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

Briefing Document

2nd Project Steering Committee – 28 June 2023

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

PURPOSE OF THIS DOCUMENT

The purpose of this briefing document is to provide members of the Project Steering Committee (PSC) with summary information, progress and results, in preparation for the PSC meeting to be held on 28 June 2023.

This briefing document contains information regarding:

- Study progress to date;
- Final priority river and estuaries sampled for Ecological Water Requirements (EWR) quantification per Integrated Units of Analysis (IUA) in the study area, including next steps;
- Summary of the prioritised Wetland Resource Units (RU) within the IUAs, including their identified Present Ecological State (PES), including next steps; and
- Summary of the groundwater PES, and quantified stress index based on the degree of impact to provide input into the Water Resource Classes.

OBJECTIVES OF THE PROJECT

Chapter 3 of the National Water Act, 1998 (Act 36 of 1998) provides for the protection of water resources through the implementation of Resource Directed Measures (RDM) which include the classification of water resources, determination of the Reserve and setting of Resource Quality Objectives.

The objective of this study is, therefore, to co-ordinate the implementation of the Water Resource Classification System (WRCS) published as Regulation 810 in September 2010 for the determination of water resource classes, the Reserve and associated RQOs.

The results of this study will guide the Department of Water and Sanitation (DWS) to meet the objectives of maintaining/ improving the state of the water resources within this catchment while ensuring that the water supply remains sufficient to meet the requirements of both current and future users. The water resource classes, the Reserve and associated RQOs will also assist the DWS in ensuring sustainable protection of the water resources.

STUDY APPROACH

The approach followed for this study is based on the 8-step integrated framework (Figure 1) and steps for Classification, Reserve and RQOs as developed for the Operationalising of Resource Directed Measures. The study is currently focussing on step 3 – Quantification of the Ecological Water Requirements (EWR) and Basic Human Needs (BHN).

STUDY AREA AND RESOURCE COMPONENTS

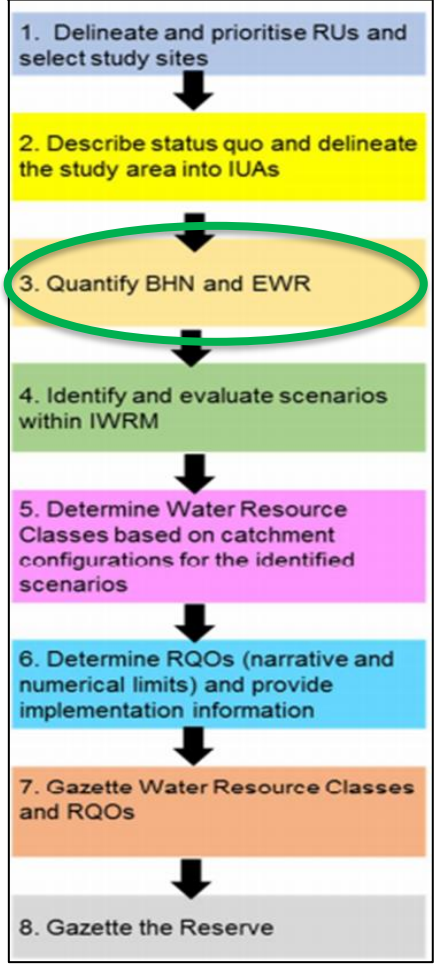
The study area comprises the water resources within the Mzimvubu to Tsitsikamma Water Management Area (WMA 7) and includes the major river systems of Great Kei, Mbashe, Great Fish, Sundays and Gamtoos Rivers as well as the smaller drainage regions in-between.

All the water resource components are considered, namely priority rivers, dams, wetlands, groundwater and estuaries and, where applicable, integration/ linkages between these components will be considered.

STUDY PROGRESS

Steps 1 and 2 of the integrated framework have been completed and the study team is currently conducting Step 3 (Figure 1). The completed activities include:

FIGURE 1: INTEGRATED FRAMEWORK FOR DETERMINATION OF WATER RESOURCE CLASSES, RESERVE AND RQOS



➢ ***Assessment of data availability, gaps analysis and status quo descriptions***

Several studies (reconciliation strategies, water availability assessments, reserve studies, etc.) have been undertaken for the water resources in the study area. Although a number of these studies were focussed around the metropolitan areas of Buffalo City and Nelson Mandela Bay, information is available for the other areas through various datasets, GIS layers and information from previous initiatives (Desktop PES/EI/ES, 2014, NBA, 2018, WR2012, NFEPA wetlands, 2011, monitoring programmes, etc.).

Most of the gaps that were identified, included low level of mapping effort of wetlands in some catchments, limited data on biota, geomorphological, riparian vegetation and current water quality data for some of the systems. However, this was mitigated through the collection of data during the two river and estuary field surveys and a single wetland survey. A groundwater hydrocensus was also undertaken for the study.

The variuos levels of detailed hydrological models will be addressed through the development of suitable WRYM models for specific catchments. The 2011 Census data will be updated with Municipal Non-financial census and household surveys or if available, with the recently completed census data.

➢ ***Integrated Units of Analysis***

Nineteen homogenous spatial units (also termed Integrated Units of Analysis (IUAs)), which consist of significant water resources that can be managed as an entity and for which Water Resource Classes are determined, were identified for the study area. The delineation was mainly based on socio-economic criteria and the boundaries of water resource components or catchments, taking into consideration ecological information and biophysical characteristics.

➢ ***Identification of Resource Units***

Resource Units (RUs) were identified and prioritised per water resource component and per IUA and are based on ecological, socio-cultural and water use considerations. These can be linear stretches of rivers, priority wetland areas, major dams, estuaries and important groundwater systems. The detail of the assessments undertaken will depend on the level of priority, namely:

Level 1 – Detailed assessments, including field surveys and determination of RQOs;
Level 2 – Mainly desktop with limited field surveys with ecological specifications and conditions; and
Level 3 – Desktop assessments using existing data, no field surveys.

RIVERS AND ESTUARIES

Table 1 and Figure 2 (end of this document) indicates the final river and estuaries sampled for EWR quantification per IUA in the study area.

Table 1: Final rivers and estuaries sampled for EWR quantification per IUA in the study area

IUA code	Description	Rivers [1]	Estuaries[1]
IUA_K01	Tsitsikamma and headwaters of Kromme to Kromme Dam	Upper Kromme	
IUA_KL01	Kromme from Kromme Dam to estuary and Gamtoos	Kromme, Gamtoos	Kromme, Gamtoos
IUA_L01	Kouga to Kouga Dam, Baviaanskloof	Kouga	
IUA_M01	M primary catchment	Swartkops	

IUA code	Description	Rivers [1]	Estuaries[1]
IUA_LN01	Groot to Kouga confluence, Upper Sundays to Darlington Dam	Dry, ephemeral systems, no surveys	
IUA_N01	Sundays downstream Darlington Dam	Lower Sundays	Sundays
IUA_P01	Primary catchment	*(2) see note below*	Bushmans
IUA_Q01	Fish	Upper Great Fish	
IUA_Q02	Great Fish	Tarka, Lower Great Fish	
IUA_Q03	Koonap and Kat	Koonap, Kat	
IUA_R01	Keiskamma	Keiskamma	Keiskamma, Gxulu, Morgan
IUA_R02	Buffalo/ Nahoon	Buffalo	Kwelera, Bulura, Cintsa
IUA_S01	Upper Great Kei	Indwe, White Kei, Tsomo	
IUA_S02	Black Kei	Black Kei	
IUA_S03	Lower Great Kei	Kubusi, Great Kei	Great Kei
IUA_T01	Upper Mbashe, Upper Mthatha	Upper Mbashe	
IUA_T02	Lower Mbashe	Middle Mbashe	Mbashe
IUA_T03	Lower Mthatha	Lower Mthatha	
IUA_T04	Pondoland coastal	Mtentu, Mngazi, Nqabara	Xora

(1) Information/ results from previous Reserve studies to be used where no surveys were undertaken as part of this study
(2) Rivers dry in priority river reaches

➢ ***Next steps for rivers and estuaries***

The final activity to complete Step 3 is the quantification of the Ecological Water Requirements. This will be undertaken in detail at the selected EWR sites on the rivers, and for the priority estuaries. For the rivers and estuaries the information collected during the field surveys will be used to:

- Undertake Eco-categorisation to determine the Present Ecological State (PES), Ecological Importance (EI), Ecological Sensitivity (ES) and Recommended Ecological Category (REC);
- Use the Revised Desktop Reserve Model (RDRM) within SPATSIM (an integrated hydrology and water resource information management and modelling system) for the integration of data produced from the surveys and Eco-categorisation process to quantify the EWRs for the rivers;
- The results from the hydraulic modelling (cross-sectional profile and discharge) will be used to evaluate the RDRM requirements; and
- Evaluation of the water quality at specific selected sites where quality was identified as an issue.

WETLANDS

All selected wetland resource units have been categorised for the purpose of the Reserve determination for the Keiskamma, Fish to Tsitsikamma study area. Table 2 provides a summary of the idetnified PES scores for each of the WRUs identified within the IUAs. More intensive management and/or rehabilitation measures have not been prescribed, as in many instances can be onerous on the landowners/users and therefore, are not adopted.

Table 2: Summary of the respective WRU identified within the IUAs

IUA	WRU	Wetland Name	HGM Type	PES
K01	**WRU01**	Lottering	Lottering	C
		Slang	Slang	B
	WRU02	Kromme	UCVB	A
L01	**WRU03**	Krakeel *(Figure 3)*	VB	D
M01	**WRU04**	Longmore	VB	C
	WRU05	Chatty River	FP	D
			CVB	D
LN01	**WRU06**	Sneeuberg West	Seep	B

IUA	WRU	Wetland Name	HGM Type	PES
			VB	C
Q02	**WRU10**	Dagbreek	VB	B
R02	**WRU15**	eDrayini	FP	C
	WRU26	KwaMasele	Seep/VB	C
S01	**WRU18**	Cala	VB	C
			HSS	C
	WRU21	Mbokotwa	FP	D
S02	**WRU12**	Cairns	UCVB/Seep	B
	WRU13	Hogsback	Seep	C
			Seep (degraded)	D
			CVB	C
			FP	C
T01	**WRU22**	Elliot/Khowa	Seep	D
			FP (east)	D
			CVB (west)	D
			FP (upper)	E
			FP (lower)	C
T04	**WRU24**	Sikombe *(Figure 4)*	CVB	B
		Xoloben	CVB	C
	WRU25	Ludeke Halt	Seep/VB	D

➢ ***Next steps for wetlands***

- The proposed management, maintenance and monitoring activities will be described;
- Setting of Resource Quality Objectives; and
- Recommendations for the quantification of the EWRs for specific priority wetlands and where integration between groundwater and/ or rivers and wetlands are crucial will be made as part of the next steps of the study.

Figure 3: Krakeel Wetland Complex: The Wabooms River with flanking palmiet (left) and mixed shrub/restio vegetation (right)

Figure 4: Sikombe wetland: View of the upstream habitat of one of the major tributaries, which has been recently burnt

GROUNDWATER

The purpose of the Groundwater component was to provide detailed descriptions of the Present Status of the groundwater based on the assessment of the data from monitoring undertaken in the study area, and to quantify the stress index based on degree of impact to provide input into the Water Resource Classes.

The available data from the Hydstra and WMS monitoring sites was used to assess the present status of groundwater in the catchment. The results can be summarised as follows:

- Groundwater levels vary significantly over the catchment
- Long term continuous groundwater level data generally indicate cyclical trends with seasonal variations
    - A decline in groundwater levels is evident at most monitoring sites from 2015 – 2021. At some monitoring sites a decline in groundwater levels is also observed from 2007 – 2011. These cycles are related to drought conditions in the catchment.
    - Although recovery is indicated at some monitoring sites in 2022, the groundwater levels are below the pre-drought conditions
- Groundwater quality (using EC as indicator) is generally good in the entire catchment
    - The exceptions are in the central and western parts of the catchment where lithology, as well as limited recharge and rainfall, have a bearing on groundwater quality.

Groundwater use data for boreholes and springs was acquired to provide a spatial distribution of groundwater use in the catchment. The total groundwater use registered in the catchment is 160.15Mm^3/annum. Currently, the irrigation sector accounts for the largest component with 51%, followed by the water supply service (i.e. mainly municipalities) sector with 40%. The remaining sectors (i.e. Aquaculture, Livestock, Industry, Mining, Power Generation and Recreation) account for <10% of the total groundwater use in the catchment. The largest groundwater use is in quaternary catchment M20A with 9.73Mm^3/annum. This quaternary catchment includes the Gqeberha metropolitan area that experienced severe drought from about 2017, which resulted in extensive groundwater exploration (municipal and private) occurring in the catchment.

The spatial distribution of EC generally reflects lithological control, favourable recharge and rainfall conditions. Though certain parts of the catchment have poor quality groundwater, it is not always impacted by external sources and occur naturally in aquifers. Where external sources are impacting negatively on groundwater quality, increases in typical pollution indicators such as nitrate, ammonia, sulphate are generally evident. The distribution of nitrate and nitrite, ammonia and sulphate was assessed to determine potential anthropogenic impacts. The results show that elevated nitrate and nitrite concentrations occur widespread in the catchment. This is likely due to the impact of farming practices in the catchment. Ammonia concentrations are generally within the SANS 241 (2015) aesthetic limits in the catchment. Elevated sulphate concentrations occur mainly in the western half of the catchment. Based on the groundwater quality assessment, the main parameters of concern are EC (salinity), nitrate and nitrite and sulphate. These areas will require treatment prior to use.

Using a GIS approach, the volume of surplus or deficit groundwater was divided into equal interval categories. The stress categories vary from “A” (Natural) to “F” (Critically Modified). The majority of the quaternary catchments falls in the “C” (Fair) category (40%), followed by the B/C (Good to Fair) category (22%) and C/D (Fair to Poor) category (21%). The main quaternary catchments of concern are K80B and K80C, which both have “F’s”. This is mainly due to the high Ecological Water Requirements (i.e. Groundwater contribution to Baseflow) demand in these catchments as the groundwater use is very low. Please refer to Figure 5 (end of this document) for the identified groundwater stress index categories of the study area.

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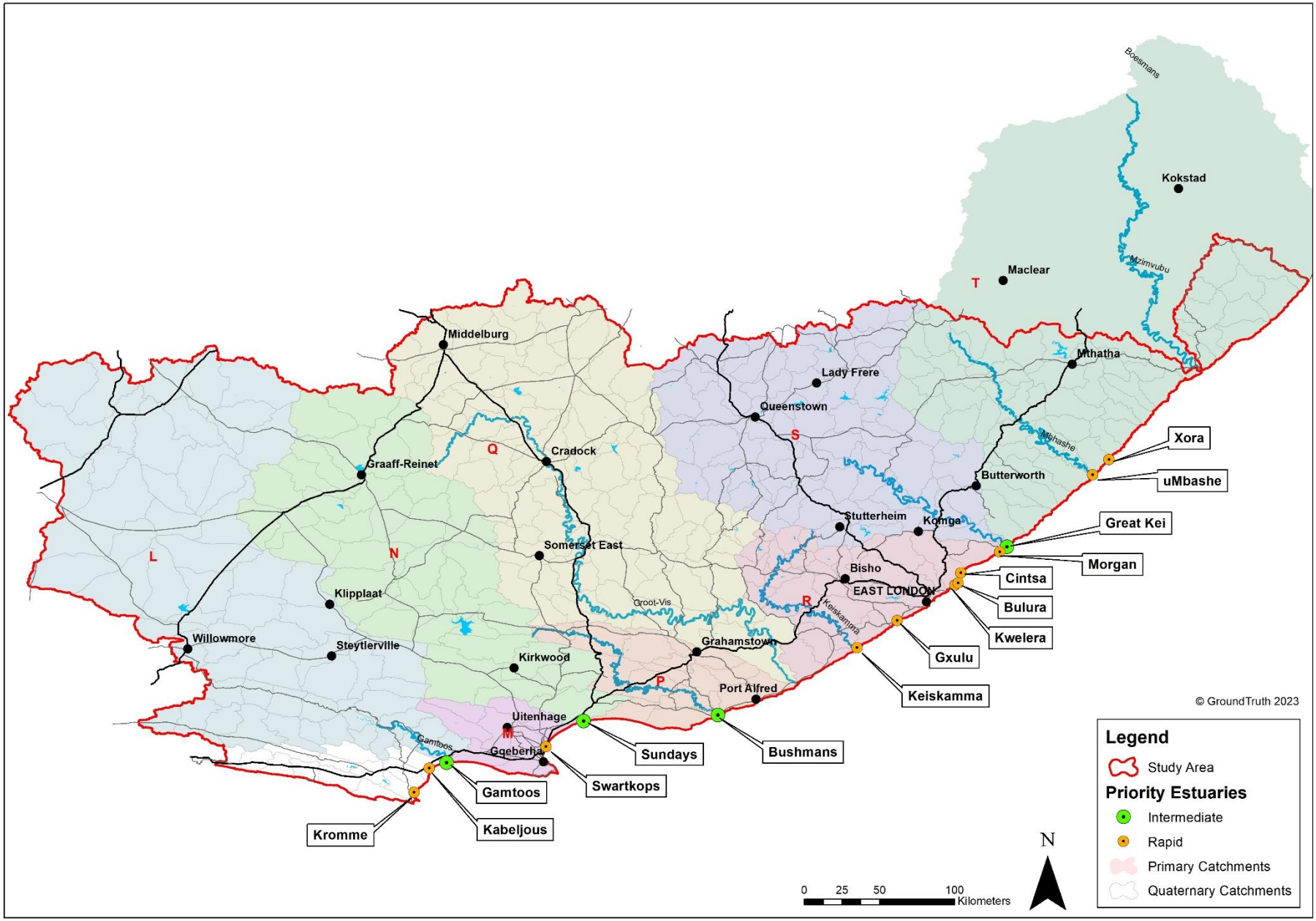

Figure 2: IUA delineation and EWR sites for rivers and priority eatuaries for the Keiskamma and Fish to Tsitsikamma catchments

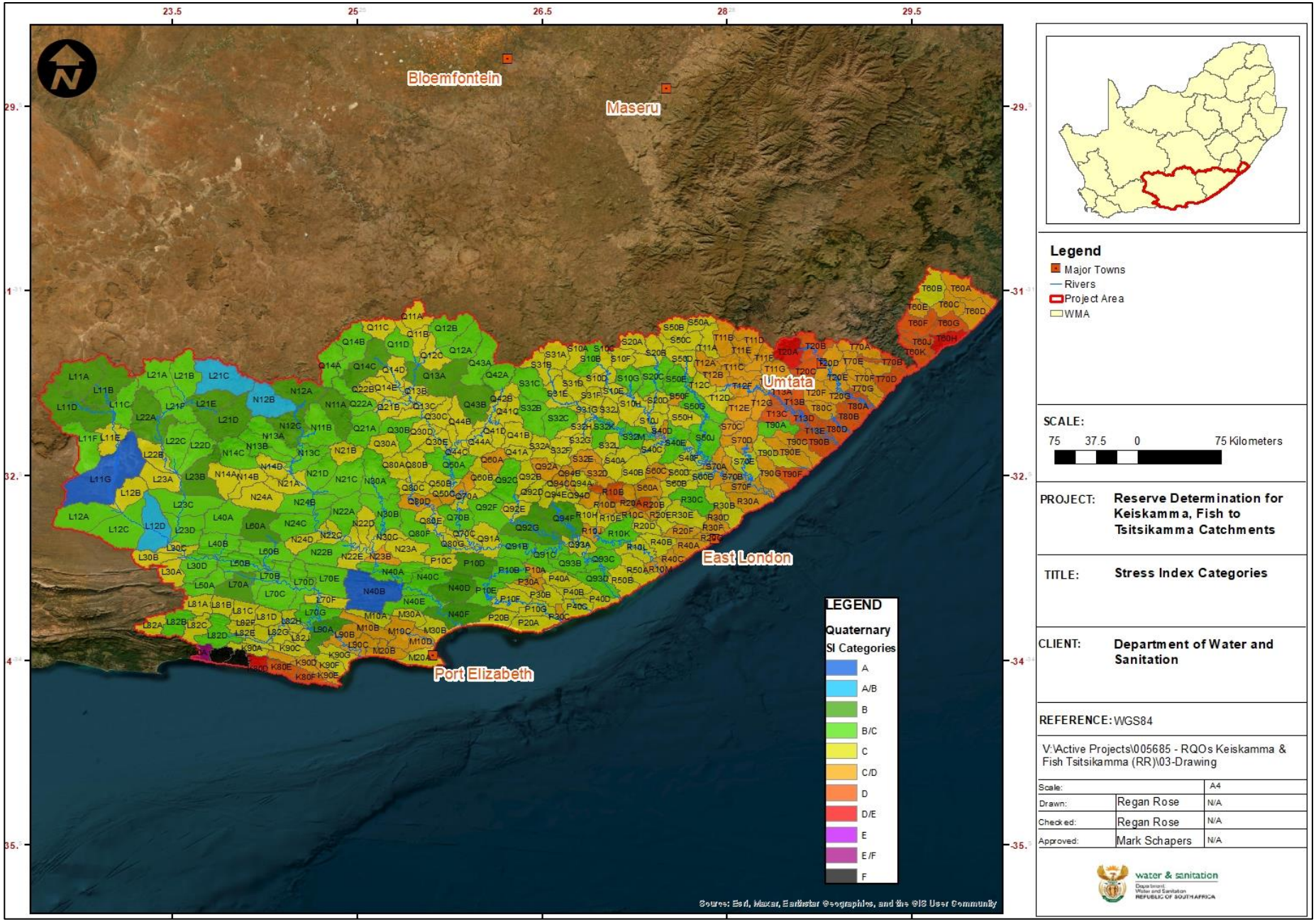

Figure 5: Stress Index categories