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

Project Steering Committee meeting no. 5
Background Information Document
19 September 2023

water & sanitation
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PURPOSE OF THIS DOCUMENT

The purpose of the background information document (BID) is to inform stakeholders about this study that will determine Water Resource Classes and Resource Quality Objectives (RQOs) for significant water resources in the Usutu to Mhlathuze Catchments.

This BID contains the following:

- A brief overview of the Water Resource Classification System (WRCS).
- An indication of study progress.
- The proposed Resource Quality Objectives (RQOs) (narrative and numerical limits) for stakeholder review.

Stakeholders are invited to participate in the process by contributing information at meetings and workshops, or by corresponding with the stakeholder engagement office or the technical team at the addresses provided below:

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BACKGROUND

The National Water Act, 1998 (Act No. 36 of 1998) (NWA) is founded on the principle that National Government has overall responsibility for and authority over water resource management for the benefit of the public. It also requires that the nation's water resources be protected, used, developed, conserved, managed and controlled in an equitable, efficient and sustainable manner.

In order to achieve this objective, Chapter 3 of the NWA provides for the protection of water resources through the determination of Resource Directed Measures (RDM).

The Chief Directorate: Water Ecosystems Management of the Department of Water and Sanitation (DWS) is responsible for the determination of RDM which includes the classification of water resources, determination of the Reserve and RQOs in line with the Water Resource Classification System (WRCS). These protection measures aim to ensure that a balance is sought between the need to protect and sustain water resources on one hand and the need to develop and use them on the other.

The DWS is progressively determining water resources classes, Reserves and RQOs for all river systems in South Africa to ensure their protection and sustainable use, with the Usutu to Mhlathuze Catchments being among one of the current systems to be classified and RQOs determined.

The Project Steering Committee (PSC) is represented by various sectors of society and meets on a regular basis to steer this study in the acceptable scientific direction. Members of the PSC provide feedback to the constitutions / organisations which they represent.

Information documents (such as this document) are developed and made available to stakeholders to inform discussions especially at PSC meetings. This study's final results will be presented at a public meeting before the gazetting process commences, which will provide further opportunity for comment.

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WHAT IS THE WATER RESOURCE CLASSIFICATION SYSTEM?

The Water Resource Classification System (WRCS) is a set of procedures for determining the three protection measures which are:

- Reserve
- Water Resource Classes
- Resource Quality Objectives

The implementation of the WRCS requires consideration of the social, economic and environmental landscape in a catchment in order to assess the costs and benefits associated with utilization versus protection of a water resource.

The Classification process is a consultative process that allows stakeholders to participate in the setting of the Classes.

The outcome of the Classification process will be the approval of the water resource classes and Catchment Configuration for each delineation unit of Classification, the Integrated Unit of Analysis (IUA).

Water resources must be classified into the following:

Class I water resource is one which is minimally used, and the overall ecological condition of that water resource is minimally altered from its predevelopment condition.

Class II water resource is one which is moderately used, and the overall ecological condition of that water resource is moderately altered from its predevelopment condition.

Class III water resource is one which is heavily used, and the overall ecological condition of that water resource is significantly altered from its predevelopment condition.

Once the classes have been established, RQOs are determined to give effect to the Classes established. These protection measures will be gazetted in a government gazette and are binding on all authorities or institutions.

The Usutu-Mhlathuze study will follow a project plan which is based on the Integrated Steps for Classification and determining RQOs.

WHAT ARE RESOURCE QUALITY OBJECTIVES?

Resource Quality Objectives are a set of narrative and/or numerical management objectives defined for any particular resource.

RQOs encompass four components of the resource:

- Water quantity
- Water quality
- Habitat integrity
- Biotic characteristics

RQOs are important management objectives against which resource monitoring will be assessed. Monitoring of set RQOs will provide an indication as to whether the Class and Catchment Configuration is being maintained or achieved.

AN OVERVIEW OF THE STUDY AREA

Please refer to the previous BIDs for a complete overview of the study area.

INTERGRATED PROCEDURE FOR DETERMINING THE WATER RESOURCE CLASSES AND SETTING RQOs: THE STUDY PLAN

The following tasks are undertaken for determining the water resource classes and for setting the RQOs. Tasks 1 - 5 have been completed. Task 6 is currently underway. The duration of the study is 33 months – December 2021 to August 2024.

Task 1	**Delineate Resource Units and Integrated Units of Analysis and describe the status quo of the water resources**	
Task 2	**Prioritise Resource Units and select study sites**	
Task 3	**Quantify Basic Human Needs and Ecological Water Requirements**	
Task 4	**Identify and evaluate scenarios within Integrated Water Resource Management**	
Task 5	**Determine Water Resource Classes based on Catchment configurations for the identified scenarios**	
Task 6	**Determine RQOs (narrative and numerical limits) and provide implementation information for stakeholder review**	
Task 7	**Input into legal notice and Gazette the Class configuration and RQOs**	

STUDY APPROACH

This study focuses on the Classification of significant water resources (rivers, wetlands, groundwater and the estuaries) and determining associated RQOs in the Usutu to Mhlathuze catchments.

The process begins by defining the current state of the water resource (or part thereof) in terms of the ecological and biophysical elements. A detailed status quo assessment of the catchment (water resource quality, water resource issues, existing monitoring programmes, infrastructure, institutional environment, socio-economics, sectoral water

uses and users) is undertaken to understand the current conditions.

The catchment is then delineated into Integrated Units of Analysis (IUAs), where the catchment area is divided into basic units of assessment for the Classification of water resources, and into Resource Units (RUs, i.e. smaller units) for determining ecological water requirements (EWR or the Ecological Reserve). The assessment of EWRs is undertaken as Step 3 of the process. These steps form Tasks 1, 2 and 3 of the Study Plan.

A process of modelling, taking into account the protection requirements and development demands, is undertaken to understand consequences of different development scenarios on the state of resources (Tasks 4 and 5 of the Study Plan). A consultative process will then be undertaken, whereby the outcomes of the scenario analysis are discussed, taking into account the ecological, social and economic aspects, to define a future desired state of a water resource, namely the Water Resource Class. Resource Quality Objectives are then determined to ensure that the Class and Catchment Configuration that have been set can be met (Task 6 of the Study Plan). Once the consultation on the proposed classes and RQOs is complete, they are gazetted (Task 7 of the Study Plan).

TASK 6: DETERMINE RQOs AND ASSOCIATED IMPLEMENTATION INFORMATION

Task 6 is to determine the RQOs for:

- Rivers
- Estuaries
- Groundwater
- Wetlands
- Water quality for users: High Priority WQ sites.

BACKGROUND TO RQOs

RQOs capture the **Water Resource Class** from the Classification System and the **ecological needs determined in the Reserve** into **measurable management goals** that give direction to resource managers as to how the resource needs to be managed. RQOs provide **numerical and/or descriptive statements** about the **biological, chemical and physical attributes that characterise a resource for the level of protection defined by its Class**. The National Water Resource Strategy 2 stipulates that "*Resource Quality Objectives might describe, among other things, the quantity, pattern and timing of instream flow; water quality; the character and condition of riparian habitat, and the characteristics and condition of the aquatic biota*".

The links between Scenarios, Water Resource Classes and RQOs are illustrated in the figure below:

RIVER RQOs

RQOs are set for **High Priority RUs,** i.e. the EWR sites: These sites require RQOs to be provided in as much detail as available information allows for all components. As such, no selection of RQO component indicators is required as EcoSpecs are provided for all relevant components, which are:

- Hydrology
- Physico-chemical variables (water quality)
- Geomorphology
- Riparian vegetation
- Fish
- Macroinvertebrates

Different level (in terms of detail) RQOs are set for river reaches or RUs which are represented by biophysical nodes. During this study the aspects that feed into the determination of RQOs have already been undertaken, i.e.:

- Identification of priority river RUs, wetlands and estuaries.
- Determination of EWRs (flow component of RQOs).
- Determination of Ecological categories leading to Target Ecological Categories, which represents the Catchment Configuration linked to the Class.

The RQOs for biota and habitat for the EWR sites are summarised on page 4 in terms of Ecological Categories. Ecological categories represent both a numerical and narrative RQO.

I IHI (Instream Index of Habitat Integrity)	**R IHI** (Riparian Index of Habitat Integrity)	**PC** (Physico-chemical)	**Geom** (Geomor-phology)	**Rip Veg** (Riparian Vegetation)	**Fish**	**Inverts** (Invertebrates)	**Instream**	**EcoStatus**
EWR MA1: Matigulu River								
B/C (80%)	**B/C (78%)**	**B (84.5%)**	**B (87%)**	**B/C (79.4%)**	**B (86.4%)**	**B/C (80.9%)**	**B (83.3%)**	**B/C (81.3%)**
EWR NS1: Nseleni River								
B/C (81%)	**C (70.3%)**	**B (82.7%)**	**B (85%)**	**C (64.4%)**	**C (67.9%)**	**B/C (79.4%)**	**C (74.3%)**	**C (68.4%)**
EWR WM1: White Mfolozi River								
B/C (79.3%)	**C (77.4%)**	**B (84.5%)**	**B/C (78.8%)**	**B/C (81.3)**	**C (73.1%)**	**B/C (81.1%)**	**C (77.08**	**B/C (79.2%)**
EWR BM1: Black Mfolozi River								
C (77.7%)	**C (74.4%)**	**B/C (81.8%)**	**A (93.4%)**	**C (74.9%)**	**C (75.9%)**	**B/C (81.3%)**	**B/C (78.9%)**	**C (76.9%)**
EWR MK1: Mkuze River								
B/C (79.2%)	**B (83.6%)**	**C (68.8%)**	**B (82.3%)**	**C (76.4%)**	**B/C (80.7%)**	**C (79.1%)**	**B/C (79.88%)**	**B/C (78.14%)**
EWR UP1: Pongola River								
B (85.7%)	**B/C (77.8%)**	**A/B (88.3%)**	**A/B (89.8%)**	**C (70%)**	**C (73.9%)**	**B/C (79.5%)**	**C (77%)**	**C (73.5%)**
EWR AS1: Assegaai River								
C/D (59.1%)	**C/D (58.7%)**	**B/C (80.6%)**	**C (70.8%)**	**C (69.9)%**	**C (69.2%)**	**B/C (784%)**	**C (77.8%)**	**C (74.16%)**
EWR NG1 (Ngwempisi River)								
C (64.3%)	**C/D (61.8%)**	**B (85.5)**	**B (83.3%)**	**C (77.4%)**	**C (72.8%)**	**B (87.3%)**	**B/C (80.36%)**	**B/C (79.8%)**

WATER QUALITY RQOs

These are generated as EcoSpecs for the EWR sites as part of the Reserve process (i.e. objectives for aquatic ecosystems), and User-Specs for the following users, where represented and relevant:

- Domestic use; assumes primary treatment
- Agriculture - Stock watering and Irrigation
- Aquaculture
- Industrial - Category 3
- Recreation - Intermediate or full-contact

To summarise, user water quality state per relevant RU and IUA is evaluated by determining the driving water quality variables linked to the primary water quality role player(s). Note that although the aquatic ecosystem is the **resource base** rather than a "user", it is grouped and evaluated with other users for purposes of this step of the Classification process. The driving user and set of variables is then identified and the water quality RQOs set accordingly. An example of a **narrative and numerical** water quality RQO for a High Priority Water Quality site is shown below:

Narrative RQO	Numerical RQO
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than or equal to 0.015 mg/L PO_4-P (Aquatic ecosystems: driver).
Ensure that electrical conductivity (salt) levels are within Acceptable limits.	95th percentile of the data must be less than or equal to 55 mS/m (Domestic use: driver).

ESTUARY RQOs

As per the DWS methodology, estuaries are sufficiently different in terms of state, functioning and management to form individual RUs. RQOs are set for the short-to medium term (5 to 10-year period) for the following components:

- Quantity, pattern and timing of instream flow (hydrology).
- Mouth state (hydrodynamics).
- Water quality.
- Characteristics and condition of primary producers (e.g. macrophytes).
- Characteristics and condition of biota (e.g. fish).

The RQOs for the estuaries were derived from the EcoSpecs and Thresholds of Potential Concern (TPCs) set for systems that were assessed as part of EWR studies. For the uMgobezeleni Estuarine Lake system, the RQOs are based on the 2018 National Biodiversity Assessment and field studies. In terms of RQOs for recreational use (water quality), the recommended targets proposed for South Africa's coastal marine waters were applied as summarised below.

RQOs for recreational use in estuaries is specified as risk-based ranges for intestinal enterococci and *E. coli* (microbiological indicator organisms) (DEA, 2012)

Category	Estimated Risk Per Exposure	Enterococci (Count per 100 ml)	*E. coli* (Count per 100 ml)
Excellent	2.9% gastrointestinal (GI) illness risk	≤ 100 (95 percentile)	≤ 250 (95 percentile)
Good	5% GI illness risk	≤ 200 (95percentile)	≤ 500 (95 percentile)
Sufficient or Fair (minimum requirement)	**8.5% GI illness risk**	**≤ 185 (90 percentile)**	**≤ 500 (90 percentile)**
Poor (unacceptable)	>8.5% GI illness risk	> 185 (90 percentile)	> 500 (90 percentile)

In South Africa, the minimum requirement for recreational use is the "Sufficient or Fair" category, thus also representative of the RQOs for estuaries used for full-contact recreation. For estuaries where Blue Flag status has been awarded, or for estuaries immediately adjacent to beaches awarded Blue Flag status, the ROQ for recreation in the "Excellent" category was used.

Ecological Categories for the eight estuaries represented below summarise the numerical and narrative RQOs according to the guidelines provided by the DWS estuarine methods.

	aMatigulu / iNyoni	iSiyaya	uMlalazi	Mhlathuze	iNhlabane	Mgobezeleni	Kosi	St Lucia/ uMfolozi
PES (trajectory)	B/C ↓	D/E↓	B/C ↓	D↓	E↓	B↓	A/B↓	D ↓↑
REC	B	C	B	D	D	A	A	B
TEC	B	D (short term)→ C (Long term)	B	D	D	A/B	A	C (Short term) → B (long term)
Hydrology	C	B/C↑	C	C	D	B	A	C
Hydrodynamics	B	D ↑	B/C	D/E	C/D	B	A	C
Physical habitat (sediments)	B	D ↑	B	D	E→D	A/B	A	C
Water quality (salinity)	A	B	B	C/D	E→D	A/B	A	D ↑
Water quality (general)	C	D ↑	C	D	D	B	A/B	D ↑
Microalgae	B	C	C	D	D	B	A	D ↑
Macrophytes	B	D→C	B/C	D	C/D	B	A/B	B
Invertebrates	B	D→C	B	E→D	E→D	A/B	B↑	D
Fish	B/C	D→C	B	D	E→D	B	B↑	C
Birds	B	D→C	B	C	D	A	A/B	C

X (short term)→Y (Long term) - indicates expected long-term trajectory of change to meet long term TEC/RQO.
↓↑ - indicates the trajectory of change is not stable.
↑ - indicates an improvement within a category (mostly associated for degraded components) and thus a focus for restoration.

Generic numerical and narrative RQOs associated with Ecological Categories for estuaries

Ecological Category	Generic Narrative RQO	Narrative RQO	Numerical RQO (expressed as similarity to reference condition)
A	Unmodified, or approximates natural condition	Characteristics of resource should be determined by unmodified natural disturbance regimes. No human induced risks to abiotic and biotic maintenance of resource. The supply capacity of resource not to be used.	> 92%
A/B			> 87%
B	Largely natural with few modifications	Small change in natural habitats and biota may have taken place, but ecosystem functions are essentially unchanged. Only a small risk of modifying natural abiotic template and exceeding resource base should not be allowed. Although risk to well-being and survival of especially intolerant biota at a very limited number of localities may be slightly higher than expected under natural conditions, the resilience and adaptability of biota must not be compromised. Impact of acute disturbances must be totally mitigated by presence of sufficient refuge areas.	>78%
B/C			>72%
C	Moderately modified	Loss and change of natural habitat and biota have occurred, but basic ecosystem functions still predominantly unchanged. A moderate risk of modifying the abiotic template and exceeding the resource base may be allowed. Risks to the well-being and survival of intolerant biota may generally be increased with some reduction of resilience and adaptability at a small number of localities. Impact of local and acute disturbances must at least partly be mitigated by the presence of sufficient refuge areas.	>63%
C/D			>57%
D	Largely modified	Large loss of natural habitat, biota and basic ecosystem functions has occurred. Large risk of modifying the abiotic template and exceeding the resource base may be allowed. Risk to the well-being and survival of intolerant biota with resulting low abundances and frequency of occurrence, and a reduction of resilience and adaptability at a large number of localities. Associated increase in abundance of tolerant species must not be allowed to assume pest proportions. Impact of local and acute disturbances must at least to some extent be mitigated by refuge areas.	>43
D/E			≥37%
E	Seriously modified	Loss of natural habitat, biota and basic ecosystem functions is extensive.	>23%
E/F			>17%
F	Critically modified	Modifications have reached a critical level and ecosystem modified completely with an almost complete loss of natural habitat and biota. In worst instances basic ecosystem functions have been destroyed and changes are irreversible.	≤ 17%

WETLAND RQOs

Due to the high number of wetlands within the Usutu to Mhlathuze Catchment area, it is unrealistic to implement and monitor RQOs for each individual wetland. Specific RQOs were therefore set for priority wetlands of high or very high importance, and catchment-level RQOs for other wetlands.

RQOs for priority individual wetland or wetland complexes are dependent on available baseline data, and where such data are available, specification of numeric and narrative RQOs to manage these systems according to the desired ecological condition can be provided. Catchment-level RQOs provide broad level objectives for wetland management, based on baseline EcoStatus and ecological importance (EI) and ecological sensitivity (ES) data (see Wetland Report) at the quaternary catchment and sub-quaternary catchment scales. It should be stressed that although RQOs at different levels have been determined, preference should be given to detailed RQOs for priority wetlands where these exist i.e., higher confidence RQOs should supersede any broad-scale RQOs for the same wetland or wetland complex.

Catchment level RQOs for wetlands

Component	Sub-component	RQO		Indicator	Motivation
		Narrative	Numerical		
Water quantity	Flow or inundation regime	Water quantity (i.e. flow and inundation regime) must maintain wetlands in good condition where practical.		Flow (water quantity) or inundation regime is sufficient to maintain the current PES .	Implementation of the EWR where possible.
	Species sensitive to flow	Water quantity (i.e., flow and inundation regime) must maintain populations of flow sensitive wetland species known to occur.		Flow (water quantity) or inundation regime is sufficient to maintain the current ES.	
Water quality	Chemistry and sediments	Water quantity (i.e., chemistry and sediments) must maintain wetlands in good condition.		Water quality is sufficient to maintain the current PES.	Implementation of the EWR where possible.
	Species sensitive to flow	Water quality (i.e., chemistry and sediments) must maintain populations of flow sensitive wetland species known to occur.		Water quality is sufficient to maintain the current ES.	
Habitat	Integrity and condition	The PES category of wetlands within each SQ must be maintained.	The PES score must be at least equal to the minimum value for the category: >92 for A, > 87.4 for A/B, > 82 for B, > 77.4 for B/C, > 62 for C, > 57.4 for C/D and > 42 for D.	PES	The NWRS (DWS, 2013) aims to address the loss of wetlands and to maintain healthy, functional ecosystems.
Habitat / Biota	Species / habitats sensitive to flow	Known or listed species or habitats sensitive to flow should be protected and the ES for each SQ should be maintained.		ES	Overall conservation of sensitive and important species and habitats (SANBI; DWS).
Biota	Threatened, endangered or endemic species	Known threatened, endangered or endemic wetland species should be protected and the EI for each SQ should be maintained.		EI	
Biota	taxon richness	Wetland species diversity and community health should be maintained.		Habitat condition is sufficient to maintain the current PES.	Is based on the premise that if the habitat is present and in good condition, the biota will be maintained.
Ecosystem services	Importance, sensitivity and demand	The ecosystem services of wetlands in a SQ must be maintained. A measure of this is the EIS, the category of which must remain the same (or improve) within each SQ.		EIS	EIS advocated as a surrogate measure of ecosystem services at the SQ scale since it considers diversity (both habitat and species), sensitivity, risk and demand.

GROUNDWATER RQOs

Groundwater RQOs were developed to maintain the required groundwater contribution (groundwater baseflow) to the Ecological Reserve, which is assumed to equal the required maintenance low flow. The relevance of the groundwater RQOs to protect groundwater is twofold; 1) to maintain and support the ecological requirements of the receiving surface water bodies; and 2) to protect groundwater resources for the direct and indirect users of groundwater.

The following groundwater data were synthesized for each quaternary catchment in each Groundwater Resource Unit (GRU) to determine the RQOs:

- Borehole yields
- Existing groundwater use and stress index (total use/aquifer recharge)
- Recharge and aquifer recharge (which excludes the component of recharge lost as interflow and not available to groundwater users)
- Natural or virgin groundwater baseflow, interflow and total baseflow from WRSM Pitman
- The groundwater baseflow that would occur under present day groundwater abstraction and afforestation and Alien Invasive Plants (AIPs) from WRSM Pitman
- The mean annual baseflow under present day afforestation, AIPs and groundwater abstraction from WRSM Pitman
- Allocable groundwater as defined from aquifer recharge, less the groundwater component of the Reserve, less current use

The reduction of groundwater baseflow can occur due to abstraction by the interception of groundwater flow which would normally discharge into rivers, or by abstraction near rivers, which creates drawdown and reverses groundwater gradients so that flow in the river is induced into the aquifer. Therefore, possible RQOs may stipulate the volume of abstraction that would cause an undesirable reduction in baseflow, or specific distances from a river, or specified distances from the surface water body where abstraction can take place.

Baseflow can also be impacted by afforestation and AIPs, which can increase evaporation from groundwater if they occur in areas of shallow water table or reduce interflow from high lying areas. Selected indicators to monitor groundwater can be based on existing monitoring data, on simulated data if available, or extrapolation from other areas of similar hydrogeological conditions. Narrative RQOs are discussed below.

a) Abstraction

Once a stress index had been calculated, each quaternary was assigned a groundwater (GW) present status based on the volume of groundwater abstracted compared to the volume recharged (stress index). The following categories were used to determine the present status:

GW present status	Description	Guide	Stress index
A	Unmodified, pristine conditions	Very limited use (GW use is less than 5% of recharge)	≤ 0.05
B	Low volume GW usage, largely natural conditions, no negative impacts apparent	Stock watering, farm domestic water supply, rural water supply (use ranges between 5% and 20% of recharge)	0.05 – 0.2
C	Moderate volumes of GW usage, little or no negative impacts apparent	Small-scale irrigation, rural water supply, water supply for villages and small towns (use ranges between 20% and 40% of recharge)	0.2 – 0.4
D	High volumes of GW usage, but with little apparent negative impact	Water supply for large rural communities, medium to large towns, large-scale irrigation (use ranges between 40% and 65% of recharge)	0.4 – 0.65
E	Stressed system due to over-abstraction of GW or inappropriate land-use	High volume of major groundwater users (use range between 65% and 95% of recharge)	0.65 – 0.95
F	Critical over-abstraction of GW or highly sensitive hydrological environment	Very high volume of major groundwater users (GW use is in excess of 95% of recharge)	> 0.95

Note that the GW present status categories are NOT directly linked to Ecological Categories used for rivers and estuaries.

b) Baseflow

In GRUs where baseflow reduction is greater than 30%, whether due to afforestation, AIPs or groundwater abstraction, it is considered necessary to monitor baseflow due to the potential impacts on the ecology. Monitoring baseflow can take the form of monitoring dry season flows at gauging stations and comparing flows to natural flows utilising flow duration curves, or via simulation of impacts on low flows by model simulation of changes in land or water use.

c) Water Level

Setting water levels as an RQO is problematic since water levels vary by borehole location in terms of topography, pumping rates and aquifer hydraulic parameters. Hence water level below surface is a very site-specific variable which cannot be stipulated for an entire catchment.

In addition, monitoring water level provides only localised information, and monitoring water level 'within 50 m of a river to ensure water levels do not drop more than 0.5 m' requires having a dense network of monitored boreholes within 50 m of a river; otherwise only point data is being gathered. Monitoring baseflow in catchments where groundwater is linked to rivers provides an integrated response of processes within the entire catchment. This data are already being collected where gauging weirs exist.

Monitoring water levels is not necessary where baseflow reduction occurs due to afforestation and AIPs, which reduce interflow from high lying areas. Monitoring of water levels should be prioritised in areas where the stress index is greater than 0.2, especially where the abstraction has had a significant impact on baseflow.

Where monitoring is necessary, the specific water level is borehole-dependent and the critical issue is whether dry season water levels show a trend of decline over several years rather than an absolute level. This may occur in one borehole due to localised pumping, but may not be applicable to an entire catchment.

d) Water Quality

The number of samples available for water quality for many quaternaries is limited, hence it is not possible to derive meaningful statistics such as range, median etc. The number of samples falling into each DWS water quality class is listed as a percentage for a catchment. GW water quality classes are defined by DWS and are linked to potability of water. Where boreholes of a quality worse than class II are present, monitoring is recommended.
Groundwater quality classes were allocated according to the following criteria:

- Quality Class I: 95% of samples of water quality class 0 and 1
- Quality Class II: 75% of samples of water quality class 0-2
- Quality Class III: <75% of samples class 0-2.

An example of groundwater RQOs are shown below:

Quat	Groundwater narrative RQO				Groundwater numerical RQO
	Abstraction	**Baseflow**	**Water Level**	**Water Quality**	
W21A	All existing users to comply with existing allocation schedules, including General Authorisation (GA) and Schedule 1, and individual licence conditions. Allocations for new users is to remain within the allocable groundwater volume.	Due to the low groundwater use, monitoring not a high priority for RQO compliance purposes.	Due to the low groundwater use and low aquifer contribution to baseflow, monitoring not a high priority for RQO compliance purposes. Local monitoring of wellfields is necessary.	Water quality to stay within the limits of Water Quality Class I	The remaining Allocable groundwater is 2.64 Mm^3/a.
W21B				Water quality to stay within the limits of Water Quality Class I	The remaining Allocable groundwater is 4.34 Mm^3/a.
W21C				Some boreholes have natural elevated fluoride, so water quality needs to be tested for domestic boreholes	The remaining Allocable groundwater is 2.47 Mm^3/a.
W21D				Some boreholes have natural elevated fluoride, so water quality needs to be tested for domestic boreholes	The remaining Allocable groundwater is 3.04Mm^3/a.

THE WAY FORWARD

PSC Meeting 5 (19 September 2023) is the final PSC meeting for this study. All stakeholders will be invited to attend public meetings where integrated study results will be presented, before the gazetting process is initiated. The gazetting process provides a 60-day comment period to stakeholders to comment on the Classes and associated RQOs.

PSC members are encouraged to attend the public meetings and provide input during the gazetting process. Personalised invitation letters will be distributed to all registered stakeholders. More information on the project is available on http://www.dwa.gov.za/rdm/WRCS/default.aspx.

Abbreviations and Acronyms

AIPs	Alien Invasive Plants
BID	Background Information Document
DWS	Department of Water and Sanitation
EC	Ecological Category
EIS	Ecological Importance and Sensitivity
ES	Ecosystem Services
EWR	Ecological Water Requirements
GA	General Authorisation
GRU	Groundwater Resource Unit
GW	groundwater
IHI	Index of Habitat Integrity
IUA	Integrated Unit of Analysis
IWRM	Integrated Water Resource Management
MAR	Mean Annual Runoff
NWA	National Water Act
NWRS	National Water Resource Strategy
PC	Physico-chemical
PES	Present Ecological State
PMC	Project Management Committee
PSC	Project Steering Committee
RDM	Resource Directed Measures
REC	Recommended Ecological Category
RQOs	Resource Quality Objectives
RU	Resource Unit
SQ	Sub Quaternary
TEC	Target Ecological Category
WQ	water quality
WRCS	Water Resource Classification System
WRSM	Water Resources Simulation Model
WTW	Water Treatment Works
WWTW	Waste Water Treatment Works