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IMPORTANT

Information

from Government Printing Works

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Please take note of these guidelines when completing your form.

GPW Business Rules

1. No hand written notices will be accepted for processing, this includes Adobe forms which have been completed by hand.
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6. The current cut-off of all Gazette's remains unchanged for all channels. (Refer to the GPW website for submission deadlines – www.gpwonline.co.za)
7. Incorrectly completed forms and notices submitted in the wrong format will be rejected to the customer to be corrected and resubmitted. Assistance will be available through the Contact Centre should help be required when completing the forms. (012-748 6200 or email info.egazette@gpw.gov.za)
8. All re-submissions by customers will be subject to the above cut-off times.
9. All submissions and re-submissions that miss the cut-off will be rejected to the customer to be submitted with a new publication date.
10. Information on forms will be taken as the primary source of the notice to be published. Any instructions that are on the email body or covering letter that contradicts the notice form content will be ignored.

You are therefore advised that effective from **Monday, 18 May 2015** should you not comply with our new rules of engagement, all notice requests will be rejected by our new system.

Furthermore, the fax number **012- 748 6030** will also be **discontinued** from this date and customers will only be able to submit notice requests through the email address submit.egazette@gpw.gov.za.

government printing
Department:
Government Printing Works
REPUBLIC OF SOUTH AFRICA

eGazette

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DEPARTMENT OF WATER AND SANITATION

NO. 609 **17 JULY 2015**

DEPARTMENT OF WATER AND SANITATION

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

PROPOSED CLASSES OF WATER RESOURCES AND RESOURCE QUALITY OBJECTIVES FOR CATCHMENT OF THE OLIFANTS-DOORN

I, Nomvula Paula Mokonyane, in my capacity as Minister of Water and Sanitation, and duly authorised in terms of section 13 (4) of the National Water Act (Act No. 36 of 1998) hereby publishes for public comment the proposed classes of water resources and the associated resource quality objectives for the catchments of the Olifants-Doorn, in the Schedule, to be issued under section 13(4) of the Act.

This Notice replaces Notice 843 of 2014 published in Government Gazette 38032 dated 3 October 2014. Any person who wishes to submit written comments with regard to the proposed classes and resource quality objectives should submit the comments within 60 days from the date of publication of this Notice to:

Director: Water Resource Classification
Attention: Ms Shane Naidoo
Department of Water and Sanitation
Zwamadaka Building 185 Francis Baard
Private Bag X313
PRETORIA
0001

E-mail: naidooshane@dwa.gov.za Facsimile: 012 336 6712

MRS NP MOKONYANE
MINISTER OF WATER AND SANITATION
DATE: 29.06.15

PROPOSED CLASSES AND RESOURCE QUALITY OBJECTIVES OF WATER RESOURCES FOR THE CATCHMENTS OF THE OLIFANTS-DOORN IN TERMS OF SECTION 13(1)(a) AND (b) OF THE NATIONAL WATER ACT, 1998 (ACT NO. 36 OF 1998)

SCHEDULE

1. DESCRIPTION OF WATER RESOURCE

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

Drainage Region:	E Primary Drainage Region
River(s):	Olifants and Doring River System
Drainage Region:	G3 Secondary Drainage Region
River(s):	Papkuil, Verlorevlei, Langvlei, Jakkalsvlei and Sandlaagte River Systems
Drainage Region:	F6 Secondary Drainage Region
River(s):	Brak and Sout River Systems

2. The Minister has in terms of section 12 of the National Water Act, 1998 (Act No.36 of 1998) (the Act), prescribed a system for classifying water resources by promulgating Regulation 810, Government Gazette 33541 dated 17 September 2010. In terms of section 13(1) of the Act, the Minister must, as soon as reasonably practicable after the Minister has prescribed a system for classifying water resources and subject to subsection (4), by notice in the Gazette, determine for all or part of every significant water resource, a class in accordance with the prescribed classification system.

3. The Minister, in terms of section 13(1) (a) of the Act, proposes to determine the following classes of each significant water resource for catchments of the Olifants-Doorn.

4. The Minister, in terms of section 13(1) (b) of the Act, proposes to determine the following resource quality objectives of each significant water resource for catchments of the Olifants-Doorn.

5. Where specified, the ecological category means the assigned ecological condition by the Minister to a water resource that reflects the ecological condition of that water resource in terms of the deviation of its biophysical components from a predevelopment condition.

2. DETERMINATION OF THE CLASS OF WATER RESOURCES IN TERMS OF SECTION 13(1)(a) OF THE NATIONAL WATER ACT, 1998

1. A summary of the water resource classes for Integrated Units of Analysis (Figure 1) and ecological categories per quaternary catchment (Figure 2) is set out in Table 1.

2. Integrated Units of Analysis (IUA) are classified in terms of their extent of permissible utilization and protection as either Class I: indicating high environmental protection and minimal utilization (Doring Rangelands); or Class II indicating moderate protection and moderate utilization (Upper Olifants Irrigation, Olifants Doring Dry lands, Kouebokkeveld); and Class III indicating sustainable minimal protection and high utilization (Lower Olifants Irrigation). The Mainstream Cumulative Category refers to flows and impacts generated in the quaternary catchment plus all the upstream flows and impacts. Average tributary Incremental ecological category refers to only the proportion of flow that comes from the runoff in the segment of the river or tributary).

3. A summary of resource quality objectives for hydrology, water quality, biota and habitat for resource units (quaternary catchments) is set out in Tables 2 – 6 respectively.

4. Resource quality objectives will apply from 1 April 2016..

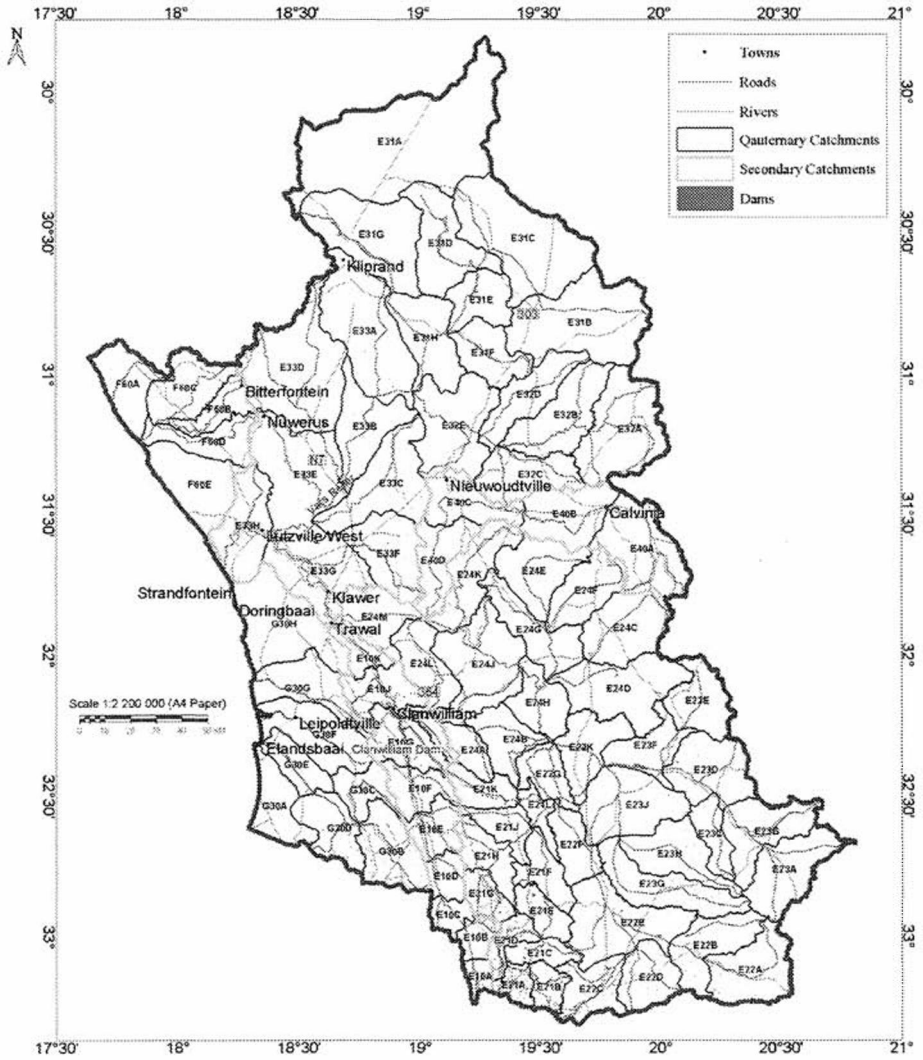

Figure 2: Quaternary catchments within Olifants Doorn WMA

Table 1: Proposed water resource classes and ecological categories for the Olifants-Doorn

IUA	Class for IUA	Quaternary catchment	River Name	Mainstem / Cumulative Ecological Category	Average Tributary / Incremental Ecological Category	Wetland area (% of quaternary) and [Ecological Category]
Lower Olifants Irrigation	III	E33G	Hol	D	C	1.9% [13% in A/B]
		E33H	Olifants	D	B	3.8% [5% in A/B]
		E33H-Est	Olifants Estuary	C		-
Upper Olifants Irrigation	II	E10A	Olifants	C	C	-
		E10B	Olifants	C	B	-
		E10C	Olifants	B	B	1.2% [85% in A/B]
		E10D	Olifants	D	C	5.4% [16% in A/B]
		E10E	Olifants	D	C	5.8% [10% in A/B]
		E10F	Olifants	D	C	-
		E10G-Rondegat	Rondegat	B	B	-
		E10G	Olifants	D	C	-
		E10H	Jan Dissels	C	C	3.3% [10% in A/B]
		E10J-Jan Dissels	Jan Dissels	D	D	-
		E10J	Olifants	D	C	1.1% [5.5% in A/B]
		E10K	Olifants	D	C	1.9% [50% in A/B]
Olifants Doring Dryland	II	E24J	Doring	B	B	0.001% [99% in A/B]
		E24K	Doring	B	B	-
		E24L	Brandewyn	B	B	0.001% [100% in A/B]
		E24M	Doring	B	B	0.001% [100% in A/B]
		E33F	Troe-Troe / Droe	D	D	-
		E40C	Oorlogskloof/ Koebee	C	B	-
		E40D	Oorlogskloof/ Koebee	B	B	-
Kouebokkeveld	II	E21A	Kruis	C	C	-
		E21B	Welgemoed	D	D	-
		E21C	Winkelhaak	C	B	0.5% [98% in A/B]
		E21D	Houdenbeks	D	D	-
		E21E	Riet	B	B	-
		E21F	Riet	B	B	0.001% [91% in A/B]
		E21G	Leeu	D	D	-
		E21H-Twee	Twee	B	B	-
		E21H	Leeu	B	B	-
		E21J	Groot	B	B	-
		E21K	Maatjies	B	B	1.7% [99% in A/B]
		E21L	Groot	B	B	-
Doring Rangelands	I	E22A	Doring	B	B	-
		E22B	Doring	B	B	-
		E22C	Tankwa	A/B	A/B	-
		E22D	Tankwa	A/B	A/B	-
		E22E	Doring	B	B	-
		E22F	Doring	B	B	-
		E22G	Doring	B	B	0.3% [100% in A]}
		E23A	Tankwa	A/B	A/B	0.1% [100% in A/B]
		E23B	Tankwa	A/B	A/B	0.1% [100% in A/B]
		E23C	Tankwa	A/B	A/B	0.001% [100% in A/B]
		E23D	Tankwa	A/B	A/B	0.7% [100% in A/B]
		E23E	Tankwa	A/B	A/B	-
		E23F	Tankwa	B	A/B	0.001% [100% in A/B]
		E23G	Ongeluks	A/B	A/B	-
		E23H	Ongeluks	A/B	A/B	-
		E23J	Ongeluks	A/B	A/B	-
		E23K	Tankwa	B	A/B	-
		E24A	Tra-tra	B	B	0.1% [100% in A/B]

IUA	Class for IUA	Quaternary catchment	River Name	Mainstem / Cumulative Ecological Category	Average Tributary / Incremental Ecological Category	Wetland area (% of quaternary) and [Ecological Category]
Doring Rangelands	I	E24B	Tra-tra	B	B	0.001% [95% in A/B]
		E24C	Bos	C	A/B	0.8% [100% in A/B]
		E24D	Bos	C	A/B	0.1% [100% in A/B]
		E24E	Wolf	A/B	A/B	-
		E24F	Wolf	A/B	A/B	0.001% [79% in A/B]
		E24G	Wolf	A/B	A/B	0.001% [100% in A/B]
		E24H	Doring	B	B	-
		E40A	Oorlogskloof	C	C	-
		E40B	Oorlogskloof	C	C	0.001% [100% in A/B]
Knersvlakte	I	E31A	Kromme	B	B	0.3% [100% in A/B]
		E31B	Kromme	B	B	0.1% [99% in A/B]
		E31C	Kromme	B	B	0.001% [100% in A/B]
		E31D	Kromme	B	B	-
		E31E	Kromme	B	B	-
		E31F	Kromme	B	B	-
		E31G	Kromme	B	B	-
		E31H	Hantams	B	B	-
		E32A	Hantams	B	B	0.1% [95% in A/B]
		E32B	Hantams	B	B	0.001% [100% in A/B]
		E32C	Hantams	B	B	0.1% [24% in A/B]
		E32D	Hantams	B	B	-
		E32E	Hantams	B	B	2.2% [48% in A/B]
		E33A	Sout	C	B	0.001% [100% in A/B]
		E33B	Sout	C	B	0.2% [100% in AB]
		E33C	Sout	C	C	1.1% [92% in A/B]
		E33D	Sout	C	C	-
		E33E	Sout	C	C	1% [99% in A/B]
		F60A	Brak	B	B	0.001% [1% in A/B]
		F60B	Klein-Goerap	B	B	-
		F60C	Sout	B	B	0.001% [1% in A/B]
		F60D	Groot-Goerap	B	B	0.001% [19% in A/B]
		F60E	Groot-Goerap	B	B	0.001% [3.5% in A/B]
Sandveld	III	G30A	Papkuils	C	C	4.1% [35% in A/B]
		G30B	Kruismans	C	C	0.9% [10% in A/B]
		G30C	Bergvallei	C	C	1.5% [7% in A/B]
		G30D	Verlorevlei	C	C	0.8% [3% in A/B]
		G30E	Verlorevlei	B	C	7.9% [3% in A/B]
		G30E-Est	Verlorevlei	C		-
		G30F	Langvlei	C	C	1.5% [5% in A/B]
		G30G	Jakkalsvlei	C	C	0.9% [11% in A/B]
		G30H	Sandlaagte	C	C	1.4% [25% in A/B]

The Olifants Estuary (E33H) and Verlorenvlei Estuary (G30E) should both be maintained in a minimum C Ecological Category

IUA	Quaternary	Node	River	Location for monitoring	Hydrology					
					Month with lowest flow	Mean of month with lowest flow (m3/s)	Instantaneous drought absolute minimum (m3/s)[1]	%nMAR	Floods in addition to Desktop Model	Implications of flood RQOs
	E21L		Groot	E2H002	February	0.017	0.001	48.1	>80% of natural floods for July, August and September	No in-channel dams
	E21J	R38	Groot	EWR Site 6	February	0.010	0.001	48.1	>80% of natural floods for July, August and September	No in-channel dams
		-		Brandkraals	February	-	0.001	48.1	>80% of natural floods for July, August and September	No in-channel dams
	Tributary of Leeu in E21H	A1	Twee	Twee	February	0.125	0.001	60.4	>80% of natural floods for July, August and September	No in-channel dams
	E21G	R 41	Leeu	E2H007	February	0.010	0.001	13.2	>60% of natural floods for July, August and September	Limited in-channel dams
Doring Rangelands	E23K	R27	Tankwa	Tankwa	The Tankwa River is ephemeral. Thus minimum lowflows do not apply.			26.4	>80% of natural floods for July, August and September (incremental)	No in-channel dams
Knersvlakte	E33C	R8	Vars	None	The Vars, Geelbek and Hol Rivers are ephemeral. Thus minimum lowflows do not apply.			17.0	-	None
	E33D		Geelbek					17.1	-	None
	E33E		Hol					17.4	-	None
	E32E	R 3	Doring(b)[3]	None	The Doring(b) River is ephemeral. Thus minimum lowflows do not apply.			26.2	-	None
Sandveld	G30D	R 53	Verlorevlei	G3H001	March	0.019	0.001	20.7	>60% of natural floods for July, August and September	Limited in-channel dams
	G30F	R56	Langvlei	River Node R56: 32°12'40.05"S, 18°23'8.25"E / Upstream of the Wadrif Pan and Wetland	March	0.010	0.001	19.3	-	None
	G30G	R 57	Jakkals	River	March	0.005	0.001	19.2	-	None

[3] Different river from the main Doring River.

Table 3 Hydrological resource quality objectives for ESTUARIES, VLEIS AND WETLANDS in priority RUs in the Olifants-Doorn

IUA	Quaternary	NODE	Waterbody	Hydrology				
				Month with lowest flow	Mean of month with lowest flow (m3/s)	Instantaneous drought absolute minimum (m3/s)	Floods in addition to Desktop Model	%nMAR
Lower Olifants Irrigation	E33H	E	Olifants Estuary	April	1.23	0.01	Doring River floods unimpeded by large dams	57.6
Sandveld	G30E	R52	Verlorenvlei	March	0.29	0.04	>60% of natural floods for July, August and September	46.0
	G30F	R56*	Wadrift wetlands	March	-	-	>60% of natural floods for July, August and September	14.8
			Wadrift saltpan	March	-	-	>60% of natural floods for July, August and September	37.7
	G30G	R 57	Jakkals	March	0.03	0.006	>60% of natural floods for July, August and September	19.2
	G30H	Q5	Sandlaagte	March	0.02	-	>60% of natural floods for July, August and September	12.8

Table 4 Resource quality objectives for water quality for rivers in the Olifants-Doorn

IUA	Quaternary	River	Location for monitoring	Target Water Quality Range (TWQR[4])	Geomorphology	Riparian vegetation	Macro-invertebrates	Fish
Upper Olifants Irrigation	E10K	Olifants	E1R001/ EWR Site 2	Should comply with the TWQRs for aquatic ecosystems as determined by the Department and the Fitness for use -Class I for agricultural use	Abundance and diversity of habitats should be equal to or greater than those measured in 2005.	Dominated by indigenous species. No *Sesbania punicea* and only isolated individuals of *Acacia longifolia*, *A. mearnsii*, *A. melanoxylon*, *Eucalyptus camaldulensis*. No *Azolla filiculoides*, *Lemna gibba* or other aquatic weeds	The abundance and diversity shall be equal to or greater than those measured in 2005	The abundance and diversity of fish shall be equal to or greater than those measured in 2005.
	E10J	Olifants	E1H016	Should comply with the TWQRs for aquatic ecosystems (DWAF 1996) and the Fitness for use - Class I for agricultural use (DWAF 1996b).	-	-	-	-
	E10H	Jan Dissel	Above causeway	Should comply with the TWQRs for aquatic ecosystems (DWAF 1996a) and the Fitness for use - Class I for agricultural use (DWAF 1996b).	Riffle-run sequence, with aquatic vegetation and stones in current.	Dominated by indigenous species. No *Sesbania punicea* and only isolated individuals of *Acacia longifolia*, *A. mearnsii*, *A. melanoxylon*, *Eucalyptus camaldulensis*. No *Azolla filiculoides*, *Lemna gibba* or other aquatic weeds.	Dominated by sensitive mountain stream taxa.	*Labeobarbus capensis*, *Austroglanis gilli*, *Austroglanis barnardi*, *Barbus calidus*, *Pseudobarbus phlegethon*, *Galaxias zebratus* should be present. There should be no alien species present
			Causeway to E1H006				-	
			E1H006 to confluence		-		-	-

[4] TWQR = Target Water Quality Range (as per South African Water Quality Guidelines)

IUA	Quaternary	River	Location for monitoring	Target Water Quality Range (TWQR[4])	Geomorphology	Riparian vegetation	Macro-invertebrates	Fish
Upper Olifants Irrigation (cont.)	E10G	Rondegat	EWR Site 3	Should comply with the TWQRs for aquatic ecosystems (DWAF 1996a) and the Fitness for use - Class I for agricultural use (DWAF 1996b).	Riffle-run sequence, with aquatic vegetation and stones in current.	The indigenous riparian vegetation should be intact with no alien species	Dominated by sensitive mountain stream taxa.	*Labeobarbus capensis*, *Austroglanis gilli*, *Austroglanis barnardi*, *Barbus calidus*, *Pseudobarbus phlegethon*, *Galaxias zebratus* should be present. There should be no alien species present.
	E10E/ E10F	Olifants	E1H013/ EWR Site 1	Should comply with the TWQRs for aquatic ecosystems (DWAF 1996a) and the Fitness for use - Class I for agricultural use (DWAF 1996b).	Riffle-run sequence, with aquatic vegetation and stones in current.	Dominated by indigenous species. No *Sesbania punicea* and only isolated individuals of *Acacia longifolia*, *A. mearnsii*, *A. melanoxylon*, *Eucalyptus camaldulensis*.	Community should be representative of a slightly impacted Western Cape foothill river.	*Labeobarbus capensis* should be present.
	E10C	Olifants	-	Should comply with the TWQRs for aquatic ecosystems (DWAF 1996a) and the Fitness for use - Class I for agricultural use (DWAF 1996b).	-	-	-	*Labeobarbus capensis* should be present.
	E10D	Olifants	E1H013	Should comply with the TWQRs for aquatic ecosystems (DWAF 1996a) and the Fitness for use - Class I for agricultural use (DWAF 1996b).	-	-	-	*Labeobarbus capensis* should be present.
Olifants/ Doring Dryland	E24M	Doring	E2H003	Should comply with the TWQRs for aquatic ecosystems (DWAF 1996a)	Riffle/run-pool sequence, with deep pools.	Dominated by indigenous species. The presence of *Nerium oleander* should be strictly controlled.	Community should be dominated by Ephemeroptera, Trichoptera.	*Labeobarbus capensis*, *Barbus serra* and *Labeo seeberi* should be present.

IUA	Quaternary	River	Location for monitoring	Target Water Quality Range (TWQR[4])	Geomorphology	Riparian vegetation	Macro-invertebrates	Fish
Olifants/ Doring Dryland (cont.)	E40D	Koebee	Koebee	-	-	-	-	*Labeobarbus capensis*, *Barbus serra*, *Barbus anoplus* and *Labeo seeberi* should be present.
	E40C	Oorlogskloof	Upstream of Oorlogskloof Nature Reserve (ONR)	-	-	-	-	-
			In ONR (Brakwater: - 31° 27' 52.3368", 19° 4' 51.3192")	Should comply with the TWQRs for aquatic ecosystems (DWAF 1996a) and the Fitness for use - Class I for agricultural use (DWAF 1996b).	-	-	-	*Labeobarbus capensis*, *Barbus serra*, *Barbus anoplus* and *Labeo seeberi* should be present.
	E33F	Troe-Troe	E3H001	-	-	-	-	None (insufficient data)
Koue Bokkeveld	E21K	Matjies	Matjies	Should comply with the TWQRs for aquatic ecosystems (DWAF 1996a) and the Fitness for use - Class I for agricultural use (DWAF 1996b).	-	-	-	At least one of *Labeobarbus capensis*, *Barbus calidus*, *Pseudobarbus phlegethon*, *Barbus serra*, *Labeo seeberi* should be present.
	E21L	Groot	E2H002	Should comply with the TWQRs for aquatic ecosystems (DWAF 1996a) and the Fitness for use - Class I for agricultural use (DWAF 1996b).	A riffle/run-pool sequence should be present at all flows.	Riparian vegetation should be intact and dominated by indigenous species. The presence of *Nerium oleander* should be strictly controlled. There should be no other alien species present.	Community should be dominated by Ephemeroptera, Trichoptera	*Labeobarbus capensis*, *Barbus serra* and *Labeo seeberi* should be present.
	Tributary of Leeu in E21H	Twee	Twee	Should comply with the TWQRs for aquatic ecosystems (DWAF 1996a) and the Fitness for use - Class I for agricultural use (DWAF 1996b).	-	-	-	*Labeobarbus capensis*, *Barbus serra* and *Labeo seeberi* should be present.

IUA	Quaternary	River	Location for monitoring	Target Water Quality Range (TWQR[4])	Geomorphology	Riparian vegetation	Macro-invertebrates	Fish
Koue Bokkeveld (cont.)	E21J	Groot	EWR Site 6	Oligotrophic and should comply with the TWQRs for aquatic ecosystems (DWAF 1996a) and the Fitness for use -Class I for agricultural use (DWAF 1996b).	A riffle/run-pool sequence should be present at all flows.	Riparian vegetation should be intact and dominated by indigenous species. The presence of *Nerium oleander* should be strictly controlled. There should be no other alien species present.	Community should be dominated by Ephemeroptera, Trichoptera	*Labeobarbus capensis*, *Barbus serra* and *Labeo seeberi* should be present.
			Brandkraals	Oligotrophic and should comply with the TWQRs for aquatic ecosystems (DWAF 1996a) and the Fitness for use -Class I for agricultural use (DWAF 1996b).	-	-	-	At least one of *Labeobarbus capensis*, *Barbus calidus*, *Pseudobarbus phlegethon*, *Barbus serra*, *Labeo seeberi* should be present.
	E21G	Leeu	E2H007	Should comply with the TWQRs for aquatic ecosystems (DWAF 1996a) and the Fitness for use - Class I for agricultural use (DWAF 1996b).	-	-	-	*Labeobarbus capensis* and *Galaxias zebratus* should be present.
Sandveld	G30D	Verlorevlei	G3H001	Should comply with the TWQRs for aquatic ecosystems (DWAF 1996a)	-	-	-	Indigenous species should dominate and *Pseudobarbus burgi* (Verlorenvlei), *Galaxias zebratus* and *Sandelia capensis* should be present.
	G30F	Langvlei	River Node R56: 32°12'40.05"S, 18°23'8.25"E / Upstream of the Wadrif Pan and Wetland	Should comply with the TWQRs for aquatic ecosystems (DWAF 1996a)	-	-	-	Indigenous species should dominate and *Pseudobarbus burgi* (Verlorenvlei), *Galaxias zebratus* and *Sandelia capensis* should be present.
	G30G	Jakkals	River	Should comply with the TWQRs for aquatic ecosystems (DWAF 1996a)	-	-	-	-

Table 5 Resource quality objectives for Water Quality in ESTUARIES, VLEIS AND WETLANDS in the Olifants-Doorn

IUA	Quaternary	Waterbody	General conditions and land based activities that must be prohibited	WQ	Vegetation	Invertebrates	Fish	Amphibians	Birds
Lower Olifants Irrigation	E33H	Olifants Estuary	No major water resource developments in the Doring River (provision of the Reserve alone in the Doring River will be insufficient to maintain the ecological integrity of the Doring River in a B-category and estuary in a C-category).	Shall not deteriorate from that measured in 2004.	The diversity and extent of indigenous macrophytes shall equal that measured in summer 2004. The extent of invasive waterweeds and nuisance filamentous algae shall be less relative to summer 2004. Microalgae should be dominated by flagellates. Phytoplankton and blue-green algal growth should be limited.	The polychaete worm species *Capitella capitata* should not dominate the invertebrate fauna.	The fish fauna should be dominated by estuarine and partially estuarine dependent species, and should include a significant number of 0-1 year old fish, with no age classes missing.	-	The abundance and diversity of birds shall be equal to or greater than those measured summer 2004.
Olifants-Doring dryland farming & Knersvlakte	E40C & E32E	Nieuwoudtville wetlands (Oorlogskloof, Grasberg, Soetfontein and other rivers)	No expansion of agriculture or other landuses in the remaining intact wetland areas (around 3000 ha taken together).	-	No further encroachment of woody alien vegetation into wetland areas and no change in WET-Health scores	-	-	-	-
Sandveld	G30E	Verlorenvlei / Verlorenvlei estuary	Mouth should open for an extended period from winter through into spring.	Shall not deteriorate from that measured prior to 2010.	Macrophytes, micro- and macro-algae community structure should not deteriorate from that measured in 2009.	-	The population should be dominated by indigenous species.	The Cape dainty frog (*Cacosternum capense*) should continue to occur.	The abundance and diversity of birds shall be equal to or greater than those measured prior to 2010.
	G30F	Wadrift wetlands	There should be no expansion of agriculture or other landuses in remaining intact wetland areas.	-	The wetlands should remain intact and the extent of invasion by woody alien plants should not increase.	-	*Galaxias zebratus* and *Sandelia capensis* should be present.	-	The abundance and diversity shall be equal to or greater than those measured prior to 2010.

IUA	Quaternary	Waterbody	General conditions and land based activities that must be prohibited	WQ	Vegetation	Invertebrates	Fish	Amphibians	Birds
		Wadrift saltpan	-	-	-	-	-	-	-
	G30G	Jakkals	There should be no expansion of agriculture or other landuses in remaining intact wetland areas.	-	-	-	-	-	-
	G30H	Sandlaagte	There should be no expansion of agriculture or other landuses in remaining intact wetland areas (around 678 ha taken together).	-	-	-	-	-	-

Table 6 Resource quality objectives for GROUNDWATER in the Olifants-Doorn

IUA	RU	Quaternary	Aquifer	PS	Hydrology			Water Quality		
					Discharge	Water level	Available yield	Nutrients	Salts	Pathogens
Upper Olifants Irrigation	40	E10D	Alluvium	A	No groundwater abstraction around wetland and river Freshwater Ecosystem Priority Areas (FEPAs) in accordance with the implementation manual for FEPAs. Compliance to the lowflow requirements in the river as per Reserve requirement	Not applicable	All users comply with the allocation schedule and individual licence conditions within the confirmed available yield	Shall not deteriorate from natural background. Fitness for use for domestic use in accordance with SANS 241:2011, after treatment		
			TMG	A	Not sufficient data	Not applicable	All users comply with the allocation schedule and individual licence conditions within the confirmed available yield	Shall not deteriorate from natural background.		
	33	E10E & E10F	Alluvium	B	No groundwater abstraction around wetland and river FEPAs in accordance with the implementation manual for FEPAs. Compliance to the lowflow requirements in the river as per Reserve requirement	Not applicable	All users comply with the allocation schedule and individual licence conditions within the confirmed available yield	Shall not deteriorate from natural background. Fitness for use for domestic use in accordance with SANS 241:2011, after treatment		
			TMG	B	Not sufficient data	Not applicable	All users comply with the allocation schedule and individual licence conditions within the confirmed available yield	Shall not deteriorate from natural background.		
Koue Bokkeveld	41	E21G	Bokkeveld	C	No groundwater abstraction around wetland and river FEPAs in accordance with the implementation manual for FEPAs. Compliance to the lowflow requirements in the river as per Reserve requirement	Not applicable	All users comply with the allocation schedule and individual licence conditions within the confirmed available yield	Shall not deteriorate from natural background. Fitness for use for domestic use in accordance with SANS 241:2011, after treatment		
			TMG	B	Not sufficient data	Not applicable	All users comply with the allocation schedule and individual licence conditions within the confirmed available yield	Shall not deteriorate from natural background.		

IUA	RU	Quaternary	Aquifer	PS	Hydrology			Water Quality		
					Discharge	Water level	Available yield	Nutrients	Salts	Pathogens
Olifants-Doring dryland farming	Q1	E33F	Gifberg	E	Not applicable	Not applicable	All users comply with the allocation schedule and individual licence conditions within the confirmed available yield	Shall not deteriorate from natural background.		
Sandveld	53	G30D	Sandveld	D	Compliance to the lowflow requirements in the river as per Reserve requirement	Not applicable	All users comply with the allocation schedule and individual licence conditions within the confirmed available yield	Shall not deteriorate from natural background. Fitness for use for domestic use in accordance with SANS 241:2011, after treatment		
	52	G30E	Sandveld	F	Compliance to the lowflow requirements in the river as per Reserve requirement	Minimum water level in abstraction boreholes within 10km from the ocean to avoid saline intrusion	All users comply with the allocation schedule and individual licence conditions within the confirmed available yield	Shall not deteriorate from natural background. Fitness for use for domestic use in accordance with SANS 241:2011, after treatment		
	56	G30F	Sandveld	F	No groundwater abstraction around wetland and river FEPAs in accordance with the implementation manual for FEPAs. Compliance to the lowflow requirements in the river as per Reserve requirement	Minimum water level in abstraction boreholes within 10km from the ocean to avoid saline intrusion	All users comply with the allocation schedule and individual licence conditions within the confirmed available yield	Shall not deteriorate from natural background. Fitness for use for domestic use in accordance with SANS 241:2011, after treatment		
	57	G30G	Sandveld	D	No groundwater abstraction around wetland and river FEPAs in accordance with the implementation manual for FEPAs. Compliance to the lowflow requirements in the river as per Reserve requirement	Minimum water level in abstraction boreholes within 10km from the ocean to avoid saline intrusion	All users comply with the allocation schedule and individual licence conditions within the confirmed available yield	Shall not deteriorate from natural background. Fitness for use for domestic use in accordance with SANS 241:2011, after treatment		

DEPARTMENT OF WATER AND SANITATION

NO. 610 **17 JULY 2015**

DEPARTMENT OF WATER AND SANITATION

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

PROPOSED CLASSES AND RESOURCE QUALITY OBJECTIVES OF WATER RESOURCES FOR CATCHMENTS OF THE UPPER VAAL

I, Nomvula Paula Mokonyane, in my capacity as Minister of Water and Sanitation, and duly authorised in terms of section 13(4) of the National Water Act (Act No. 36 of 1998) hereby publishes for public comment the proposed classes of water resources and resource quality objectives for catchments of the Upper Vaal, in the Schedule, to be issued under section 13(4) of the National Water Act (No. 36 of 1998).

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

Director: Water Resource Classification
Attention: Ms Shane Naidoo
Department of Water and Sanitation
Zwamadaka Building 185 Francis Baard Street
Private Bag X313
Pretoria
0001

E-mail: naidooshane@dwa.gov.za Facsimile: 012 336 6712

MRS NP MOKONYANE
MINISTER OF WATER AND SANITATION
DATE: 01. 07 -15

SCHEDULE

PROPOSED CLASSES AND RESOURCE QUALITY OBJECTIVES OF WATER RESOURCES FOR CATCHMENTS OF THE UPPER VAAL IN TERMS OF SECTION 13(1)(A) AND (B) OF THE NATIONAL WATER ACT (ACT NO.36 OF 1998)

1. DESCRIPTION OF WATER RESOURCE

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

Water Management Area:	Vaal
Drainage Region:	C Primary Drainage Region
River(s):	Vaal and Wilge River Systems

2. The Minister has, in terms of section 12 of the National Water Act (Act No 36 of 1998), prescribed a system for classifying water resources by promulgating Regulation 810, Government Gazette 33541 dated 17 September 2010. In terms of section 13(1) of the Act the Minister must, as soon as reasonably practicable after the Minister has prescribed a system for classifying water resources and subject to subsection (4), by notice in the *Gazette*, determine for all or part of every significant water resource, a class in accordance with the prescribed classification system.

3. The Minister, in terms of section 13(1)(a) of the Act, proposes to determine the following classes of each significant water resource for catchments of the Upper Vaal.

4. The Minister, in terms of section 13(1)(b) of the Act, proposes to determine the following resource quality objectives for each significant water resource for catchment of the Upper Vaal.

2. DETERMINATION OF THE CLASS OF WATER RESOURCES AND RESOURCE QUALITY OBJECTIVES IN TERMS OF SECTION 13(1)(A) AND (B) OF THE NATIONAL WATER ACT (ACT NO.36 OF 1998)

1. A summary of the water resource classes for Integrated Units of Analysis (Figure 1) and ecological categories for the Upper Vaal is set out in Table 1.

2. Integrated Units of Analysis (IUA) are classified in terms of their extent of permissible utilization and protection as either Class I: indicating high environmental protection and minimal utilization; or Class II indicating moderate protection and moderate utilization; and Class III indicating sustainable minimal protection and high utilization.

3. Resource Quality Objectives (RQO) are defined for each prioritised resource unit (RU) or hydrological node (Figure 2 and Table 2) for every IUA in terms of water quantity, quality, habitat and biota as shown in Tables 3 – 9 respectively.

4. Where specified, the ecological category or Recommended Ecological Category (REC) means the assigned ecological condition by the Minister to a water resource that reflects the ecological condition of that water resource in terms of the deviation of its biophysical components from a predevelopment condition.

5. RQO are applicable from 1 April 2016.

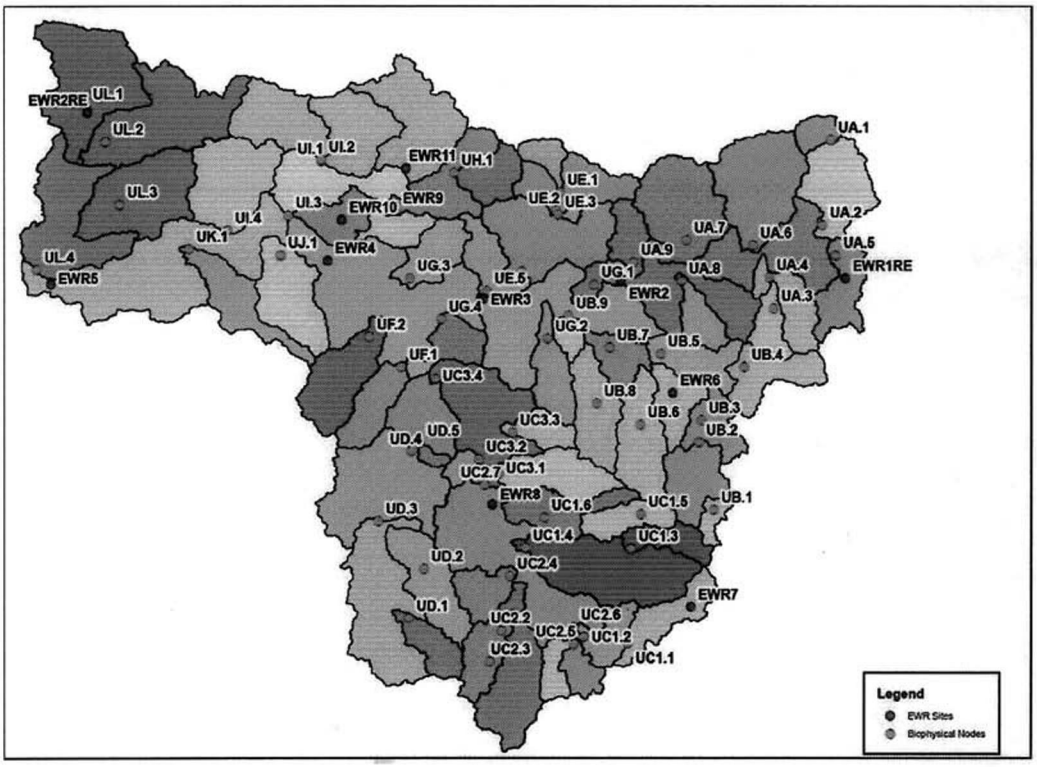

Figure 2: Resource Units (Hydro Nodes) in the Upper Vaal

Table 1: Water Resource Classes per Integrated Unit of Analysis and Ecological Categories per Biophysical Node

Integrated Unit of Analysis (IUA)	Water Resource Class for IUA	Biophysical Node Name	Quaternary Catchment	Major River Name	Tributary Name	Gross Catchment Area (km²)	Natural MAR (million m³/a)	Present Ecological State	Recommended Ecological Category
Vaal River upstream of Grootdraai Dam (UA)	II	UA.1	C11A	Vaal		197	13.27	B/C	B
		UA.2	C11B	Vaal		1073	69.33	C	C
		UA.3	C11E	Rietspruit	Skulpspruit	215	12.03	C	C
		UA.4	C11E	Vaal	Rietspruit	746	41.73	C	C
		UA.5	C11D	Vaal	Klein Vaal	533	41.66	C/D	C/D
		UA.6	C11G	Vaal	Drinkwaterspruit	1331	66.07	C/D	C/D
		UA.7	C11H	Vaal	Blesbokspruit	1084	70.66	C/D	C/D
		UA.8	C11K	Vaal	Kaalspruit	355	18.62	B/C	B/C
		UA.9	C11K	Vaal	Leeuspruit	340	18.07	C	C
		EWR1RE	C11C	Vaal	Klein Vaal	318	26.09	C	C
		EWR1	C11J	Vaal		4984	288.8	B/C	B/C
Klip River (Free State) (UB)	II	UB.1	C13C	Vaal	Klip	88	5.67	B	B
		UB.2	C13C	Vaal	Klip	837	54	B/C	B
		UB.3	C13D	Vaal	Klip (Grootdraai)	1090	68.04	B/C	B
		UB.4	C13A	Klip	Sandspruit	595	51.37	C	C
		UB.5	C13B	Klip	Sandspruit	1139	78.84	C	C
		UB.6	C13E	Klip	Komandospruit	603	33.6	B/C	B
		UB.7	C13F	Vaal	Klip (Grootdraai)	4129	248.05	C/D	C/D
		UB.8	C13G	Klip	Spruitsonderdrif	435	20.8	C	C
		UB.9	C13H	Vaal	Klip	589	19.22	C/D	C/D
		EWR6	C13D	Vaal	Klip	1583	95.31	B/C	B/C
Upper Wilge River (UC1)	II	UC1.1	C81B	Vaal	Wilge	591	69.03	B	B
		UC1.2	C81B	Vaal	Wilge	932	81.11	C	C
		UC1.3	C81L	Wilge	Meul	364	26.49	B	B
		UC1.4	C81M	Wilge	Meul	1831	104.03	C	C
		UC1.5	C82A	Wilge	Cornelius	156	7.82	C	C
		UC1.6	C82B	Wilge	Cornelis	812	39.63	C	C
		EWR7	C81A	Vaal	Wilge	170	23.47	A/B	A/B
Wilge River and tributaries (UC2)	II	UC2.1	C81F	Vaal	Elands	1405	114.76	C/D	C/D
		UC2.2	C81G	Elands	Klerkspruit	435	22.13	C	C
		UC2.3	C81G			115	5.85	B	B
		UC2.4	C81J	Wilge	Vaalbanksspruit	392	12	C	C
		UC2.5	C81C	Nuwejaarspruit	Fraser/Modder	250	18.41	B/C	B/C
		UC2.6	C81E	Wilge	Nuwejaarspruit	527	39.87	C	C
		UC2.7	C82D	Wilge	Rus-se-spruit	572	19.6	C	C
		EWR8	C82C	Vaal	Wilge	7503	474.25	C	C

Integrated Unit of Analysis (IUA)	Water Resource Class for IUA	Biophysical Node Name	Quaternary Catchment	Major River Name	Tributary Name	Gross Catchment Area (km²)	Natural MAR (million m³/a)	Present Ecological State	Recommended Ecological Category
Lower Wilge River (UC3)	II	UC3.1	C82G	Wilge	Holspruit	729	32.9	C	C
		UC3.2	C82G	Wilge	Wilge Trib	152	6.34	B/C	B/C
		UC3.3	C82F	Wilge	Grootspruit	296	11.08	C	C
		UC3.4	C82H	Vaal	Wilge	10633	591.39	C/D	C/D
Liebenbergsvlei River (UD)	III	UD.1	C83A	Liebenbergsvlei		375	14.36	C	C
		UD.2	C83D	Liebenbergsvlei	Tierkloof	465	12.42	C	C
		UD.3	C83E	Liebenbergsvlei	Tierkloof	891	23.31	C	C
		UD.4	C83G	Liebenbergsvlei	Unnamed tributary	139	4.74	B/C	B
		UD.5	C83H	Liebenbergsvlei	Unnamed tributary	76	2.66	B/C	B
Waterval River (UE)	III	UE.1	C12D	Vaal	Waterval	695	59.33	C	C
		UE.2	C12F	Vaal	Waterval	970	80.37	D	D
		UE.3	C12F	Waterval	Unnamed tributary	41	2.12	C	C
		UE.4	C12F	Vaal	Waterval	2278	149.84	D	D
		UE.5	C12G	Vaal	Waterval	2787	177.67	D	D
Kromspruit and Skulpspruit (UF)	II	UF.1	C83K	Wilge	Kromspruit	546	25.7	C	C
		UF.2	C83L	Vaal	Klip (flows into Vaal Dam from FS)	765	35.59	C	C
Vaal River from Grootdraai Dam to Vaal Dam (UG)	II	UG.1	C11M	Vaal	Brakspruit	75	3.36	C	C
		UG.2	C12A	Vaal	Venterspruit	485	21	C	C
		UG.3	C12K	Vaal	Molspruit	479	22	C	C
		UG.4	C12J	Vaal	Bankplaasspruit	344	12.43	C	C
		EWR2	C11M	Vaal		7995	457.68	C	C
		EWR3	C12H	Vaal		15638	852.13	C	C
Suikerbosrand River (UH)	II	UH.1	C21A	Vaal	Suikerbosrand	707	28.65	B/C	B
		EWR9	C21C	Vaal	Suikerbosrand	1175	31.31	C	B/C
Klip River (Gauteng) (UI)	III	UI.1	C22C	Klip River	Rietspruit	857	36.6	E	D
		UI.2	C22D	Vaal	Klip River	893	39.21	E	D
		UI.3	C22E	Vaal	Klip River	2309	96.98	E	D
		UI.4	C22J	Vaal	Rietspruit	926	22.1	D/E	D
		EWR10	C21G	Vaal	Suikerbosrand	3271	86.97	C/D	C/D
		EWR11	C21F	Suikerbosrand	Blesbokspruit	1098	29.14	D	D
Taaibosspruit (UJ)	III	UJ.1	C22G	Vaal	Taaibosspruit	831	18.4	D	D
Kromelmboog-spruit (UK)	III	UK.1	C23B	Vaal	Kromelmboogspruit	724	14.3	C	C

Integrated Unit of Analysis (IUA)	Water Resource Class for IUA	Biophysical Node Name	Quaternary Catchment	Major River Name	Tributary Name	Gross Catchment Area (km²)	Natural MAR (million m³/a)	Present Ecological State	Recommended Ecological Category
Mooi River (UL)	III	UL.1	C23F	Vaal	Mooi River	1324	37.69	C/D	C/D
		UL.2	C23E	Mooi	Mooirivierloop	1360	25.96	E	D
		UL.3	C23K	Mooi	Loopspruit	890	20.26	E	D
		UL.4	C23L	Vaal	Mooi	5535	132.21	D	D
		EWR2RE	C23G	Vaal	Mooi	1324	37.69	D	D
Vaal River reach from Vaal Dam to C23L (UM)	III	EWR4	C22F	Vaal		38638	1977.26	C	B/C
		EWR5	C23L	Vaal		49739	2288.01	C/D	C

Table 2: Prioritised Resource Units (RU) delineated for the Upper Vaal

IUA Name	RU	Hydro Node	River Name
UA. Vaal River upstream of Grootdraai Dam	1	UA.1	Vaal
	2	UA.2	Vaal
	3	EWR1RE	Vaal
	4	UA.3	Rietspruit
	5	UA.4	Vaal
	6	UA.5	Vaal
	7	UA.6	Vaal
	8	EWR1	Vaal
	9	UA.7	Vaal
	10	UA.8	Vaal
	11	UA.9	Vaal
UB. Klip River (Free State)	12	UB.1	Vaal
	13	UB.2	Vaal
	14	UB.3	Vaal
	15	EWR6	Vaal
	16	UB.4	Klip
	17	UB.5	Klip
	18	UB.6	Klip
	19	UB.7	Vaal
	20	UB.8	Klip
	21	UB.9	Vaal
UC1. Upper Wilge River	22	EWR7	Vaal
	23	UC1.1	Vaal
	24	UC1.2	Vaal
	25	UC1.3	Wilge
	26	UC1.4	Wilge
	27	UC1.5	Wilge
	28	UC1.6	Wilge
UC2. Wilge River and tributaries	29	UC2.1	Vaal
	30	UC2.2	Elands
	31	UC2.3	
	32	UC2.4	Wilge
	33	UC2.5	Nuwejaarspruit
	34	UC2.6	Wilge
	35	EWR8	Vaal
	36	UC2.7	Wilge
UC3. Lower Wilge River	37	UC3.1	Wilge
	38	UC3.2	Wilge
	39	UC3.3	Wilge
	40	UC3.4	Vaal
UD. Liebenbergsvlei River	41	UD.1	Liebenbergsvlei
	42	UD.2	Liebenbergsvlei
	43	UD.3	Liebenbergsvlei
	44	UD.4	Liebenbergsvlei
	45	UD.5	Liebenbergsvlei
UE. Waterval River	46	UE.1	Vaal
	47	UE.2	Vaal
	48	UE.3	Waterval
	49	UE.4	Vaal
	50	UE.5	Vaal
UF. Kromspruit and Skulpspruit	51	UF.1	Wilge
	52	UF.2	Vaal
UG. Vaal River from Grootdraai Dam to Vaal Dam	53	EWR2	Vaal
	54	UG.1	Vaal
	55	UG.2	Vaal
	56	EWR3	Vaal
	57	UG.3	Vaal
	58	UG.4	Vaal

IUA Name	RU	Hydro Node	River Name
IUA Name	RU	Hydro Node	River Name
UH. Suikerbosrand River	59	UH.1	Vaal
	60	EWR9	Suikerbosrand
	61	EWR10	Blesbokspruit
	62	EWR11	Blesbokspruit
UI. Klip River (Gauteng)	63	UI.1	NatalSpruit
	64	UI.2	Klip
	65	UI.3	Klip
	66	UI.4	Riet
UJ. Taaibosspruit	67	UJ.1	Vaal
UK. Kromelmboogspruit	68	UK.1	Vaal
UL. Mooi River	69	UL.1	Vaal
	70	EWR2RE	Vaal
	71	UL.2	Mooi
	72	UL.3	Mooi
	73	UL.4	Vaal
	74	EWR4	Vaal
UM. Vaal River reach from Vaal Dam to C23L	75	EWR5	Vaal

Table 3: Resource Quality Objectives for RIVER WATER QUANTITY in priority RUs in the Upper Vaal

IUA	Class	River	RU	Node	REC	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits		
										Maintenance low flows (m3/s) (Percentile)		Drought flows (m3/s) (Percentile)
										Oct	2.9 (50)	0.2 (99)
										Nov	3.7 (70)	0.22 (99)
										Dec	4 (50)	0.25 (99)
UA	II	Vaal	RU8	EWR1	B/C (B)	Quantity	Low Flows	Low flows need to be maintained in a healthy condition for the ecosystem and for users.	EWR maintenance low and drought flows: Vaal EWR1 in C11J VMAR = 332.3x10^{6}m3 REC=B/C category (equivalent to EcoClassification score 70-80)*	Jan	4.3 (50)	0.26 (99)
										Feb	5.2 (50)	0.265 (99)
										Mar	3.7 (30)	0.04 (99)
										Apr	3 (40)	0.08 (99)
										May	2.6 (50)	0.03 (90)
										Jun	2.5 (50)	0.15 (99)
										Jul	2.4 (50)	0.15 (99)
										Aug	2.4 (50)	0.15 (99)
										Sep	2.6 (50)	0.16 (99)
										Maintenance low flows (m3/s) (Percentile)		Drought flows (m3/s) (Percentile)
										Oct	0.310 (40)	0.000
										Nov	0.358 (40)	0.000
										Dec	0.366 (40)	0.000
										Jan	0.401 (40)	0.000
UB	II	Vaal	RU21	UB.9	C/D	Quantity	Low Flows	Low flows: Low flows at this site need to improve to maintain the FEPA status of this important ecosystem. Low flows to be improved to a C category.	EWR maintenance low and drought flows: EWR for C category, Klip in B13H, VMAR = 39.776x106m3	Feb	0.594 (40)	0.000
										Mar	0.341 (40)	0.000
										Apr	0.199 (50)	0.000
										May	0.102 (50)	0.000
										Jun	0.054 (50)	0.000
										Jul	0.077 (40)	0.000
										Aug	0.071 (50)	0.015 (99)
										Sep	0.092 (50)	0.000
										Maintenance low flows (m3/s) (Percentile)		Drought flows (m3/s) (Percentile)
										Oct	0.053 (99)	0.011 (99)
										Nov	0.083 (99)	0.236 (99)
UC2	II	Vaal	RU35	EWR8	C	Quantity	Low Flows	Low flows need to be maintained to support the ecosystem.	EWR maintenance low and drought flows: Wilge EWR8 in C82C, VMAR = 474.3x10^{6}m3, REC=C category*	Dec	0.97 (60)	0.274 (99)
										Jan	1.1(60)	0.316 (99)
										Feb	1.4 (60)	0.422 (99)
										Mar	1.25 (60)	0.355 (99)

IUA	Class	River	RU	Node	REC	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits		
										Apr	1 (60)	0.27 (99)
										May	0.65 (50)	0.06 (99)
										Jun	0.45 (50)	0.031 (99)
										Jul	0.4 (50)	0.011 (99)
										Aug	0.33 (50)	0.015 (99)
										Sep	0.4 (50)	0.118 (99)
UC3	II	Vaal	RU40	UC3.4	C/D	Quantity	Low Flows	Low flow: There is potential for the low flows in this RU to be negatively impacted by unnatural releases from Sterkfontein Dam. Low flows should be improved to a C/D category	1. EWR maintenance low and drought flows: EWR for C category, Wilge in C82H, VMAR = 591.36x106m3	Maintenance low flows (m3/s) (Percentile)		Drought flows (m3/s) (Percentile)
										Oct	1.358 (70)	0.011 (99)
										Nov	1.977 (99)	0.829 (99)
										Dec	2.246 (99)	0.992 (99)
										Jan	2.538 (99)	1.112 (99)
										Feb	3.297 (99)	1.431 (99)
										Mar	2.817 (99)	1.226 (99)
										Apr	2.226 (80)	0.621(99)
										May	1.606 (70)	0.060 (99)
										Jun	1.206 (70)	0.031 (99)
										Jul	1.042 (70)	0.007 (99)
										Aug	0.974 (70)	0.015 (99)
										Sep	1.102 (80)	0.321(99)
UG	II	Vaal	RU58	UG.4	C	Quantity	Low Flows	Low flows need to be improved to support the ecosystem and provide for irrigation and other users.	EWR maintenance low and drought flows: Vaal in C12H, PES = B/C category (equivalent to EcoClassification score 70-80)*	Maintenance low flows (m3/s) (Percentile)		Drought flows (m3/s) (Percentile)
										Oct	1.775 (60)	0.1 (99)
										Nov	3.591 (60)	0.3 (99)
										Dec	4.54 (60)	0.4 (99)
										Jan	5.229 (70)	0.5 (99)
										Feb	7.501 (70)	0.8 (99)
										Mar	5.002 (70)	0.5 (99)
										Apr	3.204 (60)	0.3 (99)
										May	1.559 (60)	0.1 (99)
										Jun	0.776 (60)	0.05 (00)
										Jul	0.687 (60)	0.00
										Aug	0.4 (60)	0.00
										Sep	0.554 (60)	0.00
UH	II	Vaal	RU60	EWR9	B/C	Quantity	Low Flows	Low flows need to be improved to support the ecosystem and provide for users.	EWR maintenance low and high flows and drought flows: Suikerbosrant EWR9 in C21C, VMAR=31.31x10^{6}m3, REC = C category*	Maintenance low flows (m3/s) (Percentile)	Drought flows (m3/s) (Percentile)	High flows (m3/s)
										Oct	0.12 (60)	0.05 (99)	1.5 for 3 days
										Nov	0.177 (60)	0.066 (99)	1.5 for 3 days
										Dec	0.147 (60)	0.06 (99)	1.5 for 3 days
										Jan	0.182 (60)	0.066 (99)	5 for 4 days

IUA	Class	River	RU	Node	REC	Component	Sub Component	RQO		Indicator/ measure	Numerical Limits		
											Feb	0.231 (60)	0.079 (99)	1.5 for 3 days
											Mar	0.18 (60)	0.066 (99)	1.5 for 3 days
											Apr	0.16 (60)	0.064 (99)	
											May	0.143 (60)	0.059 (99)	
											Jun	0.123 (60)	0.057 (99)	
											Jul	0.08 (70)	0.05 (99)	
											Aug	0.065 (70)	0.04 (99)	
											Sep	0.075 (70)	0.04 (99)	
UI	III	Suikerbosrand	RU62	EWR11	D	Quantity	Low Flows	Low flows should be capped to protect the ecosystem.	High flows need to be maintained to support the ecosystem especially fish	EWR maintenance and drought flows: Blesbokspruit EWR11 in C21F, VMAR=100.69x10^{6}m3, REC = D category*	Maintenance low flows (m3/s) (Percentile)		Drought flows (m3/s) (Percentile)
											Oct	0.034 99()	0.034
											Nov	0.3 (99)	0.3
											Dec	0.3 (99)	0.3
											Jan	0.34 (99)	0.34
											Feb	0.37 (99)	0.37
											Mar	0.34 (99)	0.34
											Apr	0.34 (99)	0.34
											May	0.32 (99)	0.32
											Jun	0.3 (99)	0.3
											Jul	0.3 (99)	0.3
											Aug	0.3 (99)	0.3
											Sep	0.3 (99)	0.3
UM	III	Vaal	RU75	EWR5	C	Quantity	High Flows	High flows in the river reach upstream of the confluence with the Mooi River need to be provided to support the ecosystem.		EWR high flows: Vaal EWR5 in C23L, MAR=2288.0x10^{6}m3, REC = C category*	Maintenance high flows (m3/s)		
											Nov	50 for 3 days	
											Dec	50 for 3 days	
											Jan	50 for 3 days	
											Feb	180-260 for 3-5 days	
											Mar	400-570 for 3-5 days	

Table 4: Resource Quality Objectives for RIVER WATER QUALITY in the Upper Vaal

IUA	Class	River	RU	Node	REC	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits	95th Percentile
UA	II	Vaal	RU8	EWR1	B/C (B)	Quality	Nutrients	The nutrient condition must be improved to provide for users and the ecosystem.	Phosphate(PO_4) *	≤ 0.020 mg/L P	0.121
									Nitrate (NO_3) & Nitrite (NO_2) *	≤ 0.85 mg/L N	0.858
			RU10	UA.8	B/C				Phosphate(PO_4) *	≤ 0.020 mg/L P	0.0085
									Nitrate (NO_3) & Nitrite (NO_2) *	≤ 0.85 mg/L N	0.099
UC3	II	Vaal	RU40	UC3.4	C/D	Quality	Nutrients	The nutrient condition must be maintained to provide for users and the ecosystem.	Phosphate(PO_4) *	≤ 0.075 mg/L P	0.08
									Nitrate (NO_3) & Nitrite (NO_2) *	≤ 2.50 mg/L N	1.008
UE	III	Vaal	RU47 RU50	UE.2 UE.5	D	Quality	Nutrients	The nutrient condition must be improved to an acceptable level for the ecosystem.	Phosphate(PO_4) *	≤ 0.125 mg/L P	0.08
									Nitrate (NO_3) & Nitrite (NO_2) *	≤ 4.00 mg/L N	1.008
UH	II	Vaal	RU60	EWR9	B/C	Quality	Nutrients	The nutrient condition must be improved to an acceptable level for the ecosystem.	Phosphate(PO_4)*	≤ 0.020 mg/L P	0.6
									Nitrate (NO_3) & Nitrite (NO_2) *	≤ 0.85 mg/L N	1.62
UL	III	Mooi	RU71	UL.2	D	Quality	Nutrients	The nutrients should be improved to an acceptable state.	Phosphate(PO_4) *	≤ 0.125 mg/L P	0.4
									Nitrate (NO_3) & Nitrite (NO_2) *	≤ 4.00 mg/L N	1.94
		Vaal	RU73	UL.4				The nutrients should be improved to an acceptable state	Phosphates (RWQO limits 0.4 mg/l) *	≤ 0.125 mg/L P	1.40
UM	III	Vaal	RU75	EWR5	C	Quality	Nutrients	The nutrients should be improved to an acceptable state	Phosphate(PO_4)*	≤ 0.025 mg/L P	0.2
									Nitrate (NO_3) & Nitrite (NO_2) *	≤ 1.00 mg/L N	0.25
									Total Ammonia*	≤ 73 µg/L N	1.5
UA	II	Vaal	RU8	EWR1	B/C (B)	Quality	Salts	Salt concentrations need to be maintained to meet quality requirements for agriculture and to maintain the ecosystem wellbeing..	Electrical conductivity*	≤ 70 mS/m	51.
			RU10	UA.8	B/C	Quality	Salts	Salts need to be improved to levels that do not threaten the ecosystem and to provide for users.	Electrical conductivity*	≤ 70 mS/m	29.4.
UE	III	Vaal	RU47	UE.2	D	Quality	Salts	Salts need to be improved to levels that do not threaten the ecosystem and to provide for users.	Electrical conductivity*	≤ 111 mS/m	79.1
UI	III	Suikerbosrant	RU62	EWR11	D	Quality	Salts	Salts need to be improved to levels that do not threaten the ecosystem and to provide for users.	Electrical conductivity*	≤ 111 mS/m	135
		Vaal	RU65	UI.3							90.6
			RU66	UI.4							98.1

IUA	Class	River	RU	Node	REC	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits	95th Percentile
UL	III	Mooi	RU71	UL.2	D	Quality	Salts	Salts need to be improved to levels that do not threaten the ecosystem and to provide for users.	Electrical conductivity*	≤ 111 mS/m	87
		Vaal	RU73	UL.4				Salts need to be improved to levels that do not threaten the ecosystem and to provide for users.	Electrical conductivity*	≤ 111 mS/m	90.5
									Sulphates *	≤ 500 mg/L	132
UM	III	Vaal	RU75	EWR5	C	Quality	Salts	Salts need to be improved to levels that do not threaten the ecosystem especially fish and to provide for users.	Electrical conductivity *	≤ 85 mS/m	84
									Sulphates *	≤ 200 mg/L	173
UA	II	Vaal	RU8	EWR1	B/C (B)	Quality	System Variables	Temperature and oxygen should be improved to support the ecosystem.	Temperature *	≤ abs(dev from ambient) abs(dev from ambient) 1 deg C	No data
									Dissolved oxygen *	≥ 7 mg/L O_2	No data
			RU10	UA.8	B/C				Temperature *	≤ abs(dev from ambient) abs(dev from ambient) 1 deg C	No data
									Dissolved oxygen *	≥ 7 mg/L O_2	No data
UE	III	Vaal	RU47	UE.2	D	Quality	System Variables	Oxygen levels must be improved to support the ecosystem.	Dissolved oxygen *	≥ 4 mg/L O_2	No data
UG	II	Vaal	RU58	UG.4	C	Quality	System Variables	Temperatures and oxygen concentrations must not threaten the viability of local aquatic species.	Temperature *	≤ abs(dev from ambient) abs(dev from ambient) 2 deg C	No data
									Dissolved oxygen *	≥ 6 mg/L O_2	No data
									Dissolved oxygen *	≥ 7 mg/L O_2	No data
UA	II	Vaal	RU8	EWR1	B/C (B)	Quality	Toxins	Toxics need to be maintained at levels which are non-toxic to the ecosystem.	Endosulfan *	≤ 0.103 µg/L	No data
			RU10	UA.8	B/C			Toxics need to be maintained at levels which are non-toxic to the ecosystem.	Atrazine *	≤ 64 µg/L	No data
									Endosulfan *	≤ 0.103 µg/L	No data
UB	II	Vaal	RU21	UB.9	C/D	Quality	Toxins	Ammonia toxicity must be limited for the sake of the ecosystem.	Total Ammonia *	≤ 86 µg/L N	2.9
UE	III	Vaal	RU47 RU50	UE.2 UE.5	D	Quality	Toxins	The river water should not be toxic to aquatic organisms or be a threat to human health.	F *	≤ 3.0 mg/L	0.39
									Al *	≤ 150 µg/L	No data
									As *	≤ 130 µg/L	No data
									Cd hard *	≤ 5.0 µg/L	No data
									Cr(VI) *	≤ 200 µg/L	No data
									Cu hard *	≤ 8.0 µg/L	No data
									Hg *	≤ 1.70 µg/L	No data
									Mn *	≤ 1300 µg/L	No data
									Pb hard *	≤ 13.00 µg/L	No data
									Se *	≤ 30 µg/L	No data

IUA	Class	River	RU	Node	REC	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits	95th Percentile
									Zn *	≤ 36 µg/L	No data
									Chlorine *	≤ 5.0 µg/L free Cl	No data
									Endosulfan *	≤ 0.200 µg/L	No data
									Atrazine *	≤ 100 µg/L	No data
UG	II	Vaal	RU58	UG.4	C	Quality	Toxins	The river water should not be toxic to aquatic organisms or be a threat to human health.	F *	≤ 2.5 mg/L	0.50
									Al *	≤ 105 µg/L	No data
									As *	≤ 95 µg/L	No data
									Cd hard *	≤ 3.0 µg/L	No data
									Cr(VI) *	≤ 121 µg/L	No data
									Cu hard *	≤ 6.0 µg/L	No data
									Hg *	≤ 0.97 µg/L	No data
									Mn *	≤ 990 µg/L	No data
									Pb hard *	≤ 9.50 µg/L	No data
									Se *	≤ 22 µg/L	No data
									Zn *	≤ 25 µg/L	No data
									Chlorine *	≤ 3.1 µg/L free Cl	No data
									Endosulfan *	≤ 0.130 µg/L	No data
									Atrazine *	≤ 79 µg/L	No data
UI	III	Sukerbosrant and Vaal	RU62 RU65 RU66	EWR11 UI.3 UI.4	D	Quality	Toxins	The river water should not be toxic to aquatic organisms or be a threat to human health.	F *	≤ 3.0 mg/L	0.465
									Al *	≤ 150 µg/L	No data
									As *	≤ 130 µg/L	No data
									Cd hard *	≤ 5.0 µg/L	No data
									Cr(VI) *	≤ 200 µg/L	No data
									Cu hard *	≤ 8.0 µg/L	No data
									Hg *	≤ 1.70 µg/L	No data
									Mn *	≤ 1300 µg/L	No data
									Pb hard *	≤ 13.00 µg/L	No data
									Se *	≤ 30 µg/L	No data
									Zn *	≤ 36 µg/L	No data
									Chorine *	≤ 5.0 µg/L free Cl	No data
									Endosulfan *	≤ 0.200 µg/L	No data
									Atrazine *	≤ 100 µg/L	No data
UL	III	Mooi	RU71	UL.2	D	Quality	Toxins	The river water should not be toxic to aquatic organisms or be a threat to human health. Uranium concentrations need to be at acceptable levels.	F *	≤ 3.0 mg/L	0.05
									Al *	≤ 150 µg/L	No data
									As *	≤ 130 µg/L	No data
									Cd hard *	≤ 5.0 µg/L	No data
									Cr(VI) *	≤ 200 µg/L	No data
									Cu hard *	≤ 8.0 µg/L	No data
									Hg *	≤ 1.70 µg/L	No data
									Mn *	≤ 1300 µg/L	No data
									Pb hard *	≤ 13.00 µg/L	No data
									Se *	≤ 30 µg/L	No data
									Zn *	≤ 36 µg/L	No data

IUA	Class	River	RU	Node	REC	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits	95th Percentile
									Chorine *	≤ 5.0 µg/L free Cl	No data
									Endosulfan *	≤ 0.200 µg/L	No data
									Atrazine *	≤ 100 µg/L	No data
									Uranium *	≤ 15 µg/L	No data
UE	III	Vaal	RU47 RU50	UE.2 UE.5	D	Quality	Pathogens	Pathogens should be maintained at levels safe for human use (excluding for direct consumption).	*E.coli* *	≤ 130 counts/100 ml	No data
UI	III	Suikerbosrant	RU62	EWR11	D	Quality	Pathogens	Pathogens should be maintained at levels safe for human use (excluding for direct consumption).	*E.coli* *	≤ 130 counts/100 ml	No data
		Vaal	RU65	UI.3						≤ 130 counts/100 ml	No data
			RU66	UI.4						≤ 130 counts/100 ml	No data
UM	III	Vaal	RU75	EWRS5	C	Quality	Pathogens	Pathogens should be maintained at levels safe for human use (excluding for direct consumption).	*E.coli* *	≤ 130 counts/100 ml	No data

Table 5: Resource Quality Objectives for RIVER INSTREAM HABITAT and BIOTA in the Upper Vaal catchment

IUA	Class	River	RU	REC	RQO	Numerical Limits
UA. Vaal River upstream of Grootdraai Dam	II	VAAL	1	B	Instream habitat must be in a largely natural condition to support the ecosystem. Instream biota must be in a largely condition and at sustainable levels. Low and high flows must be suitable to maintain the river habitat for ecosystem condition. Water quality: Salt concentrations must be maintained to meet quality requirements for agriculture and to maintain the ecosystem wellbeing.	Instream Habitat Integrity category ≥ B (≥ 82) Fish ecological category: ≥ B (≥ 82) Macro-invertebrate ecological category: ≥ B (≥ 82) Instream Ecostatus category ≥ B (≥ 82) Hydrological category ≥ B (≥ 82) Water Quality category: ≥ B (≥ 82)
UA. Vaal River upstream of Grootdraai Dam	II	VAAL	8	B/C	Instream habitat must be in a better than moderately modified condition to support the ecosystem and for property values and recreation Instream biota must be in a better than moderately modified condition and at sustainable levels. The requirements of ecologically important fish species must be provided for. Low and high flows must be suitable to maintain the river habitat for ecosystem condition. Water quality: The nutrient concentrations must be decreased for ecosystem condition and other users.	Instream Habitat Integrity category ≥ B/C (≥ 78) Fish ecological category: ≥ B/C (≥ 78) Macro-invertebrate ecological category: ≥ B/C (≥ 78) Instream Ecostatus category ≥ B/C (≥ 78) Hydrological category ≥ B/C (≥ 78) Water Quality category:≥ B/C (≥ 78)
UA. Vaal River upstream of Grootdraai Dam	II	VAAL	10	B/C	Instream habitat must be in a better than moderately modified condition to support the ecosystem and for property values and recreation Instream biota must be in a better than moderately modified condition and at sustainable levels. The requirements of ecologically important fish species must be provided for. Low and high flows must be suitable to maintain the river habitat for ecosystem condition. Water quality: The nutrient concentrations must be decreased for ecosystem condition and other users.	Instream Habitat Integrity category ≥ B/C (≥ 78) Fish ecological category: ≥ B/C (≥ 78) Macro-invertebrate ecological category: ≥ B/C (≥ 78) Instream Ecostatus category ≥ B/C (≥ 78) Hydrological category ≥ B/C (≥ 78) Water Quality category:≥ B/C (≥ 78)
UB. Klip River (Free State)	II	KLIP	21	C/D	Instream habitat must be in a better than largely modified condition to support the ecosystem.Instream biota must be in a better than largely modified condition and at sustainable levels to support biodiversity.Flows must be	Instream Habitat Integrity category ≥ C/D (≥ 58)Fish ecological category: ≥ C/D (≥ 58)Macro-invertebrate ecological category: ≥ C/D (≥ 58)Instream Ecostatus

IUA	Class	River	RU	REC	RQO	Numerical Limits
					suitable to maintain the river habitat for ecosystem condition. Low flows must be suitable to maintain the FEPA status.Water quality: Ammonia toxicity must be limited to protect the ecosystem.	category ≥ C/D (≥ 58)Hydrological category ≥ C/D (≥ 58)FEPA required low flows: ≥ C (≥ 62)Water Quality category:≥ C/D (≥ 58)
UC2. Wilge River and tributaries	II	WILGE	35	C	Instream habitat must be in a moderately modified or better condition to support the ecosystem. Instream biota must be in a moderately modified condition or better. The habitat conditions needed for the protecion of the genetic integrity of fish species of ecological importance must be provided for. Flows must be suitable to maintain the river habitat for ecosystem condition. Water quality: Nutrient concentrations must be suitable for users and to protect the ecosystem. Pathogens must be maintained at levels safe for human use (excluding for direct consumption).	Instream Habitat Integrity category ≥ C (≥ 62) Fish ecological category:≥ C (≥ 62) Macro-invertebrate ecological category:≥ C (≥ 62) Instream Ecostatus category ≥ C (≥ 62) Hydrological category ≥ C (≥ 62) Water Quality category:≥ C (≥ 62)
UC3. Lower Wilge River	II	LOWER WILGE	40	C/D	Instream habitat must be in a better than largely modified condition to support the ecosystem. Instream biota must be in a better than largely modified condition and at sustainable levels. Flows must be suitable to maintain the river habitat for ecosystem condition. Low flows must mimic the the natural flow patterns Water quality: Nutrient concentrations must be suitable for users and to protect the ecosystem.	Instream Habitat Integrity category ≥ C/D (≥ 58) Fish ecological category: ≥ C/D (≥ 58) Macro-invertebrate ecological category: ≥ C/D (≥ 58) Instream Ecostatus category ≥ C/D (≥ 58) Hydrological category ≥ C/D (≥ 58) Water Quality category:≥ C/D (≥ 58)
UD. Liebenbergsvlei River	III	Liebenbergsvlei River	45	B	Instream habitat must be in a largely natural condition to support the ecosystem.Instream biota must be in a largely condition and at sustainable levels.Low and high flows must be suitable to maintain the river habitat for ecosystem condition. Flows must reflect the flow regime of the region.Water quality: Water quality should be in a close to natural condition.	Instream Habitat Integrity category ≥ B (≥ 82)Fish ecological category: ≥ B (≥ 82)Macro-invertebrate ecological category: ≥ B (≥ 82)Instream Ecostatus category ≥ B (≥ 82)Hydrological category ≥ B (≥ 82)Water Quality category: ≥ B (≥ 82)
UE. Waterval River	III	Waterval River	47	D	Instream habitat must be in a largely modified or better condition to support the ecosystem. Instream biota must be in largely modified or better condition. Flows must be in largely modified or better condition. Water quality:	Instream Habitat Integrity category ≥ D (≥ 42) Fish ecological category:≥ D (≥ 42) Macro-invertebrate ecological category: ≥ D (≥ 42) Instream Ecostatus category ≥ D (≥ 42)

IUA	Class	River	RU	REC	RQO	Numerical Limits
					The nutrient concentrations must be improved to an acceptable level for the ecosystem. Salt concentrations must to be improved to levels that do not threaten the ecosystem and to provide for users. Oxygen levels must be improved to support the ecosystem. The river water must not be toxic to aquatic organisms or be a threat to human health. Pathogens must be at levels safe for human use (excluding for direct consumption).	Hydrological category ≥ D (≥ 42) Water Quality category:≥ D (≥ 42)
UE. Waterval River	III	Waterval River	50	D	Instream habitat must be in a largely modified or better condition to support the ecosystem.Instream biota must be in largely modified or better condition. The requirements of fish species of ecological importance must be provided for.Flows must be in largely modified or better condition.Water quality: The nutrient concentrations must be improved to an acceptable level for the ecosystem and to limit filamentous algal growth. The river water must not be toxic to aquatic organisms or be a threat to human health. Pathogens must be at levels safe for human use (excluding for direct consumption).	Instream Habitat Integrity category ≥ D (≥ 42)Fish ecological category:≥ D (≥ 42)Macro-invertebrate ecological category: ≥ D (≥ 42)Instream Ecostatus category ≥ D (≥ 42)Hydrological category ≥ D (≥ 42)Water Quality category:≥ D (≥ 42)
UG. Vaal River from Grootdraai Dam to Vaal Dam	II	VAAL	58	C	Instream habitat must be in a moderately modified or better condition to support the ecosystem. Instream biota must be in a moderately modified or better condition. The requirements of fish species of ecological importance must be provided for. Flows must be suitable to maintain the river habitat for ecosystem condition. Low flows must be sufficient to support the ecosystem and to provide for the requirements of irrigation and other users. Water quality: Temperatures and oxygen concentrations must not threaten the viability of aquatic biota. The river water must not be toxic to aquatic organisms or be a threat to human health.	Instream Habitat Integrity category ≥ C (≥ 62) Fish ecological category:≥ C (≥ 62) Macro-invertebrate ecological category:≥ C (≥ 62) Instream Ecostatus category ≥ C (≥ 62) Hydrological category ≥ C (≥ 62) Water Quality category:≥ C (≥ 62)
UH. Suikerbosrand River	II	Suikerbosrand River	60	B/C	Instream habitat must be in a better than moderately modified condition to support the ecosystem.Instream biota must be in a better than moderately modified condition and at sustainable levels.Low and high flows must be suitable to maintain the river habitat for ecosystem condition. Low flows must be sufficient for users.Water quality: The nutrient concentrations must be decreased for ecosystem condition and other users. Temperature and oxygen	Instream Habitat Integrity category ≥ B/C (≥ 78)Fish ecological category: ≥ B/C (≥ 78)Macro-invertebrate ecological category: ≥ B/C (≥ 78)Instream Ecostatus category ≥ B/C (≥ 78)Hydrological category ≥ B/C (≥ 78)Water Quality category:≥ B/C (≥ 78)

IUA	Class	River	RU	REC	RQO	Numerical Limits
					must be suitable to support the ecosystem in a good condition.	
UH. Suikerbosrand River	II	Blesbokspruit	62	D	Instream habitat must be in a largely modified or better condition to support the ecosystem. Instream biota must be in largely modified or better condition. Flows must be in largely modified or better condition. Low flows must be suitable to support the ecosystems functions. Water quality: The nutrient concentrations must be decreased to an acceptable mesotrophic state. Salt concentrations must be at levels that do not threaten the ecosystem and are suitable for users. The river water must not be toxic to aquatic organisms or be a threat to human health. Pathogens must be at levels safe for human use (excluding for direct consumption).	Instream Habitat Integrity category ≥ D (≥ 42) Fish ecological category:≥ D (≥ 42) Macro-invertebrate ecological category: ≥ D (≥ 42) Instream Ecostatus category ≥ D (≥ 42) Hydrological category ≥ D (≥ 42) Water Quality category:≥ D (≥ 42)
UI. Klip River (Gauteng)	III	Klip River	65	D	Instream habitat must be in a largely modified or better condition to support the ecosystem.Instream biota must be in largely modified or better condition.Flows must be in largely modified or better condition. Low flows must be suitable to support the ecosystem functions.Water quality: Salt concentrations must be at levels that do not threaten the ecosystem and are suitable for users.The river water must not be toxic to aquatic organisms or be a threat to human health. Pathogens must be at levels safe for human use (excluding for direct consumption).	Instream Habitat Integrity category ≥ D (≥ 42)Fish ecological category:≥ D (≥ 42)Macro-invertebrate ecological category: ≥ D (≥ 42)Instream Ecostatus category ≥ D (≥ 42)Hydrological category ≥ D (≥ 42)Water Quality category:≥ D (≥ 42)
UI. Klip River (Gauteng)	III	Riet	66	D	Instream habitat must be in a largely modified or better condition to support the ecosystem. Instream biota must be in largely modified or better condition. Flows must be in largely modified or better condition. Low flows must be suitable to support the ecosystem functions. Water quality: Salt concentrations must be at levels that do not threaten the ecosystem and are suitable for users. Dissolved organic carbon concentrations must not cause the ecosystem to	Instream Habitat Integrity category ≥ D (≥ 42) Fish ecological category:≥ D (≥ 42) Macro-invertebrate ecological category: ≥ D (≥ 42) Instream Ecostatus category ≥ D (≥ 42) Hydrological category ≥ D (≥ 42) Water Quality category:≥ D (≥ 42)

IUA	Class	River	RU	REC	RQO	Numerical Limits
					become unsustainable. The river water must not be toxic to aquatic organisms or be a threat to human health. Pathogens must be at levels safe for human use (excluding for direct consumption).	
UJ. Taaibosspruit	III	Taaibosspruit	67	D	Instream habitat must be in a largely modified or better condition to support the ecosystem.Instream biota must be in largely modified or better condition.Flows must be in largely modified or better condition. Low flows must be suitable to support the ecosystem functions.Water quality: Salt concentrations must be at levels that do not threaten the ecosystem and are suitable for users.The river water must not be toxic to aquatic organisms or be a threat to human health.	Instream Habitat Integrity category ≥ D (≥ 42)Fish ecological category:≥ D (≥ 42)Macro-invertebrate ecological category: ≥ D (≥ 42)Instream Ecostatus category ≥ D (≥ 42)Hydrological category ≥ D (≥ 42)Water Quality category:≥ D (≥ 42)
UL. Mooi River	III	Mooi River	71	D	Instream habitat must be in a largely modified or better condition to support the ecosystem. Instream biota must be in largely modified or better condition. Flows must be in largely modified or better condition. Low flows must be suitable to support the ecosystem functions. Water quality: The nutrient concentrations must be decreased for ecosystem condition and other users. Salt concentrations must be at levels that do not threaten the ecosystem and are suitable for users. The river water must not be toxic to aquatic organisms or be a threat to human health. Uranium must be at acceptable levels	Instream Habitat Integrity category ≥ D (≥ 42) Fish ecological category:≥ D (≥ 42) Macro-invertebrate ecological category: ≥ D (≥ 42) Instream Ecostatus category ≥ D (≥ 42) Hydrological category ≥ D (≥ 42) Water Quality category:≥ D (≥ 42)
UL. Mooi River	III	Mooi River	73	D	Instream habitat must be in a largely modified or better condition to support the ecosystem.Instream biota must be in largely modified or better condition.Flows must be in largely modified or better condition. Low flows must be suitable to support the ecosystem functions.Water quality: The nutrient concentrations must be decreased for ecosystem condition and other users. Salt concentrations must be at levels that do not threaten the ecosystem and are suitable for users.	Instream Habitat Integrity category ≥ D (≥ 42)Fish ecological category:≥ D (≥ 42)Macro-invertebrate ecological category: ≥ D (≥ 42)Instream Ecostatus category ≥ D (≥ 42)Hydrological category ≥ D (≥ 42)Water Quality category:≥ D (≥ 42)
UM. Vaal River reach from Vaal Dam to C23L	III	VAAL	75	C	Instream habitat must be in a moderately modified or better condition to support the ecosystem. Water hyacinth should be at levels that do not lower instream habitat conditions to less than moderately modified. Instream biota must be in moderately modified or better condition. The	Instream Habitat Integrity category ≥ C (≥ 62) Water hyacinth distribution and water surface coverage should be aligned to the Instream Habitat Integrity category.

IUA	Class	River	RU	REC	RQO	Numerical Limits
					requirements of fish species of ecological importance should be provided for. Flows must be in moderately modified or better condition. High flows must be sufficient to support ecosystem functions. <u>Water quality:</u> The nutrient concentrations must be decreased for ecosystem condition and other users. Salt concentrations must be at levels that do not threaten the ecosystem function and are detrimental to fish species and are suitable for users. Pathogens must be at levels safe for human use (excluding for direct consumption).	Fish ecological category: ≥ C (≥ 62) Macro-invertebrate ecological category: ≥ C (≥ 62) Instream Ecostatus category ≥ C (≥ 62) Hydrological category ≥ C (≥ 62) Water Quality category: ≥ C (≥ 62)

Table 6: Resource Quality Objectives for RIVER RIPARIAN ZONE HABITAT in the Upper Vaal

IUA	Class	River	RU	REC	RQO	Numerical Limits
UA. Vaal River upstream of Grootdraai Dam	II	VAAL	1	B	The riparian zone must be in a largely natural condition. Riparian vegetation must be in a largely natural condition. The requirements of plant species of ecological importance must be provided for. Low and high flows must be suitable to maintain the riparian zone habitat for ecosystem condition.	Riparian Zone Habitat Integrity category ≥ B (≥ 82) Riparian ecostatus category: ≥ B (≥ 82) Hydrological category ≥ B (≥ 82)
UA. Vaal River upstream of Grootdraai Dam	II	VAAL	8	B/C	The riparian zone must be in a better than moderately modified condition and must support property and recreational values. Riparian vegetation must be in a better than moderately modified condition. The requirements of plant species of ecological importance must be provided for. Low and high flows must be suitable to maintain the riparian zone habitat for ecosystem condition.	Riparian Zone Habitat Integrity category ≥ B/C (≥ 78) Riparian ecostatus category:≥ B/C (≥ 78) Hydrological category≥ B/C (≥ 78)
UA. Vaal River upstream of Grootdraai Dam	II	VAAL	10	B/C	The riparian zone must be in a better than moderately modified condition. Riparian vegetation must be in a better than moderately modified condition. The requirements of plant species of ecological importance must be provided for. Low and high flows must be suitable to maintain the riparian zone habitat for ecosystem condition.	Riparian Zone Habitat Integrity category ≥ B/C (≥ 78) Riparian ecostatus category:≥ B/C (≥ 78) Hydrological category≥ B/C (≥ 78)
UB. Klip River (Free State)	II	KLIP	21	C/D	The riparian zone must be in a better than largely modified condition to control negative influences on the river system. Riparian vegetation must be in better than largely modified condition. Low and high flows must be in a a better than largely modified condition.	Riparian Zone Habitat Integrity category ≥ C/D (≥ 58) Riparian ecostatus category: ≥ C/D (≥ 58) Hydrological category ≥ C/D (≥ 58)
UC2. Wilge River and tributaries	II	WILGE	35	C	The riparian zone must be in a moderately modified condition or better. Riparian vegetation must be in a moderately modified condition or better. Low and high flows must be in a moderately modified condition or better.	Riparian Zone Habitat Integrity category ≥ C (≥ 62) Riparian ecostatus category: ≥ C (≥ 62) Hydrological category ≥ C (≥ 62)

IUA	Class	River	RU	REC	RQO	Numerical Limits
UC3. Lower Wilge River	II	LOWER WILGE	40	C/D	The riparian zone must be in a better than largely modified condition to control negative influences on the river system. Riparian vegetation must be in better than largely modified condition. Flows must be suitable to maintain the riparian zone habitat for ecosystem condition. Low flows must mimic the the natural flow patterns	Riparian Zone Habitat Integrity category ≥ C/D (≥ 58) Riparian ecostatus category: ≥ C/D (≥ 58) Hydrological category ≥ C/D (≥ 58)
UD. Liebenbergsvlei River	III	Liebenbergsvlei River	45	B	The riparian zone must be in a largely natural condition. Riparian vegetation must be in a largely natural condition. The requirements of plant species and assemblages of ecological importance must be provided for. Low and high flows must be suitable to maintain the riparian zone habitat for ecosystem condition.	Riparian Zone Habitat Integrity category ≥ B (≥ 82) Riparian ecostatus category: ≥ B (≥ 82) Hydrological category ≥ B (≥ 82)
UE. Waterval River	III	Waterval River	47	D	The riparian zone must be in a largely modified or better condition. Riparian vegetation must be in a largely modified or better condition. Low and high flows must be in a largely modified or better condition.	Riparian Zone Habitat Integrity category ≥ D (≥ 42) Riparian ecostatus category: ≥ D (≥ 42) Hydrological category ≥ D (≥ 42)
UE. Waterval River	III	Waterval River	50	D	The riparian zone must be in a largely modified or better condition. Riparian vegetation must be in a largely modified or better condition. Low and high flows must be in a largely modified or better condition.	Riparian Zone Habitat Integrity category ≥ D (≥ 42) Riparian ecostatus category: ≥ D (≥ 42) Hydrological category ≥ D (≥ 42)
UG. Vaal River from Grootdraai Dam to Vaal Dam	II	VAAL	58	C	The riparian zone must be in a moderately modified condition or better. Riparian vegetation must be in a moderately modified condition or better. Low and high flows must be in a moderately modified condition or better.	Riparian Zone Habitat Integrity category ≥ C (≥ 62) Riparian ecostatus category: ≥ C (≥ 62) Hydrological category ≥ C (≥ 62)
UH. Suikerbosrand River	II	Suikerbosrand River	60	B/C	The riparian zone must be in a better than moderately modified condition. Riparian vegetation must be in a better than moderately modified condition. The requirements of plant species of ecological importance must be provided for. Low and high flows must be suitable to maintain the riparian zone habitat for ecosystem condition.	Riparian Zone Habitat Integrity category ≥ B/C (≥ 78) Riparian ecostatus category:≥ B/C (≥ 78) Hydrological category≥ B/C (≥ 78)

IUA	Class	River	RU	REC	RQO	Numerical Limits
UH. Suikerbosrand River	II	Blesbokspruit	62	D	The riparian zone must be in a largely modified or better condition. Riparian vegetation must be in a largely modified or better condition. Low and high flows must be in a largely modified or better condition.	Riparian Zone Habitat Integrity category ≥ D (≥ 42) Riparian ecostatus category: ≥ D (≥ 42) Hydrological category ≥ D (≥ 42)
UI. Klip River (Gauteng)	III	Klip River	65	D	The riparian zone must be in a largely modified or better condition. Riparian vegetation must be in a largely modified or better condition. Low and high flows must be in a largely modified or better condition.	Riparian Zone Habitat Integrity category ≥ D (≥ 42) Riparian ecostatus category: ≥ D (≥ 42) Hydrological category ≥ D (≥ 42)
UI. Klip River (Gauteng)	III	Riet	66	D	The riparian zone must be in a largely modified or better condition. Riparian vegetation must be in a largely modified or better condition. Low and high flows must be in a largely modified or better condition.	Riparian Zone Habitat Integrity category ≥ D (≥ 42) Riparian ecostatus category: ≥ D (≥ 42) Hydrological category ≥ D (≥ 42)
UJ. Taaibosspruit	III	Taaibosspruit	67	D	The riparian zone must be in a largely modified or better condition. Riparian vegetation must be in a largely modified or better condition. Low and high flows must be in a largely modified or better condition.	Riparian Zone Habitat Integrity category ≥ D (≥ 42) Riparian ecostatus category: ≥ D (≥ 42) Hydrological category ≥ D (≥ 42)
UL. Mooi River	III	Mooi River	71	D	The riparian zone must be in a largely modified or better condition. Riparian vegetation must be in a largely modified or better condition. Low and high flows must be in a largely modified or better condition.	Riparian Zone Habitat Integrity category ≥ D (≥ 42) Riparian ecostatus category: ≥ D (≥ 42) Hydrological category ≥ D (≥ 42)
UL. Mooi River	III	Mooi River	73	D	The riparian zone must be in a largely modified or better condition. Riparian vegetation must be in a largely modified or better condition. Low and high flows must be in a largely modified or better condition.	Riparian Zone Habitat Integrity category ≥ D (≥ 42) Riparian ecostatus category: ≥ D (≥ 42) Hydrological category ≥ D (≥ 42)

IUA	Class	River	RU	REC	RQO	Numerical Limits
UM. Vaal River reach from Vaal Dam to C23L	III	VAAL	75	C	The riparian zone must be in a moderately modified condition or better. Riparian vegetation must be in a moderately modified condition or better. Low and high flows must be in a moderately modified condition or better.	Riparian Zone Habitat Integrity category ≥ C (≥ 62) Riparian ecostatus category: ≥ C (≥ 62) Hydrological category ≥ C (≥ 62)

Table 7: Resource Quality Objectives for DAM WATER QUANTITY in the Upper Vaal

IUA	Dams	RU	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits		
UA	Amersfoort Dam (27°4'1"S; 29°53'1"E)	RU4	Quantity	Low Flows	Dam levels must be sufficient for release for domestic supply to Amersfoort and the surrounding small irrigation areas	Flow releases: Skulpspruit in C11E, VMAR = 12.035x10^{6}m^3, PES=C	Maintenance low flows (m3/s) (Percentile)		Drought flows (m3/s) (Percentile)
							Oct	0.049 (50)	0.007 (99)
							Nov	0.099 (40)	0.015 (99)
							Dec	0.130 (50)	0.030 (99)
							Jan	0.143 (40)	0.045 (99)
							Feb	0.196 (40)	0.041 (99)
							Mar	0.131 (40)	0.015 (99)
							Apr	0.087 (40)	0.012 (99)
							May	0.051 (40)	0.000
							Jun	0.035 (40)	0.000
							Jul	0.031 (40)	0.000
							Aug	0.024 (50)	0.000
							Sep	0.027 (50)	0.008 (99)
	Groodraai Dam (26°55'9.2"S; 29°17'41.6"E)	RU10			Dam levels must remain sufficient to provide for municipal and industrial use, as well as releases for ecosystem function downstream.	Flow releases: Vaal EWR2 in C11M VMAR = 457.7x10^{6}m3 REC=C category*. (Releases from C1R002)	Maintenance low flows (m3/s) (Percentile)		Drought flows (m3/s) (Percentile)
							Oct	0.7 (50)	0.116 (99)
							Nov	1 (50)	0.219 (99)
							Dec	1.2 (50)	0.281 (99)
							Jan	1.35 (50)	0.309 (99)
							Feb	1.75 (50)	0.422 (99)
							Mar	1.3 (50)	0.285 (99)
							Apr	1 (50)	0.194 (99)
							May	0.8 (50)	0.00
							Jun	0.7 (50)	0.00
							Jul	0.6 (60)	0.00
							Aug	0.55 (60)	0.00
							Sep	0.6 (60)	0.071 (99)
	Sterkfontein Dam (28°23'15"S; 29°1'1"E)	RU33 and 34		Flows	Dam levels must be sufficient for releases to protect ecosystem function and for municipal and industrial use downstream. The dam is filled from the Thukela catchment, the increased dam levels from the transfer must be maintained such that they support the protection of ecosystem function within the dam.	Flow releases: Nuwejaarspruit in C81D, VMAR == 40.089x10^{6}m^3, REC=C/D		Maintenance low flows (m^3/s) (Percentile)	Drought flows (/m^{3}s) (Percentile)	Maintenance high flows (m^3/s) (Percentile)
							Oct	0.125 (50)	0.011 (99)	0.114 (99)
							Nov	0.215 (50)	0.042 (99)	0.238 (40)
							Dec	0.252 (40)	0.045 (99)	0.115 (60)
							Jan	0.324 (50)	0.134 (99)	0.115 (99)
							Feb	0.412 (50)	0.098 (99)	0.585 (30)
							Mar	0.368 (50)	0.146 (99)	0.206 (70)
							Apr	0.246 (50)	0.042 (99)	0.056 (90)
							May	0.139 (50)	0.045 (99)	0.00
							Jun	0.075 (50)	0.031 (99)	0.00
							Jul	0.053 (50)	0.007 (99)	0.00

IUA	Dams	RU	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits		
							Aug	0.048 (50)	0.015 (99)	0.00
							Sep	0.083 (50)	0.035 (99)	0.070 (60)
UH	Balfour Dam (26°34'25"S; 28°30'37"E)	RU60	Quantity	Flows	Dam levels must be maintained at sufficient levels to provide releases for municipal and industrial use as well as protection of ecosystem function downstream.	Flow releases: Vaal EWR9 in C21C VMAR = 31.31x10^{6}m3 REC=C category*. (Daily - no flow gauge close by)	Maintenance low flows (m3/s) (Percentile)			Drought flows (m3/s) (Percentile)
							Oct	0.12 (60)		0.05 (99)
							Nov	0.177 (60)		0.066 (99)
							Dec	0.147 (60)		0.06 (99)
							Jan	0.182 (60)		0.066 (99)
							Feb	0.231 (60)		0.079 (99)
							Mar	0.18 (60)		0.066 (99)
							Apr	0.16 (60)		0.064 (99)
							May	0.143 (60)		0.059 (99)
							Jun	0.123 (60)		0.057 (99)
							Jul	0.08 (70)		0.05 (99)
							Aug	0.065 (70)		0.04 (99)
							Sep	0.075 (70)		0.04 (99)
UL	Klerkskraal Dam (26°15'9"S; 27°9'40"E)	RU69	Quantity	Flows	Dam levels must therefore be maintained at levels sufficient for irrigation releases as well as for protection of ecosystem function downstream.	Flow releases: Vaal RE-EWR2 in C23G VMAR = 37.7x106m3 REC=D*. (Releases from Klerkskraal Dam monitored by C2H006.)	Maintenance low flows (m3/s) (Percentile)			Drought flows (m3/s) (Percentile)
							Oct	0.12 (70)		0.106 (99)
							Nov	0.12 (70)		0.109 (99)
							Dec	0.12 (70)		0.106 (99)
							Jan	0.128 (60)		0.108 (99)
							Feb	0.155 (60)		0.124 (99)
							Mar	0.153 (50)		0.115 (99)
							Apr	0.16 (60)		0.12 (99)
							May	0.154 (60)		0.116 (99)
							Jun	0.154 (60)		0.118 (99)
							Jul	0.146 (60)		0.113 (99)
							Aug	0.143 (60)		0.112 (99)
							Sep	0.137 (70)		0.113 (99)
UM	Vaal Barrage (26°45'53"S; 27°41'3"E)	RU75	Quantity	Flows	Levels must be maintained at sufficient levels for municipal and industrial releases as well as to provide releases for the protection of ecosystem function downstream.	Flow releases: Vaal River in C23B, VMAR = 2 253.9x10^{6}m^3, REC=C	Maintenance low flows (m^3/s) (Percentile)			Drought flows (m^3/s) (Percentile)
							Oct	6.16 (95)		2.55 (99)
							Nov	8.56 (90)		3.59 (99)
							Dec	9.36 (95)		4.30 (99)
							Jan	10.51 (95)		4.79 (99)
							Feb	13.61 (85)		6.15 (99)
							Mar	10.97 (90)		4.99 (99)
							Apr	8.67 (85)		3.76 (99)
							May	6.19 (85)		2.96 (99)
							Jun	4.98 (90)		2.45 (99)
							Jul	4.58 (90)		2.27 (99)
							Aug	4.29 (95)		2.15 (99)

IUA	Dams	RU	Component	Sub Component	RQO		Indicator/ measure		Numerical Limits			
									Sep	4.69 (95)	2.33 (99)	
	Vaal Dam (26°52'57"S; 28°6'58"E)	RU74			Dam levels must be maintained such that they are sufficient for municipal, industrial and irrigation releases as well as protection of ecosystem function downstream.		Flow releases: Vaal EWR4 in C22F downstream Vaal Dam MAR = 1977x10^{6}m3 REC=C category*. (Releases from Vaal Dam monitored by C1H122.)	Maintenance low flows (m^3/s) (Percentile)	Oct	13.05 (70)	Drought flows (m^3/s) (Percentile) 3.44 (99)	High flows (m3/s)
									Nov	16.02 (50)	5.04 (99)	15 - 25
									Dec	17.65 (50)	5.58 (99)	15 – 25
									Jan	18.23 (50)	5.98 (90)	15 – 25
									Feb	17.38 (50)	6.63 (95)	40 - 96
									Mar	16.6 (50)	5.58 (95)	15 - 25
						During the wet season dam inflows and levels must be maintained such that they are sufficient for releases for intended use, and release for the protection of ecosystem function downstream.			Apr	13.95 (40)	4.72 (99)	
									May	11.01 (60)	4.14 (99)	
									Jun	10.03 (70)	4.14 (99)	
									Jul	9.54 (95)	3.98 (99)	
									Aug	9.37 (95)	3.98 (99)	
									Sep	9.37 (95)	3.98 (99)	

Table 8: Resource Quality Objectives for DAM WATER QUALITY in the Upper Vaal

IUA	Dams	RU	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits	95th Percentile
UA	Grootdraai Dam (26°55'9.2"S; 29°17'41.6"E)	RU10	Quality	Nutrients	The system must be maintained in a mesotrophic state or better.	Phosphate(PO_4) *	≤ 0.025 mg/L P	0.0085
						Nitrate (NO_3) & Nitrite (NO_2) *	≤ 1.00 mg/L N	0.099
UB	Vrede/Thembalihle Dam (27°26'21.8"S; 29°11'45.1"E)	RU20	Quality	Nutrients	The system must be maintained in a mesotrophic state or better.	Phosphate(PO_4) *	≤ 0.025 mg/L P	0.2
						Nitrate (NO_3) & Nitrite (NO_2) *	≤ 1.00 mg/L N	0.4
UD	Gerrands Dam (28°16'55.3"S; 28°17'30.6"E)	RU43	Quality	Nutrients	Nutrients must be maintained at mesotrophic levels.	Phosphate(PO_4) *	≤ 0.025 mg/L P	0.006
						Nitrate (NO_3) & Nitrite (NO_2) *	≤ 1.00 mg/L N	0.025
	Loch Athlone Dam (28°15'0.9"S; 28°18'31.4"E)				Nutrients must be maintained at mesotrophic levels so as to retain the recreational value of the dam.	Phosphate(PO_4) *	≤ 0.025 mg/L P	0.024
						Nitrate (NO_3) & Nitrite (NO_2) *	≤ 1.00 mg/L N	0.05
	Saulspoort Dam (Sol Plaatjie Dam) (28°13'1.5"S; 28°21'46.9"E)	RU41			Nutrients must be maintained at mesotrophic levels to protect the ecosystem and also the fitness for use.	Phosphate(PO_4) *	≤ 0.025 mg/L P	0.022
						Nitrate (NO_3) & Nitrite (NO_2) *	≤ 1.00 mg/L N	0.2
UL	Klipdrift Dam (26°37'0"S; 27°17'52"E)	RU72	Quality	Nutrients	The system is currently in a eutrophic state and must be improved and maintained in a mesotrophic state.	Phosphate(PO_4) *	≤ 0.025 mg/L P	0.031
						Nitrate (NO_3) & Nitrite (NO_2) *	≤ 1.00 mg/L N	0.11
	Boskop Dam (26°33'42"S; 27°6'41"E)	RU73			Nutrient concentrations must be maintained such that the system is in a mesotrophic state	Phosphate(PO_4) *	≤ 0.025 mg/L P	0.006
						Nitrate (NO_3) & Nitrite (NO_2) *	≤ 1.00 mg/L N	0.3
UM	Vaal Barrage (26°45'53"S; 27°41'3"E)	RU75	Quality	Nutrients	The system is currently eutrophic and must be improved and maintained in a mesotrophic state.	Phosphate(PO_4) *	≤ 0.025 mg/L P	0.295
						Nitrate (NO_3) & Nitrite (NO_2) *	≤ 1.00 mg/L N	2.4
	Vaal Dam (26°52'57"S; 28°6'58"E)				The system must be improved and managed in a mesotrophic state.	Phosphate(PO_4) *	≤ 0.025 mg/L P	0.021
						Nitrate (NO_3) & Nitrite (NO_2) *	≤ 1.00 mg/L N	0.2

IUA	Dams	RU	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits	95th Percentile
UB	Vrede/Thembalihle Dam (27°26'21.8"S; 29°11'45.1"E)	RU 20	Quality	Salts	Salt levels must be maintained at concentrations where they do not impact negatively on the ecosystem.	Electrical Conductivity*	≤ 85 mS/m	84.8
UL	Klipdrift Dam (26°37'0"S; 27°17'52"E)	RU 72	Quality	Salts	Salt levels must be maintained at concentrations where they do not impact negatively on the ecosystem.	Electrical Conductivity*	≤ 85 mS/m	102
UM	Vaal Barrage (26°45'53"S; 27°41'3"E)	RU 75	Quality	Salts	Salt levels must be maintained at concentrations where they do not impact negatively on the ecosystem.	Electrical Conductivity*	≤ 85 mS/m	80.4
UL	Boskop Dam (26°33'42"S; 27°6'41"E)	RU 73	Quality	System Variables	The pH of the water in the dam should not negatively impact on ecosystem function.	pH_max *	≥ 8.8	8.7
						pH_min *	≤ 5.9	8.1
UA	Grootdraai Dam (26°55'9.2"S; 29°17'41.6"E)	RU10	Quality	Toxins	Toxicity must be maintained better than concentrations that would pose a threat to human health. The dam must be maintained in a mesotrophic state to avoid cyanobacterial blooms and the associated algal toxins.	Chl-a: phytoplankton*	≤ 20 µg/L	No data
UD	Gerrands Dam (28°16'55.3"S; 28°17'30.6"E)	RU 43	Quality	Toxins	The system must be maintained in a mesotrophic condition to avoid cyanobacteria and the associated algal toxins.	Chl-a: phytoplankton*	≤ 20 µg/L	No data
	Loch Athlone Dam (28°15'0.9"S; 28°18'31.4"E)							
	Saulspoort Dam (Sol Plaatjie Dam) (28°13'1.5"S; 28°21'46.9"E)	RU 41 & 43						
UL	Klipdrift Dam (26°37'0"S; 27°17'52"E)	RU 72	Quality	Toxins	To avoid cyanobacteria blooms, the dam must be maintained in a mesotrophic state.	Chl-a: phytoplankton*	≤ 20 µg/L	No data
UM	Vaal Barrage (26°45'53"S; 27°41'3"E)	RU 75	Quality	Toxins	The system must be maintained in a mesotrophic state to prevent build-up of cyanobacteria blooms and associated algal toxins. The water in the Barrage should not contain toxins including metals at levels that pose a threat to human health.	Chl-a: phytoplankton*	≤ 20 µg/L	No data
	Vaal Dam (26°52'57"S; 28°6'58"E)	RU 74			The system must be maintained in a mesotrophic state to avoid cyanobacterial blooms and associated algal toxins.	Chl-a: phytoplankton*	≤ 20 µg/L	No data

Table 9: Resource Quality Objectives for GROUNDWATER in the Upper Vaal

IUA	RU	Component	RQO	Indicator/ measure	Numerical Limits
All	All Prioritised RUs	Quantity	Where water use is higher than requirements for Reserve, Schedule 1 and General Authorizations, abstraction rates should not exceed the average recharge values of the aquifer based on the area.	Abstraction Volume (Q) per hectare > Reserve, Schedule and General Authorizations.	Q < Average recharge per hectare
All	RU1 RU2 RU3 RU5 RU6 RU7 RU10 RU11 RU33 RU35 RU40 RU42 RU44 RU43 RU46 RU47 RU59 RU60 RU74	Aquifer	Medium to long-term water trends should not show negative decline or deviation from the natural trend	Depth to Groundwater Level according to Groundwater Monitoring Guidelines.	At least one NGwQI MP monitoring site that is representative of the aquifer. Water level fluctuations in Dolomitic aquifers[6] should not exceed 6m.
	RU69				Water level fluctuations around the average site water level should not exceed 4.05 m
	RU63				Water level fluctuations around the average site water level should not exceed 15.3 m
	RU71				Water level fluctuations around the average site water level should not exceed 13.8 m
	RU64				Water level fluctuations around the average site water level should not exceed 14.8 m
	RU66				Water level fluctuations around the average site water level should not exceed 23.6 m
	RU75				Water level fluctuations around the average site water level should not exceed 9.8 m
	RU70				Water level fluctuations around the average site water level should not exceed 15.4 m
	RU62				Water level fluctuations around the average site water level should not exceed 11.8 m
	RU73				Water level fluctuations around the average site water level should not exceed 4.2 m
	RU65				Water level fluctuations around the average site water level should not exceed 22.9 m
	RU72				Water level fluctuations around the average site water level should not exceed 7.16 m

DEPARTMENT OF WATER AND SANITATION

NO. 611 **17 JULY 2015**

DEPARTMENT OF WATER AND SANITATION

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

PROPOSED CLASSES AND RESOURCE QUALITY OBJECTIVES OF WATER RESOURCES FOR CATCHMENTS OF THE LOWER VAAL

I, Nomvula Paula Mokonyane, in my capacity as Minister of Water and Sanitation, and duly authorised in terms of section 13(4) of the National Water Act (Act No. 36 of 1998) hereby publishes for public comment the proposed classes of water resources and resource quality objectives for catchments of the Lower Vaal, in the Schedule, to be issued under section 13(4) of the National Water Act (Act No. 36 of 1998).

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

Director: Water Resource Classification
Attention: Ms Shane Naidoo
Department of Water and Sanitation
Zwamadaka Building 185 Francis Baard Street
Private Bag X313
Pretoria
0001

E-mail: naidooshane@dwa.gov.za Facsimile: 012 336 6712

MRS NP MOKONYANE
MINISTER OF WATER AND SANITATION
DATE: 01.07.15

SCHEDULE

PROPOSED CLASSES OF WATER RESOURCES AND RESOURCE QUALITY OBJECTIVES FOR CATCHMENTS OF THE LOWER VAAL IN TERMS OF SECTION 13(1)(A) AND (B) OF THE NATIONAL WATER ACT (ACT NO.36 OF 1998)

1 DESCRIPTION OF WATER RESOURCE

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

Water Management Area:	Vaal
Drainage Regions:	C primary drainage region
Rivers:	Vaal River System

2. The Minister has, in terms of section 12 of the National Water Act, Act No 36 of 1998 (the Act), prescribed a system for classifying water resources by promulgating Regulation 810, Government Gazette 33541 dated 17 September 2010. In terms of section 13(1) of the Act the Minister must, as soon as reasonably practicable after the Minister has prescribed a system for classifying water resources and subject to subsection (4), by notice in the *Gazette*, determine for all or part of every significant water resource, a class in accordance with the prescribed classification system.

3. The Minister, in terms of section 13(1)(a) of the Act, proposes to determine the following classes of each significant water resource for catchments of the Lower Vaal.

4. The Minister, in terms of section 13(1)(b) of the Act, proposes to determine the following resource quality objectives of each significant water resource for catchments of the Lower Vaal.

2 DETERMINATION OF THE CLASS OF WATER RESOURCES AND RESOURCE QUALITY OBJECTIVES IN TERMS OF SECTION 13(1)(A) AND (B) OF THE NATIONAL WATER ACT (ACT NO.36 OF 1998)

1. A summary of the water resource classes for Integrated Units of Analysis (Figure 1) and ecological categories for the Lower Vaal is set out in Table 1.

2. Integrated Units of Analysis (IUA) are classified in terms of their extent of permissible utilization and protection as either Class I: indicating high environmental protection and minimal utilization; or Class II indicating moderate protection and moderate utilization; and Class III indicating sustainable minimal protection and high utilization.

3. Resource Quality Objectives (RQO) are defined for each prioritised resource unit (RU) for every IUA in terms of water quantity, quality, habitat and biota as shown in Tables 2 – 8 respectively.

4. Where specified, the ecological category or Recommended Ecological Category (REC) means the assigned ecological condition by the Minister to a water resource that reflects the ecological condition of that water resource in terms of the deviation of its biophysical components from a predevelopment condition.

5. RQO are applicable from 1 April 2016.

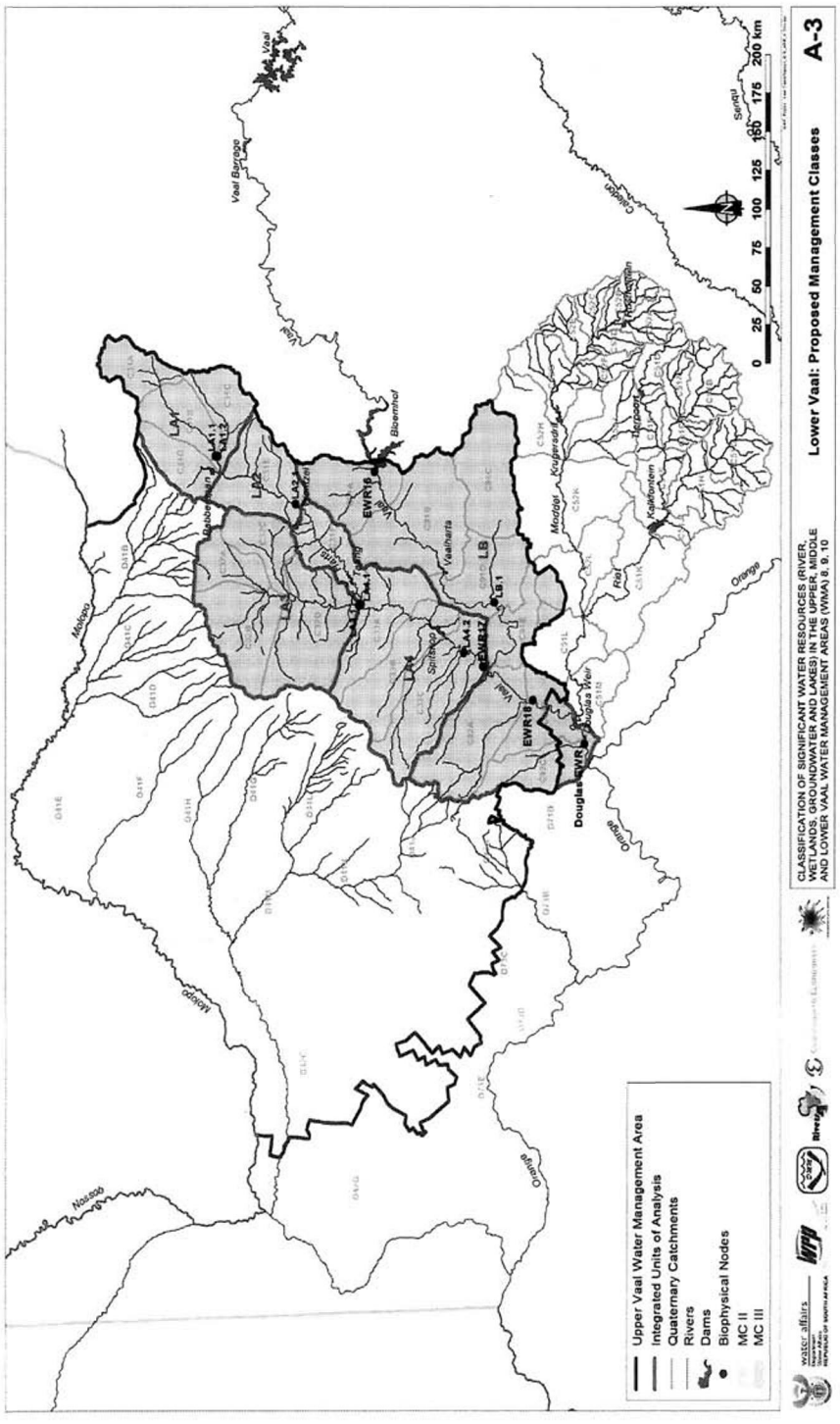

Figure 1: Integrated Units of Analysis in the Lower Vaal

Table 2: Resource Quality Objectives (RQO) for RIVER WATER QUANTITY in the Lower Vaal

IUA	Class	River	RU	Biophysical Node	REC	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits		
LA4	II	Harts River	RU6	EWR17	D	Quantity	Low Flows	Low flows need to be managed to keep the ecosystem in a sustainable condition, including reducing unnatural daily fluctuations.	EWR maintenance low and drought flows: Harts EWR17 in C33C MAR = 147.85x10^{6}m^3 REC=D category*		Maintenance low flows (m^3/s) (Percentile)	Drought flows (m^3/s) (Percentile)
										Oct	1.5 (10)	0.001 (99)
										Nov	2.0 (10)	0.001 (99)
										Dec	2.5 (20)	0.001 (99)
										Jan	3.0 (20)	0.001 (99)
										Feb	4.0 (30)	0.001 (99)
										Mar	5.0 (30)	0.001 (99)
										Apr	4.0 (30)	0.001 (99)
										May	3.0 (10)	0.001 (99)
										Jun	2.5 (10)	0.001 (99)
										Jul	2.0 (10)	0.001 (99)
										Aug	1.5 (10)	0.001 (99)
										Sep	1.0 (10)	0.001 (99)
LB	III	Vaal River	RU8	EWR16	D	Quantity	High Flows	High flows need to be used to introduce habitat variability.	EWR maintenance high flows: Vaal EWR16 in C91A MAR = 1699.3x10^{6}m^3 REC=D category*		Maintenance high flows (m^3/s) (Percentile)	
										Nov	15.8 (60)	
										Jan	15.29 (90)	
										Feb	16.929 (99)	
										Mar	15.29 (99)	
	III	Vaal River	RU9	EWR18	C	Quantity	Low Flows	The low flows should be improved to support the ecosystem and no zero flow conditions should be allowed.	EWR maintenance low flows: Vaal EWR18 in C92B MAR = 3347.2x10^{6}m^3 REC=C category*		Maintenance low flows (m^3/s) (Percentile)	Drought flows (m^3/s) (Percentile)
										Oct	2.309	0.739
										Nov	3.167	1.725
										Dec	3.589	1.95
										Jan	4.454	2.414
										Feb	5.989	3.239
										Mar	5.131	2.776
										Apr	3.91	2.123
										May	2.412	1.319
										Jun	1.65	0.912
										Jul	1.361	0.756
										Aug	1.335	0.688
										Sep	1.412	0.784

Table 3: Resource Quality Objectives (RQO) for RIVER WATER QUALITY in the Lower Vaal

IUA	Class	River	RU	Node	REC	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits	95th Percentile
LA2	II	Vaal River	RU3	VC57	C	Quality	Nutrients	Nutrient concentrations need to be managed to achieve a mesotrophic or good state.	Phosphate(PO_4)*	≤ 0.025 mg/L P	No data
									Nitrate (NO_3) & Nitrite (NO_2)*	≤ 1.00 mg/L N	No data
									Total Ammonia*	≤ 73 µg/L N	0.1628
LB	III	Vaal River	RU11	Douglas EWR	C	Quality	Nutrients	Nutrients concentrations should be maintained at low levels to limit algal growth.	Phosphate(PO_4)*	≤ 0.025 mg/L P	No data
									Nitrate (NO_3) & Nitrite (NO_2)*	≤ 1.00 mg/L N	0.685
									Total Ammonia*	≤ 73 µg/L N	0.139
LA4	II	Vaal River	RU6	EWR17	D	Quality	Salts	Salt concentrations need to be reduced to levels which are acceptable for irrigation.	Electrical conductivity*	≤ 111 mS/m	No data
LB	III	Vaal River	RU11	Douglas EWR	C	Quality	Salts	Salinity concentrations in this RU must be managed to ensure that water quality is suitable for irrigated agriculture.	Electrical conductivity*	≤ 85 mS/m	111.46
LB							System Variables	High temperatures and low oxygen levels must be improved in order to keep the ecosystem in a sustainable condition.	Temperature *	≤ abs(dev. from ambient) 2°C	No data
									Dissolved oxygen *	≥ 6 mg/L O_2	No data
LB	III	Vaal River	RU8	EWR16	D	Quality	Toxicants	Toxicants should not pose a high risk to human health.	F*	≤ 3.0 mg/L	0.5115
									Al*	≤ 150 µg/L	No data
									As*	≤ 130 µg/L	No data
									Cd hard*	≤ 5.0 µg/L	No data
									Cr(VI)*	≤ 200 µg/L	No data
									Cu hard*	≤ 8.0 µg/L	No data
									Hg*	≤ 1.70 µg/L	No data
									Mn*	≤ 1300 µg/L	No data
									Pb hard*	≤ 13.00 µg/L	No data
									Se*	≤ 30 µg/L	No data
									Zn*	≤ 36 µg/L	No data
									Chorine*	≤ 5.0 µg/L free Cl	No data
									Endosulfan*	≤ 0.200 µg/L	No data
									Atrazine*	≤ 100 µg/L	No data
LB	III	Vaal River	RU11	Douglas EWR	C	Quality	Pathogens	Microbial contamination must be minimised to reduce the impact on usability of irrigated crops.	*E.coli**	≤ 130 counts/100 ml	No data

Table 4: Resource Quality Objectives for RIVER INSTREAM and RIPARIAN HABITAT and BIOTA in the Lower Vaal catchment

IUA	Class	River	RU	REC	RQO	Numerical Limits
LA2. Middle Harts River	II	Vaal	3	C	Instream and Riparian habitat must be in a moderately modified condition or better. Instream biota must be in moderately modified condition or better. The importance of the RU as a refuge habitat and nursery area for fish must be ensured. Consumption of fish must not pose a health risk to humans. Low flows and drought flows must support the desired instream and riparian condition for ecosystem maintenance and for users. Water quality: Instream concentration of nutrients must be at a level where it supports the desired Instream and Riparian habitat conditions. The concentration of toxins must not be at a level that is toxic to aquatic organisms and a threat to human health.	Instream and Riparian habitat Integrity category ≥ C (≥ 62). Numerical values of metrics as specified. Fish ecological category: ≥ C (≥ 62). Assemblage attributes as specified Macro-invertebrate ecological category:≥ C (≥ 62). Assemblage attributes as specified Instream Ecostatus category ≥ C (≥ 62). Metric composition as specified. Riparian Ecostatus category ≥ C (≥ 62). Metric composition as specified.
LA4. Lower Harts River	II	Vaal	6	D	Instream and Riparian habitat must be in a largely modified condition or better. Instream biota must be in largely modified condition or better. Consumption of fish must not pose a health risk to humans. Low flows and drought flows must support the desired instream and riparian condition for ecosystem maintenance and for users. Water quality: Instream salinity must be at a concentration that supports the aquatic ecosystem and the water quality requirements of the water users for irrigation.	Instream and Riparian habitat Integrity category ≥ D (≥ 42). Numerical values of metrics as specified. Fish ecological category: ≥ D (≥ 42). Assemblage attributes as specified Macro-invertebrate ecological category: ≥ D (≥ 42). Assemblage attributes as specified Instream Ecostatus category ≥ D (≥ 42). Metric composition as specified. Riparian Ecostatus category ≥ D (≥ 42). Metric composition as specified.
LB. Vaal River from downstream of Bloemhof Dam to Douglas Weir	III	Vaal	8	D	Instream habitat must be in a largely modified condition or better. The riparian habitat integrity must be in a largely modified or better condition to support the ecosystem purposes and for property and recreational values. Instream biota must be in largely modified condition or better. The requirements of ecologically important species must be provided for. Consumption of fish must not pose a health risk to humans.	Instream and Riparian habitat Integrity category ≥ D (≥ 42). Numerical values of metrics as specified. Fish ecological category: ≥ D (≥ 42). Assemblage attributes as specified Macro-invertebrate ecological category: ≥ D

IUA	Class	River	RU	REC	RQO	Numerical Limits
					High flows must be used to provide habitat variability Water quality: Instream salinity must be at a concentration that support the aquatic ecosystem and the water quality requirements of the water users for irrigation. The concentration of toxins must not be at a level that is toxic to aquatic organisms and a threat to human health.	(≥ 42). Assemblage attributes as specified Instream Ecostatus category ≥ D (≥ 42). Metric composition as specified. Riparian Ecostatus category ≥ D (≥ 42). Metric composition as specified.
LB. Vaal River from downstream of Bloemhof Dam to Douglas Weir	III	Vaal	11	C	Instream and Riparian habitat must be in a moderately modified condition or better. Instream biota must be in moderately modified condition or better. The requirements of ecologically important species must be provided for. Consumption of fish must not pose a health risk to humans. Low flows and drought flows must support the desired instream and riparian condition for ecosystem maintenance and for users. No flow conditions must not be allowed. Water quality: Instream concentration of nutrients must be at a level where it supports the desired Instream and Riparian habitat conditions. The concentration of toxins must not be at a level that is toxic to aquatic organisms and a threat to human health. Oxygen concentration and temperatures must be at levels that support the ecosystem condition Microbial contamination must be minimised to reduce the impact on usability of irrigated crops.	Instream and Riparian habitat Integrity category ≥ C (≥ 62). Numerical values of metrics as specified. Fish ecological category: ≥ C (≥ 62). Assemblage attributes as specified Macro-invertebrate ecological category:≥ C (≥ 62). Assemblage attributes as specified Instream Ecostatus category ≥ C (≥ 62). Metric composition as specified. Riparian Ecostatus category ≥ C (≥ 62). Metric composition as specified.

Table 5: Resource Quality Objectives for DAM Water Quantity in the Lower Vaal

IUA	Dams	RU	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits		
							Maintenance low flows (m^3/s) (%tile)		Drought flows (m^3/s) (%tile)
LA4	Spitskop Dam (28°7'30"S; 24°30'15"E)	RU 6	Quantity	Low Flows	The dam must be able to provide EWR releases for the protection of ecosystem function downstream and for irrigation	EWR maintenance low and drought flows releases to Harts in C33C VMAR = 147.85x10^{6}m^3. (Daily releases from C3R002 to meet requirements at EWR17.)	Oct	1.5 (10)	0.001 (99)
							Nov	2.0 (10)	0.001 (99)
							Dec	2.5 (20)	0.001 (99)
							Jan	3.0 (20)	0.001 (99)
							Feb	4.0 (30)	0.001 (99)
							Mar	5 .0(30)	0.001 (99)
							Apr	4.0 (30)	0.001 (99)
							May	3.0 (10)	0.001 (99)
							Jun	2.5 (10)	0.001 (99)
							Jul	2.0 (10)	0.001 (99)
							Aug	1.5 (10)	0.001 (99)
							Sep	1.0 (10)	0.001 (99)

Table 6: Resource Quality Objectives for DAM WATER QUALITY in the Lower Vaal

IUA	Dams	RU	Component	Sub Component	RQO	Indicator/ Measure	Numerical Limits	95th Percentile
LA4	Taung Dam (27°31'34"S; 24°51'16"E)	RU 5	Quantity	Nutrients	The nutrient state of the dam must be improved and maintained in a mesotrophic state.	Phosphate(PO_4) *	≤ 0.025 mg/L P	0.1
						Nitrate (NO_3) & Nitrite (NO_2) *	≤ 1.00 mg/L N	No data
						Phosphate(PO_4) *	≤ 0.020 mg/L P	No data
						Nitrate (NO_3) & Nitrite (NO_2) *	≤ 0.85 mg/L N	0.685
LB	Vaalharts Weir (28°7'1"S; 24°56'45"E)	RU 9	Quantity	Nutrients	Nutrient levels must be improved and maintained in a mesotrophic state. Total inorganic nitrogen must be improved over present concentrations.	Phosphate(PO_4) *	≤ 0.020 mg/L P	No data
						Nitrate (NO_3) & Nitrite (NO_2) *	≤ 0.85 mg/L N	No data
	Douglas Weir (29°02'36"S; 23°50'13"E)	RU 11			Nutrient levels must be improved and maintained in a mesotrophic state.	Phosphate(PO_4) *	≤ 0.020 mg/L P	No data
						Nitrate (NO_3) & Nitrite (NO_2) *	≤ 0.85 mg/L N	No data
LA4	Taung Dam (27°31'34"S; 24°51'16"E)	RU 5	Quantity	Salts	Salinity concentrations must be maintained at levels acceptable for irrigation	Electrical Conductivity*	≤ 85 mS/m	87.5
LB	Vaalharts Weir (28°7'1"S; 24°56'45"E)	RU 9	Quantity	Salts	Salinity concentrations must be maintained at levels acceptable for irrigation	Electrical Conductivity*	≤ 85 mS/m	117
	Douglas Weir (29°02'36"S; 23°50'13"E)	RU 11			Salinity concentrations must be maintained at levels acceptable for irrigation	Electrical Conductivity*	≤ 85 mS/m	111.46
LA4	Taung Dam (27°31'34"S; 24°51'16"E)	RU 5	Quantity	Toxicants	The numbers of cyanobacteria must be kept within mesotrophic levels.	Chl-a: phytoplankton	≤ 20.0 µg/L	No data
LB	Vaalharts Weir (28°7'1"S; 24°56'45"E)	RU 9	Quality	Toxicants	The numbers of cyanobacteria must be kept within mesotrophic levels.	Chl-a: phytoplankton*	≤ 20.0 µg/L	No data
	Douglas Weir (29°02'36"S; 23°50'13"E)	RU 11				Chl-a: phytoplankton*	≤ 20.0 µg/L	No data

Table 7: Resource Quality Objectives for DAM BIOTA in the Lower Vaal

IUA	Class	Dam	RU	RQO	NUMERICAL LIMITS
LA2. Middle Harts River	II	Wentzel Dam I	3	The downstream low flow drought flow requirements must be met to support the ecosystem and users. The importance of the Dam as a fish refuge and for semi-aquatic biota must be protected. This includes ecologically and recreationally important fish species. Consumption of fish must not pose a health risk to humans. Water quality: The concentration of nutrients must be at levels that sustain ecosystem health and water quality requirements of water users. The dam must be maintained in a mesotrophic state. The concentrations of toxins must not be at levels that are toxic to aquatic organisms and a threat to human health.	Instream and Riparian habitat Integrity category ≥ C (≥ 62). Numerical values of metrics as specified. Fish ecological category: ≥ C (≥ 62). Assemblage attributes as specified Macro-invertebrate ecological category:≥ C (≥ 62). Assemblage attributes as specified Instream Ecostatus category ≥ C (≥ 62). Metric composition as specified. Riparian Ecostatus category ≥ C (≥ 62). Metric composition as specified.
LA4. Lower Harts River	II	Taung Dam	5	The downstream low flow requirements to the Harts River in C31F must be met to support a healthy condition for the ecosystem and users. The importance of the Dam as a fish refuge and for semi-aquatic biota must be protected. This includes ecologically and recreationally important fish species. Consumption of fish must not pose a health risk to humans. Water quality: The concentration of nutrients must be at levels that sustain ecosystem health and water quality requirements of water users. The dam must be maintained in a mesotrophic state. The concentrations of toxins must not be at levels that are toxic to aquatic organisms and a threat to human health.	Low flow releases to C31F as specified.
LA4. Lower Harts River	II	Spitskop Dam	6	The downstream low flow requirements to the Harts River in C33C must be met to support a healthy condition for the ecosystem and users. The importance of the Dam as a fish refuge and for semi-aquatic biota must be protected. This includes ecologically and recreationally important fish species. Consumption of fish must not pose a health risk to humans. Water quality: The concentration of nutrients must be at levels that sustain ecosystem health and water quality requirements of water users. The dam must be maintained in a mesotrophic state. The concentration of toxins must not be at a level that is toxic to aquatic organisms and a threat to human health.	Low flow releases to C33C as specified.

IUA	Class	Dam	RU	RQO	NUMERICAL LIMITS
LB. Vaal River from downstream of Bloemhof Dam to Douglas Weir	III	Vaalharts weir	9	The downstream low flow requirements to the Vaal River in C91D must be met to support a healthy condition for the ecosystem and users and irrigation. The importance of the Dam as a fish refuge and for semi-aquatic biota must be protected. This includes ecologically and recreationally important fish species. Invasion of aquatic plants must be prevented. Consumption of fish must not pose a health risk to humans. Water quality: The concentration of nutrients must be at levels that sustain ecosystem health and water quality requirements of water users. The dam must be maintained in a mesotrophic state. Salinity must be at levels acceptable for irrigation.	Low flow releases to C91D as specified
LB. Vaal River from downstream of Bloemhof Dam to Douglas Weir	III	Vaal Douglas weir	11	The downstream low flow requirements to the Vaal River in C92C must be met to support a healthy condition for the ecosystem. The importance of the Dam as a fish refuge and for semi-aquatic biota must be protected and must support local recreatuin and angling. The requirments of ecologically and recreationally important fish species must be provided for. Consumption of fish must not pose a health risk to humans. Water quality: The concentration of nutrients must be at levels that sustain ecosystem health and water quality requirements of water users. The dam must be maintained in a mesotrophic state. Salinity must be at levels acceptable for irrigation.	Low flow releases to C92C as specified.

Table 8: Resource Quality Objectives for GROUNDWATER in the Lower Vaal

IUA	RU	Component	RQO	Indicator/ Measure	Numerical Limits
All	All Prioritised RUs	Quantity	Where water use is higher than requirements for Reserve, Schedule 1 and General Authorizations, abstraction rates should not exceed the average recharge values of the aquifer area.	Abstraction Volume (Q) per hectare > Reserve, Schedule and General Authorizations.	Q < Average recharge per hectare
All	RU1	Aquifer	Medium to long-term water trends should not show negative deviation from the natural trend	Depth to Groundwater Level according to Groundwater Monitoring Guidelines.	Water level fluctuations around the average site water level should not exceed 5.6 m.
	RU2				Water level fluctuations around the average site water level should not exceed 4.4 m.
	RU3				Water level fluctuations around the average site water level should not exceed 2.7 m.
	RU4 RU7 RU10				At least one NGwQI MP monitoring site that is representative of the aquifer. Water level fluctuations in Dolomitic aquifers[6] should not exceed 6m.
	RU5				Water level fluctuations around the average site water level should not exceed 16.2 m.
	RU6				Water level fluctuations around the average site water level should not exceed 27.8 m.
	RU8				Water level fluctuations around the average site water level should not exceed 30.6 m.
	RU9				Water level fluctuations around the average site water level should not exceed 3.7 m.

DEPARTMENT OF WATER AND SANITATION

NO. 612 **17 JULY 2015**

DEPARTMENT OF WATER AND SANITATION

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

PROPOSED CLASSES AND RESOURCE QUALITY OBJECTIVES OF WATER RESOURCES FOR CATCHMENTS OF THE MIDDLE VAAL

I, Nomvula Paula Mokonyane, in my capacity as Minister of Water and Sanitation, and duly authorised in terms of section 13(4) of the National Water Act (Act No. 36 of 1998) hereby publishes for public comment the proposed classes of water resources and resource quality objectives for catchments of the Middle Vaal, in the Schedule, to be issued under section 13(4) of the National Water Act (Act No. 36 of 1998).

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

Director: Water Resource Classification
Attention: Ms Shane Naidoo
Department of Water and Sanitation
Zwamadaka Building 185 Francis Baard Street
Private Bag X313
Pretoria
0001

E-mail: naidooshane@dwa.gov.za Facsimile: 012 336 6712

MRS NP MOKONYANE
MINISTER OF WATER AND SANITATION
DATE: 01-07-15

SCHEDULE

PROPOSED CLASSES AND RESOURCE QUALITY OBJECTIVES OF WATER RESOURCES FOR CATCHMENTS OF THE MIDDLE VAAL IN TERMS OF SECTION 13(1)(A) AND (B) OF THE NATIONAL WATER ACT (ACT NO.36 OF 1998)

1 DESCRIPTION OF WATER RESOURCE

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

Water Management Area:	Vaal
Drainage Region:	C Primary Drainage Region
River(s):	Vaal River System (Vaal, Renoster, Vals, Schoonspruit, Koekemoerspruit, Sand and Vet Systems)

2. The Minister has, in terms of section 12 of the National Water Act, Act No 36 of 1998 (the Act), prescribed a system for classifying water resources by promulgating Regulation 810, Government Gazette 33541 dated 17 September 2010. In terms of section 13(1) of the Act the Minister must, as soon as reasonably practicable after the Minister has prescribed a system for classifying water resources and subject to subsection (4), by notice in the *Gazette*, determine for all or part of every significant water resource, a class in accordance with the prescribed classification system.

3. The Minister, in terms of section 13(1)(a) of the Act, proposes to determine the following classes of each significant water resource for catchments of the Middle Vaal.

4. The Minister, in terms of section 13(1)(b) of the Act, proposes to determine the following resource quality objectives for each significant water resource for catchment of the Middle Vaal.

2. DETERMINATION OF THE CLASS OF WATER RESOURCE AND RESOURCE QUALITY OBJECTIVES IN TERMS OF SECTION 13(1)(A) AND (B) OF THE NATIONAL WATER ACT (ACT NO.36 OF 1998)

1. A summary of the water resource classes for Integrated Units of Analysis (Figure 1) and ecological categories for the Middle Vaal is set out in Table 1.

2. Integrated Units of Analysis (IUA) are classified in terms of their extent of permissible utilization and protection as either Class I: indicating high environmental protection and minimal utilization; or Class II indicating moderate protection and moderate utilization; and Class III indicating sustainable minimal protection and high utilization.

3. Resource Quality Objectives (RQO) are defined for each prioritised resource unit (RU) (Table 2 and Figure 2) for every IUA in terms of water quantity, quality, habitat and biota as shown in Tables 3 – 11 respectively.

4. Where specified, the ecological category or Recommended Ecological Category (REC) means the assigned ecological condition by the Minister to a water resource that reflects the ecological condition of that water resource in terms of the deviation of its biophysical components from a predevelopment condition.

5. RQO are applicable from 1 April 2016.

1. **Water Resource Classes of the Middle Vaal**

Table 1: Water Resource Classes per Integrated Unit of Analysis and Ecological Categories per Biophysical Node

Integrated Unit of Analysis (IUA)	Water Resource Class for IUA	Biophysical Node Name	Quaternary Catchment	Major River Name	Tributary Name	Gross Catchment Area (km²)	Natural MAR (million m³/a)	Present Ecological State	Recommended Ecological Category
Renoster River (MA)	II	MA.1	C70A	Vaal River	Renoster River	613	18.46	C	C
		MA.2	C70B	Renoster River	Renoster River	881	25.55	B/C	B/C
		MA.3	C70C	Renoster River	Leeufonteinspruit	81	2.11	C	C
		MA.4	C70D	Vaal River	Renoster River	2413	63.86	C	C
		MA.5	C70D	Renoster River	Doringspruit	422	7.86	C/D	C/D
		MA.6	C70F	Vaal River	Renoster River	4092	93.14	C	C
		MA.7	C70H	Renoster River	Heuningspruit	1152	17.94	C	C
		MA.8	C70K	Vaal River	Renoster River	5868	120.92	C	C
Vals River (MB)	III	MB.1	C60A	Vaal River	Vals River	860	31.24	C	C
		MB.2	C60C	Vals River	Elandsspruit/Elands	349	8.2	C	C
		MB.3	C60G	Vaal River	Vals River	4898	131.7	C	C
		EWR14	C60J	Vaal River	Vals River	5930	145.79	C/D	C/D
Schoonspruit River (MC)	III	MC.1	C24C	Vaal River	Schoonspruit	1350	60.6	C/D	C/D
		MC.2	C24F	Vaal River	Taaibosspruit	2020	19.5	C	C
		MC.3	C24G	Vaal River	Schoonspruit	2694	105.52	C/D	C/D
		MC.4	C24H	Vaal River	Schoonspruit	3503	117.31	C/D	C/D
		MC.5	C24A	Vaal River	Koekemoerspruit	839	26.19	D/E	D
		MC.6	C24H	Schoonspruit	Jagspruit	499	5.24	D	D
Upper Sand River (MD1)	III	MD1.1	C42D	Vet River	Sand River	2215	66.4	C	C
Lower Sand River (MD2)	III	MD2.1	C42G	Vet River	Sand River	3974	104.16	C	C
		MD2.2	C42F	Sand River	Koolspruit	734	19.26	C	C
		MD2.3	C42L	Vet River	Sand River	7555	180.27	C	C
Upper Vet River (ME1)	II	ME1.1	C41D	Vaal River	Vet River	2113	72.01	C	C
		ME1.2	C41E	Vet River/Erfenis	Klein Vet River	2083	81.86	C	C
		ME1.3	C41E	Klein Vet River	Soutspruit	159	3.87	B/C	B/C
Lower Vet River (ME2)	III	ME2.1	C41H	Vaal River	Vet River	5551	190.94	C	C
		EWR15	C43A	Vaal River	Vet River	16040	413.55	C/D	C/D
Vaal River from Renoster River confluence to Bloemhof Dam (MF)	III	MF.1	C24B	Vaal River		864	4.75	C	C
		EWR12	C24J	Vaal River		62305	2546.42	D	D
		EWR13	C25A	Vaal River	Klipspruit	70809	2714.89	C/D	C/D

Table 2: Resource Units delineated for the Middle Vaal WMA

Resource Unit	Description	Quaternary Catchment
	INTEGRATED UNITS OF ANALYSIS: VAAL RIVER (MF)	
VB1.1	Vaal River mainstem: Vermaasdrift to upstream of the Schoon spruit confluence	C24B
VB1.2	Vaal River mainstem: From the Schoonspruit confluence to just upstream of the Vals River confluence	C24J
VB1.3	Vaal River mainstem: From Vals River confluence to Bloemhof Dam	C25C, C25F
VB2	Tributary catchments (Vierfonteinspruit and C24J –south of Vaal River)	C24B, C24J
VB3	Ysterspruit, Matjiespruit, Klipspruit, Wolwespruit and Makwassiespruit tributary catchments	C24J, C25A, C25C, C25D
VB4	Sandspruit tributary catchment	C25C, C25B, C25F, C43B
VB5	Bamboespruit tributary catchment	C25E
VB6	Bloemhof Dam	C25E, C25F, C43D
	TRIBUTARIES	
	INTEGRATED UNITS OF ANALYSIS: RENOSTER RIVER (MA)	
R2	Downstream Vaalbankspruit tributary confluences to Koppies Dam	C70C
R3	Koppies Dam	C70C
R4	Downstream Koppies Dam to confluence with the Heuningspruit	C70E, C70D, C70F, C70G, C70H
R5	Downstream Heuningspruit confluence to confluence with the Vaal River	C70J, C70K
	INTEGRATED UNITS OF ANALYSIS MB: VALS RIVER	
V2	Downstream Pauciflora Spruit confluence to Kroonstad	C60B, C60C, C60D, C60E, C60F
V3	Serfontein Dam	C60D
V4	Middelspruit tributary catchment	C60H
V5	From the Kroonval weir to the Vaal River confluence	C60G, C60J
	INTEGRATED UNITS OF ANALYSIS: SCHOONSPRUIT (MC)	
SK1	From origin of Koekemoerspruit to confluence with Vaal River	C24A, C24B
SK2	Schoonspruit eye	C24C
SK3	Taaibospruit tributary catchment	C24F
SK4	From Schoonspruit eye to Kaalspruit confluence	C24D, C24E
SK5	Kaalspruit and Buisfonteinspruit tributary catchment	C24G
SK6	Johan Neser Dam (Klerksdorp Dam)	C24G
SK7	From Johan Neser Dam to confluence with the Vaal River	C24H
	INTEGRATED UNITS OF ANALYSIS: UPPER SAND RIVER (MD1)	
US2	Downstream Klipspruit confluence to Allemanskraal Dam	C42D, C42E
US3	Allemanskraal Dam	C42E
	INTEGRATED UNITS OF ANALYSIS: LOWER SAND RIVER (MD2)	
LS1	Allemanskraal Dam to Merriespruit confluence	C42F, C42G, C42H,
LS2	Rietspruit tributary catchment	C42J
LS3	Downstream Rietspruit confluence to confluence with the Vet River	C42K, C42L, C43B
	INTEGRATED UNITS OF ANALYSIS: UPPER VET RIVER (ME1)	
UV1	Klein Vet and Laaispruit tributary catchments	C41A, C41B
UV2	Origin of Vet River and Leeuspruit tributary catchment to Erfenis Dam	C41C, C41D
UV3	Soutspruit tributary catchment	C41E
UV4	Erfenis Dam	C41E
	INTEGRATED UNITS OF ANALYSIS : LOWER VET RIVER (ME2)	
LV1	Erfernis Dam to confluence with Sand River	C41F, C41G, C41H, C41J
LV2	Downstream Sand River confluence to Bloemhof Dam	C43A, C43C, C43D

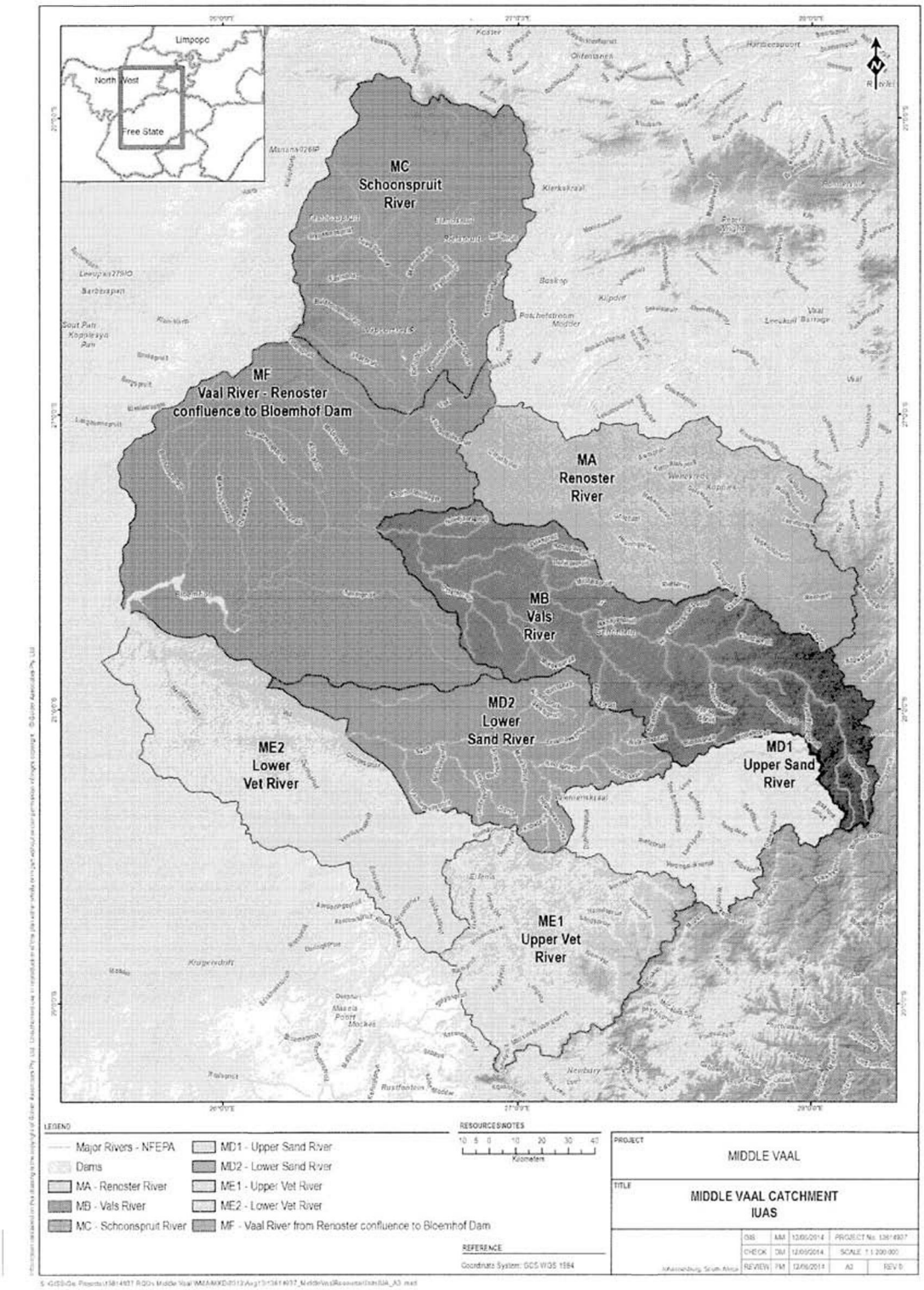

Figure 1: Integrated Units of Analysis defined in the Middle Vaal WMA

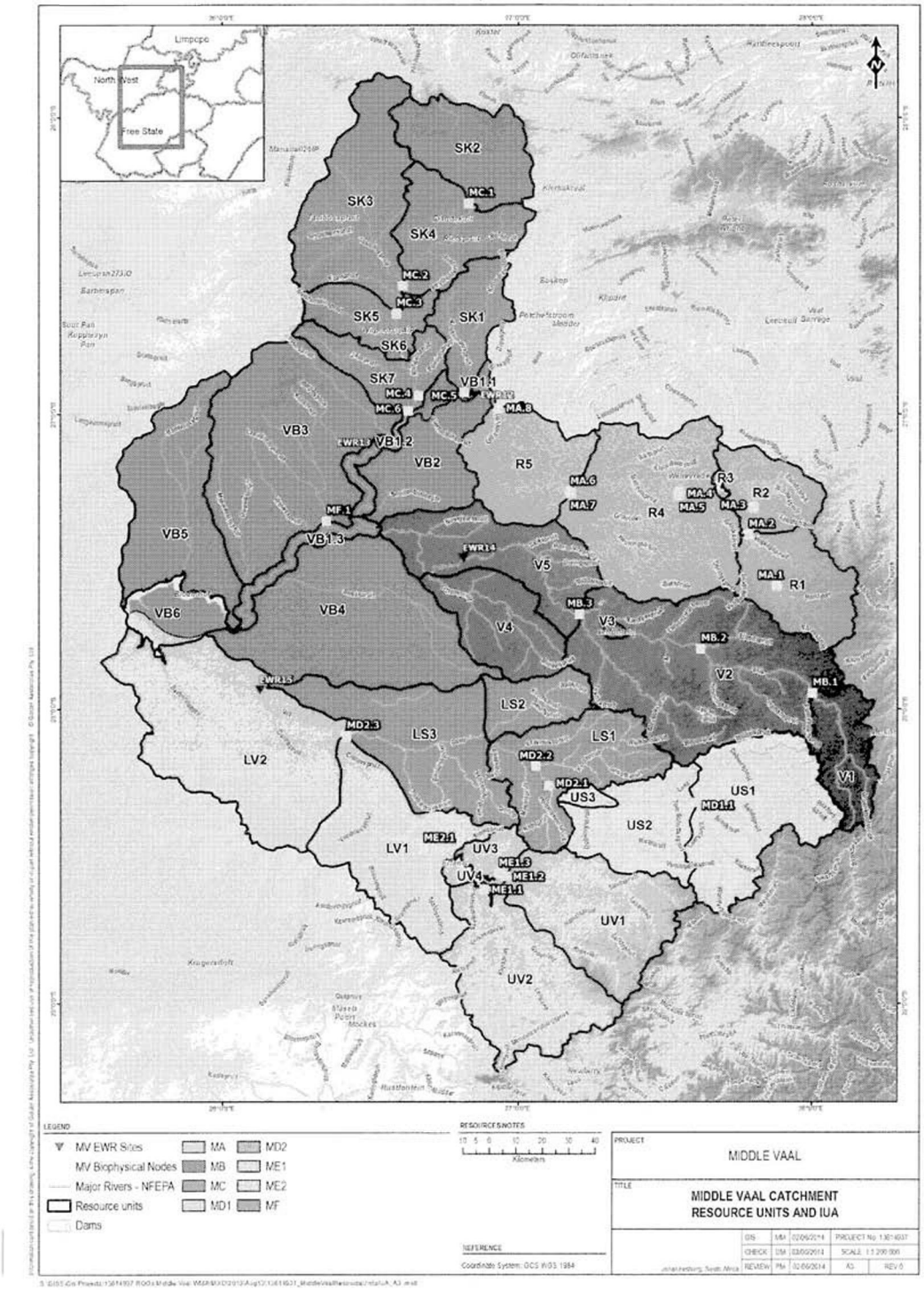

Figure 2: Resource Units and location of Nodes in the Middle Vaal WMA

Table 3: Resource Quality Objectives for RIVERS AND DAMS in priority Resource Units in the Integrated Unit of Analysis (RENOSTER)

IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit				
										Month	*Maintenance Low Flows*		*Drought Flows*	
											cubic metres/ second	*Per-cen-tile*	*cubic metres/ second*	*Per-cen-tile*
Renoster	II	Renoster (C70C) (Tributaries Elandspruit, Leeufontein and Wolwespruit)	R2	MA 3	C	Quantity	Low flows	The maintenance low flows and drought flows must be attained to support a healthy condition for the ecosystem and users.	Total Ecological Water Requirement (node MA3) = 1.097 million cubic metres/annum (51.79% of the Virgin Mean Annual Runoff) Maintenance flows (percentage value of naturalised flow distribution) Drought flows (percentage value of naturalised flow distribution)	Oct	0.0172	40	0.0000	90
										Nov	0.0428	50	0.0000	99
										Dec	0.0463	60	0.0000	99
										Jan	0.0597	60	0.0037	99
										Feb	0.0616	40	0.0000	99
										Mar	0.0455	40	0.0000	99
										Apr	0.0243	30	0.0000	99
										May	0.0093	30	0.0000	90
										Jun	0.0062	30	0.0000	90
										Jul	0.0049	50	0.0000	99
										Aug	0.0045	50	0.0000	99
										Sep	0.0073	30	0.0000	99
						Quality	Nutrients	Instream concentration of nutrients must be maintained to sustain aquatic ecosystem health and to ensure the prescribed ecological category is met.	Dissolved Inorganic Nitrogen as nitrogen	≤ 0.50 milligrams/litre (50th percentile)				
									Orthophosphate as Phosphorus	≤ 0.058 milligrams/litre (50th percentile)				
									Nitrate & Nitrite as Nitrogen	≤ 0.25 milligrams/litre (50th percentile) ≤ 6 milligrams/litre (95th percentile)				
							Salts	Instream salinity must be maintained to support the aquatic ecosystem and the water quality requirements of the water users.	Electrical conductivity	≤ 55 milliSiemens/metre (95th percentile)				
							Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95th percentile)				
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a moderately modified condition or better.	The Rapid Habitat Assessment Method must be implemented.	Instream and Riparian habitat Integrity category ≥ C (≥ 62)				

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IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
						Biota	Fish	Instream biota must be in moderately modified condition or better. The importance of the RU as a refuge habitat and nursery area for fish must be ensured.	A baseline assessment to determine the current integrity and health of the fish community must be undertaken. Fish Response Assessment Index (FRAI) must be utilized.	Fish ecological category: ≥ C (≥ 62) Macro-invertebrate ecological category:≥ C (≥ 62) Instream Ecostatus category ≥ C (≥ 62) Hydrological category ≥ C (≥ 62) With monthly flow requirements as specified. Water Quality category: ≥ C (≥ 62)
		Renoster (C70C) (Tributaries Elandspruit, Leeufontein and Wolwespruit)	**R2**	**MA 3**	**C**	**Biota**	Aquatic Invertebrates	The integrity of the macroinvertebrate community within the system must be maintained.	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually using the South African Scoring System 5 methodology.	Maintain the current C category by ensuring the Average Score Per Taxon is >5.0.
		Koppies Dam (C70C)	**R3**			**Quantity**	Low flows	The downstream maintenance low flow requirements of node MA 4 must be met to support a healthy condition for the ecosystem and users.	Total Ecological Water Requirement (node MA4) = 18.04 million cubic metres/annum (28.82% of the Virgin Mean Annual Runoff) Maintenance flows (percentage value of naturalised flow distribution) Drought flows (percentage value of naturalised flow distribution)	*Month* / *Maintenance Low Flows* (*cubic metres/second*, *Percentile*) / *Drought Flows* (*cubic metres/second*, *Percentile*) Oct: 0.2348, 60, 0.0299, 99 Nov: 0.5204, 60, 0.0231, 99 Dec: 0.5604, 70, 0.0336, 99 Jan: 0.7187, 80, 0.0672, 99 Feb: 0.7577, 70, 0.0248, 99 Mar: 0.5892, 60, 0.0448, 99 Apr: 0.3484, 60, 0.0309, 99 May: 0.1613, 50, 0.0261, 99 Jun: 0.1181, 60, 0.0386, 99 Jul: 0.1001, 60, 0.0381, 99 Aug: 0.0900, 70, 0.0351, 99 Sep: 0.1246, 50, 0.0455, 99
						Quality	Nutrients	Concentration of nutrients must be maintained to sustain ecosystem health and water quality requirements of water users. The dam should be maintained in a mesotrophic state.	Dissolved Inorganic Nitrogen as Nitrogen	≤ 0.50 milligrams/litre (50th percentile)
									Orthophosphate as Phosphorus	≤ 0.015 milligrams/litre (50th percentile)
									Nitrate & Nitrite as Nitrogen	≤ 0.25 milligrams/litre (50th percentile) 6 milligrams/litre (95th percentile)

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IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
									Phytoplankton	≤ 0.025 milligrams/litre (50^{th} percentile)
							Salts	The salinity in the dam must be maintained in order to support ecosystem health and the water quality requirements of the downstream water users.	Electrical conductivity	≤ 55 milliSiemens/metre (95^{th} percentile)
							Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95^{th} percentile)
	II	Koppies Dam (C70C)	R3			Habitat	Dam habitat	The downstream maintenance low flow requirements of node MA 4 in RU R2 must be met to support a healthy condition for the ecosystem and users. The importance of the Dam as a refuge for aquatic and semi-aquatic biota must be protected. This includes ecologically and recreationally important fish species and birds. The importance of the Dam for recreation, eco-tourism, abstraction and ecological flow releases must be protected.		
						Biota	Fish	Located in the main channel of the Renoster River, the dam provides an important fish refuge area and must be managed to maintain the upstream species.	The fish population must be monitored through health assessment studies. Suitable abundances should be determined. Monitoring should be conducted annually.	
							Aquatic birds	The dam supports a variety of aquatic and semi-aquatic bird species. The suitability of the dam as bird habitat must be maintained.	A baseline assessment should be conducted to determine the aquatic bird community around the dam.	
		Renoster (C70D, C70E, C70F, C70G, C70H) (Downstream Koppies Dam to confluence with the Heuningspruit)	R4	MA 6	C	Quantity	Low flows	The maintenance low flows and drought flows must be attained to support a healthy condition for the ecosystem and users.	Total Ecological Water Requirement (node MA6) = 25.413 million cubic metres/annum (27.28% of the Virgin Mean Annual Runoff) Maintenance flows (percentage value of naturalised flow distribution) Drought flows	

Month	Maintenance Low Flows		Drought Flows	
	cubic metres/ second	*Per-cen-tile*	*cubic metres/ second*	*Per-cen-tile*
Oct	0.2808	60	0.0373	99
Nov	0.5065	70	0.0617	99
Dec	0.6758	80	0.0971	99
Jan	0.9039	80	0.0821	99
Feb	1.0206	70	0.0661	99
Mar	0.8789	70	0.0485	99

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IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit			
									(percentage value of naturalised flow distribution)	Apr	0.5698	70	0.0887	99
										May	0.2830	60	0.0261	99
										Jun	0.1759	60	0.0502	99
										Jul	0.1434	80	0.0709	99
										Aug	0.1307	80	0.0373	99
										Sep	0.1674	50	0.0579	99
						Quality	Nutrients	Instream concentration of nutrients must be improved to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Dissolved Inorganic Nitrogen as Nitrogen	≤ 0.5 milligrams/litre (50th percentile)			
									Orthophosphate as Phosphorus	≤ 0.058 milligrams/litre (50th percentile)			
									Nitrate & Nitrite as Nitrogen	≤ 0.50 milligrams/litre (50th percentile) ≤ 6 milligrams/litre (95th percentile)			
Renoster	II	Renoster (C70D, C70E, C70F, C70G, C70H) (Downstream Koppies Dam to confluence with the Heuningspruit)	R4	MA 6	C	Quality	Salts	Instream salinity must be maintained at the current state to support the aquatic ecosystem and the water quality requirements of the water users.	Electrical conductivity	≤ 70 milliSiemens/metre (95th percentile)			
							System variables	pH must be maintained at present state.	pH range	7.4 (5th percentile) and 8.6. (95th percentile)			
								A baseline assessment to determine the present state instream turbidity is required.	Turbidity	A 10% variation from background concentration is allowed.			
							Toxics	The concentrations of toxins should not be at a level that is toxic to aquatic organisms and a threat to human health.	Ammonia as Nitrogen	≤ 0.072 milligrams/litre (95th percentile)			
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a moderately modified condition or better	The Rapid Habitat Assessment Method must be implemented.	Instream and Riparian habitat Integrity category ≥ C (≥ 62)			

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IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
						Biota	Fish	Instream biota must be in moderately modified condition or better through maintenance of habitat, flows, water quality and limitation of migration barriers for fish.	A baseline assessment to determine the integrity and health of the fish community should be conducted to determine the current state. If the current ecological category meets the recommended C category then the baseline integrity and health must be maintained. However if the baseline assessment shows that the current state does not meet the C ecological category then the C category must be met. Fish Response Assessment Index (FRAI) must be utilized.	Instream and Riparian habitat Integrity category ≥ C (≥ 62) Fish ecological category: ≥ C (≥ 62) Macro-invertebrate ecological category:≥ C (≥ 62) Instream Ecostatus category ≥ C (≥ 62) Hydrological category ≥ C (≥ 62) With monthly flow requirements as specified. Water Quality category: ≥ C (≥ 62)
							Aquatic Invertebrates	The integrity of the macroinvertebrate community within the system must be maintained.	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually using the South African Scoring System 5 methodology.	Maintain the current C category by ensuring the Average Score Per Taxon is >5.0.
Renoster	II	**Renoster (C70J, C70K)** (Downstream Heuningspruit confluence to confluence with the Vaal River) (includes the Olifantsvlei tributary)	R5	MA8	C	Quantity	Low flows	The maintenance low flows and drought flows must be attained so that the environmental flows requirements are met to support a healthy condition for the ecosystem and users.	Total Ecological Water Requirement (node MA8) = 31.578 million cubic metres/annum (26.12% of the Virgin Mean Annual Runoff) Maintenance flows (percentage value of naturalised flow distribution) Drought flows (percentage value of naturalised flow distribution)	

Month	*Maintenance Low Flows*		*Drought Flows*	
	cubic metres/ second	*Per-cen-tile*	*cubic metres/ second*	*Per-cen-tile*
Oct	0.3226	60	0.0373	99
Nov	0.6848	50	0.1003	99
Dec	0.7743	80	0.1232	99
Jan	1.0600	90	0.0821	999
Feb	1.2269	80	0.1116	99
Mar	1.0977	70	0.0485	99
Apr	0.7311	70	0.1427	99
May	0.3812	60	0.0261	99
Jun	0.2319	80	0.0502	99
Jul	0.1871	90	0.0709	99

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IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit			
										Aug	0.1725	90	0.0373	99
										Sep	0.2076	60	0.0579	99
						Quality	Nutrients	Instream concentration of nutrients must be improved to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Dissolved Inorganic Nitrogen as Nitrogen	≤1.25 milligrams/litre (50th percentile)			
									Orthophosphate as Phosphorus	≤ 0.058 milligrams/litre (50th percentile)			
									Nitrate & Nitrite as Nitrogen	≤ 1.0 milligrams/litre (50th percentile) ≤ 6 milligrams/litre (95th percentile)			
							Salts	Instream salinity must be maintained. Salinity levels should not be allowed to deteriorate.	Electrical conductivity	≤ 55 milliSiemens/metre (95th percentile)			
							Toxics	The concentrations of toxins should not be at a level that is toxic to aquatic organisms and a threat to human health.	Ammonia as Nitrogen	≤ 0.072 milligrams/litre (95th percentile)			
							Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95th percentile)			
							System variables	pH must be maintained at present state.	pH range	6.5 (5th percentile) and 8.5 (95th percentile)			
								A baseline assessment to determine the present state instream turbidity is required.	Turbidity	A 10% variation from background concentration is allowed.			
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a moderately modified condition or better.	The Rapid Habitat Assessment Method must be implemented.	Instream and Riparian habitat Integrity category ≥ C (≥ 62)			

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IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
Renoster	II	**Renoster (C70J, C70K)** (Downstream Heuningspruit confluence to confluence with the Vaal River) (includes the Olifantsvlei tributary)	R5	MA 8	C	Biota	Fish	Instream biota must be in moderately modified condition or better. The requirements of fish species of ecological importance and with particular flow and water quality needs must be provided for.	Fish Response Assessment Index (FRAI) must be utilized.	Fish ecological category: ≥ C (≥ 62) Macro-invertebrate ecological category:≥ C (≥ 62) Instream Ecostatus category ≥ C (≥ 62) Hydrological category ≥ C (≥ 62) With monthly flow requirements as specified. Water Quality category: ≥ C (≥ 62)
							Aquatic Invertebrates	The integrity of the invertebrate community within the system must be improved, by improving the water quality from a nutrient perspective	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually using the South African Scoring System 5 methodology.	An ecological category of C must be met. The Average Score Per Taxon value of > 5.0 must be achieved.
							Aquatic birdlife	The habitat requirements of aquatic bird populations must be provided for.	A baseline assessment should be conducted to determine the aquatic bird community and future changes in the bird communities compared to the baseline.	

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Table 4: Resource Quality Objectives for RIVERS AND DAMS in priority Resource Units in the Integrated Unit of Analysis (VALS)

IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit				
											Maintenance Low Flows		Drought Flows	
										Month	cubic metres/ second	Per-cen-tile	cubic metres/ second	Per-cen-tile
MB Vals	II	Vals (C60B, C60C, C60D, C60E, C60F) (from the Pauciflora spruit confluence to the Kroonval weir at Kroonstad) (Major tributaries include the Elandspruit, Liebenberg stroom and Blomspruit)	V2	MB 3	C	Quantity	Low flows	The maintenance low flows and drought flows must be attained to support a healthy condition for the ecosystem and users.	Total Ecological Water Requirement (node MB3) = 33.464 million cubic metres/annum (25.41% of the Virgin Mean Annual Runoff)	Oct	0.3200	60	0.0261	99
										Nov	0.6655	70	0.0077	99
										Dec	0.8307	70	0.0000	99
										Jan	1.1537	80	0.0373	99
									Maintenance flows (percentage value of naturalised flow distribution)	Feb	1.2475	70	0.0703	99
										Mar	1.1455	90	0.0523	99
										Apr	0.6917	60	0.0000	99
										May	0.3566	40	0.0373	99
									Drought flows (percentage value of naturalised flow distribution)	Jun	0.1991	60	0.0386	99
										Jul	0.1340	60	0.0075	99
										Aug	0.1568	60	0.0411	99
										Sep	0.2600	30	0.0000	99
						Quality	Nutrients	Instream concentration of nutrients must be improved to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Dissolved Inorganic Nitrogen as Nitrogen	≤ 0. 50 milligrams/litre (50^{th} percentile)				
									Orthophosphate as Phosphorus	≤ 0.058 milligrams/litre (50^{th} percentile)				
									Nitrate & Nitrite as Nitrogen	≤ 0.25 milligrams/litre (50^{th} percentile) ≤ 6 milligrams/litre (95^{th} percentile)				
							Salts	Instream salinity must be maintained at the present state to support the aquatic ecosystem and the water quality requirements of the water users.	Electrical conductivity	≤ 65 milliSiemens/metre (95^{th} percentile)				
							Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95^{th} percentile)				
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a moderately modified condition or better.	The Rapid Habitat Assessment Method must be implemented	Instream and Riparian habitat Integrity category ≥ C (≥ 62)				
						Biota	Aquatic Invertebrates	The integrity of the macroinvertebrate community within the system must be improved, by improving the water quality from a nutrient perspective.	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic	An ecological category of C/D must be met. The Average Score Per Taxon value of > 4.8 must be achieved.				

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IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
									biomonitoring annually using the South African Scoring System 5 methodology.	
							Diatoms	Water quality improvement is required from a nutrient perspective.	Conduct a diatom assessment annually.	The Specific Pollution Index should be > 9.2 (C category).
MB Vals	III	Vals (C60B, C60C, C60D, C60E, C60F) (from the Pauciflora spruit confluence to the Kroonval weir) (Major tributaries Elandspruit, Liebenberg stroom and Blomspruit)	V2	MB 3	C	Biota	Fish	Instream biota must be in moderately modified condition or better. The requirements of fish species of ecological importance and with particular flow and water quality needs must be provided for including the limitation of migration barriers.	A baseline assessment to determine the integrity and health of the fish community should be conducted to determine the current state and potential impacts to the population. Fish Response Assessment Index (FRAI) must be utilized.	Instream and Riparian habitat Integrity category ≥ C (≥ 62) Fish ecological category: ≥ C (≥ 62) Macro-invertebrate ecological category:≥ C (≥ 62) Instream Ecostatus category ≥ C (≥ 62) Hydrological category ≥ C (≥ 62) With monthly flow requirements as specified. Water Quality category: ≥ C (≥ 62)
MB Vals	III	Serfontein Dam (C60D)	V3			Quantity	Low flows	The downstream maintenance low flow requirements of node MB 3 must be met to support a healthy condition for the ecosystem.	Total Ecological Water Requirement (node MB3) = 33.464 million cubic metres/annum (25.41% of the Virgin Mean Annual Runoff) Maintenance flows (percentage value of naturalised flow distribution) Drought flows (percentage value of naturalised flow distribution)	Month / Maintenance Low Flows: cubic metres/second / Percentile / Drought Flows: cubic metres/second / Percentile Oct 0.3200 60 0.0261 99 Nov 0.6655 70 0.0077 99 Dec 0.8307 70 0.0000 99 Jan 1.1537 80 0.0373 99 Feb 1.2475 70 0.0703 99 Mar 1.1455 60 0.0523 99 Apr 0.6917 60 0.0000 99 May 0.3566 40 0.0373 99 Jun 0.1991 50 0.0386 99 Jul 0.1340 70 0.0075 99 Aug 0.1568 60 0.0411 99 Sep 0.2600 30 0.0000 99
						Quality	Nutrients	Concentration of nutrients in the dam must be improved to sustain ecosystem health and the water quality requirements of water users. Dam should be maintained in a mesotrophic state.	Dissolved Inorganic Nitrogen as Nitrogen Orthophosphate as Phosphorus Nitrate & Nitrite as Nitrogen	≤ 0.50 milligrams/litre (50^{th} percentile) ≤ 0.015 milligrams/litre (50^{th} percentile) ≤ 0.25 milligrams/litre (50^{th} percentile) ≤ 6 milligrams/litre (95^{th} percentile)

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IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
MB Vals	III	Serfontein Dam (C60D)	V3		C				Chlorophyll-*a*	≤ 0.025 milligrams/litre (50^{th} percentile)
							Salts	Salinity in the dam must be maintained to support ecosystem health and water quality requirements of the downstream water users.	Electrical conductivity	≤ 65 milliSiemens/metre (95^{th} percentile)
						Quality	Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95^{th} percentile)
						Biota	Fish	The downstream maintenance low flow requirements of node MB 3 in RU V2 must be met to support a healthy condition for the ecosystem and users. The importance of the Dam as a fish refuge must be protected. This includes ecologically and recreationally important fish species. The importance of the Dam for abstraction and ecological flow releases must be protected.	Maintenance of low flow releases as specified for node MB 3 in RU V2. Habitat requirements and health of specified ecologically and recreationally important fish species as specified. Habitat requirements and health of specified ecologically and recreationally important aquatic and semi-aquatic bird species as specified.	
		Middelspruit (C60H) (Otterspruit tributary)	V4			**Quantity**	Low flows	Flows must be maintained to support the wetland systems present.	Ecological Water Requirement for maintenance low flows	Use Desktop Reserve Model and updated Present Ecological State data to determine low flow requirements.
						Quality	Nutrients	Instream concentration of nutrients must be maintained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met. Concentrations should not be allowed to deteriorate.	Dissolved Inorganic Nitrogen as Nitrogen	≤ 0.50 milligrams/litre (50^{th} percentile)
									Nitrate & Nitrite as Nitrogen	≤ 0.25 milligrams/litre (50^{th} percentile) ≤ 6 milligrams/litre (95^{th} percentile)
									Orthophosphate as Phosphorus	≤ 0.058 milligrams/litre (50^{th} percentile)
							Salts	Instream salinity must be maintained to support the aquatic ecosystem.	Electrical conductivity	≤ 65 milliSiemens/metre (95^{th} percentile)
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a moderately modified	The Rapid Habitat Assessment Method must be implemented	Instream and Riparian habitat Integrity category ≥ C (≥ 62)

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IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
								condition or better.		
						Biota	Fish	Instream biota must be in moderately modified condition or better. The requirements of fish species of ecological importance and with particular flow and water quality needs must be provided for including the limitation of migration barriers.	A baseline assessment to determine the integrity and health of the fish community should be conducted to determine the current state and potential impacts to the population. Fish Response Assessment Index (FRAI) must be utilized.	Fish ecological category: ≥ C (≥ 62) Macro-invertebrate ecological category:≥ C (≥ 62) Instream Ecostatus category ≥ C (≥ 62) Hydrological category ≥ C (≥ 62) With monthly flow requirements as specified. Water Quality category: ≥ C (≥ 62)
							Aquatic Invertebrates	The integrity of the macroinvertebrate community within the system must be maintained.	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually using the South African Scoring System 5 methodology.	Maintain the current C category by ensuring the Average Score Per Taxon is >5.0.
MB Vals	III	Vals (C60G, C60J) (From Kroonvaal weir to the Vaal River confluence) (Nuwejaar spruit and Skikspruit tributaries)	V5	EWR 14	C/D	Quantity	Low flows	The maintenance low flows and drought flows must be attained so that the environmental flows requirements are met to support a healthy condition for the ecosystem and users.	Total Maintenance low flow and drought flow Ecological Water Requirement (EWR 14) = 8.003 million cubic metres/annum (5.49% of the Virgin Mean Annual Runoff) Maintenance flows (percentage value of naturalised flow distribution) Drought flows (percentage value of naturalised flow distribution)	
							High Flows	The maintenance high flows must be attained so that the environmental flows	Total Maintenance high flow Ecological Water Requirement (EWR 14) =	

Month	Maintenance Low Flows		Drought Flows	
	cubic metres/ second	Per-cen-tile	cubic metres/ second	Per-cen-tile
Oct	0.153	70	0.003	99
Nov	0.276	80	0.005	99
Dec	0.333	80	0.006	99
Jan	0.447	90	0.008	99
Feb	0.484	80	0.008	99
Mar	0.444	80	0.008	99
Apr	0.285	80	0.000	99
May	0.166	70	0.003	99
Jun	0.112	80	0.002	99
Jul	0.087	90	0.002	99
Aug	0.095	90	0.002	99
Sep	0.133	70	0.000	99

Month	Maintenance High Flows	
	cubic metres/ second	Percentile

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IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit	
								requirements are met to support a healthy condition for the ecosystem.	16.969 million cubic metres/annum (11.64% of the Virgin Mean Annual Runoff)	Oct	0.000	99
										Nov	1.653	50
										Dec	0.000	99
										Jan	0.697	90
										Feb	2.7	60
									Maintenance high flows (percentage value of naturalised flow distribution)	Mar	1.6	60
										Apr	0.000	99
										May	0.000	99
										Jun	0.000	99
										Jul	0.000	99
										Aug	0.000	99
										Sep	0.000	99
						Quality	Nutrients	Instream concentration of nutrients must sustain aquatic ecosystem health. Concentrations should not be allowed to deteriorate.	Dissolved Inorganic Nitrogen as Nitrogen	≤ 1.50 milligrams/litre (50th percentile)	
									Orthophosphate as Phosphorus	≤ 0.125 milligrams/litre (50th percentile)	
									Nitrate & Nitrite as Nitrogen	≤ 1.35 milligrams/litre (50th percentile) ≤ 6 milligrams/litre (95th percentile)	
									Chlorophyll-*a* concentrations should be monitored as a response indicator against the resource quality objective nutrient concentrations.	Chlorophyll-*a* Periphyton ≤ 1.7 milligrams/square metre (50th percentile) Chlorophyll-*a* Phytoplankton ≤ 0.025 milligrams/litre (50th percentile)	
MB Vals	III	Vals (C60G, C60J) (From Kroonvaal weir to the Vaal River confluence) (Nuwejaar spruit and Skikspruit tributaries	V5	EWR 14	C/D	Quality	Salts	Instream salinity should not deteriorate.	Electrical conductivity	≤ 85 milliSiemens/metre (95th percentile)	
							Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95th percentile)	
							System variables	pH must be maintained at present state.	pH range	7.0 (5th percentile) and 8.6 (95th percentile).	
								A baseline assessment to determine the present state instream turbidity is required.	Turbidity	A 10% variation from background concentration is allowed.	

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IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a better than largely modified condition or better.	The Rapid Habitat Assessment Method must be implemented.	Instream and Riparian habitat Integrity category ≥ C/D (≥ 58)
						Biota	Fish	Instream biota must be in a better than largely modified condition. The requirements of fish species of ecological importance and with particular flow and water quality needs must be provided for including the limitation of migration barriers. The importance of the RU as a refuge for fish in the Middle Vaal River must be maintained.	Fish Response Assessment Index (FRAI) must be utilized. The ecological specifications and Thresholds of Potential Concern for Ecological Water Requirement site 14 must be adhered to.	Fish ecological category: ≥ C/D (≥ 58) Macro-invertebrate ecological category:≥ C/D (≥ 58) Instream Ecostatus category ≥ C/D (≥ 58) Hydrological category ≥ C/D (≥ 58) With monthly flow requirements as specified. Water Quality category:≥ C/D (≥ 58)
							Aquatic Invertebrates	The Present Ecological State must be improved to a C category.	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually using the South African Scoring System 5 methodology. The ecological specifications and Thresholds of Potential Concern for Ecological Water Requirement site 14 must be adhered to.	The South African Scoring System 5 score must be >110 and the Average Score Per Taxon > 5.2.

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Table 5: Resource Quality Objectives for RIVERS AND DAMS in priority Resource Units in the Integrated Unit of Analysis (SCHOONSPRUIT)

IUA	Class	River/Dam	Resource Unit	Node	Ecological category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit				
										Month	*Maintenance Low Flows*		*Drought Flows*	
											cubic metres/second	*Percentile*	*cubic metres/second*	*Percentile*
MC Schoonspruit	III	Koekemoerspruit (C24A)	SK1	MC 5	D	Quantity	Low flows	The maintenance low flows and drought flows must be attained to support a healthy condition for the ecosystem and users.	Total Ecological Water Requirement (node MC5) = 4.691 million cubic metres/annum (17.91% of the Virgin Mean Annual Runoff)	Oct	0.0202	70	0.0037	99
										Nov	0.0409	80	0.0039	99
										Dec	0.0571	40	0.0112	99
									Maintenance flows (percentage value of naturalised flow distribution)	Jan	0.1038	40	0.0112	99
										Feb	0.1682	40	0.0165	99
										Mar	0.2012	70	0.0149	99
										Apr	0.1246	60	0.0000	99
									Drought flows (percentage value of naturalised flow distribution)	May	0.0504	50	0.0037	99
										Jun	0.0243	70	0.0039	99
										Jul	0.0179	70	0.0000	99
									The mine water and wastewater treatment works discharges in relation to the required instream flows will have to be managed in future to ensure the maintenance low in the river.	Aug	0.0138	80	0.0000	99
										Sep	0.0104	70	0.0000	99
						Quality	Nutrients	Instream concentration of nutrients must be improved to sustain aquatic ecosystem health and ensure the prescribed ecological category is met. Concentrations should not be allowed to deteriorate.	Dissolved Inorganic Nitrogen as nitrogen	≤ 3.0 milligrams/litre (50^{th} percentile				
									Orthophosphate as Phosphorus	≤ 0.125 milligrams/litre (50^{th} percentile)				
									Nitrate & Nitrite as Nitrogen	≤ 2.5 milligrams/litre (50^{th} percentile) ≤ 6 milligrams/litre (95^{th} percentile)				
							Salts	Instream salinity must be improved to acceptable levels to support a healthy aquatic ecosystem and the water quality requirements of water users.	Electrical conductivity					
									The salinity needs to be improved significantly from the present state to meet the required limit of 85 milliSiemens/ metre. A phased approach over a twenty year period is to be used to achieve the limit of 85 milliSiemens/metre.	≤ 85 milliSiemens/metre (95^{th}percentile) A numerical limit of 110 milliSiemens/ metre (95^{th}percentile) to be met by the 10^{th} year after publication date of the Government Notice. Resource Quality Objective numerical limit to be achieved by the 20^{th} year after publication date of the Government Notice.				
									Sulphate	≤ 250 milligrams/litre (95^{th}percentile) A numerical limit of 400 milligrams/ litre (95^{th}percentile) to be met by the 10^{th} year after publication date of the Government Notice. Resource Quality Objective				

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IUA	Class	River/Dam	Resource Unit	Node	Ecological category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
										numerical limit to be achieved by the 20th year after publication date of the Government Notice.
									Magnesium	≤100 milligrams/litre (95th percentile)
MC Schoonspruit	III	Koekemoer-spruit (C24A)	SK1	MC 5	D	Quality	Toxics	The concentrations of toxins should not be at a level that is toxic to aquatic organisms and a threat to human health.	Cyanide (free)	≤ 0.050 milligrams/litre (95th percentile)
									Aluminium	≤ 0.1 milligrams/litre (95th percentile)
									Manganese	≤ 0.250 milligrams/litre (95th percentile)
									Iron	≤ 0.25 milligrams/litre (95th percentile)
									Uranium	≤ 0.03 milligrams/litre (95th percentile)
									Ammonia as Nitrogen	≤ 0.1milligrams/litre (95th percentile)
									A screening level whole effluent toxicity test should be conducted at four trophic levels and should the results show toxicity greater than 1 (limited to not acutely toxic) further definitive tests are required.	
							Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95th percentile)
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a largely modified condition or better.	The Rapid Habitat Assessment Method must be implemented.	Instream and Riparian habitat Integrity category ≥ D (≥ 42)
						Biota	Fish	Instream biota must be in a largely modified condition or better. The requirements of fish species of ecological importance and with particular flow and water quality needs must be provided for.	A baseline assessment to determine the integrity and health of the fish community should be conducted to determine the current state and potential impacts to the population. Fish Response Assessment Index (FRAI) must be utilized.	Fish ecological category: ≥ ≥ D (≥ 42) Macro-invertebrate ecological category:≥ D (≥ 42) Instream Ecostatus category≥ D (≥ 42) Hydrological category≥ D (≥ 42) With monthly flow requirements as specified. Water Quality category:≥ D (≥ 42)
							Diatoms	Water quality improvement is required from a nutrient perspective.	Specific Pollution Index. Conduct a diatom assessment annually.	The Specific Pollution Index score should be > 5.0.

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IUA	Class	River/Dam	Resource Unit	Node	Ecological category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
MC Schoonspruit	III	Schoonspruit Eye (C24C)	SK2	MC 1	C	Quantity	Low flows	The maintenance low flows and drought flows must be attained to support a healthy condition for the ecosystem and users.	There is depletion of the groundwater resources which is impacting on the flow and water quality of the Schoonspruit Eye water due to irrigation water use. The water quality of the eye is currently good and it is important to maintain this quality as irrigation and domestic water users are dependent on the Schoonspruit eye for water supply.	Use Desktop Reserve Model and updated Present Ecological State data to determine low flow requirements.
									Ecological Water Requirement for maintenance low flows and drought flows	
						Quality	Nutrients	Instream concentration of nutrients must be maintained to sustain aquatic ecosystem health of the Eye and protect the good water quality present. Concentrations should not be allowed to deteriorate. The current water quality ecological status of the Schoonspruit Eye must be maintained.	Nitrate & Nitrite as Nitrogen	≤ 2.5 milligrams/litre (50th percentile) ≤ 6 milligrams/litre (95th percentile)
									Orthophosphate as Phosphorus	≤ 0.020 milligrams/litre (50th percentile)
									Chlorophyll-a	≤ 0.010 milligrams/litre (50th percentile)
							Salts	Salinity levels at the Schoonspruit eye are low and must be maintained at the present state. Salinity levels should not deteriorate.	Electrical conductivity	≤ 55 milliSiemens/metre (95th percentile)
							System variables	pH must be maintained at present state.	pH range	6.0 (5th percentile) and 8.5 (95th percentile)

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IUA	Class	River/Dam	Resource Unit	Node	Ecological category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
MC Schoonspruit	III	Taaibosspruit (C24F)	SK3	MC 2	C	Habitat	Instream Habitat	Instream and Riparian habitat must be in a largely natural condition or better. The habitat is unique to the catchment area and must be maintained at the prescribed ecological condition. Instream biota must be in a largely natural condition or better. The requirements of species of ecological importance and with particular flow and water quality needs must be provided for.	The Rapid Habitat Assessment Method must be implemented.	Instream and Riparian habitat Integrity category ≥ B (≥ 82) Fish ecological category:≥ B (≥ 82) Macro-invertebrate ecological category:≥ B (≥ 82) Instream Ecostatus category≥ B (≥ 82) Hydrological category ≥ B (≥ 82) With monthly flow requirements as specified. Water Quality category: A (> 92)
						Quantity	Low flows	The maintenance low flows and drought flows must be attained to support a healthy condition for the ecosystem and users.	Total Ecological Water Requirement (node MC2) = 4.147 million cubic metres/annum (21.27% of the Virgin Mean Annual Runoff) Maintenance flows (percentile value of naturalised flow distribution) Drought flows (percentage value of naturalised flow distribution)	
						Quality	Salts	The instream salinity must be maintained at the present state to support the aquatic ecosystem and the water quality requirements of the water users. Salinity levels should not deteriorate.	Electrical conductivity	≤ 65 milliSiemens/metre (95th percentile)

Month	Maintenance Low Flows		Drought Flows	
	cubic metres/second	Percentile	cubic metres/second	Percentile
Oct	0.0239	60	0.0075	99
Nov	0.0278	70	0.0039	99
Dec	0.0310	70	0.0037	99
Jan	0.0743	70	0.0149	99
Feb	0.1484	60	0.0124	99
Mar	0.1605	60	0.0112	99
Apr	0.1073	70	0.0270	99
May	0.0489	80	0.0224	99
Jun	0.0313	90	0.0201	99
Jul	0.0246	99	0.0153	99
Aug	0.0202	99	0.0119	99
Sep	0.0170	70	0.0096	99

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IUA	Class	River/Dam	Resource Unit	Node	Ecological category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
MC Schoonspruit	III	Schoonspruit (C24D, C24E) (From below eye to the Kaalspruit confluence) (Rietspruit and Strydfontein-loop tributaries)	SK4	MC 3	C/D	Quantity	Low flows	The maintenance low flows and drought flows must be attained to support a healthy condition for the ecosystem and users.	Ecological Water Requirement for maintenance low flows	Use Desktop Reserve Model and updated Present Ecological State data to determine low flow requirements.
						Quality	Nutrients	Instream concentration of nutrients must be maintained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Dissolved Inorganic Nitrogen as Nitrogen	≤ 3.0 milligrams/litre (50^{th} percentile)
									Orthophosphate as Phosphorus	≤ 0.125 milligrams/litre (50^{th} percentile)
									Nitrate & Nitrite as Nitrogen	≤ 2.5 milligrams/litre (50^{th} percentile) ≤ 6 milligrams/litre (95^{th} percentile)
							Salts	The instream salinity must be maintained at the current state to support the aquatic ecosystem and the water quality requirements of the water users.	Electrical conductivity	≤ 75 milliSiemens/metre (95^{th}percentile)
							Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95^{th} percentile)
		Schoonspruit (C24D, C24E) (From below eye to the Kaalspruit confluence) (Rietspruit and Strydfontein-loop tributaries)	SK4	MC 3	C/D	Habitat	Instream Habitat	Instream and Riparian habitat must be in a better than largely modified condition.	The Rapid Habitat Assessment Method must be implemented.	Instream and Riparian habitat Integrity category ≥ C/D (≥ 58)
						Biota	Fish	Instream biota must be in a better than largely modified condition. The requirements of fish species of ecological importance and with particular flow and water quality needs must be provided for.	A baseline assessment to determine the integrity and health of the fish community should be conducted to determine the current state and potential impacts to the population. Fish Response Assessment Index (FRAI) must be utilized.	Fish ecological category:≥ C/D (≥ 58) Macro-invertebrate ecological category:≥ C/D (≥ 58) Instream Ecostatus category≥ C/D (≥ 58) Hydrological category≥ C/D (≥ 58) With monthly flow requirements as specified. Water Quality category:≥ C/D (≥ 58)

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IUA	Class	River/Dam	Resource Unit	Node	Ecological category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
							Aquatic Invertebrates	The integrity of the macroinvertebrate community within the system must be maintained.	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually using the South African Scoring System 5 methodology.	Maintain the current C category by ensuring the Average Score Per Taxon is >5.0.
		Schoonspruit (24F) From Kaalspruit confluence to Johan Neser Dam) (includes Buisfontein-spruit)	SK5	MC 3	C/D	Quantity	Low flows	The maintenance low flows and drought flows must be attained to support a healthy condition for the ecosystem and users.	Ecological Water Requirement for maintenance low flows	Use Desktop Reserve Model and updated Present Ecological State data to determine low flow requirements.
						Quality	Nutrients	Instream concentration of nutrients must be improved to sustain aquatic ecosystem health and ensure the prescribed ecological category is met. Concentrations should not be allowed to deteriorate.	Dissolved Inorganic Nitrogen as nitrogen	≤ 1.0 milligrams/litre (50^{th} percentile)
									Orthophosphate as Phosphorus ≤	0.125 milligrams/litre (50^{th} percentile)
									Nitrate & Nitrite as Nitrogen	≤ 2.5 milligrams/litre (50^{th} percentile) ≤ 6 milligrams/litre (95^{th} percentile)
							Salts	The instream salinity must be maintained at the present state to support the aquatic ecosystem and the water quality requirements of the water users.	Electrical conductivity	≤ 70 milliSiemens/metre (95^{th} percentile)
							Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95^{th} percentile)
							System variables	pH must be maintained at present state.	pH range	6.0 (5^{th} percentile) and 8.5 (95^{th} percentile)
MC Schoon spruit	III	Schoonspruit (24F) From Kaalspruit confluence to	SK5	MC 3	C/D	Habitat	Instream Habitat	Instream and Riparian habitat must be in a better than largely modified condition.	The Rapid Habitat Assessment Method must be implemented.	Instream and Riparian habitat Integrity category ≥ C/D (≥ 58)

IUA	Class	River/Dam	Resource Unit	Node	Ecological category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
		Johan Neser Dam) (includes Buisfontein-spruit)				Biota	Fish	Instream biota must be in a better than largely modified condition. The requirements of fish species of ecological importance and with particular flow and water quality needs must be provided for.	A baseline assessment to determine the integrity and health of the fish community should be conducted to determine the current state and potential impacts to the population. Fish Response Assessment Index (FRAI) must be utilized.	Fish ecological category:≥ C/D (≥ 58) Macro-invertebrate ecological category:≥ C/D (≥ 58) Instream Ecostatus category≥ C/D (≥ 58) Hydrological category≥ C/D (≥ 58) With monthly flow requirements as specified. Water Quality category:≥ C/D (≥ 58)
							Aquatic Invertebrates	The integrity of the macroinvertebrate community within the system must be maintained.	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually using the South African Scoring System 5 methodology.	Maintain the current C ecological category by ensuring the Average Score Per Taxon is >5.0.
		Johan Neser (Klerksdorp Dam) (C24G)	SK6			Quality	Nutrients	Concentrations of nutrients must be maintained to sustain ecosystem health and the water quality requirements of water users. Concentrations should not be allowed to deteriorate. Nutrient concentrations must be maintained in a mesotrophic state.	Dissolved Inorganic Nitrogen as Nitrogen	≤ 0.5 milligrams/litre (50^{th} percentile)
									Orthophosphate as Phosphorus	≤ 0.025 milligrams/litre (50^{th} percentile)
									Nitrate & Nitrite as Nitrogen	≤ 2.5 milligrams/litre (50^{th} percentile) ≤ 6 milligrams/litre (95^{th} percentile)
									Chlorophyll-*a*	≤ 0.025 milligrams/litre (50^{th} percentile)
							Salts	Salinity must be maintained to support ecosystem health and the water quality requirements of the water users.	Electrical conductivity	≤ 70 milliSiemens/metre (95^{th} percentile)
							Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95^{th} percentile)
						Biota	Fish	The importance of the Dam as a refuge for upstream aquatic and semi-aquatic biota must be protected. This includes ecologically and	Habitat requirements and health of specified ecologically and recreationally important fish species as specified.	

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IUA	Class	River/Dam	Resource Unit	Node	Ecological category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
								recreationally important fish species. The importance of the Dam for recreation, abstraction and ecological flow releases must be protected.		
MC Schoonspruit	III	Schoonspruit (24H) (From Johan Neser Dam to the confluence of the Vaal River) (includes Jagspruit tributary	SK7	MC 4	C/D	Quantity	Low flows	The maintenance low flows and drought flows must be attained to support a healthy condition for the ecosystem and users.	Ecological Water Requirement for maintenance and drought low flows.	Use Desktop Reserve Model and updated Present Ecological State data to determine low flow requirements for node MC 4 on the Schoonspruit.
						Quality	Nutrients	Instream concentration of nutrients must be improved to sustain aquatic ecosystem health and ensure the prescribed ecological category is met. Concentrations should not be allowed to deteriorate.	Dissolved Inorganic Nitrogen as Nitrogen	≤ 3.0 milligrams/litre (50^{th} percentile)
									Orthophosphate as Phosphorus	≤ 0.125 milligrams/litre (50^{th} percentile)
									Nitrate & Nitrite as Nitrogen	≤ 2.5 milligrams/litre (50^{th} percentile) ≤ 6 milligrams/litre (95^{th} percentile)
							Salts	The instream salinity must be improved to support the aquatic ecosystem and the water quality requirements ofwater users.	Electrical conductivity	≤ milliSiemens/metre (95^{th}percentile)
									Sulphate	≤ 200 milligrams/litre (95^{th} percentile)
							Toxics	The concentrations of toxins should not be at a level that is toxic to aquatic organisms and a threat to human health.	Cyanide (free)	≤ 0.050 milligrams/litre (95^{th} percentile)
									Aluminium	≤0.1 milligrams/litre (95^{th} percentile)
									Manganese	≤ 0.250 milligrams/litre (95^{th} percentile)
									Uranium	≤ 0.03 milligrams/litre (95^{th} percentile)
									Ammonia as Nitrogen	≤ 0.072 milligrams/litre (95^{th} percentile)
									Iron	≤ 0.25 milligrams/litre (95^{th} percentile)
										A screening level whole effluent toxicity test should be conducted at four trophic levels and should the results show toxicity greater than 1 (limited to not acutely toxic) further definitive tests are required.

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IUA	Class	River/Dam	Resource Unit	Node	Ecological category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
							Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95th percentile)
MC Schoonspruit	III	Schoonspruit (24H) (From Johan Neser Dam to the confluence of the Vaal River) (includes Jagspruit tributary	SK7	MC 4	C/D	Habitat	Instream Habitat	Instream and Riparian habitat must be in a better than largely modified condition.	The Rapid Habitat Assessment Method must be implemented.	Instream and Riparian habitat Integrity category ≥ C/D (≥ 58)
						Biota	Fish	Instream biota must be in a better than largely modified condition. The requirements of fish species of ecological importance and with particular flow and water quality needs must be provided for.	A baseline assessment to determine the current integrity and health of the fish community must be undertaken. Fish Response Assessment Index (FRAI) must be utilized.	Fish ecological category:≥ C/D (≥ 58) Macro-invertebrate ecological category:≥ C/D (≥ 58) Instream Ecostatus category≥ C/D (≥ 58) Hydrological category≥ C/D (≥ 58) With monthly flow requirements as specified at Node MC 4. Water Quality category:≥ C/D (≥ 58)
							Aquatic Invertebrates	The integrity of the macroinvertebrate community within the system must be improved through the implementation of the water quality objective specified above.	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually using the South African Scoring System 5 methodology.	The current ecological category D/E must be improved to a D ecological category. Aim to reach an Average Score Per Taxon value of > 4.2

Table 6: Resource Quality Objectives for RIVERS AND DAMS in priority Resource Units in the Integrated Unit of Analysis (UPPER SAND)

IUA	Class	River/ Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit				
										Month	Maintenance Low Flows		Drought Flows	
											cubic metres/ second	Per-cen-tile	cubic metres/ second	Per-cen-tile
MD1 Upper Sand	III	Upper Sand (C42D, C42E) (From Klipspruit confluence to Allemanskraal Dam)	US2	MD 1.1	C	Quantity	Low flows	The maintenance low flows and drought flows must be attained to support a healthy condition for the ecosystem and users.	Total Ecological Water Requirement (node MD1.1) = 17.349 million cubic metres/annum (26.13% of the Virgin Mean Annual Runoff) Maintenance flows (percentage value of naturalised flow distribution) Drought flows (percentage value of naturalised flow distribution)	Oct	0.2225	60	0.0373	99
										Nov	0.3673	80	0.0193	99
										Dec	0.4066	80	0.0112	99
										Jan	0.5615	80	0.0411	99
										Feb	0.7068	70	0.0496	99
										Mar	0.6213	70	0.0299	99
										Apr	0.4201	70	0.0231	99
										May	0.2640	50	0.0187	99
										Jun	0.1659	50	0.0000	99
										Jul	0.1094	70	0.0299	99
										Aug	0.1057	80	0.0302	99
										Sep	0.1644	60	0.0444	99
						Quality	Nutrients	Instream concentration of nutrients must be maintained to sustain aquatic ecosystem health and to ensure the prescribed ecological category is met.	Dissolved Inorganic Nitrogen as Nitrogen	≤ 0.50 milligrams/litre (50^{th} percentile)				
									Nitrate & Nitrite as Nitrogen	≤ 0.25 milligrams/litre (50^{th} percentile) ≤ 6 milligrams/litre (95^{th} percentile)				
									Orthophosphate as Phosphorus	≤ 0.058 milligrams/litre (50^{th} percentile)				
							Salts	Instream salinity must be maintained to support the aquatic ecosystem health and the water quality requirements of the water users.	Electrical conductivity	≤ 75 milliSiemens/metre (95^{th} percentile)				
							Toxics	The concentrations of toxins should not be at a level that is toxic to aquatic organisms and a threat to human health.	Ammonia as Nitrogen	≤ 0.072 milligrams/litre (95^{th} percentile)				
							Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95^{th} percentile)				

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IUA	Class	River/ Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
MD1 Upper Sand	III	Upper Sand (C42D, C42E) (From Klipspruit confluence to Allemanskraal Dam)	US2	MD 1.1	C	Biota	Fish	Instream biota must be in moderately modified condition or better. The requirements of fish species of ecological importance and with particular flow and water quality needs must be provided for.	A baseline assessment to determine the integrity and health of the fish community should be conducted to determine the current state and potential impacts to the population. Fish Response Assessment Index (FRAI) must be utilized.	Fish ecological category: ≥ C (≥ 62) Macro-invertebrate ecological category:≥ C (≥ 62) Instream Ecostatus category ≥ C (≥ 62) Hydrological category ≥ C (≥ 62) With monthly flow requirements as specified. Water Quality category: ≥ C (≥ 62)
							Aquatic Invertebrates	The integrity of the macroinvertebrate community within the system must be maintained.	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually using the South African Scoring System 5 methodology.	Maintain the current C ecological category by ensuring that the Average Score Per Taxon is >5.0.
		Allemanskraal Dam (C42E)	US3			Quantity	Low flows	The maintenance low flow requirements of the downstream node MD 2.1 must be met to support a healthy condition for the ecosystem and users.	Total Ecological Water Requirement (node MD2.1) = 29.516 million cubic metres/annum (28.34% of the Virgin Mean Annual Runoff) Maintenance flows (percentage value of naturalised flow distribution) Drought flows (percentage value of naturalised flow distribution)	Month / Maintenance Low Flows (cubic metres/second / Percentile) / Drought Flows (cubic metres/second / Percentile) Oct 0.3558 60 0.0523 99 Nov 0.6034 70 0.0270 99 Dec 0.6743 80 0.0187 99 Jan 0.9457 80 0.0709 99 Feb 1.1913 70 0.0827 99 Mar 1.0629 70 0.0523 99 Apr 0.7284 70 0.0424 99 May 0.4529 40 0.0336 99 Jun 0.2662 50 0.0193 99 Jul 0.1635 70 0.0448 99 Aug 0.1591 80 0.0627 99 Sep 0.2600 60 0.0887 99
						Quality	Nutrients	Concentration of nutrients must be maintained to sustain ecosystem health and water quality requirements of water users.	Dissolved Inorganic Nitrogen as Nitrogen	≤ 0.5 milligrams/litre (50th percentile)
									Nitrate & Nitrite as Nitrogen	≤ 0.25 milligrams/litre (50th percentile) ≤ 6 milligrams/litre (95th percentile)

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IUA	Class	River/ Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
MD1 Upper Sand	III	Allemanskraal Dam (C42E)	US3			Quality		Dam should be maintained in a mesotrophic state.	Orthophosphate as Phosphorus	≤ 0.025 milligrams/litre (50th percentile)
									Chlorophyll-*a*	≤ 0.025 milligrams/litre (50th percentile)
							Salts	The salinity in the dam must be maintained in order to support ecosystem health and the water quality requirements of the downstream water users.	Electrical conductivity	≤ 30 milliSiemens/metre (95th percentile).
							System variables	pH must be maintained at present state.	pH range	7.0 (5th percentile) and 8.5 (95th percentile)
							Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95th percentile)
						Biota	Fish	The importance of the Dam as a refuge for upstream aquatic and semi-aquatic biota must be protected. This includes ecologically and recreationally important fish species and ecologically important aquatic bird species The importance of the Dam for recreation, abstraction and ecological flow releases must be protected.	Habitat requirements and health of specified ecologically and recreationally important fish speciesaquatic bird species as specified.	
							Aquatic birds	The dam supports large numbers of a rich diversity of locally resident and migratory water fowl and associated birds. Of these the Greater Flamingo (*Phoenicopterus roseus*), Lesser Flamingo (*Phoenicopterus minor*), the Caspian Tern (*Sterna caspia*) are of conservation importance. The suitability of the dam for aquatic bird populations must be maintained through proper habitat management.	A baseline assessment should be conducted to determine the aquatic bird community around the dam.	

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Table 7: Resource Quality Objectives for RIVERS in priority Resource Units in the Integrated Unit of Analysis (LOWER SAND)

IUA	Class	River	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit				
										Month	*Maintenance Low Flows*		*Drought Flows*	
											cubic metres/ second	*Per-cen-tile*	*cubic metres/ second*	*Per-cen-tile*
MD 2 Lower Sand	III	Lower Sand (C42F, C42G,C42H) (From Allemanskraal Dam to Merriespruit confluence)	LS1	MD 2.1, MD 2.2	C	Quantity	Low flows	The maintenance low flows and drought flows must be attained to support a healthy condition for the ecosystem and users.	Total Ecological Water Requirement (node MD2.2) = 5.989 million cubic metres/annum (31.08% of the Virgin Mean Annual Runoff) Maintenance flows (percentage value of naturalised flow distribution) Drought flows (percentage value of naturalised flow distribution)	Oct	0.0459	50	0.0000	99
										Nov	0.1076	60	0.0000	99
										Dec	0.1307	60	0.0000	99
										Jan	0.2106	70	0.0037	99
										Feb	0.2534	60	0.0000	99
										Mar	0.2699	60	0.0000	99
										Apr	0.1956	50	0.0000	99
										May	0.1064	30	0.0000	99
										Jun	0.0444	30	0.0000	99
										Jul	0.0004	50	0.0000	99
										Aug	0.0056	50	0.0000	99
										Sep	0.0343	30	0.0000	99
						Quality	Nutrients	Instream concentration of nutrients must be maintained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Dissolved Inorganic Nitrogen as Nitrogen	≤ 0.50 milligrams/litre (50^{th} percentile)				
									Nitrate & Nitrite as Nitrogen	≤ 0.50 milligrams/litre (50^{th} percentile) ≤ 6 milligrams/litre (95^{th} percentile)				
									Orthophosphate as Phosphorus	≤ 0.058 milligrams/litre (50^{th} percentile)				
							Salts	The instream salinity must be maintained to support the aquatic ecosystem and the water quality requirements of the water users. Salinity levels should not deteriorate.	Electrical conductivity	≤ 65 milliSiemens/metre (95^{th} percentile)				
							System variables	pH must be maintained at present state.	pH range	6.5 (5^{th} percentile) and 8.5 (95^{th} percentile)				
							Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95^{th} percentile)				

IUA	Class	River	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a moderately modified condition or better.	The Rapid Habitat Assessment Method must be implemented	Instream and Riparian habitat Integrity category ≥ C (≥ 62)
MD 2 Lower Sand	**III**	**Lower Sand (C42F, C42G,C42H)** (From Allemanskraal Dam to Merriespruit confluence)	**LS1**	**MD 2.1, MD 2.2**	**C**	**Biota**	Fish	Instream biota must be in moderately modified condition or better through maintenance of habitat, flows, water quality.	Monitor the integrity of the fish community at a downstream point selected within the Resource Unit. A baseline assessment to determine the current integrity and health of the fish community must be undertaken. Fish Response Assessment Index (FRAI) must be utilized.	Fish ecological category: ≥ C (≥ 62) Macro-invertebrate ecological category:≥ C (≥ 62) Instream Ecostatus category ≥ C (≥ 62) Hydrological category ≥ C (≥ 62) With monthly flow requirements as specified. Water Quality category: ≥ C (≥ 62)
							Aquatic Invertebrates	The integrity of the macroinvertebrate community within the system must be maintained.	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually using the South African Scoring System 5 methodology.	Maintain the current C ecological category by ensuring that the Average Score Per Taxon is ≥5.0.
MD2 Lower Sand	**III**	**Rietspruit tributary (C42J)**	**LS2**		**D**	**Quality**	Nutrients	Instream concentration of nutrients must be improved to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Dissolved Inorganic Nitrogen as Nitrogen	≤ 3.0 milligrams/litre (50^{th} percentile)
									Nitrate & Nitrite as Nitrogen	≤ 2.5 milligrams/litre (50^{th} percentile) ≤ 6 milligrams/litre (95^{th} percentile)
									Orthophosphate as Phosphorus	≤ 0.125 milligrams/litre (50^{th} percentile)

IUA	Class	River	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
							Salts	Instream salinity must be improved to support the aquatic ecosystem and the water quality requirements of the water users and to ensure the prescribed ecological category is met.	Electrical conductivity The salinity needs to be improved significantly from the present state to meet the electrical conductivity required limit of 85 milliSiemens/metre. A phased approach over a twenty year period is to be used to achieve the limit of 85 milliSiemens/metre.	≤ 85 milliSiemens/metre (95th percentile). A numerical limit of 185 milliSiemens/metre (95th percentile) to be met by the 10th year after publication date of the Government Notice. Resource Quality Objective numerical limit to be achieved by the 20th year after publication date of the Government Notice.
							System variables	pH must be maintained at present state.	pH range	6.5 (5th percentile) and 9.2 (95th percentile).
								A baseline assessment to determine the present state instream turbidity is required.	Turbidity	A 10% variation from background concentration is allowed.
MD2 Lower Sand	III	Rietspruit tributary (C42J)	LS2		D	Quality	Toxics	The concentrations of toxins should not be at a level that is toxic to aquatic organisms and a threat to human health.	Cyanide (free)	≤ 0.050 milligrams/litre (95th percentile)
									Aluminium	≤ 0.1 milligrams/litre (95th percentile)
									Manganese	≤0.25 milligrams/litre (95th percentile)
									Iron	≤ 0.25 milligrams/litre (95th percentile)
									Uranium	≤ 0.030 milligrams/litre (95th percentile)
									Ammonia as Nitrogen	≤ 0.1 milligrams/litre (95th percentile)

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IUA	Class	River	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
									A screening level whole effluent toxicity test should be conducted at four trophic levels and should the results show toxicity greater than 1 (limited to not acutely toxic) further definitive tests are required.	
							Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95th percentile)
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a largely modified condition or better.	The Rapid Habitat Assessment Method must be implemented.	Instream and Riparian habitat Integrity category ≥ D (≥ 42)
						Biota	Fish	Instream biota must be in largely modified condition or better through maintenance of habitat, flows, water quality.	A baseline assessment to determine the integrity of the fish community should be conducted to determine the current state and localised impacts. Fish Response Assessment Index (FRAI) must be utilized.	Fish ecological category: ≥ D (≥ 42) Macro-invertebrate ecological category:≥ D (≥ 42) Instream Ecostatus category≥ D (≥ 42) Hydrological category ≥ D (≥ 42) With monthly flow requirements as specified. Water Quality category: ≥ D (≥ 42)
MD2 Lower Sand	**III**	**Lower Sand (C42J)** (Downstream Rietspruit tributary to confluence with the Vet River)	**LS3**	**MD 2.3**	**C**	**Quantity**	Low flows	The maintenance low flows and drought flows must be attained to support a healthy condition for the ecosystem and users.	Total Ecological Water Requirement (node MD 2.3) = 43.933 million cubic metres/annum (24.37% of the Virgin Mean Annual Runoff) Maintenance flows (percentage value of naturalised flow distribution) Drought flows (percentage value of naturalised flow distribution)	

Month	*Maintenance Low Flows*		*Drought Flows*	
	cubic metres/ second	*Per-cen-tile*	*cubic metres/ second*	*Per-cen-tile*
Oct	0.4014	70	0.0523	99
Nov	0.7481	80	0.0270	99
Dec	0.8658	80	0.0187	99
Jan	1.2769	80	0.1792	99
Feb	1.5828	80	0.1819	99
Mar	1.5177	80	0.1120	99
Apr	1.0849	70	0.0849	99
May	0.6440	40	0.0933	99
Jun	0.3306	50	0.0849	99
Jul	0.1404	80	0.0448	99
Aug	0.1493	90	0.0493	99
Sep	0.2986	60	0.0876	99

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IUA	Class	River	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
MD2 Lower Sand	III	Lower Sand (C42J) (Downstream Rietspruit tributary to confluence with the Vet River)	LS3	MD 2.3	C	Quality	Nutrients	Instream concentration of nutrients must be improved to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Dissolved Inorganic Nitrogen as Nitrogen	≤ 1.5 milligrams/litre (50th percentile)
									Nitrate & Nitrite as Nitrogen	≤ 1.0 milligrams/litre (50th percentile)
									Orthophosphate as Phosphorus	≤ 6 milligrams/litre (95th percentile)
							Salts	Salinity levels are significantly high. Instream salinity must be improved to support the aquatic ecosystem and the water quality requirements of the water users.	Electrical conductivity	≤ 0.058 milligrams/litre (50th percentile)
										≤ 85 milliSiemens/metre (95th percentile)
							Toxics	The concentrations of toxins should not be at a level that is toxic to aquatic organisms and a threat to human health.	Cyanide (free)	≤ 0.045 milligrams/litre (95th percentile)
									Aluminium	≤ 0.1 milligrams/litre (95th percentile)
									Manganese	≤ 0.25 milligrams/litre (95th percentile)
									Iron	≤ 0.3 milligrams/litre (95th percentile)
									Uranium	≤ 0.03 milligrams/litre (95th percentile)
									Ammonia as Nitrogen	≤ 0.072 milligrams/litre (95th percentile)
									A screening level whole effluent toxicity test should be conducted at four trophic levels and should the results show toxicity greater than 1 (limited to not acutely toxic) further definitive tests are required.	
							Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95th percentile)
							System variables	pH must be maintained at present state.	pH range	6.5 (5th percentile) and 9.2 (95th percentile)
								A baseline assessment to determine the present state instream turbidity is required.	Turbidity	A 10% variation from background concentration is allowed.

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IUA	Class	River	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a moderately modified condition or better.	The Rapid Habitat Assessment Method must be implemented.	Instream and Riparian habitat Integrity category ≥ C (≥ 62)
						Biota	Fish	Instream biota must be in moderately modified condition or better through maintenance of habitat, flows, water quality.	A baseline assessment to determine the integrity and health of the fish community should be conducted to determine the current state and potential impacts to the population. Fish Response Assessment Index (FRAI) must be utilized.	Fish ecological category: ≥ C (≥ 62) Macro-invertebrate ecological category:≥ C (≥ 62) Instream Ecostatus category ≥ C (≥ 62) Hydrological category ≥ C (≥ 62) With monthly flow requirements as specified. Water Quality category: ≥ C (≥ 62)
							Aquatic Invertebrates	The integrity of the macroinvertebrate community within the system must be maintained.	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually using the South African Scoring System 5 methodology.	Maintain the D ecological category by ensuring that the Average Score Per Taxon is >5 4.0.

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Table 8: Resource Quality Objectives for RIVERS AND DAMS in priority Resource Units in the Integrated Unit of Analysis (UPPER VET)

IUA	Class	River / Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit				
											Maintenance Low Flows		*Drought Flows*	
										Month	*cubic metres/ second*	*Per-centile*	*cubic metres/ second*	*Per-centile*
ME1 Upper Vet	II	Upper Vet (C41A, C41B) (Klein Vet and Laaispruit tributary catchments) (C41C, C41D) (Vet and Leeuspruit tributary catchments to Erfenis Dam)	UV1 and UV2	ME 1.1, ME 1.2	C	Quantity	Low flows	The maintenance low flows and drought flows must be attained to support a healthy condition for the ecosystem and users.	Total Ecological Water Requirement (node ME 1.1) = 18.861 million cubic metres/annum (26.19% of the Virgin Mean Annual Runoff)	Oct	0.2180	60	0.0373	99
										Nov	0.3376	70	0.0386	99
										Dec	0.2950	80	0.0187	99
										Jan	0.4719	70	0.0075	99
									Maintenance flows (percentage value of naturalised flow distribution)	Feb	0.6477	70	0.0289	99
										Mar	0.6481	70	0.0261	99
										Apr	0.6320	60	0.0248	99
										May	0.3188	50	0.0336	99
									Drought flows (percentage value of naturalised flow distribution)	Jun	0.1917	50	0.0270	99
										Jul	0.1299	70	0.0362	99
										Aug	0.1254	80	0.0351	99
										Sep	0.1539	60	0.0424	99
											Maintenance Low Flows		*Drought Flows*	
										Month	*cubic metres/ second*	*Per-centile*	*cubic metres/ second*	*Per-centile*
									Total Ecological Water Requirement (node ME 1.2) = 20.946 million cubic metres/annum (25.59% of the Virgin Mean Annual Runoff)	Oct	0.2386	60	0.0448	99
										Nov	0.3684	70	0.0463	99
										Dec	0.3218	80	0.0224	99
										Jan	0.5141	70	0.0075	99
									Maintenance flows (percentage value of naturalised flow distribution)	Feb	0.7056	70	0.0331	99
										Mar	0.7056	70	0.0299	99
										Apr	0.6424	60	0.0231	99
										May	0.3480	50	0.0336	99
									Drought flows (percentage value of naturalised flow distribution)	Jun	0.2099	50	0.0309	99
										Jul	0.1426	70	0.0403	99
										Aug	0.1378	80	0.0392	99
										Sep	0.1690	70	0.0471	99
						Quality	Nutrients	Instream concentration of nutrients must be maintained to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Dissolved Inorganic Nitrogen as Nitrogen	≤ 0.50 milligrams/litre (50^{th} percentile)				
									Nitrate & Nitrite as Nitrogen	≤ 0.25 milligrams/litre (50^{th} percentile) ≤ 6 milligrams/litre (95^{th} percentile)				
									Orthophosphate as Phosphorus	≤ 0.020 milligrams/litre (50^{th} percentile)				

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IUA	Class	River / Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
ME1 Upper Vet	II	Upper Vet (C41A, C41B) (Klein Vet and Laaispruit tributary catchments) (C41C, C41D) (Vet and Leeuspruit tributary catchments to Erfenis Dam)	UV1 and UV2	ME 1.1, ME 1.2	C	Quality	Salts	Instream salinity must be maintained to support the aquatic ecosystem and the water quality requirements of the water users.	Electrical conductivity	≤ 70 milliSiemens/metre (95th percentile)
							System variables	pH must be maintained at present state.	pH range	6.5 (5th percentile) and 8.4 (95th percentile)
								A baseline assessment to determine the present state instream turbidity is required	Turbidity	A 10% variation from background concentration is allowed.
							Toxics	The concentrations of toxins should not be at a level that is toxic to aquatic organisms and a threat to human health.	Ammonia as Nitrogen	≤ 0.072 milligrams/litre (95th percentile)
							Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95th percentile)
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a moderately modified condition or better.	The Rapid Habitat Assessment Method must be implemented.	Instream and Riparian habitat Integrity category ≥ C (≥ 62)
						Biota	Fish	Instream biota must be in moderately modified condition or better through maintenance of habitat, flows, water quality.	A baseline assessment to determine the current integrity and health of the fish community must be undertaken. Fish Response Assessment Index (FRAI) must be utilized.	Fish ecological category: ≥ C (≥ 62) Macro-invertebrate ecological category:≥ C (≥ 62) Instream Ecostatus category ≥ C (≥ 62) Hydrological category ≥ C (≥ 62) With monthly flow requirements as specified. Water Quality category: ≥ C (≥ 62)

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IUA	Class	River / Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
ME1 Upper Vet	II	Soutspruit (C41E)	UV3	ME 1.3	B/C	Biota	Aquatic Invertebrates	The integrity of the macroinvertebrate community within the system must be maintained.	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually using the South African Scoring System 5 methodology.	Maintain the current C ecological category by ensuring that the Average Score Per Taxon is > 4.8.
						Quantity	Low flows	The maintenance low flows and drought flows must be attained to support a healthy condition for the ecosystem and users.	Total Ecological Water Requirement (node ME 1.3) = 2.369 million cubic metres/annum (61.17% of the Virgin Mean Annual Runoff) Maintenance flows (percentage value of naturalised flow distribution) Drought flows (percentage value of naturalised flow distribution)	
						Quality	Salts	Instream salinity must be maintained at the current state to support the aquatic ecosystem and the water quality requirements of the water users.	Electrical conductivity	≤ 55 milliSiemens/metre (95th percentile)
							System variables	pH must be maintained at present state.	pH range	6.5 (5th percentile) and 8.5 (95th percentile)
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a better than moderately modified condition.	The Rapid Habitat Assessment Method must be implemented.	Instream and Riparian habitat Integrity category ≥ B/C (≥ 78)

Month	Maintenance Low Flows		Drought Flows	
	cubic metres/ second	Per-centile	cubic metres/ second	Per-centile
Oct	0.0310	40	0.0000	99
Nov	0.0563	50	0.0000	99
Dec	0.0474	50	0.0000	99
Jan	0.0859	40	0.0000	99
Feb	0.1228	40	0.0000	99
Mar	0.1247	40	0.0000	99
Apr	0.1115	30	0.0000	99
May	0.0526	20	0.0000	99
Jun	0.0243	20	0.0000	99
Jul	0.0116	40	0.0000	99
Aug	0.0105	50	0.0015	99
Sep	0.0166	40	0.0019	99

IUA	Class	River / Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
						Biota	Fish	Instream biota must be in better than moderately modified condition through maintenance of habitat, flows, water quality.	A baseline assessment to determine the integrity and health of the fish community should be conducted to determine the current state. Fish Response Assessment Index (FRAI) must be utilized	Fish ecological category: ≥ B/C (≥ 78) Macro-invertebrate ecological category: ≥ B/C (≥ 78) Instream Ecostatus category ≥ B/C (≥ 78) Hydrological category ≥ B/C (≥ 78) With monthly flow requirements as specified. Water Quality category: ≥ B/C (≥ 78)
							Aquatic Invertebrates	The integrity of the macroinvertebrate community within the system must be maintained.	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually using the South African Scoring System 5 methodology.	Maintain the current B category by ensuring the Average Score Per Taxon is >5.0.
ME1 Upper Vet	II	Erfenis Dam	UV4			Quantity	Low flows	The downstream maintenance low flow requirements of node ME 2.1 must be met to support a healthy condition for the ecosystem and users.	Ecological Water Requirement for maintenance low flows.	Use Desktop Reserve Model and updated Present Ecological State data to determine low flow requirements.
						Quality	Nutrients	Concentration of nutrients must be improved to sustain ecosystem health and water quality requirements of water users. Dam should be maintained in a mesotrophic state.	Dissolved Inorganic Nitrogen as Nitrogen	≤ 0.50 milligrams/litre (50^{th} percentile)
									Orthophosphate as Phosphorus	≤ 0.025 milligrams/litre (50^{th} percentile)
									Nitrate & Nitrite as Nitrogen	≤ 0.25 milligrams/litre (50^{th} percentile) ≤ 6 milligrams/litre (95^{th} percentile)
									Chlorophyll-*a*	≤ 0.025 milligrams/litre (50^{th} percentile)

IUA	Class	River / Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
							Salts	The salinity in the dam must be maintained in order to support ecosystem health and the water quality requirements of the downstream water users.	Electrical conductivity	≤ 30 milliSiemens/ metre (95th percentile)
							System variables	pH must be maintained at present state.	pH range	6.5 (5th percentile) and 8.5 (95th percentile)
							Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95th percentile)
						Habitat	Dam	The importance of the Dam as a fish refuge and for semi-aquatic biota in upstream reaches must be protected. This includes ecologically and recreationally important fish species. The importance of the Dam for recreation, eco-torism, abstraction and ecological flow releases must be protected.		
						Biota	Fish	The dam provides an important fish refuge area and must be managed to maintain the upstream recruitment.	The fish population must be monitored through health assessment studies. Suitable abundances should be determined. Monitoring should be conducted annually.	

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Table 9: Resource Quality Objectives for RIVERS in priority Resource Units in the Integrated Unit of Analysis (LOWER VET)

IUA	Class	River	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
ME 2 Lower Vet	III	Lower Vet (C41F, C41G, C41H, C41J) (From Erfenis Dam to Sand River confluence) (includes the Taaibosspruit tributary)	LV1	ME 2.1	C	Quantity	Low flows	The maintenance low flows and drought flows must be attained to support a healthy condition for the ecosystem and users.	Ecological Water Requirement for maintenance low flows (ME 2.1)	Use Desktop Reserve Model and updated Present Ecological State data to determine low flow requirements.
						Quality	Nutrients	Instream concentration of nutrients must be improved to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Dissolved Inorganic Nitrogen as Nitrogen	≤ 0.50 milligrams/litre (50th percentile)
									Nitrate & Nitrite as Nitrogen	≤ 0.25 milligrams/litre (50th percentile) ≤ 6 milligrams/litre (95th percentile)
									Orthophosphate as Phosphorus	≤ 0.030 milligrams/litre (50th percentile)
							Salts	Instream salinity must be maintained. Salinity levels should not be allowed to deteriorate.	Electrical conductivity	≤ 75 milliSiemens/metre (95th percentile)
							System variables	pH must be maintained at present state.	pH range	6.5 (5th percentile) and 8.5 (95th percentile)
							Toxics	The concentrations of toxins should not be at a level that is toxic to aquatic organisms and a threat to human health.	Ammonia as Nitrogen	≤ 0.072 milligrams/litre (95th percentile)
							Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95th percentile)
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a moderately modified condition or better.	The Rapid Habitat Assessment Method must be implemented.	Instream and Riparian habitat Integrity category ≥ C (≥ 62)
						Biota	Fish	Instream biota must be in moderately modified condition or better. The requirements of fish species of ecological importance and with particular flow and water quality needs must be provided for.	A baseline assessment to determine the integrity and health of the fish community should be conducted to determine the current state. Fish Response Assessment Index (FRAI) must be utilized	Fish ecological category: ≥ C (≥ 62) Macro-invertebrate ecological category:≥ C (≥ 62) Instream Ecostatus category ≥ C (≥ 62) Hydrological category ≥ C (≥ 62) With monthly flow requirements as specified. Water Quality category: ≥ C (≥ 62)

IUA	Class	River	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
							Aquatic Invertebrates	The integrity of the macroinvertebrate community within the system must be improved to the recommended ecological category.	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually using the South African Scoring System 5 methodology.	An ecological category of C must be met. The Average Score Per Taxon value of > 4.8 must be achieved.
ME 2 Lower Vet	III	Lower Vet (C43A, C43C, C43D) (Downstream Sand River Confluence to Bloemhof Dam)	LV2	EWR 15	C/D	Quantity	Low flows	The maintenance and drought flows must be attained so that the environmental flows requirements are met to support a healthy condition for the ecosystem and users.	Total Maintenance low flow and drought flow Ecological Water Requirement (EWR 15) = 19.765 million cubic metres/annum (7.81% of the Virgin Mean Annual Runoff) Maintenance flows (percentage value of naturalised flow distribution) Drought flows (percentage value of naturalised flow distribution)	
							High Flows	The high flows must be attained so that the environmental flows requirements are met to support a healthy condition for the ecosystem	Total Maintenance high flow Ecological Water Requirement (EWR 15) = 32.309 million cubic metres/annum (12.76% of the Virgin Mean Annual Runoff) Maintenance high flows (percentage value of naturalised flow distribution)	

	Maintenance Low Flows		Drought Flows	
Month	cubic metres/second	Percentile	cubic metres/second	Percentile
Oct	0.250	99	0.142	99
Nov	0.420	99	0.135	99
Dec	0.446	99	0.071	99
Jan	0.67	99	0.34	99
Feb	0.857	90	0.327	99
Mar	0.849	90	0.213	99
Apr	0.701	90	0.17	99
May	0.403	99	0.269	99
Jun	0.227	99	0.177	99
Jul	0.129	99	0.129	99
Aug	0.130	99	0.13	99
Sep	0.190	99	0.19	99

	Maintenance High Flows	
Month	cubic metres per second	Percentile
Oct	0.00	99
Nov	3.462	30
Dec	0.00	99
Jan	6.358	30
Feb	0.00	99
Mar	2.355	60
Apr	0.00	99

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IUA	Class	River	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit		
										May	0.00	99
										Jun	0.00	99
										Jul	0.00	99
										Aug	0.00	99
										Sep	0.00	99
ME 2 Lower Vet	III	Lower Vet (C43A, C43C, C43D) (Downstream Sand River Confluence to Bloemhof Dam)	LV2	EWR 15	C/D	Quality	Nutrients	Instream concentration of nutrients must sustain aquatic ecosystem health. Concentrations should not be allowed to deteriorate.	Dissolved Inorganic Nitrogen as Nitrogen	≤ 0.7 milligrams/litre (50^{th} percentile)		
									Nitrate & Nitrite as Nitrogen	≤ 0.50 milligrams/litre (50^{th} percentile) ≤ 6 milligrams/litre (95^{th} percentile)		
									Orthophosphate as Phosphorus	≤ 0.058 milligrams/litre (50^{th} percentile)		
									Chlorophyll-*a* concentrations should be monitored as a response indicator against the resource quality objective nutrient concentrations.	Chlorophyll-*a* Periphyton should be between ≤ 84 milligrams/square metre (50^{th} percentile) Chlorophyll-*a* Phytoplankton ≤ 0.025 milligrams/litre (50^{th} percentile)		
							Salts	Salinity levels must be maintained.	Electrical conductivity	≤ 80 milliSiemens/metre (95^{th} percentile)		
									Sulphate	≤ 120 milligrams/litre (95^{th} percentile)		
									Chloride	≤100 milligrams/litre (95^{th} percentile)		
							System variables	pH must be maintained at present state.	pH range	6.5 (5^{th} percentile) and 9.2 (95^{th} percentile)		
							Toxics	The concentrations of toxins should not be at a level that is toxic to aquatic organisms and a threat to human health.	Aluminium	≤ 0.1 milligrams/litre (95^{th} percentile)		
									Manganese	≤ 0.25 milligrams/litre (95^{th} percentile)		
									Iron	≤0.75 milligrams/litre (95^{th} percentile)		
									Uranium	≤ 0.07 milligrams/litre (95^{th} percentile)		

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IUA	Class	River	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
									Ammonia as Nitrogen	≤ 0.072 milligrams/litre (95th percentile)
										A screening level whole effluent toxicity test should be conducted at four trophic levels and should the results show toxicity greater than 1 (limited to not acutely toxic) further definitive tests are required.
ME 2 Lower Vet	III	Lower Vet (C43A, C43C, C43D) (Downstream Sand River Confluence to Bloemhof Dam)	LV2	EWR 15	C/D	Quality	Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95th percentile)
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a better than largely modified condition.	The Rapid Habitat Assessment Method must be implemented. The ecological specifications for Ecological Water Requirement site 15 as determined in terms of the Comprehensive Reserve Determination Study (2010) must be implemented.	Instream and Riparian habitat Integrity category ≥ C/D (≥ 58)
							Riparian Habitat	Exotic invasive riparian plant species must be controlled.	The ecological specifications for Ecological Water Requirement site 15 as determined in terms of the Comprehensive Reserve Determination Study (2010) must be implemented.	Instream and Riparian habitat Integrity category ≥ C/D (≥ 58)
						Biota	Fish	Instream biota must be in a better than largely modified condition. The requirements of fish species of ecological importance and with particular flow and water quality needs must be provided for. The value of the RU as fish refuge must be maintained and migration barriers limited.	Fish Response Assessment Index (FRAI) must be utilized. The ecological specifications and thresholds of potential concern for Ecological Water Requirement site 15 must be adhered to.	Fish ecological category:≥ C/D (≥ 58) Macro-invertebrate ecological category:≥ C/D (≥ 58) Instream Ecostatus category≥ C/D (≥ 58) Hydrological category≥ C/D (≥ 58) With monthly flow requirements as specified. Water Quality category:≥ C/D (≥ 58)

IUA	Class	River	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
							Aquatic Invertebrates	The integrity of the macroinvertebrate community within the system must be maintained.	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually using the South African Scoring System 5 methodology. The ecological specifications and thresholds of potential concern for Ecological Water Requirement site 15 must be adhered to.	Maintain the current C/D ecological category by ensuring the South African Scoring System 5 score must be > 90 and the Average Score Per Taxon is > 4.8.

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Table 10: Resource Quality Objectives for RIVERS AND DAMS in priority Resource Units in the Integrated Unit of Analysis (VAAL RIVER)

IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical Limit				
MF Vaal River	III	Vaal River (C24B) (From Vermaasdrift to upstream Schoonspruit confluence)	VB 1.1	EWR 12	D	Quantity	Low flows	The maintenance and drought flows must be attained so that the environmental flows requirements are met to support a healthy condition for the ecosystem and users.	Total Maintenance low flow and drought flow Ecological Water Requirement (EWR 12) = 346.444 million cubic metres/annum (22% of the Virgin Mean Annual Runoff) Maintenance flows (percentage value of naturalised flow distribution) Drought flows (percentage value of naturalised flow distribution)	Month	Maintenance Low Flows		Drought Flows	
											cubic metres/ second	Per-cen-tile	cubic metre/ second	Per-cen-tile
										Oct	5.421	99	4.284	99
										Nov	6.592	99	5.21	99
										Dec	6.783	99	5.361	99
										Jan	7.588	99	5.997	99
										Feb	9.845	99	6.486	99
										Mar	7.72	99	6.101	99
										Apr	6.521	99	5.154	99
										May	5.619	99	4.441	99
										Jun	5.184	99	4.097	99
										Jul	5.035	99	3.98	99
										Aug	3.954	99	3.125	99
										Sep	4.321	99	3.415	99
							High flows	The high flows must be attained so that the environmental flows requirements are met to support a healthy condition for the ecosystem	Total Maintenance high flow Ecological Water Requirement (EWR 12) = 250.042 million cubic metres/annum (15.88% of the Virgin Mean Annual Runoff) Maintenance high flows (percentage value of naturalised flow distribution)	Month	Maintenance High Flows			
											cubic metres per second	Percentile		
										Oct	0.00	99		
										Nov	14.6	90		
										Dec	0.00	99		
										Jan	14.129	90		
										Feb	72.071	20		
										Mar	0.00	99		
										Apr	0.00	99		
										May	0.00	99		
										Jun	0.00	99		
										Jul	0.00	99		
										Aug	0.00	99		
										Sep	0.00	99		
						Quality	Nutrients	Instream concentration of nutrients must be improved to sustain aquatic ecosystem health and ensure the prescribed ecological category and the water quality requirements of the water users are met.	Nitrate & Nitrite as Nitrogen	≤ 1.35 milligrams/litre (50th percentile) ≤ 6 milligrams/litre (95th percentile)				
									Dissolved Inorganic Nitrogen as Nitrogen	≤1.65 milligrams/litre (50th percentile)				
									Orthophosphate as Phosphorus	≤ 0.125 milligrams/litre (50th percentile)				
									Chlorophyll-*a*	≤ 0.075 milligrams/litre (50th percentile)				

IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical Limit
MF Vaal River	III	Vaal River (C24B) (From Vermaasdrift to upstream Schoonspruit confluence)	VB 1.1	EWR 12	D	Quality	Salts	Instream salinity must be improved to meet the recommended ecological category and the water quality requirements of the water users in the Middle Vaal River. The river must be managed to assimilate the impacts of the land based activities and inflow of the Koekemoerspruit and Schoonspruit.	Electrical conductivity	≤ 70 milliSiemens/metre (95th percentile)
									Sulphate	≤160 milligrams/litre (95th percentile)
									Magnesium	≤ 33 milligrams/litre (95th percentile)
									Total Dissolved Solids	≤ 560 milligrams/litre (95th percentile)
							System variables	pH must be maintained at present state.	pH range	pH range 7.5 (5th percentile) - 9.2 (95th percentile)
							Toxics	The concentrations of toxins should not be at a level that is toxic to aquatic organisms and a threat to human health.	Cyanide (free)	≤ 0.050 milligrams/litre (95th percentile)
									Aluminium	≤ 0.1 milligrams/litre (95th percentile)
									Manganese	≤ 0.25 milligrams/litre (95th percentile)
									Iron	≤ 0.25 milligrams/litre (95th percentile)
									Uranium	≤ 0.030 milligrams/litre (95th percentile)
									Ammonia as Nitrogen	≤ 0.1 milligrams/litre (95th percentile)
									A screening level whole effluent toxicity test should be conducted at four trophic levels and should the results show toxicity greater than 1 (limited to not acutely toxic) further definitive tests are required.	
							Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95th percentile)

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IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical Limit
MF Vaal River	III	Vaal River (C24B) (From Vermaasdrift to upstream Schoonspruit confluence)	VB 1.1	EWR 12	D	Habitat	Instream Habitat	Instream and Riparian habitat must be in a largely modified condition or better.	The Rapid Habitat Assessment Method must be implemented. The ecological specifications for Ecological Water Requirement site 12 as determined in terms of the Comprehensive Reserve Determination Study (2010) must be implemented.	Instream and Riparian habitat integrity category ≥ D (≥ 42)
							Riparian Habitat	Exotic invasive plant species must be controlled.	The ecological specifications for Ecological Water Requirement site 12 as determined in terms of the Comprehensive Reserve Determination Study (2010) must be implemented.	Instream and Riparian habitat integrity category ≥ D (≥ 42)
						Biota	Fish	Instream biota must be in a largely modified condition or better. The specific requirements of fish species of ecological importance and with particular flow and water quality needs must be provided for. The specific requirements of aquatic bird species of ecological importance must provided for.	Fish Response Assessment Index (FRAI) must be utilized. The ecological specifications and thresholds of potential concern for Ecological Water Requirement site 12 must be adhered to.	Fish ecological category: ≥ C (≥ 62) Macro-invertebrate ecological category:≥ D (≥ 42) Habitat requirements and health of specified ecologically and recreationally important fish species aquatic bird species as specified. Instream Ecostatus category≥ D (≥ 42) Hydrological category≥ D (≥ 42) With monthly flow requirements as specified. Water Quality category:≥ D (≥ 42)

IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical Limit		
							Aquatic Invertebrates	The integrity of the macroinvertebrate community within the system and recommended ecological category must be maintained.	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually using the South African Scoring System 5 methodology. The ecological specifications and thresholds of potential concern for Ecological Water Requirement site 12 must be adhered to.	Maintain the current C/D ecological category by ensuring the South African Scoring System 5 score must be >100 and the Average Score Per Taxon value must be > 5.0.		
MF Vaal River	III	Vaal River (C24B)	VB 1.1	EWR12	D	Biota	Aquatic Birds	The area supports more 5000 water fowl and occasionally exceeds the 1% of the bio-geographical population threshold of several water fowl species although no comprehensive data are available. This is one of few sites in South Africa holding a substantial population of a White-backed Night Heron (*Gorsachius leuconotus*) and over twenty pairs of Goliath Heron (*Ardea goliath*). The suitability of this stretch of river for aquatic bird populations must be maintained through proper habitat management.	A baseline assessment should be conducted to determine the aquatic bird community around the dam.			
							Diatoms	Water quality improvement is required from a nutrient perspective.	Conduct a diatom assessment annually.	The Specific Pollution Index should be > 5.0.		
		Vaal River	VB 1.2,	EWR 13	C/D	Quantity	Low flows	The maintenance and	Total Maintenance	*Month*	*Maintenance Low Flows*	*Drought Flows*

IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical Limit			
		(C24J) (From Schoonspruit confluence to upstream Vals River confluence) (C25C, C25F) (From Vals River confluence to Bloemhof Dam-Quaternary catchment)	VB 1.3					drought flows must be attained so that the environmental flows requirements are met to support a healthy condition for the ecosystem and users.	low flow and drought flow Ecological Water Requirement (EWR 13) = 309.184 million cubic metres/annum (11.65% of the Virgin Mean Annual Runoff)		cubic metres/ second	Per-cen-tile	cubic metres/ second	Per-cen-tile
										Oct	7.254	90	0.029	99
										Nov	10.7	99	0.043	99
										Dec	11.931	99	0.047	99
										Jan	13.892	99	0.055	99
										Feb	18.531	99	0.073	99
										Mar	15.172	99	0.06	99
										Apr	11.532	90	0.046	80
									Maintenance flows (percentage value of naturalised flow distribution)	May	7.732	90	0.031	90
										Jun	5.863	99	0.024	99
										Jul	5.278	99	0.022	99
									Drought flows (percentage value of naturalised flow distribution)	Aug	4.78	99	0.02	99
										Sep	5.177	99	0.022	99
MF Vaal River	III	Vaal River (C24J) (From Schoonspruit confluence to upstream Vals River confluence) (C25C, C25F) (From Vals River confluence to Bloemhof Dam-Quaternary catchment)	VB 1.2, VB 1.3	EWR 13	C/D	Quantity	High flows	The high flows must be attained so that the environmental flows requirements are met to support a healthy condition for the ecosystem	Total Maintenance high flow Ecological Water Requirement (EWR 13) = 298.797 million cubic metres/annum (11.26% of the Virgin Mean Annual Runoff)	Month	Maintenance High Flows			
											cubic metres per second	Percentile		
										Oct	0.00	99		
										Nov	14.6	90		
										Dec	0.00	99		
										Jan	14.129	99		
										Feb	92.225	50		
										Mar	0.00	99		
										Apr	0.00	99		
									Maintenance high flows (percentage value of naturalised flow distribution)	May	0.00	99		
										Jun	0.00	99		
										Jul	0.00	99		
										Aug	0.00	99		
										Sep	0.00	99		
						Quality	Nutrients	Instream concentration of nutrients must be improved to sustain aquatic ecosystem health and ensure the prescribed ecological category and the water quality requirements	Nitrate & Nitrite as Nitrogen	≤ 1.35 milligrams/litre (50th percentile) ≤ 6 milligrams/litre (95th percentile)				
									Dissolved Inorganic Nitrogen as Nitrogen	≤ 1.65 milligrams/litre (50th percentile)				

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IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical Limit
MF Vaal River	III	Vaal River (C24J) (From Schoonspruit confluence to upstream Vals River confluence) (C25C, C25F) (From Vals River confluence to Bloemhof Dam-Quaternary catchment)	VB 1.2, VB 1.3	EWR 13	C/D	Quality	Salts	of the water users are met.	Orthophosphate as Phosphorus	≤ 0.125 milligrams/litre (50th percentile)
									Chlorophyll-*a*	≤ 0.075 milligrams/litre (50th percentile)
								Instream salinity must be improved to meet the recommended ecological category and the water quality requirements of the water users in the Middle Vaal River. The water resource must be managed to assimilate the impacts of the land based activities.	Electrical conductivity	≤ 70 milliSiemens/metre (95th percentile)
									Sulphate	≤160 milligrams/litre (95th percentile)
									Magnesium	≤ 33 milligrams/litre (95th percentile)
									Total Dissolved Solids	≤ 560 milligrams/litre (95th percentile)
							System variables	pH must be maintained at present state.	pH range	7.5 (5th percentile) - 9.2 (95th percentile)
							Toxics	The concentrations of toxins should not be at a level that is toxic to aquatic organisms and a threat to human health.	Cyanide (free)	≤ 0.050 milligrams/litre (95th percentile)
									Aluminium	≤ 0.1 milligrams/litre (95th percentile)
									Manganese	≤ 0.25 milligrams/litre (95th percentile)
									Iron	≤ 0.25 milligrams/litre (95th percentile)
									Uranium	≤ 0.030 milligrams/litre (95th percentile)
									Ammonia as Nitrogen	≤ 0.1 milligrams/litre (95th percentile)
										A screening level whole effluent toxicity test should be conducted at four trophic levels and should the results show toxicity greater than 1 (limited to not acutely toxic) further definitive tests are required.

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IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical Limit
						Habitat	Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95th percentile)
							Instream Habitat	Instream and Riparian habitat must be in a largely modified condition or better.	The Rapid Habitat Assessment Method must be implemented at prescribed intervals as stated in the ecological specifications to ensure that a 10% increase or decrease in current habitat integrity is avoided as this is undesirable. The ecological specifications for Ecological Water Requirement site 13 as determined in terms of the Comprehensive Reserve Determination Study (2010) must be implemented.	Instream and Riparian habitat Integrity category ≥ D (≥ 42)
							Riparian Habitat	Exotic invasive plant species must be controlled.	The ecological specifications for Ecological Water Requirement site 13 as determined in terms of the Comprehensive Reserve Determination Study (2010) must be implemented.	Instream and Riparian habitat Integrity category ≥ D (≥ 42)

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IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical Limit
MF Vaal River	III	Vaal River (C24J) (From Schoonspruit confluence to upstream Vals River confluence) (C25C, C25F) (From Vals River confluence to Bloemhof Dam-Quaternary catchment)	VB 1.2, VB 1.3	EWR 13	C/D	Biota	Fish	Instream biota must be in a largely modified condition or better. The specific requirements of fish species of ecological importance and with particular flow and water quality needs must be provided for. The specific requirements of aquatic bird species of ecological importance must provided for.	Fish Response Assessment Index (FRAI) must be utilized. The ecological specifications and thresholds of potential concern for Ecological Water Requirement site 13 must be adhered to.	Fish ecological category: ≥ C (≥ 62) Macro-invertebrate ecological category:≥ D (≥ 42) Habitat requirements and health of specified ecologically and recreationally important fish species aquatic bird species as specified. Instream Ecostatus category≥ D (≥ 42) Hydrological category≥ D (≥ 42) With monthly flow requirements as specified. Water Quality category:≥ D (≥ 42)
							Aquatic Invertebrates	The integrity of the macroinvertebrate community within the system must be maintained.	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually using the South African Scoring System 5 methodology. The ecological specifications and thresholds of potential concern for Ecological Water Requirement site 13 must be adhered to.	An ecological category of C/D must be met. To ensure this the South African Scoring System 5 score must be >100 and the Average Score Per Taxon value must > than 5.0.
							Diatoms	Water quality improvement is required from a nutrient perspective.	Conduct a diatom assessment annually.	The Specific Pollution Index should be > 8.9 (C/D category).
		Vierfontein-spruit	VB2		D	Quality	Salts	Instream salinity must be improved to sustain the aquatic ecosystem.	Electrical conductivity	≤ 85 milliSiemens/metre (95th percentile)
									Sulphate	≤ 300 milligrams/litre (95th percentile)
							System variables	pH must be maintained at present state.	pH range	7.5 (5thpercentile) - 9.2 (95th percentile)

IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical Limit
MF Vaal River	III	Ystersprui, Matjiespruit, Klipspruit, Leeudoring-spruit, Wolvespruit, Makwassie-spruit (C24J, C25A, C25C,C25D)	VB3		B and C	Quality	Toxics	The concentrations of toxins should not be at a level that is toxic to aquatic organisms and a threat to human health.	Aluminium	≤ 0.1 milligrams/litre (95th percentile)
									Manganese	≤ 0.25 milligrams/litre (95th percentile)
									Iron	≤ 0.25 milligrams/litre (95th percentile)
						Quantity	Low flows	The maintenance and drought flows must be maintained.	Ecological Water Requirement for maintenance low flows	Use Desktop Reserve Model and updated Present Ecological State data to determine low flow requirements.
							Nutrients	Instream concentration of nutrients must be improved to sustain aquatic ecosystem health and ensure the prescribed ecological category is met.	Nitrate & Nitrite as Nitrogen	≤ 1.35 milligrams/litre (50th percentile) ≤ 6 milligrams/litre (95th percentile)
									Dissolved Inorganic Nitrogen as Nitrogen	≤ 1.65 milligrams/litre (50th percentile)
									Orthophosphate as Phosphorus	≤ 0.125 milligrams/litre (50th percentile)
									Chlorophyll-a	≤ 0.05 milligrams/litre (50th percentile)
							Salts	Instream salinity must be maintained at the present state to support the aquatic ecosystem and the water quality requirements of the water users.	Electrical conductivity	Matjiespruit and Leeudoringspruit: ≤ 55 milliSiemens/metre (95th percentile)
										Ystersprui, Makwassiespruit and Wolwespruit: ≤ 85 milliSiemens/metre (95th percentile)
							System variables	pH must be maintained at present state.	pH range	7.5 (5th percentile) - 9.2 (95th percentile)
								A baseline assessment to determine the present state instream turbidity is required	Turbidity	A 10% variation from background concentration is allowed.
							Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95th percentile)

IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical Limit
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a moderately modified condition or better.	The Rapid Habitat Assessment Method must be implemented. All land use activities impacting on the riparian zone and thus causing an effect on water resources should be authorised and regulated to prevent deterioration of the habitat.	Instream and Riparian habitat Integrity category ≥ C (≥ 62)
							Riparian Habitat	Instream and Riparian habitat must be in a largely natural condition. Instream and Riparian habitat must be in a moderately modified condition or better.	All land use activities impacting on riparian zone should be authorised and regulated to prevent deterioration of the habitat.	Instream and Riparian habitat Integrity category ≥ B (≥ 82) Instream and Riparian habitat Integrity category ≥ C (≥ 62)
MF Vaal River	III	Ysterspruit, Matjiespruit, Klipspruit, Leeudoring-spruit, Wolwespruit, Makwassie-spruit (C24J, C25A, C25C,C25D)	VB3		B and C	Biota	Fish	Instream biota must be in a largely natural condition and contribute to the sustainability of the fish assemblages in the Vaal River Instream biota must be in a moderately modified condition or better and contribute to the sustainability of the fish assemblages in the Vaal River	A baseline assessment to determine the integrity of the fish community should be conducted to determine the current state. Fish Response Assessment Index (FRAI) must be utilized.	Fish ecological category:≥ B (≥ 82) Macro-invertebrate ecological category: ≥ B (≥ 82) Instream Ecostatus category ≥ B (≥ 82) Hydrological category ≥ B (≥ 82) With monthly flow requirements as specified. Water Quality category: ≥ B (≥ 82) Fish ecological category:≥ C (≥ 62) Macro-invertebrate ecological category: ≥ C (≥ 62) Instream Ecostatus category ≥ C (≥ 62) Hydrological category ≥ C (≥ 62) With monthly flow requirements as specified. Water Quality category: ≥C (≥ 62)

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IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical Limit
							Aquatic Invertebrates	In order to maintain the ecological integrity of the macroinvertebrate community within the Middle Vaal River the tributaries need to be sustainably managed. The Present Ecological State must be maintained.	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually using the South African Scoring System 5 methodology	The Present Ecological State must be maintained.
		Sandspruit (C25C, C25B, C25F, C43B)	VB4		C	Quality	Nutrients	Instream concentration of nutrients must be improved to sustain aquatic ecosystem health and ensure the present ecological category is maintained.	Orthophosphate as Phosphorus	≤ 0.091 milligrams/litre (50th percentile)
									Nitrate & Nitrite as Nitrogen	≤ 0.25 milligrams/litre (50th percentile) ≤ 6 milligrams/litre (95th percentile)
							Salts	Instream salinity must be improved to sustain the aquatic ecosystem.	Electrical conductivity	≤ 70 milliSiemens/metre (95th percentile)
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a moderately modified condition or better.	The Rapid Habitat Assessment Method must be implemented.	Instream and Riparian habitat Integrity category ≥ C (≥ 62)
						Biota	Fish	Instream biota must be in moderately modified condition or better through maintenance of habitat, flows, water quality. The importance of the lower reaches as refuge habitat must be sustained.	Fish Response Assessment Index (FRAI) must be utilized.	Fish ecological category: ≥ C (≥ 62) Macro-invertebrate ecological category:≥ C (≥ 62) Instream Ecostatus category ≥ C (≥ 62) Hydrological category ≥ C (≥ 62) With monthly flow requirements to be specified. Water Quality category: ≥ C (≥ 62)
							Aquatic Invertebrates	The integrity of the macroinvertebrate community within the system must be maintained.	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic	Maintain the current C category by ensuring the Average Score Per Taxon is >5.0.

IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical Limit
									biomonitoring annually using the South African Scoring System 5 methodology.	
MF Vaal River	III	Bamboes-spruit (C25E)	VB5		D	Quality	Nutrients	Instream concentration of nutrients must be improved to sustain aquatic ecosystem health.	Dissolved Inorganic Nitrogen as Nitrogen	≤ 1.62 milligrams/litre (50^{th} percentile)
									Nitrate & Nitrite as Nitrogen	≤ 1.50 milligrams/litre (50^{th} percentile) ≤ 6 milligrams/litre (95^{th} percentile)
									Orthophosphate as Phosphorus	≤ 0.125 milligrams/litre (50^{th} percentile)
							Salts	The instream salinity must be maintained to support the aquatic ecosystem and the water quality requirements of the water users. Salinity levels should not deteriorate.	Electrical conductivity	≤ 80 milliSiemens/metre (95^{th} percentile)
									Sulphate	≤160 milligrams/litre (95^{th} percentile)
							System variables	pH must be maintained.	pH range	7.5 (5^{th} percentile) - 9.2 (95^{th} percentile)
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a largely modified condition or better.	Ensure that mining activities impacting on the riparian zone and instream habitats are authorised and regulated to prevent deterioration of the habitat. Rehabilitation management plans must be developed to improve the habitat integrity to obtain a minimum D category. The Rapid Habitat Assessment Method must be implemented	Instream and Riparian habitat Integrity category ≥ D (≥ 42)
							Riparian Habitat	Invasive riparian plant species must be controlled.	Rehabilitation must be undertaken which must include the removal of invasive exotic species from the riparian zone.	Instream and Riparian habitat Integrity category ≥ D (≥ 42)

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AIDS HELPLINE: 0800-0123-22 Prevention is the cure

IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical Limit
						Biota	Fish	Instream biota must be in largely modified condition or better. The importance of the lower reaches must be maintained as fish refuge and nursery area for species moving in from the Bloemhof Dam.	A baseline assessment to determine the integrity and health of the fish community should be conducted to determine the current state and potential impacts to the population. This assessment should include a fish tissue contamination study to determine heavy metal concentrations. Fish Response Assessment Index (FRAI) must be utilized.	Instream and Riparian habitat Integrity category ≥ D (≥ 42) Fish ecological category: ≥ D (≥ 42) Macro-invertebrate ecological category:≥ D (≥ 42) Instream Ecostatus category≥ D (≥ 42) Hydrological category ≥ D (≥ 42) With monthly flow requirements to be specified. Water Quality category: ≥ D (≥ 42)
MF Vaal River	**III**	**Bloemhof Dam (C25E, C25F, C43D)**	**VB6**			**Quantity**	Low flows	The downstream maintenance low flow requirements of EWR 16 must be met to support a healthy condition for the ecosystem.	Total Maintenance low flow and drought flow Ecological Water Requirement (EWR 16) = 360.296 million cubic metres/annum (21.2% of the Virgin Mean Annual Runoff) Maintenance flows (percentage value of naturalised flow distribution) Drought flows (percentage value of naturalised flow distribution)	
						Quality	Nutrients	Concentration of nutrients in the dam must be improved to sustain ecosystem health	Nitrate & Nitrite as Nitrogen	≤ 0.15 milligrams/litre (50th percentile) ≤ 6 milligrams/litre (95th percentile)

Month	*Maintenance Low Flows*		*Drought Flows*	
	cubic metres/ second	*Per-cen-tile*	*cubic metres/ second*	*Per-cen-tile*
Oct	6.333	99	4.905	99
Nov	6.794	99	5.262	99
Dec	6.971	99	5.4	99
Jan	8.266	99	6.403	99
Feb	11.052	99	2.646	99
Mar	8.974	99	6.952	99
Apr	7.086	99	5.489	99
May	5.71	99	4.423	99
Jun	4.717	99	3.654	99
Jul	4.669	99	3.617	99
Aug	4.46	99	3.454	99
Sep	5.632	99	4.363	99

IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical Limit
MF Vaal River	III	Bloemhof Dam (C25E, C25F, C43D)	VB6					and the water quality requirements of water users. Nutrient levels must not be allowed to deteriorate. Dam has the potential to be hypertrophic.	Dissolved Inorganic Nitrogen as Nitrogen	≤ 0.25 milligrams/litre (50th percentile)
									Orthophosphate as Phosphorus	≤ 0.015 milligrams/litre (50th percentile)
								Dam should be maintained in a mesotrophic state.	Chlorophyll - *a*	≤ 0.050 milligrams/litre (50th percentile)
							Salts	The salinity in the dam must be maintained in order to support ecosystem health and the water quality requirements of the downstream water users.	Electrical conductivity	≤ 70 milliSiemens/metre (95th percentile)
									Sulphate	≤150 milligrams/litre (95th percentile)
									Sodium	≤ 80 milligrams/litre (95th percentile)
									Chloride	≤ 75 milligrams/litre (95th percentile)
									Total Dissolved Solids	≤ 560 milligrams/litre (95th percentile)
						Quality	System variables	pH must be maintained.	pH range	7.5 (5th percentile) - 9.2 (95th percentile)
							Pathogens	The presence of pathogens should pose a low risk to human health.	*Escherichia coli*	≤ 130 counts/100 millilitres (95th percentile)
						Habitat	Dam Habitat	The importance of the Dam as a fish refuge and for aquatic and semi-aquatic biota must be protected. This includes ecologically and recreationally important fish species. The requirements of ecologically important bird species must provide for. The importance of the Dam for recreation, eco-torism, abstraction and ecological flow releases must be protected.		
						Biota	Fish	The dam provides a refuge area and is important in maintaining the upstream species.	The fish population must be monitored through health assessment studies. Suitable abundances should be determined. Monitoring should be conducted annually.	

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IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical Limit
						Biota	Aquatic Birds	The dam supports a high number of water fowl, with several mixed heronries supporting a variety of breeding egrets, herons and cormorants. A number of bird species recorded at the dam and in the adjacent terrestrial habitats are listed as threatened species. These include amongst others the Greater Flamingo (*Phoenicopterus roseus*), Lesser Flamingo (*Phoenicopterus minor*), the Caspian Tern (*Sterna caspia*) and African Marsh Harrier (*Circus ranivorus*).The suitability of the dam for aquatic bird populations must be maintained through proper habitat management.	A baseline assessment should be conducted to determine the aquatic bird community around the dam.	

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Table 11: Regional and Resource Unit specific Resource Quality Objectives for GROUNDWATER in the MIDDLE VAAL WMA

IUA	Ground-water unit	Resource Unit	Resource Quality Objective	Indicator/ Measure	Numerical Limit
MC – Schoonspruit	RU G1	SK3	Groundwater flow directions in the non-dolomite aquifer part of the resource unit should not be reversed from it natural flow directions towards the drainage systems (specifically the Schoonspruit and Taaiboschspruit cases).	Water Level - Depth to groundwater level from ground elevation. Time series water level monitoring (Monthly) required to comply with limits.	Dolomite aquifer systems: Saturation levels should not be lowered >6metres below an average water level depth of ~23metres in the dolomite aquifer area. Due to ground stability risks, the water table range limit should remain 100% compliance
			Groundwater balance (aquifer recharge and irrigation abstraction) needs to be assessed for wet and dry cycles (to secure groundwater yields during dry periods).	Abstraction - Abstraction Volume (Q) Time series water level monitoring (Monthly) required to comply with limits.	Annual abstraction rates should be in balance with recharge rates. Abstraction of groundwater within a 500m zone from the river course should be regulated.
			Nitrate values in the recharge area must be maintained to support domestic water users.	Nutrients - Nitrate	Nitrate < 6 milligrams/litre in recharge area (based on quality dataset). Specified annual trend should not approach the 95th percentile.
			Salinity levels should not increase. Concentrations must be maintained at levels to support water users.	Salts - Electrical Conductivity	Electrical Conductivity ≤ 50milliSiemens/metre; based on typical groundwater quality in dolomite aquifers Specified annual trend should not approach the 95th percentile.
MC - Schoonspruit	RU - G2	SK 2, SK 4		Water Level - Depth to groundwater level Time series water level monitoring (Monthly) required to comply to limits.	Dolomite aquifer systems: Saturation levels should not be lowered >6 metres below an average water level depth of ~23 metres in the dolomite aquifer area. Due to ground stability risks, the water table range limit should remain 100% compliance.
			The flow at the Schoonspruit Eye must be maintained at a sustainable volume maintain the Eye and to support downstream users.	Abstraction - Abstraction rate (Q) Continuous Flow measurement at Eye	The allocable volumes in the catchment of the Eye should not be higher than 4Mm^3/m (~48 million cubic metres/annum) – and should be correlated with latest flow data at flow gauge C2H024 and irrigation requirements downstream from the Eye (based on historical flow measurements). Proper irrigation schedules need to be developed and applied at all times (100% compliance). Groundwater balance (aquifer recharge and irrigation abstraction) needs to be assessed for wet and dry

IUA	Ground-water unit	Resource Unit	Resource Quality Objective	Indicator/ Measure	Numerical Limit
					cycles.
MC - Schoonspruit	RU - G2	SK 2, SK 4	Nitrate values in the recharge area should not increase to > 2 milligrams /litre.	Nutrients - Nitrate Bi-annual monitoring	Nitrate values in the recharge area should not increase to > 2 milligrams /litre.
			Salinity levels should not increase. Concentrations must be maintained at levels to support the catchment of the Eye.	Salts - Electrical Conductivity	Electrical conductivity ≤ 50 milliSiemens/metre in the catchment of the Eye Groundwater criteria for the dolomite aquifer should be based on the groundwater quality criteria of the Schoonspruit dolomite water compartment as observed by the Department of Water and Sanitation. The Schoonspruit Eye catchment area (~5 square kilometre area) must be managed as a protected area in terms of the Department of Water Affair's Dolomitic Guidelines Document (August 2006).
MC – Schoonspruit; MF – Vaal; MA - Renoster	Venters-dorp aquifers	VB 3, VB 5, SK 5, SK 6, SK 7 and R5	Medium to long-term declining water level trends should be managed in a sustainable manner.	Water Level (metres below ground level) Water level (wl) recession rate, dh (metres/day): $dh=(h_0-h_n)/t$; where h_0=wl on day1; h_n=wl on day 30; t=number of days. Water use monitoring dataset	A specific recession rate must be calculated for each licensed water user based on the area, use and compliance status (in cubic metres/square kiliometres/annum). Critical rate: <0.25 metres/month.
			The regional groundwater quality criteria should be managed to meet the water use requirements for domestic, agricultural and or industrial users.	Nutrients – Nitrate (as Nitrogen) Annual water quality analysis	Domestic:< 10 milligrams/litre; Stock water:<110 milligrams/litre; Irrigation: <10 milligrams/litre

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IUA	Ground-water unit	Resource Unit	Resource Quality Objective	Indicator/ Measure	Numerical Limit
MC – Schoonspruit; MF – Vaal; MA - Renoster	Venters-dorp aquifers	VB 3, VB 5, SK 5, SK 6, SK 7 and R5			Salinity: Electrical conductivity <150 milliSiemens/metre for domestic use; Total dissolved solids <1000 milligrams/litre for stock watering; Electrical conductivity < 40 milliSiemens/metre for irrigation water Macro elements – Specific levels for fluoride (<1.0 milligrams/litre), sodium (<200 milligrams/litre), chloride (<200 milligrams/litre) and sulphate (<400 milligrams/litre). 100% compliance
				Electrical conductivity and specific macro elements for domestic use; Electrical Conductivity and Sodium Adsorption Ratio for Irrigation water use. Annual water quality analysis.	
				Toxics: specific trace metal constituents. Annual water quality analyses must be undertaken.	Domestic Use: Trace metals –Arsenic (<0.05 milligrams/litre), Cadmium (<0.005 milligrams/litre), Copper (<1.0 milligrams/litre), Iron (<0.5 milligrams/litre), manganese (<0.4 milligrams/litre) and zinc (<10 milligrams/litre). For stock and irrigation water: Refer to appropriate guideline.
MA - Renoster, MB - Vals, MD1 - Upper Sand, MD2 - Lower Sand, ME1- Upper Vet, ME2 - Lower Vet, MF - Vaal to Bloemhof Dam	Karoo aquifers	UV1, UV2, UV3, UV4, LV1, LV2, US2, US3, LS1, LS2, LS3, V2, V3, V4, V5, R2, R3, R4, R5, VB4, VB2, VB6	Medium to long-term declining water level trends should remain sustainable	Water Level (m below ground level) Water level (wl) recession rate, dh (metres/day): $dh=(h_0-h_n)/t$; where h_0=wl on day1; h_n=wl on day 30; t=number of days. Water use monitoring dataset	A specific recession rate must be calculated for each licensed water user based on the area and use and compliance (in $m^3/km^2/a$). Critical rate: <0.25metres/month

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IUA	Ground-water unit	Resource Unit	Resource Quality Objective	Indicator/ Measure	Numerical Limit
MA - Renoster, MB - Vals, MD1 - Upper Sand, MD2 - Lower Sand, ME1- Upper Vet, ME2 - Lower Vet, MF - Vaal to Bloemhof Dam	Karoo aquifers	UV1, UV2, UV3, UV4, LV1, LV2, US2, US3, LS1, LS2, LS3, V2, V3, V4, V5, R2, R3, R4, R5, VB4, VB2, VB6	Where water use (m^3/a) is higher than requirements for Reserve, Schedule 1 and General Authorizations, balance between annual recharge and abstraction on specified property area (hectares) must be satisfied.	Water use > Reserve, Schedule 1 and General Authorisations Abstraction rate Q ($mm/km^2/a$) and recharge ($mm/km^2/a$). (Refer to Groundwater Resources Assessment Phase II or more recent updated recharge estimation in $mm/km^2/a$). Estimate local Stress Index, SI(%): SI(%)=Use (Q)/Recharge	Abstraction rate < Average recharge (based on the licensed area average recharge estimation). Stress Index <60% - Category A investigation, Stress Index =60-100% - Category B investigation; and Stress Index >100% - Category C investigation Water Use Registration (million cubic metres/annum)
			The regional groundwater quality criteria should be based on the water use requirement for domestic, agricultural and or industrial limits.	Nutrients: Nitrate (as Nitrogen) Annual water quality analysis	Domestic use:<10 milligrams/litre; Stock water use:<110 milligrams/litre; Irrigation use: <10 milligrams/litre
				Salts: Electrical conductivity and specific macro elements for all domestic use. Electrical Conductivity and Sodium Adsorption Ratio for Irrigation waters. Annual water quality analysis.	Electrical conductivity <150 milliSiemens/metre for domestic use; Total dissolved solids <1000 milligrams/litre for stock watering; Electrical conductivity < 40 milliSiemens/metre for irrigation water Macro elements – Specific levels for fluoride (<1.0 milligrams/litre), sodium (<200 milligrams/litre), chloride (<200 milligrams/litre) and sulphate (<400 milligrams/litre). 100% compliance
				Toxics: Specific trace metal constituents Annual water quality analyses must be undertaken.	Domestic Use: Trace metals –Arsenic (<0.05 milligrams/litre), Cadmium (<0.005 milligrams/litre), Copper (<1.0 milligrams/litre), Iron (<0.5 milligrams/litre), Manganese (<0.4 milligrams/litre) and Zinc (<10 milligrams/litre). For stock and irrigation water: Refer to appropriate guideline.

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WARNING!!!

To all *suppliers and potential suppliers* of goods to the Government Printing Works

The Government Printing Works would like to warn members of the public against an organised syndicate(s) scamming unsuspecting members of the public and claiming to act on behalf of the Government Printing Works.

One of the ways in which the syndicate operates is by requesting quotations for various goods and services on a quotation form with the logo of the Government Printing Works. Once the official order is placed the syndicate requesting upfront payment before delivery will take place. Once the upfront payment is done the syndicate do not deliver the goods and service provider then expect payment from Government Printing Works.

Government Printing Works condemns such illegal activities and encourages service providers to confirm the legitimacy of purchase orders with GPW SCM, prior to processing and delivery of goods.

To confirm the legitimacy of purchase orders, please contact:

Renny Chetty (012) 748-6375 (Renny.Chetty@gpw.gov.za),

Anna-Marie du Toit (012) 748-6292 (Anna-Marie.DuToit@gpw.gov.za) and

Siraj Rizvi (012) 748-6380 (Siraj.Rizvi@gpw.gov.za)

IMPORTANT

Information

from Government Printing Works

Dear Valued Customers,

Government Printing Works has implemented rules for completing and submitting the electronic Adobe Forms when you, the customer, submits your notice request.

Please take note of these guidelines when completing your form.

GPW Business Rules

1. No hand written notices will be accepted for processing, this includes Adobe forms which have been completed by hand.
2. Notices can only be submitted in Adobe electronic form format to the email submission address submit.egazette@gpw.gov.za. This means that any notice submissions not on an Adobe electronic form that are submitted to this mailbox will be **rejected**. National or Provincial gazette notices, where the Z95 or Z95Prov must be an Adobe form but the notice content (body) will be an attachment.
3. Notices brought into GPW by "walk-in" customers on electronic media can only be submitted in Adobe electronic form format. This means that any notice submissions not on an Adobe electronic form that are submitted by the customer on electronic media will be **rejected**. National or Provincial gazette notices, where the Z95 or Z95Prov must be an Adobe form but the notice content (body) will be an attachment.
4. All customers who walk in to GPW that wish to submit a notice that is not on an electronic Adobe form will be routed to the Contact Centre where the customer will be taken through the completion of the form by a GPW representative. Where a customer walks into GPW with a stack of hard copy notices delivered by a messenger on behalf of a newspaper the messenger must be referred back to the sender as the submission does not adhere to the submission rules.
5. All notice submissions that do not comply with point 2 will be charged full price for the notice submission.
6. The current cut-off of all Gazette's remains unchanged for all channels. (Refer to the GPW website for submission deadlines – www.gpwonline.co.za)
7. Incorrectly completed forms and notices submitted in the wrong format will be rejected to the customer to be corrected and resubmitted. Assistance will be available through the Contact Centre should help be required when completing the forms. (012-748 6200 or email info.egazette@gpw.gov.za)
8. All re-submissions by customers will be subject to the above cut-off times.
9. All submissions and re-submissions that miss the cut-off will be rejected to the customer to be submitted with a new publication date.
10. Information on forms will be taken as the primary source of the notice to be published. Any instructions that are on the email body or covering letter that contradicts the notice form content will be ignored.

You are therefore advised that effective from **Monday, 18 May 2015** should you not comply with our new rules of engagement, all notice requests will be rejected by our new system.

Furthermore, the fax number **012- 748 6030** will also be **discontinued** from this date and customers will only be able to submit notice requests through the email address submit.egazette@gpw.gov.za.

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