DEPARTMENT OF WATER AND SANITATION

NO. 612

17 JULY 2015

DEPARTMENT OF WATER AND SANITATION

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

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

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

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

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

E-mail: naidooshane@dwa.gov.za

Facsimile: 012 336 6712

MRS NP MOKONYANE MINISTER OF WATER AND SANITATION DATE: $\bigcirc \uparrow \bullet \bigcirc \neg \uparrow - \checkmark S$

SCHEDULE

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

1 DESCRIPTION OF WATER RESOURCE

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

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

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

- 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)
- 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.
- 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.
- Resource Quality Objectives (RQO) are defined for each prioritised resource unit (RU) (Table 2 and Figure 2) for every IUA in terms of water quantity, quality, habitat and biota as shown in Tables 3 – 11 respectively.
- 4. Where specified, the ecological category or Recommended Ecological Category (REC) means the assigned ecological condition by the Minister to a water resource that reflects the ecological condition of that water resource in terms of the deviation of its biophysical components from a predevelopment condition.
- RQO are applicable from 1 April 2016.

Integrated Unit of Analysis (IUA)	Water Resource Class for IUA	Biophysi cal Node Name	Quaternary Catchment	Major River Name	Tributary Name	Integrated Water Biophysi Quaternary Major River Tributary Name Gross Natural MAR Escource cal Node Catchment Name Catchment (million m ³ /a) s (IUA) IUA	Natural MAR (million m ³ /a)	Present Ecological State	Recommended Ecological Category
Renoster River	=	MA.1	C70A	Vaal River	Renoster River	613	18.46	c	o
		MA.2	C70B	Renoster River	Renoster River	881	25.55	B/C	B/C
		MA.3	C70C	Renoster River	Leeufonteinspruit	81	2.11	o	o
		MA.4	C70D	Vaal River	Renoster River	2413	63.86	o	o
		MA.5	C70D	Renoster River	Doringspruit	422	7.86	C/D	CD
		MA.6	C70F	Vaal River	Renoster River	4092	93.14	o	o
		MA.7	C70H	Renoster River	Heuningspruit	1152	17.94	v	o
		MA.8	C70K	Vaal River	Renoster River	5868	120.92	0	o
Vals River (MB)	=	MB.1	C60A	Vaal River	Vals River	860	31.24	0	o
		MB.2	C60C	Vals River	Elandsspruit/Elands	349	8.2	0	o
		MB.3	C60G	Vaal River	Vals River	4898	131.7	0	o
		EWR14	C60J	Vaal River	Vals River	5930	145.79	C/D	C/D
Schoonspruit	=	MC.1	C24C	Vaal River	Schoonspruit	1350	60.6	C/D	C/D
River (MC)		MC.2	C24F	Vaal River	Taaibosspruit	2020	19.5	o	v
		MC.3	C24G	Vaal River	Schoonspruit	2694	105.52	CD	CD
		MC.4	C24H	Vaal River	Schoonspruit	3503	117.31	C/D	C/D
		MC.5	C24A	Vaal River	Koekemoerspruit	839	26.19	D/E	٥
		MC.6	C24H	Schoonspruit	Jagspruit	499	5.24	0	0
Upper Sand River (MD1)	H	MD1.1	C42D	Vet River	Sand River	2215	66.4	0	C
Lower Sand River	=	MD2.1	C42G	Vet River	Sand River	3974	104.16	o	c
(MD2)		MD2.2	C42F	Sand River	Koolspruit	734	19.26	0	0
		MD2.3	C42L	Vet River	Sand River	7555	180.27	0	o
Upper Vet River	=	ME1.1	C41D	Vaal River	Vet River	2113	72.01	o	o
(ME1)	3	ME1.2	C41E	Vet River/Erfenis	Klein Vet River	2083	81.86	o	c
		ME1.3	C41E	Klein Vet River	Soutspruit	159	3.87	B/C	B/C
Lower Vet River	=	ME2.1	C41H	Vaal River	Vet River	5551	190.94	o	o
(ME2)		EWR15	C43A	Vaal River	Vet River	16040	413.55	C/D	C/D
/er	Ξ	MF.1	C24B	Vaal River		864	4.75	J	o
Kenoster Kiver		EWR12	C24J	Vaal River		62305	2546.42	D	D
		EWR13	C25A	Vaal River	Kliosonuit	70800	2714 80	ç	GD

1. Water Resource Classes of the Middle Vaal

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	ber er - Contra
	INTEGRATED UNITS OF ANALYSIS: RENOSTER RIVER (MA)	A MARS
R2	Downstream Vaalbankspruit tributary confluences to Koppies Dam	C70C
R3	Koppies Dam	C70C
R4	Downstream Koppies Dam to confluence with the Heuningspruit	C70E, C70D, C70F, C70G, C70H
R5	Downstream Heuningspruit confluence to confluence with the Vaal River	C70J, C70K
	INTEGRATED UNITS OF ANALYSIS MB: VALS RIVER	
V2	Downstream Pauciflora Spruit confluence to Kroonstad	C60B, C60C, C60D C60E, C60F
V3	Serfontein Dam	C60D
V4	Middelspruit tributary catchment	C60H
V5	From the Kroonval weir to the Vaal River confluence	C60G, C60J
	INTEGRATED UNITS OF ANALYSIS: SCHOONSPRUIT (MC)	
SK1	From origin of Koekemoerspruit to confluence with Vaal River	C24A, C24B
SK2	Schoonspruit eye	C24C
SK3	Taaibospruit tributary catchment	C24F
SK4	From Schoonspruit eye to Kaalspruit confluence	C24D, C24E
SK5	Kaalspruit and Buisfonteinspruit tributary catchment	C24G
SK6	Johan Neser Dam (Klerksdorp Dam)	C24G
SK7	From Johan Neser Dam to confluence with the Vaal River	C24H
	INTEGRATED UNITS OF ANALYSIS: UPPER SAND RIVER (MD1)	
US2	Downstream Klipspruit confluence to Allemanskraal Dam	C42D, C42E
US3	Allemanskraal Dam	C42E
	INTEGRATED UNITS OF ANALYSIS: LOWER SAND RIVER (MD2)	
LS1	Allemanskraal Dam to Merriespruit confluence	C42F, C42G, C42H
LS2	Rietspruit tributary catchment	C42J
LS3	Downstream Rietspruit confluence to confluence with the Vet River	C42K, C42L, C43B
	INTEGRATED UNITS OF ANALYSIS: UPPER VET RIVER (ME1)	
UV1	Klein Vet and Laaispruit tributary catchments	C41A, C41B
UV2	Origin of Vet River and Leeuspruit tributary catchment to Erfenis Dam	C41C, C41D
UV3	Soutspruit tributary catchment	C41E
UV4	Erfenis Dam	C41E
	INTEGRATED UNITS OF ANALYSIS : LOWER VET RIVER (ME2)	
LV1	Erfernis Dam to confluence with Sand River	C41F, C41G, C41H, C41J
LV2	Downstream Sand River confluence to Bloemhof Dam	C43A, C43C, C43D

Table 2: Resource Units delineated for the Middle Vaal WMA

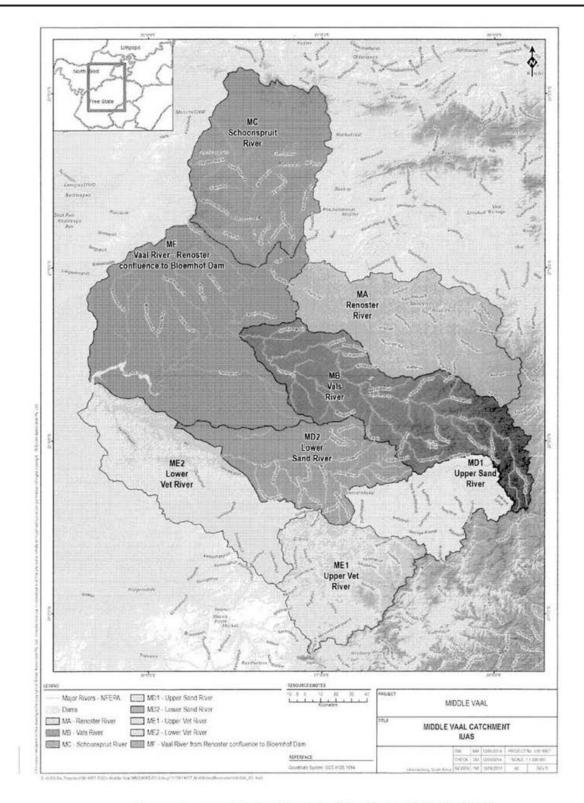


Figure 1: Integrated Units of Analysis defined in the Middle Vaal WMA

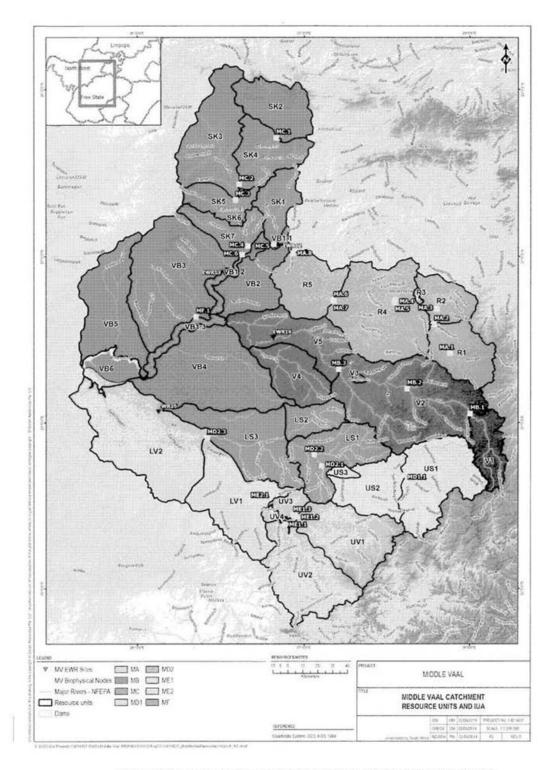


Figure 2: Resource Units and location of Nodes in the Middle Vaal WMA

Mode Ecological Component Category Quantity C Quantity Quality	Sub-component Resource Quality Indicator/measure	Total Ecological Water Maintenance tow Flows Drought Flows Requirement (node Month cubic Per- metrec/ Per- metrec/	cubic metres/annum second tile record tile (51.79% of the Virgin Oct 0.0172 40 0.0000 90	Mean Annual Runoff)	Dec 0.0463 60 0.0000	Toris Barrier	Low flows support a healthy (necreation successing to a necreation of the second of th	condition for the	condition for the opticentage value of Feb 0.0616 40 0.0000	naturalised flow	Mar 0.0455 40 0.0000	unauraniany Apr 0.0243 30 0.0000 99	Drought flows May 0.0003 30 0.0000 90	ue of Jun 0.0062 30 0.0000	Jul 0.0049 50	0.0045 50 0.0000	0.0073 30 0.0000		Instream concentration Dissolved Inorganic s 0.50 milligrams/litre (50 th percentile) of nutrients must be	Nutrients aquatic excision Orthophosphate as a 0.058 milligrams/fitre (50" percentile)	prescribed ecological Nitrate & Nitrite as Nitrogen S 6 milligrams/litre (50 th percentile) s 6 milligrams/litre (95 th percentile)	Instream salinity must Instream salinity must the maintained to support 5.5 milliSiemens/metre Saits and the water quality 5.5 milliSiemens/metre requirements of the requirements of the requirements 10.5 ^m percentile)		Pathogens patrogens should pose Escherichia coli 5 130 counts 100 millitres a tow risk to human (95 th percentite)
Qua	row flows	Low flows	row flows	Low flows	Low flows		condition for the ecosystem and instream concei	ecosystem and Instream conce	ecosystem and Instream conce	ecosystem and Instream concei	Instream concer	Instream concer	Instream concer	Instream concer	Instream concer of nutrients mus			nealth and to en prescribed ecold category is met.	Saits	The presence of				
MA 3							Quantity	formation	•										v			Quality		
R2 R2	~																	-	MA 3					
	River/Dam															Denotes	(CTOC)	(Tributaries	Elandspruit, Leeufontein	and Wolwespruit)				
Renoster (C70C) (Tributaries Elandsprite Leeufontein Wolwespruit)	Class	=																						
	IUA		Renoster																					

il limit	2 C (2 62)	Macro-invertebrate ecological category:≿ C (≿ 62)	pory 2 C (2 62)	C (2 62)	With monthly flow requirements as specified. Water Quality category: ≥ C (≥ 62)		Maintain the current C category by ensuring	axon is >5.0.	sce Drought Flows	r- cubic	tile second tile	60 0.0299 99	0.0231	70 0.0336 99 00 0.0577 00	0.0248	0.0448	60 0.0309 99	0.0261	0.0360	60 0.0381 99 70 0.0361 99	0.0455	in percentile)		
Numerical limit	Fish ecological category: 2 C (2 62)	nvertebrate ecolo	Instream Ecostatus category ≥ C (≥ 62)	Hydrological category 2 C (2 62)	With monthly flow requirements as Water Quality category: 2 C (2 62)		n the current C ca	the Average Score Per Taxon is >5.0.	Maintenance Low Flows	cubic	second	0.2348	1	0.5604	t	t	0.3484	0.1613	+	0.1001	0.1246	\$ 0.50 milligrams/litre (50 th percentile)	s 0.015 milligrams/litre (50 th percentile)	< 0.35 millioname (iton (50% compatibility)
	Fish ecc			Hydrolo	With mo		Maintair	the Ave		Month	_	Oct	NON	Dec	Fab	Mar	Apr	May	unr	Iul	Sep	s 0.50 n	s 0.015 (50 ^m per	s 0.25 n
Indicator/measure		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.	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	Total Ecological Water	Requirement (node	MA4) = 18.04 million cubic metres/annum	(28.82% of the Virgin	Mean Annual Runoff)		(percentage value of	naturalised flow	(uomnaulsip	Drought flows	naturalised flow	distribution)		Dissolved Inorganic Nitrogen as Nitrogen	Orthophosphate as Phosphorus	Nitrate & Nitrite as
Resource Quality Objective		Instream biota must be in moderately modified	importance of the RU as	a reruge nabilatiand nursery area for fish	must be ensured.		The integrity of the macroinvertebrate community within the	system must be maintained.				The downstream	maintenance low flow	MA 4 must be met to	support a healthy	condition for the ecosystem and users.						Concentration of nutrients must be maintained to sustain	ecosystem health and water quality requirements of water	users. The dam should
Sub-component			Fish				Aquatic	Invertebrates							Low flows								Nutrients	
Component			Biota				Biota								Quantity								Quality	
Ecological Category							U																	
Node							MA 3																	
Resource Unit							R2											R3						
River/Dam						Renoster	(C70C) (Tributaries Elandspruit.	Leeufontein and Wolwespruit)										Koppies Dam (C70C)						
Class																								
IUA																								

GOVERNMENT GAZETTE, 17 JULY 2015

Node	Unit	Resource Node Ecological Unit Category
Habitat	Habitat	Habitat
	83	
3	3	3
8		8
MA6 C Quantity	υ	υ

	66	66	-	66	66	66								
it	0.0887	0.0261	0.0502	0.0709	0.0373	0.0579	centile)		ercentile) entile)			pund		t Integrity
Numerical limit	20	39	8	80	80	20	50° per	ø	(50" pt 5" perce	e	d 8.6.	backgro ed.		i habitat
Numer	0.5698	0.2830	0.1759	0.1434	0.1307	0.1674	ams/litre (ligrams/litr tile)	grams/litre ns/litre (9	smens/mel	centile) an tile)	ation from I	igrams/litre tile)	d Ripariar C (z 62)
	Apr	Way	Iun	lut	Aug	Sep	s 0.5 milligrams/litre (50 th percentile)	 s 0.058 milligrams/litre (50th percentile) 	 S 0.50 milligrams/litre (50th percentile) S 6 milligrams/litre (95th percentile) 	s 70 milliSiemens/metre (95th percentile)	7.4 (5th percentile) and 8.6. (95th percentile)	A 10% variation from background concentration is allowed.	 < 0.072 milligrams/litre (95th percentile) 	Instream and Riparian habitat Integrity category ≥ C (≥ 52)
Indicator/measure	(percentage value of	distribution)					Dissolved Inorganic Nitrogen as Nitrogen	Orthophosphate as Phosphorus	Nitrate & Nitrite as Nitrogen	Electrical conductivity	pH range	Turbidity	Ammonia as Nitrogen	The Rapid Habitat Assessment Method must be implemented.
Resource Quality Objective							Instream concentration	improved to sustain aquatic ecosystem health and ensure the	prescribed ecological category is met.	Instream salinity must be emaintained at the current state to support the aquatic ecosystem and the water quality requirements of the water users.	pH must be maintained at present state.	A baseline assessment to determine the present state instream turbidity is required.	The concentrations of toxins should not be at a level that is toxic to aquatic organisms and a threat to human health.	Instream and Riparian habitat must be in a moderately modified condition or better
Sub-component								Nutrients		Salts		System variables	Toxics	Instream Habitat
Component								Quality				Audit		Habitat
Ecological Category												υ		
Node												MA6		
Resource Unit												R4		
River/Dam											Renoster (C70D, C70E,	C70F, C70G, C70H) (Downstream Koppies Dam to confluence	with the Heuningspruit)	
Class												=		
IUA												Renoster		

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	grity 2) gory.2 C (2 2 62) i specified.	ensuring 5.0.	ht Fl	cubic Per- metres/ cen-	second tile	+	+	0.0821 999		-	+	+	0.0709 99
imit	tat Inte; C (≥ 62 C (≥ 62 y ≥ C (; (≥ 62) ents as	gory by >< si no	\vdash	- 2012 	+	+	+			1	+	+	+
Numerical limit	an habi gory: ≥ ecologi catego ory: ≥ C ory: ≥ C	Per Tax	Flov	/ cen-	5 Bile	+	+	06 0		-	-	+	80
Num	d Ripari (2 62) cal cate cal cate (ebrate ostatus ostatus r flow re y flow re	current Score I	Main Low	cubic metres/	Second 0 3226	0.6848	0.7743	1.0600	1.2269	1.0977	0.7311	0.3812	0.1871
	Instream and Riparian habitat Integrity category ≥ C (≈ 62) Fish ecological category: ≥ C (≈ 62) Macro-invertebrate ecological category:≥ C (≈ 62) Instream Ecostatus category ≥ C (≈ 62) Hydrological category ≥ C (≈ 62) With monthly flow requirements as specified. Water Quality category: ≥ C (≈ 62)	Maintain the current C category by ensuring the Average Score Per Taxon is >5.0.		MONTH	04	Nov	Dec	Jan	Feb	Mar	Apr	May	Inf
Indicator/measure	A baseline assessment to determine the integrity and health for the fish continutity should be conducted to determine the current state. If the current ecological category meets the category meets the recommended C category meets the category meet the baseline assessment baseline assessment shows that the current shows the shows that the current shows the shows that the current shows the	The integrity of the invertebrate community invertebrate community using the determined Macroinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually using the South African Scoring System 5 methodology.	Total Ecological Water Requirement (node	MA8) = 31.578 million cubic metres/annum	(26.12% of the Virgin			maintenance nows (percentage value of	naturalised flow	distribution)	Drought flows	(percentage value of	distribution)
Resource Quality Objective	Instream biota must be in moderately modified condition or better through maintenance of habitat, flows, water quality and imitation of migration barriers for fish.	The integrity of the macroinvertebrate community within the system must be maintained.			flows and drought flows	must be attained so that	requirements are met to	support a healthy	condition for the ecosystem and users.				
Sub-component	Fish	Aquatic Invertebrates						LOW HOWS					
Component	Biota							Cuantry					
Ecological Category							c	J					
Node							MAD	OMM					
Resource Unit							20	2					
River/Dam				Renoster	(C70J, C70K)	Heuningspruit	confluence to	with the Vaal	River)	(includes the	tributary)		
Class													
IUA								Renoster					

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	66	66				(85 ^m			(0		
	0.0373	0.0579	tile)		(jie) e)	(8			6.5 (5 th percentile) and 8.5 (95 th percentile)	1.000	Alube
l limit	0 06	60 0	percen		percentil			ø	3.5 (95 th	kground	bitat Inte
Numerical limit	0.1725	0.2076	litre (50"	Is/litre	litre (50 ^m	s/metre	s/litre) millitre	e) and 8	from bac allowed.	arian ha 12)
z			s1.25 milligrams/litre (50 th percentile)	 ≤ 0.058 milligrams/litre (50th percentile) 	 4.0 milligrams/litre (50th percentile) 6 milligrams/litre (95th percentile) 	55 milliSiemens/metre percentile)	s 0.072 milligrams/litre (95 th percentile)	 130 counts/100 millilitres (95th percentile) 	percentil	A 10% variation from background concentration is allowed.	Instream and Riparian habitat Integrity category ≥ C (≥ 62)
	Aug	Sep	s1.25 m	≤ 0.058 (50 th pe	s 1.0 m s 6 mill	s 55 milliSi percentile)	s 0.072 (95" pe	s 130 o (95" pe	6.5 (5 ^m	A 10% concent	Instrear categor
Indicator/measure			Dissolved Inorganic Nitrogen as Nitrogen	Orthophosphate as Phosphorus	Nitrate & Nitrite as Nitrogen	Electrical conductivity	Ammonia as Nitrogen	Escherichia coll	pH range	Turbidity	The Rapid Habitat Assessment Method must be implemented.
Resource Quality Objective			Instream concentration of nutrients must be	improved to sustain aquatic ecosystem	prescribed ecological category is met.	Instream salinity must be maintained. Salinity levels should not be allowed to deteriorate.	The concentrations of toxins should not be at a level that is toxic to aquatic organisms and a threat to human health.	The presence of pathogens should pose a low risk to human health.	pH must be maintained at present state.	A baseline assessment to determine the present state instream turbidity is required.	Instream and Riparian habitat must be in a moderately modified condition or better.
Sub-component				Nutrients		Salts	Toxics	Pathogens		System variables	Instream Habitat
Component							Quality				Habitat
Ecological Category											
Node											
Resource Unit											
River/Dam											
Class											
IUA											

Numerical limit	Fish ecological category: ≥ C (≥ 62) Macro-invertebrate ecological category:≥ C (≥ 62) Instream Ecostatus category ≥ C (≥ 62) Hydrological category ≥ C (≥ 62) With monthly flow requirements as specified. Water Quality category: ≥ C (≥ 62)	An ecological category of C must be met. The Average Score Per Taxon value of > 5.0 must be achieved.	A baseline assessment should be conducted to determine the aquatic bird community and future changes in the bird communities compared to the baseline.
Indicator/measure	Fish Response Assessment Index (FRAI) must be utilized.	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually using the South African South African South African	A baseline assessment sl community and future ch baseline.
Resource Quality Objective	Instream blota must be in moderably modified condition or better. The requirements of fish species of or ological importance and with particular flow and water quality needs must be provided for.	The integrity of the invertebrate community within the system must be improving the water quality from a nutrient perspective	The habitat requirements of aquatic bird populations must be provided for.
Sub-component	Fish	Aquatic Invertebrates	Aquatic birdlife
Component		Biota	
Ecological Category		υ	
Node		MA8	
Resource Unit		8	
River/Dam	Renoster (C70J, C70K) Heuningsprut confluence to	confluence with the Vaal River) (includes the Olifantsviei tributary)	
Class		=	
IUA		Renoster	

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	lows	Per-	cen-	tile	66	66	66	66	66	66	66	66	66	66	66	66		Γ	le)			L.	8_
Imit	Drought Flows	cubic	metres/	second	0.0261	0.0077	0.0000	0.0373	0.0703	0.0523	0.0000	0.0373	0.0386	0.0075	0.0411	0.0000			0 th percenti percentile)		sa	abitat Integr	f C/D must a Per Taxor chieved.
Numerical limit	Maintenance Low Flows	Per-	cen-	+	-	-	20	80	-	6		40	_		99	30	is/litre	ms/litre	s/litre (5 re (95 th	is/metre	0 millitit	parian hu 62)	tegory o ge Score ust be ar
NUN	_	-	metres/	$^{+}$	1	v 0.6655	c 0.8307	1.1537		r 1.1455		y 0.3566		0.1340	g 0.1568	0.2600	s 0. 50 milligrams/litre (50 th percentile)	s 0.058 milligrams/litre (50 th percentile)	<pre>≤ 0.25 milligrams/litre (50th percentile) < 6 milligrams/litre (95th percentile)</pre>	65 milliSiemens/metre (95 th percentile)	 4 130 counts/100 millilitres (95th percentile) 	Instream and Riparian habitat Integrity category ≥ C (≥ 62)	An ecological category of C/D must be met. The Average Score Per Taxon value of > 4.8 must be achieved.
Indicator/measure	Total Ecolocical Water	Requirement (node MB3) Month	= 33.464 million cubic	1	Virgin	Mean Annual Runoff) Nov	Dec	Jan Jan	1	ed flow Mar		Drought flows (nerrentane May		lut (noi	Aug	Sep	Dissolved Inorganic \$ 0. Nitrogen as Nitrogen (50 th	hate as	Nitrite as	Electrical conductivity \$ 65 (95"		The Rapid Habitat Assessment Method must be implemented	ity of the te community determined ritebrate Assessment
Indie	Total Fc	Require	= 33.46	metres/annum	(25.41%	Mean Ar		Animian	(percent	naturalised flow	distribution)	Drought	value of	distribution)			Dissolve Nitrogen	Orthophosph Phosphorus	Nitrate & Nitrogen	Electrica	Escherichia coli	The Rap Assessn be imple	The integr invertebra should be using the Macroinve Response
Resource Quality Objective							The maintenance low flows	and drought flows must be	condition for the ecosystem	and users.							Instream concentration of	to sustain aquatic accession health and	ensure the prescribed ecological category is met.	Instream salinity must be maintained at the present state to support the aquatic ecosystem and the water quality requirements of the water users.	The presence of pathogens should pose a low risk to human health.	Instream and Riparian habitat must be in a moderately modified condition or better.	The integrity of the macroinvertebrate community within the system must be improved, by improved, by improved by andro duality
Sub-component								1 and Barrier	LUW IUWS									Nutrients		Salts	Pathogens	Instream Habitat	Aquatic Invertebrates
Component								Cumples.	Construct											Quality		Habitat	Biota
Ecological Category																		U					
Node																		MB 3					
Resour ce Unit																		72					
River/Dam													Vals (C60B.	C60C, C60D,	C60E, C60F)	(from the	spruit confluence to	the Kroonval weir at	Kroonstad) (Major tributaries	include the Elandspruit, Liebenberg stroom and Blomspruit)			
Class																		=					
IUA		MB Vals																					

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

IUA	Class	River/Dam	Resour ce Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit	i limit	
									biomonitoring annually using the South African Scoring System 5 methodology.			
							Diatoms	Water qualify improvement is required from a nutrient perspective.	Conduct a diatom assessment annually.	The Specific Pollution Index should be > 9.2 (C category).	Index shou	Id be >
		Vals (C60B, C60C, C60D,							A baseline assessment to determine the integrity and	Instream and Riparian habitat Integrity category ≥ C (≥ 62)	habitat Inte	grity
		(from the						Instream biota must be in	health of the fish community should be	Fish ecological category: 2 C (2 62)	ry: 2 C (2 6	2)
MB	1	spruit confluence to	5			i	i	condition or better. The requirements of fish species	conducted to determine the current state and potential impacts to the	Macro-invertebrate ecological category:≥ C (≥ 62)	ological	
Vals	•	the Kroonval weir)	77	2 aw	c	biota	FISH	of ecological importance and with particular flow and	population.	Instream Ecostatus category ≥ C (≥ 62)	tegory ≥ C	(z 62)
		(Major tributaries Elandspruit, Liebenberg						water quality needs must be provided for including the limitation of migration barriers.	Fish Response Assessment Index (FRAI) must be utilized.	Hydrological category ≥ C (≥ 62) With monthly flow requirements as specified.	i z C (z 62) Lirements a	ø
		Blomspruit)								Water Quality category: 2 C (2 62)	y: 2 C (2 62	
										Maintenance	H	
									Total Ecological Water		-	Drought Flows
									Requirement (node MB3)	Month cubic Per-	- cubic	Per-
									= 33.464 million cubic	-		Dile
									(25.41% of the Virgin	Oct 0.3200 60	0.0261	66
								The downstream	Mean Annual Runoff)	Nov 0.6655 70	0.0077	66
								requirements of node MB 3		0.8307		-
_						Quantity	I ow flows	must be met to support a	Maintenance flows	1.1537	-	-
_						6		healthy condition for the	(percentage value of	1.2475	+	+
									naturalised flow	1.1455	+	+
MB	=	Serfontein	5						(noundrisin	Apr 0.6917 60	0.0000	66
Vals	I.	Dam (C60D)	:						Drought flows (percentage	10010	+	+
									value of naturalised flow	+	+	+
									distribution)	0.1568	+	+
										0.2600	+	+
								Concentration of nutrients in	Dissolved Inorganic	< 0.50 milligrams/litre		
								the dam must be improved	Nitrogen as Nitrogen	(50° percentile)		
						Quality	Nutrients	to sustain ecosystem health and the water quality	Orthophosphate as Phosphorus	 S 0.015 milligrams/litre (50th percentile) 		
								Dam should be maintained in a mesotrophic state.	Nitrate & Nitrite as Nitrogen	 S 0.25 milligrams/litre (50th percentile) S 6 milligrams/litre (95th percentile) 	(50 th perce	ntile) e)
]

Numerical limit	≤ 0.025 milligrams/litre (50 th percentile)	s 65 militSlemens/metre (95 th percentile)	\$ 130 counts/100 millilitres (95 th percentile)	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.		Use Desktop Reserve Model and updated Present Ecological State data to determine low flow requirements.	 0.50 milligrams/litre (50th percentile) 	 s 0.25 milligrams/litre (50th percentile) s 6 milligrams/litre (95th percentile) 	 0.058 miligrams/litre (50th percentile) 	6.65 millSiemens/metre (95 th percentile)	Instream and Riparian habitat Integrity category \ge C (\ge 62)
Indicator/measure	Chlorophyll-a (5(Electrical conductivity (9)	Escherichia coli (9	Maintenance of low flow release: 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 specified.	×.	Ecological Water Us Requirement for up maintenance low flows to	S (5) Nitrogen as Nitrogen (5)	Nitrate & Nitrite as s (Nitrogen	Orthophosphate as s (5)	Electrical conductivity (9.	The Rapid Habitat Assessment Method must be implemented
Resource Quality Objective		Salinity in the dam must be maintained to support ecosystem health and water quality requirements of the downstream water users.	The presence of pathogens should pose a low risk to human health.	The downstream maintenance low flow requirements of node MB 3 in RU V2 must be met to support a healthy condition for the ecosystem and users.	The importance of the Dam as a fish refuge must be protected. This includes recologically and recreationally important fish species.	The importance of the Dam for abstraction and ecological flow releases must be protected.	Flows must be maintained to support the wetland systems present.	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.	Instream salinity must be maintained to support the aquatic ecosystem.	Instream and Riparian habitat must be in a moderately modified
Sub-component		Salts	Pathogens		Fish		Low flows		Nutrients		Salts	Instream Habitat
Component			Quality		Biota		Quantity			Quality		Habitat
Ecological Category	3									υ		
Node												
Resour ce Unit					ŝ					V4		
River/Dam				Confrontesin	Dam (C60D)				Middelspruit (C60H)	(Otterspruit tributary)		
Class												
IUA						MB	Vals					

Image: Condition of below. Condition of below. <thcondit below.<="" geno="" of="" th=""> Condit geno of be</thcondit>		Class	River/Dam	ce Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure		Numerical limit	limit	
Note Consistent for projection Absertion streament for intervention for subject, the according of constraints of the projection of redenting the intervention of a constraints of the projection of the projec									condition or better.					
Find Consideration of mediation of mediatin mediatinde mediation of mediatinde mediation of mediation of med									factories blate milit he le	A baseline assessment to	Fish ecol	ogical categor	y: 2 C (26	(2)
Final Condition of the current state Contractions contraction of the current state Contractions contraction of the current state Contractions contractions (contraction of the current state Contractions (contraction of the current state P Not Contraction (contraction									moderately modified	Determine the fish	Macro-inv	ertebrate eco	looical	
Finh controlled to controlled									condition or better. The	community should be	category:	≥ C (≥ 62)	in the second	
Fish of conjugation and and an and and									requirements of fish species	conducted to determine	1000		10	111
Normalization (Constraint) Electan (Constraint) Description (Constraint) Description (Constraint) <thdescription< th=""> Description (Constraint</thdescription<>								Fish	of ecological importance and	the current state and	Instream	Ecostatus cat	egory ≥ C	(2 62)
For Matching Event Instance Event Ins									water guality needs must be	population.	Hvdrologi	cal category	2 C (2 62)	
Advantation Financian Conjugation Financian Conjugation Financian Conjugation Periodician									provided for including the		With mon	thly flow requi	rements a	S
Blota Dames. Assessment index (PVI) investorate on multiply of the multiply of the using the commonly within the system investorate common with the system and investorate common with the system investorate common with the system investorate common with the s					2				limitation of migration	Fish Response	specified.			
Advantation The integrity of the system The system The integrity of the system The syste							Biota		barners.	Assessment Index (FRAI) must be utilized	Water Or	ality category	2 C (2 62	-
Visual Conduction Aquatic main integration of main integ										The integrity of the		Inform fun		
Aquatic resolution resolution resolution from Reported resolution from Re										invertebrate community				
Aquatic Invertebrates Aquatic macrimeteorial mentebrates The infegro mention must be maintained. Maintain the cummunity must be maintained. Maintain the cummunity must be maintained. Maintain the cummunity must be maintained. Aquatic must be formularly form Aquatic Aquatic Maintained. Maintained. Maintained. Aquatic Form Maintained. Maintained. Maintained. Maintained. Avaination Form Maintained. Maintained. Maintained. Maintained. Cvals Form Maintained. Maintained. Maintained. Maintained. Cvals Form Form Form Formanity within the system for with the system for some and the sound the sound for some for maintained. Maintained. Maintained. Cvals Form Form and forught flow Mointained. Mointained. Room Form Maintained. Mointained. Mointained. Room Form Form and forught flow Mointained. Mointained. Room Room Mointained. Mointained. Mointained. Mointained. <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>using the</td><td></td><td></td><td></td><td></td></t<>										using the				
Anduence inverted biomonitoring annualy friend for the control open and state inverted for the control for for for for for for for for for for								Amoto	The integrity of the	Macroinvertebrate	Maintain	the current C	category t	Ň
And the source and so								Invertebrates	macroinverteorate community within the system	Response Assessment	ensuring	the Average S	core Per	Taxon
Image: second system 5 Image: second system 5 Vals Vals (c606, c60) C100, Stand Grought flow (c000, c60) Stand Grought flows (c000, c60) Stand Grought flows (c000, c60) Stand Grought flows (c100, c60) Stand Grought flows (_								must be maintained.	biomonitoring annually	0.0.0			
Image: state of the s										using the South African Scoring System 5				
Visit Costo Maintenance low Month Month Month Crical Maintenance low From and drought flows From and drought flows From and drought flows Crical Water Crical Maintenance low From and drought flows From and drought flows From and drought flows Crical Water Crical Maintenance low From and drought flows From and drought flows From and drought flows Crical Water Vision cubic From and drought flows From and drought flows From and drought flows Crical Water Vision cubic From and drought flows From and drought flows From and drought flows Crical Water Vision cubic From and drought flows From and drought flows From and drought flows Crical Water Vision cubic From and drought flows From and drought flows From and drought flows Northeracio Vision cubic From and drought flows From and drought flows From and drought flows Northeracio Northeracio Skikspruit Vision cubic From 0112 From 0112 Northeracio Northeracio From 0110 From 0112 From 0112 From 0112 Northeracio Northeracio From 0112 From 0112 From 0112 From 0112 Skikspruit N	_	1								methodology.				
Kinch Construction Month Test construction Month										Total Malabasana lass		Maintenance Low Flows	Drough	It Flows
Value (From Nonversion (From Nonve										flow and drought flow	Month	F	cubic	Per-
Vals Free Ceoor. Evolution (Coroundativeir Free Martinual Striptutaries) The maintenance low flows and drought flows and drought flows the Vrigin Mean Annual Free Martinual Striptutaries) The maintenance (LWK 14) =										Ecological Water			metres/	Cen-
Vals (FeG. E60.5 (FeG. FeG. Sevential from the virgin from the virgin the virgin the virgin from the virgin from the virgin from the vi									200	Requirement (EWR 14) = 8.003 million cubic	t	-	0.003	+
(Feed) (Free (Norwajaar (Nuversia) EWR 14 CID Quantity contraction (Precentage (Nuversia) Low flows (Precentage (Precentage (Precentage) Precentage (Precentage) Precentage) Procentage Procon			Vals						The maintenance low flows and drough flows must ha	metres/annum (5.49% of			0.005	66
Krownsal weir to the Vaal Kewin Feb Cut 14 Cr0 Quantity Low flows environmental flows Incomposition			(C60G, C60J)						attained so that the	the Virgin Mean Annual Prinoffi			0.006	_
to the Vaal Rever EWR 14 CID Cummons antennection requrements are metric metric for the consystem and for the consystem and for the ecosystem and for t			Kroonvaal weir					and and	environmental flows	lucion			0.008	_
River Rever V5 14 CID Quantty River (Nuverejaar spruit spruit inbutaries) 14 CID Quantty River (Nuverejaar spruit spruit inbutaries) 14 0.444 80 0.008 Nuverejaar spruit inbutaries) May 0.125 80 0.000 Strisspruit inbutaries) May 0.112 80 0.000 Strisspruit inbutaries) May 0.013 90 0.002 High Flows Parturalised flow Juli 0.013 90 0.002 High Flows The maintenance high flows Total Maintenance high flows Aprit Month 0.033 70 0.000			to the Vaal		EWR			LOW NOWS	requirements are met to support a healthy condition			_	0.008	66
High Flows Heat Apr Current regression of the current regression o		=	River	V5	14	CID	Quantity		for the ecosystem and	Maintenance flows			0.008	66
High Flows High Flows High Flows Many 0.156 70 0.003 0.002			(Nuwejaar						users.	naturalised flow			0.000	1200
High Flows High Flows Loculation Jun 0.112 80 0.002 Name Value of naturalised flow Jul 0.013 90 0.002 Name Sep 0.133 70 0.002 High Flows The maintenance high flows Total Maintenance high flows Total Maintenance high flows High Flows The maintenance high flows Total Maintenance high flows Total Maintenance high flows			spruit and							distribution)		_	0.003	_
High Flows The maintenance high flows Total Maintenance high flows Month Mont			Skikspruit							Dminht flows (namentane		_	0.002	66
distribution) Aug 0.095 90 0.002 The maintenance high flows Total Maintenance high 5ep 0.133 70 0.000 The maintenance high flows Total Maintenance high Month Ameter high flow 0.000 Russie Month Ameter high flow Preventer Preventer Preventer			featiminnin							value of naturalised flow		_	0.002	66
The maintenance high flows Total Maintenance high Sep 0.133 70 0.000 Monthenance high flows Monthenance high flows Monthenance high flows Monthenance high flows Procession Procession </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>distribution)</td> <td></td> <td>_</td> <td>0.002</td> <td>-</td>										distribution)		_	0.002	-
The maintenance high flows Total Maintenance high Mointenance High must be attained so that the flow Ecological Water Month autoiment flows Recutirement (EVNR 14) = monototater											-	_	0.000	66
must be attained so that the flow Ecological Water Month cubic metree/ environmental flows record									The maintenance high flows	Total Maintenance high		Mainter	Nance High	Flows
								High Flows	must be attained so that the environmental flows	flow Ecological Water Remirement (FWR 14) =	Month	cubic met		rcentile

STAATSKOERANT, 17 JULIE 2015

		-		-		_		_		-			(alite)	(alti	ile)		10					
mit	66	So	66	66	60	69	66	66	66	66	66	66	(50th percentile)	50 th percer	0 th percenti percentile)	\$ 1.7 (50 ^m	ton \$ 0.02	entile)		\$	9	kground
Numerical limit	0.000	1.653	0.000	0.697	2.7	1.6	0.000	0.000	0.000	0.000	0.000	0.000		ams/litre (ms/litre (50 litre (95 th 1	Periphyton are metre	Phytoplank	(50 th perce	ens/metre	00 millitre	tile) and 8.	n from bac is allowed.
Ň	Oct	NOV	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	< 1.50 milligrams/litre	< 0.125 milligrams/litre (50 th percentile)	 \$ 1.35 milligrams/litre (50th percentile) \$ 6 milligrams/litre (95th percentile) 	Chlorophyll-a Periphyton ≤ 1.7 milligrams/square metre (50 th	percentile) Chlorophyli-a Phytoplankton ≤ 0.025	milligrams/litre (50th percentile)	 85 milliSiemens/metre (95th percentile) 	 s 130 counts/100 milititres (95th percentile) 	7.0 (5 th percentile) and 8.6 (95 th percentile).	A 10% variation from background concentration is allowed.
Indicator/measure	16.969 million cubic	metres/annum	Mean Annual Runoff)			Maintenance high flows	(percentage value of	naturalised flow	filmmninsin				Dissolved Inorganic Nitrogen as Nitrogen	Orthophosphate as Phosphorus	Nitrate & Nitrite as Nitrogen	Chlorophyll-a concentrations should be	indicator against the	nutrient concentrations.	Electrical conductivity	Escherichia coli	pH range	Turbidity
Resource Quality Objective	requirements are met to	support a healthy condition	tor the ecosystem.												Instream concentration of nutrients must sustain	Concentrations should not be allowed to deteriorate.			Instream salinity should not deteriorate.	The presence of pathogens should pose a low risk to human health.	pH must be maintained at present state.	A baseline assessment to determine the present state instream turbidity is
Sub-component															Nutriante	ension			Salts	Pathogens		System variables
Component															Outling	(max)					Quality	
Ecological Category																					CID	
Node) X										12	
Resour ce Unit																					V5	
River/Dam																			Vals	(From Kroonvaal weir to the Vaal	River confluence) (Nuwejaar	spruit and Skikspruit tributaries
Class																					=	
IUA																				a	Vals	

NA	Class	River/Dam	Resour ce Unit	Node	Ecological Category	Component	Sub-component	Resource Quality Objective	Indicator/measure	Numerical limit
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a better than largely modified condition or better.	The Rapid Habitat Assessment Method must be implemented.	Instream and Riparian habitat Integrity category ≥ C/D (≥ 58)
								Instream biola must be in a better than largely modified condition. The requirements of fish species of ecological imordance and with	Fish Response Assessment Index (FRAI) must be utilized.	Fish ecological category: 2 C/D (2 58) Macro-invertebrate ecological category:2 C/D (2 58)
							Fish	particular flow and water quality needs must be	The ecological specifications and	Instream Ecostatus category z C/D (z 58)
								provided for including the limitation of migration barriers. The importance of the RU as a refuge for fish in the Middle Vaal River must	Thresholds of Potential Concern for Ecological Water Requirement site 14 must be adhered to.	Hydrological category z C/D (z 58) With monthly flow requirements as specified.
								be maintained.		Water Quality category:2 C/D (2 58)
						Biota	Aquatic Invertebrates	The Present Ecological State must be improved to a C category.	The integrity of the invertebrate dominantly should be determined wing the Macroinvertebrate Response Assessment Index. Conduct aquatic Index. Conduct aquatic 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.
								4	The ecological specifications and Thresholds of Potential Concern for Ecological Water Requirement site 14 must be adhered to.	

	ų,	Per-	cen-	tile	8	0	5	66	66	66	66	66	66	66	66	66	66				(e)	ofed	re /ear ent
	Drought	cubic	metres/	second	0.0037	00000	0.0039	0.0112	0.0112	0.0165	0.0149	0.0000	0.0037	0.0039	0.0000	0.0000	0.0000			centile) entile)	percenti iemens/	e of the ce Qualit a achiev ion date	rentile) rams/ lit he 10 th j
al limit	ace	4	-uao	-	70	t	+	-	40	-	70	60	-	70	-	80	70			50 th pero	re (95 th 0 milliS to be m	tion dat Resource nit to be oublicat	(95 th pei 0 millig net by 1 of the G ality Ob
Numerical limit	Maintenance Low Flows	cubic	metres/s	econd	0.0202	00000	SOtto O	0.0571	0.1038	0.1682	0.2012	0.1246	0.0504	0.0243	0.0179	0.0138	0.0104	ams/litre tile	grams/litre tile)	ams/litre (5 ns/litre (95	mens/met limit of 11 ercentile)	er publicat t Notice. F umerical lir rear after p nent Notic	ams/litre limit of 40 lie) to be n tion date o
		Month	1		F	Marie	t	1	Jan		Mar	Apr		Jun	Inf	Aug	Sep	< 3.0 milligrams/litre (50 th percentile	s 0.125 milligrams/litre (50 th percentile)	s 2.5 milligrams/litre (50 th percentile) s 6 milligrams/litre (95 th percentile)	≤ 85 milliSiemens/metre (95 th percentile) A numerical limit of 110 milliSiemens/ metre (95 th percentile) to be met by the	10" year after publication date of the Government Notice. Resource Quality Dijective numerical limit to be achieved by the 20" year after publication date of the Government Notice.	\$ 250 milligrams/litre (95" percentile) A numerical limit of 400 milligrams/ litre (95" percentile) to be met by the 10" year after publication date of the Government Notice. Resource Guality Objective
Indicator/measure	Total Ecological Water	Requirement (node MC5)	= 4.691 million cubic	metres/annum (17.91% of	the Virgin Mean Annual	Runoff)		Maintenance flows	(percentage value of	naturalised flow	distribution)	Drought flows (percentage	value of naturalised flow	distribution)	The miss mater 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 tiver.	Dissolved Inorganic Nitrogen as nitrogen	Orthophosphate as Phosphorus	Nitrate & Nitrite as Nitrogen	Electrical conductivity The salinity needs to be improved significantly from the mesent 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	Sulphate
Resource Quality Objective									The maintenance lour	flows and drought flows	must be attained to	support a healthy	condition for the	ecosystem and users.				Instream concentration of nutrients must be	aquatic ecosystem health and ensure the prescribed	ecological category is met. Concentrations should not be allowed to deteriorate.		Instream salinity must be improved to acceptable levels to support a healthy aquatic ecosystem and the water quality requirements	of water users.
sup- component											I am Barre	LOW HOWS							Nutrients			Salts	
Component											Ounder	quantity									VillenO		
Ecological category																	٥						
Node																	MC 5						
Resource Unit																	SK1						
River/Dam																	Koekemoer- spruit	(C24A)					
Class																	=						
IUA																	MC	pruit					

ted Unit of Analysis (SCHOONSPRUIT) Inte the 2 Inite ò for RIVERS AND DAMS in Ohio 114.1 ć Table 5: Res

		_		_	_	_		_					
Numerical limit	numerical limit to be achieved by the 20 th year after publication date of the Government Notice.	<100 milligrams/litre (95hpercentile)	< 0.050 milligrams/litre (95 th percentile)	s 0.1 milligrams/litre (95 th percentile)	s 0.250 milligrams/litre (95" percentile)	s 0.25 milligrams/litre (95 ^m percentile)	s 0.03 milligrams/litre (95 th percentile)	s 0.1milligrams/litre (95hpercentile)	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.	s 130 counts/100 millilitres (95 th percentile)	Instream and Riparian habitat Integrity category $\gtrsim D~(\simeq 42)$	Fish ecological category: 2 ≥ D (2 42) Macro-invertebrate ecological category:2 D (2 42) Instream Ecostatus category2 D (2 42) Hydrological category2 D (2 42) With monthly flow requirements as specified. Water Quality category:2 D (2 42)	The Specific Pollution index score should be > 5.0 .
Indicator/measure		Magnesium	Cyanide (free)	Aluminium	Manganese	Iron	Uranium	Ammonia as Nitrogen	A screening level whole effluter four trophic levels and should (limited to not acutely toxic) fi	Escherichia coli	The Rapid Habitat Assessment Method must be implemented.	A baseline assessment to determine the integrity and determine the integrity and community should be conducted to determine the current state and propulation. Fish Response Population. Assessment Index (FRAI) must be utilized.	Specific Pollution Index. Conduct a diatom assessment annually.
Resource Quality Objective					The concentrations of	toxins should not be at a level that is toxic to	aquatic organisms and a threat to human health.			The presence of pathogens should pose a low risk to human health.	Instream and Riparian habitat must be in a largely modified condition or better.	Instream blota must be in a largely modified a largely modified requirements of fish species of ecological importance and with particular flow and water quality needs must be provided for.	Water quality improvement is required from a nutrient perspective.
Sub- component						Toxics				Pathogens	Instream Habitat	Fish	Diatoms
Component							Quality				Habitat	Biota	
Ecological category										۵			
Node										MC 5			
Resource Unit										SK1			
River/Dam										Koekemoer- spruit (C24A)			
Class										=			
IUA										MC Schoon soruit	ļ		

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

		-	_	_	_		-	-	_	-	-	-	-	-		-	-		,	_	_	-	
	Aut		gory:2	(82)			Drought	Flows	-	cen-	66	66				_	_	-	_	_	_	66	
ij	itat Integ	B (≥ 82)	ical cate	ry2 B (2	(2 82) tents as	(> 92)	Dro	FIG	cubic	second	0.0075	0.0039	0.0037	0.0149	0.0124	0.0112	0.0270	0.0224	0.0201	0.0153	0.0119	0.0096	
Numerical limit	ian hab	5:Ynoge	ecologi	catego	ory ≥ 8 equirem	Bory: A	nance	smo	Per-	Cen-	60	70	20	70	60	60	70	80	90	66	66	70	netre
Nume	id Ripar B (z 82)	jical cate	rtebrate	costatus	I categ	ity cate;	Maintenance	Low Flows	cubic	econd	0.0239	0.0278	0.0310	0.0743	0.1484	0.1605	0.1073	0.0489	0.0313	0.0246	0.0202	0.0170	emens/r
	Instream and Riparian habitat Integrity category ≥ B (≥ 82)	Fish ecological category:≥ B (≥ 82)	Macro-invertebrate ecological category:2 B (2 82)	Instream Ecostatus category2 B (2 82)	Hydrological category z B (z 82) With monthly flow requirements as	specified. Water Quality category: A (> 92)		1000	Month		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	s 65 milliSiemens/metre (95 th percentile)
Indicator/measure				Assessment Method must be implemented.					Total Ecological Water	= 4.147 million cubic	metres/annum	(21.27% of the Virgin		Maintenance flows	(percentile value of	distribution)	(incompany)	Drought flows (percentage	value of naturalised flow	(includent)			Electrical conductivity
Resource Quality Objective	Instream and Riparian habitat must be in a largely natural condition or better. The habitat is unique to the catchment	area and must be maintained at the	prescribed ecological condition.	Instream biota must be in	a largely natural condition or better.	The requirements of species of ecological importance and with particular flow and water quality needs must be provided for.						The melatometer for	flows and drought flows	must be attained to	support a healthy	condition for the							The instream salinity must present state to support the aquatic ecosystem and the water quality requirements of the water users. Salinity levels should not deteriorate.
Sub- component			Instraam	Habitat										I and Barne	LUW IDWS								Salts
Component				Habitat										Output to	Autom								Quality
Ecological category																	¢	2					
Node																		MC 4					
Resource Unit																	010	220					
River/Dam																	Taaibosspruit	(C24F)					
Class																	;						
NA																1000	MC	spruit					

Numerical limit	Use Desktop Reserve Model and updated Present Ecological State data to determine low flow requirements.	s 3.0 milligrams/litre (50 th percentile)	s 0.125 milligrams/litre (50 th percentile)	≤ 2.5 milligrams/litre (50 th percentile) ≤ 6 milligrams/litre (95 th percentile)	s 75 mill/Siemens/metre (95"percentile)	 4 130 counts/100 millilitres (95th percentile) 	Instream and Riparian habitat Integrity category $\gtrsim C/D~(\simeq 58)$	Fish ecological category:≥ C/D (≥ 58) Macro-invertebrate ecological category:≥	C/D (≥ 58) Instream Ecostatus category≥ C/D (≥ 58)	Hydrological categoryz C/D (z 58) With monthly flow requirements as spacified	Water Quality category:2 C/D (2 58)
Indicator/measure	Ecological Water Requirement for maintenance low flows	Dissolved Inorganic Nitrogen as Nitrogen	Orthophosphate as Phosphorus	Nitrate & Nitrite as Nitrogen	Electrical conductivity	Escherichia coli	The Rapid Habitat Assessment Method must be implemented.	A baseline assessment to determine the integrity and	community should be conducted to determine the current state and	population.	Fish Response Assessment Index (FRAI) must he utilized
Resource Quality Objective	The maintenance low flows and drought flows must be attained to support a healthy condition for the ecosystem and users.	Instream concentration of putniants must be	maintained to sustain aquatic ecosystem health and ensure the prescribed	ecological category is met.	The instream salinity must be maintained at the current state to support the aquatic ecosystem and the water quality the water quality were.	The presence of pathogens should pose a low risk to human health.	Instream and Riparian habitat must be in a better than largely modified condition.	Instream biota must be in	modified condition. The requirements of fish	importance and with particular flow and water quality needs must be	provided for.
Sub- component	Low flows		Nutrients		Saits	Pathogens	Instream Habitat		Fish	5	
Component	Quantity				Quality		Habitat		Biota		
Ecological category			1	CD					CID		
Node				MC 3					MC 3		
Resource Unit				SK4					SK4		
River/Dam		Schoonspruit	(From below eye to the	confluence) (Rietspruit and	tributaries)		Schoonspruk	(C24D, C24E) (From below eye to the	confluence) (Rietspruit and Struttontein-	loop tributaries)	
Class								j.	=		
IUA								MC	Schoon spruit		

The	The integrity of	category Component component The	Node congreat Component component	The inte	Ecological Component Sub- category component The inte
Aquatic macroinvertebrate community within the system must be maintained.	rates	rates	rates	rates	rates
The maintenance low flows and drought flows must be attained to support a healthy condition for the ecosystem and users.		Low flows	Low flows	Low flows	Low flows
Instream concentration of nutrients must be	Instre	Instre	Instre	Instre	Instre
Nutrients aquatic ecosystem health and ensure the prescribed					
ecological category is met. Concentrations should not be allowed to deteriorate.	ecol be a	cıp	MC 3 C/D	cıp	nt ario SKs MC3 C/D
The instream salinity must be maintained at the present state to support the aquatic eccesystem and the water quality requirements of the water users.		Saits	Saits	Saits	Quality Salts
Pathogens pathogens should pose a low risk to human health.					
System pH must be maintained at variables present state.	5	5	5	5	5
Instream and Riparian Instream and Riparian habitat habitat must be in a better than largely modified condition.		C/D Habitat Instream Habitat	MC 3 C/D Habitat Instream	C/D Habitat Instream	MC 3 C/D Habitat Instream

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IUA	Class	River/Dam	Resource Unit	Node	Ecological category	Component	Sub- component	Resource Quality Objective	Indicator/measure	Numerical limit
		Johan Neser Dam) (Includes Buistontein- spruit)				Biota	Fish	Instream biota must be in a better than largely modified contition. The requirements of fish species of ecological importance and with aptrolar flow and water quality needs must be provided for.	A baseline assessment to determine the integrity and determine the integrity and 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:2 C/D (2 58) Macro-invertebrate ecological category:2 C/D (2 58) Instream Ecostatus category2 C/D (2 58) Hydrological category2 C/D (2 58) With monthly flow requirements as specified. Water Quality category:2 C/D (2 58)
							Aquatic Invertebrates	The integrity of the maccoinvertebrate community within the system must be maintained.	The integrity of the should be determined using the determined warcoinvertebrate Response Assesment Index. Conduct aquatic biomonitoring annually biomonitoring annually	Maintain the current C ecological category by ensuring the Average Score Per Taxon is >5.0.
								Concentrations of nutrients must be	Dissolved Inorganic Nitrogen as Nitrogen	 ≤ 0.5 milligrams/litre (50th percentile)
								maintained to sustain ecosystem health and the water quality requirements	Orthophosphate as Phosphorus	s 0.025 miligrams/litre (50th percentile)
							Nutrients	of water users. Concentrations should not be allowed to deteriorate. Nutrient concentrations.	Nitrate & Nitrite as Nitrogen	s 2.5 milligrams/litre (50 th percentile) s 6 milligrams/litre (95 th percentile)
		Johan Neser				Quality		must be maintained in a mesofrophic state.	Chlorophyll-a	s 0.025 milligrams/litre (50 th percentile)
		(Klerksdorp Dam) (C24G)	SKG				Salts	Salinity must be maintained to support ecosystem health and the water quality requirements of the water users.	Electrical conductivity	s 70 milliSiemens/metre (95 th percentile)
							Pathogens	The presence of pathogens should pose a low risk to human health.	Escherichia coli	s 130 counts/100 millilitres (95 th percentile)
						Biota	Fish	The importance of the Dam as a retuge for upstream aquatic and semi-aquatic biota must be protected. This includes ecologically and	Habitat requirements and health of specified ecol recreationally important fish species as specified.	Habitat requirements and health of specified ecologically and recreationally important fish species as specified.

		6		(50"			(95 th	(95 ^m			(95 ^m	(95 th		
Numerical limit		Use Desktop Reserve Model and updated Present Ecological State data to determine low flow requirements for node MC 4 on the Schoonspruit.	 3.0 milligrams/litre (50^m percentile) 	s 0.125 milligrams/litre (5 percentile)	s 2.5 milligrams/litre (50° percentile) s 6 milligrams/litre (95 th percentile)	s milliSiemens/metre (95 th percentile)	≤ 200 miligrams/litre (9 percentile)	 s 0.050 miligrams/litre (9 percentile) 	s0.1 milligrams/litre (95 th percentile)	s 0.250 milligrams/litre (95 th percentile)	 ≤ 0.03 milligrams/litre (9) percentile) 	 s 0.072 milligrams/litre (9) 	 25 milligrams/litre 95th percentile) 	A screening level whole effluent toxicity test should be conducted at four trophic levels and should the results show toxicity greater than 1 (limited to not acutely toxic) further definitive tests are required.
Indicator/measure		Ecological Water U Requirement for un maintenance and drought d	Dissolved inorganic s Nitrogen as Nitrogen (6	Orthophosphate as s Phosphorus	Nitrate & Nitrite as s Nitrogen s	Electrical conductivity s	Sulphate 5	Cyanide (free)	Aluminium (1	Manganese (Uranium	Ammonia as Nitrogen 5	Iron (G	A screening level whole effluent four trophic levels and should th (limited to not acutely toxic) furt
Resource Quality Objective	recreationally important fish species. In importance of the Dam for recreation. abstraction and ecological abstraction and ecological	The maintenance low flows and drought flows must be attained to condition for the ecosystem and users.	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.	The instream salinity must be improved to support the	aquatic ecosystem and the water quality requirements ofwater users.			The concentrations of	toxins should not be at a level that is toxic to	aquatic organisms and a threat to human health.		
sub- component		Low flows		Nutrients			Salts				Toxics			an and an
Component		Quantity						Quality	Î					
category							CID							
Node							MC 4							
Resource Unit							SK7							
River/Dam						Schoonspruit (24H) (From Johan	Neser Dam to the confluence	River) (includes	tributary					
Class							=							
IUA							MC Schoon	spruit						

Numerical limit	millifitres	Instream and Riparian habitat Integrity category ≥ C/D (≥ 58)	Fish ecological category:2 C/D (2 58)	Macro-invertebrate ecological category.2 C/D (2 58)	Instream Ecostatus category≥ C/D (≥ 58)	Hydrological category2 C/D (2 58) With monthly flow requirements as specified at Node MC 4.	Water Quality category:2 C/D (2 58)	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
Mun	s 130 counts/100 millifitres (95 th percentile)	Instream and Ripariar category ≥ C/D (≥ 58)	Fish ecological ca	Macro-invertebrat C/D (≥ 58)	Instream Ecostatu	Hydrological category2 C/D (2 58) With monthly flow requirements as specified at Node MC 4.	Water Quality cat	The current ecological category must be improved to a D ecolog category. Aim to reach an Aven Score Per Taxon value of > 4.2
Indicator/measure	Escherichia coli	The Rapid Habitat Assessment Method must be implemented.		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.		The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic biomonitoring amually using the South African Scoring System 5 methodoloxy.
Resource Quality Objective	The presence of pathogens should pose a low risk to human health.	Instream and Riparian habitat must be in a better than largely modified condition.		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 integrity of the accoinventerate community within the system must be improved through the implementation of the water quality objective specified above.
Sub- component	Pathogens	Instream Habitat			Fish			Aquatic Invertebrates
Component		Habitat					Biota	
Ecological category						CID		
Node						MC 4		
Resource Unit						SK7		
River/Dam					Schoonspruit (24H)	(From Johan Neser Dam to the confluence of the Vaal	River)	Jagspuit
Class						=		
IUA						MC Schoon spruit		

	Flows	Per-	olle -	66	66	66	66	66	66	66	66	66 00	5	66	66		(bile)			ntile)	
ij	Drought Flows	cubic	second	0.0373	0.0193	0.0112	0.0411	0.0496	0.0299	0.0231	0.0187	000000	66700	0.0302	0.0444		ercentile			5 th percer	ø
Numerical limit	unce ws	Per	tile	3	80	80	80	20	2	20	20	20	2	80	99	tre	tre (50 (95" p	Aitre	metre	litre (9:	nillitre
Numer	Maintenance Low Flows	cubic	second	0.2225	0.3673	0.4066	0.5615	0.7068	0.6213	0.4201	0.2640	6591.0	+50T'0	0.1057	0.1644	 S0.50 milligrams/litre (50th percentile) 	 s 0.25 milligrams/litre (50th percentile) s 6 milligrams/litre (95th percentile) 	 0.058 milligrams/litre (50th percentile) 	5.75 milliSiemens/metre (95 th percentile)	s 0.072 milligrams/litre (95 th percentile)	\$ 130 counts/100 millilitres (95 th percentile)
		Month		Oct	Nov	Dec	Jan	Feb	Mar	Apr	VeW	Int	in	Aug	Sep	 s 0.50 milligram (50th percentile) 	s 0.25 m s 6 millig	s 0.058 milligra (50 ^m percentile)	s 75 mili (95º perc	s 0.072 n	\$ 130 counts/10 (95 th percentile)
Indicator/measure		Requirement (node	MD1.1) = 17.349 million	cubic metres/annum	(26.13% of the Virgin		Maintenance flows	(percentage value of	distribution)	lummer	Drought flows	(percentage value of naturalised flow	distribution)	1. company		Dissolved Inorganic Nitrogen as Nitrogen	Nitrate & Nitrite as Nitrogen	Orthophosphate as Phosphorus	Electrical conductivity	Ammonia as Nitrogen	Escherichia coli
Resource Quality Objective					2020 0124	The maintenance low flows	and drought flows must be	condition for the ecosystem	and users.							Instream concentration of	moments must be maintained to sustain aquatic ecosystem health and to ensure the proceeded	ecological category is met.	Instream salinity must be maintained to support the aquatic ecosystem health and the water quality requirements of the water requirements of the water	The concentrations of toxins should not be at a level that is toxic to aquatic organisms and a threat to human health.	The presence of pathogens should pose a low risk to
Sub- component							1 num finne										Nutrients		Salts	Toxics	Pathogens
Component							Outstation	Sminne											Quality		
Ecological Category															1400	U					
Node																W	5				
Resource Unit																US2					
River/ Dam																Upper Sand (C42D, C42E) (From Klipspruit	contruence to Allemanskraal Dam)				
Class																=	Į				
IUA						26										MD1 Upper	Sand				

In the second se	Cla	Class	River/ Dam	Resource Unit	Node	Ecological Category	Component	Sub- component	Resource Quality Objective	Indicator/measure		Numerical limit	l limit	
Upper Sand Cubber Sand Ubper Sand Ubber Green Ubper Sand Ubper Sand Ubper Green Ubper Sand Ubber Green Ubper Sand Ubber Green Ubper Sand Ubber Green Ubber Green										A baseline assessment to determine the interrity	Fish ecol	ogical catego	ory: 2 C (2	62)
Vibro Stand Upper Stand Condition or better. The integrity of the	_								Instream biota must be in	and health of the fish	Macro-in	vertebrate ec	ological	
Upper Sand (C420, C320) (2400 C 330) Upper Sand (C420, C320) ND C Blota consultantents of fais species of ecological imponents of fais species attention of effert. Constrained of ecological imponents of attention of effert. Constrained of ecological imponents of attention of effert. Constrained of ecological imponents of attention of		-							moderately modified	community should be	category	2 C (2 62)		
Image: Second									condition or better. The	conducted to determine	are and			
Image: statute in the statut	_							Fish	requirements of fish species	the current state and	Instream	Ecostatus ca	stegory > (C (≥ 62)
Upper Start For Negeo S									with particular flow and	potential impacts to the population.	Hvdrolog	ical category	1 2 C (2 62	10
Cubbo Case (Name Animatican Dami) C Biora Provided for (Name Animatican Dami) Resonant index (FM) (Name Dami) Seessense (Name Dami)	_	-							water quality needs must be		With mor	othiv flow regi	uirements	as
Image: Second System US3 ND C Blots Ture Integrity of the integrity		_	Upper Sand						provided for.	Fish Response	specified			
Table Bloa Low longering in the unterface of community of the nonserverate community of the nonserv	_		Ecom Vincensi		CW1		1000000			Assessment Index (FRAI)	121120000000000000000000000000000000000			
Nationalization Interplay of the integrity of the i			confluence to	US2		υ	Biota			must be utilized.	Water QI	uality categor	y: 2 C (2 6	32)
Dam) Dam Image: Control of the determined investigation of the metabolisment of		-	Allemanskraal							The integrity of the				
II Autor Condition and a setter of the sette		_	Dam)							invertebrate community				
Interfactor Totalistic The maintained. Interfactories Assessment community with the system wish the system issue in the system is	_									should be determined				
II II II II II II II II II II	_								The integrity of the	using the				1
II II II II II II II II II II	-			_				Aquatic	macroinvertebrate	Macroinvertebrate	Maintain	the current C	ecologica	m
Image: constraint of the maintained. monomined of partnershy using partnershy partnershy using partnershy using partnershy p	_							Invertebrates	community within the system	Response Assessment	category	by ensuring	that the Av	verage
II Pointending System 5 Pointending Pointending Pointend	_								must be maintained	Index. Conduct aquatic	Score Pe	er Taxon is >5	5.0.	
II II II II II II II II II II	_									biomonitoring annually				
II Alternanskraal Jom (c422) Jom (c423) Jom (c44) Jom (c44	_									using the South African				
Allemanekraal Low flows Total Ecological Water frequirement (node requirement (node requirement) (node										Scoring System 5 methodology				
Alternativaal Low flows Constream node MD 2, 1) = 29,516 million Month route revention of the version of the ver	_											Maintenance	F	
Allemanskraal Dam (C42E) North C42 Total Ecological Water Requirement (node ment) Month C40 Content (node ment) Month C40 Content (node ment) Month C40 Content (node ment)	_											Low Flows	nond	SWORT 31
US3 Quantity Low flows Requirements of the contraction of the contrecont of the contraction of the contractio										Total Ecological Water	Month	-	-	-
US3 Calify Low flows US3 US3 US3 US3 US3 US3 US3 US3	_									Requirement (node			_	_
US3 US3 US3 US3 US3 US3 US3 US3										MD2.1) = 29.516 million	T	_	ł	+
US3 Cuantity Low flows devicements of the virgin hear Annual Runoff) bec 0.0573 80 0.0709 devicements of the virgin hear Annual Runoff) bec 0.0573 80 0.0709 devicements of the virgin healthy condition for the percentage value of hard 1.1913 70 0.0827 healthy condition for the cosystem and users. distribution) healthy condition for the cosystem and users. Drought flows durated flow hard 1.00123 70 0.0336 for the virgin healthy condition for the cosystem and users. distribution) healthy condition for the cosystem and users. distribution) healthy condition for the distribution for the distribution for the cosystem and users. Drought flows durated flow hard 1.00122 70 0.0336 for distribution) healthy condition for the distribution for the distrubution for th										cubic metres/annum		_	-	-
US3 US3 US3 US3 US3 US3 US3 US3	_	-							The melatosanee law fam	(28.34% of the Virgin		-		
Quantity Low flows downstream node MD 2.1 must be met to support a must be met to support a must be met to support a must be met to support a distribution) Maintenance flows Ian 0.9457 80 0.0709 US3 Quantity Low flows maintenance flows Feb 1.1913 70 0.0323 Percentage value of distribution) Maintenance flows Maintenance flows Maintenance flows Maintenance flows 0.0424 Constition Contrained users. Contrained flows Maintenance flows Maintenance flows 0.0424 Maintenance Constition for the distribution) Contrained flows Maintenance flows Maintenance flows 0.0424 Maintenance Constition Constition for the distribution) Maintenance flows Maintenance flows 0.0424 Maintenance Constition Constition Maintenance flows Maintenance flows 0.0424 Maintenance Constition Constition Constition Maintenance flows 0.0133 Maintenance Constition Maintenance Maintenance 0.0562 50 0.01434 Maintenance Maintenance Maintenance Maintenance 0.0562 50 0.0448 Maintenance Maintenance Maintenance Mainte	_								requirements of the	Mean Annual Runoff)				
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US3 US3 US3 US3 US3 US3 US3 US3 US3 US3 US3 US3 US3 US3 US3 US3	_						Quantity	Low flows	must be met to support a	Maintenance flows	t	⊢	t	+
US3 ecosystem and users. Harturansee now with the interval of	_	-							healthy condition for the	(percentage value of	$^{+}$	+	T	+
Outside distribution) Apr 0.7284 70 0.0342 Image: Concentration of number of the number o	_		Allemanskraal						ecosvstem and users.	naturalised now	IDIAL	+	-	4
Quality Nutrients Drought flows May 0.4529 40 0.0336 Imaturalised flow Jun 0.2602 50 0.0348 Imaturalised flow Jun 0.1512 20 0.0448 Imaturalised flow Jun 0.15621 80 0.0627 Imaturalised flow Jun 0.15612 80 0.0627 Imaturalised flow Nutrients Dissolved inorganic 5.6.6 0.0887 Imaturalised to Nutrients Societation 10.0527 80 0.0627 Imaturalised to Nutrients Societation Societation 10.0887 Imate glow Imate glow Dissolved inorganic s.0.5 milligrams/litre (50 ^m percentile			Dam (C42E)	ns3						distribution)		_		_
Nutrients Nutrients 0.2662 50 0.0193 Nutrients 0.1655 0.1655 70 0.0448 Nutrients 0.1551 0.1655 70 0.0487 Nutrients 0.2600 60 0.0887 Nutrients 0.1551 80 0.0627 Nutrients 0.1550 0.2600 60 0.0887 Nutrients 0.1550 8.0.5 0.2600 60 0.0887	_									Descript Rouse		_		
Nutrients Nutrients 0.1635 70 0.0448 Nutrients Aug 0.1531 80 0.0627 Sep 0.2600 60 0.0887 Nutrients Nutrients Nitrogen as Nitrogen \$0.5 milligrams/litre (50 ^m percentile	_									(nercentage value of		_	_	-
Aug 0.1591 80 0.0627 Concentration of nutrients Sep 0.2600 60 0.0887 Concentration of nutrients Dissolved Inorganic s.0.5 milligrams/litre (50 ^m percentile and interventile s.0.25 milligrams/litre (50 ^m percentile and interventile and interventile and interventile and interventile										naturalised flow		_	_	-
Nutrients Dissolved Inorganic 5 ep 0.2600 60 0.0837 Concentration of nutrients Dissolved Inorganic \$ 0.5 milligrams/litre (50 ^m percentile sustain ecosystem health Nitrogen as Nitrogen \$ 0.25 milligrams/litre (50 ^m percentile solved health	_	-								distribution)			-	-
Concentration of nutrients Dissolved Inorganic must be maintained to Nitrogen as Nitrogen sustain ecosystem health Nitrogen as Nitrogen and water usater verses of valar verses of the second	_										-	-	-	-
Nutrients must be maintained to Nitrogen as Nitrogen as Nitrogen as Nitrogen and water verse verse water verse ver									Concentration of mitriante					
Nutrients sustain ecosystem health measurements and water usater nearer Nutrate & Nitrite as conjection and water nearer water nearer with the second	_							Contraction of the second	must be maintained to	Nitrogen as Nitrogenic	s 0.5 mill	igrams/litre (50 ^m percei	ntile)
Nitrate & Nitrite as							Quality	Nutrients	sustain ecosystem health					
	_								and water quality requirements of water users.	Nitrate & Nitrite as	s 0.25 m	illigrams/litre	(50 th perc	centile)

Numerical limit	s 0.025 milligrams/litre (50 th percentile)	s 0.025 milligrams/litre (50 th percentile)	umetre (95 th) and 8.5 (95 th	mälilitres (95 th	cologically and d species as		o determine the
Nume	< 0.025 milligrams	s 0.025 milligrams	s 30 milliSiemens/metre (95 th percentile).	7.0 (5 th percentile) and 8.5 (95 th percentile)	s 130 counts/100 mällititres (95 th percentile)	health of specified ec		hould be conducted to round the dam.
Indicator/measure	Orthophosphate as Phosphorus	Chlorophyll-a	Electrical conductivity	pH range	Escherichia coli	Habitat requirements and health of specified ecologically and recreationally important fish speciesaquatic bird species as specified.		A baseline assessment should be conducted to determine the aquatic bird community around the dam.
Resource Quality Objective	Dam should be maintained in a mesotrophic state.		The salinity in the dam must be maintained in order to support ecosystem health and the water quality requirements of the downstream water users.	pH must be maintained at present state.	The presence of pathogens should pose a low risk to human health.	The importance of the Dam aquatic and semi-aquatic biota must be protected. This includes ecologically and ecceationally important fish species and ecologically important aquatic bird species	The importance of the Dam for recreation, abstraction and ecological flow releases must be protected.	The dam supports large numbers of a chich diversity of locally resident and norally resident and associated birds. Of these the Greater Flamingo (<i>Phoenicopterus rinor)</i> , the Caspian Tern (<i>Sterna</i> caspie) are of conservation importance. The suitability of populations must be maintained through proper
Sub- component			Salts	System variables	Pathogens	Fish		Aquatic birds
Component				Quality				Blota
Ecological Category								
Node								
Resource Unit						nsa		
River/ Dam						Allemanskraal Dam (C42E)		
Class						Ξ		
IUA						MD1 Upper Sand		

_			-	-	00		2			-	_	-					_	_			
nit	Drought	cubic	second	0.0000	0.0000	0.0000	0.0037	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		ⁿ percentil ercentile)	" percent		(95 ^m	s (95°
rical lir	ce Low	Per	tile	50	60	60	20	60	09	50	30	30	50	50	30	e	tre (50 (95 th p	litre (50	netre	and 8.5	nillilitres
Nume	Maintenan Flow	cubic	second	0.0459	0.1076	0.1307	0.2106	0.2534	0.2699	0.1956	0.1064	0.0444	0.0004	0.0056	0.0343	illigrams/li	illigrams/li rams/litre	nilligrams/	Siemens/r	ercentile) e)	unts/100 n
	and Canada and	Month		Oct	NOV	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	s 0.50 m (50 ^m per	s 0.50 m s 6 millio	s 0.058 r	s 65 mills (95° perc	6.5 (5 th p percentil	s 130 cour percentile)
Indicator/measure	Total Ecological Mistor	Requirement (node	MD2.2) = 5.989 million	cubic metres/annum	Mean Annual Runoff)		Malatanana Barra	maintenance nows (nercentane value of	naturalised flow	distribution)	Control of the second	Urought nows	naturalised flow	distribution)		Dissolved Inorganic Nitrogen as Nitrogen	Nitrate & Nitrite as Nitrogen	Orthophosphate as Phosphorus	Electrical conductivity	pH range	Escherichia coli
Resource Quality Objective						The maintenance low flows	and drought flows must be	condition for the eccenter	and users.							Instream concentration of	numents must be maintained to sustain aquatic ecosystem health	and ensure the prescribed ecological category is met.	The instream salinity must be maintained to support the aquatic eccsystem and the water quality requirements of the water users. Salinity levels should not deteriorate.	pH must be maintained at present state.	The presence of pathogens should pose a low risk to human hash
Sub- component								LOW TIOWS									Nutrients		Salts	System variables	Pathogens
Component	MD MD MD MD MD MD MD MD MD MD																				
Ecological Category	MD 2.1, MD 2.2, MD 2.2 C Quantity Low flows Low flows Authority System System System Category C C Quantity C C C C C C C C C C C C C C C C C C C																				
Node	Unit rote category component component objective objective category component committee to support shealthy condition for the ecosystem and drought flows must be and drought flows must be condition for the ecosystem mathing and users. I condition for the ecosystem mathing and users and																				
Resource Unit																					
River	NVOF Unit Node Category Component component Lower Sand (CA3F, (From Dam to Dam to Minescuti Low from Low from Low from Low from Low from Low from Low from Low from Low from Low from Low from Low from Low from Low from Low from Low from Low from Low from Low from Low from Low from Low fro																				
Class																					
IUA															MD 2	Sand					

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
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a moderately modified condition or better.	The Rapid Habitat Assessment Method must be implemented	Instream and Riparian habitat Integrity category ≥ C (≥ 62)
MD 2 Lower Sand	=	Lower Sand (G42F, C426,C42H) (From Allemanskraal	5	MD 2,1,0	o	Biota	Fish	Instream biota must be in 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: 2 C (2 62) Macro-invertebrate ecological category:2 C (2 62) Instream Ecostatus category 2 C (2 62) Hydrological category 2 C (2 62) With monthly flow requirements as specified. Water Quality category: 2 C (2 62)
		Merriespruit confluence)		22			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 Macoinvertebrate Macoinvertebrate Macoinvertebrate biomonitoring anualty using the South African Sconing System 5 methodology.	Maintain the current C ecological category by ensuring that the Average Score Per Taxon is >5.0.
MD2 Lower Sand	Ξ	Rietspruit tributary (C42J)	LS2		۵	Quality	Nutrients	Instream concentration of nutrients must be improved to sustain aquatic ecosystem health and ensure the prescribed ensure the prescribed	Dissolved Inorganic Nitrogen as Nitrogen Nitrogen Orthophosphate as	 \$3.0 miligrams/litre (50th percentile) \$2.5 miligrams/litre \$6 miligrams/litre \$6 miligrams/litre \$0.125 miligrams/litre

Τ	eed to						(95°		
Numerical limit	5.85 milliSiemens/metre (95" percentile). A numerical limit of 185 milliSiemens/ anter (95° percentile) to be met by the 10° year after publication date of the Government Notice. Resource Quality Dijective numerical limit to be achieved by the 20° year after publication date of the Government Notice.	6.5 (5 $^{\rm th}$ percentile) and 9.2 (95 $^{\rm th}$ percentile).	A 10% variation from background concentration is allowed.	 ≤ 0.050 milligrams/litre (95^m percentile) 	s 0.1 milligrams/litre (95 th percentile)	s0.25 milligrams/litre (95 th percentile)	s 0.25 milligrams/litre (percentile)	\$ 0.030 milligrams/litre (95 th percentile)	 milligrams/litre (95th percentile)
Indicator/measure	Electrical conductivity The salinity needs to be improved significantly from the present state to meet present state to meet conductivity required imit of 85 milliSiemens/ mere. A phased approach over a twenty year period is to be used to achieve the used to achieve the milliSiemens/metre.	pH range	Turbidity	Cyanide (free)	Aluminium	Manganese	Iron	Uranium	Ammonia as Nitrogen
Resource Quality Objective	Instream salinity must be instream salinity must be aquatic ecosystem and the water quality requirements of the water users and to ensure the prescribed ecological category is met.	pH must be maintained at present state.	A baseline assessment to determine the present state instream turbidity is required.			The concentrations of toxins should not be at a level that is toxic to aquatic organisms	and a threat to human health.		
Sub- component	Salts		System variables			Toxics			
Component		,				Quality			
Ecological Category						٥			
Node									
Resource Unit						LS2			
River						Rietspruit tributary (C42J)			
Class						Ξ			
NN						MD2 Lower	Sand		

Т	d at		\$	Т	siy:2	2)			1	SM	Per-	tile	66	66	66	5	5 0	66	66	66	66	66	66
imit	be conducte ity greater th are required	35 (95°	Instream and Riparian habitat Integrity category ≿ D (≳ 4.2)	Fish ecological category: 2 D (2 42)	Macro-invertebrate ecological category:≥ D (≥ 42)	instream Ecostatus category≥ D (≥ 42)	Hydrological category ≥ D (≥ 42)	00 0110110	Water Quality category: 2 D (2 42)	Drought Flows	cubic		0.0523	0.0270	0.0187	76/170	01120	0.0849	0.0933	0.0849	0.0448	0.0493	0.0876
Numerical limit	t should low toxic ive tests	0 millilitre	parian ha 42)	ategory:	ate ecolo	tus cate;	tegory 2		itegory: 2	nance lows	Per	tile	70	80	80	00	80	20	40	SO	80	90	60
Nur	xicity tes results sh her definit	± 130 counts/100 millitres (95 th percentile)	m and Ri ry≥D(≥	cological o	invertebra	m Ecosta	Hydrological category > D (> 42)	ad.	Quality ce	Maintenance Low Flows	cubic	second	0.4014	0.7481	0.8658	F0/7.1	1 5177	1.0849	0.6440	0.3306	0.1404	0.1493	0.2986
	effluent to iould the oxic) furth	s 130 cour percentile)	Instrea	Fish ec	Macro-ir D (≥ 42)	Instrea	Hydrok	specified.	Water		Month		Oct	NON	Dec	uer	Mar	Apr	May	Jun	Jul	Aug	Sep
Indicator/measure	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.	Escherichia coli	The Rapid Habitat Assessment Method must be implemented.		A basetine assessment to determine the integrity of the fish	community should be conducted to determine	the current state and localised impacts.	Fish Response Assessment Index	(FRAI) must be utilized.	Total Ecological Water	Requirement (node	million cubic	metres/annum	(24.37% of the Virgin Mean Annual Princh)			Maintenance tlows (percentage value of	naturalised flow	distribution)	Drought flows	(percentage value of	distribution)	(inconnoinein
Resource Quality Objective		The presence of pathogens should pose a low risk to human health.	Instream and Riparian habitat must be in a largely modified condition or better.		Instream hinte must he in	largely modified condition or better through maintenance	of habitat, flows, water quality.								The maintenance low flows	attained to support a healthy	condition for the ecosystem	and users.					
Sub- component		Pathogens	Instream Habitat			Fish										Low flows							
Component			Habitat			Riota										Quantity							
Ecological Category																U	6						
Node																Q	2.3						
Resource Unit			×													LS3							
River														Lower Sand	(C42J)	Rietspruit tributary	to confluence with	(Javin raver)					
Class																=							
IUA															MD2	Lower	Sand						

Indicator/measure Numerical limit	Dissolved Inorganic s 1.5 milligrams/litre (50 th percentile)	Nitrate & Nitrite as 1.0 militgrams/litre (50" percentile) Nitrogen s 6 militgrams/litre (95" percentile)	Orthophosphate as Phosphorus \$ 0.058 milligrams/litre (50 th percentile)	Electrical conductivity \$ 85 milliSiemens/metre (95 th percentile)	Cyanide (free) ≤ 0.045 milligrams/litre (95 th percentile)	Aluminium s 0.1 milligrams/litre (95 th percentile)	Aanganese s 0.25 milligrams/litre (95 th percentile)	≤ 0.3 milligrams/fitre (95 th percentile)	Uranium s 0.03 milligrams/litre (95th percentile)	Ammonia as Nitrogen s 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.	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.	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.
Resource Quality In Objective	ion of		ensure the prescribed Orth ecological category is met. Phos	Salinity levels are significantly high. Instream salinity must be improved to support the aquatic ecosystem and the water quality requirements of the water users.	Cya	Alun	Man	The concentrations of toxins should not be at a level that Iron	is toxic to aquatic organisms and a threat to human health		A sc four 1 (iii	A sc four 1 (III The presence of pathogens should pose a low risk to human health.	2 -
Sub- component		Nutrients		Saits					1 0005			Pathogens	Pathogens
Component					Outling	America							Quality
Category													U
Node													MD 23
Resource Unit													LS3
River												Lower Sand	Lower Sand (Downstream Releptruit Inbutary to confluence with hear Var Bistered
Class													=
IUA													MD2 Lower Sand

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IUA	Class	River	Resource Unit	Node	Ecological Category	Component	Sub- component	Resource Quality Objective	Indicator/measure	Numerical limit
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a moderately modified condition or better.	The Rapid Habitat Assessment Method must be implemented.	Instream and Riparian habitat Inlegrity category ≥ C (≥ 62)
			E			Biota	Fish	Instream biola 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 (FRA) must be utilized.	Fish ecological category: 2 C (z 62) Macro-invertebrate ecological category:2 C (z 62) Instream Ecostatus category 2 C (z 62) Hydrological category 2 C (z 62) With monthly flow requirements as specified. Water Quality category: 2 C (z 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 Response Assessment index. Conduct aquatic biomonitoring annually using the South African South African South System 5 methodology.	Maintain the D ecological category by ensuring that the Average Score Per Taxon is >5

	Flows	Per-	centile	66	66	66	66	66	66	66	66	66	66	66	66	Flows		Per	centile	66	66	66	66	66	66	66	66	66	66	66	66		üle)	ntile)
nit	Drought Flows	cubic		0.0373	0.0386	0.0187	0.0075	0.0289	0.0261	0.0248	0.0336	0.0270	0.0362	0.0351	0.0424	Drought Flows		cubic	metres/	0.0448	0.0463	0.0224	0.0075	0.0331	0.0299	0.0231	0.0336	60E0.0	0.0403	0.0392	0.0471		^{In} percent ercentile)	< 0.020 milliorame/litra (50 th namentila)
Numerical limit	ionce Divis	Per-	tile	60	70	80	70							80	60	ance	SWO		cen-		70	80			20		50		70	80	70	litre	litre (50 e (95 th p	o litera 16
Mum	Maintenance Low Flows	cubic	second	0.2180	0.3376	0.2950	0.4719	0.6477	0.6481	0.6320	0.3188	0.1917	0.1299	0.1254	0.1539	Maintenance	Low Flows	cubic	metres/	0.2386	0.3684	0.3218	0.5141	0.7056	0.7056	0.6424	0.3480	0.2099	0.1426	0.1378	0.1690	s 0.50 milligrams/litre (50 th percentile)	<pre>< 0.25 milligrams/litre (50th percentile) < 6 milligrams/litre (95th percentile)</pre>	menellim (
		Month		Oct	NOV	Dec	Jan	Feb	Mar	Apr	May	lun	Jul	Aug	Sep		1	Month		Oct	Nov	Dec	Jan	Feb	Mar	Apr	Way	Jun	Jul	Aug	Sep	s 0.50 r (50 th pe	s 0.25 r s 6 mill	20.02
Indicator/measure	Total Ecological Water	Requirement (node ME	1.1) = 10.001 million	(26.19% of the Virgin	Mean Annual Runoff)		Maintenance Bows	(percentage value of	naturalised flow	distribution)	Drought flows	(percentage value of	naturalised flow	distribution)			Total Ecological Water	Requirement (node ME	1.2) = 20.946 million	(25.59% of the Virgin	Mean Annual Runoff)		Maintenance flows	(percentage value of	naturalised flow	distribution)	Drought flows	(percentage value of	naturalised flow	distribution)		Dissolved Inorganic Nitrogen as Nitrogen	Nitrate & Nitrite as Nitrogen	Orthophosphate as
Resource Quality Objective														The maintenance low flows	and drought flows must be	condition for the ecosystem	and users.															Instream concentration of nutrients must be	maintained to sustain aquatic ecosystem health	and ensure the prescribed ecological category is met.
Sub- component															Town Brune	LOW ILOWS																	Nutrients	
Component															Cumatitu																		Quality	
Ecological Category																			υ															
Node																	MF	12	WE	1.2														
Resource Unit																		UV1 and	UV2															
River / Dam														And and the second	Upper Vet	(Klein Vet and	Laaispruit tributary	catchments)	(C41C, C41D)	Leeuspruit	tributary	Catchments to												
Class																		3	=															
NA																		ME1	Upper	-														

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Numerical limit	s 70 milliSiemens/metre (95" percentile)	6.5 (5 th percentile) and 8.4 (95 th percentile)	A 10% variation from background concentration is allowed.	s 0.072 milligrams/litre (95 th percentile)	≤ 130 counts/100 millilitres (95 th percentile)	Instream and Riparian habitat integrity category ≥ C (≥ 62)	Fish ecological category: 2 C (2 62)	Macro-invertebrate ecological category: 2 C (≥ 62)	Instream Ecostatus category ≥ C (≥ 62)	Hydrological category 2 C (2 62) With monthly flow requirements as specified.	Water Quality category: 2 C (2 62)
Indicator/measure	Electrical conductivity	pH range	Turbidity	Ammonia as Nitrogen	Escherichia coli	The Rapid Habitat Assessment Method must be implemented.		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.	
Resource Quality Objective	Instream salinity must be maintained to support the aquatic ecosystem and the water quality requirements of the water users.	pH must be maintained at present state.	A baseline assessment to determine the present state instream turbidity is required	The concentrations of toxins should not be at a level that is toxic to aquatic organisms and a threat to human health.	The presence of pathogens should pose a low risk to human health.	Instream and Riparian habitar must be in a moderately modified condition or better.		Instream biota must be in	moderately modified condition or better through	maintenance of habitat, flows, water quality.	
Sub- component	Salts		system variables	Toxics	Pathogens	Instream Habitat			Fish		
Component			Quality			Habitat			Biota		
Ecological Category					υ						
Node	M 2 2 2 2										
Resource Unit	UV1 and 1.1 UV2 ME 1.2 1.2										
River / Dam				Upper Vet (C41A, C41B) (Klein Vet and	Catchments) (C41C, C41D) (Vet and Leeuspruit	tributary catchments to Erfenis Dam)					
Class					=						
IUA					ME1 Upper Vet						

	age	Flows	Per- centile	66	66	66	66	66	66	66	66	66	66	66	66			tut
nit	plogical the Aver	Drought Flows	cubic metres/ second	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0015	0.0019	(95 ^m	5 (95 ^m	bitat Integ
Numerical limit	ent C ecc rring that is > 4.8.	nance	Per- cen-	40	50	50	40	40	40	30	20	20	40	50	40	s/metre	and 8.5	arian hal 2 78)
Num	Maintain the current C ecological calegory by ensuring that the Average Score Per Taxon is > 4.8.	Maintenance Low Flows	cubic metres/ second	0.0310	0.0563	0.0474	0.0859	0.1228	0.1247	0.1115	0.0526	0.0243	0.0116	0.0105	0.0166	s 55 milliSiemens/metre (95 ^m percentile)	6.5 (5 th percentile) and 8.5 (95 th percentile)	Instream and Riparian habitat Integrity category ≥ B/C (≥ 78)
	Maintair categor Score P		Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	lut	Aug	Sep	s 55 milliS percentile)	6.5 (5 th per percentile)	Instream
Indicator/measure	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually biomonitoring system 5 methodology.		Total Ecological Water Requirement (node ME 1.3) = 2.369 million	cubic metres/annum	(61.17% of the Virgin Mean Annual Runoff)		Malatanana Baue	(percentage value of	naturalised flow	distribution)	Drought flows	(percentage value of	distribution)	/		Electrical conductivity	pH range	The Rapid Habitat Assessment Method must be implemented.
Resource Quality Objective	The integrity of the macroinvertebrate community within the system must be maintained.					The maintenance low flows	and drought flows must be	attained to support a healthy condition for the ecosystem	and users.							Instream salinity must be maintained at the current state to support the aquatic ecosystem and the water quality requirements of the water users.	pH must be maintained at present state.	Instream and Riparian habitat must be in a better than moderately modified condition.
Sub- component	Aquatic Invertebrates							Low flows								Salts	System variables	Instream Habitat
Component	Biota							Quantity								Quality		Habitat
Ecological Category												B/C						
Node												ME	3					
Resource Unit												UV3						
River / Dam												Soutspruit						
Class												=						
IUA											ME1	Upper	Vet					

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Numerical limit	Fish ecological category: ≥ B/C (≥ 78) Macro-Invertebrate ecological category: ≥ B/C (≥ 78) Instream Ecostatus category ≥ B/C (≥ 78) With monthly flow requirements as specified. Water Quality category: ≥ B/C (≥ 78)	Maintain the current B calegory by ensuring the Average Score Per Taxon is >5.0.	Use Desktop Reserve Model and updated Present Ecological State data to determine low flow requirements.	s 0.50 milligrams/litre (50° percentile)	s 0.025 milligrams/litre (50" percentile)	 s 0.25 milligrams/litre (50th percentile) s 6 milligrams/litre (95th percentile) 	s 0.025 milligrams/litre (50 th percentile)
Indicator/measure	A baseline assessment to determine the integrity and health of the fish community should be conducted to determine the current state. Assessment Index (FRAI) must be utilized	The integrity of the invertebrate community should be determined using the Maccinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually using the South African Scoring System 5 methodology.	Ecological Water Requirement for maintenance low flows.	Dissolved Inorganic Nitrogen as Nitrogen	Orthophosphate as Phosphorus	Nitrate & Nitrite as Nitrogen	Chlorophyll-a
Resource Quality Objective	Instream biola must be in modified confiled control in through maintenance of habitat, flows, water quality.	The integrity of the macroinvertebrate community within the system must be maintained.	The downstream maintenance low flow requirements of node ME 2.1 must be met to support a healthy condition for the ecosystem and users.		Concentration of nutrients must be improved to sustain ecosystem health and water	quarry requirements or water users. Dam should be maintained in a mesotrophic state.	
Sub- component	Fish	Aquatic Invertebrates	Low flows			Nutrens	
Component	Biota		Quantity			quanty	
Ecological Category							
Node							
Resource Unit					UV4		
River / Dam					Erfenis Dam		
Class				2	=		
IUA				ME1	Vet		

sure Numerical limit	wity \$30 milliSiemens/ metre (95" percentile)	6.5 (5th percentile) and 8.5 (95th percentile)	\$ 130 counts/100 millitres (95 th percentile)	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-lorism, abstraction and ecological flow releases must proversed.	The fish population must be monitored through health assessment studies. Suitable abundances should be determined. Monitoring should be conducted annually.
Indicator/measure	Electrical conductivity	pH range	Escherichia coli	a fish refuge and fo pically and recreation recreation, eco-tori	The fish population must be m studies. Suitable abundances should be conducted annually
Resource Quality Objective	The salinity in the dam must be maintained in order to support ecosystem health and the water quality requirements of the downstream water users.	pH must be maintained at present state.	The presence of pathogens should pose a low risk to human health.	The importance of the Dam as a fish refuge and for semi-aquatic biota in upst protected. This includes ecologically and recreationally important fish species. The importance of the Dam for recreation, eco-torism, abstraction and ecologi the connected.	The dam provides an important fish refuge area and must be managed to maintain the upstream recoutiment.
Sub- component	Salts	System variables	Pathogens	Dam	Fish
Component				Habitat	Biota
Ecological Category					
Node					
Resource Unit			2		
River / Dam					
Class					
IUA					

IUA	Class	River	Resource Unit	Node	Ecological Category	Component	Sub- component	Resource Quality Objective	Indicator/measure	Numerical limit
						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.
								Instream concentration of nutrients must be improved	Dissolved Inorganic Nitrogen as Nitrogen	s 0.50 milligrams/litre (50 th percentile)
							Nutrients	to sustain aquatic ecosystem health and	Nitrate & Nitrite as Nitrogen	 s 0.25 milligrams/litre (50th percentile) s 6 milligrams/litre (95th percentile)
								ensure the prescribed ecological category is met.	Orthophosphate as Phosphorus	5 0.030 milligrams/litre (50 th percentile)
						Ouality	Salts	Instream salinity must be maintained. Salinity levels should not be allowed to deteriorate.	Electrical conductivity	5 75 mill/Siemens/metre (95 th percentile)
		Lower Vet					System variables	pH must be maintained at present state.	pH range	6.5 (5 th percentile) and 8.5 (95 th percentile)
ME 2 Lower Vet	Ξ	C411, C410, C411, C41J) (From to C41J) Dam to Sand River confluence)	LV1	ME 2.1	o		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)
		Taaibosspruit tributary)					Pathogens	The presence of pathogens should pose a low risk to human health.	Escherichia coli	s 130 counts/100 millitres(95th percentile)
						Habitat	Instream Habitat	Instream and Riparian habitat must be in a moderately modified condition or better.	The Rapid Habitat Assessment Method must be implemented.	Instream and Riparian habitat Integrity category ≥ C (≥ 62)
										Fish ecological category: 2 C (2 62)
								Instream biota must be in moderately modified	A baseline assessment to determine the integrity and health of the fish	Macro-invertebrate ecological category:2 C (2 62)
						Biota	Fish	requirements of fish species of ecological importance and	conducted to determine the current state.	Instream Ecostatus calegory ≥ C (≥ 62)
								with particular flow and water quality needs must be provided for.	Fish Response Assessment Index (FBAI) must ha utilized	Hydrological category ≥ C (≥ 62) With monthly flow requirements as specified.
									and the second s	Mater Orielts estensor > C (> 82)

Water Quality category: 2 C (2 62)

Resource Node	te Ecological Category	Component	sub- component	Resource Quality Objective	Indicator/measure		Numer	Numerical limit	
			Aquatic Invertebrates	The integrity of the macroinvertebrate community within the system must be improved to the recommended ecological category.	Internegary on the invertebrate community should be determined warcoinvertebrate Response Assessment Index. Conduct aquatic biomonitoring annually using the South African Scoring System 5 methodology.	An eco met. T value d	An ecological category of C must be met. The Average Score Per Taxon value of > 4.8 must be achieved.	gory of C Score P t be achi	must be ar Taxon wed.
							Maintenance Low Flows	22	Drought Flows
					Total Maintenance low flow and drought flow Ecological Water Requirement (FMR 15)	www.	cubic P metres/ co second t	Per- cu cen- mer ble sec	cubic Per- metres/ cen- second tile
				The second se	= 19.765 million cubic	Oct			
				drought flows must be	of the Virgin Mean	NON	-	+	+
				attained so that the environmental flows	Annual Runoff)	Dec	0.446 9	99 00	0.24 00
			Low flows	requirements are met to support a healthy condition	Maintenance flows	Feb	-	+	-
				for the ecosystem and	(percentage value of	Mar	0.849	90 06	0.213 99
				coeio.	distribution)	Apr	0.701	90 06	0.17 99
_					Drought flows	May		99 0.	0.269 99
	6				(percentage value of	Jun	0.227	99 0.	0.177 99
15 5	CID	Quantity			naturalised flow distribution)	Inf	0.129 9	99 0.	0.129 99
					1.0000	Aug	_	+	-
_						Sep	0.190 0.190	Mointenance High Elvine	0.19 99
					Total Maintenance high flow Ecological Water	Mon	cubic metres per second	ber	Percentile
				The high flows must be	= 32.309 million cubic	Oct	00:0	+	66
				attained so that the	(12.76% of the Virain	Nov	3.462	\vdash	30
			High Flows	environmental flows requirements are met to	Mean Annual Runoff)	Dec	00.00		66
				support a healthy condition for the ecosystem		Jan	6.358		30
					Maintenance high flows (percentage value of	Feb	00:00	-	66
					naturalised flow	Mar	2.355	-	60
					finning		000		00

_		_	_	_				-	_				_			_
66	66	66	66	66		0 th percentile) percentile)		should be /square metre tton ≤ 0.025				.2 (95 th				
0.00	0.00	0.00	0.00	0.00	milligrams/litre percentile)) milligrams/litre (5 illigrams/litre (95 th	58 milligrams/litre percentile)	ophyll-a Periphytor een s 84 milligrams percentile) ophyll-a Phytoplani ams/litre percentile)	nilliSiemens/metre percentile)	milligrams/litre percentile)	milligrams/litre percentile)	^{In} percentile) and 9 ntile)	milligrams/litre percentile)	5 milligrams/litre bercentile)	milligrams/litre bercentile)	s 0.07 milligrams/litre (95 th percentile)
May	jun	'n	Aug	Sep	s 0.7 (50 ^m	s 0.5 s 6 m	\$ 0.0	Chlor betwe (50 ^m) (50 ^m) (50 ^m)	< 80 i (95 th	s 120 (95 th 1	≤100 (95 ^m	6.5 (5 perce	s 0.1 (95 th	s 0.2 (95 th	\$0.75 (95 ^m	s 0.0 (95 th 1
					Dissolved Inorganic Nitrogen as Nitrogen	Nitrate & Nitrite as Nitrogen	Orthophosphate as Phosphorus	Chlorophtyll-a concentrations should be monitored as a response indicator against the resource quality objective nutrient concentrations.	Electrical conductivity	Sulphate	Chloride	pH range	Aluminium	Manganese	Iron	Uranium
						Instream concentration of	nutrients must sustain aquatic ecosystem health. Concentrations should not	be allowed to detenorate.		Salinity levels must be maintained.		pH must be maintained at present state.		The concentrations of toxins should not be at a level that	is toxic to aquatic organisms and a threat to human health.	
							Nutrients			Salts		System variables		Tanias	10005	
										Quality						
										C/D						
					15 EV											
					LV2 EWR											
									(C43A, C43C, C43D)	(Downstream Sand River Confinence to	Bloemhof Dam)					
										=						
Ĩ									ME 2	Lower Vet						
	00.00	0.00	0.00	000	0.00 0.00 0.00 0.00 0.00 0.00	May 0.00 Jun 0.00 Jul Jul 0.00 Auge Distribution Distribution <thdistributication< th=""> Distribution</thdistributication<>	May 0.00 May 0.00 Ini 0.00 Ini <	Dissolved Inorganic Dissolved Inorganic Nitrogen as Nitrogen Nitrogen as Nitrogen Instream concentration of Nitrogen Orthophosphate as Connentrations should not Dissolved Inorganic	Nutrients Dissolved inorganic Nutrients Nutrients Nutrients Concentration of nutrients Nutrients Concentration of nutrients	Lower Vet. Catabolise Concentration of the allowed to deteriorate a solution	Lower Vet Caliborer Control for Caliborer Control for Control for Caliborer Control for Control for Caliborer Control for Control for Caliborer Control for Control for Contro	II Control III Con	I Converting the formation of the second and the se	III Cover Vet. Concentration of the intervention of the interventing of the interventing of the interventing of the intervent	I Lover Viti Construction of the anticipation	III Contracting the second sec

			S				_				
Numerical limit	 0.072 milligrams/litre (95th percentile) 	A screening level whole effluent toxicity test should be conducted at four trophic levels and should the results show toxicity greater than 1 (limited to not acutely toxic) further definitive tests are required.	s 130 counts/100 millilitres (95 th percentile)		Instream and Riparian habitat Integrity category ≥ C/D (≥ 58)	Instream and Riparian habitat Integrity category ≿ C/D (≿ 58)	Fish ecological category:≥ C/D (≥ 58)	Macro-invertebrate ecological category:2 C/D (2 58)	Instream Ecostatus category≥ C/D (≥ 58)	Hydrological categoryz C/D (2.58) With monthly flow requirements as specified.	Water Quality category:2 C/D (2 58)
Indicator/measure	Ammonia as Nitrogen	A screening level whole eff four trophic levels and shot 1 (limited to not acutely tox	Escherichia coli	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.	The ecological specifications for Ecological Water Requirement site 15 as determined in terms of the Comprehensive Reserve Determination Reserve Determination implemented.		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.	
Resource Quality Objective			The presence of pathogens should pose a low risk to human health.		Instream and Riparian habitat must be in a better than largely modified condition.	Exotic invasive riparian plant species must be controlled.	the state of the second se	better than largely modified condition. The requirements	or rish 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.
Sub- component			Pathogens		Instream Habitat	Riparian Habitat			Fish		
Component			Quality		Habitat				Biota		
Ecological Category				,		сл					
Node						EWR 15					
Resource Unit						LV2					
River					Lower Vet	Confluence to Bloemhof Dam)					
Class						=					
IUA						ME 2 Lower Vet					

\$

Numerical limit	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.	
Indicator/measure	The integrity of the invertebrate community should be determined using the Maccoinvertebrate Response Assessment Index. Conduct aquatic biomonitoring amualy 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.
Resource Quality Objective	The integrity of the macroinvertebrate community within the system must be maintained.	
Sub- component	Aquatic	
Component		
Ecological Category		
Node		
Resource Unit		
River		
Class		
IUA		

	smol;	Per-	cen-	66	66	66	66	66	66	66	66	66	66	66	66	ows	Percentile	66	90	66	90	20	66	66	66	66	66	66	66	~		()	
Ħ	Drought Flows	cubic	second	4.284	5.21	5.361	5.997	6.486	6.101	5.154	4.441	4.097	3.98	3.125	3.415	Maintenance High Flows		0	5	5	5		0,		01	01	5	5	5	bercentile)		percentile	percentile
Numerical Limit	nce vs	-	tile -	66	66	66	66	66	66	66	66	66	66	66	66	aintenan	cubic metres per second	00.00	14.6	0,00	14.129	72.071	0.00	00.0	0.00	0.00	0.00	0.00	0.00	e (50" p 95" perc		re (50 th	re (50 ^m
Numeri	Maintenance Low Flows	cubic	second	5.421	6.592	6.783	7.588	9.845	7.72	6.521	S.619	5.184	5.035	3.954	4.321	W	dub eq			_	1	-	_		_	_			_	prams/litre ms/litre (5	rams/litre	igrams/lit	igrams/lit
		Month		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	lut	Aug	Sep		Month	Oct	NOV	Dec	Jan	Feb	Mar	Apr	May	Iun	Inf	Aug	Sep	s 1.35 milligrams/litre (50 th percentile) s 6 milligrams/litre (95 th percentile)	s1.65 milligrams/litre	 S 0.125 milligrams/litre (50th percentile) 	< 0.075 milliarams/litre (50 ^m percentile)
Indicator/measure		Total Maintenance	flow Ecological Water	Requirement (EWR	cubic metres/annum	(22% of the Virgin	נווסטא אוווחפו אוווסטא	Malatanana Bauch	(percentage value of	naturalised flow	distribution)	Drought flows	(percentage value of naturalised flow	distribution)			Total Maintenance	high flow Ecological	Vater Requirement	million cubic	metres/annum	(15.88% of the Virgin			Maintenance high	flows (percentage	Value of naturalised	(inonnainein Maii		Nitrate & Nitrite as Nitrogen	Dissolved Inorganic Nitrooen as Nitrooen	Orthophosphate as	Chlorophyll-a
Resource Quality Objective					The melateness and	drought flows must be	attained so that the	requirements are met to	support a healthy condition	tor the ecosystem and users.										The high flows must be	attained so that the	environmental flows	support a healthy condition	for the ecosystem			5			Instream concentration of nutrients must be improved	to sustain aquatic ecosystem health and	ensure the prescribed ecological category and the	water quality requirements
Sub- component														Alteriante	SHOULDE																		
Component														Quantity																	- the second	Auanty	
Ecological Category																	٥																
Node																	EWR 12																
Resourc e Unit																	VB 1.1																
River/Dam	5																																
Class																	=																
IUA																MF	Vaal River																

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

_				_	_			-				
s 70 milliSiemens/metre (95 th percentile)	\$160 milligrams/litre (95% percentile)	≤ 33 milligrams/litre (95 th percentile)	s 560 milligrams/litre (95 th percentile)	pH range 7.5 (5" percentile) - 9.2 (95" percentile)	\$ 0.050 milligrams/litre (95 th percentile)	 1 milligrams/litre (95th percentile) 	s 0.25 milligrams/litre (95% percentile)	 25 milligrams/litre (95th percentile) 	 0.030 milligrams/litre 95th percentile) 	s 0.1 milligrams/litre (95 th percentile)	effluent toxicity test should be conducted at hould the results show toxicity greater than 1 kic) further definitive tests are required.	 4 130 counts/100 millilitres (95th percentile)
Electrical conductivity	Sulphate	Magnesium	Total Dissolved Solids	pH range	Cyanide (free)	Aluminium	Manganese	Iron	Uranium	Ammonia as Nitrogen	A screening level whole to the four trophic levels and sh four trophic levels and sh (limited to not acutely tox	Escherichia coli
Instream salinity must be improved to meet the	recommenced 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.	pH must be maintained at present state.				The concentrations of toxins should not be at a level that is toxic to aquatic organisms and a threat to human	health.		0	The presence of pathogens should pose a low risk to human health.
		Salts		System variables				Toxics				Pathogens
						- Hereit	Autorica					
						4	5					
						CM0 45						
						+ + a/						
						Vaal River (C24B) (From Vermaasdrift	to upstream Schoonspruit confluence)					
							1					
						MF	Vaal River					
	Electrical conductivity	Instream salinity must be Electrical conductivity improved to meet the recommended ecological category and the water quality requirements of the water users in the Middle	Electrical conductivity Sulphate Magnesium	Instream salinity must be improved to meet the recommended exclopical recommended exclopical recommended exclopical recommended exclopical category and the water water users in the Middle Vaal River. The river must be managed to assimilate the impacts of the land beased activities and inflow of the Koekennerspruit and Schoonspruit.	instream salinity must be Instream salinity must be Instream salinity must be Instream salinity must be recommended exclopical category and the water category and the water category and the water water water water water water be managed to assimilate Vaal River. The river must be managed to assimilate the inpacts of the fand based activities and inhow of the Koekennerspruit and Total Dissolved Solids Schoonspruit. PH range per sent state.	Instream satinity must be improved to meet the recommended ecological Electrical conductivity reacommended ecological Suphate category and the water cuality requirements of the water users in the Middle Suphate Vaal River. The river must water users in the Middle Magnesium Vaal River. The river must be managed to assimilate the impacts of the land based activities and inflow of the Koekenoerspruit and Schoonspruit. Total Dissolved Solids m PH must be maintained at present state. PH range	Imate and any must be improved to meet the improved to meet the improved to meet the improved to meet the improved ecological conductivity requirements of the valence of the impacts of the impact of the impacts of	ver Instream satinity must be improved to meat the improved to meat the im	III Val River Val River Conductivity to a science of the section of the secti	In the matching of the section of th	Instrumental of most files and the water series of the methods of methods in the method of methods	III IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII

Numerical Limit	ın habitat integrity	ın habitat integrity	Fish ecological category: ≥ C (≈ 62) Macro-invertebrate ecological category:≥ D (A 22) Habitat requirements and health of specified ecologically and recreationally important fish species aquatic bird species as specified. Instream Ecostatus category≥ D (≈ 42) With monthly flow requirements as specified. Water Quality category:≥ D (≈ 42)
Numer	Instream and Riparian habitat Integrity category ≥ D (≥ 42)	Instream and Riparian habitat Integrity category ≿ D (≿ 42)	Fish ecological category: 2 C (2 62) Macro-invertebrate ecological category: (2 42) Habitat requirements and health of specified ecologically and recreationally important fish species aquatic bird speci as specified. Instream Ecostatus category2 D (2 42) With monthly flow requirements as specified. Water Quality category2 D (2 42)
Indicator/measure	The Rapid Habitat Assessment Method must be implemented. The ecological specifications for Ecological Water Requirement site Requirement site as determined in terms of the Reserve Reserve Determination Study (2010) must be implemented.	The ecological specifications for Ecological water Requirement site 12 as determined in terms of the Comprehensive Reserve Reserve (2010) must be implemented.	Fish Response Assessment Index (FRA) must be utilized. The ecological specifications and thresholds of potential concern for Ecological Water Requirement site 12 must be adhered to.
Resource Quality Objective	Instream and Riparian habitat must be in a largely modified condition or better.	Exolic invasive plant species must be controlled.	Instream blota must be in a largely modified condition or requirements of fish species of ecological importance and with particular flow and water quality needs must be provided for. The specific species of ecological importance must provided for.
Sub- component	Instream Habitat	Riparian Habitat	Fish
Component	Habitat		Biota
Ecological Category		٩	
Node		EWR 12	
Resourc e Unit		VB 1.1	
River/Dam		Vaal River (C24B) (From (C24B) to wraasdrift to upstream Schoorspruit confluence)	
Class		Ξ	
IUA		MF Vaal River	

_				-
nit	cological outh African ist be >100 and on value must	mine the	x should be >	Drought Flows
Numerical Limit	Maintain the current C/D ecological category by ensuring the South African be category by ensuring the South African the Average Score Per Taxon value must be > 5.0.	conducted to deter	The Specific Pollution index should be > 5.0.	Maintenance Low Flows
	Maintain category Scoring S be > 5.0.	thould be c	The Spec 5.0.	Month
Indicator/measure	The integrity of the invertebrate community should be determined using the Macroinvertebrate Response Assessment Index. Conduct aqualic South African Scoring south African Scoring System 5 methodology. The ecological specifications and thresholds of polential specifications and Water Requirement water Requirement adhered thus the	A baseline assessment should be conducted to determine the aquatic bird community around the dam.	Conduct a diatom assessment annually.	Total Maintenance
Resource Quality Objective	The integrity of the macroinvertebrate macroinvertebrate community within the system and recommended he system maintained.	The area supports more occasionally exceeds the 1% of the bio-geographical several water fowl species attrough noter fowl species attrough not of the species attrough not of the strain data are available. This is data are available. This is propulation must be maintained through proper	Water quality improvement is required from a nutrient perspective.	The maintenance and
Sub- component	Aquatic Invertebrates	Aquatic Birds	Diatoms	Low flows
Component		Biota		Quantity
Ecological Category		۵		C/D
Node		EWR12		EWR 13
Resourc e Unit		VB1.1		VB 1.2,
River/Dam		Vaal River (C24B)		Vaal River
Class		Ξ		
IUA		MF Vaal River		

	Per-	cen- tile	66	66	66	66	66	66	80	90	66	66	66	66	s	ole															
	_	metres/ second	0.029	0.043	0.047	0.055	0.073	0.06	0.046	0.031	0.024	0.022	0.02	0.022	Maintenance High Flows	Percentile	66	66	66	66	50	66	66	66	66	66	66	66	centile)	(ille)	
I Limit	Per- C		90 0.	0 66	99 0.	99 0.	99 0.	0 66	90 06	90 06	.0 66	99 07	0 66	99 0.	tenance	cond	0	9	Q	29	25	0	8	0	0	Q	0	0	50 th perc	" percer	
Numerical Limit	-	metres/ ce second ti	7.254 9	10.7 9	11.931 9	13.892 9	18.531 9	15.172 9	11.532 9	7.732 9	5.863 9	5.278 9	4.78 9	5.177 9	Main	cubic metres per second	0.00	14.6	0.00	14.129	92.225	0.00	0.00	0.00	0.00	0.00	0.00	00.00	ns/litre (litre (95	ns/litre
z	8	sec										5.2				Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	s 1.35 milligrams/litre (50 th percentile)	s 6 milligrams/litre (95 th percentile)	 1.65 milligrams/litre 50th percentile)
			Oct	Nov	Dec	Jan	Feb	Mar	Apr	Nav	Jun	Jul	Aug	Sep		Ň	0	Z	0	7	ι.	2	4	Z	1	1	A	s	s 1.35	s 6 mi	s 1.65 (50 ^m p
Indicator/measure	low flow and drought	Requirement (EWR	cubic metres/annum	(11.65% of the Virgin Mean Annual Princelly		Maintenance flows	(percentage value of	distribution)	Drought flows	(percentage value of	distribution)						high flow Ecological	Water Requirement	(EWR 13) = 298.797	million cubic	(11.26% of the Virgin	Mean Annual Runoff)	Heldessee high	finus (nerrentene	value of naturalised	flow distribution)	5		Nitrate & Nitrite as	Nitrogen	Dissolved Inorganic Nitrogen as Nitrogen
Resource Quality Objective	drought flows must be	environmental flows	requirements are met to support a healthy condition	for the ecosystem and															The high flows must be	attained so that the	environmental flows	support a healthy condition	for the ecosystem						Instream concentration of	to sustain aquatic	ecosystem health and ensure the prescribed ecological category and the water quality requirements
Sub- component																					High flows										Nutrients
Component																					Quantity										Quality
Ecological Category																								CD							
Node																								EWR 13							
Resourc e Unit	VB 1.3																							VB 1.2,	VB1.3						
River/Dam	(C24J) V (From Schoonspruit confluence to upstream Vals River confluence) (From Vals River River Bloemhof Dam- Cuutermary catchment)															A Defined of the Carlot of the	Vaal River	(C24J)	Schoonspruit	confluence to	upstream Vals	confluence)	(C25C, C25F)	(From Vals	River	Rinembof	Dam-	Quaternary	comment		
Class																								=							
IUA																							-	MF WITH	Vaal Kiver						

Numerical Limit	 125 milligrams/litre (50th percentile) 	 0.075 milligrams/litre (50th percentile) 	< 70 millisiemens/metre (95 th percentile)	\$160 milligrams/litre (95 th percentile)	s 33 milligrams/litre (95° percentile)	\$ 560 milligrams/litre (95" percentile)	7.5 (5 ^m percentile) - 9.2 (95 ^m percentile)	 0.050 milligrams/litre 95th percentile) 	 1 miligrams/litre (95th percentile) 	 2.5 milligrams/fitre 95th percentile) 	 2.25 milligrams/litre 95" percentile) 	 0.030 milligrams/litre (95th percentile) 	 1 milligrams/litre 5th 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.
Indicator/measure	Orthophosphate as Phosphorus	Chlorophyll-a	Electrical conductivity	Sulphate	Magnesium	Total Dissolved Solids	pH range	Cyanide (free)	Aluminium	Manganese	Iron	Uranium	Ammonia as Nitrogen	A screening level whole e four trophic levels and sh (limited to not acutely tox
Resource Quality Objective	of the water users are met		Instream salinity must be	recommended ecological category and the water quality requirements of the	water users in the Middle Vaal River. The water resource must be managed	to assimitate the impacts of the land based activities.	pH must be maintained at present state.				The concentrations of toxins should not be at a level that is toxic to aquatic organisms and a threat to human	health.		
Sub- component					Saits		System variables				Toxics			
Component											Quality			
Ecological Category											C/D			
Node											EWR 13			
Resourc e Unit											VB 1.2, VB 1.3			
River/Dam									Vaal River (C24J)	Schoonspruit confluence to upstream Vals	River confluence) (C25C, C25F)	(From Vals River confluence to Bloomhof	Dam- Dam- Quaternary catchment)	
Class											=			
IUA											MF Vaal River			

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		Auto	Brity
Numerical Limit	 4 130 counts/100 millilitres (95th percentile) 	Instream and Riparian habitat Integrity category ≥ D (≥ 42)	Instream and Riparian habitat Integrity category ≿ D (≿ 42)
Indicator/measure	Escherichia coli	The Rapid Habitat Assessment Method must be implemented at prescribed in the ess stated in the escological specifications to ensure that a 10% ensure that a 10% increase or decrease in current habitat incegrify is avoided as this is undesirable. The ecological specifications for Requirement site 13 as determined in terms of the Comprehensive Reserve Determination Study (2010) must be implemented.	The ecological specifications for Ecological Water Requirement site 13 as determined in terms of the Comprehensive Reserve Reserve Reserve (2010) must be implemented.
Resource Quality Objective	The presence of pathogens should pose a low risk to human health.	Instream and Riparian habitat must be in a largely modified condition or better.	Exotic invasive plant species must be controlled.
Sub- component	Pathogens	Instream Habitat	Riparian Habitat
Component		Habitat	
Ecological Category			
Node			
Resourc e Unit			
River/Dam			
Class			
IUA			

Π	ry:2 D illy ecies	e 0 and nust	^ 0		
Numerical Limit	Fish ecological category: 2 C (2 62) Macro-invertebrate ecological category:2 D (2 42) Habitat requirements and health of specified ecologically and recreationally important fish species aquatic bird species as specified. Instream Ecostatus category2 D (2 42) Hydrological category2 D (2 42) With monthly flow requirements as specified. Water Quality category:2 D (2 42)	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.	The Specific Pollution Index should be > 8.9 (C/D category).	s 85 milliSiemens/metre (95 ^m percentile)	s 300 milligrams/litre (95 th percentile) 7 6 (5 th percentila) - 0 2 (05 th percentila)
Indicator/measure	Fish Response Fish Response (FRAI) must be utilized. The ecological specifications and thresholds of potential concern for Ecological Water Requirement site 13 must be adhered to.	The integrity of the invertebrate community should be determined using the determined using the Response Assessment Index. Conduct aquatic biomonitoring annually using the South African Scoring System 5 methodology. The ecological System 5 methodology. The ecological system 6 methodology.	Conduct a diatom assessment annually.	Electrical conductivity	Sulphate oH ranne
Resource Quality Objective	Instream biola must be in a largely modified condition or largely modified condition or requirements of fish species of ecological importance and with particular flow and wate quality needs must be provided for. The specific requirements of aquatic bird species of ecological importance must provided for.	The integrity of the macroinvertebrate community within the system must be maintained.	Water quality improvement is required from a nutrient perspective.	Instream salinity must be improved to sustain the	pH must be maintained at
Sub- component	Fish	Aquatic Invertebrates	Diatoms	Salts	System
Component		Biota			Quality
Ecological Category		сю			٥
Node		EWR 13			
Resourc e Unit		VB 1.2, VB 1.3		ļ	VB2
River/Dam	Vaal River (C24.1) (From	Schoonsprut confluence to upstream Vals River confluence) (From Vals (From Vals (From Vals Castor Bloemhof Dam- Quatemnt catchment)		Vierfontein-	spruit
Class		Ξ			
IUA		MF Vaal River			

Numerical Limit	≤ 0.1 milligrams/litre (95 th percentile)	s 0.25 milligrams/litre (95 th percentile)	< 0.25 milligrams/litre (95 th percentile)	Use Desktop Reserve Model and updated Present Ecological State data to determine low flow requirements.	≤ 1.35 milligrams/litre (50 th percentile) ≤ 6 milligrams/fitre (95 th percentile)	s 1.65 milligrams/litre (50 th percentile)	s 0.125 milligrams/litre (50 ^m percentile)	s 0.05 milligrams/litre (50 th percentile)	Matijlespruit and Leeudoringspruit: 5 55 milltSiemens/metre (95" percentile)	Ysterspruit, Makwassiespruit and Wolwespruit: s 85 milliSiemens/metre (95° percentile)	7.5 (5th percentile) - 9.2 (95th percentile)	A 10% variation from background concentration is allowed.	± 130 counts/100 millitres (95 th percentile)
Indicator/measure	Aluminium	Manganese	Iron	Ecological Water Requirement for maintenance low flows	Nitrate & Nitrite as Nitrogen	Dissolved Inorganic Nitrogen as Nitrogen	Orthophosphate as Phosphorus	Chlorophyll-a	5	Electrical conductivity	pH range	Turbidity	Escherichia coli
Resource Quality Objective	The concentrations of toxins	should not be at a level that is toxic to aquatic organisms and a threat to human	health.	The maintenance and drought flows must be maintained.		Instream concentration of nutrients must be improved to sustain aquatic	ecosystem health and ensure the prescribed ecological category is met.		Instream salinity must be maintained at the present	succession and the water coosystem and the water quality requirements of the water users.	pH must be maintained at present state.	A baseline assessment to determine the present state instream turbidity is required	The presence of pathogens should pose a low risk to human health.
Sub- component		Toxics		Low flows		Nutrients				Salts		System variables	Pathogens
Component				Quantity					į	duality			
Ecological Category	3								B and C				
Node													
Resourc e Unit									VB3				
River/Dam								Ysterspruit, Matileeoruit	Klipspruit, Leeudoring- spruit, Wolwespruit, Makwassie-	spruit (C24J, C25A, C25C,C25D)			
Class									=				
IUA									MF Vaal River				

Numerical Limit	Instream and Riparian habitat Integrity category ≥ C (≥ 62)	Instream and Riparian habitat Integrity category ≥ B (≥ 82) Instream and Riparian habitat Integrity category ≥ C (≥ 82)	Fish ecological category: 2 B (2 82) Macro-invertebrate ecological category: 2 B (2 82) hydrological category 2 B (2 82) With monthly flow requirements as specified. Water Quality category: 2 B (2 82) Fish ecological category: 2 C (2 62) Fish ecological category: 2 C (2 62) hydrological category: 2 C (2 62)
	Instream and Ripari category ≿ C (≿ 62)	Instream and Ripari category ≥ B (≥ 82) Instream and Ripari category ≥ C (≥ 62)	Fish ecologics Macro-inverte B (2 82) hinstream Ecoc With monthly specified. Water Quality Fish ecological Macro-inverte C (2 62) Instream Eco Mith monthly specifical
Indicator/measure	The Rapid Habitat Assessment Method must be implemented, must be implemented, my and use activities impacting on the riparian zone and thus causing an effect on water resources should be authorised and regulated to prevent detrioration of the habitat.	All land use activities impacting on riparian zone should be authorised and regulated to prevent deterioration of the habitat.	A basesine 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.
Resource Quality Objective	Instream and Riparian habitat must be in a moderately modified condition or better.	Instream and Riparian habitat must be in a largely natural condition. Instream and Riparian habitat must be in a modreately modified condition or better.	Instream biola must be in a largely natural condition and contribute to the sustainability of the fish assemblages in the Vaal River Instream biola must be in a moderately modified contribute to the condition or better and contribute to the sustainability of the fish assemblages in the Vaal River
Sub- component	Instream Habitat	Riparian Habitat	Fish
Component	Habitat		Biota
Ecological Category			B and C
Node			
Resourc e Unit			VB3
River/Dam			Ysterspruit, Matjiespruit, Kilpspruit, Leeudoring- spruit, Makwassie- spruit C250, C250)
Class			Ξ
IUA			MF Vaal River

River/Dam	am Resourc	rc 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 methodoloxy	The Present Ecological State must be maintained.
	1					Instream concentration of nutrients must be improved to sustain acruatic	Orthophosphate as Phosphorus	 S 0.091 milligrams/litre (50th percentile)
				Quality	Nutrients	ecosystem health and ensure the present ecological category is maintained.	Nitrate & Nitrite as Nitrogen	s 0.25 milligrams/litre (50° percentile) s 6 milligrams/litre (95° percentile)
					Salts	Instream salinity must be improved to sustain the aquatic ecosystem.	Electrical conductivity	≤ 70 milliSiemens/metre (95 th percentile)
				Habitat	Instream Habitat	Instream and Riparian habitar 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)
Sandspruit (C25C, C25B,	oruit 25B, VB4		υ					Fish ecological category: 2 C (2 62)
C26F, C.	43B)					Instream biota must be in moderately modified		Macro-invertebrate ecological category:2 C (2.62)
					Fish	condition or better through maintenance of habitat,	Assessment Index	Instream Ecostatus category ≥ C (≥ 62)
				Biota		nows, water quainy. The importance of the lower reaches as refuge habitat must be sustained.	(Frow) must be utilized.	Hydrological category ≥ C (≥ 62) With monthly flow requirements to be specified.
								Water Quality category: 2 C (2 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 Assessment Index. Conduct aquatic	Maintain the current C category by ensuring the Average Score Per Taxon is >5.0.

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Numerical Limit		 4.62 milligrams/litre (50th percentile) 	 1.50 milligrams/litre (50th percentile) 5 6 milligrams/litre (95th percentile) 	 0.125 milligrams/litre 50th percentile) 	≤ 80 milliSiemens/metre (95th percentile)	\$160 milligrams/litre (95 th percentile)	7.5 (5th percentile) - 9.2 (95th percentile)	Instream and Riparian habitat Integrity category ≥ D (2 42)		Instream and Riparian habitat Integrity category ≥ D (≥ 42)
Indicator/measure	biomonitoring annualty using the South African Scoring System 5 methodology.	Dissolved Inorganic Nitrogen as Nitrogen	Nitrate & Nitrite as Nitrogen	Orthophosphate as Phosphorus	Electrical conductivity	Sulphate	pH range	Ensure that mining activities impacting on the riparian zone and instream habitats are authorised and regulated to prevent deterioration of the habitat. Rehabitat improve the habitat improve the habitat improve the habitat integrity to obtain a minimum D category.	The Rapid Habitat Assessment Method must be implemented	Rehabilitation must be undertaken which must include the removal of invasive exotic species from the riparian zone.
Resource Quality Objective		Instream concentration of	nutrients must be improved to sustain aquatic	ecosystem health.	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.	pH must be maintained.	Instream and Riparian habitat must be in a largely modified condition or better.	1	Invasive riparian plant species must be controlled.
Sub- component			Nutrients		Caller	oalts	System variables	Instream Habitat		Riparian Habitat
Component					Quality			Habitat		
Ecological Category								٥		
Node										
Resourc e Unit								VBS		
River/Dam								Bamboes - spruit (C25E)		
Class								Ξ		
IUA								MF Vaal River		

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	D AND C	Drought Flows	Per- cen- tile	66	66	66	66	66	66	66	66	66	66	66	66	
nit	Instream and Riparian habitat Integrity category ≥ D (≥ 42) Fish ecological category: ≥ D (≥ 42) Macro-invertebrate ecological category:≥ D (≥ 42) Instream Ecostatus category ≥ D (≥ 42) With monthy flow requirements to be specified. Water Quality category: ≥ D (≥ 42)		cubic metres/ second	4.905	5.262	5.4	6.403	2.646	6.952	5.489	4,423	3.654	3.617	3.454	4.363	s 0.15 milligrams/litre (50 th percentile) s 6 milligrams/litre (95 th percentile)
Numerical Limit			Per- cen- tile	66	66	66	66	66	66	66	66	66	66	66	66	litre (50 th (95 th per
Num	Instream and Ripari category ≥ D (≥ 42) Fish ecological cate Macro-invertebrate (≥ 42) Instream Ecostatus Instream Ecostatus With monthy flow r specified. Water Quality categ	Maintenance Low Flows	cubic metres/ second	6.333	6.794	6.971	8.266	11.052	8.974	7.086	5.71	4.717	4.669	4,46	5.632	s 0.15 milligrams/litre (50 th percentil s 6 milligrams/litre (95 th percentile)
	Instream category Fish ecok Macro-inv (2 42) Instream With mong with mong specified Water Qu		Month	Oct	Nov	Dec	lan	Feb	Mar	Apr	Way	Jun	Jul	Aug	Sep	s 0.15 m s 6 millig
Indicator/measure	A baseline assessment to determine the integrity and health of the fish community should be conducted to determine the current astes and potential impacts to the assessment should include a fish tissue population. This population. This propulation. This assessment should include a fish tissue contamination study the determine heavy metal concentrations. Fish Resonate Assessment index (FRAI) must be utilized.	Total Maintenance	I otal Maintenance low flow and drought flow Ecological Water	16) = 360.296 million	cubic metres/annum	(21.2% of the Virgin Mean Annual Runoff)		Maintenance flows	(percentage value of	distribution)	Devents Rouse	(percentage value of	naturalised flow	distribution)		Nitrate & Nitrite as Nitrogen
Resource Quality Objective	Instream biola must be in bagely modified condition or barer. The inportance of the lower reaches must be maintained as fish refuge and nursery area for species moving in from the Bloemhof Dam.					The downstream	requirements of EWR 16	must be met to support a healthy condition for the	ecosystem.							Concentration of nutrients in the dam must be improved to sustain ecosystem health
Sub- component	Fish						1 nur finne									Nutrients
Component	Biota						Outantity	Annual P								Quality
Ecological Category																
Node																
Resourc e Unit		ABS														
River/Dam		Bloemhof Dam (C26E, C26F, C43D)														
Class								12.00	=							
IUA								MF	Vaal River							

IUA	Class	River/Dam	Resourc e Unit	Node	Ecological Category	Component	Sub- component	Resource Quality Objective	Indicator/measure	Numerical Limit
								and the water quality requirements of water users. Nutrient levels must not be	Dissolved Inorganic Nitrogen as Nitrogen	< 0.25 milligrams/litre (50th percentile)
								allowed to deteriorate. Dam has the potential to be hypertrophic.	Orthophosphate as Phosphorus	< 0.015 milligrams/litre (50 th percentile)
								Dam should be maintained in a mesotrophic state.	Chlorophyll - a	< 0.050 milligrams/litre (50 th percentile)
									Electrical conductivity	s 70 milliSiemens/metre (95 th percentile)
			-					The salinity in the dam must be maintained in order to	Sulphate	s150 milligrams/litre (95 th percentile)
							Salts	support ecosystem health and the water quality requirements of the	Sodium	s 80 milligrams/litre (95 th percentile)
								downstream water users.	Chloride	< 75 milligrams/litre (95 th percentile)
									Total Dissolved Solids	s 560 milligrams/litre (95 th percentile)
							System variables	pH must be maintained.	pH range	7.5 (5 th percentile) - 9.2 (95 th percentile)
						Quality	Pathogens	The presence of pathogens should pose a low risk to human health.	Escherichia coli	s 130 counts/100 milititres (95 th percentile)
MF Vaal River	=	Bloemhof Dam (C25E, C25F, C43D)	VB6			Habitat	Dam Habitat	The importance of the Dam as a fish refuge and for protected. This includes ecologically and recreations ecologically important bird species must provide for.	a fish refuge and for aquipically and recreationally in the second secon	The importance of the Dam as a fish refuge and for aquatic and semi-aquatic biota must be protected. This includes ecologically and recreationally important fish species. The requirements of ecologically important bird species must provide for.
								The importance of the Dam for be protected.	r recreation, eco-torism, a	The importance of the Dam for recreation, eco-torism, abstraction and ecological flow releases must be protected.
						Biota	Fish	The dam provides a refuge area and is important in maintaining the upstream species.	The fish population must be m studies. Suitable abundances should be conducted annually	The fish population must be monitored through health assessment studies. Suitable abundances should be determined. Monitoring should be conducted annually.

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Numerical Limit	A baseline assessment should be conducted to determine the aquatic bird community around the dam.
Indicator/measure	A baseline assessment should be condu aquatic bird community around the dam.
Resource Quality Objective	The dam supports a high number of water fow, with several mixed heromies several mixed heromies beeding egrets, herons and cormorants. A number of bird species recorded at the dam and in the adjacent therestrial habitats are listed as threatened species. These include amongst of the amongst of the amongst of the amongst of the amongst of the amongst craspian Tem (Sterna caspian and African Marsh Harrier (Circus the dam for aquatic bird populations must be maintained through proper habitat management.
Sub- component	Aquatic Birds
Component	Biota
Ecological Category	
Node	
Resourc e Unit	
River/Dam	
Class	
IUA	

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
			Groundwater flow directions in the non- dolomite aquifer part of the resource unit should not be reversed from it natural flow directions towards the drainage systems (specifically the Schoonspruit and Taalboschspruit cases).	Vider Level - Depth to groundwater level from ground elevation. Time series water level monitoring (Monthy) 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.
MC - Schoonspruit	RU G1	SK3	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 s 50milliSiemens/metre; based on typical groundwater quality in dolomite aquifers Specified annual trend should not approach the 95 ^m percentile.
				Water Level - Depth to groundwater level Time series water level monitoring (Monthly) required to comply to	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 generation 700%, commissions
MC - Schoonspruit	RU - G2	SK 2, SK 4	The flow at the Schoorspruit 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 ² /m (~48 million cubic metestanum) – 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 batance (aquifer recharge and irrigation Groundwater batance (aquifer recharge and irrigation

IUA	Ground-water unit	Resource Unit	Resource Quality Objective	Indicator/ Measure	Numerical Limit
					cycles.
			Nitrate values in the recharge area should not increase to > 2 milligrams //itre.	Nutrients - Nitrate Bi-annual monitoring	Nitrate values in the recharge area should not increase to > 2 milligrams //itre.
MC - Schoonspruit	RU - G2	SK 2, SK 4	Salinity levels should not increase. Concontrations must be maintained at levels to support the calchment of the Eve.	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 Schoonsput dolomite water compartment as observed by the Department of Water and Sanitation.
					The Schoonspruit Eye catchment area (-5 square kilometre area) must be managed as a protected area in terms of the Department of Water Affair's Dolomtic Guidelines Document (August 2006).
			Medium to long-term declining water level trends should be managed in a sustainable	Water Level (metres below ground level) Water level (wl) recession rate, dh (metres/day): dh=(h ₂ -h ₃)t;	A specific recession rate must be calculated for each licensed water user based on the area, use and compliance status (in cubic metres/square killometres/annum).
MC – Schoonspruit; MF – Vaal; MA - Renoster	Venters-dorp aquifers	VB 3, VB 5, SK 5, SK 6, SK 7 and R5	manner.	haren h=wion day1; h _a =wi on day 30; t=number of days. Water use monitoring dataset	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
					Salinity: Electrical conductivity <150 milliSiemens/metre for domestic use;
				Electrical conductivity and specific macro elements for domestic use;	Total dissolved solids <1000 milligrams/litre for stock watering;
				Electrical Conductivity and Sodium Adsorption Ratio for Irrigation water	Electrical conductivity < 40 milliSiemens/metre for irrigation water
MC - Schoonspruit; MF - Vaal; MA - Renoster	Venters-dorp aquifers	VB 3, VB 5, SK 5, SK 6, SK 7 and R5		ase. Annual water quality analysis.	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), Cadmum (<0.05 milligrams/litre), Copper (<1.0 milligrams/litre), ton (<0.5 milligrams/litre), manganese (<0.4 milligrams/litre) and zinc (<10 milligrams/litre). For stock and irrigation water: Refer to appropriate outoletine.
MA - Renoster, MB - Vals, MD1 - Upper Sand, MD2 - Lower MD2 - Lower Vet, ME1 - Vaal to Bloemhof Dam	Karoo aquifers	UV1, UV2, UV3, UV4, UV3, UV4, UV3, UV3, US3, V2, V3, LS3, V2, V3, LS3, V2, V3, V3, K8, VB4, VB2, VB6	Medium to long-term declining water level trends should remain sustainable	Water Level (m below ground level) Water Jevel (m) recession rate, dh (metresday): dh=(h ₂ -h ₃)t; here h=m on day1; h ₂ =w 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

Numerical Limit	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 Vater Use Registration (million cubic metres/annum).	Domestic use:<10 milligrams/litre; Stock water use:<110 milligrams/litre; Irrigation use: <10 milligrams/litre	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), socium (<200 milligrams/litre), chloride (<200 milligrams/litre).	100% compliance	Domestic Use: Trace metals –Arsenic (<0.05 milligrams/litre). Cadmium (<0.05 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.					
Indicator/ Measure	Water use > Reserve, Schedule 1 and General Authorisations Abstraction rate Q (mm/km²/a) and recharge (mm/km²/a). Refer to Groundwater Resources Assessment Phase II or more recent updated recharge estimation in mm/km²/a). Estimate local Stress Index, SI(%): SI(%)=Use (Q)/Recharge	Nutrients: Nitrate (as Nitrogen) Annual water quality analysis	Salts: Electrical conductivity and specific	Electrical conductivity and Sodium Adsorption Ratio for Irrigation waters. Annual water quality analysis.		Toxics: Specific trace metal constituents Annual water quality analyses must be undertaken.					
Resource Quality Objective	Where water use (m ³ /a) is higher than requirements for Reserve, Schedule 1 and General Authorizations, balance between amual recharge and abstraction on specified property area (hectares) must be satisfied. The regional groundwater quality criteria should be based on the water use requirement for domestic, agricultural and or industrial limits.										
Resource Unit	UV1. UV2. LV1. UV2. LV1. UV2. UV2. UV2. UV2. UV2. VV4. V5. R2. VB3. R2. V3. VB6. VB6.										
Ground-water unit			Karoo aquifers								
NU			MA - Renoster, MB - Vals, MD1 - Upper Sand, MD2 - Lower Sand, ME1- Upper Vet, ME2	- Vaal to - Vaal to Bloemhof Dam							