ANNEXURE A

WATER RESOURCE CLASSES AND RESOURCE QUALITY OBJECTIVES FOR THE LEPHALALA, MOGALAKWENA, SAND, NZHELELE AND LUVUVHU CATCHMENTS IN THE LIMPOPO WATER MANAGEMENT AREA AND THE SHINGWEDZI CATCHMENT IN THE OLIFANTS WATER MANAGEMENT AREA

Table 1. Water Resource Classes for the secondary catchments A5, A6, A7, A8 and A9 in the Limpopo Water Management Area and B9 in the Olifants Water Management Area

Integrated Units of Analysis	Catchment	Recommended Water Resource Class
Upper Lephalala	A50A, A50B, A50C, A50D, A50E, A50F	II
Lower Lephalala	A50G, A50H	II
Kalkpan Se Loop	A50J,A63C	I
Upper Nyl & Sterk	A61A, A61B, A61C, A61D, A61E, A61F, A61G, A61H, A61J	II
Mogalakwena		II
Mapungubwe	A62A, A62B, A62C, A62D, A62E, A62F, A62G, A62H, A62J, A63A, A63B, A63D	II
Upper Sand	A63E, A71L	III
Lower Sand	A71A, A71B, A71C, A71E, A71F	II
Nzhelele/Ṅwaneḍi	A71D, A71G, A71H, A71J, A71K, A72A, A72B	II
Upper Luvuvhu	A80A, A80B, A80C, A80D, A80E, A80F, A80G, A80H, A80J	II
Lower Luvuvhu/Mutale	A91A, A91B, A91C, A91D, A91E, A91F, A91G	II
Shingwedzi	A91H, A91J, A91K, A92A, A92B, A92C, A92D	II

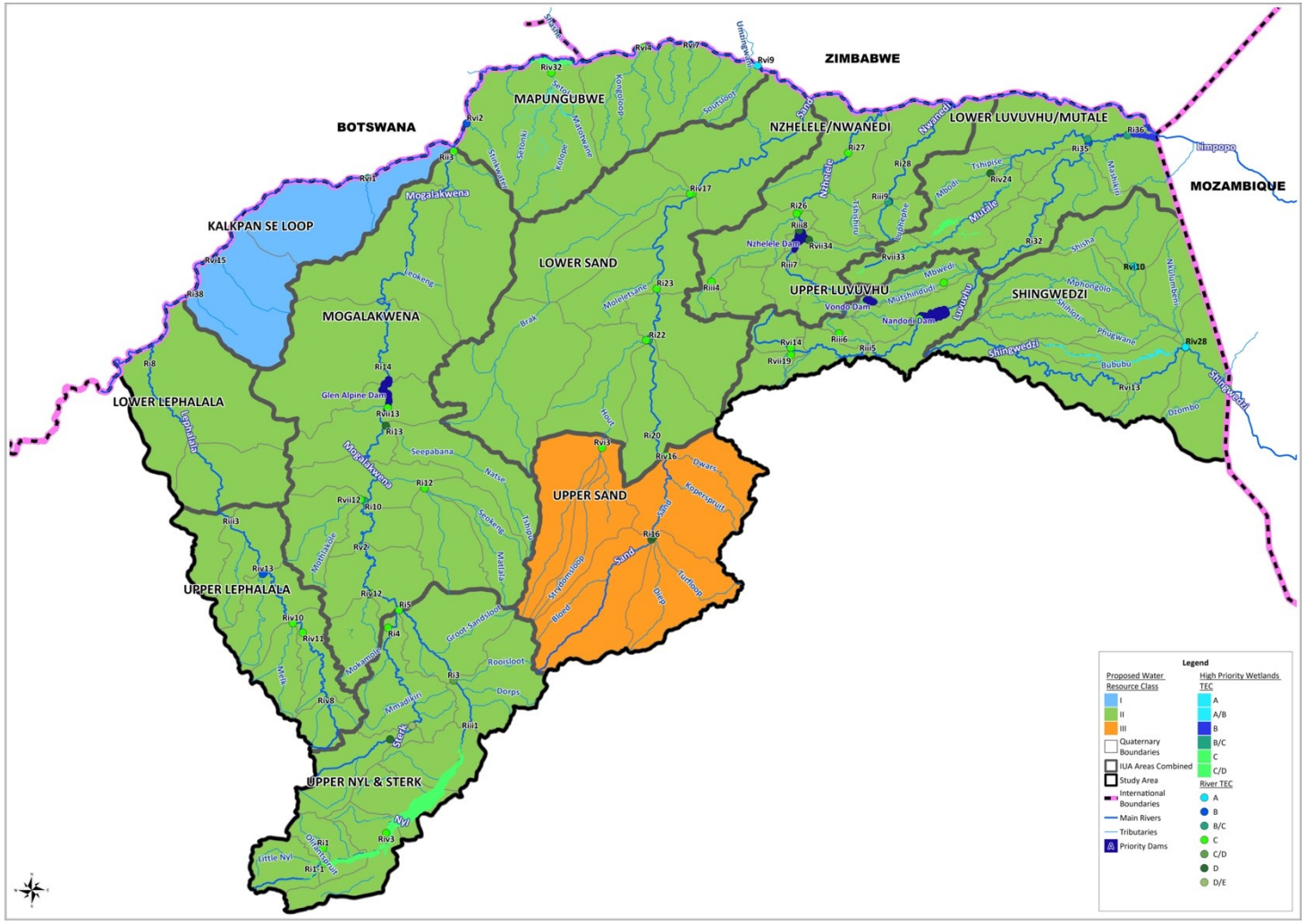

Figure 1. Proposed Water Resource Class for the secondary catchments A5, A6, A7, A8 and A9 in the Limpopo Water Management Area and B9 in the Olifants Water Management Area

Table 2. Integrated Units of Analysis delineated for the secondary catchments A5, A6, A7, A8 and A9 in the Limpopo Water Management Area and B9 in the Olifants Water Management Area

IUA name	Quaternary catchments
Upper Lephalala	A50A, A50B, A50C, A50D, A50E, A50F
Lower Lephalala	A50G, A50H
Kalkpan se Loop	A50J,A63C
Upper Nyl & Sterk	A61A, A61B, A61C, A61D, A61E, A61F, A61G, A61H, A61J
Mogalakwena	A62A, A62B, A62C, A62D, A62E, A62F, A62G, A62H, A62J, A63A, A63B, A63D
Mapungubwe	A63E, A71L
Upper Sand	A71A, A71B, A71C, A71E, A71F
Lower Sand	A71D, A71G, A71H, A71J, A71K, A72A, A72B
Nzhelele/Ṅwaneḍi	A80A, A80B, A80C, A80D, A80E, A80F, A80G, A80H, A80J
Upper Luvuvhu	A91A, A91B, A91C, A91D, A91E, A91F, A91G
Lower Luvuvhu/Mutale	A91H, A91J, A91K, A92A, A92B, A92C, A92D
Shingwedzi	B90A, B90B, B90C, B90D, B90E, B90F, B90G, B90J

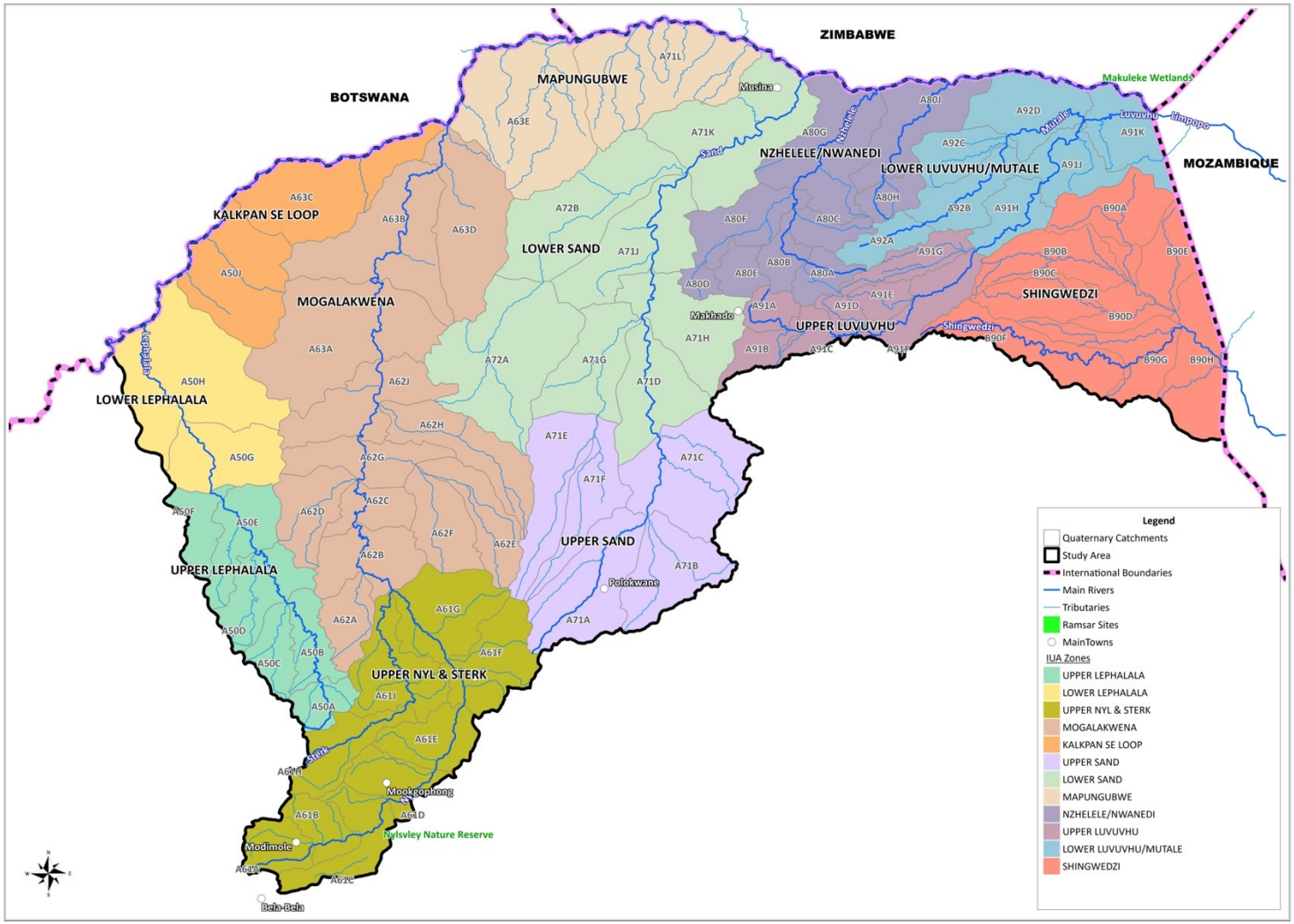

Figure 2. Integrated Units of Analysis delineated for the secondary catchments A5-A9 in the Limpopo WMA and B9 in the Olifants WMA

Table 3. Summary of Water Resource Classes per Integrated Unit of Analysis and Ecological Categories

Water Resource Class	River Resource Unit	Biophysical Node Name	Sub-quaternary reach	River Name	nMAR	PES	EI	ES	REC	TEC
Upper Lephalala IUA										
II	RRU-Riv8	Riv8	A50A-00354	Lephalala	32.56	B	High	High	B/C	B/C
II	**RRU-Riv11**	**Riv11**	**A50B-00262**	**Lephalala**	**67.63**	**C**	**High**	**Very High**	B/C	**C**
II	RRU-Riv10	Riv10	A50C-00273	Melk	14.86	C	High	Very High	C	C
II	RRU-Riv13	Riv13	A50D-00237	Boklandspruit	13.27	B	High	Very High	B	B
II	RRU-Riii3	Riii3	A50H-00110	Lephalala	122.93	D	High	High	C/D	D
Lower Lephalala IUA										
II	**RRU-Ri8**	**Ri8**	**A50H-00110**	**Lephalala**	**139.46**	**C**	**High**	**High**	**C**	**C**
Kalkpan se Loop IUA										
I	RRU-Ri38	Ri38	A50J-00073	Kalkpan Se Loop	2.08	B	Moderate	Very Low	B	B
I	RRU-Rvi15	Rvi15	A50J-00061	No Name	1.64	B	Moderate	Very Low	B	B
I	**RRU-Rvi1**	**Rvi1**	**A63C-00033**	**Rietfontein**	**0.19**	**B/C**	**Moderate**	**Very Low**	**B/C**	**B/C**
Upper Nyl/Sterk IUA										
II	RRU-Rvii4	Rvii4	A61H-00395	Sterk	35.56	E	Moderate	High	D	D
II	RRU-Rv1	Rv1	A61H-00395	Sterk	39.60	E	Moderate	High	D	D/E
II	RRU-Ri4	Ri4	A61J-00267	Sterk	58.17	C	Moderate	High	C	C
II	**RRU-Ri1**	**Ri1**	**A61B-00489**	**Olifantspruit**	**8.11**	**C**	**High**	**Very High**	**B/C**	**C**
II	RRU-Ri1-1	Ri1-1	A61B-00552	Nyl	23.80	C	Moderate	High	C	C
II	RRU-Riv3	Riv3	A61C-00501	Nyl	23.44	C	High	High	B/C	C
II	RRU-Riii1	Riii1	A61E-00386	Nyl	32.70	D	Moderate	Moderate	D	C/D

Water Resource Class	River Resource Unit	Biophysical Node Name	Sub-quaternary reach	River Name	nMAR	PES	EI	ES	REC	TEC
II	RRU-Ri3	Ri3	A61G-00297	Mogalakwena	52.78	D	Moderate	Moderate	D	C/D
II	**RRU-Ri5**	**Ri5**	**A61G-00248**	**Upper Mogalakwena**	**133.27**	**C**	**Moderate**	**Moderate**	**C**	**C**
Mogalakwena IUA										
II	RRU-Riv12	Riv12	A62B-00223	Mogalakwena	136.05	C	Moderate	Moderate	C	C
II	RRU-Ri6	Ri6	A62A-00253	Mokamole	15.01	D	High	High	C/D	D
II	RRU-Rv2	Rv2	A62B-00188	Mogalakwena	161.14	C	High	High	B/C	B/C
II	RRU-Rvii12	Rvii12	A62D-00179	Klein Mogalakwena	5.04	C	Moderate	High	C	C
II	RRU-Ri10	Ri10	A62C-00188	Mogalakwena	165.59	C	High	High	B/C	B/C
II	RRU-Ri12	Ri12	A62G-00167	Matlalane	9.65	C	Moderate	Very Low	C	C
II	RRU-Ri13	Ri13	A62H-00148	Seepabana	4.71	D	Moderate	Very Low	D	D
II	RRU-Rvii13	Rvii13	A62J-00143	Mogalakwena	190.98	C	Moderate	Moderate	C	C
II	**RRU-Ri14**	**Ri14**	**A63A-00071**	**Middle Mogalakwena**	**193.27**	**C**	**High**	**Moderate**	**C**	**C**
II	**RRU-Rii3**	**Rii3**	**A63D-00034**	**Mogalakwena**	**205.52**	**C**	**Moderate**	**Moderate**	**C**	**C**
Mapungubwe IUA										
II	RRU-Rvi2	Rvi2	A63E-00011	Stinkwater	0.24	C	High	High	B/C	B

Water Resource Class	River Resource Unit	Biophysical Node Name	Sub-quaternary reach	River Name	nMAR	PES	EI	ES	REC	TEC
II	**RRU-Riv32**	**Riv32**	**A63E-00008**	**Kolope**	**2.06**	**C**	**Moderate**	**Low**	B/C	**C**
II	RRU-Rvi4	Rvi4	A71L-00005	Kongoloop	3.14	C	Moderate	Very Low	C	C
II	RRU-Rvi7	Rvi7	A71L-00003	No Name	0.20	C	High	Very Low	C	B
II	RRU-Rvi9	Rvi9	A71L-00015	Soutsloot	1.10	A	Moderate	Very Low	A	A
Upper Sand IUA										
II	RRU-Rvi3	Rvi3	A71G-00131	Hout	6.92	C	Moderate	Low	C	C
II	RRU-Ri21	Ri21	A71G-00107	Hout	11.70	C	Moderate	Moderate	C	C/D
III	RRU-Ri16	Ri16	A71A-00211	Sand	11.05	D	Moderate	Moderate	D	D/E
III	RRU-Ri17	Ri17	A71B-00214	Diep	7.83	D	Moderate	Low	D	D
III		Riv16	A71C-00156	Dwars	2.43	C	Moderate	Moderate	C	C
Lower Sand IUA										
III	**RRU-Ri20**	**Ri20**	**A71D-00118**	**Sand**	**27.45**	**C**	**Moderate**	**Moderate**	**C**	**C**
III	RRU-Ri22	Ri22	A71D-00118	Sand	31.59	C	Moderate	Moderate	C	B/C
II	RRU-Ri23	Ri23	A71H-00088	Sand	52.35	C	High	High	B/C	C
II	RRU-Ri24	Ri24	A71J-00055	Sand	62.54	C	Moderate	Moderate	C	C
II	RRU-Riv17	Riv17	A72B-00038	Brak	13.55	C	Moderate	Moderate	C	C
II	**RRU-Ri25**	**Ri25**	**A71K-00019**	**Sand**	**85.32**	**C**	**High**	**Moderate**	**C**	**C**
Nzhelele and Nwanedi IUA										
II	RRU-Riii4	Riii4	A80D-00075	Mutamba	7.14	C	High	Very High	B/C	C
II	RRU-Riv23	Riv23	A80F-00063	Mutamba	18.61	C	Moderate	Moderate	C	C
II	RRU-Riii7	Riii7	A80B-00069	Nzhelele	14.81	D	Moderate	High	D	D
II	RRU-Rvii34	Rvii34	A80C-00068	Mafungudi	6.68	D	High	High	C/D	D
II	RRU-Riii8	Riii8	A80F-00068	Nzhelele	76.26	D	High	High	C/D	D
II	RRU-Ri26	Ri26	A80G-00053	Nzhelele	94.92	C	High	Moderate	C	C

Water Resource Class	River Resource Unit	Biophysical Node Name	Sub-quaternary reach	River Name	nMAR	PES	EI	ES	REC	TEC
II	RRU-Riv33	Riv33	A80G-00054	Tshishiru	1.27	C/D	Moderate	Low	C/D	C
II	**RRU-Ri27**	**Ri27**	**A80G-00026**	**Nzhelele**	**99.73**	**C**	**High**	**High**	**C**	**C**
II	RRU-Riii9	Riii9	A80H-00064	Ṅwaneḍi	21.85	B	High	Very High	A/B	B/C
II	RRU-Riii10	Riii10	A80H-00060	Luphephe	10.17	C	High	High	B/C	B
II	**RRU-Ri28**	**Ri28**	**A80J-00028**	**Ṅwaneḍi**	**33.47**	**C**	**High**	**High**	**C**	**C**
Upper Luvuvhu IUA										
II	RRU-Rvi14	Rvi14	A91A-00105	Luvuvhu	22.60	C	Moderate	High	C	C
II	RRU-Rvii19	Rvii19	A91B-00120	Doringspruit	11.58	C	Moderate	High	C	C
II	RRU-Riii5	Riii5	A91C-00115	Luvuvhu	75.34	C	Moderate	High	B	B
II	**RRU-Riii6**	**Riii6**	**A91D-00108**	**Latonyanda**	**23.55**	**C**	**Moderate**	**Very High**	**C**	**C**
II	RRU-Riv18	Riv18	A91E-00103	Dzindi	69.63	D	High	Very High	C/D	D
II	RRU-Riv19	Riv19	A91F-00111	Luvuvhu	172.98	C	Moderate	High	C	C
II	RRU-Rvii24	Rvii24	A91F-00093	Luvuvhu	247.68	D	Moderate	High	D	D
II	**RRU-Ri30**	**Ri30**	**A91G-00091**	**Mutshindudi**	**55.81**	**C**	**Moderate**	**High**	**C**	**C**
Lower Luvuvhu / Mutale IUA										
II	**RRU-Ri32**	**Ri32**	**A91H-00045**	**Luvuvhu**	**398.53**	**C**	**High**	**High**	**B/C**	**C**
II	RRU-Rvii33	Rvii33	A92B-00051	Mutale	73.89	C	High	High	B/C	C
II	**RRU-Ri33**	**Ri33**	**A92B-00051**	**Middle Mutale**	**124.65**	**C**	**High**	**High**	**C**	**C**
II	RRU-Riv24	Riv24	A92C-00049	Mbodi	4.49	D	Moderate	Very Low	D	D
II	**RRU-Ri34**	**Ri34**	**A92D-00030**	**Lower Mutale**	**154.95**	**C**	**High**	**High**	**C**	**B/C**
II	RRU-Ri35	Ri35	A91J-00040	Luvuvhu	416.74	B	High	High	A/B	B
II	**RRU-Ri36**	**Ri36**	**A91K-00035**	**Luvuvhu**	**573.18**	**C**	**Very High**	**High**	**C**	**B/C**

Water Resource Class	River Resource Unit	Biophysical Node Name	Sub-quaternary reach	River Name	nMAR	PES	EI	ES	REC	TEC
Shingwedzi River IUA										
II	RRU-Rvi10	Rvi10	B90D-00067	Shisha	7.10	A	High	Moderate	A	A
II	RRU-Riv28	Riv28	B90H-00113	Mphongolo	39.31	A	High	Very Low	A	A
II	RRU-Rvi13	Rvi13	B90F-00114	Shingwedzi	18.67	C	High	Moderate	C	C
II	RRU-Riv27	Riv27	B90G-00124	Shingwedzi	33.80	A	High	Low	A	A
II	**RRU-Ri37**	**Ri37**	**B90H-00145**	**Shingwedzi**	**89.63**	**C**	**High**	**High**	**B/C**	**C**

Table 4. Resource Units selected for determination for Resource Quality Objectives in the secondary catchments A5-A9 in the Limpopo WMA and B9 in the Olifants WMA

IUA	River Resource Unit	Dam Resource Unit	Wetland Resource Unit	Groundwater Resource Unit
Upper Lephalala	RRU-Riv11 A50B-00262			
	RRU-Riii3 - A50H-00110			
Lower Lephalala	RRU-Ri8 A50H-00110			A50-2 (A50G)
				A50-3 (A50H)
Kalkpan se Loop	RRU-Rvi1 A63C-00033			A50-4 (A63C)
Upper Nyl/Sterk	RRU-Ri4 - A61J-00267	Doorndraai	Nyl River floodplain	A61-1 (A61A,B,C,D,E)
	RRU-Ri1 A61B-00489	Donkerpoort	Nyl Pans	A61-2 (A61H)
	RRU-Ri1-1 - A61B-00552		Wonderkrater	A61-3 (A61F, G)
	RRU-Ri3 - A61G-00297			
	RRU-Ri5 A61G-00248			
Mogalakwena	RRU-Ri14 A63A-00071	Glen Alpine	Mokamole	A62-2 (A62E)
	RRU-Rii3 A63D-00034			A63-1 (A63A,D)
Mapungubwe	RRU-Rvi2 - A63E-00011		Maloutswa Floodplain	A63/71-3 (A63E, A71L)
	RRU-Riv32 A63E-00008		Kolope riverine wetlands	
Upper Sand	RRU-Riv16 - A71C-00156			A71-1 (A71A, B)
				A71-2 (A71C, D, H)
				A71-3 (A71E, F, G, A72A)
Lower Sand	RRU-Ri20 A71D-00118			A71-4 (A71J, A72B)
	RRU-Ri22 A71D-00118			A71-5 (A71K)
	RRU-Ri25 A71K-00019			
Nzhelele/Nwanedi	RRU-Ri26 - A80G-00053	Nzhelele		A80-1 (A80A, F)
	RRU-Riv33 - A80G-00054			A80-2 (A80G)
	RRU-Ri27 A80G-00026			A80-3 (A80J)
	RRU-Ri28 A80J-00028			
Upper Luvuvhu	RRU-Riii6 A91D-00108	Albasini		A91-1 (A91A, B, C, E, F, G)
	RRU-Ri30 A91G-00091	Vondo		
Lower Luvuvhu/Mutale	RRU-Ri32 A91H-00045	Mvuwe	Luvuvhu Floodplain (Makuleke)	A91-2 (A91H, A92B, C, D)
	RRU-Rvii33 A92B-00051	Nandoni	Lake Fundudzi	
	RRU-Ri33 A92B-00051		Mutale wetlands	
	RRU-Ri34 A92D-00030			

IUA	River Resource Unit	Dam Resource Unit	Wetland Resource Unit	Groundwater Resource Unit
	RRU-Ri36 A91K-00035			
Shingwedzi	RRU-Riv28 B90H-00113		Malahlapanga	B90-1 (B90B, F)
	RRU-Ri37 B90H-00145		Bububu	

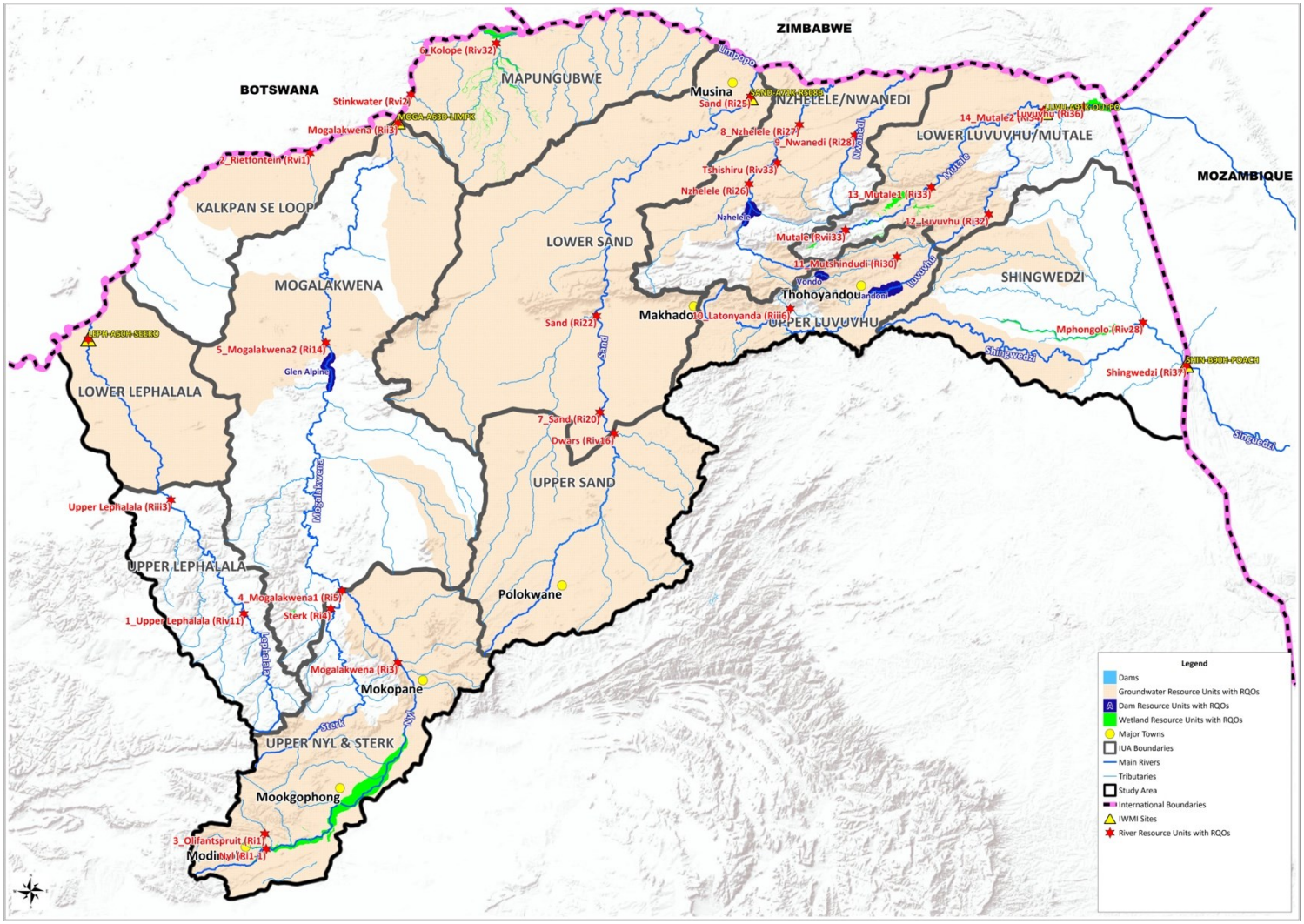

Figure 3. Selected Resource Units for determination of Resource Quality Objectives in the secondary catchments A5-A9 in the Limpopo WMA and B9 in the Olifants WMA for which RQOs have been defined

Table 5. Resource Quality Objectives for the prioritised river resource unit (RRU_Riv11) in the Upper Lephalala IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
Upper Lephalala IUA	II	A50B	Lephalala	RRU Riv11 - A50B-00262 (EWR site 1_Lephalala)	Riv11	C	Water quantity		Month*		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
								Low flows	Maintenance low flows (MCM)	Flows must be sufficient to maintain the Lephalala River in a condition equal to or better than a C category.	0.419	0.775	1.833	3.380	6.007	7.550	6.342	4.807	3.314	2.000	0.905	0.492
								High flows	Maintenance high flows (MCM)		0.050	0.277	0.970	1.550	1.356	1.410	1.208	0.604	0.295	0.117	0.010	0.023
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations must be maintained at levels that do not adversely affect aquatic ecosystems (C category).	95 percentile EC ≤ 55 mS/m											
								Nutrients	Total Inorganic nitrogen (TIN)	River nutrient concentrations must be maintained in a mesotrophic state or better (Acceptable category).	Median TIN ≤ 1.75 mg/l											
									Orthophosphate (PO_4-P)		Median PO_4-P ≤ 0.075 mg/l											
								System variables	Dissolved oxygen	Dissolved oxygen concentrations must be such that some oxygen sensitive species are present in the river.	5% percentile Dissolved oxygen concentration ≥ 6 mg/l											
									pH		6.5 ≤ pH ≤ 8.5											

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
									Water temperature	Water temperatures must fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).	Water temperature within the reference thermograph (95% band) plus or minus 1 standard deviation
								Toxins/Biocides	Ammonia (NH_3-N) Atrazine Endosulfan (α, β and the sulphate)	Toxicity levels must not pose a threat to river aquatic ecosystems.	Ammonia (NH_3-N) ≤ 44 µg/l (95% percentile) Atrazine ≤ 49 µg/l (95% percentile) Endosulfan ≤ 0.075 µg/l (95% percentile)
								Pathogens	Escherichia coli (E coli) Faecal coliforms	Concentrations of waterborne pathogens must be maintained in an Acceptable category for contact recreation	E coli / Faecal coliforms ≤ 25 cfu/100ml (95^{th} percentile)
							Habitat	Geomorphology	GAI score	Maintain or improve catchment drivers and site impacts. Maintain pool-riffle reach type.	Maintain a GAI PES score of at least a 'C' or > 63%
									Bed erosion	Maintain bed elevation in relation to banks and benches	Maintain lowest point along riffle cross-section at < 0.5 m difference in elevation from previous cross-sectional surveys
									Bank erosion	Maintain low to moderate proportion of bank length actively eroding	Maintain active bank erosion below 30% of riverbank length
									Bed sediment size	Maintain riffle sediment size to include largely gravel and cobble	Maintain riffle with mobile sediment in the range of a D50 of 25 mm, D16 of 9 mm and D84 of 58 mm
									Embeddedness	Maintain low to moderate embeddedness of riffle sediment	Maintain embeddedness of < 25% for riffle sediment

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
									Pool depth	Maintain upstream pool with deep open water	Maintain upstream pool with water > 0.5 m deep for > 60% of pool area
									Flood bench	Maintain flood benches along at least one of the banks	Maintain flood bench of > 8 m wide along at least one bank with signs of recent fine sediment deposition
							Biota	Aquatic zone	Key Species	*Potamogeton schweinfurthii* and *Stuckenia pectinatus* must be present in the wet season.	2 listed species must be present in the wet season.
								Marginal zone	Dominant vegetation	Non-woody vegetation must dominate the marginal zone	Non-woody cover >= 60% (aerial cover).
									Key species	*Miscanthus junceus* and *Ischaemum fasciculatum* must be present.	2 listed species present.
									Alien plant species	The riparian vegetation structure and composition in the marginal zone must maintain desired dominance and non-dominance.	No perennial alien plant species.
									Terrestrial woody cover		No terrestrial woody plants.
									Indigenous woody cover		Woody cover ≤ 10% (aerial cover).
									Non-woody cover		Non-woody cover ≥ 60% (aerial cover).
									Reed cover		Reed cover ≤ 15% (aerial cover).
								Non-marginal (lower - flood benches)	Dominant vegetation	Non-woody vegetation must dominate the flood features	Non-woody cover ≥ 60% (aerial cover).
									Key species	*Miscanthus junceus* and *Ischaemum fasciculatum* must be present.	2 listed species present.
									Alien plant species	The riparian vegetation structure	Perennial alien plant species ≤ 20% (aerial cover).

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
									Terrestrial woody cover	and composition on the flood features must maintain desired dominance and non-dominance.	No terrestrial woody plants.
									Indigenous woody cover		Woody cover ≤ 20% (aerial cover).
									Non-woody cover		Non-woody cover ≥ 60% (aerial cover).
								Non-marginal (upper - banks)	Dominant vegetation	Woody vegetation must dominate the macro-channel banks	Woody cover ≥ 60% (aerial cover).
									Alien plant species	Alien invasive plant species must be kept low or absent on macro-channel banks	Perennial alien plant species ≤ 10% (aerial cover).
								Riparian zone	PES	The PES category must be a C at least	VEGRAI score ≥ 62%
									Species richness	Indigenous plant species richness in the riparian zone must be maintained.	≥20 indigenous species.
									Endemic riparian species	*Buxus macowanii* (SA endemic) and *Miscanthus junceus* (southern African endemic) must be present.	2 listed species present.
								Fish	FRAI score	A diversity of fish representative of the fish species reference list as per the EWR surveys	PES for fish to remain within a C category (FRAI PES C >62%)
									Overall fish health	Fish must be free of bacterial and parasitic infections	<1% of all fish sampled at the site to be affected by bacterial and/or parasitic infections.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
									Species diversity	The site must support the diversity and relative abundance of fish as per the reference list used during the EWR studies	
									Key species	maintain flow conditions during the summer wet season to support the key species identified at the site.	Presence/absence records. Relative abundance of species: *Chiloglanis pretoriae* (2) *Labeobarbus marequensis* (2) *Labeo cylindricus* (1)
								Macroinvertebrates	MIRAI Category and Score	The Ecological Category must be maintained within a minimum of a B/C Category.	the MIRAI score must remain within the range of a B/C category (>78 - ≤82 %), using the same reference data used in the EWR study.
									SASS5 Total Score and ASPT	Ensure that the SASS scores attained, support the specified Ecological Category.	the SASS5 scores and ASPT values to occur in the following range: SASS5 score: >140; ASPT value: >6.1
									Taxon dominance	Ensure that no group consistently dominates the fauna, over more than two consecutive surveys.	No group/taxon occurs at a C abundance (>100 individuals)
									Key taxa and abundance	maintain conditions for the following two key taxa: maintain flow velocity (>0.6m/s) and maintain clean, unembedded surface area (cobbles) to support the following flow-dependent taxa: Heptageniidae.	Minimum abundance of an A attained.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										maintain sufficient quantity and quality of inundated vegetation to support the following vegetation-dwelling taxon: Coenagrionidae. maintain sufficient quality and quantity of inundated gravel, sand and mud to support the following taxa: Gomphidae	Minimum abundance of an A attained.

Table 6. Resource Quality Objectives for the prioritised river resource unit (RRU_Riii3) in the Upper Lephalala IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
Upper Lephalala IUA	II	A50E	Lephalala	RRU_Riii3 - A50H-00110	Riii3	D	Water quantity	Overall Ecological Category	Target Ecological Category	To maintain the Ecological Category of the resource unit in a D category												
								Total flows	Month*		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
									MCM	Flows shall be sufficient to maintain the Lephalala River in a condition equal to or better than a D category.	0.761	2.255	4.302	10.832	22.249	19.887	13.147	8.436	5.299	3.207	1.841	0.862
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations need to be maintained at levels that is do not adversely affect aquatic												

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										ecosystems (C category or better).	
								Nutrients	Total Inorganic nitrogen (TIN), Orthophosphate (PO4-P)	River nutrient concentrations should be maintained in a mesotrophic state or better (Acceptable category[1] or better).	
								System variables	Dissolved oxygen	Dissolved oxygen concentrations should be maintained so that some oxygen sensitive species are present in the river (C category).	
									pH	pH levels should be maintained in a C category to protect aquatic organisms.	
									Water temperature	Water temperatures (°C) should fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).	

[1] Acceptable category relates to fitness for use of water for its intended use or for protecting the health of aquatic ecosystems. The narrative descriptions commonly used to express judgements about the fitness of water for use are:

- Ideal; 100% fit for use; desirable water quality; target water quality range;
- Acceptable;
- Tolerable, usually for a limited time period only;
- Unacceptable for use;
- Completely unfit for use.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
								Toxins/Biocides	Ammonia (NH_3-N), Atrazine, Endosulfan	Toxic substances should be maintained at concentrations that does not pose a threat to river aquatic ecosystems (B category or better).	
								Pathogens	Escherichia coli (E coli), Faecal coliforms	Concentrations of waterborne pathogens should be maintained in an Acceptable category or better to safeguard contact recreational water users.	

Table 7. Resource Quality Objectives for the prioritised river resource unit (RRU_Ri8) in the Lower Lephalala IUA (LIMCOM site LEPH-A50H-SEEKO)

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
											Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Lower Lephalala IUA	II	A50H	Lephalala	RRU_Ri8 - A50H-00110 (EWR site LEPH-A50H-SEEKO)	Ri8	C	Water quantity	Low flows	Maintenance low flows (MCM)	Flows must be sufficient to maintain the Lephalala River in a condition equal to or better than a C category. Flows must be met at the confluence with the Limpopo River, i.e. must flow into the Limpopo.	0.568	0.644	0.726	0.911	1.277	1.104	0.980	0.844	0.807	0.727	0.661	0.577
								High flows	Maintenance high flows (MCM)		0.612	0.632	0.612	1.758	5.756	1.758	0.632	0.000	0.000	0.000	0.000	0.000
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations must be maintained at levels that does not adversely affect aquatic ecosystems (C category).	95 percentile EC ≤ 55 mS/m											
								Nutrients	Total Inorganic nitrogen (TIN)	River nutrient concentrations must be maintained in a mesotrophic state or better (Acceptable category).	Median TIN ≤ 1.75 mg/l											
									Ortho-phosphate (PO4-P)		Median PO4-P ≤ 0.075 mg/l											
								System variables	Dissolved oxygen	Dissolved oxygen concentrations must be such that some oxygen sensitive species are present in the river.	5% percentile Dissolved oxygen concentration ≥ 6 mg/l											
									pH		6.5 ≤ pH ≤ 8.5											
									Water temperature	Water temperatures must fall within the reference	Water temperature within the reference thermograph (95% band) plus or minus 1 standard deviation											

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).	
								Toxins	Ammonia (NH3-N) Atrazine Endosulfan (α, β and the sulphate)	Toxicity levels must not pose a threat to river aquatic ecosystems.	Ammonia (NH3-N) ≤ 44 µg/l (95% percentile) Atrazine ≤ 49 µg/l (95% percentile) Endosulfan ≤ 0.075 µg/l (95% percentile)
								Pathogens	Escherichia coli (E coli) Faecal coliforms	Concentrations of waterborne pathogens must be maintained in an Acceptable category for contact recreation	E coli / Faecal coliforms ≤ 25 cfu/100ml (95th percentile)
							Habitat	Geomorphology	GAI score	Maintain or improve catchment drivers and site impacts. Maintain similar reach type.	
									Bed erosion	Maintain bed elevation in relation to banks and benches	Maintain lowest point along riffle cross-section at < 0.5 m difference in elevation from previous cross-sectional surveys
									Bank erosion	Maintain low to moderate proportion of bank length actively eroding	Maintain active bank erosion below 30% of riverbank length
									Bed sediment size	Maintain riffle sediment size to include largely gravel	Maintain riffle with mobile sediment in the range of a D50 of 15 mm, D16 of 7 mm and D84 of 25 mm
									Embeddedness	Maintain low to moderate	Maintain embeddedness of < 25% for riffle sediment

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										embeddedness of riffle sediment	
									Pool depth	Maintain upstream pool with deep open water	Maintain upstream pool with >60% deep (> 0.5 m) open water
									Flood bench	Maintain flood benches along one of the banks	Maintain flood bench of > 10 m wide along at least one bank with signs of recent fine sediment deposition
							Biota	Marginal (bed)	Dominant vegetation	Non-woody vegetation must dominate the channel bed	Non-woody cover ≥ 40% (aerial cover).
									Key species	*Phragmites mauritianus* and *Faidherbia albida* must be present.	2 listed species present.
									Alien plant species	The riparian vegetation structure and composition in the channel bed must maintain desired dominance and non-dominance.	No perennial alien plants
									Terrestrial woody cover		No terrestrial woody plants.
									Reed cover		Reeds ≤20%
								Non-marginal (bank)	Dominant vegetation	Woody vegetation must dominate the macro-channel banks	Woody cover ≥ 60% (aerial cover).
									Alien plant species	Alien invasive plant species must be kept low or absent on macro-channel banks	perennial alien plant species ≤ 10% (aerial cover).
								Riparian zone	PES	The PES category must be a C at least	VEGRAI score ≥ 62%
									Species richness	Indigenous plant species richness in the	≥14 indigenous species.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										riparian zone must be maintained.	
								Fish	FRAI score	The Ecological Category must be maintained within a B/C Category, using reference data used for the EWR studies	FRAI to be maintained within the range of a B/C category (>77%)
									Overall fish health	Fish generally healthy (no ulcerative bacterial infections, and limited parasite burden)	Bacterial infections and/or parasitic burdens must impact <1% of the fish population
									Species diversity	maintain habitat conditions that would support the key species.	
									Key species	Maintain suitable flow conditions to support the key species identified at the site.	Presence/absence records. Relative abundance of species: *Labeobarbus marequensis* (1), *Labeo cylindricus* (1), *Chiloglanis pretoriae* (2)
								Macroinvertebrates	MIRAI Category and Score	The Ecological Category must be maintained within a minimum of a C Category.	the MIRAI score must remain within the range of a C category (>62 - ≤78 %), using the same reference data used in the EWR study.
									SASS5 Total Score and ASPT	Ensure that the SASS scores attained, support the specified Ecological Category.	the SASS5 scores and ASPT values must occur in the following range: SASS5 score: >100; ASPT value: >6.0.
									Key taxa and abundance	maintain suitable flow velocity (>0.6m/s) and to maintain clean, unembedded surface area (cobbles) to	Minimum abundance of an A attained for Hydropsychidae, Coenagrionidae, Gomphidae and Caenidae.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										support the following flow-dependent taxa: Hydropsychidae. maintain sufficient quantity and quality of inundated vegetation to support the following vegetation-dwelling taxon: Coenagrionidae. maintain sufficient quality and quantity of inundated gravel, sand and mud to support the following taxa: Gomphidae Caenidae	
									Taxon dominance	ensure that no group consistently dominates the fauna, over more than two consecutive surveys.	No taxon occurs at a C abundance (>100 individuals).

Table 8.Resource Quality Objectives for the prioritised river resource unit (RRU_Rvi1) in the Kalkpan se Loop

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
Kalkpan se Loop IUA	I	A63C	Kalkpan Se Loop	RRU_Rvi1 - A63C-00033 (EWR site 2_Rietfontein)	Rvi1	B/C	Water quantity		Month		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
								Low flows	Maintenance low flows (MCM)	Flows mustbe sufficient to maintain the Rietfontein River in a condition equal to or better than a B/C category.	0.000	0.001	0.004	0.011	0.019	0.019	0.002	0.001	0.000	0.000	0.000	0.000
								High flows	Maintenance high flows (MCM)		0.000	0.000	0.002	0.002	0.003	0.002	0.000	0.000	0.000	0.000	0.000	0.000
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations must be maintained at levels that is do not adversely affect aquatic ecosystems (C category).	95 percentile EC ≤ 260 mS/m											
								Nutrients	Total Inorganic nitrogen (TIN)	River nutrient concentrations must be maintained in a mesotrophic state or better (Acceptable category).	Median TIN ≤ 1.75 mg/l											
									Orthophosphate (PO_4-P)		Median PO_4-P ≤ 0.075 mg/l											
								System variables	Dissolved oxygen	Dissolved oxygen concentrations must be such that most oxygen sensitive species are present in the river.	5% percentile Dissolved oxygen concentration ≥ 7 mg/l											
									pH		6.5 ≤ pH ≤ 8.5											

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
									Water temperature	Water temperatures must fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).	Water temperature within the reference thermograph (95% band)
								Toxins	Ammonia (NH_3-N) Atrazine Endosulfan(α, β and the sulphate)	Toxicity levels must not pose a threat to river aquatic ecosystems.	Ammonia (NH_3-N) ≤ 44 µg/l (95% percentile) Atrazine ≤ 49 µg/l (95% percentile) Endosulfan ≤ 0.075 µg/l (95% percentile)
								Pathogens	Escherichia coli (E coli) Faecal coliforms	Concentrations of waterborne pathogens must be maintained in an Acceptable category for contact recreation	E coli / Faecal coliforms ≤ 25 cfu/100ml (95^{th} percentile)
							Habitat	Geomorphology	Bed erosion	Maintain bed elevation in relation to banks and benches	Maintain lowest point along riffle cross-section at < 0.5 m difference in elevation from previous cross-sectional surveys
									Bank erosion	Maintain low to moderate proportion of bank length actively eroding	Maintain active bank erosion below 30% of riverbank length
							Biota	Marginal zone	Dominant vegetation	Non-woody vegetation must dominate the marginal zone	Non-woody cover ≥70% (aerial cover).
									Key species	*Cyperus sexangularis* and *Juncus rigidus* must be present.	2 listed species present.
									Alien plant species	The riparian vegetation structure and composition in the marginal zone must maintain desired	No perennial alien plant species.
									Terrestrial woody cover		No terrestrial woody plants.
									Indigenous woody cover		Woody cover ≤ 5% (aerial cover).

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
									Non-woody cover	dominance and non-dominance.	Non-woody cover ≥ 70% (aerial cover).
									Reed cover		No reeds.
								Non-marginal (lower - flood benches)	Dominant vegetation	Non-woody vegetation must dominate the flood features	Non-woody cover ≥ 50% (aerial cover).
									Key species	*Cyperus sexangularis* and *Juncus rigidus* must be present.	2 listed species present.
									Alien plant species	The riparian vegetation structure and composition on the flood features must maintain desired dominance and non-dominance.	No perennial alien plant species.
									Terrestrial woody cover		Terrestrial woody cover ≤ 10% (aerial cover).
									Indigenous woody cover		Woody cover ≤ 50% (aerial cover).
									Non-woody cover		Non-woody cover ≥50% (aerial cover).
								Non-marginal (upper - banks)	Dominant vegetation	Woody vegetation must dominate the macro-channel banks	Woody cover ≥ 80% (aerial cover).
									Alien plant species	Alien invasive plant species must be kept low or absent on macro-channel banks	No perennial alien plant species.
								Riparian zone	PES	The PES category must be a A/B at least	VEGRAI score ≥ 88%
									Species richness	Indigenous plant species richness in the riparian zone must be maintained.	≥ 15 indigenous species.
								Fish	FRAI score	Only one species of fish inhabited this site, therefore the PES can be regarded as an A category	PES A; Abundance of juvenile size classes predominantly during the summer breeding season
									Overall fish health	Maintain overall health of fish	Maintain the overall fish health by limiting bacterial and parasitic infections to <1% of population
									Species diversity	Only one species found at the site.	Maintain diversity of age size classes within the population to maintain

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
									Key species	*Oreochromis mossambicus*	*Oreochromis mossambicus*
								Macroinvertebrates	MIRAI Category and Score	N/A*	
									SASS5 Total Score and ASPT	N/A*	
									Key taxa and abundance	maintain sufficient quantity and quality of inundated vegetation to support the following vegetation-dwelling taxon: Coenagrionidae	Minimum abundance of an A attained.
										Maintain sufficient quantity and quality of Gravel, sand and mud (GSM) habitat to support Gomphidae.	Minimum abundance of an A attained.
									Taxon dominance	Ensure that no group consistently dominates the fauna, over more than two consecutive surveys.	No taxon occurs at a C abundance (>100 individuals).

*N/A = Not Applicable as it is an ephemeral site.

Table 9. Resource Quality Objectives for the prioritised river resource unit (RRU_Ri4) in the Upper Nyl/Sterk IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
Upper Nyl & Sterk	II	A61J	Sterk	RRU_Ri4 - A61J-00267	Ri4	C		Overall Ecological Category	Target Ecological Category	To maintain the Ecological Category of the resource unit in a C category												
							Water quantity		Month*		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
								Total flows	MCM	Flows shall be sufficient to maintain the Sterk River in a condition equal to or better than a C category.	0.289	0.792	2.046	3.274	7.472	2.715	1.321	0.716	0.513	0.506	0.421	0.363
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations need to be maintained at levels that is do not adversely affect aquatic ecosystems (C category).												
								Nutrients	Total Inorganic nitrogen (TIN), Orthophosphate (PO4-P)	River nutrient concentrations should be maintained in a mesotrophic state or better (Acceptable category or better).												
								System variables	Dissolved oxygen	Dissolved oxygen concentrations should be maintained so that some oxygen sensitive species are present in the river (C category).												
									pH	pH levels should be maintained in a C category to protect aquatic organisms.												
									Water temperature	Water temperatures (°C) should fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).												

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
								Toxins/Biocides	Ammonia (NH_3-N), Atrazine, Endosulfan	Toxic substances should be maintained at concentrations that does not pose a threat to river aquatic ecosystems (B category or better).	
								Pathogens	Escherichia coli (E coli), Faecal coliforms	Concentrations of waterborne pathogens should be maintained in an Acceptable category or better to safeguard contact recreational water users.	

Table 10. Resource Quality Objectives for the prioritised river resource unit (RRU_Ri1) in the Upper Nyl/Sterk IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
											Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Upper Nyl/Sterk IUA	II	A61B	Olifantspruit	RRU_Ri1 - A61B-00489 (EWR site 3 Olifantspruit)	Ri1	C	Water quantity		Month													
								Low flows	Maintenance low flows (MCM)	Flowsmust be sufficient to maintain the Rietfontein River in a condition equal to or better than a C category.	0.089	0.259	0.399	0.494	0.578	0.549	0.392	0.229	0.132	0.103	0.087	0.075
								High flows	Maintenance high flows (MCM)		0.012	0.215	0.485	0.570	0.588	0.475	0.237	0.032	0.001	0.001	0.000	0.000
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations must be maintained at levels that is do not adversely affect aquatic ecosystems (C category).	95 percentile EC ≤ 55 mS/m											

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
								Nutrients	Total Inorganic nitrogen (TIN)	River nutrient concentrations must be maintained in a mesotrophic state or better (Acceptable category).	Median TIN ≤ 1.75 mg/l
									Orthophosphate (PO_4-P)		Median PO_4-P ≤ 0.075 mg/l
								System variables	Dissolved oxygen	Dissolved oxygen concentrations must be such that some oxygen sensitive species are present in the river.	5% percentile Dissolved oxygen concentration ≥ 6 mg/l
									pH		6.5 ≤ pH ≤ 8.5
									Water temperature	Water temperatures must fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).	Water temperature within the reference thermograph (95% band) plus or minus 1 standard deviation
								Toxins	Ammonia (NH_3-N) Atrazine Endosulfan (α, β and the sulphate)	Toxicity levels must not pose a threat to river aquatic ecosystems.	Ammonia (NH_3-N) ≤ 44 µg/l (95% percentile) Atrazine ≤ 49 µg/l (95% percentile) Endosulfan ≤ 0.075 µg/l (95% percentile)
								Pathogens	Escherichia coli (E coli) Faecal coliforms	Concentrations of waterborne pathogens must be maintained in an Acceptable category for contact recreation	E coli / Faecal coliforms ≤ 25 cfu/100ml (95th percentile)
							Habitat	Geomorphology	GAI score	Maintain or improve catchment drivers and site impacts. Maintain pool-riffle reach type.	Maintain a GAI PES score of at least a 'C' or > 63%

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
									Bed erosion	Maintain bed elevation in relation to banks and benches	Maintain lowest point along riffle cross-section at < 0.5 m difference in elevation from previous cross-sectional surveys
									Bank erosion	Maintain low to moderate proportion of bank length actively eroding	Maintain active bank erosion below 30% of riverbank length
									Bed sediment size	Maintain riffle sediment size to include largely gravel and cobble	Maintain riffle with mobile sediment in the range of a D50 of 27 mm, D16 of 14 mm and D84 of 55 mm
									Embeddedness	Maintain low to moderate embeddedness of riffle sediment	Maintain embeddedness of < 25% for riffle sediment
									Pool depth	Maintain downstream pool with deep open water	Maintain downstream pool with water > 0.5 m deep for > 60% of pool area
									Flood bench	Maintain flood benches along one of the banks	Maintain flood bench of > 2 m wide along at least one bank with signs of recent fine sediment deposition
							Biota	Marginal zone	Dominant vegetation	Non-woody vegetation must dominate the marginal zone	Non-woody cover ≥ 20% (aerial cover).
									Key species	*Phragmites australis, Juncus dregeanus* and *Juncus oxycarpus.*	3 listed species present.
									Alien plant species	The riparian vegetation structure and composition in the marginal zone must maintain desired dominance and non-dominance.	Perennial alien plant species ≤ 20% (aerial cover).
									Terrestrial woody cover		No terrestrial woody plants.
									Indigenous woody cover		Woody cover ≤10% (aerial cover).
									Non-woody cover		Non-woody cover≥20% (aerial cover).
									Reed cover		Reed cover ≤ 30% (aerial cover).

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
								Non-marginal (upper - banks)	Dominant vegetation	Woody vegetation must dominate the macro-channel banks	Woody cover ≥ 40% (aerial cover).
									Alien plant species	Alien invasive plant species must be kept low or absent on macro-channel banks	perennial alien plant species ≤50% (aerial cover).
								Riparian zone	PES	The PES category must be a D at least	VEGRAI score ≥42%
									Species richness	Indigenous plant species richness in the riparian zone must be maintained.	≥20 indigenous species.
									Endemic riparian species	*Combretum erythrophyllum* (southern African endemic) must be present.	1 listed species present.
								Fish	FRAI score	The Ecological Category must be maintained within a B/C Category, using reference data used for the EWR studies	FRAI to be maintained within the range of a B/C category (>77%)
									Overall fish health	Fish generally healthy (no ulcerative bacterial infections, and limited parasite burden)	Bacterial infections and/or parasitic burdens must impact <1% of the fish population
									Species diversity	Maintain suitable habitat conditions that would support the key species.	
									Key species	Maintain suitable flow conditions to support the key species identified at the site.	Presence/absence records. Relative abundance of species (values indicated in parenthesis): *Labeobarbus marequensis (2), Labeo cylindricus (1), Chiloglanis pretoriae (2), Enteromius bifrenatus (2)*
								Macroinvertebrates	MIRAI Category and Score	The Ecological Category must remain	the MIRAI score must remain within the range of a B/C category (>78 - ≤82 %), using the same reference data used in the EWR study.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										within a minimum of a B/C Category.	
									SASS5 Total Score and ASPT	Ensure that the SASS scores attained, support the specified Ecological Category.	the SASS5 scores and ASPT values must occur in the following range: SASS5 score: >140; ASPT value: >6.1.
									Key taxa and abundance	Maintain suitable flow velocity (>0.6m/s) and to maintain clean, unembedded surface area (cobbles) to support the following flow-dependent taxa: Simuliidae	Minimum abundance of an A attained.
										Maintain sufficient quality and quantity of inundated vegetation to support the following vegetation-dwelling taxon: Coenagrionidae	Minimum abundance of an A attained.
										Maintain sufficient quantity and quality of Gravel, sand and mud (GSM) habitat to support Gomphidae.	Minimum abundance of an A attained.

Table 11. Resource Quality Objectives for the prioritised river resource unit (RRU_Ri1-1) in the Upper Nyl/Sterk IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
Upper Nyl & Sterk	II	A61A	Nyl	RRU_Ri1-1 - A61B-00552	Ri1-1	C		Overall Ecological Category	Target Ecological Category	To maintain the Ecological Category of the resource unit in a C category												
							Water quantity	Total flows	Month*		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
									MCM	Flows shall be sufficient to maintain the Nyl River in a condition equal to or better than a C category.	0.478	1.211	1.845	2.473	3.389	2.868	2.077	1.51	1.133	0.889	0.663	0.492
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations need to be maintained at levels that is do not adversely affect aquatic ecosystems (C category).												
								Nutrients	Total Inorganic nitrogen (TIN), Orthophosphate (PO4-P)	River nutrient concentrations should be maintained in a mesotrophic state or better (Acceptable category or better).												
								System variables	Dissolved oxygen	Dissolved oxygen concentrations should be maintained so that some oxygen sensitive species are present in the river (C category).												
									pH	pH levels should be maintained in a C category to protect aquatic organisms.												
									Water temperature	Water temperatures (°C) should fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).												

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
								Toxins/Biocides	Ammonia (NH_3-N), Atrazine, Endosulfan	Toxic substances should be maintained at concentrations that does not pose a threat to river aquatic ecosystems (B category or better).	
								Pathogens	Escherichia coli (E coli), Faecal coliforms	Concentrations of waterborne pathogens should be maintained in an Acceptable category or better to safeguard contact recreational water users.	

Table 12. Resource Quality Objectives for the prioritised river resource unit (RRU_Ri3) in the Upper Nyl/Sterk IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical												
Upper Nyl & Sterk	II	A61F	Mogalakwena	RRU_Ri3 - A61G-00297	Ri3	C/D		Overall Ecological Category	Target Ecological Category	To maintain the Ecological Category of the resource unit in a C/D category													
							Water quantity	Total flows	Month*		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
									MCM	Flows shall be sufficient to maintain the Mogalakwena River in a condition equal to or better than a C/D category.	0.604	2.405	4.519	9.415	14.208	6.496	2.89	1.312	0.892	0.822	0.735	0.681
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations need to be maintained at levels that is do not adversely affect												

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										aquatic ecosystems (C/D category).	
								Nutrients	Total Inorganic nitrogen (TIN), Orthophosphate (PO4-P)	River nutrient concentrations should be maintained in a eutrophic state or better (Tolerable category or better).	
								System variables	Dissolved oxygen	Dissolved oxygen concentrations should be maintained so that some oxygen sensitive species are present in the river (C/D category).	
									pH	pH levels should be maintained in a C/D category to protect aquatic organisms.	
									Water temperature	Water temperatures (°C) should fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).	
								Toxins/Biocides	Ammonia (NH_3-N), Atrazine, Endosulfan	Toxic substances should be maintained at concentrations that does not pose a threat to river aquatic ecosystems (B category or better).	
								Pathogens	Escherichia coli (E coli), Faecal coliforms	Concentrations of waterborne pathogens should be maintained in an Acceptable category or better to safeguard contact recreational water users.	

Table 13. Resource Quality Objectives for the prioritised river resource unit (RRU_Ri5) in the Upper Nyl/Sterk IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
Upper Nyl/Sterk IUA	II	A61G	Upper Mogalakwena	RRU_Ri5 - A61G-00248 (EWR site 4_Mogalakwena)	Ri5	C	Water quantity		Month		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
								Low flows	Maintenance low flows (MCM)	Flowsmust be sufficient to maintain the Mogalakwena River in a condition equal to or better than a C category.	0.273	0.999	2.503	4.283	6.628	5.248	1.928	1.337	0.935	0.868	0.659	0.458
								High flows	Maintenance high flows (MCM)		0.154	0.409	1.007	1.135	1.019	0.992	0.697	0.334	0.198	0.157	0.135	0.132
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations must be maintained at levels that is do not adversely affect aquatic ecosystems (C category).	95 percentile EC ≤ 85 mS/m											
								Nutrients	Total Inorganic nitrogen (TIN)	River nutrient concentrations must be maintained in a mesotrophic state or better (Acceptable category).	Median TIN ≤ 2.24 mg/l											
									Orthophosphate (PO_4-P)		Median PO_4-P ≤ 0.090 mg/l											
								System variables	Dissolved oxygen	Dissolved oxygen concentrations must be such that some oxygen sensitive species are present in the river.	5% percentile Dissolved oxygen concentration ≥ 6 mg/l											
									pH		5.6 ≤ pH ≤ 9.2											
									Water temperature	Water temperatures must fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).	Water temperature within the reference thermograph (95% band) plus or minus 1 standard deviation											

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
								Toxins	Ammonia (NH3-N) Atrazine Endosulfan(α, β and the sulphate)	Toxicity levels must not pose a threat to river aquatic ecosystems.	Ammonia (NH3-N) ≤ 44 µg/l (95% percentile) Atrazine ≤ 49 µg/l (95% percentile) Endosulfan ≤ 0.075 µg/l (95% percentile)
								Pathogens	Escherichia coli (E coli) Faecal coliforms	Concentrations of waterborne pathogens must be maintained in an Acceptable category for contact recreation	E coli / Faecal coliforms ≤ 25 cfu/100ml (95th percentile)
							Habitat	Geomorphology	GAI score	Maintain or improve catchment drivers and site impacts. Maintain pool-riffle reach type.	Maintain a GAI PES score of at least a 'C' or > 63%
									Bed erosion	Maintain bed elevation in relation to banks and benches	Maintain lowest point along riffle cross-section at <0.5 m difference in elevation from previous cross-sectional surveys
									Bank erosion	Maintain low to moderate proportion of banks actively eroding	Maintain active bank erosion below 30% of riverbank length
									Bed sediment size	Maintain dominant riffle sediment size to include gravel and cobble	Maintain riffle with mobile sediment in the range of a D50 of 30 mm, D16 of 16 mm and D84 of 65 mm
									Embeddedness	Maintain low to moderate embeddedness of riffle sediment	Maintain embeddedness of <25% for riffle sediment
									Pool depth	Maintain downstream pool with deep open water	Maintain downstream pool with water >0.5 m deep for > 60% of pool area
									Flood bench	Maintain flood benches along one of the banks	Maintain flood bench of >5 m wide along at least one bank with signs of recent fine sediment deposition
							Biota	Marginal zone	Dominant vegetation	Non-woody vegetation must dominate the marginal zone	Non-woody cover ≥ 70% (aerial cover).
									Key species	*Juncus lomatophyllus* and *Phragmites australis* must be present.	2 listed species present.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
									Alien plant species	The riparian vegetation structure and composition in the marginal zone must maintain desired dominance and non-dominance.	No perennial alien plant species.
									Terrestrial woody cover		No terrestrial woody plants.
									Indigenous woody cover		Woody cover <= 10% (aerial cover).
									Non-woody cover		Non-woody cover >= 70% (aerial cover).
									Reed cover		Reed cover <= 20% (aerial cover).
								Non-marginal (lower - flood benches)	Dominant vegetation	Non-woody vegetation must dominate the flood features	Non-woody cover ≥ 60% (aerial cover).
									Key species	*Flugea virosa*, *Agrostis lachnantha, Phragmites australis* and *Cynodon dactylon* must be present.	4 listed species present.
									Alien plant species	The riparian vegetation structure and composition on the flood features must maintain desired dominance and non-dominance.	Perennial alien plant species ≤5% (aerial cover).
									Terrestrial woody cover		Terrestrial woody cover ≤ 10% (aerial cover).
									Indigenous woody cover		Woody cover≤30% (aerial cover).
									Non-woody cover		Non-woody cover ≥ 60% (aerial cover).
								Non-marginal (upper - banks)	Dominant vegetation	Woody vegetation must dominate the macro-channel banks	Woody cover ≥ 70% (aerial cover).
									Alien plant species	Alien invasive plant species must be kept low or absent on macro-channel banks	Perennial alien plant species≤5% (aerial cover).
								Riparian zone	PES	The PES category must be a C/D at least	VEGRAI score ≥ 58%
									Species richness	Indigenous plant species richness in the riparian zone must be maintained.	≥ 15 indigenous species.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
									Endemic riparian species	*Combretum erythrophyllum* (southern African endemic) must be present.	1 listed species present.
								Fish	FRAI score	The Ecological Category must be maintained within a B/C Category, using reference data used for the EWR studies	FRAI to be maintained within the range of a B/C category (>77%)
									Overall fish health	Fish generally healthy (no ulcerative bacterial infections, and limited parasite burden)	Bacterial infections and/or parasitic burdens must impact <1% of the fish population
									Species diversity	Maintain suitable habitat conditions that would support the key species.	
									Key species	Maintain suitable flow conditions to support the key species identified at the site.	Presence/absence records. Relative abundance of species: *Labeobarbus marequensis (1), Labeo cylindricus (1), Chiloglanis pretoriae (2) Micralestes acutidens (1), Enteromius trimaculatus (1)*
								Macroinvertebrates	MIRAI Category and Score	The Ecological Category must remain within a minimum of a C Category.	the MIRAI score must remain within the range of a C category (>62 - ≤78 %), using the same reference data used in this EWR study.
									SASS5 Total Score and ASPT	Ensure that the SASS scores attained, support the specified Ecological Category.	the SASS5 scores and ASPT values must occur in the following range: SASS5 score: >130; ASPT value: >6.3.
									Key taxa and abundance	Maintain suitable flow velocity (>0.6m/s) and to maintain clean, unembedded surface area (cobbles) to support the following flow-dependent taxa: Hydropsychidae >2pp; Simuliidae.	Minimum abundance of an A to be attained for both Hydropsychidae and Simuliidae.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										Maintain sufficient quantity and quality of inundated vegetation to support the following vegetation-dwelling taxon: Coenagrionidae	Minimum abundance of an A attained.
										Maintain sufficient quantity and quality of Gravel, sand and mud (GSM) habitat to support Gomphidae.	Minimum abundance of an A attained.

Table 14. Resource Quality Objectives for the prioritised river resource unit (RRU_Ri14) in the Mogalakwena IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical												
Mogalakwena IUA	II	A63A	Middle Mogalakwena	RRU_Ri14 - A63A-00071 (EWR site 5_Mogalakwena)	Ri14	C	Water quantity		Month		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
								Low flows	Maintenance low flows (MCM)	Flowsmust be sufficient to maintain the Mogalakwena River in a condition equal to or better than a C category.	0.487	2.1	2.557	3.9	10.	9.2	4.486	2.4	1.3	1.104	0.5	0.300
								High flows	Maintenance high flows (MCM)		0.107	0.13	0.313	0.75	0.49	0.60	0.658	0.62	0.36	0.183	0.05	0.038
							Water ...	Salts	Electrical conductivity (EC)	Salt concentrations must to be maintained at levels that is do not adversely affect aquatic ecosystems (C category).	95 percentile EC ≤ 85 mS/m											

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
								Nutrients	Total Inorganic nitrogen (TIN)	River nutrient concentrations must be maintained in a mesotrophic state or better (Acceptable category).	Median TIN ≤ 2.24 mg/l
									Orthophosphate (PO_4-P)		Median PO_4-P ≤ 0.090 mg/l
								System variables	Dissolved oxygen	Dissolved oxygen concentrations must be such that some oxygen sensitive species are present in the river.	5% percentile Dissolved oxygen concentration ≥ 6 mg/l
									pH		5.6 ≤ pH ≤ 9.2
									Water temperature	Water temperatures must fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).	Water temperature within the reference thermograph (95% band) plus or minus 1 standard deviation
								Toxins	Ammonia (NH_3-N) Atrazine Endosulfan(α, β and the sulphate)	Toxicity levels must not pose a threat to river aquatic ecosystems.	Ammonia (NH_3-N) ≤ 44 µg/l (95% percentile) Atrazine ≤ 49 µg/l (95% percentile) Endosulfan ≤ 0.075 µg/l (95% percentile)
								Pathogens	Escherichia coli (E coli) Faecal coliforms	Concentrations of waterborne pathogens must be maintained in an Acceptable category for contact recreation	E coli / Faecal coliforms ≤ 25 cfu/100ml (95^{th} percentile)

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
							Habitat	Geomorphology	GAI score	Maintain or improve catchment drivers and site impacts. Maintain pool-riffle reach type.	Maintain a GAI PES score of at least a 'C' or > 63%
									Bed erosion	Maintain bed elevation in relation to banks and benches	Maintain lowest point along riffle cross-section at <0.5 m difference in elevation from previous cross-sectional surveys
									Bank erosion	Maintain low to moderate proportion of banks actively eroding	Maintain active bank erosion below 30% of riverbank length
									Bed sediment size	Maintain dominant riffle sediment size to include gravel and cobble	Maintain riffle with mobile sediment in the range of a D50 of 35 mm, D16 of 17 mm and D84 of 55 mm
									Embeddedness	Maintain low to moderate embeddedness of riffle sediment	Maintain embeddedness of < 25% for riffle sediment
									Pool depth	Maintain downstream pool with deep open water	Maintain downstream pool with water > 0.5 m deep for > 60% of pool area
									Flood bench	Maintain flood benches along at least one of the banks	Maintain flood bench of > 5 m wide along at least one bank with signs of recent fine sediment deposition
							Biota	Marginal zone	Dominant vegetation	Non-woody vegetation must dominate the marginal zone	Non-woody cover >= 70% (aerial cover).
									Key species	*Juncus lomatophyllus, Cyperus digitatus, Ischaemum fasciculatum* and *Salix mucronata* must be present.	4 listed species present.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
									Alien plant species	The riparian vegetation structure and composition in the marginal zone must maintain desired dominance and non-dominance.	No perennial alien plant species.
									Terrestrial woody cover		No terrestrial woody plants.
									Indigenous woody cover		Woody cover <= 10% (aerial cover).
									Non-woody cover		Non-woody cover >= 70% (aerial cover).
									Reed cover		Reed cover <= 20% (aerial cover).
								Non-marginal (lower - flood benches)	Dominant vegetation	Non-woody vegetation must dominate the flood features	Non-woody cover >= 80% (aerial cover).
									Key species	*Cyperus digitatus* and *Gomphocarpus fruticosus* must be present.	2 listed species present.
									Alien plant species	The riparian vegetation structure and composition on the flood features must maintain desired dominance and non-dominance.	Perennial alien plant species <= 20% (aerial cover).
									Terrestrial woody cover		Terrestrial woody cover <= 30% (aerial cover).
									Indigenous woody cover		Woody cover <= 30% (aerial cover).
									Non-woody cover		Non-woody cover >= 50% (aerial cover).

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
								Non-marginal (upper - banks)	Dominant vegetation	Woody vegetation must dominate the macro-channel banks	Woody cover >= 50% (aerial cover).
									Alien plant species	Alien invasive plant species must be kept low or absent on macro-channel banks	No perennial alien plant species.
								Riparian zone	PES	The PES category must be a C at least	VEGRAI score >= 62%
									Species richness	Indigenous plant species richness in the riparian zone must be maintained.	>= 20 indigenous species.
									Endemic riparian species	*Schotia brachypetala* (southern African endemic) must be present.	1 listed species present.
									Threatened riparian species	3 nationally protected tree species: Apple Leaf (*Philenoptera violacea*), Leadwood (*Combretum imberbe*) and Camel Thorn (*Vachellia erioloba*) must be present.	3 listed species present.
								Fish	FRAI score	The Ecological Category must be maintained within a A/B Category, using reference data	FRAI to be maintained within the range of a A/B category (>87%)

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										used for the EWR studies	
									Overall fish health	Fish generally healthy (no ulcerative bacterial infections, and limited parasite burden)	Bacterial infections and/or parasitic burdens must impact <1% of the fish population
									Species diversity	To maintain suitable habitat conditions that would support the key species.	Maintain the diversity of species as per EWR studies
									Key species	To maintain suitable flow conditions to support the key species identified at the site.	Presence/absence records. Relative abundance of species: *Labeobarbus marequensis (2), Labeo cylindricus (2), Chiloglanis pretoriae (2) Micralestes acutidens (1), Enteromius trimaculatus (1), Engrulicypris brevianalis (1)*
								Macroinvertebrates	MIRAI Category and Score	The Ecological Category must remain within a minimum of a C Category.	To ensure that the MIRAI score remains within the range of a C category (>62 - ≤78 %), using the same reference data used in the EWR study.
								Macroinvertebrates	SASS5 Total Score and ASPT	To ensure that the SASS scores attained, support the specified Ecological Category.	To ensure that the SASS5 scores and ASPT values occur in the following range: SASS5 score: >110; ASPT value: >5.2.
								Macroinvertebrates	Key taxa and abundance	To maintain suitable flow velocity (>0.6m/s) and to maintain clean, unembedded surface	Minimum abundance of an A attained.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										area (cobbles) to support the following flow-dependent taxa: Simuliidae	
										To maintain sufficient quality and quantity of inundated vegetation to support vegetation-dwelling Coenagrionidae.	Minimum abundance of an A attained.
										To maintain sufficient quantity and quality of Gravel, sand and mud (GSM) habitat to support Gomphidae	Minimum abundance of an A attained.

Table 15. Resource Quality Objectives for the prioritised river resource unit (RRU_Rii3) in the Mogalakwena IUA (LIMCOM Site MOGA-A63D-LIMPK)

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
Mogalakwena IUA	II	A63D	Mogalakwena	RRU_Rii3 - A63D-0024 (EWR site	Rii3	C	Water quantity		Month		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
								Low flows	Maintenance low flows (MCM)	Flows must be sufficient to maintain the Mogalakwena River in a condition equal to or better than a C	1.091	1.388	1.464	1.754	2.366	1.772	1.608	1.406	1.370	1.281	1.202	1.129

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
								High flows	Maintenance high flows (MCM)	category. Flows must be met at the confluence with the Limpopo River, i.e. must flow into the Limpopo.	0.677	2.356	0.677	2.280	10.565	0.677	0.000	0.000	0.000	0.000	0.000	0.000
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations must to be maintained at levels that is do not adversely affect aquatic ecosystems (C category).	95 percentile EC ≤ 85 mS/m											
								Nutrients	Total Inorganic nitrogen (TIN)	River nutrient concentrations must be maintained in a mesotrophic state or better (Acceptable category).	Median TIN ≤ 2.24 mg/l											
									Orthophosphate (PO_4-P)		Median PO_4-P ≤ 0.090 mg/l											
								System variables	Dissolved oxygen	Dissolved oxygen concentrations must be such that some oxygen sensitive species are present in the river.	5% percentile Dissolved oxygen concentration ≥ 6 mg/l											
									pH		5.6 ≤ pH ≤ 9.2											
									Water temperature	Water temperatures must fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).	Water temperature within the reference thermograph (95% band) plus or minus 1 standard deviation											
								Toxins	Ammonia (NH_3-N) Atrazine Endosulfan(α, β and the sulphate)	Toxicity levels must not pose a threat to river aquatic ecosystems.	Ammonia (NH_3-N) ≤ 44 µg/l (95% percentile) Atrazine ≤ 49 µg/l (95% percentile) Endosulfan ≤ 0.075 µg/l (95% percentile)											
								Pathogens	Escherichia coli (E coli)	Concentrations of waterborne pathogens	E coli / Faecal coliforms ≤ 25 cfu/100ml (95th percentile)											

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
									Faecal coliforms	must be maintained in an Acceptable category for contact recreation	
							Habitat	Geomorphology	GAI score	Maintain or improve catchment drivers and site impacts. Maintain reach type.	GAI score not available as part of IWMI study. Determine and maintain the GAI PES score in a similar or better category
									Bed erosion	Maintain bed elevation in relation to banks and benches	Maintain lowest point along cross section at < 0.5 m difference in elevation from previous cross-sectional surveys
									Bank erosion	Maintain low to moderate proportion of banks actively eroding	Maintain active bank erosion below 30% of riverbank length
									Bed sediment size	Maintain riffle sediment size to include mainly gravel	Maintain riffle with mobile sediment in the range of a D50 of 17 mm, D16 of 12 mm and D84 of 27 mm
									Embeddedness	Maintain low to moderate embeddedness of riffle sediment	Maintain embeddedness of < 25% for riffle sediment
									Pool depth	Maintain downstream pool with deep open water	Maintain downstream pool with water > 0.5 m deep for > 60% of pool area
									Flood bench	Maintain flood benches along at least one of the banks	Maintain flood bench of > 5 m wide along at least one bank with signs of recent fine sediment deposition
							Biota	Marginal (bed)	Dominant vegetation	A mix of woody and non-woody vegetation must dominate the channel bed	Non-woody cover >= 10%; Woody cover >= 10% (aerial cover).
									Key species	*Phragmites mauritianus and Ficus capreifolia* must be present.	2 listed species present.
									Alien plant species	The riparian vegetation structure and composition in the channel bed must	No perennial alien plants
									Terrestrial woody cover		No terrestrial woody plants.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
									Reed cover	maintain desired dominance and non-dominance.	Reeds <=10% (aerial cover)
								Non-marginal (bank)	Dominant vegetation	A mix of woody and non-woody vegetation must dominate the channel bank	Woody cover >= 40%; non-woody cover >= 20% (aerial cover).
									Alien plant species	Alien invasive plant species must be kept low or absent on macro-channel banks	No perennial alien plants
								Riparian zone	PES	The PES category must be a C at least	VEGRAI score >= 62%
									Species richness	Indigenous plant species richness in the riparian zone must be maintained.	>= 10 indigenous species.
								Fish	FRAI score	A diversity of fish representative of the fish species reference list as per the EWR surveys if sufficient flow and habitat are provided for	PES for fish to remain within a C category (FRAI PES C >62%) after sufficient flow has returned to the river for at least 4 weeks
									Overall fish health	Fish must be free of bacterial and parasitic infections	<1% of all fish sampled at the site to be affected by bacterial and/or parasitic infections.
									Species diversity	The site must support the diversity and relative abundance of fish as per the reference list used during the EWR studies if sufficient flow and habitat are provided for	Maintain the diversity of species as per EWR studies
									Key species	To maintain suitable flow conditions to support the key species identified at the site.	Presence/absence records. Relative abundance of species: *Chiloglanis pretoriae* (2) *Labeobarbus marequensis* (2)

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
											Labeo cylindricus (2)
								Macroinvertebrates	MIRAI Category and Score	The Ecological Category must remain at a minimum within a D Category.	To ensure that the MIRAI score remains within the range of a D category (>42 - ≤58 %), using the same reference data used in this EWR study.
									SASS5 Total Score and ASPT	To ensure that the SASS scores attained, support the specified Ecological Category.	To ensure that the SASS5 scores and ASPT values occur in the following range: SASS5 score: >70; ASPT value: >4.8.
									Key taxa and abundance	To maintain suitable flow velocity (>0.3m/s) and to maintain clean, unembedded surface area (cobbles) to support the following flow-dependent taxa: Leptophlebiidae. To maintain sufficient quality and quantity of inundated gravel, sand and mud to support the following taxa: Gomphidae, Caenidae.	Minimum abundance of an A attained.
									Dominant taxa	To ensure that no group consistently dominates the fauna, over more than two consecutive surveys.	No taxon occurs at a C abundance (>100 individuals).

Table 16. Resource Quality Objectives for the prioritised river resource unit (RRU_Rvi2) in the Mapungubwe IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
Mapungubwe	II	A63E	Stinkwater	RRU_Rvi2 - A63E-00011	Rvi2	B		Overall Ecological Category	Target Ecological Category	To maintain the Ecological Category of the resource unit in a B category												
							Water quantity		Month*		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
								Total flows	MCM	Flows shall be sufficient to maintain the Stinkwater River in a condition equal to or better than a B category.	0	0	0	0.014	0.078	0.039	0.006	0	0	0	0	0
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations need to be maintained at levels that is do not adversely affect aquatic ecosystems (B category).												
								Nutrients	Total Inorganic nitrogen (TIN), Orthophosphate (PO4-P)	River nutrient concentrations should be maintained in an oligo/mesotrophic state or better (Ideal/Acceptable category or better).												
								System variables	Dissolved oxygen	Dissolved oxygen concentrations should be maiintained so that most oxygen sensitive species are present in the river (B category).												
									pH	pH levels should be maintained in a B category to protect aquatic organisms.												
									Water temperature	Water temperatures (°C) should fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).												

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
								Toxins/Biocides	Ammonia (NH_3-N), Atrazine, Endosulfan	Toxic substances should be maintained at concentrations that does not pose a threat to river aquatic ecosystems (B category or better).	
								Pathogens	Escherichia coli (E coli), Faecal coliforms	Concentrations of waterborne pathogens should be maintained in an Acceptable category or better to safeguard contact recreational water users.	

Table 17. Resource Quality Objectives for the prioritised river resource unit (RRU_Riv32) in the Mapungubwe IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
Mapungubwe IUA	II	A63E	Kolope	RRU_Riv32 - A63E-00008 (EWR site [illegible])	Riv32	C	Water quantity		Month		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
								Low flows	Maintenance low flows (MCM)	Flows must be sufficient to maintain the Kolope River in a condition equal to or better than a C category. Flows must be met at the confluence with the Limpopo River, i.e. must flow into the Limpopo.	0.000	0.001	0.008	0.038	0.141	0.143	0.015	0.002	0.000	0.000	0.000	0.000
								High flows	Maintenance high flows (MCM)		0.000	0.001	0.005	0.004	0.003	0.004	0001	0.000	0.000	0.000	0.000	0.000
							Water [illegible]	Salts	Electrical conductivity (EC)	Salt concentrations must to be maintained at levels that is do not adversely affect aquatic ecosystems (C category).	95 percentile EC ≤ 85 mS/m											

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
								Nutrients	Total Inorganic nitrogen (TIN)	River nutrient concentrations must be maintained in a mesotrophic state or better (Acceptable category).	Median TIN ≤ 2.24 mg/l
									Orthophosphate (PO_4-P)		Median PO_4-P ≤ 0.090 mg/l
								System variables	Dissolved oxygen	Dissolved oxygen concentrations must be such that some oxygen sensitive species are present in the river.	5% percentile Dissolved oxygen concentration ≥ 6 mg/l
									pH		5.6 ≤ pH ≤ 9.2
									Water temperature	Water temperatures must fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).	Water temperature within the reference thermograph (95% band) plus or minus 1 standard deviation
								Toxins	Ammonia (NH_3-N) Atrazine Endosulfan(α, β and the sulphate)	Toxicity levels must not pose a threat to river aquatic ecosystems.	Ammonia (NH_3-N) ≤ 44 µg/l (95% percentile) Atrazine ≤ 49 µg/l (95% percentile) Endosulfan ≤ 0.075 µg/l (95% percentile)
								Pathogens	Escherichia coli (E coli)Faecal coliforms	Concentrations of waterborne pathogens must be maintained in an Acceptable category for contact recreation	E coli / Faecal coliforms ≤ 25 cfu/100ml (95^{th} percentile)
							Habitat	Geomorphology	GAI score	Maintain or improve catchment drivers and site impacts. Maintain plain bed reach type.	Maintain a GAI PES score of at least a 'D' or > 42%
									Bed erosion	Maintain bed elevation in relation to banks and benches	Maintain lowest point along cross-section at < 0.5 m difference in elevation from previous cross-sectional surveys
									Bank erosion	Maintain low to moderately high proportion of banks actively eroding	Maintain bank erosion below 60% of riverbank length

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
							Biota	Non-marginal (lower - flood benches)	Dominant vegetation	Non-woody vegetation must dominate the flood features	Non-woody cover >= 20% (aerial cover).
									Key species	*Flueggea virosa* and *Croton megalobotrys* must be present.	2 listed species present.
									Alien plant species	The riparian vegetation structure and composition on the flood features must maintain desired dominance and non-dominance.	No perennial alien plant species.
									Terrestrial woody cover		Terrestrial woody cover <= 10% (aerial cover).
								Non-marginal (upper - banks)	Dominant vegetation	Woody vegetation must dominate the macro-channel banks	Woody cover >= 35%
									Alien plant species	Alien invasive plant species must be kept low or absent on macro-channel banks	No perennial alien plant species.
								Riparian zone	PES	The PES category must be a C at least	VEGRAI score >= 62%
									Species richness	Indigenous plant species richness in the riparian zone must be maintained.	>= 20 indigenous species.
									Threatened riparian species	2 nationally protected tree species: Apple Leaf (*Philenoptera violacea*) and Leadwood (*Combretum imberbe*) must be present.	2 listed species present.
								Fish	FRAI score	A diversity of fish representative of the fish species reference list as per the EWR surveys must be able to recruit to the reach associated with the study site after sufficient flow has been maintained for at least 4 weeks	PES for fish to remain within a C category (FRAI PES C >62%) after sufficient flow has returned to the river for at least 4 weeks

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
									Overall fish health	Fish must be free of bacterial and parasitic infections	<1% of all fish sampled at the site to be affected by bacterial and/or parasitic infections.
									Species diversity	The site must support the diversity and relative abundance of fish as per the reference list used during the EWR studies after flow has been restored for at least 4 weeks	Maintain the diversity of species as per EWR studies
									Key species	To maintain suitable flow conditions to support the key species identified at the site	Presence/absence records. Relative abundance of species: *Chiloglanis pretoriae* (1) *Labeobarbus marequensis* (2) *Labeo cylindricus* (1)
								Macroinvertebrates	MIRAI Category and Score	N/A*	
									SASS5 Total Score and ASPT	N/A*	
									Key taxa and abundance	To maintain sufficient quantity and quality of inundated vegetation to support the following vegetation-dwelling taxon: Coenagrionidae	To maintain a minimum abundance of an A.
									Taxon dominance	To ensure that no group consistently dominates the fauna, over more than two consecutive surveys.	No taxon occurs at a C abundance (>100 individuals).

*N/A = Not Applicable as it is an ephemeral site.

Table 18. Resource Quality Objectives for the prioritised river resource unit (RRU_Riv16) in the Upper Sand IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
Upper Sand	III	A71F	Dwars	RRU_Riv16 - A71C-00156	Riv16	C		Overall Ecological Category	Target Ecological Category	To maintain the Ecological Category of the resource unit in a C category												
							Water quantity		Month*		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
								Total flows	MCM	Flows shall be sufficient to maintain the Dwars River in a condition equal to or better than a C category.	0	0.005	0.016	0.322	0.776	0.297	0.001	0	0	0	0	0
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations need to be maintained at levels that is do not adversely affect aquatic ecosystems (C category).												
								Nutrients	Total Inorganic nitrogen (TIN), Orthophosphate (PO4-P)	River nutrient concentrations should be maintained in a mesotrophic state or better (Acceptable category or better).												
								System variables	Dissolved oxygen	Dissolved oxygen concentrations should be maintained so that some oxygen sensitive species are present in the river (C category).												
									pH	pH levels should be maintained in a C category to protect aquatic organisms.												
									Water temperature	Water temperatures (°C) should fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).												
								Toxins/Biocides	Ammonia (NH_3-N), Atrazine, Endosulfan	Toxic substances should be maintained at concentrations that does not pose a threat to river aquatic ecosystems (B category or better).												

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
								Pathogens	Escherichia coli (E coli), Faecal coliforms	Concentrations of waterborne pathogens should be maintained in an Acceptable category or better to safeguard contact recreational water users.	

Table 19. Resource Quality Objectives for the prioritised river resource unit (RRU_Ri20) in the Lower Sand IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
											Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Lower Sand IUA	III	A71D	Sand	RRU_Ri20 - A71D-00118 (EWR site 7_Sand)	Ri20	C	Water quantity	Low flows	Maintenance low flows (MCM)	Flows must be sufficient to maintain the Sand River in a condition equal to or better than a C category.	0.230	0.212	0.231	0.581	0.669	0.230	0.344	0.315	0.356	0.361	0.317	0.279
								High flows	Maintenance high flows (MCM)		0.023	0.112	0.226	0.361	0.364	0.173	0.101	0.018	0.004	0.012	0.002	0.023
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations must to be maintained at levels that is do not adversely affect aquatic ecosystems (C category).	95 percentile EC ≤ 85 mS/m											
								Nutrients	Total Inorganic nitrogen (TIN)	River nutrient concentrations must be maintained in a mesotrophic state or better (Acceptable category).	Median TIN ≤ 2.24 mg/l											
									Orthophosphate (PO_4-P)		Median PO_4-P ≤ 0.090 mg/l											

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
								System variables	Dissolved oxygen	Dissolved oxygen concentrations must be such that some oxygen sensitive species are present in the river.	5% percentile Dissolved oxygen concentration ≥ 6 mg/l
									pH		5.6 ≤ pH ≤ 9.2
									Water temperature	Water temperatures must fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).	Water temperature within the reference thermograph (95% band) plus or minus 1 standard deviation
									Turbidity	A baseline assessment to determine the present state instream turbidity is required.	A 10% variation from background concentration is allowed.
								Toxins	Ammonia (NH_3-N) Atrazine Endosulfan(α, β and the sulphate)	Toxicity levels must not pose a threat to river aquatic ecosystems.	Ammonia (NH_3-N) ≤ 44 µg/l (95% percentile) Atrazine ≤ 49 µg/l (95% percentile) Endosulfan ≤ 0.075 µg/l (95% percentile)
								Pathogens	Escherichia coli (E coli) Faecal coliforms	Concentrations of waterborne pathogens must be maintained in a Tolerable category for contact recreation	E coli / Faecal coliforms ≤ 84 cfu/100ml (95^{th} percentile)
							Habitat	Geomorphology	GAI score	Maintain or improve catchment drivers and site impacts.	Maintain a GAI PES score of at least a 'C' or > 63%

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										Maintain plain bed reach type.	
									Bed erosion	Maintain bed elevation in relation to banks and benches	Maintain lowest point along riffle cross-section at < 0.7 m difference in elevation from previous cross-sectional surveys
									Bank erosion	Maintain low to moderate proportion of banks actively eroding	Maintain active bank erosion below 30% of riverbank length
									Flood bench	Maintain flood benches along at least one of the banks	Maintain flood bench of > 2 m wide along at least one bank with signs of recent fine sediment deposition
									Sediment size	Maintain a largely sandy riverbed, with localised gravel deposits	Maintain localised coarse sediment deposits in the range of a D50 of 14 mm, D16 of 8 mm and D84 of 22 mm
							Biota	Marginal (Channel bed)	Dominant vegetation	Non-woody vegetation must dominate the channel bed	Non-woody cover >= 5% (aerial cover).
									Key species	*Cynodon dactylon* must be present.	1 listed species present.
									Alien plant species	The riparian vegetation structure and composition on the channel bed must maintain desired dominance and non-dominance.	No perennial alien plant species.
									Terrestrial woody cover		No terrestrial woody plants.
									Reed cover		No reeds.
								Non-marginal (lower - flood benches)	Dominant vegetation	Non-woody vegetation must dominate the flood features	Non-woody cover >= 60% (aerial cover).
									Key species	*Cynodon. dactylon, Sporobolus ioclados* and *Pennisetum*	3 listed species present.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										macrourum must be present.	
									Alien plant species	The riparian vegetation structure and composition on the flood features must maintain desired dominance and non-dominance.	Perennial alien plant species <= 20% (aerial cover).
									Terrestrial woody cover		Terrestrial woody cover <= 5% (aerial cover).
									Non-woody cover		Non-woody cover >= 60% (aerial cover).
								Non-marginal (upper - banks)	Dominant vegetation	Woody and non-woody vegetation must co-dominate the macro-channel banks	Combined cover (Woody and non-woody vegetation) <= 80% or >= 10% (aerial cover).
									Alien plant species	Alien invasive plant species must be kept low or absent on macro-channel banks	Perennial alien plant species <= 10% (aerial cover).
								Riparian zone	PES	The PES category must be a C at least	VEGRAI score >= 62%
									Species richness	Indigenous plant species richness in the riparian zone must be maintained.	>= 15 indigenous species.
									Endemic riparian species	*Combretum erythrophyllum* (southern African endemic) must be present.	1 listed species present.
								Fish	FRAI score	A diversity of fish representative of the fish species reference list as per the EWR surveys must be able to recruit to the reach associated with the	PES for fish to remain within a C category (FRAI PES C >62%) after sufficient flow has returned to the river for at least 4 weeks

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										study site after sufficient flow has been maintained for at least 4 weeks	
									Overall fish health	Fish must be free of bacterial and parasitic infections	<1% of all fish sampled at the site to be affected by bacterial and/or parasitic infections.
									Species diversity	The site must support the diversity and relative abundance of fish as per the reference list used during the EWR studies after flow has been restored for at least 4 weeks	Maintain the diversity of species as per EWR studies
									Key species	To maintain suitable flow conditions during the summer wet season to support the key species identified at the site	Presence/absence records. Relative abundance of species: *Chiloglanis pretoriae* (1) *Labeobarbus marequensis* (2) *Labeo cylindricus* (2)
								Macroinvertebrates	MIRAI Category and Score	N/A*	
									SASS5 Total Score and ASPT	N/A*	
									Key taxa and abundance	To maintain sufficient quantity and quality of inundated vegetation to support the following vegetation-dwelling taxon: Coenagrionidae.	Minimum abundance of an A attained.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										To maintain sufficient quantity and quality of inundated gravel, sand and mud to support the following taxa: Gomphidae, Caenidae	
									Taxon dominance	To ensure that no group consistently dominates the fauna, over more than two consecutive surveys.	No taxon occurs at a C abundance (>100 individuals).

*N/A = Not Applicable as it is an ephemeral site.

Table 20. Resource Quality Objectives for the prioritised river resource unit (RRU_Ri22) in the Lower Sand IUA

IUA	Class	Quaternary	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
Lower Sand	II	A71G	Sand	RRU_Ri22 -	Ri22	B/C	Water quantity	Overall Ecological Category	Target Ecological Category	To maintain the Ecological Category of the resource unit in a B/C category												
								Total flows	Month*		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep

IUA	Class	Quaternary	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical										
									MCM	Flows shall be sufficient to maintain the Sand River in a condition equal to or better than a B/C category.	1.146	1.332	1.584	8.111	14.207	6.548	1.402	1.213	1.227	1.236	1.202	1.192
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations need to be maintained at levels that is do not adversely affect aquatic ecosystems (B/C category).												
								Nutrients	Total Inorganic nitrogen (TIN), Orthophosphate (PO4-P)	River nutrient concentrations should be maintained in an oligo/mesotrophic state or better (Ideal/Acceptable category or better).												
								System variables	Dissolved oxygen	Dissolved oxygen concentrations should be maintained so that most oxygen sensitive species are present in the river (B/C category).												
									pH	pH levels should be maintained in a B/C category to protect aquatic organisms.												
									Water temperature	Water temperatures (°C) should fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).												
								Toxins/Biocides	Ammonia (NH_3-N), Atrazine, Endosulfan	Toxic substances should be maintained at concentrations that does not pose a threat to river aquatic ecosystems (B category or better).												
								Pathogens	Escherichia coli (E coli), Faecal coliforms	Concentrations of waterborne pathogens should be maintained in an Acceptable category or better to safeguard contact recreational water users.												

Table 21. Resource Quality Objectives for the prioritised river resource unit (RRU_Ri25) in the Lower Sand IUA (LIMCOM Site SAND-A71K-R508B)

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
											Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Lower Sand IUA	II	A71K	Sand	RRU_Ri25 - A71K-00019 (EWR site SAND-A71K-R508B)	Ri25	C	Water quantity		Month													
								Low flows	Maintenance low flows	Flows must be sufficient to maintain the Sand River in a condition equal to or better than a C category. Flows must be met at the confluence with the Limpopo River, i.e. must flow into the Limpopo.	0.104	0.163	0.188	0.372	0.720	0.320	0.195	0.141	0.119	0.099	0.086	0.078
								High flows	Maintenance high flows		0.000	0.720	0.697	0.697	3.324	0.697	0.720	0.000	0.000	0.000	0.000	0.000
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations must to be maintained at levels that is do not adversely affect aquatic ecosystems (C category).	95 percentile EC ≤ 85 mS/m											
								Nutrients	Total Inorganic nitrogen (TIN)	River nutrient concentrations must be maintained in a mesotrophic state or better (Acceptable category).	Median TIN ≤ 2.24 mg/l											
									Orthophosphate (PO_4-P)		Median PO_4-P ≤ 0.090 mg/l											
								System variables	Dissolved oxygen	Dissolved oxygen concentrations must be such that some oxygen sensitive species are present in the river.	5% percentile Dissolved oxygen concentration ≥ 6 mg/l											
									pH		5.6 ≤ pH ≤ 9.2											
									Water temperature	Water temperatures must fall within the reference thermograph (graph of the 95% band of seasonal pattern of	Water temperature within the reference thermograph (95% band) plus or minus 1 standard deviation											

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										minimum and maximum temperatures river).	
									Turbidity	A baseline assessment to determine the present state instream turbidity is required.	A 10% variation from background concentration is allowed.
								Toxins	Ammonia (NH_3-N) Atrazine Endosulfan(α, β and the sulphate)	Toxicity levels must not pose a threat to river aquatic ecosystems.	Ammonia (NH_3-N) ≤ 44 µg/l (95% percentile) Atrazine ≤ 49 µg/l (95% percentile) Endosulfan ≤ 0.075 µg/l (95% percentile)
								Pathogens	Escherichia coli (E coli) Faecal coliforms	Concentrations of waterborne pathogens must be maintained in an Acceptable category for contact recreation	E coli / Faecal coliforms ≤ 25 cfu/100ml (95^{th} percentile)
							Habitat	Geomorphology	GAI score	Maintain or improve catchment drivers and site impacts. Maintain largely plain bed reach type.	GAI score not available as part of IWMI study. Determine and maintain the GAI PES score in a similar or better category
									Bed erosion	Maintain bed elevation in relation to banks and benches	Maintain lowest point along riffle cross-section at < 0.5 m difference in elevation from previous cross-sectional surveys
									Bank erosion	Maintain low to moderate proportion of banks actively eroding	Maintain active bank erosion below 30% of riverbank length
									Bed sediment size	Maintain largely sandy bed with localised gravel component	Maintain largely sandy bed with localised gravel deposits with range of a D50 of 20 mm, D16 of 9 mm and D84 of 46 mm
									Flood bench	Maintain flood benches along at least one of the banks	Maintain flood bench of > 5 m wide along at least one bank with signs of recent fine sediment deposition
							Biota	Marginal (bed)	Dominant vegetation	Non-woody vegetation must dominate the channel bed	Non-woody cover >= 10% (aerial cover).
									Alien plant species	The riparian vegetation structure and	No perennial alien plants

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
									Terrestrial woody cover	composition in the channel bed must maintain desired dominance and non-dominance.	No terrestrial woody plants.
									Reed cover		Reeds <=5%
								Non-marginal (bank)	Dominant vegetation	Woody vegetation must dominate the macro-channel banks	Woody cover >= 60% (aerial cover).
									Alien plant species	Alien invasive plant species must be kept low or absent on macro-channel banks	No perennial alien plants
								Riparian zone	PES	The PES category must be a B/C at least	VEGRAI score >= 78%
									Species richness	Indigenous plant species richness in the riparian zone must be maintained.	>= 10 indigenous species.
								Fish	FRAI score	A diversity of fish representative of the fish species reference list as per the LIMCOM surveys must be able to recruit to the reach associated with the study site after sufficient flow has been maintained for at least 4 weeks	PES for fish to remain within a C category (FRAI PES C >62%) after sufficient flow has returned to the river for at least 4 weeks
									Overall fish health	Fish must be free of bacterial and parasitic infections	<1% of all fish sampled at the site to be affected by bacterial and/or parasitic infections.
									Species diversity	The site must support the diversity and relative abundance of fish as per the reference list used during the EWR studies after flow has been	Maintain the diversity of species as per EWR studies

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										restored for at least 4 weeks	
									Key species	To maintain suitable flow conditions during the summer wet season to support the key species identified at the site	Presence/absence records. Relative abundance of species: *Chiloglanis pretoriae* (2) *Labeobarbus marequensis* (2) *Labeo cylindricus* (1)
								Macroinvertebrates	MIRAI Category and Score	N/A*	
									SASS5 Total Score and ASPT	N/A*	
									Key taxa and abundance	To maintain sufficient quantity and quality of inundated vegetation to support the following vegetation-dwelling taxon: Coenagrionidae. To maintain sufficient quantity and quality of inundated gravel, sand and mud to support the following taxa: Gomphidae, Caenidae	Minimum abundance of an A attained.
									Taxon dominance	To ensure that no group consistently dominates the fauna, over more than two consecutive surveys.	No taxon occurs at a C abundance (>100 individuals).

*N/A = Not Applicable as it is an ephemeral site.

Table 22. Resource Quality Objectives for the prioritised river resource unit (RRU_Ri26) in the Nzhelele/Nwanedi IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
Nzhelele/Nwanedi	II	A80F	Nzhelele	RRU_Ri26 - A80G-00053	Ri26	C		Overall Ecological Category	Target Ecological Category	To maintain the Ecological Category of the resource unit in a C category												
							Water quantity	Total flows	Month*		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
									MCM	Flows shall be sufficient to maintain the Nzhelele River in a condition equal to or better than a C category.	0.857	0.703	1.123	7.225	16.87	11.878	6.959	3.568	2.549	2.089	1.336	0.918
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations need to be maintained at levels that is do not adversely affect aquatic ecosystems (C category).												
								Nutrients	Total Inorganic nitrogen (TIN), Orthophosphate (PO4-P)	River nutrient concentrations should be maintained in a mesotrophic state or better (Acceptable category or better).												
								System variables	Dissolved oxygen	Dissolved oxygen concentrations should be maintained so that some oxygen sensitive species are present in the river (C category).												
									pH	pH levels should be maintained in a C category to protect aquatic organisms.												
									Water temperature	Water temperatures (°C) should fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).												
								Toxins/Biocides	Ammonia (NH_3-N), Atrazine, Endosulfan	Toxic substances should be maintained at concentrations that does not pose a threat to river aquatic ecosystems (B category or better).												
								Pathogens	Escherichia coli (E coli), Faecal coliforms	Concentrations of waterborne pathogens should be maintained in an Acceptable category or better to safeguard contact recreational water users.												

Table 23. Resource Quality Objectives for the prioritised river resource unit (RRU_Riv33) in the Nzhelele/Nwanedi IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
Nzhelele/Nwanedi	II	A80G	Tshishiru	RRU_Riv33 - A80G-00054	Riv33	C		Overall Ecological Category	Target Ecological Category	To maintain the Ecological Category of the resource unit in a C category	
							Water	Total flows	Month*		Oct / Nov / Dec / Jan / Feb / Mar / Apr / May / Jun / Jul / Aug / Sep
									MCM	Flows shall be sufficient to maintain the Tshishiru River in a condition equal to or better than a C category.	0.009 / 0.002 / 0.005 / 0.22 / 0.36 / 0.122 / 0.008 / 0 / 0 / 0 / 0 / 0
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations need to be maintained at levels that is do not adversely affect aquatic ecosystems (C category).	
								Nutrients	Total Inorganic nitrogen (TIN), Orthophosphate (PO4-P)	River nutrient concentrations should be maintained in a mesotrophic state or better (Acceptable category or better).	
								System variables	Dissolved oxygen	Dissolved oxygen concentrations should be maiintained so that some oxygen sensitive species are present in the river (C category).	
									pH	pH levels should be maintained in a C category to protect aquatic organisms.	
									Water temperature	Water temperatures (°C) should fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).	
								Toxins/Biocides	Ammonia (NH_3-N), Atrazine, Endosulfan	Toxic substances should be maintained at concentrations that does not pose a threat to river aquatic ecosystems (B category or better).	
								Pathogens	Escherichia coli (E coli), Faecal coliforms	Concentrations of waterborne pathogens should be maintained in an Acceptable category or better to safeguard contact recreational water users.	

Table 24. Resource Quality Objectives for the prioritised river resource unit (RRU_Ri27) in the Nzhelele/Nwanedi IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
Nzhelele and Nwanedi IUA	II	A80G	Nzhelele	RRU_Ri27 - A80G-00026 (EWR site 7_Nzhelele)	Ri27	C	Water quantity		Month		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
								Low flows (MCM)	Maintenance low flows	Flows must be sufficient to maintain the Nzhelele River in a condition equal to or better than a C category. Flows must be met at the confluence with the Limpopo River, i.e. must flow into the Limpopo.	1.212	1.023	1.252	3.229	6.116	7.159	6.174	4.635	3.641	3.012	2.381	1.762
								High flows (MCM)	Maintenance high flows		0.328	0.455	0.788	1.080	1.220	1.476	1.453	0.490	0.481	0.345	0.201	0.345
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations must to be maintained at levels that is do not adversely affect aquatic ecosystems (C category).	95 percentile EC ≤ 85 mS/m											
								Nutrients	Total Inorganic nitrogen (TIN)	River nutrient concentrations must be maintained in a mesotrophic state or better (Acceptable category).	Median TIN ≤ 2.24 mg/l											
									Orthophosphate (PO_4-P)		Median PO_4-P ≤ 0.090 mg/l											
								System variables	Dissolved oxygen	Dissolved oxygen concentrations must be such that some oxygen sensitive species are present in the river.	5% percentile Dissolved oxygen concentration ≥ 6 mg/l											
									pH		5.6 ≤ pH ≤ 9.2											
									Water temperature	Water temperatures must fall within the reference thermograph (graph of the 95% band of seasonal pattern of	Water temperature within the reference thermograph (95% band) plus or minus 1 standard deviation											

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										minimum and maximum temperatures river).	
								Toxins	Ammonia (NH_3-N) Atrazine Endosulfan (α, β and the sulphate)	Toxicity levels must not pose a threat to river aquatic ecosystems.	Ammonia (NH_3-N) ≤ 44 µg/l (95% percentile) Atrazine ≤ 49 µg/l (95% percentile) Endosulfan ≤ 0.075 µg/l (95% percentile)
								Pathogens	Escherichia coli (E coli) Faecal coliforms	Concentrations of waterborne pathogens must be maintained in an Acceptable category for contact recreation	E coli / Faecal coliforms ≤ 25 cfu/100ml (95th percentile)
							Habitat	Geomorphology	GAI score	Maintain or improve catchment drivers and site impacts. Maintain pool-riffle reach type.	Maintain a GAI PES score of at least a 'D' or > 42%
									Bed erosion	Maintain bed elevation in relation to banks and benches	Maintain lowest point along riffle cross-section at < 0.5 m difference in elevation from previous cross-sectional surveys
									Bank erosion	Maintain low to moderately-high proportion of banks actively eroding	Maintain active bank erosion below 60% of riverbank length
									Bed sediment size	Maintain dominant riffle sediment size to include gravel and cobble	Maintain riffle with mobile sediment in the range of a D50 of 27 mm, D16 of 11 mm and D84 of 82 mm
									Embeddedness	Maintain low to moderate embeddedness of riffle sediment	Maintain embeddedness of < 25% for riffle sediment
									Pool depth	Maintain downstream pool with deep open water	Maintain downstream pool with water > 0.5 m deep for > 60% of pool area
									Flood bench	Maintain flood benches along at least one of the banks	Maintain flood bench of > 2 m wide along at least one bank with signs of recent fine sediment deposition

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
							Biota	Marginal zone	Dominant vegetation	Non-woody vegetation must dominate the marginal zone	Non-woody cover >= 20% (aerial cover).
									Key species	*Juncus oxycarpus, Cyperus sexangularis, Phragmites mauritianus* and *Pluchea bojeri* must be present.	4 listed species present.
									Alien plant species	The riparian vegetation structure and composition in the marginal zone must maintain desired dominance and non-dominance.	No perennial alien plant species.
									Terrestrial woody cover		No terrestrial woody plants.
									Non-woody cover		Woody cover <= 5% (aerial cover).
									Reed cover		Reed cover <= 10% (aerial cover).
								Non-marginal (lower - flood benches)	Dominant vegetation	Non-woody vegetation must dominate the flood features	Non-woody cover >= 10% (aerial cover).
									Key species	*Pluchea bojeri* must be present.	1 listed species present.
									Alien plant species	The riparian vegetation structure and composition on the flood features must maintain desired dominance and non-dominance.	Perennial alien plant species <= 5% (aerial cover).
									Terrestrial woody cover		Terrestrial woody cover <= 10% (aerial cover).
									Non-woody cover		Non-woody cover >= 10% (aerial cover).
								Non-marginal (upper - banks)	Dominant vegetation	Woody vegetation must dominate the macro-channel banks	Woody cover >= 60% (aerial cover).
									Alien plant species	Alien invasive plant species must be kept low or absent on macro-channel banks	Perennial alien plant species <= 5% (aerial cover).
								Riparian zone	PES	The PES category must be a B/C at least	VEGRAI score >= 78%
									Species richness	Indigenous plant species richness in the riparian	>= 25 indigenous species.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										zone must be maintained.	
									Threatened riparian species	1 nationally protected tree species: Apple Leaf (*Philenoptera violacea*) must be present.	1 listed species present.
								Fish	FRAI score	The Ecological Category must be maintained within an B Category, using reference data used for the EWR studies	FRAI to be maintained within the range of a B category (>82%)
									Overall fish health	Fish generally healthy (no ulcerative bacterial infections, and limited parasite burden)	Bacterial infections and/or parasitic burdens must impact <1% of the fish population
									Species diversity	To maintain suitable habitat conditions that would support the key species	Maintain the diversity of species as per EWR studies
									Key species	To maintain suitable flow conditions to support the key species identified at the site	Presence/absence records. Relative abundance of species: *Labeobarbus marequensis (2), Labeo cylindricus (2), Labeo molybdinus (1), Chiloglanis pretoriae (2), Engraulicypris brevianalis (1)*
								Macroinvertebrates	MIRAI Category and Score	The Ecological Category must remain within a C Category.	To ensure that the MIRAI score remains within the range of a C category (>62 - ≤78 %), using the same reference data used in the EWR study.
									SASS5 Total Score and ASPT	To ensure that the SASS scores attained, support the specified Ecological Category.	To ensure that the SASS5 scores and ASPT values occur in the following range: SASS5 score: >130; ASPT value: >6.0.
									Key taxa and abundance	To maintain suitable flow velocity (>0.6m/s) and to maintain clean, unembedded surface area (cobbles) to support the following flow-dependent taxa:	Minimum abundance of an A attained for the Hydropsychidae, Simuliidae.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										Hydropsychidae >2pp; Simuliidae	
										To maintain sufficient quantity and quality of inundated vegetation to support the following vegetation-dwelling taxon: Coenagrionidae.	Minimum abundance of an A attained for Coenagrionidae.
										To maintain sufficient quantity and quality of inundated gravel, sand and mud to support the following taxa: Gomphidae.	Minimum abundance of an A attained for Gomphidae.

Table 25. Resource Quality Objectives for the prioritised river resource unit (RRU_Ri28) in the Nzhelele/Nwanedi IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
Nzhelele and Nwanedi IUA	II	A80J	Ṅwaneḍi	RRU_Ri28 - A80J-00028	Ri28	C	Water quantity		Month		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
								Low flows (MCM)	Maintenance low flows	Flows must be sufficient to maintain the Ṅwaneḍi River in a condition equal to or better than a C category. Flows must be met at the confluence with the Limpopo River, i.e. must flow into the Limpopo.	0.437	0.517	0.763	1.307	1.877	1.830	1.344	1.063	0.860	0.730	0.630	0.515
								High flows (MCM)	Maintenance high flows		0.195	0.314	0.513	0.829	0.998	0.866	0.468	0.117	0.043	0.024	0.017	0.036

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations must to be maintained at levels that is do not adversely affect aquatic ecosystems (C category).	95 percentile EC ≤ 85 mS/m
								Nutrients	Total Inorganic nitrogen (TIN)	River nutrient concentrations must be maintained in a mesotrophic state or better (Acceptable category).	Median TIN ≤ 2.24 mg/l
									Orthophosphate (PO_4-P)		Median PO_4-P ≤ 0.090 mg/l
								System variables	Dissolved oxygen	Dissolved oxygen concentrations must be such that some oxygen sensitive species are present in the river.	5% percentile Dissolved oxygen concentration ≥ 6 mg/l
									pH		5.6 ≤ pH ≤ 9.2
									Water temperature	Water temperatures must fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).	Water temperature within the reference thermograph (95% band) plus or minus 1 standard deviation
									Turbidity	A baseline assessment to determine the present state instream turbidity is required.	A 10% variation from background concentration is allowed.
								Toxins	Ammonia (NH_3-N) Atrazine Endosulfan(α, β and the sulphate)	Toxicity levels must not pose a threat to river aquatic ecosystems.	Ammonia (NH_3-N) ≤ 44 µg/l (95% percentile) Atrazine ≤ 49 µg/l (95% percentile) Endosulfan ≤ 0.075 µg/l (95% percentile)
								Pathogens	Escherichia coli (E coli) Faecal coliforms	Concentrations of waterborne pathogens must be maintained in	E coli / Faecal coliforms ≤ 25 cfu/100ml (95^{th} percentile)

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										an Acceptable category for contact recreation	
							Habitat	Geomorphology	GAI score	Maintain or improve catchment drivers and site impacts. Maintain pool-riffle reach type.	Maintain a GAI PES score of at least a 'D' or > 42%
									Bed erosion	Maintain bed elevation in relation to banks and benches	Maintain lowest point along cross section at < 0.5 m difference in elevation from previous cross-sectional surveys
									Bank erosion	Maintain low to moderately-high proportion of banks actively eroding	Maintain bank erosion below 50% of riverbank length
									Bed sediment size	Maintain dominant riffle sediment size to include gravel	Maintain riffle with mobile sediment in the range of a D50 of 32 mm, D16 of 14 mm and D84 of 59 mm
									Embeddedness	Maintain low to moderate embeddedness of riffle sediment	Maintain embeddedness of < 25% for riffle sediment
									Pool depth	Maintain downstream pool with deep open water	Maintain downstream pool with water > 0.5 m deep for > 60% of pool area
									Flood bench	Maintain flood benches along at least one of the banks	Maintain flood bench of > 1 m wide along at least one bank with signs of recent fine sediment deposition
							Biota	Marginal zone	Dominant vegetation	Non-woody vegetation must dominate the marginal zone	Non-woody cover >= 10% (aerial cover).
									Key species	*Commelina diffusa* must be present.	1 listed species present in the wet season
									Alien plant species	The riparian vegetation structure and composition in the marginal zone must maintain desired dominance and non-dominance.	No perennial alien plant species.
									Terrestrial woody cover		No terrestrial woody plants.
									Reed cover		No reeds.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
								Non-marginal (lower - flood benches)	Dominant vegetation	Non-woody vegetation must dominate the flood features	Non-woody cover >= 70% (aerial cover).
									Key species	*Ficus sycomorus, Breonaria salicina, Combretum erythrophyllum* and *Faidherbia albida* must be present.	4 listed species present.
									Alien plant species	The riparian vegetation structure and composition on the flood features must maintain desired dominance and non-dominance.	Perennial alien plant species <= 10% (aerial cover).
									Terrestrial woody cover		Terrestrial woody cover <= 10% (aerial cover).
								Non-marginal (upper - banks)	Dominant vegetation	Woody vegetation must dominate the macro-channel banks	Woody cover >= 80% (aerial cover).
									Alien plant species	Alien invasive plant species must be kept low or absent on macro-channel banks	Perennial alien plant species <= 10% (aerial cover).
								Riparian zone	PES	The PES category must be a C at least	VEGRAI score >= 62%
									Species richness	Indigenous plant species richness in the riparian zone must be maintained.	>= 20 indigenous species.
									Endemic riparian species	*Buxus macowanii (*SA endemic*)* and *Schotia brachypetala (*southern African endemic*)* must be present.	2 listed species present.
									Threatened riparian species	1 nationally protected tree species: Matumi (*Breonadia salicina* must be present.	1 listed species present.
								Fish	FRAI score	The Ecological Category must be maintained	FRAI to be maintained within the range of a B/C category (>77%)

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										within a B/C Category, using reference data used for the EWR studies	
									Overall fish health	Fish generally healthy (no ulcerative bacterial infections, and limited parasite burden)	Bacterial infections and/or parasitic burdens must impact <1% of the fish population
									Species diversity	To maintain suitable habitat conditions that would support the key species	Maintain the diversity of species as per EWR studies
									Key species	To maintain suitable flow conditions to support the key species identified at the site	Presence/absence records. Relative abundance of species: *Labeobarbus marequensis (1), Labeo cylindricus (1), Chiloglanis pretoriae (2)*
								Macroinvertebrates	MIRAI Category and Score	The Ecological Category must remain within a C Category.	To ensure that the MIRAI score remains within the range of a C category (>62 - ≤78 %), using the same reference data used in the EWR study.
									SASS5 Total Score and ASPT	To ensure that the SASS scores attained, support the specified Ecological Category.	To ensure that the SASS5 scores and ASPT values occur in the following range: SASS5 score: >110; ASPT value: >6.1.
									Key taxa and abundance	To maintain suitable flow velocity (>0.6m/s) and to maintain clean, unembedded surface area (cobbles) to support the following flow-dependent taxa: Hydropsychidae.	Minimum abundance of an A attained.
										To maintain sufficient quantity and quality of inundated gravel, sand and mud to support the following taxa: Gomphidae	Minimum abundance of an A attained.

Table 26. Resource Quality Objectives for the prioritised river resource unit (RRU_Riii6) in the Upper Luvuvhu IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
									Month		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Upper Luvuvhu IUA	II	A91D	Latonyanda	RRU_Riii6 - A91D-00108 (EWR site 10_Latonyanda)	Riii6	C	Water quantity	Low flows	Maintenance low flows (MCM)	Flows must be sufficient to maintain the Latonyanda River in a condition equal to or better than a C category.	0.384	0.431	0.690	1.504	2.259	2.645	1.989	1.206	0.862	0.674	0.535	0.419
								High flows	Maintenance high flows (MCM)		0.035	0.127	0.344	0.722	0.769	0.616	0.444	0.060	0.026	0.017	0.010	0.018
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations must to be maintained at levels that is do not adversely affect aquatic ecosystems (C category).	95 percentile EC ≤ 55 mS/m											
								Nutrients	Total Inorganic nitrogen (TIN)	River nutrient concentrations must be maintained in a mesotrophic state or better (Acceptable category).	Median TIN ≤ 1.75 mg/l											
									Orthophosphate (PO_4-P)		Median PO_4-P ≤ 0.075 mg/l											
								System variables	Dissolved oxygen	Dissolved oxygen concentrations must be such that some oxygen sensitive species are present in the river.	5% percentile Dissolved oxygen concentration ≥ 6 mg/l											
									pH		6.5 ≤ pH ≤ 8.5											
									Water temperature	Water temperatures must fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).	Water temperature within the reference thermograph (95% band) plus or minus 1 standard deviation											
									Turbidity	A baseline assessment to determine the present	A 10% variation from background concentration is allowed.											

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										state instream turbidity is required.	
								Toxins	Ammonia (NH_3-N) Atrazine Endosulfan(α, β and the sulphate)	Toxicity levels must not pose a threat to river aquatic ecosystems.	Ammonia (NH_3-N) ≤ 44 µg/l (95% percentile) Atrazine ≤ 49 µg/l (95% percentile) Endosulfan ≤ 0.075 µg/l (95% percentile)
								Pathogens	Escherichia coli (E coli) Faecal coliforms	Concentrations of waterborne pathogens must be maintained in an Acceptable category for contact recreation	E coli / Faecal coliforms ≤ 25 cfu/100ml (95th percentile)
							Habitat	Geomorphology	GAI score	Maintain or improve catchment drivers and site impacts. Maintain pool-riffle/rapid reach type.	Maintain a GAI PES score of at least a 'C' or > 63%
									Bed erosion	Maintain bed elevation in relation to banks and benches	Maintain lowest point along riffle cross-section at < 0.5 m difference in elevation from previous cross-sectional surveys
									Bank erosion	Maintain low to moderate proportion of banks actively eroding	Maintain active bank erosion below 30% of riverbank length
									Bed sediment size	Maintain dominant riffle sediment size to include gravel and cobble	Maintain riffle with mobile sediment in the range of a D50 of 14 mm, D16 of 7 mm and D84 of 56 mm
									Embeddedness	Maintain low to moderate embeddedness of riffle sediment	Maintain embeddedness of < 25% for riffle sediment
									Pool depth	Maintain downstream pool with deep open water	Maintain downstream pool with water > 0.5 m deep for > 60% of pool area
									Flood bench	Maintain flood benches along at least one of the banks	Maintain flood bench of > 2 m wide along at least one bank with signs of recent fine sediment deposition
							Biota	Channel	Dominant vegetation	Non-woody vegetation must dominate the channel	Non-woody cover >= 30% (aerial cover).

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
									Key species	*Cyclosorus interruptus, Commelina diffusa* and *Isolepis cernua* must be present.	3 listed species present in the wet season
									Alien plant species	The riparian vegetation structure and composition in the channel must maintain desired dominance and non-dominance.	Perennial alien plant species <= 10% (aerial cover).
									Terrestrial woody cover		Terrestrial woody cover <= 10% (aerial cover).
									Reed cover		No reeds.
								MCB	Dominant vegetation	Woody vegetation must dominate the macro-channel banks	Woody cover >= 70% (aerial cover).
									Alien plant species	Alien invasive plant species must be kept low or absent on macro-channel banks	Perennial alien plant species <= 10% (aerial cover).
								Riparian zone	PES	The PES category must be a C/D at least	VEGRAI score >= 58%
									Species richness	Indigenous plant species richness in the riparian zone must be maintained.	>= 15 indigenous species.
									Endemic riparian species	*Combretum erythrophyllum* (southern African endemic) must be present.	1 listed species present.
								Fish	FRAI score	The Ecological Category must be maintained within a B/C Category, using reference data used for the EWR studies	FRAI to be maintained within the range of a B/C category (>77%)
									Overall fish health	Fish generally healthy (no ulcerative bacterial infections, and limited parasite burden)	Bacterial infections and/or parasitic burdens must impact <1% of the fish population
									Species diversity	To maintain suitable habitat conditions that	Maintain the diversity of species as per EWR studies

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										would support the key species	
									Key species	To maintain suitable flow conditions to support the key species identified at the site	Presence/absence records. Relative abundance of species: *Labeobarbus marequensis (2), Labeo cylindricus (1), Chiloglanis pretoriae (1), Anoplopterus "southern stargazer sp" (2)*
								Macroinvertebrates	MIRAI Category and Score	The Ecological Category must remain within a B/C Category.	To ensure that the MIRAI score remains within the range of a B/C category (>78 - ≤82 %), using the same reference data used in this EWR study.
									SASS5 Total Score and ASPT	To ensure that the SASS scores attained, support the specified Ecological Category.	To ensure that the SASS5 scores and ASPT values occur in the following range: SASS5 score: >175; ASPT value: >7.2.
									Key taxa and abundance	To maintain suitable flow velocity (>0.6m/s) and to maintain clean, unembedded surface area (cobbles) to support the following flow-dependent taxa: Heptageniidae Simuliidae	Minimum abundance of an A attained.
										To maintain sufficient quantity and quality of inundated vegetation to support the following vegetation-dwelling taxon: Atyidae	Minimum abundance of an A attained.
										To maintain sufficient quantity and quality of inundated gravel, sand and mud to support the following taxa: Gomphidae	Minimum abundance of an A attained.

Table 27.Resource Quality Objectives for the prioritised river resource unit (RRU_Ri30) in the Upper Luvuvhu IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
Upper Luvuvhu IUA	II	A91G	Mutshindudi	RRU_Ri30 - A91G-00091 (EWR site 11_Mutshindudi)	Ri30	C	Water quantity		Month		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
								Low flows	Maintenance low flows (MCM)	Flows must be sufficient to maintain the Mutshindudi River in a condition equal to or better than a C category.	0.664	0.967	2.094	3.638	4.140	4.494	2.662	1.633	1.213	1.035	0.853	0.714
								High flows	Maintenance high flows (MCM)		0.078	0.436	1.827	3.433	4.931	3.825	1.711	0.324	0.082	0.015	0.016	0.025
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations must to be maintained at levels that is do not adversely affect aquatic ecosystems (C category).	95 percentile EC ≤ 55 mS/m											
								Nutrients	Total Inorganic nitrogen (TIN)	River nutrient concentrations must be maintained in a mesotrophic state or better (Acceptable category).	Median TIN ≤ 1.75 mg/l											
									Orthophosphate (PO_4-P)		Median PO_4-P ≤ 0.075 mg/l											
								System variables	Dissolved oxygen	Dissolved oxygen concentrations must be such that some oxygen sensitive species are present in the river.	5% percentile Dissolved oxygen concentration ≥ 6 mg/l											
									pH		6.5 ≤ pH ≤ 8.5											
									Water temperature	Water temperatures must fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).	Water temperature within the reference thermograph (95% band) plus or minus 1 standard deviation											

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
								Toxins	Ammonia (NH_3-N) Atrazine Endosulfan (α, β and the sulphate)	Toxicity levels must not pose a threat to river aquatic ecosystems.	Ammonia (NH_3-N) ≤ 44 µg/l (95% percentile) Atrazine ≤ 49 µg/l (95% percentile) Endosulfan ≤ 0.075 µg/l (95% percentile)
								Pathogens	Escherichia coli (E coli) Faecal coliforms	Concentrations of waterborne pathogens must be maintained in an Acceptable category for contact recreation	E coli / Faecal coliforms ≤ 25 cfu/100ml (95^{th} percentile)
							Habitat	Geomorphology	GAI score	Maintain or improve catchment drivers and site impacts. Maintain pool-riffle/rapid reach type.	Maintain a GAI PES score of at least a 'C' or > 63%
									Bed erosion	Maintain bed elevation in relation to banks and benches	Maintain lowest point along riffle cross-section at < 0.5 m difference in elevation from previous cross-sectional survey
									Bank erosion	Maintain low to moderate proportion of banks actively eroding	Maintain active bank erosion below 30% of riverbank length
									Bed sediment size	Maintain dominant riffle sediment size to include gravel, cobble and bedrock	Maintain riffle with mobile sediment in the range of a D50 of 25 mm, D16 of 13 mm and D84 of 50 mm
									Embeddedness	Maintain low to moderate embeddedness of riffle sediment	Maintain embeddedness of < 25% for riffle sediment
									Pool depth	Maintain downstream pool with deep open water	Maintain downstream pool with water > 0.5 m deep for 60% of pool area
									Flood bench	Maintain flood benches along at least one of the banks	Maintain flood bench of > 5 m wide along at least one bank with signs of recent fine sediment deposition
							Biota	Marginal zone	Dominant vegetation	Woody and non-woody vegetation must co-	A mix of woody and non-woody plants.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										dominate the marginal zone	
									Key species	*Breonadia salicina, Cyclosorus interruptus, Phragmites mauritianus, Salix mucronata, Cyperus alopecuroides, Cyperus eragrostis* and *Juncus lomatophyllus* must be present.	7 listed species present.
									Alien plant species	The riparian vegetation structure and composition in the marginal zone must maintain desired dominance and non-dominance.	No perennial alien plant species.
									Terrestrial woody cover		No terrestrial woody plants.
									Indigenous woody cover		Woody cover <= 20% (aerial cover).
									Non-woody cover		Non-woody cover >= 30% (aerial cover).
									Reed cover		Reed cover <= 55% (aerial cover).
								Non-marginal (lower - flood benches)	Dominant vegetation	Woody and non-woody vegetation must co-dominate the flood features	Non-woody cover >= 15% (aerial cover), Woody cover >= 5% (aerial cover).
									Key species	*Breonadia salicina, Phragmites mauritianus, Salix mucronata,* and *Ficus sycomorus* must be present.	4 listed species present.
									Alien plant species	The riparian vegetation structure and composition on the flood features must maintain desired dominance and non-dominance.	Perennial alien plant species <= 10% (aerial cover).
									Terrestrial woody cover		Terrestrial woody cover <= 10% (aerial cover).
									Indigenous woody cover		Woody cover >= 5% (aerial cover).
									Non-woody cover		Non-woody cover >= 15% (aerial cover).

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
								Non-marginal (upper - banks)	Dominant vegetation	Woody vegetation must dominate the macro-channel banks	Woody cover >= 20% (aerial cover).
									Alien plant species	Alien invasive plant species must be kept low or absent on macro-channel banks	Perennial alien plant species <= 20% (aerial cover).
								Riparian zone	PES	The PES category must be a C at least	VEGRAI score >= 62%
									Species richness	Indigenous plant species richness in the riparian zone must be maintained.	>= 25 indigenous species.
									Threatened riparian species	2 nationally protected tree species: Apple Leaf (*Philenoptera violacea*) and Matumi (*Breonadia salicina*) must be present.	2 listed species present.
								Fish	FRAI score	The Ecological Category must be maintained within a B/C Category, using reference data used for the EWR studies	FRAI to be maintained within the range of a C category (>62%)
									Overall fish health	Fish generally healthy (no ulcerative bacterial infections, and limited parasite burden)	Bacterial infections and/or parasitic burdens must impact <1% of the fish population
									Species diversity	To maintain suitable habitat conditions that would support the key species.	Maintain the diversity of species as per EWR studies
									Key species	To maintain suitable flow conditions to support the key species identified at the site.	Presence/absence records. Relative abundance of species: *Labeobarbus marequensis (2), Labeo cylindricus (2), Chiloglanis pretoriae (2), Anoplopterus "southern stargazer sp" (1), Enteromius trimaculatus (2)*

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
								Macroinvertebrates	MIRAI Category and Score	The Ecological Category must remain within a C Category.	To ensure that the MIRAI score remains within the range of a C category (>62 - ≤78 %), using the same reference data used in the EWR study.
									SASS5 Total Score and ASPT	To ensure that the SASS scores attained, support the specified Ecological Category.	To ensure that the SASS5 scores and ASPT values occur in the following range: SASS5 score: >160; ASPT value: >6.8.
									Key taxa and abundance	To maintain suitable flow velocity (>0.6m/s) and to maintain clean, unembedded surface area (cobbles) to support the following flow-dependent taxa: Heptageniidae Simuliidae	Minimum abundance of an A attained.
										To maintain sufficient quantity and quality of inundated vegetation to support the following vegetation-dwelling taxon: Atyidae	Minimum abundance of an A attained.
										To maintain sufficient quantity and quality of inundated gravel, sand and mud to support the following taxa: Gomphidae	Minimum abundance of an A attained.

Table 28. Resource Quality Objectives for the prioritised river resource unit (RRU_Ri32) in the Lower Luvuvhu/Mutale IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
Lower Luvuvhu / Mutale IUA	II	A91H	Luvuvhu	RRU_Ri32 - A91H-00045 (EWR site 12_Luvuvhu)	Ri32	B/C	Water quantity		Month		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
								Low flows	Maintenance low flows (MCM)	Flows must be sufficient to maintain the Luvuvhu River in a condition equal to or better than a C category.	1.441	2.622	7.833	15.474	25.241	28.602	16.085	6.640	3.964	2.787	1.938	1.520
								High flows	Maintenance high flows (MCM)		0.169	1.095	4.808	7.867	9.055	8.316	5.574	0.732	0.090	0.038	0.007	0.023
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations must to be maintained at levels that is do not adversely affect aquatic ecosystems (C category).	95 percentile EC ≤ 55 mS/m											
								Nutrients	Total Inorganic nitrogen (TIN)	River nutrient concentrations must be maintained in a mesotrophic state or better (Acceptable category).	Median TIN ≤ 1.75 mg/l											
									Orthophosphate (PO_4-P)		Median PO_4-P ≤ 0.075 mg/l											
								System variables	Dissolved oxygen	Dissolved oxygen concentrations must be such that some oxygen sensitive species are present in the river.	5% percentile Dissolved oxygen concentration ≥ 6 mg/l											
									pH		6.5 ≤ pH ≤ 8.5											
									Water temperature	Water temperatures must fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).	Water temperature within the reference thermograph (95% band) plus or minus 1 standard deviation											

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
								Toxins	Ammonia (NH_3-N) Atrazine Endosulfan (α, β and the sulphate)	Toxicity levels must not pose a threat to river aquatic ecosystems.	Ammonia (NH_3-N) ≤ 44 µg/l (95% percentile) Atrazine ≤ 49 µg/l (95% percentile) Endosulfan ≤ 0.075 µg/l (95% percentile)
								Pathogens	Escherichia coli (E coli) Faecal coliforms	Concentrations of waterborne pathogens must be maintained in an Acceptable category for contact recreation	E coli / Faecal coliforms ≤ 25 cfu/100ml (95th percentile)
							Habitat	Geomorphology	GAI score	Maintain or improve catchment drivers and site impacts. Maintain pool-riffle reach type.	Maintain a GAI PES score of at least a 'D' or > 42%
									Bed erosion	Maintain bed elevation in relation to banks and benches	Maintain lowest point along riffle cross-section at < 0.5 m difference in elevation from previous cross-sectional survey
									Bank erosion	Maintain low to moderate proportion of banks actively eroding	Maintain active bank erosion below 40% of riverbank length
									Bed sediment size	Maintain dominant riffle sediment size to include gravel and cobble	Maintain riffle with mobile sediment in the range of a D50 of 35 mm, D16 of 19 mm and D84 of 59 mm
									Embeddedness	Maintain low to moderate embeddedness of riffle sediment	Maintain embeddedness of < 25% for riffle sediment
									Pool depth	Maintain upstream pool with deep open water	Maintain upstream pool with water > 0.5 m deep for > 60% of pool area
									Flood bench	Maintain flood benches along at least one of the banks	Maintain flood bench of > 5 m wide along at least one bank with signs of recent fine sediment deposition
							Biota	Marginal zone	Dominant vegetation	Non-woody vegetation must dominate the marginal zone	Non-woody cover >= 60% (aerial cover).
									Key species	*Phragmites mauritianus*, Breonadia *salicina* and	3 listed species present.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										Ficus caprefolia must be present.	
									Alien plant species	The riparian vegetation structure and composition in the marginal zone must maintain desired dominance and non-dominance.	No perennial alien plant species.
									Terrestrial woody cover		No terrestrial woody plants.
									Indigenous woody cover		Woody cover <= 25% (aerial cover).
									Non-woody cover		Non-woody cover >= 60% (aerial cover).
									Reed cover		Reed cover >= 30% (aerial cover).
								Non-marginal (lower - flood benches)	Dominant vegetation	Woody and non-woody vegetation must co-dominate the flood features	A mix of woody and non-woody plants.
									Key species	*Phragmites mauritianus, Ludwigia octovalvis, Pluchea dioscoridis, Phyllanthus reticulatus, Flueggea virosa, Ficus sycomorus* and *Combretum erythrophyllum* must be present.	7 listed species present.
									Alien plant species	The riparian vegetation structure and composition on the flood features must maintain desired dominance and non-dominance.	Perennial alien plant species <= 10% (aerial cover).
									Terrestrial woody cover		Terrestrial woody cover <= 10% (aerial cover).
									Indigenous woody cover		Woody cover <= 15% (aerial cover).
									Non-woody cover		Non-woody cover >= 15% (aerial cover).
								Non-marginal (upper - banks)	Dominant vegetation	Woody vegetation must dominate the macro-channel banks	Woody cover >= 60% (aerial cover).
									Alien plant species	Alien invasive plant species must be kept	Perennial alien plant species <= 10% (aerial cover).

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										low or absent on macro-channel banks	
								Riparian zone	PES	The PES category must be a C at least	VEGRAI score >= 62%
									Species richness	Indigenous plant species richness in the riparian zone must be maintained.	>= 35 indigenous species.
									Endemic riparian species	*Combretum erythrophyllum* (southern African endemic) must be present.	1 listed species present.
									Threatened riparian species	2 nationally protected tree species: Apple Leaf (*Philenoptera violacea*) and Matumi (*Breonadia salicina*) must be present.	2 listed species present.
								Fish	FRAI score	The Ecological Category must be maintained within a B/C Category, using reference data used for the EWR studies	FRAI to be maintained within the range of a C category (>62%)
									Overall fish health	Fish generally healthy (no ulcerative bacterial infections, and limited parasite burden)	Bacterial infections and/or parasitic burdens must impact <1% of the fish population
									Species diversity	To maintain suitable habitat conditions that would support the key species.	Maintain the diversity of species as per EWR studies
									Key species	To maintain suitable flow conditions to support the key species identified at the site	Presence/absence records. Relative abundance of species: *Labeobarbus marequensis (2), Labeo cylindricus (2), Anoplopterus "southern stargazer sp" (1)*, *Anguilla marmorata (1), Glossogobius callidus (1), Chiloglanis pretoriae (2), Enteromius trimaculatus (1)*

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
								Macroinvertebrates	MIRAI Category and Score	The Ecological Category must remain within a C Category.	To ensure that the MIRAI score remains within the range of a C category (>62 - ≤78 %), using the same reference data used in the EWR study.
									SASS5 Total Score and ASPT	To ensure that the SASS scores attained, support the specified Ecological Category.	To ensure that the SASS5 score and ASPT values are in the following range: SASS5 score: >170; ASPT value: >6.1.
									Key taxa and abundance	To maintain suitable flow velocity (>0.6m/s) and to maintain clean, unembedded surface area (cobbles) to support the following flow-dependent taxa: Perlidae Simuliidae	Minimum abundance of an A attained for both Perlidae and Simuliidae.
										To maintain sufficient quantity and quality of inundated vegetation to support the following vegetation-dwelling taxon: Atyidae	Minimum abundance of an A attained.
										To maintain sufficient quantity and quality of inundated gravel, sand and mud to support the following taxa: Gomphidae	Minimum abundance of an A attained.

Table 29. Resource Quality Objectives for the prioritised river resource unit (RRU_Rvii33) in the Lower Luvuvhu/Mutale IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
Lower Luvuvhu/Mutale	II	A92A	Mutale	RRU_Rvii33 - A92B-00051	Rvii33	C		Overall Ecological Category	Target Ecological Category	To maintain the Ecological Category of the resource unit in a C category												
							Water quantity		Month*		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
								Total flows	MCM	Flows shall be sufficient to maintain the Mutale River in a condition equal to or better than a C category.	1.408	2.828	5.683	11.565	15.937	13.589	7.055	2.337	1.105	0.975	0.718	0.753
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations need to be maintained at levels that is do not adversely affect aquatic ecosystems (C category).												
								Nutrients	Total Inorganic nitrogen (TIN), Orthophosphate (PO4-P)	River nutrient concentrations should be maintained in a mesotrophic state or better (Acceptable category or better).												
								System variables	Dissolved oxygen	Dissolved oxygen concentrations should be maiintained so that some oxygen sensitive species are present in the river (C category).												
									pH	pH levels should be maintained in a C category to protect aquatic organisms.												
									Water temperature	Water temperatures (°C) should fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).												
								Toxins/Biocides	Ammonia (NH_3-N), Atrazine, Endosulfan	Toxic substances should be maintained at concentrations that does not pose a threat to river aquatic ecosystems (B category or better).												
								Pathogens	Escherichia coli (E coli), Faecal coliforms	Concentrations of waterborne pathogens should be maintained in an Acceptable category or better to safeguard contact recreational water users.												

Table 30. Resource Quality Objectives for the prioritised river resource unit (RRU_Ri33) in the Lower Luvuvhu/Mutale IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
Lower Luvuvhu / Mutale IUA	II	A92B	Middle Mutale	RRU_Ri33 - A92B-00051 (EWR site 13_Mutale1)	Ri33	B/C	Water quantity		Month		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
								Low flows	Maintenance low flows (MCM)	Flows must be sufficient to maintain the Mutale River in a condition equal to or better than a C category.	1.828	3.207	5.888	9.399	10.421	10.140	6.325	3.143	1.720	1.608	1.258	1.173
								High flows	Maintenance high flows (MCM)		0.415	1.472	4.181	5.897	7.925	7.593	3.299	0.360	0.061	0.104	0.043	0.137
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations must to be maintained at levels that is do not adversely affect aquatic ecosystems (C category).	95 percentile EC ≤ 55 mS/m											
								Nutrients	Total Inorganic nitrogen (TIN)	River nutrient concentrations must be maintained in a mesotrophic state or better (Acceptable category).	Median TIN ≤ 1.75 mg/l											
									Orthophosphate (PO_4-P)		Median PO_4-P ≤ 0.075 mg/l											
								System variables	Dissolved oxygen	Dissolved oxygen concentrations must be such that some oxygen sensitive species are present in the river.	5% percentile Dissolved oxygen concentration ≥ 6 mg/l											
									pH		6.5 ≤ pH ≤ 8.5											
									Water temperature	Water temperatures (°C) must fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).	Water temperature within the reference thermograph (95% band) plus or minus 1 standard deviation											
									Turbidity	A baseline assessment to determine the present	A 10% variation from background concentration is allowed.											

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										state instream turbidity is required.	
								Toxins	Ammonia (NH_3-N) Atrazine Endosulfan (α, β and the sulphate)	Toxicity levels must not pose a threat to river aquatic ecosystems.	Ammonia (NH_3-N) ≤ 44 µg/l (95% percentile) Atrazine ≤ 49 µg/l (95% percentile) Endosulfan ≤ 0.075 µg/l (95% percentile)
								Pathogens	Escherichia coli (E coli) Faecal coliforms	Concentrations of waterborne pathogens must be maintained in an Acceptable category for contact recreation	E coli / Faecal coliforms ≤ 25 cfu/100ml (95th percentile)
							Habitat	Geomorphology	GAI score	Maintain or improve catchment drivers and site impacts. Maintain pool-riffle/rapid reach type.	Maintain a GAI PES score of at least a 'C' or > 63%
									Bed erosion	Maintain bed elevation in relation to banks and benches	Maintain lowest point along riffle cross-section at < 0.5 m difference in elevation from previous cross-sectional surveys
									Bank erosion	Maintain low to moderate proportion of banks actively eroding	Maintain active bank erosion below 30% of riverbank length
									Bed sediment size	Maintain dominant riffle sediment size to include gravel, cobble and bedrock	Maintain riffle with mobile sediment in the range of a D50 of 32 mm, D16 of 18 mm and D84 of 53 mm
									Embeddedness	Maintain low to moderate embeddedness of riffle sediment	Maintain embeddedness of < 25% for riffle sediment
									Pool depth	Maintain upstream pool with deep open water	Maintain upstream pool with water > 0.5 m deep for 60% of pool area
									Flood bench	Maintain flood benches along at least one of the banks	Maintain flood bench of > 5 m wide along at least one bank with signs of recent fine sediment deposition
							Biota	Aquatic zone	Key species	*Potamogeton schweinfurthii, Stuckenia*	3 listed species present in the wet season

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										pectinatus and *Nymphoides thunbergiana* must be present.	
								Marginal zone	Dominant vegetation	Non-woody vegetation must dominate the marginal zone	Non-woody cover >= 80% (aerial cover).
									Key species	*Ischaemum fasciculatum, Juncus lomatophyllus, Phragmites mauritianus, Breonadia salicina* and *Gomphostigma virgatum* must be present.	5 listed species present in the wet season
									Alien plant species	The riparian vegetation structure and composition in the marginal zone must maintain desired dominance and non-dominance.	No perennial alien plant species.
									Terrestrial woody cover		No terrestrial woody plants.
									Indigenous woody cover		Woody cover <= 5% (aerial cover).
									Non-woody cover		Non-woody cover >= 80% (aerial cover).
									Reed cover		Reed cover <= 30% (aerial cover).
								Non-marginal (lower - flood benches)	Dominant vegetation	Woody and non-woody vegetation must co-dominate the flood features	Non-woody cover >= 50% (aerial cover).
									Key species	*Syzygium cordatum, Syzygium guineense, Combretum erythrophyllum, Miscanthus junceus, Juncus lomatophyllus, Juncus oxycarpus, Schoenoplectus brachyceras* and *Ischaemum fasciculatum* must be present.	8 listed species present.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
									Alien plant species	The riparian vegetation structure and composition on the flood features must maintain desired dominance and non-dominance.	Perennial alien plant species <= 10% (aerial cover). Maintain absence of Mimosa pigra.
									Terrestrial woody cover		Terrestrial woody cover <= 5% (aerial cover).
									Indigenous woody cover		Woody cover <= 20% (aerial cover).
									Non-woody cover		Non-woody cover >= 50% (aerial cover).
								Non-marginal (upper - banks)	Dominant vegetation	Woody vegetation must dominate the macro-channel banks	Woody cover >= 60% (aerial cover).
									Alien plant species	Alien invasive plant species must be kept low or absent on macro-channel banks	Perennial alien plant species <= 5% (aerial cover).
								Riparian zone	PES	The PES category must be a B/C at least	VEGRAI score >= 78%
									Species richness	Indigenous plant species richness in the riparian zone must be maintained.	>= 35 indigenous species.
									Endemic riparian species	*Combretum erythrophyllum* and *Miscanthus junceus* (southern African endemics) must be present.	2 listed species present.
								Fish	FRAI score	The Ecological Category must be maintained within a C Category, using reference data used for the EWR studies	FRAI to be maintained within the range of a C category (>62%)
									Overall fish health	Fish generally healthy (no ulcerative bacterial infections, and limited parasite burden)	Bacterial infections and/or parasitic burdens must impact <1% of the fish population
									Species diversity	To maintain suitable habitat conditions that	Maintain the diversity of species as per EWR studies

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										would support the key species.	
									Key species	To maintain suitable flow conditions to support the key species identified at the site	Presence/absence records. Relative abundance of species: *Labeobarbus marequensis (2), Labeo cylindricus (2), Chiloglanis pretoriae (2), Anoplopterus "southern stargazer sp" (formerly Amphilius uranoscopus) (1), Glossogobius callidus (1), Petrocephalus wesselsi (2), Marcusenius macrolepidotus (2)* and *Anguilla marmorata (1)*
								Macroinvertebrates	MIRAI Category and Score	The Ecological Category must remain within a C Category.	To ensure that the MIRAI score remains within the range of a C category (>62 - ≤78 %), using the same reference data used in the EWR study.
									SASS5 Total Score and ASPT	To ensure that the SASS scores attained, support the specified Ecological Category.	To ensure that the SASS5 scores and ASPT values occur in the following range: SASS5 score: >120; ASPT value: >6.1.
									Key taxa and abundance	To maintain suitable flow velocity (>0.6m/s) and to maintain clean, unembedded surface area (cobbles) to support the following flow-dependent taxa: Heptageniidae	Minimum of an A abundance attained.
										To maintain sufficient quantity and quality of inundated vegetation to support the following vegetation-dwelling taxon: Coenagrionidae	Minimum of an A abundance obtained.
									Dominant taxa	To ensure that no group consistently dominates the fauna, over more than two consecutive surveys.	No taxon occurs at a C abundance (>100 individuals).

Table 31.Resource Quality Objectives for the prioritised river resource unit (RRU_Ri34) in the Lower Luvuvhu/Mutale IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
Lower Luvuvhu / Mutale IUA	II	A92D	Lower Mutale	RRU_Ri34 - A92D-00030 (EWR site 14_Mutale2)	Ri34	B/C	Water quantity		Month		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
								Low flows	Maintenance low flows (MCM)	Flows must be sufficient to maintain the Mutale River in a condition equal to or better than a C category.	2.001	3.347	6.257	10.677	13.442	13.943	7.119	3.467	2.035	1.903	1.467	1.404
								High flows	Maintenance high flows (MCM)		0.501	1.662	5.061	7.505	9.146	8.277	3.763	0.483	0.051	0.083	0.059	0.111
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations must to be maintained at levels that is do not adversely affect aquatic ecosystems (B/C category).	95 percentile EC ≤ 42.5 mS/m											
								Nutrients	Total Inorganic nitrogen (TIN)	River nutrient concentrations must be maintained in a mesotrophic state or better (Ideal/Acceptable or B/C category).	Median TIN ≤ 1.23 mg/l											
									Orthophosphate (PO_4-P)		Median PO_4-P ≤ 0.050 mg/l											
								System variables	Dissolved oxygen	Dissolved oxygen concentrations must be such that most oxygen sensitive species are present in the river.	5% percentile Dissolved oxygen concentration ≥ 6.5 mg/l											
									pH	pH values must be maintained at in a B/C category to protect aquatic ecosystems.	6.5 ≤ pH ≤ 8.5											
									Water temperature	Water temperatures (°C) must fall within the reference thermograph (graph of the 95% band of seasonal pattern of	Water temperature within the reference thermograph (95% band) plus or minus 1 standard deviation											

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										minimum and maximum temperatures river).	
								Toxins	Ammonia (NH_3-N) Atrazine Endosulfan (α, β and the sulphate)	Toxicity levels must not pose a threat to river aquatic ecosystems.	Ammonia (NH_3-N) ≤ 44 µg/l (95% percentile) Atrazine ≤ 49 µg/l (95% percentile) Endosulfan ≤ 0.075 µg/l (95% percentile)
								Pathogens	Escherichia coli (E coli) Faecal coliforms	Concentrations of waterborne pathogens must be maintained in an Acceptable category for contact recreation	E coli / Faecal coliforms ≤ 25 cfu/100ml (95th percentile)
							Habitat	Geomorphology	GAI score	Maintain or improve catchment drivers and site impacts. Maintain pool-riffle/rapid reach type.	Maintain a GAI PES score of at least a 'C' or > 63%
									Bed erosion	Maintain bed elevation in relation to banks and benches	Maintain lowest point along riffle cross-section at < 0.5 m difference in elevation from previous cross-sectional surveys
									Bank erosion	Maintain low to moderate proportion of banks actively eroding	Maintain active bank erosion below 30% of riverbank length
									Bed sediment size	Maintain dominant riffle sediment size to include gravel and cobble	Maintain riffle with mobile sediment in the range of a D50 of 24 mm, D16 of 15 mm and D84 of 50 mm
									Embeddedness	Maintain low to moderate embeddedness of riffle sediment	Maintain embeddedness of < 25% for riffle sediment
									Pool depth	Maintain downstream pool with deep open water	Maintain downstream pool with water > 0.5 m deep for 60% of pool area
									Flood bench	Maintain flood benches along at least one of the banks	Maintain flood bench of > 5 m wide along at least one bank with signs of recent fine sediment deposition

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
							Biota	Marginal zone	Dominant vegetation	Non-woody vegetation must dominate the marginal zone	Non-woody cover >= 60% (aerial cover).
									Key species	*Phragmites mauritianus* and *Breonadia salicina* must be present.	2 listed species present.
									Alien plant species	The riparian vegetation structure and composition in the marginal zone must maintain desired dominance and non-dominance.	No perennial alien plant species.
									Terrestrial woody cover		No terrestrial woody plants.
									Indigenous woody cover		Woody cover <= 5% (aerial cover).
									Non-woody cover		Non-woody cover >= 60% (aerial cover).
								Non-marginal (lower - flood benches)	Dominant vegetation	Woody and non-woody vegetation must co-dominate the flood features	Dominance by either woody or non-woody plants.
									Key species	*Faidherbia albida, Phragmites mauritianus and Pluchea bojeri* must be present.	3 listed species present.
									Alien plant species	The riparian vegetation structure and composition on the flood features must maintain desired dominance and non-dominance.	Perennial alien plant species <= 5% (aerial cover).
									Terrestrial woody cover		Terrestrial woody cover <= 5% (aerial cover).
									Indigenous woody cover		Woody cover <= 20% (aerial cover).
									Non-woody cover		20% >= Non-woody cover <= 60%.
								Non-marginal (upper - banks)	Dominant vegetation	Woody vegetation must dominate the macro-channel banks	Woody cover >= 60% (aerial cover).
									Alien plant species	Alien invasive plant species must be kept low or absent on macro-channel banks	No perennial alien plant species.
								Riparian zone	PES	The PES category must be a B at least	VEGRAI score >= 82%

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
									Species richness	Indigenous plant species richness in the riparian zone must be maintained.	>= 35 indigenous species.
									Threatened riparian species	3 nationally protected tree species: Apple Leaf (*Philenoptera violacea*) Leadwood (*Combretum imberbe*) and Matumi (*Breonadia salicina*) must be present.	3 listed species present.
								Fish	FRAI score	The Ecological Category must be maintained within a C Category, using reference data used for the EWR studies	FRAI to be maintained within the range of a C category (>62%)
									Overall fish health	Fish generally healthy (no ulcerative bacterial infections, and limited parasite burden)	Bacterial infections and/or parasitic burdens must impact <1% of the fish population
									Species diversity	To maintain suitable habitat conditions that would support the key species.	
									Key species	To maintain suitable flow conditions to support the key species identified at the site	Presence/absence records. Relative abundance of species: *Labeobarbus marequensis (2), Labeo cylindricus (2) (2), Chiloglanis pretoriae, Anoplopterus "southern stargazer sp" (formerly Amphilius uranoscopus) (1), Glossogobius callidus (1), Micralestes acutidens (2)* and *Anguilla marmorata (1)*
								Macroinvertebrates	MIRAI Category and Score	The Ecological Category must remain within a B/C Category.	To ensure that the MIRAI score remains within the range of a B/C category (>78 - ≤82 %), using the same reference data used in the EWR study.
									SASS5 Total Score and ASPT	To ensure that the SASS scores attained, support the specified Ecological Category.	To ensure that the SASS5 scores and ASPT values occur in the following range: SASS5 score: >160; ASPT value: >6.0.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
									Key taxa and abundance	To maintain suitable flow velocity (>0.6m/s) and to maintain clean, unembedded surface area (cobbles) to support the following flow-dependent taxa: Perlidae Heptageniidae	Minimum abundance of an A attained for Perlidae and Heptageniidae.
										To maintain sufficient quantity and quality of inundated vegetation to support the following vegetation-dwelling taxon: Coenagrionidae	Minimum of an A abundance attained.
										To maintain sufficient quantity and quality of inundated gravel, sand and mud to support the following taxa: Gomphidae	Minimum of an A abundance attained.

Table 32. Resource Quality Objectives for the prioritised river resource unit (RRU_Ri36) in the Lower Luvuvhu/Mutale IUA (LIMCOM Site LUVU-A91K-OUTPO)

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
Lower Luvuvhu / Mutale IUA	II	A91K	Luvuvhu	RRU_Ri36 - A91K-00035 (EWR site LUVU-A91K-OUTPO)	Ri36	B/C	Water quantity		Month		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
								Low flows	Maintenance low flows	Flows must be sufficient to maintain the Luvuvhu River in a condition equal to or better than a C category. Flows must be met at the confluence with the Limpopo River, i.e. must flow into the Limpopo.	3.070	3.363	3.786	5.018	7.075	6.315	5.113	4.042	3.837	3.492	3.257	3.184
								High flows	Maintenance high flows		3.948	1.540	3.948	5.439	12.866	5.439	1.540	0.000	0.000	0.000	0.000	0.000
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations must to be maintained at levels that is do not adversely affect aquatic ecosystems (B/C category).	95 percentile EC ≤ 42.5 mS/m											
								Nutrients	Total Inorganic nitrogen (TIN)	River nutrient concentrations must be maintained in a mesotrophic state or better (Acceptable/BC category).	Median TIN ≤ 1.23 mg/l											
									Orthophosphate (PO_4-P)		Median PO_4-P ≤ 0.050 mg/l											
								System variables	Dissolved oxygen	Dissolved oxygen concentrations must be such that most oxygen sensitive species are present in the river.	5% percentile Dissolved oxygen concentration ≥ 6.5 mg/l											
									pH		6.5 ≤ pH ≤ 8.5											
									Water temperature	Water temperatures (°C) must fall within the reference thermograph (graph of the 95% band of seasonal pattern of	Water temperature within the reference thermograph (95% band) plus or minus 1 standard deviation											

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										minimum and maximum temperatures river).	
									Turbidity	A baseline assessment to determine the present state instream turbidity is required.	A 10% variation from background concentration is allowed.
								Toxins	Ammonia (NH_3-N) Atrazine Endosulfan(α, β and the sulphate)	Toxicity levels must not pose a threat to river aquatic ecosystems.	Ammonia (NH_3-N) ≤ 44 µg/l (95% percentile) Atrazine ≤ 49 µg/l (95% percentile) Endosulfan ≤ 0.075 µg/l (95% percentile)
								Pathogens	Escherichia coli (E coli) Faecal coliforms	Concentrations of waterborne pathogens must be maintained in an Acceptable category for contact recreation	E coli / Faecal coliforms ≤ 25 cfu/100ml (95th percentile)
							Habitat	Geomorphology	GAI score	Maintain or improve catchment drivers and site impacts. Maintain pool-riffle/rapid reach type.	GAI score not available as part of IWMI study. Determine and maintain the GAI PES score in a similar or better PES category
									Bed erosion	Maintain bed elevation in relation to banks and benches	Maintain lowest point along riffle cross-section at < 0.5 m difference in elevation from previous cross-sectional surveys
									Bank erosion	Maintain low to moderate proportion of banks actively eroding	Maintain active bank erosion below 30% of riverbank length
									Bed sediment size	Maintain cobble as dominant riffle sediment	Maintain riffle with mobile sediment in the range of a D50 of 145 mm, D16 of 78 mm and D84 of 242 mm
									Embeddedness	Maintain low to moderate embeddedness of riffle sediment	Maintain embeddedness of < 25% for riffle sediment
									Pool depth	Maintain downstream pool with deep open water	Maintain downstream pool with water > 0.5 m deep for > 60% of pool area
									Flood bench	Maintain flood benches along at least one of the banks	Maintain flood bench of > 2 m wide along at least one bank with signs of recent fine sediment deposition

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
							Biota	Marginal (bed)	Dominant vegetation	A mix of woody and non-woody vegetation must dominate the channel bed	Non-woody cover >= 10%; Woody cover >= 5% (aerial cover).
									Key species	*Breonadia salicina and Ficus capreifolia must be* present.	2 listed species present.
									Alien plant species	The riparian vegetation structure and composition in the channel bed must maintain desired dominance and non-dominance.	No perennial alien plants
									Terrestrial woody cover		No terrestrial woody plants.
									Reed cover		Reeds <=10%
								Non-marginal (bank)	Dominant vegetation	Woody vegetation must dominate the macro-channel banks	Woody cover >= 60% (aerial cover).
									Alien plant species	Alien invasive plant species must be kept low or absent on macro-channel banks	No perennial alien plants
								Riparian zone	PES	The PES category must be a B at least	VEGRAI score >= 82%
									Species richness	Indigenous plant species richness in the riparian zone must be maintained.	>= 12 indigenous species.
								Fish	FRAI score	The Ecological Category must be maintained within a B/C Category, using reference data used for the EWR studies	FRAI to be maintained within the range of a B/C category (>77%)
									Overall fish health	Fish generally healthy (no ulcerative bacterial infections, and limited parasite burden)	Bacterial infections and/or parasitic burdens must impact <1% of the fish population
									Species diversity	To maintain suitable habitat conditions that	Maintain the diversity of species as per EWR studies

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										would support the key species.	
									Key species	To maintain suitable flow conditions to support the key species identified at the site.	Presence/absence records. Relative abundance of species: *Labeobarbus marequensis (2), Labeo cylindricus (2), Chiloglanis pretoriae (3), Anoplopterus "southern stargazer sp" (formerly Amphilius uranoscopus) (3), Glossogobius callidus (2), Micralestes acutidens (2)* and *Anguilla marmorata (2)*
								Macroinvertebrates	MIRAI Category and Score	The Ecological Category must remain within a B/C Category.	To ensure that the MIRAI score remains within the range of a C category (>78 - ≤82 %), using the same reference data used in the EWR study.
									SASS5 Total Score and ASPT	To ensure that the SASS scores attained, support the specified Ecological Category.	To ensure that the SASS5 scores and ASPT values occur in the following range: SASS5 score: >170; ASPT value: >6.5.
									Key taxa and abundance	To maintain suitable flow velocity (>0.6m/s) and to maintain clean, unembedded surface area (cobbles) to support the following flow-dependent taxa: Perlidae and Hydropsychidae>2spp. To maintain sufficient quantity and quality of inundated vegetation to support the following vegetation-dwelling taxa: Atyidae Coenagrionidae To maintain sufficient quantity and quality of inundated gravel, sand and mud to support the following taxa: Gomphidae,	Minimum abundance of an A attained for Perlidae, Hydropschidae >2spp, Atyidae, Coenagrionidae, Gomphidae and Caenidae.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										Caenidae	
									Dominant taxa	To ensure that no group consistently dominates the fauna, over more than two consecutive surveys.	No taxon occurs at a C abundance (>100 individuals).

Table 33. Resource Quality Objectives for the prioritised river resource unit (RRU_Riv28) in the Shingwedzi IUA

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
Shingwedzi	II	B90H	Mphongolo	RRU_Riv28 - B90H-00113	Riv28	A		Overall Ecological Category	Target Ecological Category	To maintain the Ecological Category of the resource unit in a A category	
							Water quantity	Total flows	Month*		Oct / Nov / Dec / Jan / Feb / Mar / Apr / May / Jun / Jul / Aug / Sep
									MCM	Flows shall be sufficient to maintain the Mphongolo River in a condition equal to or better than an A category.	0.414 / 1.525 / 5.23 / 11.921 / 13.2 / 5.712 / 1.127 / 0.409 / 0.39 / 0.393 / 0.39 / 0.397
							Water quality	Salts	Electrical conductivity (EC)	Salt concentrations need to be maintained at levels that is do not adversely affect aquatic ecosystems (A category).	
								Nutrients	Total Inorganic nitrogen (TIN), Orthophosphate (PO4-P)	River nutrient concentrations should be maintained in an oligotrophic state or better (Ideal category).	
								System variables	Dissolved oxygen	Dissolved oxygen concentrations should be maintained so that all oxygen sensitive species are present in the river (A category).	
									pH	pH levels should be maintained in a A category to protect aquatic organisms.	

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
									Water temperature	Water temperatures (°C) should fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).	
								Toxins/Biocides	Ammonia (NH_3-N), Atrazine, Endosulfan	Toxic substances should be maintained at concentrations that does not pose a threat to river aquatic ecosystems (A category).	
								Pathogens	Escherichia coli (E coli), Faecal coliforms	Concentrations of waterborne pathogens should be maintained in an Ideal category to safeguard contact recreational water users.	

Table 34. Resource Quality Objectives for the prioritised river resource unit (RRU_Ri37) in the Shingwedzi IUA (LIMCOM Site SHIN-B90H-POACH)

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical											
Shingwedzi River IUA	II	B90H	Shingwedzi	RRU_Ri37 - B90H-00145 (EWR site SHIN-B90H-POACH)	Ri37	C	Water quantity		Month		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
								Low flows	Maintenance low flows (MCM)	Flows must be sufficient to maintain the Shingwedzi River in a condition equal to or better than a B/C category. Flows must be met at the confluence with the Limpopo River, i.e. must flow into the Limpopo.	0.229	0.255	0.366	0.797	1.079	0.779	0.412	0.274	0.273	0.257	0.246	0.241
								High flows	Maintenance high flows (MCM)		0.000	0.000	0.000	1.510	2.507	1.150	0.000	0.000	0.000	0.000	0.000	0.000
							Water [illegible]	Salts	Electrical conductivity (EC)	Salt concentrations need to be maintained at levels that is do not adversely affect aquatic ecosystems (C category).	95 percentile EC ≤ 85 mS/m											

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
								Nutrients	Total Inorganic nitrogen (TIN)	River nutrient concentrations must be maintained in a mesotrophic state or better (Acceptable category).	Median TIN ≤ 2.24 mg/l
									Orthophosphate (PO_4-P)		Median PO_4-P ≤ 0.090 mg/l
								System variables	Dissolved oxygen	Dissolved oxygen concentrations must be such that some oxygen sensitive species are present in the river.	5% percentile Dissolved oxygen concentration ≥ 6 mg/l
									pH		5.6 ≤ pH ≤ 9.2
									Water temperature	Water temperatures (°C) must fall within the reference thermograph (graph of the 95% band of seasonal pattern of minimum and maximum temperatures river).	Water temperature within the reference thermograph (95% band) plus or minus 1 standard deviation
									Turbidity	A baseline assessment to determine the present state instream turbidity is required.	A 10% variation from background concentration is allowed.
								Toxins	Ammonia (NH_3-N) Atrazine Endosulfan(α, β and the sulphate)	Toxicity levels must not pose a threat to river aquatic ecosystems.	Ammonia (NH_3-N) ≤ 44 µg/l (95% percentile) Atrazine ≤ 49 µg/l (95% percentile) Endosulfan ≤ 0.075 µg/l (95% percentile)
								Pathogens	Escherichia coli (E coli) Faecal coliforms	Concentrations of waterborne pathogens must be maintained in an Acceptable category for contact recreation	E coli / Faecal coliforms ≤ 25 cfu/100ml (95^{th} percentile)
							Habitat	Geomorphology	GAI score	Maintain or improve catchment drivers and site impacts. Maintain pool-riffle/plain bed reach type.	GAI score not available as part of IWMI study. Determine and maintain the GAI PES score in a similar or better category

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
									Bed erosion	Maintain bed elevation in relation to banks and benches	Maintain lowest point along riffle cross-section at < 0.5 m difference in elevation from previous cross-sectional surveys
									Bank erosion	Maintain low to moderate proportion of banks actively eroding	Maintain active bank erosion below 30% of riverbank length
									Bed sediment size	Maintain gravel as dominant riffle sediment	Maintain riffle with mobile sediment in the range of a D50 of 27 mm, D16 of 17 mm and D84 of 53 mm
									Embeddedness	Maintain low to moderate embeddedness of riffle sediment	Maintain embeddedness of < 25% for riffle sediment
									Pool depth	Maintain pool downstream of bridge with deep open water	Maintain pool downstream of bridge with water > 0.5 m deep for > 60% of pool area
									Flood bench	Maintain flood benches along at least one of the banks	Maintain flood bench of > 2 m wide along at least one bank with signs of recent fine sediment deposition
							Biota	Marginal (bed)	Dominant vegetation	Non-woody vegetation must dominate the channel bed	Non-woody cover >= 10% (aerial cover).
									Alien plant species	The riparian vegetation structure and composition in the channel bed must maintain desired dominance and non-dominance.	No perennial alien plants
									Terrestrial woody cover		No terrestrial woody plants.
									Reed cover		Reeds <=10%
								Non-marginal (bank)	Dominant vegetation	Woody vegetation must dominate the macro-channel banks	Woody cover >= 60% (aerial cover).
									Alien plant species	Alien invasive plant species must be kept low or absent on macro-channel banks	No perennial alien plants
								Riparian Zone	PES	The PES category must be a B at least	VEGRAI score >= 82%
									Species richness	Indigenous plant species richness in the riparian	>= 10 indigenous species.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										zone must be maintained.	
								Fish	FRAI score	The Ecological Category must be maintained within a C Category, using reference data used for the EWR studies	FRAI to be maintained within the range of a C category (>62%)
									Overall fish health	Fish generally healthy (no ulcerative bacterial infections, and limited parasite burden)	Bacterial infections and/or parasitic burdens must impact <1% of the fish population
									Species diversity	To maintain suitable habitat conditions that would support the key species.	Maintain the diversity of species as per EWR studies
									Key species	To maintain suitable flow conditions to support the key species identified at the site	Presence/absence records. Relative abundance of species: *Labeobarbus marequensis (2), Labeo cylindricus (2), Chiloglanis pretoriae (1)* if suitable flow and habitat are present
								Macroinvertebrates	MIRAI Category and Score	The Ecological Category must remain within a C Category.	To ensure that the MIRAI score remains within the range of a C category (>62 - ≤78 %), using the same reference data used in the EWR study.
									SASS5 Total Score and ASPT	To ensure that the SASS scores attained, support the specified Ecological Category.	To ensure that the SASS5 scores and ASPT values occur in the following range: SASS5 score: >130; ASPT value: >5.0.
									Key taxa and abundance	To maintain suitable flow velocity (>0.6m/s) and to maintain clean, unembedded surface area (cobbles) to support the following flow-dependent taxa: Simuliidae To maintain sufficient quantity and quality of inundated vegetation to	Minimum A abundance attained.

IUA	Class	Quaternary catchment	Resource Name	RU	Biophysical Node	TEC	Component	Sub-component	Indicator	RQO Narrative	RQO Numerical
										support the following vegetation-dwelling taxon: Coenagrionidae To maintain sufficient quantity and quality of inundated gravel, sand and mud to support the following taxa: Gomphidae, Caenidae	
									Dominant taxa	To ensure that no group consistently dominates the fauna, over more than two consecutive surveys.	No taxon occurs at a C abundance (>100 individuals).

Table 35. Wetland Resource Quality Objectives for priority wetland resource units

IUA / RU	Component	Subcomponent	Indicator	RQO								
				Narrative	Numerical							
The RQOs outlined below for the Luvuvhu Floodplain (Makuleke) - river & floodplain complex with pans, are to maintain a B category (TEC), with a percentage score of at least 82%, and the EI must remain Very High and the ES High.												
Lower Luvuvhu / Mutale (RU15)	Water quantity	Water Inputs	Hydrology (EWR)	Maintenance of perenniality, seasonality and wet and dry season baseflows is required to provide the necessary wetting regime required for supporting wetland components. The quantity and timing of inputs, depth to groundwater. and the distribution and retention patterns within the wetland must be maintained to avoid the loss of wetland hydrological function.	The EWR determined for the upstream Luvuvhu River site must be implemented (not shown here) i.e. main channel must remain perennial, and the EWR for the floodplain component (floods) is shown below.							
					Floods. Flood can occur in the month before or after the month indicated							
						Within year floods				Inter annual floods		
						<1:2 years				>=1:2 years		
					Flood Class	Class1	Class2	Class3	Class4	1:2 year	1:5 year	1:10 year	1:20 year
					Ave peak discharge (m^3/s)	11.1	23.4	50.4	88.7	200	593	1029	1660
					Ave duration (days)	4	6	8	10	10	15	20	34
					Number	2	2	2	1	As per return period			
					Oct								
					Nov	1							
					Dec	1	1						
					Jan		1	1					
					Feb				1	1	1	1	1
					Mar			1					
					Apr	1							
					May								
					Jun								
					Jul								
					Aug								
					Sep								
					Vol (10^6m^3)	8.66	14.49	32.78	28.72	74.55	208.14	420.84	787.78
					% PES (2022) MAR	1.81	3.04	6.87	6.02	15.62	43.61	88.19	165.08
			Depth to ground water on the floodplain	The average depth to groundwater across the floodplain must remain mustow to support phreatophytic vegetation communities and pan levels.	The average depth to groundwater must range between 2.5m and 4.5m and must only extent to 6.5m during natural droughts.							

IUA / RU	Component	Subcomponent	Indicator	RQO	
				Narrative	Numerical
		Water distribution and retention patterns	Flooding by damming with the wetland	Maintain the absence of artificial damming within the wetland complex (excludes pans).	Artificial damming within the delineated wetland area must not exceed 0Ha (excludes pans).
			Pan water level regime	Pan water level regimes are dependent on flooding regimes and rainfall for infilling. The return period for floods required by different pans must be adhered to as far as possible according to the EWR determined for pans.	The EWR determined for the floodplain component including pans must be implemented (See above).
	Habitat	Wetland vegetation structure / composition	Extent of natural wooded land within the wetland complex (land cover classes 1-4, 2020)	The extent of natural wooded land within the wetland complex must remain a dominant component of overall vegetation	The extent of natural wooded land within the wetland complex must not decline below 2600Ha.
			Extent of herbaceous wetlands (land cover classes 22-23, 2020)	The extent of herbaceous wetlands must not decline.	The extent of herbaceous wetlands must not decline below 49.6Ha.
		Habitat fragmentation with the wetland delineation	Extent of alien invasive plants within the wetland / complex	Dense patches of alien invasive plant species must be prevented from establishing within the wetland complex.	Dense patches of alien invasive plant species must not exceed 2% of the wetland area.
			Developments within the wetland complex (includes mines and quarries, SANLC classes 68-72, built-up areas, infrastructure, canals, furrows and trenching , SANLC classes 47-67)	Wetland habitat loss or fragmentation due to developments must not be permitted within the wetland complex.*	The aerial extent of developments within the delineated wetland area must not exceed 0Ha.
			Land cover classes denoted to cultivated areas within the wetland complex (classes 32-46 & 73, 2020)	Wetland habitat loss due to direct agricultural activities and croplands must not be permitted within the wetland complex.	The aerial extent of agricultural activities and croplands within the delineated wetland area must not exceed 0Ha.
	Habitat / Biota	Protection	Protected areas / Conservation	The wetland complex must remain under the national protection of conservation.	100% of the delineated wetland complex must remain protected by conservation, such that it also remains a Ramsar site and IBA.
			Ramsar wetland	The wetland complex must retain qualities to uphold its Ramsar status as a wetland of international importance.	

IUA / RU	Component	Subcomponent	Indicator	RQO	
				Narrative	Numerical
			Important birding area	The wetland complex must remain an IBA (Important Birding Area).	
	Biota	Birds	Threatened bird species (water / wetland / riparian-dependent)	Populations of Pels Fishing Owl (*Scotopelia peli*) White Crowned Lapwing (*Vanellus albiceps*) Black Stork (*Ciconia nigra*), Yellow billed Stork (*Mycteria ibis*), Open billed stork (*Anastomus lamelligerus*), Saddle-billed Stork (*Ephippiorhynchus senegalensis*), Great White Pelican (*Pelecanus onocrotalus*), Greater Painted-Snipe (*Rostratula benghalensis*) and Pygmy Goose (*Nettapus auritus*) must be maintained within the wetland complex.	9 listed species must occur during the wet season
			Bird species diversity within the wetland complex	The number of bird species (includes residents and migrants) that utilise the Luvuvhu River and its floodplain and pans must be maintained.	The number of bird species that utilise the Luvuvhu River and its floodplain and pans must be at least 450 species.
		Mammals	Elephant abundance	The abundance of elephants within the wetland complex must be strategically and adaptively managed to promote conservation targets for all species, and overall vegetation health.	N/A
			Hippo abundance (VU)	The main Luvuvhu River and perennial and near-perennial pans within the floodplain must continue to supports pods of Hippopotamus (*Hippopotamus amphibius*, VU). The Luvuvhu main channel must remain perennial to maintain critical hippo habitats, especially during the dry season.	N/A
		Reptiles	Crocodile abundance (VU)	The main Luvuvhu River and perennial and near-perennial pans within the floodplain must continue to supports Nile Crocodiles (*Crocodylus niloticus*, VU). The Luvuvhu main channel must remain perennial to	N/A

IUA / RU	Component	Subcomponent	Indicator	RQO	
				Narrative	Numerical
				maintain critical crocodile habitats, especially during the dry season.	
			Threatened reptile species (water-dependent)	The Nile crocodile (*Crocodylus niloticus*, CITES App. II; SA Red Data: Vulnerable) and African python (*Python sebae*, CITES App. II; SA Red Data: Vulnerable), must both remain an integral part of the wetland complex.	2 listed species must remain present within the wetland complex
		Fish	Species diversity in the Luvuvhu River and perennial pans	The number of fish species that occur in the Luvuvhu River and perennial pans must be maintained, and alien fish species must be kept as low as possible (especially *Tilapia niloticus*)	The number of fish species that occur in the Luvuvhu River and perennial pans must be at least 26 indigenous species in the wet season.
		Amphibians	Frogs and toads (species diversity)	The number of amphibian species that occur along the Luvuvhu River and within its floodplain and pans must be maintained.	The number of amphibian species that occur along the Luvuvhu River and within its floodplain and pans must be at least 30 species in the wet season.
		Vegetation	Alian invasive plants	The wetland complex must be maintained by removal of perennial alien plant species, especially *Mimosa pigra*.	There must be zero occurrence of *Mimosa pigra* within the wetland complex.
			Plant species diversity within the wetland complex	The number of plant species that occur along the Luvuvhu River and within its floodplain and pans must be maintained.	The number of plant species that occur along the Luvuvhu River and within its floodplain and pans must be at least 250 species.
	Water quality	Salts	Electrical conductivity (mS/m)	Water quality in the main Luvuvhu River channel must maintain the TEC (B/C).	95th percentile EC < 70 mS/m
		System Variables	pH		5.75 >= pH <= 9.0
		Nutrients	Total inorganic nitrogen (TIN) (mg/l)		Median TIN < 1.90 mg/l
			Orthophosphate (mg/l)		Median PO_4-P < 0.075 mg/l
			Ammonia (NH_3-N) (mg/l)		Median NH_3-N < 0.044 mg/l
The RQOs outlined below for the Mutale Wetlands (Seeps, Valley bottom with and without channel) are to maintain a C category (TEC), with a percentage score of at least 62%, and the EI must remain Very High and the ES High.					
Lower Luvuvhu / Mutale (RU15)	Water quantity	Water Inputs	Hydrology (EWR)	Maintenance of perenniality and wet and dry season baseflows is required. to provide the necessary wetting regime required for	The EWR determined for the downstream Mutale River site (Ri33) must be implemented

IUA / RU	Component	Subcomponent	Indicator	RQO	
				Narrative	Numerical
				supporting other wetland components. 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.	
		Water distribution and retention patterns	Flooding by damming within the wetland	The current extent of damming within the wetland complex must not be permitted to increase.	The extent of damming within the delineated wetland area must not exceed 6Ha.
	Habitat	Wetland vegetation structure / composition	Extent of natural grassland within the wetland complex (land cover classes 12-13; SANLC, 2020)	The extent of natural grassland within the wetland complex must not decline.	The extent of natural grassland within the wetland complex must not decline below 3.7Ha.
			Extent of natural wooded land within the wetland complex (land cover classes 1-4; SANLC, 2020)	The extent of natural wooded land within the wetland complex must not decline.*	The extent of natural wooded land within the wetland complex must not decline below 2935Ha.*
			Extent of herbaceous wetlands (land cover classes 22-23; SANLC, 2020)	The extent of herbaceous wetlands must not decline.	The extent of herbaceous wetlands must not decline below 49.6Ha.
		Habitat fragmentation within the wetland complex delineation	Extent of alien invasive plants within the wetland complex	Dense patches of alien invasive plant species must be prevented from establishing within the wetland complex.	Dense patches of alien invasive plant species must not exceed 5% of the wetland area.
			Extent of planted forest within the wetland complex (land cover classes 5-7; SANLC, 2020)	The current extent of planted forest within the wetland complex must not increase.*	The current extent of planted forest within the wetland complex must not exceed 6.8Ha.*
			Developments within the wetland complex (includes mines and quarries, SANLC classes 68-72, built-up areas, infrastructure, canals, furrows and trenching, SANLC classes 47-67)	Wetland habitat loss or fragmentation due to developments must not be permitted within the wetland complex.*	The aerial extent of developments within the delineated wetland area must not exceed 34.6Ha.*

IUA / RU	Component	Subcomponent	Indicator	RQO	
				Narrative	Numerical
			Land cover classes denoted to cultivated areas within the wetland complex (classes 32-46 & 73; SANLC, 2020)	Wetland habitat loss due to direct agricultural activities and croplands must not be permitted to increase in extent within the wetland complex. *	The aerial extent of agricultural activities and croplands within the delineated wetland area must not exceed 98Ha.*
	Biota	Taxon richness	Number of wetland-dependent plant species	The number of wetland-dependent plant species that occur within the wetland complex must be maintained.	The number of wetland-dependent plant species that occur within the wetland complex must be 20 at least (see Table # for list).
	Water quality	Salts	Electrical conductivity (mS/m)	Water quality river RQOs from the upper Mutale river site (Ri33) apply. Water quality is sufficient to maintain the TEC.	95th percentile EC < 70 mS/m
		System Variables	pH		5.75 >= pH <= 9.0
		Nutrients	Total inorganic nitrogen (TIN) (mg/l)		Median TIN < 1.90 mg/l
			Orthophosphate (mg/l)		Median PO_4-P < 0.075 mg/l
			Ammonia (NH_3-N) (mg/l)		Median NH_3-N < 0.044 mg/l
The RQOs outlined below for Lake Fundudzi with valley bottom wetlands are to maintain a B category (TEC), with a percentage score of at least 82%, and the EI must remain Very High and the ES High.					
Lower Luvuvhu / Mutale (RU15)	Water quantity	Water distribution and retention patterns	Lake water level regime	Lake water level regime must be maintained within its natural fluctuation range.	N/A
	Habitat	Wetland extent	Delineated wetland area (Ha)	The extent of valley bottom wetlands upstream of the lake must be maintained.	The extent of valley bottom wetlands upstream of the lake must be maintained at a minimum of 40Ha.
		Wetland vegetation structure / composition	Extent of natural grassland and non-woody vegetation within the wetland complex, including herbaceous wetlands.	The extent of natural grassland and non-woody vegetation including herbaceous wetlands within the wetland complex must be maintained.	The extent of natural grassland and non-woody vegetation, including herbaceous wetlands, within the wetland complex must remain at about 170Ha.
			Extent of natural wooded land within the wetland complex.	The extent of natural wooded land within the wetland complex must not increase*	The extent of natural wooded land within the wetland delineation must not become more 248Ha.*
		Habitat fragmentation within the wetland delineation	Extent of alien invasive plants within the wetland / complex	Dense patches of alien invasive plant species must be prevented from establishing within the wetland complex.	Dense patches of alien invasive plant species must not exceed 5% of the wetland area.
			Extent of planted forest within the wetland	Wetland habitat loss or fragmentation due to forestry must	The aerial extent of forestry within the delineated wetland area must not exceed 0Ha.*

IUA / RU	Component	Subcomponent	Indicator	RQO	
				Narrative	Numerical
			complex (land cover classes 5-7; SANLC, 2020)	not be permitted within the wetland complex.*	
			Developments within the wetland complex (includes mines and quarries, SANLC classes 68-72, built-up areas, infrastructure, canals, furrows and trenching , SANLC classes 47-67)	Wetland habitat loss or fragmentation due to developments must not be permitted within the wetland complex.*	The aerial extent of developments within the delineated wetland area must not exceed 0Ha.*
			Land cover classes denoted to cultivated areas within the wetland complex (classes 32-46 & 73; SANLC, 2020)	Wetland habitat loss due to direct agricultural activities, including croplands must not be permitted within the wetland complex*	The aerial extent of agricultural activities, including croplands within the delineated wetland area must not exceed 0Ha.*
	Habitat / Biota	Protection	Rehabilitation structures	WfW rehabilitation structures in valley-bottom wetlands upstream of the Lake must be maintained.	N/A
			Cultural importance	Lake Fundudzi must remain a water body of cultural importance as a sacred site to the surrounding people.	100% of Lake Fundudzi and its surrounding wetlands must remain a water body of cultural importance as a sacred site to the surrounding people.
	Biota	Taxon richness	Number of wetland-dependent plant species	The number of wetland-dependent plant species that occur within the wetland complex must be maintained.	The number of wetland-dependent plant species that occur within the wetland complex must be 10 at least.
	Water quality	Sediments	Sediment supply from the catchment	The Lake Fundudzi catchment is steep and has gravel roads which erode during rain events. Sediment supply from the catchment in these denuded areas must be managed before entering the valley bottom wetlands or Lake.	Zero supply of catchment sediments to the valley bottom wetlands
		Salts	Electrical conductivity (mS/m)	Water quality in the main Mutale River channel must maintain the TEC (B/C).	95th percentile EC < 70 mS/m
		System Variables	pH		5.75 >= pH <= 9.0
		Nutrients	Total inorganic nitrogen (TIN) (mg/l)		Median TIN < 1.90 mg/l
			Orthophosphate (mg/l)		Median PO4-P < 0.075 mg/l

IUA / RU	Component	Subcomponent	Indicator	RQO	
				Narrative	Numerical
			Ammonia (NH_3-N) (mg/l)		Median NH_3-N < 0.044 mg/l
The RQOs outlined below for the Kolope riverine wetlands are to maintain a A/B category (TEC), with a percentage score of at least 88%, and the EI must remain Very High and the ES at least Low.					
Mapungubwe (RU 8)	Water quantity	Water Inputs	Hydrology (EWR)	These riverine wetlands are intermittent to ephemeral with a high degree of flashiness during rainfall events, but also with a myriad of small pans both off-channel and within the broader channel that have high levels of clay and clearly hold water for some time (a few weeks at most). This is a difficult flow regime to maintain, nevertheless an EWR was determined for the downstream Kolope River site, which must be implemented.	The EWR determined for the downstream Kolope River site (Riv32) must be implemented
		Water distribution and retention patterns	Flooding by damming within the wetland	The current extent of damming within the wetland complex must not be permitted to increase (excludes water holding facilities at Venetia mine).	The extent of damming within the delineated wetland area must not exceed 1Ha.
	Habitat	Wetland vegetation structure / composition	Extent of natural grassland within the wetland complex (land cover classes 12-13; SANLC, 2020)	The overall extent of natural grassland must be maintained within the wetland complex, but must not become the dominant cover type.	The overall extent of natural grassland must be maintained at around 30% of the wetland extent.
			Extent of natural wooded land within the wetland complex (land cover classes 1-4; SANLC, 2020)	The overall extent of open and dense woodland within the wetland complex must be maintained as the dominant cover type.	The overall extent of woodland must be maintained at around 60% of the wetland extent.
		Habitat fragmentation within the wetland delineation	Extent of alien invasive plants within the wetland / complex	Dense patches of alien invasive plant species must be prevented from establishing within conserved portion of the wetland complex.	Dense patches of alien invasive plant species must not exceed 0% of the wetland area within the conserved portion.
			Developments within the wetland complex (includes mines and quarries, SANLC classes 68-72, built-up areas, infrastructure, canals, furrows and	Wetland habitat loss or fragmentation due to developments must not be permitted within the wetland complex.*	The aerial extent of developments within the delineated wetland area must not exceed 15Ha.*

IUA / RU	Component	Subcomponent	Indicator	RQO	
				Narrative	Numerical
			trenching , SANLC classes 47-67)		
			Land cover classes denoted to cultivated areas within the wetland complex (classes 32-46 & 73; SANLC, 2020)	Wetland habitat loss due to direct agricultural activities and croplands must not be permitted to increase within the wetland complex. *	The aerial extent of agricultural activities and croplands within the delineated wetland area must not exceed 180Ha.*
	Habitat / Biota	Protection	Protected areas / Conservation	The wetland complex must remain under the national and private protection of conservation.	100% of the delineated wetland complex within Mapungubwe National Park and De Beers Venetia Nature Reserve must remain protected by conservation, and WfW rehabilitation structures at Leeuwpan must be maintained.
The RQOs outlined below for the Maloutswa Floodplain with depressional wetlands (pans) are to maintain a C category (TEC), with a percentage score of at least 62%, and the EI must remain Very High and the ES High					
Mapungubwe (RU 8)	Water quantity	Water Inputs	Hydrology (EWR)	Floods from the Limpopo, Maloutswa and Kolope rivers are necessary to inundate this complex floodplain thereby providing the wetting regime required for supporting the floodplain vegetation and dependent biota. 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. The EWR determined for the upstream Kolope River must be implemented, but environmental flows in the Limpopo River will also need to be maintained.	The EWR determined for the upstream Kolope River site (Riv32) must be implemented
		Water distribution and retention patterns	Flooding by damming within the wetland	The current extent of damming within the wetland complex must not be permitted to increase.	The extent of damming within the delineated wetland area must not exceed 40Ha.
	Habitat	Wetland vegetation structure / composition	Extent of natural grassland within the wetland complex (land cover classes 12-13; SANLC, 2020) combined with the extent of herbaceous wetlands (land cover	The combined extent of natural grassland and herbaceous wetlands must be maintained within the wetland complex and not allowed to decrease.	The combined extent of natural grassland and herbaceous wetlands must not decline below 1338Ha.

IUA / RU	Component	Subcomponent	Indicator	RQO	
				Narrative	Numerical
			classes 22-23; SANLC, 2020)		
			Extent of natural wooded land within the wetland complex (land cover classes 1-4; SANLC, 2020)	The extent of open and dense woodland must not be allowed to increase within the wetland complex*	The extent of open and dense woodland must not increase above 1300Ha.*
		Habitat fragmentation within the wetland delineation	Extent of alien invasive plants within the wetland / complex	Dense patches of alien invasive plant species must be prevented from establishing within conserved portion of the wetland complex.	Dense patches of alien invasive plant species must not exceed 0% of the wetland area within the conserved portion.
			Developments within the wetland complex (includes mines and quarries, SANLC classes 68-72, built-up areas, infrastructure, canals, furrows and trenching , SANLC classes 47-67)	Wetland habitat loss or fragmentation due to developments must not be permitted within the wetland complex.*	The aerial extent of developments within the delineated wetland area must not exceed 12Ha.*
			Land cover classes denoted to cultivated areas within the wetland complex (classes 32-46 & 73; SANLC, 2020)	Wetland habitat loss due to direct agricultural activities and croplands must not increase within the wetland complex. *	The aerial extent of agricultural activities and croplands within the delineated wetland area must not exceed 800Ha.*
	Habitat / Biota	Protection	Protected areas / Conservation	The wetland complex must remain under the national protection of conservation.	100% of the delineated wetland complex must remain protected by conservation, allowing for current agreements that cater for existing agriculture.
	Biota	Waterbirds	Wetland / floodplain birds (species diversity)	The number of wetland-dependent bird species that utilise the floodplain must be maintained.	The number of wetland-dependent bird species that utilise the floodplain must be at least 37.
		Amphibians	Amphibian species diversity	The number of amphibian species that utilise the floodplain and wetland features must be maintained.	The number of amphibian species that utilise the floodplain and wetland features must at least 4.
		Wetland plants	Number of wetland-dependent plant species	The number of wetland-dependent plant species must be maintained.	The number of wetland-dependent plant species must be at least 15.
	Water quality	Salts	Electrical conductivity (mS/m)	Water quality parameters for the upstream Kolope River site are given since these flows will feed the floodplain, but water quality in the	95th percentile EC < 85 mS/m
		System Variables	pH		5.6 >=pH<= 9.2

IUA / RU	Component	Subcomponent	Indicator	RQO	
				Narrative	Numerical
		Nutrients	Total inorganic nitrogen (TIN) (mg/l)	Limpopo River will also be important during flooding.	Median TIN < 2.24 mg/l
			Orthophosphate (mg/l)		Median PO_4-P < 0.09 mg/l
			Ammonia (NH_3-N) (mg/l)		Median NH_3-N < 0.073 mg/l
The RQOs outlined below for the Peat domes in KNP - Malahlapanga (with thermal springs), are to maintain a B/C category (TEC), with a percentage score of at least 78%, and the EI must remain Very High and the ES at least Moderate.					
Shingwedzi (RU 16)	Water quantity	Water Inputs	Flow rates from natural springs	Water flowing from springs must not be impeded so as to cause drying of peats	N/A
	Habitat	Wetland vegetation structure / composition	Extent of woody vegetation within the wetland complex	Woody vegetation must not be permitted to encroach into the wetland complex	N/A
			Extent of natural grassland within the wetland complex (land cover classes 12-13; NLC, 2020) together with the extent of herbaceous wetlands (land cover classes 22-23, 2020)	The current extent of natural grassland together with herbaceous wetland must not decline.	The current extent of natural grassland together with herbaceous wetland must not decline below 8Ha.
		Habitat fragmentation within the wetland delineation	Extent of alien invasive plants within the wetland / complex	Dense patches of alien invasive plant species must be prevented from establishing within the wetland complex.	Dense patches of alien invasive plant species must not exceed 0% of the wetland area.
			Developments within the wetland complex (includes mines and quarries, SANLC classes 68-72, built-up areas, infrastructure, canals, furrows and trenching , SANLC classes 47-67)	Wetland habitat loss or fragmentation due to developments must not be permitted within the wetland complex.*	The aerial extent of developments within the delineated wetland area must not exceed 0Ha.*
			Land cover classes denoted to cultivated areas within the wetland complex (classes 32-46 & 73; SANLC, 2020)	Wetland habitat loss due to direct agricultural activities and croplands must not be permitted within the wetland complex. *	The aerial extent of agricultural activities and croplands within the delineated wetland area must not exceed 0Ha.*
			Grazing and trampling pressure	The abundance of megaherbivores (mainly elephants and buffalos)	N/A

IUA / RU	Component	Subcomponent	Indicator	RQO	
				Narrative	Numerical
				within the wetland complex must be strategically and adaptively managed to promote conservation targets for all species, and integrity of peat domes.	
	Habitat / Biota	Protection	Protected areas / Conservation	The wetland complex must remain under the national protection of conservation.	100% of the delineated wetland complex must remain protected by conservation.
			Rehabilitation structures	WfW rehabilitation structures. mainly earthen berms, to promote pooling and wetland vegetation recovery, must be maintained where necessary.	N/A
	Biota	Taxon richness	Number of wetland-dependent plant species	The number of wetland-dependent plant species that occur within the wetland complex must be maintained.	The number of wetland-dependent plant species that occur within the wetland complex must be 6 at least.
The RQOs outlined below for the Bububu riverine wetlands with sodic sites (tributary of the Shingwedzi), are to maintain a A category (TEC), with a percentage score of at least 92%, and the EI must remain Very High and the ES at least Moderate.					
Shingwedzi (RU 16)	Habitat	Wetland vegetation structure / composition	Extent of natural grassland within the wetland complex (land cover classes 12-13; SANLC, 2020)	The wetland complex must retain a non-dominant natural grassland component	The wetland complex must comprise 10-25% natural grassland.
			Extent of natural wooded land within the wetland complex (land cover classes 1-4; SANLC, 2020)	The wetland complex must remain dominated by natural wooded land (dense and open woodland)	The wetland complex must comprise 60-85% natural wooded land (dense and open woodland)
		Habitat fragmentation within the wetland delineation	Extent of alien invasive plants within the wetland / complex	Dense patches of alien invasive plant species must be prevented from establishing within the wetland complex.	Dense patches of alien invasive plant species must not exceed 0% of the wetland area.
			Developments within the wetland complex (includes mines and quarries, SANLC classes 68-72, built-up areas, infrastructure, canals, furrows and trenching , SANLC classes 47-67)	Wetland habitat loss or fragmentation due to developments must not be permitted within the wetland complex.*	The aerial extent of developments within the delineated wetland area must not exceed 0Ha.*

IUA / RU	Component	Subcomponent	Indicator	RQO	
				Narrative	Numerical
			Land cover classes denoted to cultivated areas within the wetland complex (classes 32-46 & 73; SANLC, 2020)	Wetland habitat loss due to direct agricultural activities and croplands must not be permitted within the wetland complex. *	The aerial extent of agricultural activities and croplands within the delineated wetland area must not exceed 0Ha.*
	Habitat / Biota	Protection	Protected areas / Conservation	The wetland complex must remain under the national protection of conservation.	100% of the delineated wetland complex must remain protected by conservation.
The RQOs outlined below for the Nyl River floodplain (including Nylsvley), are to maintain a B/C category (TEC), with a percentage score of at least 78%, and the EI must remain Very High and the ES High.					
Upper Nyl & Sterk (RU1)	Water quantity	Water Inputs	Hydrology (EWR)	Floods are necessary to inundate the floodplain thereby providing the wetting regime required for supporting the floodplain vegetation and dependent biota. 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. The EWR determined for the floodplain must be implemented.	The EWR determined for the floodplain must be implemented: The flood requirements are:
					· an annual flood of 3 - 5 m3/s
					· a 1:2 year flood of 16 - 20 m3/s with a duration of 3 to 4 months
					· a 1:3 year flood of 28 - 30 m3/s with a duration of 50 to 90 days
					· a 1:5 year flood of 45 - 50 m3/s with a duration of 90 to -150 days.
		Water distribution and retention patterns	Flooding by damming with the wetland	The current extent of damming within the wetland complex must not be permitted to increase.	The extent of damming within the delineated wetland area must not exceed 23Ha.
	Habitat	Wetland vegetation structure / composition	Extent of woody vegetation on the floodplain	Woody vegetation must not be permitted to encroach onto the floodplain	N/A
			Extent of natural grassland within the wetland complex (land cover classes 12-13; NLC, 2020) together with the extent of herbaceous wetlands (land cover classes 22-23, 2020)	The current extent of natural grassland together with herbaceous wetland must not decline.	The current extent of natural grassland together with herbaceous wetland must not decline below 4070Ha.
		Habitat fragmentation with the wetland delineation	Extent of alien invasive plants within the wetland / complex	Dense patches of alien invasive plant species must be prevented from establishing within the wetland complex.	Dense patches of alien invasive plant species must not exceed 5% of the wetland area.

IUA / RU	Component	Subcomponent	Indicator	RQO	
				Narrative	Numerical
				Dense patches of alien invasive plant species must be prevented from establishing within the Ramsar site (Nylsvley Nature Reserve).	Dense patches of alien invasive plant species must not exceed 0% of the wetland area within the Ramsar site (Nylsvley Nature Reserve).
			Developments within the wetland complex (includes mines and quarries, SANLC classes 68-72, built-up areas, infrastructure, canals, furrows and trenching, SANLC classes 47-67)	Wetland habitat loss or fragmentation due to developments must not be permitted within the wetland complex*	The aerial extent of developments within the delineated wetland area must not exceed 0Ha*
			Land cover classes denoted to cultivated areas within the wetland complex (classes 32-46 & 73, 2020)	Wetland habitat loss due to direct agricultural activities, including grazing, and croplands must not be permitted to increase in extent within the wetland complex. *	The aerial extent of agricultural activities, including grazing, and croplands within the delineated wetland area must not exceed 3430Ha. *
	Habitat / Biota	Protection	Protected areas / Conservation	Nylsvley Nature Reserve (a portion of the floodplain) must remain under the provincial protection of conservation.	100% of the Nylsvley Nature Reserve (a portion of the floodplain) must remain protected by conservation, such that it also remains a Ramsar site and IBA.
			Ramsar wetland	Nylsvley Nature Reserve (a portion of the floodplain) must retain qualities to uphold its Ramsar status as a wetland of international importance.	
			Important birding area	Nylsvley Nature Reserve (a portion of the floodplain) must remain an IBA (Important Birding Area).	
	Biota	Birds	Threatened bird species (water / wetland-dependent)	Breeding populations of threatened species must be maintained. These include Rufous bellied Heron (*Butroides rufiventris*), Little Bittern (*Ixobrychus minutus*), Dwarf Bittern (*Ixobychus sturmiz*), Bittern (*Botaurus stellaris*), Pygmy Goose (*Nettapus auritus),* Baillon's Crake (*Porzana pusilla*), Striped Crake (*Aenigmatolimnas marginalis*) and Black Stork (*Ciconia nigra*) .	The number of threatened bird species that use the floodplain for breeding during the flood season must be at least 8

IUA / RU	Component	Subcomponent	Indicator	RQO	
				Narrative	Numerical
			Waterbird species diversity	The number of bird species (includes residents and migrants) that utilise the floodplain must be maintained.	The number of bird species that utilise the floodplain must be at least 102 species.
		Fish	Species diversity in the floodplain during flooding	The number of fish species that occur on the floodplain during flooding must be maintained.	The number of fish species that occur in the floodplain during floods must be at least 10 species.
		Amphibians	Amphibian species diversity	The number of amphibian species that utilise the floodplain must be maintained.	The number of amphibian species that utilise the floodplain in the wet season must be at least 11.
		Vegetation	Alian invasive plants	The wetland complex must be maintained by removal of perennial alien plant species.	Dense patches of alien invasive plant species must not exceed 5% of the wetland area.
			Threatened plants species	The floodplain is the only location in South Africa where wild rice (*Oryza longistaminata*; VU) grows and provides an important breeding ground for frogs and toads after rain and during floods. As such, Wild Rice populations must be maintained within the floodplain.	The aerial extent of *Oryza longistaminata* on the floodplain must correspond to the flooding regime: · 50-59 % (area) of floodplain grasses inundated during an annual flood of 3 - 5 m3/s (at Nylsvley - central region) · 80-89 % (area) of floodplain grasses inundated during a 1:2 year flood of 16 - 20 m3/s with a duration of 3 to 4 months (at Nylsvely - central region) · 80-89 % (area) of floodplain grasses inundated during a 1:3 year flood of 28 - 30 m3/s with a duration of 50 to 90 days (at Nylsvely - central region) · 90-99 % (area) of floodplain grasses inundated during a 1:5 year flood of 45 - 50 m3/s with a duration of 90 to -150 days (at Nylsvely - central region)
			Plant species diversity within the wetland complex	The number of plant species that occur within the floodplain and are water or wetland-dependent must be maintained.	The number of plant species that occur within the floodplain and are water or wetland-dependent must be at least 35.
	Water quality	Salts	Electrical conductivity (mS/m)	Water quality in the Nyl River and the tributaries that feed the floodplain must maintain the TEC (C).	95th percentile EC < 85 mS/m
		System variables	pH		5.6 >=pH<= 9.2
		Nutrients	Total inorganic nitrogen (TIN) (mg/l)		Median TIN < 2.24 mg/l
			Orthophosphate (mg/l)		Median PO_4-P < 0.09 mg/l
			Ammonia (NH_3-N) (mg/l)		Median NH_3-N < 0.073 mg/l
The RQOs outlined below for the Nyl Pans (valley bottom with a channel with depressional wetlands / lakes), are to maintain a C/D category (TEC), with a percentage score of at least 58%, and the EI must remain High and the ES High.					
Upper Nyl & Sterk (RU2)	Water quantity	Water Inputs	Hydrology (EWR)	Flows are necessary to replenish these large depressional lakes and	The EWR determined for the floodplain must be implemented: The flood requirements are:

IUA / RU	Component	Subcomponent	Indicator	RQO	
				Narrative	Numerical
				flood the wetland between them, thereby providing the wetting regime required for supporting the wetland and lake vegetation and dependent biota. 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. The EWR determined for the upstream Nyl floodplain must be implemented, and will service these downstream wetlands.	· an annual flood of 3 - 5 m3/s
					· a 1:2 year flood of 16 - 20 m3/s with a duration of 3 to 4 months
					· a 1:3 year flood of 28 - 30 m3/s with a duration of 50 to 90 days
					· a 1:5 year flood of 45 - 50 m3/s with a duration of 90 to -150 days.
	Habitat	Wetland vegetation structure / composition	Extent of natural grassland within the wetland complex (land cover classes 12-13; SANLC, 2020) combined with the extent of herbaceous wetlands (land cover classes 22-23; SANLC, 2020)	The combined extent of natural grassland and herbaceous wetlands must be maintained within the wetland complex and not allowed to decrease.	The combined extent of natural grassland and herbaceous wetlands must not decline below 340Ha (excluding water bodies).
			Extent of natural wooded land within the wetland complex (land cover classes 1-4; SANLC, 2020)	The extent of open and dense woodland must not be allowed to increase within the wetland complex*	The extent of open and dense woodland must not increase above 1080Ha.*
		Habitat fragmentation within the wetland delineation	Extent of alien invasive plants within the wetland / complex	Dense patches of alien invasive plant species must be prevented from establishing within the wetland complex.	Dense patches of alien invasive plant species must not exceed 5% of the wetland area.
			Developments within the wetland complex (includes mines and quarries, SANLC classes 68-72, built-up areas, infrastructure, canals, furrows and trenching , SANLC classes 47-67)	Wetland habitat loss or fragmentation due to developments must not be permitted within the wetland complex.*	The aerial extent of developments within the delineated wetland area must not exceed 78Ha.*

IUA / RU	Component	Subcomponent	Indicator	RQO	
				Narrative	Numerical
			Land cover classes denoted to cultivated areas within the wetland complex (classes 32-46 & 73; SANLC, 2020)	Wetland habitat loss due to direct agricultural activities, including croplands must not be permitted to increase in extent within the wetland complex. *	The aerial extent of agricultural activities, including croplands within the delineated wetland area must not exceed 390Ha.*
			Grazing and trampling pressure	The grazing and trampling pressure within the wetland must be managed so as not to cause any denudation within the wetland	Extent of bare soil within the wetland to be 0Ha
		Lake area	Extent of natural open water	The extent of natural open water bodies must be maintained (given seasonal fluctuations).	The extent of natural open water bodies must be maintained (given seasonal fluctuations) at about 200Ha.
	Biota	Wetland plants	Number of wetland-dependent species	The number of wetland-dependent plant species must be maintained.	The number of wetland-dependent plant species must be at least 15.
	Water Quality	Effluent	Water chemistry	Water chemistry (effluent) to comply with effluent standards.	Water quality (effluent) to comply with standards outlined in DWS notice 169 of 2013
		Salts	Electrical conductivity (mS/m)	Water quality in the Nyl River and the tributaries that feed the floodplain must maintain the TEC (C/D).	95th percentile EC < 85 mS/m
		System variables	pH		5.6 >=pH<= 9.2
		Nutrients	Total inorganic nitrogen (TIN) (mg/l)		Median TIN < 2.24 mg/l
			Orthophosphate (mg/l)		Median PO_4-P < 0.09 mg/l
			Ammonia (NH3-N) (mg/l)		Median NH3-N < 0.073 mg/l
The RQOs outlined below for Wonderkrater depressional wetland & spring with peat, are to maintain a B category (TEC), with a percentage score of at least 82%, and the EI must remain Very High and the ES at least Moderate.					
Upper Nyl & Sterk (RU1)	Water quantity	Water Inputs	Flow rates from natural spring	Water flowing from springs must not be impeded so as to cause drying of peats	N/A
	Habitat	Wetland vegetation structure / composition	Extent of natural grassland and non-woody vegetation within the wetland complex.	The extent of natural grassland and non-woody vegetation within the wetland complex must be maintained, or increase.	The extent of natural grassland and non-woody vegetation within the wetland complex must remain at about 50% of the wetland or more.
			Extent of natural wooded land within the wetland complex.	The extent of natural wooded land within the wetland complex must not increase	The extent of natural wooded land within the wetland complex must not become more than 50% of the wetland extent.
		Habitat fragmentation within the	Extent of alien invasive plants within the wetland / complex	Dense patches of alien invasive plant species must be prevented from establishing within the wetland complex.	Dense patches of alien invasive plant species must not exceed 5% of the wetland area.

IUA / RU	Component	Subcomponent	Indicator	RQO	
				Narrative	Numerical
		wetland delineation	Land cover classes denoted to cultivated areas within the wetland complex (classes 32-46 & 73; SANLC, 2020)	Wetland habitat loss due to direct agricultural activities, including croplands must not be permitted within the wetland complex.	The aerial extent of agricultural activities, including croplands within the delineated wetland area must not exceed 0Ha.
			Erosion / incision	Existing WfW rehabilitation structures must be protected and maintained so as not to promote erosion or incision within the wetland	N/A
			Grazing and trampling pressure	The grazing and trampling pressure within the wetland must be managed so as not to cause any denudation within the wetland	N/A
	Habitat / Biota	Protection	Protected areas / Conservation	The wetland complex must remain under protection	100% of the wetland complex must remain under protection
	Biota	Taxon richness	Number of wetland-dependent plant species	The number of wetland-dependent plant species must be maintained	The number of wetland-dependent plant species must be at least 10.
The RQOs outlined below for the Mokamole wetlands (tributary of the Mogalakwena; Valley bottom with a channel), are to maintain a B/C category (TEC), with a percentage score of at least 78%, and the EI must remain High and the ES High.					
Mogalakwena (RU 4)	Water quantity	Water distribution and retention patterns	Flooding by damming within the wetland	The current extent of damming within the wetland complex, or upstream from it, must not be permitted to increase.	The extent of damming within the delineated wetland, or upstream from it, must not exceed 0Ha.
	Habitat	Wetland vegetation structure / composition	Extent of natural grassland within the wetland complex (land cover classes 12-13; SANLC, 2020) combined with the extent of herbaceous wetlands (land cover classes 22-23; SANLC, 2020)	The combined extent of natural grassland and herbaceous wetlands must be maintained within the wetland complex and not allowed to decrease.	The combined extent of natural grassland and herbaceous wetlands must not decline below 100Ha.
			Extent of natural wooded land within the wetland complex (land cover classes 1-4; SANLC, 2020)	The extent of open and dense woodland must not be allowed to increase within the wetland complex	The extent of open and dense woodland must not increase above 5Ha.
		Habitat fragmentation within the	Extent of alien invasive plants within the wetland / complex	Dense patches of alien invasive plant species must be prevented from establishing within the wetland complex.	Dense patches of alien invasive plant species must not exceed 0% of the wetland area

IUA / RU	Component	Subcomponent	Indicator	RQO	
				Narrative	Numerical
		wetland delineation	Extent of planted forest within the wetland complex (land cover classes 5-7; SANLC, 2020)	Wetland habitat loss or fragmentation due to forestry must not be permitted within the wetland complex.*	The aerial extent of forestry within the delineated wetland area must not exceed 0Ha.*
			Developments within the wetland complex (includes mines and quarries, SANLC classes 68-72, built-up areas, infrastructure, canals, furrows and trenching , SANLC classes 47-67)	Wetland habitat loss or fragmentation due to developments must not be permitted within the wetland complex.*	The aerial extent of developments within the delineated wetland area must not exceed 1Ha.*
			Land cover classes denoted to cultivated areas within the wetland complex (classes 32-46 & 73; SANLC, 2020)	Wetland habitat loss due to direct agricultural activities and croplands must not be permitted to increase in extent within the wetland complex. *	The aerial extent of agricultural activities and croplands within the delineated wetland area must not exceed 10Ha.*
	Biota	Taxon richness	Number of wetland-dependent plant species	The number of wetland-dependent plant species that occur within the wetland complex must be maintained.	The number of wetland-dependent plant species that occur within the wetland complex must be 10 at least.

* - includes a 200m buffer

N/A - Not Available (a numerical limit could not be defined)

Table 36. Groundwater Resource Quality Objectives for GRU A50-2 in the Lower Lephalala

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
Lower Lephalala	A50-2	A50G	Gabrro-Anorthotsie (weathered and fractured aquifer, i.e., secondary) aquifers overlain by a weathered horizon of variable thickness)	Low to Moderate groundwater use to support rural water supply and groundwater schemes.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time.	Water level fluctuations must not exceed long-term averages of 4.5 m.

							Groundwater use must be sustainable for all users and the environment	
					Groundwater Quality	NO_3 (as N) EC F	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 20 mg/l < 150 mS/m <1.5 mg/l

Table 37. Groundwater Resource Quality Objectives for the GRU A50-3 in the Lower Lephalala

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
Lower Lephalala	A50-3	A50H	Limpopo River alluvial aquifer and the Beitbridge Complex intergranular/weathered and fractured aquifer	Moderate groundwater use to support economic activities (agriculture), rural water supply and groundwater schemes.	Abstraction (Available Yield)	Groundwater Levels:	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 4.0 m.
					Groundwater Quality:	NO_3 (as N) EC F	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 10 mg/l < 150 mS/m <1.5 mg/l

Table 38. Groundwater Resource Quality Objectives for the GRU A50-4 in the Kalkpan se Loop

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
Kalkpan se Loop	A50-4	A63C	Limpopo River alluvial aquifer and the Beitbridge Complex weathered and fractured aquifer	Low to Moderate groundwater use to rural water supply. GW could play a role in supporting spring seepages.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 4.5 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (incl. springs) (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river/spring towards wellfield in a 250 m zone along main stem/spring not allowed.
					Low flow in river	Compliance with the low flow requirements in the river (as per riverine RQO)	Maintain the low flow requirements in the river	RRU_Rvi1 RQO

Table 39.Groundwater Resource Quality Objectives for GRU A61-1 for the Nyl River Valley

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
Nyl River Valley	A61-1	A61A	Waterberg Group, comprising of sedimentary and metamorphic rocks weathered and fractured aquifer	High groundwater use to support groundwater schemes and Modimolle wellfield. GW play a moderate role in supporting baseflow.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment.	Water level fluctuations must not exceed long-term averages of 7 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 250 m zone along main stem not allowed.
		A61B		Low to Moderate groundwater use to support rural water supply. GW play a moderate role in supporting baseflow (and wetlands).	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	n/a (Add (Hydstra mon. borehole to catchment)

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient (river towards wellfield in a 250 m zone along main stem not allowed.
					Low flow in river	Compliance with the low flow requirements in the river (as per riverine RQO)	Maintain the low flow requirements in the river	Refer to Ri1 (Olifantspruit RQO)
		A61C		Low to Moderate groundwater use to support rural water supply. GW play a moderate role in supporting baseflow (and Nylsvlei).	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 6.5 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface (incl. springs) water (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river/spring towards wellfield in a 250 m zone along main stem (and Nylsvlei) not allowed.

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
		A61D	Upper Nyl River Valley alluvial aquifers and Karoo weathered aquifer	Low to Moderate groundwater use to support groundwater schemes and Mookgophong wellfield. GW play a moderate role in supporting baseflow (and wetlands).	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 8.5 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 250 m zone along main stem (and wetland) not allowed.
					Groundwater Quality:	NO_3 (as N) EC	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 1 mg/l < 100 mS/m
						E.coli Total Coliform	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	0 counts / 100ml <10 counts / 100ml
		A61E	Lower Nyl River Valley alluvial	Moderate groundwater use to support groundwater schemes/wellfields and rural water supply. GW play a	Abstraction (Available Yield)	Groundwater Levels:	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate	Water level fluctuations must not exceed long-

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
			aquifers and Karoo weathered aquifer Gabbro-Norite (weathered and fractured aquifer, i.e., secondary) aquifers overlain by a weathered horizon of variable thickness)	moderate role in supporting baseflow (and wetlands).			change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	term averages of 4.5 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 250 m zone along main stem (and wetland) not allowed.

Table 40. Groundwater Resource Quality Objectives for GRU A61-2 in the Sterk area

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
Sterk	A61-2	A61H	Waterberg Group, comprising of sedimentary and metamorphic rocks weathered and fractured aquifer	Low to Moderate groundwater use to support groundwater schemes/wellfields and rural water supply. GW could play a moderate role in supporting baseflow (and wetlands).	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 4.5 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (incl. springs) (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 250 m zone along main stem (and wetland) not allowed.

Table 41. Groundwater Resource Quality Objectives for GRU A61-3 in the Upper Mogalakwena

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
Upper Mogalakwena	A61-3	A61F	Gabbro-Norite (weathered and fractured aquifer, i.e., secondary) aquifers overlain by a weathered horizon of variable thickness) Dorps River dolomite aquifer	Low to Moderate groundwater use to support groundwater schemes/Mokopane wellfields and rural water supply. GW play a role in supporting baseflow.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 8.5 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 250 m zone along main stem not allowed.
					Groundwater Quality:	NO_3 (as N) EC Mg	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 20 mg/l < 150 mS/m < 70 mg/l
						E.coli Total Coliform	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	0 counts / 100ml <10 counts / 100ml
		A61G	Gabbro-Norite (weathered and fractured aquifer, i.e., secondary)	Moderate groundwater use to support groundwater schemes, Mogalakwena Mine wellfields and rural water supply. GW	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate	Water level fluctuations must not exceed long-term

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
			aquifers overlain by a weathered horizon of variable thickness)	play a moderate role in supporting baseflow.			change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	averages of 8.5 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 500 m zone along main stem not allowed.
					Groundwater Quality:	NO_3 (as N) EC Mg	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 10 mg/l < 150 mS/m < 70 mg/l

Table 42.Groundwater Resource Quality Objectives for GRU A62-2 in the Matlala

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
Matlala	A62-2	A62E	Hout River Gneiss weathered and fractured aquifer Matlala Granite fractured aquifers	Low to Moderate groundwater use to support economic activities (agriculture) and rural water supply. GW could play a role in supporting baseflow (and wetlands).	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 3.5 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 250 m zone along main stem (and wetland) not allowed.

Table 43. Groundwater Resource Quality Objectives for GRU A63-1 in the Lower Mogalakwena

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
Lower Mogalakwena	A63-1	A63A	Beitbridge Complex weathered and fractured aquifer	High groundwater use to support economic activities (agriculture).	Abstraction (Available Yield)	Groundwater Levels: (Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time.	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 4.5 m.
					Groundwater Quality:	NO_3 (as N) EC Mg Ca Cl	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 10 mg/l < 200 mS/m < 70 mg/l < 70 mg/l < 200 mg/l
		A63D	Beitbridge Complex and Letaba Formation weathered and fractured aquifer	Moderate groundwater use to support economic activities (agriculture) (Alldays) and groundwater schemes and rural water supply.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 5.0 m.
					Groundwater Quality:	NO_3 (as N) EC Mg Ca Cl	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 10 mg/l < 150 mS/m < 70 mg/l < 70 mg/l < 100 mg/l

Table 44. Groundwater Resource Quality Objectives for GRU A63/71-3 for the Limpopo Tributaries/Mapungubwe

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
Limpopo Tributaries/ Mapungubwe,	A63/71-3	A63E	Limpopo River alluvial aquifer and the Beitbridge Complex intergranular/weathered and fractured aquifer Limpopo River alluvial aquifer and the Beitbridge Complex intergranular/weathered and fractured aquifer	High groundwater use to support economic activities (agriculture). Hosts Mapungubwe and Venetia Mine. GW could play a role in supporting wetlands.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 4.5 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (incl. springs) (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river/spring towards wellfield in a 250 m zone along main stem (and wetland) not allowed.
					Groundwater Quality:	NO_3 (as N) EC Mg Cl	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 6 mg/l < 200 mS/m < 70 mg/l < 200 mg/l

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
		A71L		High groundwater use to support economic activities (mining). Schroda/Greefswald Wellfields. Hosts Mapungubwe.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 4.5 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (incl. springs) (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river/spring towards wellfield in a 250 m zone along main stem (and wetland) not allowed.
					Groundwater Quality:	NO_3 (as N) EC Mg Cl Na	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 6 mg/l < 200 mS/m < 70 mg/l < 200 mg/l < 200 mg/l

Table 45. Groundwater Resource Quality Objectives for GRU A71-1 in the Upper Sand IUA

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
Upper Sand	A71-1	A71A	Turfloop Granite fractured aquifers Hout River Gneiss and weathered and fractured aquifer Alluvial aquifers	High groundwater use to support economic activities. Hosts Polokwane (i.e. Sand River) wellfields.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 6.5 m.
					Groundwater Quality:	NO_3 (as N) EC	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 10 mg/l < 150 mS/m
						E.coli Total Coliform	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	0 counts / 100ml <10 counts / 100ml
		A71B	Turfloop Granite fractured aquifers Hout River Gneiss and weathered and fractured aquifer Alluvial aquifers	High groundwater use to support economic activities (Several wellfields, groundwater schemes and rural water supply).	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 3.5 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 250 m zone along main stem not allowed.

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
					Groundwater Quality:	NO_3 (as N) EC	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 10 mg/l < 200 mS/m
						E.coli Total Coliform	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	0 counts / 100ml <10 counts / 100ml

Table 46.Groundwater Resource Quality Objectives for GRU A71-2 in the Middle Sand

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
Middle Sand	A71-2	A71C	Matlala Granite fractured aquifers Hout River Gneiss and weathered and fractured aquifer	High groundwater use to support economic activities (agriculture), rural water supply and groundwater schemes.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 3.5 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 250 m zone along main stem not allowed.
					Groundwater Quality:	NO_3 (as N) EC	Groundwater must be fit for domestic use after treatment; and groundwater	< 20 mg/l < 200 mS/m

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
						Na	quality must not show a deteriorating trend from natural background	< 200 mg/l
		A71D	Matlala Granite and Bandelierkop fractured aquifers Hout River Gneiss and weathered and fractured aquifer	High groundwater use to support groundwater schemes and rural water supply.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 4.0 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 250 m zone along main stem not allowed.
		A71H	Bandelierkop fractured aquifers Hout River Gneiss and weathered and fractured aquifer	Moderate groundwater use to support groundwater schemes	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	n/a (Add (Hydstra mon.borehole to catchment)
					Groundwater Quality:	NO_3 (as N) EC Na	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 20 mg/l < 200 mS/m < 200 m/l

Table 47.Groundwater Resource Quality Objectives for GRU A71-3 in the Hout

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
Hout	A71-3	A71E	Hout River Gneiss and weathered and fractured aquifer Alluvial aquifers	High groundwater use to support groundwater schemes and rural water supply. GW could play a role in supporting wetlands.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 3.5 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 250 m zone along main stem (and wetland) not allowed.
					Groundwater Quality:	NO_3 (as N) EC	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 10 mg/l < 150 mS/m
		A71F	Hout River Gneiss and weathered and fractured aquifer	High groundwater use to support groundwater schemes and rural water supply. GW could play a role in supporting wetlands.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	n/a (Add (Hydstra mon.borehole to catchment)

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 250 m zone along main stem (and wetland) not allowed.
					Groundwater Quality:	NO_3 (as N) EC	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 10 mg/l < 75 mS/m
		A71G	Matlala Granite and Bandelierkop fractured aquifers Hout River Gneiss and weathered and fractured aquifer Alluvial aquifers	High groundwater use to support economic activities (agriculture), groundwater schemes and rural water supply.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 3.5 m.
					Groundwater Quality:	NO_3 (as N) EC Mg Na	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 10 mg/l < 100 mS/m < 70 mg/l < 200 mg/l
		A72A	Bandelierkop fractured aquifers Hout River Gneiss and weathered and fractured aquifer Alluvial aquifers	High groundwater use to support economic activities (agriculture), groundwater schemes and rural water supply.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time.	Water level fluctuations must not exceed long-term averages of 4.0 m.

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
							Groundwater use must be sustainable for all users and the environment	
					Groundwater Quality:	NO_3 (as N) EC Mg Na Cl	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 10 mg/l < 100 mS/m < 70 mg/l < 200 mg/l < 200 mg/l

Table 48. Groundwater Resource Quality Objectives for GRU A71-4 and A71-5 in the Sandbrak/Lower Sand

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
Sandbrak/ Lower Sand	A71-4	A71J	Beitbridge Complex weathered and fractured aquifer Karoo aquifers	High groundwater use to support economic activities (agriculture) and rural water supply. GW could play a role in supporting wetlands.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 7.0 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (incl. springs) (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river/spring towards wellfield in a 250 m zone along main stem not allowed.

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
		A72B	Beitbridge Complex weathered and fractured aquifer Karoo aquifers	Moderate groundwater use to support economic activities (agriculture), groundwater schemes and rural water supply.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 6.0 m.
	A71-5	A71K	Limpopo River alluvial aquifer and the Beitbridge Complex weathered and fractured aquifer	High groundwater use to support groundwater schemes, rural water supply and Musina (i.e., Limpopo River) wellfield.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 3.5 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 250 m zone along main stem not allowed.
					Groundwater Quality:	NO_3 (as N) EC Sulphate Mg	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 10 mg/l < 200 mS/m < 200 mg/l < 70 mg/l

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
						E.coli Total Coliform	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	0 counts / 100ml <10 counts / 100ml

Table 49.Groundwater Resource Quality Objectives for GRU A80-1 in the Upper Nzhelele

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
Upper Nzhelele	A80-1	A80A	Soutpansberg Basalts weathered and fractured aquifer Alluvial aquifers	Low to moderate groundwater use to support groundwater schemes and rural water supply. GW play a role in supporting wetlands and spring seepages.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 3.5 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (incl. springs) (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river/spring towards wellfield in a 250 m zone along main stem (and wetland) not allowed.
		A80F	Soutpansberg Basalts weathered and fractured aquifer Beitbridge Complex weathered and fractured aquifer	Moderate groundwater use to support economic activities (agriculture) and rural water supply. GW could play a role in supporting wetlands. Potential coal mining development.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 3.0 m.

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
					Groundwater Quality:	NO_3 (as N) EC	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 10 mg/l < 150 mS/m

Table 50. Groundwater Resource Quality Objectives for GRU A80-2 in the Lower Nzhelele

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
Lower Nzhelele	A80-2	A80G	Soutpansberg Basalts weathered and fractured aquifer Beitbridge Complex weathered and fractured aquifer	Moderate groundwater use to support economic activities (agriculture) and rural water supply. GW could play a role in supporting baseflow and spring seepages.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 3.5 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (incl. springs) (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river/spring towards wellfield in a 250 m zone along main stem not allowed.
					Low flow in river	Compliance with the low flow requirements in the river (as per riverine RQO)	Maintain the low flow requirements in the river	Refer to Ri27

Table 51.Groundwater Resource Quality Objectives for GRU A80-3 in the Nwanedi

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
Nwanedi	A80-3	A80J	Soutpansberg Basalts weathered and fractured aquifer Beitbridge Complex weathered and fractured aquifer	Moderate groundwater use to support economic activities (agriculture), groundwater schemes and rural water supply. GW could play a role in supporting wetlands.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 5.5 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 250 m zone along main stem (and wetland) not allowed.
					Low flow in river	Compliance with the low flow requirements in the river (as per riverine RQO)	Maintain the low flow requirements in the river	Ri28 applies.

Table 52. Groundwater Resource Quality Objectives for GRU A91-1 in the Upper Luvuvhu

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
Upper Luvuvhu	A91-1	A91A	Soutpansberg Basalts weathered and fractured aquifer Hout River Gneiss weathered and fractured aquifer	High groundwater use (Makhado) to support groundwater schemes and rural water supply. GW could play a role in supporting baseflow.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 6.0 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 250 m zone along main stem not allowed.
		A91B	Hout River Gneiss weathered and fractured aquifer	Moderate groundwater use to support economic activities (agriculture), groundwater schemes and rural water supply. GW could play a role in supporting baseflow.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 7.0 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
						surface water (in mamsl)		towards wellfield in a 250 m zone along main stem not allowed.
					Groundwater Quality:	NO_3 (as N) EC	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 10 mg/l < 100 mS/m
		A91C	Hout River Gneiss weathered and fractured aquifer Soutpansberg Basalts weathered and fractured aquifer		Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 7.5 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 250 m zone along main stem not allowed.
					Groundwater Quality:	NO_3 (as N) EC	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 10 mg/l < 100 mS/m
		A91E	Hout River Gneiss	Low groundwater use to support groundwater schemes and rural water	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under	n/a

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
			weathered and fractured aquifer Soutpansberg Basalts weathered and fractured aquifer	supply. GW could play a role in supporting baseflow.			consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 250 m zone along main stem not allowed.
					Groundwater Quality:	NO_3 (as N) EC	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 10 mg/l < 100 mS/m
		A91F	Hout River Gneiss weathered and fractured aquifer Soutpansberg Basalts weathered and fractured aquifer	Low groundwater use to support groundwater schemes and rural water supply. GW could play a role in supporting baseflow.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 8.5 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
						surface water (in mamsl)		towards wellfield in a 500 m zone along main stem not allowed.
					Groundwater Quality:	NO_3 (as N) EC Mg	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 10 mg/l < 100 mS/m < 70 mg/l
		A91G	Hout River Gneiss weathered and fractured aquifer Soutpansberg Basalts weathered and fractured aquifer Alluvial aquifer	Low groundwater use to support groundwater schemes and rural water supply. GW could play a role in supporting baseflow and wetlands.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	n/a
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 250 m zone along main stem (and wetland) not allowed.
					Groundwater Quality:	NO_3 (as N) EC	Groundwater must be fit for domestic use after treatment; and groundwater quality must not show a deteriorating trend from natural background	< 10 mg/l < 100 mS/m
					Low flow in river	Compliance with the low flow	Maintain the low flow requirements in the river	Ri28 (Mutshindudi) applies.

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
						requirements in the river (as per riverine RQO)		

Table 53. Groundwater Resource Quality Objectives for GRU A91-2 in the Mutale/Luvuvhu

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
Mutale/Luvuvhu	A91-2	A91H	Soutpansberg Basalts weathered and fractured aquifer Alluvial aquifer	Low groundwater use to support groundwater schemes and rural water supply. GW could play a role in supporting baseflow.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 5.0 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 250 m zone along main stem not allowed.
					Low flow in river	Compliance with the low flow requirements in the river (as per riverine RQO)	Maintain the low flow requirements in the river	Ri32 applies

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
		A92B	Soutpansberg Basalts weathered and fractured aquifer Alluvial aquifer	Low to Moderate groundwater use to support groundwater schemes and rural water supply. GW could play a role in supporting baseflow and wetlands	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment.	Water level fluctuations must not exceed long-term averages of 7.0 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 250 m zone along main stem (and wetland) not allowed.
					Low flow in river	Compliance with the low flow requirements in the river (as per riverine RQO)	Maintain the low flow requirements in the river	Refer to Ri33
		A92C	Soutpansberg Basalts weathered and fractured aquifer Karoo aquifer	Low to Moderate groundwater use to support groundwater schemes and rural water supply. GW could play a role in supporting baseflow and spring seepages.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time.	Water level fluctuations must not exceed seasonal averages of 6.5 m.

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
							Groundwater use must be sustainable for all users and the environment	
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (incl. springs) (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 250 m zone along main stem not allowed.
		A92D	Soutpansberg Basalts weathered and fractured aquifer Karoo aquifer Beitbridge Complex weathered and fractured aquifer	Low to Moderate groundwater use to support groundwater schemes and rural water supply. GW could play a role in supporting baseflow and wetlands.	Abstraction (Available Yield)	Groundwater Levels:	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 8.5 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (incl. springs) (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 250 m zone along main stem (and wetland) not allowed.
					Low flow in river	Compliance with the low flow requirements in the river (as per riverine RQO)	Maintain the low flow requirements in the river	Ri34 applies.

Table 54. Groundwater Resource Quality Objectives for GRU B90-1 in the Shingwedzi

Area/IUA	GRU	Quat	Aquifer	Description (of prioritised resource units)	Component and sub-component	Indicator	RQO Narrative	RQO Numerical
Shingwedzi	B90-1	B90B	Soutpansberg Basalts weathered and fractured aquifer Hout River Gneiss weathered and fractured aquifer Hout River Gneiss weathered and fractured aquifer	Low to Moderate groundwater use to support groundwater schemes and rural water supply.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 6.0 m.
		B90F		Low to Moderate groundwater use to support groundwater schemes and rural water supply. GW could play a role in supporting wetlands.	Abstraction (Available Yield)	Groundwater Levels	(Seasonal abstraction) water level recovers from abstraction impact during wet season, under consideration of climate change and drought cycles. (Permanent abstraction) water level decline stabilises under consideration of aquifer response time. Groundwater use must be sustainable for all users and the environment	Water level fluctuations must not exceed long-term averages of 5.5 m.
					Discharge	Groundwater Levels: Relative water levels between groundwater and surface water (in mamsl)	The natural gradient between groundwater and surface water must be maintained	Reverse groundwater gradient river towards wellfield in a 250 m zone along main stem not allowed.

Table 55. Monthly Flow Requirements from Glen Alpine Dam

nMAR	188.946	MCM			
S.Dev.	15.804				
CV	0.084				
Q75	0.2848				
Ecological Category	**C**				
	MCM	% nMAR	Excludes floods with return period ≥1:2 years.		
Total EWR	43.439	22.99			
Maint. Low flows	39.096	20.692			
Drought Low flows	26.707	14.135			
Maint. High flows	4.343	2.299			
Monthly Distributions (MCM)					
	Natural	Modified Flows (EWR)			
		Low flows		High flows	Total EWR
Month	Mean	Maint.	Drought	Maint.	Maint.
Oct	3.417	0.487	0.741	0.107	0.594
Nov	13.305	2.12	1.02	0.135	2.255
Dec	18.652	2.557	1.951	0.313	2.87
Jan	31.569	3.906	3.485	0.758	4.663
Feb	52.951	10.47	4.785	0.495	10.965
Mar	26.374	9.273	4.619	0.606	9.879
Apr	15.229	4.486	2.522	0.658	5.143
May	8.955	2.496	2.082	0.629	3.125
Jun	5.898	1.351	1.632	0.367	1.717
Jul	4.964	1.104	1.552	0.183	1.287
Aug	4.168	0.546	1.266	0.057	0.603
Sep	3.464	0.3	1.054	0.038	0.338
Total	**188.95**	**39.1**	**26.71**	**4.34**	**43.44**

Table 56. Monthly Flow Requirements from Nzhelele Dam

nMAR	98.42	MCM			
S.Dev.	7.494				
CV	0.076				
Q75	0.2467				
Ecological Category	**C**				
	MCM	% nMAR	Excludes floods with return period ≥1:2 years.		
Total EWR	50.257	51.063			
Maint. Low flows	41.595	42.263			
Drought Low flows	22.504	22.865			
Maint. High flows	8.662	8.801			
Monthly Distributions (MCM)					
	Natural	Modified Flows (EWR)			
		Low flows		High flows	Total EWR
Month	Mean	Maint.	Drought	Maint.	Maint.
Oct	1.719	1.212	0.626	0.328	1.539
Nov	2.083	1.023	0.603	0.455	1.478
Dec	4.001	1.252	0.998	0.788	2.039
Jan	14.739	3.229	2.323	1.08	4.309
Feb	25.98	6.116	3.542	1.22	7.336
Mar	18.102	7.159	3.919	1.476	8.635
Apr	10.976	6.174	3.048	1.453	7.627
May	6.986	4.635	2.387	0.49	5.124
Jun	5.158	3.641	1.779	0.481	4.122
Jul	3.835	3.012	1.395	0.345	3.358
Aug	2.794	2.381	1.076	0.201	2.582
Sep	2.047	1.762	0.809	0.345	2.107
Total	98.42	41.59	22.5	8.66	50.26

Table 57.Monthly Flow Requirements from Vondo Dam

nMAR	56.42	MCM			
S.Dev.	3.444				
CV	0.061				
Q75	0.135				
Ecological Category	**C**				
	MCM	% MAR	Excludes floods with return period ≥1:2 years.		
Total EWR	40.811	72.335			
Maint. Lowflows	24.108	42.73			
Drought Lowflows	11.736	20.802			
Maint. Highflows	16.703	29.605			
Monthly Distributions (MCM)					
	Natural	Modified Flows (EWR)			
		Low flows		High Flows	Total EWR
Month	Mean	Maint.	Drought	Maint.	Maint.
Oct	1.154	0.664	0.421	0.078	0.742
Nov	2.528	0.967	0.688	0.436	1.403
Dec	6.135	2.094	1.267	1.827	3.921
Jan	9.959	3.638	1.847	3.433	7.07
Feb	13.104	4.14	1.803	4.931	9.071
Mar	10.55	4.494	1.897	3.825	8.32
Apr	5.171	2.662	1.178	1.711	4.373
May	2.593	1.633	0.776	0.324	1.958
Jun	1.707	1.213	0.569	0.082	1.295
Jul	1.374	1.035	0.491	0.015	1.05
Aug	1.125	0.853	0.413	0.016	0.87
Sep	1.02	0.714	0.387	0.025	0.739
Total	56.42	24.11	11.74	16.7	40.81

Table 58. Monthly Flow Requirements from Nandoni Dam

nMAR	388.014	MCM			
S.Dev.	22.81				
CV	0.059				
Q75	0.905				
Ecological Category	C				
	MCM		% nMAR	Excludes floods with return period ≥1:2 years.	
Total EWR	111.111		28.64%		
Maint. Lowflows	90.04		23.21%		
Drought Lowflows	80.379		20.72%		
Maint. Highflows	21.071		5.43%		
Monthly Distributions (MCM)					
	Natural	Modified Flows (EWR)			
		Low flows		High flows	Total EWR
Month	Mean	Maint.	Drought	Maint.	Maint.
Oct	8.099	0.777	3.204	0.091	0.868
Nov	11.927	1.655	3.731	0.659	2.314
Dec	24.511	5.739	6.156	2.981	8.72
Jan	50.438	11.836	8.993	4.434	16.27
Feb	79.083	21.101	11.928	4.124	25.225
Mar	64.405	24.108	13.935	4.491	28.599
Apr	32.452	13.423	9.574	3.863	17.286
May	18.145	5.007	6.337	0.408	5.415
Jun	13.614	2.751	5.018	0.008	2.759
Jul	11.352	1.752	4.332	0.023	1.775
Aug	9.526	1.085	3.782	-0.009	1.076
Sep	8.043	0.806	3.389	-0.002	0.804
Total	**331.595**	**90.04**	**80.379**	**21.071**	**111.111**

Table 59 Resource Quality Objectives for water quality and biota in the Glen Alpine Dam

IUA	Dam Name	Component	Sub-component	Indicator/ Measure	RQO Narrative	RQO Numerical
Mogalakwena	Glen Alpine Dam	Quality	Nutrients	Total Phosphates (mg/l) Chlorophyll a (µg/l)	Maintain Glen Alpine Dam in a mesotrophic state or better (intermediate levels of nutrients, fairly productive in terms of aquatic animal and plant life and showing emerging signs of water quality problems) in order to protect irrigation water supply to downstream users and rural domestic water users.	Median annual Total Phosphates ≤ 0.047 mg/l Median annual Chlorophyll a ≤ 20 µg/l
			Salts	Electrical Conductivity (EC) (mS/m) Total dissolved salts (TDS) (mg/l)	Salt concentrations must be maintained at a level that is not harmful to aquatic ecosystems in the dam and is in an Acceptable fitness for use state for domestic and industrial water supply, and for irrigation water supply.	95%tile EC ≤ 90 mS/m 95%tile TDS ≤ 585 mg/l
			Pathogens	Escherichia coli, Faecal coliforms	Glen Alpine Dam must be maintained in an Acceptable microbiological state that is safe for contact recreational user.	95%tile E coli / Faecal coliforms ≤ 25 cfu/100ml
		Biota	Fish	Maintenance of fish species diversity	Maintain fish abundance at a level that fulfils ecosystem services roles of recreational angling and subsistence harvesting	Balanced relative abundance and diversity between Cichlidae, Cyprinidae and Clariidae
				Fish health	Fish health must be maintained in a state that is safe for consumption and suitable for recreational angling	Ulcers, bacterial infections and parasite burdens limited to <1% of fish population
				Fish abundance	Maintaining fish abundance to support subsistence and recreational fishing	Maintain a stable catch per unit effort relative to previous surveys
			Alien aquatic plant species	Water Quality (Nutrients)	Maintain Glen Alpine Dam in a mesotrophic state or better	Median annual Total Phosphates ≤ 0.047 mg/l Median annual Chlorophyll a ≤ 20 µg/l
				Aerial extent	Maintain low % aerial cover of AIP (Water Hyacinth, Water Lettuce, Water Fern, Kariba Weed, Parrot's Feather) on dam surface and fringe	Maintain aerial cover of AIP on dam surface below 10%

Table 60 Resource Quality Objectives for water quality and biota in the Nzhelele Dam

IUA	Dam Name	Component	Sub-component	Indicator/ Measure	RQO Narrative	RQO Numerical
Nzhelele/Nwanedi	Nzhelele Dam	Quality	Nutrients	Total Phosphates (mg/l) Chlorophyll a (µg/l)	Maintain Nzhelele Dam in a mesotrophic state or better (intermediate levels of nutrients, fairly productive in terms of aquatic animal and plant life and showing emerging signs of water quality problems) in order to protect irrigation water supply to downstream users and rural domestic water users.	Median annual Total Phosphates ≤ 0.047 mg/l Median annual Chlorophyll a ≤ 20 µg/l
			Salts	Electrical Conductivity (EC) (mS/m) Total dissolved salts (TDS) (mg/l)	Salt concentrations must be maintained at a level that is not harmful to aquatic ecosystems in the dam and is in an Acceptable fitness for use state for domestic and industrial water supply, and for irrigation water supply.	95%tile EC ≤ 90 mS/m 95%tile TDS ≤ 585 mg/l
			Pathogens	Escherichia coli, Faecal coliforms	Nzhelele Dam must be maintained in an Acceptable microbiological state that is safe for contact recreational user.	95%tile E coli / Faecal coliforms ≤ 25 cfu/100ml
		Biota	Fish	Maintenance of fish species diversity	Maintain fish abundance at a level that fulfils ecosystem services roles of recreational angling and subsistence harvesting	Balanced relative abundance and diversity between Cichlidae, Cyprinidae and Clariidae
				Fish health	Fish health to be maintained in a state that is safe for consumption and suitable for recreational angling	Ulcers, bacterial infections and parasite burdens limited to <1% of fish population
				Fish abundance	Maintaining fish abundance to support subsistence and recreational fishing	Maintain a stable catch per unit effort relative to previous surveys
			Alien aquatic plant species	Water Quality (Nutrients)	Maintain Nzhelele Dam in a mesotrophic state or better	Median annual Total Phosphates ≤ 0.047 mg/l Median annual Chlorophyll a ≤ 20 µg/l
				Aerial extent	Maintain low % aerial cover of AIP (Water Hyacinth, Water Lettuce, Water Fern, Kariba Weed, Parrot's Feather) on dam surface and fringe	Maintain aerial cover of AIP on dam surface below 10%

Table 61 Resource Quality Objectives for water quality and biota in the Vondo Dam

IUA	Dam Name	Component	Sub-component	Indicator/ Measure	RQO Narrative	RQO Numerical
Upper Luvuvhu	Vondo Dam	Quality	Nutrients	Total Phosphates (mg/l) Chlorophyll a (µg/l)	Maintain Vondo Dam in a mesotrophic state or better (intermediate levels of nutrients, fairly productive in terms of aquatic animal and plant life and showing emerging signs of water quality problems) in order to protect irrigation water supply to downstream users and rural domestic water users.	Median annual Total Phosphates ≤ 0.047 mg/l Median annual Chlorophyll a ≤ 20 µg/l
			Salts	Electrical Conductivity (EC) (mS/m) Total dissolved salts (TDS) (mg/l)	Salt concentrations must be maintained at a level that is not harmful to aquatic ecosystems in the dam and is in an Acceptable fitness for use state for domestic and industrial water supply, and for irrigation water supply.	95%tile EC ≤ 90 mS/m 95%tile TDS ≤ 585 mg/l
			Pathogens	Escherichia coli, Faecal coliforms	Vondo Dam must be maintained in an Acceptable microbiological state that is safe for contact recreational user.	95%tile E coli / Faecal coliforms ≤ 25 cfu/100ml
		Biota	Fish	Maintenance of fish species diversity	Maintain fish abundance at a level that fulfils ecosystem services roles of recreational angling and subsistence harvesting	Balanced relative abundance and diversity between Cichlidae, Cyprinidae and Clariidae
				Fish health	Fish health to be maintained in a state that is safe for consumption and suitable for recreational angling	Ulcers, bacterial infections and parasite burdens limited to <1% of fish population
				Fish abundance	Maintaining fish abundance to support subsistence and recreational fishing	Maintain a stable catch per unit effort relative to previous surveys
			Alien aquatic plant species	Water Quality (Nutrients)	Maintain Vondo Dam in a mesotrophic state or better	Median annual Total Phosphates ≤ 0.047 mg/l Median annual Chlorophyll a ≤ 20 µg/l
				Aerial extent	Maintain low % aerial cover of AIP (Water Hyacinth, Water Lettuce, Water Fern, Kariba Weed, Parrot's Feather) on dam surface and fringe	Maintain aerial cover of AIP on dam surface below 10%

Table 62 Resource Quality Objectives for water quality and biota in the Nandoni Dam

IUA	Dam Name	Component	Sub-component	Indicator/ Measure	RQO Narrative	RQO Numerical
Upper Luvuvhu	Nandoni Dam	Quality	Nutrients	Total Phosphates (mg/l) Chlorophyll a (µg/l)	Maintain Nandoni Dam in a mesotrophic state or better (intermediate levels of nutrients, fairly productive in terms of aquatic animal and plant life and showing emerging signs of water quality problems) in order to protect irrigation water supply to downstream users and rural domestic water users.	Median annual Total Phosphates ≤ 0.047 mg/l Median annual Chlorophyll a ≤ 20 µg/l
			Salts	Electrical Conductivity (EC) (mS/m) Total dissolved salts (TDS) (mg/l)	Salt concentrations must be maintained at a level that is not harmful to aquatic ecosystems in the dam and is in an Acceptable fitness for use state for domestic and industrial water supply, and for irrigation water supply.	95%tile EC ≤ 90 mS/m 95%tile TDS ≤ 585 mg/l
			Pathogens	Escherichia coli, Faecal coliforms	Nandoni Dam must be maintained in an Acceptable microbiological state that is safe for contact recreational user.	95%tile E coli / Faecal coliforms ≤ 25 cfu/100ml
		Biota	Fish	Maintenance of fish species diversity	Maintain fish abundance at a level that fulfils ecosystem services roles of recreational angling and subsistence harvesting	Balanced relative abundance and diversity between Cichlidae, Cyprinidae and Clariidae
				Fish health	Fish health to be maintained in a state that is safe for consumption and suitable for recreational angling	Ulcers, bacterial infections and parasite burdens limited to <1% of fish population
				Fish abundance	Maintaining fish abundance to support subsistence and recreational fishing	Maintain a stable catch per unit effort relative to previous surveys
			Alien aquatic plant species	Water Quality (Nutrients)	Maintain Nandoni Dam in a mesotrophic state or better	Median annual Total Phosphates ≤ 0.047 mg/l Median annual Chlorophyll a ≤ 20 µg/l
				Aerial extent	Maintain low % aerial cover of AIP (Water Hyacinth, Water Lettuce, Water Fern, Kariba Weed, Parrot's Feather) on dam surface and fringe	Maintain aerial cover of AIP on dam surface below 10%