DEPARTMENT OF WATER AND SANITATION

NO. 1297 23 NOVEMBER 2018

NATIONAL WATER ACT, 1998
(ACT NO. 36 OF 1998)

PROPOSED CLASSES OF WATER RESOURCES AND RESOURCE QUALITY OBJECTIVES FOR THE MZIMVUBU CATCHMENT

I, Gugile Nkwinti, in my capacity as Minister of Water and Sanitation and duly authorised in terms of Section 13(4) of the National Water Act, 1998 (Act No. 36 of 1998) hereby publish, the notice for the proposed classes of water resources and the proposed resource quality objectives for the Mzimvubu catchment.

Any person who wishes to submit written comments with regard to the proposed classes of water resources and the proposed resource quality objectives should submit the comments within 60 days from the date of publication of this Notice to:

Director: Water Resource Classification
Attention: Ms Lebogang Matlala
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NKWINTI GE (MP)
MINISTER OF WATER AND SANITATION
DATE: 23/10/2018

SCHEDULE

DESCRIPTION OF WATER RESOURCE

The classes and resource quality objectives are determined for all or part of every significant water resource within the Mzimvubu catchment, as set out below:

Catchment:	Mzimvubu
Drainage areas:	Secondary drainage area T3 (Mzimvubu)
River(s) and estuary:	Major rivers include the Mzimvubu, Mzintlava, Thina, Kinira, Tsitsa and Inxu (Wildebees) rivers, and the Mzimvubu Estuary

A. CLASSES OF WATER RESOURCES AS REQUIRED IN TERMS OF SECTION 13(1)(a) OF THE NATIONAL WATER ACT, 1998

i. A summary of the water resource classes for Integrated Units of Analysis (IUA) (Figure 1) and Target Ecological Categories (TEC) are set out in Table 1 per Resource Unit (RU).

ii. IUAs are classified in terms of their extent of permissible utilisation and protection as either Class I: indicating high environmental protection and minimal utilisation; Class II indicating moderate protection and moderate utilisation; and Class III indicating sustainable minimal protection and high utilisation.

iii. Table 1 provides the IUA, its water resource classes and its respective catchment configuration. The catchment configuration consists of a number of biophysical nodes representing river reaches or Resource Units (RUs). The TEC for each RU in the IUA is provided.

B. RESOURCE QUALITY OBJECTIVES OF WATER RESOURCES AS REQUIRED IN TERMS OF SECTION 13(1)(b) OF THE NATIONAL WATER ACT, 1998

i. Resource Quality Objectives (RQOs) are defined for each High Priority RU in terms of water quantity, habitat and biota, and water quality.

ii. Table 2 to Table 4 provide the RQOs for each Ecological Water Requirement (EWR) site in a High Priority RU.

iii. Table 5 represents the water quality RQOs for each IUA for High Priority Resource Units represented by EWR sites and for each High Priority water quality (WQ) RU.

iv. Tables 6 and 7 represents the ECs and associated RQOs of the Mzimvubu Estuary for water quality, geomorphology, vegetation, invertebrates, fish and birds, respectively to achieve the TEC listed in Table 1.

v. Table 8 provides the RQOs for each High Priority wetland in the Mzimvubu catchment.

vi. RQOs will apply from the date signed off as determined in terms of Section 13(1) of the National Water Act, 1998, unless otherwise specified by the Minister.

1. WATER RESOURCE CLASSES AND CATCHMENT CONFIGURATION

Table 1 Summary of Water Resource Classes and Ecological Categories

IUA	Water Resource Class	Quaternary catchment[1]	RU[2]	Water resource[3]	TEC
T31: Mzimvubu	II	T31A	T31-1	Mzimvubu	B/C
		T31B	T31-2	Krom	B
		T31C	T31-3	Mngeni	B
		T31C	T31-4	Nyongo	C
		T31D	T31-5	Mzimvubu	B
		T31D	T31-6	Riet	C
		T31E	T31-7	Tswereka	B
		T31E	T31-8	Malithasana	B/C
		T31E	T31-9	name unknown	C
		T31E	T31-10	Tswereka	D
		T31F	T31-11	name unknown	B/C
		T31F	T31-12	Mzimvubu	C
		T31F, T31G, T31J	T31-13	Mzimvubu	B/C
		T31H	T31-14	Mvenyane	B
		T31H	T31-15	Mvenyane	B/C
		T31H	T31-16	Mkemane	B
		T31H	T31-17	name unknown	B/C
		T31H	T31-18	Mkemane	B/C
		T31J	T31-19	Mzimvubu	B/C
T32_a: Mzintlava	II	T32A	T32-1	Mzintlava	B/C
		T32A	T32-2	Mzintlanga	C
		T32B	T32-3	name unknown	B/C
		T32C	T32-4	Mill Stream	B/C
		T32C	T32-5	aManzamnyama	B/C
		T32C	T32-6	Mzintlava	B
		T32C	T32-7	name unknown	B/C

[1] Quaternary catchment representing the largest section of the RU as RUs may cross quaternary catchment boundaries.

[2] Note that each RU is represented by a biophysical node which has the same name as the RU. Where the RU includes an EWR site, the EWR site name follows the RU name in brackets.

[3] This refers to the main river and/or estuary in the RU.

IUA	Water Resource Class	Quaternary catchment[1]	RU[2]	Water resource[3]	TEC
		T32D	T32-8	Droewig	C
		T32C, T32D	T32-9	Mzintlava	D
T32_b: Mzintlava	II	T32D	T32-10	Mzintlava	D
		T32E, T32F	T32-11	Mvalweni	C
		T32G	T32-12	Mzintlavana	B
		T32H	T32-13	Mzintlava	B
T33_a: Kinira	II	T33A	T33-1	Mafube	B
		T33A	T33-2	Kinira	B/C
		T33A	T33-3	Kinira	C
		T33B	T33-4	Jordan	B
		T33B	T33-5	Seeta	B/C
		T33B	T33-6	Mabele	C
T33_b: Kinira	II	T33C, T33D	T33-7	Morulane	C
		T33E	T33-8	Somabadi	C
		T33G	MRU Kinira (MzimEWR3)	Kinira	C
		T33F	T33-9	Rolo	C
		T33F	T33-10	Ncome	C
		T33G	T33-11	Cabazi	C
		T33H	T33-12	Mnceba	B
		T33H	T33-13	Caba	B
		T33J	T33-14	Mzimvubu	B
T34_a: Thina	I	T34C	T34-1	Tinana	B
		T34A	T34-2	Zindawa	B
		T34A	T34-3	Khohlong	B/C
		T34B	T34-4	Nxotshana	B
T34_b: Thina	II	T34D	T34-5	Thina	B/C
		T34D	T34-6	Tokwana	C
		T34E	T34-7	Bradgate se Loop	B
		T34F	T34-8	Luzi	B/C
		T34G	T34-9	Qwidlana	B
		T34H	MRU Thina_B	Thina	C
		T34H	T34-10	Qhanqu	B
		T34H	T34-11	Ngcothi	B
		T34H	T34-12	Mvuzi	C
		T34J, T34K	MRU Thina_C (MzimEWR2)	Thina	C
T35_a: Tsitsana	I	T35A	T35-1	Tsitsana	B

IUA	Water Resource Class	Quaternary catchment[1]	RU[2]	Water resource[3]	TEC
		T35B	T35-2	Pot	B
		T35C	T35-3	Mooi	B
		T35C, T35D	T35-4	Mooi	C
		T35D, T35E	MRU Tsitsa_B	Tsitsa	C
		T35E	T35-5	Gqukunqa	B
T35_b: Tsitsa	I	T35F	T35-6	Inxu	B
		T35G	T35-7	Gqaqala	B
		T35F	T35-8	Kuntombizininzi	B
		T35H	MRU Inxu (EWR1)	Inxu	C
		T35G	MRU Gat (IFR1)	Gatberg	B
T35_c: Tsitsa	II	T35H	MRU Inxu	Inxu	B/C
		T35H	T35-9	Umnga	B/C
		T35H	T35-10	Qwakele	B/C
		T35J	T35-11	Ncolosi	C
		T35K	T35-12	Culunca	B/C
		T35K	T35-13	Tyira	C/D
		T35K	T35-14	Xokonxa	C
		T35L	T35-15	Ngcolora	C
		T35M	T35-16	Ruze	B
T35_d: Tsitsa	II	T35K	MRU Tsitsa Ca (MzimEWR1)	Tsitsa	C
		T35L	MRU Tsitsa Cb (EWR1 Lalini)	Tsitsa	C
		T35M	MRU Tsitsa_D	Tsitsa	B
T36_a: Mzimvubu	I	T36A	T36-1	Mzintshana	B
		T36A	T36-2	Mkata	B
		T36A	MRU Mzim (MzimEWR4)	Mzimvubu	C
T36_b: Mzimvubu	I	T36B	MRU Estuary	Mzimvubu Estuary	B

2. RESOURCE QUALITY OBJECTIVES

Resource Quality Objectives for each Resource Unit (RU) are presented in Tables 2 to 8 below. All RQOs are applicable from the date signed off, unless otherwise specified by the Minister.

Table 2 provides the hydrological RQOs for rivers expressed in terms of an assigned volume at the Ecological Water Requirement (EWR) sites. The volume assigned for low (base) flows and for high (flood) flows are also provided. The distribution of this volume across the months must be variable according to a natural (unless specified differently) variability. The variability is dependent on the intra-annual (seasonal) and inter-annual patterns of natural flow conditions. Details are provided in technical documents as follows:

- Low (base flows): These flows are provided as a monthly volume in the form of a flow assurance table which provides discharges which must be equalled or exceeded with different percentage frequencies.

- High (flood) flows: These flows are a set of flood events defined by a peak discharge in cubic meters per second, an event duration in hours and the frequency of the event. The frequency with which these flood events are expected to occur, as well as the size of each event, is also dependent on the natural variability and this is reflected in the high flow assurance table that defines the volume requirements with different percentage frequencies of exceedance.

Information for MzimEWR1 (Tstitsa River) and MzimEWR4 (Lower Mzimvubu River) are presented as both EWR flows (no dam development) and flows related to Scenario (Sc) 69, i.e. flows required to be released from Ntabelanga and Lalini dams (of the Mzimvubu Water Project (MWP)) to meet downstream ecological requirements. Note that the Sc 69 flows therefore represent the total flows, which include releases, spills and tributary inflows (if relevant) that flow past the EWR site.

Table 2 RIVERS: Summary of key hydrological RQOs

RU	Biophysical node	Water resource	TEC	Low flow volume (MCM[1])		High flow volume (MCM)	Total flow volume (MCM)	Narrative
Thina_C	MzimEWR2	Thina River	C	89.24		32.41	121.65	Flows must be distributed according to specified requirements in terms of low flows and high flows.
Kinira	MzimEWR3	Kinira River	C	82.87		52.57	135.44	Flows must be distributed according to specified requirements in terms of low flows and high flows.
Tsitsa_Ca	MzimEWR1	Tsitsa River	C	EWR	87.43	48.25	135.68	Flows must be distributed according to specified requirements in terms of low flows and high flows.
				Sc 69[2]			354.7	These flows represent the total flows not to be exceeded if the MWP is implemented. The flows must be distributed as specified.
Tsitsa_Cb	EWR1 Lalini	Tsitsa River	Must be a perennial river to cater for aesthetic and other user requirements (Tsitsa Falls)					This RQO is only relevant if the MWP is implemented. Flows should be released from Lalini Dam to ensure that the Tsitsa Falls are perennial. The flows released from Lalini Dam and the return flows from the main hydropower plant outlet must be equal to Sc 69 at the point in the river downstream of the main hydropower outlet, where the return flows enter back into the river.
Mzim	MzimEWR4	Mzimvubu River	C	EWR	331.16	301.3	632.46	Flows must be distributed according to specified requirements in terms of low flows and high flows.
				Sc 69[2]			2464.9	These flows represent the total flows not to be exceeded if the MWP is implemented. The flows must be distributed as specified.

[1] MCM: million cubic metres
[2] Sc 69 is the scenario comprising the building of dams of the Mzimvubu Water Project (MWP) i.e. Ntabelanga and Lalini dams

Habitat and biota RQOs are provided as Ecological Categories. There are generic narrative and numerical RQOs associated with the Ecological Categories. Table 3 describes these for each Ecological Category relevant for rivers. Table 4 provides the habitat and biota RQOs for each IUA for High Priority RUs in rivers.

Table 3 Generic numerical and narrative RQOs associated with RIVER Ecological Categories

Ecological Category	Generic narrative RQO	Instream and riparian habitat narrative RQO	Fish, macroinvertebrate and riparian vegetation narrative RQO	Numerical RQO
A	Unmodified, near natural.	Very similar to natural reference conditions	Assemblage attributes as specified	≥ A (≥ 92%)
A/B				≥ A/B (≥ 88%)
B	Largely natural with few modifications.	Largely natural with few modifications. The flow regime has been only slightly modified and pollution is limited to sediment. A small change in natural habitats may have taken place. However, the ecosystem functions are essentially unchanged.	Assemblage attributes as specified	≥ B (≥ 82%)
B/C				≥ B/C (≥ 78%)
C	Moderately modified.	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	Assemblage attributes as specified	≥ C (≥ 62%)
C/D				≥ C/D (≥58%)
D	Largely modified.	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	Assemblage attributes as specified	≥ D (≥ 42%)
D/E				≥ D/E (≥ 38%)
E	Seriously modified.	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.	Assemblage attributes as specified	20-39%
F	Critically / Extremely modified.	Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.	Assemblage attributes as specified	0-19%

Table 4 RIVERS: RQOs for habitat integrity, riparian vegetation, geomorphology, macroinvertebrates and fish in High Priority RUs

IUA	Water Resource Class	Quaternary catchment[4]	RU	Biophysical node	River	Instream Habitat Integrity	Riparian Habitat Integrity	Fish	Macro-invertebrates	Riparian vegetation	Geomorphology
T35_d	II	T35E	MRU Tsitsa_Ca	MzimEWR1	Tsitsa	**B/C**	**C**	**C**	**C**	**C/D**	**C**
T34_b	II	T34J	MRU Thina_C	MzimEWR2	Thina	**C**	**C**	**B/C**	**C**	**C/D**	**C**
T33_b	II	T33G	MRU Kinira	MzimEWR3	Kinira	**C**	**C**	**C**	**C**	**C/D**	**C**
T36_a	I	T36A	MRU Mzim	MzimEWR4	Mzimvubu	**B/C**	**C**	**C**	**C**	**C/D**	**C**

Table 5 provides the water quality RQOs for each IUA for High Priority RUs, either represented by EWR sites assessed in the Mzimvubu Classification study (shown in bolded text) or high priority 3(WQ) and 4(WQ) sites. Note that water quality includes both the TEC and the user targets as narrative RQOs.

[4] Quaternary catchment where EWR site is located.

Table 5 RQOs for RIVERS for water quality (ecological and user) in High Priority RUs containing EWR sites or 3(WQ)/ 4(WQ) sites

IUA	Water Resource Class	Quaternary catchment[5]	RU[6]	Water resource	TEC	Component	Sub-Component	Indicator	RQO	
									Narrative	Numerical
IUA T32_a: Mzintlava	II	T32C	RU T32-6: T32C-05273	Mzintlava		River Water Qualtiy	Nutrients	Orthophosphate	Acceptable	50th percentile of the data must be less than 0.025 mg/L PO_4-P (aquatic ecosystems: driver).
						River Water Qualtiy	Toxics		Ideal	95th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996) and DWAF (2008).
						River Water Qualtiy	Microbial	Faecal coliforms and *E.coli*	Recreation (full or partial contact)	Meet targets for recreational / other use*.
	II	T32C, T32D	RU T32-9: T32D-05352	Mzintlava		River Water Qualtiy	Nutrients	Orthophosphate	Tolerable	50th percentile of the data must be less than 0.125 mg/L PO_4-P (aquatic ecosystems: driver).
						River Water Qualtiy	Toxics		Ideal	95th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996) and DWAF (2008).
							Microbial	Faecal coliforms and *E.coli*	Recreation (full or partial contact)	Meet targets for recreational / other use*.

[5] Quaternary catchment representing the largest section of the RU as RUs may cross quaternary catchment boundaries

[6] Note that each RU is represented by a biophysical node which has the same name as the RU. Where the RU includes an EWR site, the EWR site name follows the RU name in brackets.RU designation also lists sub-quaternary (SQ) catchments where water quality RQOs are applicable.

IUA	Water Resource Class	Quaternary catchment	RU	Water resource	TEC	Component	Sub-Component	Indicator	RQO	
									Narrative	Numerical
IUA T32_b: Mzintlava	II	T32D	RU T32-10: T32D-05373	Mzintlava		River Water Quality	Nutrients	Orthophosphate	Tolerable	50th percentile of the data must be less than 0.125 mg/L PO_4-P (aquatic ecosystems: driver).
						River Water Quality	Toxics	.	Ideal	95th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996) and DWAF (2008).
						River Water Quality	Salts	Electrical conductivity	Acceptable	95th percentile of the data must be less than or equal to 55 mS/m (aquatic ecosystems: driver).
						River Water Quality	Microbial	Faecal coliforms and *E.coli*	Recreation (full or partial contact)	Meet targets for recreational / other use*.
	II	T32E, T32F	RU T32-11: T32F-05464	Mvalweni		River Water Quality	Nutrients	Orthophosphate	Tolerable	50th percentile of the data must be less than 0.125 mg/L PO_4-P (aquatic ecosystems: driver).
						River Water Quality	Nutrients	Total Inorganic Nitrogen	Acceptable	50th percentile of the data must be less than 1.0 mg/L TIN-N (aquatic ecosystems: driver).
						River Water Quality	Toxics		Ideal	95th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996) and DWAF (2008).
						River Water Quality	Salts	Electrical conductivity	Ideal	95th percentile of the data must be less than or equal to 30 mS/m (aquatic ecosystems: driver).
						River Water Quality	Suspended sediments	Turbidity/clarity or TSS levels.	Acceptable	A moderate change from natural with temporary high sediment loads and turbidity during runoff events (aquatic ecosystems: driver).
						River Water Quality	Microbial	Faecal coliforms and *E.coli*	Recreation (full or partial contact)	Meet targets for recreational / other use*.

IUA	Water Resource Class	Quaternary catchment	RU	Water resource	TEC	Component	Sub-Component	Indicator	RQO	
									Narrative	Numerical
IUA T33_a: Kinira	II	T33A	RU T33-3: T33A-04990, T33A-04991	Kinira		River Water Quality	Nutrients	Orthophosphate	Acceptable	50th percentile of the data must be less than 0.025 mg/L PO_4-P (aquatic ecosystems: driver).
						River Water Quality	Suspended sediments	Turbidity/clarity or TSS levels	Acceptable	A moderate change from natural with temporary high sediment loads and turbidity during runoff events (aquatic ecosystems: driver).
						River Water Quality	Microbial	Faecal coliforms and *E.coli*	Recreation (full or partial contact)	Meet targets for recreational / other use*.
IUA T33_b: Kinira	II	T33G	**MRU Kinira (MzimEWR3):** T33E-05213, T33F-05326, T33G-05395	Kinira	**B/C**	River Water Quality	Suspended sediments	Turbidity/clarity or TSS levels	Tolerable	A large change from natural with erosion being a known cause of unnaturally large increases in sediment loads and turbidity. Habitat often silted but clears (aquatic ecosystems: driver).

IUA	Water Resource Class	Quaternary catchment	RU	Water resource	TEC	Component	Sub-Component	Indicator	RQO	
									Narrative	Numerical
IUA T34_b: Thina	II	T34D	RU T34-6: T34D-05463	Tokwana		River Water Quality	Nutrients	Orthophosphate	Acceptable	50th percentile of the data must be less than 0.025 mg/L PO_4-P (aquatic ecosystems: driver).
							Toxics		Ideal	95th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996) and DWAF (2008).
							Microbial	Faecal coliforms and *E.coli*	Recreation (full or partial contact)	Meet targets for recreational / other use*.
IUA T34_b: Thina	II	T34J, T34K	**MRU Thina_C (MzimEWR2):** T34H-05772, T34H-05838, T34K-05835	Thina	**B**	River Water Quality	Suspended sediments	Turbidity/clarity or TSS levels	Acceptable	A moderate change from natural with temporary high sediment loads and turbidity during runoff events (aquatic ecosystems: driver).
							Nutrients	Orthophosphate	Acceptable	50th percentile of the data must be less than 0.025 mg/L (aquatic ecosystems: driver).

IUA	Water Resource Class	Quaternary catchment	RU	Water resource	TEC	Component	Sub-component	Indicator	RQO	
									Narrative	Numerical
IUA T35_a: Tsitsa	I	T35C, T35D	RU T35-4: T35C-05874	Mooi		River Water Quality	Nutrients	Orthophosphate	Acceptable	50th percentile of the data must be less than 0.025 mg/L PO_4-P (aquatic ecosystems: driver).
							Toxics		Ideal	95th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996) and DWAF (2008).
							Microbial	Faecal coliforms and *E.coli*	Recreation (full or partial contact)	Meet targets for recreational / other use*.
IUA T35_b: Tsitsa	I	T35H	MRU Inxu (EWR1): T35F-06020	Inxu		River Water Quality	Nutrients	Orthophosphate	Acceptable	50th percentile of the data must be less than 0.075 mg/L PO_4-P (aquatic ecosystems: driver).
							Toxics		Ideal	95th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996) and DWAF (2008).
							Microbial	Faecal coliforms and *E.coli*	Recreation (full or partial contact)	Meet targets for recreational / other use*.
IUA T35_c: Tsitsa	II	T35K	RU T35-14: T35K-06167	Xokonxa		River Water Quality	Nutrients	Orthophosphate	Tolerable	50th percentile of the data must be less than 0.125 mg/L PO_4-P (aquatic ecosystems: driver).
							Toxics		Ideal	95th percentile of the data must be within the TWQR for toxics. Numerical limits can be found in DWAF (1996) and DWAF (2008).
							Microbial	Faecal coliforms and *E.coli*	Recreation (full or partial contact)	Meet targets for recreational / other use*.

IUA	Water Resource Class	Quaternary catchment	RU	Water resource	TEC	Component	Sub-Component	Indicator	RQO	
									Narrative	Numerical
IUA T35_d: Tsitsa	II	T35K	**MRU Tsitsa_Ca (MzimEWR1):** T35E-05977, T35K-06037, T35K-06098, T35L-05976	Tsitsa	**B**	River Water Quality	Nutrients	Orthophosphate	Acceptable	50th percentile of the data must be less than 0.015 mg/L (aquatic ecosystems: driver).
							Suspended sediments	Turbidity/clarity or TSS levels	Acceptable	Moderate – Large changes from natural are evident, with erosion and urban runoff processes being known causes of unnaturally large increases in sediment loads and turbidity. Increases are not permanent with clearing of habitats at times (aquatic ecosystems: driver).
IUA T36_a: Mzimvubu	I	T36A	**MRU Mzim (MzimEWR4):** T36A-06250, T36A-06354, T36B-06391	Mzimvubu	**A/B**	River Water Quality	Suspended sediments	Turbidity/clarity or TSS levels	Acceptable	Moderate changes from natural with temporary high sediment loads and turbidity during runoff events. Urban activities and land-use have resulted in high sediment loads

TWQR = Target Water Quality Range (DWAF, 1996a).
DWAF (1996): South African Water Quality Guidelines: Volume 7: Aquatic Ecosystems.
DWAF (2008): Methods for determining the water quality component of the Ecological Reserve for rivers.

* Note that all river faecal coliform and *E. coli* targets for full and partial contact are presented in terms of SA National Microbial Monitoring Programme (NMMP) guidelines and health risks in terms of counts/100 mL, as follows:

Low	Medium	High
< 600	600 - 2 000	> 2 000

Guidelines are provided in the absence of data or knowledge of recreational activities in the area.

Ecological Categories for estuaries represent both a numerical and narrative RQO, according to the guidelines in Table 6. In accordance with these guidelines the Ecological Categories and associated RQOs of the Mzimvubu Estuary for flow, water quality, sediment dynamics, vegetation, macrophytes, microalgae, invertebrates, fish and birds, respectively to achieve the target Ecological Category (as listed in Table 1) are presented in Table 7. The configurations of TECs, as well as quantification of RQOs, are based on best available information at the time of gazetting. ROQs for complex and dynamic ecosystems such as estuary may require refinement to meet the target Ecological Category if so indicated by future monitoring programmes (through the adaptive management approach).

Table 6 Generic numerical and narrative RQOs associated with Ecological Categories for ESTUARIES

Ecological Category	Generic narrative RQO	Narrative RQO	Numerical RQO
A	Unmodified, or approximates natural condition	Characteristics of resource should be determined by unmodifed 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 wellbeing 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. Risk to the well-being and survival of intolerant biota at a large number of localities depending on their resilience and adaptability. 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%

Table 7 **MZIMVUBU ESTUARY: RQOs for hydrology, hydrodynamics, water quality, sediment dynamics, microalgae, macrophytes, invertebrates, fish and birds (based on best available information at time of gazetting)**

IUA	Water Resource Class	Quaternary Catchment	RU	Water resource	Target EC	Component	Sub-Component	Indicator	RQO	
									Narrative	Numerical
IUA T36_b	I	T36B	MRU Estuary	Mzimvubu Estuary	B	Hydrology	-	Protect the flow regime to create the required habitat for birds, fish, macrophytes, microalgae and water quality	• Changes in river inflow distribution patterns (i.e. floods and base flows) less than 5% from that of Scenario 69 (i.e. the target flow scenario).	Maintain TEC = A (> 92%).
						Hydro-dynamics	-	Maintain a mouth conditions to protect estuarine ecosystems and the associated habitat for birds, fish, macrophytes, microalgae and water quality	• Estuary mouth not to close or become very constricted • Changes in tidal amplitude at the tidal gauge not to be more than 20% from present baseline (refer to DWS, 2014a, 2014b and 2017).	Maintain TEC = A (> 92%).
						Water quality	Salinity	Water quality to be suitable for maintaining TEC for dependent biotic components.	▪ Salinity in lower reaches to remain above 20 for at least 4 to 6 months (i.e. overlapping with winter period) ▪ Salinity in lower reaches to remain above 25 and in middle reaches above 15 for at least 1 to 2 months (overlapping with winter period).	Maintain TEC = A/B (> 87%).
							pH		River: pH 7.0 - 8.5 Estuary: pH 7.0 - 8.5	Maintain TEC = C (> 63%).
							Dissolved oxygen		River: DO > 6 mg/ℓ Estuary: DO > 6 mg/ℓ	
							Turbidity		River: Naturally turbid Estuary: Naturally turbid	
							Nutrients		River: ▪ Dissolved Inorganic Nitrogen (DIN) < 200 µg/ℓ (monthly average) ▪ Dissolved Inorganic Phosphate (DIP) < 30 µg/ℓ (monthly average).	

IUA	Water Resource Class	Quaternary Catchment	RU	Water resource	Target EC	Component	Sub-Component	Indicator	RQO	
									Narrative	Numerical
									Estuary: ▪ Dissolved Inorganic Nitrogen (DIN) < 150 µg/ℓ (average across estuary) ▪ Dissolved Inorganic Phosphate (DIP) < 20 µg/ℓ (average across estuary)	
							Toxics		▪ Total metal concentrations in water not to exceed target values as per South African Water Quality Guidelines for coastal marine waters (DWAF, 1995 or official future updates thereof) ▪ Total metal concentration in sediment not to exceed target values as per WIO Region guidelines (UNEP/Nairobi Convention Secretariat and CSIR, 2009 or official future updates thereof for South Africa)	
							Micro-biology		For recreational use areas in estuary (refer to DEA, 2012): ▪ Enterococci < 185 counts per 100 ml (90th percentile), and ▪ E. coli < 500 counts per 100 ml (90th percentile).	-
						Sediment dynamics				Maintain TEC = A/B (> 87%)
						Microalgae				Maintain TEC = C (> 63%)
						Macrophytes				Maintain TEC = C (> 63%)
						Invertebrates				Maintain TEC = A/B (> 87%)
						Fish				Maintain TEC = B/C (> 72%)
						Birds				Maintain TEC of C/D (> 60%).

18

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Table 8 RQOs for High Priority wetlands of the Mzimvubu catchment

IUA	Water Resource Class	Quaternary Catchment	RU	Water Resource	TEC	Component	Sub-component	Indicator	RQO	
									Narrative	Numerical
IUA T31	II	T31D, T31E, T31F: T31D-05076, T31E-05013, T31F-05112, T31F-05108, T31F-05111	T31-5, T31-12, T31-13	Wetlands: Mzimvubu floodplains	C	Quantity	Hydrology	Wetland hydrology score. Detailed assessment of wetland hydrology using a PES tool.	The quantity and timing of inputs, and the distribution and retention patterns within the wetland must be maintained to avoid the loss of wetland hydrological function.	
							Shallow flooding by damming	Impact score within Wet-Health.	The current extent of damming within the wetland complex should not be permitted to increase	The aerial extent of damming within the delineated wetland area shall not exceed 8.4%.
						Quality			Detailed data of water quality indicators for this wetland were not available and no detailed RQOs related to water quality have been determined.	
						Habitat	General wetland vegetation	Impact score: Wetland vegetation score and PES as assessed with Wet-Health.	The wetland vegetation must be maintained to ensure that the ecosystem structure and function are maintained.	Present condition is a D (impact score of 4.7), while the TEC is a C (impact score of 3.9 or less). The numerical criteria should equate to the same or improved value.
							Loss / de-fragmentation due to direct agricultural activities	Impact score (aerial extent) as assessed with Wet-Health.	Direct agricultural activities and croplands should not be permitted to increase in extent within the wetland complex.	The aerial extent of agricultural activities and croplands within the delineated wetland area shall not exceed 20%.
							Loss / de-fragmentation due to infrastructure, including canals, furrows and trenching	Impact score (aerial extent) as assessed with Wet-Health.	Additional development of infrastructure should not be permitted within the wetland complex.	The aerial extent of infrastructure, including canals, furrows and trenching, within the delineated wetland area shall not exceed 5%.

IUA	Water Resource Class	Quaternary Catchment	RU	Water Resource	TEC	Component	Sub-component	Indicator	RQO	
									Narrative	Numerical
							Overall vegetation PES	Wetland vegetation score and PES as assessed with Wet-Health.	The overall wetland PES as indicated by the vegetation component of Wet-Health, must be maintained, or the TEC should be achieved.	Present condition is a D (impact score of 4.7), while the TEC is a C (impact score of 3.9 or less). The numerical criteria should equate to the same or improved value.
						Biota	Endangered crane species	Counts of the number of breeding pairs of crane species.	Water quantity, vegetation condition and land use practices must be maintained so as to not cause any population decline.	Data exist but were not available for this assessment
							Invasive alien vegetation	Impact score (aerial extent) as assessed with Wet-Health.	Invasive alien vegetation within the wetland complex should be kept in check so as not to increase in aerial extent.	The aerial extent of invasive alien vegetation within the delineated wetland area shall not exceed 3%.

IUA	Water Resource Class	Quaternary Catchment	RU	Water Resource	TEC	Component	Sub- component	Indicator	RQO	
									Narrative	Numerical
IUA T33_a	II	T33A: T33A-04990, T33A-04991, T33A-05011	T33-1 T33-2 T33-3	Wetlands:Matatiele Floodplains	C	Water quantity	Hydrology	Wetland hydrology score. Detailed assessment of wetland hydrology using a PES tool.	The quantity and timing of inputs, and the distribution and retention patterns within the wetland must be maintained to avoid the loss of wetland hydrological function.	
							Shallow flooding by damming	Impact score within Wet-Health.	The current extent of damming within the wetland complex should not be permitted to increase	The aerial extent of damming within the delineated wetland area shall not exceed 2.2%.
						Habitat	General wetland vegetation	Impact score: Wetland vegetation score and PES as assessed with Wet-Health.	The wetland vegetation must be maintained to ensure that the ecosystem structure and function are maintained.	Present condition is a D (impact score of 5.5), while the TEC is a C (impact score of 3.9 or less). The numerical criteria should equate to the same or improved value.
							Loss / defragmentation due to direct agricultural activities	Impact score (aerial extent) as assessed with Wet-Health.	Direct agricultural activities and croplands should not be permitted to increase in extent within the wetland complex.	The aerial extent of agricultural activities and croplands within the delineated wetland area shall not exceed 34%.
							Loss / defragmentation due to infrastructure, including canals, furrows and trenching	Impact score (aerial extent) as assessed with Wet-Health.	Additional development of infrastructure should not be permitted within the wetland complex.	The aerial extent of infrastructure, including canals, furrows and trenching, within the delineated wetland area shall not exceed 4.5%.
							Overall vegetation PES	Wetland vegetation score and PES as assessed with Wet-Health.	The overall wetland PES as indicated by the vegetation component of Wet-Health, must be maintained, or the TEC should be achieved.	Present condition is a D (impact score of 5.5), while the TEC is a C (impact score of 3.9 or less). The numerical criteria should equate to the same or improved value.
						Biota	Invasive alien vegetation	Impact score (aerial extent) as assessed with Wet-Health.	Invasive alien vegetation within the wetland complex should be kept in check so as not to increase in aerial extent.	The aerial extent of invasive alien vegetation within the delineated wetland area shall not exceed 3%.

T35_b	I	T35G: T35G-06099, T35G-06133, T35G-06118	T35-7, MRU Gat	Wetlands: Gatberg Floodplains	B	Quality	Water quantity	Hydrology	Detailed data of water quality indicators for this wetland were not available and no detailed RQOs related to water quality have been determined.
									Wetland hydrology score. Detailed assessment of wetland hydrology using a PES tool.
								Shallow flooding by damming	The aerial extent of damming within the delineated wetland area shall not exceed 0%.
									Impact score within Wet-Health.
							Habitat	General wetland vegetation	Present condition is a B (impact score of 1.8). The numerical criteria should equate to the same or improved value.
									Impact score: Wetland vegetation score and PES as assessed with Wet-Health.
								Loss / defragmentation due to direct agricultural activities	The aerial extent of agricultural activities and croplands within the delineated wetland area shall not exceed 3.5%.
									Impact score (aerial extent) as assessed with Wet-Health.
								Loss / defragmentation due to commercial plantations or forestry	The aerial extent of commercial plantations or forestry within the delineated wetland area shall not exceed 10%.
									Impact score (aerial extent) as assessed with Wet-Health.
								Loss / defragmentation due to infrastructure, including canals, furrows and trenching	The aerial extent of infrastructure, including canals, furrows and trenching, within the delineated wetland area shall not exceed 2%.
									Impact score (aerial extent) as assessed with Wet-Health.
								Overall vegetation PES	Present condition is a B (impact score of 1.8). The numerical criteria should equate to the same or improved value.
									Wetland vegetation score and PES as assessed with Wet-Health.

	Biota	Endangered crane species	Counts of the number of breeding pairs of crane species.				Counts of the number of breeding pairs of crane species.
		Invasive alien vegetation	Impact score (aerial extent) as assessed with Wet-Health.		The aerial extent of invasive alien vegetation within the delineated wetland area shall not exceed 1%.		Impact score (aerial extent) as assessed with Wet-Health.

24

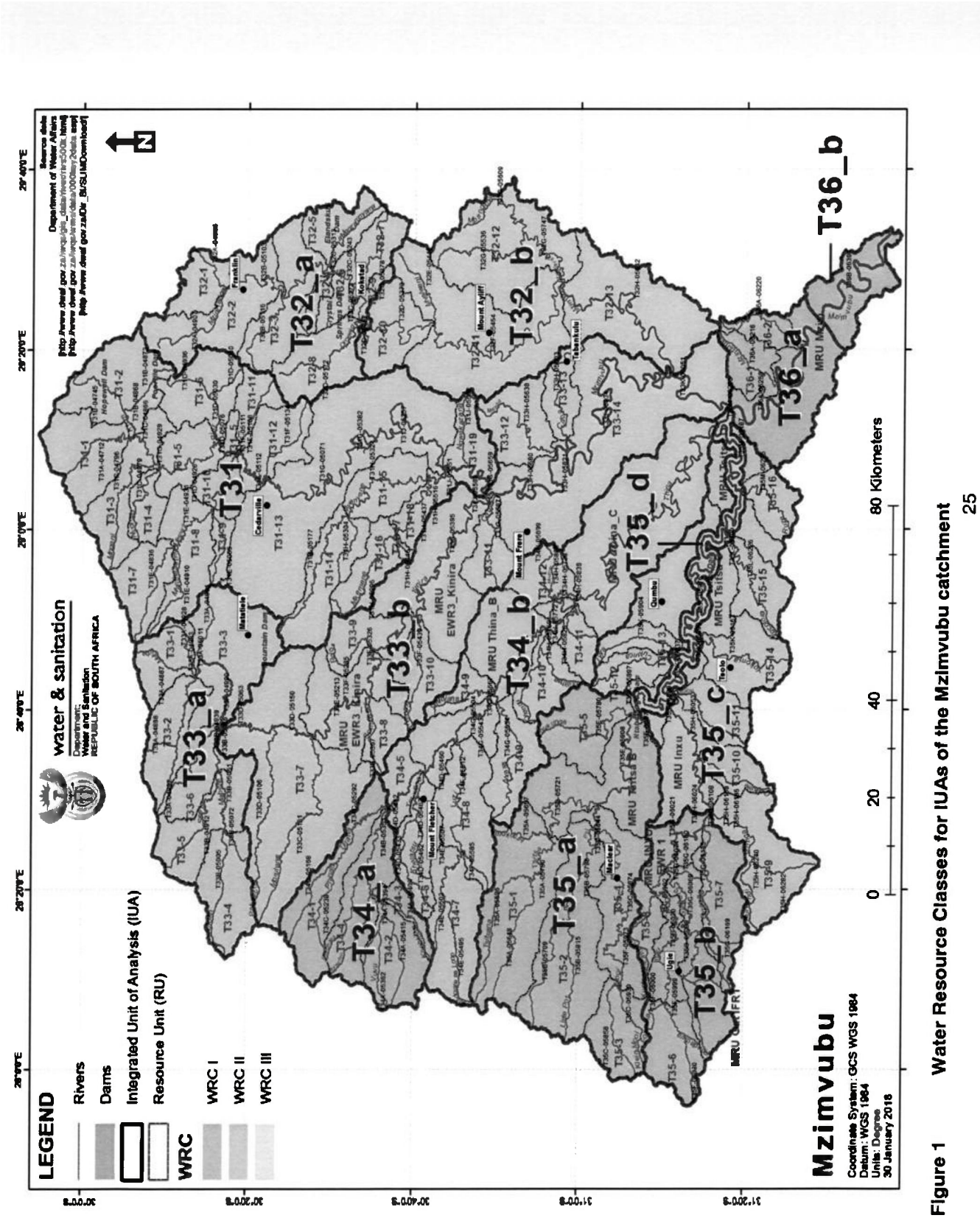

Figure 1 Water Resource Classes for IUAs of the Mzimvubu catchment

25