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A message from Government Printing Works

Notice Submissions Rule: Single notice, single email

Dear Valued Customer,

Over the last six months, GPW has been experiencing problems with many customers that are still not complying with GPW's rule of **single notice, single email** (with proof of payment or purchase order).

You are advised that effective from **18 January 2016**, all notice submissions received that do not comply with this rule will be failed by our system and your notice will not be processed.

In the case where a Z95, Z95Prov or TForm3 Adobe form is submitted with content, there should be a separate Adobe form completed for each notice content which must adhere to the single notice, single email rule.

A reminder that documents must be attached separately in your email to GPW. (In other words, your email should have an electronic Adobe Form plus proof of payment/purchase order – 2 separate attachments – where notice content is applicable, it should also be a 3rd separate attachment).

To those customers who are complying with this rule, we say Thank you!

Regards,

Government Printing Works



Government Printing Works

Notice submission deadlines

Government Printing Works has over the last few months implemented rules for completing and submitting the electronic Adobe Forms when you, the customer, submit your notice request.

In line with these business rules, GPW has revised the notice submission deadlines for all gazettes. Please refer to the below table to familiarise yourself with the new deadlines.

ORDINARY GAZETTES

Government Gazette Type	Publishing Frequency	Publication Date	Submission Deadline	Cancellations Deadline
National Gazette	Weekly	Friday	Friday 15h00 for next Friday	Tuesday, 12h00 - 3 days prior to publication
Regulation Gazette	Weekly	Friday	Friday 15h00, to be published the following Friday	Tuesday, 12h00 - 3 days prior to publication
Petrol Price Gazette	As required	First Wednesday of the month	One week before publication	3 days prior to publication
Road Carrier Permits	Weekly	Friday	Thursday 15h00, to be published the following Friday	3 days prior to publication
Unclaimed Monies (justice, labour or lawyers)	January / As required 2 per year	Any	15 January / As required	3 days prior to publication
Parliament (acts, white paper, green paper)	As required	Any		3 days prior to publication
Manuals	As required	Any	None	None
Legal Gazettes A, B and C	Weekly	Friday	One week before publication	Tuesday, 12h00 - 3 days prior to publication
Tender Bulletin	Weekly	Friday	Friday 15h00 for next Friday	Tuesday, 12h00 - 3 days prior to publication
Gauteng	Weekly	Wednesday	Two weeks before publication	3 days after submission deadline
Eastern Cape	Weekly	Monday	One week before publication	3 days prior to publication
Northern Cape	Weekly	Monday	One week before publication	3 days prior to publication
North West	Weekly	Tuesday	One week before publication	3 days prior to publication
KwaZulu-Natal	Weekly	Thursday	One week before publication	3 days prior to publication
Limpopo	Weekly	Friday	One week before publication	3 days prior to publication
Mpumalanga	Weekly	Friday	One week before publication	3 days prior to publication
Gauteng Liquor License Gazette	Monthly	Wednesday before the First Friday of the month	Two weeks before publication	3 days after submission deadline
Northern Cape Liquor License Gazette	Monthly	First Friday of the month	Two weeks before publication	3 days after submission deadline
National Liquor License Gazette	Monthly	First Friday of the month	Two weeks before publication	3 days after submission deadline
Mpumalanga Liquor License Gazette	2 per month	Second & Fourth Friday	One week before	3 days prior to publication

CANCELLATIONS

Don't forget!

Cancellation of notice submissions are accepted by GPW according to the deadlines stated in the table above. Non-compliance to these deadlines will result in your request being failed. **Please pay special attention to the different deadlines for each gazette.**

Please note that any notices cancelled after the cancellation deadline will be published and charged at full cost.

Your request for cancellation must be accompanied by the relevant notice reference number (N-).

AMENDMENTS TO NOTICES

take!
note!

With effect from **01 October**, GPW will not longer accept amendments to notices. The cancellation process will need to be followed and a new notice submitted thereafter for the next available publication date.

Until then, amendments to notices must be received before the submission deadline.

CUSTOMER INQUIRIES



Many of our customers request immediate feedback/confirmation of notice placement in the gazette from our Contact Centre once they have submitted their notice – While GPW deems it one of their highest priorities and responsibilities to provide customers with this requested feedback and the best service at all times, we are only able to do so once we have started processing your notice submission.

GPW has a **2-working day turnaround time for processing notices** received according to the business rules and deadline submissions.

Please keep this in mind when making inquiries about your notice submission at the Contact Centre.

PROOF OF PAYMENTS



GPW reminds you that all notice submissions **MUST** be submitted with an accompanying proof of payment (PoP) or purchase order (PO). If any PoP's or PO's are received without a notice submission, it will be failed and your notice will not be processed.

When submitting your notice request to submit.egazette@gpw.gov.za, please ensure that a purchase order (GPW Account customer) or proof of payment (non-GPW Account customer) is included with your notice submission. All documentation relating to the notice submission must be in a single email.

A reminder that documents must be attached separately in your email to GPW. (In other words, your email should have an Adobe Form plus proof of payment/purchase order – 2 separate attachments – where notice content is applicable, it should also be a 3rd separate attachment).

FORMS AND GAZETTES

The electronic Adobe Forms and published gazettes can be found on our website: www.gpwonline.co.za

Should you require assistance with downloading forms or gazettes, please contact the eGazette Contact Centre who will gladly assist you.

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Email: info.egazette@gpw.gov.za

Telephone: 012-748 6200



REMINDER OF THE GPW BUSINESS RULES

- ☐ Single notice, single email – with proof of payment or purchase order.
- ☐ All documents must be attached separately in your email to GPW.
- ☐ 1 notice = 1 form, i.e. each notice must be on a separate form
- ☐ Please submit your notice **ONLY ONCE**.
- ☐ Requests for information, quotations and inquiries must be sent to the Contact Centre **ONLY**.
- ☐ The notice information that you send us on the form is what we publish. Please do not put any instructions in the email body.



eGazette



For purposes of reference, all Proclamations, Government Notices, General Notices and Board Notices published are included in the following table of contents which thus forms a weekly index. Let yourself be guided by the gazette numbers in the righthand column:

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DEPARTMENT OF WATER AND SANITATION

NO. 468

22 APRIL 2016

**NATIONAL WATER ACT, 1998
(ACT NO.36 OF 1998)
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 publish the notices for the 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 (Act No. 36 of 1998).

Acting Director: Water Resource Classification
Attention: Ms Lebogang Matlala
Department of Water and Sanitation
Ndinaye Building 178 Francis Baard Street
Private Bag X313
Pretoria
0001

E-mail: matlalat@dws.gov.za

Facsimile: 012 336 6712



MRS NP MOKONYANE
MINISTER OF WATER AND SANITATION
DATE: 17.03.2016

SCHEDULE

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 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 has determined 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, has determined 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 Table 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 upon the date of approval by the Minister, unless otherwise specified.

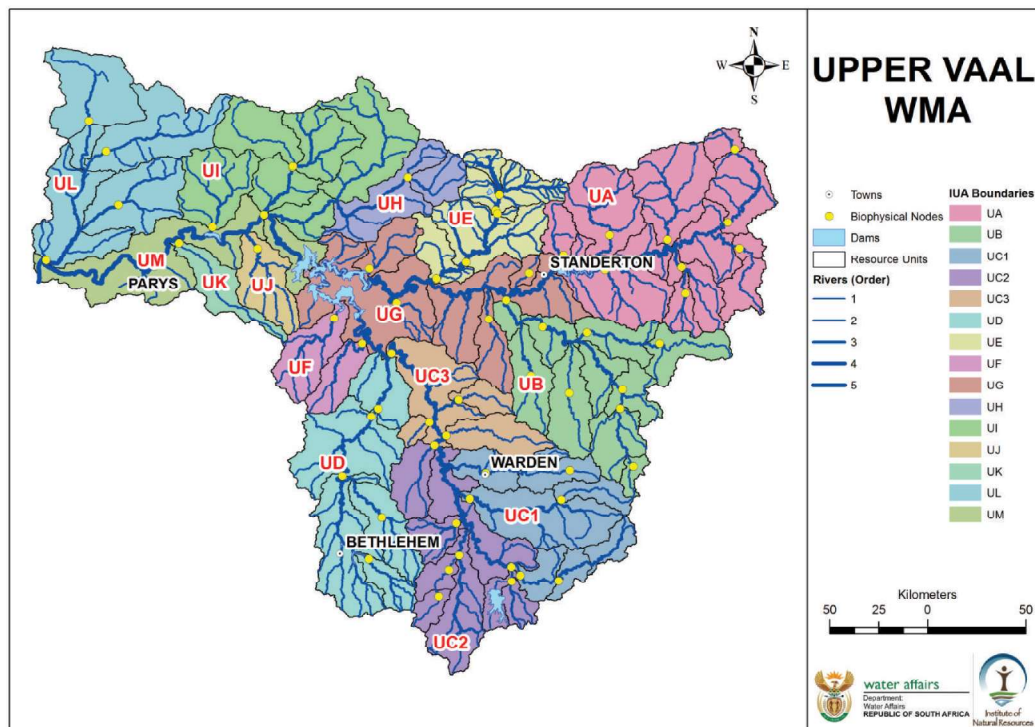


Figure 1: Integrated Units of Analysis (IUAs) in the Upper Vaal

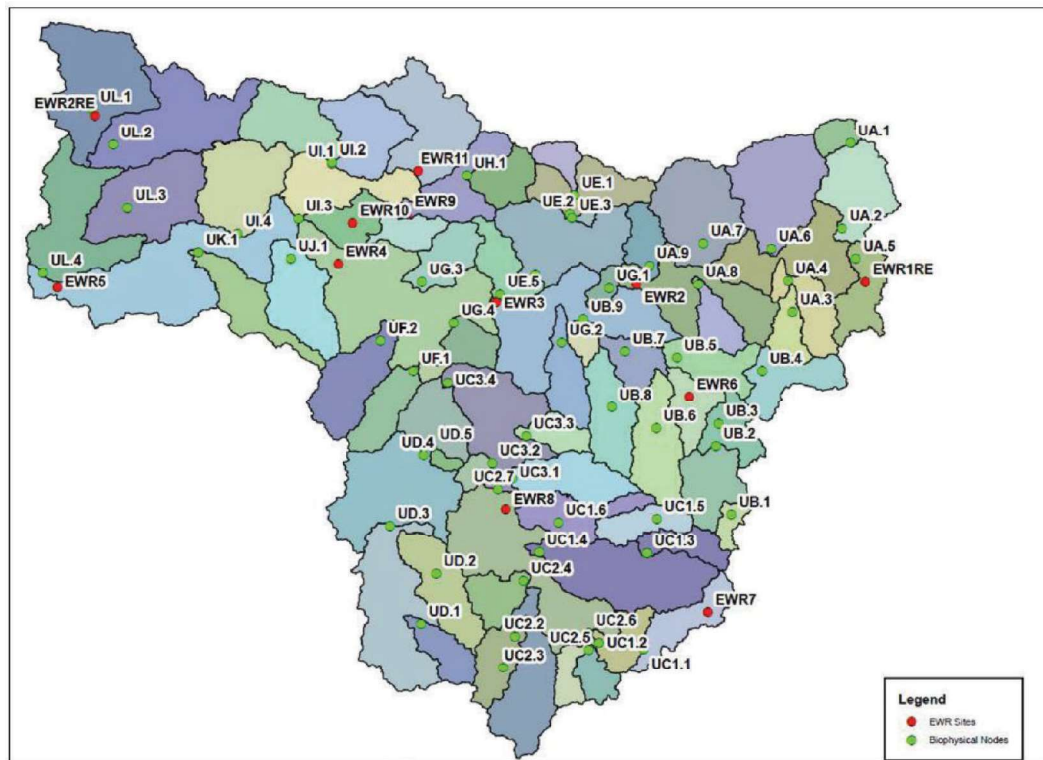


Figure 2: Resource Units (Hydro Nodes) in the Upper Vaal

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 (km ²)	Natural MAR (million m ³ /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	Biesbokspruit	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
		EW1RE	C11C	Vaal	Klein Vaal	318	26.09	C	C
Klip River (Free State) (UB)	II	EW1	C11J	Vaal		4984	288.8	B/C	B/C
		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	Komandospuit	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
Upper Wilge River (UC1)	II	EW6	C13D	Vaal	Klip	1583	95.31	B/C	B/C
		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	Cornelius	812	39.63	C	C
		EW7	C81A	Vaal	Wilge	170	23.47	A/B	A/B
		UC2.1	C81F	Vaal	Elands	1405	114.76	C/D	C/D
		UC2.2	C81G	Elands	Klerkspruit	435	22.13	C	C
Wilge River and tributaries (UC2)	II	UC2.3	C81G			115	5.85	B	B
		UC2.4	C81J	Wilge	Vaalbankspruit	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
		EW8	C82C	Vaal	Wilge	7503	474.25	C	C
		UC3.1	C82G	Wilge	Holspruit	729	32.9	C	C
Lower Wilge River	II								

Integrated Unit of Analysis (IUA)	Water Resource Class for IUA	Biophysical Node Name	Quaternary Catchment	Major River Name	Tributary Name	Gross Catchment Area (km ²)	Natural MAR (million m ³ /a)	Present Ecological State	Recommended Ecological Category
(UC3)		UC3.2	C82G	Wilge	Wilge Trib	152	6.34	B/C	B/C
		UC3.3	C82F	Wilge	Groetspruit	296	11.08	C	C
		UC3.4	C82H	Vaal	Wilge	10633	591.39	C/D	C/D
		UD.1	C83A	Liebenbergsvlei		375	14.36	C	C
Liebenbergsvlei River (UD)	III	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
Kromspruit and Skulpspruit (UF)	II	UE.5	C12G	Vaal	Waterval	2787	177.67	D	D
		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
		UG.1	C11M	Vaal	Brakspruit	75	3.36	C	C
Vaal River from Grootdraai Dam to Vaal Dam (UG)	II	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
		EW.2	C11M	Vaal		7995	457.68	C	C
Suikerbosrand River (UH)	II	EW.3	C12H	Vaal		15638	852.13	C	C
		UH.1	C21A	Vaal	Suikerbosrand	707	28.65	B/C	B
		EW.9	C21C	Vaal	Suikerbosrand	1175	31.31	C	B/C
		UI.1	C22C	Klip River	Rietspruit	857	36.6	E	D
Klip River (Gauteng) (UI)	III	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
		EW.10	C21G	Vaal	Suikerbosrand	3271	86.97	C/D	C/D
Taalbospruit (UJ)	III	EW.11	C21F	Suikerbosrand	Blesbospruit	1098	29.14	D	D
		UJ.1	C22G	Vaal	Taalbospruit	831	18.4	D	D
		UK.1	C23B	Vaal	Kromelmspruit	724	14.3	C	C
		UL.1	C23F	Vaal	Mooi River	1324	37.69	C/D	C/D

Integrated Unit of Analysis (IUA)	Water Resource Class for IUA	Biophysical Node Name	Quaternary Catchment	Major River Name	Tributary Name	Gross Catchment Area (km ²)	Natural MAR (million m ³ /a)	Present Ecological State	Recommended Ecological Category
		UL.2	C23E	Mooi	Moorivierloop	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
		EW2RE	C23G	Vaal	Mooi	1324	37.69	D	D
		EW4	C22F	Vaal		38638	1977.26	C	B/C
Vaal River reach from Vaal Dam to C23L (UM)	III	EW5	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	EW1RE	Vaal
	4	UA.3	Rietspruit
	5	UA.4	Vaal
	6	UA.5	Vaal
	7	UA.6	Vaal
	8	EW1	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	EW6	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	EW7	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	EW8	Vaal
	36	UC2.7	Wilge
	37	UC3.1	Wilge
UC3. Lower Wilge River	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	EW2	Vaal
	54	UG.1	Vaal
	55	UG.2	Vaal
	56	EW3	Vaal
	57	UG.3	Vaal
	58	UG.4	Vaal

IUA Name	RU	Hydro Node	River Name
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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. Taaibosspuit	67	UJ.1	Vaal
UK. Kromelmoogspuit	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

RIVER WATER QUANTITY									
IUA	Class	River	RU	Node	REC	Component	Sub Component	RQO	Indicator/ measure
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 m ³ REC=B/C category (equivalent to EcoClassification score 70-80)*
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 = 39.776x10 ⁶ m ³
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 m ³ , REC=C category*

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, VMAR = 591.36x106m3		Mar	1.25 (60)	0.355 (99)
											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)
											Maintenance low flows (m3/s) (Percentile)		
											Oct	1.358 (70)	0.011 (99)
											Nov	1.977 (99)	0.829 (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)		
											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)
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)		
											Oct	0.12 (60)	1.5 for 3 days
											Nov	0.177 (60)	1.5 for 3 days
											Dec	0.147 (60)	1.5 for 3 days
											Jan	0.182 (60)	5 for 4 days
											Feb	0.231 (60)	1.5 for 3 days
											Drought flows (m3/s) (Percentile)		
											Oct	0.05 (99)	1.5 for 3 days
											Nov	0.066 (99)	1.5 for 3 days
											Dec	0.06 (99)	1.5 for 3 days

UI	III	Suikerbosrand	RU62	EWR11	D	Quantity	Low Flows	Low flows should be capped to protect the ecosystem.	EWR maintenance and drought flows: Biesboskspuit EWR11 in C21F, VMAR=100.69x10 ⁶ m ³ , REC = D category*	High flows need to be maintained to support the ecosystem especially fish	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)	
											Maintenance low flows (m3/s) (Percentile)			
											Oct	0.034 99(1)		0.034
											Nov	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 m ³ , REC = C category*	High flows in the river reach upstream of the confluence with the Mooi River need to be provided to support the ecosystem.	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		
											Maintenance low flows (m3/s) (Percentile)			
											Oct	0.034 99(1)		0.034
											Nov	0.3 (99)		0.3
											Dec	0.3 (99)		0.3

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

RIVER WATER QUALITY													
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		
			RU10	UA.8	B/C				Nitrate (NO ₃) & Nitrite (NO ₂) *	≤ 0.85 mg/L N	0.858		
		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
					RU47 RU50	UE.2 UE.5	D				Nitrate (NO ₃) & Nitrite (NO ₂) *	≤ 2.50 mg/L N	1.008
UE	III	Vaal	RU60	EWR9	B/C	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		
UH	II	Vaal	RU60	EWR9	B/C	Quality	Nutrients	The nutrient condition must be improved to an acceptable level for the ecosystem.	Nitrate (NO ₃) & Nitrite (NO ₂) *	≤ 4.00 mg/L N	1.008		
									Phosphate(PO ₄) *	≤ 0.020 mg/L P	0.6		
UL	III	Mooi	RU71	UL.2	D	Quality	Nutrients	The nutrients should be improved to an acceptable state.	Nitrate (NO ₃) & Nitrite (NO ₂) *	≤ 0.85 mg/L N	1.62		
		Vaal	RU73	UL.4					Phosphate(PO ₄) *	≤ 0.125 mg/L P	0.4		
UM	III	Vaal	RU75	EWR5	C	Quality	Nutrients	The nutrients should be improved to an acceptable state	Phosphates (RWQO limits 0.4 mg/l) *	≤ 0.125 mg/L P	1.40		
									Phosphate(PO ₄) *	≤ 0.025 mg/L P	0.2		
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..	Nitrate (NO ₃) & Nitrite (NO ₂) *	≤ 1.00 mg/L N	0.25		
									Total Ammonia*	≤ 73 µg/L N	1.5		
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*	≤ 70 mS/m	51.		
									Electrical conductivity*	≤ 70 mS/m	29.4.		
UI	III	Vaal	RU62 RU65	EWR11 UI.3	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		
									Electrical conductivity*	≤ 111 mS/m	135		
UI	III	Vaal	RU66	UI.4	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	90.6		
									Electrical conductivity*	≤ 111 mS/m	98.1		

RIVER WATER QUALITY											
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* Sulphates *	≤ 111 mS/m ≤ 500 mg/L	90.5 132
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
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
			RU10	UA.8	B/C				Dissolved oxygen *	≥ 7 mg/L O ₂	No data
									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 *	≥ 6.5 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	
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	
								Total Ammonia *	≤ 86 µg/L N	2.9	
UE	III	Vaal	RU21	UB.9	C/D	Quality	Toxins	Ammonia toxicity must be limited for the sake of the ecosystem.	F *	≤ 3.0 mg/L	0.39
								Al *	≤ 150 µg/L	No data	
			Vaal	RU47 RU50	UE.2 UE.5	D	Quality	Toxins	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				

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RIVER WATER QUALITY											
IUA	Class	River	RU	Node	REC	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits	95th Percentile
									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
									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).	<i>E.coli</i> *	≤ 130 counts/100 ml	No data
UI	III	Suikerbosrant Vaal	RU62	EWR11	D	Quality	Pathogens	Pathogens should be maintained at levels safe for human use (excluding for direct consumption).	<i>E.coli</i> *	≤ 130 counts/100 ml	No data
			RU65	UI.3						≤ 130 counts/100 ml	No data
			RU66	UI.4						≤ 130 counts/100 ml	No data
UM	III	Vaal	RU75	EWR55	C	Quality	Pathogens	Pathogens should be maintained at levels safe for human use (excluding for direct consumption).	<i>E.coli</i> *	≤ 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. <u>Water quality:</u> Salt concentrations must be maintained to meet quality requirements for agriculture and to maintain the ecosystem wellbeing.	Instream Habitat Integrity category $\geq B$ (≥ 82) Fish ecological category: $\geq B$ (≥ 82) Macro-invertebrate ecological category: $\geq B$ (≥ 82) Instream Ecosystem category $\geq B$ (≥ 82) Hydrological category $\geq B$ (≥ 82) Water Quality category: $\geq B$ (≥ 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. <u>Water quality:</u> The nutrient concentrations must be decreased for ecosystem condition and other users.	Instream Habitat Integrity category $\geq B/C$ (≥ 78) Fish ecological category: $\geq B/C$ (≥ 78) Macro-invertebrate ecological category: $\geq B/C$ (≥ 78) Instream Ecosystem category $\geq B/C$ (≥ 78) Hydrological category $\geq B/C$ (≥ 78) Water Quality category: $\geq B/C$ (≥ 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. <u>Water quality:</u> The nutrient concentrations must be decreased for ecosystem condition and other users.	Instream Habitat Integrity category $\geq B/C$ (≥ 78) Fish ecological category: $\geq B/C$ (≥ 78) Macro-invertebrate ecological category: $\geq B/C$ (≥ 78) Instream Ecosystem category $\geq B/C$ (≥ 78) Hydrological category $\geq B/C$ (≥ 78) Water Quality category: $\geq B/C$ (≥ 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 $\geq C/D$ (≥ 58) Fish ecological category: $\geq C/D$ (≥ 58) Macro-invertebrate ecological category: $\geq C/D$ (≥ 58) Instream Ecosystem

IUA	Class	River	RU	REC	RQO	Numerical Limits
UC2. Wilge River and tributaries	II	WILGE	35	C	suitable to maintain the river habitat for ecosystem condition. Low flows must be suitable to maintain the FEPA status. <u>Water quality:</u> Ammonia toxicity must be limited to protect the ecosystem. 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 protection 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. <u>Water quality:</u> 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).	category $\geq$ C/D ($\geq$ 58) Hydrological category $\geq$ C/D ($\geq$ 58) FEPA required low flows: $\geq$ C ($\geq$ 62) Water Quality category: $\geq$ C/D ($\geq$ 58) Instream Habitat Integrity category $\geq$ C ($\geq$ 62) Fish ecological category: $\geq$ C ($\geq$ 62) Macro-invertebrate ecological category: $\geq$ C ($\geq$ 62) Instream Ecosystem category $\geq$ C ($\geq$ 62) Hydrological category $\geq$ C ($\geq$ 62) Water Quality category: $\geq$ C ($\geq$ 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 natural flow patterns <u>Water quality:</u> Nutrient concentrations must be suitable for users and to protect the ecosystem.	Instream Habitat Integrity category $\geq$ C/D ($\geq$ 58) Fish ecological category: $\geq$ C/D ($\geq$ 58) Macro-invertebrate ecological category: $\geq$ C/D ($\geq$ 58) Instream Ecosystem category $\geq$ C/D ($\geq$ 58) Hydrological category $\geq$ C/D ($\geq$ 58) Water Quality category: $\geq$ C/D ($\geq$ 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. <u>Water quality:</u> Water quality should be in a close to natural condition.	Instream Habitat Integrity category $\geq$ B ($\geq$ 82) Fish ecological category: $\geq$ B ($\geq$ 82) Macro-invertebrate ecological category: $\geq$ B ($\geq$ 82) Instream Ecosystem category $\geq$ B ($\geq$ 82) Hydrological category $\geq$ B ($\geq$ 82) Water Quality category: $\geq$ B ($\geq$ 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. <u>Water quality:</u>	Instream Habitat Integrity category $\geq$ D ($\geq$ 42) Fish ecological category: $\geq$ D ($\geq$ 42) Macro-invertebrate ecological category: $\geq$ D ($\geq$ 42) Instream Ecosystem category $\geq$ D ($\geq$ 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 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 $\geq D$ (≥ 42) Water Quality category $\geq D$ (≥ 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 $\geq D$ (≥ 42) Fish ecological category: $\geq D$ (≥ 42) Macro-invertebrate ecological category: $\geq D$ (≥ 42) Instream Ecotatus category $\geq D$ (≥ 42) Hydrological category $\geq D$ (≥ 42) Water Quality category $\geq D$ (≥ 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. <u>Water quality:</u> 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 $\geq C$ (≥ 62) Fish ecological category $\geq C$ (≥ 62) Macro-invertebrate ecological category $\geq C$ (≥ 62) Instream Ecotatus category $\geq C$ (≥ 62) Hydrological category $\geq C$ (≥ 62) Water Quality category $\geq C$ (≥ 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 $\geq B/C$ (≥ 78) Fish ecological category: $\geq B/C$ (≥ 78) Macro-invertebrate ecological category: $\geq B/C$ (≥ 78) Instream Ecotatus category $\geq B/C$ (≥ 78) Hydrological category $\geq B/C$ (≥ 78) Water Quality category $\geq B/C$ (≥ 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. <u>Water quality:</u> 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 $\geq D$ (≥ 42) Fish ecological category: $\geq D$ (≥ 42) Macro-invertebrate ecological category: $\geq D$ (≥ 42) Instream Ecosystem category $\geq D$ (≥ 42) Hydrological category $\geq D$ (≥ 42) Water Quality category: $\geq D$ (≥ 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. <u>Water quality:</u> 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 $\geq D$ (≥ 42) Fish ecological category: $\geq D$ (≥ 42) Macro-invertebrate ecological category: $\geq D$ (≥ 42) Instream Ecosystem category $\geq D$ (≥ 42) Hydrological category $\geq D$ (≥ 42) Water Quality category: $\geq D$ (≥ 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. <u>Water quality:</u> 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 $\geq D$ (≥ 42) Fish ecological category: $\geq D$ (≥ 42) Macro-invertebrate ecological category: $\geq D$ (≥ 42) Instream Ecosystem category $\geq D$ (≥ 42) Hydrological category $\geq D$ (≥ 42) Water Quality category: $\geq D$ (≥ 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. Taalbospruit	III	Taalbospruit	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. <u>Water quality</u>. 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 $\geq D$ (≥ 42) Fish ecological category: $\geq D$ (≥ 42) Macro-invertebrate ecological category: $\geq D$ (≥ 42) Instream Ecosystem category $\geq D$ (≥ 42) Hydrological category $\geq D$ (≥ 42) Water Quality category: $\geq D$ (≥ 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. <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 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 $\geq D$ (≥ 42) Fish ecological category: $\geq D$ (≥ 42) Macro-invertebrate ecological category: $\geq D$ (≥ 42) Instream Ecosystem category $\geq D$ (≥ 42) Hydrological category $\geq D$ (≥ 42) Water Quality category: $\geq D$ (≥ 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. <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 and are suitable for users.	Instream Habitat Integrity category $\geq D$ (≥ 42) Fish ecological category: $\geq D$ (≥ 42) Macro-invertebrate ecological category: $\geq D$ (≥ 42) Instream Ecosystem category $\geq D$ (≥ 42) Hydrological category $\geq D$ (≥ 42) Water Quality category: $\geq D$ (≥ 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 $\geq C$ (≥ 62) Water hyacinth distribution and water surface coverage should be aligned to the Instream Habitat Integrity category.

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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: $\geq C$ (≥ 62) Macro-invertebrate ecological category: $\geq C$ (≥ 62) Instream Ecosystem category $\geq C$ (≥ 62) Hydrological category $\geq C$ (≥ 62) Water Quality category: $\geq C$ (≥ 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	VAAAL	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 $\geq B$ (≥ 82) Riparian ecostatus category: $\geq B$ (≥ 82) Hydrological category $\geq B$ (≥ 82)
UA. Vaal River upstream of Grootdraai Dam	II	VAAAL	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 $\geq B/C$ (≥ 78) Riparian ecostatus category: $\geq B/C$ (≥ 78) Hydrological category $\geq B/C$ (≥ 78)
UA. Vaal River upstream of Grootdraai Dam	II	VAAAL	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 $\geq B/C$ (≥ 78) Riparian ecostatus category: $\geq B/C$ (≥ 78) Hydrological category $\geq B/C$ (≥ 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 better than largely modified condition.	Riparian Zone Habitat Integrity category $\geq C/D$ (≥ 58) Riparian ecostatus category: $\geq C/D$ (≥ 58) Hydrological category $\geq C/D$ (≥ 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 $\geq C$ (≥ 62) Riparian ecostatus category: $\geq C$ (≥ 62) Hydrological category $\geq C$ (≥ 62)

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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 natural flow patterns	Riparian Zone Habitat Integrity category $\geq$ C/D ($\geq$ 58) Riparian ecostatus category: $\geq$ C/D ($\geq$ 58) Hydrological category $\geq$ C/D ($\geq$ 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 $\geq$ B ($\geq$ 82) Riparian ecostatus category: $\geq$ B ($\geq$ 82) Hydrological category $\geq$ B ($\geq$ 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 $\geq$ D ($\geq$ 42) Riparian ecostatus category: $\geq$ D ($\geq$ 42) Hydrological category $\geq$ D ($\geq$ 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 $\geq$ D ($\geq$ 42) Riparian ecostatus category: $\geq$ D ($\geq$ 42) Hydrological category $\geq$ D ($\geq$ 42)
UG. Vaal River from Grootdraai Dam to Vaal Dam	II	VAAAL	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 $\geq$ C ($\geq$ 62) Riparian ecostatus category: $\geq$ C ($\geq$ 62) Hydrological category $\geq$ C ($\geq$ 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 $\geq$ B/C ($\geq$ 78) Riparian ecostatus category: $\geq$ B/C ($\geq$ 78) Hydrological category $\geq$ B/C ($\geq$ 78)

IUA	Class	River	RU	REC	RQO	Numerical Limits
U.H. Suikerbosrand River	II	Blesbospruit	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 $\geq D$ (≥ 42) Riparian ecostatus category: $\geq D$ (≥ 42) Hydrological category $\geq D$ (≥ 42)
U.I. 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 $\geq D$ (≥ 42) Riparian ecostatus category: $\geq D$ (≥ 42) Hydrological category $\geq D$ (≥ 42)
U.I. 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 $\geq D$ (≥ 42) Riparian ecostatus category: $\geq D$ (≥ 42) Hydrological category $\geq D$ (≥ 42)
U.J. Taalbospruit	III	Taalbospruit	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 $\geq D$ (≥ 42) Riparian ecostatus category: $\geq D$ (≥ 42) Hydrological category $\geq D$ (≥ 42)
U.L. 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 $\geq D$ (≥ 42) Riparian ecostatus category: $\geq D$ (≥ 42) Hydrological category $\geq D$ (≥ 42)
U.L. 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 $\geq D$ (≥ 42) Riparian ecostatus category: $\geq D$ (≥ 42) Hydrological category $\geq D$ (≥ 42)

IUA	Class	River	RU	REC	RQO	Numerical Limits
UM, Vaal River reach from Vaal Dam to C23L	III	VAAAL	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 $\geq$ C ($\geq$ 62) Riparian ecostatus category: $\geq$ C ($\geq$ 62) Hydrological category $\geq$ C ($\geq$ 62)

Dam Water Quantity							
IUA	Dams	RU	Component	Sub Component	RQO	Indicator/ measure	
UA	Amersfoort Dam (27°41'1"S; 29°53'1"E)	RU4			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)	
						Oct 0.049 (50)	
						Nov 0.099 (40)	
						Dec 0.130 (50)	
	Grootdraai Dam (26°55'9.2"S; 29°17'41.6"E)	RU10	Quantity			Dam levels must remain sufficient to provide for municipal and industrial use, as well as releases for ecosystem function downstream.	Flow releases: Vaal EWRP2 in C11M VMAR = 457.7x10 ³ m ³ REC=C category*. (Releases from C1R002)
							Maintenance low flows (m3/s) (Percentile)
							Oct 0.7 (50)
							Nov 1.50)
							Dec 1.2 (50)
	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)	
						Oct 0.125 (50)	
						Nov 0.215 (50)	
						Dec 0.252 (40)	
						Drought flows high flows (m ³ /s) (Percentile)	
							Oct 0.007 (99)
							Nov 0.015 (99)
							Dec 0.030 (99)
							Jan 0.143 (40)
					Drought flows (m3/s) (Percentile)		
						Feb 0.196 (40)	
						Mar 0.131 (40)	
						Apr 0.087 (40)	
						May 0.051 (40)	
					Drought flows (m3/s) (Percentile)		
						Jun 0.000	
						Jul 0.031 (40)	
						Aug 0.024 (50)	
						Sep 0.027 (50)	
					Drought flows (m3/s) (Percentile)		
						Oct 0.116 (99)	
						Nov 0.219 (99)	
						Dec 0.281 (99)	
						Jan 0.309 (99)	
					Drought flows (m3/s) (Percentile)		
						Feb 0.422 (99)	
						Mar 0.285 (99)	
						Apr 0.194 (99)	
						May 0.000	
					Drought flows (m3/s) (Percentile)		
						Jun 0.000	
						Jul 0.000	
						Aug 0.000	
						Sep 0.000	

Dam Water Quantity						
IUA	Dams	RU	Component	Sub Component	RQO	Indicator/ measure
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 m ³ REC=C category* (Daily - no flow gauge close by)
						Maintenance low flows (m ³ /s) (Percentile)
						Oct 0.12 (60)
						Nov 0.177 (60)
						Dec 0.147 (60)
						Jan 0.182 (60)
						Feb 0.231 (60)
						Mar 0.18 (60)
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 = 37.7x10 ⁶ m ³ REC=D* (Releases from Klerkskraal Dam monitored by C2H006.)
						Maintenance low flows (m ³ /s) (Percentile)
						Oct 0.12 (70)
						Nov 0.12 (70)
						Dec 0.12 (70)
						Jan 0.128 (60)
						Feb 0.155 (60)
						Mar 0.153 (50)
						Apr 0.16 (60)
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)
						Oct 6.16 (95)
						Nov 8.56 (90)
						Dec 9.36 (95)
						Jan 10.51 (95)
						Feb 13.61 (85)
						Mar 10.97 (90)
						Apr 8.67 (85)

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Dam Water Quality								
IUA	Dams	RU	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits	95th Percentile
UA	Groodraai 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	Gerrards 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) *
	Loch Athlone Dam (28°15'0.9"S; 28°18'31.4"E)				Phosphate(PO ₄) *	≤ 0.025 mg/L P	0.024	
					Nitrate (NO ₃) & Nitrite (NO ₂) *	≤ 1.00 mg/L N	0.05	
		Saalspoort Dam (Sol Plaattje 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
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.	Nitrate (NO ₃) & Nitrite (NO ₂) *	≤ 1.00 mg/L N	0.2
								Phosphate(PO ₄) *
	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	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) *
	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

Dam Water Quality						
IUA	Dams	RU	Component	Sub Component	RQO	Indicator/ measure
UB	Vrede/Thembalilile 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*
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*
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*
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 * pH_min *
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*
UD	Gerrards Dam (28°16'55.3"S; 28°17'30.6"E) Loch Athlone Dam (28°15'0.9"S; 28°18'31.4"E) Saulspoort Dam (Sol Plaatsje Dam) (28°13'1.5"S; 28°21'46.9"E)	RU 43 RU 41 & 43	Quality	Toxins	The system must be maintained in a mesotrophic condition to avoid cyanobacteria and the associated algal toxins.	Chl-a: phytoplankton*
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*
UM	Vaal Barrage (26°45'53"S; 27°41'3"E) Vaal Dam (26°52'57"S; 28°6'58"E)	RU 75 RU 74	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. The system must be maintained in a mesotrophic state to avoid cyanobacterial blooms and associated algal toxins.	Chl-a: phytoplankton* Chl-a: phytoplankton*
						No data No data No data

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

GROUNDWATER				
IUA	RU	Component	RQO	Indicator/ measure
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.
	RU1 RU2 RU3 RU5 RU6 RU7 RU10 RU11 RU33 RU35 RU40 RU42 RU44 RU43 RU46 RU47 RU59 RU60 RU74			
	RU69			
	RU63			
	RU71			
	RU64			
	RU66			
	RU75			
	RU70			
	RU62			
	RU73			
	RU65			
	RU72			
		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.
				Water level fluctuations around the average site water level should not exceed 4.05 m
				Water level fluctuations around the average site water level should not exceed 15.3 m
				Water level fluctuations around the average site water level should not exceed 13.8 m
				Water level fluctuations around the average site water level should not exceed 14.8 m
				Water level fluctuations around the average site water level should not exceed 23.6 m
				Water level fluctuations around the average site water level should not exceed 9.8 m
				Water level fluctuations around the average site water level should not exceed 15.4 m
				Water level fluctuations around the average site water level should not exceed 11.8 m
				Water level fluctuations around the average site water level should not exceed 4.2 m
				Water level fluctuations around the average site water level should not exceed 22.9 m
				Water level fluctuations around the average site water level should not exceed 7.16 m

DEPARTMENT OF WATER AND SANITATION

NO. 469

22 APRIL 2016

NATIONAL WATER ACT, 1998
(ACT NO.36 OF 1998)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 publish the notices for the 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).

Acting Director: Water Resource Classification
Attention: Ms Lebogang Matlala
Department of Water and Sanitation
Ndinaye Building 178 Francis Baard Street
Private Bag X313
Pretoria
0001

E-mail: matlalal@dws.gov.za

Facsimile: 012 336 6712



MRS NP MOKONYANE
MINISTER OF WATER AND SANITATION
DATE: 17.03.2016

SCHEDULE

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 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, has determined 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, has determined 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 Table 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 upon the date of approval by the Minister, unless otherwise specified.

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 (km ²)	Natural MAR (million m ³ /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
Vals River (MB)	III	MA.7	C70H	Renoster River	Heuningspruit	1152	17.94	C	C
		MA.8	C70K	Vaal River	Renoster River	5868	120.92	C	C
		MB.1	C60A	Vaal River	Vals River	860	31.24	C	C
		MB.2	C60C	Vals River	Elandspruit/Elands	349	8.2	C	C
		MB.3	C60G	Vaal River	Vals River	4898	131.7	C	C
		EW14	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	Taalbospruit	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
Upper Vet River (ME1)	II	MD2.3	C42L	Vet River	Sand River	7555	180.27	C	C
		ME1.1	C41D	Vaal River	Vet River	2113	72.01	C	C
Lower Vet River (ME2)	III	ME1.2	C41E	River/Erferis	Klein Vet River	2083	81.86	C	C
		ME1.3	C41E	Klein Vet River	Soutspruit	159	3.87	B/C	B/C
		ME2.1	C41H	Vaal River	Vet River	5551	190.94	C	C
		EW15	C43A	Vaal River	Vet River	16040	413.55	C/D	C/D
Vaal River from Renoster River	III	MF.1	C24B	Vaal River	Vet River	864	4.75	C	C
		EW12	C24J	Vaal River	Vet River	62305	2546.42	D	D

confluence Bloemhof (MF)		EW13	C25A	Vaal River	Klipspruit	70809	2714.89	C/D	C/D
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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 Naser Dam (Klerksdorp Dam)	C24G
SK7	From Johan Naser 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	Erfenis Dam to confluence with Sand River	C41F, C41G, C41H, C41J
LV2	Downstream Sand River confluence to Bloemhof Dam	C43A, C43C, C43D

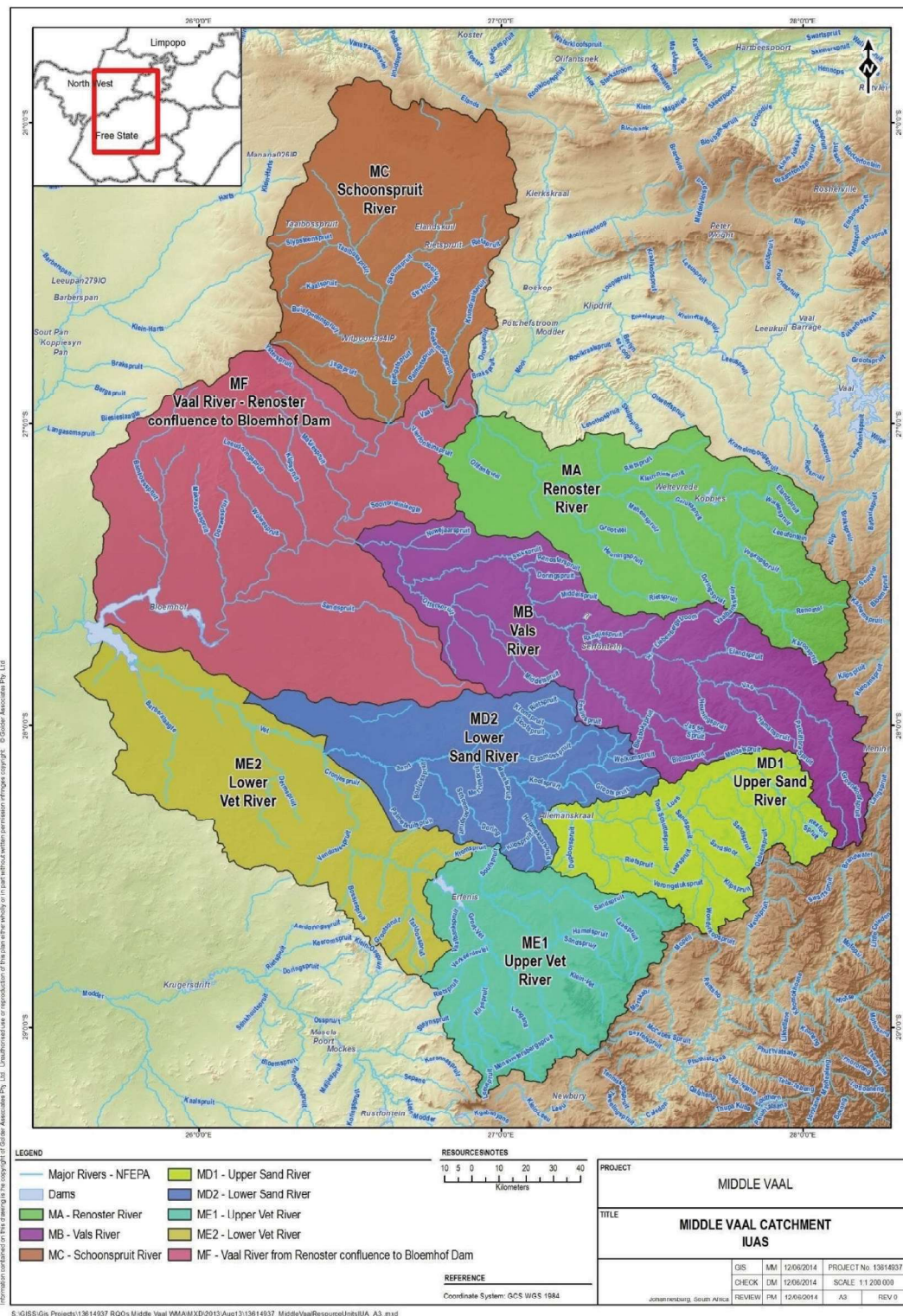


Figure 1: Integrated Units of Analysis defined in the Middle Vaal WMA

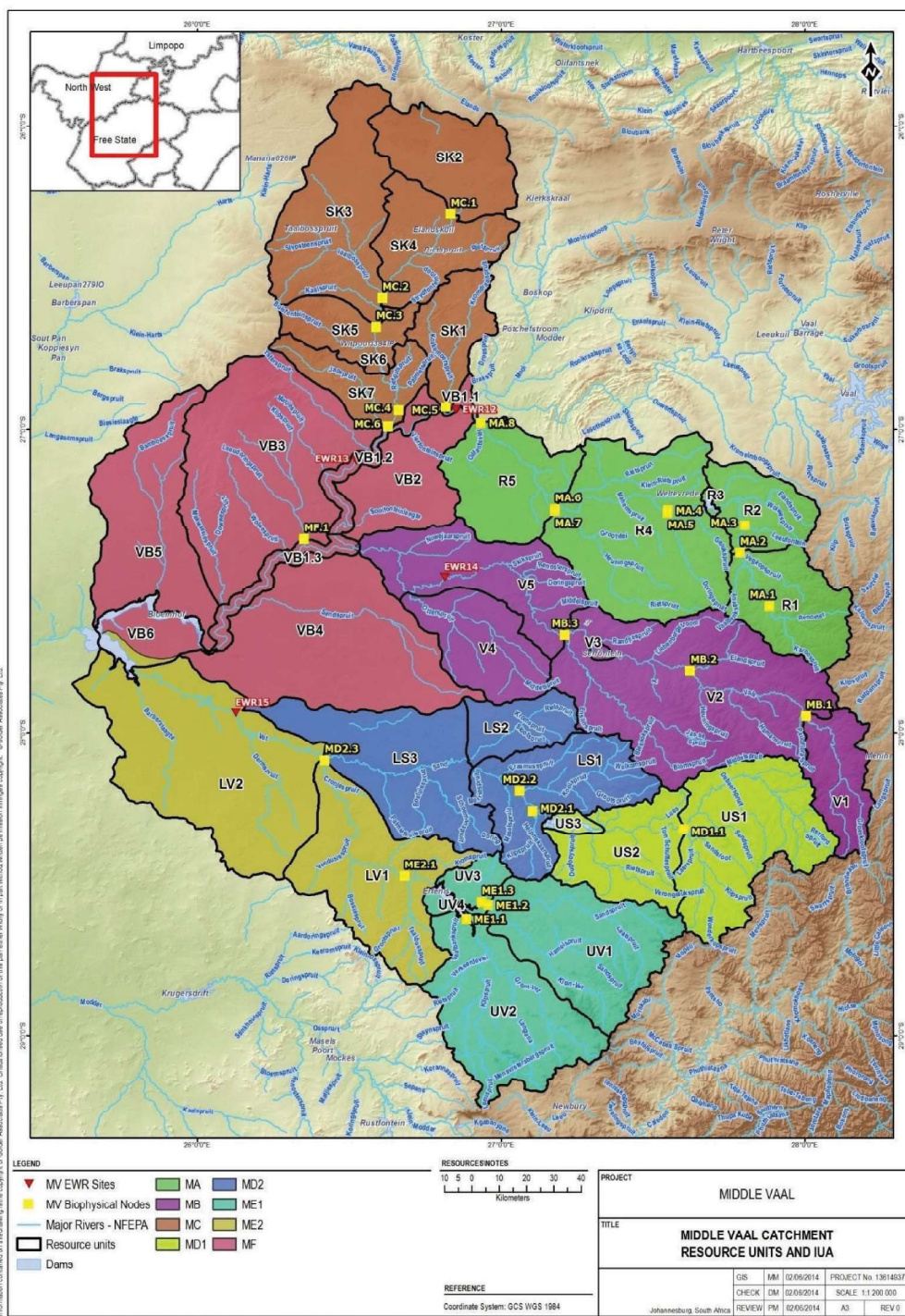


Figure 2: Resource Units and location of Nodes in the Middle Vaal WMA

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				
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)	Month	Maintenance Low Flows		Drought Flows	
											cubic metres/second	Per-centile	cubic metres/second	Per-centile
										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				
						≤ 0.50 milligrams/litre (50 th percentile)								
						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	≤ 0.058 milligrams/litre (50 th percentile)				
									Orthophosphate as Phosphorus	≤ 0.25 milligrams/litre (50 th percentile)				
									Nitrate & Nitrite as Nitrogen	≤ 6 milligrams/litre (95 th percentile)				
						Quality	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 (95 th percentile)				
									The presence of pathogens should pose a low risk to human health.	≤ 130 counts/100 millilitres (95 th percentile)				
Habitat	Instream Habitat	Instream and Riparian habitat must be in a moderately modified condition or better.	<i>Escherichia coli</i>	Instream and Riparian habitat Integrity category ≥ C (≥ 62)										

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: $\geq C$ (≥ 62) Macro-invertebrate ecological category: $\geq C$ (≥ 62) Instream Ecotatus category $\geq C$ (≥ 62) Hydrological category $\geq C$ (≥ 62) With monthly flow requirements as specified. Water Quality category: $\geq C$ (≥ 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)	<table><thead><tr><th rowspan="2">Month</th><th colspan="2">Maintenance Low Flows</th><th colspan="2">Drought Flows</th></tr><tr><th>cubic metres/second</th><th>Per-centile</th><th>cubic metres/second</th><th>Per-centile</th></tr></thead><tbody><tr><td>Oct</td><td>0.2348</td><td>60</td><td>0.0299</td><td>99</td></tr><tr><td>Nov</td><td>0.5204</td><td>60</td><td>0.0231</td><td>99</td></tr><tr><td>Dec</td><td>0.5604</td><td>70</td><td>0.0336</td><td>99</td></tr><tr><td>Jan</td><td>0.7187</td><td>80</td><td>0.0672</td><td>99</td></tr><tr><td>Feb</td><td>0.7577</td><td>70</td><td>0.0248</td><td>99</td></tr><tr><td>Mar</td><td>0.5892</td><td>60</td><td>0.0448</td><td>99</td></tr><tr><td>Apr</td><td>0.3484</td><td>60</td><td>0.0309</td><td>99</td></tr><tr><td>May</td><td>0.1613</td><td>50</td><td>0.0261</td><td>99</td></tr><tr><td>Jun</td><td>0.1181</td><td>60</td><td>0.0386</td><td>99</td></tr><tr><td>Jul</td><td>0.1001</td><td>60</td><td>0.0381</td><td>99</td></tr><tr><td>Aug</td><td>0.0900</td><td>70</td><td>0.0351</td><td>99</td></tr><tr><td>Sep</td><td>0.1246</td><td>50</td><td>0.0455</td><td>99</td></tr></tbody></table>	Month	Maintenance Low Flows		Drought Flows		cubic metres/second	Per-centile	cubic metres/second	Per-centile	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
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								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 (50 th percentile)																																																																					
						Quality	Nutrients		Orthophosphate as Phosphorus	≤ 0.015 milligrams/litre (50 th percentile)																																																																					
									Nitrate & Nitrite as Nitrogen	≤ 0.25 milligrams/litre (50 th percentile) 6 milligrams/litre (95 th percentile)																																																																					

IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit																										
II		Koppies Dam (C70C)	R3			Habitat			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.	<i>Escherichia coli</i>	≤ 130 counts/100 millilitres (95 th percentile)																									
									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.																											
							Dam habitat	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.																												
							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.																											
			R4	MA 6	C	Quantity	Low flows	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.	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																						
												Oct	0.2808	60	0.0373	99																				
																	Nov	0.6065	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

IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit					
Renoster	II	Renoster (C70D, C70E, C70F, C70G, C70H) (Downstream Koppies Dam to confluence with the Heuningspruit)	R4	MA 6	C	Quality			(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	
							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 (50 th percentile)					
									Orthophosphate as Phosphorus	≤ 0.058 milligrams/litre (50 th percentile)					
									Nitrate & Nitrite as Nitrogen	≤ 0.50 milligrams/litre (50 th percentile) ≤ 6 milligrams/litre (95 th percentile)					
							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 (95 th percentile)					
									pH range	7.4 (5 th percentile) and 8.6. (95 th percentile)					
									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 (95 th percentile)					
									The Rapid Habitat Assessment Method must be implemented.	Instream and Riparian habitat integrity category ≥ C (≥ 62)					
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a moderately modified condition or better							

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	MA8	C	Quantity	Low flows	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.	Instream and Riparian habitat integrity category $\geq C$ (≥ 62) Fish ecological category: $\geq C$ (≥ 62) Macro-invertebrate ecological category $\geq C$ (≥ 62) Instream Ecotatus category $\geq C$ (≥ 62) Hydrological category $\geq C$ (≥ 62) With monthly flow requirements as specified. Water Quality category: $\geq C$ (≥ 62)		
											Fish	Fish Response Assessment Index (FRAI) must be utilized.
											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.
											Low flows	Maintenance flows (percentage value of naturalised flow distribution)
											C	MA8
											Renoster (C70J, C70K) (Downstream Heuningspruit confluence to confluence with the Vaal River) (includes the Olifantsvlei tributary)	R5
II	C											
		MA8	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.											
		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.									
Aquatic Invertebrates	Fish Response Assessment Index (FRAI) must be utilized.											
		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.									
Macro-invertebrate ecological category $\geq C$ (≥ 62)	Fish ecological category: $\geq C$ (≥ 62)											
		Hydrological category $\geq C$ (≥ 62)	With monthly flow requirements as specified.									
Water Quality category: $\geq C$ (≥ 62)	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				
										Aug	0.1725	90	0.0373	99
										Sep	0.2076	60	0.0579	99
							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 (50 th percentile)				
									Orthophosphate as Phosphorus	≤ 0.058 milligrams/litre (50 th percentile)				
									Nitrate & Nitrite as Nitrogen	≤ 1.0 milligrams/litre (50 th percentile) ≤ 6 milligrams/litre (95 th percentile)				
							Salts	Instream salinity must be maintained. Salinity levels should not be allowed to deteriorate.	Electrical conductivity	≤ 55 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.	<i>Escherichia coli</i>	≤ 130 counts/100 millilitres (95 th percentile)				
								pH must be maintained at present state.	pH range	6.5 (5 th percentile) and 8.5 (95 th percentile)				
							System variables	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)				

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: $\geq C$ (≥ 62) Macro-invertebrate ecological category: $\geq C$ (≥ 62) Instream Ecotatus category $\geq C$ (≥ 62) Hydrological category $\geq C$ (≥ 62) With monthly flow requirements as specified. Water Quality category: $\geq C$ (≥ 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.	

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				
MB Vals	III	Vals (C60B, C60C, C60D, C60E, C60F) (from the Pauciflora spruit confluence to the Kroonval weir at Kroonstad) (Major tributaries include the Elandspruit, Liebenberg stream 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) 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-centile	cubic metres/second	Per-centile	
										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	90	0.0523	99
										Apr	0.6917	60	0.0000	99
										May	0.3566	40	0.0373	99
										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				
						≤ 0.50 milligrams/litre (50 th percentile)								
						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	≤ 0.058 milligrams/litre (50 th percentile)				
									Orthophosphate as Phosphorus	≤ 0.25 milligrams/litre (50 th percentile)				
									Nitrate & Nitrite as Nitrogen	≤ 6 milligrams/litre (95 th percentile)				
									Electrical conductivity	≤ 65 milliSiemens/metre (95 th percentile)				
						Habitat	Pathogens	The presence of pathogens should pose a low risk to human health.	<i>Escherichia coli</i>	≤ 130 counts/100 millilitres (95 th percentile)				
The Rapid Habitat Assessment Method must be implemented	Instream and Riparian habitat Integrity category ≥ C (≥ 62)													
The integrity of the macroinvertebrate community within the system must be improved, by improving the water quality from a nutrient perspective.	An ecological category of C/D must be met. The Average Score Per Taxon value of > 4.8 must be achieved.													

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 stream and Blomspruit)	V2	MB 3	C	Biota	Fish	Water quality improvement is required from a nutrient perspective. 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 $\geq C (\geq 62)$ Fish ecological category: $\geq C (\geq 62)$ Macro-invertebrate ecological category: $\geq C (\geq 62)$ Instream Ecosystem category $\geq C (\geq 62)$ Hydrological category $\geq C (\geq 62)$ With monthly flow requirements as specified. Water Quality category: $\geq C (\geq 62)$
								The downstream maintenance low flow requirements of node MB 3 must be met to support a healthy condition for the ecosystem. Low flows	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 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 ≤ 0.50 milligrams/litre (50th percentile) ≤ 0.015 milligrams/litre (50th percentile)
MB Vals	III	Serfontein Dam (C60D)	V3			Quantity	Nutrients	Concentration of nutrients in the dam must be improved to sustain ecosystem health and the water quality requirements of water users.	Dissolved Inorganic Nitrogen as Nitrogen	
									Orthophosphate as Phosphorus	

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					Dam should be maintained in a mesotrophic state.	Nitrate & Nitrite as Nitrogen	≤ 0.25 milligrams/litre (50 th percentile) ≤ 6 milligrams/litre (95 th percentile)
								Salinity in the dam must be maintained to support ecosystem health and water quality requirements of the downstream water users.	Chlorophyll-a	≤ 0.025 milligrams/litre (50 th percentile)
							Salts	The presence of pathogens should pose a low risk to human health.	Electrical conductivity	≤ 65 milliSiemens/metre (95 th percentile)
								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.	<i>Escherichia coli</i>	≤ 130 counts/100 millilitres (95 th percentile)
						Biota	Fish	The importance of the Dam as a fish refuge must be protected. This includes ecologically and recreationally important fish species.	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.	
								The importance of the Dam for abstraction and ecological flow releases must be protected.		
		Middelstroom (Otterspruit tributary)	V4		C	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.
								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)
						Quality	Nutrients		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)
									Electrical conductivity	≤ 65 milliSiemens/metre (95 th percentile)

IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit									
MB Vals	III	Vals (C60G, C60J) (From Kroonvaal weir to the Vaal River confluence) (Nuwejaar spruit and Skispruit tributaries)	V5	EWR 14	C/D	Quantity	Low flows	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)									
								Fish	A baseline assessment to determine the integrity and health of the fish community should be conducted to determine the current state and the potential impacts to the population.	Fish ecological category: ≥ C (≥ 62) Macro-invertebrate ecological category:≥ C (≥ 62) Instream Ecosystem category ≥ C (≥ 62) Hydrological category ≥ C (≥ 62) With monthly flow requirements as specified.									
								Biota	Fish Response Assessment Index (FRAI) must be utilized.	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.								
								Month	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)	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.	Maintenance flows (percentage value of naturalised flow distribution)	Drought flows (percentage value of naturalised flow distribution)	Maintenance Low Flows	Drought Flows	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															
High Flows	The maintenance high flows must be attained so that the	Total Maintenance high flow Ecological Water Requirement	Maintenance High Flows	cubic metres/centile	Percentile														
						Month													

IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit	
MB Vals	III	Vals (C60G, C60J) (From Kroonvaal weir to the Vaal River confluence) (Nuwejaar spruit and Skispruit tributaries)	V5	EWR 14	C/D	Quality	Nutrients	Instream concentration of nutrients must sustain aquatic ecosystem health. Concentrations should not be allowed to deteriorate.	16.989 million cubic metres/annum (11.64% of the Virgin Mean Annual Runoff)	Oct	0.000
										Nov	1.653
										Dec	0.000
										Jan	0.697
										Feb	2.7
										Mar	1.6
										Apr	0.000
										May	0.000
										Jun	0.000
										Jul	0.000
										Aug	0.000
										Sep	0.000
										≤ 1.50 milligrams/litre (50 th percentile)	
										≤ 0.125 milligrams/litre (50 th percentile)	
MB Vals	III	Vals (C60G, C60J) (From Kroonvaal weir to the Vaal River confluence) (Nuwejaar spruit and Skispruit tributaries)	V5	EWR 14	C/D	Quality	Nutrients	Instream concentration of nutrients must sustain aquatic ecosystem health. Concentrations should not be allowed to deteriorate.	Maintenance high flows (percentage value of naturalised flow distribution)	≤ 1.35 milligrams/litre (50 th percentile)	
										≤ 6 milligrams/litre (95 th percentile)	
										Chlorophyll- <i>a</i> concentrations should be monitored as a response indicator against the resource quality objective nutrient concentrations.	
										Electrical conductivity (95 th percentile)	
										≤ 130 counts/100 millilitres (95 th percentile)	
MB Vals	III	Vals (C60G, C60J) (From Kroonvaal weir to the Vaal River confluence) (Nuwejaar spruit and Skispruit tributaries)	V5	EWR 14	C/D	Quality	Pathogens	The presence of pathogens should pose a low risk to human health.	<i>Escherichia coli</i>	7.0 (5 th percentile) and 8.6 (95 th percentile).	
										pH range	
										A 10% variation from background concentration is allowed.	

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 $\geq$ C/D ($\geq$ 58)
							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: $\geq$ C/D ($\geq$ 58) Macro-invertebrate ecological category: $\geq$ C/D ($\geq$ 58) Instream Ecotaxa category $\geq$ C/D ($\geq$ 58) Hydrological category $\geq$ C/D ($\geq$ 58) With monthly flow requirements as specified. Water Quality category: $\geq$ C/D ($\geq$ 58)
						Biota			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 South African Scoring System 5 score must be $>$ 110 and the Average Score Per Taxon $>$ 5.2.
							Aquatic Invertebrates	The Present Ecological State must be improved to a C category.	The ecological specifications and Thresholds of Potential Concern for Ecological Water Requirement site 14 must be adhered to.	

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	Low Flows cubic metres/second	Maintenance Per-centile	Drought Flows cubic metres/second
MC Schoon spruit	III	Koekemoer-spruit (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
										Nov	0.0409	80	0.0039
										Dec	0.0571	40	0.0112
									Maintenance flows (percentage value of naturalised flow distribution)	Jan	0.1038	40	0.0112
										Feb	0.1682	40	0.0165
										Mar	0.2012	70	0.0149
									Drought flows (percentage value of naturalised flow distribution)	Apr	0.1246	60	0.0000
										May	0.0504	50	0.0037
										Jun	0.0243	70	0.0039
										Jul	0.0179	70	0.0000
										Aug	0.0138	80	0.0000
									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.	Sep	0.0104	70	0.0000
									Dissolved Inorganic Nitrogen as nitrogen	≤ 3.0 milligrams/litre (50 th percentile)			
									Orthophosphate as Phosphorus	≤ 0.125 milligrams/litre (50 th percentile)			
						Quality	Salts	Instream salinity must be improved to acceptable levels to support a healthy aquatic ecosystem and the water quality requirements of water users.	Nitrate & Nitrite as Nitrogen	≤ 2.5 milligrams/litre (50 th percentile) ≤ 6 milligrams/litre (95 th percentile)			
									Electrical conductivity	≤ 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.			
									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.	≤ 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			

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 20 th year after publication date of the Government Notice.
									Magnesium	≤100 milligrams/litre (95 th percentile)
									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)
									Iron	≤ 0.25 milligrams/litre (95 th percentile)
									Uranium	≤ 0.03 milligrams/litre (95 th percentile)
									Ammonia as Nitrogen	≤ 0.1 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.	
									<i>Escherichia coli</i>	≤ 130 counts/100 millilitres (95 th percentile)
									The presence of pathogens should pose a low risk to human health.	
									The Rapid Habitat Assessment Method must be implemented.	
									Instream and Riparian habitat must be in a largely modified condition or better.	
									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.	
									Fish ecological category: ≥ D (≥ 42)	
									Macro-invertebrate ecological category: ≥ D (≥ 42)	
									Instream Ecological category: ≥ D (≥ 42)	
									Hydrological category: ≥ D (≥ 42)	
									With monthly flow requirements as specified.	
									Water Quality category: ≥ D (≥ 42)	
									The Specific Pollution Index score should be > 5.0.	

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 ecosystem and users.	There is depletion of the groundwater resources which is impacting on the flow and water quality of the Schoonspruit Eye 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	
									Nitrate & Nitrite as Nitrogen	
						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.	Orthophosphate as Phosphorus	≤ 2.5 milligrams/litre (50 th percentile) ≤ 6 milligrams/litre (95 th percentile)
									Chlorophyll-a	≤ 0.020 milligrams/litre (50 th percentile)
									Electrical conductivity	≤ 0.010 milligrams/litre (50 th percentile)
							Salts	Salinity levels at the Schoonspruit eye are low and must be maintained at the present state. Salinity levels should not deteriorate.		≤ 55 milliSiemens/metre (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)

IUA	Class	River/Dam	Resource Unit	Node	Ecological category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit			
MC Schoonspruit	III	Taalbospruit (C24F)	SK3	MC 2	C	Quantity	Low flows	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.	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 Ecosystem category ≥ B (≥ 82)					
								Hydrological category ≥ B (≥ 82) With monthly flow requirements as specified.					
								Water Quality category: A (> 92)					
								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)					
								Month				Maintenance Low Flows	
Oct	cubic metres/second	Per-centile	cubic metres/second	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									
						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 must be maintained at or below 1000 µS/cm.	Electrical conductivity	≤ 65 milliSiemens/metre (95 th percentile)			

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.
							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)
						Quality	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)
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a better than largely modified condition.		
									<i>Escherichia coli</i>	≤ 130 counts/100 millilitres (95 th percentile)
									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 the 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 Ecotatus category: ≥ C/D (≥ 58) Hydrological category: ≥ C/D (≥ 58) With monthly flow requirements as specified. Water Quality category: ≥ C/D (≥ 58)

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.
						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.	<i>Escherichia coli</i>	≤ 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 Schoonspruit	III	Schoonspruit (24F) From Kaalspruit confluence to Johan Nesser Dam (includes Buisfontein-spruit)	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 (includes Buisfontein- spruit)	Resource Unit	Node	Ecological category	Component	Sub- component	Resource Quality Objective	Indicator/measure	Numerical limit
							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 Ecosystem category ≥ C/D (≥ 58) Hydrological category ≥ C/D (≥ 58) With monthly flow requirements as specified. Water Quality category ≥ C/D (≥ 58)
									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.
									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.	≤ 0.5 milligrams/litre (50 th percentile) ≤ 0.025 milligrams/litre (50 th percentile) ≤ 2.5 milligrams/litre (50 th percentile) ≤ 6 milligrams/litre (95 th percentile) ≤ 0.025 milligrams/litre (50 th percentile)
									Salinity must be maintained to support ecosystem health and the water quality requirements of the water users.	≤ 70 milliSiemens/metre (95 th percentile)
									The presence of pathogens should pose a low risk to human health.	≤ 130 counts/100 millilitres (95 th percentile)
									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.

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.		
						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 of water users.	Electrical conductivity	≤ milliSiemens/metre (95 th percentile)
									Sulphate	≤ 200 milligrams/litre (95 th percentile)
									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.	

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.	<i>Escherichia coli</i>	≤ 130 counts/100 millilitres (95 th percentile)
MC Schoonspruit	III	Schoonspruit (24H) (From Johan Naser 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)
							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 Ecosystem category ≥ C/D (≥ 58) Hydrological category ≥ C/D (≥ 58) With monthly flow requirements as specified at Node MC 4.
							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				
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)	Month	Maintenance Low Flows		Drought Flows	
										cubic metres/second	Per-cent-tile	Per-cubic metres/second	Per-cent-tile	
										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
										≤ 0.50 milligrams/litre (50 th percentile)				
										Dissolved Inorganic Nitrogen as Nitrogen	Instream concentration of nutrients must be maintained to sustain aquatic ecosystem health and to ensure the prescribed ecological category is met.	Nutrients	Nitrate & Nitrite as Nitrogen	≤ 0.25 milligrams/litre (50 th percentile)
						Orthophosphate as Phosphorus	≤ 0.058 milligrams/litre (50 th percentile)							
						Quality	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.			<i>Escherichia coli</i>	≤ 130 counts/100 millilitres (95 th percentile)		

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 the potential impacts to the population. Fish Response Assessment Index (FRAI) must be utilized.	Fish ecological category: $\geq C$ (≥ 62) Macro-invertebrate ecological category: $\geq C$ (≥ 62) Instream Ecosystem category $\geq C$ (≥ 62) Hydrological category $\geq C$ (≥ 62) With monthly flow requirements as specified. Water Quality category: $\geq C$ (≥ 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)	<table><tr><th rowspan="2">Month</th><th colspan="2">Maintenance Low Flows</th><th colspan="2">Drought Flows</th></tr><tr><th>cubic metres/second</th><th>Per-centile</th><th>cubic metres/second</th><th>Per-centile</th></tr><tr><td>Oct</td><td>0.3558</td><td>60</td><td>0.0523</td><td>99</td></tr><tr><td>Nov</td><td>0.6034</td><td>70</td><td>0.0270</td><td>99</td></tr><tr><td>Dec</td><td>0.6743</td><td>80</td><td>0.0187</td><td>99</td></tr><tr><td>Jan</td><td>0.9457</td><td>80</td><td>0.0709</td><td>99</td></tr><tr><td>Feb</td><td>1.1913</td><td>70</td><td>0.0827</td><td>99</td></tr><tr><td>Mar</td><td>1.0629</td><td>70</td><td>0.0523</td><td>99</td></tr><tr><td>Apr</td><td>0.7284</td><td>70</td><td>0.0424</td><td>99</td></tr><tr><td>May</td><td>0.4529</td><td>40</td><td>0.0336</td><td>99</td></tr><tr><td>Jun</td><td>0.2662</td><td>50</td><td>0.0193</td><td>99</td></tr><tr><td>Jul</td><td>0.1635</td><td>70</td><td>0.0448</td><td>99</td></tr><tr><td>Aug</td><td>0.1591</td><td>80</td><td>0.0627</td><td>99</td></tr><tr><td>Sep</td><td>0.2600</td><td>60</td><td>0.0887</td><td>99</td></tr></table>	Month	Maintenance Low Flows		Drought Flows		cubic metres/second	Per-centile	cubic metres/second	Per-centile	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
													Month	Maintenance Low Flows		Drought Flows																																																																
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Sep	0.2600	60	0.0887	99																																																																												
									≤ 0.5 milligrams/litre (50 th percentile)																																																																							
										≤ 0.25 milligrams/litre (50 th percentile)																																																																						
										≤ 6 milligrams/litre (95 th percentile)																																																																						

IUA	Class	River/ Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
								Dam should be maintained in a mesotrophic state.	Orthophosphate as Phosphorus	≤ 0.025 milligrams/litre (50 th percentile)
									Chlorophyll-a	≤ 0.025 milligrams/litre (50 th percentile)
						Quality	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 (95 th percentile).
							System variables	pH must be maintained at present state.	pH range	7.0 (5 th percentile) and 8.5 (95 th percentile)
							Pathogens	The presence of pathogens should pose a low risk to human health.	<i>Escherichia coli</i>	≤ 130 counts/100 millilitres (95 th percentile)
MD1 Upper Sand	III	Allenanskraal Dam (C42E)	US3			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 species/aquatic 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 (<i>Phoenicopterus roseus</i>), Lesser Flamingo (<i>Phoenicopterus minor</i>), the Caspian Tern (<i>Sterna caspia</i>) 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.	

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					
MD 2 Lower Sand	III	Lower Sand (C42F, C42G, C42H) (From Allemanskraal Dam to Merriespruit confluence)	LS1	MD 2.1, MD 2.2	C		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)	Month	Maintenance Low Flows		Drought Flows		
										Oct	cubic metres/second	Per-cen-tile	Per-cen-tile		
											50	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	
														≤ 0.50 milligrams/litre (50 th percentile)	
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	≤ 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)												
		pH range	6.5 (5 th percentile) and 8.5 (95 th percentile)												
		System variables	pH must be maintained at present state.												
Pathogens	The presence of pathogens should pose a low risk to human health.	<i>Escherichia coli</i>	≤ 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 $\geq C$ (≥ 62)
MD 2 Lower Sand	III	Lower Sand (C42F, C42G, C42H) (From Allenskraal 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: $\geq C$ (≥ 62) Macro-invertebrate ecological category: $\geq C$ (≥ 62) Instream Ecotatus category $\geq C$ (≥ 62) Hydrological category $\geq C$ (≥ 62) With monthly flow requirements as specified. Water Quality category: $\geq C$ (≥ 62)
								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 .
							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 Nitrate & Nitrite as Nitrogen Orthophosphate as Phosphorus	≤ 3.0 milligrams/litre (50 th percentile) ≤ 2.5 milligrams/litre (50 th percentile) ≤ 6 milligrams/litre (95 th percentile) ≤ 0.125 milligrams/litre (50 th percentile)
MD2 Lower Sand	III	Rietspruit tributary (C42J)	LS2		D	Quality				

IUA	Class	River	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
MD2 Lower Sand	III	Rietspuit 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.	Electrical conductivity	≤ 85 milliSiemens/metre (95 th percentile).
									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.	A numerical limit of 185 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.
									pH range	6.5 (5 th percentile) and 9.2 (95 th percentile).
							System variables	pH must be maintained at present state.	Turbidity	A 10% variation from background concentration is allowed.
								A baseline assessment to determine the present state instream turbidity is required.		
									Cyanide (free)	≤ 0.050 milligrams/litre (95 th percentile)
									Aluminium	≤ 0.1 milligrams/litre (95 th percentile)
									Manganese	≤ 0.25 milligrams/litre (95 th percentile)
									Iron	≤ 0.25 milligrams/litre (95 th percentile)
									Uranium	≤ 0.030 milligrams/litre (95 th percentile)
									Ammonia as Nitrogen	≤ 0.1 milligrams/litre (95 th percentile)

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 Rietspuit 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.	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.				
									The presence of pathogens should pose a low risk to human health.	<i>Escherichia coli</i>	≤ 130 counts/100 millilitres (95 th percentile)		
									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 ecological category: ≥ D (≥ 42) Macro-invertebrate ecological category: ≥ D (≥ 42) Instream Ecstatus category ≥ D (≥ 42) Hydrological category ≥ D (≥ 42) With monthly flow requirements as specified.			
									Fish Response Assessment Index (FRAI) must be utilized.	Water Quality category: ≥ D (≥ 42)			
									Total Ecological Water Requirement (node MD 2.3) = 43 933 million cubic metres/annum (24.37% of the Virgin Mean Annual Runoff)				
									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

IUA	Class	River	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
						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 (50 th 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.	Nitrate & Nitrite as Nitrogen	≤ 1.0 milligrams/litre (50 th percentile)
									Orthophosphate as Phosphorus	≤ 6 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.	Electrical conductivity	≤ 0.058 milligrams/litre (50 th percentile)
									Cyanide (free)	≤ 85 milliSiemens/metre (95 th percentile)
									Aluminium	≤ 0.045 milligrams/litre (95 th percentile)
									Manganese	≤ 0.1 milligrams/litre (95 th percentile)
									Iron	≤ 0.25 milligrams/litre (95 th percentile)
									Uranium	≤ 0.3 milligrams/litre (95 th percentile)
									Ammonia as Nitrogen	≤ 0.03 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.	≤ 0.072 milligrams/litre (95 th percentile)
MD2 Lower Sand	III	Lower Sand (C42J) (Downstream Rietpruit tributary to confluence with the Vet River)	LS3	MD 2.3	C	Quality	Pathogens	The presence of pathogens should pose a low risk to human health.	<i>Escherichia coli</i>	≤ 130 counts/100 millilitres (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)
								A baseline assessment to determine the present state instream turbidity is required.	Turbidity	A 10% variation from background concentration is allowed.

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 $\geq C$ (≥ 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: $\geq C$ (≥ 62) Macro-invertebrate ecological category: $\geq C$ (≥ 62) Instream Ecotatus category $\geq C$ (≥ 62) Hydrological category $\geq C$ (≥ 62) With monthly flow requirements as specified.
							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.	Water Quality category: $\geq C$ (≥ 62) Maintain the D ecological category by ensuring that the Average Score Per Taxon is >54.0 .

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				
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)	Month	Maintenance Low Flows		Drought Flows	
										cubic metres/second	Per-centile	cubic metres/second	Per-centile	
										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
										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
										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	
									Total Ecological Water Requirement (node ME 1.2) = 20.946 million cubic metres/annum (25.59% of the Virgin Mean Annual Runoff)	Month	Maintenance Low Flows		Drought Flows	
										cubic metres/second	Per-centile	cubic metres/second	Per-centile	
										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
										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
						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)										

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 (95 th percentile)
							System variables	pH must be maintained at present state.	pH range	6.5 (5 th percentile) and 8.4 (95 th percentile)
							Toxics	A baseline assessment to determine the present state instream turbidity is required	Turbidity	A 10% variation from background concentration is allowed.
							Pathogens	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)
								The presence of pathogens should pose a low risk to human health.	<i>Escherichia coli</i>	≤ 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	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 Ecotatus category ≥ C (≥ 62) Hydrological category ≥ C (≥ 62) With monthly flow requirements as specified. Water Quality category: ≥ C (≥ 62)

IUA	Class	River / Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit																																																																					
						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.																																																																					
ME1 Upper Vet	II	Soutspruit (C41E)	UV3	ME 1.3	B/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 1.3) = 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)	<table><thead><tr><th rowspan="2">Month</th><th colspan="2">Maintenance Low Flows</th><th colspan="2">Drought Flows</th></tr><tr><th>cubic metres/second</th><th>Per-centile</th><th>cubic metres/second</th><th>Per-centile</th></tr></thead><tbody><tr><td>Oct</td><td>0.0310</td><td>40</td><td>0.0000</td><td>99</td></tr><tr><td>Nov</td><td>0.0563</td><td>50</td><td>0.0000</td><td>99</td></tr><tr><td>Dec</td><td>0.0474</td><td>50</td><td>0.0000</td><td>99</td></tr><tr><td>Jan</td><td>0.0859</td><td>40</td><td>0.0000</td><td>99</td></tr><tr><td>Feb</td><td>0.1228</td><td>40</td><td>0.0000</td><td>99</td></tr><tr><td>Mar</td><td>0.1247</td><td>40</td><td>0.0000</td><td>99</td></tr><tr><td>Apr</td><td>0.1115</td><td>30</td><td>0.0000</td><td>99</td></tr><tr><td>May</td><td>0.0526</td><td>20</td><td>0.0000</td><td>99</td></tr><tr><td>Jun</td><td>0.0243</td><td>20</td><td>0.0000</td><td>99</td></tr><tr><td>Jul</td><td>0.0116</td><td>40</td><td>0.0000</td><td>99</td></tr><tr><td>Aug</td><td>0.0105</td><td>50</td><td>0.0015</td><td>99</td></tr><tr><td>Sep</td><td>0.0166</td><td>40</td><td>0.0019</td><td>99</td></tr></tbody></table>	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
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									≤ 55 milliSiemens/metre (95 th percentile)																																																																						
							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																																																																						
							System variables	pH must be maintained at present state.	pH range	6.5 (5 th percentile) and 8.5 (95 th percentile)																																																																					
							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)																																																																					

IUA	Class	River / Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
ME1 Upper Vet	II	Erfenis Dam	UV4			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: $\geq$ B/C ($\geq$ 78) Macro-invertebrate ecological category: $\geq$ B/C ($\geq$ 78) Instream Ecotatus category $\geq$ B/C ($\geq$ 78) Hydrological category $\geq$ B/C ($\geq$ 78) With monthly flow requirements as specified. Water Quality category: $\geq$ B/C ($\geq$ 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 .
						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 millSiemens/ 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.	<i>Escherichia coli</i>	≤ 130 counts/100 millilitres (95 th percentile)
							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-tourism, abstraction and ecological flow releases must be protected.	
						Habitat	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.		

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 Taabosspruit 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.
							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 Nitrate & Nitrite as Nitrogen Orthophosphate as Phosphorus	≤ 0.50 milligrams/litre (50 th percentile) ≤ 0.25 milligrams/litre (50 th percentile) ≤ 6 milligrams/litre (95 th percentile) ≤ 0.030 milligrams/litre (50 th percentile)
							Salts	Instream salinity must be maintained. Salinity levels should not be allowed to deteriorate.	Electrical conductivity	≤ 75 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)
						Quality	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.	<i>Escherichia coli</i>	≤ 130 counts/100 millilitres (95 th percentile)
						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 $\geq C$ (≥ 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 ecological category: $\geq C$ (≥ 62) Macro-invertebrate ecological category: $\geq C$ (≥ 62)
									Fish Response Assessment Index (FRAI) must be utilized	Instream Ecological category $\geq C$ (≥ 62) Hydrological category $\geq C$ (≥ 62) With monthly flow requirements as specified. Water Quality category: $\geq C$ (≥ 62)

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 (C43A, C43C, C43D) (Downstream Sand River Confluence to Bloemhof Dam)	LV2	EWR 15	C/D	Quantity	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.								
											Low flows							
												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)				
															Maintenance High Flows			
																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)	
																		The high flows must be attained so that the environmental flows requirements are met to support a healthy condition for the ecosystem
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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)				
									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)				

IUA	Class	River	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
									Ammonia as Nitrogen	$\leq 0,072$ 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.	
						Quality	Pathogens	The presence of pathogens should pose a low risk to human health.	<i>Escherichia coli</i>	≤ 130 counts/100 millilitres (95 th 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 $\geq$ 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 $\geq$ C/D (≥ 58)
ME 2 Lower Vet	III	Lower Vet (C43A, C43C, C43D) (Downstream Sand River Confluence to Bloemhof Dam)	LV2	EWR 15	C/D	Biota		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 $\geq$ C/D (≥ 58) Macro-invertebrate ecological category $\geq$ C/D (≥ 58) Instream Ecological category $\geq$ C/D (≥ 58) Hydrological category $\geq$ C/D (≥ 58) With monthly flow requirements as specified. Water Quality category $\geq$ 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.

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)	Month	Maintenance Low Flows		Drought Flows	
											cubic metres/second	Per-centile	cubic metres/second	Per-centile
										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)	Month	Maintenance High Flows		Percentile	
											cubic metres per second			
										Oct	0.00	0.00	99	
										Nov	14.6	14.6	90	
										Dec	0.00	0.00	99	
										Jan	14.129	14.129	90	
										Feb	72.071	72.071	20	
										Mar	0.00	0.00	99	
										Apr	0.00	0.00	99	
										May	0.00	0.00	99	
										Jun	0.00	0.00	99	
										Jul	0.00	0.00	99	
						Aug				0.00	0.00	99		
						Sep				0.00	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 (50 th percentile)				
									Dissolved Inorganic Nitrogen as Nitrogen	≤ 6 milligrams/litre (95 th percentile)				
Orthophosphate as Phosphorus	≤ 1.65 milligrams/litre (50 th percentile)													
Chlorophyll-a	≤ 0.125 milligrams/litre (50 th 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 (95 th percentile)
									Sulphate	≤ 160 milligrams/litre (95 th percentile)
									Magnesium	≤ 33 milligrams/litre (95 th percentile)
									Total Dissolved Solids	≤ 560 milligrams/litre (95 th percentile)
							System variables	pH must be maintained at present state.	pH range	pH range 7.5 (5 th percentile) - 9.2 (95 th percentile)
									Cyanide (free)	≤ 0.050 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.	Aluminium	≤ 0.1 milligrams/litre (95 th percentile)
									Manganese	≤ 0.25 milligrams/litre (95 th percentile)
									Iron	≤ 0.25 milligrams/litre (95 th percentile)
									Uranium	≤ 0.030 milligrams/litre (95 th percentile)
									Ammonia as Nitrogen	≤ 0.1 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.	
							Pathogens	The presence of pathogens should pose a low risk to human health.	<i>Escherichia coli</i>	≤ 130 counts/100 millilitres (95 th 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	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 $\geq D$ (≥ 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 $\geq D$ (≥ 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 be 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: $\geq C$ (≥ 62) Macro-invertebrate ecological category: $\geq D$ (≥ 42) Habitat requirements and health of important fish species aquatic bird species as specified. Instream Ecotatus category $\geq D$ (≥ 42) Hydrological category $\geq D$ (≥ 42) With monthly flow requirements as specified. Water Quality category $\geq D$ (≥ 42)

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)	VB 1.1	EWR1 2	D	Biota	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.	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.
								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 (<i>Gorsachius leuconotus</i>) and over twenty pairs of Goliath Heron (<i>Ardea goliath</i>). 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.
							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				
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	drought flows must be attained so that the environmental flows requirements are met to support a healthy condition for the ecosystem	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-centile	cubic metres/second	Per-centile
										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
										May	7.732	90	0.031	90
										Jun	5.863	99	0.024	99
										Jul	5.278	99	0.022	99
										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	0.00	99	99
										Nov	14.6	0.00	99	90
										Dec	0.00	0.00	99	99
										Jan	14.129	0.00	99	99
										Feb	92.225	0.00	50	50
										Mar	0.00	0.00	99	99
										Apr	0.00	0.00	99	99
										May	0.00	0.00	99	99
										Jun	0.00	0.00	99	99
										Jul	0.00	0.00	99	99
										Aug	0.00	0.00	99	99
Sep	0.00	0.00	99	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	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 (50 th percentile)				
										≤ 6 milligrams/litre (95 th percentile)				
										≤ 1.65 milligrams/litre (50 th 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 (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	Toxics	of the water users are met.	Orthophosphate as Phosphorus	≤ 0.125 milligrams/litre (50 th percentile)
									Chlorophyll- <i>a</i>	≤ 0.075 milligrams/litre (50 th percentile)
									Electrical conductivity	≤ 70 milliSiemens/metre (95 th percentile)
									Sulphate	≤160 milligrams/litre (95 th percentile)
									Magnesium	≤ 33 milligrams/litre (95 th percentile)
									Total Dissolved Solids	≤ 560 milligrams/litre (95 th percentile)
									pH range	7.5 (5 th percentile) - 9.2 (95 th percentile)
									Cyanide (free)	≤ 0.050 milligrams/litre (95 th percentile)
									Aluminium	≤ 0.1 milligrams/litre (95 th percentile)
									Manganese	≤ 0.25 milligrams/litre (95 th percentile)
									Iron	≤ 0.25 milligrams/litre (95 th percentile)
									Uranium	≤ 0.030 milligrams/litre (95 th percentile)
									Ammonia as Nitrogen	≤ 0.1 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.										

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.	<i>Escherichia coli</i>	≤ 130 counts/100 millilitres (95 th percentile)
						Habitat			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)
							Instream Habitat	Instream and Riparian habitat must be in a largely modified condition or better.		
							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)

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 (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 be 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: $\geq C$ (≥ 62) Macro-invertebrate ecological category: $\geq D$ (≥ 42) Habitat requirements and health of important fish species and recreationally important fish species aquatic bird species as specified. Instream Ecological category: $\geq D$ (≥ 42) Hydrological category: $\geq D$ (≥ 42) With monthly flow requirements as specified. Water Quality category: $\geq D$ (≥ 42)
								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.
		Vierfontein-spruit	VB2	D	Quality	Salts	Instream salinity must be improved to sustain the aquatic ecosystem.	Electrical conductivity	≤ 85 milliSiemens/metre (95 th percentile)	
						System variables	pH must be maintained at present state.	Sulphate	≤ 300 milligrams/litre (95 th percentile)	
								pH range	7.5 (5 th percentile) - 9.2 (95 th percentile)	

IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical Limit
MF Vaal River	III	Ysterspruit, Matjiespruit, Klipspruit, Leeudoring-spruit, Wolwespruit, Makwassie-spruit (C24J, C25A, C25C, C25D)	VB3		B and C		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	≤ 0.25 milligrams/litre (95 th 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 (50 th percentile) ≤ 6 milligrams/litre (95 th percentile)
									Dissolved Inorganic Nitrogen as Nitrogen	≤ 1.65 milligrams/litre (50 th percentile)
									Orthophosphate as Phosphorus	≤ 0.125 milligrams/litre (50 th percentile)
									Chlorophyll-a	≤ 0.05 milligrams/litre (50 th percentile)
						Quality	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 Leeudoring-spruit: ≤ 55 milliSiemens/metre (95 th percentile)
										Ysterspruit, Makwassiespruit and Wolwespruit: ≤ 85 milliSiemens/metre (95 th percentile)
							System variables	pH must be maintained at present state.	pH range	7.5 (5 th percentile) - 9.2 (95 th 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.	<i>Escherichia coli</i>	≤ 130 counts/100 millilitres (95 th percentile)

IUA	Class	River/Dam	Resource Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical Limit
MF Vaal River	III	Ysterspruit, Matjiespruit, Klipspruit, Leeudoring- spruit, Wolwespruit, Makwassie- spruit (C24J, C25A, C25C, C25D)	VB3		B and C	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 $\geq C$ (≥ 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 $\geq B$ (≥ 82) Instream and Riparian habitat Integrity category $\geq C$ (≥ 62)
						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 $\geq B$ (≥ 82) Macro-invertebrate ecological category: $\geq B$ (≥ 82) Instream Ecosystem category $\geq B$ (≥ 82) Hydrological category $\geq B$ (≥ 82) With monthly flow requirements as specified. Water Quality category: $\geq B$ (≥ 82) Fish ecological category $\geq C$ (≥ 62) Macro-invertebrate ecological category: $\geq C$ (≥ 62) Instream Ecosystem category $\geq C$ (≥ 62) Hydrological category $\geq C$ (≥ 62) With monthly flow requirements as specified. Water Quality category: $\geq C$ (≥ 62)

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.
						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 (50 th percentile)
					Salts		Instream salinity must be improved to sustain the aquatic ecosystem.	Nitrate & Nitrite as Nitrogen	≤ 0.25 milligrams/litre (50 th percentile) ≤ 6 milligrams/litre (95 th percentile)	
							Electrical conductivity	≤ 70 milliSiemens/metre (95 th percentile)		
		Sandspruit (C25C, C25B, C25F, C43B)	VB4		C	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)	
							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 Ecotatus category ≥ C (≥ 62) Hydrological category ≥ C (≥ 62) With monthly flow requirements to be specified.
						Biota				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	
MF Vaal River	III	Bamboes-spruit (C25E)	VB5		D	Quality			biomonitoring annually using the South African Scoring System 5 methodology.		
							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 and Riparian habitat must be in a largely modified condition or better.	Instream Habitat	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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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 (50 th percentile)
								Dam should be maintained in a mesotrophic state.	Orthophosphate as Phosphorus	≤ 0.015 milligrams/litre (50 th percentile)
									Chlorophyll - <i>a</i>	≤ 0.050 milligrams/litre (50 th percentile)
									Electrical conductivity	≤ 70 milliSiemens/metre (95 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.	Sulphate	≤ 150 milligrams/litre (95 th percentile)
									Sodium	≤ 80 milligrams/litre (95 th percentile)
									Chloride	≤ 75 milligrams/litre (95 th percentile)
									Total Dissolved Solids	≤ 560 milligrams/litre (95 th percentile)
					Quality		System variables	pH must be maintained.	pH range	7.5 (5 th percentile) - 9.2 (95 th percentile)
							Pathogens	The presence of pathogens should pose a low risk to human health.	<i>Escherichia coli</i>	≤ 130 counts/100 millilitres (95 th 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 bird species must provide for.	The importance of the Dam for recreation, eco-tourism, 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.	

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 (<i>Phoenicopterus roseus</i>), Lesser Flamingo (<i>Phoenicopterus minor</i>), the Caspian Tern (<i>Sterna caspia</i>) and African Marsh Harrier (<i>Circus ranivorus</i>). 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.

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 its natural flow directions towards the drainage systems (specifically the Schoonspruit and Taai Boschspruit 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 95 th 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 95 th percentile.
MC - Schoonspruit	RU - G2	SK 2, SK 4		Water Level - Depth to groundwater level Time series water level monitoring (Monthly) required to comply with 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 Affairs' 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): $dh = (h_0 - h_t)/t$; where h_0 = wl on day 1; h_t = 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 kilometres/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

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		Electrical conductivity and specific macro elements for domestic use; Electrical Conductivity and Sodium Adsorption Ratio for Irrigation water use. Annual water quality analysis.	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
				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): $dh = (h_0 - h_t) / t$ where $h_0 = wl$ on day 1; $h_t = wl$ 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

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 Authorizations 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)
				Nutrients: Nitrate (as Nitrogen) Annual water quality analysis	Domestic use: <10 milligrams/litre; Stock water use: <110 milligrams/litre; Irrigation use: <10 milligrams/litre
			The regional groundwater quality criteria should be based on the water use requirement for domestic, agricultural and or industrial limits.	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.

DEPARTMENT OF WATER AND SANITATION

NO. 470

22 APRIL 2016

NATIONAL WATER ACT, 1998
(ACT NO.36 OF 1998)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 publish the notices for the 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).

Acting Director: Water Resource Classification

Attention: Ms Lebogang Matlala

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0001

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MRS NP MOKONYANE

MINISTER OF WATER AND SANITATION

DATE: 17.03.2016

SCHEDULE

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 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, has determined 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, has determined 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 Table 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 upon the date of approval by the Minister, unless otherwise specified.

1. Water Resource Classes of the Lower 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	Biophysical Node Name	Quaternary Catchment	River Name	Tributary Name	Gross Catchment Area (km ²)	Natural MAR (million m ³ /a)	Present Ecological State	Recommended Ecological Category
Upper Harts River (LA1)	II	LA1.1	C31B	Vaal River	Harts River	3145	17.06	C	C
		LA1.2	C31C	Harts River	Klein Harts	1554	12.18	C	C
Middle Harts River (LA2)	II	LA2.1	C31E	Vaal River	Harts River	9109	45.33	C	C
Dry Harts River (LA3)	III	LA3.1	C32D	Harts River	Dry harts	10205	48.7	D	D
Lower Harts River (LA4)	II	LA4.2	C33A	Vaal River	Harts River	1167	3.29	A/B	A/B
		EW17	C33C	Vaal River	Harts River	31029	147.85	D	D
	III	LB.1	C33C	Harts River	Unnamed Tributary	4743	11.62	A/B	A/B
		EW16	C91A	Vaal River		108474	3303.1	D	D
		EW18	C92B	Vaal River		157685	3407.79	C	C
Douglas Weir (LB)		Douglas EWR	C92B	Vaal River		194479	3759	C/D	C

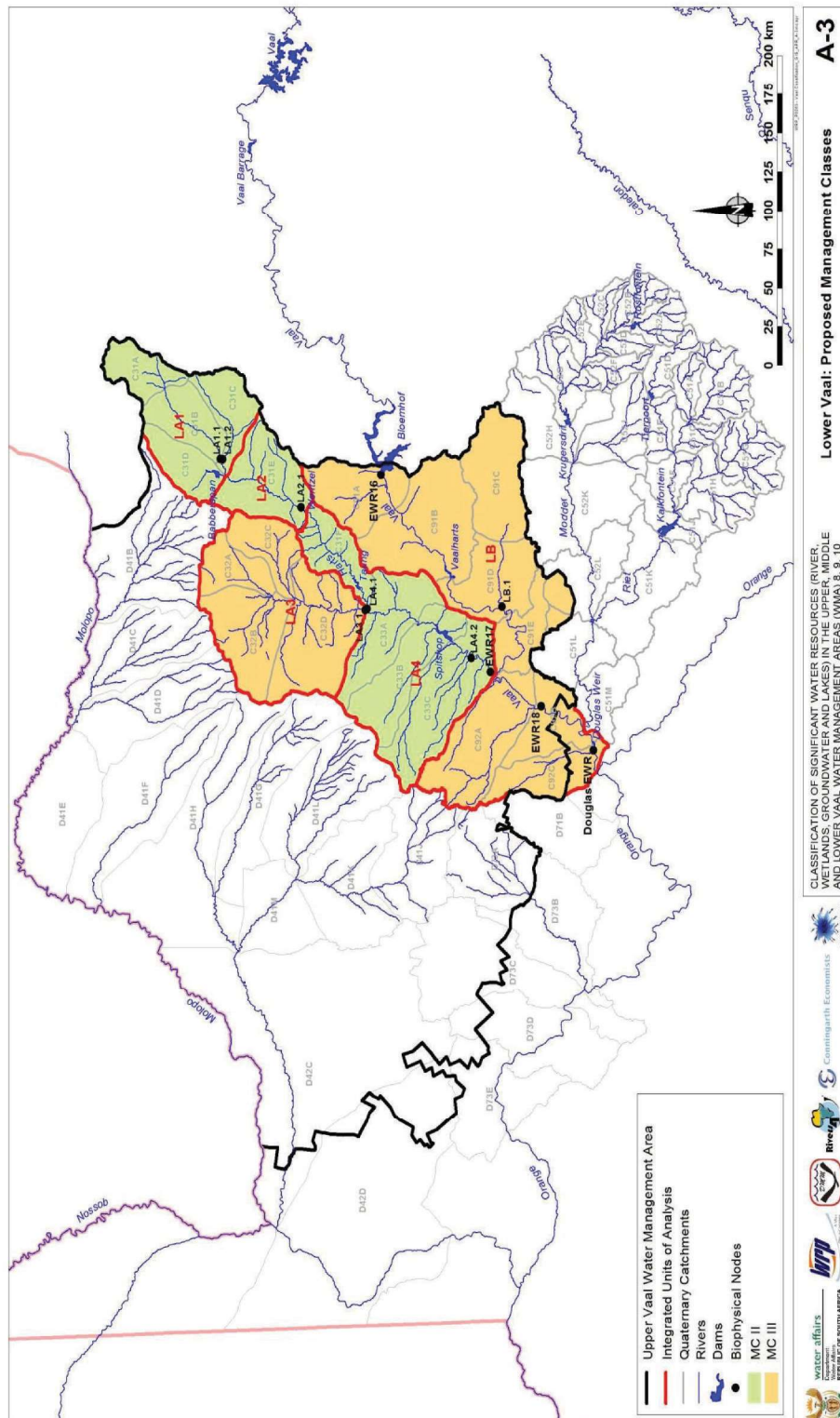


Figure 1: Integrated Units of Analysis in the Lower Vaal

RIVER WATER QUANTITY												
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)
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 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
LB	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
LB	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
LB	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
LB	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
LB	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
LB	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
LB	III	Vaal River	RU9	EWR18								

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

RIVER WATER QUALITY											
IUA	Class	River	RU	Node	REC	Component	Sub Component	RQO	Indicator/ measure	Numerical Limits	95 th 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) [*] Nitrate (NO ₃) & Nitrite (NO ₂) [*] Total Ammonia [*]	≤ 0.025 mg/L P ≤ 1.00 mg/L N ≤ 73 µg/L N	No data No data 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) [*] Nitrate (NO ₃) & Nitrite (NO ₂) [*] Total Ammonia [*]	≤ 0.025 mg/L P ≤ 1.00 mg/L N ≤ 73 µg/L N	No data 0.685 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 [*] Dissolved oxygen [*]	≤ abs(dev. from ambient) 2°C ≥ 6 mg/L O ₂	No data 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
LB	III	Vaal River	RU11	Douglas EWR	C	Quality	Pathogens	Microbial contamination must be minimised to reduce the impact on usability of irrigated crops.	<i>E.coli</i> [*]	≤ 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. <u>Water quality:</u> 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 $\geq C$ (≥ 62). Numerical values of metrics as specified. Fish ecological category: $\geq C$ (≥ 62). Assemblage attributes as specified Macro-invertebrate ecological category: $\geq C$ (≥ 62). Assemblage attributes as specified Instream Ecotatus category $\geq C$ (≥ 62). Metric composition as specified. Riparian Ecotatus category $\geq C$ (≥ 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. <u>Water quality:</u> 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 $\geq D$ (≥ 42). Numerical values of metrics as specified. Fish ecological category: $\geq D$ (≥ 42). Assemblage attributes as specified Macro-invertebrate ecological category: $\geq D$ (≥ 42). Assemblage attributes as specified Instream Ecotatus category $\geq D$ (≥ 42). Metric composition as specified. Riparian Ecotatus category $\geq D$ (≥ 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 $\geq D$ (≥ 42). Numerical values of metrics as specified. Fish ecological category: $\geq D$ (≥ 42). Assemblage attributes as specified Macro-invertebrate ecological category: $\geq D$

IUA	Class	River	RU	REC	RQO	Numerical Limits
					High flows must be used to provide habitat variability <u>Water quality:</u> 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 Ecosystem category ≥ D (≥ 42). Metric composition as specified. Riparian Ecosystem 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. <u>Water quality:</u> 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 Ecosystem category ≥ C (≥ 62). Metric composition as specified. Riparian Ecosystem category ≥ C (≥ 62). Metric composition as specified.

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

Dam Water Quantity							
IUA	Dams	RU	Component	Sub Component	RQO	Indicator/ measure	
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.)	
						Maintenance low flows (m³/s)	
						Oct 1.5 (10)	
						Nov 2.0 (10)	
						Dec 2.5 (20)	
						Jan 3.0 (20)	
						Feb 4.0 (30)	
						Mar 5.0 (30)	
						Apr 4.0 (30)	
						May 3.0 (10)	
						Jun 2.5 (10)	
						Jul 2.0 (10)	
						Aug 1.5 (10)	
						Sep 1.0 (10)	
						Drought flows (m³/s)	
						Oct 0.001 (99)	
						Nov 0.001 (99)	
						Dec 0.001 (99)	
						Jan 0.001 (99)	
						Feb 0.001 (99)	
						Mar 0.001 (99)	
						Apr 0.001 (99)	
						May 0.001 (99)	
						Jun 0.001 (99)	
						Jul 0.001 (99)	
						Aug 0.001 (99)	
						Sep 0.001 (99)	

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

DAM WATER QUALITY							Numerical Limits	95 th Percentile
IUA	Dams	RU	Component	Sub Component	RQO	Indicator/ Measure		
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) Douglas Weir (29°02'36"S; 23°50'13"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
		RU 11	Quantity	Nutrients	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) Douglas Weir (29°02'36"S; 23°50'13"E)	RU 9	Quantity	Salts	Salinity concentrations must be maintained at levels acceptable for irrigation	Electrical Conductivity*	≤ 85 mS/m	117
		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) Douglas Weir (29°02'36"S; 23°50'13"E)	RU 9	Quality	Toxicants	The numbers of cyanobacteria must be kept within mesotrophic levels.	Chl-a: phytoplankton*	≤ 20.0 µg/L	No data
		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. <u>Water quality:</u> 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 $\geq C$ (≥ 62). Numerical values of metrics as specified. Fish ecological category: $\geq C$ (≥ 62). Assemblage attributes as specified Macro-invertebrate ecological category: $\geq C$ (≥ 62). Assemblage attributes as specified Instream Ecotatus category $\geq C$ (≥ 62). Metric composition as specified. Riparian Ecotatus category $\geq C$ (≥ 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. <u>Water quality:</u> 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. <u>Water quality:</u> 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	Low flow releases to C33C as specified.

LB. Vaal River from downstream of Bloemhof Dam to Douglas Weir	III	Vaalharts weir	9	threat to human health. 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. <u>Water quality:</u> 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 recreation and angling. The requirements of ecologically and recreationally important fish species must be provided for. Consumption of fish must not pose a health risk to humans. <u>Water quality:</u> 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

GROUNDWATER				
IUA	RU	Component	RQO	Indicator/ Measure
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.
	RU1	Aquifer	Medium to long-term water trends should not show negative deviation from the natural trend	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 NGwQIMP monitoring site that is representative of the aquifer. Water level fluctuations in Dolomitic aquifers ⁶ should not exceed 6m.
All	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.
				Q < Average recharge per hectare