water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

2030 NDP

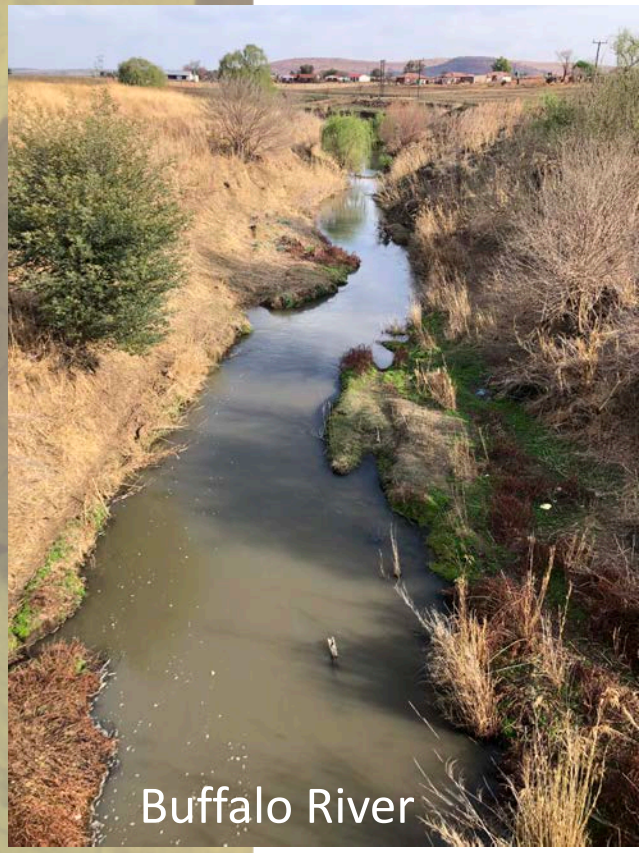
DETERMINATION OF WATER RESOURCE CLASSES AND ASSOCIATED RESOURCE QUALITY OBJECTIVES IN THE THUKELA CATCHMENT

PUBLIC MEETINGS

Presented by:
Project Team

Date: 16th and 17th of November 2021

AGENDA


Buffalo River

1. Welcome and Introductions
2. Acceptance of Agenda
3. Introduction and Background to the Study
4. Classification and Resource Quality Objectives (RQOs) Determination in the Thukela Catchment
    a. Study Approach (steps undertaken and major outcomes)
    b. Proposed Water Resource Classes
    c. Proposed Resource Quality Objectives
5. Discussion
6. Way Forward
7. Closure

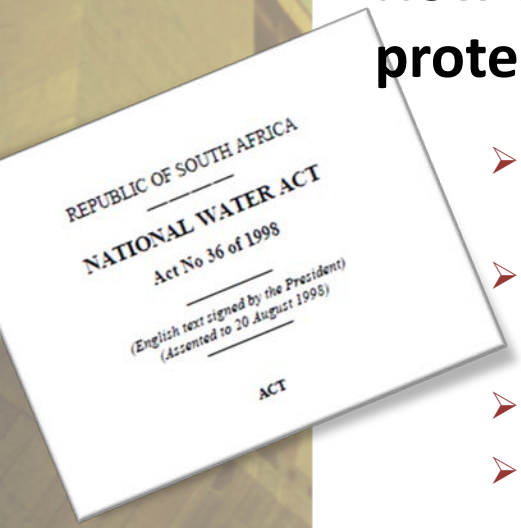
What does this mean for your organisation?

Protecting Water Resources

RESOURCE DIRECTED MEASURES

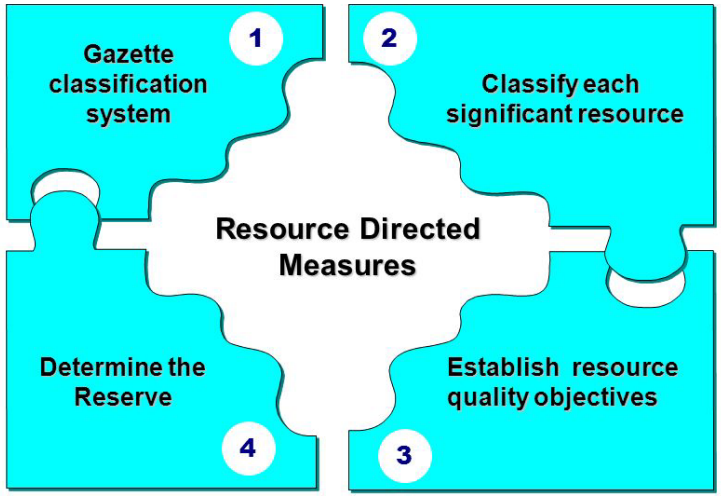
Middle Thukela River at uThukela weir

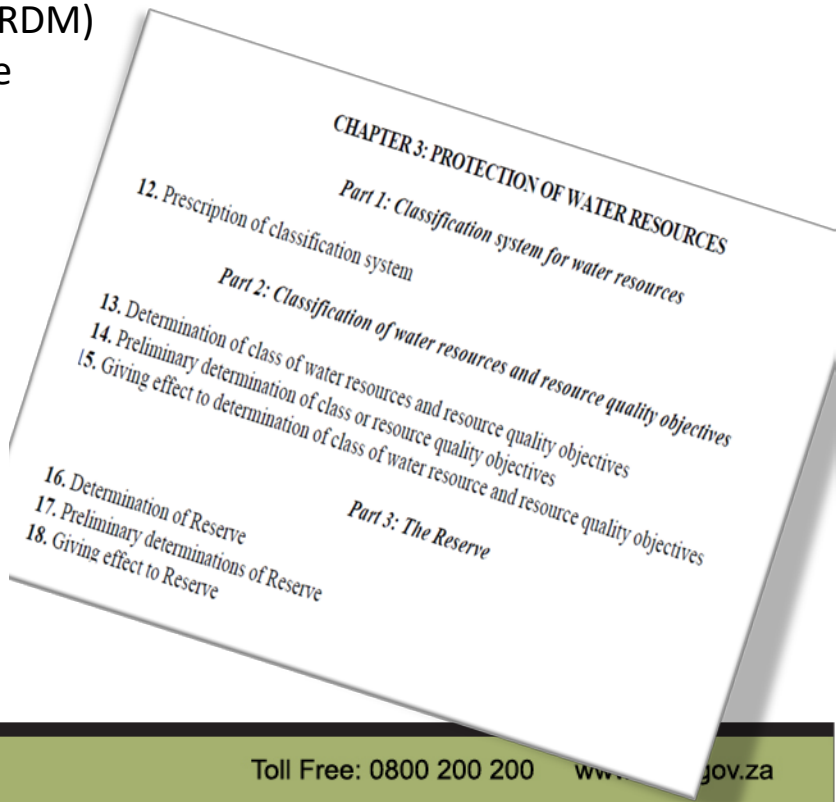
How does national government determine the level of protection required for a particular water resource?



- Very few water sources that are in a natural state and therefore our water resources require protection.
- Protection is aimed at ensuring current and future use of water resources
- Quantity and quality (overall health)
- Different water resources require different levels of protection.

Chapter 3 - Resource Directed Measures (RDM) which together are intended to ensure the comprehensive protection of all water resources.




CHAPTER 3: PROTECTION OF WATER RESOURCES

Part 1: Classification system for water resources

12. Prescription of classification system

Part 2: Classification of water resources and resource quality objectives

13. Determination of class of water resources and resource quality objectives
14. Preliminary determination of class or resource quality objectives
15. Giving effect to determination of class of water resource and resource quality objectives

Part 3: The Reserve

16. Determination of Reserve
17. Preliminary determinations of Reserve
18. Giving effect to Reserve

Defining the Water Resource Class

- Rivers
- Groundwater
- Wetlands and estuaries.

Each class represents:

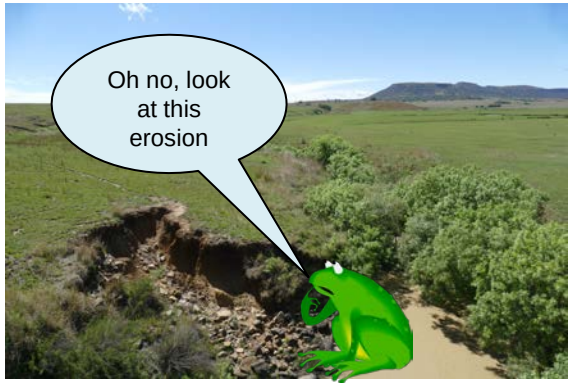
- A different level of protection that is required for the water resource, and
- The extent to which water can be used.

	Description of use	Ecological Category	Description of resource
Class I	Minimally used	A-B	Minimally altered
Class II	Moderately used	C	Moderately altered
Class III	Heavily used	D	Heavily altered

Determining Resource Quality Objectives

Resource quality objectives provide statements about:

- what the quantity of water should be (water level, pattern, timing)
- what the water quality should be (physical, chemical, biological)
- what the condition of the instream and riparian (river bank) habitat should be
- what the condition of the aquatic (water) animal and plant life should be.



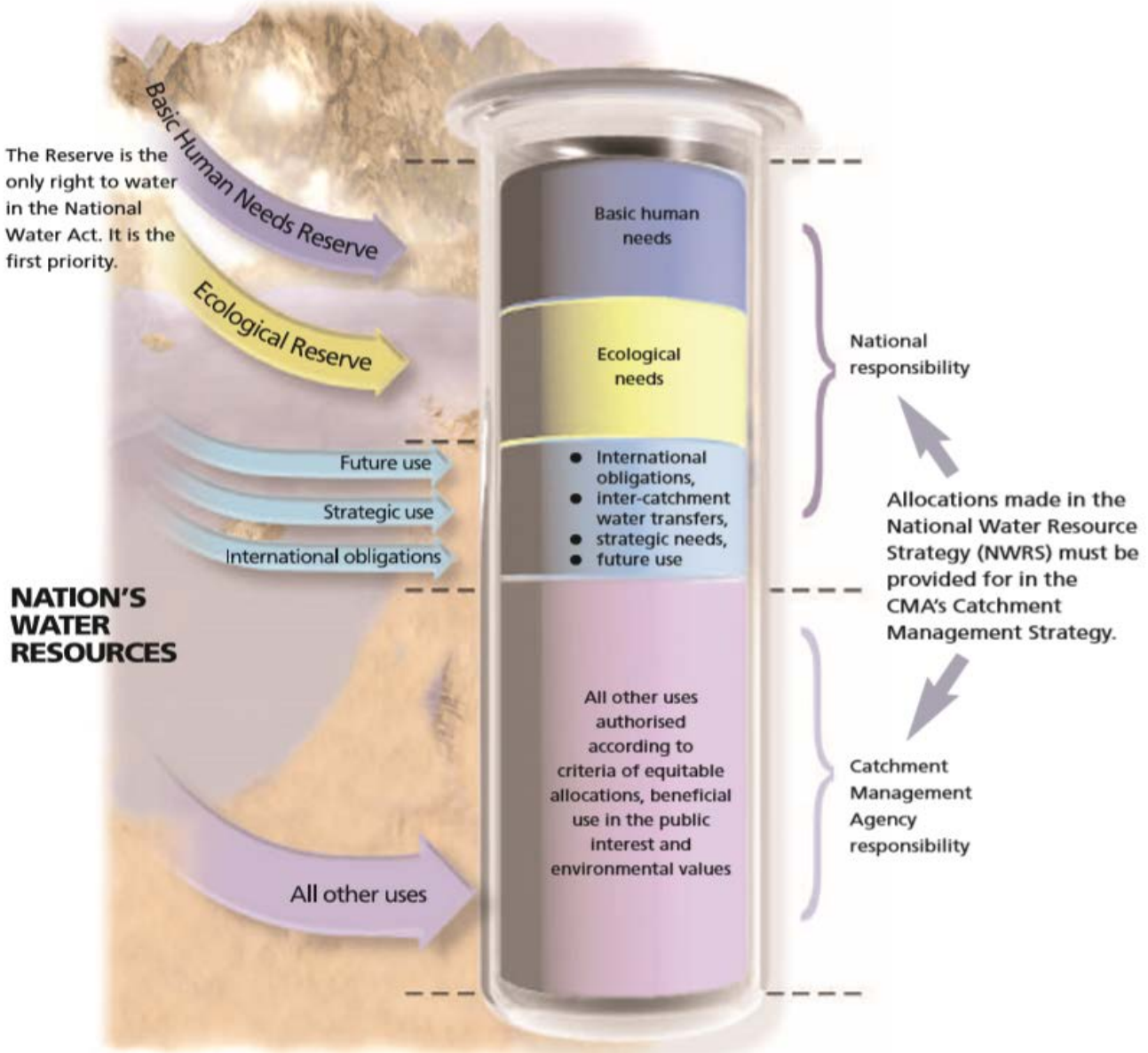
Setting the Reserve

Only *RIGHT* in the NWA

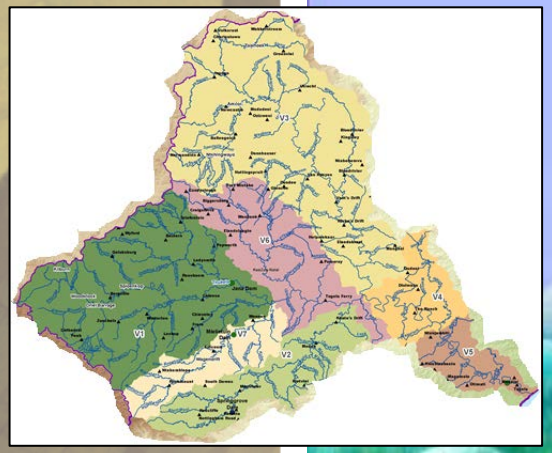
The Reserve is part of the water resource that is under the direct control of the Minister.

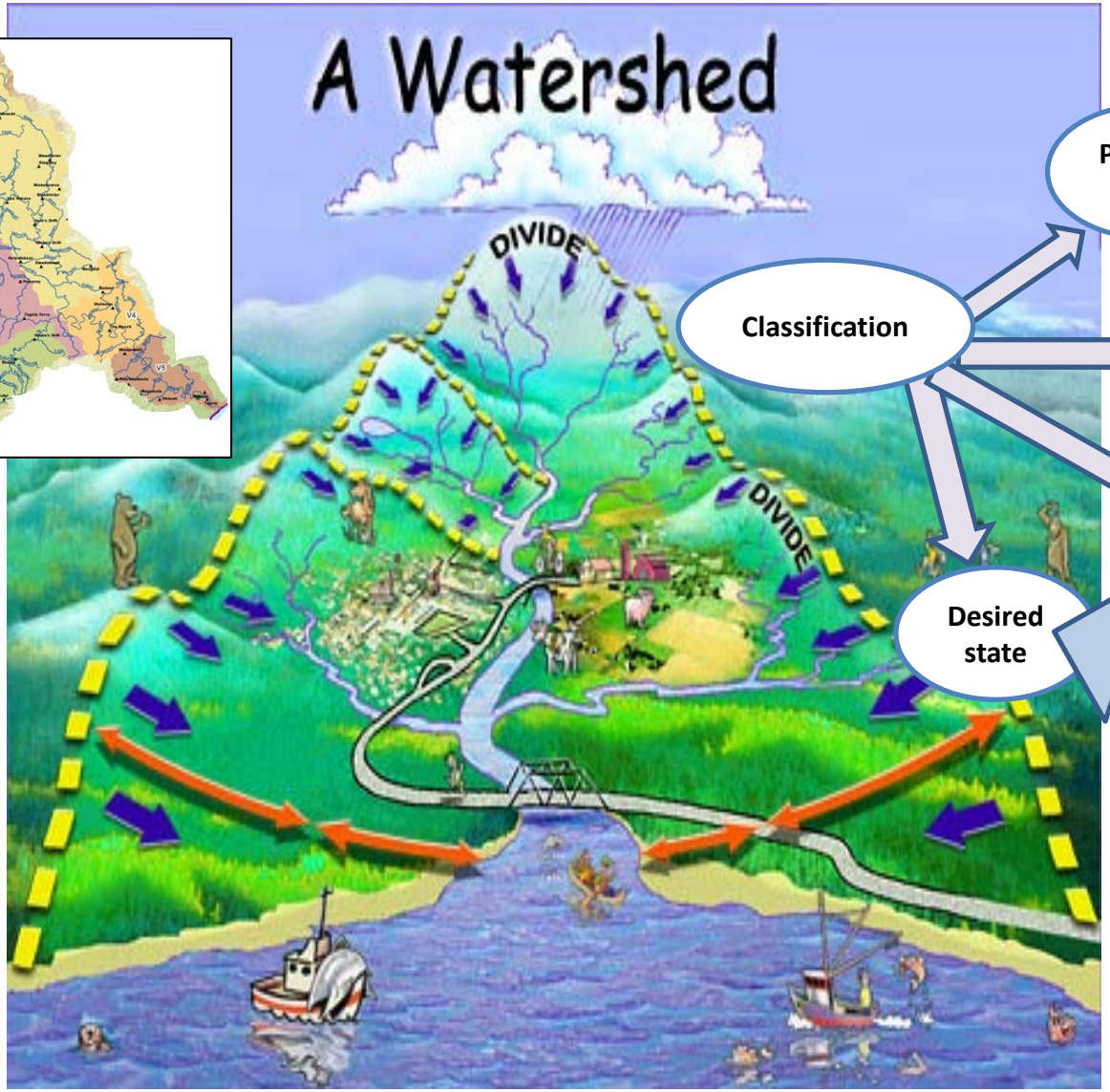
It has priority over all other water use.

Reserve must be met before water resources can be allocated to other water users



Classification of Water Resources





We all live downstream

Resource Management

Source Control

Resource Protection

WRC

RQO

Reserve

- Setting requirements in water resources – Water Resource Class
- Resource Requirements:
  - Human Needs
  - Aquatic System Health (Ecospecs)
  - **Resource Quality Objectives**

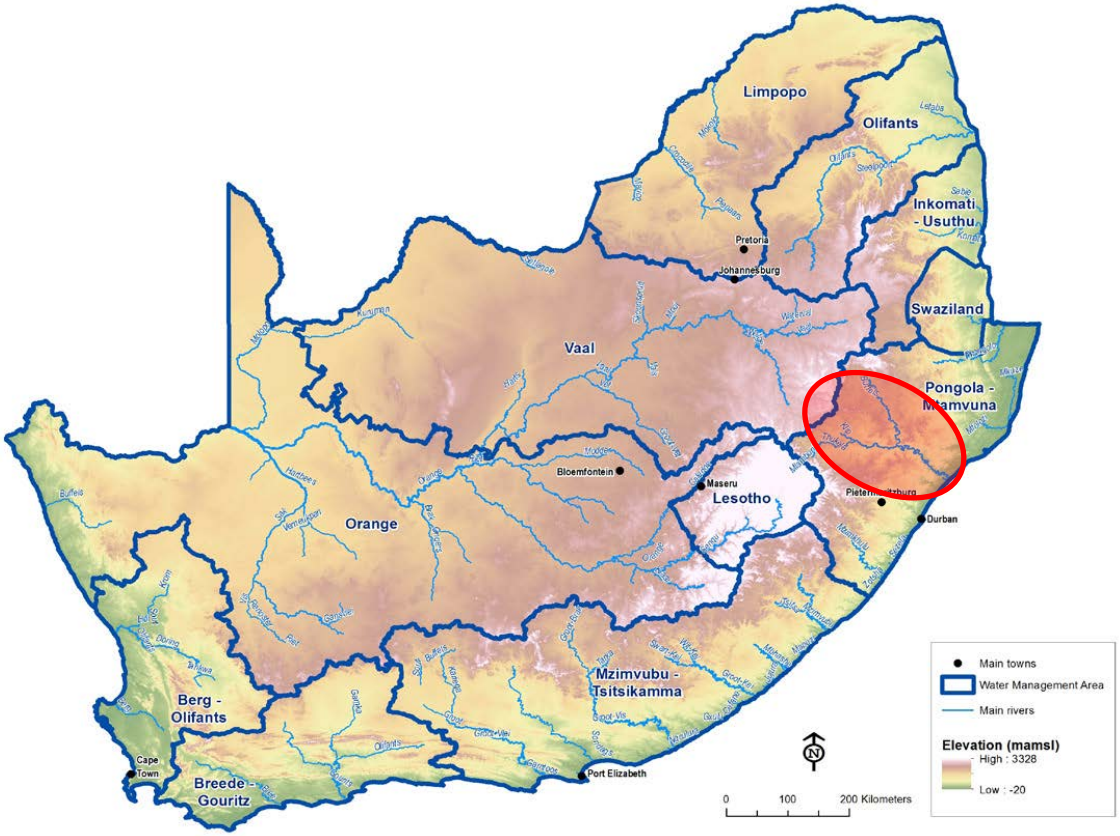
Thukela Catchment

THE STUDY AREA

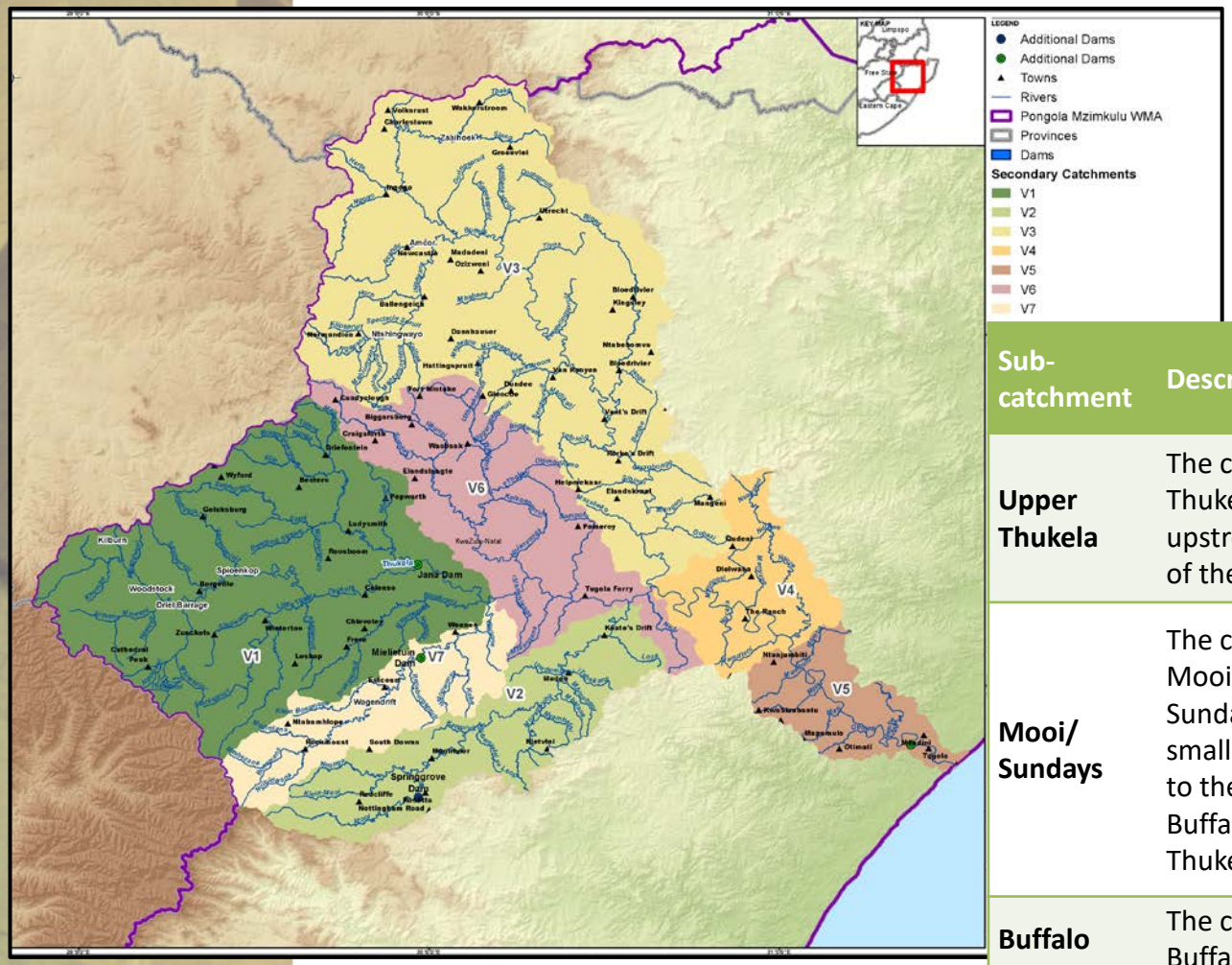
Sundays River

Thukela catchment

- Pongola to Mtamvuma Water Management Area (WMA 4)
- Largest river system within the WMA
- Catchment drains an area of 29 040km^2
- Two main drainage systems: Upper Thukela and Buffalo rivers

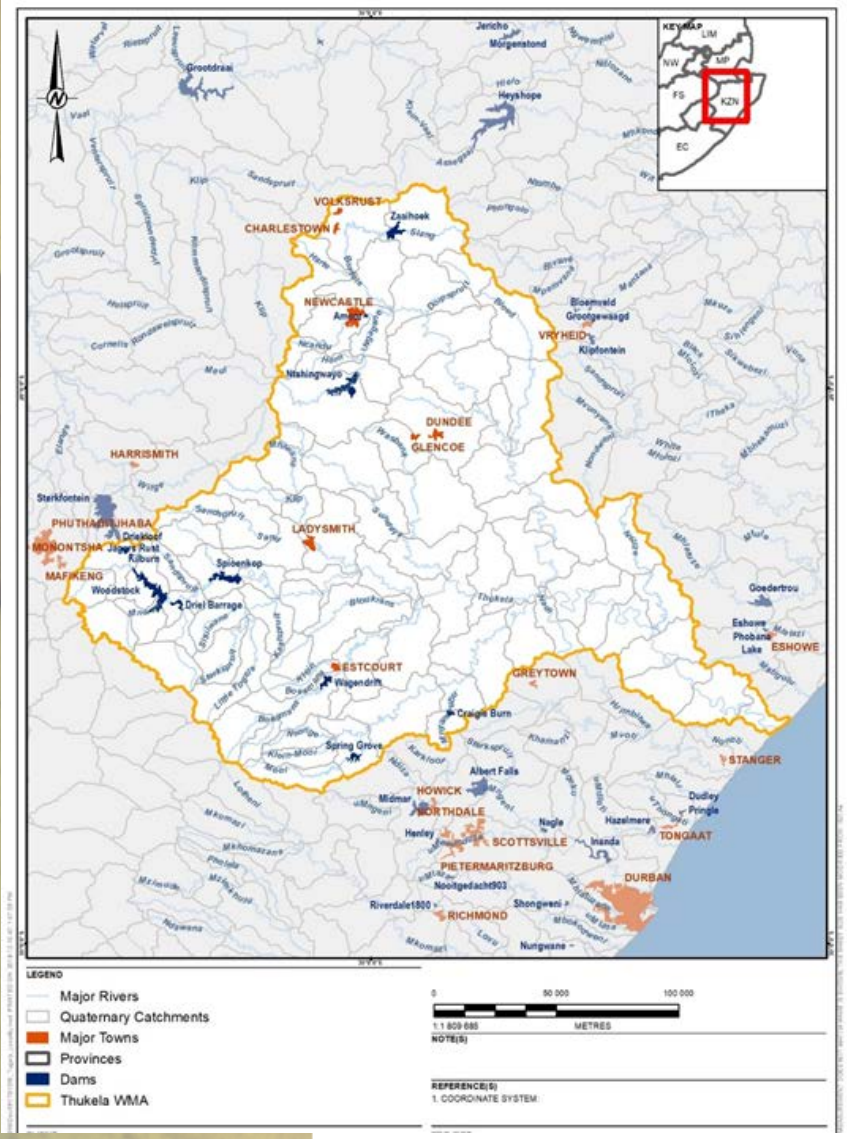


Study Overview: Thukela catchments



Sub-catchment	Description	Tertiary drainage regions	Catchment area[1] (km²)
Upper Thukela	The catchment of the Thukela River to just upstream of the confluence of the Bushmans River.	V11, V12, V13 and V14	7645
Mooi/ Sundays	The catchment of the Mooi, Bushmans and Sundays River as well as of smaller tributaries, down to the confluence of the Buffalo River with the Thukela River.	V20, V60, V70	8496
Buffalo	The catchment of the Buffalo River.	V31, V32 and V33	9803
Lower Thukela	The catchment of the Thukela River between the confluence of the Buffalo River and the Indian ocean.	V40 and V50	3102

Water Resources



- Thukela River – primary river
- Major surface water resource of SA
- Originates on the 3050 m high Mont-aux-Sources plateau in the Drakensberg Mountain Range along the border between Lesotho and the KZN
- a funnel shaped catchment with several tributaries
- discharge into the Indian Ocean on the eastern side of catchment (512 km).
- Major tributaries flowing into the Thukela River from the north include:
  - The Klip River, which passes through Ladysmith,
  - The Sundays River, and
  - The Buffalo River, which rises above Newcastle.
- Major tributaries into the Thukela River from the south include:
  - The Little Thukela River,
  - The Bloukrans River,
  - The Bushmans River, passing though Estcourt, and
  - The Mooi River.
- Thukela Estuary
- Aquifers – weathered and fractured hard rock systems
- Protected Wetlands

STUDY OBJECTIVES

Key aims of this study

- co-ordination the implementation of the Water Resource Classification System (WRCS); and
- undertaking the implementation of the RQO determination procedure (7 step process)

- The study was linked to previous Reserves studies and other water resource management initiatives.
- Where the preliminary Reserve was available and relevant, was adopted and where needed and possible within the study mandate, gaps were filled.

Water Resource Classes and RQOs Integrated Process

Reserve

- Step 1: Confirm, quantify and finalise EWRs
- Step 2: Describe status quo and delineate Integrated Units of Analysis (IUA)s and Resource Units (RUs)
- Step 3: Identify and model scenarios within IWRM, and evaluate with stakeholders
- Step 4: Determine water resource class
- Step 5: Determine RQOs (narrative and numerical limits)
- Step 6: Agree on classes and RQOs with stakeholders
- Step 7: Finalise and prepare for gazette

Status quo - water resources and systems, water use, economy, river and wetland ecology, water quality problems and ecosystem services and attributes

Integrated units of analysis (IUAs) - spatial units that will be defined as significant water resources

Resource Units (RUs) and biophysical nodes identified for different levels of Ecological Water Resource Requirements (EWR) assessment and setting of RQOs


Wagendrift Dam

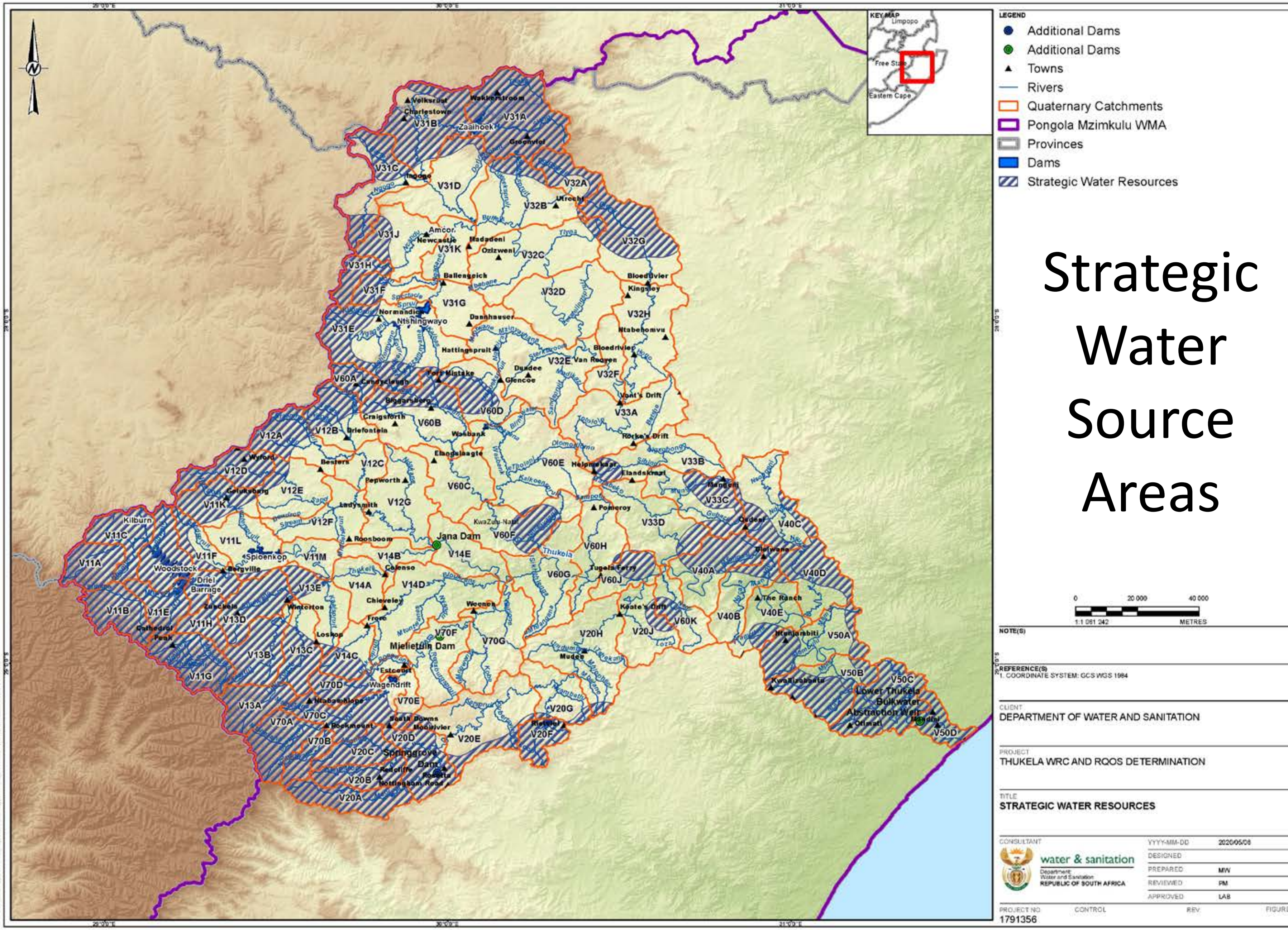

Spring Grove Dam


STATUS QUO SUMMARY

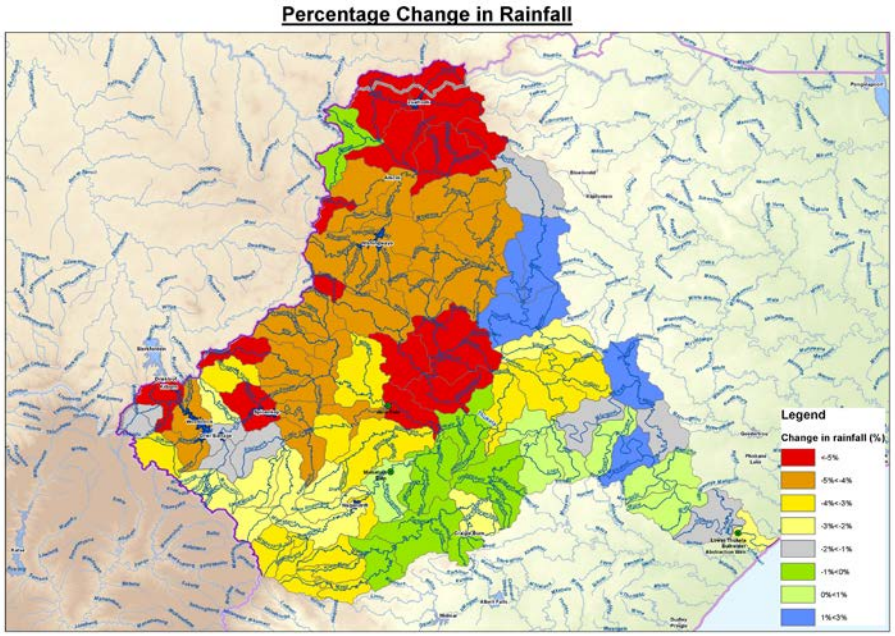
Bushmans River at Weenen

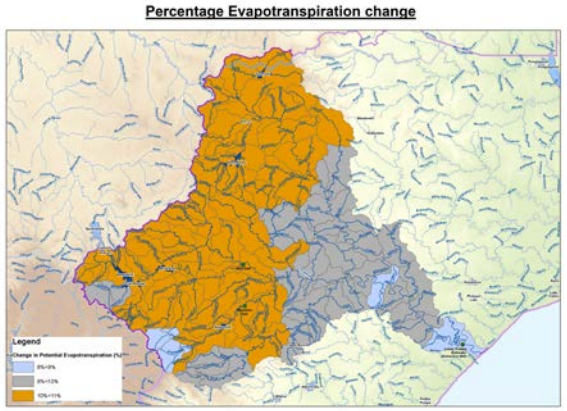

Thukela at Bergville DS
Woodstock and Driel

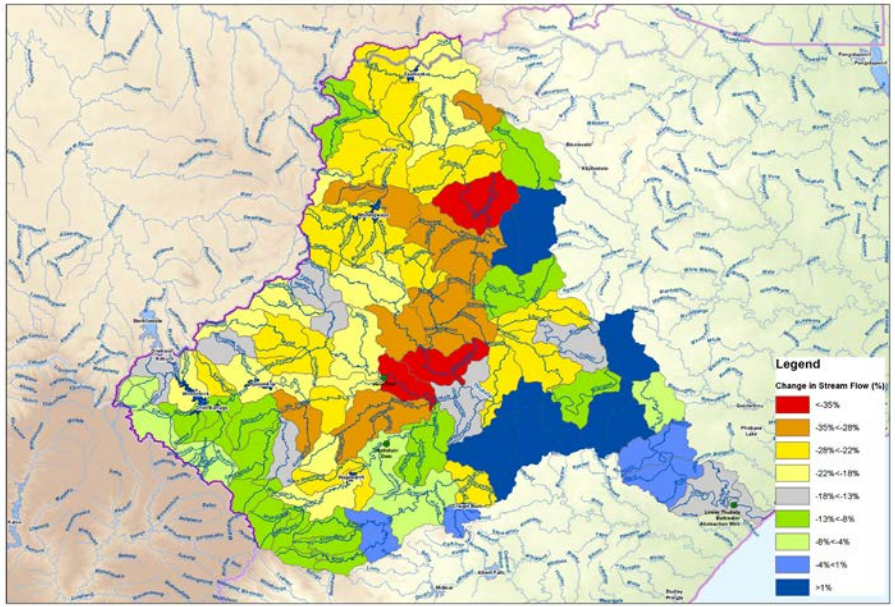
Strategic Water Source Areas



Climate change (NIWIS)







Also considered data/ reports received from stakeholders (Wakkerstroom conservation area)

Water Resource Systems Analysis

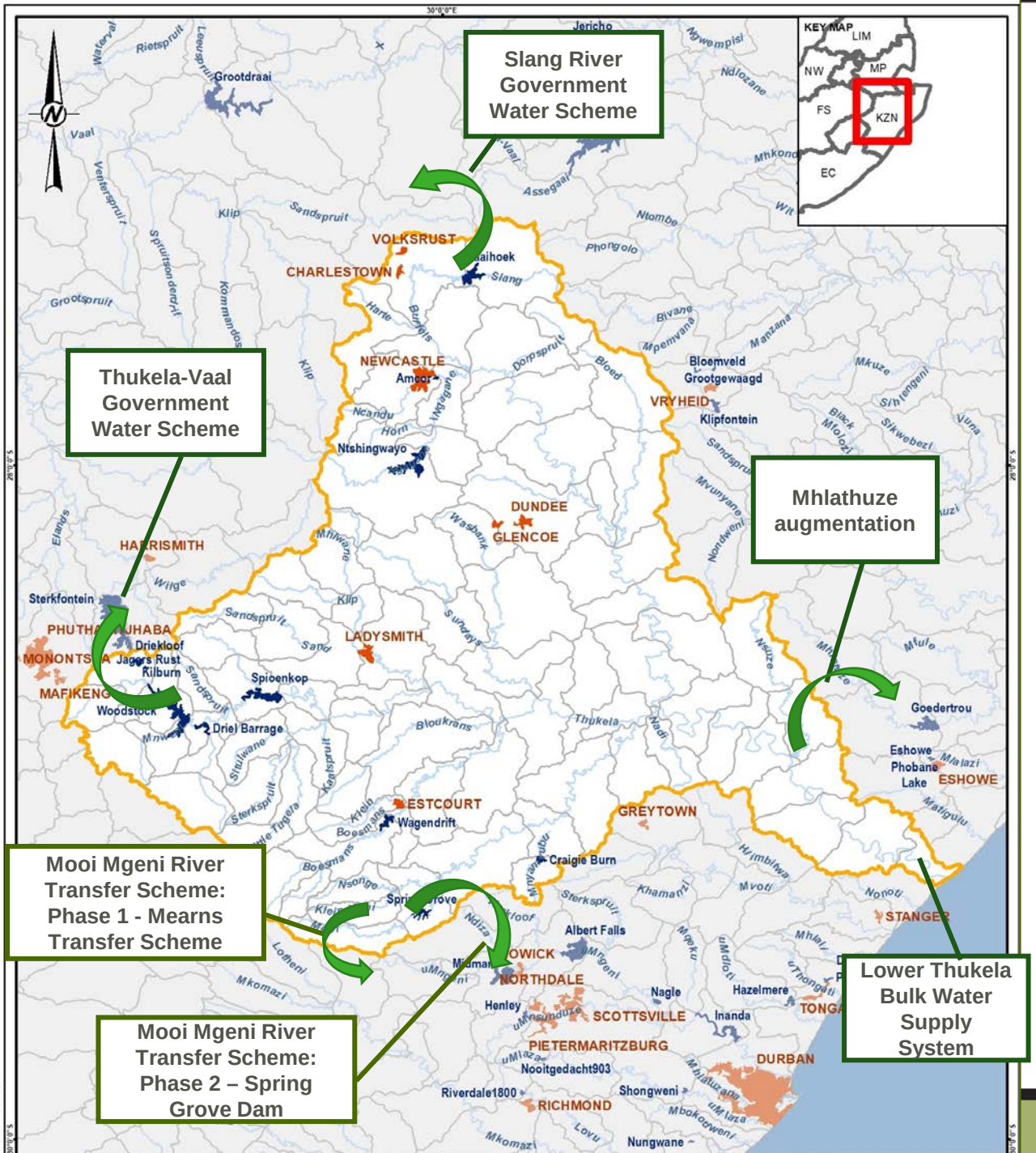
Major Dams

Dam name	Sub - catchment	Purpose	Capacity (million m3)
Woodstock	Upper Thukela	Water transfer	373.25
Spioenkop	Upper Thukela	water supply and irrigation	270.64
Qedusizi	Upper Thukela	Flood Control (operated empty)	±200
Zaaihoek	Buffalo	Water transfer	184.63
Ntshingwayo	Buffalo	Water supply and irrigation	194.56
Spring Grove	Mooi	Water Transfer and Irrigation	139.46
Mearns Weir	Mooi	Water Transfer and Irrigation	5.12
Craigieburn	Mooi	Water supply and irrigation	22.47
Wagendrift	Boesmans	Water supply and irrigation	55.90

Minor Dams

River Catchment	Total surface area of small dams (km^2)	Total capacity of small dams (million m^3)
Upper Thukela River	19.8	73.2
Upper Thukela River	2.54	9.4
Sundays River	11.28	41.8
Middle Buffalo	12.32	38.2
Blood River	4.93	15.3
Upper Mooi River	21.24	44.17
Lower Mooi River	3.27	6.46
Total	99.9	319.1

Inter-basin Transfers



Scheme	Capacity#	Operating rules*
Thukela Vaal Scheme	20 m^3/s (1 700 ML/d)	To fill Sterkfontein Dam and support Vaal System.
Buffalo Vaal Scheme	2.16 m^3/s (186 ML/d)	To supply Majuba PS and support Grootdraai Dam.
Mooi Mgeni Transfer Scheme (phase 1 and 2)	4.5 m^3/s (388 ML/d)	To keep Midmar Full and support Mgeni.
Thukela to Mhlathuze scheme (also known as the Middledrift Transfer)	1.0 m3/s (86 ML/d)	Support Mhlathuze by pumping until Goedetrouw Dam > 60%
Lower Thukela Bulk Water Supply Scheme (phase 1)	0.63 m^3/s (55 ML/d)	To supply users along North coast (KwaDukuza)

Sub-systems water availability

Upper Thukela

	Volumes as per 2015 projection (million m^3/a)		
Sector	Requirement	Supply	Percentage Supply
Irrigation	158.8	121.0	76%
Afforestation	6.8	5.6	82%
Rural / Urban / Industrial	33.1	33.1	100%
Transfer	631.2	498.6	79%
Total	829.9	658.3	79%

Mooi Sundays

	Volumes as per 2015 projection (million m^3/a)		
Sector	Requirement	Supply	Percentage Supply
Irrigation	138.7	115.7	83%
Afforestation	16.8	16.5	98%
Rural / Urban / Industrial	23.1	20.5	89%
Transfer	142.0	112.2	79%
Total	320.6	264.9	83%

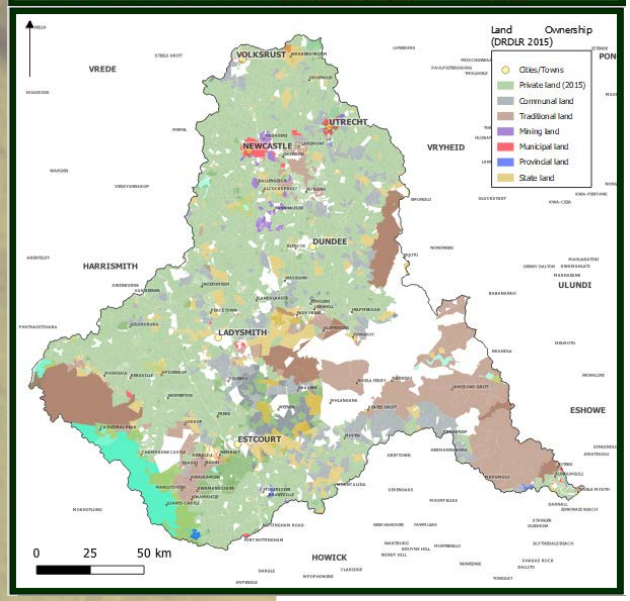
Buffalo

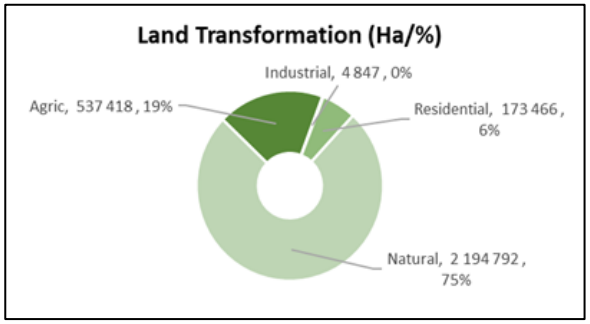
	Volumes as per 2015 projection (million m^3/a)		
Sector	Requirement	Supply	Percentage Supply
Irrigation	66.9	50.2	75%
Afforestation	16.7	14.2	85%
Rural / Urban / Industrial	57.1	56.5	99%
Transfer	31.6	31.6	100%
Total	172.3	152.5	89%

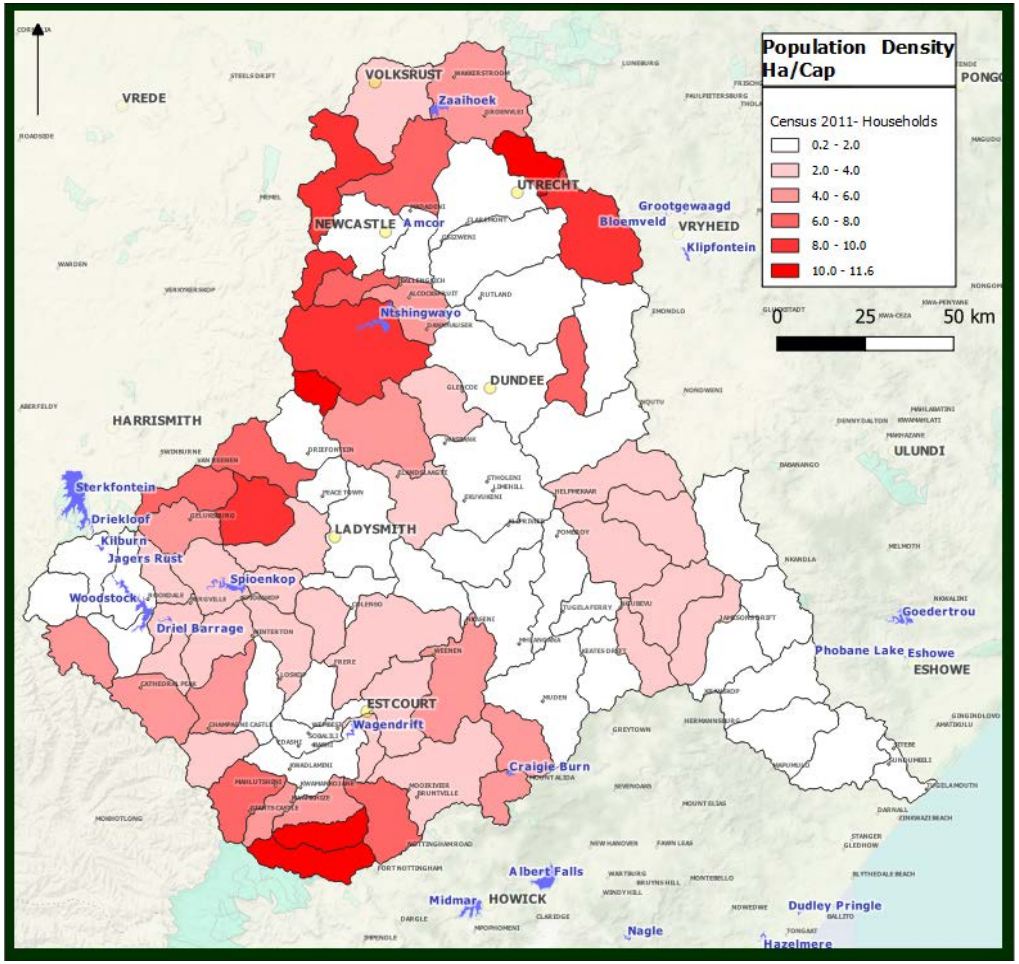
Lower Thukela

	Volumes as per 2015 projection (million m^3/a)		
Sector	Requirement	Supply	Percentage Supply
Irrigation	33.3	33.3	100%
Afforestation	5.5	5.5	100%
Rural / Urban / Industrial	58.0	58.0	100%
Transfer	37.9	37.9	100%
Total	134.6	134.6	100%

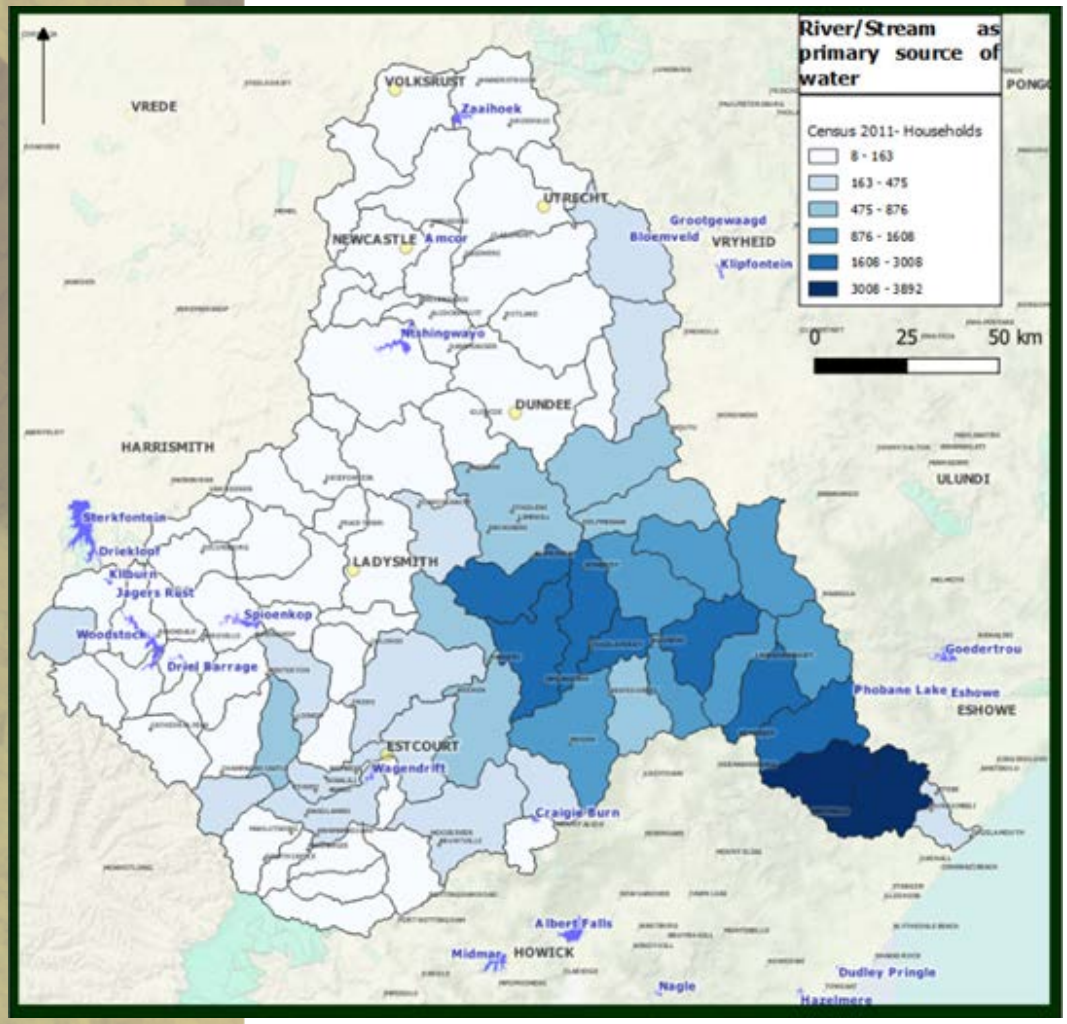
Socio-economics

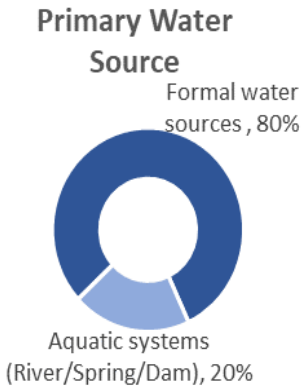


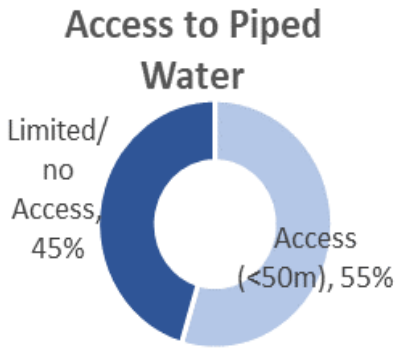




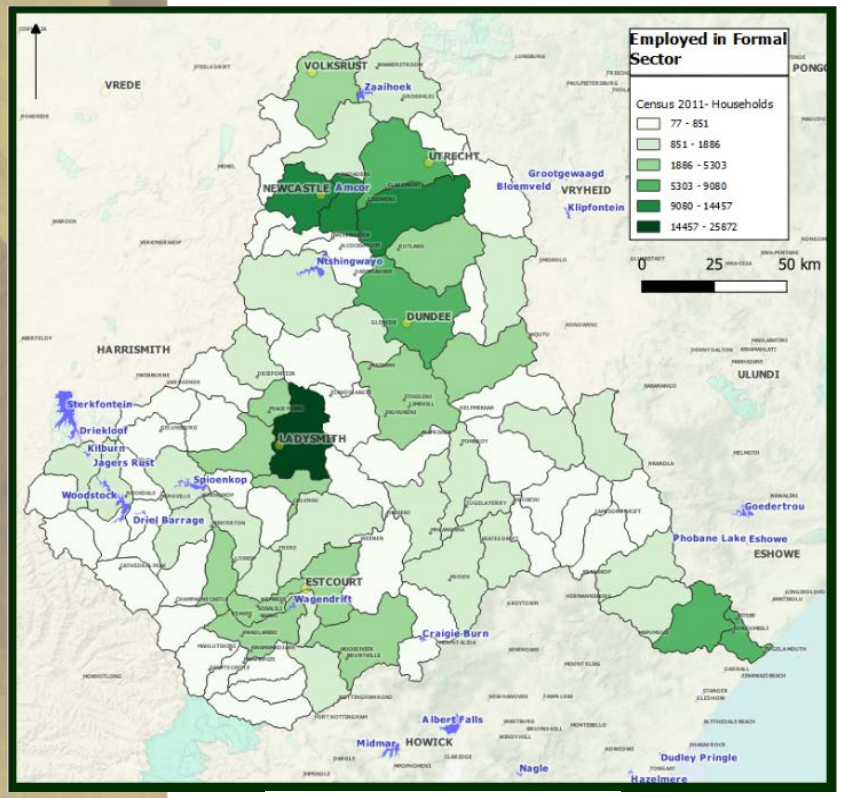
Reliance on rivers, streams, and dams as primary source

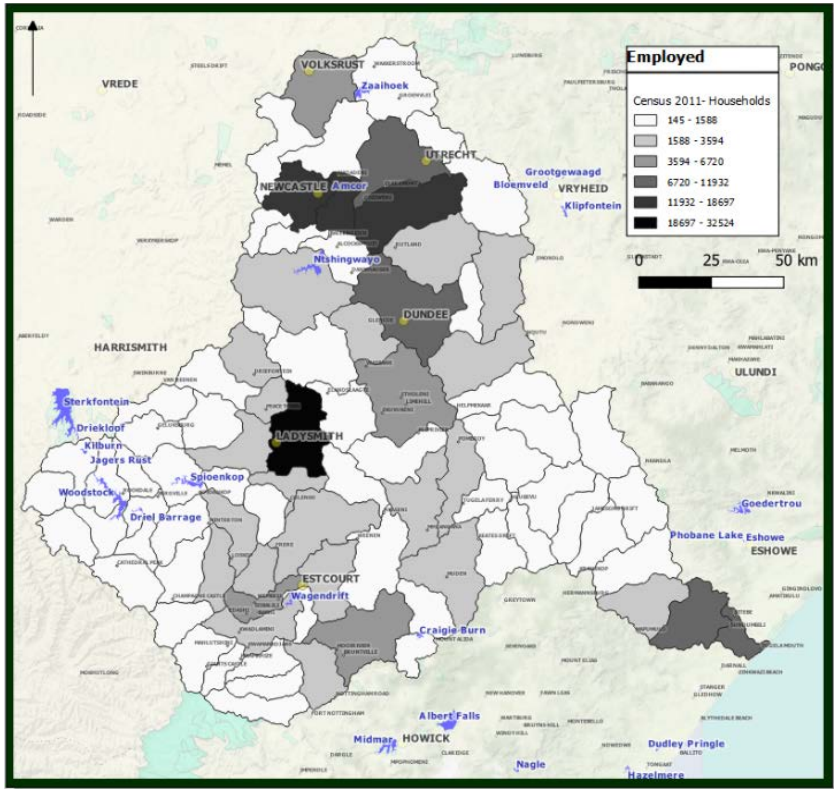




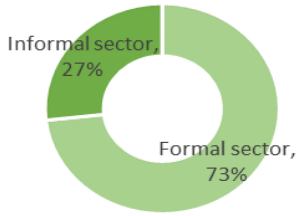


Employment statistics

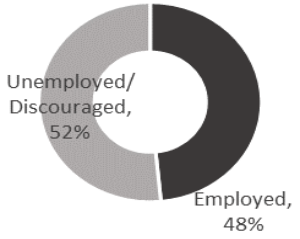




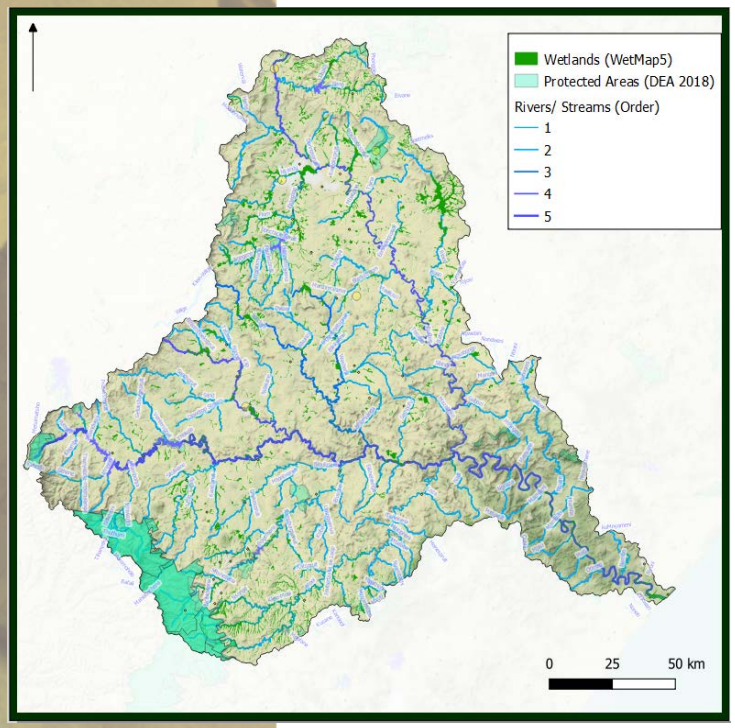
Employment Sector



Employment



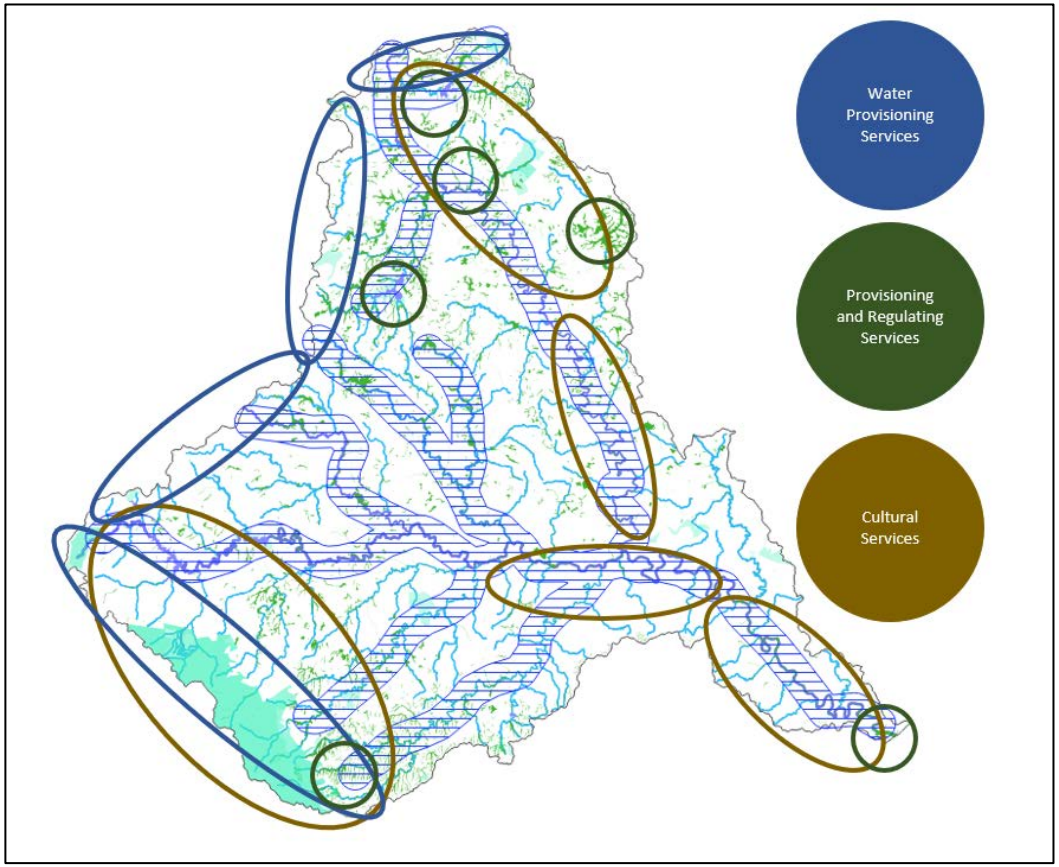
Ecological Infrastructure



Ecosystem Service Sensitivity areas are identified at a high level through two general ways:

1. Knowledge of benefits received through ecological infrastructure, and
2. Inferring the flow of ecosystem services through the spatial relationship of potential beneficiaries and ecological infrastructure.

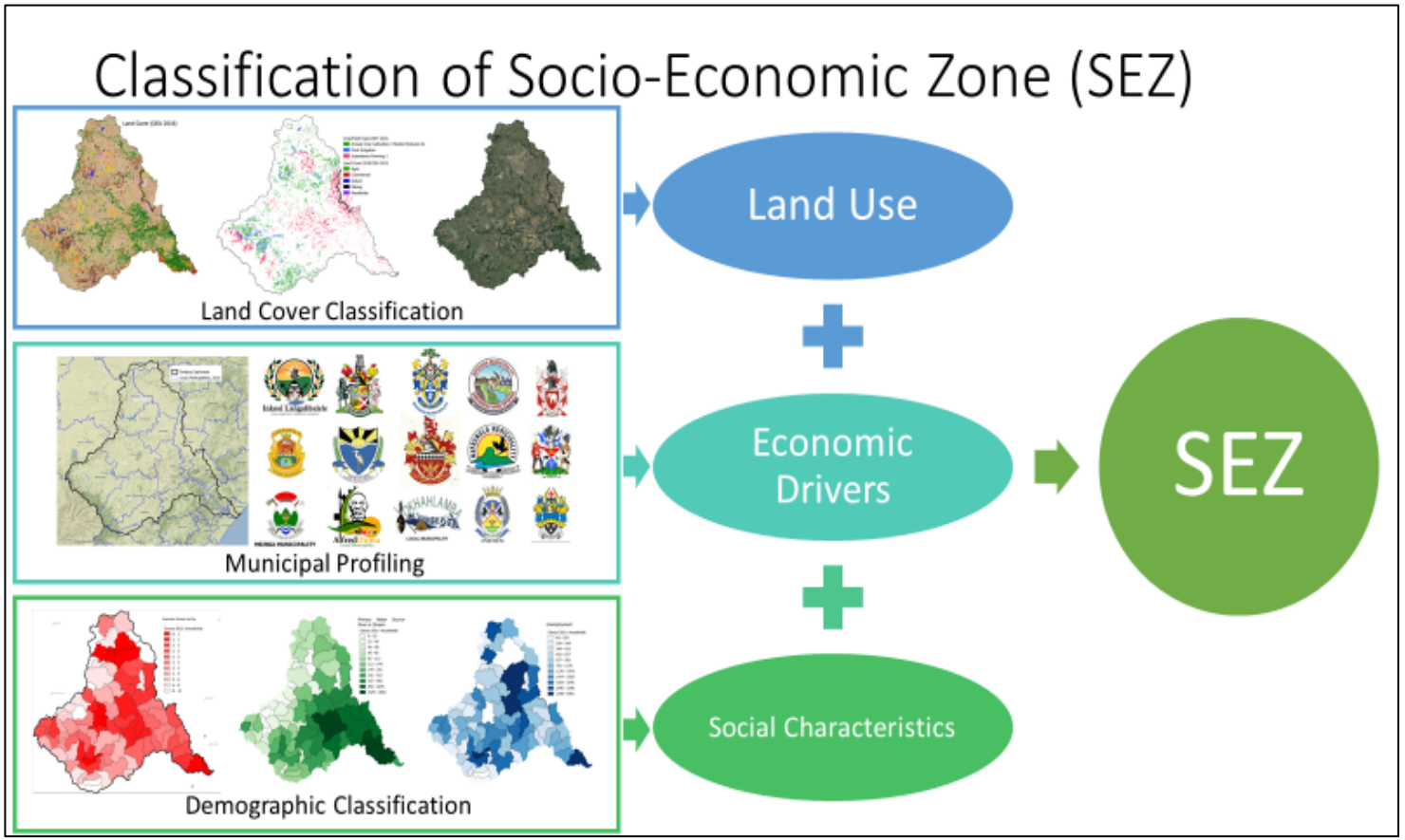
Ecosystem Service Sensitivity



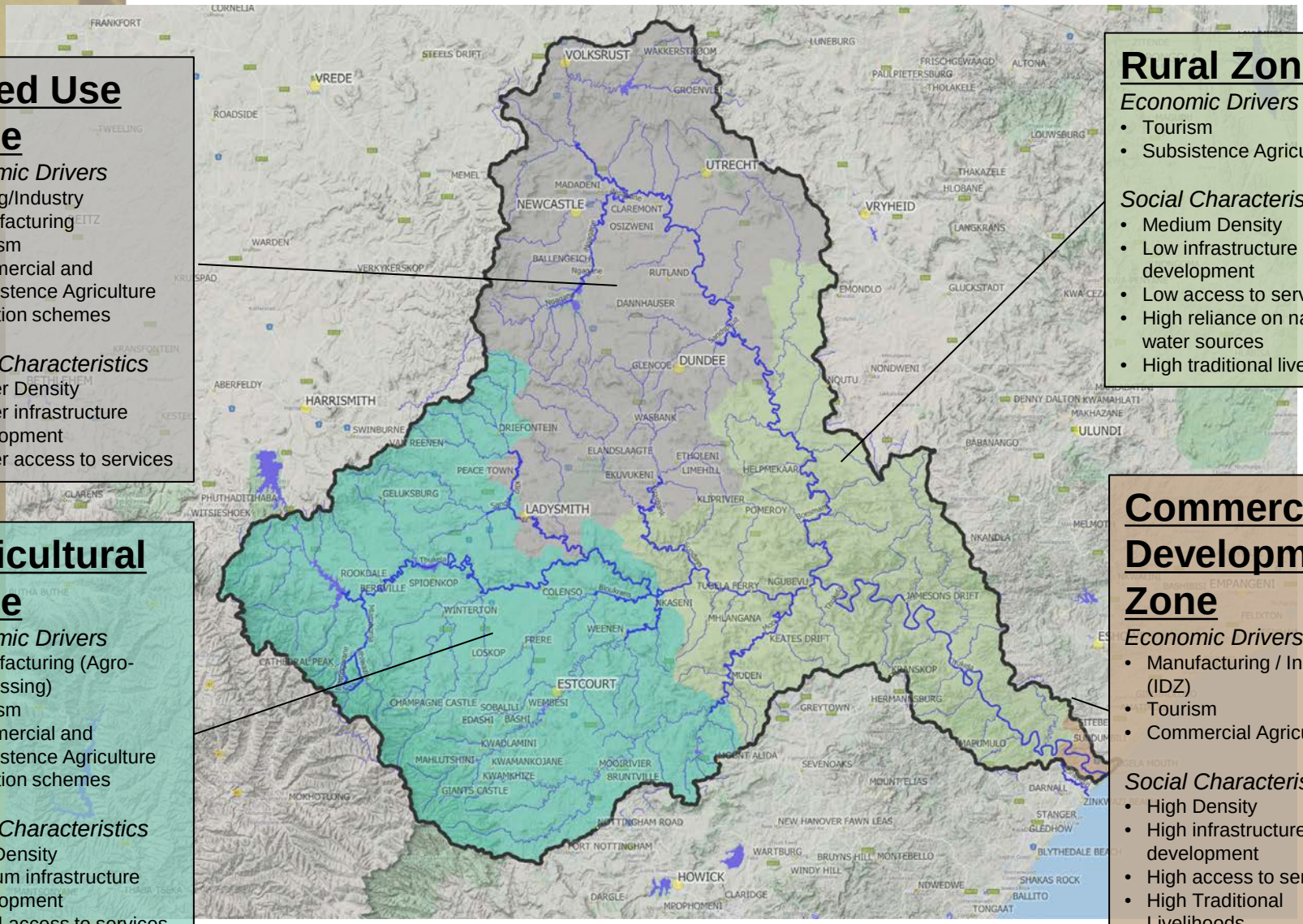
Water Provisioning Services provided by network of rivers, dams and impoundments and Strategic Water Source Areas (SWSA) along upper catchment escarpment
Provisioning and regulating services provided by complex ecosystems. Identified in the Thukela as major wetlands and the Tugela Mouth estuary. Provisioning services (other than water) will play a larger role in rural livelihoods. Regulating services will provide overarching benefits to the wider economy.
Cultural services as indicated by the distribution of protected areas, tourism and community demographics

Socio-economic zones

- Zones of relatively homogenous socio-economic characteristics and dependencies to the services provided by associated aquatic ecosystems



Socio-economic zones (SEZ)



Mixed Use Zone

Economic Drivers

- Mining/Industry
- Manufacturing
- Tourism
- Commercial and Subsistence Agriculture
- Irrigation schemes

Social Characteristics

- Higher Density
- Higher infrastructure development
- Higher access to services

Rural Zone

Economic Drivers

- Tourism
- Subsistence Agriculture

Social Characteristics

- Medium Density
- Low infrastructure development
- Low access to services
- High reliance on natural water sources
- High traditional livelihoods

Agricultural Zone

Economic Drivers

- Manufacturing (Agro-processing)
- Tourism
- Commercial and Subsistence Agriculture
- Irrigation schemes

Social Characteristics

- Low Density
- Medium infrastructure development
- Mixed access to services

Commercial Development Zone

Economic Drivers

- Manufacturing / Industry (IDZ)
- Tourism
- Commercial Agriculture

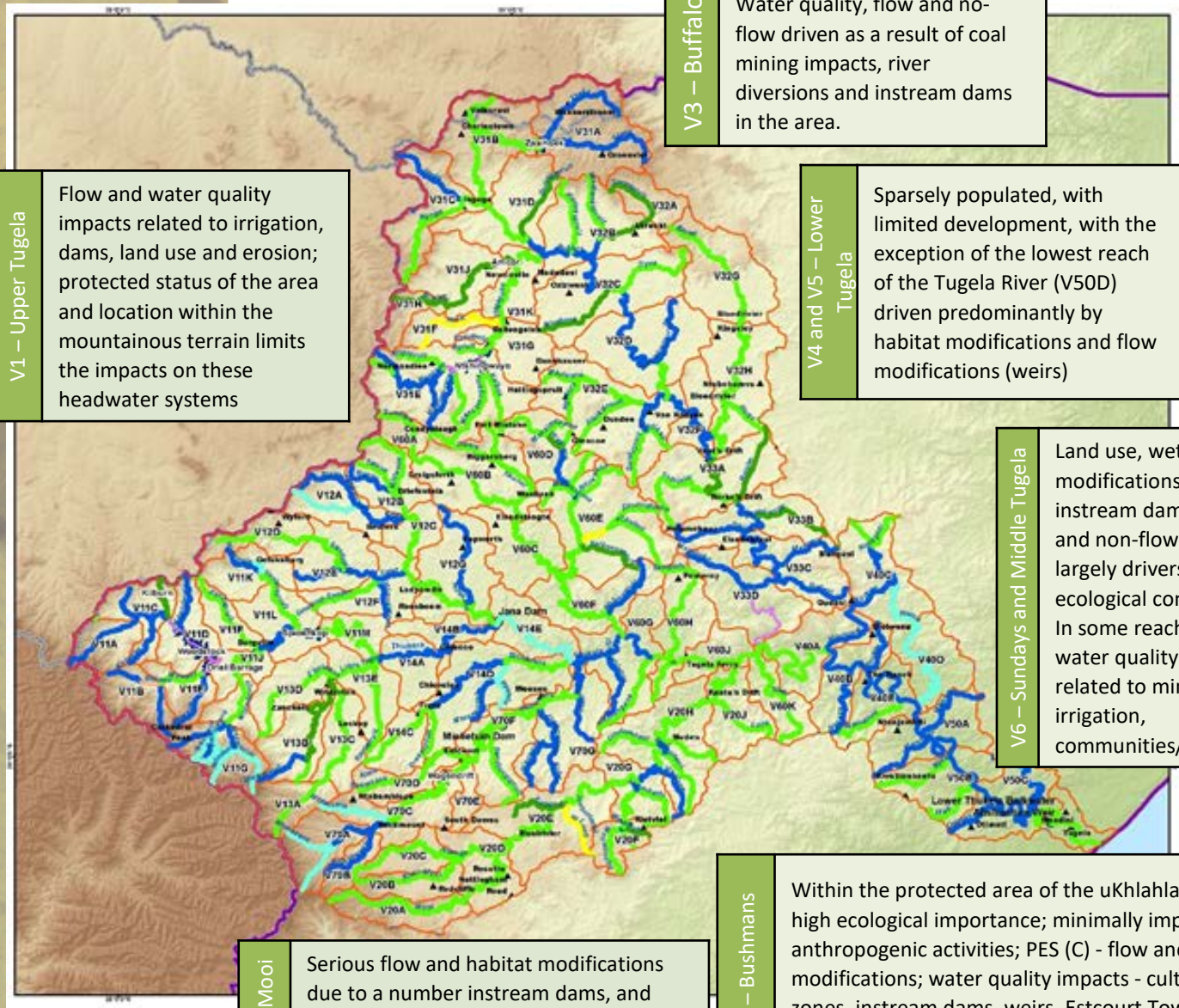
Social Characteristics

- High Density
- High infrastructure development
- High access to services
- High Traditional Livelihoods

Rivers

Sub-catchment	Quaternary	Main river	Major Tributaries
V10	V11A-V11M, V12A-V12G, V13A-V13E, V14A-V14E	Upper Thukela	Little Tugela, Putterill, Majaneni, Khombe, Mnweni; Mpandweni, Njongola, Venterspruit, Sandspruit, Mlambonja, Sterkspruit, Situlwane; Klip (and tributaries), Bloukrans (and tributaries)
V20	V20A-V20J	Mooi	Klein-Mooi, Nsonge, Katspruit, Joubertsvlei, Mnyamvubu, Mbalane, Mhlopheni, Umdumbeni, iTshekana, Loza
V30	V31A-V31K, V32A–V32H, V33A–V33D	Buffalo	Ngogo River, Harte River, Thaka River, Slang River, Doringspruit, Ngagane (and tributaries), Kweekspruit, Wasbankpruit, Mbabane, Blood River, Tiyna, Eesteling, Sand, Totololo, Batse, Sibindi, Ngxobongo, Mangeni, Gubazi, Mazabeko
V40	V40A-V40E	Lower Thukela	Nadi, Mfongosi, Ngcaza, Manyane, Mamdleni, Nsuze and tributaries
V50	V50A-V50D		Mamba, Mambulu, Mpisi, Mati, Otimati, Nembe, Mandeni
V60	V60A-V60F	Sundays	Dwars, Nkunzi, Wasbank (and tributaries), Nhlanyanga
	V60G-V60K	Thukela	Sundays, Sikhehlenga, uMhlangana, Sampofu, Nadi, Mooi, Buffalo
V70	V70A-V70G	Bushman's	Mtshezana, Ncibidwana, Klein Bushmans, Rensburgspruit, uMngwenya, Busone

Present Ecological Status and impacts/ drivers



V1 – Upper Tugela

Flow and water quality impacts related to irrigation, dams, land use and erosion; protected status of the area and location within the mountainous terrain limits the impacts on these headwater systems

V3 – Buffalo

Water quality, flow and no-flow driven as a result of coal mining impacts, river diversions and instream dams in the area.

V4 and V5 – Lower Tugela

Sparsely populated, with limited development, with the exception of the lowest reach of the Tugela River (V50D) driven predominantly by habitat modifications and flow modifications (weirs)

V6 – Sundays and Middle Tugela

Land use, wetland modifications and instream dams (flow and non-flow) are largely drivers of ecological condition; In some reaches water quality impacts related to mining, irrigation, communities/ towns,

V2 – Mooi

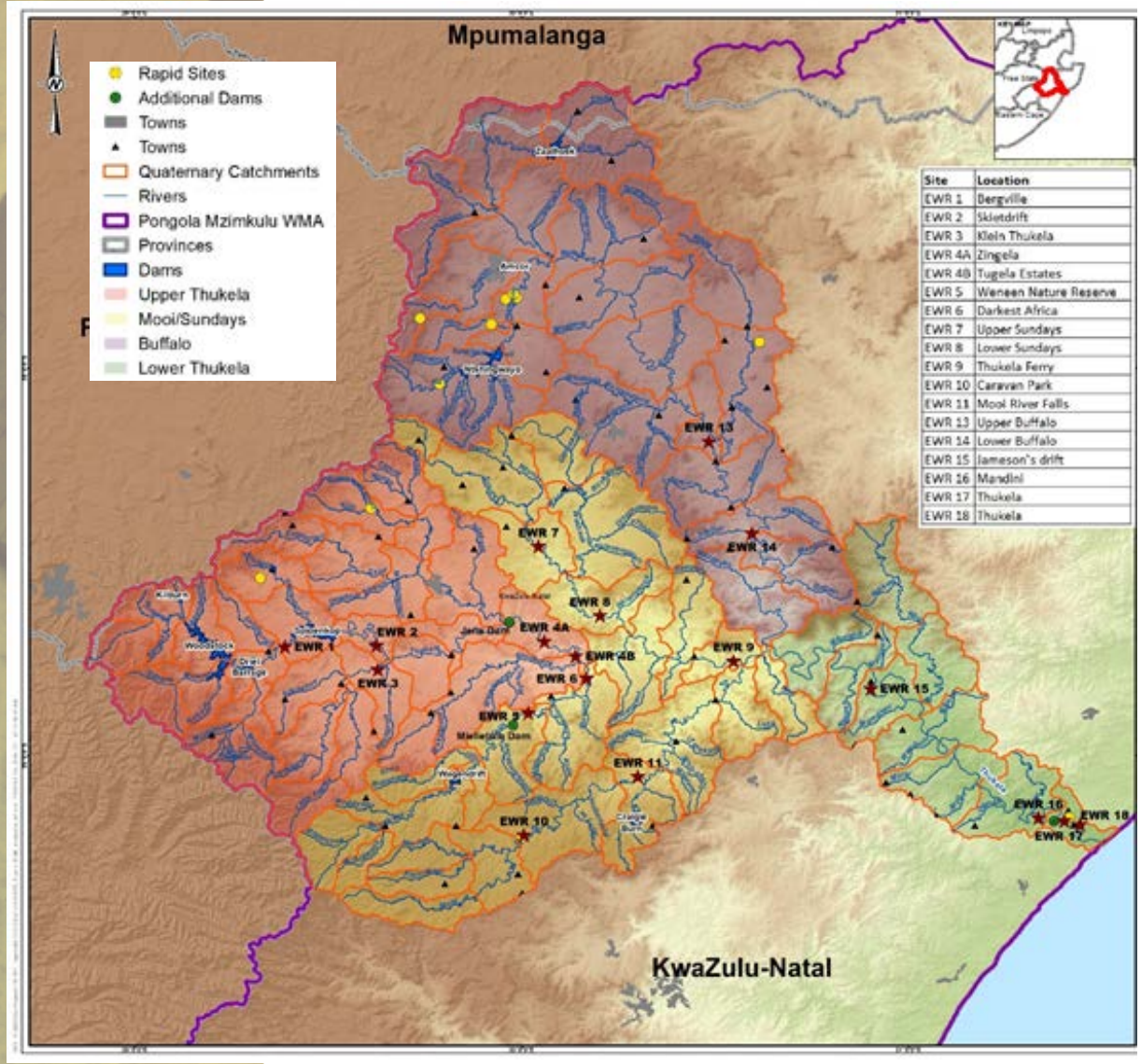
Serious flow and habitat modifications due to a number instream dams, and impacts associated with irrigation, forestry, and erosion

V7 – Bushmans

Within the protected area of the uKhlahlamba Drakensberg; high ecological importance; minimally impacted by any anthropogenic activities; PES (C) - flow and non-flow modifications; water quality impacts - cultivation in riparian zones, instream dams, weirs, Estcourt Town activities, sand mining and irrigation

EC	Description
A	Unmodified, natural.
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.
F	Critically / Extremely modified. Modified completely with an almost complete loss of natural habitat and biota.

EWR Site information



Site	Location
EWR 1	Bergville
EWR 2	Sklietdrift
EWR 3	Klein Thukela
EWR 4A	Zingela
EWR 4B	Tugela Estates
EWR 5	Wenaen Nature Reserve
EWR 6	Darkest Africa
EWR 7	Upper Sundays
EWR 8	Lower Sundays
EWR 9	Thukela Ferry
EWR 10	Caravan Park
EWR 11	Mooi River Falls
EWR 13	Upper Buffalo
EWR 14	Lower Buffalo
EWR 15	Jameson's drift
EWR 16	Mandini
EWR 17	Thukela
EWR 18	Thukela

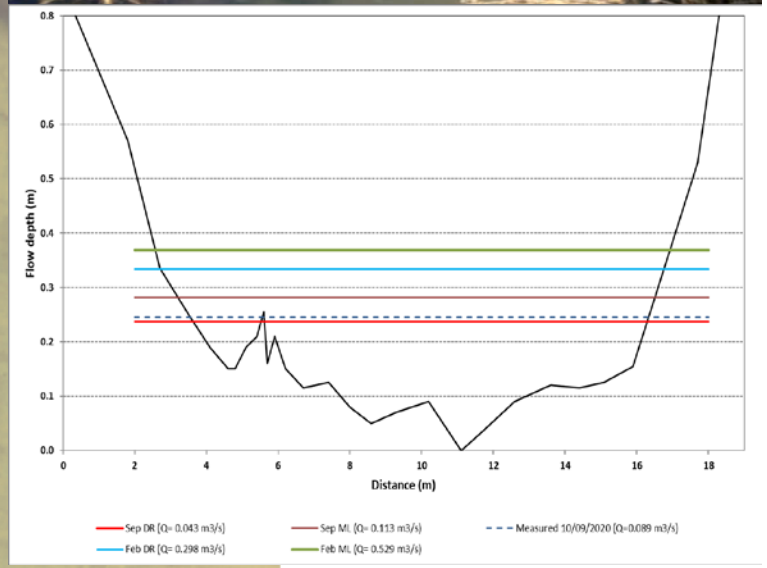
Thukela preliminary Reserve: 17 EWR sites:

- upper Thukela Catchment (9); Lower Thukela (8) .
- A number of rapid Reserve determinations were undertaken between 2002 and 2005 - no reports available for these studies.

Rapid assessments - Ngagane, Horn, Ncandu and Ncone rivers in 2013 and for the Mooi River just upstream of the existing comprehensive site, Thukela_10, in V20E during 2019.

Intermediate assessment - 2017 for the lower Thukela River at Thukela_16, and two additional sites just downstream of the new abstraction weir in quaternary catchment V50D.

Example of additional assessment undertaken to fill gaps
THU_EWR22: Klip River in V12A

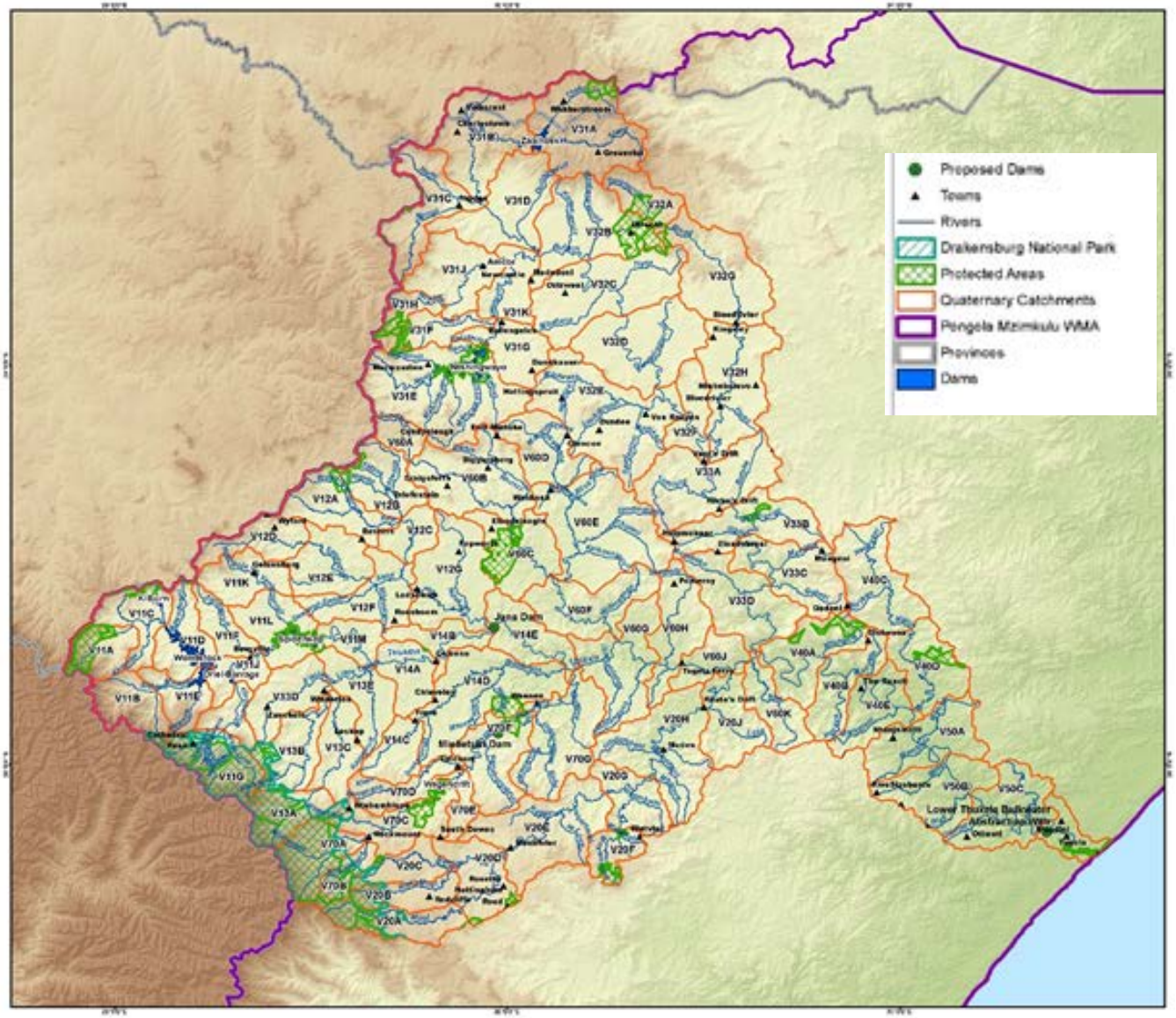


Component	PES	Importance	REC	Trend	TEC
Fish	C	EI = High ES = Very High		Stable	Rationale: Ecological condition driven by ant5hropogenic activities. Predominantly non-flow and water impacts that require management of upstream activities.
Macroinvertebrates	C			Stable	
HI: Instream	C			Stable	
HI: Riparian	C/D			Negative	
ECOSTATUS	C	High	B/C		C

The final step is the quantification of the EWR and include the conversion of the EWR flow data for a TEC of a B/C category to hydraulic conditions at the EWR site (i.e. depths and flow velocities at discharges measured in m^3/s) using a hydraulic model. The maintenance and drought flows were examined for July and February. August is the month with the lowest maintenance flow (i.e. base-flow) and February is the month with the highest maintenance flow conditions.

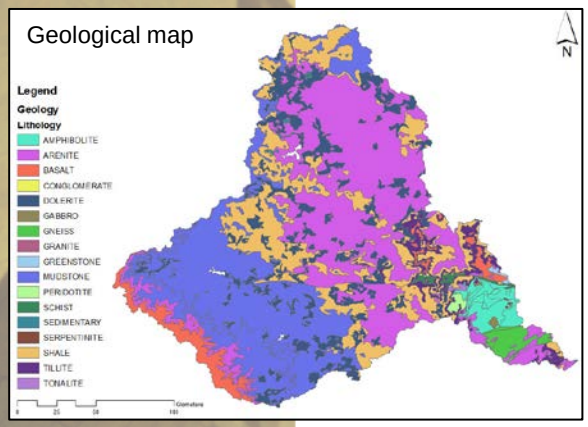
Quaternary Catchment	V12A
River	Klip
EWR Site Co-ordinates	-28.3952; 29.7197
Present Ecological State	C
Target Ecological Category	C
NMAR at EWR site	52.44
Total EWR	13.271 (25.31 %MAR)
Maintenance Low flows	7.085 (13.51 %MAR)
Drought Low flows	2.988 (5.70 %MAR)
Maintenance High flows	6.186 (11.80 %MAR)
Overall confidence	Low to medium

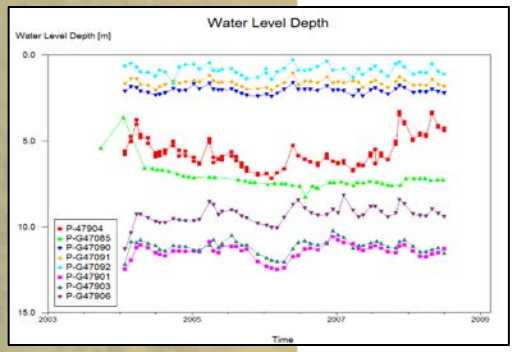
Protected Areas



- ***~ 35 protected conservation areas*** of high biodiversity, cultural heritage, water and landscape importance
- ***uKhahlamba-Drakensberg Park*** is the most prominent conservation area designated as a World Heritage Site by UNESCO in 2000;
- Others: Royal National Park, and Weenen and the Nkandla Nature Reserves (V40D). The Qudeni (V40A), Hlatikulu (V40A), Normandien (V31H) and Ncandu (V31F) Reserves are small and do not have major rivers flowing through them.
- Number of ecological sensitive and biological diverse areas such as waterfalls and major gorges that are habitat to a number of rare and diverse species of flora
- ***Thukela Estuary*** – Marine Protected Area

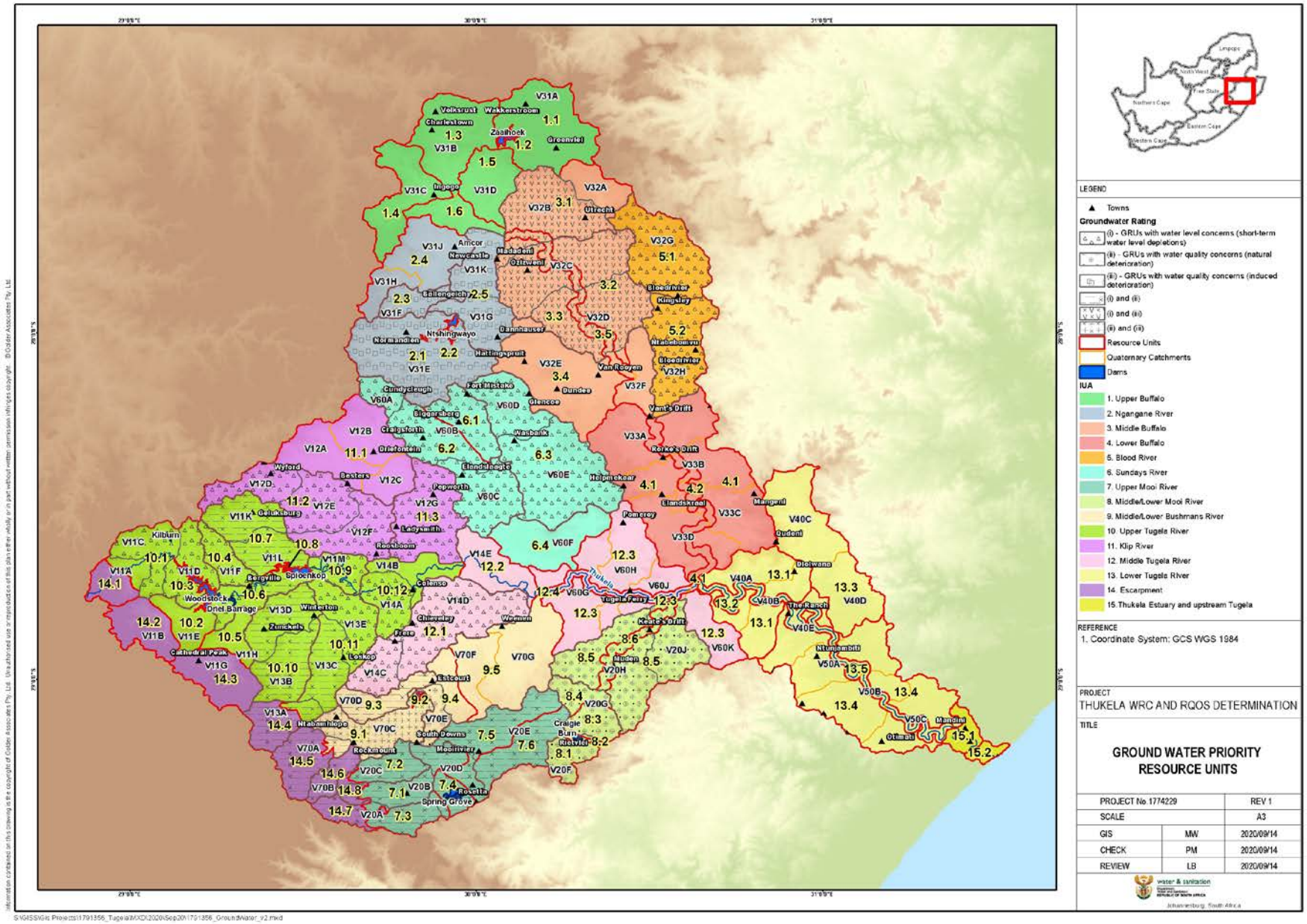
Groundwater Status



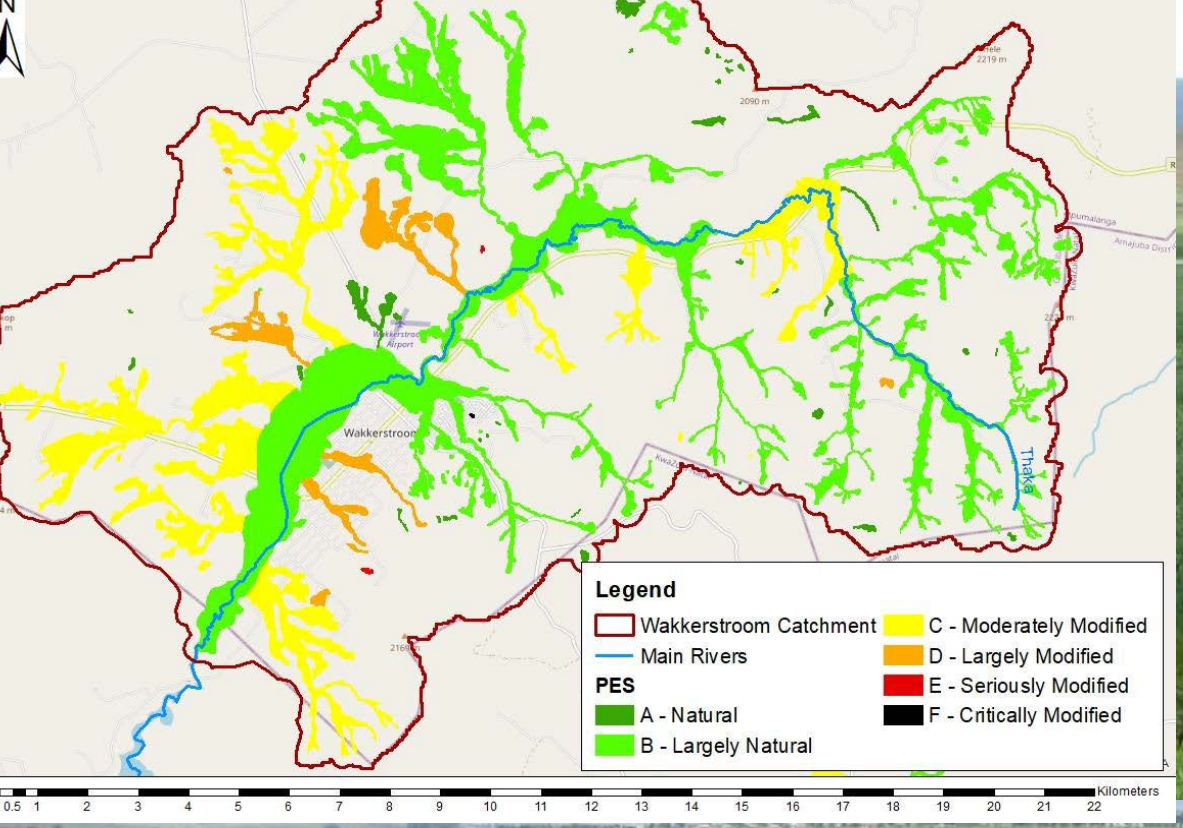


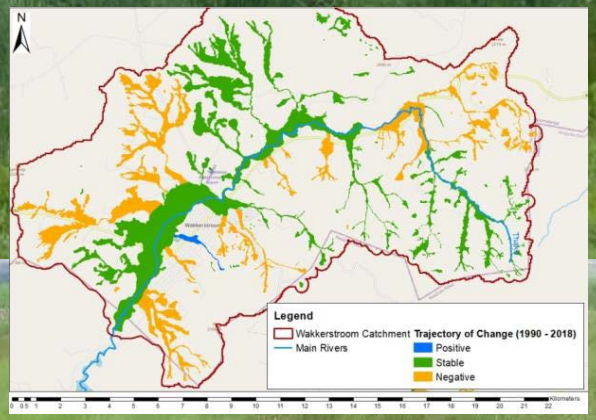
- Recharge:
  - Average recharge values vary between ~15 and 45 mm·a^{-1}, or between 1 and 6% of MAP
  - The bulk (~85%) of the catchment recharge figures of ~3% of MAP (~750 mm) =~25 mm·a^{-1}
- Water Levels: monitoring data limited
  - Long term Water level trends are of the same order/pattern for period assessed 2007 to 2019
  - A clear water table recession is noticeable - that took place from 2012 to 2017 due to potential over abstraction and/or limited groundwater recharge due to a drier period (drought between 2014 and 2016).
- Contribution to baseflow
  - 2009 baseflow values from Reserve study still applicable
  - Wetlands identified – clear hydraulic connection to groundwater
  - Significant land use changes will result in an increase in baseflow (assessment of catchment)
- Groundwater use
  - Data limited; WARMS - under registration
  - Estimated total groundwater use in order of 435 Mm^3·a^{-1}
- Quality
  - Generally good – best quality in higher rainfall regions.
  - TDS = 90 to 200 mg/l; >500 mg/l in lower portions of catchment

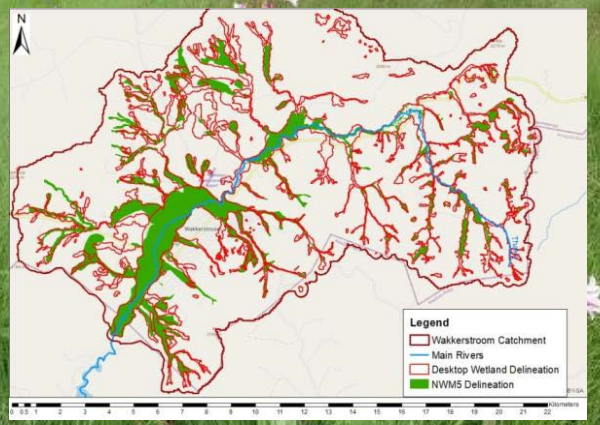
Groundwater Priority Areas



WETLANDS

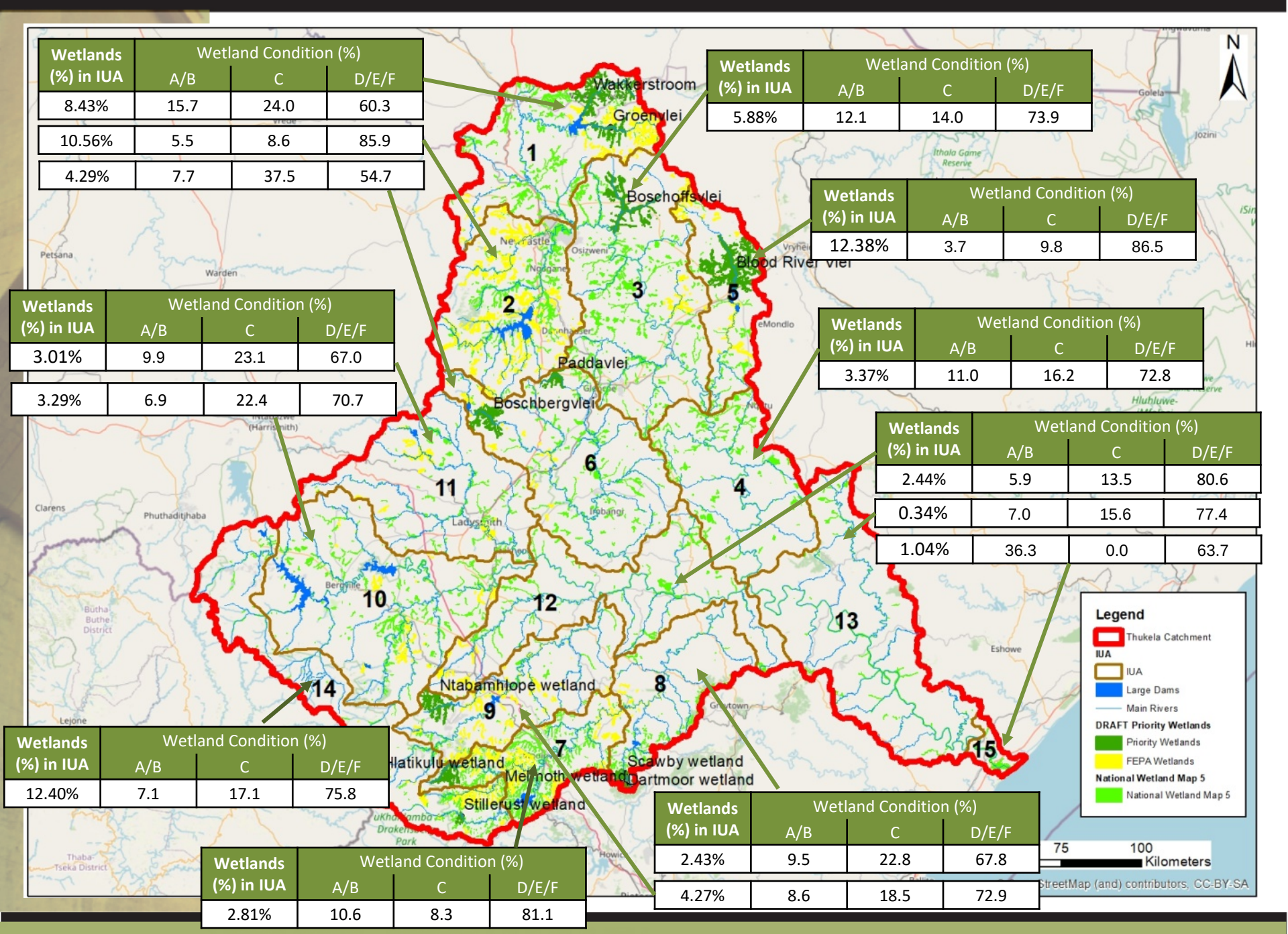






Wakkerstroom Wetland

- IUA 1 Quaternary Catchment – V31A
- Total wetland area mapped – 4 101 ha (main wetland ~ 715 ha) Wetland sub-catchment – 20 973 hectares
- Types – Main wetland unchannelled Valley Bottom (others include Floodplain, Valley Bottom, Seep, Depression)
- Impacts: Flow reduction, WWTW inputs



Wetlands (%) in IUA	Wetland Condition (%)		
	A/B	C	D/E/F
8.43%	15.7	24.0	60.3
10.56%	5.5	8.6	85.9
4.29%	7.7	37.5	54.7

Wetlands (%) in IUA	Wetland Condition (%)		
	A/B	C	D/E/F
5.88%	12.1	14.0	73.9

Wetlands (%) in IUA	Wetland Condition (%)		
	A/B	C	D/E/F
12.38%	3.7	9.8	86.5

Wetlands (%) in IUA	Wetland Condition (%)		
	A/B	C	D/E/F
3.01%	9.9	23.1	67.0
3.29%	6.9	22.4	70.7

Wetlands (%) in IUA	Wetland Condition (%)		
	A/B	C	D/E/F
3.37%	11.0	16.2	72.8

Wetlands (%) in IUA	Wetland Condition (%)		
	A/B	C	D/E/F
2.44%	5.9	13.5	80.6
0.34%	7.0	15.6	77.4
1.04%	36.3	0.0	63.7

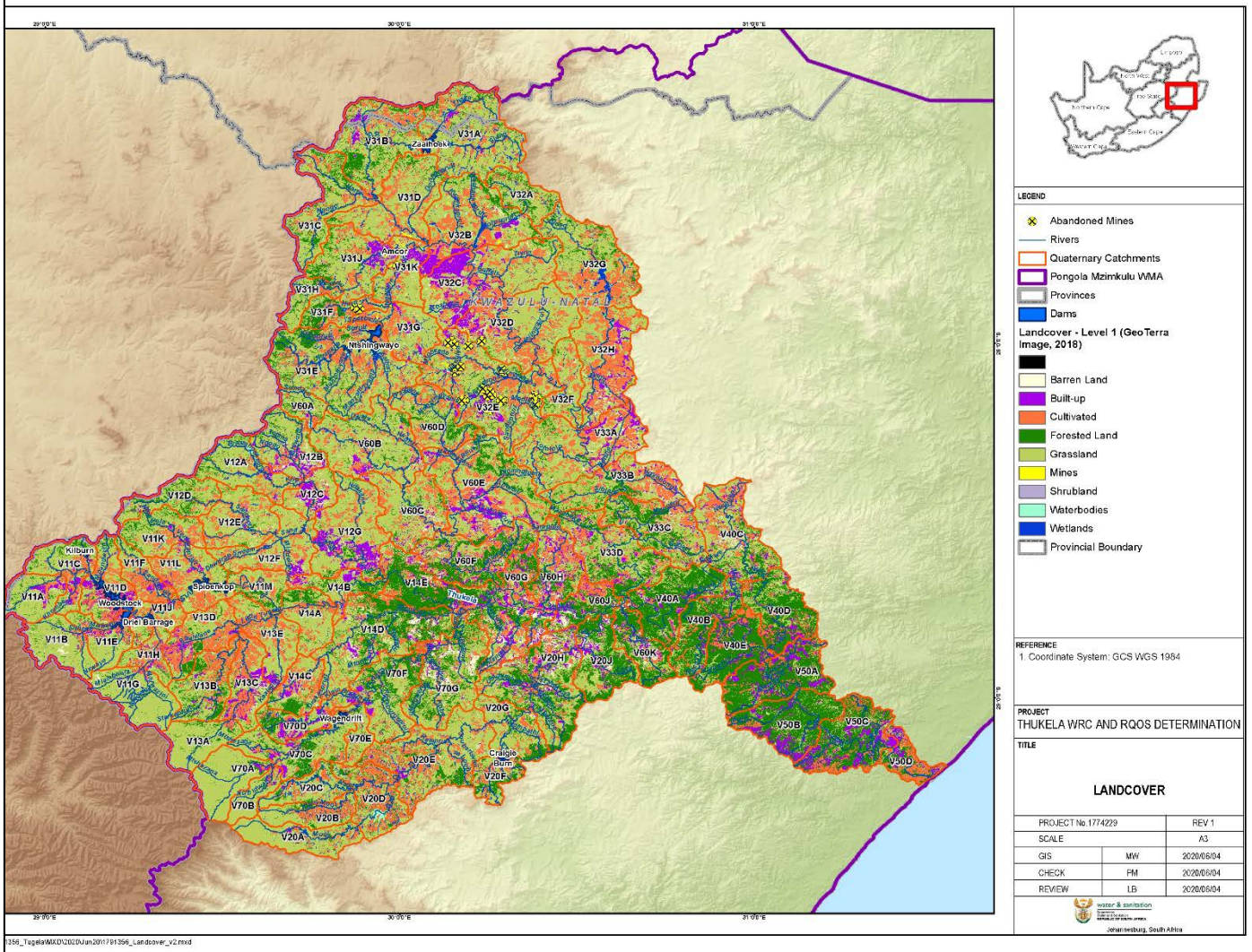
Wetlands (%) in IUA	Wetland Condition (%)		
	A/B	C	D/E/F
12.40%	7.1	17.1	75.8

Wetlands (%) in IUA	Wetland Condition (%)		
	A/B	C	D/E/F
2.81%	10.6	8.3	81.1

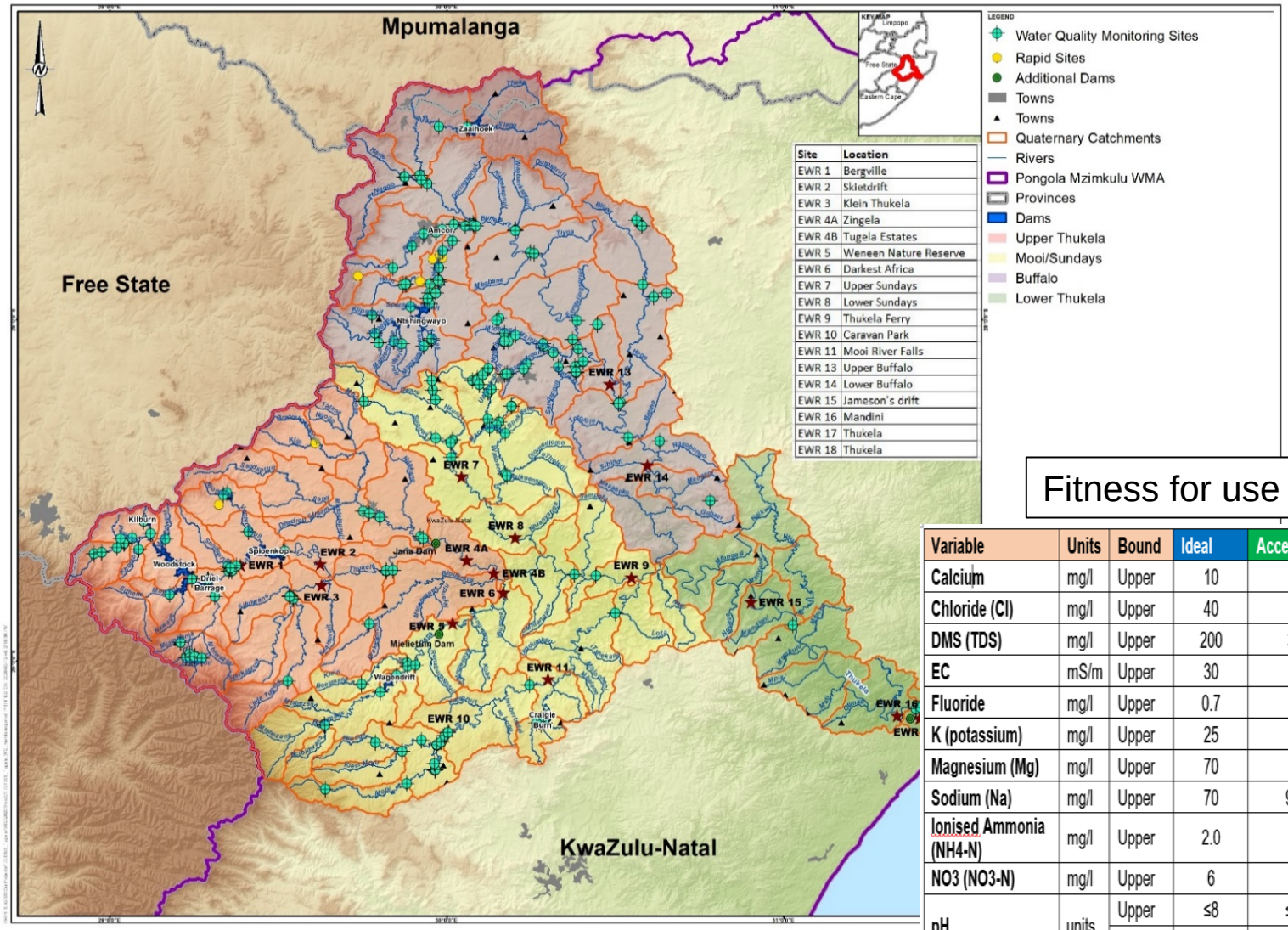
Wetlands (%) in IUA	Wetland Condition (%)		
	A/B	C	D/E/F
2.43%	9.5	22.8	67.8
4.27%	8.6	18.5	72.9

Land use – water quality impacts

- ***Coal Mining*** – Ngagane, middle Buffalo and upper Wasbank and Sundays River catchments
- ***Sand Mining*** –Buffalo River from the Ngagane River confluence to the lower reaches
- ***Poor performing wastewater treatment works (WWTWs) and surcharging sewers, solid waste*** are a major concern and a significant source of nutrient enrichment and high organic load throughout the catchment
- ***Industrial activity***: Ngagane, Lower Thukela, Bushmans, Klip and the Mooi Rivers. Large industrial development in the Newcastle area (Madadeni) impacts on the salinity levels of the Ngagane River and on the downstream Buffalo River.
- ***Irrigation*** occurs extensively throughout the Thukela Catchment
- Extensive ***subsistence agriculture*** (erosion)



Water Quality monitoring



Site	Location
EWR 1	Bergville
EWR 2	Skletdrift
EWR 3	Klein Thukela
EWR 4A	Zingela
EWR 4B	Tugela Estates
EWR 5	Weneen Nature Reserve
EWR 6	Darkest Africa
EWR 7	Upper Sundays
EWR 8	Lower Sundays
EWR 9	Thukela Ferry
EWR 10	Caravan Park
EWR 11	Mooi River Falls
EWR 13	Upper Buffalo
EWR 14	Lower Buffalo
EWR 15	Jameson's drift
EWR 16	Mandini
EWR 17	Thukela
EWR 18	Thukela

Fitness for use assessment

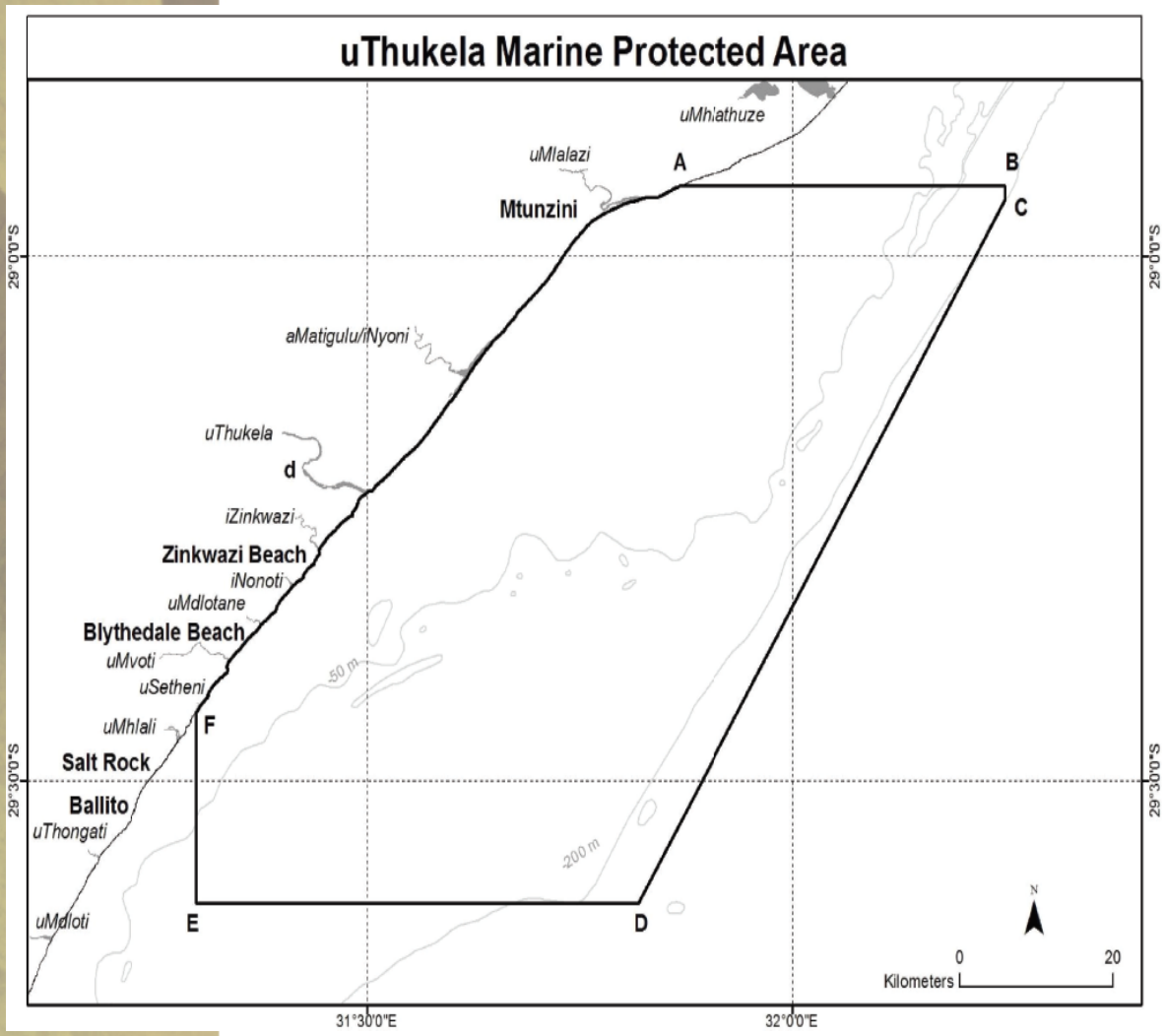
Variable	Units	Bound	Ideal	Acceptable	Tolerable	Unacceptable
Calcium	mg/l	Upper	10	80	80	>80
Chloride (Cl)	mg/l	Upper	40	120	175	>175
DMS (TDS)	mg/l	Upper	200	350	800	>800
EC	mS/m	Upper	30	50	85	>85
Fluoride	mg/l	Upper	0.7	1	1.5	>1.5
K (potassium)	mg/l	Upper	25	50	100	>100
Magnesium (Mg)	mg/l	Upper	70	100	100	>100
Sodium (Na)	mg/l	Upper	70	92.5	115	<115
Ionised Ammonia (NH4-N)	mg/l	Upper	2.0	2.5		>3.0
NO3 (NO3-N)	mg/l	Upper	6	10	20	>20
pH	units	Upper	≤8	≤8.4	≤8.4	
		Lower	≥6.5	≥6.5	≥6.5	
PO4-P	mg/l	Upper	0.025	0.075	0.125	>0.125
SO4	mg/l	Upper	80	165	250	>250

Summary of Water Quality Compliance per Secondary Catchment
(number the monitoring sites)

Sub-catchment	Calcium (mg/l)	Chloride (mg/l)	Total Dissolved Salts (mg/l)	Electrical Conductivity (mS/m)	Flouride (mg/l)	Magnesium (mg/l)
V1 - Upper Tugela	55% 40% 5%	95% 5%	88% 6% 6%	36% 9% 40% 15%	100%	95% 5%
V2 - Mooi River	80% 20%	100%	86% 7% 7%	85% 5% 5% 5%	100%	100%
V3 - Buffalo River	17% 67% 15%	83% 13% 4%	25% 28% 30% 18%	19% 8% 46% 27%	60% 29% 5% 7%	86% 10% 4%
V4/V5 - Lower Tugela	100%	100%	100%	8% 8% 17% 67%	100%	100%
V6 - Sundays River	5% 71% 24%	71% 14% 14%	5% 30% 15% 50%	3% 24% 17% 55%	60% 10% 15% 15%	67% 14% 19%
V7 - Bushmans River	80% 20%	100%	80% 20%	63% 25% 13%	80% 20%	100%
Ideal	10	40	200	30	0.7	70
Acceptable	80	120	350	50	1	100
Tolerable	80	175	800	85	1.5	100
Unacceptable	>80	>175	>800	>85	>1.5	>100

Sub-catchment	Sodium (mg/l)	Ionised Ammonia (mg/l)	Nitrate (mg/l)	pH	Orthophospate (mg/l)	Sulphate (mg/l)
V1 - Upper Tugela	100%	54% 11% 7% 28%	100%	47% 34% 19%	40% 2% 15% 43%	100%
V2 - Mooi River	100%	90% 5% 5%	100%	36% 41% 23%	91% 9%	100%
V3 - Buffalo River	7% 57% 15% 20%	62% 7% 1% 30%	92% 5% 3%	40% 28% 33%	24% 28% 11% 36%	37% 33% 9% 20%
V4/V5 - Lower Tugela	100%	86% 14%	92% 8%	42% 33% 25%	8% 25% 67%	100%
V6 - Sundays River	42% 4% 54%	85% 15%	100%	7% 28% 66%	55% 24% 3% 17%	30% 30% 10% 30%
V7 - Bushmans River	100%	63% 13% 25%	100%	62% 38%	50% 25% 25%	100%
Ideal	70	0.015	6	≤8 and ≥ 6.5	0.025	80
Acceptable	92.5	0.044	10	≤8.4 and ≥ 6.5	0.075	165
Tolerable	115	0.073	20	≤8.4 and ≥ 6.5	0.125	250
Unacceptable	>115	>0.073	>20		>0.125	>250

Thukela Estuary



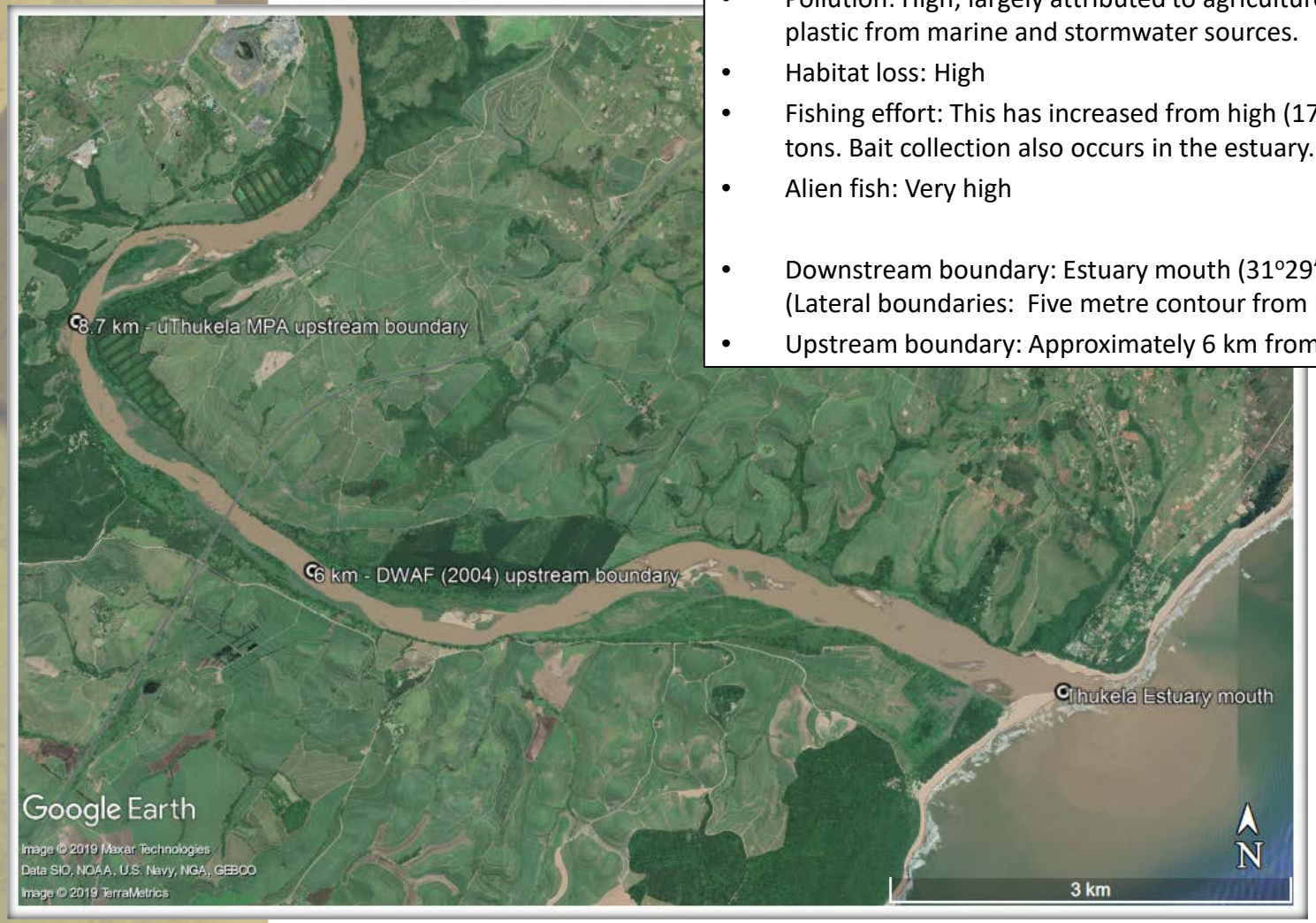
Boundaries of the uThukela Marine Protected Area; note that point d is located within the Thukela Estuary is approximately 8.5 km upstream of the estuary mouth (Government Gazette 42478 2019)

Mouth of the Thukela Estuary during low flow period with well-developed sand berm to the right hand side of the image (photo taken 18-10-2019)

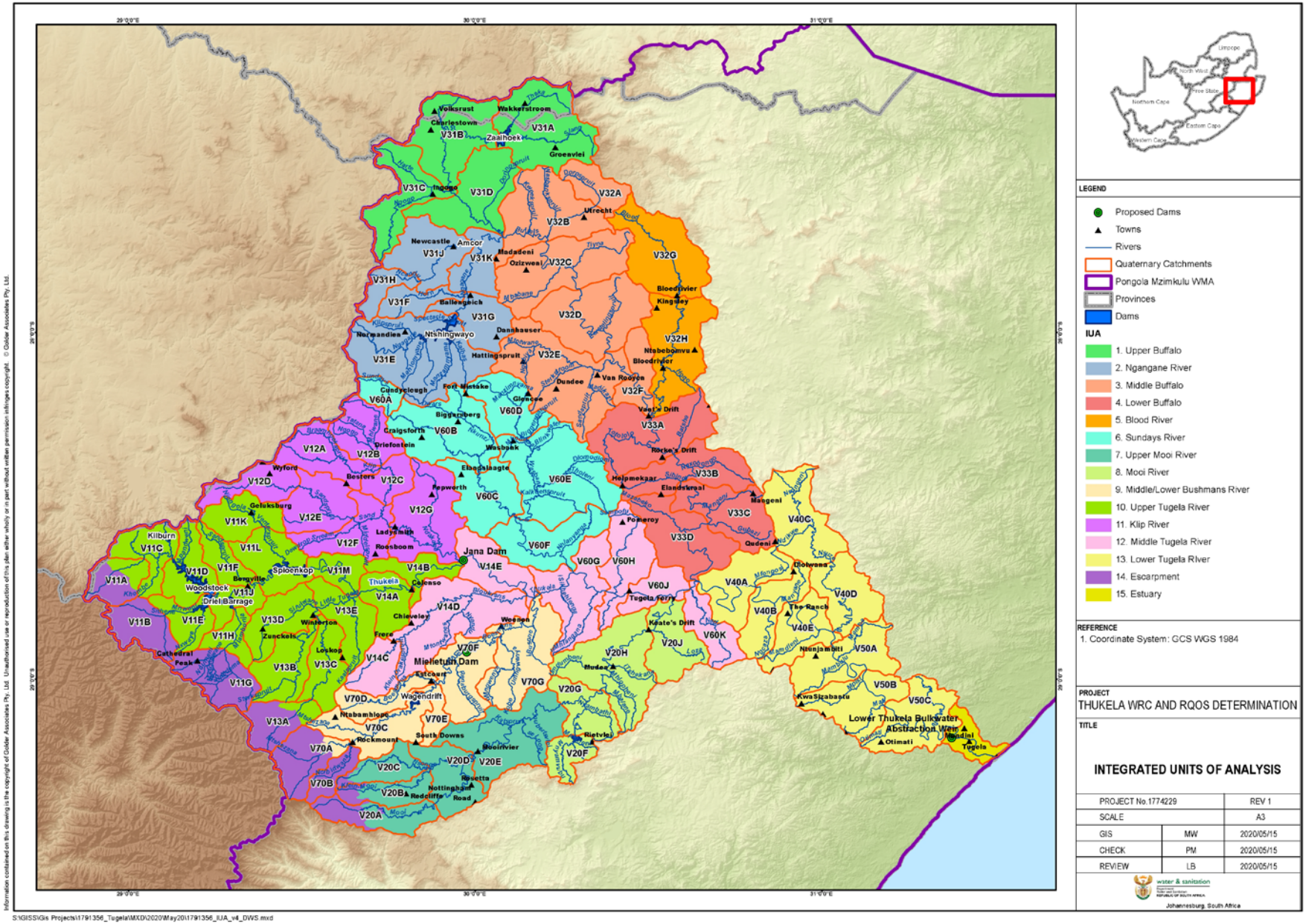
Estuary: Description

- Flow modification: Medium
- Pollution: High; largely attributed to agriculture in the catchment and plastic from marine and stormwater sources.
- Habitat loss: High
- Fishing effort: This has increased from high (17 tons to very high (30 tons. Bait collection also occurs in the estuary.
- Alien fish: Very high

- Downstream boundary: Estuary mouth (31°29’56” E, 29°13’24”S) (Lateral boundaries: Five metre contour from MSL along banks
- Upstream boundary: Approximately 6 km from the mouth



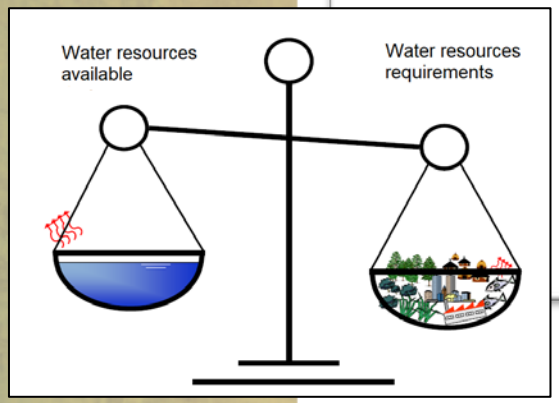
Integrated Units of Analysis (IUA)



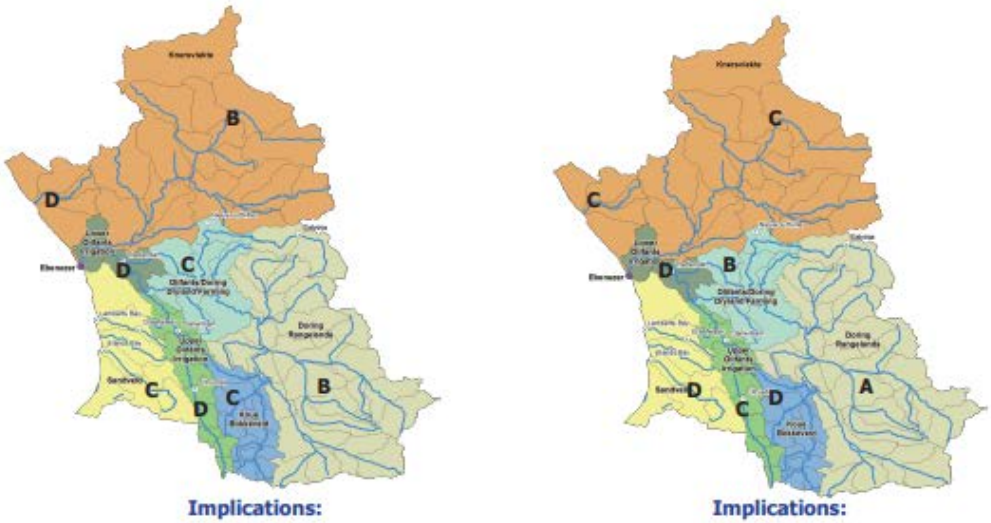
Umgeni abstraction work s on Lower Thukela

THE EVALUATION OF SCENARIOS WITHIN THE INTEGRATED WATER RESOURCE MANAGEMENT PROCESS

Typical water resource system



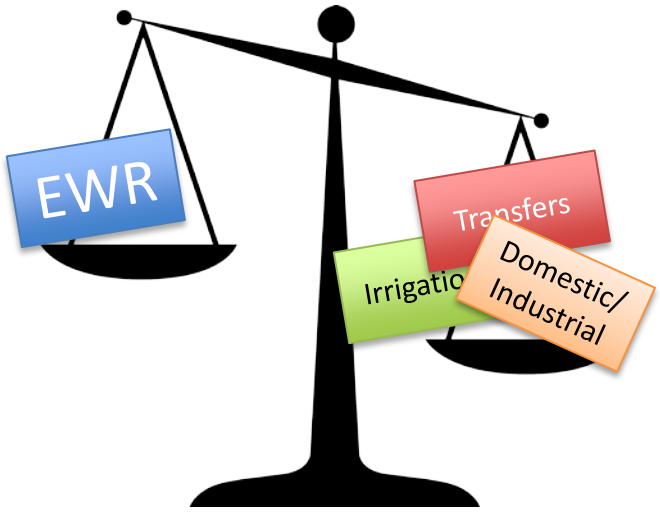
What is a scenario?



Outcome: Various scenarios of possible ecosystem condition configurations for the entire catchment together with the economical, social and ecological implications

Scenarios, in the context of water resource management and planning are **plausible definitions (settings) or factors (variables) that influence the water balance and water quality in a catchment and the system as a whole.**

Each scenario is an alternative future condition (change to the present condition). Analysis allows comparison of the implications of one scenario against another = selection of the preferred scenario.



- The process requires a wide range of trade-offs to be evaluated.
- Final outcome of the process is a set of desired characteristics for use and ecological condition for each of the water resources.
- Recommend classes for IUAs for the Minister's consideration

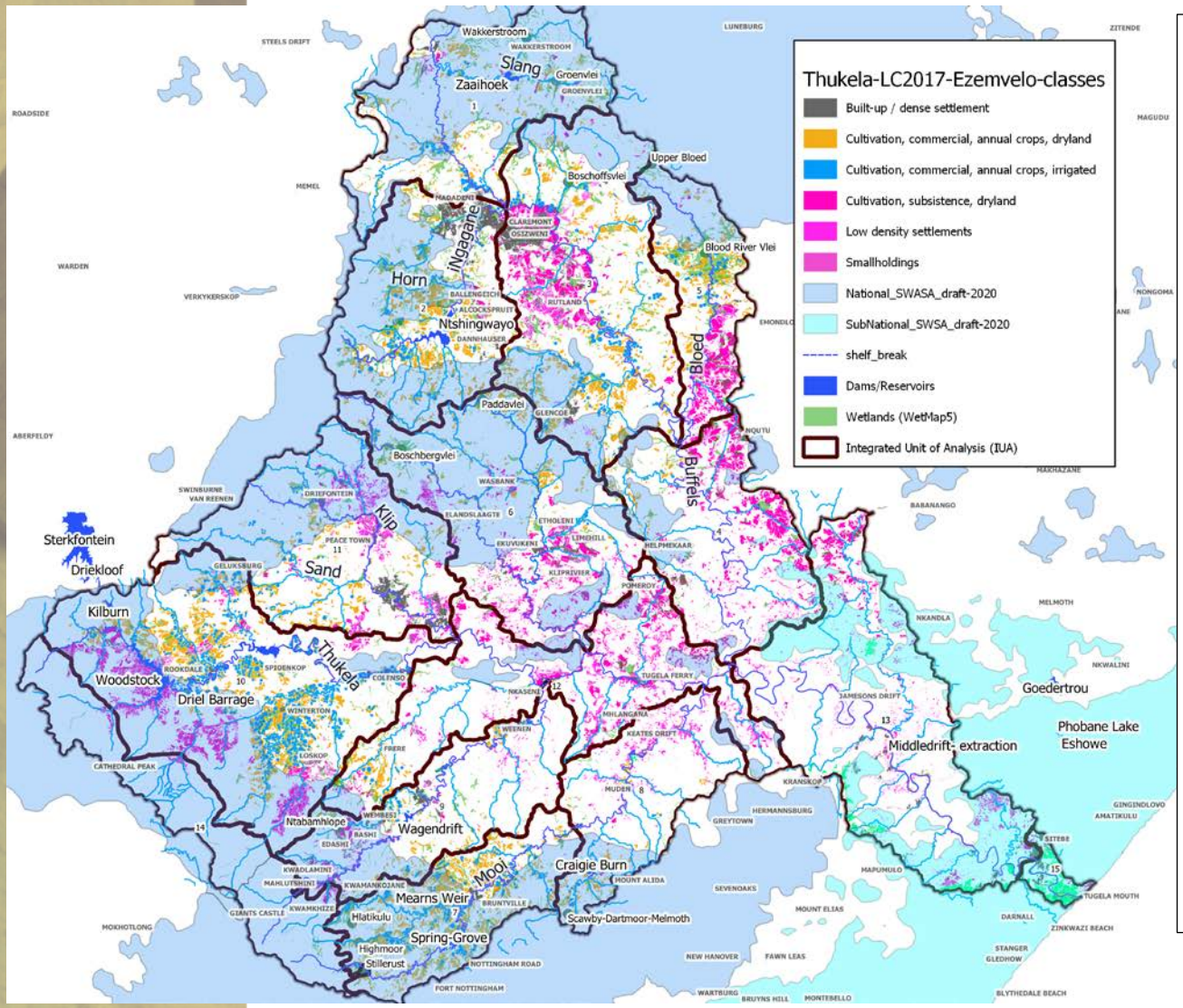
Ecological Scenarios

Present Ecological Status (PES)	Target Ecological Category (TEC)
Ecological Sustainable Base Case (ESBC)	Slightly improved ecological categories
The ESBC scenario, which could permit the maximum water use scenario, requires that the base condition for each water resource is at minimum established as either a D category or whichever higher category is required to maintain all downstream nodes in at least a D category. However, where the ecological condition requires it, a higher ecological category needs to be set. The selected ecological category per IUA for the Thukela catchment is the **Present Ecological State (PES)** and not a D throughout.	The Target Ecological Category (TEC) was also determined as an alternate scenario at the nodes. The TEC is based on the ultimate target to achieve a sustainable system both ecologically and economically, considering the PES and Recommended Ecological Category (REC). Thus, the TEC can be the same as the PES or the REC. However, it may also be worse than the PES if a system is targeted for development that will impact the present state, or better where a higher level of protection is needed.

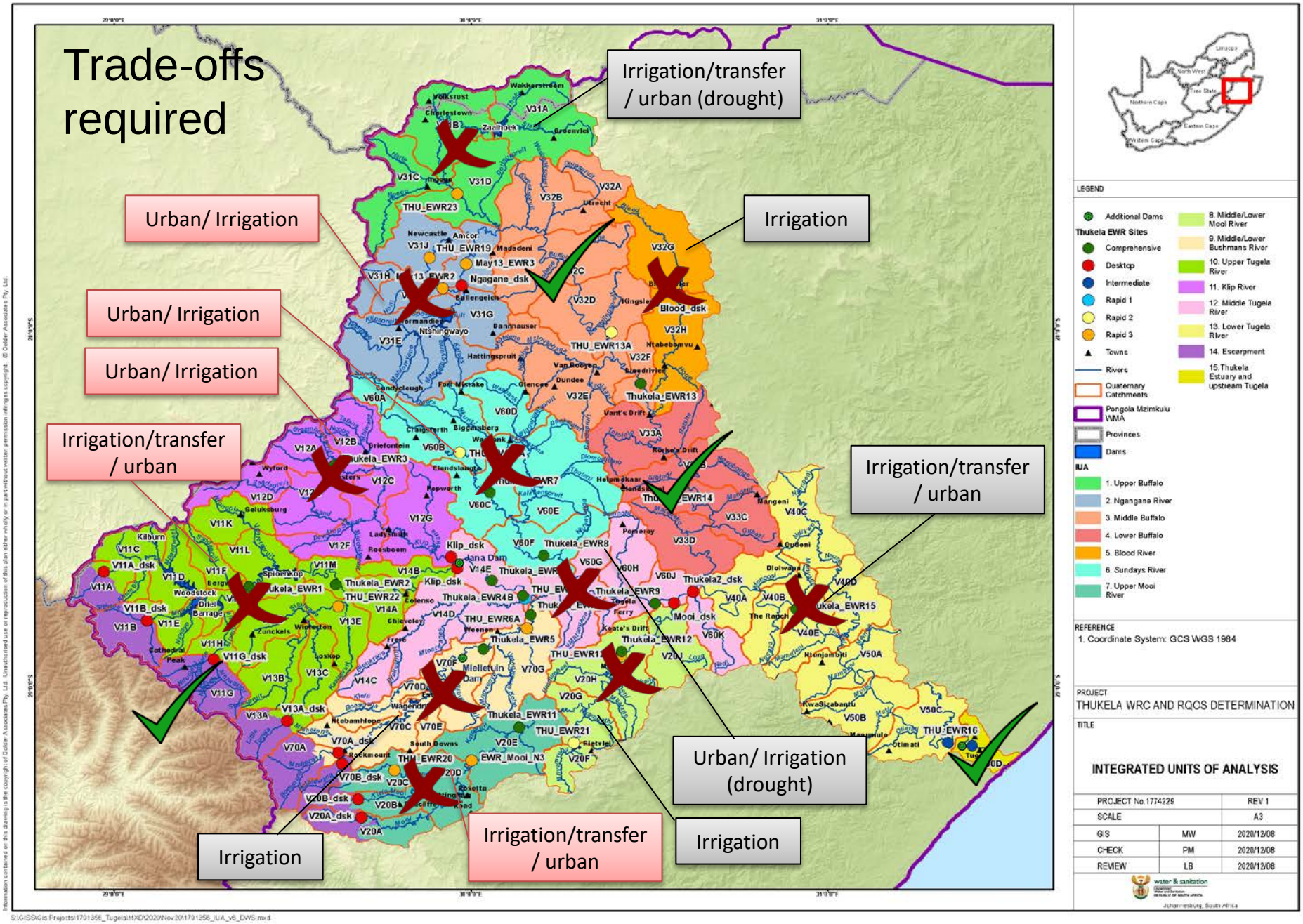
Planning interventions assessed

3 Development levels / time slices:	**Development interventions:**
Current day (± 2020) Intermediate (± 2030) Long term (± 2045) ***Challenge: no reconciliation strategy, however the outcomes of this ty will now inform the reconciliation strategy development***	Planned / committed interventions as part of approved reconciliation strategies included. Water requirements current and projected according to Water board / WSA plans. Longer-term infrastructure options added as an alternative to balance water supply.

Resource economic evaluation

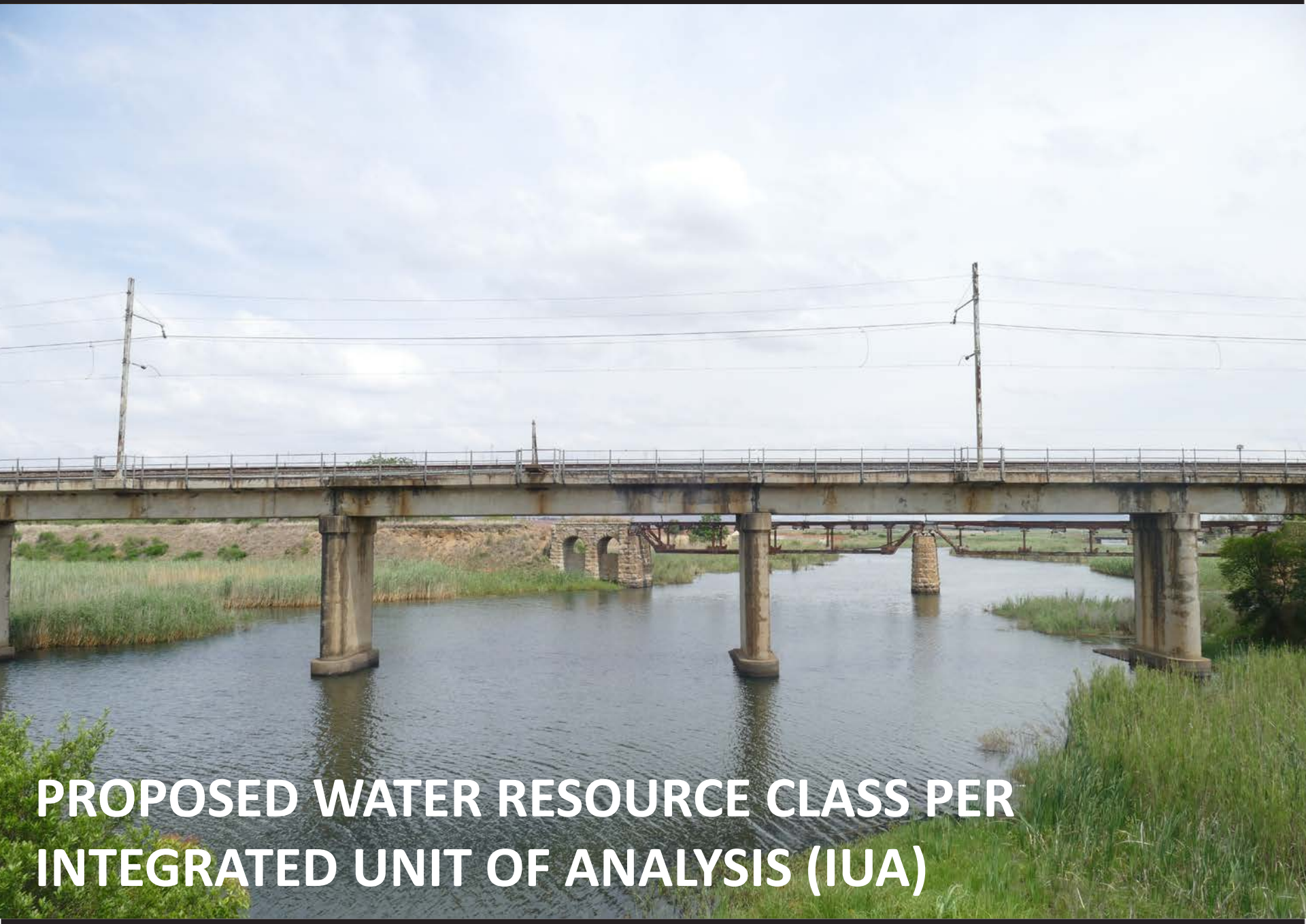


- All water users are important: human and ecological
- Value of ecological water requirements
- Practically, the EWR is implemented through several measures
- Value of impact on the economy
- Allocating water required for ecological functioning to household and economic uses is an environmental externality
- Mitigation measures exists for managing the effects of trade-offs (to some extent)


Trade-offs required
Irrigation/transfer / urban (drought)
Urban/ Irrigation
Irrigation
Urban/ Irrigation
Urban/ Irrigation
Irrigation/transfer / urban
Irrigation/transfer / urban
Urban/ Irrigation (drought)
Irrigation
Irrigation
Irrigation/transfer / urban
LEGEND
Additional Dams
Thukela EWR Sites
Comprehensive
Desktop
Intermediate
Rapid 1
Rapid 2
Rapid 3
Towns
Rivers
Quaternary Catchments
Pongola Mzimkulu WMA
Provinces
Dams
IUA
1. Upper Buffalo
2. Ngangane River
3. Middle Buffalo
4. Lower Buffalo
5. Blood River
6. Sundays River
7. Upper Mooi River
8. Middle/Lower Mooi River
9. Middle/Lower Bushmans River
10. Upper Tugela River
11. Klip River
12. Middle Tugela River
13. Lower Tugela River
14. Escarpment
15. Thukela Estuary and upstream Tugela
REFERENCE
1. Coordinate System: GCS WGS 1984
PROJECT
THUKELA WRC AND RQOS DETERMINATION
TITLE
INTEGRATED UNITS OF ANALYSIS
PROJECT No.1774229
REV 1
SCALE
A3
GIS
MW
2020/12/08
CHECK
PM
2020/12/08
REVIEW
LB
2020/12/08
water & sanitation
Johannesburg, South Africa

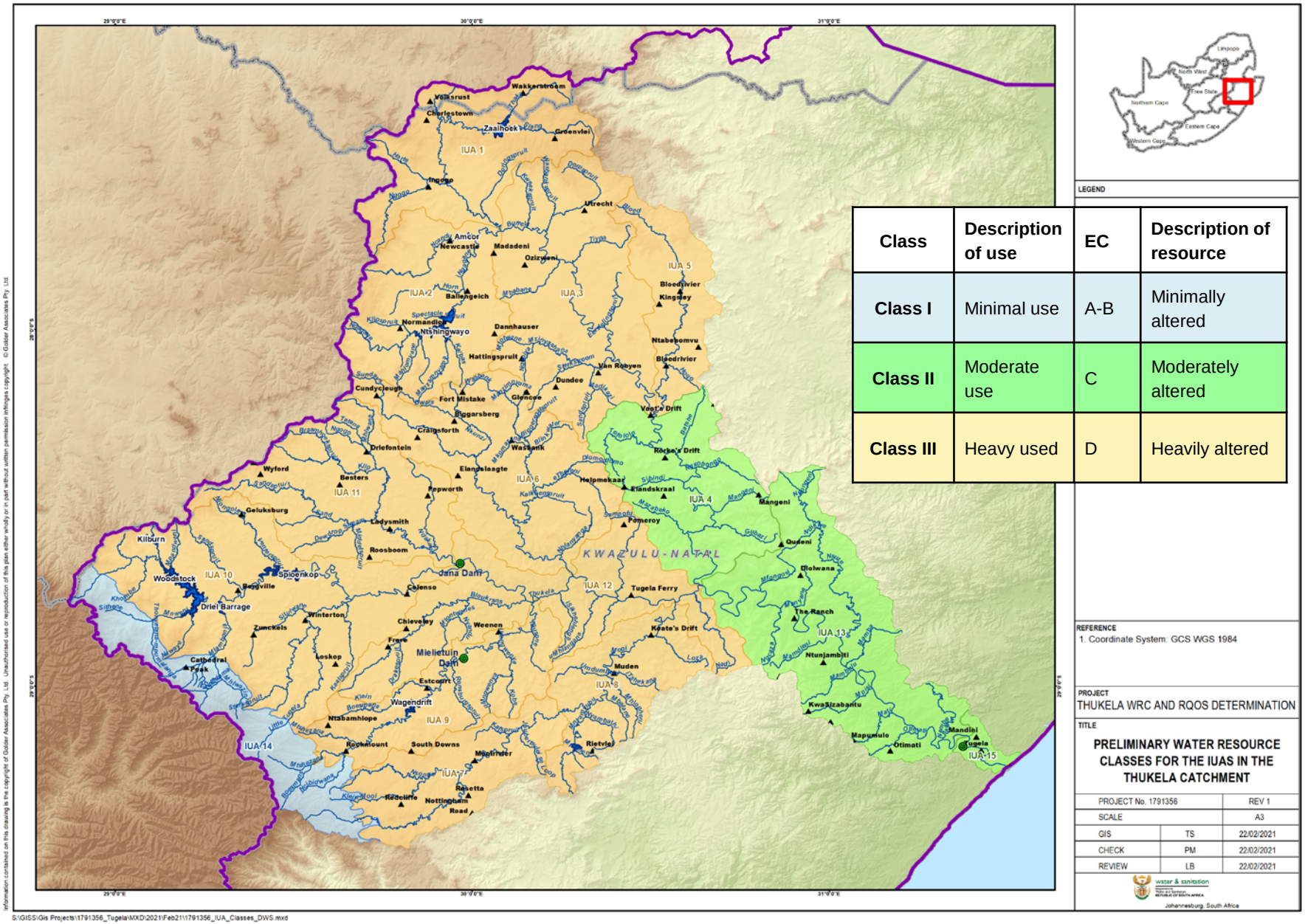
Key considerations to trade-off evaluation

- Key driver is flow (reduced flow/ seasonality loss)
- Modified flows - not getting freshets and floods through the systems (habitat not maintained)
- Overall the water resources of the Thukela are over utilised
- A key finding is that ecological requirements cannot be met because of over allocation to transfers and local catchment demands
- For the water resources to remain sustainable some vital decisions will need to be made as some significant trade-offs will be required over the planning horizon assessed; in some IUAs mitigation options are available to reduce trade-offs
- Domestic supply to local households to supply basic needs to be prioritised (vs future transfers)
- Ultimately the estuary (the only open mouthed system on the eastern side of SA; MPA) needs to be maintained - this requires a minimum flow and C category
- The evaluation has indicated that medium and long-term planning interventions need to be implemented sooner
- This classification process presents the most feasible option to achieve ecological sustainability with the least economic impact
- ***There is not enough water in the Thukela***



PROPOSED WATER RESOURCE CLASS PER INTEGRATED UNIT OF ANALYSIS (IUA)

Proposed Water Resource Classes



Class	Description of use	EC	Description of resource
Class I	Minimal use	A-B	Minimally altered
Class II	Moderate use	C	Moderately altered
Class III	Heavy used	D	Heavily altered

LEGEND

REFERENCE
1. Coordinate System: GCS WGS 1984

PROJECT
THUKELA WRC AND RQOS DETERMINATION

TITLE
PRELIMINARY WATER RESOURCE CLASSES FOR THE IUAS IN THE THUKELA CATCHMENT

PROJECT No. 1791358		REV 1
SCALE		A3
GIS	TS	22/02/2021
CHECK	PM	22/02/2021
REVIEW	LB	22/02/2021

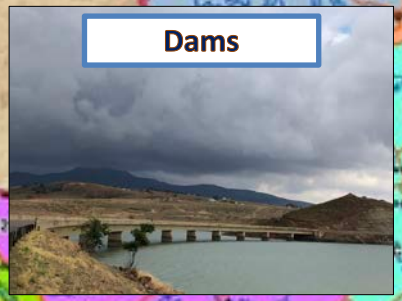
water & sanitation
Johannesburg, South Africa

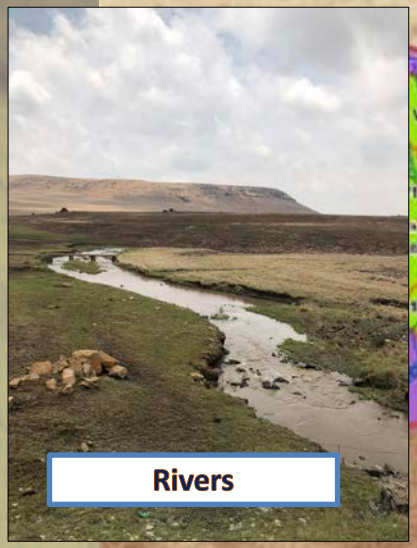
S:\GIS\Gis Projects\1791356_Tugela\MXD\2021\Feb21\1791356_IUA_Classes_DWS.mxd

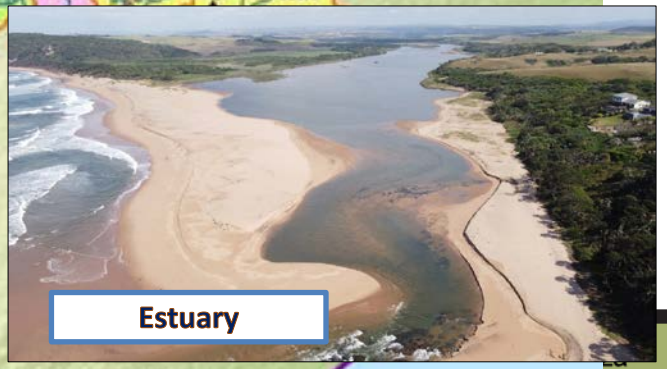
DETERMINING THE RESOURCE QUALITY OBJECTIVES

RQOs are determined for:

- Rivers
- Dams
- Wetlands
- Groundwater
- Estuary





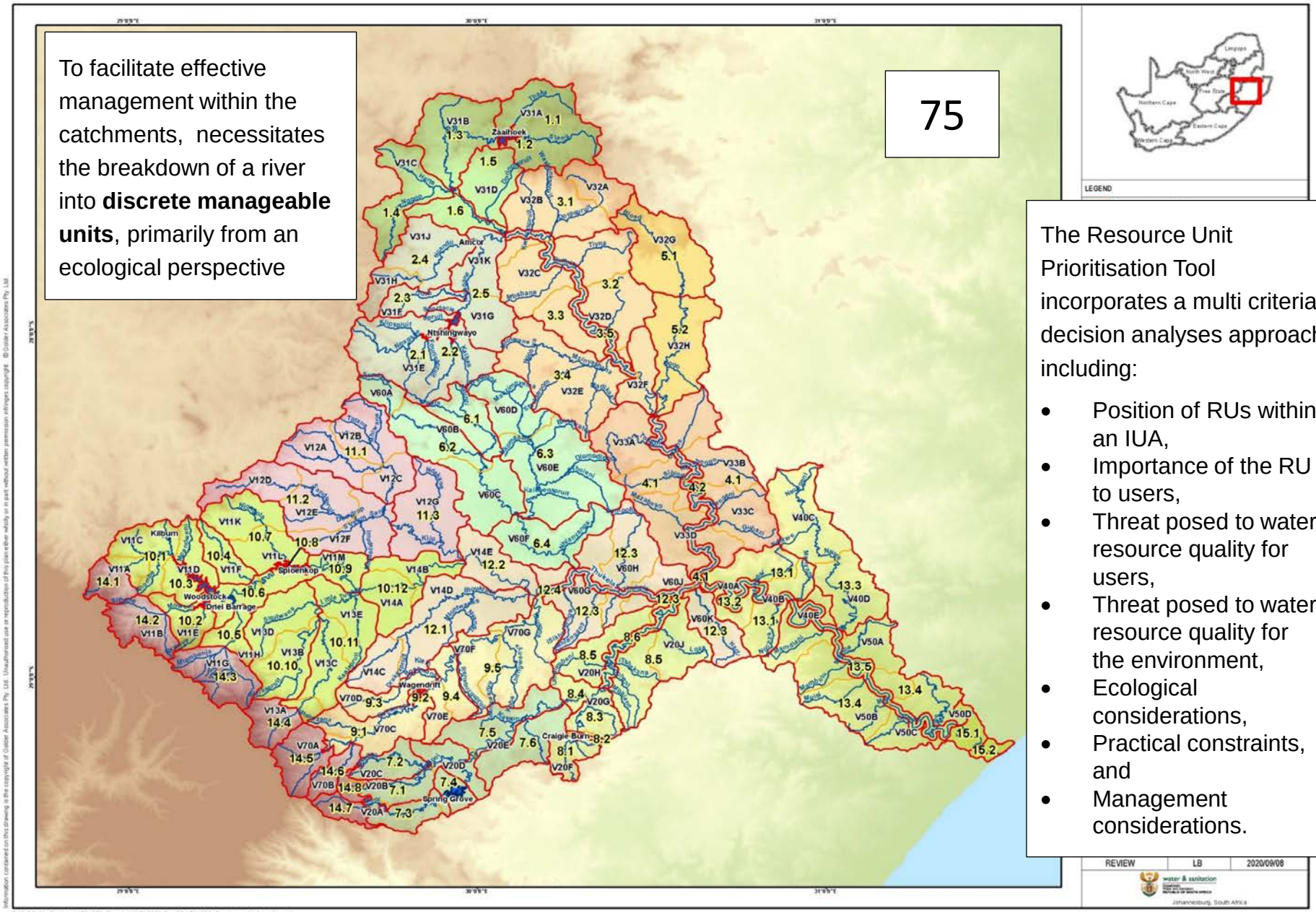


→ These are divided into management sections – called **resource units**

→ **Resource quality objectives** are determined and gazetted for **resource units**

Resource Units

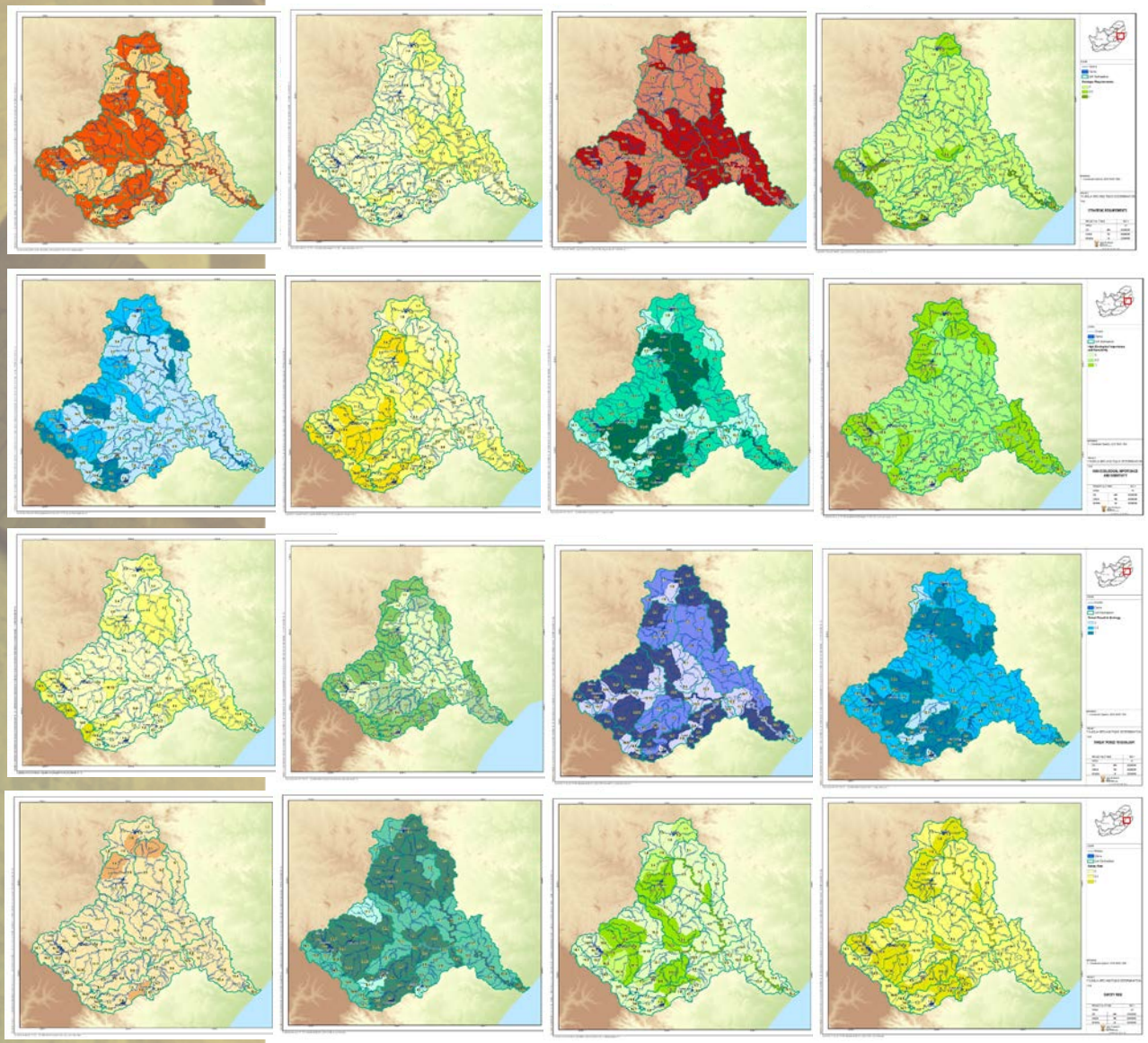
To facilitate effective management within the catchments, necessitates the breakdown of a river into **discrete manageable units**, primarily from an ecological perspective



The Resource Unit Prioritisation Tool incorporates a multi criteria decision analyses approach including:

- Position of RUs within an IUA,
- Importance of the RU to users,
- Threat posed to water resource quality for users,
- Threat posed to water resource quality for the environment,
- Ecological considerations,
- Practical constraints, and
- Management considerations.

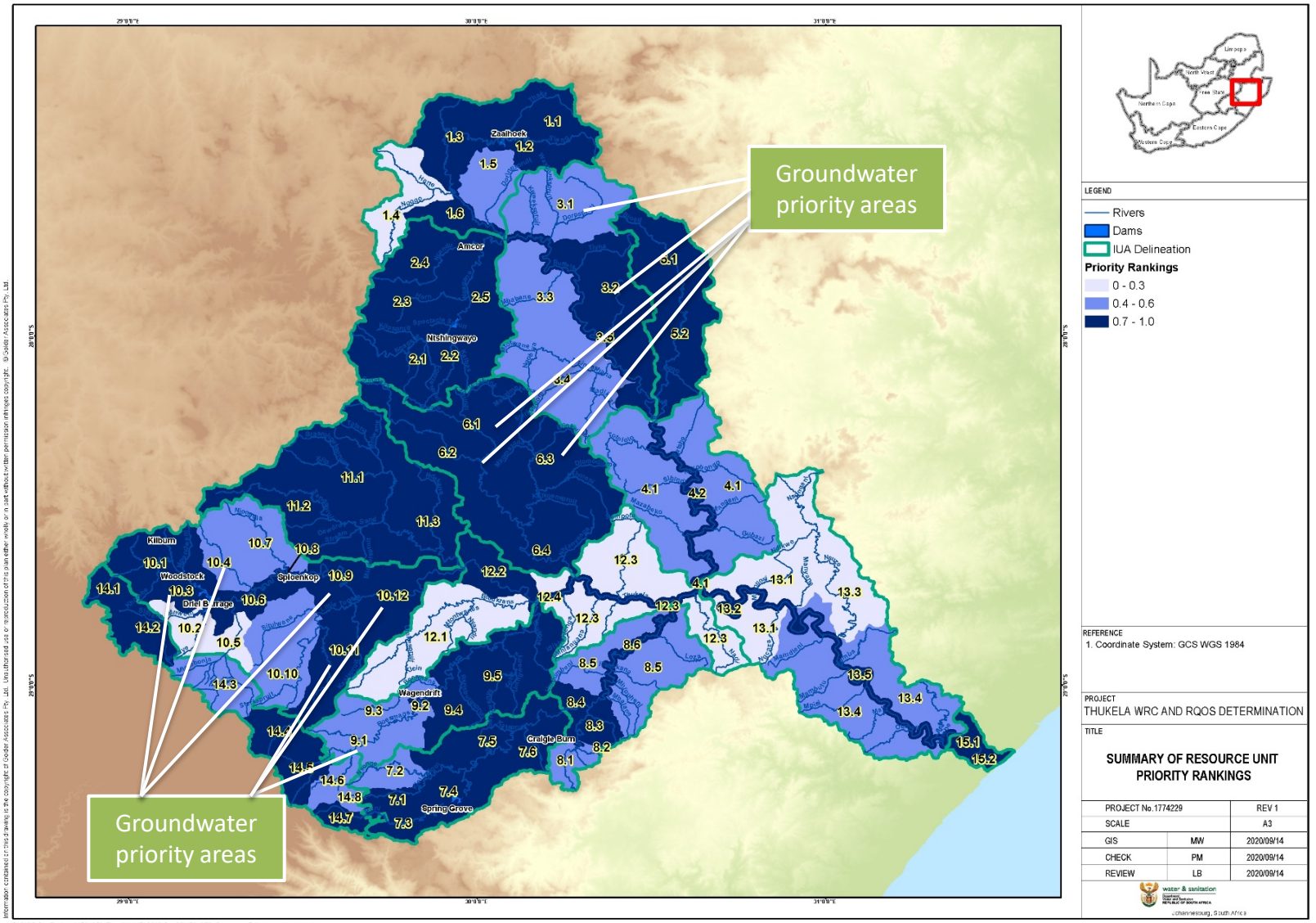
Resource Units Prioritisation



The criteria assessed per RU (rating 0 (low), 0.5 (moderate), 1 (high):

- Position of RUs within an IUA (main stem)
- Importance of the RU to users
  - Cultural services to society
  - Supporting livelihoods
  - Strategic requirements
  - Supporting and regulating services
  - Contribution to the economy
- Threat posed to water resource quality for users
- Ecological considerations:
  - High Ecological importance and Sensitivity
  - EC or PES of A/B
  - Freshwater Ecosystem Priority Areas
  - Priority conservation plans
- Threat posed to water resource quality for the environment (threat the ecology)
- Management Considerations
  - PES lower than a D or lower than MC
- Practical Constraints
  - Availability of data
  - Accessibility for monitoring
  - Safety risk

Prioritised Resource Units



Priority wetlands and Estuary





QC	Wetland Name
V60B	Boschberg
V20C	Hlatikulu
V20A	Stillerust
V20F	Melmoth
V20F	Dartmoor
V20F	Scawby

QC	Wetland Name
V31A	Wakkerstroom
V31A	Groenvlei
V32B	Boschoffsvlei
V32B	Boschoffsvlei pan complex
V32G	Upper Blood River
V32G	Blood River
V60D	Paddavlei

QC	Wetland Name
V70D	Ntabamhlope
V11B, G; V13A; V70A, B; V20A, B, C	Natal Drakensberg Park including the Highmoor wetlands

Sub-components for which RQOs have been set

Rivers and dams:

- **Quantity**
  - Low Flows
  - High Flows
- **Quality**
  - Nutrients
  - Salts
  - Systems variables
  - Toxics
  - Pathogens
- **Habitat**
  - Instream habitat
  - Riparian habitat
- **Biota**
  - Fish
  - Aquatic and riparian plant species
  - Mammals
  - Birds
  - Amphibians and reptiles
  - Periphyton
  - Aquatic invertebrates
  - Diatoms

Wetlands:

- Quality
- Quantity and
- Habitat
- Biota

Groundwater:

- Quantity (abstraction)
- Aquifer water level,
- Water quality, and
- Protection zones

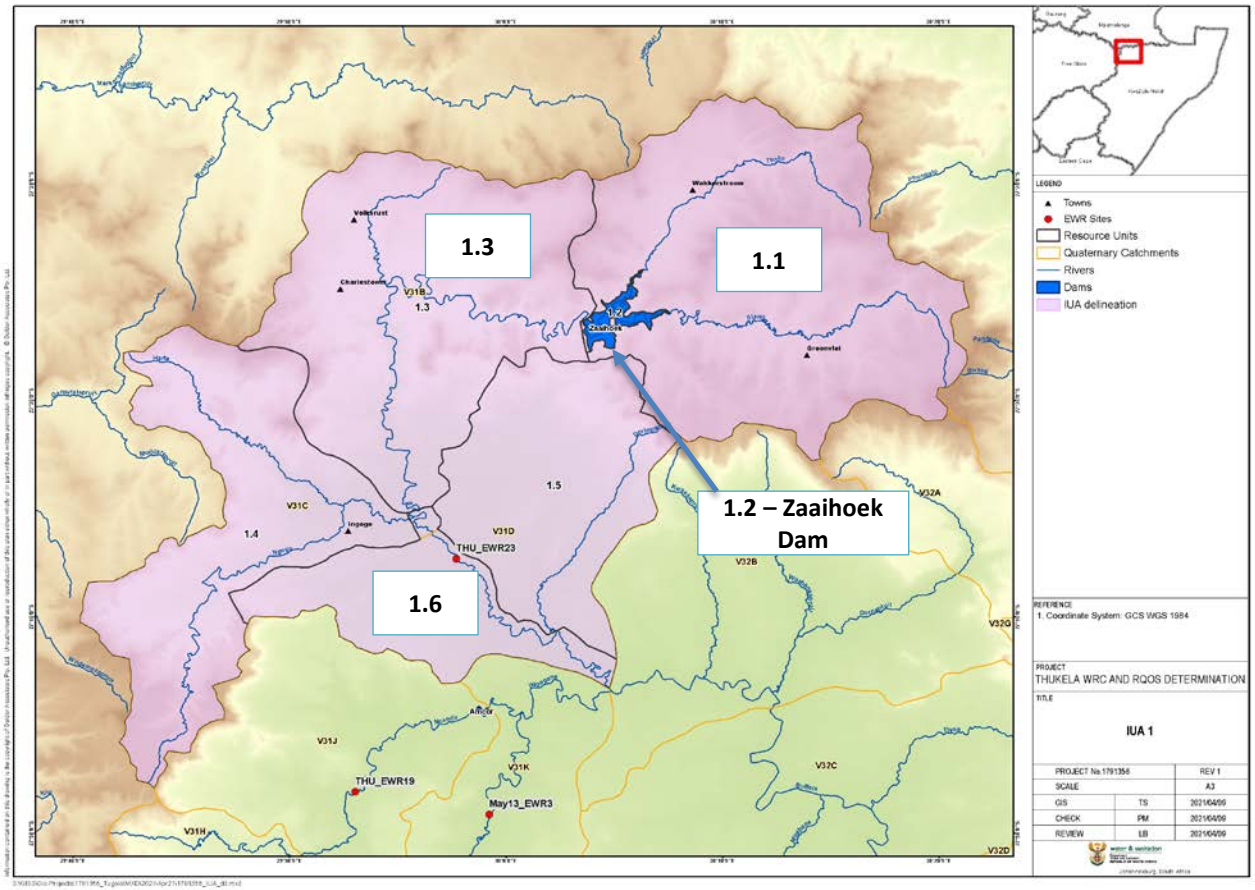
Estuary:

- Dissolved inorganic phosphate
- Water clarity
- Dissolved oxygen
- Toxic substances
- Pathogens

- **Physical Habitat**
  - Intertidal
  - Subtidal
  - Substrate type
- **Biota**
  - Microalgae
  - Macrophytes
  - Invertebrates
  - Fish
  - Birds

RESOURCE QUALITY OBJECTIVES PER IUA

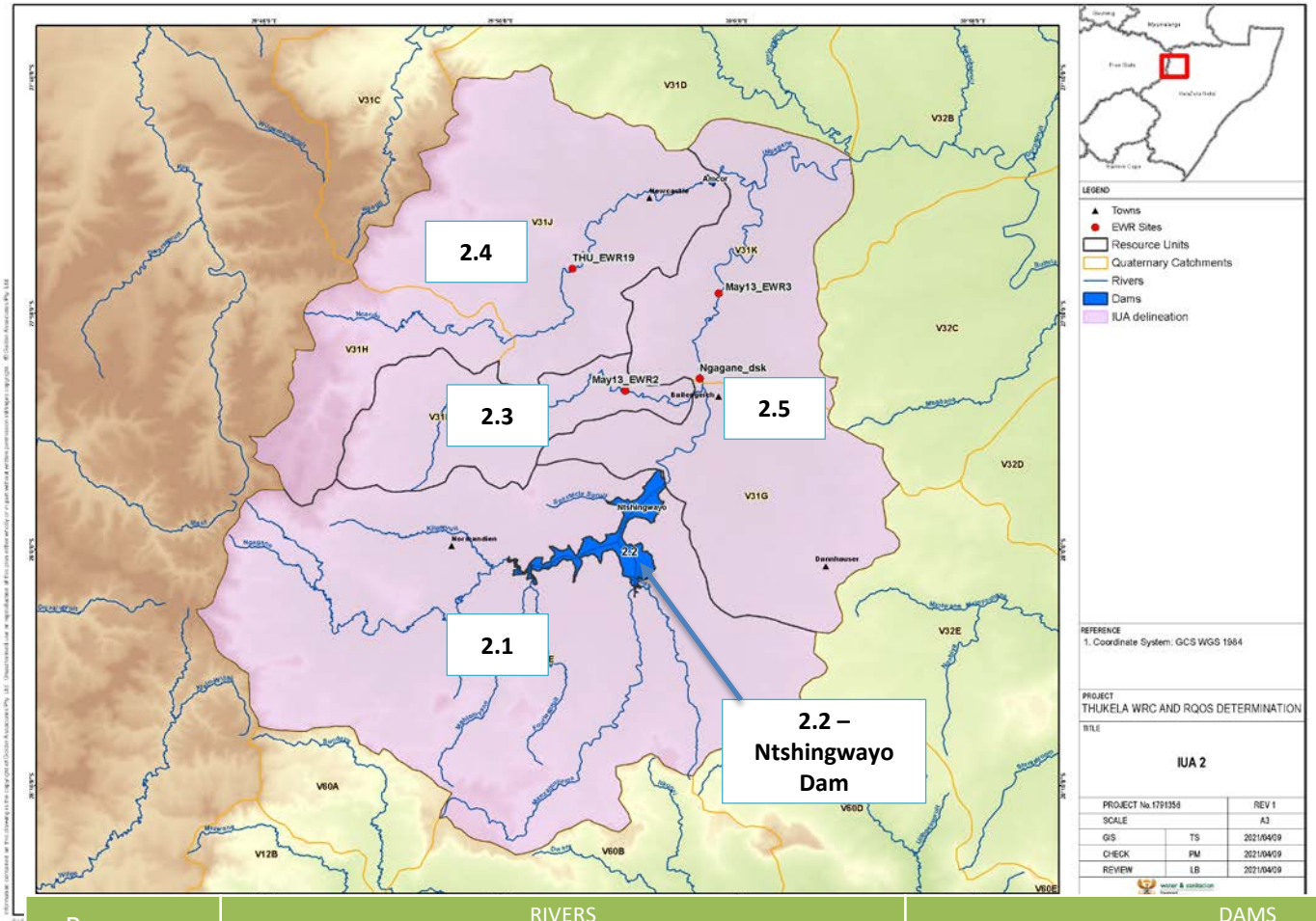
IUA 1: Upper Buffalo River



- Class III
- TEC: B/C
- Groundwater RQOs:
  - Quantity (stress Index and water depth)
  - Quality
  - Protection criteria (water level and quality trends
- Wetlands:
  - Wakkerstroom
  - Groenvlei
    - Quantity
    - Quality
    - Habitat
    - Biota

Resource Unit	RIVERS				DAMS	
	Quantity	Quality	Habitat	Biota	Quantity	Quality
1.1	X	X		X		
1.2					X	X
1.3	X	X	X	X		
1.6	X	X	X	X		

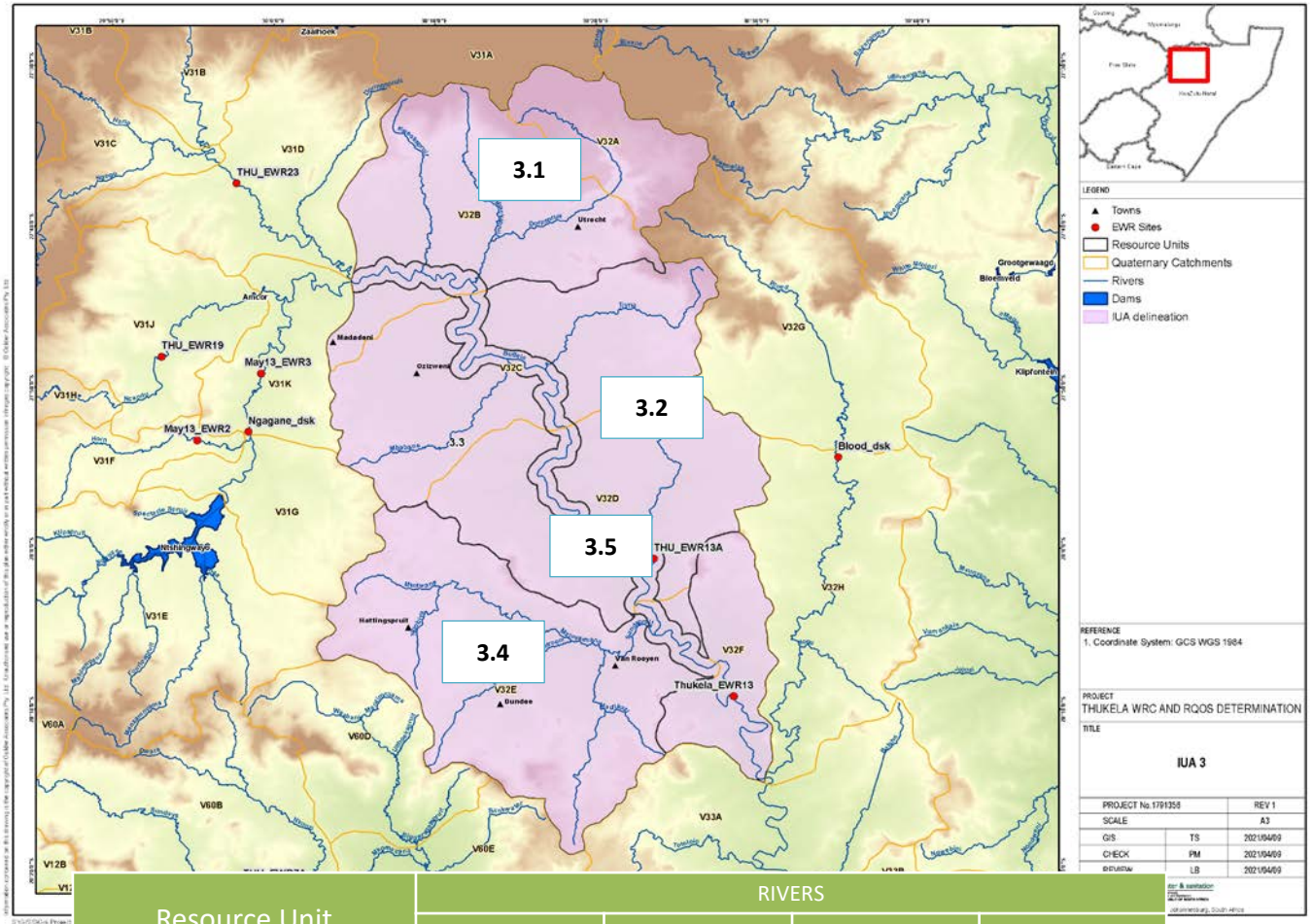
IUA 2: Ngagane River



- Class III
- Groundwater RQOs:
  - Quantity (stress Index and water depth)
  - Quality
  - Protection criteria (water level and quality trends

Resource Unit	RIVERS				DAMS			
	Quantity	Quality	Habitat	Biota	Quantity	Quality	Habitat	Biota
2.1	X	X	X	X				
2.2					X	X	X	X
2.3	X	X	X	X				
2.4	X	X	X	X				
2.5	X	X	X	X				

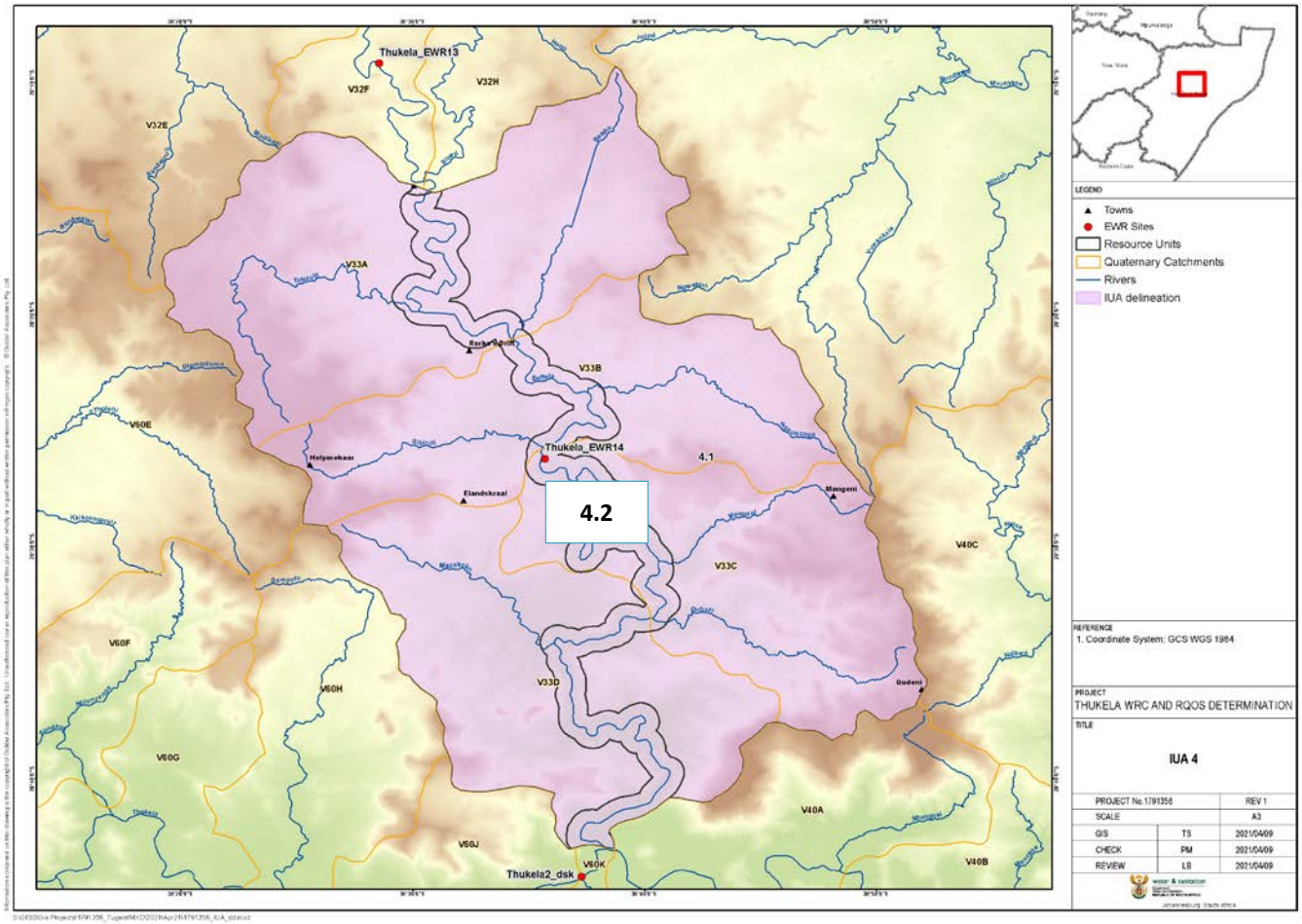
IUA 3: Middle Buffalo River



Resource Unit	RIVERS			
	Quantity	Quality	Habitat	Biota
3.1		X		
3.2		X		X
3.4		X		
3.5	X	X	X	X

- Class III
- Groundwater RQOs:
  - Quantity (stress Index and water depth)
  - Quality
  - Protection criteria (water level and quality trends
- Wetlands:
  - Boschoffsvlei
    - Quantity
    - Quality
    - Habitat
    - Biota

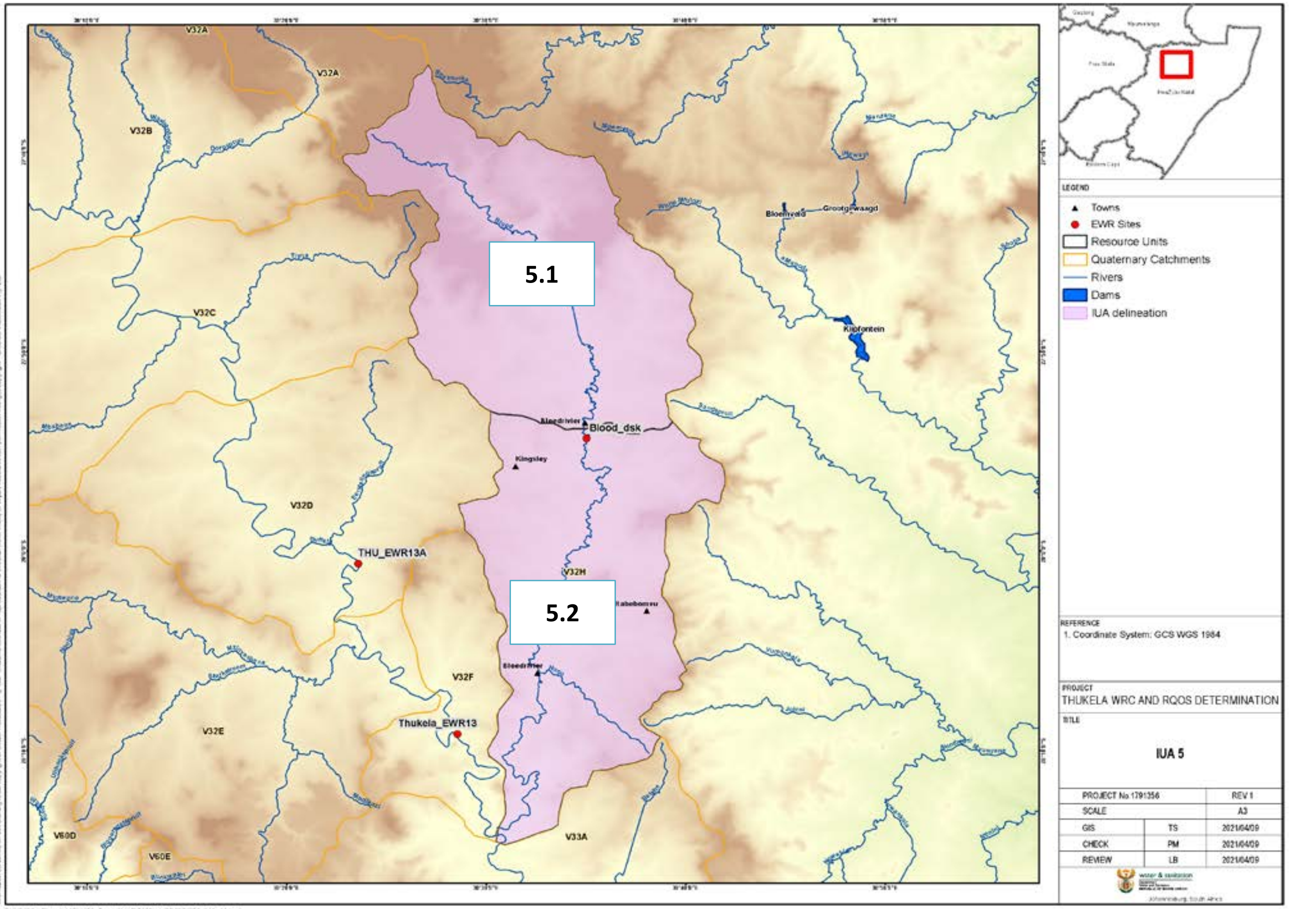
IUA 4: Lower Buffalo River



- Class II
- Groundwater RQOs:
  - Quantity (stress Index and water depth)
  - Quality
  - Protection criteria (water level and quality trends

Resource Unit	RIVERS			
	Quantity	Quality	Habitat	Biota
3.1	X	X	X	X

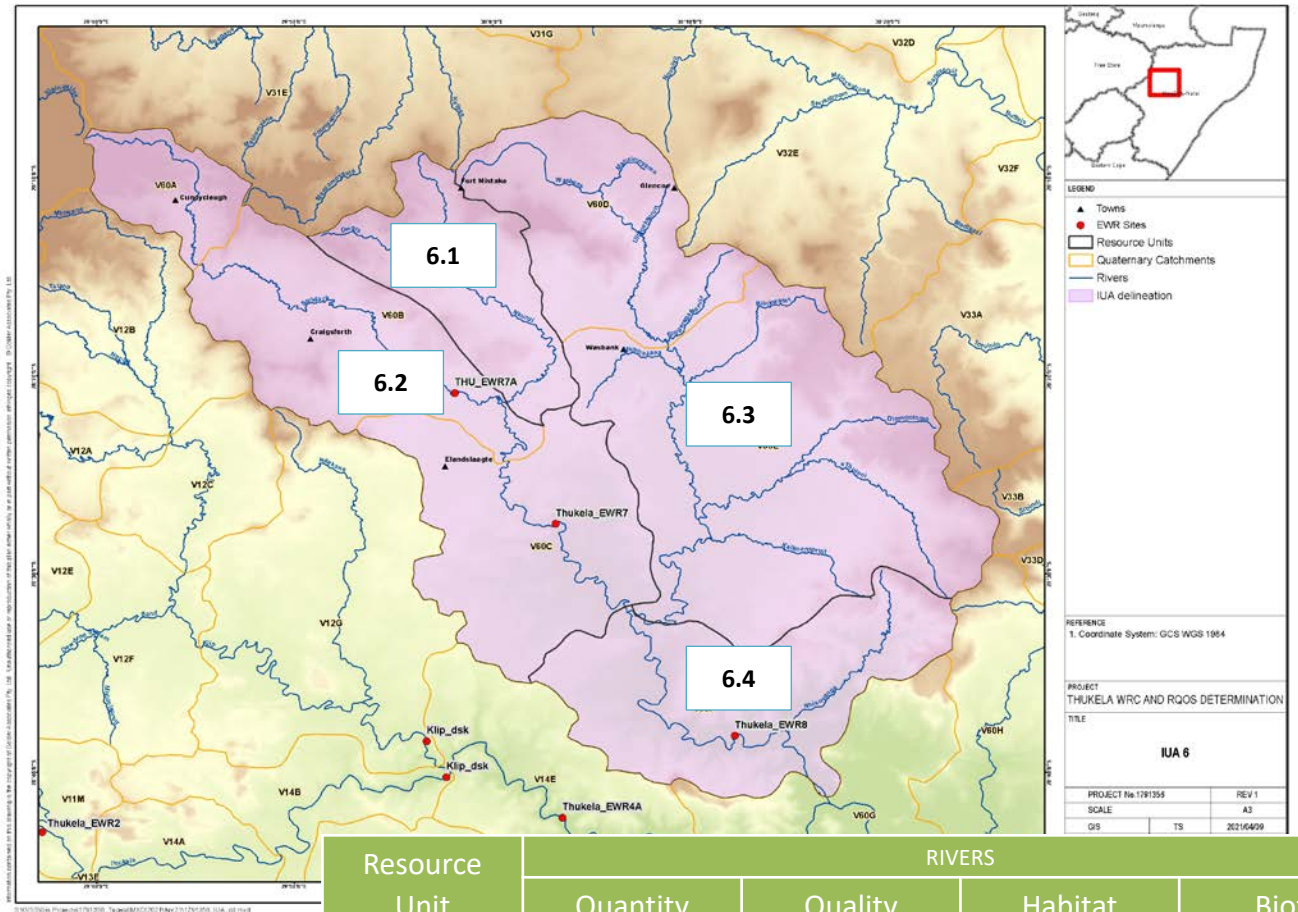
IUA 5: Blood River



- Class III
- Groundwater RQOs:
  - Quantity (stress Index and water depth)
  - Quality
  - Protection criteria (water level and quality trends
- Wetlands:
  - Blood River Vlei
  - Upper Blood wetlands
    - Quantity
    - Quality
    - Habitat
    - Biota

Resource Unit	RIVERS			
	Quantity	Quality	Habitat	Biota
5.1		x		x
5.2	x	x	x	x

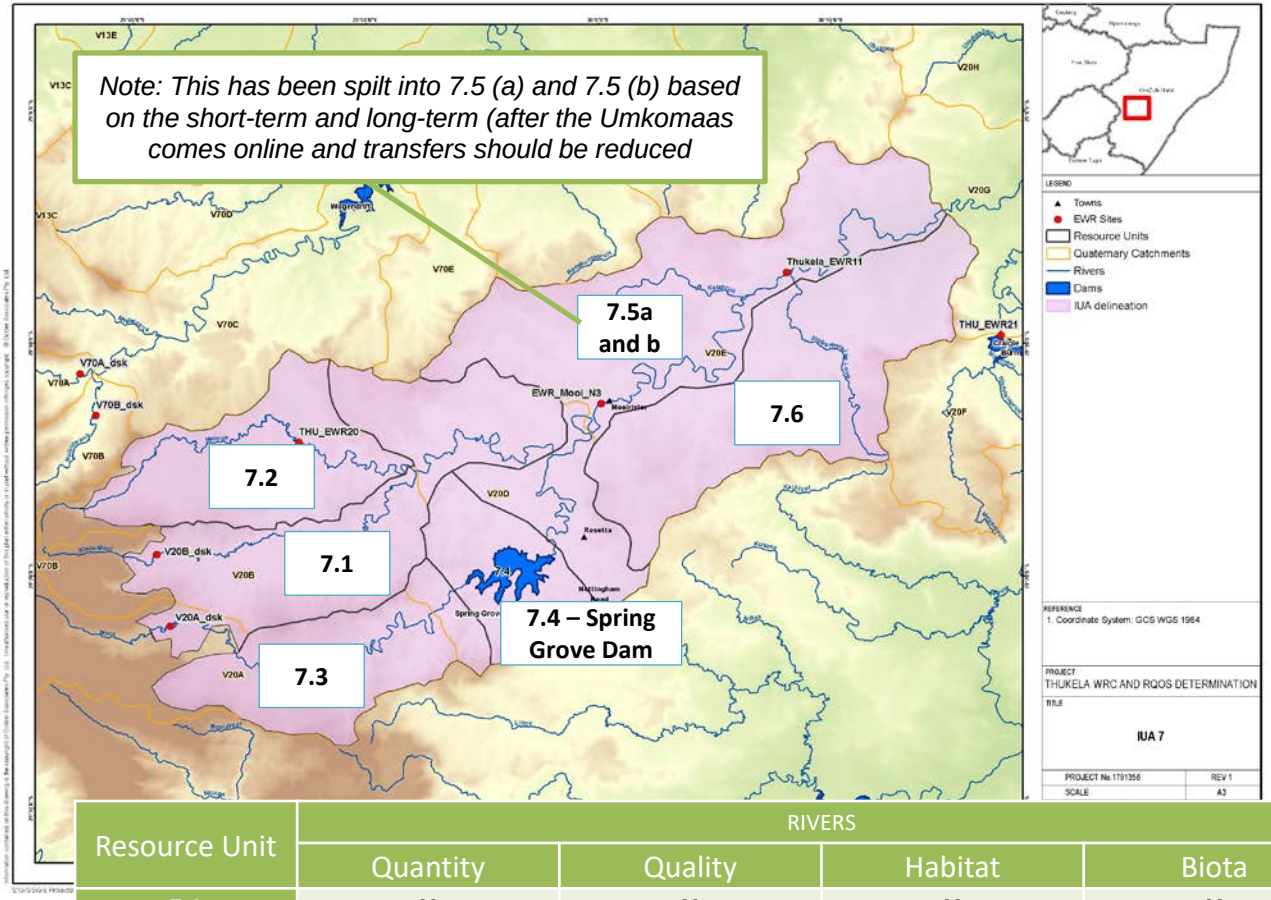
IUA 6: Sundays River



Resource Unit	RIVERS			
	Quantity	Quality	Habitat	Biota
6.1	X	X	X	X
6.2	X	X	X	X
6.3	X	X	X	X
6.4	X	X	X	X

- Class III
- Groundwater RQOs
  - Quantity (stress Index and water depth)
  - Quality
  - Protection criteria (water level and quality trends
- Wetlands:
  - Boschbergvlei
  - Paddavlei
    - Quantity
    - Quality
    - Habitat
    - Biota

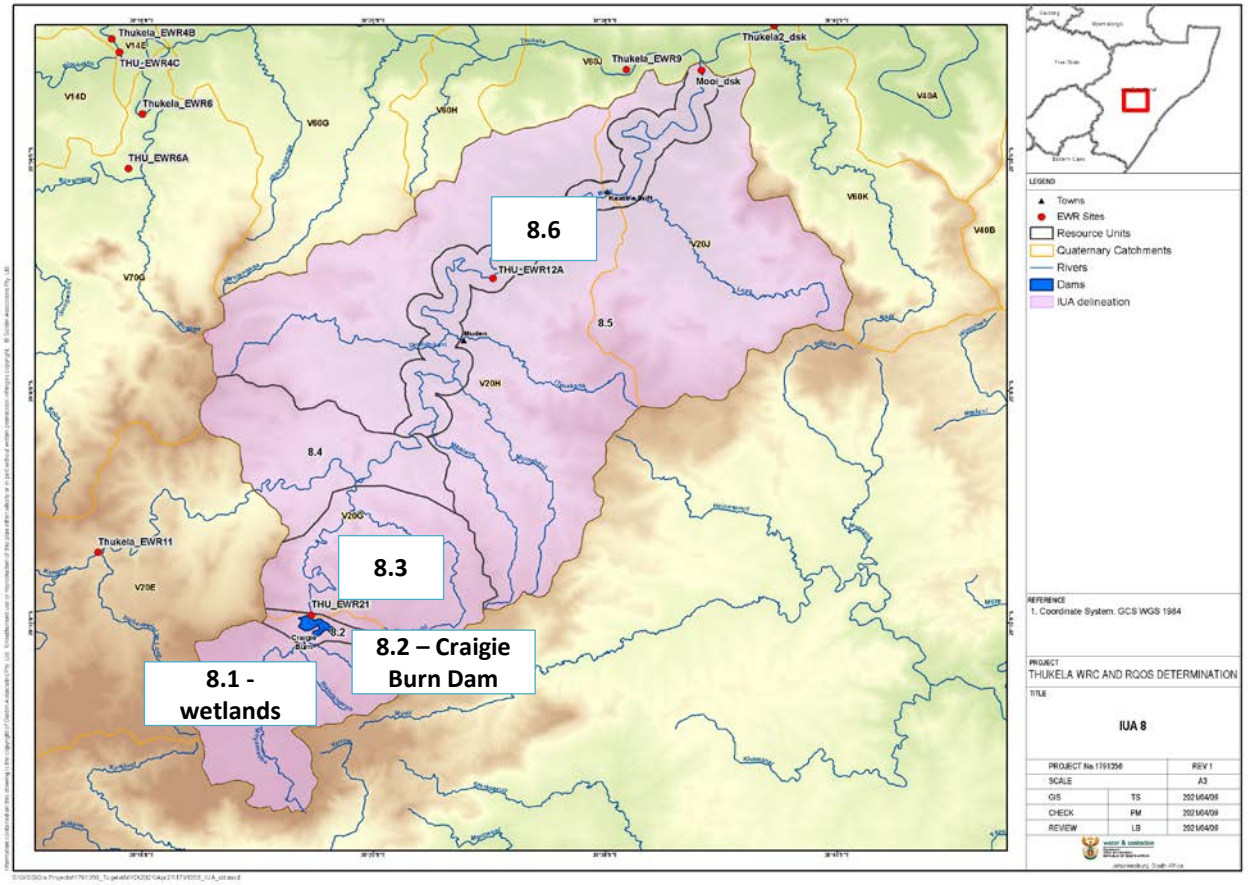
IUA 7: Upper Mooi River



Resource Unit	RIVERS			
	Quantity	Quality	Habitat	Biota
7.1	X	X	X	X
7.2	X	X	X	X
7.3	X	X		X
7.4	X	X		X
7.5 a	X	X	X	X
7.5b	X	X	X	X
7.6		X		X

- Class III
- Groundwater RQOs
  - Quantity (stress Index and water depth)
  - Quality
  - Protection criteria (water level and quality trends
- Wetlands:
  - Stillerust
  - Hlatikhulu
    - Quantity
    - Quality
    - Habitat
    - Biota

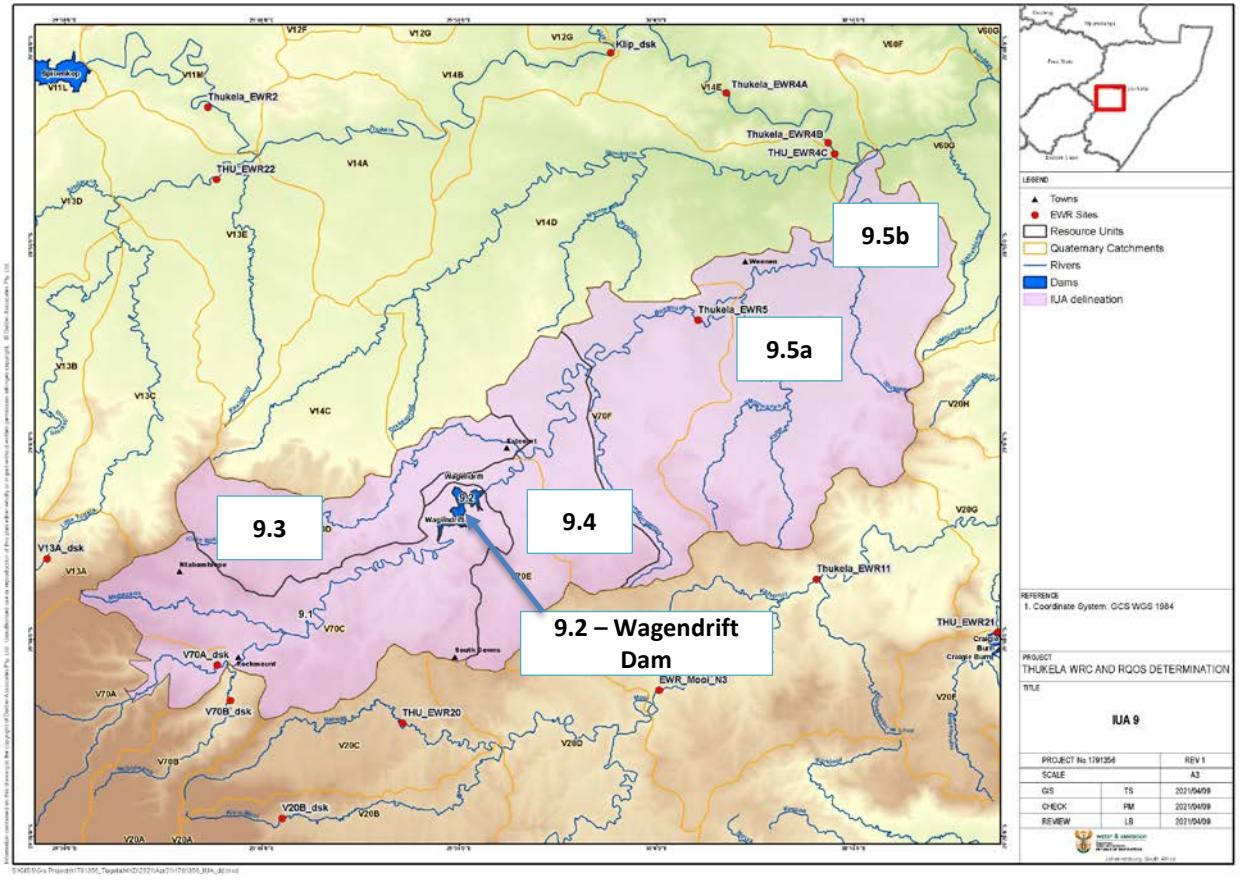
IUA 8: Middle/ Lower Mooi River



- Class III
- Groundwater RQOs:
  - Quantity (stress Index and water depth)
  - Quality
  - Protection criteria (water level and quality trends
- Wetlands:
  - Scawby, Dartmoor, Melmoth
    - Quantity
    - Quality
    - Habitat
    - Biota

Resource Unit	RIVERS				DAMS			
	Quantity	Quality	Habitat	Biota	Quantity	Quality	Habitat	Biota
8.2					X	X		X
8.3	X	X	X	X				
8.6	X	X	X	X				

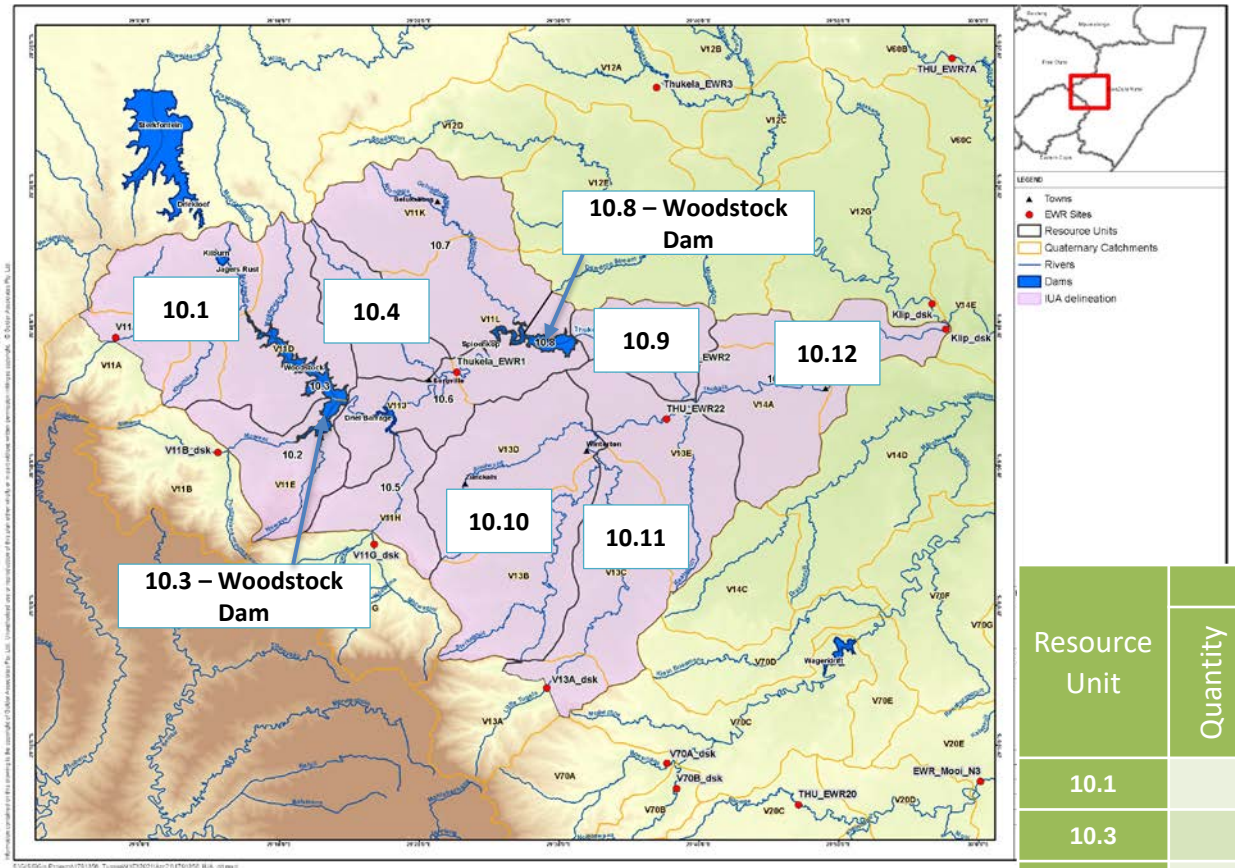
IUA 9: Middle/ Lower Bushman's River



- Class III
- Groundwater RQOs:
  - Quantity (stress Index and water depth)
  - Quality
  - Protection criteria (water level and quality trends
- Wetlands:
  - Ntabamhlope
    - Quantity
    - Quality
    - Habitat
    - Biota

Resource Unit	RIVERS				DAMS		
	Quantity	Quality	Habitat	Biota	Quantity	Quality	Biota
9.2					X	X	X
9.3		X	X	X			
9.4		X					
9.5a	X	X	X	X			
9.5b	X	X	X	X			

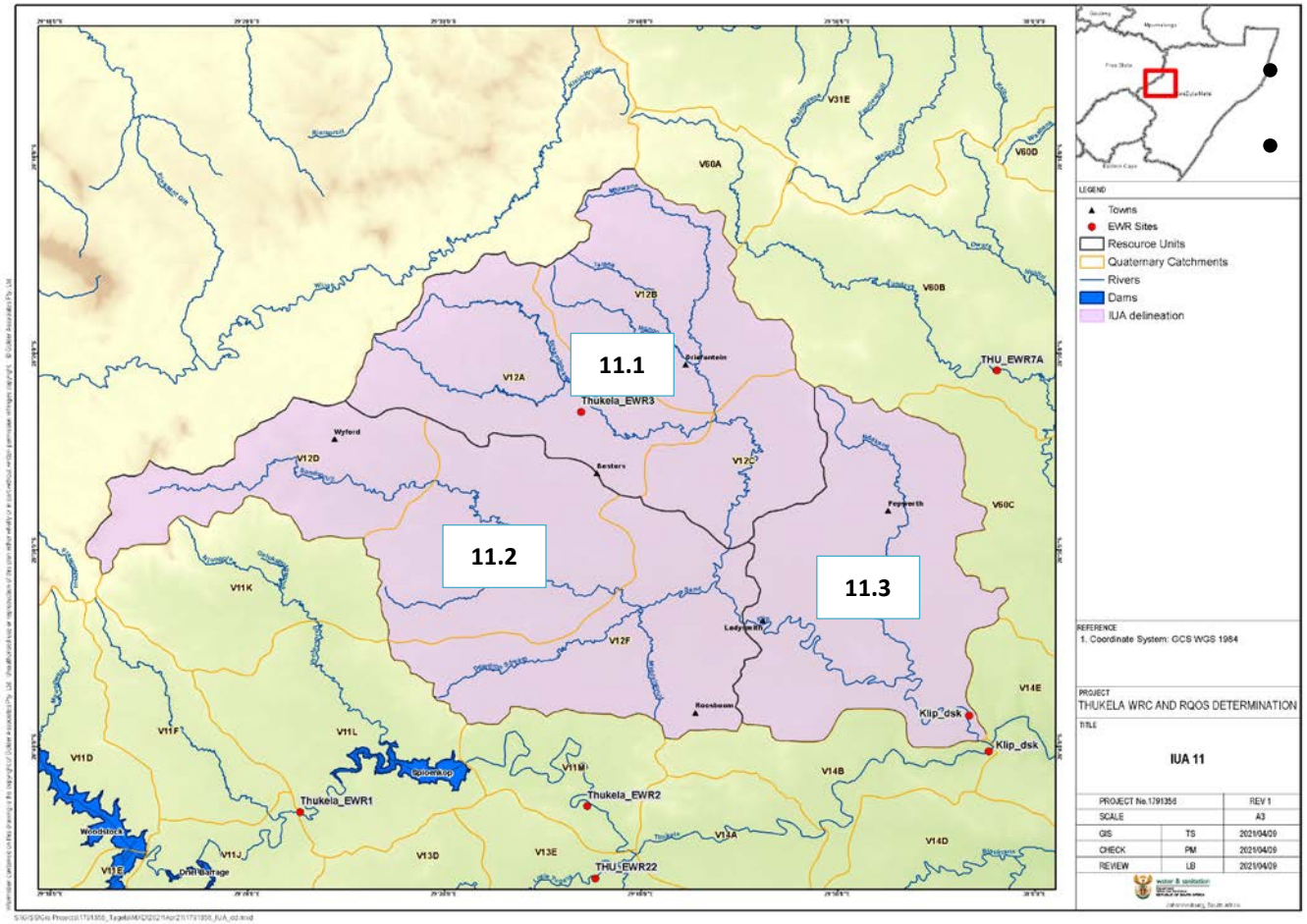
IUA 10: Upper Thukela River



- Class III
- Groundwater RQOs
  - Quantity (stress Index and water depth)
  - Quality
  - Protection criteria (water level and quality trends

Resource Unit	RIVERS				DAMS			
	Quantity	Quality	Habitat	Biota	Quantity	Quality	Habitat	Biota
10.1		X	X	X				
10.3					X	X		X
10.4		X	X	X				
10.8					X	X		X
10.9	X	X	X	X				
10.10		X	X	X				
10.11	X	X	X	X				
10.12	X	X	X	X				

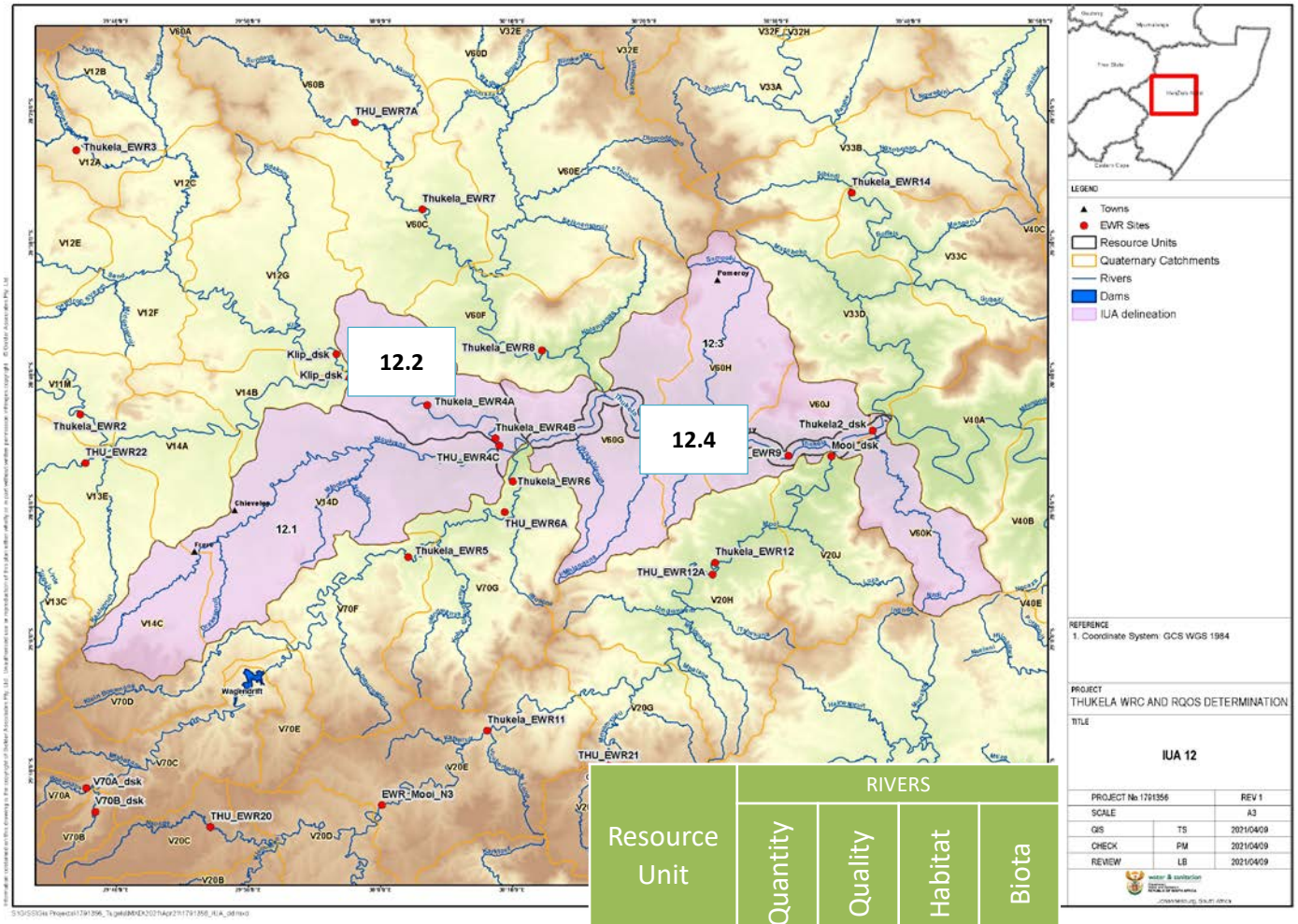
IUA 11: Klip River



- Class III
- Groundwater RQOs
  - Quantity (stress Index and water depth)
  - Quality
  - Protection criteria (water level and quality trends

Resource Unit	RIVERS			
	Quantity	Quality	Habitat	Biota
11.1		X	X	X
11.2	X	X	X	X
11.3	X	X	X	X

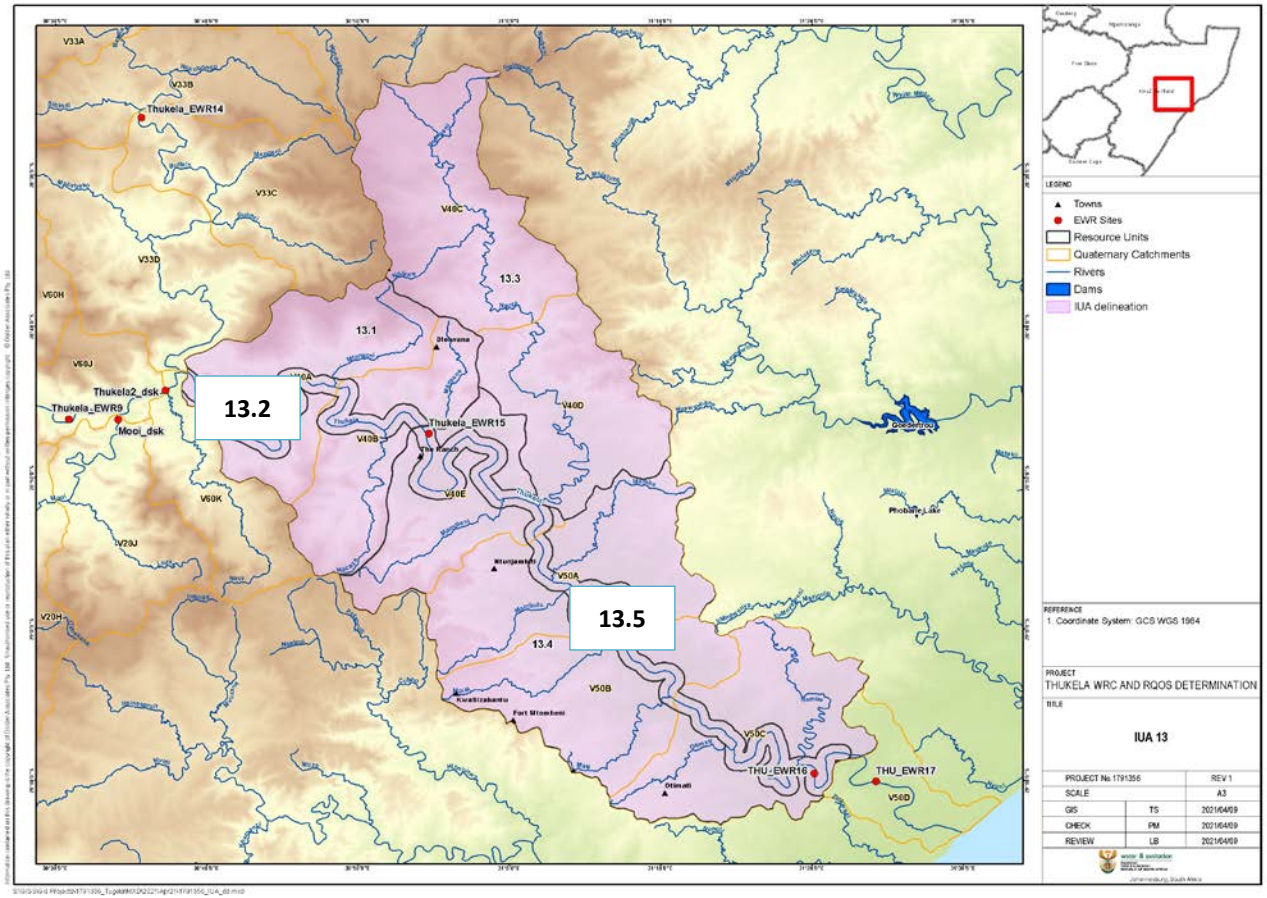
IUA 12: Middle Thukela River



Resource Unit	RIVERS			
	Quantity	Quality	Habitat	Biota
12.2	X		X	X
12.4	X	X	X	X

- Class III
- Groundwater RQOs
  - Quantity (stress Index and water depth)
  - Quality
  - Protection criteria (water level and quality trends

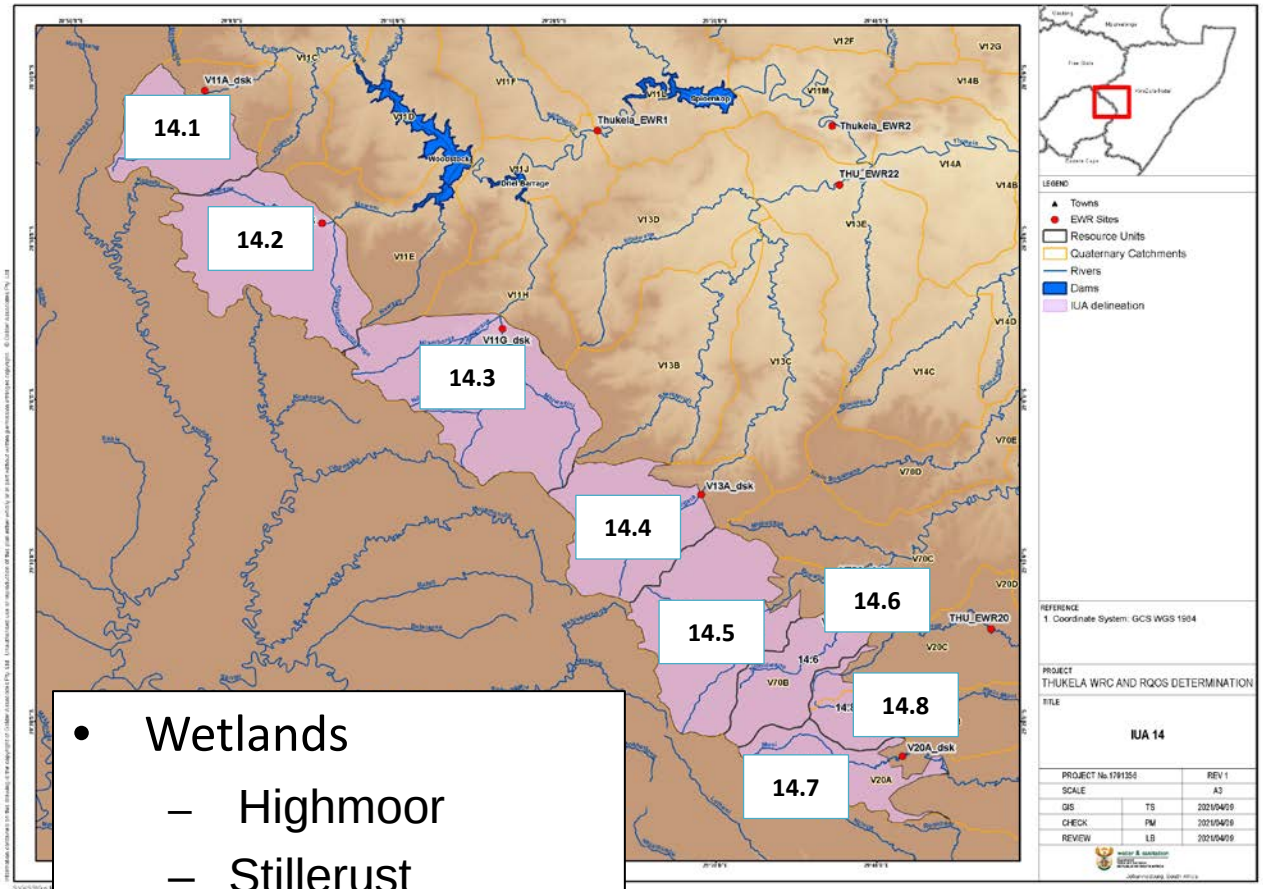
IUA 13: Lower Thukela River



- Class II
- Groundwater RQOs
  - Quantity (stress Index and water depth)
  - Quality
  - Protection criteria (water level and quality trends

Resource Unit	RIVERS			
	Quantity	Quality	Habitat	Biota
13.2	X	X	X	X
13.5	X	X	X	X

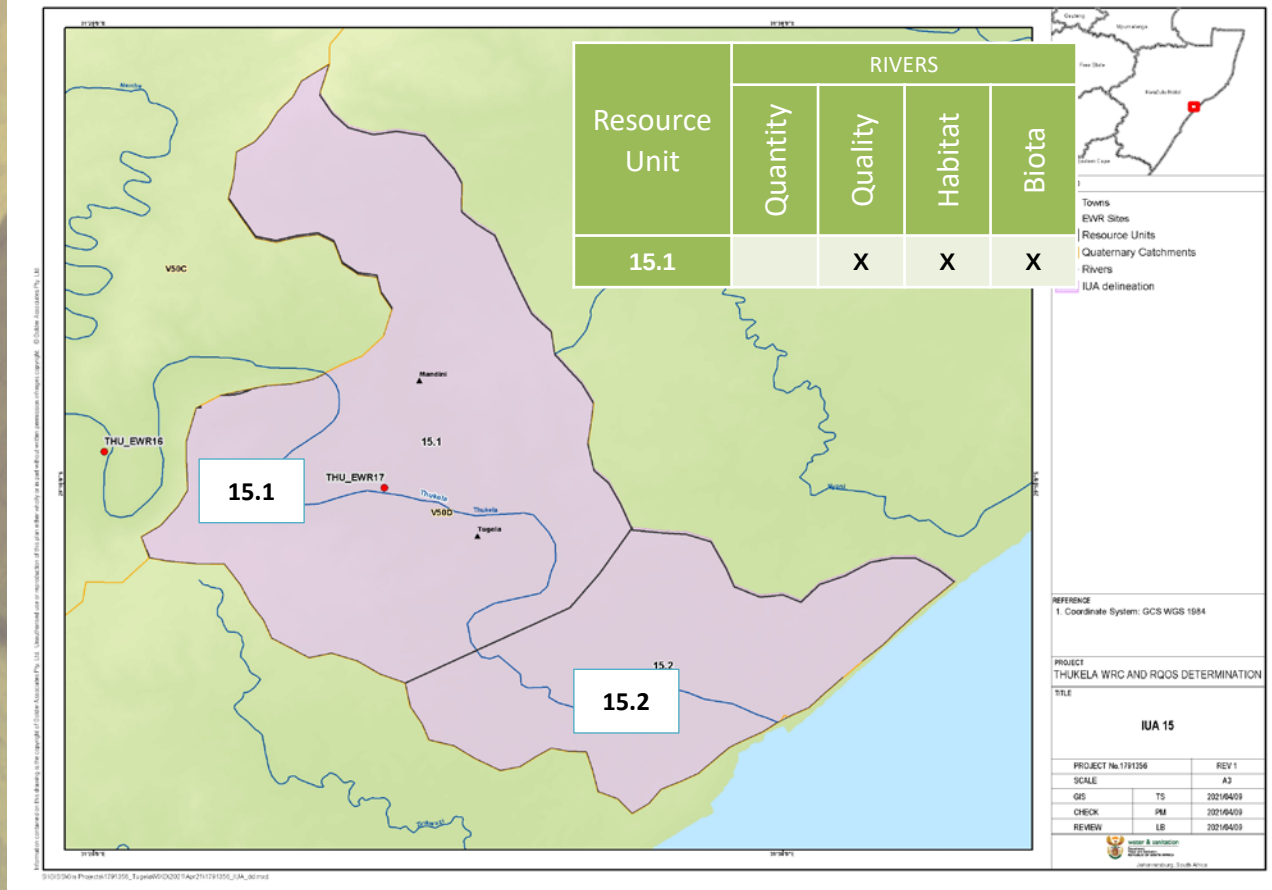
IUA 14: Escarpment



- Wetlands
  - Highmoor
  - Stillerust
    - Quantity
    - Quality
    - Habitat
    - Biota

- Class I
- River RQOs – quantity only
- Groundwater RQOs
  - Quantity (stress Index and water depth)
  - Quality
  - Protection criteria (water level and quality trends)

IUA 13: Thukela Estuary



- Class II
- Groundwater RQOs
  - Quantity (stress Index and water depth)
  - Quality
  - Protection criteria (water level and quality trends)

- Hydrology (low flow and high flows)
- Hydrodynamics (mouth condition and abiotic states)
- Water quality (salinity, dissolved inorganic nitrogen, dissolved inorganic phosphorus, nutrients, water clarity, dissolved oxygen, system variables, toxic substances. Pathogens)
- Physical Habitat (intertidal habitat, subtidal habitat, substrate type)
- Biota (Microalgae, Macrophytes, Invertebrates, Fish, Birds)

EXAMPLES OF WHAT YOU WILL SEE IN THE DRAFT GAZETTE

List of Tables in the Draft Gazette

- Table 1: Proposed Water Resource classes for the Thukela catchments
- Table 2: Integrated Units of Analysis delineated for Thukela catchments
- Table 3: Resource Units delineated for the Thukela catchments
- Table 4: Summary of Water Resource Classes per Integrated Unit of Analysis and Ecological Categories – Thukela catchments
- Table 5: Integrated Unit of Analysis and Resource Units with the indicated sub-components of water resources for which Resource Quality Objectives are proposed
  - Tables 6 to 20: Rivers and Dams
  - Table 21: Wetlands:
  - Tables 22 – 36: Groundwater:
  - Table 37: Estuary

Resource Quality Objectives' details

- Figure 1: Proposed Water Resource Classes for the Thukela catchments
- Figure 2: Integrated Units of Analysis delineated for the Thukela catchments
- Figure 3: Resource Units of the Thukela catchment

RESOURCE UNITS SELECTED WITH PROPOSED RESOURCE QUALITY OBJECTIVES

Table 5 provides:

(i) the listed Integrated Unit of Analysis in the Thukela catchments for which Resource Quality Objectives are proposed;
(ii) the selected Water Resources (Rivers, Wetlands, Dams and Groundwater) for which Resource Quality Objectives are proposed and
(iii) reference to subsequent tables that list the proposed Resource Quality Objectives per selected sub-components (quantity, quality, habitat, biota or groundwater) per Resource Unit.

Integrated Unit of Analysis	Resource Unit	RIVERS				DAMS				List of applicable tables with proposed Resource Quality Objectives (RQOs)	Ground Water tables with proposed RQOs	Wetlands tables with proposed RQOs	Estuary table with proposed RQOs
		Quantity	Quality	Habitat	Biota	Quantity	Quality	Habitat	Biota				
1: Upper Buffalo River	1.1	X	X		X					Table 6 (Rivers and Dams)	Table 22 (Groundwater)	Table 21 (Wetlands)	
	1.2					X	X			Table 6 (Rivers and Dams)			
	1.3	X	X	X	X					Table 6 (Rivers and Dams)			
	1.6	X	X	X	X					Table 6 (Rivers and Dams)			

2.5

Ngagane from Ntshingwayo Dam to confluence with Buffalo

V31G, K (May 13_EWR 3)

Component	Sub-component	RQO	Indicator	Numerical Limit/ measure		
Quantity	Low flows	EWR maintenance low and drought flows: Ngagane River at the EWR site May13_EWR3 (-27.819, 29.987) in V31K NMAR = 160.12 x10^{6}m^3 TEC=C/D category The maintenance low flows and drought flows must be attained to support the upstream and downstream aquatic ecosystem of the Ngagane River to the confluence with the Buffalo River.	Maintenance and drought flows required for the Ngagane River		Maintenance	Drought
					Low flows (m^3/s) flows m^3/s)	Low flows (m^3/s) flows m^3/s)
				Oct	0.366	0.091
				Nov	0.560	0.068
				Dec	0.762	0.051
				Jan	1.138	0.527
				Feb	1.541	0.711
				Mar	1.269	0.587
				Apr	0.928	0.433
				May	0.539	0.202
				Jun	0.326	0.112
				Jul	0.243	0.123
				Aug	0.234	0.119
				Sep	0.273	0.111
	Freshets	EWR freshets to be released from Chelmsford Dam (V3R001) and Horn River	Freshets required for the Ngagane River		Freshet (m^3/s)	Days
				Nov	10.0	2
				Dec	12.0	2
				Jan	15.0	2
				Feb	20.0	2
				Mar	10.0	2

Component	Sub-component	RQO	Indicator	Numerical Limit/ measure
Quality	Nutrients	Nutrient levels should not deteriorate and should support aquatic ecosystem and sustain the present ecological state (PES B)	Orthophosphate as P	≤0.01 mg/L (50th percentile)
			Total Inorganic Nitrogen (TIN)	≤0.5 milligrams per Litre (mg/L) (50th percentile)
	Salts	Total Dissolved Solids needs to be maintained to support aquatic ecosystem and sustain the present ecological state (PES B)	Total Dissolved Solids	≤120 milligrams per Litre (mg/L) (95th percentile)
	Pathogens	The presence of pathogens should not pose a risk to human health	*Escherichia coli*	≤130 Colony forming units per 100 millilitres (CFU/100 mL)
Biota	Fish	Flow and water quality sensitive Fish species to be maintained in a PES B ecological category.	*Barbus (Enteromius) anoplus* (BANO) *Amphilius natalensis* (ANAT) *Anguilla mossambica* (AMOS)	During survey in all flow habitat classes all species present (BANO, ANAT and AMOS). BANO and ANAT ≥ 5 individuals per species
	Aquatic invertebrates	Flow and water quality sensitive macroinvertebrate assemblages to be maintained. Macroinvertebrate assemblages must be maintained within a B ecological category or improved upon.	Baetidae 2 sp Perlidae Tricorythidae Hydropsychidae 1 sp Leptoceridae Ancyidae Psephenidae	At least 2 biotopes sampled: assemblages to be ≥ A abundances South African Scoring System (SASS) 5 score ≥180 Average Score per Taxon (ASPT): ≥6.0 Macroinvertebrate Response Assessment Index (MIRAI) Ecological Category: B (80%-90%)
	Diatoms	Ecological water quality should be maintained as good quality	Specific Pollution Sensitivity Index (SPI) Percentage pollution tolerant values (%PTV)	SPI: ≥15 PTV: 20% to < 40%

Way Forward

- Publish draft classes and RQOs notice for public comments - 60 days
- Address public comments and update notice for Minister's approval
- Gazette final notice containing Classes and RQOs

Thank you