### DEPARTMENT OF WATER AND SANITATION

NO. 55

#### 22 JANUARY 2016

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

#### PROPOSED CLASSES OF WATER RESOURCES AND RESOURCE QUALITY OBJECTIVES FOR THE CATCHMENTS OF THE INKOMATI

I, Nomvula Paula Mokonyane, 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, for public comment, the proposed classes of water resources and the proposed resource quality objectives for the catchments of the Inkomati, in the Schedule.

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

Chief Director: Water Ecosystems Attention: Ms Ndileka Mohapi Department of Water and Sanitation Ndinaye Building 5107 178 Francis Baard Street Private Bag x 313 Pretoria 0001 E-mail: mohapin@dws.gov.za

Facsimile: 012 336 8813

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MRS NP MOKONYANE MINISTER OF WATER AND SANITATION DATE: 191,17,7019

#### SCHEDULE

### DESCRIPTION OF WATER RESOURCE

The proposed classes and resource quality objectives are determined for all or part of every significant water resource within the catchments of the Inkomati as set out below:

Water Management Area:	Inkomati-Usuthu
Drainage Region:	X Primary Drainage Region
River(s):	Komati (X1), Crocodile (X2), Sabie-Sand (X3), and X4 river systems

# PROPOSED CLASSES OF WATER RESOURCES AS REQUIRED IN TERMS OF SECTION 13(4) (a)(i)(aa) OF THE NATIONAL WATER ACT, 1998

- 1. A summary of the water resource classes for Integrated Units of Analysis (Figure 1.1-1.4) and Ecological Categories (ECs) per biophysical node is set out in Table 1 to Table 4.
- 2. Integrated Units of Analysis (IUA) are classified in terms of their extent of permissible utilisation and protection as either Class I: indicating high environmental protection and minimal utilisation; or Class II indicating moderate protection and moderate utilisation; and Class III indicating sustainable minimal protection and high utilisation.
- 3. Table 1 to Table 4 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. The target EC for each unit in the IUA is provided.

# PROPOSED RESOURCE QUALITY OBJECTIVES OF WATER RESOURCES AS REQUIRED IN TERMS OF SECTION 13(4)(a)(i)(bb) OF THE NATIONAL WATER ACT, 1998

- 1. Table 5 to Table 19 provides the Resource quality objectives for each Resource Unit (RU) which is represented by a biophysical node.
- 2. Resource quality objectives 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.

### PROPOSED WATER RESOURCE CLASSES FOR THE CATCHMENTS OF THE INKOMATI

## Table 1:Summary of Water Resource Classes and Ecological Categories in the Komati<br/>(X1) River System

IUAs	Class for IUAs	Biophysical node	River Name	Target EC
		X11A-01300		В
		X11A-01354		С
		X11A-01358	Vaalwaterspruit	С
X1-1:		X11A-01295	Vaalwaterspruit	С
Dam		X11A-01248	Vaalwaterspruit	С
		X11B-01370	Boesmanspruit	В
		X11B-01361		B/C
		X11B-01272	Boesmanspruit	B/C
X1-2: Komati River between Nooitgedacht and Vygeboom Dam	II	EWRK1	Komati	с
		X11C-01147	Witkloofspruit	С
		X11D-01129	Klein-Komati	С
X1-3:		X11D-01137	Waarkraalloop	С
and Vygeboom Dam excluding the	Ш	X11E-01237	Swartspruit	В
main Komati River		X11F-01133	Bankspruit	В
		X11G-01188	Ndubazi	В
		X11G-01143	Gemakstroom	С
		EWRG1	Mngubhudle	D
Gladdespruit catchment	Ш	X11K-01165	Poponyane	С
		X11K-01199		D
X1-5: Komati River downstream of Vygeboom Dam to Swaziland	II	EWRK2	Komati	С
		EWRT1	Teespruit	С
		X12A-01305	Buffelspruit	В
		X12B-01246	Hlatjiwe	С
		X12C-01242	Phophenyane	В
X1-6:		X12C-01271	Buffelspruit	В
All tributaries downstream of	1	X12D-01235	Seekoeispruit	С
Vygeboom Dam in X1-6 excluding the Gladdespruit		X12H-01338	Sandspruit	В
		X12H-01340		В
		X12H-01318	Sandspruit	С
		X12J-01202	Mtsoli	В
		X12K-01333	Mlondozi	B/C
		X12K-01332	Mhlangampepa	В
X1-7: Lomati catchment upstream of	11	X14A-01173	Lomati	B/C
Swaziland		X14B-01166	Ugutugulo	С

IUAs	Class for IUAs	Biophysical node	River Name	Target EC
X1-8:		EWRL1	Lomati	С
Driekoppies Dam	111	X14G-01128	Lomati	D/E
X1-9:		X13J-01205	Mbiteni	D
Komati catchment downstream of Swaziland to the Lomati River	Ш	X13J-01141	Mzinti	D
confluence		EWRK3A	Komati	D
		X13K-01114	Komati	D
		X13K-01136	Mambane	D
X1-10:		X13K-01068	Nkwakwa	C/D
Komati catchment downstream of the	111	X13K-01038	Komati	E
Lomati River		X13L-01000	Ngweti	D
		X13L-01027	Komati	E
		X13L-00995	Komati	D

# Table 2:Summary of Water Resource Classes and Ecological Categories in the<br/>Crocodile (X2) River System

IUAs	Class for IUAs	Biophysical node	River Name	Target EC
		X21B-00898	Lunsklip	C/D
		X21B-00929	Gemsbokspruit	C/D
X2-1: Crocodile sub catchment unstream		X21B-00925	Lunsklip	С
of Kwena Dam		EWRC1	Crocodile	A/B
		EWRC2	Crocodile	В
		X21C-00859	Alexanderspruit	С
X2-2 <sup>.</sup>		EWRC3	Crocodile	B/C
Crocodile River downstream of the	Ш	X21D-00957	Buffelskloofspruit	B/C
Kwena Dam to the Elands River		X21E-00897	Buffelskloofspruit	В
		X21F-01100	Leeuspruit	С
X2-3:		X21F-01092	Leeuspruit	C/D
Weltevredespruit (excluded)	1	X21F-01091	Rietvleispruit	С
		EWRE1	Elands	В
X2-4:		X21G-01090	Weltevredespruit	С
the Ngodwana confluence, including		X21G-01016	Swartkoppiespruit	С
the Weltevredenspruit, the	I	X21H-01060	Ngodwana	В
Ngodwana River upstream of the Ngodwana Dam and the Lupelele River		X21K-01007	Lupelule	В
X2-5: Elands River downstream of the Ngodwana River	I	EWRE2	Elands	В
X2-6:		X22B-00987	Crocodile	С
Crocodile River to the Nels River	"	X22B-00888	Crocodile	С

24 No. 39614

IUAs	Class for IUAs	Biophysical node	River Name	Target EC
confluence		X22C-00946	Crocodile	С
		X22J-00993	Crocodile	С
		X22A-00824	Blystaanspruit	В
		X22A-00887	Beestekraalspruit	B/C
		X22A-00875	Houtbosloop	В
X2-7:		X22A-00919	Houtbosloop	B/C
Houtbos and Visspruit Rivers	1	X22A-00920		В
		X22A-00917	Houtbosloop	С
		X22A-00913	Houtbosloop	В
		X22C-00990	Visspruit	B/C
		X22D-00843	Nels	С
		X22D-00846		С
		X22F-00842	Nels	С
		X22E-00849	Sand	С
X2-8: Nels Wit and Gladdespruit rivers	П	X22E-00833	Kruisfonteinspruit	С
		X22F-00886	Sand	С
		X22F-00977	Nels	C/D
		X22C-01004	Gladdespruit	B/C
		X22H-00836	Wit	D
NO O:		X22K-01042	Mbuzulwane	В
Crocodile River to the Kaap		X22K-01043	Blinkwater	В
confluence including the Blinkwater		X22K-01029	Blinkwater	С
tributary		EWRC4	Crocodile	С
		X23B-01052	Noordkaap	С
		X23C-01098	Suidkaap	B/C
X2-10: Kaap Catchment	Ш	EWRK7	Каар	С
		X23E-01154	Queens	B/C
		X23F-01120	Suidkaap	С
X2-11:		EWRC5	Crocodile	С
Crocodile River from the Kaap confluence to the Komati River.	II	EWRC6	Crocodile	С
		X24A-00826	Nsikazi	С
		X24A-00860	Sithungwane	Α
		X24A-00881	Nsikazi	В
X2-12: Nsikazi River	II	X24B-00903	Gutshwa	D
		X24B-00928	Nsikazi	A/B
		X24C-00969	Mnyeleni	Α
		X24C-00978	Nsikazi	В
X2-13:	-	X24E-00973	Matjulu	В
Northern tributaries of the Crocodile		X24E-00922	Mlambeni	A/B

IUAs	Class for IUAs	Biophysical node	River Name	Target EC
River located in the KNP		X24G-00902	Mitomeni	А
		X24G-00876	Komapiti	A
		X24G-00844	Mbyamiti	A
		X24G-00823	Muhlambamadubo	A
		X24G-00820	Mbyamiti	A
		X24G-00904	Mbyamiti	А
		X24H-00882	Vurhami	А
		X24H-00892	Mbyamiti	Α

## Table 3:Summary of Water Resource Classes and Ecological Categories in the Sabie-<br/>Sand (X3) River System

IUAs	Class for IUAs	Biophysical node	River Name	Target EC
		X31A-00741	Klein Sabie	B/C
¥0.4.		X31A-00783		С
X3-1: Sabia catchmont unstroam of the		X31A-00786		В
Klein Sabie included confluence	•	X31A-00794		В
		X31A-00796		В
		X31A-00803		B/C
		EWR S1	Sabie	В
X3-2:		X31B-00792	Goudstroom	B/C
Sabie River downstream of X3-1 to		EWR S4	Mac-Mac	В
the Marite confluence including the Goudstroom, MacMac, Motitsi and Marite upstream of Inyaka Dam.	•	EWR S2	Sabie	В
		X31E-00647a	Marite (US of dam)	В
		X31F-00695	Motitsi	В
X3-3: Marite and Sabie River downstream	1	EWR S5	Marite	B/C
of Inyaka Dam to the Sand confluence.	•	EWR S3	Sabie	A/B
		X31H-00819	White Waters	С
		X31J-00774	Noord-Sand	D
		X31D-00773	Sabani	C/D
X3-4:		X31J-00835	Noord-Sand	D
Sabaan, Noord-Sand, Bejani,	111	X31K-00713	Bejani	D
Sarıngwa, Musutlu rivers.		X31L-00657	Matsavana	С
		X31M-00673	Musutlu	B/C
		X31L-00664	Saringwa	С
		X31L-00678	Saringwa	B/C
		X33A-00731	Sabie	A/B
X3-5: Sabie River downstream of the Sand		X33A-00737	Sabie	A/B
confluence to the RSA border.		X33B-00784	Sabie	A/B
		X33B-00804	Sabie	A/B

IUAs	Class for IUAs	Biophysical node	River Name	Target EC
		X33B-00829	Sabie	A/B
		X33D-00811	Sabie	A/B
		X33D-00861	Sabie	A/B
		X31K-00771	Phabeni	В
		X31M-00763	Nwaswitshaka	А
		X33A-00661	Nwatindlopfu	А
		X33A-00806	Nwatimhiri	А
X3-6: Southern and northern tributaries of		X33B-00694	Salitje	А
the Sabie in the KNP downstream of	I	X33B-00834	Lubyelubye	А
the Sand confluence including the Phabeni.		X33C-00701	Mnondozi	А
		X33D-00864	Mosehla	А
		X33D-00894	Nhlowa	А
		X33D-00908	Shimangwana	А
		X33D-00911	Nhlowa	А
		X32E-00629	Nwarhele	С
X3-7:		X32E-00639	Ndlobesuthu	D/E
Mutlumuvi catchment.		EWR S6	Mutlumuvi	С
		X32F-00628	Nwarhele	C/D
		EWR S7	Tlulandziteka	С
		X32B-00551	Motlamogatsana	С
X3-8: Sand establight to the Khekbevela		X32C-00558	Nwandlamuhari	С
included confluence		X32C-00564	Mphyanyana	С
		X32C-00606	Nwandlamuhari	С
		X32G-00549	Khokhovela	С
X3-9 <sup>.</sup>		X32H-00560	Phungwe	A
Sand catchment downstream of the	I	EWR S8	Sand	В
Khokovela confluence.		X32J-00651	Mutlumuvi	Α

IUAs	Class for IUAs	Biophysical node	River Name	Target EC						
		X40A-00437	Shinkelengane	А						
		X40A-00454	Mmondzo	Α						
									X40A-00479	Nwanedzi
		X40A-00492	Rihlazeni	A						
		X40A-00433	Mtomeni	А						
		X40A-00420	Gudzani	Α						
		X40A-00426	Mavumbye	Α						
		X40A-00475	Mavumbye	A/B						
	I	X40A-00459	Nwanedzi	Α						
		X40A-00486	Nwanedzi	A/B						
		X40A-00469	Nwanedzi	В						
IUA X4:		X40B-00534	Nungwini	А						
Nwanedzi and Mwaswitsontso rivers		X40B-00537	Gwini	Α						
		X40B-00532	Mrunzuluku	Α						
		X40B-00497	Sweni	Α						
		X40B-00531	Mrunzuluku	Α						
		X40B-00530	Mrunzuluku	А						
		X40B-00511	Sweni	A						
		X40C-00592	Ripape	A						
		X40C-00513	Nwaswitsontso	В						
		X40D-00663	Shilolweni	Α						
		X40D-00594	Metsimetsi	Α						
		X40D-00598	Nwaswitsontso	A/B						
		X40D-00660	Nwaswitsontso	Α						

## Table 4:Summary of Water Resource Classes and Ecological Categories in the X4<br/>River Systems

#### **RESOURCE QUALITY OBJECTIVES**

Resource Quality Objectives for each Resource Unit (RU) are presented in Tables below. All RQOs are applicable from the date signed off, unless otherwise stated.

Table 5-7 provides an indication of the hydrological RQOs for Rivers expressed in terms of flow at the Ecological Water Requirement (EWR) sites. These summarised statistics are representative of the required flow regime in the river where the variability is dependent on the seasonal and temporal pattern of natural flow conditions. The mean monthly flows represent low flow requirements of a representative wet (February) and dry (October) month.

### Table 5: RIVERS: Summary of key hydrological RQOs of the KOMATI RIVER System (X1)

							Oct	ober	Feb		
	Biophysical		Target	nMAR <sup>1</sup>	I ow flows	Total	(m <sup>3</sup> /s)		(m <sup>3</sup> /s)		
RU	node	River	EC	(MCM)	(%nMAR) <sup>2</sup>	flows (%nMAR)	Mean in	Mean of monthly flows at the indicated frequency <sup>3</sup> .			
							90%	60/70%	90%	60/70%	
				IUA	X1-2						
MRU Komati B	X11G-01142 EWR K1	Komati	С	158.6	16.1	27.5	0.254	0.374	0.618	0.779	
				IUA	X1-4						
MRU Komati G	X11J-01106 EWR G1	Mngubhudle	D	29.5	19.9	26.9	0.041	0.063	0.122	0.205	
				IUA	X1-5						
MRU Komati C	X12H-01258 EWR K2	Komati	С	545.6	9.3	18.3	0.599	0.82	1.156	1.649	
				IUA	X1-6						
MRU Komati T	X12E-01287 EWR T1	Teespruit	С	56.4	22.6	35.3	0.206	0.272	0.294	0.349	
				IUA	X1-8						
MRU Komati M	X14H-01066 EWR L1	Lomati	С	294.3	11.7	17.3	0.502	0.664	0.989	1.168	
				IUA	X1-9						
MRU Komati D	X13J-01130 EWR K3A	Komati	D	1021.7	9.9	17.2	0.672	1.547	1.552	2.802	
				IUA	X1-10						
MRU	X13K-01114	Komati	D	1341.4	12.9	18.1	3.75	3.942	5.529	6.121	
Komati E	X13L-00995	Komati	D	1356.6	7.2	11.1	0.485	0.5	0.481	2.956	

nMAR is the natural Mean Annual Runoff in million cubic meters per annum.
 %nMAR is flow required at the nodes expressed as a percentage of the natural formation of the na

%nMAR is flow required at the nodes expressed as a percentage of the natural Mean Annual Runoff, Low flows and Total flows.

3 Percentage points on the monthly low flow frequency distribution continuum at the nodes, expressed as the percentage of the months (90% and 60% for biophysical nodes and 90% and 70% for EWR sites) that the flow should equal or exceed the indicated minimum values.

		River					October		F	Feb	
	Biophysical		Target	Nmar <sup>1</sup>	I ow flows	Total	(m³/s)		(m³/s)		
RU	node		EC	(MCM)	(%nMAR) <sup>2</sup>	(%nMAR) <sup>3</sup>	Mean of monthly flows at the indicated frequency <sup>4</sup>				
							90%	60/70%	90%	60/70%	
				IUA X2	:-1						
MRU Croc	X21A-00930 EWR C1	Crocodile	A/B	15.6	24.36	30.13	0.033	0.059	0.121	0.205	
Α	X21B-00962 EWR C2	Crocodile	В	76.1	30.88	35.48	0.246	0.373	0.673	1.162	
				IUA X2	2-2						
MRU Croc B	X21E-00943 (EWR C3)	Crocodile	B/C	194	15.86	47.09	0.456	0.808	0.676	1.083	
				IUA X2	2-3						
MRU Elan A	X21G-01037 ER 1	Elands	В	60.00	10.39	47.12	0.100	0.177	0.293	0.613	
				IUA X2	?-5						
MRU Elan B	X21K-01035 ER 2	Elands	В	217.19	4.97	43.07	0.369	0.502	1.429	2.090	
				IUA X2	2-9						
MRU Croc D	X22K-01018 EWR C4	Crocodile	С	824.8	9.07	31.93	0.772	1.426	2.44	4.137	
				IUA X2	-10						
MRU Kaap A	X23G-01057 EWR C7	Каар	С	179.5	6.18	19.23	0.069	0.144	0.349	0.559	
				IUA X2	-11						
MRU Croc	X24H-00934 EWR C6	Crocodile	С	1165.6	9.65	19.55	0.76	0.898	3.083	4.276	
E	X24D-00994 EWR C5	Crocodile	С	1117.4	10.93	23.96	1.616	2.047	2.7	4.408	

#### Table 6: RIVERS: Summary of key hydrological RQOs of the CROCODILE RIVER System (X2)

1 nMAR is the natural Mean Annual Runoff in million cubic meters per annum.

% MMAR is flow required at the nodes expressed as a percentage of the natural Mean Annual Runoff, Low flows and Total flows.
 The monthly flow requirements for EWR 3 and 6 represent the total flow defined by the current operating rule where the revised

3 The monthly flow requirements for EWR 3 and 6 represent the total flow defined by the current operating rule where the revised Present Ecological State low flows and releases for water users defines the minimum requirements for the respective EWR sites.
4 Percentage points on the monthly low flow frequency distribution continuum at the nodes, expressed as the percentage of the months (90% and 60% for biophysical nodes and 90% and 70% for EWR sites) that the flow should equal or exceed the indicated minimum values.

### Table 7:RIVERS: Summary of key hydrological RQOs of the SABIE AND SAND RIVER<br/>System (X3)

							October		F	eb
	Biophysical		Target		Low flows	Total flows (%nMAR) <sup>3</sup>	(m	<sup>3</sup> /s)	(n	n <sup>3</sup> /s)
RU	node	River	EC	(MCM)	(%nMAR) <sup>2</sup>		Mean of monthly flows at the indicated frequency <sup>4</sup>			
							90%	60/70%	90%	60/70%
IUA X3-2										
MRU	X31B-00757 EWR S1	Sabie	В	132	12.88	54	40.91	0.189	0.320	0.393
Sabie A	X31D-00755 EWR S2	Sabie	В	261.7	11.14	63.35	24.21	0.360	0.535	0.638
MRU Mac A	X31C-00683 EWR S4	Mac-Mac	В	65.8	14.35	45.07	0.16	0.047	0.459	1.133
				IUA X3	-3					
Mar A	X31G-00728	Marite	B/C	156.4	28.32	63.94	0.68	0.88	0.75	1

	Biophysical node	River	Target EC	nMAR <sup>1</sup> (MCM)	Low flows (%nMAR) <sup>2</sup>	Total flows (%nMAR) <sup>3</sup>	October		Feb	
							(m³/s)		(m³/s)	
RU							Mean of monthly flows at the indicated frequency <sup>4</sup>			
							90%	60/70%	90%	60/70%
	EWR S5									
MRU Sabie B	X31K-00715 EWR S3	Sabie	A/B	493.7	9.71	37.94	0.581	0.955	1.489	2.848
				IUA X3	-7					
MRU Mut A	X32F-00597 EWR S6	Mutlumuvi	С	45.0	22.21	28.46	0.0016	0.042	0.111	0.193
				IUA X3	-8					
MRU Sand A	X32A-00583 EWR S7	Tlulandziteka	В	28.9	11.14	39.66	0.025	0.047	0.086	0.138
				IUA X3	-9					
MRU Sand B	X32J-00602 EWR S8	Sand	В	133.6	3.36	24.71	0.028	0.088	0.235	0.605

1 nMAR is the natural Mean Annual Runoff in million cubic meters per annum.

2 %nMAR is flow required at the nodes expressed as a percentage of the natural Mean Annual Runoff, Low flows and Total flows.

3 The monthly flow requirements for EWR 5 represents the total flow defined by current operating rule where the Present Ecological State low flows and releases for water users defines the minimum requirements for the respective EWR site.

4 Percentage points on the monthly low flow frequency distribution continuum at the nodes, expressed as the percentage of the months (90% and 60% for biophysical nodes and 90% and 70% for EWR sites) that the flow should equal or exceed the indicated minimum values.

Table 8 to Table 10 provides the habitat, biota and water quality RQOs for priority RUs in the respective river systems. RQOs and the target ECs are provided for each component and/or indicator.

### Table 8:RIVERS: RQOs for water quality, geomorphology, riparian vegetation, macro-<br/>invertebrates and fish in priority RUs of the KOMATI RIVER System (X1)

Component/ Indicator	Target EC	RQOs
		IUA X1-2; MRU KOMATI B (EWR K1) (Komati River)
Geomorphology	С	Maintain the current EC of C (>62%) and geomorphological structure.
Fish	с	Maintain target EC of C(>62%) and fish species richness of 11 species. Suitable habitats should be adequate for especially the primary indicator fish species, namely the small rheophilic ( <i>Amphilius uranoscopus</i> (AURA)) and the large semi-rheophilic ( <i>Labeobarbus marequensis</i> (BMAR)).
Invertebrates	B/C	Community is representative of a medium-sized foothill stream assemblage. Maintain the EC(>78%), good stones in current (SIC) and marginal vegetation, two high flow velocity species.
Riparian vegetation	с	Maintain current EC of C (>62%). Maintain vegetation cover (woody and non- woody) between 70 - 90%. Perennial invasive alien species kept in check. No increase of riparian zone fragmentation. Maintain riparian taxon richness.
	В	Ensure that nutrient levels are within Acceptable limits: 50 <sup>th</sup> percentile of the data must be less than 0.02 mg/L PO₄-P (aquatic ecosystems: driver).
Water quality		Ensure that electrical conductivity (salt) levels are within Ideal limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 42 mS/m (aquatic ecosystems: driver).
		Ensure that toxics are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR <sup>1</sup> for toxics or the upper limit of the A category in DWAF (2008).
	IU	A X1-4; MRU KOMATI G (EWR G1) (Gladdespruit River)
Geomorphology	D	Maintain the current EC of D (>42%) and geomorphological structure.
Fish	D	Maintain target EC of D (>42%) and fish species richness of 11 species. Suitable habitats should be adequate for especially the primary indicator fish species, namely the small rheophilic (AURA) and ( <i>Chiloglanis pretoriae</i> (CPRE)).
Invertebrates	D	Community is representative of a small mountain stream assemblage. Maintain

Component/ Indicator	Target EC	RQOs
		the EC of D (>42%), good SIC and marginal vegetation, two moderate flow velocity species.
Riparian vegetation	D	Maintain target EC of D (>42%). Maintain vegetation cover (woody and non- woody) above 50%. Perennial invasive alien species kept in check. No increase of riparian zone fragmentation. Maintain riparian taxon richness.
		Ensure that turbidity/clarity or TSS levels stay within Acceptable limits: A small change from present with minor silting of habitats and turbidity loads; or <10% change from background TSS levels (aquatic ecosystems: driver).
		Ensure that nutrient levels are within Acceptable limits: $50^{tn}$ percentile of the data must be less than 0.02 mg/L PO <sub>4</sub> -P (aquatic ecosystems: driver).
Water quality	С	Ensure that toxics are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008).
		Ensure that As levels are within Ideal limits or A categories: 95 <sup>th</sup> percentile of the data must be less than 0.020 mg/L As (aquatic ecosystems: driver).
		Ensure that (free) Cn levels are within Ideal limits or A categories: 95 <sup>th</sup> percentile of the data must be less than 0.004 mg/L Cn (aquatic ecosystems: driver).
		IUA X1-5; MRU KOMATI C (EWR K2) (Komati River)
Geomorphology	С	Maintain the current EC of C (>62%) and geomorphological structure.
Fish	С	Maintain target EC of C (>62%) and fish species richness of 19 species. Suitable habitats should be adequate for especially the primary indicator fish species, namely the small rheophilic (AURA) and the large semi-rheophilic (BMAR).
Invertebrates	С	Community is representative of a medium mountain stream assemblage. Maintain the EC of C (>62%), good SIC and marginal vegetation, two high flow velocity species.
Riparian vegetation	С	Maintain current EC of C (>62%). Maintain vegetation cover (woody and non- woody) between 50 - 80%. Perennial invasive alien species kept in check. No increase of riparian zone fragmentation. Maintain riparian taxon richness.
		Ensure that nutrient levels are within Acceptable limits: $50^{th}$ percentile of the data must be less than 0.02 mg/L PO <sub>4</sub> -P (aquatic ecosystems: driver).
		Ensure that electrical conductivity (salt) levels are within Ideal limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 42 mS/m (aquatic ecosystems: driver).
Water quality	B/C	Ensure that turbidity/clarity or TSS levels stay within Acceptable limits: A small change from present with minor silting of habitats and turbidity loads; or <10% change from background TSS levels (aquatic ecosystems: driver).
		Meet faecal coliform and <i>E.coli</i> targets for recreational (full contact) use: Meet the TWQR of 0-130 counts per 100 ml (DWAF, 1996b).
	١U	A X1-5; MRU KOMATI T (EWR T1) (Teewaterspruit River)
Geomorphology	С	Maintain the current EC of C (>62%) and geomorphological structure.
Fish	С	Maintain target EC of C (>62%) and fish species richness of 19 species. Suitable habitats should be adequate for especially the primary indicator fish species, namely the small rheophilic (AURA) and the large semi-rheophilic (BMAR).
Invertebrates	С	Community is representative of a medium mountain stream assemblage. Maintain the EC of C (>62%), good SIC and marginal vegetation, two high flow velocity species.
Riparian vegetation	С	Maintain current EC of C (>62%). Maintain vegetation cover (woody and non- woody) above 30%. Perennial invasive alien species kept in check (less than 20%). No increase of riparian zone fragmentation. Maintain riparian taxon richness.
		Ensure that nutrient levels are within Tolerable limits: $50^{th}$ percentile of the data must be less than 0.125 mg/L PO <sub>4</sub> -P (aquatic ecosystems: driver).
Water quality	С	Ensure that turbidity/clarity or TSS levels stay within Acceptable limits: A small change from present with minor silting of habitats and turbidity loads; or <10% change from background TSS levels (aquatic ecosystems: driver).
		Meet faecal coliform and <i>E.coli</i> targets for recreational (full contact) use: Meet the TWQR of 0-130 counts per 100 ml (DWAF, 1996b).

Component/ Target Indicator EC		RQOs
		IUA X1-8; MRU KOMATI M (EWR L1) (Lomati River)
Geomorphology	D	Maintain the current EC of D (>42%) and geomorphological structure.
Fish	С	Maintain target EC of C (>62%) and high fish species richness of 36 species. Suitable habitats should be adequate for especially the primary indicator fish species, namely the small rheophilic ( <i>Chiloglanis anoterus</i> CANO)) and the large semi-rheophilic (BMAR).
Invertebrates	С	Community is representative of a medium-sized Lowveld river assemblage. Maintain the EC of C (>62%), good SIC, sand and gravel habitat, and marginal vegetation, one high flow velocity species.
Riparian vegetation	B/C	Maintain current EC of B/C (>78%). Maintain vegetation cover (woody and non- woody) between 50 - 80%. Perennial invasive alien species kept in check (less than 10%). No increase of riparian zone fragmentation. Maintain riparian taxon richness.
		Ensure that turbidity/clarity or TSS levels stay within Acceptable limits: A small change from present with minor silting of habitats and turbidity loads; or <10% change from background TSS levels (aquatic ecosystems: driver).
		Ensure that electrical conductivity (salt) levels are within Acceptable limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 55 mS/m (aquatic ecosystems: driver).
Water quality:	B/C	Ensure that nutrient levels (phosphate) are within Tolerable limits: $50^{th}$ percentile of the data must be less than 0.075 mg/L PO <sub>4</sub> -P (aquatic ecosystems: driver).
		Ensure that nutrient levels (TIN) are within Acceptable limits: 50 <sup>th</sup> percentile of the data must be less than 1.0 mg/L TIN (aquatic ecosystems: driver).
		Meet faecal coliform and <i>E.coli</i> targets for recreational (full contact) use: Meet the TWQR of 0-130 counts per 100 ml (DWAF, 1996b).
		Ensure that toxics are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008).
		IUA X1-9; MRU KOMATI D (EWR K3) (Komati River)
Geomorphology	D/E	Maintain the current EC of D/E (>38%) and geomorphological structure.
Fish	C/D	Maintain target EC of C/D (>58%) and high fish species richness of 35 species. Suitable habitats should be adequate for especially the primary indicator fish species, namely the small rheophilic orangefin barb ( <i>Barbus eutaenia</i> BEUT)) and the large semi-rheophilic (BMAR).
Invertebrates	D	Community is representative of a larger-sized Lowveld river assemblage. Maintain the EC of D (>42%); good SIC sand and gravel habitat, and marginal vegetation, one high flow velocity species.
Riparian vegetation	D	Maintain a D EC (>42%). Maintain vegetation cover (woody and non-woody) between 50 - 75%. Perennial invasive alien species kept in check (less than 15%). No increase of riparian zone fragmentation. Maintain riparian taxon richness.
		Ensure that electrical conductivity (salt) levels are within Tolerable limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 85 mS/m (aquatic ecosystems: driver).
		Ensure that nutrient levels (phosphate) are within Tolerable limits: $50^{th}$ percentile of the data must be less than 0.125 mg/L PO <sub>4</sub> -P (aquatic ecosystems: driver).
Water quality	D	Ensure that nutrient levels (TIN) are within Acceptable limits: 50 <sup>th</sup> percentile of the data must be less than 1.0 mg/L TIN (aquatic ecosystems: driver).
	-	Ensure that periphyton levels are within Acceptable limits: 50 <sup>th</sup> percentile of the data must be less than 21 mg/m <sup>2</sup> (aquatic ecosystems: driver).
		Meet faecal coliform and <i>E.coli</i> targets for recreational (full contact) use: Meet the TWQR of 0-130 counts per 100 ml (DWAF, 1996b).
		Ensure that toxics are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008).

1 TWQR = Target Water Quality Range (DWAF, 1996a). DWAF (1996a): South African Water Quality Guidelines: Volume 7: Aquatic Ecosystems. DWAF (1996b): South African water quality guidelines. Volume 2: Recreational Use.

### Table 9:RIVERS: RQOs for water quality, geomorphology, riparian vegetation, macro-<br/>invertebrates and fish in priority RUs of the CROCODILE RIVER System (X2)

Component/ Target Indicator EC		RQOs
		IUA X2-1; MRU CROC A (EWR C1) (Crocodile River)
Geomorphology	в	Maintain the bed material size distribution within the active channel in order to maintain the available physical habitats. Maintain the reach as an alluvial meandering channel type. Maintain the target EC (>82%).
Fish	А	Maintain target EC of A (>92%) and low fish species richness of one species. Suitable vegetated habitats should be available for small semi-rheophilic (BANO).
Invertebrates	В	Community is representative of a small mountain stream assemblage. Maintain the B EC (>82%), good SIC and marginal vegetation, five high flow velocity species.
Riparian vegetation	Α	Maintain current EC (>92%). Maintain woody vegetation cover below 10%. Maintain non-woody cover between 80% and 100%. Maintain reed cover below 5%.Perennial invasive alien species kept in check (less than 1%). No increase of riparian zone fragmentation. Maintain riparian taxon richness.
		Ensure that nutrient levels are within Acceptable limits: 50 <sup>th</sup> percentile of the data must be less than 0.015 mg/L PO₄-P (aquatic ecosystems: driver).
Water quality	A	Ensure that electrical conductivity (salt) levels are within Ideal limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 30 mS/m (aquatic ecosystems: driver).
		Meet faecal coliform and <i>E.coli</i> targets for recreational (intermediate) use: Meet the TWQR <sup>1</sup> of 0-1000 counts per 100 ml (DWAF, 1996b).
-		IUA X2-1; MRU CROC A (EWR C2) (Crocodile River)
Geomorphology	в	Maintain the bed material size distribution within the active channel in order to maintain the available physical habitats. Maintain the reach as an alluvial meandering channel type. Maintain the target EC of B (>82%).
Fish	в	Maintain target EC of B (>82%) and fish species richness of 11 species. Suitable habitats should be adequate for especially the primary indicator fish species, namely the small rheophilic (AURA) and (CPRE).
Invertebrates	в	Community is representative of a small mountain stream assemblage. Maintain the B EC (>82%), good SIC and marginal vegetation, five high flow velocity species.
Riparian vegetation	A/B	Maintain current EC (>92%). Maintain woody vegetation cover below 5%. Maintain non-woody cover between 80% and 100%. Maintain reed cover below 5%. Perennial invasive alien species kept in check (less than 5%). No increase of riparian zone fragmentation. Maintain riparian taxon richness.
		Ensure that nutrient levels are within Acceptable limits: 50 <sup>th</sup> percentile of the data must be less than 0.015 mg/L PO <sub>4</sub> -P (aquatic ecosystems: driver).
Water quality	с	Ensure that electrical conductivity (salt) levels are within Ideal limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 30 mS/m (aquatic ecosystems: driver).
		Meet faecal coliform and <i>E.coli</i> targets for recreational (intermediate) use: Meet the TWQR of 0-1000 counts per 100 ml (DWAF, 1996b).
-		IUA X2-2; MRU CROC B (EWR C3) (Crocodile River)
Geomorphology	с	Maintain the bed material size distribution within the active channel in order to maintain the available physical habitats. Maintain the reach as an alluvial meandering channel type. Maintain the target EC of C (>62%).
Fish	В	Maintain target EC of B (>82%) and fish species richness of six species. Suitable habitats should be adequate for especially the primary indicator fish species, namely the small rheophilic (AURA) and (CPRE).
Invertebrates	С	Community is representative of a medium-sized foothill stream assemblage. Maintain the EC of C (>62%), good SIC and marginal vegetation, five high flow velocity species.

Component/ Targ Indicator E0		RQOs
Riparian vegetation	С	Maintain current EC of C (>62%). Maintain woody vegetation cover between 20 - 70%. Maintain non-woody cover between 30% and 90%.Maintain reed cover below 10%. Perennial invasive alien species kept in check (less than 15%). No increase of riparian zone fragmentation. Maintain riparian taxon richness.
		Ensure that nutrient levels are within Acceptable limits: 50 <sup>th</sup> percentile of the data must be less than 0.025 mg/L PO <sub>4</sub> -P (aquatic ecosystems: driver).
Water quality	с	Ensure that electrical conductivity (salt) levels are within Ideal limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 30 mS/m (aquatic ecosystems: driver).
		Ensure that toxics are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008).
		IUA X2-9; MRU CROC D (EWR C4) (Crocodile River)
Geomorphology	B/C	Maintain the bed material size distribution within the active channel in order to maintain the available physical habitats. Maintain the channel/reach type. Maintain the target EC of B/C (>78%).
Fish	в	Maintain target EC of B (>82%) and fish species richness of 20 species. Suitable habitats should be adequate for especially the primary indicator fish species, namely the small rheophilic (CPRE) and the large semi-rheophilic (BMAR).
Invertebrates	с	Community is representative of a larger-sized Lowveld riverassemblage. Maintain the EC of C (>62%), good SIC, sand and gravel habitat, and marginal vegetation, one high flow velocity species.
Riparian vegetation	С	Maintain current C EC (>62%). Maintain woody vegetation cover between 20 - 70%. Maintain non-woody cover above 30%. Maintain reed cover between 10 - 20%.Perennial invasive alien species kept in check (less than 20%). No increase of riparian zone fragmentation. Maintain riparian taxon richness.
	с	Ensure that nutrient levels are within Tolerable limits: 50 <sup>th</sup> percentile of the data must be less than 0.125 mg/L PO <sub>4</sub> -P (aquatic ecosystems: driver).
Water quality		Ensure that electrical conductivity (salt) levels are within Acceptable limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 55 mS/m (aquatic ecosystems: driver).
Water quality		Meet faecal coliform and <i>E.coli</i> targets for recreational (full contact) use: Meet the TWQR of 0-130 counts per 100 ml (DWAF, 1996b).
		Ensure that toxics are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008).
	1	IUA X2-11; MRU CROC E (EWR C5) (Crocodile River)
Geomorphology	C/D	Maintain the bed material size distribution within the active channel in order to maintain the available physical habitats. Maintain the channel/reach type. Maintain the target C/D EC (>58%).
Fish	с	Maintain target EC of C (>62%) and high fish species richness of 35 species. Suitable habitats should be adequate for especially the primary indicator fish species, namely the small rheophilic (CPRE) and the large semi-rheophilic (BMAR).
Invertebrates	с	Community is representative of a large, wide Lowveld river assemblage. Maintain the C (>62%), good SIC, sand and gravel habitat, and marginal vegetation, one moderate flow velocity species.
Riparian vegetation	С	Maintain current EC (>62%). Maintain woody vegetation cover between 20 - 70%. Maintain non-woody cover above 40%. Maintain reed cover above 10% along the channel. Perennial invasive alien species kept in check (less than 10%). No increase of riparian zone fragmentation. Maintain riparian taxon richness.
		Ensure that nutrient levels are within Tolerable limits: $50^{th}$ percentile of the data must be less than 0.075 mg/L PO <sub>4</sub> -P (aquatic ecosystems: driver, EWR C6.
Water quality:	С	Ensure that electrical conductivity (salt) levels are within Acceptable limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 70 mS/m (aquatic ecosystems: driver).

Component/ Indicator	Target EC	RQOs
		Ensure that turbidity/clarity or TSS levels stay within Acceptable limits: A moderate change from present with temporary high sediment loads and turbidity.
		Ensure that temperatures stay within Acceptable limits: A moderate change to instream temperatures should occur infrequently, i.e. vary by no more than 2°C. Highly temperature sensitive species will occur in lower abundances (aquatic ecosystems: driver).
		Meet faecal coliform and <i>E.coli</i> targets for recreational (full contact) use: Meet the TWQR of 0-130 counts per 100 ml (DWAF, 1996b).
		Ensure that toxics are within the CEV limits: 95 <sup>th</sup> percentile of the data must be within the CEV for toxics or the B category in DWAF (2008).
		IUA X2-11; MRU CROC E (EWR C6) (Crocodile River)
Geomorphology	с	Maintain the bed material size distribution within the active channel in order to maintain the available physical habitats. Maintain the channel/reach type. Maintain the target EC of C (>62%).
Fish	С	Maintain target EC of C (>62%) and high fish species richness of 34 species. Suitable habitats should be adequate for especially the primary indicator fish species, namely the small rheophilic sawfin suckermouth ( <i>Chiloglanis paratus</i> CPAR)) and the large semi-rheophilic (BMAR).
Invertebrates	С	Community is representative of a large, wide Lowveld riverassemblage. Maintain the C EC (>62%), good SIC, sand and gravel habitat, and marginal vegetation, one moderate flow velocity species.
Riparian vegetation	с	Maintain current EC (>62%). Maintain woody vegetation cover between 5 - 60%. Maintain non-woody cover above 30% in the marginal zone. Maintain reed cover between 10 - 90% along the channel. Maintain absence of perennial invasive alien species. No increase of riparian zone fragmentation. Maintain riparian taxon richness.
		Ensure that nutrient levels are within Tolerable limits: 50 <sup>th</sup> percentile of the data must be less than 0.125 mg/L PO <sub>4</sub> -P (aquatic ecosystems: driver, EWR C6.
		Ensure that electrical conductivity (salt) levels are within Acceptable limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 70 mS/m (aquatic ecosystems: driver).
	_	Ensure that turbidity/clarity or TSS levels stay within Acceptable limits: A moderate change from present with temporary high sediment loads and turbidity.
Water quality	С	Ensure that temperatures stay within Acceptable limits: A moderate change to instream temperatures should occur infrequently, i.e. vary by no more than 2°C. Highly temperature sensitive species will occur in lower abundances (aquatic ecosystems: driver).
		Meet faecal coliform and <i>E.coli</i> targets for recreational (full contact) use: Meet the TWQR of 0-130 counts per 100 ml (DWAF, 1996b).
		Ensure that toxics are within the CEV limits: 95 <sup>th</sup> percentile of the data must be within the CEV for toxics or the B category in DWAF (2008).
		IUA X2-10; MRU KAAP A (EWR C7) (Kaap River)
Geomorphology	В	Maintain the bed material size distribution within the active channel in order to maintain the available physical habitats. Maintain the channel/reach type. Maintain the target EC of B (>82%).
Fish	С	Maintain target EC of C (>62%) and fish species richness of 11 species. Suitable habitats should be adequate for especially the primary indicator fish species, namely the small rheophilic (CPRE) and (BEUT) and the large semi-rheophilic (BMAR).
Invertebrates	В	Community is representative of a medium-sized Lowveld riverassemblage. Maintain the Category B (>82%), good SIC and marginal vegetation, three high flow velocity species.
Riparian vegetation	C/D	Maintain current EC of C/D (>58%). Maintain woody vegetation cover between 20 - 70%. Maintain non-woody cover above 30%.Maintain reed cover between 10 - 90% along the channel. Perennial invasive alien species kept in check (less than

Component/ Indicator	Target EC	RQOs
		30%). No increase of riparian zone fragmentation. Maintain riparian taxon richness.
	<ul> <li>B</li> <li>Ensure that nutrient levels are within Tolerable limits: The 5 data may be at 0.125 mg/L PO₄-P (aquatic ecosystems: driver). The 50<sup>th</sup> percentile of the data must be ≤ 4.0 mg/L TIN-N (adriver).</li> <li>Ensure that electrical conductivity (salt) levels are within Acceptercentile of the data must be less than or equal to 200 mSJ ecosystems: driver). Note this is a naturally salinised system Ensure that toxics are within Ideal limits or A categories or To of the data must be within the TWQR for toxics or the upper in DWAF (2008).</li> <li>Ensure that As levels are within Ideal limits or A categories: data must be less than 0.020 mg/L As (aquatic ecosystems Ensure that (free) Cn levels are within Ideal limits or A categories of the data must be less than 0.004 mg/L Cn (aquatic ecosystems)</li> </ul>	Ensure that nutrient levels are within Tolerable limits: The 50 <sup>th</sup> percentile of the data may be at 0.125 mg/L PO <sub>4</sub> -P (aquatic ecosystems: driver). The 50 <sup>th</sup> percentile of the data must be $\leq$ 4.0 mg/L TIN-N (aquatic ecosystems: driver).
		Ensure that electrical conductivity (salt) levels are within Acceptable limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 200 mS/m (Aquatic ecosystems: driver). <i>Note this is a naturally salinised system.</i>
vvater quality		Ensure that toxics are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008).
		Ensure that As levels are within Ideal limits or A categories: 95 <sup>th</sup> percentile of the data must be less than 0.020 mg/L As (aquatic ecosystems: driver).
		Ensure that (free) Cn levels are within Ideal limits or A categories: 95 <sup>th</sup> percentile of the data must be less than 0.004 mg/L Cn (aquatic ecosystems: driver).

1 TWQR = Target Water Quality Range (DWAF, 1996a). DWAF (1996a): South African Water Quality Guidelines: Volume 7: Aquatic Ecosystems. DWAF (1996b): South African water quality guidelines. Volume 2: Recreational Use.

#### Table 10: RIVERS: RQOs for water quality, geomorphology, riparian vegetation, macroinvertebrates and fish in priority RUs of the SABIE AND SAND RIVER System (X3)

Component/ Indicator	Target EC	RQOs
		IUA X3-2;MRU SABIE A (EWR S1) (Sabie River)
Geomorphology	В	Maintain the bed material size distribution within the active channel in order to maintain the available physical habitats. Maintain the channel/reach type. Maintain the target EC of B (>82%).
Fish	в	Maintain the EC of a B (>82%). RQO will be immediately applicable if the non-flow related measures are addressed. This will result in an improvement in the fish assemblage (reduced sedimentation of rocky substrate, improved indigenous vegetative habitats). Fish species richness of eight species must be maintained. Suitable habitats should be adequate for especially the primary indicator fish species, namely the small rheophilic (CANO) and the large semi-rheophilic ( <i>Varicorhinus nelspruitensis</i> VNEL)).
Invertebrates	В	Community is representative of a small mountain stream assemblage. Maintain the EC(>82%), good SIC and marginal vegetation, one high flow velocity species. For an improvement in the PES additional key taxa for the improved situation: Oligoneuridae and Prosopistomatidae.
Riparian vegetation	в	Achieve and then maintain the B EC (>82%) RQO will be immediately applicable if the non-flow related measures are addressed. This will result in the woody cover improving and reed cover decreasing. Perennial invasive alien species should be less than 10%. No increase of riparian zone fragmentation. Maintain riparian taxon richness.
		Ensure that nutrient levels are within Acceptable limits: 50 <sup>th</sup> percentile of the data must be less than 0.015 mg/L PO <sub>4</sub> -P (aquatic ecosystems: driver).
		Ensure that electrical conductivity (salt) levels are within Ideal limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 30 mS/m (aquatic ecosystems: driver).
Water quality	A/B	Meet faecal coliform and <i>E.coli</i> targets for recreational (full contact) use: Meet the TWQR <sup>1</sup> of 0-130 counts per 100 ml (DWAF, 1996b).
		Ensure that toxics are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008).
		IUA X3-2:MRU SABIE A (EWR S2) (Sabie River)

Component/ Indicator	Target EC	RQOs
Geomorphology	в	Maintain the bed material size distribution within the active channel in order to maintain the available physical habitats. Maintain the channel/reach type. Maintain the target EC (>82%).
Fish	в	RQO will be immediately applicable if the non-flow related measures are addressed. This will result in an improvement to a B EC (>82%) in the fish assemblage (reduced sedimentation of rocky substrate, improved indigenous vegetative habitats).Maintain fish species richness of eight species. Suitable habitats should be adequate for especially the primary indicator fish species, namely the small rheophilic (CANO) and the large semi-rheophilic (VNEL).
Invertebrates	в	Community is representative of a small mountain stream assemblage. RQO will be immediately applicable if the non-flow related measures are addressed. This will result in an improvement to a B EC (>82%) with increased SASS V and MIRAI scores as well as additional taxa that will occur (Trichorythidae and Libellulidae)
Riparian vegetation	В	RQO will be immediately applicable if the non-flow related measures are addressed. This will result in a B EC (>82%) the woody cover improving and reed cover decreasing. Perennial invasive alien species should be less than 10%. No increase of riparian zone fragmentation. Maintain riparian taxon richness.
		Ensure that nutrient levels are within Acceptable limits: 50 <sup>th</sup> percentile of the data must be less than 0.025 mg/L PO <sub>4</sub> -P (aquatic ecosystems: driver). For an improvement in the PES ensure that nutrient levels are within Acceptable limits: 50 <sup>th</sup> percentile of the data must be less than 0.015 mg/L PO <sub>4</sub> -P (aquatic ecosystems: driver)
Water quality	В	Ensure that electrical conductivity (salt) levels are within Ideal limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 30 mS/m (aquatic ecosystems: driver).
		Meet faecal coliform and <i>E.coli</i> targets for recreational (full contact) use: Meet the TWQR of 0-130 counts per 100 ml (DWAF, 1996b).
		Ensure that toxics are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008).
		IUA X3-3;MRU SABIE B (EWR S3) (Sabie River)
Geomorphology	в	Maintain the bed material size distribution within the active channel in order to maintain the available physical habitats. Maintain the channel/reach type. Maintain the target EC of B (>82%).
Fish	В	Maintain target EC of B (>82%) and fish species richness of 26 species. Suitable habitats should be adequate for especially the primary indicator fish species, namely the small rheophilic (CANO) and the large semi-rheophilic (BMAR).
Invertebrates	в	Community is representative of a medium-sized foothill stream assemblage. Maintain the EC of B (>82%), good SIC and marginal vegetation, two high flow velocity species.
Riparian vegetation	A/B	Maintain current A/B EC (>92%). Maintain woody vegetation cover between 20 - 40%. Maintain non-woody cover between 30 - 90%. Maintain reed cover between 20 - 40% along the channel. Perennial invasive alien species kept in check (less than 5%). No increase of riparian zone fragmentation. Maintain riparian taxon richness.
		Ensure that nutrient levels are within Acceptable limits: 50 <sup>th</sup> percentile of the data must be less than 0.015 mg/L PO <sub>4</sub> -P (aquatic ecosystems: driver).
		Ensure that electrical conductivity (salt) levels are within Ideal limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 30 mS/m (aquatic ecosystems: driver).
Water quality	в	Ensure that turbidity/clarity or Total Suspended Solids (TSS) levels stay within Acceptable limits: A moderate change from present with temporary high sediment loads and turbidity (aquatic ecosystems: driver).
		Meet faecal coliform and <i>E.coli</i> targets for recreational (full contact) use: Meet the TWQR of 0-130 counts per 100 ml (DWAF, 1996b).
		Ensure that toxics are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008).

Component/ Target Indicator EC		RQOs
	1	IUA X3-2;MRU MAC A (EWRS4) (MacMac River)
Geomorphology	A	Maintain the bed material size distribution within the active channel in order to maintain the available physical habitats. Maintain the channel/reach type. Maintain the target EC (>92%).
Fish	B/C	Maintain target EC of B/C (>78%) and fish species richness of 20 species. Suitable habitats should be adequate for especially the primary indicator fish species, namely the small rheophilic (CANO) and the large semi-rheophilic (VNEL).
Invertebrates	A/B	Community is representative of a small mountain stream assemblage. Maintain the EC(>92%), good SIC and marginal vegetation, two high flow velocity species.
Riparian vegetation	A/B	Maintain current A/B EC (>92%). Maintain woody vegetation cover between 20 - 80%. Maintain non-woody cover between 30 - 60% in the marginal zone. Maintain the absence of reed cover. Perennial invasive alien species kept in check (less than 5%). No increase of riparian zone fragmentation. Maintain riparian taxon richness.
Water quality	A/B	Ensure that turbidity/clarity or TSS levels stay within Acceptable limits: A small change from present with minor silting of habitats and turbidity loads; or <10% change from background TSS levels (aquatic ecosystems: driver).
	1	IUA X3-3;MRU MAR A (EWR S5) (Marite River)
Geomorphology	с	Maintain the bed material size distribution within the active channel in order to maintain the available physical habitats. Maintain the channel/reach type. Maintain the target EC of C (>62%).
Fish	B/C	Maintain target EC of B/C (>78%) and fish species richness of 26 species. Suitable habitats should be adequate for especially the primary indicator fish species, namely the small rheophilic (CANO) and the large semi-rheophilic (BMAR).
Invertebrates	B/C	Community is representative of a medium-sized foothill stream assemblage. Maintain the B/C EC (>78%), good SIC and marginal vegetation, two high flow velocity species.
Riparian vegetation	B/C	Maintain current EC(>78%). Maintain woody vegetation cover between 70 - 80%. Maintain non-woody cover between 40 - 50% in the marginal zone. Maintain reed cover between 20 - 30% along the channel. Perennial invasive alien species kept in check (less than 15%). No increase of riparian zone fragmentation. Maintain riparian taxon richness.
		Ensure that nutrient levels are within Acceptable limits: $50^{th}$ percentile of the data must be less than 0.015 mg/L PO <sub>4</sub> -P (aquatic ecosystems: driver).
Water quality	в	Ensure that electrical conductivity (salt) levels are within Ideal limits: $95^{th}$ percentile of the data must be less than or equal to 30 mS/m (aquatic ecosystems: driver). Meet faecal coliform and <i>E.coli</i> targets for recreational (full contact) use: Meet the TWOP of 0.130 counts per 100 mL(DWAE, 1996b)
		Ensure that toxics are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008).
		IUA X3-7;MRU MUT A (EWR S6) (Mutlumuvi River)
Geomorphology	с	Maintain the bed material size distribution within the active channel in order to maintain the available physical habitats. Maintain the channel/reach type. Maintain the target EC (>62%).
Fish	С	Maintain target EC of C (>62%) and fish species richness of 26 species. Suitable habitats should be adequate for especially the primary indicator fish species, namely the small rheophilic (CANO) and the large semi-rheophilic (BMAR).
Invertebrates	B/C	Community is representative of a medium-sized Lowveld river assemblage. Maintain the B/C EC (>78%), good SIC, sand and gravel habitat, and marginal vegetation, two moderate flow velocity species.
Riparian	С	Maintain current EC of C (>62%). Maintain woody vegetation cover between 20 -

Component/ Indicator	Target EC	RQOs
vegetation		70% along the banks. Maintain reed cover between 10 - 90% along the channel. Perennial invasive alien species kept in check (less than 20%). No increase of riparian zone fragmentation. Maintain riparian taxon richness.
		Ensure that nutrient levels are within Tolerable limits: 50 <sup>th</sup> percentile of the data must be less than 0.125 mg/L PO <sub>4</sub> -P (aquatic ecosystems: driver).
		Ensure that electrical conductivity (salt) levels are within Acceptable limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 55 mS/m (aquatic ecosystems: driver).
Water quality	B/C	Ensure that turbidity/clarity or Total Suspended Solids (TSS) levels stay within Acceptable limits: A moderate change from present with temporary high sediment loads and turbidity (aquatic ecosystems: driver).
		Meet faecal coliform and <i>E.coli</i> targets for recreational (full contact) use: Meet the TWQR of 0-130 counts per 100 ml (DWAF, 1996b).
		Ensure that toxics are within Ideal limits or CEV limits or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008).
		UA X3-8;MRU SAND A (EWR S7) (Thulandziteka River)
Geomorphology	C/D	Maintain the bed material size distribution within the active channel in order to maintain the available physical habitats. Maintain the channel/reach type. Maintain the target EC of C/D (>58%).
Fish	С	Maintain target EC of C (>62%) and fish species richness of 29 species. Suitable habitats should be adequate for especially the primary indicator fish species, namely the small rheophilic (CANO) and the large semi-rheophilic (BMAR).
Invertebrates	B/C	Community is representative of a medium-sized Lowveld river assemblage. Maintain the EC(>78%) , good SIC, sand and gravel habitat, and marginal vegetation, one high flow velocity species.
Riparian vegetation	С	Maintain current EC(>62%) . Maintain woody vegetation cover between 20 - 70% along the banks. Maintain reed cover between 10 - 90% along the channel. Perennial invasive alien species kept in check (less than 20%). No increase of riparian zone fragmentation. Maintain riparian taxon richness.
		Ensure that nutrient levels are within Tolerable limits: 50 <sup>th</sup> percentile of the data must be less than 0.125 mg/L PO <sub>4</sub> -P (aquatic ecosystems: driver).
		Ensure that electrical conductivity (salt) levels are within Ideal limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 42 mS/m (aquatic ecosystems: driver).
Water quality	с	Ensure that turbidity/clarity or Total Suspended Solids (TSS) levels stay within Acceptable limits: A moderate change from present with temporary high sediment loads and turbidity (aquatic ecosystems: driver).
		Meet faecal coliform and <i>E.coli</i> targets for recreational (full contact) use: Meet the TWQR of 0-130 counts per 100 ml (DWAF, 1996b).
		Ensure that toxics are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008).
		IUA X3-9;MRU SAND B (EWR S8) (Sand River)
Geomorphology	С	Maintain the bed material size distribution within the active channel in order to maintain the available physical habitats. Maintain the channel/reach type. Maintain the target EC (>62%).
Fish	В	Maintain target EC of B (>82%) and high fish species richness of 35 species. Suitable habitats should be adequate for especially the primary indicator fish species, namely the small rheophilic (CANO) and the large semi-rheophilic (BMAR).
Invertebrates	В	Community is representative of a medium-sized Lowveld riverassemblage. Maintain the B EC (>82%), good SIC, sand and gravel habitat, and marginal vegetation, one moderate flow velocity species.
Riparian vegetation	В	Maintain current B $\pm$ C(>82%). Maintain the absence of terrestrial woody species in the channel. Maintain reed cover between 20 - 80% along the channel.

Component/ Indicator	Target EC	RQOs		
		Perennial invasive alien species kept in check (less than 10%). No increase of riparian zone fragmentation. Maintain riparian taxon richness.		
	в	Ensure that nutrient levels are within Tolerable limits: 50 <sup>th</sup> percentile of the data must be less than 0.125 mg/L PO₄-P (aquatic ecosystems: driver).		
water quality	В	Meet faecal coliform and <i>E.coli</i> targets for recreational (full contact) use: Meet the TWQR of 0-130 counts per 100 ml (DWAF, 1996b).		

1 TWQR = Target Water Quality Range (DWAF, 1996a). DWAF (1996a): South African Water Quality Guidelines: Volume 7: Aquatic Ecosystems. DWAF (1996b): South African water quality guidelines. Volume 2: Recreational Use.

Tables 11 - 13 provide the water quality RQOs for priority RUs (other than EWR sites) in the respective river systems.

#### RIVERS: Summary of key WATER QUALITY RQOs in WQ priority RUs of the Table 11: **KOMATI RIVER System (X1)**

RUs	SQ number	Water Quality RQOs					
	·	IUA X1-1					
RU K1	X11A-01358	Ensure that <b>nutrient levels</b> are within Acceptable limits: 50 <sup>th</sup> percentile of the data must be less than 0.025 mg/L <b>PO<sub>4</sub>-P</b> (aquatic ecosystems: driver). Ensure that <b>electrical conductivity (salt) levels</b> are within Ideal limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 30 mS/m (aquatic ecosystems: driver). Ensure <b>nH levels</b> stay within Acceptable limits: A small change from the Ideal range.					
	X11A-01248	is allowed, i.e. a 5 <sup>th</sup> percentile of 5.9-6.5, and a 95 <sup>th</sup> percentile of 8.0-8.8 (aquatic ecosystems: driver). Ensure that <b>toxics</b> are within Ideal limits or A categories or TWQR <sup>1</sup> : 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAE (2008). Ensure that <b>subpate lovels</b> are within Acceptable limits: $O_{5}^{th}$					
	X11A-01295	percentile of the data must be less than 30 mg/L (industrial cat 3: drivers; DWA, 2012a). Meet <b>faecal coliform and <i>E.coli</i> targets</b> for recreational (full contact) use: Meet the TWQR of 0-130 counts per 100 ml (DWAF, 1996b).					
RU K2	X11B-01370	Ensure that <b>nutrient levels</b> are within Acceptable limits: 50 <sup>th</sup> percentile of the data must be less than 0.025 mg/L <b>PO<sub>4</sub>-P</b> (aquatic ecosystems: driver). Ensure that <b>electrical conductivity (salt) levels</b> are within Ideal limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 30 mS/m (aquatic ecosystems: driver).					
	X11B-01361	is allowed, i.e. a 5 <sup>th</sup> percentile of 5.9-6.5, and a 95 <sup>th</sup> percentile of 8.0 - 8.8 (aquatic ecosystems: driver). Ensure that <b>toxics</b> are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in					
	X11B-01272	Ensure that <b>sulphate levels</b> are within Acceptable limits: 95 <sup>th</sup> percentile of the data must be less than 30 mg/L (industrial cat 3: drivers; DWA, 2012a). Meet <b>faecal coliform and <i>E.coli</i> targets</b> for recreational (full contact) use: Meet the TWQR of 0 - 130 counts per 100 ml (DWAF, 1996b).					
		IUA X1-3					
RU K3	X11C-01147	Ensure that <b>electrical conductivity (salt) levels</b> are within Ideal limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 30 mS/m (aquatic ecosystems: driver). Ensure <b>pH levels</b> stay within Acceptable limits: A small change from the Ideal range					
	X11D-01129	is allowed, i.e. a 5 <sup>th</sup> percentile of 5.9 - 6.5, and a 95 <sup>th</sup> percentile of 8.0 - 8.8 (aquatic ecosystems: driver). Ensure that <b>toxics</b> are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in					
	X11D-01137	DWAF (2008). Ensure that <b>sulphate levels</b> are within Acceptable limits: 95 <sup>th</sup> percentile of the data must be less than 30 mg/L (industrial cat 3: drivers; DWA, 2012a).					
RU K4	X11E-01237	Ensure that <b>toxics</b> are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in					

RUs	SQ number	Water Quality RQOs				
		DWAF (2008). Ensure that <b>turbidity/clarity or TSS levels</b> stay within Acceptable limits: A small change from present with minor silting of habitats and turbidity loads; or <10% change from background TSS levels (aquatic ecosystems: driver).				
		IUA X1-10				
RU K13	X13L-01000	Ensure that <b>electrical conductivity (salt) levels</b> are within Tolerable limits: $95^{th}$ percentile of the data must be less than or equal to $85 \text{ mS/m}$ (aquatic ecosystems: driver). Ensure that <b>nutrient levels</b> are within Tolerable limits: $50^{th}$ percentile of the data must be less than 0.125 mg/L <b>PO<sub>4</sub>-P</b> (aquatic ecosystems: driver). Ensure that <b>turbidity/clarity or TSS levels</b> stay within Acceptable limits: A small change from present with minor silting of habitats and turbidity loads; or <10% change from background TSS levels (aquatic ecosystems: driver). Meet <b>faecal coliform and</b> <i>E.coli</i> <b>targets</b> for recreational (full contact) use: Meet the TWQR of 0 - 130 counts per 100 ml (DWAF, 1996b).				
MRU Komati E	X13K-01114	Ensure that <b>electrical conductivity (salt) levels</b> are within Tolerable limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 85 mS/m (aquatic ecosystems: driver).				
	X13K-01038	Ensure that <b>temperatures</b> stay within Acceptable limits: A moderate change to instream temperatures should occur infrequently, i.e. vary by no more than 2°C. Highly temperature sensitive species will occur in lower abundances (aquatic ecosystems: driver).				
	X13L-01027	Ensure that <b>nutrient levels</b> are within Tolerable limits: 50 <sup>°°</sup> percentile of the data must be less than 0.125 mg/L <b>PO<sub>4</sub>-P</b> (aquatic ecosystems: driver). Ensure that <b>turbidity/clarity or TSS levels</b> stay within Acceptable limits: A moderate change from present with temporary high sediment loads and turbidity.				
	X13L-00995	TWQR of 0 - 130 counts per 100 ml (DWAF, 1996b). Ensure that <b>toxics</b> are within the CEV limits: 95 <sup>th</sup> percentile of the data must be within the CEV for toxics or the B category in DWAF (2008).				

L TWQR = Target Water Quality Range (DWAF, 1996a). DWAF (1996a): South African Water Quality Guidelines: Volume 7: Aquatic Ecosystems. DWAF (1996b): South African water quality guidelines. Volume 2: Recreational Use.

#### Table 12: RIVERS: Summary of key WATER QUALITY RQOs in WQ priority RUs of the **CROCODILE RIVER System (X2)**

RUs	SQ number	Water Quality RQOs					
		IUA X2-3					
MRU Elan A	X21F-01046	Ensure that <b>electrical conductivity (salt) levels</b> are within Ideal limits: $95^{th}$ percentile of the data must be less than or equal to 30 mS/m (aquatic ecosystem driver). Ensure that <b>nutrient levels</b> are within Acceptable limits: $50^{th}$ percentile of the data must be less than 0.025 mg/L <b>PO<sub>4</sub>-P</b> (aquatic ecosystems: driver).					
	X21F-01081	Meet <b>faecal coliform and</b> <i>E.coli</i> <b>targets</b> for recreational (full contact) use: Meet the TWQR of 0 - 130 counts per 100 ml (DWAF, 1996b). Ensure that <b>toxics</b> are within Ideal limits or A categories or TWQR <sup>1</sup> : 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008). Ensure that <b>pH</b> stays within Ideal limits: 5 <sup>th</sup> and 95 <sup>th</sup> percentiles of pH data must be					
	X21G-01037 ER 1	between 6.5 and 8.0 (aquatic ecosystems: driver). Ensure that <b>Cr-VI levels</b> are within Ideal limits or A categories: 95 <sup>th</sup> percentile of the data must be less than 0.014 mg/L Cr-VI (aquatic ecosystems: driver). Ensure that <b>Mn levels</b> are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR of 0.180 mg/L Mn (aquatic ecosystems: driver).					
RU C7	X21F-01100	Ensure that <b>electrical conductivity (salt) levels</b> are within Ideal limits: $95^{th}$ percentile of the data must be less than or equal to 30 mS/m (aquatic ecosystems: driver). Ensure that <b>nutrient levels</b> are within Acceptable limits: $50^{th}$ percentile of the data must be less than 0.025 mg/L <b>PO<sub>4</sub>-P</b> (aquatic ecosystems: driver). Meet <b>faecal coliform and</b> <i>E.coli</i> <b>targets</b> for recreational (full contact) use: Meet the					
L	1						

RUs	SQ number	Water Quality RQOs					
		TWQR of 0 - 130 counts per 100 ml (DWAF, 1996b). Ensure that <b>toxics</b> are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008)					
		Ensure that <b>pH</b> stays within Ideal limits: 5 <sup>th</sup> and 95 <sup>th</sup> percentiles of pH data must be between 6.5 and 8.0 (aquatic ecosystems: driver). Ensure that <b>Cr-VI levels</b> are within Ideal limits or A categories: 95 <sup>th</sup> percentile of the data must be less than 0.014 mg/L Cr-VI (aquatic ecosystems: driver). Ensure that <b>Mn levels</b> are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR of 0.180 mg/L Mn (aquatic ecosystems: driver).					
		IUA X2-4					
	X21G-1073	Ensure that <b>electrical conductivity (salt) levels</b> are within Acceptable limits: $95^{\text{th}}$ percentile of the data must be less than or equal to 55 mS/m (aquatic ecosystems: driver). Ensure that <b>nutrient levels</b> are within Acceptable limits: $50^{\text{th}}$ percentile of the data must be less than 0.025 mg/L <b>PO</b> _4- <b>P</b> (aquatic ecosystems: driver).					
Elan B	X21J-01013	Ensure that <b>toxics</b> are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008). Ensure that <b>turbidity/clarity or TSS levels</b> stay within Acceptable limits: A moderate					
		change from present with temporary high sediment loads and turbidity.					
		IUA X2-5					
MDU	X21K-01035 ER 2	percentile of the data must be less than or equal to 55 mS/m (aquatic ecosystems: driver). Ensure that <b>nutrient levels</b> are within Acceptable limits: 50 <sup>th</sup> percentile of the data					
Elan B	X21K-00997	Ensure that <b>toxics</b> are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008). Ensure that <b>turbidity/clarity or TSS levels</b> stay within Acceptable limits: A moderate change from present with temporary high sediment loads and turbidity.					
		IUA X2-6 AND PART OF IUA X2-9					
	X22B-00987	Ensure that <b>electrical conductivity (salt) levels</b> are within Acceptable limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 55 mS/m (aquatic ecosystems: driver)					
	X22B-00888	Ensure that <b>nutrient levels</b> are within Acceptable limits: $50^{\text{th}}$ percentile of the data must be less than 0.025 mg/L <b>PO<sub>4</sub>-P</b> (aquatic ecosystems: driver).					
	X22C-00946	Meet <b>faecal coliform and <i>E.coli</i> targets</b> for recreational (full contact) use: Meet th TWQR of 0 - 130 counts per 100 ml (DWAF, 1996b).					
	X22J-00993	Ensure that <b>toxics</b> are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAE (2008). Ensure that <b>Mn lovels</b> are within Ideal limits or A categories or TWQR:					
MRU	X22J-00958	95 <sup>th</sup> percentile of the data must be within the TWQR of 0.180 mg/L Mn (aquatic ecosystems: driver).					
Croc C	X22K-00981	Ensure that <b>turbidity/clarity or TSS levels</b> stay within Acceptable limits: A moderate change from present with temporary high sediment loads and turbidity.					
	X22J-00958	Ensure that <b>electrical conductivity (salt) levels</b> are within Acceptable limits: 95 <sup>°°</sup> percentile of the data must be less than or equal to 55 mS/m (aquatic ecosystems: driver). Ensure that <b>nutrient levels</b> are within Acceptable limits: 50 <sup>th</sup> percentile of the data must be less than 0.025 mg/L <b>PO</b> <sub>4</sub> - <b>P</b> (aquatic ecosystems: driver).					
	X22K-00981	Meet <b>faecal coliform and</b> <i>E.coli</i> <b>targets</b> for recreational (full contact) use: Meet the TWQR of 0 - 130 counts per 100 ml (DWAF, 1996b). Ensure that <b>toxics</b> are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008).					
		Ensure that toxics are within Ideal limits or A categories or TMOR: 05 <sup>th</sup> percentile of					
RU C12	X22C-01004	the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008). Ensure that <b>Mn levels</b> are within Ideal limits or A categories or TWQR:					

RUs	SQ number	Water Quality RQOs				
		95 <sup>th</sup> percentile of the data must be within the TWQR of 0.180 mg/L Mn (aquatic				
		Ecosystems: driver). Ensure that <b>turbidity/clarity or TSS levels</b> stay within Acceptable limits: A moderate change from present with temporary high sediment loads and turbidity.				
RU C14	X22H-00836	Ensure that <b>electrical conductivity (salt) levels</b> are within Acceptable limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 55 mS/m (aquatic ecosystems: driver). Ensure that <b>nutrient levels</b> are within Tolerable limits: 50 <sup>th</sup> percentile of the data must be less than 0.125 mg/L <b>PO<sub>4</sub>-P</b> (aquatic ecosystems: driver). Meet <b>faecal coliform and</b> <i>E.coli</i> <b>targets</b> for recreational (full contact) use: Meet the TWQR of 0 - 130 counts per 100 ml (DWAF, 1996b). Ensure that <b>toxics</b> are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008).				
RU C16	X23B-01052	Ensure that <b>electrical conductivity (salt) levels</b> are within Ideal limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 30 mS/m (aquatic ecosystems: driver). Ensure that <b>nutrient levels</b> are within Acceptable limits: 50 <sup>th</sup> percentile of the data must be less than 0.025 mg/L <b>PO</b> <sub>4</sub> - <b>P</b> (aquatic ecosystems: driver). Ensure that <b>turbidity/clarity or TSS levels</b> stay within Acceptable limits: A moderate change from present with temporary high sediment loads and turbidity.				
RU C17	X23C-01098	Ensure that <b>electrical conductivity (salt) levels</b> are within Ideal limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 30 mS/m (aquatic ecosystems: driver). Ensure that <b>nutrient levels</b> are within Tolerable limits: 50 <sup>th</sup> percentile of the data				
	X23E-01154	Meet <b>faecal coliform and</b> <i>E.coli</i> <b>targets</b> for recreational (full contact) use: Meet the TWQR of 0 - 130 counts per 100 ml (DWAF, 1996b). Ensure that <b>toxics</b> are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in				
	X23F-01120	Ensure that <b>As levels</b> are within Ideal limits or A categories: 95 <sup>th</sup> percentile of the data must be less than 0.020 mg/L As (aquatic ecosystems: driver). Ensure that <b>(free) Cn levels are</b> within Ideal limits or A categories: 95 <sup>th</sup> percentile of the data must be less than 0.004 mg/L Cn (aquatic ecosystems: driver).				
		IUA X2-11				
MRU Croc D	X24C-01033	Ensure that <b>electrical conductivity (sait) levels</b> are within Acceptable limits: $95^{\circ\circ}$ percentile of the data must be less than or equal to $85 \text{ mS/m}$ (aquatic ecosystems: driver). Ensure that <b>nutrient levels</b> are within Tolerable limits: $50^{\circ\circ}$ percentile of the data must be less than 0.125 mg/L <b>PO</b> <sub>4</sub> - <b>P</b> (aquatic ecosystems: driver). Meet <b>faecal coliform and</b> <i>E.coli</i> <b>targets</b> for recreational (full contact) use: Meet the TWQR of 0 - 130 counts per 100 ml (DWAF, 1996b). Ensure that <b>turbidity/clarity or TSS levels</b> stay within Acceptable limits: A moderate change from present with temporary high sediment loads and turbidity.				
		IUA X2-12 AND X2-13				
RU C19	X24B-00903	Ensure that <b>electrical conductivity (sait) levels</b> are within Acceptable limits: $95^{\text{th}}$ percentile of the data must be less than or equal to 55 mS/m (aquatic ecosystems: driver). Ensure that <b>nutrient levels</b> are within Tolerable limits: $50^{\text{th}}$ percentile of the data must be less than 0.125 mg/L <b>PO</b> <sub>4</sub> - <b>P</b> (aquatic ecosystems: driver). Meet <b>faecal coliform and</b> <i>E.coli</i> <b>targets</b> for recreational (full contact) use: Meet the TWQR of 0 - 130 counts per 100 ml (DWAF, 1996b). Ensure that <b>toxics</b> are within Ideal limits or A categories or TWQR: $95^{\text{th}}$ percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008).				

1 TWQR = Target Water Quality Range (DWAF, 1996a). DWAF (1996a): South African Water Quality Guidelines: Volume 7: Aquatic Ecosystems. DWAF (1996b): South African water quality guidelines. Volume 2: Recreational Use.

## Table 13:RIVERS: Summary of key WATER QUALITY RQOs in WQ priority RUs of the<br/>SABIE AND SAND RIVER System (X3)

RUs	SQ number	Water quality RQOs				
		IUA X3-4				
RU S6	X31J-00774	Ensure that <b>nutrient levels</b> are within Acceptable limits: $50^{th}$ percentile of the data must be less than 0.025 mg/L <b>PO</b> <sub>4</sub> - <b>P</b> (aquatic ecosystems: driver). Ensure that <b>electrical conductivity (salt) levels</b> are within Ideal limits: $95^{th}$ percentile of the data must be less than or equal to 30 mS/m (aquatic ecosystems: driver). Ensure that <b>turbidity/clarity or TSS levels</b> stay within Acceptable limits: A moderate change from present with temporary high sediment loads and turbidity (aquatic				
	X31J-00835	ecosystems: driver). Meet <b>faecal coliform and</b> <i>E.coli</i> <b>targets</b> for recreational (full contact) use: Meet the TWQR of 0 - 130 counts per 100 ml (DWAF, 1996b). Ensure that <b>toxics</b> are within Ideal limits or A categories or TWQR <sup>1</sup> : 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008).				
RU S9	X31K-00713	Ensure that <b>nutrient levels</b> are within Acceptable limits: $50^{th}$ percentile of the data must be less than 0.025 mg/L <b>PO</b> <sub>4</sub> - <b>P</b> (aquatic ecosystems: driver). Ensure that <b>electrical conductivity (salt) levels</b> are within Ideal limits: $95^{th}$ percentile of the data must be less than or equal to 30 mS/m (aquatic ecosystems: driver). Ensure that <b>turbidity/clarity or TSS levels</b> stay within Acceptable limits: A moderate change from present with temporary high sediment loads and turbidity (aquatic ecosystems: driver). Meet <b>faecal coliform and</b> <i>E.coli</i> <b>targets</b> for recreational (full contact) use: Meet the TWQR of 0 - 130 counts per 100 ml (DWAF, 1996b). Ensure that <b>toxics</b> are within Ideal limits or A categories or TWQR: $95^{th}$ percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008).				
		IUA X3-5				
	X33A-00731	Ensure that <b>nutrient levels</b> are within Tolerable limits: 50 <sup>th</sup> percentile of the data must				
	X33A-00737	Ensure that electrical conductivity (salt) levels are within Ideal limits: 95 <sup>th</sup> percentile				
	X33B-00784	of the data must be less than or equal to 42 mS/m (aquatic ecosystems: driver). Ensure that <b>turbidity/clarity or TSS levels</b> stay within Acceptable limits: A moderate				
Sabie C	X33B-00804	change from present with temporary high sediment loads and turbidity (aquatic				
	X33B-00829	Ensure that <b>toxics</b> are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of				
	X33D-00811	DWAF (2008). Meet <b>faecal coliform and </b> <i>E.coli</i> <b>targets</b> for recreational (full contact)				
	X33D-00861	use: Meet the TWQR of 0 - 130 counts per 100 ml (DWAF, 1996b).				
		IUA X3-7				
RU S13	X32E-00639	Ensure that <b>nutrient levels</b> are within Tolerable limits: 50 <sup>th</sup> percentile of the data must be less than 0.125 mg/L <b>PO<sub>4</sub>-P</b> (aquatic ecosystems: driver). Ensure that <b>periphyton chl-a levels</b> are within Tolerable limits: 50 <sup>th</sup> percentile of the data must be less than or equal to 84 mg/m <sup>2</sup> (aquatic ecosystems: driver). Ensure that <b>electrical conductivity (salt) levels</b> are within Ideal limits: 95 <sup>th</sup> percentile of the data must be less than or equal to 42 mS/m (aquatic ecosystems: driver). Ensure that <b>turbidity/clarity or TSS levels</b> stay within Acceptable limits: A moderate change from present with temporary high sediment loads and turbidity (aquatic ecosystems: driver). Meet <b>faecal coliform and</b> <i>E.coli</i> <b>targets</b> for recreational (full contact) use: Meet the TWQR of 0 - 130 counts per 100 ml (DWAF, 1996b). Ensure that <b>toxics</b> are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008).				
		IUA X3-8				

RUs	SQ number	Water quality RQOs
RU S14	X32B-00551	Ensure that <b>nutrient levels</b> are within Acceptable limits: 50 <sup>th</sup> percentile of the data must be less than 0.025 mg/L <b>PO<sub>4</sub>-P</b> (aquatic ecosystems: driver). Ensure that <b>turbidity/clarity or TSS levels</b> stay within Acceptable limits: A small change from present with minor silting of habitats and turbidity loads; or <10% change from background TSS levels (aquatic ecosystems: driver). Meet <b>faecal coliform and</b> <i>E.coli</i> <b>targets</b> for recreational (full contact) use: Meet the TWQR of 0 - 130 counts per 100 ml (DWAF, 1996b). Ensure that <b>toxics</b> are within Ideal limits or A categories or TWQR: 95 <sup>th</sup> percentile of the data must be within the TWQR for toxics or the upper limit of the A category in DWAF (2008).
1 T M O D - 1	Target Water Oue	lity Papago (D) M A E (100 Ga)

1 TWQR = Target Water Quality Range (DWAF, 1996a).

DWAF (1996a): South African Water Quality Guidelines: Volume 7: Aquatic Ecosystems.

DWAF (1996b): South African water quality guidelines. Volume 2: Recreational Use.

Table 14 to table 16 provides the habitat and biota RQOs for priority wetlands in each IUA. The locality of the wetlands is linked to the river RU and biophysical nodes. The target EC is provided for the relevant wetlands in the Resource Unit. All target EC are set to maintain the PES and are therefore immediately applicable. It must be noted, that although these wetlands can be of high priority, the level of RQOs provided are at moderate level due to a lack of detailed information such as baseflow conditions and as none of the scenarios will impact on the wetlands.

Note that the following RQOs for the wetlands are standard and relevant for all RUs:

- Maintain species composition and vegetative cover.
- No increase in the cover or abundance of woody alien invasive species.
- No increase in wetland fragmentation.

Table 14:	WETLANDS:	Summary	of RQOs	for	priority	wetlands	in t	he K	OMATI	RIVER
	System (X1)									

RUs	SQ number	Target EC	Wetland RQO			
			X1-1			
	X11A-01354	С	Maintain C EC(>62%).			
RU K1	X11A-01248	С	Valley bottom wetland.			
RU K2	X11B-01272	B/C	mprove to B/C(>78%) by increasing buffer zones where wetlands are not artificial. Cessation of land use encroachment on non-artificial channeled valley bottom wetlands.			
			X1-3			
	X11C-01147	С	Maintain C EC (>62%). Cessation of land use encroachment on pans,			
NO NS	X11D-01129	С	seeps and non-artificial channeled valley bottom wetlands.			
RU K4	X11E-01237	В	Maintain wetland EC of B/C (>78%). Cessation of land use encroachment on channeled valley bottom wetlands.			
RU K5	X11G-01143	С	Maintain wetland EC of C (>62%). Cessation of land use encroachment on seeps.			
			X1-6			
	X12A-01305	В				
RU K8	X12C-01271	В	Cessation of land use, urban and forestry encroachment on seeps and channeled valley bottom wetlands (>62%, >62%, >78%)			
	X12D-01235	B/C				
			X1-9			
RU K11	X13J-01205	D	Maintain wetland EC of D (>42%). Cessation of land use and agricultural encroachment on floodplain and non-artificial channeled valley bottom wetlands.			

### Table 15:WETLANDS: Summary of RQOs for priority wetlands in the CROCODILE<br/>RIVER System (X2)

RUs	SQ number	Target EC	Target Wetland RQO				
	IUA X2-1						
MRU Croc A	X21A-00930	В	Improve only wetlands not already in B (>82%) category by improving wetland buffers, removing alien woody species within wetlands, not increasing the amount of dams, rehabilitating dams not in use, reducing amount of dams if possible and the cessation of land use and forestry encroachment on wetlands. Note that this MRU includes Verloren Vlei which is already in a B EC.				
	X21B-00929	С	Maintain $C = C (62\%)$ See above				
KU CI	X21B-00898	С					
RU C2	X21C-00859	С	mprove to a C (62%) by improving buffer zones for wetlands especially with reference to agriculture. Cessation of land use and forestry encroachment on natural wetlands.				
			IUA X2-3				
MRU Elan A	X21F-01046	B/C	Improve to a B/C (78%) by removing agriculture from wetland areas. Cessation of land use and agricultural encroachment on natural wetlands (seeps and channelled valley bottom).				
			IUA X2-8				
RU C12	X22C-01004	B/C	Improve to a B/C (78%) by removing agriculture from wetland areas. Cessation of land use and forestry encroachment on natural wetland (seeps and channelled valley bottom).				
RU C14	X22H-00836	D	Maintain EC of a D (42%). Cessation of farm dam construction				
			IUA X2-10				
RU C17	X23E-01154	B/C	Maintain EC of a B/C (78%). Cessation of forestry encroachment on seeps.				

### Table 16:WETLANDS: Summary of RQOs for priority wetlands in the SABIE AND SAND<br/>RIVER System (X3)

RUs	SQ number	Target EC	Wetland RQO			
	IUA X3-7					
MRU Mut A	MRU Mut AX32D-00605 (EWR S6)CImprove to a C (62%) by improving wetland buffers and reduce overgrazing.					
	IUA X3-8					
MRU Sand A	X32A-00583 (EWR S7)	С	Improve to a C (62%) by improving wetland buffers and reduce overgrazing.			
RU S14	X32B-00551	С	Maintain wetland EC of C (62%). Cessation of land use encroachment on channeled valley bottom wetlands.			

Table 17 – 19 provides the groundwater RQOs based on the prioritisation and baseline assessment of the eleven Groundwater Units. The relevant RQO parameters used included water level, baseflow and water quality. The setting of water quantity related RQOs (i.e. water level and baseflow) is aimed at maintaining water levels within natural seasonal fluctuations ensuring sufficient yield for all users and to improve or maintain groundwater discharge to support low flow river requirements. The setting of water quality related RQOs is aimed at maintaining the groundwater quality in relation to its background/present level, or ensuring compliance with water

quality standards for domestic use, as this is the more stringent requirement for the variety of users in the Groundwater Unit.

IUA	Groundwater Unit	Component	Narrative RQO	Indicator/Measure	Numerical Criteria
X1-2 and X1-3	GU1-3	Quantity	Groundwater flow directions in the resource unit should not be reversed from it natural flow directions towards the drainage systems.	Flow measurement at EWR G1.	19.9 % nMAR <sup>1</sup>
X1-6 and X1-5	GU1-5			Flow measurement at EWR T1.	22.6 % nMAR <sup>1</sup>
X1-8 and X1-9	GU1-6			Flow measurement at EWR K3 and EWR L1.	9.9 and 11.7 % nMAR <sup>1</sup>
X1-6 and X1-5	GU1-5		No negative trend between peak drawdowns during dry seasons. Seasonal fluctuation to stay within natural range.	Water level - Depth to Groundwater Level at active monitoring boreholes using Groundwater Monitoring Guidelines*.	
X1-8 and X1-9	GU1-6	Aquifer			
All	All		Groundwater quality should be based on background groundwater quality. Sites that exceed the water use requirement <sup>#</sup> should not be allowed to deteriorate in water quality.	Background water quality per borehole/spring using Groundwater Monitoring Guidelines* Bi-annual monitoring.	
X1-1	GU1-1	Quality	Salinity levels should not increase. Concentrations must be maintained at levels to support domestic and ecological water users.	Salts - Electrical Conductivity. Bi-annual monitoring.	Electrical Conductivity ≤ 40 mS/m (based on quality dataset) <sup>2</sup> .
X1-6 and X1-5	GU1-5		Nitrate values in the GU must be maintained to support domestic water users.	Nutrients – Nitrate (as Nitrogen). Bi-annual monitoring.	Nitrate (as N)< 4 mg/l in recharge area (based on quality dataset) <sup>2</sup> .
X1-8 and X1-9	GU1-6		Nitrate values in the GU must be maintained to support domestic water users.	Nutrients – Nitrate (as Nitrogen). Bi-annual monitoring.	Nitrate (as N)< 5 mg/l in recharge area (based on quality dataset) <sup>2</sup> .

Table 17:	Summary	of RQOs for Groundwater in the Komati River Catcl	hment
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### Table 18: Summary of RQOs for Groundwater in the Crocodile River Catchment

IUA	GUs	Component	Narrative RQO	Indicator/Measure	Numerical Criteria
X2-2 and X2- 4	GU2-3	Quantity	Groundwater flow directions in the resource unit should not be reversed from it natural flow directions towards the drainage systems.	Flow measurement at EWR C3 and ER1.	30.1 and 4.97 % nMAR <sup>1</sup> .
X2-7, X2-5, X2-6, X2-8 and X2-9	GU2-4			Flow measurement at EWR C4.	9.07 % nMAR <sup>1</sup> .
X2-10	GUA2-5			Continuous flow measurement at EWR C7.	6.18 % nMAR <sup>1</sup> .
X2-2 and X2- 4	GU2-3		No negative trend between peak	Water level - Depth to	
X2-7, X2-5, X2-6, X2-8 and X2-9	GU2-4	Aquifer	drawdowns during dry seasons. Seasonal fluctuation to stay within	Groundwater Level at active monitoring boreholes using Groundwater Monitoring Guidelines*	
X2-10	GU2-5		natural range.	Monitoring Culdelines .	
All	All	Quality	Groundwater quality should be based on background groundwater quality. Sites that exceed the water use requirement <sup>#</sup> should not be allowed to deteriorate in water quality.	Background water quality per borehole/spring using Groundwater Monitoring Guidelines*.	
X2-2 and X2-	GU2-3		Salinity levels should not	Salts - Electrical	Electrical Conductivity ≤

#### GOVERNMENT GAZETTE, 22 JANUARY 2016

4		increase.	Conductivity. Bi-annual monitoring.	55mS/m (based on quality dataset) <sup>2</sup> .
X2-7, X2-5, X2-6, X2-8 and X2-9	GU2-4	Nitrate values mi maintained to su	ust be Nutrients – Nitrate (as pport Nitrogen).	Nitrate values in the recharge area should not
X2-10	GUA2-5	domestic water t	Bi-annual monitoring.	increase to >3mg/i .
X2-10	GUA2-5	Salinity levels sh increase. Concer must be maintair levels to support domestic and ec- water users.	ould not htrations hed at Salts - Electrical Conductivity. Bi-annual monitoring.	Electrical Conductivity ≤ 60 mS/m (based on quality dataset) <sup>2</sup> .

#### Table 19: Summary of RQOs for Groundwater in the Sabie-Sand River Catchment

IUA	GUs	Component	Narrative RQO	Indicator/Measure	Numerical Criteria
X3-1 and X3- 2	GU3-1	Quantity	Groundwater flow directions in the resource unit should not be reversed from it natural flow directions towards the drainage systems.	Flow measurement at EWR 1 and EWR 4.	12.88 and 14.35 % nMAR <sup>1</sup> .
X3-2, X3-4, X3-3 and X3- 6	GU3-2			Flow measurement at EWR 5 and EWR 3.	28.32 and 9.71 % nMAR <sup>1</sup> .
X3-7 and X3- 8	GU3-3			Flow measurement at EWR 7 and EWR 6.	11.14 and 13.38 % nMAR <sup>1</sup> .
X3-1 and X3- 2	GU3-1		No negative trend between peak drawdowns during dry seasons. Seasonal fluctuation to stay within natural range.	Water level - Depth to Groundwater Level at active monitoring boreholes using Groundwater Monitoring Guidelines*.	
X3-7 and X3- 8	GU3-3	Aquifer			
All	All		Groundwater quality should be based on background groundwater quality. Sites that exceed the water use requirement <sup>#</sup> should not be allowed to deteriorate in water quality.	Background water quality per borehole/spring using Groundwater Monitoring Guidelines*.	
X3-1 and X3- 2	GU3-1	Quality			Nitrate values in the recharge area should not increase to >2mg/l <sup>2</sup> .
X3-2, X3-4, X3-3 and X3- 6	GU3-2	Nitrate values must be maintained to support	Nutrients – Nitrate (as Nitrogen).	Nitrate (as N)<8mg/l in recharge area (based on	
X3-7 and X3- 8	GU3-3	J3-3	domestic water users.	Bi-annual monitoring.	quality dataset) <sup>2</sup> .
X3-4	GU3-4				Nitrate (as N)<6mg/l in recharge area (based on quality dataset) <sup>2</sup> .

\* - A Guideline for the Assessment, Planning and Management of Groundwater Resources in South Africa, DWAF (2008). \* - South African Water Quality Guidelines, DWAF (1996).

 <sup>- %</sup>mMAR is flow required at the nodes expressed as a percentage of the natural Mean Annual Runoff, Low flows.
 2 - It is generally recognised that the groundwater chemistry evolves along a flow path, e.g. from a fresh low mineralised bicarbonate water in recharge areas to an older, higher mineralised water (water type dependent on amongst other factors the underlying geology) in discharge areas, where it often undergoes additional concentration increases due to evapotranspiration. Additional factors influencing the groundwater quality over relatively short distances include the occurrence of preferential flow paths (along fractures) or the proximity to pollution sources. The background quality observed at one monitoring site is therefore not necessarily applicable as a background value for another monitoring location.















Figure 1.4: X4 Catchment IUAs and Biophysical Nodes