



water and sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Classification of Significant Water Resources and Determination of Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments

INCEPTION REPORT



FINAL
March 2022

Department of Water and Sanitation
Chief Directorate: Water Ecosystem Management

PROJECT NUMBER: WP 11387

INCEPTION REPORT

CLASSIFICATION OF SIGNIFICANT WATER RESOURCES AND DETERMINATION OF RESOURCE QUALITY OBJECTIVES FOR WATER RESOURCES IN THE USUTU TO MHLATHUZE CATCHMENTS

MARCH 2022

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REPORT SCHEDULE

Index Number	DWS Report Number	Report Title
1	WEM/WMA3/4/00/CON/CLA/0122	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Inception Report including Gap Analysis chapter
2	WEM/WMA3/4/00/CON/CLA/0222	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Status Quo and Delineation of Resource Units and Integrated Units of Analysis Report
3	WEM/WMA3/4/00/CON/CLA/0322	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Resource Units Prioritization Report
4	WEM/WMA3/4/00/CON/CLA/0422	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Hydrology Systems Analysis Report
5	WEM/WMA3/4/00/CON/CLA/0522	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: River EWR estimates for Desktop Biophysical Nodes Report
6	WEM/WMA3/4/00/CON/CLA/0622	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: River Survey Report
7	WEM/WMA3/4/00/CON/CLA/0722	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Basic Human Needs Report
8	WEM/WMA3/4/00/CON/CLA/0822	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Groundwater Report
9	WEM/WMA3/4/00/CON/CLA/0922	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: River specialist meeting Report
10	WEM/WMA3/4/00/CON/CLA/1022	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Estuary Survey Report
11	WEM/WMA3/4/00/CON/CLA/1122	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Wetland Report
12	WEM/WMA3/4/00/CON/CLA/1222	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Ecological Water Requirements Report
13	WEM/WMA3/4/00/CON/CLA/1322	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Scenario Description Report
14	WEM/WMA3/4/00/CON/CLA/0123, volume 1	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Ecological Consequences Report, Volume 1: Rivers
	WEM/WMA3/4/00/CON/CLA/0123, volume 2	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Ecological Consequences Report, Volume 2: Estuaries

Index Number	DWS Report Number	Report Title
15	WEM/WMA3/4/00/CON/CLA/0323	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Ecosystem Services Consequences Report
16	WEM/WMA3/4/00/CON/CLA/0423	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Economic & User water quality Consequences Report
17	WEM/WMA3/4/00/CON/CLA/0523	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Water Resource Classes Report
18	WEM/WMA3/4/00/CON/CLA/0623, volume 1	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Resource Quality Objectives Report, Volume 1: Rivers
	WEM/WMA3/4/00/CON/CLA/0623, volume 2	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Resource Quality Objectives Report, Volume 2: Estuaries
	WEM/WMA3/4/00/CON/CLA/0623, volume 3	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Resource Quality Objectives Report, Volume 3: Wetlands and Groundwater
19	WEM/WMA3/4/00/CON/CLA/0723	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Monitoring and Implementation Report
20	WEM/WMA3/4/00/CON/CLA/0124	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Main Report
21	WEM/WMA3/4/00/CON/CLA/0224	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Issues and Responses Report
22	WEM/WMA3/4/00/CON/CLA/0324	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Close out Report

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APPROVAL

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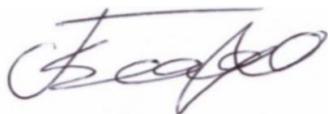
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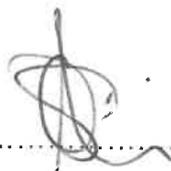
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EXECUTIVE SUMMARY

BACKGROUND

Chapter 3 of the National Water Act, 1998 (NWA) (Act 36 of 1998), deals with the protection of water resources. Section 12 of the NWA requires the Minister to develop a system to classify water resources. In response to this, the Water Resource Classification System (WRCS) was gazetted on 17 September 2010 and published in Government Gazette 33541 as Regulation 810. Once significant water resources have been classified through the WRCS, Resource Quality Objectives (RQOs) have to be determined to give effect to the class.

Thus, the Chief Directorate: Water Ecosystems Management (CD: WEM) of the Department of Water and Sanitation (DWS) initiated a study for determining the Water Resource Classes and Resource Quality Objectives (RQOs) in the Usutu to Mhlathuze Catchment. The Usutu to Mhlathuze Catchments are amongst many water-stressed catchments in South Africa. These catchment areas contain a number of protected areas, natural heritage sites, cultural and historic sites and other conservation areas that need protection. There are five RAMSAR sites within the study area, including the world heritage site, St Lucia, Lake Sibaya, Kosi Bay, Ndumo Game Reserve and Turtle Beaches.

STUDY AREA

The study area, the Usutu to Mhlathuze Catchment has been divided into six drainage regions and secondary catchment areas as follows:

- W1 catchment (main river: Mhlathuze);
- W2 catchment (main river: Umfolozi);
- W3 catchment (main river: Mkuze);
- W4 catchment (main river: Pongola) - part of this catchment area falls within eSwatini;
- W5 catchment (main river: Usutu) - much of this catchment falls within eSwatini; and
- W7 catchment (Kosi Bay estuary and Lake Sibiya)

The catchments included in the study area provide water resources to a number of urban and industrial users. Richards Bay (and surrounding towns), Vryheid, Nongomo, Pongola and Piet Retief are the main urban-rural domestic users. Richards Bay Minerals, Tronox, Foskor and Mondi are some of the main industrial users. Major irrigation schemes such as Nkwalini, Heatonville and the Impala Irrigation Boards are located within the study area. Furthermore, large transfers are made from the Usutu catchment to Eskom from the major dams of Heyshope, Jericho, Westoe and Morgenstond.

PROJECT STRUCTURE

The Usutu-Mhlathuze study will be managed according to the following project plan which is based on the Integrated Steps when undertaking Classification and the RQOs as well as addressing Ecological Water Requirements (EWRs) and the Basic Human Needs requirements (BHN) (DWS 2016c and 2017). The following steps form the tasks which are the basis of the project plan.

- Describe status quo and delineate the study area into Integrated Units of Analysis (IUAs)
- Delineate and prioritise Resource Units and select study sites.
- Quantify BHN and EWRs
- Identify and evaluate scenarios within Integrated Water Resources Management (IWRM)

- Determine Water Resource Classes (referred to as Classes in this document) based on catchment configurations for the identified scenarios.
- Determine Resource Quality Objectives (narrative and numerical limits) and provide implementation information.
- Gazette Water Resource Classes and RQOs.

STRUCTURE OF THE REPORT

The report outlines the tasks to be conducted as part of the Usutu-Mhlathuze Classification and Resource Quality Objectives study, including deliverable dates and task responsibilities. Chapter 1 provides a context to the study area, while Chapter 2 outlines any gaps encountered during preparation of this document.

Chapters 3, 4 and 5 deal with the scope of works for Project Management related activities, the technical work and capacity building and mentorship respectively. Chapters 6 and 7 show the study programme and team. References are listed in Chapter 8. The report is supported by Appendices documenting more detailed information.

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Appendix A: DETAILED LITERATURE REVIEW TABLE FOR HYDROLOGY AND WATER RESOURCES

Appendix B: MENTORSHIP PROGRAMME

Appendix C: STAKEHOLDER ENGAGEMENT PLAN

Appendix D: COMMENTS AND RESPONSE REGISTER

TERMINOLOGY AND ACRONYMS

BHN	Basic Human Needs
BID	Background Information Document
CAs	Conservation Areas
CD: WEM	Chief Directorate: Water Ecosystems Management
CMA	Catchment Management Agency
DFFE	Department of Forestry, Fisheries and the Environment
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EC	Ecological Category
EcoSpecs	Ecological Specifications
EFZ	Estuarine Functional Zone
EGIM	Enterprise Geospatial Information Management
EGIS	Environmental geographic information system
EI	Ecological Importance
EIS	Ecological Importance and Sensitivity
EWR	Ecological Water Requirements
GIS	Geographic Information System
GRAII	Groundwater Resource Assessment Phase II
GRU	Groundwater Resource Unit
HGM	Hydrogeomorphic
IRR	Issues and Responses Report
IUA	Integrated Unit of Analysis
IUCMA	Inkomati-Usutu Catchment Management Agency
IWRM	Integrated Water Resource Management
MPAs	Marine Protected Areas
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Area
NGO	Non-Governmental Organization
NWM5	National Wetland Map (version) 5
PACA	Protected and Conservation Areas Database
PAs	Protected Areas
PES	Present Ecological State
PES/EI/ES	Present Ecological State, Ecological Importance and Ecological Sensitivity
PMC	Project Management Committee
PMT	Project Management Team
PSC	Project Steering Committee
PSP	Professional Service Provider
RDM	Resource Directed Measures
REC	Recommended Ecological Category
RGDP	Regional Gross Domestic Product
RGM	Reference Group Meetings
RQO	Resource Quality Objectives
RU	Resource Unit
SAIIAE	South African Inventory of Inland Aquatic Ecosystems

SAM	Social Accounting Matrix
SAWS	South African Weather Service
SCI	Socio-Cultural Importance
SEP	Stakeholder Engagement Plan
SMME	Small, Medium and Micro Enterprise
SQR	Sub Quaternary Reach
SWSA	Strategic Water Source Area
SWSA-gw	Strategic Water Source Area - groundwater
SWSA-sw	Strategic Water Source Area – surface water
TEC	Target Ecological Category
TOR	Terms of Reference
TTT	Technical Task Team
WARMS	Water use Authorization & Registration Management System
WMA	Water Management Area
WRCS	Water Resource Classification System
WRP	WRP Consulting Engineers
WRPM	Water Resource Planning Model
WRSM2000	Water Resources Simulation Model 2000.
WRUI	Water Resource Use Importance
WRYM	Water Resource Yield Model
WSA	Water Source Area

GLOSSARY

<i>Ecological Water Requirements (EWR)</i>	The flow patterns (magnitude, timing and duration) and water quality needed to maintain a riverine ecosystem in a particular condition. This term is used to refer to both the quantity and quality components.
<i>Integrated Unit of Analysis (IUAs)</i>	An IUA is a homogeneous area that can be managed as an entity. It is the basic unit of assessment for the Classification of water resources, and is defined by areas that can be managed together in terms of water resource operations, quality, socio-economics and ecosystem services.
<i>Resource Quality Objectives (RQOs)</i>	RQOs are numeric or descriptive goals or objectives that can be monitored for compliance to the Water Resource Classification, for each part of each water resource. “The purpose of setting RQOs is to establish clear goals relating to the quality of the relevant water resources” (NWA, 1998).
<i>Scenario</i>	Scenarios, in the context of water resource management and planning, are plausible definitions (settings) of factors (variables) that influence the water balance and water quality in a catchment and the system as a whole. Each scenario represents an alternative future condition, generally reflecting a change to the present condition.
<i>Sub-quaternary reaches (SQR)</i>	A finer subdivision of the quaternary catchments (the catchment areas of tributaries of main stem rivers in quaternary catchments), to a sub-quaternary reach or quinary level.
<i>Target Ecological Category (TEC)</i>	This is the ecological category toward which a water resource will be managed once the Classification process has been completed and the Reserve has been finalised. The draft TECs are therefore related to the draft Classes and selected scenario.
<i>Water Resource Class</i>	The Water Resource Class (hereafter referred to as Class) is representative of those attributes that the DWS (as the custodian) and society require of different water resources. The decision-making toward a Class requires a wide range of trade-offs to be assessed and evaluated at a number of scales. Final outcome of the process is a set of desired characteristics for use and ecological condition of the water resources in a given catchment. The WRCS defines three management classes, Class I, II, and III, based on extent of use and alteration of ecological condition from the predevelopment condition.

1 INTRODUCTION

1.1 BACKGROUND

Chapter 3 of the National Water Act, 1998 (NWA) (Act 36 of 1998), deals with the protection of water resources. Section 12 of the NWA requires the Minister to develop a system to classify water resources. In response to this, the Water Resource Classification System (WRCS) was gazetted on 17 September 2010 and published in Government Gazette 33541 as Regulation 810. The Water Resource Classification System is a step-wise process whereby water resources are categorised according to specific classes that represent a management vision of a particular catchment. This vision takes into account the current state of the water resource, the ecological, social and economic aspects that are dependent on the resource. Once significant water resources have been classified through the WRCS, Resource Quality Objectives (RQOs) have to be determined to give effect to the class. The implementation of the Water Resource Classification System therefore assesses the costs and benefits associated with utilisation versus protection of a water resource. Section 13 of the NWA requires that Water Resource Classes and RQOs be determined for all significant water resources.

Thus, the Chief Directorate: Water Ecosystems Management (CD: WEM) of the Department of Water and Sanitation (DWS) initiated a study for determining the Water Resource Classes and Resource Quality Objectives in the Usutu to Mhlathuze Catchment. According to the Terms of Reference (TOR), the Usutu to Mhlathuze Catchments are amongst many water-stressed catchments in South Africa. These catchment areas are important for conservation and contain a number of protected areas, natural heritage sites, cultural and historic sites and other conservation areas that need protection. There are five RAMSAR¹ sites within the catchment, which includes the world heritage site, St Lucia. The others are Sibaya, Kosi Bay, Ndumo Game Reserve and Turtle Beaches.

The purpose of this Inception Report is to outline the methodology that will be undertaken to address the objectives of the Study. The original TOR, submitted proposal, discussions held during the Contract negotiation phase as well as additional information sourced as part of the Inception Phase, have all been used in preparation of the Inception Report. The aim of this document is to provide a reference for the Study in order to gain an understanding between the Client and the Professional Service Provider (PSP) as to how the Study will commence.

1.2 STUDY AREA

1.2.1 Location

The study area is the Usutu to Mhlathuze Catchment that has been divided into six drainage areas and secondary catchment areas as follows (**refer to the locality map provided as Figure 1.1**):

- W1 catchment (main river: Mhlathuze);
- W2 catchment (main river: Umfolozi);
- W3 catchment (main river: Mkuze);
- W4 catchment (main river: Pongola) - part of this catchment area falls within eSwatini;
- W5 catchment (main river: Usutu) - much of this catchment falls within eSwatini; and
- W7 catchment (Kosi Bay estuary and Lake Sibiya)

¹ A Ramsar site is a wetland site designated to be of international importance under the Ramsar Convention, also known as "The Convention on Wetlands", an intergovernmental environmental treaty established in 1971 by UNESCO in the Iranian city of Ramsar, which came into force in 1975.

Note that all assessments within eSwatini are excluded apart from the hydrological modelling required to assess any downstream rivers in South Africa that either run through eSwatini or originate (source) in eSwatini.

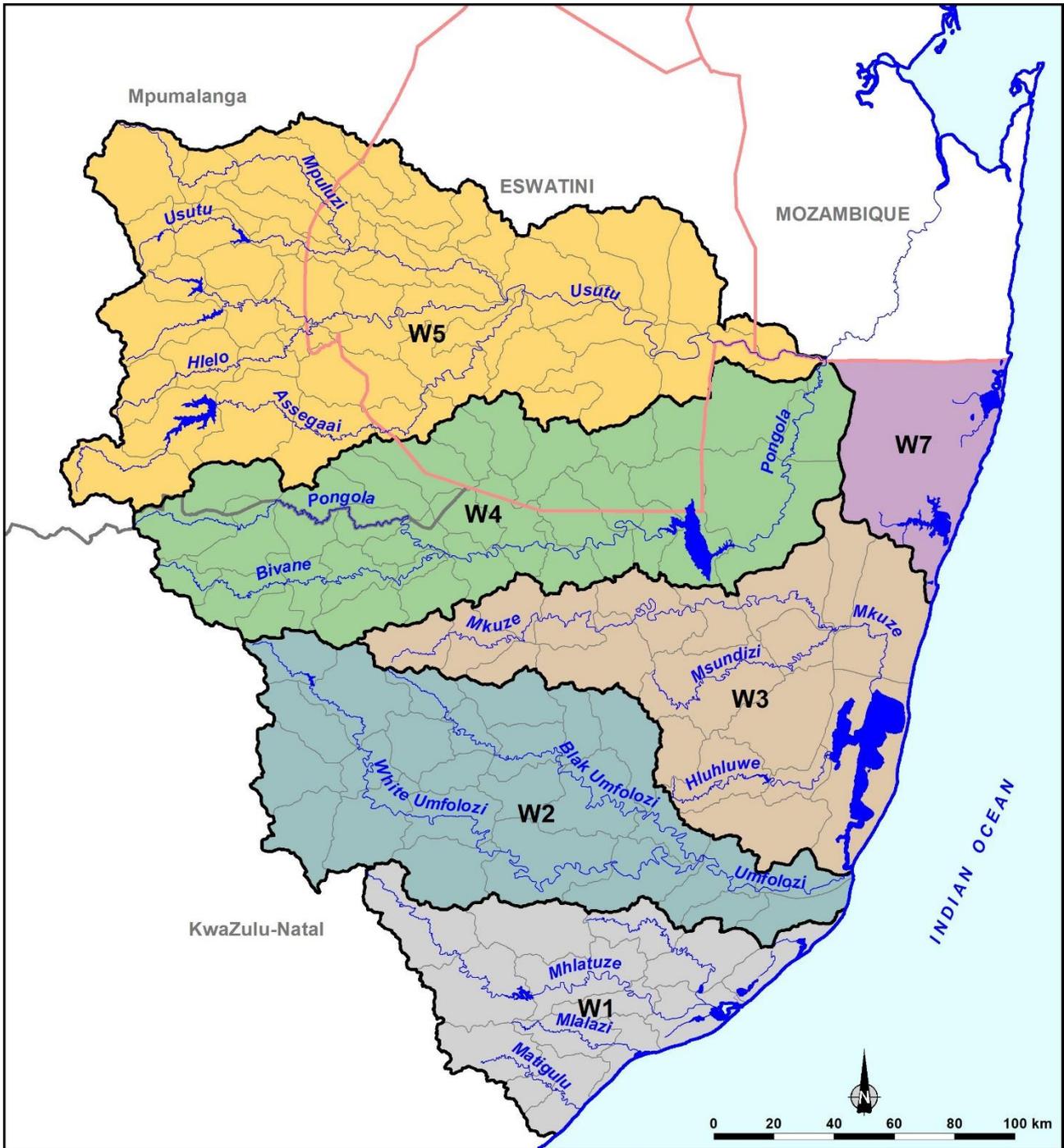


Figure 1.1 Locality Map of the Study Area

1.2.2 Catchment overview

A general overview of the secondary rivers, sub-catchments, users and key infrastructure is provided in **Table 1-1**. It should be noted that, all the relevant details are currently being sourced, and will be presented in the second report deliverable of the Study, namely the status quo report.

Table 1-1: Overview of Study Area

Component	W1	W2	W3	W4	W5	W7
Primary Rivers	Mhlathuze, Mlalazi, Matigulu	Umfoloji	Mkuze, Hluhluwe	Pongola	Usutu	-
Secondary Rivers	Mfule	Black Umfolozi, White Umfolozi	Msunduzi	Bivane	Assegaai, Hlelo, Mpuluzi	-
Minor Rivers	Gologodo Kondweni kuMnyameni KwaGugushe KwaMazula Manzamnyama Mateku Mavungwini Mbabe Mfulazane Mhlatuzana Mhtatuzana Mkukuze Mpisini Mposa Mzingwenya Ngoje Nhlabane Nhlozane Nseleni Ntambanana Nundwane Nyawushane Nyezane Nyoni Okula uMngwenya	aMagoda Bululwana Hlangabende Hlonyana Hlonyane iShoba iThaka Jojosi KwaMbizankulu Lenjane Manzimakulu Maphophoma Mapopoma Mavuya Mayayeni Mbhekamuzi Mbilane Mbukwini Mgobhozi Mhlahlane Mkumbane Mona Mpembeni Msunduzi Munywana Mvalo Mvamanzi Mvunyane Mzinhlanga Ngwebini Nhlungwane	Hlazane Khobeyane KwaSekane Mansiya Manzabomvu Manzimhlope Masundwini Mduna Mhlosinga Mnyaba Mpate Mpuphisi Msebe Mthambalala Mtiki Munywana Mzinene Ndlamyane Neshe Ngweni Nhlohlela Nkongolwana Nkunzana Nsane Nsumu Ntutshe Ntweni Nyalazi Nzimane Sihlengeni Sikhathula	Bazangoma Gode iNxwayi iThalu KwaCeba Lubambo Mangqwashi Manzana Manzawakho Mbizane Mdlavenga Mfongosi Mhulumbela Mlambo Mnloni Mozana Mpemvana Mpontshane Msunduzi Mtokotshwala Ngwavuma Ntombe Pandana Soetmelks Spekboom Tsakwe uBivanyana uMsunduzi Voyizana Wit Zibayeni	Anysspruit Blesbokspruit Boesmanspruit Bonnie Brook Klein-Assegaai Lusushwana Majosie se Vlei Metula Mhkondvo Mpama Ndlozane Ngulane Ngwempisi Sandspruit Seganagana Swartwater Swartwaterspruit Thole Tweelingspruit	Swamanzi Malangeni

Component	W1	W2	W3	W4	W5	W7
		Nkatha Nondweni Nsubeni Ntenja Ntinini Ntobozi Sandspruit Sikwebezi Vumankala Vuna Vuwankala Wela	Wela			
Catchment size (km²)	5 661	10 008	9 545	11 714	16 697 (incl. eSwatini portion)	2589
No. Quaternary Catchments	14	26	19	32	47	1
Main Water Resources infrastructure	Goedertrouw Dam Mhlathuze weir Eshowe Dam Rutledge Dam Lake Nsezi Lake Mzingazi Lake Cubhu	Klipfontein Dam Blomveld Dam Grootgewacht Dam Vuna Dam Vokwena Dam	Hluhluwe Dam Blackie Dam	Pongolapoort Dam Bivane Dam Edumbe Dam	Heyshope Dam Jericho Dam Westoe Dam Morgenstond Dam Churchill weir	Lake Sibiya
Main Urban-domestic abstraction	Richards Bay Empangeni Nseleni. Ngwelezane Esikhaleni Eshowe Mtunzini Gingindlovu Melmoth Nkandla	Vryheid Emondli Ulundi Nongoma Ceza Mpungamhlope Matubatuba	Hluhluwe Mkuze Ubombo Mandlakazi	Paul Pietersburg Pongola Simdlangentsha West Simdlangentsha Esst Khiphunyano Msibi Belgrade Shemula Jozini Malobeni	Amsterdam Piet Retief Iswepe Empuluzi Lushushwane	Mbazwane Mseleni Manguzi
Main Industrial use	Richards Bay Minerals Tronox Foskor Mondi	Richards Bay Minerals			Mpact	

Component	W1	W2	W3	W4	W5	W7
	Tongaat Mpact					
Main irrigators	Nkwalini Heatonville Mfule Lower Mhlathuze		Charl Senekal	Impala IB Sibuyele Ekhaye Trust Umjindi Farming		
Key Transfers	Transfer in from Thukela				Transfer out to Eskom	

1.2.3 Socio-economic overview

The study area is a large and diverse component of the south-eastern portion of SA. The economic land use profile includes significant amounts of the area given over to the Ingonyama Trust. Some of these areas are rural in nature with subsistence agriculture as an important component. Other parts of Ingonyama are given over to closer settlement. These areas are probably heavily dependent on the state for social security grants. The area includes commercial farming with sugar cane and timber as key products being produced. Sugar mills that process the cane are a major industrial part of the economy, as are paper-manufacturing plants. The main industrial hub in the study area is the Richards Bay – Empangeni axis. Mining is also present in the area with a number of mines scattered around mineral resources. Tourism plays a role with a number of state-owned and private nature reserves and expanses of beach that attract both local and international tourists. From a cultural and heritage perspective the area serves as the birthplace of the Zulu nation and is home to areas of high cultural and historical importance.

The accessibility for transporting of sugar cane and other products to the mills and then to the harbour is of major importance to the economic existence of the study area. The economic growth of the Usutu to Mhlathuze Catchment stems from the decision to build a deep-water port at Richards Bay in the 1970s, and to construct an extensive rail and road infrastructure to access the area. The availability of infrastructure and water led to the establishment of a number of large industries such as the Hillside Aluminium Smelters, Richards Bay Coal Terminal, Richards Bay Minerals, Mondi Pulp mills, Indian Ocean Fertilisers, Bell Equipment, and the Felixton Sugar mill; one of the largest in the country.

1.2.4 Strategic Water Source Areas

Water Source Areas (WSAs) are *natural* places or areas, such as water catchments, which produce disproportionately greater volumes of water per unit area than other areas. The SWSAs-sw (surface water) are all located in high rainfall areas where baseflow is at least 11-25 mm/a, evidence of a strong link between groundwater and surface water. The aquifers are sustaining baseflow, contributing to runoff and especially to dry season flows (Le Maitre *et al.*, 2018a).

SWSAs are therefore sub-sets of WSAs and defined as areas of land that either (a) supply a disproportionate (i.e. relatively large) quantity of mean annual surface water runoff in relation to their size and so are considered nationally important, or (b) have high groundwater recharge and where the groundwater forms a nationally important resource, or (c) areas that meet both criteria (a) and (b). They are vital for water and food security in South Africa and also provide the water used in generating most of the electricity. SWSAs include transboundary WSAs that extend into Lesotho and eSwatini (Le Maitre *et al.*, 2018a). **Figure 1.2** shows the SWSAs defined for the three countries.

Twenty-two Strategic Water Source Areas for surface water (SWSA-sw) have been delineated as significant at a national level, and a further nine at a sub-national level. The SWSAs were found to represent just 8% of the land area in South Africa, Lesotho and Swaziland, but produced 50% of its mean annual surface run-off (Nel *et al.*, 2013). Documentation for identification, delineation and importance (including groundwater SWSAs), and a management framework and implementation guidelines were published in 2018 (Le Maitre *et al.*, 2018a and b).

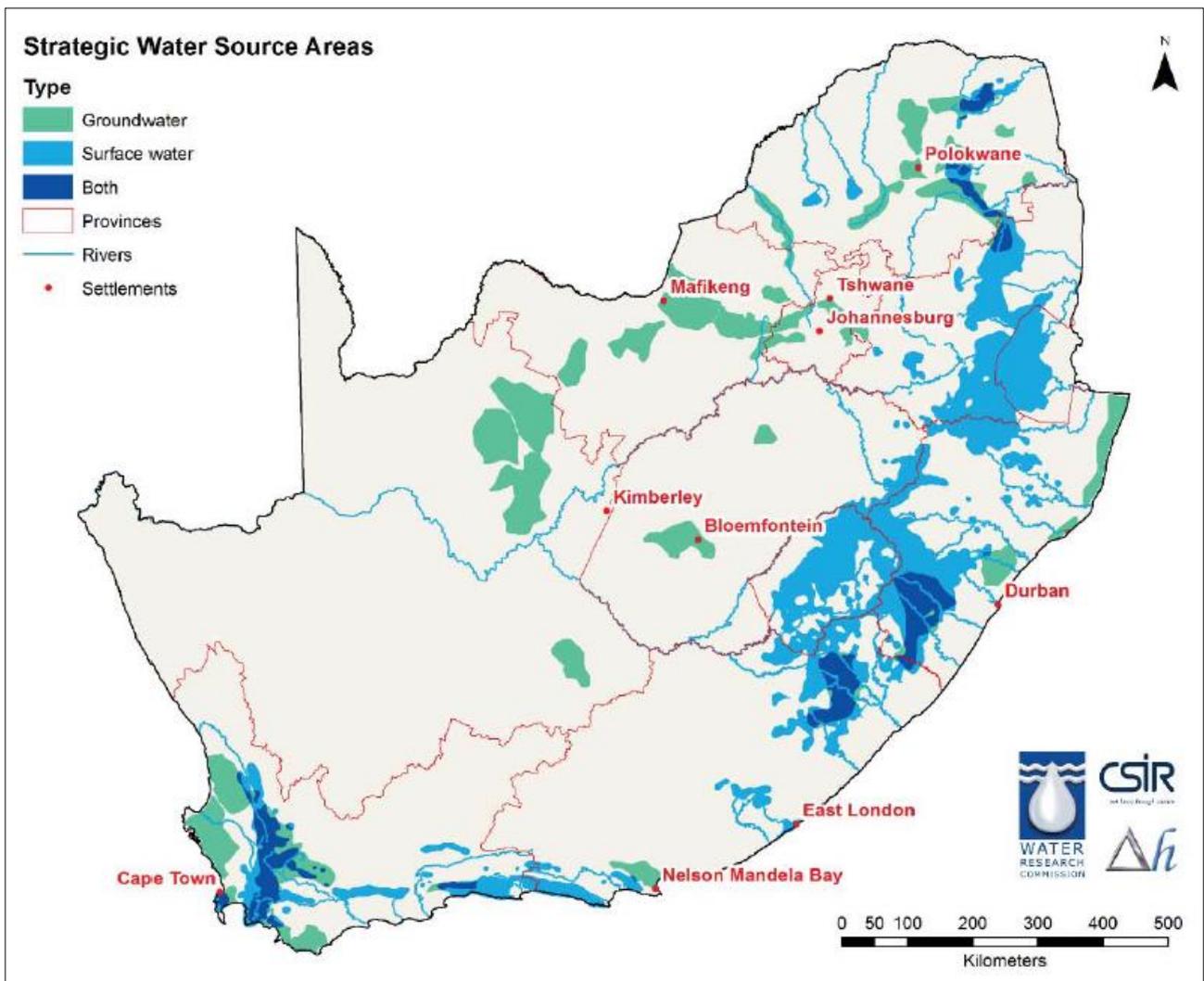


Figure 1.2 SWSAs for surface water and groundwater in SA, Lesotho and eSwatini (Le Maitre et al., 2018a)

SWSAs located in the study area are captured per secondary catchment in **Table 1-2**.

Table 1-2: Strategic Water Source Areas per Secondary Catchment

Year	Groundwater	Surface water	Surface – Ground water
W1	24: Richards Bay GW Fed Lakes: 60 600 ha	27: Mfolozi headwaters: 8 581 ha 28: Mfolozi headwaters: 13 935 ha (Ophathe Game Reserve) 71: Zululand Coast: 940 268 ha	160: Zululand Coast: 60 574 ha
W2		29: Mfolozi headwaters: 18 483 ha 30: Mfolozi headwaters: 2 372 ha 33: Mfolozi headwaters: 6 009 ha 31: Mfolozi headwaters: 10 957 ha 34: Mfolozi headwaters: 124 106 ha	
W3	37: Zululand Coastal Plain: 330 500 ha	32: Mfolozi headwaters: 8 056 ha 34: Mfolozi headwaters: 124 106 ha 72: Zululand Coast: 4 509 ha	161: Zululand Coast: 42 503 ha 163: Zululand Coast: 11 082 ha
W4		2: Ndumo: 4 966 ha 4: Ubombo: 3 10 4ha 16: Ekangala Grassland 858 216 ha	
W5		26: Mbabane Hills: 1 001 481	

Year	Groundwater	Surface water	Surface – Ground water
		59: Upper Usutu: 619 058 ha	
W7	37: Zululand Coastal Plain: 330 500 ha		

1.2.5 Conservation/Protected Areas

Information on protected and conservation areas was downloaded from the SANBI website's (<https://www.sanbi.org/resources/>) link to the Department of Forestry Fisheries and the Environment's (DFFE) Directorate Enterprise Geospatial Information Management (EGIM) (<http://egis.environment.gov.za>). Information is stored in the Protected Areas and Conservation Areas (PACA) database, which is a spatial database maintained by DFFE. Maps will be prepared from shapefiles provided, and included in the Status Quo Report for the study.

Protected Areas (PAs) follow the definition in the National Environmental Management Act (NEMA): Protected Areas Act (Act No. 57 of 2003) and include the following:

- Special nature reserves
- National parks
- Nature reserves
- Protected environments
- World heritage sites
- Marine Protected Areas (MPAs) declared in the Marine Living Resources Act
- Specially protected forest areas, forest nature reserves and forest wilderness areas declared in the National Forests Act (Act No. 84 of 1998)
- Mountain catchment areas declared in the Mountain Catchment Areas Act (Act No. 63 of 1970).

Conservation Areas (CAs) included in PACA are the following:

- Biosphere reserves
- Ramsar site
- Stewardship agreements (other than nature reserves and protected environments)
- Botanical gardens
- Transfrontier conservation areas and parks
- Military conservation areas
- Conservancies

Table 1-3 is a list of PAs and CAs sourced to date, based on the PACA of December 2021. The list is not conclusive and will be mapped as a product of the Status Quo Report.

Note that only 11% of the SWSAs in SA is under Protected Areas, with only 67 SWSA sections having some PA status. A total of 44 of the SWSAs include Conservation Areas (CAs), which makes up a small contribution to the protection of SWSAs. All SWSAs in the study area have some protection status, ranging from 7.05% PA in the Mfolozi Headwaters SWSA to 40% PA in the Zululand Coastal Plain SWSA (Le Maitre *et al.*, 2018a).

Table 1-3: Conservation Areas (to be mapped in detail in Status Quo report)

Private Game/Nature Reserves	Manyoni, Uithoek, Laughing Waters, Bendor, Skaapkraal, Umkoonyan No 1, Welkom, Josua Moolman
Marine protected areas	iSimangaliso MPA, uThukela MPA
Nature Reserves	Amatikulu, Mandlakazi Community Nature Reserve, Lake Sibayi Fresh Water Reserve, Sileza, Manguzi Forest Reserve, Tembe Elephant Park, Mkuzi Game Reserve, Ubombo Mountain Nature Reserve, Pongola Bush, Hlathikulu, Itala, Somkhanda Game Reserve, Zululand Rhino Reserve, Mun-ya-wana Conservancy, Greater Ukuwela, Umfolozi Game Reserve, Lake Eteza, Corridor Game Reserve, Obuka Community Nature Reserve, Somopho Community Nature Reserve, Hluhluwe, Hluhluwe-iMfolozi Park, Mandlakazi Community Nature Reserve, Matshitsholo, Opathe Game Reserve, Emakhosini Heritage Park, Gelijkwater Misbelt, Ntinini, Paardeplaats, Tafelkop, Dhlabe, Witbad, Mome, Jericho Dam, Vungwini, Entumeni, Dlinza Forest Reserve, Amatikulu, Red Hill, Umlalazi, Nkandla, Edodweni, Mndunduzeli, Sibudeni, Ithala, Coastal Forest Reserve, St Lucia Marine Reserve, Maputaland Marine Reserve, Lake Sibaya Fresh Water Reserve
Ramsar sites	Kosi Bay, Turtle Beaches/Coral Reefs of Tongaland, Ndumo Game Reserve, Lake Sibaya, St Lucia System
Forest Wilderness Areas	Ntendeka
Protected environments	KwaMandlangampisi, Mbola, Chrissiesmeer, Pongola Bush
World Heritage Sites	iSimangaliso Wetland Park

2 GAP ANALYSIS

2.1 HYDROLOGICAL DATA

2.1.1 Previous and parallel studies

The study area in general has been the subject of various studies in the past. Past relevant studies that will be referred to in order to undertake the hydrological and water resources assessments, are presented in detailed tables in **Appendix A**. The most relevant studies (past and parallel, for the various catchments are as follows:

- **Usutu:** The “*Usutu Water Availability Assessment*” (IUCMA, 2016) study was carried out for the Inkomati-Usutu Catchment Management Agency (IUCMA) in 2016. This study saw a detailed hydrological assessment of the sub-catchments within the main Usutu catchment falling within South Africa. The hydrology was produced to cover a period from 1920 to 2013 (hydrological years). The hydrology and subsequent water resources models produced are considered high confidence with sufficient detail to use as a basis for this study.
- **Pongola to Umfolozi:** The “Development, Updating and Review of Strategies to Reconcile Water Availability and Requirement in the East Planning Area Comprising Water Supply Systems for Mbombela, Richards Bay, Mgeni and all Other Towns and Clusters of Villages” (DWS, 2021) study is of particular relevance to the Classification study. The study was initiated in September 2021 and is therefore running in parallel to this study. One of the main objectives for the Reconciliation Strategy is to prepare hydrology for the Pongola, Mkuze, Hluhluwe and Umfolozi catchments, as well as the W71A quaternary. This hydrology will cover a period 1920 to 2019 (hydrological years) and will involve a detailed hydrological assessment. The hydrology is expected to be available by June 2022, and the water resources models will then be configured afterwards. The same hydrology and water resources models will be used for this study.
- **Mhlathuze:** The hydrology and water resources models produced in the “Mhlathuze Water Availability Assessment” (DWAf, 2009) have been used for various important studies, including Compulsory Licensing and the Reconciliation Strategy that have been undertaken in the Mhlathuze catchment. This will again be used for this study.

2.1.2 Water resource modelling: Gap Analysis

For the most part the hydrology is available or will be made available from current parallel studies. However, two main items of concern need to be addressed as part of this study, as outlined below.

- The hydrology and water resources models available from the IUCMA (2016) study stop at the border of South Africa and eSwatini. However, a significant part of the Usutu catchment lies within the country of eSwatini, and hydrology for this portion of the catchment will need to be sourced. This area is important to consider as it impacts the flows for the part of the Usutu River which forms the border between South Africa and Mozambique (part of which consists of the Ndumo Game Reserve). The most appropriate hydrology for this area will be sourced, and the existing Water Resources Yield Model (WRYM) for the Usutu will need to be extended to consider this portion of the catchment.
- The existing reserves determined as part of the 2014 Study (DWS, 2014a;b) were developed using different hydrology to that currently being prepared as part of the Reconciliation Strategy in the Pongola to Umfolozi catchments. The Ecological Water Requirement (EWR) results (EWR rule) cannot therefore be used as is within the existing hydrological operational and yield

models. A task will need to be undertaken in order to adjust the existing reserves to be more in line with the most recent hydrology.

Furthermore, it should be noted that the Reconciliation Strategy that is preparing new hydrology for the Pongola to Umfolozi area requires recent rainfall data (2012 to 2020) that is not readily available from the DWS database. The DWS is currently in negotiations with the South African Weather Service (SAWS) to obtain this data, and indications are that it will be made available to the DWS for use. The timeframe of this is not confirmed., Should there be delays in sourcing the information, the hydrology development on the Reconciliation Strategy will be delayed and that could impact on this study, in terms of a delay in the production if natural flows at the required sites.

2.2 RIVER RESERVE DETERMINATION

A Reserve study was undertaken during 2013 - 2016 on the same catchments, i.e. WP 10544, "Reserve determination studies for selected surface water, groundwater, estuaries and wetlands in the Usutu/Mhlathuze Water Management Area". A key objective of this study was to determine the Reserve in preparation for a Classification and RQO study. The Reserve for rivers was determined at Intermediate level and included some Rapid assessments.

The following issues and assumptions are outlined, based on a rapid overview of the available reports and known issues:

- The EcoClassification Report (DWS, 2014a) does not include any chapter on methods followed, and the required suite of EcoStatus models are not referred to, or referenced. **As these models form the basis of all EWR assessments and the scenarios evaluations as well as the final input into Classification, it is assumed that the populated models and collated raw data are available to the project team and will be provided by DWS.** If EcoStatus models are not available, the available information will have to be used to set them up.
- The determined EWRs did not use accepted (by DWS planning directorates) hydrology for the Black Umfolozi River catchment as motivated in the report "Evaluation of The Hydrology Available for the Black Mfolozi Catchment", dated February 2015, compiled for the Zululand District Municipality. This has the implication that the determined EWRs cannot be used to consistently evaluate scenarios with the prevailing hydrological information. Therefore, the EWRs will have to be re-calculated using the current revised hydrology and the available field data in this study.
- No new EWRs were undertaken for the Mhlathuze system. The EWRs are historical and therefore outdated. However, as no updated Reserves have been undertaken as part of the 2013-2016 study, the results will be used.

To address the gaps within this Classification and RQO study, the EWRs undertaken during 2013 - 2016 will be reviewed and, using previous assessment information as far as possible, information will be recalculated providing EWR rules for use in Classification. Additional desktop estimates for all RUs will be determined for desktop biophysical nodes to ensure a desktop level coverage of the whole study area.

2.3 ESTUARINE RESERVE DETERMINATION

Eight of the nine estuaries in the study area have been covered in previous Environmental Flow Requirement (or EWR) studies, albeit mostly at low confidence. No EWR determination have been undertaken on the uMgobezeleni Estuary, while those conducted on the Sibiya (2006), Mhlathuze /

Richards Bay (2000), and iNhlabane (2000) largely followed outdated methods or do not reflect current pressures on the systems. Subsequent evaluations (DWS 2015) of the Mhlathuze and iNhlabane EWRs were largely based on these historical assessments (dated 2000), with only limited refinements recommend for iNhlabane Lake while largely ignoring the estuary requirements and the need for an updated assessment of both important systems.

Thus, for the above four estuaries, the EWRs will be re-assessed or alternatively, new EWRs will be determined. For the other five estuaries results from previous studies will be used in terms of the Present Ecological State (PES) and Recommended Ecological Category (REC). However, any new operational scenarios, and associated ecological categories, will have to be re-evaluated.

The importance of addressing the freshwater flow requirements of the marine environment in EWR and Classification studies has been highlighted in the Framework for Operationalising Resource Directed Measures (RDM) (DWS, 2016a). Given the importance of freshwater flow from the Umfolozi (and potentially the Mlalazi), it would be important to determine any riverbed dependant nearshore ecosystems in the study area. As the TOR for this study did not include any investigations into the marine component, it should be noted as a gap and requirement for future work.

2.4 WETLANDS

During a February 2016 meeting with a group of wetland specialists, an Integrated Framework was designed, and subsequently finalised (DWS, 2016b), to operationalize Resource Directed Measures for wetlands. The Integrated Framework consists of eight steps that will be used to guide the proposed methods for the wetland contribution to the determination of Water Resource Classes and associated RQOs in the Usutu to Mhlathuze catchments, as specified in the TOR.

The procedural steps include delineation and prioritization of wetland Resource Units (RUs), description of the status quo and contribution to the delineation of Integrated Unit of Analysis (IUAs), quantification or justification of wetland EWRs, identification and evaluation of operational scenarios within IWRM for affected wetlands and the determination of RQOs for high priority wetlands. The 2014 study (DWS, 2014a; b; d) assessed and prioritised wetlands in the study area for a future Classification study. The results of wetlands then identified as high priority and assessed, will be used within this study. The 2014 study included wetland typing, categorisation (PES), threat status assessment and prioritisation, and field work for ground-truthing. Given the size of the Usutu to Mhlathuze catchments, and the high number of wetlands as well as the availability of wetland information, a desktop approach will be followed for outstanding wetlands. Extensive work has been done on some of the important wetlands, especially lakes. This work includes Intermediate and Rapid level Ecological Reserves, which will be summarised in this study and not replicated.

Available wetland information in the study area is shown in **Table 2.1** and identified gaps in **Table 2.2**.

Table 2-1 Available wetland information in the study area

Year	Study Name
1980's	Begg, G. (1986). The Wetlands of Natal (Part 1). An overview of their extent, role and present status. Natal Town and Regional Planning Report Volume 68, Pietermaritzburg, South Africa. Begg, G. (1988). The Wetlands of Natal (Part 2). The distribution, extent and status of wetlands in the Mfolozi catchment. Natal Town and Regional Planning Report Volume 71, Pietermaritzburg, South Africa. Begg, G. (1989). The Wetlands of Natal (Part 3). The location status and function of the priority wetlands of Natal. Natal Town and Regional Planning Report Volume 73, Pietermaritzburg, South Africa.
h2007	Aquifer dependent ecosystems: Colvin, C., Le Maitre, D., Saayman, I., Soltau, L., Maherry A. and Hughes S. (2007). Aquifer Dependent Ecosystems in Key Hydrogeological Typesettings in South Africa. WRC project K5/1330.
2010	KwaZulu Natal Province Map of Critical Biodiversity Areas and Ecological Support Areas. (KZN, 2010) Terrestrial Critical biodiversity areas in KZN developed 2010. This is an update to the 2007 terrestrial C-Plan.
2011	Grobler, L. (2011). A phytosociological study of Peat Swamp Forests in the Kosi Bay lake system, Maputaland, South Africa. (MSc Thesis)
2011	NFEPA Wetlands (National desktop inventory) Nel, J.L., Murray, K.M., Maherry, A.M., Petersen, C.P., Roux, D.J., Driver, A., Hill, L., Van Deventer, H., Funke, N., Swartz, E.R., Smith-Adao, L.B., Mbona, N., Downsborough, L. and Nienaber, S. (2011). Technical report for the national freshwater ecosystem priority areas project. WRC Report No. 1801/2/11. Water Research Commission, Pretoria, South Africa
2011	National List of threatened ecosystems. South African National Biodiversity Institute. (2011). National List of Threatened Ecosystems 2011 [vector geospatial dataset] 2011. Available from the Biodiversity GIS website.
2012	SANBI (2012). Rehabilitated Wetlands. This layer maps the location of wetlands rehabilitated within the working for wetlands programme. South African National Biodiversity Institute. Rehabilitated Wetlands 2012 [vector geospatial dataset] 2012. Available from the Biodiversity GIS website, downloaded on 22 November 2021
2014	DWS (2014c). Resource Directed Measures: Reserve determination study of selected surface water and groundwater resources in the Usutu/Mhlathuze Water Management Area. Integrated Groundwater-Wetland Water Resource Units. Volume 1: Wetland Prioritisation. Report produced by Wetland Consulting Services (Pty) Ltd for Tlou Consulting (Pty) Ltd for the Department of Water and Sanitation. Report no: RDM/WMA6/CON/COMP/1013.
2014	DWS (2014 a;b;d). Reserve Determination Studies for Selected Surface Water, Groundwater, Estuaries and Wetlands in the Usutu/Mhlathuze Water Management Area: Lake Sibaya Intermediate EWR, Volume 1 - EcoClassification Report. Volume 2 – Intermediate EWR Assessment. Volume 3 – Specialists Report.
2016	Ndlovu, M. and Demlie, M. (2016). Hydrogeological characterization of the Kosi Bay Lakes system, north-eastern South Africa. <i>Environ Earth Sci</i> 75 , 1334
2018	Birkhead <i>et al.</i> , (2018). The Pongola Floodplain, South Africa - Part 1: Two-dimensional hydrodynamic modelling in support of an environmental flows assessment. <i>Water SA</i> Vol. 44:4 , October 2018. Brown <i>et al.</i> , (2018). The Pongola Floodplain, South Africa – Part 2: Holistic environmental flows assessment. <i>Water SA</i> Vol. 44: 4 , October 2018.
2018	National Wetland Map 5: South African National Biodiversity Assessment. (2018). Technical Report. Volume 2a: South African Inventory of Inland Aquatic Ecosystems (SAIIAE). Version 3, final released on 3 October 2019. Council for Scientific and Industrial Research (CSIR) and South African National Biodiversity Institute (SANBI): Pretoria, South Africa. Report Number: CSIR report number CSIR/NRE/ECOS/IR/2018/0001/A; SANBI report number http://hdl.handle.net/20.500.12143/5847 .

The following key data sources and information will form the bulk of the inputs to this study and augment field and desktop assessments:

- Ramsar site information and site descriptions (Ramsar sites in the study area include St Lucia system, Lake Sibaya, Kosi Bay, Ndumo Game Reserve and Turtle Beaches).
- National Freshwater Ecosystem Priority Areas (NFEPA) (Nel *et al.*, 2011) map coverage and Geographic Information System (GIS) data to augment the new updates.
- Present Ecological State, Ecological Importance and Ecological Sensitivity (PES/EI/ES) data (DWS, 2014e). Although these data are not directly related to wetlands within the sub-

quaternary catchments they represent, the riparian and wetland metrics form a useful additional input.

- National Wetland Map version 5 (NWM5) and GIS coverage data (Van Deventer *et al.*, 2018) and metadata files.
- Level 1 and 2 Ecoregions.
- Threatened wetland species distribution data e.g., cranes.
- Reserve Determination Studies for Selected Surface Water, Groundwater, Estuaries and Wetlands in the Usutu/Mhlathuze Water Management Area (DWS, 2014a; b; d) - includes various wetlands.
- The Pongola Floodplain study (Birkhead *et al.* 2018; Brown *et al.*, 2018).
- Department of Water Affairs (DWA). 2014c. Resource Directed Measures: Reserve determination study of selected surface water and groundwater resources in the Usutu/Mhlathuze Water Management Area. Integrated Groundwater-Wetland Water Resource Units. Volume 1: Wetland Prioritisation. Report produced by Wetland Consulting Services (Pty) Ltd for Tlou Consulting (Pty) Ltd for the Department of Water and Sanitation. Report no: RDM/WMA6/CON/COMP/1013.

The following sources of information and data that are not currently available include:

- PES / wetland condition of most wetlands in the study area.
- Wetland EWRs for most wetlands.

Table 2-2 Identified gaps for wetland information / data

Criteria	Data available	Gaps identified	Mitigation Measures
Wetland mapping	NFEPA, NWM5.	Coarse scale, often under mapping.	None at National scale, but can be improved for High priority wetlands on a localised scale
Wetland typing	NFEPA, NWM5.	Lack of field verification of the HGM types.	None at National scale, but can be improved for High priority wetlands on a localised scale
Wetland PES and Ecological Importance and Sensitivity (EIS)	NFEPA: for all mapped wetlands, PES has been inferred based on land cover.	Lack of field verification for PES, low confidence.	None at National scale, but can be improved for High priority wetlands on a localised scale
	PES/EI/ES (DWS, 2014e): Two metrics rated for riparian / wetland continuity and integrity at the desktop level (Google Earth ©).	Metrics include riparian zones and frequently omit wetlands with the SQR that are not directly linked / related to the main channel, not wetland specific.	Update current PES/EI/ES data with wetland focus
Wetland prioritisation	List of high priority wetlands with assessment criteria and detailed methodology.	Conducted in 2013, 2014, may be outdated in certain aspects.	Check for relevance for high priority wetlands
Wetland EWR	Sibaya, Pongola floodplain including Ndumo wetlands, St Lucia (many estuaries have EWRs at different levels), Kosi (rapid)	Chrissiesmeer pans, Kosi Bay (lacks detail)	Determine EWR
Wetland Reference State	Historical studies e.g., Chrissiesmeer, 1929 and 1943 studies.	No PES, no EWR.	n/a

2.5 GROUNDWATER COMPONENT OF THE RESERVE

Information on the groundwater component of the preliminary Reserve is available as part of the draft Reserve Report for the Mhlathuze to Usutu in 2014 (DWS, 2014c). It is uncertain which hydrology was utilised to obtain baseflow, and if Schedule 1 groundwater use was incorporated. This may be problematical when correlating hydrology and groundwater to the results of the Reconciliation studies and existing accepted hydrology.

Some of the catchments have had their hydrology redone and calibrated using the surface-water groundwater interaction module (SAMI model) of the Water Resources Simulation Model 2000 (WRSM2000). These will be utilised to obtain recharge and baseflows for Classification. In the Mhlathuze, the coastal lakes have also been integrated into WRSM2000 using a Lakes Model to examine the interaction between surface water, groundwater and abstraction from the lakes. The upper Usutu was also simulated including groundwater (IUCMA, 2016). This will ensure that the groundwater balance is fully integrated with surface water. Other catchments will have their hydrology and groundwater component revised during the Eastern Region Reconciliation Strategy project (DWS, 2021). This may result in problems of reconciliation between the existing Groundwater Reserve and the revised hydrology. Section 2.1.2 describes how the existing Reserves were not derived from the accepted hydrology and cannot be used within existing operational models. If the baseflows utilised to derive the groundwater reserve is also not in line with the accepted hydrology and observed low flows, it may be necessary to adjust the groundwater reserve. This will be addressed by comparing the hydrology used for determining the groundwater component of the reserve to the new hydrology when it is available. If any mismatches occur, the groundwater component will be recalculated.

2.6 ECONOMICS

Two economic studies have previously been conducted in the Usutu to Mhlathuze catchments study area, as follows:

- Allocation Plan to Guide Compulsory Licensing in the Mhlathuze Catchment, Regional Economy Report, December 2007, i.e. DWAF (2007a).
- Reserve Determination of the Usutu to Mhlathuze Catchments - Economic and Socio-Economic Assessment of the Usutu to Mhlathuze Catchment, March 2014 (the base year was 2012), i.e. DWS (2014f).

The economics data in previous studies used 2012 as the base year; this data will be updated to current. The different water user sectors on which research was conducted are the following:

- Irrigation agriculture
- Commercial forestry
- Mining
- Industry: The sugar and sawmills and Heavy industry operations in the Lower Mhlathuze
- Tourism

Thirteen Economic Zones were defined in the 2012 base year study (DWS, 2014f), and will form the basis of the economic assessment for this study. The zones used in the 2014 study are listed below.

- Usutu / Assegai economic zone
- Upper Pongola economic zone
- Lower Pongola economic zone
- Kosi Bay / Sodwana economic zone

- Mkhuze economic zone
- Hluhluwe economic zone
- St. Lucia economic zone
- Black Umfolozi economic zone
- White Umfolozi economic zone
- Umfolozi economic zone
- Upper Mhlathuze economic zone
- Lower Mhlathuze economic zone
- Matigule / Mhlazi economic zone

3 SCOPE OF WORK: PROJECT MANAGEMENT, COMMUNICATION AND LIAISON

3.1 DELIVERABLES

An agreed list of deliverables and due dates as per the contract is provided in **Table 3.1**. All deliverables that are referred to in all the Scope of Work chapters (Chapter 3, 4 and 5) will be cross-referenced to Column 1 (No.) in the table. Note that the due date refers to the date of submission of the final deliverable and invoicing.

Table 3-1 Deliveries and due dates

No.*	Deliverable	Due Date
4.3.1	Inception Report, including Gap Analysis Chapter	Feb-22
4.3.2	Stakeholder Engagement Plan and stakeholder database	Feb-22
4.3.3	PES/EIS spreadsheet	Feb-22
4.3.4	<i>Status quo</i> and Delineation of Resource Units and Integrated Units of Analysis Report	May-22
4.3.5	Resource Units Prioritisation Report	May-22
4.3.6	Hydrology Systems Analysis Report	Jun-22
4.3.7	River EWR for the Desktop Biophysical Nodes Report	Jul-22
4.3.8	River Survey and Site Visit Report	Jul-22
4.3.9	Basic Human Needs Report	Aug-22
4.3.10	Groundwater Report	Sep-22
4.3.11	2x Specialist workshop Reports (Rivers, estuaries)	Sept 22 (rivers) Feb 23 (estuaries)
4.3.12	Estuary Survey and Site Visit Report	Oct-22
4.3.13	Wetland Report	Nov-22
4.3.14	Ecological Water Requirements Report	Dec-22
4.3.15	Scenario Description Report	Feb-23
4.3.16	Classes decision-making tool spreadsheet	Feb-23
4.3.17	Ecological Consequences Report	May-23
4.3.18	Ecosystem Services Consequences Report	Jun-23
4.3.19	Economic & User Water Quality Consequences Report	Jun-23
4.3.20	Water Resource Classes Report	Jul-23
4.3.21	RQOs and Numerical Limits Report	Oct-23
4.3.22	Implementation and Monitoring Report	Nov-23
4.3.23	Project Steering Committee Meeting Minutes and updated Issues & Responses Register (5x)	5x throughout lifecycle of project
4.3.24	Technical Task Group Meeting Minutes and updated Issues & Responses Register (3x)	3x throughout lifecycle of project
4.3.25	Public Meeting Minutes and updated Issues & Responses Register (2x)	2x throughout lifecycle of project
4.3.26	Sectoral / one-on-one meetings and updated Issues & Responses Register (2x)	2x throughout lifecycle of project
4.3.27	Classes and RQOs Gazette Template (i.e. technical input to the legal notice)	Jan-24

No.*	Deliverable	Due Date
4.3.28	Capacity Building Reports: Mentorship programme; Capacity Building workshops (3x) and Stakeholder Empowerment Sessions (3x)	3x throughout lifecycle of project
4.3.29	SMME; including Progress Reporting with PMC Progress Reports (7x)	7x throughout lifecycle of project
4.3.30	Project Administration and Management (9x)	9x quarterly
4.3.31	Progress Reports (7x)	7x throughout lifecycle of project
4.3.32	Main Report	Jan-24
4.3.33	Final I&R Report	May-24
4.3.34	Project Closing report and Electronic Information and Data	May-24
	Note *: This numbering refers to that in the Contract	

3.2 REPORTS AS DELIVERABLES

It is acknowledged that reports will only be finalised once comments from the PMC and PSC (where relevant) are received. The assumption is that comments will be sourced and consolidated and provided to the PSP *three weeks* after the first draft has been provided to the Client. The most significant risk to the project timing is that the review and report finalisation periods are not met. A two week window has been allocated after the receipt of integrated comments from the DWS PM for the attention of the project team to make corrections and produce finalised documents. Should review periods not be met by DWS, or report finalisation by the project team, there will be a direct impact on the financial management of the project as invoices and payment are linked to final deliverables. This timing has been incorporated into the Gantt chart. Note that reports will be considered as Final, once accepted by DWS as a Final Report.

3.3 PROJECT MANAGEMENT

This Section refers to the non-technical work that will be carried out to successfully execute the study. Dates have not yet been finalized for several of the management items presented in **Table 3.1** as these will need to be discussed and agreed with DWS. For now, this Section includes approximate dates where items are expected to occur throughout the study duration.

The project will be managed under the guidance of a PMC and PSC. The PMC will consist of individuals from the CD: WEM, other DWS directorates, DWS Regional office directorates, IUCMA and the PSP team. The PSC will be comprised of members from various sectors providing strategic guidance and reporting functions to their interested sectors. The DWS Project Manager for the study is Mr Mkhevu Mnisi, Scientific Manager: Water Resource Classification, supported by Ms Koleka Makanda, Scientist: Water Resource Classification.

Other management functions include the appointment and management of specialists, report editing and final review, and financial management. A short Invoice Report will accompany each invoice, reflecting the cash flow and a brief description of related and completed tasks. The GIS and mapping tasks are included here as services will be provided for all components and reporting.

The management of the task will include the following:

- Study Leader (Caryn Seago, WRP).
- Co-Study Leader (Patsy Scherman, Scherman Environmental).
- Financial management (WRP and Scherman Environmental).
- Report review and editing (Shael Koekemoer (editor), Seago, Scherman, Louw).

- Mapping and GIS (de Sousa, WRP).

3.3.1 PMC MEETINGS

PMC meetings will be held approximately quarterly throughout the project period, i.e., 7 meetings, excluding a Initiation / Planning meeting and an Inception meeting (to present the Inception Report). The format of the meetings will be determined depending on Covid regulations at the time. PMC meetings will be organized by the DWS Project Manager (including logistic and agenda). Progress Reports will be provided by the PSP prior to PMC meetings as required (excluding the Planning meeting). Minutes will be prepared by the DWS PM.

Task responsibility

Seago, Scherman, team members as required.

Actions

- Participate in meetings.

Deliverables and milestones

- Project Administration and Management – **Deliverable 4.3.30,**

3.3.2 PSC MEETINGS

PSC meetings will be held at five occasions during the study, i.e., two meetings per year, and will be organized by the PSP, in liaison with the DWS PM. Secretarial services for PSC meetings will be provided by the PSP (Ms Lötter). The PSC will consist of members from various organisations and sectors, striving for balanced representation, who will provide strategic advice, oversight and guidance to achieve balanced viewpoints and inputs from stakeholders within the study area. There is no limit to the number of PSC members. Existing structures, which are in place in the study area, will be utilised for this purpose. The PMC will approve the list of PSC members, which is constituted at the first Public Meeting.

For each PSC meeting, invitation letters and a proposed agenda will be distributed to PSC members providing them with sufficient information about the status of the project, the purpose of the meeting and what will be expected of them (e.g., read through documents prior to the meeting and the subjects on which to provide input and comments).

Task responsibility

Seago, Scherman, Lötter, team members as required.

Information required

- List of DWS internal officials and/or representatives from the relevant directorates.
- List of members from the Catchment Management Forums.
- DWS to provide Terms of Reference for PSC members.

Actions

- Establish database of PSC members.
- Compile invitation letter, which will be accompanied by detailed TOR for PSC members.
- Distribution of invitations to PSC meetings.
- Prepare progress reports for distribution prior to meetings.
- Preparation, participation in the meetings, compilation and distribution of meeting minutes.

- Input from meetings to the Issues and Responses Report (IRR).

Deliverables and milestones

- Progress reports – **Deliverable 4.3.31.**
- Preparation for and participation in the meetings, compilation and distribution of meeting minutes – **Deliverable 4.3.23.**

3.3.3 PMC AND PSC MEETING DATES AND PURPOSE

Table 3.2 provides an overview of the proposed dates when the meetings will occur, as well as the main focus of each meeting.

Table 3-2 Overview: PMC and PSC meetings

Proposed Month	Meeting Reference no.	Focus	Team members included
Jan 2022	Initiation meeting	Initiation meeting	Seago, C Scherman, P
Feb 2022	Inception meeting	Present Inception Report	Seago, C Scherman, P Lötter, A Louw, D
May 2022	PMC meeting 1	Present progress and dry-run planning for PSC meeting 1 (delineation and status quo). Dry-run for public meeting 1	Seago, C Scherman, P Lötter, A
TBD	PMC meeting 2	TBD	Seago, C Scherman, P
May 2022	PSC meeting 1	Steps 1 and 2: Status Quo, Delineation of IUAs	Seago, C Scherman, P Lötter, A
Nov 2022	PMC meeting 3	Present progress and dry-run planning for PSC 2 (Hydrology, River EWRs, BHN). Table and discuss Scenario document (identify scenarios) and dry-run planning for PSC 3.	Seago, C Scherman, P Louw, D Van Niekerk, L
Dec 2022	PSC meeting 2: Day 1	Stakeholder empowerment session Step 3: EWRs, BHN, groundwater, and wetlands	Scherman, P Seago, C Lötter, A Sami, K Mackenzie, J
Dec 2022	PSC meeting 3: Day 2	Step 4: Input to scenarios	Seago, C Scherman, P Lötter, A Louw, D Van Niekerk, L
April 2023	PMC meeting 4	Table and discuss Water Resources Classification discussion document and dry-run planning for PSC 4 (consequences and draft classes)	Seago, C Scherman, P Louw, D
April 2023	PSC meeting 4	Step 5: Consequences and draft classes	Seago, C Louw, D Lötter, A Van Niekerk, L Scherman, P Birkhead, A
Aug 2023	PMC meeting 5	Present progress and dry-run planning for PSC 5 (RQOs)	Seago, C Scherman, P
Sept 2023	PSC meeting 5	Step 7: Classes and RQOs	Seago, C Louw, D Lötter, A Scherman, P
Jan 2024	PMC meeting 6	Dry-run for Public Meeting 2	Seago, C Scherman, P Lötter, A

Proposed Month	Meeting Reference no.	Focus	Team members included
May 2024	PMC meeting 7	Wrap up of Study	Seago, C Scherman, P

3.3.4 OTHER

Guidance from the DWS Project Management Team regarding the following points, in particular:

- Report numbers.
- Report formats.
- Numbers of final reports to be printed and flash drives to be delivered at the end of the study.
- Invoicing process, including format of invoices and deliverable dates.
- DWS letters and input, as required.
- Review of all documents, letters etc. as required.
- Selection of the PMC.
- Compilation of PMC and PSC review comments within the agreed three and two week review periods respectively.
- Other information or assistance as required, including all reports and electronic data from previous DWS studies.

Notes:

- The PSP is not responsible for ensuring reports are signed by the other delegated authorities as shown on the signatory pages of the reports.
- The PSP is not responsible for ensuring PMC and PSC comments on technical reports are received timeously.
- The PSP is not responsible for appointing or funding external reviewers.

3.4 INCEPTION PHASE

The objective of this project planning task is to produce a concise, clear and unambiguous Inception Report, which will include the Capacity Building and Mentorship Programme, the Stakeholder Engagement Plan and initial stakeholder database as associated deliverables. This is required to ensure that the Client and PSP are clear as to the deliverables, timing and associated costs of the programme.

The Inception Phase will therefore focus on the design of a detailed Project Plan and includes a section on available information and a Gap Analysis. Many of the members of the consulting team have worked widely in the study area and are therefore familiar with the previous work done in the Study Area and the gaps that exist.

Task responsibility

Louw, Scherman, Seago, Mare, Koekemoer, Mackenzie, Van Niekerk, Sami, Mullins, Cloete, De Sousa, Huggins

Information required

- Timeous delivery of information at the initiation of the study from D: Reserve Requirements on previous Reserve studies undertaken in the study area, including electronic data and model set-ups and the Reserve database.

Actions

- Internal planning liaison.
- DWS inception meeting.
- Appoint the sub-PSPs as approved by the DWS. Note, however that the PSP cannot be held responsible if indicated specialists resign or leave their work – however it is the responsibility of the PSP to find suitable replacements. Any replacements must be agreed on by the PSP and the Client.

Deliverables and milestones

Deliverable 4.3.1: Inception Report, including Gap Analysis Chapter (Feb 22)

3.5 COMMUNICATION AND LIAISON

3.5.1 Stakeholder Database

The stakeholder database for the project will be developed during the project inception phase. The stakeholder database will consist of representatives of sectors of society and an electronic contact list will be developed and updated as the project unfolds during the 30-month contract period. The stakeholder database will include relevant representatives of the following sectors of society:

- National, provincial and local government as well as relevant government institutions and traditional authorities.
- Conservation, environment, eco-tourism and Non-Governmental Organizations (NGOs).
- Agriculture (unions, e.g. Kwanalu, AgriSA), sub-sectors such as forestry, sugar, etc.
- Mining.
- Industries.
- Media.
- Water resource management institutions (Irrigation Boards, Catchment Forums, etc.).

Information from the DWS will be used as a basis for the development of a project-specific database for this project.

Task responsibility

Lötter

Information required:

- Names and contact details of stakeholders, which the DWS has which they would like to be part of this study.
- Contact details of Catchment Management Forums, Irrigation Boards, Water User Associations and all DWS officials to be involved in the study.

Actions

- Compilation and upkeep of stakeholder database throughout the study.

Deliverables and milestones

- **Deliverable 4.3.2:** Stakeholder Engagement Plan and stakeholder database (Feb 22).
- The database will continually be updated as the study unfolds.

3.5.2 Stakeholder Engagement Plan

The Stakeholder Engagement Plan (SEP) is provided in **Appendix B**. The SEP lists the various sectors to be involved in the study, the means to communicate with them, the purpose / message to

be communicated at which timeframes and who would be responsible for such communication. The SEP will become the guideline for communication and liaison for this project.

Task responsibility

Lötter

Information required

- Contact details for stakeholders and Catchment Management Forums.

Actions

- Compilation of the SEP and updating of SEP as the study unfolds.
- Implementation of SEP is shared between DWS and PSP.

Deliverables and milestones

- **Deliverable 4.3.2:** Stakeholder Engagement Plan and stakeholder database (Feb 22).

3.5.3 Public Meetings

Two rounds of public meetings are proposed (same content, but two separate meetings to be held at two different locations / or dates in the study area); meeting 1 at two venues at the start of the study once a draft inception report is available; and meeting 2 at two venues towards the end of the study. The purpose of the first round of public meetings will be to:

- a) Announce the study of the DWS;
- b) provide the content of the draft Inception Report and request stakeholder inputs and comments on the report;
- c) establish a PSC and discuss the proposed TOR of the PSC; and
- d) obtain suggestions from stakeholders on the way forward with the proposed study.

Before the public meeting, a Background Information Document (BID) will be compiled which will provide stakeholders with the objective of the study, proposed framework of how the study will be unfolding, where in the study process and how stakeholders can become involved with the study. The BID will also invite stakeholders to nominate representatives to become part of the PSC, which will be discussed at the public meeting.

The preliminary results of the study will be presented at a second round of public meetings which will be held towards the end of the study. A summary of information that will be discussed at this public meeting will be compiled and distributed electronically as background information to persons who indicate their attendance. The outcomes of this meeting will be captured in the IRR and considered during the gazetting process.

The venues for the public meetings will be discussed at a PMC meeting, however it is suggested that these meetings be held in central locations in the study area should the Covid-19 regulations at the time permit such gatherings.

Task responsibility

Public Meeting 1: **Lötter**, Seago, Scherman, isiZulu interpreter

Public Meeting 2: **Lötter**, Seago, Scherman, isiZulu interpreter, Van Niekerk

Information required

- Inception Report for Public Meeting 1.
- Specialist reports.

Actions

- Draft stakeholder database (approved by DWS).
- Final draft reports required for all deliverables up to Task 6.
- Compilation of invitations, agendas, BID, presentations to be delivered at meetings, other relevant summary documentation, attendance registers, minutes of the meetings, updating of IRR.

Deliverables and milestones

- **Deliverable 4.3.25:** Public Meeting 1 (3-4 May 2022).
- **Deliverable 4.3.25:** Public Meeting 2 (Feb 2024).

3.5.4 Technical Task Team

The PMC will also recommend if certain key technical aspects must be further discussed. In this instance, a maximum of three Technical Task Team (TTT) meetings will be held. The TTT will consist of the PMC members, the PSP and any other stakeholders (with technical science knowledge) who can contribute to discussions that are required.

TTT meetings will be held on an ad-hoc basis as the need arise with stakeholders which are recommended by the PMC.

- Three TTT meetings to be attended by two members of the PSP team.
- It is assumed that each meeting will be no longer than six hours and that the meetings can be held at DWS offices or over an electronic platform.
- Venue and catering costs have not been included.

Task responsibility

Seago, Scherman, Lötter, team members as required.

Actions

- Compilation of agenda and invitations.
- Summary of relevant information to be discussed and presentations to be delivered.
- Compilation of attendance registers, minutes of the meetings and updating of IRR.

Deliverables and milestones

Dates are provisional.

- **Deliverable 4.3.24:** TTT1 (Aug 22).
- **Deliverable 4.3.24:** TTT2 (Apr 23).
- **Deliverable 4.3.24:** TTT3 (Aug 23).

3.5.5 Sectoral Meetings

Sectoral one-on-one meetings will be held on an ad-hoc basis as the need arise with stakeholders which are recommended by the PMC and depending on technical information required.

- Two workshops
- It is assumed that each meeting will be no longer than six hours and that the meetings can be held at DWS offices.
- Venue and catering costs have not been included in the PSP budget.

Task responsibility

Lötter, Scherman, PSP team members as required.

Information required

- Ad hoc.

Actions

- Compilation of agenda and invitations.
- Summary of relevant information to be discussed and presentations to be delivered.
- Compilation of attendance registers, minutes of the meetings and updating of IRR.

Deliverables and milestones

Provisional dates are shown below.

- **Deliverable 4.3.26:** Sector meeting 1 (Apr 23).
- **Deliverable 4.3.26:** Sector meeting 2 (Aug 23).

3.5.6 Issues And Responses Register

All comments and inputs, questions and queries from stakeholders throughout the project will be recorded in an Issues and Responses Register (IRR). The compilation of the report will begin during the announcement of the study and will be completed at the end of the project. All comments will be recorded and responses (to be compiled by the PSP and DWS) will be provided for every comment. At the end of the study a Consolidated IRR will be available for all stakeholders to review to ensure that their comments, concerns and questions are considered.

Task responsibility

Lötter

Information required:

- Responses from DWS where issues are noted for the attention of the DWS.

Actions

- Compilation and upkeep of IRR throughout the study.

Deliverables and milestones

- **Deliverable 4.3.23 – 4.3.25:** Continual updating of IRR report. Final version to be included in the Close-out Report.

4 SCOPE OF WORK: TECHNICAL PROJECT PLAN

The TOR refers to the guidelines and gazetted processes for the Water Resources Classes (referred to as Classes in the rest of the document) and Resource Quality Objectives (RQOs). An integrated framework (DWS, 2016d) (**Figure 4.1**) was developed and agreed on.

The integrated framework refers to the Classification, Resource Water Quality Objectives and the Reserve. This Classification and RQO study does not address the Reserve, as the Reserve can only be finalized once the National Water Resources Classes have been gazetted, i.e. after this current study has been completed. Step 8 (**Figure 4.1**) which refers to the ‘Gazetting of the Reserve’ is therefore not part of this study. All work undertaken in terms of EWRs, i.e. the Preliminary Reserve, does however form part of this study. Some of this EWR work will be based on work already undertaken and the results (reviewed and updated where required during this Classification study) will be used in this study. Additional EWR work at the appropriate level may be undertaken to cover the study area.

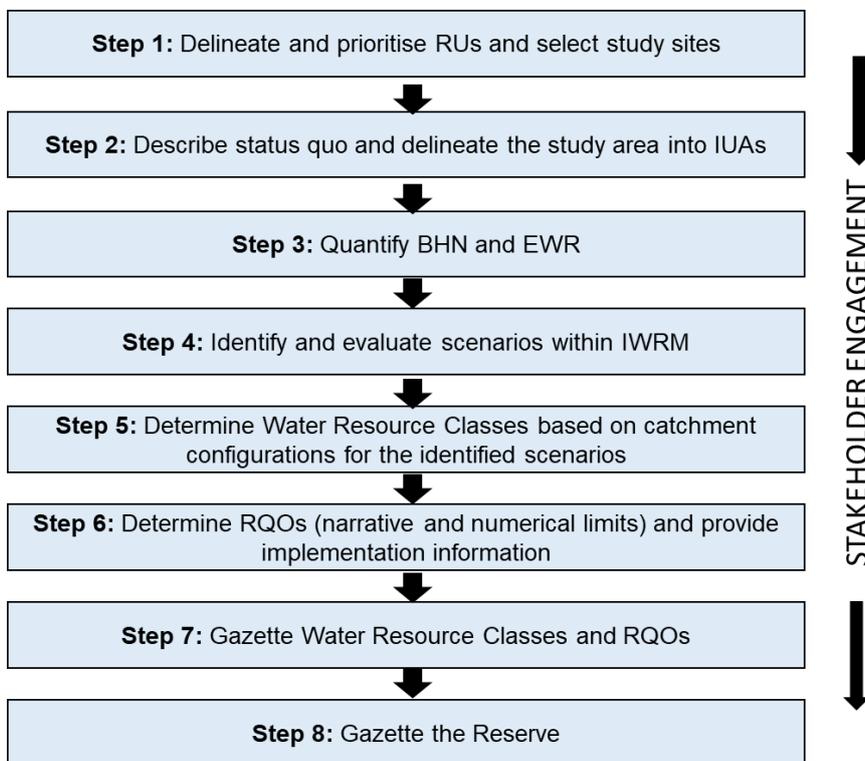


Figure 4.1 Integrated Framework for Classification, Resource Quality Objectives and the Reserve (DWS, 2017).

This integrated framework (**Figure 4.1**) was used as the basis for the technical project plan for the Usutu to Mhlathuze Catchment Classification and RQO study (**Figure 4.2**). The Project Plan is provided as consecutive Steps which relate to the technical work tasks described in the rest of Chapter 4.

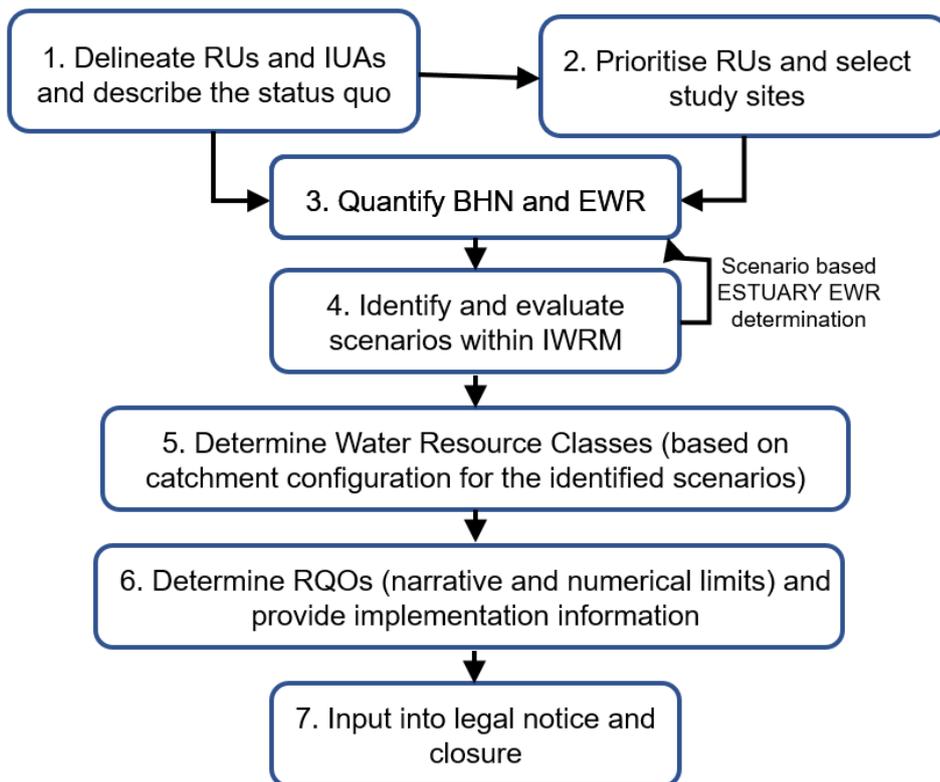


Figure 4.2 Project Plan for the Usutu-Mhlathuze Classification study

The sections below provide the main tasks that comply with the TOR, the accepted proposal and the project plan. These tasks together formulate the project plan and will address the objectives and aims of this study. The subtasks are built around the deliverables to be provided as the TOR requests a deliverable-based project.

4.1 TASK 1: STEP 1 - DELINEATE RUs AND IUAs AND DESCRIBE THE STATUS QUO

The objective of this step is to define Integrated Units of Analysis (IUAs) and provide a status quo description of each IUA. An IUA is a homogenous catchment or linear section of river based on the similarity of ecological state, system operation, land characteristics, etc. The status quo description therefore provides the information at a broad scale to inform the delineation of the IUAs. This step includes the following:

- **Information and data collection:** Most of this work is obtained as part of the gap analysis and information gathering during the Inception Phase. Additional spatial and related data, census information, and the Present Ecological State, Ecological Importance and Ecological Sensitivity (PES/EI/ES; also referred to as PES/EIS or PESEIS) (DWS, 2014e) desktop, wetland (NFEPA and NWM5) and estuary databases will be accessed.
- **Assessment of water resource system components:** The surface water resources in the study area will be defined and described following a catchment-by-catchment approach and identifying key river reaches where the flow is controlled by current or future operational activities. The following will be undertaken as part of this task:
 - A description of water resource infrastructure.
 - The identification of water users and sources.
 - The identification of water quality areas of high importance, e.g., hotspot areas.

- The definition of the network of significant resources.
 - The identification of controlled river reaches.
 - The description of the water resource status quo (including water quality).
- **Assessment of Groundwater resources:** Groundwater Resource Units (GRUs) will be defined, described and delineated, based on quaternary catchment boundaries, aquifer type, and other physical, management and/or functional criteria. The following actions will be required:
 - Description of water resource infrastructure.
 - Identification of water users and sources.
 - Identification of water quality problem areas.
 - Definition of the area of significant resources.
 - Definition of the surface groundwater interaction areas.
 - Description of the groundwater quantity and quality status quo.
- **Assessment of Rivers:** The Present Ecological State (PES) for the study area will be determined in terms of the A - F Ecological Categories (ECs) which informs the delineation of IUAs. A review and update of the PES/EIS study for the specific study area at sub-quaternary reach (SQR) scale will be undertaken. The actions performed during this task are:
 - A description of the PES (desktop) baseline per SQR.
 - The identification of the pressures and impacts (review and update the PES baseline).
 - Grouping similar rivers together into Resource Units (RUs) based on similar PES and impacts.
- **Assessment of Wetlands:** Groups of wetlands will be identified and typed, and the ecological state broadly described per group. The following actions will be undertaken:
 - The spatial distribution and extent of wetlands.
 - Typing in terms of EcoRegions and hydrogeomorphic (HGM) types.
 - Identified wetland groups based on type, condition and Ecological Importance (EI).
- **Assessment of Estuaries:** The PES for the nine estuaries in the study area will be broadly determined in terms of the ECs (A to F) which inform the delineation of IUAs. The detailed work required is as follows:
 - Delineation of individual estuary Resource Units (RUs) ensuring alignment with the Estuarine Functional Zones (EFZ).
 - A description of estuary PES categories.
 - Identify key flow and non-flow pressures on individual estuaries.
 - Estuaries will be grouped along the coast based on ecological condition and function, pressures (current and future) and management boundaries (local authorities and water management).
- **Assessment of Economics:** The information needed to quantify and describe the socio-economic benefits that are derived from utilising the water resources in each of the UIAs in the study area will be collated to inform the following:
 - The present socio-economic status and key drivers.
 - Delineate economic zones based on relevant data.
 - Qualify and assess the risk of the different scenarios formulated by environmental team with respect to change from status quo for aquatic ecosystems, (risk-based approach).
 - A description and economic value of the status quo market and/or commercial use of water.
- **Define IUAs:** Utilising all the above information and information collated during Task 1, IUAs are defined and then presented to stakeholders for comment.

Task responsibility

- **Deliverable 4.3.3: Louw**, Scherman, Mackenzie, Deacon, Kotze
- **Deliverable 4.3.4: Louw**, Seago, Scherman, Koekemoer, Huggins, Sami, Mackenzie, Van Niekerk, Mullins, Cloete, Mare, De Sousa

Information required

- Schematics of all model networks and configurations.
- Reports of all available hydrological, yield and/or Water Resource Planning Model (WRPM) studies done in the WRPM Information of Reconciliation Strategy Maintenance Study, including operational and other scenarios.
- Wetland spatial datasets (NFEPA - Nel *et al.*, (2011) and NWM5 - Van Deventer *et al.*, (2018)).

Actions

- Assess all relevant databases, review where required, analyse information according to SQRs and then grouped into IUAs.

Deliverables and milestones

Deliverable 4.3.3: PES/EIS spreadsheet (Feb 22) that will include the following:

- Review of the 2017 PES ratings produced as an updated spreadsheet.
- Assessment of the NFEPA, based on the presence of fish and the reviewed PES assessment.
- Analysis of the EIS results and adjustment of criteria if required.

Deliverable 4.3.4: Status Quo and delineation of Integrated Units of Analysis and Resource Units Report (May 22) that will include the following:

- Status Quo of water resources described, and operational zones defined.
- Economic zones for major water users defined including quantification of economic sectors per zone.
- Delineating and describing communities that are important with respect to Ecosystem Services.
- Water quality analysis indicating water quality hotspots.
- Status quo of identified wetlands according to NFEPA, the New Wetland Map 5 (NWM5 from the National Biodiversity Assessment, 2018) and an updated PES/EIS-type approach specifically for wetland assessment.
- Delineation of the relevant estuaries.
- Summary of existing information on the state of and pressures on estuaries.
- Review of PES/EIS database and status quo assessment of rivers.

4.2 TASK 2: STEP 2 - PRIORITISE RUs AND SELECT STUDY SITES

The objective of this task is to identify high priority areas, as these would be the areas where more detailed work for the rest of the steps would be the focus. These high priority areas are selected based on ecological, socio-cultural and water resource use importance and are often areas of high ecological importance where water resources are stressed or may be stressed in future.

- **Drivers - Surface water resources:** Water Resource Use Importance (WRUI) is rated using a scoring system and considers various aspects such as the current water balance and possible future developments. The rating is used to provide a priority list according to SQRs.
- **Drivers - Groundwater resources:** The GRUs are categorised based on stresses on baseflow and then prioritised.

- **Drivers - Water quality:** Water quality problem areas are identified and prioritized for both rivers and estuaries.
- **Aquatic Ecosystem - Rivers:** The EIS, sourced from the reviewed PES/EIS database is used to identify high priority SQRs. The REC is derived and SQRs prioritised.
- **Aquatic Ecosystem - Wetlands:** Wetland RUs are identified according to the distribution of wetland type, notable clusters, wetlands of National or International importance and land use as a surrogate of main impacts. The wetland PES and EIS will be reviewed / assessed and used to prioritise wetlands.
- **Aquatic Ecosystem - Estuaries:** Note that the team is only dealing with nine estuaries and during this task, the EFZ for each estuary will be identified using existing information as captured in the South African National Ecosystem Classification System (van Niekerk *et al.*, 2019; Dayaram *et al.*, 2021). PES and REC for five systems will be extracted from the existing studies or refinements made by the National Biodiversity Study (Van Niekerk *et al.*, 2019), while the PES and REC of the other four systems (as indicated earlier) will be determined as part of this study.
- **Ecosystem services and values:** The Socio-Cultural Importance (SCI) is identified to allow the prioritisation of RUs.
- **SQR prioritisation:** All relevant information focussing on the various components' importance forms part of an assessment procedure that rates the priority areas (a rule-based scoring system will be applied).
- **RU prioritisation and site selection for Rivers:** A filtering process is required to combine the SQRs into RUs. The process is based on a specific level of priority SQRs into the same priority RUs and EWR sites are selected in some of the high priority RUs. As the number of high priority RUs will only be identified at this stage, it is not known currently whether the existing EWR sites are in areas of high priority.

Task responsibility

- **Louw**, Seago, Scherman, Koekemoer, Huggins, Sami, Mackenzie, Van Niekerk, Mare, De Sousa

Information required

- All information obtained during Task 1.
- Spreadsheet layout (**Deliverable 4.3.3**) according to SQRs for the completion of the WRUI and SCI models.

Actions

- Compile the models.
- Integrate the results and determine areas of High and Very High Importance.

Deliverables and milestones

- **Deliverable 4.3.5:** Resource Unit Prioritisation Report (selection and prioritization) (May 22) which will include the following:
 - Water resources: WRUI results.
 - Ecosystem Services: The SCI results and relevant description.
 - Rivers: The importance of the SQRs, the reviewed PES of the SQRs, the amalgamation of the prioritized RUs.
 - Wetlands: Importance and status of SQRs.

4.3 TASK 3: STEP 3 - QUANTIFY BASIC HUMAN NEEDS AND ECOLOGICAL WATER REQUIREMENTS

The objective of this step is to quantify the EWRs for different ecological states and determine the Basic Human Needs (BHN), for areas where people are directly dependent on water resources. These EWRs (ECs and associated flow regime) are essential input into all following steps and especially for the scenario evaluation. **Once a recommendation is made regarding the Target Ecological Category (TEC), the EWR determined during this step, which supports the TEC and the Class, will become the flow / hydrology RQO.**

4.3.1 Hydrological System Analysis

During this task, all relevant available hydrological information is reviewed and a decision will be made as to the most appropriate hydrology to be used for each catchment in the Study area. All available water resource models (WRSM2000, WRYM and WRPM) will be sourced and their status assessed.

The gap analysis has been undertaken and is presented in **Section 2.1.2** of this report. For the most part, it appears that the required water resources information is available, except for a portion where it is currently being developed as part of the Reconciliation Strategy.

The selected network layouts of the models will be assessed, subdivided and delineated to increase the resolution for deriving the natural and present hydrological time series. This network review will give due consideration to the simulations that will be required for the scenario analyses to be carried out as part of Step 4.

The outcomes of this Task is to provide the EWR specialists with the required hydrological time series flows, which are produced at various requested locations from results of WRYM simulations. Furthermore, additional water resources analyses are undertaken after scenarios are developed, in order to assess the impacts of the various scenarios at key points in the catchment. An iterative process usually takes place whereby scenarios are analysed, results assessed, modifications made and then reanalysed.

Task responsibility

- **Seago, Mare, Sami, Van Niekerk, Louw**

Information required

- Hydrology and water resources models from other studies, as available.

Actions

- Obtain all water resources model configurations including hydrology files.
- Using the system network diagrams, locate the required points throughout the catchment for which flows are required.

Deliverables and milestones

- **Deliverable 4.3.6:** Hydrology Systems Analysis Report (Jun 22).

4.3.2 Basic Human Needs

The BHN associated with all resources will be determined. In order to do this, an analysis of the current demographic profile of the Water Management Area (WMA) will be undertaken. The results of Census 2011 and the National 2016 Community Survey will be used as the departure point. This will be supplemented with available data that is either more recent or the result of dedicated studies undertaken to link the population in the WMA with water resources and usage. The population figures will be adjusted from the 2011/2016 base to a 2022 figure using the currently accepted population growth figures for the applicable districts within the WMA. The data will be matched with the profiles of reliance on water resources as provided by the Census 2011 and Community Survey 2016 figures or additional relevant data. The Census 2011 gives a breakdown of reliance on water sources, which is key in determining the sources used by the population. This is essential for calculating Schedule 1 water use and the groundwater component of the BHN. Sources typically specified in the census include Regional Water supply schemes, boreholes, springs, rainwater dams, rivers or streams, water vendors, and water tanks. The WMA can be analysed in terms of these types of services provided and by ward as well as source of supply. This allows for the geographical spread of service types within the WMA. For the riverine use a maximum distance to the relevant resource is assumed on terms of population reliant on run of river. In terms of groundwater this will be crosschecked with the specialist part of the study to ensure that the assumed usage as per the Census is reflected in terms of what is understood with respect to specialist understanding of the groundwater resource. Existing mapping will be used. The Schedule 1 provision of water to settlements from groundwater and boreholes will have to be overlaid with the results of the analysis and model for required supply. The report will show requirements of supply for Schedule 1 use analysed by current category of supply and then calculate the remnant required for run-of-river BHN.

The data will be geo-referenced so that BHN per quaternary and by type of resource reliance are available. Data will be provided in a table that sets out the BHN with respect to a series of mooted models of provision, and by resource, as well as by source/resource.

Task responsibility

- **Huggins, Sami, Scherman, Koekemoer**

Information required

- Census 2011 data.
- National 2016 Community Survey data.

Actions

- Obtaining all relevant demographic data
- Calculating the BHN for relevant area.

Deliverables and milestones

- **Deliverable 4.3.9:** Basic Human Needs Report. Single integrated report considering both surface and groundwater BHN (Aug 22).

4.3.3 Groundwater

The Groundwater Component of the Reserve and Groundwater Classification will be undertaken by calculating the Stress Index for each quaternary catchment based on abstraction (sourced from Registered use in WARMS and the Schedule 1 water use for domestic and livestock based on StatsSA household survey) and revised figures for baseflow and recharge calibrated using

WRSM2000/Pitman. This will include estimated Schedule 1 groundwater uses. Groundwater baseflow and the BHN component from groundwater will be utilised to determine the Groundwater contribution to the Ecological Reserve.

Variables to be utilised include:

- Baseflow and interflow contributions to total runoff and as a fraction of recharge, as derived from WRSM2000/Pitman and calibrated against observed flows.
- Recharge and aquifer recharge obtained via WRSM2000/Pitman, compared to other estimates like the Groundwater Resource Assessment Phase II (GRAII).
- Baseflow reduction by abstraction and streamflow reduction activities.
- Groundwater quality.
- Groundwater level.

Task responsibility

- **Sami**, Louw, Koekemoer

Information required

- Existing lawful water use from the Water use Authorization and Registration Management System (WARMS).
- BHN to be met from groundwater.
- Estimate of Schedule 1 water use not included on WARMS.
- Revised WRSM2000 hydrology including groundwater.
- Groundwater quality data.

Actions

- Calculation of aquifer recharge and baseflow.
- Categorisation of water quality in Classes.
- Calculation of lawful water use from groundwater.
- Calculation of the Groundwater contribution to the Ecological Reserve.

Deliverables and milestones

- **Deliverable 4.3.10:** Groundwater Report (Sep 22).

4.3.4 River EWR: Desktop Biophysical Nodes

Each RU is represented by either a desktop biophysical node or a key biophysical node – otherwise referred to as an EWR site. The Revised Desktop Reserve Model (Version 2) will be used at desktop level to determine the EWRs for the desktop nodes. The output will be in the form of EWR rules for each desktop biophysical node for all categories.

Task responsibility

- **Birkhead**, Louw, Koekemoer

Information required

- Natural and present day hydrology for each node.
- REC for each node.

Actions

- Set up the model with all collated data.

- Model the results and provide summary tables and EWR rules for each node.

Deliverables and milestones

- **Deliverable 4.3.7:** River EWR for the Desktop Biophysical Nodes Report (Jul 22).

4.3.5 River EWR: EWR Site Visit and EWRs

A detailed study was undertaken at eight EWR sites during early 2015. It is assumed that the raw data will be available, and that the same sites can be used for this study. Included in this study will be the Rapid sites as part of the 2015 Reserve study as well as an extended Rapid study undertaken by Rivers for Africa during 2015 on the Black Umfolozi River. A reconnaissance site visit will be undertaken by key specialists to familiarise themselves with the sites. No biophysical surveys will be undertaken at the sites. If possible, an additional hydraulic calibration will be undertaken to improve the confidence in the hydraulic modelling. This will only be possible if the locality of fixed benchmarks can be supplied as well as photo-point monitoring. If only temporary benchmarks have been installed, this will not be possible.

The EWRs will be based on all the survey results and biophysical information generated during previous site visits and assessments. No additional sites will be selected. It is therefore vital that all raw data from previous preliminary Reserve assessments are provided to the PSP. The updated, revised DWS recommended hydrology will be used to recalculate the EWR results and produce EWR rules.

Task responsibility

- **Deliverable 4.3.8:** Louw, Kotze, Rowntree, Birkhead
- **Deliverable 4.3.11:** Louw, Kotze, Rowntree, Birkhead, Mackenzie, Deacon, Scherman, Koekemoer
- **Deliverable 4.3.14:** Louw, Scherman, Koekemoer

Deliverables and milestones

- **Deliverable 4.3.8:** River Survey and Site Visit Report (Jul 22).
A site visit by key specialists to familiarise themselves with existing sites.
- **Deliverable 4.3.11:** Specialist Workshop Report (Sept 22).
This refers to the EWR assessment to produce results as well as specialist documents providing summarised specialist accounts.
- **Deliverable 4.3.14:** Ecological Water Requirements Report (Dec 22).
This report provides the final river EWR results and the motivations for the flows for different ecological states recommended for rivers.

4.3.6 Estuary

Of the nine estuaries in the study area, eight will be the focus of historical Environmental Flow Requirement or EWR studies, albeit mostly at low confidence. However, available information for four of these systems is either lacking or outdated. This highlights the need for the collection of additional new field data and the re-evaluation of historical PES assessments.

Table 4-1 Estuaries: Current available information

Estuary (updated 2018 NBA* names used here)	Existing EWR assessments	Field visit
aMatigulu/iNyoni	Rapid 2016	
Sibiya	Rapid 2006	✓
Mlalazi	Rapid 2015	
uMhlathuze /Richards Bay	EFR 2000 (converted to EWR 2002)	✓
iNhlabane	EFR 2000 (converted to EWR 2002)	✓
uMfolozi/uMsunduze	Intermediate 2016	
St Lucia	Rapid 2004 Intermediate/ Comprehensive 2016	
uMgobezeleni	-	✓
Kosi	Rapid 2016	

* National Biodiversity Assessment

Field sampling and data report:

A once-off reconnaissance-level field survey will be conducted during the low flow period with observations/limited data collected on the Sibiya, uMhlathuze, iNhlabane and uMgobezeleni estuaries following the data requirements specified in the EWR methods for estuaries (DWAf, 2008). As per the methods, data will be collected on water quality, vegetation, invertebrates, fish and birds. Sampling of the different components will be coordinated to ensure that linking between components is possible.

Estuary data reports:

Following the field survey, data reports will be prepared for the Sibiya, uMhlathuze, iNhlabane and uMgobezeleni estuaries. Existing hydrodynamic and sediment modelling results will be used.

Task responsibility

- **Deliverable 4.3.12: Van Niekerk, Weerts, Adams, Allan, Mackay, Assistant, Assistant, Koekemoer (report)**
- **Deliverable 4.3.11: Van Niekerk, Taljaard, Weerts, Adams, Allan, Mackay**
- **Deliverable 4.3.14: Van Niekerk, Taljaard, Weerts, Adams, Allan, Mackay, Koekemoer (report)**

Information required

- Historical measured river inflow data.
- Historical estuary water levels.
- Historical observations on mouth state (open closed).
- Historical observations on salinity and water quality.
- Simulated monthly flow scenarios (> 70 years) for:
 - Natural.
 - Present.
 - Future developments in the catchments (x4) (to be assessed as part of Task 4.4.2).
- Where relevant, i.e., estuaries predominantly fed by groundwater such as Umgobezeleni) provide simulated monthly groundwater scenarios (> 70 years) for:
 - Natural.

- Present Future developments in the catchments (x4) (to be assessed as part of Task 4.4.2).

Actions

- A site visit by the estuary team to selected estuaries.
- Specialist workshop

Deliverables and milestones

- **Deliverable 4.3.12:** Estuary survey and site visit report (Oct 22).
- **Deliverable 4.3.11:** Specialist workshop report.
This refers to the specialist workshop undertaken during Task 4. The purpose of the workshop is to confirm the PES and REC of selected estuaries, i.e., the Sibiya, uMhlathuze, iNhlabane and uMgobezeleni estuaries as well as the consequences of scenarios (part of Task 4).
- **Deliverable 4.3.14:** Ecological Water Requirements Report (Dec 22).
This report will present the estuary component (with the rivers in Task 3.5) and will report on the status (PES) and importance of estuaries only. The status and importance assessment provide the REC and a scenario that results in this state (Task 4) will in essence represent the estuary EWR.

Note:

- One estuary workshop will be held, during which estuary status, as well as ecological consequences of operational scenarios will be determined. Results will be presented in two reports, as requested by the client.

4.3.7 Wetlands

The overall approach is in keeping with outlined techniques for the Rapid Ecological Reserve determination of inland wetlands (DWA, 2012), and to provide conditions that support the hydrological functioning of wetlands for the maintenance of a desired ecological state (DWS, 2016b). These conditions will vary depending on wetland type from quantified flow volumes and distribution or inundation regimes (i.e., quantification of the Reserve for high priority wetlands) to setting of criteria for the protection of wetland condition where the hydrological requirements cannot be quantified.

The quantification of wetland EWRs will focus on the following:

- A desktop assessment of the EcoClassification for wetlands at sub-quaternary reach (SQR) scale using updated information (DWS, 2014e) and re-evaluation using Google Earth ©, to specifically focus on wetland components within quaternaries.
- A refinement of the wetland priorities within the wetland RUs which will include the wetland EI, the Socio-Cultural Importance (SCI), the Water Resource Use Importance (WRUI) and an estimation of wetland PES.
- Ecological Water Requirements (EWRs) will be determined for wetlands with high priority. In most cases, these EWRs will consist of wetland specific EcoClassification using more detailed tools, such as the Wetland Index of Habitat Integrity (DWAF, 2007b) and providing Ecological Specifications (EcoSpecs) were possible.

For each high priority wetland RU, where further detailed RDM work is to be undertaken, the following actions will be required:

1. Determine dominant wetland HGM type.
2. Determine appropriate level of RDM study for wetlands:

- Approach: DWA (2012) - Uses the type of wetland and main impact or threat to identify an appropriate level of RDM assessment.
3. Assess EcoStatus of priority wetlands (use of detailed tool):
- Validation of the PES, the determination of the EIS and the determination of the REC, essentially updating the DWS 2014 data to be more wetland orientated.
 - Using Google Earth © for each SQR where wetlands shown in the NWM5 occur, and metrics re-evaluated with specific focus on the wetlands in the SQR.
 - Following the Rapid Assessment of Wetlands PES protocols (the DSP; Ollis *et al.*, 2014).
4. Determine EWR (or other RDM) to achieve REC:
- The methods for determining wetland EWR vary according to the HGM type of wetland and level of study.
 - Since this will be a desktop evaluation the PES scores and metrics rated, using Google Earth © will become the measures for determining the EWR.

Where EWRs for lakes and other wetlands have been addressed during previous studies, these results will be utilised during this study.

Task responsibility

- **Mackenzie**, Louw, Koekemoer

Information required

- NFEPA and NWM5 datasets for the study area.

Actions

- Desktop re-evaluation of wetland PES, EI and ES per SQR, noting primary drivers, primary impacts and NFEPA and NWM5 relevance / accuracy.

Deliverables and milestones

- **Deliverable 4.3.13:** Wetland Report (Nov 22).

4.4 TASK 4: STEP 4 - IDENTIFY AND EVALUATE SCENARIOS WITHIN INTEGRATED WATER RESOURCES MANAGEMENT

Step 4 consists of the identification and description of operational scenarios within IWRM. The objective of this step is to identify scenarios (operational) which are then modelled to provide the output in the formats required to evaluate the scenarios. Note that these scenarios could consist of any changes to the water resource in terms of quantity and quality. As such, it can include groundwater scenarios as well as water quality scenarios (those associated with wastewater treatment works), amongst others. A scenario incorporating likely differences due to climate change will be included. These scenarios are then tested with stakeholders and an agreed list of scenarios are finalised for further analyses. The scenarios are in most cases modelled using the WRYM (Water Resources Yield Model) and WRPM (Water Resources Planning Model) and the outputs are evaluated to determine a range of consequences (e.g., ecological and socio-economic) which are then compared through a Decision Support System in order to rank the scenarios.

The details of the task are further described below:

4.4.1 Define Scenarios

This step encompasses the identification and description of scenarios that will be evaluated to arrive at the desirable balance between the protection of the ecology and the utilisation of the water resource for socio-economic purposes. The scenarios need to be coherent by appropriately accounting for the relevant aspects (variables) in the catchment's water balance pertaining to each scenario's narrative. The scenario narrative definitions are tested with stakeholders to ensure that a complete list of scenarios has been identified.

For each operational and development scenario the standard DWS Water Resources Yield Model (WRYM) will be configured to represent the scenario conditions (variables), tested for consistency after which time series of monthly flows will be simulated for use in the ecological evaluations. Alternatively, difference analysis based on an appropriate base scenario will be carried out in cases where different abstractions or discharges need to be evaluated. Appropriate statistics of the simulated time series will be compiled for interpretation and application in the other tasks.

It is envisaged that a scenario where the flow conditions comply with the REC will be evaluated as the one extreme with the largest potential negative implication on the economy. Other intermediate scenarios will also be defined to provide for a practical range of conditions (settings) for comparison and to find the best balance between protection and level of water use. A maximum of five scenarios will be considered (over and above those for natural and present day conditions).

Task responsibility

- **Seago**, Louw, Van Niekerk, Mare

Information required

- Possible future options for development in the catchment from the Reconciliation Strategy and other sources.

Actions

- Configure Scenarios into water resources models.
- Analyse Scenarios and produce results.

Deliverables and milestones

- Identified scenarios as part of a discussion document (internal deliverable) presented at PMC meeting 3 (**Deliverable 4.3.30**).
- **Deliverable 4.3.15**: Scenario description report (Feb 23).

4.4.2 Ecological Consequences of Scenarios (Rivers and Estuaries)

The operational scenarios (once approved by DWS after comments from the catchment stakeholders) will be tested to determine the estimated change in PES for each scenario as well as to measure how successful the scenarios will be in achieving the REC for the ecological systems. The scoring for the PES and the components that make up the PES EcoStatus as generated during previous tasks will be used. This will allow a consistent ranking of scenarios at each EWR site and the estuary and through a process of weighting (based on importance), the provision of an integrated ranking for the system.

Specific actions undertaken for the Estuarine component are listed below:

- Estuarine Specialist Workshop to assess consequences of scenarios and develop/confirm RQOs and Monitoring (Task 5/Step 5) requirements: A 5-day specialist workshop will be convened to determine/confirm the estuaries PES and REC, and to assess the consequences of future scenarios. In addition, the workshop will develop/confirm the EcoSpecs/ROQs and the monitoring programmes for the estuaries of the catchment (Task 5/Step 5). The identified Ecosystem Services will also be evaluated in terms of their responses to flow modification.
- Estuary Scenario Consequences Report: The study team will prepare an Estuary Scenario Consequences report for the Estuaries Component based on the outcome of the specialist workshop.
- A new EWR study will not be conducted on St Lucia/Umfolozi system considering the recently completed 2016 Lake St Lucia Intermediate EcoClassification and EWR. However, given the controversial artificial breaching of St Lucia mouth in January 2021, it may become necessary to adjust the 2016 PES and RQOs based on the outcomes of the Expert Panel being set up to review the scientific basis for the breach of the Lake St Lucia Estuary mouth (Government Gazette, 30 April 2021, Vol 670, No 44507). Outcomes of the Expert Panel Review will only be served to the Minister of Forestry, Fisheries and the Environment (DFFE) in March 2022 after which it would be released to the wider public. The outcome of the Expert Panel is vital as input into the RQO determination and how it relates to the existing EWR.

Task responsibility

- **Louw, Van Niekerk**, Birkhead, Deacon, Kotze, Mackenzie, Rowntree, Scherman, Mackay, Koekemoer

Information required

- Historical fisheries catch data from DFFE Branch: Fisheries Research).

Actions

- The result of the Expert Panel Review of the scientific basis for the breach of the Lake St Lucia Estuary mouth (Government Gazette, 30 April 2021, Vol 670, No 44507) is due to be published in March 2022.

Deliverables and milestones

- **Deliverable 4.3.17:** Ecological Consequences Report (May 23)
This includes the specialist assessment and the final consequences report for rivers and the report for estuaries as an outcome of their specialist assessment which forms part of **Deliverable 4.3.11** covered in Task 3.6.

4.4.3 Wetlands

Once operational scenarios have been approved, the following process will be followed:

- Assess which high priority wetlands will be affected by scenarios.
- Evaluate the ecological consequences of each scenario to wetland EC: Evaluate both the non-flow related and flow related (including groundwater input) impacts associated with each scenario, and determine the ecological consequences in relation to REC.
- Rank scenarios in terms of meeting the REC.

Task responsibility

- **Mackenzie**

Information required

- Scenario outputs.

Deliverables and milestones

- **Deliverable 4.3.17:** Ecological Consequences Report (a wetland component within the main Ecological Consequences Report) (May 23).

4.4.4 Ecosystem Services

The evaluation is undertaken to determine the consequences of operational scenarios on the current state of the Ecosystem Services for rivers and the key wetlands, lakes and estuaries. The output will be a populated spreadsheet table with the analysis of changes from a quantum based on status quo and expressed as a magnitude of change, to key ecosystem services – specifically provisioning services - per scenario with narrative description of reasons for change.

Task responsibility

- **Huggins**

Information required

- Appropriate narrative description/discussion of scenarios and geographical cues (river reaches) with results of scenario analysis workshop.

Actions

- Spreadsheet analysis of scenarios.

Deliverables and milestones

- **Deliverable 4.3.18:** Ecosystems Services Consequences Report (Jun 23).

4.4.5 Non-Ecological Water quality

The evaluation is undertaken to determine the consequences of operational scenarios on identified non-ecological water quality users or role players. This step assesses consequences on water quality for users such as domestic, recreational, irrigation, mining and stock watering. Impacts on water quality as a physical habitat parameter for maintenance of the aquatic ecosystem (i.e. the resource base) is referred to as “ecological” water quality, and is satisfied through the river and estuary EWR tasks. The output from the user water quality task is provided for rivers as a probability of exceedance of fitness for use for the driving user (and variable). For estuaries, the output is the identification of the compliance or non-compliance of the scenarios as it relates to water quality requirements of users and uses.

This task will require a Technical Task Team (TTT) workshop to meet with users or contributors to the system in terms of water quality (e.g., mines, irrigated agriculture, wastewater treatment works), particularly considering the recent spill into the Black Umfolozi by Zululand Anthracite Colliery. The Water Quality Specialist Report for rivers, prepared by Dr H Malan as part of the Reserve study undertaken by Southern Waters in 2014 (DWS, 2014b), provides a good overview of the catchment, but focuses on ecological water quality, and then particularly on the eight EWR sites. As impacts on users are an important aspect of Classification, a water quality (rivers and estuaries) Technical Task Team workshop will be valuable in providing water quality information. Stakeholder interaction and input to the study are also a tenant and legal requirements of Classification. The information gathered

here will also inform the water quality RQO process, and prepare stakeholders for input to RQOs, as well as the review of draft water quality RQOs.

Task responsibility

- **Scherman**, Taljaard, Lötter (TTT meeting)

Information required

- Input from stakeholders at a TTT meeting; preferentially the provisional date of August 2022 (TTT meeting 1) or provisional date of April 2023 (TTT meeting 2).

Actions

- Prepare and run TTT meeting, provide notes for DWS and use information provided.
- Prepare the relevant section of the Economic and User water quality consequences report.

Deliverables and milestones

- **Deliverable 4.3.24:** Technical Task Team meeting.
- **Deliverable 4.3.19:** Economic & User water quality consequences report (Jun 23).

4.4.6 Economics

The economic activities that rely on the water resources from the catchments will be estimated and analysed in terms of both a baseline as well as alternative scenarios. The alternative scenarios will be measured against the baseline to establish the marginal impact. A Water Impact Model that will be populated with the required data, representative for each river system, will be applied to conduct the impact analysis. This input data will flow from work undertaken by other members of the research team with respect to the various river systems.

The baseline input data will entail parameters such as water use per economic activity, where users have a higher or lower intensity of water use in terms of economic output, and the annual turnover expressed in terms of the base year prices etc. Variables such as a price and employment impact will be determined depending on the nature of the economic activity. In this case, the contribution of economic activities for every river will be determined in terms of the following socio - economic criteria, namely:

- Gross Domestic Product (GDP).
- Impact on Capital Formation.
- Employment creation, and
- Impact on Household income (Poverty alleviation) with emphasis on low-income households.

These socio-economic indicators will be determined by applying an area specific partial general equilibrium model underpinned by the Social Accounting Matrix (SAM) modelling framework.

The focus of the economic analyses will therefore be on estimating the relative economic changes (marginal impacts) that will be caused by the proposed identified scenarios. The quantified impact of scenarios per IUA or other relevant zones will be provided as output of the socio-economic impact model.

Task responsibility

- **Mullins**, Cloete, Scherman, Koekemoer

Information required

- The economic impacts will be determined from the scenarios provided by the hydrological and environmental team.

Actions

- Analysis of operational scenarios determining social and economic impacts.

Deliverables and milestones

- **Deliverable 4.3.19:** Economic & User Water Quality Consequences Report (Jun 23).

4.4.7 Compare and evaluate scenarios

The objective is to carry out a systematic process of evaluating and comparing the identified scenarios and apply a form of decision support analysis to assist with the selection of the proposed Water Resource Classes (see next task). The activities of this decision support process are broadly two-fold. Firstly, an analytical approach is undertaken for comparing and ranking scenarios preferably by means of a set of quantitative metrics. The second activity is linked to the interaction with stakeholders as part of Task 5 (the next task).

As input into the Water Resource Class determination step, a tool applying multi-criteria analysis and decision-making will be applied to rank the scored scenarios for the rivers and estuary, ecosystem services and economic criteria (such as usually GDP, jobs and the impact on poverty alleviation). This tool is referred to as a Multi Criteria Decision Analysis (MCDA) and Classes determination tool (model) (DWS 2016e).

As part of setting up of the model, the basic spreadsheet will be converted to an application within Excel such as the Visual Basic Applications within an Excel MS environment. This will allow for ease of general use/application for this and future general applications.

The MCDA and Classes determination model is set up and populated at the end of Task 4 and then utilised within the process of selecting the appropriate scenarios and Classes during Task 5.

Task responsibility

- **Birkhead, Louw**

Information required

- Excel spreadsheet developed by Pieter van Rooyen, WRP.

Actions

- Code the spreadsheet in Visual Basic or other appropriate model for use in this project.

Deliverables and milestones

- **Deliverable 4.3.16:** Finalise Classes decision-making tool spreadsheet (Feb 23).

4.5 TASK 5: STEP 5 - DETERMINE WATER RESOURCE CLASSES BASED ON CATCHMENT CONFIGURATIONS FOR THE IDENTIFIED SCENARIOS

The objective of this step is to:

- Integrate the consequences to provide the resulting Classes of each scenario, as well as Classes for the PES, REC and Target Ecological Category (TEC) for stakeholder evaluation during the next step; and
- with stakeholder input, arrive at Classes and the catchment configuration that will be available for the preparation of the legal notice.

Note that PES, REC, TEC and operational scenarios are the suite of scenarios that will be evaluated.

The most important part of Integrated Step 5 is the determination of the Water Resource Classes for each IUA under different operational scenarios, as well as for different ecological states at various biophysical nodes. An analysis is undertaken to determine the best balanced option between protection and use for each IUA and the biophysical nodes in the IUA (referred to as the Catchment Configuration). The implications of not meeting the ecological objectives represented by the REC are identified and the best balanced option, the TEC, is selected with appropriate motivations.

Established rules are used to define the portion of the resource in each Ecological Category relative to the total resource (unit of measurement is river length, footprint area for wetlands and estuaries within an IUA). The MCDA and WRC determination model (Task 4.4.7) will be used to calculate the Class.

A discussion document will be prepared that will:

- Describe the interventions required to achieve the REC.
- Identify where the REC is problematic to meet and recommend management options.
- Suggest the proposed TEC based on the best balanced scenario as well as attainability criteria.
- Provide the implications of the TEC.

After input from both internal and external stakeholders, as well as liaison with relevant government institutions that play a role in IWRM or who are affected, recommendations will be made regarding the Classes and Catchment Configuration. This information then feeds into the legal notice.

Task responsibility:

- **Louw**, Seago, Mullins, Cloete, Mare, Van Niekerk, Scherman

Information required

- Water Resources Class Model population with all required information.

Actions

- Preparation of the model to allow a range of possible Water Resource Classes in terms of catchment configuration to be evaluated.
- Internal team meetings with DWS to agree on Target Ecological Categories to be presented to stakeholders.
- Preparation of a discussion document.

Deliverables and milestones

- Identified scenarios as part of a discussion document (internal deliverable) presented at PMC Meeting 4 (**Deliverable 4.3.30**)
- **Deliverable 4.3.20**: Water Resources Class Report (Jul 23).

4.6 TASK 6: STEP 6 - DETERMINE RQOs (NARRATIVE AND NUMERICAL LIMITS) AND

PROVIDE IMPLEMENTATION INFORMATION

RQOs (narrative and numerical) are specified for the Classes and catchment configuration per RU. Different RQO levels, according to the RU priority (as determined during Step 2), will be determined. The output will be to provide appropriate level of RQOs for all RUs with the high priority RQOs being available for gazetting. According to the priorities of the RUs (determined during Integrated Step 2), different levels of detail are provided. High priority RUs will require detailed RQOs for a variety of components that will be gazetted. Only flow RQOs will be provided for low and moderate priority RUs. This information will be tested with stakeholders in preparation of gazetting the RQOs.

- **RQO sub-component indicators:** Sub-components will be identified and prioritised in each RU.
- **Groundwater:** Critical subcomponents will be identified and indicators selected. Narrative and/or numerical limits for RQOs will be identified.
- **Rivers and estuaries:** Flow, habitat and biota RQOs as generated in Step 3 (rivers) and Step 4 (estuaries) will be provided for the TEC of High priority RUs (at EWR sites and estuaries). Water quality RQOs will also be determined for High priority water quality RUs. Broad (desktop level) flow RQOs (at desktop biophysical nodes) as generated during Step 3 for the TEC of Low and Moderate priority RUs will be provided. To ensure integration with the estuary management planning processes, broad ecological condition RQOs will also be provided for the estuaries, as well as an indication of interventions needed for achieving the RQOs that should be embedded in local estuary management plans.
- **Non-ecological (user) water quality RQOs:** Areas may be identified where water quality is significant to users, and not just to the resource base (ecology). In addition to RQOs being provided at EWR sites, water quality RQOs may need to be provided in a range of other areas where water quality issues of importance have been identified. This step will build on stakeholder involvement and input to the process. Adjustments to current methods as outlined in DWS (2016c), will be followed as far as possible.
- It is recommended that this information be provided together with the River RQOs in a single report, and per identified significant Resource Unit or sub-quaternary catchment.
- **Wetlands:** Flow and non-flow related impacts will be identified and sub-components for RQO determination and monitoring will be selected. Indicators that represent sub-components will be identified.
- **Implementation:** The rollout actions needed to implement the Classes and RQOs will be defined and described. An Implementation Report will be prepared which will include recommendations regarding the monitoring network. Linkages with other institutions e.g., environmental and local government, will be recommended. This information will feed into the relevant implementation plans and catchment operating rules.

Task responsibility

- **Deliverable 4.3.21: Scherman, Louw, Deacon, Kotze, Mackenzie Rowntree, Koekemoer, Van Niekerk, Sami**
- **Deliverable 4.3.22: Seago, Scherman, Louw, Koekemoer, Van Niekerk, Sami**

Information required

- Acceptance of proposed RQOs and reviewer comments received timeously on previous reports.

Deliverables and milestones

- **Deliverable 4.3.21: RQOs and Numerical Limits Report (Oct 23).**

- **Deliverable 4.3.22:** Monitoring programme to support implementation / operationalisation of the Water Resource Classes and the RQOs (Nov 23).

Responsibility of the PSP

- Information available for a RQO legal notice.
- The PSP is not responsible for the setting of operational rules or an implementation plan. The PSP is responsible for providing input into an implementation plan.

4.7 TASK 7: STEP 7 – INPUT INTO LEGAL NOTICE AND CLOSURE

4.7.1 Gazette Water Resource Classes and Resource Quality Objectives

These steps will follow the DWS process as is currently in place to prepare the Classes and RQO information in the legal templates. The Reserves are only finalized and gazetted once Classification has been gazetted and therefore does not form part of this study. Technical input to the gazette is provided by the project team, together with the support of a legal practitioner. Note that support is provided during the 60-day comments period of gazetting as part of stakeholder engagement, with issues and responses recorded in the final IRR.

Task responsibility

- **Scherman, Louw, Koekemoer, Van Niekerk, Seago, Thompson, Lötter**

Information required

- A template from the DWS for preparation of the Classification and RQO gazette.
- Issues and responses received during the gazetting period will be recorded in the final IRR.

Actions

- Technical and legal input to the gazetting process.
- Populate draft gazette for review by DWS.
- Management of review process.
- Addressing of comments on the gazette.
- Gazetting period: Dec 23 to May 24.

Deliverables and milestones

- **Deliverable 4.3.27:** Classes and RQOs gazette template (technical input to the legal notice) (Jan 24).

4.7.2 Preparation of Main Report

The final task of the study is the preparation of final deliverables. It is also proposed that the public stakeholder meeting presenting the final outcomes of the study is held during this phase, i.e., February 2024.

Task responsibility:

- **Deliverable 4.3.32: Seago, Scherman, Louw, Koekemoer, Van Niekerk, Sami, Mackenzie, Huggins, Mullins**

Information required

- Results from all the previous tasks.

Actions

- Collating all existing project data and results.

Deliverables and milestones

- **Deliverable 4.3.32:** Main Report (Jan 24).
- **Deliverable 4.3.34:** Project Close-out Report and Electronic Information and Data.
- This report forms the final deliverable of the study and serves as feedback on final deliverables, milestones, stakeholder participation, training, challenges and lessons learnt through the undertaking of the Study.
Recommendations which can be considered in the review of the WRCS Guidelines.

5 SCOPE OF WORK: CAPACITY BUILDING

As itemized in the TOR, capacity building will take place at three levels, i.e. (1) mentorship of Mr Mnisi and Ms Makanda, as identified by DWS; (2) broad capacity building workshops that provide an overview of specific study components to DWS and IUCMA staff; and (3) stakeholder empowerment sessions. More detail is provided below per training category.

5.1 MENTORSHIP PROGRAMME

The mentorship programme is designed so that seconded staff to the study can be directly involved and provide active and effective input to the study. The programme listed below has been developed with input from the DWS PMT at the outset of the study. Involvement of seconded staff in fields of their choice is possible, although it is assumed that the DWS Project Manager will be involved with all the steps of the process. A proposed Mentorship Programme is presented in **Appendix C**.

5.2 CAPACITY BUILDING WORKSHOPS

It is assumed that capacity building workshops will be broad and cover certain phases of the study, and will be designed to build knowledge on phases of the study before each phase progresses. Three workshops are planned, with the proposed subject matter being as follows:

1. Phase 1: *An overview of Classification, Reserve and RQOs as RDM tools in Integrated Water Resource Management (IWRM)*. This workshop will go through all the steps to be covered in the study in an interactive discussion session, so that all officials that are likely to be involved in management of the study catchment understand the intent behind each step, and the sub-steps and components to be covered by each step. It is planned for May 2022.
2. Phase 2: *Operational scenarios – selection, modelling and evaluation – and Classes*. This workshop would cover systems modelling, the process of scenario identification and selection, evaluation of consequences (ecological and user consequences), and the process to determine Classes. It is planned for August 2023.
3. Phase 3: *RQOs and gazetting*. The final phase of the study will be the steps after Class selection, i.e., determination of RQOs, monitoring and the implementation programme, and gazetting, including the legal framework. It is planned for December 2023.

These workshops are assumed to include at least DWS and IUCMA officials.

5.3 STAKEHOLDER EMPOWERMENT SESSIONS

Stakeholder capacitation is essential for stakeholder contribution to the process. It is proposed that stakeholder sessions take place before selected PSC meetings as required, as stakeholders are generally not able to travel for additional sessions. Note that these empowerment sessions **MUST** be planned together with the representative from the DWS Chief Directorate: Institutional Oversight, which manage communication and liaison with stakeholder groups in the catchment. This will ensure that the information presented at empowerment sessions dovetail with the information provided at other DWS-led meetings.

An important capacitation session is proposed for the back-to-back PSC meetings 2 and 3 proposed for December 2022. Due to the subject matter being discussed, i.e., from the EWR assessment process (Day 1) through to the scenario development and selection process (Day 2), this is considered an important opportunity to capacitate the PSC for decision-making that they will be party

to. It is suggested that the training session is run on Day 1 as an introductory session before the EWR PSC meeting 2. This session will be designed to expose stakeholders to terminology and briefly take them through to process, while identifying steps where their input will be particularly required.

Other empowerment sessions will be identified and run as required.

5.4 EMERGENT SMME INVOLVEMENT

The TOR required the appointment of an emergent Small, Medium and Micro Enterprise (SMME) as part of capacity building. Mr Nathi Ncube of Khapheni Consulting based in Mtunzini will serve as both the isiZulu interpreter for the study and as the SMME contractor. Funds set aside in the budget were split between the seven PMC meetings (this expense excludes Mr Ncube's role as interpreter). Mr Ncube has many years' experience in the environmental field, so it would be valuable to extend his expertise into the RDM field. It is therefore proposed that he attend appropriate training opportunities, particularly Capacity building workshop 1 and general training/empowerment sessions. This attendance would ensure he has a good overview of the process and would assist him in his role as isiZulu interpreter for public meetings to be held at the end of the study.

Task responsibility:

- **Scherman, Seago, Louw, van Niekerk, Lötter, Ncube**

Actions

- Liaise with DWS throughout the study regarding capacity building.
- Run all capacity building workshops and meetings.

Deliverables and milestones

- **Deliverable 4.3.28:** Capacity building reports (Mentorship programme, capacity building workshops and stakeholder empowerment sessions).
- **Deliverable 4.3.29:** Management of, and liaison with Mr Ncube as selected SMME contractor.

6 STUDY PROGRAMME

The duration of the project is 30 months, with initiation in December 2021. All tasks to the point where the draft gazette is available will be undertaken during the first 24 months. This leaves a six-month period for DWS to approve the publishing of the Legal Notice for comments, addressing the comments and finalisation of the Gazette. The finalisation of the project, which entails the Closing Report, amongst others, will run concurrently with the six months allocated for the Gazetting process.

The deliverables and milestones are listed in **Table 6.1**. Milestones for the study were categorised as Technical Reports and/or technical information generated during the study. It is envisaged that 23 milestones will be achieved during the course of the study. A Gantt chart is provided in **Table 6.2**, outlining the timetable of activities and main outcomes of the assignment as deliverables and milestones.

Table 6-1 Milestones and deliverables

Task	Milestones & Deliverables	Date
1.1 TASK A: INCEPTION PHASE	Initiation meeting	Jan-22
	Inception meeting	Feb-22
	Inception Report, including Gap Analysis Chapter	Feb-22
	Stakeholder Engagement Plan and stakeholder database	Feb-22
	PMC meeting (PMC1): Dry run for the public meeting & Present progress and dry-run planning for PSC meeting 1 (delineation and status quo)	May- 22
	Public meeting 1	May-22
TASK 1: STEP 1 - DELINEATE IUAs AND DESCRIBE THE STATUS QUO	1.1 PMC meeting (PMC2):	TBD
	1.2 PSC meeting (PSC1)	May-22
	1.3 Status Quo, IUA and RU Report	May-22
TASK 2: STEP 2 - DELINEATE AND PRIORITISE RUs AND SELECT STUDY SITES	2.1 PES/EIS spreadsheet	Feb-22
	2.2 Resource Units Prioritisation Report	May-22
TASK 3: QUANTIFY BHN & EWRs	3.1 Hydrology Systems Analysis Report	Jun-22
	3.2 Groundwater Report	Sep-22
	3.3 Basic Human Needs Report	Aug-22
	3.4 River Survey and Site Visit Report	Jul-22
	3.5 River EWR for the Desktop Biophysical Nodes Report	Jul-22
	3.6 Ecological Water Requirements Report	Dec-22
	3.7 Estuary Survey and Site Visit Report	Oct-22
	3.8 Estuaries: Specialist Reports	Nov-22
	3.9 Wetland Report	Nov-22
	3.10 PMC meeting (PMC3)	Nov-22
3.11 PSC meeting (PSC2)	Dec-22	
TASK 4: IDENTIFY AND EVALUATE OPERATIONAL SCENARIOS	4.1 Classes decision-making tool spreadsheet	Feb-23

Task	Milestones & Deliverables	Date
	4.2 PMC meeting (PMC4) and scenario discussion document	Apr-23
	4.3 Scenario Description Report	Feb-23
	4.4 Ecological Consequences Report	May-23
	4.6 Ecosystem Services Consequences Report	Jun-23
	4.7 Economic & User Water Quality Consequences Report	Jun-23
	4.8 PSC meeting (PSC3)	Dec-22
TASK 5: DETERMINE WATER RESOURCE CLASSES BASED ON CATCHMENT CONFIGURATIONS FOR THE RANGE OF SCENARIOS	5.1 Water Resources Class Report	Jul-23
	5.2 PMC meeting (PMC5) and Water Resource Class discussion document	Aug-23
	5.3 PSC meeting (PSC4)	Apr-24
	5.4 Legal notice template	Jan-24
TASK 6: DETERMINE RQOs & PROVIDE IMPLEMENTATION INFORMATION	6.1 RQOs and Numerical Limits Report	Oct-23
	6.2 Implementation and Monitoring Report	Nov-23
	6.3 PMC meeting (PMC6)	Jan-24
	6.4 PSC meeting (PSC5)	Sep-23
TASK 7: INPUT INTO LEGAL NOTICE AND CLOSURE	7.1 Main Report	Jan-24
	7.2 Technical input into the legal notice	Mar-24
	7.3 Final I&R Report	May-24
	7.4 Project Closing report and Electronic Information and Data	May-24
	7.5 PMC meeting (PMC6)	Jan-24
	7.6 Public meeting 2	Feb-24
	7.7 PMC meeting (PMC7)	May-24
ADDITIONAL STAKEHOLDER COMMUNICATION & LIAISON	Technical Task Team meeting (x3)	Sep-22, May-23, Oct-23
	Reference Group meeting (x2)	Apr-23, Aug-23
ADDITIONAL CAPACITY BUILDING	Training workshop 1	Dec-22
	Training workshop 2	May-23
	Training workshop 3	Nov-23
	Stakeholder capacity building	Apr-23, Sep-23, Dec-23

According to the information provided by the Client, the study should be completed within a 30-month period. A Gantt chart is provided below.

Table 6-2 Gantt chart

Task	Sub-Task (Numbers co-incide with Tasks)	Contract Table n°	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24			
INCEPTION	Info Review & Inception report	4.3.1			s,i																														
INCEPTION	Stakeholder database and SEP	4.3.2			s,i																														
INCEPTION	Mentorship Program	4.3.1			s,i																														
INCEPTION	Kick off meeting	4.3.30, 4.3.31		s	i																														
INCEPTION	Inception report presentation meeting	4.3.30, 4.3.31			s,i																														
INCEPTION	PMC 1: dry run for PSC 1 and public meeting prep	4.3.30, 4.3.31						s,i																											
INCEPTION	Public meeting 1	4.3.25						s,i																											
TASK 1	1: Status quo, RU & IUA report	4.3.4					s	i																											
TASK 1	PMC 2: TBD	4.3.30, 4.3.31																																	
TASK 1	PSC meeting 1 (Step 1+2: Status Quo, Delin, IUAs)	4.3.23						s,i																											
TASK 1	1: Review of PESEIS results	4.3.3			s,i																														
TASK 2	2: RU Prioritisation report	4.3.5					s	i																											
TASK 3	3.1: Hydrological Systems Analysis Report	4.3.6						s	i																										
TASK 3	3.2: BHN Report	4.3.9								s	i																								
TASK 3	3.3: Groundwater Report	4.3.10									s	i																							
TASK 3	3.4: River EWR for the Desktop Biophysical Nodes Report	4.3.7							s	i																									
TASK 3	3.5: EWR river site visit and site visit report	4.3.8								s,i																									
TASK 3	3.5: EWR specialist workshop report (Assessment & report for Rivers)	4.3.11									s,i																								
TASK 3	3.6: Estuary field sampling & Site Visit report	4.3.12										s,i																							
TASK 3	3.6 Report: EWR report; rivers	4.3.14											s	i																					
TASK 3	3.7: Wetland EWR report	4.3.13											s	i																					
TASK 3	PMC 3: dry run for back to back PSC 2&3 (Step 3 & Step 4)	4.3.30, 4.3.31												s,i																					
TASK 3	PSC meeting 2 (Step 3: EWRs, BHN)	4.3.23												s,i																					
TASK 3	PSC meeting 3 (Step 4: input to scenarios)	4.3.23												s,i																					
TASK 4	4.1: Scenario description report	4.3.15													s	i																			
TASK 4	4.2: River Ecological Consequences analysis	4.3.17														s	i																		
TASK 4	4.2 Estuary EWR/Consequences Specialist Meeting + data analyses	4.3.11														s,i																			
TASK 4	4.4: Ecosystem Services Consequences analysis and report	4.3.18															s	i																	
TASK 4	4.6: Economic Consequences analysis and reporting	4.3.19															s	i																	
TASK 4	4.7: Water Resources Class decision making Tool	4.3.16														s,i																			
TASK 5	5: Water Resources Class determination and report	4.3.20																		s	i														
TASK 5	PMC 4: Water Resources Class discussion document	4.3.30, 4.3.31															s	i																	
TASK 5	PSC meeting 4 (Step 5: consequences + draft classes)	4.3.23															s	i																	
TASK 6	6: Analysis and RQO Report	4.3.21																			s	i													
TASK 6	6: Implementation report	4.3.22																				s	i												
TASK 6	PMC 5: dry run - Classes & RQOs	4.3.30, 4.3.31																				s,i													
TASK 6	PSC meeting 5 (Step 7: Classes + RQOs)	4.3.23																					s,i												
TASK 6	PMC 6: dry run for public meeting	4.3.30, 4.3.31																																	
TASK 6	Public meeting 2	4.3.25																																	
TASK 7	7.2: Technical summary report (Main report)	4.3.32																								s									
TASK 7	7.1: Technical input into the Legal Notice	4.3.27																																	
TASK 7	Consolidate I&R register	4.3.33																																	
TASK 7	7.2: Electronic data & Close out report	4.3.34																																	
TASK 7	PMC 7	4.3.30, 4.3.31																																	
TASK 9	Technical Task Group (x 3)	4.3.24									s,i																								
TASK 9	Sectoral meeting (x 2)	4.3.26																																	
TASK 8	Training 1 (General overview)	4.3.28						s,i																											
TASK 8	Stakeholder capacity building	4.3.28												s,i																					
TASK 8	Emergent SMME	4.3.29									s,i																								

Note: "s" = Submit deliverable, "i" = invoice

7 STUDY TEAM

The study team consists of individuals with extensive experience in the field of water resource planning. The proposed team members (**Table 7.1**) have been involved in a variety of studies for DWS since 1988. A summary of key personnel and their expertise in the 13 study components outlined in the TOR, are provided in **Figure 7.1**. The task leaders are listed below:

- Study Leader – C Seago
- Co Study Leader – P-A Scherman
- River Team Leader – D Louw
- Estuary Team Leader – L Van Niekerk

WRP Consulting Engineers (Pty) Ltd and Scherman Environmental CC will subcontract all team members.

Table 7-1 Study team members

Surname	Name	Title	Company	Study Components and team member expertise
Rivers				
Louw	Delana	Ms	Rivers for Africa eFlows Consulting (Pty) Ltd	Task Leader: RIVERS (EWR specialist, IHI)
Birkhead	Drew	Dr	Streamflow Solutions	EcoHydraulics
Deacon	Andrew	Dr	Rivers for Africa eFlows Consulting (Pty) Ltd	Macroinvertebrates
Koekemoer	Shael	Ms	Rivers for Africa eFlows Consulting (Pty) Ltd	Diatoms and report editor
Kotze	Piet	Dr	Clean Stream Biological Services (Pty) Ltd	Fish
Mackenzie	James	Mr	Mackenzie Ecological And Development Services Cc	Riparian vegetation
Rowntree	Kate	Prof	Rivers for Africa eFlows Consulting (Pty) Ltd	Fluvial geomorphology
Scherman	Patsy	Dr	Scherman Environmental CC	Ecological water quality
Estuaries				
Van Niekerk	Lara	Dr	Council for Scientific and Industrial Research	Task Leader: ESTUARIES (Hydrodynamics)
Adams	Janine	Prof	Nelson Mandela University	Microalgae and macrophytes
Allan	David	Mr	WRP Consulting Engineers (Pty) Ltd	Birds
Lamberth	Stephen	Dr	DFFE*	Fisheries
MackKay	Fiona	Ms	South African Association for Marine Biological Research	Invertebrates
Mselegu	Sam	Mr	South African Association for Marine Biological Research	Assistant/intern
Pillay	Clare	Ms	South African Association for Marine Biological Research	Assistant/intern
Taljaard	Susan	Dr	Council for Scientific and Industrial Research	Water quality

Surname	Name	Title	Company	Study Components and team member expertise
Weerts	Stephen	Mr	Council for Scientific and Industrial Research	Fish
Hydrology and Systems Analysis				
Seago	Caryn	Ms	WRP Consulting Engineers (Pty) Ltd	Study leader and Task leader: HYDROLOGY AND SYSTEM ANALYSIS (Yield modelling)
Mare	Manie	Mr	WRP Consulting Engineers (Pty) Ltd	Hydrology, systems analysis
Sami	Karim	Mr	WSM Leshika Consulting (Pty) Ltd	Geohydrology
BHN & Socio-Cultural (River & Estuary)				
Huggins	Greg	Mr	Nomad Consulting	Ecosystems Services: Surface water
Sami	Karim	Mr	WSM Leshika Consulting (Pty) Ltd	Ecosystems Services: Groundwater
Economics				
Mullins	William	Mr	Conningarth Economists	Water Resource Economics
Cloete	Riekie	Ms	Conningarth Economists	Water Resource Economics
Wetlands				
Mackenzie	James	Mr	Mackenzie Ecological And Development Services CC	Wetland classification and EWR determination
Water quality				
Scherman	Patsy	Dr	Scherman Environmental CC	Co-Study Leader and Task Leader: WATER QUALITY (incl. non-ecological (user) water quality) AND CAPACITY BUILDING
Taljaard	Susan	Dr	Council for Scientific and Industrial Research	Ecological and non-ecological water quality: Estuaries
Koekemoer	Shael	Ms	Koekemoer Aquatic Services CC	Ecological water quality: Diatoms (River)
Communication				
Lötter	Anelle	Ms	Anelle Lotter Communications	Stakeholder communication and liaison
Capacity Building				
Scherman	Patsy	Dr	Scherman Environmental CC	Capacity Building
Support				
De Sousa	Paul	Mr	WRP Consulting Engineers (Pty) Ltd	GIS
Thompson	Hubert	Mr	Thompson and Thompson	Water Legal expert

Note *: Dr Lamberth is a non-paid member of the Team

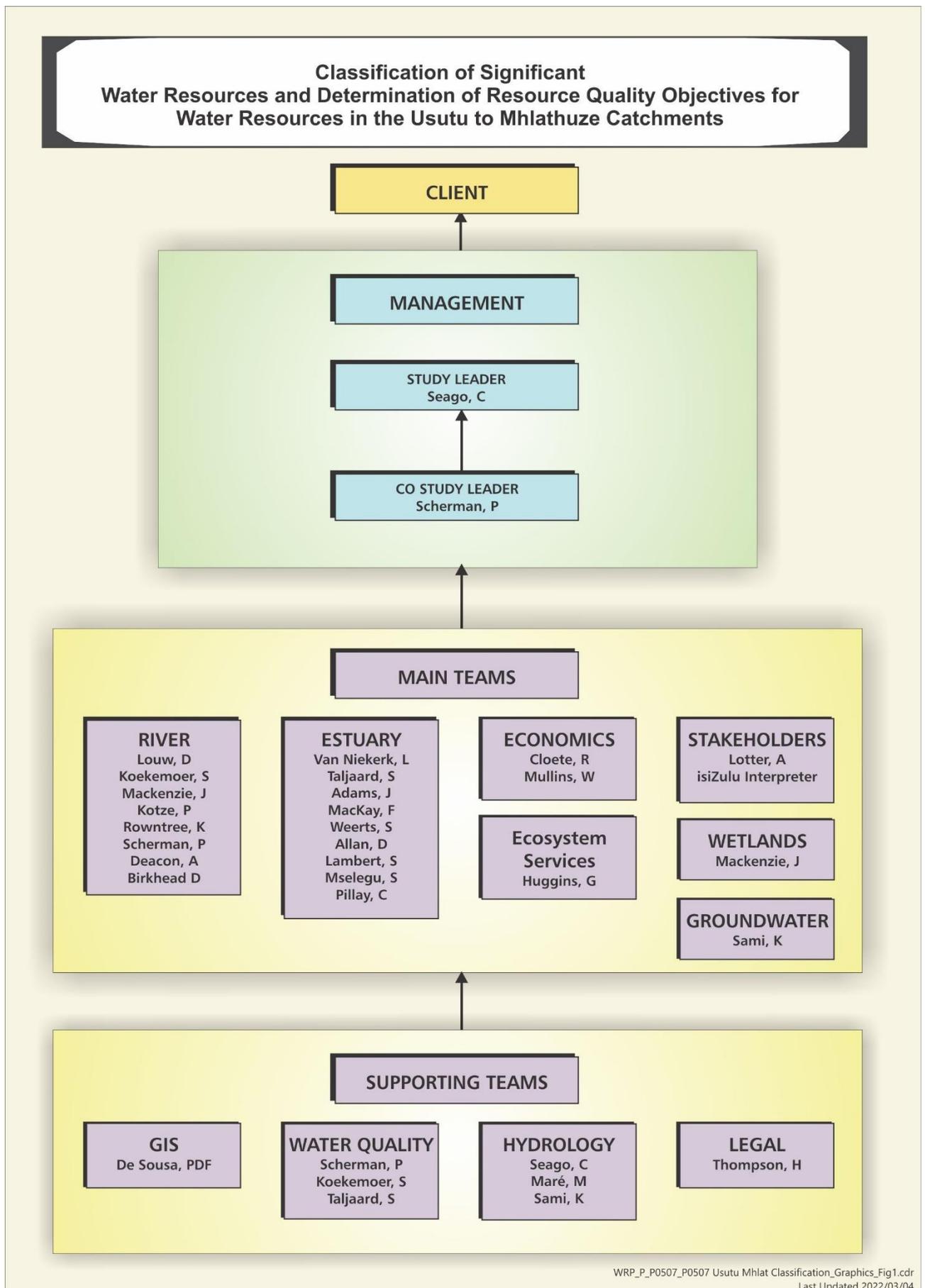


Figure 7.1 Team organogram

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APPENDIX A: DETAILED LITERATURE REVIEW TABLE FOR HYDROLOGY AND WATER RESOURCES

A1 PONGOLA – UMFOLOZI

Study / Report	Year	Client	Author	Relevant information
DEVELOPMENT OF A RECONCILIATION STRATEGY FOR ALL TOWNS IN THE EASTERN REGION (WP9712)				
Kwangwanase (Manguzi) WSS Area	2011	DWS: NWRP	Water for Africa (Pty) Ltd in association with Aurecon (Pty) Ltd; Water Geosciences and Charles Sellick and Associates	Water Supply scheme layouts, water sources per scheme, water requirement projections, first order options of future interventions
Mbazwana WSS Area – Umhlabuyalingana LM				
Mseleni WSS Area – Umhlabuyalingana LM				
Shemula WSS Area				
Jozini-Malobeni WSS Area				
Mkuze ubombo WSS Area – Jozini LM				
Hluhluwe WSS Area				
Mtubatuba and Surrounding Towns/Areas				
Greater Ulundi WSS Area - Ulundi LM				
Greater Mpungamhlope WSS Area - Ulundi LM				
The Usuthu (Ceza) Regional WSS Area - Ulundi LM				
Greater Nongoma (Vuna) WSS Area - Nongoma LM				
Greater Mandlakazi WSS Area - Nongoma LM				
Vryheid Regional WSS Area – Abaqulusi LM				
Greater Emondlo WSS Area - Abaqulusi LM				
Simdlangentsha West Regional WSS Area – Edumbe LM				
Greater Simdlangentsha Central (Belgrade) WSS Area - Uphongolo LM				
Simdlangentsha East Regional WSS Area – Uphongolo LM				
Greater Simdlangentsha Central (Msibi) WSS Area - Uphongolo LM				
Greater Simdlangentsha Central (Khiphunyawo) WSS Area - Uphongolo LM				
Greater Paulpietersburg WSS Area - Edumbe LM				
Update of the Water Reconciliation strategy of the Nongoma supply Area - 2012 to 2040	2016	DWS: NWRP	Tlou Consulting (Pty) Ltd in association with WR Nyabeze & Associates	Water Supply scheme layouts, water sources per scheme, water requirement projections, first order options of future interventions
Umkhanyakude District Municipality: update of the Water Reconciliation Strategy of Kwangwanase Water Supply Area -2012 to 2040				
Umkhanyakude District Municipality: update of the Water Reconciliation Strategy of Mbazwana Water Supply Area -2012 to 2040				
Umkhanyakude District Municipality: update of the Water Reconciliation Strategy of Mseleni Water Supply Area -2012 to 2040				
Update of the Water Reconciliation Strategy of the Mtubatuba Supply Area - 2012 to 2040				

Study / Report	Year	Client	Author	Relevant information
Umkhanyakude District Municipality: update of the Water Reconciliation Strategy of Shemula Water Supply Area - 2012 to 2040				
Update of the Water Reconciliation Strategy of the White Mfolozi river system in Zululand District Municipality for the period -2012 to 2040				
THE DEVELOPMENT OF WATER SUPPLY AND DROUGHT OPERATING RULES FOR STAND ALONE DAMS AND SCHEMES TYPICAL OF RURAL/SMALL MUNICIPAL WSS's: EASTERN CLUSTER				
The Greater Paulpietersburg WSS: Edumbe Dam Decision Support System	2013	DWS: WRPS	BKS (Pty) Ltd	Reference to hydrology and resource model configurations
The Greater Nongoma WSS: Vokwana Dam and Vuna Dam Decision Support System				
White Mfolozi River Catchment Vryheid, Greater Mpungamhlope, Greater Ulundi, Greater Emondlo and Nondweni Water WSS Scheme Areas including Klipfontein, Bloemveld, Grootgewacht & Mvunyana Dams as well as the Ulundi Balancing Weir Decision Support System				
Pongolapoort Dam: Yield Analyses with Different Operating Levels	2011	DWS: WRPS	BKS (Pty) Ltd	
DEVELOPMENT OF OPERATING RULES FOR WATER SUPPLY AND DROUGHT MANAGEMENT FOR STAND-ALONE DAMS AND SCHEMES: EASTERN CLUSTER PHASE 2 (WP10778)				
Drought Operating Rules for Hluhluwe Dam	2016	DWS: WRPS	AECOM	Reference to hydrology and resource model configurations
DEVELOPMENT OF OPERATING RULES FOR WATER SUPPLY AND DROUGHT MANAGEMENT FOR STAND-ALONE DAMS AND SCHEMES: EASTERN PLANNING AREA (WP11251)				
Drought Operating Rules for White Mfolozi System	2021	DWS: WRPS	Bigen	Reference for latest model configurations and scheme layouts
Drought Operating Rules for Pongolapoort Dam System				
DISTRICT MUNICIPALITY STUDIES				
Proposed Off-channel Storage Dam and Associated Works on the Kwa Nkweme River near Nongoma	2012 2015	Zululand DM	KV3 Engineers	Potential infrastructure intervention
Usuthu Master Plan for Regional Water Supply	2002	Zululand DM	DLV	Old report, may have insights into Usuthu WSS operations and layout
Water Resource Modelling of the White Mfolozi River System Planning Model Report	2012	Zululand DM	Hydrosol	Detailed hydrology of portion of White Mfolozi
Ceza Supply Scheme: Hydrological Update and Water Source Options Analysis (W22E)	2017	Zululand DM	Hydrosol	Reference to Ceza layout, and model configuration, WRPM was used in this assessment
EWR STUDIES				
Reserve Determination Studies for Selected Surface Water, Groundwater, Estuaries and Wetlands in the Usutu/Mhlathuze Water Management Area (WP10544)	2015	DWS: Water Ecosystems	Tlou Consulting (Pty) Ltd.	Preliminary Ecological Water Requirements
GROUNDWATER / LAKES				
Report on the Geohydrology around Lake Sibaya Northern Zululand Coastal Plain. Rep No ENV-P-C 2003-003	2003	NA	Meyer R and Godfrey L	Lake Sibaya water resources

Study / Report	Year	Client	Author	Relevant information
Conceptual Modelling of Lake-Groundwater Interactions for the Lake Sibayi Catchment, North Eastern South Africa	2013	NA	Weitz, J and Demlie, M	Lake Sibaya water resources
Modelling and water yield assessment of Lake Sibhayi Water SA (43) 3		NA	Smithers JC <i>et al.</i>	Lake Sibaya water resources
The Impacts of Proposed Streamflow Reduction Activities in the W70 and W32 Catchments	2014	DWS	North West University	Lake Sibaya water resources
uMkhanyakude District Municipality Assessment of existing groundwater sources	2014	DWS	J&G	Groundwater
OTHER				
Umgeni Water Infrastructure Master Plan 2021 2021/2022 – 2051-2052. Volume 9: uMfolozi System and uMkuze-uPhongolo-Lake Sibiya System	2021	Umgeni Water	Umgeni Water	Layouts of water supply schemes, water requirement projections for comparison
Umgeni Water: Universal Access Plan Phase III: Towards the Progressive Development of a Secondary Bulk Water Master Plan for the Kwazulu-Natal Province	2021	Umgeni Water	Umgeni Water	Future infrastructure plans
Water Resources 2012	2015	WRC	SSI	Hydrology model configurations: base to compare with
The Kwazulu-Natal Provincial Water Master Plan	2020	COGTA	LTE Consulting	Future infrastructure plans

A2 MHLATHUZE

Item	Report Name	Owner	Year	Relevance to Study
WATER RECONCILIATION STRATEGY FOR RICHARDS BAY AND SURROUNDING TOWNS				
1	Inception Report (109343/9167)	DWS	2014	Updated Reconciliation Strategy
2	Water Requirements P WMA 06/W100/00/3114/1	DWS	2015	Water Requirements
3	Water Balance P WMA 06/W100/00/3114/2	DWS	2015	Water Resources
4	Screening of Options P WMA 06/W100/00/3114/3	DWS	2015	Infrastructure
5	Scenarios Evaluation P WMA 06/W100/00/3114/4	DWS	2015	Water Resources
6	Reconciliation Strategy P WMA 06/W100/00/3114/5	DWS	2016	Strategy
7	Literature Review Report (109343)	DWS	2014	Background
8	Yield Analysis Report	DWS	2015	Water Resources
9	Water Reuse Report	DWS	2015	Infrastructure
10	Preliminary Reconciliation Strategy	DWS	2015	Strategy
RESERVE DETERMINATION STUDIES FOR SELECTED SURFACE WATER, GROUNDWATER, ESTUARIES AND WETLANDS IN THE USUTU/MHLATHUZE WATER MANAGEMENT AREA				
11	Summary of Relevant EWR Information for Mhlathuze and Nhlabane Estuaries RDM/WMA6/CON/COMP/2013	DWS	2015	Ecological Water Requirements

Item	Report Name	Owner	Year	Relevance to Study
12	Determination of Water Resource Classes and Associated Resource Quality Objectives in the Usutu and Mhlathuze Catchment. Terms of Reference, Bid Number: WP 11264	DWS	2017	Ecological Water Requirements
13	Final Allocation Schedule in Terms of Section 47 of the National Water Act, 1998 for the Mhlathuze River Catchment, Government Gazette no. 38599, 25 March 2015	DWS	2015	Water Requirements
ANNUAL OPERATING ANALYSES				
14	Water Supply and Drought Operating Rules for Stand-Alone Dams and Schemes Typical of Rural/Small Municipal Water Supply Schemes: Eastern Cluster: The Eshowe Water Supply Scheme: Rutledge and Eshlazi Dams	DWS	2015	Water Resources
15	IWRP Maintenance and support Services: Annual Operating Analysis for the Mhlathuze WSS	DWS	2017	Water Resources
WATER ALLOCATIONS				
16	Final Allocation Schedule in Terms of Section 47 of the National Water Act, 1998 for the Mhlathuze River Catchment, Government Gazette No 38599, 25 March 2015	DWS	2015	Water Requirements
17	Background detailed tables of final schedules per individual user	DWS	2015	Water Requirements

NAME OF STUDY OR REPORT	YEAR	RELEVANT INFORMATION
Suite of Reports from the: Implementation and Maintenance of the Water Reconciliation Strategy for Richards Bay and Surrounding Towns	2021	Previous Reconciliation Strategy includes intervention options to be monitored against and water balance components to be updated.
Development of Operating Rules for Water Supply and Drought Management for Stand-Alone Dams and Schemes: Eastern Planning Area (WP11251)	2021	2021/2022 Annual Operating Analysis for the Umhlathuze Water Supply Scheme

APPENDIX B: STAKEHOLDER ENGAGEMENT PLAN

Classification of Significant Water Resources and Determination of Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments

STAKEHOLDER ENGAGEMENT PLAN

**Chief Directorate: Water Ecosystems
Management**

Directorate: Water Resource Classification



water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

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1 BACKGROUND

The purpose of this project is to implement a Water Resource Classification System (WRCS) to classify all significant water resources in the Usutu to Mhlathuze Catchments in order to determine suitable Water Resource Classes as well as to determine Resource Quality Objectives (RQOs).

The determination of the Classes will be undertaken using the generic seven steps as outlined in the WRCS Regulation published in the Government Gazette No. 33541 (R810, dated 17 September 2010) and the integrated process as outlined in the recently completed study, 'Development of Procedures to operationalise Resource Directed Measures (DWS, 2016). The determination of the RQOs will be undertaken using the Department of Water and Sanitation's (DWS) Procedures to Determine and Implement Resource Quality Objectives.

The management of water resources by the implementation of water resource protection measures emphasise the need of stakeholder engagement throughout the project, as the outcomes of this project will affect both ecosystem health and the economic activities that rely on water supply. The process of trade-offs will need to be assessed and evaluated at a number of scales.

It is recognised that the process of determining water resources classes and associated RQOs requires a strongly driven stakeholder engagement and communication component supported and guided by the necessary technical and institutional components. Stakeholder engagement is a key consideration, however, the outcome in terms of this process is essentially technically driven and supported by the appropriate engagement structures.

Thus, the classification of the significant water resources and determination of associated RQOs in the study area will not be successful if these components are not able to complement each other.

Furthermore, the National Water Act (NWA) (No. 36 of 1998), Section 13.4a requires as a minimum that water resource classes and proposed RQOs be published for public comment in the Government Gazette for 60 days, and that the Minister consider all comments before finalising the water resource classes and RQOs for a water resource.

It is, therefore, vital for the success of this study that a stakeholder engagement plan be developed, that must include a communication plan and an extensive stakeholder database.

2 PURPOSE OF THE ENGAGEMENT

It is always important to know *who*, *what*, *why*, *when* and *where* to communicate to stakeholders. The diversity of this catchment in terms of water users, as briefly described below, makes this even more important to understand their needs in terms of the water resources.

Different sectors in this catchment that may require slightly different approaches are:

- Municipalities;
- Tribal communities;
- Mining;
- Industries;

- Agriculture;
- Bulk water users; and
- Environmental organisations.

Given the context of engagement, this plan seeks to:

- Inform the broader public of the project and what water protection measures means to them and the catchment;
- Engage key stakeholders (directly affected parties, influencers, decision-makers and thought leaders representing various sectors of society) involved in concurrent activities to intelligently apply the collective wisdom to the successful determination of water classes and RQOs; and
- Through sound relationships with key stakeholders and satisfactory communication, build trust and create an understanding as well as, collaboration to ensure that all role players work towards sustainable water resource protection and use.

It is recognised that the project is one of a national strategic nature and that communication with the broader public remains important. It is important that the intention of the Department and the process are understood.

The engagement will primarily be on the key technical aspects, approach and methodology as well as the evaluation of various scenarios. Robust engagement with stakeholders is required in steps 6 and 7 of both the classification procedure and RQO determination procedure.

However, the processes are dependent on the consolidation of water resource related information, undertaking of assessments and generation of key outputs and as a result a Project Steering Committee (PSC) will be established to represent all sectors, to ensure that adequate consultation and collaboration is undertaken at the onset at key milestones.

2.1 Objectives

Stakeholder engagement has the following key objectives:

- To conduct focussed consultation with stakeholders to obtain an understanding of their needs and requirements in terms of water users on the demands and use of water resources;
- To understand the aspiration of stakeholders in terms of their catchments and the benefits to be derived from aquatic ecosystem services and the costs associated with their use;
- To promote shared awareness and understanding amongst water resource users and encourage people to adjust their individual demands on the resource in the broader interests of sustainability and co-operative management;
- To build a holistic and thorough understanding of the project and its components by sharing information in an open and transparent manner, to reduce and manage expectations by providing information within the right context and helping stakeholders to understand the context, to build trust and to manage emotion;
- To engage stakeholders representing various sectors of society on the technical process to obtain their comments, inputs, concerns, local knowledge, and to provide regular feedback on an ongoing basis;

- To reduce the potential for future conflict;
- To enable the DWS and stakeholders to share knowledge and expertise;
- To inform and educate stakeholders about the function and responsibilities of the DWS and to assist the DWS to maintain a high level of information sharing with the broader stakeholder community; and
- Record stakeholder input for use towards successful project implementation.

2.2 Principles

Stakeholder engagement will be based on the accountability principles of inclusivity, materiality and responsiveness. As far as possible, all stakeholders with material interests in the process will be included in the classification of water resources process, their material interests will be identified and addressed and the DWS will respond to their interests. Stakeholders will receive feedback on a regular basis according to the communication plan.

2.3 Outputs

The following documents will comprise the key outputs / activities of the stakeholder engagement process:

- Technical targeted stakeholder consultation meetings as required;
- Broader public consultation;
- Background information documents;
- Media releases (as required);
- Comments and responses register; and
- Stakeholder database.

3 EXTENT OF THE ENGAGEMENT

The stakeholder engagement process will be limited to that related to the determination of the Water Resource Classes and RQOs for the Usutu to Mhlathuze Catchments.

The engagement will conclude following the public comment period associated with the gazetting of the Classes and RQOs.

The matters and aspects that will be engaged on, in addition to the milestone technical process information, will be determined by the needs of the stakeholders, limited to the DWS's mandate over the management, use, development, control, protection and conservation of water resources.

4 OWNERSHIP OF THE STAKEHOLDER ENGAGEMENT

Stakeholder engagement will be managed by the Directorate: Water Resource Classification in collaboration with the WRP Consulting Engineers (Pty) Ltd consultant's study team.

5 TARGET AUDIENCE / MEMBERS OF THE STAKEHOLDER DATABASE

Stakeholders are persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and / or the ability to influence its outcome, either positively or negatively.

Stakeholders may include locally affected communities or individuals and their formal and informal representatives, national or local government authorities, politicians, religious leaders, civil society organisations and groups with special interests, the academic community, or other businesses.

Previous stakeholder databases generated through previous processes, e.g. the Reserve Determination Study, Coastal Areas Water Reconciliation Maintenance Strategy Study of the DWS, etc., were used as a basis to identify stakeholders.

The stakeholders representing various sectors of society identified or who may have interest in this project are as follows:

5.1 DWS officials who have an interest in the outcome of the project

- Chief Directorate: Integrated water monitoring and information
- Directorate: Systems operations
- Directorate: Water quality planning
- Chief Directorate: Water use compliance monitoring and enforcement
- Inkomati Usutu Catchment Management Agency
- Directorate: Climate change
- Chief Directorate: Water Use authorization Branch: Regulation
- Directorate: Surface and ground water information
- Directorate: Water resource planning systems: Sub directorate: Integrated hydrological planning
- Directorate: Reserve determinations
- KwaZulu-Natal (KZN) Regional Office.
- Directorate: Water Use Efficiency.
- Directorate: Water Abstraction and Instream Use.
- Directorate: Regional Coordination and Support.
- Directorate: Water Allocation.
- Directorate: integrated Water Resources Planning.
- Directorate: Options Analysis.
- Directorate: Reserve Requirements.
- Directorate: Resource Quality Information Services.
- Branch: Water Resource Infrastructure.

5.2 Government departments that may affect or be affected by the outcome of the project

- Department of Agriculture, Land Reform and Rural Development (DALRRD).
- Department of Cooperative Governance and Traditional Affairs (COGTA).
- Department of Forestry, Fisheries and the Environment (DFFE).

- Department of Mineral Resources and Energy (DMRE).
- Ezemvelo KZN Wildlife.
- KZN Department of Agriculture and Rural Development.
- KZN Department of Economic Development, Tourism and Environmental Affairs.
- KZN Department of Co-operative Governance and Traditional Affairs.
- Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs.
- Mpumalanga Department of Economic Development and Tourism.
- Mpumalanga Department of Co-operative Governance and Traditional Affairs.

5.3 District and local municipalities in the Usutu to Mhlathuze Catchments

- **King Cetshwayo District Municipality**
 - City of uMhlathuze
 - uMlalazi Local Municipality
 - Nkandla Local Municipality
 - uMfolozi Local Municipality
 - Mthonjaneni Local Municipality
- **Zululand District Municipality**
 - AbaQulusi Local Municipality
 - eDumbe Local Municipality
 - Ulundi Local Municipality
 - uPhongolo Local Municipality
- **uMkhanyakude District Municipality**
 - Mtubatuba Local Municipality
 - Jozini Local Municipality
 - Big 5 Hlabisa Local Municipality
- **Gert Sibande District Municipality**
 - Mkhondo Local Municipality

5.4 Water resource management institutions

- South African Association of Water User Associations.
- Irrigation Boards.
- South African Irrigation Institute.
- Water Boards.
- Water Institute of South Africa.

5.5 Agricultural associations

- National African Farmers Union (NAFU).
- African Farmers Association of South Africa (AFASA).
- Agri SA.
- KZN Agricultural Union (KWANALU).
- Agri Mpumalanga.

- Ingonyama Trust Board.

5.6 Research institutions

- Council for Scientific and Industrial Research (CSIR).
- Water Research Commission (WRC).
- Agricultural Research Council (ARC).
- Institute of Natural Resources (INR).
- Marine and Estuarine Research (MER).
- South African Association for Marine Biological Research (SAAMBR).
- South African Environment Observation Network (SAEON).
- University of Zululand.
- University of KwaZulu-Natal.

5.7 Other sectors

- South African Local Government Association (SALGA).
- Local Industry.
- Chambers of Commerce.
- Mining Sector.
- Chamber of Mines.
- Eskom.

5.8 Civil society and the environment

- South African Water Caucus.
- Environmental Monitoring Group.
- Birdlife SA.
- KZN Wildlife and Environment Society of South Africa (WESSA).
- Groundwork.
- Earthlife Africa.
- Biowatch SA.
- Coastwatch KZN.
- Centre for Environmental Rights.

A copy of the stakeholder database complete with stakeholder's names, organisations and contact details is attached.

The stakeholder database is dynamic and will be updated during the course of the project. The study team will keep track of interactions with stakeholders, e.g. correspondence and meeting attendance. The study team will provide the DWS with a copy of the stakeholder database upon completion of the project.

6 OBTAINING STAKEHOLDER COMMENT

Stakeholders will have an opportunity to participate in the project by contributing comments, issues of concern, local knowledge and suggestions at any stakeholder event or by submitting written comments. The study team will make available registration and comment sheets that will enable stakeholders to contribute comments directly to the study team. The study team will have a dedicated email address, through the stakeholder engagement office of the project to facilitate the consultation process.

All comments will be responded to or referred to the technical team or Project Management Committee for consideration.

The aspects to be engaged on will be determined as they emerge in the meetings. However, stakeholders can engage on the following initial list of aspects related specifically to the technical process:

- Status quo of the study area in relation to ecological and socio-economic aspects;
- Technical aspects of the project;
- Data and methodology used;
- Practical implementation of the scenarios and implications of the recommended Classes; and
- Catchment context and visioning.

7 APPROACH TO STAKEHOLDER ENGAGEMENT

7.1 Communication methods

To ensure relevant coverage for the project, the following processes are envisaged:

i. **Direct Engagement**

Direct contact with key stakeholders via meetings:

- Project Steering Committee (PSC);
- Technical Task Group (TTG);
- Sectoral / one-on-one meetings (as required); and
- Public meetings.

More detail on the above is provided in Section 10 in the Communication Plan.

ii. **Sectoral/One on One Interviews**

One-on-one meetings may be scheduled with relevant stakeholders within the DWS and external groups to discuss matters related to data and methodology and to address specific concerns. Discussions may be required to be scheduled with, for example, people from the following sections:

- Chief Directorate: Water Ecosystems Management.
- Chief Directorate: Integrated Water Resources Planning.
- KZN Regional Office.
- Mpumalanga Regional Office.

- IUCMA.
- Chief Directorate: Water use compliance monitoring and enforcement
- Ingonyama Trust Board.
- Ezemvelo KZN Wildlife.
- Environmental groups.
- Water user associations.

iii. ***Print Media***

The following print media will be employed:

- Formal letter of announcement with the Director-General or Minister's signature.
- A simplified background information document (BID) made available to all delegates attending the meetings (PSC, TTG and public meetings).
- A media release will be sent out to national and local newspapers to announce the project. This will be the formal letter of announcement of the project.

iv. ***Electronic Media***

The following electronic media will be employed:

- The information listed under Print Media will be posted on the DWS website.

7.2 Engagement methods

The following engagement methods will be followed, as required:

- Telephone.
- Email.
- Meetings (PSC, TTG and public).
- Distribution of documents and invitations to comment.
- One on one interviews or meetings with different sectors, if required.

7.3 Engagement levels

The engagement will empower stakeholders on several levels, depending on their needs:

- Some stakeholders (PSC members) will be invited to comment on the draft reports.
- Some stakeholders (PSC members) will take part in the engagement on approaches adopted and the development of the operational scenarios.
- All stakeholders will be provided with regular feedback on the project through different platforms (stakeholder meetings, public meetings and specific one-on-one sectoral workshop engagements, if required) and given the opportunity to comment.

8 CAPTURING AND SYNTHESIS OF STAKEHOLDER INFORMATION

A Comments and responses register will be compiled and updated throughout the project. This report will list all the comments from stakeholders (to be received from comment sheets, at meetings, emails, telephone calls, etc.) and responses from the project team. This report will be used as a monitoring tool and will also support the gazette template to the Minister.

9 FEEDBACK TO STAKEHOLDERS

Feedback to stakeholders will be done by means of:

- Direct answers to any questions or requests for additional information by emails;
- Meetings (PSC, TTT, sectoral and public) throughout the project;
- The comments and response register will available on the website (<http://www.dwa.gov.za/rdm/WRCS/default.aspx>); and
- Regular BIDs during the project.

10 COMMUNICATION PLAN

The following communication plan illustrates the stakeholder engagement that will be done during the course of this project. Dates will be aligned with the programme in the Inception Report, once approved.

Proposed Communication Plan

PLATFORMS	STAKEHOLDER GROUP	FREQUENCY	MESSAGE / PURPOSE	RESPONSIBILITY	PROPOSED DATES
Project Steering Committee (PSC) (5 meetings)	Representatives of various sectors important to the study due to their presence, stake and involvement in the Usutu to Mhlathuze Catchments and who can contribute because of their expertise and experience.	Every six months as per the project plan (Inception Report)	<ul style="list-style-type: none"> Attend the PSC meeting and be well prepared. Provide executive support and guidance to the study. Identify practical solutions that will improve the findings of the study. Share information and data or facilitate the sharing of data. Facilitate strategic linkages of the study with other stakeholders. Study status reports and provide comments. Provide strategic advice to ensure that the national and regional perspectives on water management are maintained. Provide feedback to the organisations the PSC member represents. 	Coordination and arrangement of meetings - Professional Service Provider (PSP). Facilitation - DWS. Presentations - DWS/PSP.	Dates to be included once Inception Report is approved.
Technical Task Team (TTT) (3 meetings)	Technical input from persons or groups who can contribute to improve the findings of the study.	Three meetings.	Addressing key technical aspects that may require clarification	Coordination and arrangement of meetings - PSP. Facilitation – DWS/. Presentations - DWS/PSP.	Dates to be included once Inception Report is approved.
Public Meetings (2 rounds of meetings)	General public	Two meetings at two venues / electronic platform (hybrid format).	<u>First round of meetings</u> <ul style="list-style-type: none"> Announce the project; and Overview of study and the approach. <u>Second round of meetings</u> <ul style="list-style-type: none"> Proposed water resource classes; and RQOs. 	Coordination and arrangement of meetings - PSP. Facilitation - DWS. Presentations - DWS/PSP.	Dates to be included once Inception Report is approved.
Catchment Management Forums (CMF)	?? CMF ?? CMF ?? CMF ?? CMF	As invited / required	Information sharing and access to local knowledge.	Coordination of liaison with CMF. Presentations - DWS.	DWS officials to present at regular CMFs.

PLATFORMS	STAKEHOLDER GROUP	FREQUENCY	MESSAGE / PURPOSE	RESPONSIBILITY	PROPOSED DATES
Sectors (One-on-one)	Suggested stakeholder groups will be included as required	When needed.			
	Mining and Industries	Meetings with a specific group or sector will be held should the need arise. Representatives will, however, be invited to the PSC meetings.	<ul style="list-style-type: none"> Obtain input on possible data gaps and verify the appropriateness of data collected. To engage them on the proposed scenarios developed in this project To determine demands and water requirements. 	Coordination and arrangement of meetings - PSP. Facilitation - DWS. Presentations - DWS/PSP.	When needed.
	Agricultural Associations	Meetings with a specific group or sector will be held should the need arise. Representatives will, however, be invited to the PSC meetings.	Obtain input on possible data gaps and verify the appropriateness of data collected. <ul style="list-style-type: none"> Engage on the proposed scenarios developed in this project. To determine demands and water requirements. 	Coordination and arrangement of meetings - PSP. Facilitation - DWS. Presentations - DWS/PSP.	When needed.
	Civil society and the environment	Meetings with a specific group or sector will be held should the need arise. Representatives will, however, be invited to the PSC meetings.	Address concerns.	Coordination and arrangement of meetings - PSP. Facilitation - DWS. Presentations - DWS/PSP.	When needed.
	Integrated Water Resource Planning (DWS)	Once off	To determine development scenarios and possible reconciliation options identified for the Usutu to Mhlathuze Catchments.	PSP, facilitation through DWS Study Manager.	Dates to be included once Inception Report is approved.

APPENDIX C: MENTORSHIP PROGRAMME

Mentorship Programme for the Usutu-Mhlathuze study: Mr Mkhevu Mnisi (MM) and Ms Koleka Makanda (KM)

Training opportunities are shown related to the steps for the operationalization of Resource Directed Measures (DWS, 2016), with a focus on the objectives of the Usutu-Mhlathuze study and the training requirements as outlined by DWS. In addition to exposure to general process, specific emphasis is placed on the following fields per mentee:

- Mr Mnisi: estuary process
- Ms Makanda: wetlands

It is recommended that mentee involvement in these specific fields include sessions with specialists, culminating in tasks or short documents to be prepared by the mentees and assessed by the overseeing specialist and study co-leader responsible for Capacity Building.

Steps	Learning area	Task description	Skills required	Mentee participation / involvement
	General process	<ul style="list-style-type: none"> ▪ Capacity building workshop 1: <i>An overview of Classification, Reserve and RQOs as RDM tools in IWRM</i> ▪ Interrogation of DWS reports on operationalizing RDM 	General understanding	<ul style="list-style-type: none"> ▪ Attendance of Capacity building workshop 1 (May 2022). ▪ Understanding of the framework documents and application to the study.
Step 1: Describe status quo and delineate study area into IUAs	Ecology, Hydrology, Water Quality, Socio-economics, Groundwater, Delineation	<ul style="list-style-type: none"> ▪ Review PES/EIS spreadsheet ▪ Establishment of a network of nodes to be used as the basis of the Classification Process ▪ Determination of the present-day status of the catchment (ecological, economic, social, ecosystem services and water quality) ▪ Water resources rezoning and identification of important water use ▪ Delineation of IUAs 	<ul style="list-style-type: none"> ▪ Application of GIS ▪ Use of Google Earth ▪ Allocation of nodes ▪ Data collection and sourcing (what to collect and how; specifically in terms of estuaries (MM) and wetlands (KM)). Understanding of delineation process	<ul style="list-style-type: none"> ▪ Review of PES/EIS spreadsheet. Assistance will be provided by river task leader in terms of general understanding of the spreadsheet forming the basis of further work during the study. Interrogation and use of the spreadsheet will be required as part of training and will be led by the study co-leader. ▪ Delineation study team meeting: Delineation of IUAs, Water Resource Use Importance and selection of nodes in form of discussion session with team. ▪ Review of associated report.
Step 2: Delineation of RUs and select	Ecology, Hydrology, Water Quality, Delineation	<ul style="list-style-type: none"> ▪ Hot spot identification and level assessment 	<ul style="list-style-type: none"> ▪ Use of Google Earth ▪ Sourcing of data 	<ul style="list-style-type: none"> ▪ Delineation of RUs in form of discussion session with study co-leader.

Steps	Learning area	Task description	Skills required	Mentee participation / involvement
provisional study sites		<ul style="list-style-type: none"> ▪ Delineation of RUs 	<ul style="list-style-type: none"> ▪ Delineation of the Resource Units 	<ul style="list-style-type: none"> ▪ Delineating the estuary EFZ and estuary RUs and identifying pressures; in consultation with estuary team: MM. ▪ Process of identifying wetland types and assigning EI, with a focus on wetland spatial datasets. Session to be led by wetland specialist: KM. ▪ Review of associated report.
Step 3: Quantify EWRs and BHNr	Ecology, Hydrology, Hydrodynamics, Water Quality	<ul style="list-style-type: none"> ▪ Feld surveys ▪ Extrapolation and estimation processes, i.e. biophysical nodes ▪ Understanding the hydrology of the system ▪ Understanding the BHNr ▪ EWR processes ▪ Ecosystem services 	<ul style="list-style-type: none"> ▪ Sourcing of data ▪ Exposure to field data collection methods ▪ Desktop EWR estimation for biophysical nodes ▪ Interpretation of results ▪ Understanding the application of EcoStatus and estuary models ▪ Knowledge of DWS's interpretation of the BHNr 	<ul style="list-style-type: none"> ▪ Attendance of the River specialist workshop, to aid an understanding of process (Sept 2022). This should include a short session with the relevant specialists around the desktop EWR estimations for biophysical nodes. ▪ Attendance of Estuary survey in Oct 2022: MM. During the survey the team leader (or assigned specialist) will go through estuary process regarding ecological states and PES / importance contributions to the EWR report. Special emphasis will be placed on information requirements, timing and links with the rivers task, which will aid understanding of how the overall process links together. ▪ Attendance of Estuary specialist workshop (to be held under Step 4 and cover consequences). ▪ Desktop data analysis sessions with the wetland specialist and an understanding of how to assign wetland PES, EI and ES per SQR, noting primary drivers and primary impacts: KM. An important aspect of the wetland task will be a critical evaluation of steps beyond the wetland scope defined in the TOR and Study Plan, based on work previously done for the large lake systems. ▪ A session with the two BHN specialists and a critical evaluation of the process, considering DWS's approach to the BHNr. ▪ Review of specialist reports
Step 4: Identification and evaluation of scenarios within Integrated Water Resource Management	Ecology, Hydrology, Water quality, macro-economics, ecosystem services	Establishment of operational scenarios, considering the relationship among social, economic and ecological trade-offs	<ul style="list-style-type: none"> ▪ The development of the scenarios and understanding the scenario modelling process ▪ Interpretation of consequences results ▪ Training skills 	<ul style="list-style-type: none"> ▪ A session with the study leaders and river and estuary team leaders regarding the development of scenarios and the iterative process leading to selection. ▪ A session with the modellers around the process of modelling of scenarios. ▪ Attendance of Estuary specialist workshop covering inputs to Steps 3 and 4 (Feb 2023): MM.

Steps	Learning area	Task description	Skills required	Mentee participation / involvement
				<ul style="list-style-type: none"> ▪ Attendance of, and assistance at TTT meetings potentially held as part of Step 4. ▪ Assistance at stakeholder empowerment sessions related to scenarios, consequences and Classes. ▪ Review of specialist reports.
Step 5: Determine Classes and catchment configurations for the identified scenarios	MDA	<ul style="list-style-type: none"> ▪ Social, economic and ecological trade-offs ▪ MDA ▪ Selection of catchment configurations ▪ Allocation of Classes ▪ Capacity building workshop 2: <i>Operational scenarios – selection, modelling and evaluation – and Classes</i> 	<ul style="list-style-type: none"> ▪ Understanding and use of the MDA ▪ Understanding the process of defining Classes ▪ Training skills 	<ul style="list-style-type: none"> ▪ A session with the specialist developing and running the MDA regarding the process and how scenario impacts are evaluated. ▪ Attendance of a working session to discussion TECs ▪ Attendance of Capacity building workshop 2 (Aug 2023). ▪ Assistance at stakeholder empowerment sessions related to scenarios, consequences and Classes.
Step 6: RQOs and implementation	Determination of the RQOs	Development of RQOs	<ul style="list-style-type: none"> ▪ Use of the RQOs toolkit and development of numerical limits ▪ Knowledge on effective water resourcing monitoring, including availability of DWS resources to undertake monitoring 	<ul style="list-style-type: none"> ▪ Attendance of internal preparatory meeting for RQO determinations. ▪ Input on implementation in terms of DWS resources, objectives and practicalities of implementation. ▪ Review of associated reports.
Step 7: Gazette Classes and RQOs	Communication, Public participation, Stakeholder engagement	<ul style="list-style-type: none"> ▪ Stakeholder consultation ▪ Legal input to gazetting ▪ Capacity building workshop 3: <i>RQOs and gazetting</i> 	<ul style="list-style-type: none"> ▪ Stakeholder engagement ▪ Knowledge of DWS's legal structures 	<ul style="list-style-type: none"> ▪ Input from the perspective of the water resource custodian into the legal process. ▪ Assistance at public meetings. ▪ Attendance of Capacity building workshop 3 (Dec 2023).

APPENDIX D: COMMENTS AND RESPONSE REGISTER

No.	Sect	Comment	From	Addressed?			
1		The inception report amongst others should provide details of the study area listing all the major rivers in the secondary catchment	M Mnisi	An overview summary included; detail will be provided in the status quo report (April 2022)			
2		Capture the socioeconomic activities within the catchment to give a detailed view of how the catchment looks like	M Mnisi	A summary is included as the detail will be provided in the status quo report (April 2022)			
3		Highlight strategic water source areas and conservation areas	M Mnisi	A summary is included as the detail will be provided in the status quo report (April 2022)			
4		Identify the gaps and provide details on how to mitigate the gaps	M Mnisi	Addressed in Chapter 2			
5		Because this report also includes a Gap analysis chapter perhaps it should reflect here as well	K Makanda	Addressed			
6		<table border="1" style="width: 100%;"> <tr> <td style="width: 50px; text-align: center;">3</td> <td style="width: 200px;">WEM/WMA3/4/00/CON/CLA/0322</td> <td>Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Resource Units Delineation and Prioritization Report (selection and prioritisation)</td> </tr> </table>	3	WEM/WMA3/4/00/CON/CLA/0322	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Resource Units Delineation and Prioritization Report (selection and prioritisation)	M Mnisi L Matlala	Report 2 deals with delineation, not Report 3. The word “units” was added to the title as suggested
3	WEM/WMA3/4/00/CON/CLA/0322	Classification of Significant Water Resources and Resource Quality Objectives for Water Resources in the Usutu to Mhlathuze Catchments: Resource Units Delineation and Prioritization Report (selection and prioritisation)					
7		Close out report	M Mnisi	Addressed			
8	Exec Sum	Exec Summary Background: In the background you must refer to the legislative mandate that drives the work we are doing here.	L Matlala	Addressed			
9		Mkuze W3 not W5	K Makanda R Pillay (1.1)	Addressed			
10	Exec Sum	Re. Figure in exec summary: Can you please refer to the WRCS. These integrated ones are for when we do all three studies in one. In this particular study we are not doing the Reserve. Remove step 8 as it does not form part of this study	L Matlala M Mnisi	Addressed			
11		Why is chapter 5 separate from chapter 3?	L Matlala	Addressed			
12		WRCS must feature as well: Acronym	L Matlala	Addressed			
13	Glossary	I would like to see this being “descriptive statements of conditions that should be met in receiving waters, instead of descriptive goals”	K Makanda	Addressed. The NWA refers to establishing clear goals relating to quality of the water resource. Have changed to goals or objectives.			

No.	Sect	Comment	From	Addressed?
14		Write in full as the acronym is not listed on terminology table-There is no acronym for water resource classification	M Mnisi	Addressed
15		The study is not for provision of PSP to assist the department. The department is undertaking the study to determine classes and RQOs. Can you therefore please remove this throughout the document and ensure that in all other reports it is not reported.	L Matlala	Agreed and adjusted
16	1.1	This part is the repetition of what has been captured under executive summary. There is no mention of the National Water Act, 1998 which gives us the mandate under chapter 3 to undertake this work. Nowhere do you mention the WRCS that were gazetted in 2010.	L Matlala	Addressed
17	1.1	I do not see why this has to be captured in the report. This report must give information necessary to undertake the work. Contractual issues are dealt with between the PSP and the project manager and not in this report.	L Matlala	Addressed
18	1.2	Can you please ensure that you list all the major Rivers in the secondary catchments. Consider doing this in a table. Also include the size of the catchment as a whole as well as the breakdown of sub-catchments.	L Matlala	Done as an overview. The details will be captured in the status quo report
19		Where is the study motivation to state the ultimate goal for undertaking this study? The report must provide the purpose of this report. Can you also please provide narrative on each secondary catchment, tell us about the activities in these. Water uses, dams. Give us a picture of what the catchment looks like in detail. Provide detail information on the conservation areas.	L Matlala	Done as an overview. The details will be captured in the status quo report
20	2	Heading: I would rather call this information review and separate the two. Have a chapter dealing with information review and another with gaps	L Matlala	Changed to gap only as the information gathered is linked to the gap analysis.
21	2.1.2	Specify the impact. (delay of rainfall)	L Matlala	Addressed
22	2.3	"No hydrodynamic or sediment modelling will be undertaken as part of this study for the estuaries, only existing results will be used" Why?	L Matlala	Addressed
23	Tab 2.1	let's stick to one reference style for all references on the Table	K Makanda	All reference styles have been aligned.
24	Tab 2.2	Include a column on how to mitigate gaps " Mitigation measures"	M Mnisi	Included in the Table.
25	2.5	What is the proposed solution? "This may result in problems of reconciliation between the existing Groundwater Reserve and the revised hydrology".	L Matlala R Pillay (2.6)	Addressed and clarified

No.	Sect	Comment	From	Addressed?
		Groundwater: The Report states that they may be problems with reconciliation between the existing Groundwater Reserve and the revised hydrology. Can this be overcome, and if so, how will this be done?		
26	2.6.2	I am uncertain what is meant by “needs to” it is unclear to me whether this means it will be identified? If yes, can you please outline it as such. I have seen this in several other places throughout the report. Could you please make it clear that it will be done or identified or whatever the case will be. If you leave it as “it needs” it means you need to say who needs to do it?	L Matlala	Addressed and adjusted
27	2.6.2	Are you implying you will use these SEZ in this project? Or you implying you will review these for this project?	L Matlala	The 13 zones will form the basis of the study, but will be reviewed and adjusted if required.
28	Tab 3.1	Whilst the contract has due dates and ideally they should be dates for final product, however at times these are not adhered to for various reasons. I therefore do not see it necessary to add submission date which is the same as due date. it really doesn't help any of us since there are no specific dates.	L Matlala	Addressed. Removed submission dates
29	3.3.1	We do not have kick off meeting, it is called initiation meeting	L Matlala	Addressed
30	3.3.1	Can you please write project manager in full	L Matlala	Addressed
31	3.3.1	Progress reports is under 4.3.31	M Mnisi	4.3.31 is PSC progress reports, this is the PMC section, therefore 4.3.30
32	4	Can you please add integrated framework for ease of reference.	L Matlala	Addressed
33	Fig 4.1	Remove step 8, see previous comment	M Mnisi	Adjusted
34	4.1	surface water=rivers; wetlands and estuaries. After groundwater resources you discuss rivers, wetlands and estuaries and those are part of the surface water resources?	L Matlala	Addressed
35	4.3.6	Why limited when contractually the department is supposed to pay almost half a million for estuary survey and site visit report?	L Matlala	Addressed
36	4.3.6	I have asked the why before. If the reason you will not be doing hydrodynamic and sediment modelling is because existing available data is sufficient, then say so and remove the first part.	L Matlala	Addressed
37	4.3.6	I do not understand why this is captured because you provided a table with all the deliverables and their timeframes. This is a duplication.	L Matlala	The detail in the bullets links the tasks to the deliverables. This link is not necessarily clear from the deliverable titles in the table and this allows for cross-referencing.
38	4.3.6	So if the information is not in the original format what are you planning to do about it?	L Matlala	Addressed

No.	Sect	Comment	From	Addressed?
39	4.3.7	The report should already provide a brief overview of wetlands and their ecological condition. Give us information about the size of wetlands and description of wetlands per sub-catchment. I advise that you put that in a table format.	L Matlala	NFEPA metadata includes a wetland condition variable, which will be used in the wetland prioritization step together with other data inputs. Determining wetland ecological condition is therefore part of the status quo report (April 2022), as data are not currently available at a level of confidence for any wetlands other than Ramsar wetlands.
40	4.4.1	I understand this as saying over and above the five scenarios you will also do natural and present day scenarios?	L Matlala	Addressed
41	4.4.1	Reconciliation strategy is not the only source for future options. I therefore advise that you make room for where the information may likely come from	L Matlala	Addressed
42	4.4.2	which Minister are you referring to here?	L Matlala	Addressed
43	4.4.2	has this been confirmed and discussed?	K Makanda	The outcomes of a gazetted ministerial (DEA) panel is being awaited as it impacts on RQOs and EWR. Question not clear. We are awaiting expert panel outcomes which is not open for discussion.
44	4.4.2	Based on the heading, one expects to see the responsibility of PSP not what should happen which by the way it is captured is not the responsibility of the PSP.	L Matlala	Adjusted
45	4.4.5	It would help to list a few of those contributors here.	L Matlala	Addressed
46	4.4.5	Why? The ecological water requirements report is a deliverable in the contract. Why is it that some components of this are said to be unprovided for?	L Matlala	This section focuses on non-ecological water quality for the wider catchment, and not the water quality analysis for the ecology at EWR sites.
47	4.4.5	Inception report is like a roadmap. It should detail how the work will be undertaken therefore terminology is very important.	L Matlala	It is unclear what is meant by this comment. Text is clarified to aid understanding.
48	4.4.7	There is no need to highlight these. Simply refer to the tool to be used for this component	L Matlala	Addressed
49	4.4.7	What is the meaning of this? I find that the information captured here doesn't respond to the meaning of the heading. This applies throughout the document.	L Matlala	Addressed

No.	Sect	Comment	From	Addressed?
50	4.6	Why desktop level at EWR sites?	L Matlala	Addressed
51	4.6	What is the meaning of this given the heading of 4.5 and deliverable 4.3.22?	L Matlala	Addressed
52	4.7.1	It has never been expected of the PSP to be involved in the departmental administrative processes. As such it is not necessary to include this statement here.	L Matlala	Addressed
53	4.7.1	It is not necessary to include this sentence/point	M Mnisi	Addressed
54	5.4	If? It is a requirement for the PSP to subcontract the SMME to be part of the project. This doesn't mean the SMME must sit and be taught about classification process. It means they must financially benefit from the project by being subcontracted to do some work.	L Matlala	Addressed. Now that the SMME has been identified, his role is clarified.
55	5.4	The funds set aside. Were you not supposed to budget for this?	M Mnisi	Addressed. Budget has been set aside.
56		Are we (DWS) going to participate in the field surveys as listed in Appendix C of the inception report?	M Mazibuko	The field surveys are listed in the mentorship programme, so relevant to Mr Mnisi and Ms Koleka. The rivers survey is a reconnaissance trip only, with no biophysical data collection. A full estuary survey will take place. Attendance of all activities by DWS staff will be discussed throughout the study as part of Capacity Building.
57		Based on the contents of the inception report, is the PSP team going to identify additional/new EWR Sites or not?	M Mazibuko	No. Existing sites will be used. Refer to 4.3.5.
58	1.1	What are the other RAMSAR Sites within the Catchment	M Mazibuko	Adjusted
78	2.1	What about the 2014-2016 Preliminary Comprehensive Reserve Study? Why is it not listed here?	M Mazibuko	Section 2.1 refers to hydrological studies. A detailed hydrological study was not undertaken during the 2014-2016 Reserve study
60	2.1.2	I am not sure what this statement means or aims to achieve, the 2014 Reserve study was done in consultation with experts in the field and many hurdles and misconceptions were cleared. There is a hydrology report that is available from the study, that lists the information that was relied on in modelling the hydrology data. The scope of the hydrology study was to provide the above Preliminary Reserve studies with daily and/or monthly streamflow sequences for natural, present-day and various future scenario catchment development conditions for nine environmental water	M Mazibuko	See Explanation 2

No.	Sect	Comment	From	Addressed?
		requirement (EWR) river and floodplain sites and as inflows to Lake St Lucia and Kosi Bay. Additionally, natural monthly streamflow sequences were determined at 50 individual river sites (known as extrapolation nodes) across the Study Area		
61	2.2	After having read this section, the only question I have is ' what is the acceptable hydrology? '...perhaps the current PSP team can indicate what the problems are with the hydrology used by the PSP team that led the 2014 Preliminary Comprehensive Reserve Study?	M Mazibuko	See Explanation 2
62	2.2	The study undertaken was a Preliminary Reserve Study and not The Reserve Study	M Mazibuko	The references and the title of the study refers to Reserve and not Preliminary Reserve.
63	2.2	Each specialist team ran its own ecoclassification model as explained by Christa at the inception meeting. The models were not included in the HABFLO model, but were included in the DRIFT model	M Mazibuko	Explanation 1. Please see below this table.
64	2.2	For the Black Mfolozi the PSP team then used the ACRU model to model the hydrology, and the data was refined to meet the required and acceptable standards. The ACRU configuration for the Black Mfolozi sourced from the iSimangaliso (GEF) study (Aurecon, 2014) was considerably refined for this hydrology study, as follows: <ul style="list-style-type: none"> • Irrigation return flows were explicitly and dynamically modelled whereas in the prior study irrigation return flows had been treated as a proportion of demand. • Return flows from urban areas, ignored in the prior study, were included downstream of all urban water supply nodes. • The existing built-in excessive runoff responses of degraded areas were significantly dampened. 	M Mazibuko	Explanation 2
65	2.2	The EWR sites were originally set in 2003, but were also reviewed in 2012 as part of the DWS Compulsory Licensing Study...therefore by the time the Preliminary Reserve study started in 2014, the PSP team felt that the results are still relevant and applicable.	M Mazibuko	Explanation 3
66	2.2	I am not sure what is meant by accepted format??? The Preliminary Reserve Study was also done using acceptable formats...if perhaps there are challenges, the current PSP team can meet with the previous PSP team and try to understand each other...	M Mazibuko	The word accepted is linked to what is required for classification. It does not imply that the 2013 – 2016 study supplied results that were not in the acceptable format. DRIFT outputs EWRs in the accepted format. The accepted format refers to EWR rules. Use of the word 'accepted' has been adjusted accordingly

No.	Sect	Comment	From	Addressed?
68	2.1	Another study that might potentially be of relevance is the Groundwater Reserve Determination Study in the Mhlathuze Catchment - High Level Assessment.	P Khoza	Noted with thanks. We must please receive the report
69	2.1	What does this mean explicitly, and what is this conclusion based on?	K Majola	Reworded for clarity
70	2.2	Can't this project team liaise with the PSP of that 2014 project rather than speculating? Facts are preferable.	K Majola	See explanation 1: The correct procedure is for DWS to supply all raw data to WRP. Until such a date, even a discussion will be speculation. The statement however that NO reference in the Reserve report is made to the EcoClassification models is not speculation Some changes have been made based on M Mazibuko comment.
71	2.3	Is it iSiyaya or iSibaya? Or could it be a typo?	P Khoza	Addressed
72	2.3	Is it Umlazi or uMlalazi? Is this meant to refer to the uMlalazi River?	P Khoza R Pillay (1.4)	Addressed
73	4.7	I think this should be clarified also under Project Structure above.	K Majola	Addressed
74	Tab 7.1	PSP Project team member while working for the Department? Isn't this a conflict of interest for an employee of a government department serving as a consultant?	P Khoza K Majola	Provided clarification note
75	5	Other local municipalities under this district that might be directly or indirectly affected by this project, are Nkandla, uMfolozi, Mthonjaneni.	P Khoza	Included
76		What does this represent? RAMSAR	T Sawunyama	Addressed in footnote 1.
77	4.3.3	What will be the source of groundwater abstraction?	T Sawunyama	Addressed
78	4.4	I would appreciate impact of climate change to be considered as part of these scenarios, DWS have done some work already	T Sawunyama	Added wording
79		Other comments	T Sawunyama	Mentioned and addressed by others
80		Please also consider the RQO for Lakes and dams within the study area, they do not feature prominently in the inception report	S Mthembu	Addressed
81		This is confusing. Ndumo Game Reserve is only 1 RAMSAR site not 6 as is implied by using i.e. In addition there are the 4 inside the Isimangaliso wetland park (St Lucia, Lake	C Thirion	Addressed

No.	Sect	Comment	From	Addressed?
		Sibaya, Kosi Bay and the Turtle beaches). Where is the 6th RAMSAR site in the catchment?		
82		Drainage region would be the preferred term here	C Thirion	Reworded, initial wording was from TOR
83		Swaziland to eSwatini	C Thirion	Addressed
84		Check spelling of Usuthu and other river names and be consistent	C Thirion	Addressed
85	2.2	There may be some limited macroinvertebrate information available from the River Ecstatus Monitoring Programme	C Thirion	Noted
86	4.2	I understand that the existing EWRs are likely to be out of date, but why do you assume that the sites will not be applicable	C Thirion	Addressed
87	4.5	Why will the model have to be re-coded?	C Thirion	Addressed
88	Tab 7.1	Please not that Dr Deacon is not currently SASS accredited. I strongly suggest that he obtains SASS accreditation prior to any fieldwork conducted.	C Thirion	Dr Piet Kotze is responsible for the instream biota section. He is SASS accredited. As the biota surveys have been undertaken during the 2014-2016 Reserve study, it is not planned at this stage to undertake surveys.
89		A number of editorial changes in track changes.	C Thirion	Addressed after all other changes done as many items already incorporated. Usutu is as per study name, however, IUCMA is the Inkomati Usuthu CMA.
90		There may be some river systems which are not considered significant by the Department but are considered significant by local communities. How will this be addressed?	R Pillay (1.2)	Noted. These systems and uses will be identified during the Water Quality Technical Task Team stakeholder process.
91	2.2	The PSP has indicated that <i>"No new EWRs were undertaken for the Mhlathuze system. The EWRs are historical and therefore out of date. However, as no updated Reserves have been undertaken as part of the 2013-2016 study, these results will have to be use."</i> What are the implications of using EWRs that are out of date? How does affect the level of confidence of the study and the study outcome? Has there been any significant changes to hydrological conditions, etc. in the Mhlathuze catchment since the previous	R Pillay (1.3)	Addressed. Also see Explanation 3

No.	Sect	Comment	From	Addressed?
		EWRs were done, considering that the reconciliation study is re-looking at the hydrology of the system?		
92		Useful information was received from Ms Pillay as follows: (1.5) a water quality planning review document available from Mr Pieter Viljoen; (1.6) historic WMS monitoring IDs provided as well as a way of accessing data from the past 3-4 years; (1.9) an offer of assistance to Ms Lötter regarding setting up a PSC; (1.10) a recommendation that the PSC/stakeholder empowerment session for Dec 2022 be held at the beginning of December; (1.11) details for sourcing Validation + Verification information; and (1.12) details regarding water users in the study area (from WARMS).	R Pillay	Information provided to the study team as required
93		The Implementation Plan referred to as Deliverable 4.3.22 refers to a monitoring programme only. A table is a preferable format which must include the co-ordinates for each monitoring point, what monitoring is required and the frequency of monitoring. Is there any room to expand the scope to included important actions required to achieve the implementation of the RQOs and assigning roles and responsibilities in the implementation of RQOs? Some of this would require co-operation with other government departments and/or entities (institutional roles and responsibilities).	R Pillay (1.14)	These points will be considered when the Plan is drafted.
94		Another research institution that can be added to the Stakeholder Engagement Plan is SAEON (South African Environment Observation Network).	R Pillay (1.15)	Addressed
95		Considering that part of the Usutu and Pongola falls within Swaziland, that the Pongola River flows north towards Mozambique and that RQOs will be set within South African, are there any international obligations that need to be met? Does there need to be any engagement with Swaziland/Mozambique regarding this study or will they be informed of the outcome of the study by DWS?	R Pillay (1.16)	Cognisance will be taken of international obligations. This is within the mandate of the IUCMA, who are represented on the PMC.
96		Track changed editorial inputs	L Matlala	Addressed
97	App B: Comm Plan	See comment 1.8 from Ms Renelle Pillay. Engage Mr Nkosi Mkhize, Deputy Director: Catchment Management, to get a list of CMFs	M Mnisi	Comment passed on to Ms Lötter for noting

Explanation 1.

The Ecoclassification models stand separate from EWR methods such as DRIFT or HFSR. These models form the basis for all assessments during the Classification process. At present (11 March 2022), no models have been received from DWS as output of the 2014-2016 Reserve study, so it is uncertain what is available. Furthermore, no mention is made of any of the models in the Ecoclassification report for the Reserve study. Even though

Dr Thirion indicated that these models were utilised, at this stage, there is uncertainty whether this is the full suite and whether all models are available in raw format. Once the information has been received, the scope of work that may be required can be defined. The review (and/or) reconfiguring of the models is included as part of this Study. Confidence in results will however be higher if the raw data and models are used as the basis for the review.

The reference to DRIFT in the inception report is based on the plausible assumption that, if the EcoClassification models were not used (due to no reference made to them in the EcoClassification report) a facility within DRIFT that does provide severity indices may have been used as a substitute. This section will be removed, however the uncertainty of the models used will have to stay in the inception report as the evaluation and review can only be done after the inception phase once the models have been received. The inception report does say that it is **assumed that the populated models and collated raw data are available to the project team and will be provided by DWS.**

There is uncertainty about the reference to HABFLOW. This is a hydraulic model and EcoClassification models' output is not used within HABFLOW.

Explanation 2

It is important that agreed hydrology is used during the setting of EWRs in terms of the future use of EWRs within the running of the DWS standard yield, planning and operational models. The same hydrology that is used to run these models should be used to set EWRs. EWR results are supplied as an EWR Rule Table, which is a Flow Duration Table, and are linked and derived from the natural hydrology. EWR results generated with a certain hydrology cannot be input into models which make use of a different hydrology. Therefore, when EWR studies are undertaken, the most up-to-date hydrology and, most importantly, the hydrology used in the DWS directorates responsible for planning and or operation of the systems, should be used. The term 'acceptable' used in the proposal and in the inception report refers to:

- acceptable to all relevant directorates in DWS
- compliance with the tool's requirements for hydrology to be used in EWR determination (DWS 2016e)

It should be noted that this situation is relevant irrespective of which method was used to set EWRs (e.g. DRIFT, Habitat-Flow Stressor Response and the Revised Desktop Reserve Model). In the case of the 2014-2016 Reserve study undertaken using DRIFT, the PSP used an acceptable EWR method and used hydrology which was agreed on by the RDM office.

In all cases where previous EWRs have to be used within yield models (scenario modelling being a key part of Classification) there are normally two issues:

1. The hydrology may well be out of date. Hydrology is continuously being updated by DWS or, for example, in other studies undertaken by municipalities or other organisations. The hydrology used in the Reserve study is therefore approximately 9 years old. As has been indicated in the inception report, DWS is currently updating the hydrology for the Pongola to Umfolozi catchments and EWR results will have to be re-assessed using the updated hydrology.

2. The hydrological model used to generate natural hydrology for the EWR study was ACRU, which is a daily time step model. The standard DWS hydrological model is the PITMAN model, a monthly time step model. One of the issues around ACRU modelling is that it is not calibrated. The concerns regarding the hydrology developed using the ACRU model came to light during the Reserve study, as a Municipal study into an off channel storage dam on the Umfolozi was being undertaken at the same time and the Reserve results were required as input. Once the problems were identified, a meeting was held initiated by the Directorate National Water Resources Planning and the RDM office. RDM was informed about the problems. Additional to this, a document was written comparing the ACRU hydrology for the Black Mfolozi and the WRSM 2000 hydrology for DWS and this indicated some issues with the ACRU hydrology and the rainfall data used. This is an unpublished report produced for DWS planning, but is available on request. The problem regarding the use of the EWRs is therefore a historic problem.

In summary, the EWRs generated during the Reserve study will be reviewed to obtain the basis for the EWR assessments, i.e. the habitat requirements. This can then be used, with the revised hydrology, to generate updated EWRs. The approach therefore is not to redo the basis of the EWRs, but to use the EWR assessments as far as possible and produce revised EWR results.

Furthermore, as all hydrology is currently being reviewed, the issue of the use of ACRU becomes a moot point as the latest hydrology will have to be used. As such, the sections in the inception report which refers to unacceptable hydrology have been reviewed and more clarity supplied where necessary.

Explanation 3.

The initial EWR work on the Mhlathuze was undertaken in 1998, for which EWR sites were selected. Work to update results and the results format was undertaken during 2000. Hard copies of reports are available. This was followed by a Rapid Reserve on tributaries (2002). These are the origin of the biophysical work undertaken and setting of EWRs using either a comprehensive or extended rapid methods. As far as the PSP is aware, no specific Reserve studies at these levels (which include field work) have since been undertaken in the Mhlathuze catchment. All further Reserve analysis that has been undertaken since the original work, has been centered on updating the results using revised hydrology for uses in other studies such as Compulsory Licensing.

As has been indicated in the inception report, the current results used in studies such as the Compulsory Licensing study, and reviewed during the 2014-2016 Reserve study, will be used in this study as they have been published in a Preliminary Reserve template. It must also be noted that the Mhlathuze River downstream of Goedertrouw Dam is severely degraded and the restoration capacity is minimal. Therefore the focus will be on acceptable water quality for human use such as recreation and releases to satisfy estuary requirements.