especially the seep wetlands, may have a high vulnerability to even a modest decrease in the MAP to Potential Evapotranspiration (PET) ratio, as predicted with climate change (Snaddon et al. 2019). This is given that they appear close to the perceived threshold of occurrence in terms of minimum MAP to PET ratio (Kotze et al. 2022).
Monitoring Recommendations	A minimum requirement for monitoring is, every 3-5 years, to repeat the WET-Health Level 1B assessment carried out in this baseline assessment, which was based primarily on land-cover types in the wetland and the areas of influence in its catchment. This recommended monitoring comprises desktop detection of land-cover change, but with approximately 8 hours of field verification for each wetland. In addition, IAP extent must be monitored and reviewed at least biennially. Should resources be available, the following are recommended to further increase the resolution of assessment: • The inflows, throughflows and outflows of the wetlands and how these have been anthropogenically modified should be described in more detail. This would likely be best achieved with hydrological modelling and/or a hydro-pedological assessment, as well as accessing relevant available data, e.g., borehole level data and any direct measures of water use/abstraction. • Some of the valley-bottom wetlands are associated with dolerite dykes, which are also favoured sites for boreholes in the Karoo generally (Woodford and Chevallier 2002). Thus, some of these valley-bottom wetlands (and possibly some of the seep wetlands as well) may potentially be vulnerable to groundwater abstraction, and further investigation would be very valuable to help establish the surface/groundwater connections and degree to which these dolerite dykes (and sills) might act as hydrological controls (Kotze et al 2022). It may be, for example, that a particular wetland is “perched” well above the aquifer and therefore not affected by aquifer draw down.

3.5 IUA_Q01: Upper Fish

Table 3-7 Summary of wetland information for IUA_Q01

IUA Description	Upper Fish
HGM unit type	Total of 88 wetlands mapped; Channelled Valley Bottom Wetlands: 69% Depression Wetlands: 21% Hillslope Seep Wetlands: 7% Unchannelled Valley Bottom Wetlands: 3%
PES per HGM unit type	Channelled Valley Bottom Wetlands – A/B: 57%; C: 6%; D/E/F: 37%. Depression Wetlands – A/B: 94%; D/E/F: 6%. Hillslope Seep Wetlands – A/B: 43%; C: 14%; D/E/F: 43%. Unchannelled Valley Bottom Wetlands – A/B: 33% D/E/F: 67%.
FEPA Wetlands	Several FEPA wetlands exist in IUA_Q01, many of them being small, isolated depression wetlands. However, several channelled and unchannelled valley-bottom FEPA wetlands have been mapped in both the Klein-Fish and Groot-Fish River catchments.
WRU	WRU27

3.5.1 WRU 27 – Loodsberg

Factor	Comment
WRUNumber(Quaternary Catchment)	WRU 27 (Q22A)
Site Coordinates	32°57'29.08"S, 27°20'32.16"E
HGM Unit Type(s)	Valley-bottom and seepage wetlands
Vegetation types	Upper Nama Karoo
Threat Status	**VALLEY-BOTTOM**: ENDANGERED **SEEP**: CRITICALLY ENDANGERED
Strategic Water Source Area	Yes (Upper Eastern Karoo)

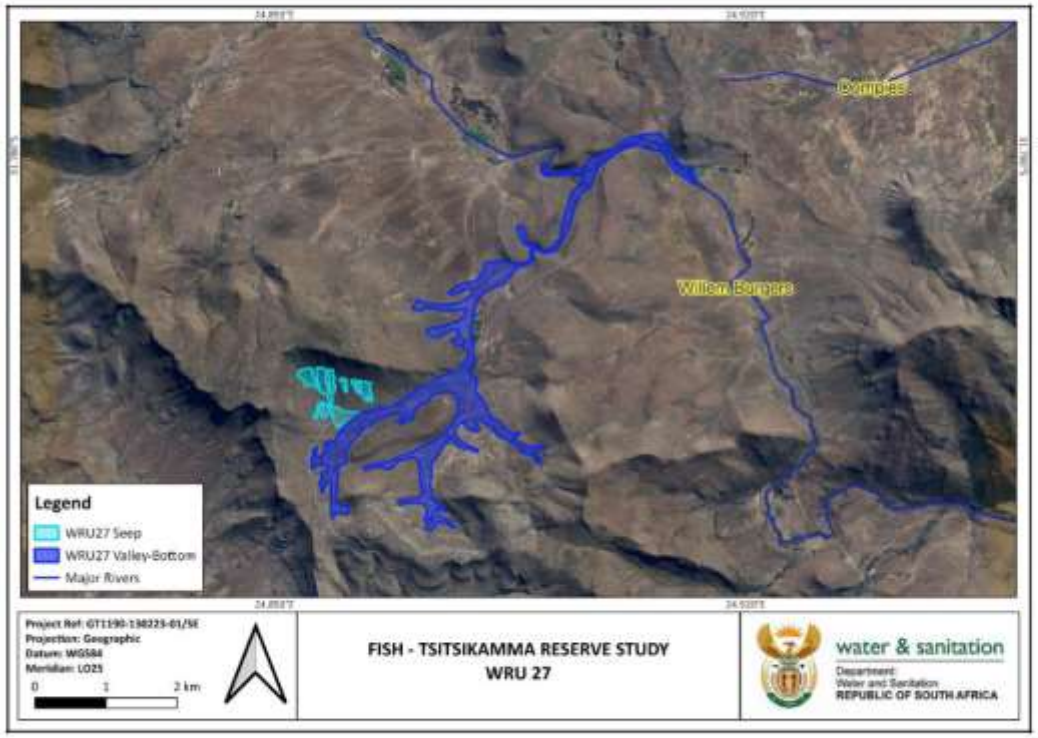
Factor	Comment
Overview Map	

Figure 3-16 Overview of the Loodsberg wetland complexes

<table>
<tr><th>Factor</th><th>Comment</th></tr>
<tr><td>PES</td><td>
<table>
<tr><th>PES Summary</th><th>Combined Seepage Wetlands</th><th>Combined Valley-Bottom Wetlands</th><th>Main impacts</th></tr>
<tr><td>Combined Impact Score</td><td>1.6</td><td>3.6</td><td rowspan="4">• Erosion and grazing within the wetlands
• Dams within the wetland
• Low levels of alien invasive plants</td></tr>
<tr><td>Combined PES Score (%)</td><td>84%</td><td>64%</td></tr>
<tr><td>Combined Ecological Category</td><td>B →</td><td>C →</td></tr>
</table>
</td></tr>
<tr><td>EIS</td><td>
<table>
<tr><th></th><th>Importance</th></tr>
<tr><td>Ecological Importance & Sensitivity</td><td>2.8</td></tr>
<tr><td>Hydro-Functional Importance</td><td>2.6</td></tr>
<tr><td>Direct Human Benefits</td><td>2.0</td></tr>
<tr><td>Overall Importance and Sensitivity Score</td><td>2.8</td></tr>
<tr><td>Overall Importance and Sensitivity Category</td><td>B</td></tr>
</table>
</td></tr>
<tr><td>REC/BAS</td><td>
<table>
<tr><th></th><th>Seepage Wetlands</th><th>Valley-Bottom Wetlands</th></tr>
<tr><td>REC</td><td>B</td><td>C</td></tr>
</table>
</td></tr>
<tr><td>Preliminary management and mitigation measures</td><td>Maintenance of existing rehabilitation structures in the valley-bottom wetland. The erosion-control interventions present in the valley bottom wetland appear to have contributed to stabilizing what was a very actively eroding wetland historically. However, it is important to recognize that these interventions require maintenance in order to maintain their effectiveness.
Manage the level of grazing by livestock within the wetland and associated catchment area. Although current livestock grazing appears generally not to be negatively impacting the wetlands greatly, it has the potential to do so in the future if not well managed, especially given that livestock grazing has been identified as an important contributor to historical degradation of the nearby Sneeuberg area more generally (Keay-Bright and Boardman 2007).
There must be no further expansion of agricultural activities or other impinging land-uses into the remaining natural areas of the wetlands. While the conversion of the intact wetland areas to cultivated lands appears to have been very limited</td></tr>
</table>

Factor	Comment
	in the last approximately two decades, further expansion of cultivation into the wetland remains an important future threat to the wetland. **Prevent any further expansion of IAP infestations in the wetlands.** Although Invasive alien plant extent in the wetland appears not to have increased greatly in the last few decades, IAPs constitute a major threat to the remaining intact areas of wetland. **There must be no further reductions in water inflows to the wetlands.** As described for the Sneeuberg West RU, several of the wetlands may be vulnerable to even modest aridification of the climate, while some of the wetlands may potentially be vulnerable to groundwater abstraction, but further investigation is required.
Monitoring Recommendations	A minimum requirement for monitoring is, every 3-5 years, to repeat the WET-Health Level 1B assessment carried out in this baseline assessment, which was based primarily on land-cover types in the wetland and the areas of influence in its catchment. This recommended monitoring comprises desktop detection of land-cover change, but with approximately 8 hours of field verification for each wetland.

3.6 IUA_Q02: Great Fish

Table 3-8 Summary of wetland information for IUA_Q02

IUA Description	Great Fish
HGM unit type	Total of 262 wetlands mapped; Channelled Valley Bottom Wetlands: 36% Depression Wetlands: 45% Floodplain Wetlands: 0.5% Hillslope Seep Wetlands: 13% Unchannelled Valley Bottom Wetlands: 5.5%
PES per HGM unit type	Channelled Valley Bottom Wetlands - A/B: 61%; C: 18%; D/E/F: 21%. Depression Wetlands - A/B: 63%; C: 10%; D/E/F: 27%. Floodplain Wetlands - C: 100%. Hillslope Seep Wetlands - A/B: 54%; C: 33%; D/E/F: 23%. Unchannelled Valley Bottom Wetlands - A/B: 50%; C: 17%; D/E/F: 33%.
FEPA Wetlands	All of the FEPA wetlands that have been mapped in IUA_P01 are depression wetlands and have been mapped for their endangered threat status.
WRU	WRU10

3.6.1 WRU 10 – Dagbreek

Factor	Comment
WRUNumber(Quaternary Catchment)	WRU 10 (Q43A)
Site Coordinates	31°44'54.32"S, 25°56'17.98"E
HGM Unit Type(s)	Unchannelled valley-bottom wetlands (artificially created)
Vegetation types	Upper Nama Karoo
Threat Status	**UNCHANNELLED VALLEY-BOTTOM**: VULNERABLE
Strategic Water Source Area	No

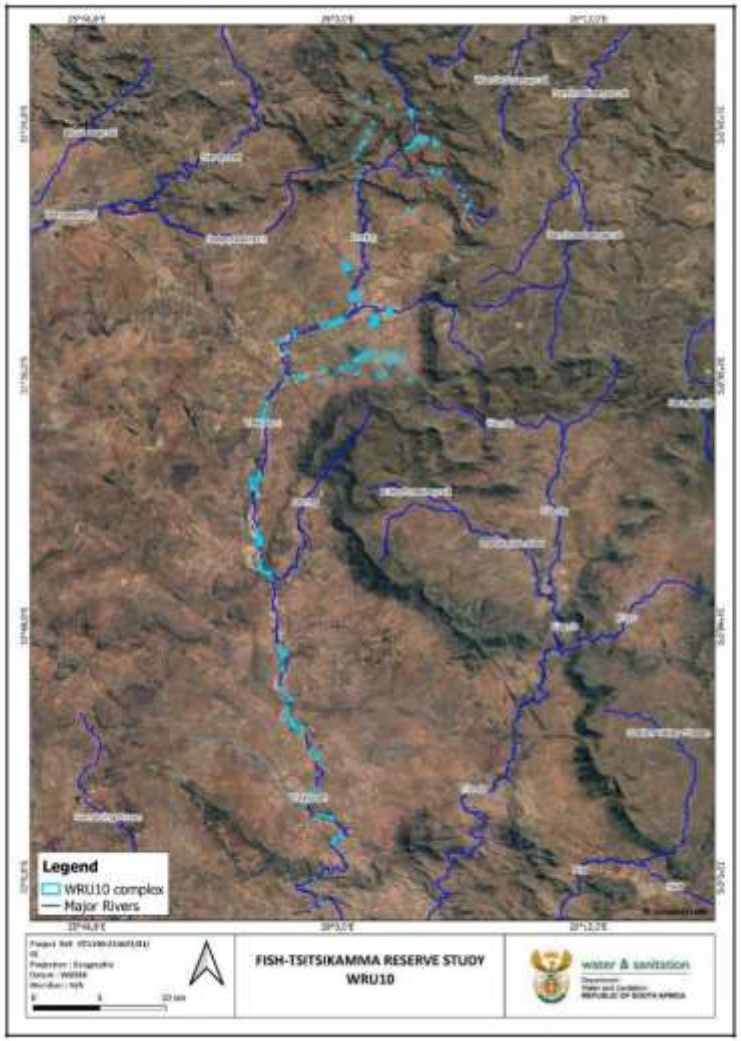
Factor	Comment
Overview Map	

Figure 3-17 Overview of the Dagbreek wetland complexes along the Vlekpoort River

<table>
<tr><th>Factor</th><th>Comment</th></tr>
<tr><td>PES</td><td>
<table>
<tr><th>PES Summary</th><th>Dagbreek</th><th>Main impacts</th></tr>
<tr><td>Combined Impact Score</td><td>1.6</td><td rowspan="3">Artificially created systems:
• Degraded catchments (gully and sheet erosion)
• Overgrazing by livestock
• Bush encroachment
• Structural failure – gully erosion</td></tr>
<tr><td>Combined PES Score (%)</td><td>84%</td></tr>
<tr><td>Combined Ecological Category</td><td>B →</td></tr>
</table>
</td></tr>
<tr><td>EIS</td><td>
<table>
<tr><th></th><th>Importance</th></tr>
<tr><td>Ecological Importance & Sensitivity</td><td>3.5</td></tr>
<tr><td>Hydro-Functional Importance</td><td>2.1</td></tr>
<tr><td>Direct Human Benefits</td><td>0.8</td></tr>
<tr><td>Overall Importance and Sensitivity Score</td><td>3.5</td></tr>
<tr><td>Overall Importance and Sensitivity Category</td><td>A</td></tr>
</table>
</td></tr>
<tr><td>REC/BAS</td><td>
<table>
<tr><th></th><th>Dagbreek</th></tr>
<tr><td>REC</td><td>A / B</td></tr>
</table>
</td></tr>
<tr><td>Preliminary management and mitigation measures.</td><td>Areas dominated by wetland vegetation within the systems must be prevented from degrading, especially given their role in providing wetland habitat in an area that naturally does not sustain wetland habitat due to the climatic conditions.
In instances where exotic species have established and/or been cultivated e.g., Populus sp., these should be removed. These species not only reduce the integrity of the overall wetland habitat but may also pose a threat to the engineered structures, potentially leading to the failure thereof.
Bush encroachment within the wetland and associated buffer areas (200m) should be managed. The encroachment of trees e.g., Vachellia karoo, should be carefully managed in the majority of the wetlands, as not only does this reduce the integrity of the wetland habitat but also threatens the integrity of the engineered structures.
Prevent any further encroachment of IAP infestations into the wetlands. Generally, the level of IAPs is low, with some localised clusters of infestations. If not managed whilst the densities are low, the IAPs pose a threat to both the wetlands and surrounding habitat. Therefore, a long-term control plan with repeated follow ups must be followed.</td></tr>
</table>

Factor	Comment
	Manage the level of grazing by livestock within the wetland and associated catchment area. Historical overgrazing in the catchment areas lead to the mass export of sediments, leading to the implementation of the engineered structures. The high level of sediment loss within the landscape is evident through the accumulation of sediment upstream of the structures. However, most of these structures have reached capacity and any mobilised sediment will end up in the Kommandodrift dam. **Erosion threatening the erosion control structures and associated wetlands needs to be effectively controlled.** The combination of erosional features within the channels and the lack of maintenance of the interventions has resulted in several of the structures failing, leading to the loss of the upstream wetland habitat and formation of an erosion gully. The management of erosional features within the channel (i.e., active channel incision) would serve to protect both the engineered structures and upstream wetland habitat.
Monitoring Recommendations	The minimum requirements for monitoring: • Every 3-5 years, to repeat the WET-Health Level 1B assessment carried out in this baseline assessment, which was based primarily on land-cover types in the wetland and the areas of influence in its catchment. This recommended monitoring comprises desktop detection of land-cover change in the wetland and its catchment. • Extent of IAPs and removal efforts must be monitored and reviewed annually. • The extent of bush encroachment and removal efforts, particularly around the erosion control structures, must be monitored, and reviewed annually. • Structural integrity of the erosion control structures should be monitored every three years. Any issues that may compromise the interventions should be addressed, possibly through the DFFE's NRM programme, to reduce the risk of failure.

3.7 IUA_R02: Buffalo/ Nahoon

Table 3-9 Summary of wetland information for IUA_R02

IUA Description	Buffalo/ Nahoon
HGM unit type	Total of 200 wetlands mapped; Channelled Valley Bottom Wetlands: 18% Depression Wetlands: 50% Floodplain Wetlands: 0.5% Hillslope Seep Wetlands: 27.5% Unchannelled Valley Bottom Wetlands: 4%
PES per HGM unit type	Channelled Valley Bottom Wetlands - A/B: 50%; C: 8%; D/E/F: 42%. Depression Wetlands - A/B: 45%; C: 18%; D/E/F: 37%. Floodplain Wetlands - D/E/F: 100%. Hillslope Seep Wetlands - A/B: 25%; C: 26%; D/E/F: 49%. Unchannelled Valley Bottom Wetlands - A/B: 22%; C: 45%; D/E/F: 33%.
FEPA Wetlands	All of the FEPA wetlands that have been mapped in IUA_R02 are depression wetlands and have been mapped for their endangered threat status.
WRU	WRU 15 and WRU 26

3.7.1 WRU 15 – eDrayini Floodplain Wetland

Factor	Comment
WRUNumber(Quaternary Catchment)	WRU 15 (R20E)
Site Coordinates	32°45'48.70"S, 27°29'43.95"E
HGM Unit Type(s)	Floodplain
Vegetation types	Sub-Escarpment Savanna
Threat Status	**FLOODPLAIN:** CRITICALLY ENDANGERED
Strategic Water Source Area	No

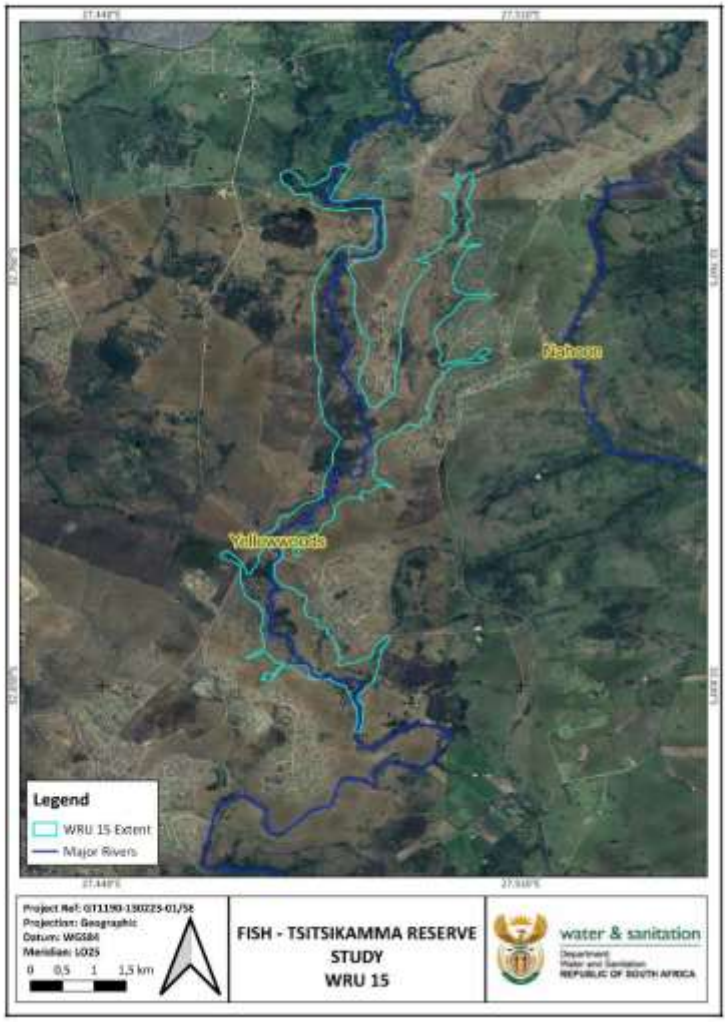
Factor	Comment
Overview Map	

Figure 3-18 Overview of the eDrayini wetland resource unit

<table>
<tr><th>Factor</th><th>Comment</th></tr>
<tr><td>PES</td><td>
<table>
<tr><th>PES Summary</th><th>eDrayini</th><th>Main impacts</th></tr>
<tr><td>Combined Impact Score</td><td>3.4</td><td rowspan="3">• Abandoned farmland and associated drains
• Subsistence crops
• Infestations of alien invasive plants
• Erosion due to overgrazing</td></tr>
<tr><td>Combined PES Score (%)</td><td>66%</td></tr>
<tr><td>Combined Ecological Category</td><td>C →</td></tr>
</table>
</td></tr>
<tr><td>EIS</td><td>
<table>
<tr><th></th><th>Importance</th></tr>
<tr><td>Ecological Importance & Sensitivity</td><td>3.2</td></tr>
<tr><td>Hydro-Functional Importance</td><td>3.1</td></tr>
<tr><td>Direct Human Benefits</td><td>2.3</td></tr>
<tr><td>Overall Importance and Sensitivity Score</td><td>3.2</td></tr>
<tr><td>Overall Importance and Sensitivity Category</td><td>B</td></tr>
</table>
</td></tr>
<tr><td>REC/BAS</td><td>
<table>
<tr><th></th><th>eDrayini</th></tr>
<tr><td>REC</td><td>C</td></tr>
</table>
</td></tr>
<tr><td>Preliminary management and mitigation measures</td><td>Natural areas within the wetlands must be prevented from declining in extent. This will require proactively addressing factors which threaten to impinge on these natural areas (see the two items below).
There must be no expansion of residential developments or other impinging land-uses such as roads into the remaining natural areas of the wetlands. While the extent of settlements within the wetlands is not currently large, the extent of other infrastructure such as roads have increased in the wetlands since 2006. No further housing infrastructure should be permitted to be constructed within the wetland extent. It is acknowledged that smaller-scale infrastructure such as roads and pipelines may need to be constructed within the wetlands. However, every effort should be made to tie new infrastructure into existing disturbances within the wetland. New developments should only be permitted under extenuating circumstances.
Prevent any further expansion of IAP infestations in the wetland and its buffer. If not effectively controlled, IAPs constitute the largest current threat to the remaining intact areas of wetland. Therefore, a long-term control plan with repeated follow ups must be set up and followed. The current level of infestation of IAPs in the wetland and most of its buffer is low to moderate and has increased rapidly over the last decade with the retraction of agricultural activities in the wetland. As such, IAPs remain</td></tr>
</table>

Factor	Comment
	a key threat to the wetland. It is acknowledged that many of the woody IAP species are utilised by the surrounding communities for firewood and construction purposes, but it is imperative that the extent of these species is maintained at less than 10% of the total wetland area (the extent is currently 16%). **Explore options to institute wise-use grazing and farming practices in the wetlands.** Extensive **g**razing and the potential re-introduction of agricultural practices in the wetlands pose a large threat to the wetland's integrity. It is acknowledged that livestock production is currently an important source of subsistence and income generation for several households surrounding the eDrayini wetland, and that crop production has historically been an important source of subsistence. These uses contribute to the well-being of local households and there is, therefore, a need to support these activities, but simultaneously a need to promote and empower the adoption of sustainable / better management practices related to farming and livestock rearing practices. Existing guidelines such as WET-Sustainable Use (Kotze, 2010) can be used to assess the ecological sustainability of agricultural activities (cultivation, grazing and vegetation harvesting) within the eDrayini wetland, as well as make useful and actionable recommendations for sustaining the use of this WRU. **Erosion threatening the wetland needs to be effectively controlled.** Although multiple erosion headcuts exist within the main body of the wetland, none have actively advanced over the last few decades. However, they remain a potential threat to the wetland, particularly those that threaten intact wetland areas that are sustained by lateral inputs. If these erosion headcuts were to advance, it is likely to result in direct habitat loss and desiccation of these laterally supported wetland areas. Furthermore, many large patches of erosion were observed within the buffer of the wetland which have advanced to some degree in the last few decades. The management and rehabilitation of these erosional features in the buffer of the wetland would prevent sedimentation within the wetland. Additionally, managing erosion within the wetland will prevent further sedimentation of the Laing Dam which is located approximately 20km downstream of the eDrayini wetland. As such, erosion control measures within the wetland and its buffer must be explored. This could double as a local capacity building and income generating project for the local community.
Monitoring Recommendations	The minimum requirements for monitoring: • Every 3-5 years, to repeat the WET-Health Level 1B assessment carried out in this baseline assessment, which was based primarily on land-cover types in the wetland and the areas of influence in its catchment. This recommended monitoring comprises desktop detection of land-cover change, but with approximately 8 hours of field verification for the wetland. • IAP and terrestrial species such as *V karroo* extent must be monitored and reviewed annually. Should resources be available, the following are recommended to further increase the resolution of assessment:

Factor	Comment
	• Describe in much more detail the impacts that cattle grazing is currently having on the wetland, and the affect that agriculture has had on the wetland. This would require an additional veld condition assessment to be undertaken and would contribute significantly understanding the current and historical impacts on vegetation within the wetland. Although this would require additional specialist expertise and would add considerably more time and resources to the assessment, it would greatly increase the resolution of the vegetation component of the assessment and would contribute significantly to the development of a wise use/sustainable use plan for the wetland.

3.7.2 WRU 26 – KwaMasele Wetland Complex

Factor	Comment
WRUNumber(Quaternary Catchment)	WRU 26 (R20D)
Site Coordinates	32°57'29.08"S, 27°20'32.16"E
HGM Unit Type(s)	Hillslope seep, unchannelled and channelled valley-bottom wetlands
Vegetation types	Sub-Escarpment Savanna
Threat Status	**SEEP**: ENDANGERED, **UNCHANNELLED VALLEY-BOTTOM**: CRITICALLY ENDANGERED, **CHANNELLED VALLEY-BOTTOM**: ENDANGERED
Strategic Water Source Area	No

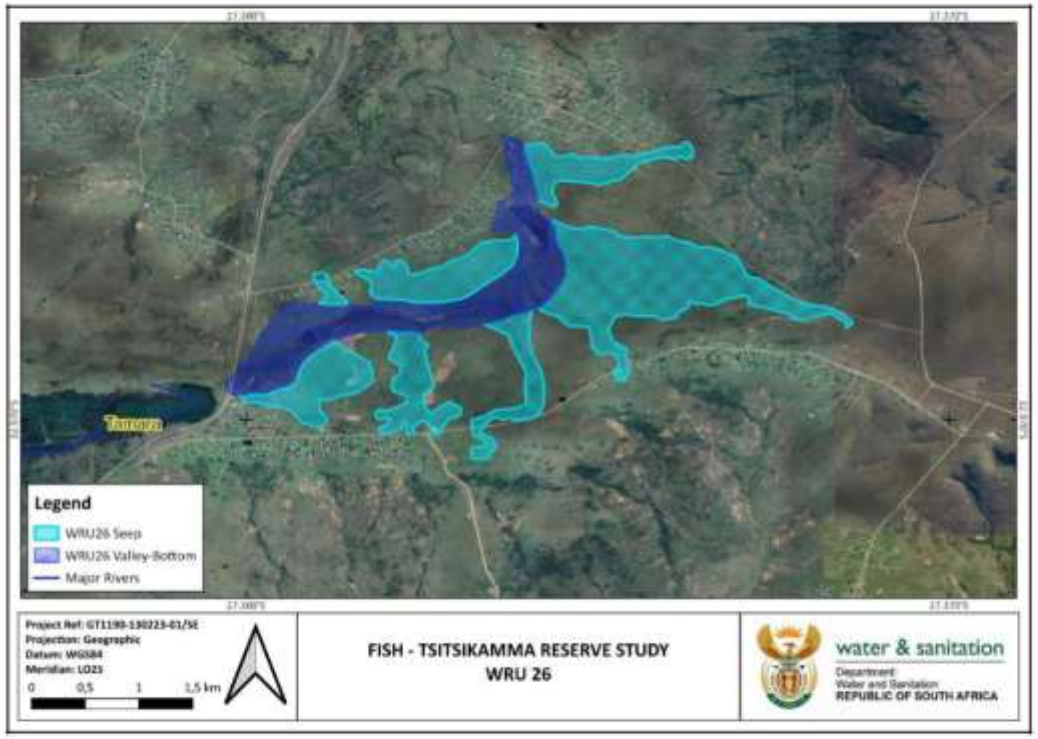
Factor	Comment
Overview Map	

Figure 3-19 Overview of the KwaMasele wetland resource unit

PES

PES Summary	Combined Seepage Wetlands	Main impacts
Combined Impact Score	2.9	• Cultivation within the wetland • Extensive grazing within the wetlands • Channel incision and erosion in the valley-bottom wetland • Large dam in the valley-bottom wetland
Combined PES Score (%)	71%	
Combined Ecological Category	**C →**	

<table>
<tr><th>Factor</th><th>Comment</th></tr>
<tr><td>EIS</td><td>
<table>
<tr><th></th><th>Importance</th></tr>
<tr><td>Ecological Importance & Sensitivity</td><td>3.3</td></tr>
<tr><td>Hydro-Functional Importance</td><td>2.6</td></tr>
<tr><td>Direct Human Benefits</td><td>2.1</td></tr>
<tr><td>Overall Importance and Sensitivity Score</td><td>3.3</td></tr>
<tr><td>Overall Importance and Sensitivity Category</td><td>B</td></tr>
</table>
</td></tr>
<tr><td>REC/BAS</td><td>
<table>
<tr><th></th><th>KwaMasele Wetlands</th></tr>
<tr><td>REC</td><td>C</td></tr>
</table>
</td></tr>
<tr><td>Preliminary management and mitigation measures</td><td>Natural areas within the wetlands must be prevented from declining in extent. This will require proactively addressing factors which threaten to impinge on these natural areas (see the three items below).
There must be no expansion of residential developments or other impinging land-uses such as roads or agriculture into the remaining natural areas of the wetlands. While the extent of settlements and infrastructure within the wetlands is not currently large, the expansion of settlements, agricultural activities and road infrastructure are possible, especially given the rapidly increasing population and the demand for housing, infrastructure and food. No further infrastructure should be permitted to be constructed within the wetland extent, and given the rarity of the wetland type, no further agriculture should be permitted within the wetland.
Explore options to institute wise-use grazing and farming practices in the wetlands. Extensive grazing and the currently active agricultural practices in the wetlands pose a large threat to the wetland’s integrity. It is acknowledged that livestock production and subsistence agriculture are currently an important source of subsistence and income generation for several households surrounding the KwaMasele wetland. These uses contribute to the well-being of local households and there is, therefore, a need to support these activities, but simultaneously a need to promote and empower the adoption of sustainable / better management practices related to farming and livestock rearing practices. Existing guidelines such as WET-Sustainable Use (Kotze, 2010) can be used to assess the ecological sustainability of agricultural activities (cultivation, grazing and vegetation harvesting) within the KwaMasele wetland, as well as make useful and actionable recommendations for sustaining the use of this WRU.
Erosion threatening the wetland needs to be effectively controlled. Although multiple erosion headcuts exist within the wetland, none have actively advanced over the last few decades. However, they remain a potential threat to the wetland,</td></tr>
</table>

Factor	Comment
	particularly those that threaten intact wetland areas. If these erosion headcuts were to advance, it is likely to result in direct habitat loss and desiccation of these wetland areas. The management and rehabilitation of these erosional features in the wetland would prevent the unnatural erosion and subsequent sedimentation within the wetland. As such, erosion control measures within the wetland must be explored. This could double as a local capacity building, awareness raising and income generating project for the local community. **Establish formal protection of the KwaMasele wetland given the rarity of the wetland type and the presence of the vulnerable *Arctotis debensis.*** Some level of formal protection of the KwaMasele wetland must be instituted such that the wetland receives some level of formal protection. This can be achieved while simultaneously allowing for measured and careful grazing and cultivation to occur within the wetland, in accordance with the guidelines set out in the WET-Sustainable Use (Kotze, 2010).
Monitoring Recommendations	The minimum requirements for monitoring: • Every 3-5 years, to repeat the WET-Health Level 1B assessment carried out in this baseline assessment, which was based primarily on land-cover types in the wetland and the areas of influence in its catchment. This recommended monitoring comprises desktop detection of land-cover change, but with approximately 8 hours of field verification for the wetland. Careful attention should be paid to the extent of the two major headcut features in the wetland while conducting this assessment. Furthermore, careful attention should be paid to the extent of crops within the wetland. Should resources be available, the following are recommended to further increase the resolution of assessment: • Describe in much more detail the impacts that cattle grazing, and agriculture are currently having on the wetland. This would require an additional veld condition assessment to be undertaken and would contribute significantly understanding the current and historical impacts on vegetation within the wetland. Although this would require additional specialist expertise and would add considerably more time and resources to the assessment, it would greatly increase the resolution of the vegetation component of the assessment and would contribute significantly to the development of a wise use/sustainable use plan for the wetland.

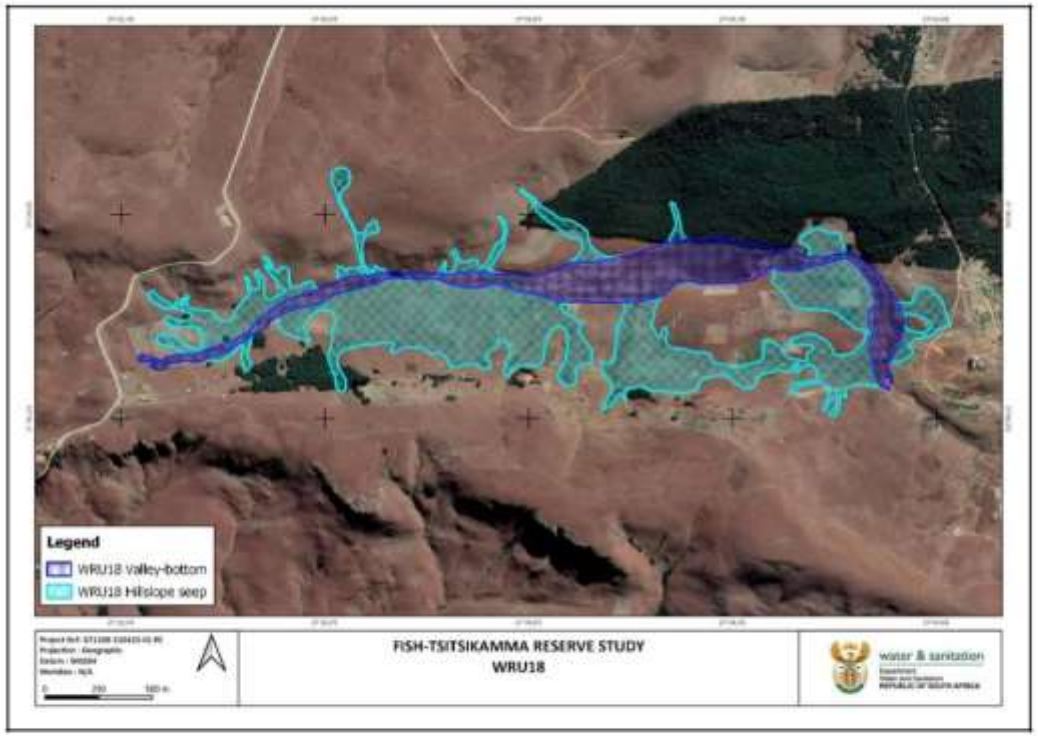
3.8 IUA_S01: Upper Great Kei

Table 3-10 Summary of wetland information for IUA_S01

IUA Description	Upper Great Kei
HGM unit type	Total of 372 wetlands mapped; Channelled Valley Bottom Wetlands: 29% Depression Wetlands: 36% Floodplain Wetlands: 2% Hillslope Seep Wetlands: 28% Unchannelled Valley Bottom Wetlands: 5%
PES per HGM unit type	Channelled Valley Bottom Wetlands - A/B: 44%; C: 28%; D/E/F: 28%. Depression Wetlands - A/B: 67%; C: 11%; D/E/F: 22%. Floodplain Wetlands - A/B: 14%; C: 43%; D/E/F: 43%. Hillslope Seep Wetlands - A/B: 39%; C: 39%; D/E/F: 22%. Unchannelled Valley Bottom Wetlands - A/B: 30%; C: 45%; D/E/F: 25%.
FEPA Wetlands	A number of FEPA wetlands exist in IUA_KL01, many of them being small, isolated depression wetlands. However, several channelled and unchannelled valley bottom FEPA wetlands have been mapped in the Groot-Kei River catchment.
WRU	WRU 18 and WRU 21

3.8.1 WRU 18 – Cala wetland complex

Factor	Comment
WRUNumber(Quaternary Catchment)	WRU 18 (S50E)
Site Coordinates	31°39'46.78"S, 27°33'54.19"E
HGM Unit Type(s)	Hillslope seepage and discontinuously channelled valley-bottom wetlands
Vegetation types	Sub-Escarpment Grassland Group 5
Threat Status	**VALLEY-BOTTOM**: ENDANGERED, **SEEP**: LEAST THREATENED
Strategic Water Source Area	Yes (Eastern Cape Drakensberg)

Factor	Comment
Overview Map	 **Figure 3-20 Overview of the Cala wetland complexes**
PES	

PES Summary	Valley-Bottom Wetland	Hillslope Seepage Wetland	Main Impacts
Combined Impact Score	2.0	3.6	• Abandoned state plantation • Cultivated fields • Two ineffective drains • Livestock trampling in lower portion
Combined PES Score (%)	80%	64%	
Combined Ecological Category	**C →**	**C →**	

<table>
<tr><th>Factor</th><th>Comment</th></tr>
<tr><td>EIS</td><td>
<table>
<tr><th></th><th colspan="2">Importance</th></tr>
<tr><th></th><th>Valley-Bottom Wetland</th><th>Hillslope Seepage Wetland</th></tr>
<tr><td>Ecological Importance & Sensitivity</td><td>3.3</td><td>3.1</td></tr>
<tr><td>Hydro-Functional Importance</td><td>2.5</td><td>2.2</td></tr>
<tr><td>Direct Human Benefits</td><td>0.9</td><td>0.9</td></tr>
<tr><td>Overall Importance and Sensitivity Score</td><td>3.3</td><td>3.1</td></tr>
<tr><td>Overall Importance and Sensitivity Category</td><td>B</td><td>B</td></tr>
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</td></tr>
<tr><td>REC/BAS</td><td>
<table>
<tr><th></th><th>Valley-Bottom Wetland</th><th>Hillslope Seepage Wetland</th></tr>
<tr><td>REC</td><td>B</td><td>B</td></tr>
</table>
</td></tr>
<tr><td>Preliminary management and mitigation measures.</td><td>Natural areas within the wetlands must be maintained in their current state and not be allowed to degrade, especially given that this system is one of the few remaining intact wetland systems within the broader landscape. This will require proactively addressing factors which could lead to its degradation e.g., subsistence agriculture, overgrazing by livestock, or encroachment of IAPs.
The abandoned/defunct state forests should be excised from the wetland habitat and its associated buffer area (200m). Although further encroachment of plantation forestry into the wetland habitat has not occurred over the last few decades, it is imperative that any further conversion of the wetland does not occur. The removal of the plantation forestry and active vegetation management of the excised areas is critical in achieving the REC and should be carefully managed to prevent the encroachment of IAPs into this portion of the wetland and buffer zone.
Explore options to institute wise-use subsistence farming and grazing practices in the wetlands. Portions of the wetland, particularly the seepage wetland, have been converted to subsistence farming practices, with livestock grazing also occurring within the wetland. Managing these existing practices to minimise impacts and ensuring that the expansion of these activities is limited is critical to maintaining the REC. Overgrazing and transformation of the wetland, if not managed appropriately, pose a large threat to the wetlands' integrity. It is acknowledged that subsistence agricultural practices and livestock grazing contribute towards the livelihoods of the surrounding community members and therefore, are important land use activities.</td></tr>
</table>

Factor	Comment
	Existing guidelines such as WET-Sustainable Use (Kotze, 2010) can be used to assess the ecological sustainability of agricultural activities (cultivation, grazing and vegetation harvesting) within the Cala wetland, as well as make useful and actionable recommendations for sustaining the use of this wetland ecosystem. **Prevent any further expansion of IAP infestations in the wetland and its catchment.** If not effectively controlled, IAPs constitute the largest current threat to the remaining intact areas of wetland. Therefore, a long-term control plan with repeated follow ups must be followed. The current level of infestation of IAPs in the wetland and most of its catchment is encouragingly low. Nonetheless, IAPs remain a key threat to the wetland, especially given portions of the wetland have been modified creating a disturbance from which IAPs may expand. **Management of potential erosional features within the adjacent catchment**. The catchment associated with the lower portion of the wetland is closest to the Lanqanci village, and therefore has been modified through the criss-crossing of livestock access paths on the hillside. These need to be carefully managed to ensure that these do not erode and deliver additional sediments into the wetland habitat. In addition, the access paths directly adjacent to and within the wetland should be monitored and managed to prevent the formation of headcut erosion. **There must be no further canalization/furrowing/diversion of the remaining intact areas of the wetlands.** Although currently very limited, these onsite modifications are recognized as having potentially important impacts on the distribution and retention of water in the wetland and should be avoided in land use practices.
Monitoring Recommendations	The minimum requirements for monitoring include: • Every 3-5 years, to repeat the WET-Health Level 1B assessment carried out in this baseline assessment, which was based primarily on land-cover types in the wetland and the areas of influence in its catchment. This recommended monitoring comprises desktop detection of land-cover change, but with approximately 8 hours of field verification. • Monitor the extent of the land use activities i.e. subsistence agricultural activities, to ensure these have not further expanded into the wetland and/or that the current practices are not having a detrimental effect on the wetland. • Should the plantation forests be removed, vegetation monitoring within this portion needs to be undertaken to ensure there is no encroachment of IAPs into the system and catchment. This would have to be undertaken annually.

3.8.2 WRU 21 – Mbokotwa floodplain

Factor	Comment
WRUNumber(Quaternary Catchment)	WRU 21 (S50C)
Site Coordinates	31°24'9.458"S, 27°32'48.57"E
HGM Unit Type(s)	Floodplain
Vegetation types	Sub-Escarpment Grassland Group 7
Threat Status	**FLOODPLAIN**: CRITICALLY ENDANGERED
Strategic Water Source Area	No

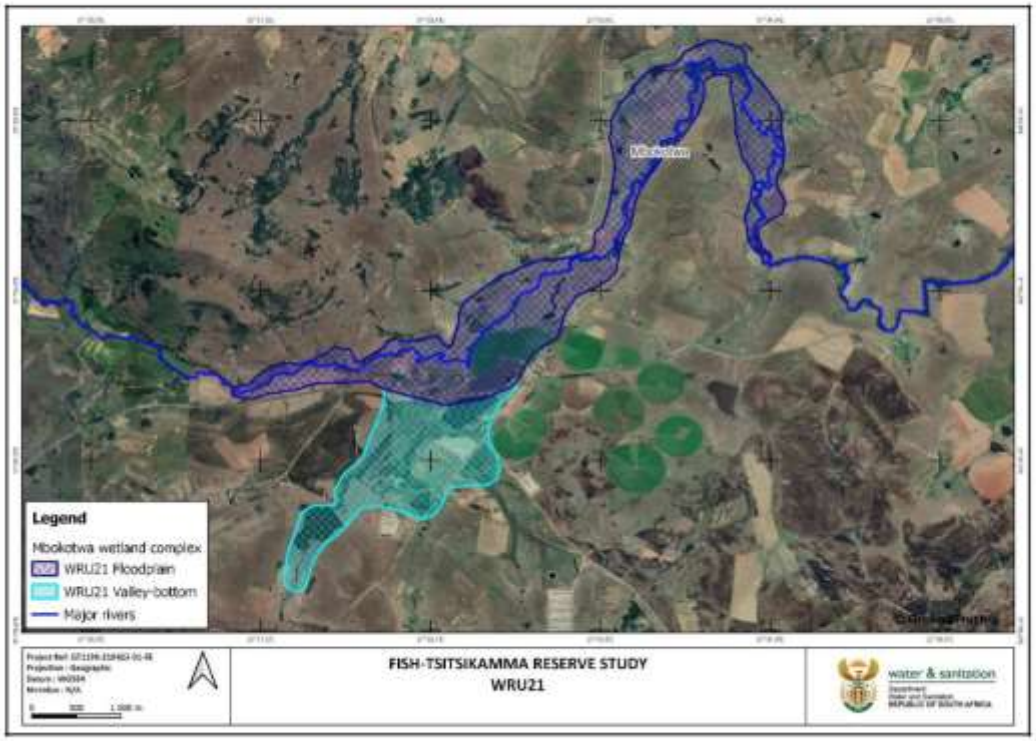
Factor	Comment
Overview Map	

Figure 3-21 Overview of the Mbokotwa floodplain wetland

PES

PES Summary	Floodplain Wetland	Main impacts
Combined Impact Score	4.9	• Commercial agriculture activities • Irrigated pivots • Freshwater dam • Settling/effluent dams • Discharge from dams into channel • Off-take channel • Incised channel • Alien invasive vegetation
Combined PES Score (%)	51%	
Combined Ecological Category	**D →**	

EIS

	Importance
Ecological Importance & Sensitivity	3.5
Hydro-Functional Importance	2.3
Direct Human Benefits	1.2
Overall Importance and Sensitivity Score	**3.5**
Overall Importance and Sensitivity Category	**A**

REC/BAS

	Mbokotwa	
REC	**C /**	**D**

Preliminary management and mitigation measures.

Natural areas within the wetland must be prevented from declining in extent. This will require proactively addressing factors which threaten to impinge on these natural areas.

There must be no expansion of agricultural and/or infrastructural developments within the wetland and its associated buffer. No expansion of large-scale infrastructure should be permitted due to the already modified nature of the wetland. It is acknowledged that smaller-scale infrastructure such as roads and pipelines may need to be constructed within the wetland. However, every effort should be made to tie new infrastructure into existing disturbance areas within the wetland.

Control of invasive alien plants in the wetland, its buffer, and upslope catchment areas. From a hydrological impact perspective, the greatest urgency is to control the IAPs e.g., *Populus* spp and *Acacia* spp., across the areas of concern, as this would fundamentally improve the ecological integrity of the overall wetland system.

	There must be no further reductions in water inflows to the wetland. While being foundational to the existence of the wetlands, this is recognized as being very difficult to determine with any confidence unless the resolution of the hydrology component of the assessment is greatly increased. **There must be no further canalization/furrowing/diversion of the remaining intact areas of the wetland.** The overall floodplain has been subjected to substantial modifications to the hydrology of the system. It is recommended that the drains/diversion berms within the lower portion of the floodplain be carefully reviewed in conjunction with the grazing regime within this portion of the wetland, to potentially allow the rehabilitation of this portion of the wetland. Rehabilitation activities would not exclude the utilisation of the wetland; however, grazing would need to be controlled and account for flood waters spreading across the wetland more frequently. This, however, would be subject to an inclusive consultation phase with the existing landowner, as these modifications have been evident in the landscape for over 15 years. **There must be no further deterioration in the water quality component of the ecological state of the wetland.** It is assumed that the discharge into the main channel is formally monitored, any additional water quality impacts on the system should be limited, particularly as the system hydrology has been substantially modified limiting the ability of the system to provide water quality enhancement services. **Explore options to institute wise-use grazing and farming practices in the wetland, for the portions which are not associated with the commercial agricultural practices.** Portions of the wetland which are not dominated by commercial agriculture are being utilised by the local landowners. These landowners are reliant on the open space for grazing and/or subsistence farming, and therefore, the adoption of sustainable management practices should be promoted. Existing guidelines such as WET-Sustainable Use (Kotze, 2010) can be used to assess the ecological sustainability of agricultural activities (cultivation, grazing and vegetation harvesting) within the KwaMasele wetland, as well as make useful and actionable recommendations for sustaining the use of this system.
Monitoring Recommendations	The minimum requirements for monitoring: • Every 3-5 years, to repeat the WET-Health Level 1B assessment carried out in this baseline assessment, which was based primarily on land-cover types in the wetland and the areas of influence in its catchment. This recommended monitoring comprises desktop detection of land-cover change, but with approximately 8 hours of field verification for each wetland. • It is assumed that the commercial farming activities are legally required to monitor the quality of the water being discharged into the river. Therefore, bi-annual reviews of the water quality results should be undertaken to ensure that the discharge is within the legal limits. • Extent of IAPs and removal efforts must be monitored and reviewed annually. Should resources be available, the following are recommended to further increase the resolution of monitoring: • Describe in much more detail the inflows, throughflows and outflows of the wetland and how these have been anthropogenically modified. This would likely be best achieved with hydrological modelling and/or a hydro-pedological

	assessment, as well as accessing relevant available data. Although this would require additional specialist expertise and would add considerably more time and resources to the assessment, it would greatly increase the resolution of the hydrological component of the assessment. • The flows along the main channel should be carefully monitored to ensure the off-take channel does not compromise the ecological integrity of the floodplain and its associated biota.

3.9 IUA_S02: Black Kei

Table 3-11 Summary of wetland information for IUA_S02

IUA Description	Black Kei
HGM unit type	Total of 428 wetlands mapped; Channelled Valley Bottom Wetlands: 17% Depression Wetlands: 15% Floodplain Wetlands: 1% Hillslope Seep Wetlands: 52% Unchannelled Valley Bottom Wetlands: 15%
PES per HGM unit type	Channelled Valley Bottom Wetlands - A/B: 41%; C: 22%; D/E/F: 37%. Depression Wetlands - A/B: 75%; C: 10%; D/E/F: 15%. Floodplain Wetlands - C: 33%; D/E/F: 67%. Hillslope Seep Wetlands - A/B: 52%; C: 17%; D/E/F: 31%. Unchannelled Valley Bottom Wetlands - A/B: 43%; C: 40%; D/E/F: 17%.
FEPA Wetlands	There are a number of FEPA wetlands in the IUA_S02 that include channelled valley bottom, unchannelled valley bottom, hillslope seep and depression wetlands. Many of these have been identified as FEPA wetlands because they are known crane breeding/feeding sites or are located in key water supply areas in their catchment.
WRU	WRU 12 and WRU 13

3.9.1 WRU 12 – Cairns Wetland Complex

Factor	Comment
WRUNumber(Quaternary Catchment)	WRU 12 (S32E)
Site Coordinates	32°24'54.96"S, 26°45'22.46"E
HGM Unit Type(s)	Unchannelled Valley-bottom and Hillslope Seep Wetlands
Vegetation types	Drakensberg Grassland Group 1
Threat Status	**UNCHANNELLED VALLEY-BOTTIM:** CRITICALLY ENDANGERED, **CHANNELLED VALLEY-BOTTOM:** LEAST THREATENED, **SEEP:** LEAST THREATENED
Strategic Water Source Area	Yes (Amathole)

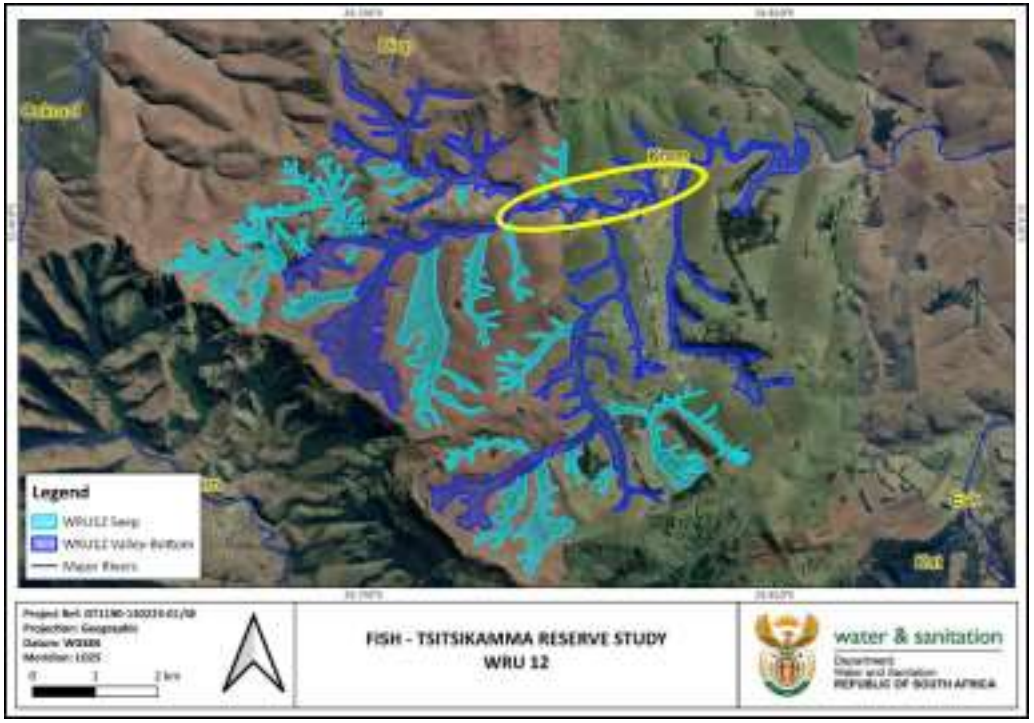
Factor	Comment
Overview Map	

Figure 3-22 Overview of the Cairns wetland resource unit. The yellow oval indicates the HGM unit that was assessed.

PES

PES Summary	Unchannelled Valley-Bottom	Main impacts
Combined Impact Score	1.1	• Small area of infilling from road crossing • Alterations to vegetation composition and structure due to grazing
Combined PES Score (%)	89%	
Combined Ecological Category	**B →**	

EIS

	Importance
Ecological Importance & Sensitivity	3.7
Hydro-Functional Importance	2.2
Direct Human Benefits	1.0
Overall Importance and Sensitivity Score	**3.7**
Overall Importance and Sensitivity Category	**A**

REC/BAS

	Cairns
REC	**B**

Preliminary management and mitigation measures

Natural areas within the wetlands must be prevented from declining in extent. This will require proactively addressing factors which threaten to impinge on these natural areas (see the three items below).

There must be no expansion of residential developments or other impinging land-uses such as roads or agriculture into the remaining natural areas of the wetlands. While the extent of settlements and infrastructure within the wetlands is not currently large, the expansion of settlements, agricultural activities and road infrastructure are possible, especially given the rapidly increasing population and the demand for housing, infrastructure, and food. No further infrastructure should be permitted to be constructed within the wetland extent, and given the rarity of the wetland type, no further agriculture should be permitted within the wetland.

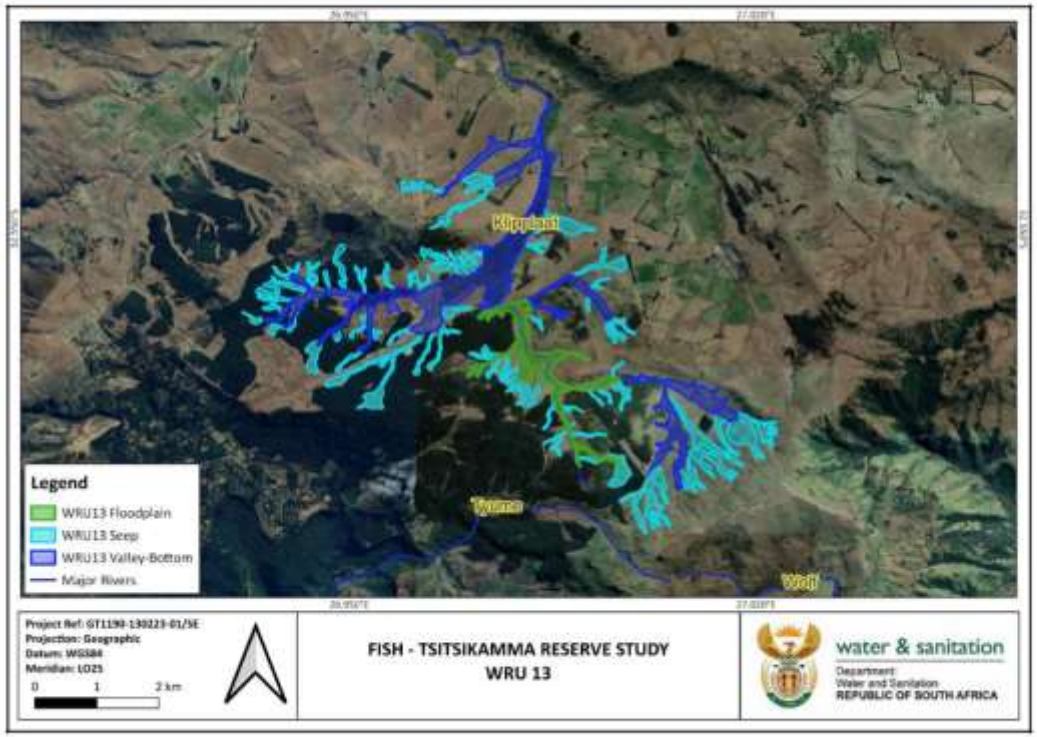
Explore options to institute wise-use grazing and farming practices in the wetlands. Grazing and the currently active agricultural practices in the wetlands pose a large threat to the wetland's integrity (particular emphasis is placed on the northern and eastern arms of the wetland complex). It is acknowledged that livestock production and subsistence agriculture are currently an important source of subsistence and income generation for several households surrounding the Cairns wetland. These uses contribute to the well-being of local households and there is, therefore, a need to support these activities, but simultaneously a need to promote and empower the adoption of sustainable / better management practices related to farming and livestock rearing practices. Existing guidelines such as WET-Sustainable Use (Kotze, 2010) can be used to assess the ecological sustainability of agricultural activities (cultivation, grazing and vegetation harvesting) within the Cairns wetland, as well as make useful and actionable recommendations for sustaining the use of this WRU.

Erosion threatening the wetland needs to be effectively controlled. Although multiple erosion headcuts exist within the wetland, none have actively advanced over the last few decades. However, they remain a potential threat to the wetland, particularly those that threaten intact wetland areas. A number of these erosional features have been specified for rehabilitation through the Working for Wetland programme, and it is recommended that these rehabilitation structures are prioritised for the next round of implementation. If these erosion headcuts were to advance, it is likely to result in direct habitat loss and

	desiccation of these wetland areas. Given the rarity of the kommetjievlakte wetlands, it is vital that these rehabilitation interventions are prioritised. The management and rehabilitation of these erosional features in the wetland would prevent the unnatural erosion and subsequent sedimentation within the wetland. As such, erosion control measures within the wetland must be explored. This could double as a local capacity building, awareness raising and income generating project for the local community. **A burning and grazing regime needs to be followed which is ecologically favourable, both for general wetland/grassland ecological functioning and for the Amathole toad specifically**. A biennial spring burn is recommended, which would prevent the accumulation of fuel and the risk of wildfires, as well as preventing the vegetation from becoming moribund, which has the potential to impact negatively on grasslands (including wetland grasslands) in terms of species diversity and basal cover (Lechmere-Oertel 2012). The grasslands and wetlands should be grazed in a conservative regime with stocking rate not exceeding 4.5 ha / AU / year and with short bursts of high-intensity grazing followed by long periods of rest of at least a full growing season (Lechmere-Oertel 2012). This grazing regime is identified by EWT as also being favourable for the Amathole toad, but with the proviso that in the wetland areas used by breeding toads, wetland grazing should be outside of the toad's breeding season from August through November (Bionerds 2021).
Monitoring Recommendations	A minimum requirement for monitoring is, every 3-5 years, to repeat the WET-Health Level 1B assessment carried out in this baseline assessment, which was based primarily on land-cover types in the wetland and the areas of influence in its catchment. This recommended monitoring comprises desktop detection of land-cover change, but with approximately 8 hours of field verification for each wetland. In addition, IAP extent and the burning and grazing regime must be monitored and reviewed annually. Should resources be available, the following are recommended to further increase the resolution of assessment: • The status in the wetlands of the Amathole Toad (*Vandijkophrynus amatolicus*) should be monitored in collaboration with EWT, who are already engaged in monitoring this species in the general Hogsback area. • Describe in much more detail the inflows, throughflows and outflows of the wetland and how these have been anthropogenically modified. This would likely be best achieved with hydrological modelling and/or a hydro-pedological assessment, as well as accessing relevant available data, e.g. borehole level data and any direct measures of water use/abstraction. Although this would require additional specialist expertise and would add considerably more time and resources to the assessment, it would greatly increase the resolution of the hydrological component of the assessment.

3.9.2 WRU 13 – Hogsback Wetland Complex

Factor	Comment
WRUNumber(Quaternary Catchment)	WRU 13 (S32D)
Site Coordinates	32°33'22.51"S, 26°58'33.89"E
HGM Unit Type(s)	Hillslope Seeps, Floodplain and Channelled Valley-Bottom Wetlands
Vegetation types	Drakensberg Grassland Group 1
Threat Status	**SEEP**: LEAST THREATENED, **FLOODPLAIN**: CRITICALLY ENDANGERED, **CHANNELLED VALLEY-BOTTOM**: LEAST THREATENED, **UNCHANNELLED VALLEY-BOTTOM**: LEAST THREATENED
Strategic Water Source Area	Yes (Amathole)
Overview Map	

Factor	Comment
	 **Figure 3-23 Overview of the Hogsback wetland resource unit**

PES

PES Summary	Seeps - Intact	Seeps - Degraded	Floodplain	Unchannelled Valley-Bottom	Main impacts
Combined Impact Score	2.0	4.7	3.0	3.1	• Plantations within the catchment • Extensive road networks in catchment and wetlands • Erosion and channel incision • Alien invasive plants
Combined PES Score (%)	80%	53%	70%	69%	
Combined Ecological Category	**C →**	**D →**	**C →**	**C →**	

EIS

	Importance			
	Seeps - intact	Seeps - degraded	Floodplain	Unchannelled Valley-Bottom
Ecological Importance & Sensitivity	3.5	2.0	3.3	3.3
Hydro-Functional Importance	3.3	3.3	3.2	3.3
Direct Human Benefits	1.3	1.1	1.3	1.3
Overall Importance and Sensitivity Score	**3.5**	**3.3**	**3.3**	**3.3**
Overall Importance and Sensitivity Category	**A**	**B**	**B**	**B**

REC/BAS

	Seeps intact	Seeps degraded	Floodplain	Unchannelled valley bottom
REC	**B / C**	**D**	**B / C**	**B / C**

Preliminary management and mitigation measures	Given that the trajectory of change in ecological state is projected to decline, ecological specifications will be required to maintain the PES in the face of key factors contributing to the projected decline. **The water sources sustaining the three different wetland HGM types in the wetland RUs must be maintained**. For the floodplain, these sources appear to include a combination of periodic overspill during major flow events and lateral inflows, including both major rainfall events and sustained low flows. The UVB is likely dependent primarily on sustained low flows in the main inflowing channel. Until confirmed otherwise, lateral inputs to the UVB should also be assumed to be important. For the seeps, sustained input of predominantly sub-surface flows from the adjacent hillslopes are assumed to be most important. **Particular attention should be focussed on sustaining the ecological contribution of the intact seep areas. This includes maintaining the quality of habitat in the wetlands as well as in their generous buffers and, in some cases, in most of their upslope catchments which still remain under natural vegetation.** The intact seep wetlands stand out as key ecological links across the broad landscape for the critically endangered Amathole toad, in particular forming an ecological link between the sub-population to the southeast of the wetland RU and Elandsberg sub-population to the northeast of the wetland RU. **Withdrawal of a few key strategically located forestry areas is required to enhance the ecological links of key wetland areas in the RU**. Probably the most important withdrawal has already occurred. This comprised a strip of tree plantations obstructing the main ecological link which was withdrawn in 2011, greatly improving the link between the sub-population to the southeast of the wetland RU and Elandsberg sub-population to the north. The following additional minor withdrawals **(Figure 3-24)** are also recommended: (1) north of Seep 1, which would contribute to improving the link between the sub-population to the south east of the wetland RU and the sub-population to the west of the wetland RU (the Hogsback sub-population); and (2) along the central margins of Hogsback Seep 7, which presently almost “pinches off” the broad and botanically diverse upper portion of this seep from the main wetland downstream, which would improve connectivity of this high quality habitat within the wetland RU. **Control of invasive alien plants in the wetlands and their buffers and upslope catchments**. From a hydrological impact perspective, the greatest urgency is to control the self-seeded pine trees which have increased dramatically in extent over the last 20 years in the catchment northeast of the UVB wetland unit. In terms of American bramble, the priority area for control are the intact seep wetlands and their buffers, as emphasized earlier. For the lower priority seeps, which are generally severely compromised through a high edge effect of plantations, cost-effective means should be sought of limiting the expansion of the bramble, perhaps through controlled utilization by browsing livestock (e.g., goats) with utilization timed when the bramble is still in an early stage of seasonal growth and access is not overly impaired by the mature thorny bramble canes. If burning does not effectively remove obstructing old canes, then livestock browsing may need to be preceded by initial mowing. **A burning and grazing regime needs to be followed which is ecologically favourable, both for general wetland/grassland ecological functioning and for the Amathole toad specifically**. A biennial spring burn is recommended,

	which would prevent the accumulation of fuel and the risk of wildfires, as well as preventing the vegetation from becoming moribund, which has the potential to impact negatively on grasslands (including wetland grasslands) in terms of species diversity and basal cover (Lechmere-Oertel 2012). The grasslands and wetlands should be grazed in a conservative regime with stocking rate not exceeding 4.5 ha / AU / year and with short bursts of high-intensity grazing followed by long periods of rest of at least a full growing season (Lechmere-Oertel 2012). This grazing regime is identified by EWT as also being favourable for the Amathole toad, but with the proviso that in the wetland areas used by breeding toads, wetland grazing should be outside of the toad's breeding season from August through November (Bionerds 2021). **Where occurring, uncontrolled grazing needs to be addressed**. In some portions of the wetland RU to the east, where cattle from the neighbouring community graze illegally, there was evidence in July 2022 of heavy trampling of some seeps in this area, and in these eastern areas generally there is evidence of grassland degradation in terms of changes to the species composition and reduced basal cover, and for which improved grazing management is most required (Lechmere-Oertel 2012). **There must be no further expansion of cultivation, tree plantations or other impinging land-uses into the remaining natural areas of the wetlands.** While the conversion of the intact wetland areas to tree plantations and cultivated lands appears to have been very limited in the last approximately two decades (with some tree plantations, in fact, having been withdrawn from wetland areas), further expansion of impinging land-uses into the wetlands is a potential important future threat, and therefore needs to be controlled.

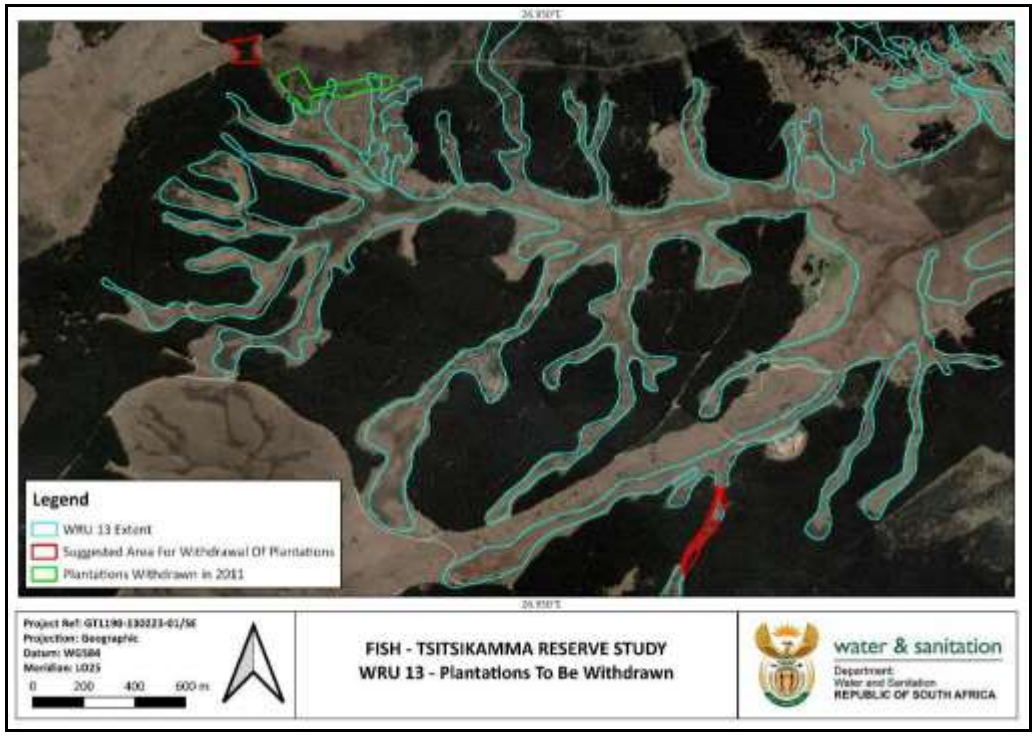


Figure 3-24 Key localized areas where tree plantations were noted impinging into and immediately adjacent to the wetlands and are recommended to be withdrawn.

Monitoring Recommendations	A minimum requirement for monitoring is, every 3-5 years, to repeat the WET-Health Level 1B assessment carried out in this baseline assessment, which was based primarily on land-cover types in the wetland and the areas of influence in its catchment. This recommended monitoring comprises desktop detection of land-cover change, but with approximately 8 hours of field verification for each wetland. In addition, IAP extent and the burning and grazing regime must be monitored and reviewed biennually. Should resources be available, the following are recommended to further increase the resolution of assessment:

	• The status in the wetlands of the Amathole Toad (*Vandijkophrynus amatolicus*) should be monitored in collaboration with EWT, who are already engaged in monitoring this species in the general Hogsback area. • Rehabilitation interventions in the wetland should be reviewed in terms maintenance requirements and ecological outcomes, including unintended negative outcomes. In terms of the latter, it appears that the Working for Wetlands weirs constructed in the floodplain wetland have increased greatly the likelihood of channel avulsion, and in terms of long-term integrity of the wetland may potentially benefit from a lowering of the current spillway height. • Describe in much more detail the inflows, throughflows and outflows of the wetland and how these have been anthropogenically modified. This would likely be best achieved with hydrological modelling and/or a hydro-pedological assessment, as well as accessing relevant available data, e.g. borehole level data and any direct measures of water use/abstraction. Although this would require additional specialist expertise and would add considerably more time and resources to the assessment, it would greatly increase the resolution of the hydrological component of the assessment.

3.10 IUA_T01: Upper Mbashe, Upper Mthatha

Table 3-12 Summary of wetland information for IUA_T01

IUA Description	Upper Mbashe, Upper Mthatha
HGM unit type	Total of 257 wetlands mapped; Channelled Valley Bottom Wetlands: 30% Depression Wetlands: 32% Floodplain Wetlands: 8% Hillslope Seep Wetlands: 19% Unchannelled Valley Bottom Wetlands: 11%
PES per HGM unit type	Channelled Valley Bottom Wetlands - A/B: 51%; C: 26%; D/E/F: 23%. Depression Wetlands - A/B: 46%; C: 31%; D/E/F: 33%. Floodplain Wetlands - A: 29%; C: 15%; D/E/F: 57%. Hillslope Seep Wetlands - A/B: 62%; C: 26%; D/E/F: 12%. Unchannelled Valley Bottom Wetlands - A/B: 67%; C: 18%; D/E/F: 15%.
FEPA Wetlands	There are a number of FEPA wetlands in the IUA_T01 that include channelled valley bottom, unchannelled valley bottom, hillslope seep, depression and floodplain wetlands. Many of these have been identified as FEPA wetlands because they are known crane breeding/feeding sites or are located in key water supply areas in their catchment. Several of the floodplain and unchannelled valley bottom wetlands have been identified by experts and have been included in the FEPA matrix.
WRU	WRU 22

3.10.1 WRU 22 – Elliot/Khowa wetland complex

Factor	Comment
WRUNumber(Quaternary Catchment)	WRU 22 (T11A)
Site Coordinates	31°24'9.458"S, 27°32'48.57"E
HGM Unit Type(s)	Hillslope seepage wetlands, channelled valley-bottom, floodplain
Vegetation types	Sub-Escarpment Grassland Group 5
Threat Status	**FLOODPLAIN**: CRITICALLY ENDANGERED, **CHANNELLED VALLEY-BOTTOM**: ENDANGERED, **UNCHANNELLED VALLEY-BOTTOM**: ENDANGERED, **SEEP**: LEAST THREATENED
Strategic Water Source Area	No

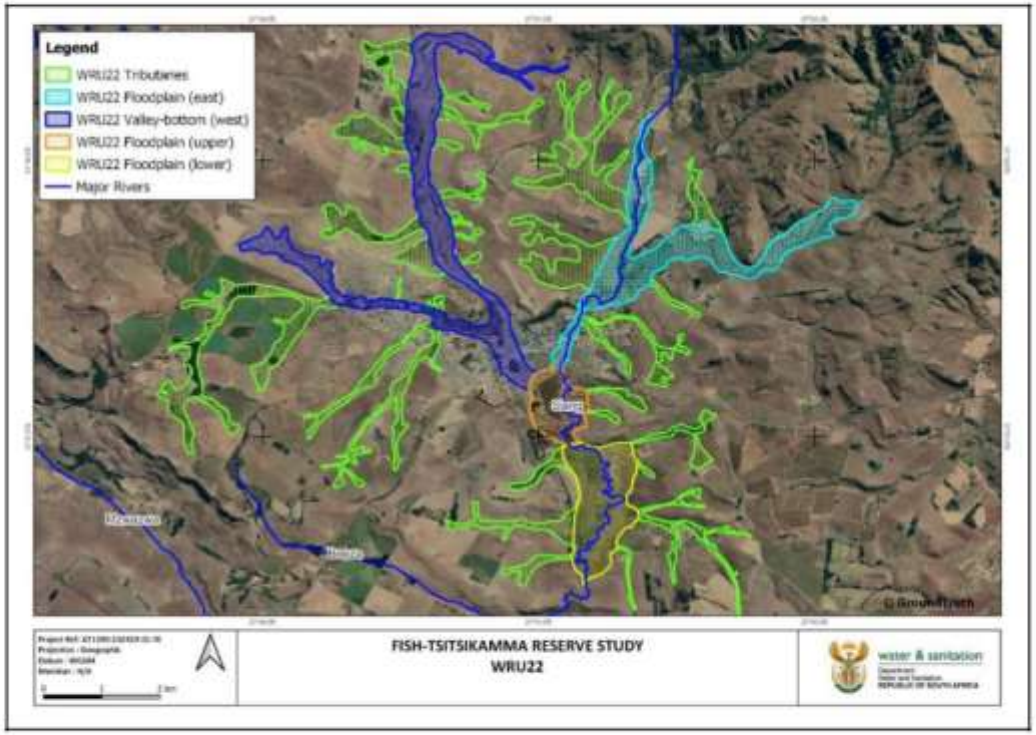
Factor	Comment
Overview Map	

Figure 3-25 Overview of the identified wetland complexes and the level at which the complex was assessed

PES

PES Summary	Tributaries	Floodplain (eastern arm)	Channelled Valley-Bottom (west)	Floodplain (upper)	Floodplain (lower)	Main impacts
Combined Impact Score	4.1	5.0	4.5	6.3	3.1	• Commercial agriculture activities • Impoundment of flows • Water quality • Channel diversion • Earthen diversion/flood protection berms • Alien invasive vegetation
Combined PES Score (%)	59%	50%	55%	37%	69%	
Combined Ecological Category	**D →**	**D →**	**D →**	**E →**	**C →**	

EIS

	Importance				
	Tributaries	**Floodplain (eastern arm)**	**Channelled Valley-Bottom (west)**	**Floodplain (upper)**	**Floodplain (lower)**
Ecological Importance & Sensitivity	2.5	3.5	3.7	3.7	3.7
Hydro-Functional Importance	2.2	2.5	2.6	2.7	3.1
Direct Human Benefits	0.7	1.2	1.3	1.0	1.0
Overall Importance and Sensitivity Score	**2.5**	**3.5**	**3.7**	**3.7**	**3.7**
Overall Importance and Sensitivity Category	**C**	**A**	**A**	**A**	**A**

<table>
<tr><td>REC/BAS</td><td>
<table>
<tr><td></td><td colspan="2">Level 1B: Tributaries</td><td colspan="2">Level 1B: Floodplain (eastern arm)</td><td>Level 2: Channelled Valley-Bottom (west)</td><td>Level 2: Floodplain (upper)</td><td>Level 2: Floodplain (lower)</td></tr>
<tr><td>REC</td><td colspan="2">C / D</td><td colspan="2">C / D</td><td>C</td><td>D</td><td>B</td></tr>
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<tr><td>Preliminary management and mitigation measures.</td><td>
Natural areas within the wetlands must be prevented from declining in extent. This will require proactively addressing factors which threaten to impinge on these natural areas. Most importantly, the lower floodplain HGM unit is a large and relatively intact floodplain system, which must be protected to prevent any further degradation of the system.
Factors that contribute to a decline in the water quality in the wetlands must be mitigated against. Discharge of sewage into the wetland must be halted. The wastewater treatment plant alongside the channelled valley-bottom has not been operational since its construction, resulting in the manholes in the adjacent community surcharging raw sewage that then drains into the wetland. This is the primary driver of the poor water quality within the wetland. This needs to be addressed as a matter of urgency, as not only is it contributing to the degradation of the wetland, but more importantly is a health hazard to the community. Additionally, any further industries and/or commercial practices that discharge wastewater into the wetland habitat, should ensure these are within the specified standards.
Monitoring of the groundwater resource. Due to the suite of water quality related issues within the system, it is recommended that the groundwater water resource is monitored for potential contamination.
Management of litter/solid waste within the community areas. A substantial amount of litter and trash was observed within and directly adjacent to the wetland habitat. Appropriate refuse collection and clean up initiatives should be adopted and implemented by the municipality, particularly due to the presence of the large relatively intact floodplain wetland downstream thereof.
There must be no expansion of residential or infrastructural developments such as sport fields, schools, industrial parks etc. or other impinging land-uses into the remaining natural areas of the wetlands. Historical encroachment into the wetland habitat has occurred however, any further development of the wetland should be prohibited. It is acknowledged that smaller-scale infrastructure such as roads and pipelines may need to be constructed within the wetlands. However, every effort should be made to tie new infrastructure into existing disturbances within the wetland. New developments should only be permitted with the adoption of appropriate mitigation measures to avoid impacts on the wetlands.
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	There must be no further expansion of cultivation, damming of streams/seepage areas, or other impinging land-uses into the remaining natural areas of the wetlands. Large portions of the catchment area and portions of the tributaries have been converted to commercial agricultural activities, including inter alia dams, crops, wastewater ponds etc. The expansion of these activities within wetland areas should be limited to ensure the overall integrity of the greater wetland complex is not further compromised. **Explore options to institute wise-use grazing and farming practices in the wetlands.** Portions of the wetlands are being utilised by the adjacent community for livestock grazing purposes. It is understood that livestock production is an important source of subsistence and income generation for several households surrounding the wetland. These uses contribute to the well-being of local households and there is, therefore, a need to support these activities, but simultaneously a need to promote and empower the adoption of sustainable management practices related to farming and livestock rearing practices. Existing guidelines such as WET-Sustainable Use (Kotze, 2010) can be used to assess the ecological sustainability of agricultural activities (cultivation, grazing and vegetation harvesting) within the Elliot/Khowa wetland, as well as make useful and actionable recommendations for sustaining the use of this system. **Prevent any further expansion of IAP infestations in the wetlands and their buffers.** While IAPs do not currently constitute a significant threat to the integrity of the wetland, the constant disturbances associated with the surrounding land uses and within wetland land uses can provide ideal conditions for the proliferation of IAPs. Portions of the wetland have been significantly modified, however, the density of IAPs is low for a wetland located in a disturbed landscape. Therefore, it is important for these levels to be maintained at current densities. **Stakeholder involvement in maintaining the existing diversity of the system**. Cumulative efforts in the conservation of the diversity of the system, in particular the grey crowned cranes, with various interested stakeholders, including inter alia the local government departments, landowners, wetland users and the Endangered Wildlife Trust; should form part of the conservation of the greater wetland.
Monitoring Recommendations	The minimum requirements for monitoring: • Every 3-5 years, to repeat the WET-Health Level 1B assessment carried out in this baseline assessment, which was based primarily on land-cover types in the wetlands and the areas of influence in their catchments. This recommended monitoring comprises desktop detection of land-cover change, but with approximately 8 hours of field verification for each HGM unit. • It is assumed that the WWTW are legally required to monitor the quality of the water being discharged into the main stem. Therefore, bi-annual review of the water quality results should be undertaken to ensure that the discharge is within the legal limits. • Extent of IAPs and removal efforts must be monitored and reviewed annually.

	Should resources be available, the following are recommended to further increase the resolution of assessment: • A bi-annual water quality testing program must be set up to test the water quality of each wetland. A monitoring point must be set up at the toe of each wetland such that a water quality reading can be collected for each wetland. • Describe in much more detail the inflows, throughflows and outflows of the wetland and how these have been anthropogenically modified. This would likely be best achieved with hydrological modelling and/or a hydro-pedological assessment, as well as accessing relevant available data. Although this would require additional specialist expertise and would add considerably more time and resources to the assessment, it would greatly increase the resolution of the hydrological component of the assessment.

3.11 IUA_T04: Pondaland Coastal

Table 3-13 Summary of wetland information for IUA_T04

IUA Description	Pondaland Coastal
HGM unit type	Total of 562 wetlands mapped; Channelled Valley Bottom Wetlands: 36% Depression Wetlands: 28% Floodplain Wetlands: 1% Hillslope Seep Wetlands: 23% Unchannelled Valley Bottom Wetlands: 12%
PES per HGM unit type	Channelled Valley Bottom Wetlands - A/B: 31%; C: 41%; D/E/F: 28%. Depression Wetlands - A/B: 13%; C: 11%; D/E/F: 76%. Floodplain Wetlands - A/B: 57%; C: 29%; D/E/F: 14%. Hillslope Seep Wetlands - A/B: 37%; C: 25%; D/E/F: 38%. Unchannelled Valley Bottom Wetlands - A/B: 42%; C: 33%; D/E/F: 24%.
FEPA Wetlands	Multiple wetlands have been given FEPA status in IUA_T04 – predominantly for the fact that they are important crane breeding for feeding wetlands.
WRU	WRU 24 and WRU 25

3.11.1 WRU 24 – Sikombe and Xolobeni

Factor	Comment
WRUNumber(Quaternary Catchment)	WRU 24 (T60D)
Site Coordinates	31°11'6.716"S, 30°03'18.58"E
HGM Unit Type(s)	Channelled Valley-bottom Wetlands
Vegetation types	Indian Ocean Coastal Belt Group 3
Threat Status	**CHANNELLED VALLEY-BOTTOM**: LEAST THREATHENED
Strategic Water Source Area	No

Factor	Comment
Overview Map	 **Figure 3-26 Overview of the Sikombe and Xolobeni WRUs**
PES	

PES Summary	Sikombe	Xolobeni	Main impacts
Combined Impact Score	1.9	3.7	• Headcut erosional features • Water abstraction • Subsistence agricultural activities • Wood lots • Brick making
Combined PES Score (%)	80%	63%	
Combined Ecological Category	**B →**	**C ↓↓**	

<table>
<tr><th>Factor</th><th>Comment</th></tr>
<tr><td>EIS</td><td>
<table>
<tr><th></th><th colspan="2">Importance</th></tr>
<tr><th></th><th>Sikombe</th><th>Xolobeni</th></tr>
<tr><td>Ecological Importance & Sensitivity</td><td>3.3</td><td>3.0</td></tr>
<tr><td>Hydro-Functional Importance</td><td>3.0</td><td>2.4</td></tr>
<tr><td>Direct Human Benefits</td><td>1.4</td><td>1.8</td></tr>
<tr><td>Overall Importance and Sensitivity Score</td><td>3.3</td><td>3.0</td></tr>
<tr><td>Overall Importance and Sensitivity Category</td><td>B</td><td>B</td></tr>
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<tr><td>REC/BAS</td><td>
<table>
<tr><th></th><th>Sikombe</th><th>Xolobeni</th></tr>
<tr><td>REC</td><td>B</td><td>B</td></tr>
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</td></tr>
<tr><td>Preliminary management and mitigation measures.</td><td>Natural areas within the wetlands must be prevented from declining in extent. This will require proactively addressing factors which threaten to impinge on these natural areas.
There must be no expansion of tree plantations/wood lots or other impinging land-uses into the remaining natural areas of the wetlands or immediate buffer zones. While the extent of tree plantations in the wetland has remained unchanged over the years in the Xolobeni wetland, it is essential that there is no increase in extent in the wetlands or their immediate buffer zones, as more people become reliant on the wetland. Should the extent of plantation forestry/woodlots in the catchment areas beyond the wetland or buffers need to be increased, these should be subject to appropriate planning and authorisations.
Prevent any further expansion of IAP infestations in the wetland and its buffer, especially the Xolobeni wetland. If not effectively controlled, IAPs constitute one of the current threats to the remaining intact areas of wetland. Therefore, a long-term control plan with repeated follow ups must be followed. The current level of infestation of IAPs in the wetland and most of its buffer is encouragingly low. Given the potential impacts of these IAPs on this especially important and sensitive area of the wetland, they should be cleared as soon as possible.
Secure the Xolobeni wetland as a continuous water source, through the stabilisation of the headcut erosional feature. It is essential that the headcut erosional feature which has formed at the water pipeline and pump house in the Xolobeni wetland is stabilised. The further migration of the headcut will result in the loss of peatland through the desiccation of the wetland and thus threatening the communities water source.</td></tr>
</table>

Factor	Comment
	The management of sediment sources within the wetland. Several brickmaking sites were identified alongside and within the wetland habitat. The harvesting of sediment for the brickmaking should be carefully managed to ensure that extensive portions of habitat are not lost due to the harvesting and/or loss of sediment during rainfall events. **Explore options to institute wise-use grazing and farming practices in the wetlands.** Extensive **g**razing and the currently active agricultural practices in the wetlands pose a large threat to the wetland's integrity. It is acknowledged that livestock production and subsistence agriculture are currently an important source of subsistence and income generation for several households surrounding the wetlands. These uses contribute to the well-being of local households and there is, therefore, a need to support these activities, but simultaneously a need to promote and empower the adoption of sustainable management practices related to farming and livestock rearing practices. Existing guidelines such as WET-Sustainable Use (Kotze, 2010) can be used to assess the ecological sustainability of agricultural activities (cultivation, grazing and vegetation harvesting) within the wetlands, as well as make useful and actionable recommendations for sustaining the use of this WRU.
Monitoring Recommendations	The minimum requirements for monitoring: • Every 3-5 years, to repeat the WET-Health Level 1B assessment carried out in this baseline assessment, which was based primarily on land-cover types in the wetland and the areas of influence in its catchment. This recommended monitoring comprises desktop detection of land-cover change, particularly prior and following the rehabilitation of the Xolobeni wetland. Careful attention should be paid to the extent of the two major headcut features in the wetland while conducting this assessment. • Monitor the extent of the land use activities i.e., subsistence agricultural activities and plantation forestry/woodlots, to ensure these have not further expanded into the wetland and/or that the current practices are not detrimental to the wetland. • Extent of IAPs and removal efforts must be monitored and reviewed annually. • Rehabilitation interventions (which must be implemented as a matter of urgency within the Xolobeni wetland) should be reviewed in terms of maintenance requirements and ecological outcomes, including unintended negative outcomes, in accordance with WET-RehabEvaluate V2 (Walters et al. 2019). Should resources be available, the following are recommended to further increase the resolution of assessment: • A detailed flora assessment of the Sikombe wetland and surrounding habitat should be undertaken. It is understood that within the greater Sikombe area, there is a high plant species diversity. Thus, ideally, it needs to be understood whether this system is as biologically diverse and whether additional conservation efforts need to be given to the system and surrounding catchment.

3.11.2 WRU 25 – Ludeke Halt

Factor	Comment
WRUNumber(Quaternary Catchment)	WRU 25 (T60B)
Site Coordinates	30°50'58.96"S, 29°43'06.23"E
HGM Unit Type(s)	Hillslope seepage and channelled valley-bottom wetlands
Vegetation types	Sub-Escarpment Grassland Group 3
Threat Status	**SEEP**: CRITICAL, **CHANNELLED VALLEY-BOTTOM**: CRITICAL
Strategic Water Source Area	No

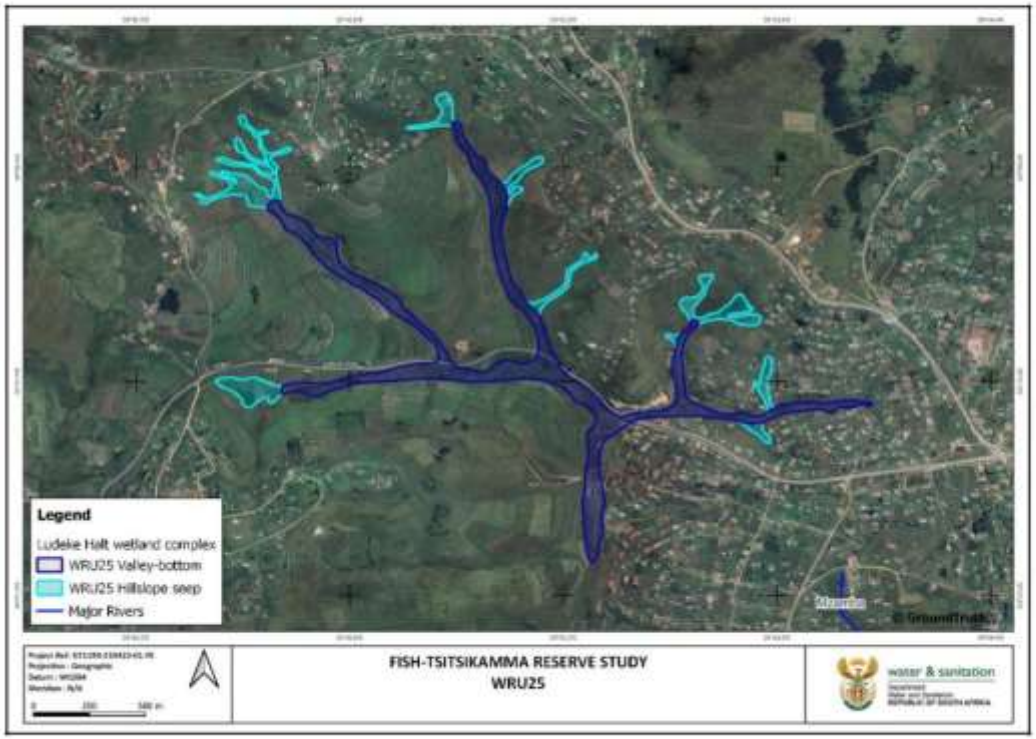
Factor	Comment
Overview Map	

Figure 3-27 Overview of the Ludeke Halt wetland complex

PES

PES Summary	Ludeke Halt	Main impacts
Combined Impact Score	4.4	• Mass crop production • Livestock grazing • Subsistence agriculture • Headcut erosional features • Brick making • Breeched dam
Combined PES Score (%)	56%	
Combined Ecological Category	**D →**	

EIS

	Importance
Ecological Importance & Sensitivity	2.6
Hydro-Functional Importance	2.4
Direct Human Benefits	1.4
Overall Importance and Sensitivity Score	**2.6**
Overall Importance and Sensitivity Category	**B**

REC/BAS

	Ludeke Halt	
REC	**C /**	**D**

Preliminary management and mitigation measures

Natural areas within the wetlands must be prevented from declining in extent. This will require proactively addressing factors which threaten to impinge on these natural areas.

There must be no expansion of residential developments or other impinging land-uses such as roads or agriculture into the remaining natural areas of the wetlands. While the extent of settlements and infrastructure within the wetlands is not currently large, the expansion of settlements, agricultural activities and road infrastructure are possible, especially given the rapidly increasing population and the demand for housing, infrastructure, and food. No further infrastructure should be permitted to be constructed within the wetland extent, and given the rarity of the wetland type, no further agriculture should be permitted within the wetland.

Explore options to institute wise-use grazing and farming practices in the wetlands. Extensive grazing and the currently active subsistence agricultural practices in the wetlands, and more commercial practices within the adjacent catchment pose a large threat to the wetland's integrity. It is acknowledged that livestock production and subsistence agriculture are currently an important source of subsistence and income generation for several households surrounding the wetland. These uses contribute

	to the well-being of local households and there is, therefore, a need to support these activities, but simultaneously a need to promote and empower the adoption of sustainable management practices related to farming and livestock rearing practices. Existing guidelines such as WET-Sustainable Use (Kotze, 2010) can be used to assess the ecological sustainability of agricultural activities (cultivation, grazing and vegetation harvesting) within the Ludeke Halt wetland, as well as make useful and actionable recommendations for sustaining the use of this system. **The management of sediment sources within the wetland**. Several brickmaking sites were identified alongside and within the wetland habitat. The harvesting of sediment for the brickmaking should be carefully managed to ensure that extensive portions of habitat are not lost due to the harvesting and/or loss of sediment during rainfall events. **Erosion threatening the wetland needs to be effectively controlled.** Although multiple erosional features exist within the wetland, none have actively advanced over recent years. However, they remain a potential threat to the wetland, particularly those that threaten intact wetland areas. If these erosion features were to advance, it is likely to result in direct habitat loss and desiccation of these wetland areas. The management and rehabilitation of these erosional features in the wetland would prevent the unnatural erosion and subsequent sedimentation within the wetland. As such, erosion control measures within the wetland must be explored. This could double as a local capacity building, awareness raising and income generating project for the local community through a programme like Working for Wetlands
Monitoring Recommendations	The minimum requirements for monitoring: • Every 3-5 years, to repeat the WET-Health Level 1B assessment carried out in this baseline assessment, which was based primarily on land-cover types in the wetland and the areas of influence in its catchment. This recommended monitoring comprises desktop detection of land-cover change, but with approximately 8 hours of field verification for the wetland. • Monitor the extent of the land use activities i.e. subsistence agricultural activities, to ensure these have not further expanded into the wetland and/or that the current practices are not detrimental to the wetland. • Extent of IAPs and removal efforts must be monitored and reviewed annually.

4. SUMMARY OF WORK COMPLETED AND WORK TO BE COMPLETED

Most of the relevant data for the wetland component of the Keiskamma, Fish to Tsitsikamma study are contained within the Wetland Eco-Categorisation Report (Report WEM/WMA7/00/CON/RDM/1223) and within this report. The process of WRU selection can be found in the RU Report (Report WEM/WMA7/00/CON/RDM/0422) and the results of the field survey can be found in the Wetland Field Survey Report (Report WEM/WMA7/00/CON/RDM/0522).

Ecological specifications, RQOs and the quantification of EWRs for prioritised WRU are to be included in the RQO, Numerical Limits and Confidence Report (Deliverable 4.3.24). Although Eco-specifications will be presented for all of the WRUs, not all of the wetland types have been selected for the quantification of EWRs for the wetlands, due to a number of factors. Upon the assessment of the various WRUs, each of the systems were reviewed in terms of the necessity and relevance of quantifying the EWRs and determining RQOs. Although numerical RQOs may not be available for all the WRUs, descriptive statements about biological, and physical attributes that characterise a WRU for the level of protection, will be presented in the above mentioned RQO Report. The considerations listed below have been incorporated into a decision support system which systematically guides an assessor through the process of deciding whether a WRU should receive an EWR quantification or not **(Figure 4-1)**. This process was applied to the seventeen WRUs assessed in this study – the results being that two WRUs were considered suitable candidates for low-confidence EWR quantifications to be undertaken, namely the Kromme Wetland (WRU 02) and the Mbokotwa Floodplain (WRU 21) – to be included in the RQO Report. This decision support system could be adapted to support the decision-making in other future wetland Reserve studies. This decision support system should be read in conjunction with the numbered items below which unpack the motivation for the quantification of EWRs for selected WRUs. These numbers correspond with the numbers in **Figure 4-1**.

1. As highlighted in the Wetland Field Survey Report (Report WEM/WMA7/00/CON/RDM/0522) the various WRUs were subjected to a tiered assessment approach, which was adopted by the team to prioritise the wetlands that could be visited during the fieldwork and to define the level of assessment and engagement that was going to be undertaken at each visited wetland. Two tiers were identified in which site visits and assessments for Tier 1 were of **moderate** intensity whilst Tier 2 were of **low** intensity. Therefore, any of the systems which fell within the Tier 2 level of intensity were excluded EWR quantification, as insufficient information/data would be available to allow for the development of EWRs at an accepted confidence level;
2. The hydrogeomorphic (HGM) unit type was a significant contributing factor in terms of prioritising systems for the derivation of EWRs, as only those systems supported by a stream/river could be considered, i.e., channelled valley-bottom and floodplain wetlands. Furthermore, WRUs that met the HGM unit type criteria but water and sediment inputs into the system were mostly sustained by lateral inputs (with limited inputs from the catchment upstream) were excluded. As a general rule this was considered appropriate where the upstream inputs were only considered to contribute approximately 30% of the hydrological, geomorphic and water quality inputs and functioning of the system. There are some cases where unchannelled valley-bottom wetlands are supported by river related flows. In cases

where an unchannelled valley-bottom or seep wetlands received greater than 70% of their hydrological inputs from river related flows, these systems were included for consideration for EWR quantification;

3. Anticipated drivers of change within the WRUs catchments were also considered, with detailed reviews/observations of the current land use practices within the catchments undertaken during the integrity assessments, including desktop mapping of these land uses. Where applicable, the historical imagery for the WRUs and their associated catchments was also reviewed to develop an understanding of the level of modification that has occurred within these systems in recent times. For the systems located in more rural areas, and in which the catchment land use practices have not significantly changed over time, developing EWR's was not considered as it unlikely that significant modifications to the systems will occur within the short- to medium-term;
4. Significant biodiversity (e.g. cranes or endangered species) and ecosystem assets (e.g. peat wetlands or significant areas of permanently saturated wetland) likely to be influenced by changes in stream flows were considered for these systems too, and any significant features that would be detrimentally influenced by reduced flows were considered in prioritising WRUs for the development of EWRs;
5. Location of the WRU in relation to its catchment, i.e., whether the system is located near the headwaters or further downstream was also considered, with systems located in the catchment's headwaters being considered less likely to be influenced by major flow altering activities e.g. a large water storage dam;
6. The number of landholdings/owners in relation to the upstream catchment and wetland was considered in prioritising WRUs for the development of EWRs. For example, should the upstream catchment be dominated by plantation forestry, which is under ownership by a single entity that is certified or legislatively bound under a certain mechanism which promotes environmental stewardship, it is less likely that challenges would emerge with access to water compared to a situation where a number of farms with irrigated croplands were located adjacent to or upstream of the wetland;
7. The level of overall degradation of the WRU, especially relating to in-system impacts on water distribution and retention was considered. Although some of the wetlands are largely degraded, the impacts contributing to the level of degradation can be partially mitigated through the adoption of some of the prescribed management and maintenance activities. However, other priority systems which are largely degraded might be locked in these altered states and EWR quantification would not serve to influence the long-term integrity or trajectory of change for the ecosystem. These latter systems, where no rehabilitation options are available, were excluded from development and quantification of the EWRs. Wetlands that have crossed into an alternate stable state, where significant and non-justifiable investment is required to rehabilitate them are considered as having little to no rehabilitation options available; and
8. Finally, the availability of any river related flow data from a nearby weir and/or previous studies also influenced the prioritisation process, as without such data, any quantities set for the system would be based on a number of assumptions and thereby, be considered of low confidence.

Table 4-1 provides a summary of the work completed to date and indicates the nature of the WRUs and the prioritisation of systems in terms of requirements for Eco-specifications, RQOs and/or EWR quantification.

Figure 4-1 Decision support system used to determine which WRUs would receive an EWR quantification and which systems would receive detailed ecological specifications and non-flow related RQOs.

Table 4-1 Summary of wetland work completed to date and work still outstanding

IUA	IUA Description	Quaternary catchment(s)	RU No.	HGM Unit Type	PES	EIS	REC	Degree of flow reliance	Need for management measures and objectives
IUA_K01	Tsitsikamma and headwaters of Kromme to Kromme Dam	K80A	W_RU01	Valley Bottom and Hillslope seep	C	B	C	While the wetlands rely predominantly on water inputs from the surrounding upstream catchment, the majority of their catchments are either plantation or natural forest and are unlikely to be developed or altered drastically.	Monitoring, mitigation and management recommendations have been made to prevent all further reductions in water inflows as well as to expand the buffer widths around the wetlands. No further recommendations were deemed necessary. Ecological specifications for this wetland complex will be made in the RQO report
				Valley Bottom and Hillslope seep	B	A	B		
		K90A	W_RU02	Valley-bottom	A	A	A	The Kromme wetland is reliant on both surface runoff and groundwater inputs. It is located in a catchment that could potentially be developed towards extensive agricultural use which may include the construction of dams and additional boreholes. It is also upstream of Churchill Dam which is an important irrigation and water supply dam.	Monitoring, mitigation and management recommendations have been made to prevent further reductions in water inflows. However, due to the sensitivity and importance of this wetland, and its reliance on in-stream hydrological inputs, a low confidence EWR quantification will be undertaken on the Kromme wetlands. RQO's and ecological specifications will be set for this wetland in the RQO report.
IUA_KL01	Kromme from Kromme Dam to estuary and Gamtoos	No priority wetlands identified for this study.						N/A	N/A
IUA_L01	Kouga to Kouga Dam, Baviaanskloof	L82D	W_RU03	Valley-bottom	D	A	C/D	The Krakeel wetland is reliant on surface runoff and may be reliant on groundwater inputs. It is in a catchment that is highly modified towards agricultural land uses, and most inflowing streams are extensively dammed. Additionally, there are several boreholes located within the catchment.	Monitoring, mitigation and management recommendations have been specified for this wetland complex, which include the characterisation of the hydrological functioning of the wetlands. Further RQO's and EWR quantification may be required if additional and significant developments are planned to occur within the catchment. Ecological specifications for this wetland complex will be made in the RQO report.
IUA_M01	M primary catchment	M10D	W_RU05	Floodplain	D	A	C	The Chatty River wetlands have been severely altered because of the urban development surrounding the wetlands – most of which cannot be undone. The most pressing and addressable issue for the Chatty River wetlands are related to water quality impacts to the wetlands.	Extensive management and monitoring recommendations have been made in the final wetland report. As per the cost-benefit analysis undertaken by Prime Africa, it is further recommended that the local Nelson Mandela Bay Municipality create a Chatty River wetland management plan which will detail the correct management approach for these wetlands and would include some level of water quality and water quantity monitoring. Ecological specifications will be specified in the RQO report.
				Channelled valley-bottom	D	A	C		
		M10B	W_RU04	Valley-bottom	C	A	B/C	Whilst the wetlands rely predominantly on water inputs from the surrounding upstream catchment, most of their catchments are either plantation or natural forest and are unlikely to be developed or altered drastically. Additionally, the Longmore wetland complex lies within the headwaters of the Van Stadens River and is therefore not reliant on extensive in-stream flows	Extensive management and monitoring recommendations have been made to prevent all further reductions in water inflows as well as to expand the buffer widths around the wetlands. Ecological specifications will be specified for this WRU in the RQO report.
IUA_LN01	Groot to Kouga confluence, Upper Sundays to Darlington Dam	L21D	W_RU06	Hillslope seep	B	B	B	This wetland complex is thought to rely on groundwater connection to a large degree. Multiple boreholes were observed near the Sneeuberg wetlands, or within their catchments and it would be useful to understand the relative reliance of these wetlands on groundwater inputs.	Management and monitoring recommendations have been made. Ecological specifications will be specified for this WRU in the RQO report.
				Valley-bottom	C	B	C		

IUA	IUA Description	Quaternary catchment(s)	RU No.	HGM Unit Type	PES	EIS	REC	Degree of flow reliance	Need for management measures and objectives
IUA_N01	Sundays downstream Darlington Dam	No priority wetlands identified for this study.						N/A	N/A
IUA_P01	P primary catchment	No priority wetlands identified for this study.						N/A	N/A
IUA_Q01	Upper Fish	Q22A	W_RU27	Hillslope seep	B	B	B	These wetlands are located within a remote catchment that is unlikely to receive intense and large-scale development.	Management and mitigation measures have been provided in the final wetland report along with basic monitoring requirements. Ecological specifications for this wetland complex will be made in the RQO report
				Valley-bottom	C	B	C		
IUA_Q02	Great Fish	Q43A, Q43B	W_RU10	Valley-bottom	B	A	A/B	The water inputs into these systems are predominantly from the upstream catchment – as is evident by the sediment accumulation upstream of the interventions/structures which have led to the formation of 'artificial' wetland habitat. Based on a review of the historical imagery, the landscape has remained relatively unchanged over the last several decades.	Management and mitigation measures have been provided in the final wetland report to prevent further degradation of the natural veld. In addition, both catchment and in-system monitoring requirements have been presented. Ecological specifications for this wetland complex will be made in the RQO report
IUA_Q03	Koonap and Kat	No priority wetlands identified for this study.						N/A	N/A
IUA_R01	Keiskamma	No priority wetlands identified for this study.						N/A	N/A
IUA_R02	Buffalo/ Nahoon	R20E	W_RU15	Floodplain	C	B	C	The water inputs into this wetland are predominantly from the upstream catchment and would naturally have originated from overbank flooding. However, some incision of the channels within the floodplain has resulted in the loss of the ability to act as a floodplain and the wetland areas are now predominantly supported by lateral inputs. This floodplain wetland is located within a relatively rural area, and it is unlikely that there will be extensive development within the wetland or catchment.	Management, mitigation, and monitoring recommendations have been provided in the final wetland report. Additional monitoring recommendations which relate to monitoring the impacts of grazing have additionally been made. Ecological specifications will be included in the RQO report.
		R20D	W_RU26	Valley-bottom and Hillslope seep	C	B	C	This wetland complex is fed by a combination of surface inflows and groundwater inputs. While it is unlikely that there will be significant development within the wetland or catchment, if there is a significant proliferation of groundwater abstraction within the region, there could be significant negative impacts on the hydrology of the wetland.	Management, mitigation, and monitoring recommendations have been provided in the final wetland report. Additional monitoring recommendations which relate to monitoring the impacts of grazing have additionally been made. Ecological specifications will be included in the RQO report.
IUA_S01	Upper Great Kei	S50E	W_RU18	Valley-bottom	C	B	B	The seeps and valley-bottom wetlands are dominated by lateral inputs versus upstream flows. The likelihood of any substantial degradational development occurring within the catchment is considered to be unlikely. The likely anticipated changes to the catchment include the establish of a few more houses and the associated subsistence agricultural activities. These activities are generally not considered to be massive flow reduction activities.	Management, mitigation, and monitoring activities have been presented in the final wetland report. Ecological specifications for this wetland complex will be made in the RQO report.
				Hillslope seep	C	B	B		
		S50C	W_RU21	Floodplain	D	A	C/D	The hydrological inputs into the main floodplain system are largely from the catchment and are related to overbank flooding. There have been several modifications to the system including storage dams and diversion canals. It has been assumed that these	Management, mitigation, and monitoring recommendations have been provided in the final wetland report. Additional monitoring recommendations have been presented should resources be available. The additional monitoring is mostly associated with the

IUA	IUA Description	Quaternary catchment(s)	RU No.	HGM Unit Type	PES	EIS	REC	Degree of flow reliance	Need for management measures and objectives
								activities have been authorised and that some level of quantification was considered during the application process. Any additional modifications to the flows within the system should be carefully considered into the future.	inflows, throughflows and outflows of the wetland, and the monitoring of the main channel to ensure the ecological integrity of the main channel has not been compromised by the offtake channel. Further RQO's and EWR quantification may be required if additional and significant developments are planned to occur within the catchment. Ecological specifications for this wetland complex will be made in the RQO report.
IUA_S02	Black Kei	S32D	W_RU13	Hillslope seep	C	A	B/C	The wetland complex is located within active forestry and agricultural lands both of which have the potential to expand. The floodplain wetland is sensitive to changes in flood peaks and the seep wetlands are sensitive to changes in groundwater abstraction (and are home to the endangered Amathole Toad). However, extensive lateral hydrological inputs contribute a significant volume of water to the floodplain wetland. Additionally, this wetland is located in the headwaters of the Klipplaat River such that the wetlands do not rely extensively on river-related flows.	Extensive management recommendations have been made in the final wetland report, along with extensive monitoring recommendations. However, to understand the current hydrological regimes of these wetlands and the potential impacts of further plantation or agriculture in the landscape, further studies have been recommended. Ecological specifications will be compiled in the RQO report.
				Hillslope seep (degraded)	D	B	D		
				Channelled valley-bottom	C	B	B/C		
				Floodplain	C	B	B/C		
		S32E	W_RU12	Unchannelled valley-bottom and seep	B	A	B	The wetland complex is located on communally owned land that is predominantly used for grazing and small subsistence agriculture. However, given the importance of these wetlands as being potential Amathole Toad breeding sites, any activities in the catchments of these wetlands would need to be carefully considered for authorisation.	Extensive management recommendations have been made in the final wetland report, along with extensive monitoring recommendations. However, to understand the hydrological regimes of these wetlands and the potential impacts of any development in the landscape, an EWR quantification is recommended if any development is proposed in the landscape. Ecological specifications for this wetland complex will be made in the RQO report
IUA_S03	Lower Great Kei	No priority wetlands identified for this study.						N/A	N/A
	UpperMbashe, Upper Mthatha			Hillslope seep (tributaries)	D	C	C/D	The seeps and valley-bottom wetlands are supported by lateral flows, whilst the main floodplain systems are maintained by both upstream inputs and lateral inputs. Unless there are substantial changes earmarked for the catchment, it is unlikely that a Reserve study would be required. The greatest threat to the wetlands is linked to water quality i.e., discharge of raw sewage into the wetlands	Management and mitigation recommendations for the system have been presented in the final wetland report. These largely focus on the management of water quality within the broader system due to this being one of the main degradational components to the broader system. Furthermore, monitoring requirements have been presented, with the recommendation of undertaking more detailed monitoring should the resources be available. Further RQO's and EWR quantification may be required if additional and significant developments are planned to occur within the catchment. Ecological specifications will be included in the RQO report for this WRU.
IUA_T01		T11A	W_RU22	Floodplain (east)	D	A	C/D		
				Channelled valley-bottom (west)	D	A	C		
				Floodplain (upper)	E	A	D		
				Floodplain (lower)	C	A	B		
IUA_T02	Lower Mbashe	No priority wetlands identified for this study.						N/A	N/A
IUA_T03	Lower Mthatha	No priority wetlands identified for this study.						N/A	N/A
IUA_T04	Pondoland coastal	T60D	W_RU24	Channelled valley-bottom	B	B	B	Based on the evidence of the sediment inputs in the Sikombe wetland, a large portion of the flows are catchment related versus lateral, which stands true for the Xolobeni system, too. It is anticipated that the changes to the catchment conditions will be mostly	Management, mitigation and monitoring recommendations have been presented in the final wetland report. The most urgent recommendation is the stabilisation of the headcut erosion within the Xolobeni wetland, which is associated with the abstraction point.
				Channelled valley-bottom	C	B	B		

IUA	IUA Description	Quaternary catchment(s)	RU No.	HGM Unit Type	PES	EIS	REC		Degree of flow reliance	Need for management measures and objectives
									linked to increased number of households and the associated subsistence farming, and thus an EWR is not required. However, should there be a greater reliance on the systems in terms of the abstraction of water, an EWR may be considered.	The monitoring of the systems and their associated catchments should be regularly undertaken to confirm whether further RQO's and EWR's are required. Ecological specifications for this wetland complex will be made in the RQO report.
		T60B	W_RU25	Valley-bottom and seep	D	B	C/	D	Both the seeps and valley-bottom wetlands are dominated by lateral inputs. The anticipated changes to the system in the short to medium term are associated with the expansion of the houses within the catchment and the associated agricultural activities. These activities are generally not considered to be massive flow reduction activities.	Management, mitigation and monitoring activities have been presented in the final wetland report. Ecological specifications for this wetland complex will be made in the RQO report.

5. SUMMARY AND CONCLUSION

Seventeen systems have been identified as being important water resources within the Keiskamma and Fish to Tsitsikamma catchments, due to the combination of either size, integrity, locality, forming part of a Strategic Water Source Area, biodiversity considerations, and/or the direct and indirect benefits derived from these systems. The assessment of the selected WRUs highlighted these systems as being critically important to maintain within the landscape, although the majority of these have been modified through both current and historic anthrophonic activities. Some of these impacts on the system are, in theory, easily reversible (e.g., surcharging manholes), whilst other impacts are reliant on significant investment both financially and cooperatively between government entities and the landowner/s. Nonetheless, the preliminary management and mitigation measures that have been prescribed are activities that would contribute to the overall improvement of the systems ecological condition. Improving their present state, will not only improve the benefits derived from these systems and associated catchments, but also reduce the cost to society, e.g., reduced water purification costs due to improved water quality. As such, securing and protecting these wetlands from further degradation is crucial for water security in a water stressed country like South Africa, particularly as the demand for clean, potable water increases.

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