water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

DETERMINATION OF RESOURCE QUALITY OBJECTIVES IN THE MOKOLO, MATLABAS, CROCODILE (WEST) AND MARICO CATCHMENTS IN THE LIMPOPO WATER MANAGEMENT AREA (WMA 01)

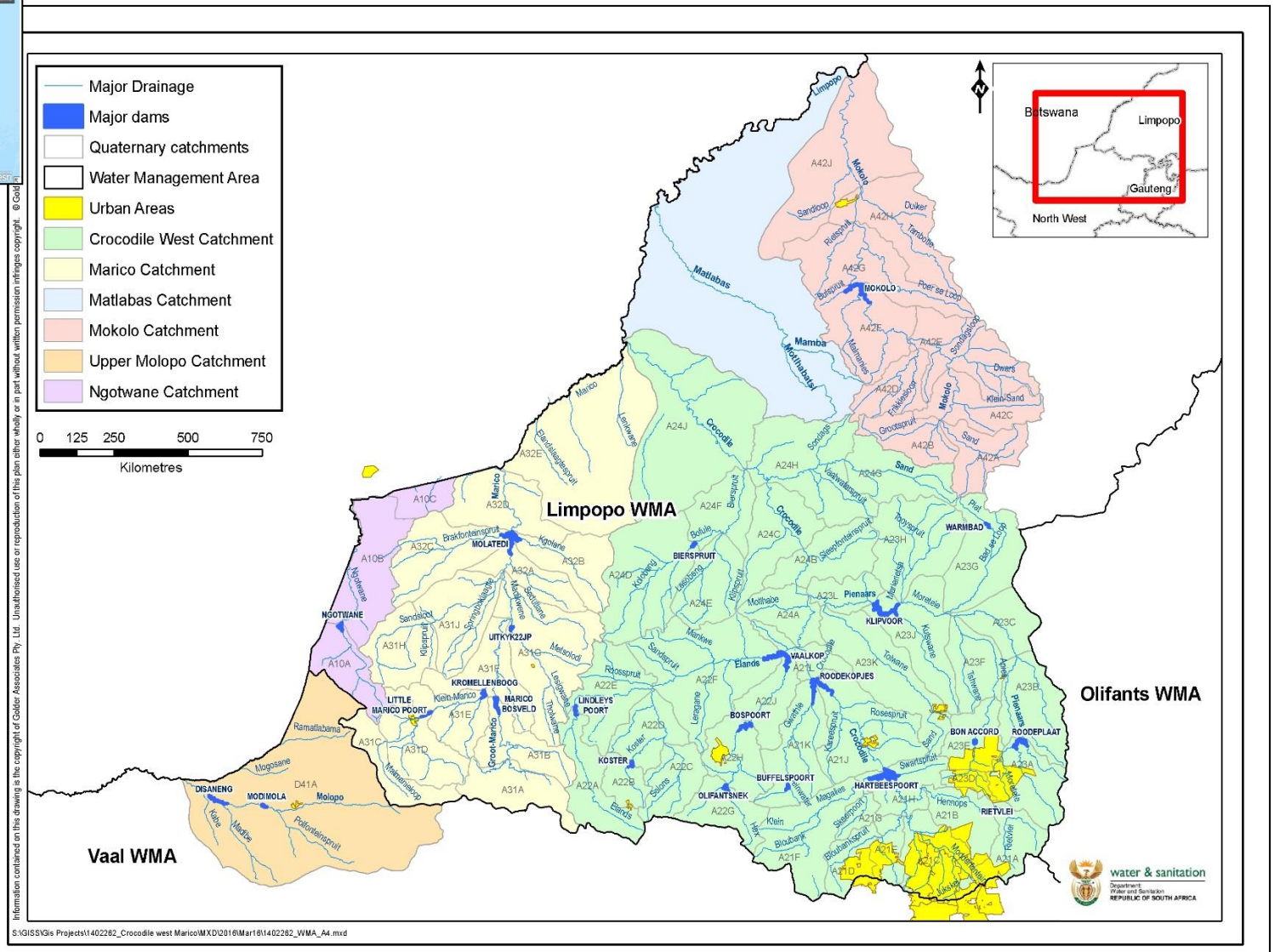
PROJECT STEERING COMMITTEE MEETING

27 AND 28 SEPTEMBER 2016

4.2 STUDY AREA

STUDY AREA: MOKOLO, MATLABAS, CROCODILE (WEST), MARICO AND MOLOPO CATCHMENTS

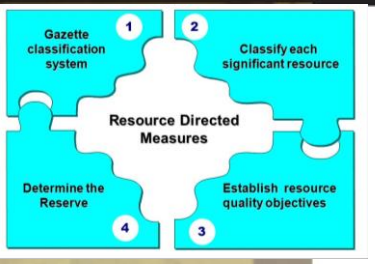
Southern Portion of the Limpopo Water Management Area



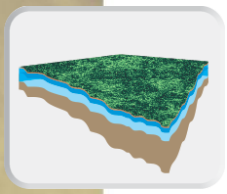
S:\GIS\Gis Projects\1402262_Crocodile west Marico\MXD\2016\Mar16\1402262_WMA_A4.mxd

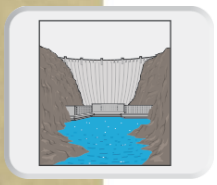
STUDY AREA: SUB-CATCHMENTS

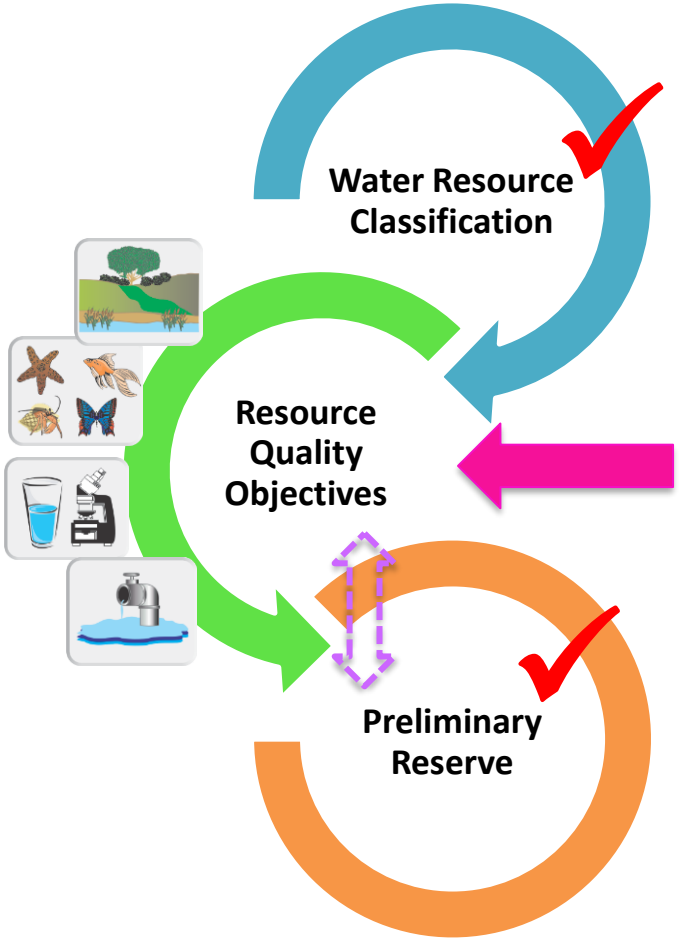
Sub-catchment	Catchment Area (km^2)	Quaternary catchments
Upper Crocodile (A21)	6 336	A21 A - L
Elands (A22)	6 221	A22 A - J
Apies/Pienaars (A23)	7 588	A23 A - L
Lower Crocodile (A24)	9 204	A24 A – J;
Marico (A31 and A 32)	12 030	A32 A – E; A31 A – J
Ngotwane (A10)	1 842	A10 A - C
Upper Molopo (D41)	4 300	D41 A
Matlabas (A41)	6 014	A41A - E
Mokolo (A42)	8 387	A42 A - J



WATER RESOURCE PROTECTION IN THE MOKOLO, MATLABAS, CROCODILE (WEST) AND MARICO CATCHMENTS

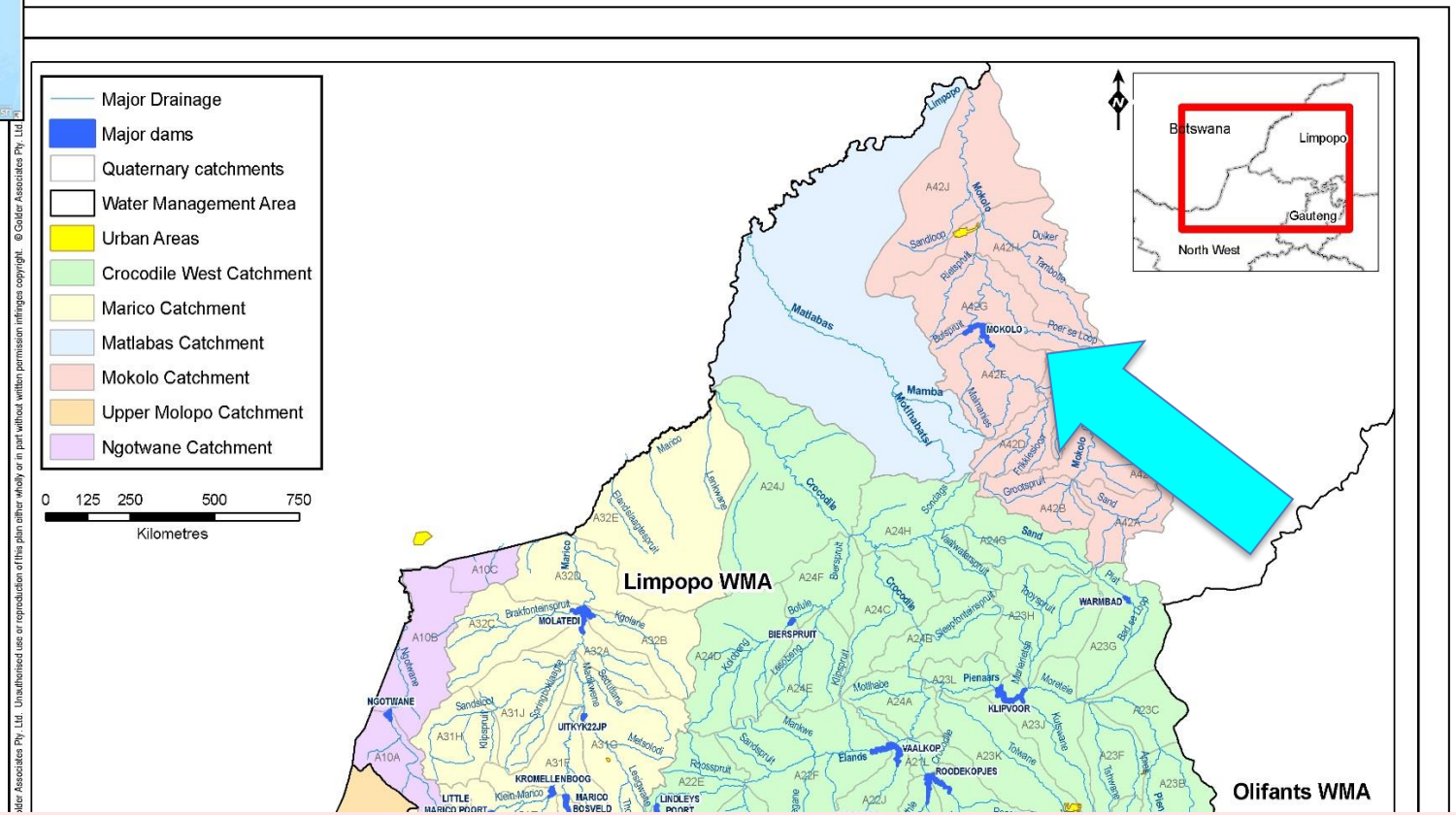






Focus of this study

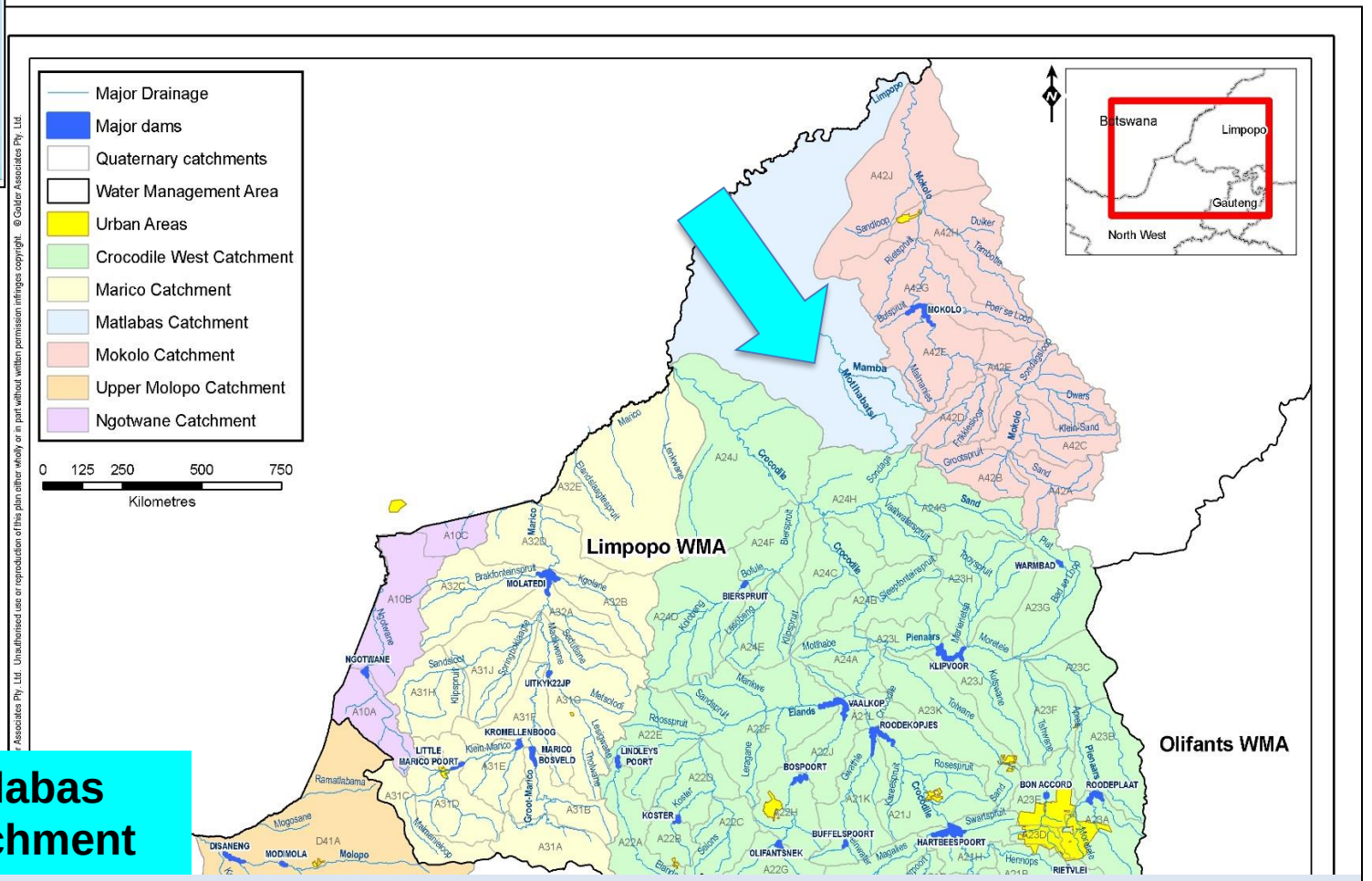
STUDY AREA: SUB-CATCHMENT MOKOLO



Mokolo catchment

- **A42: Flows from the Waterberg Mountains; Sand River, includes Mokolo Dam; small tributaries Tambotie, Poer-se- Loop, and Rietspruit rivers. Confluence with the Limpopo River.**
  - **Exxaro's Grootegeluk Colliery (in Waterberg Basin**
  - **Two power stations – New Medupi, Matimba.**
  - **Lephalale area - Sasol to access the vast coal reserves in the Waterberg coal fields for its Maphuta coal to liquid fuel projects**
  - **Game farming**

STUDY AREA: SUB-CATCHMENT MATLABAS



Matlabas catchment

- **A41: Mamba and Motlhabatsi Rivers → Matlabas**
  - **Includes the Marakele Nature Reserve**
  - **Lephalale coalfield and numerous mining developments are foreseen for this region**

Mokolo at Marken Road, Lepalale

Medupi PS

Matimba PS

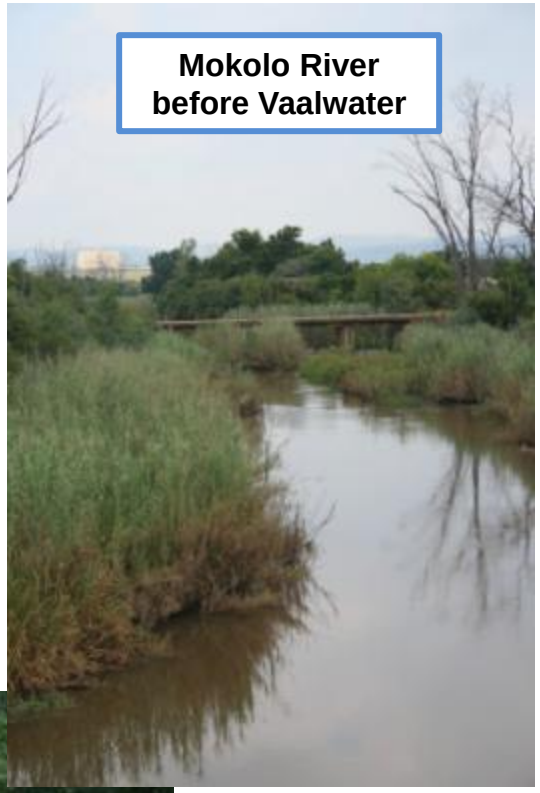
Mokolo (A42)

Tailings

Tambotie River

Sand mining along the Mokolo

Bulspruit u/s of Mokolo Dam



Mokolo River before Vaalwater

Malmani RIver u/s of Mokolo Dam

Sterkstroom River u/s of Mokolo Dam

Mokolo (A42)

Crocodile River at Thabazimbi

Mokolo River just before confluence

Matlabas River

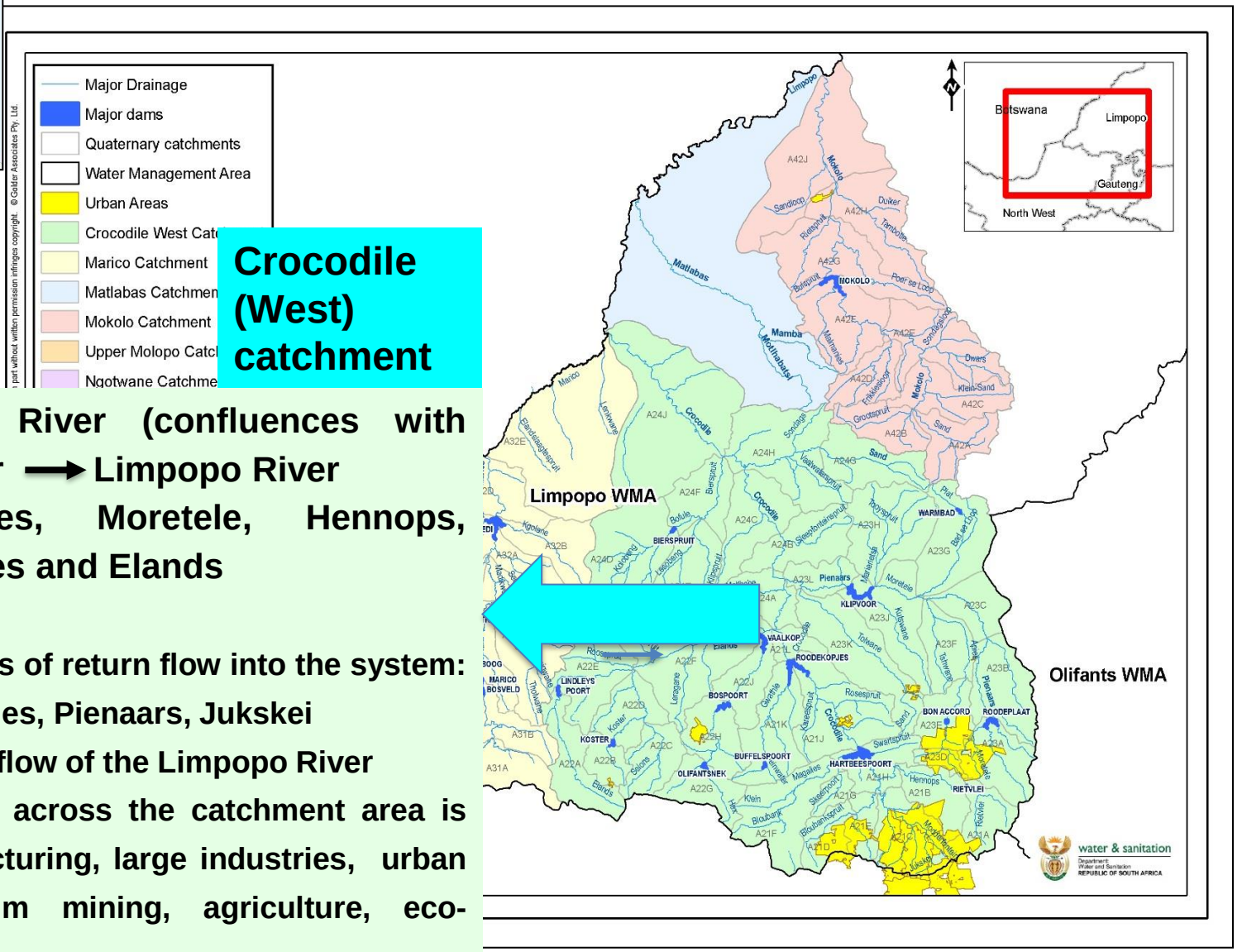
Riet River

Mokolo River on R510

Matlabas (A41)

Mokolo (A42)

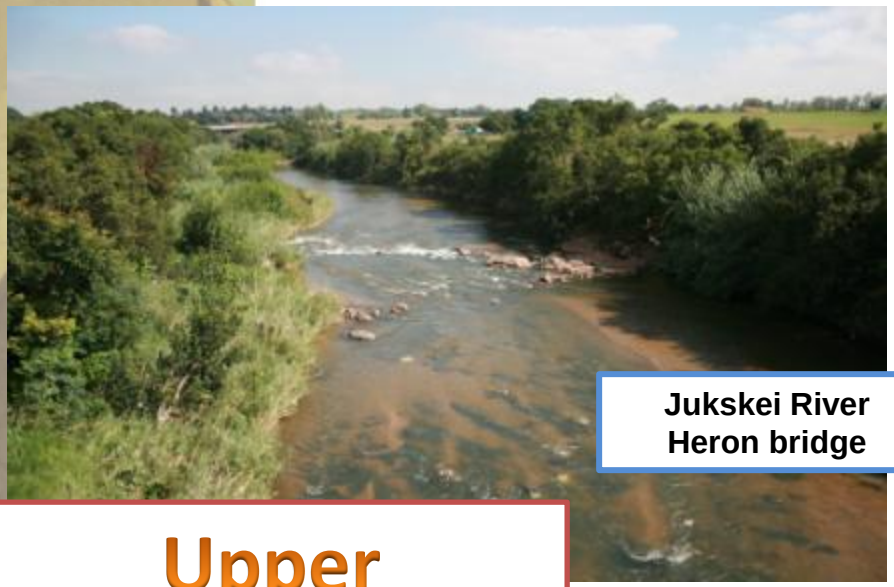
STUDY AREA: CROCODILE (WEST) SUB-CATCHMENT



- A2: Crocodile River (confluences with Marico at border → Limpopo River
- Pienaars, Apies, Moretele, Hennops, Jukskei, Magalies and Elands

- significant volumes of return flow into the system: Impacts on the Apies, Pienaars, Jukskei
- contributes to the flow of the Limpopo River
- Economic activity across the catchment area is diverse – manufacturing, large industries, urban economy, platinum mining, agriculture, eco-tourism
- Number of dams

Upper Crocodile (A21)



Jukskei River Heron bridge

Hartebeespoort Dam

Swartspruit

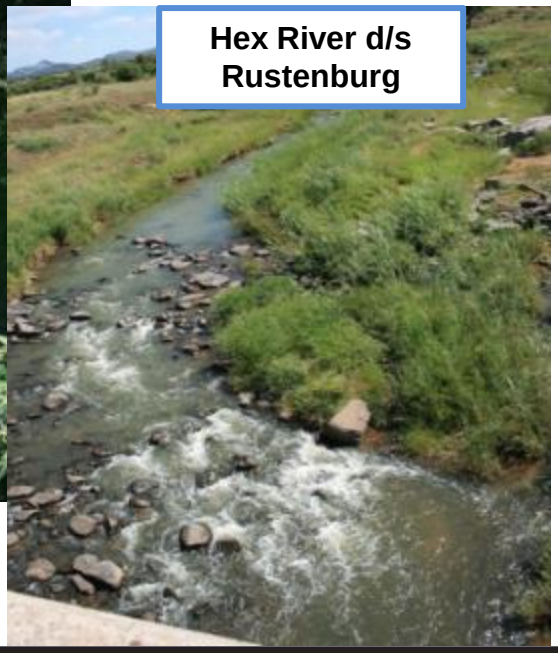
Scheerpooort

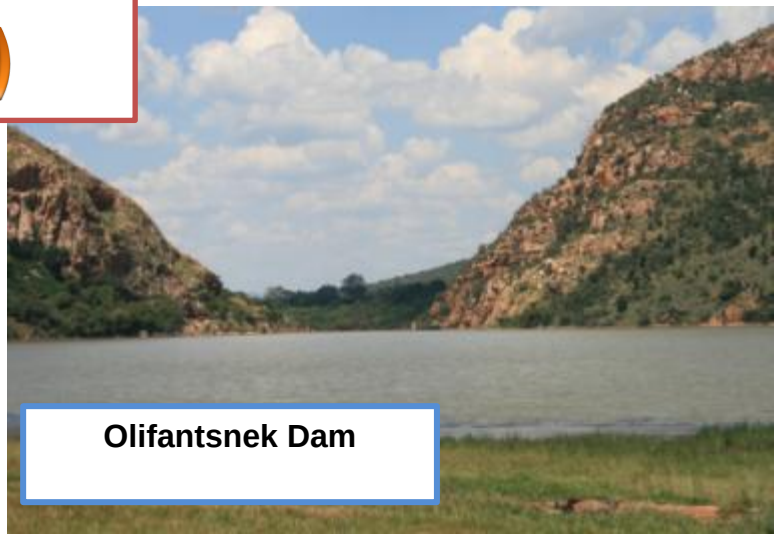
Elands (A22)

Magalies River

Hex River

Hex River d/s Rustenburg

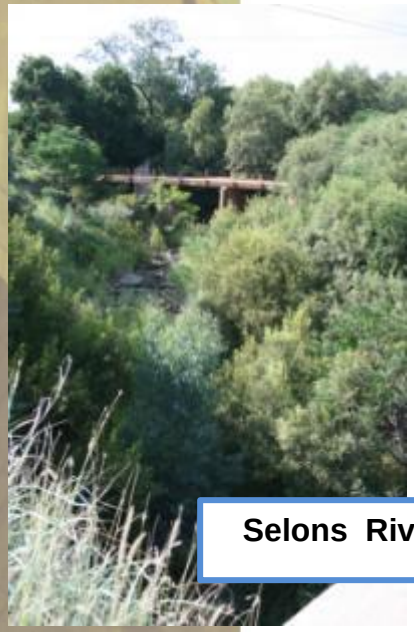




Olifantsnek Dam

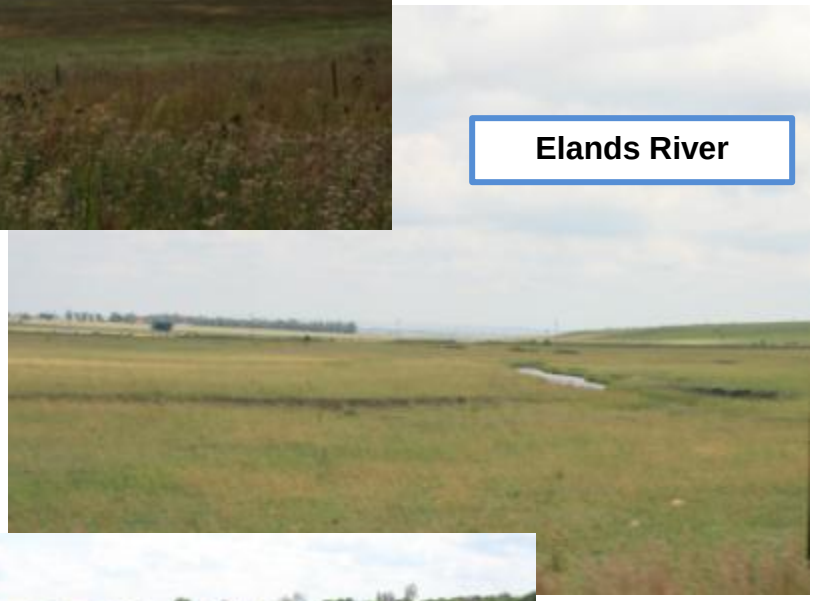
Wetland u/s of Waterkloosspruit

Elands (A22)



Selons River

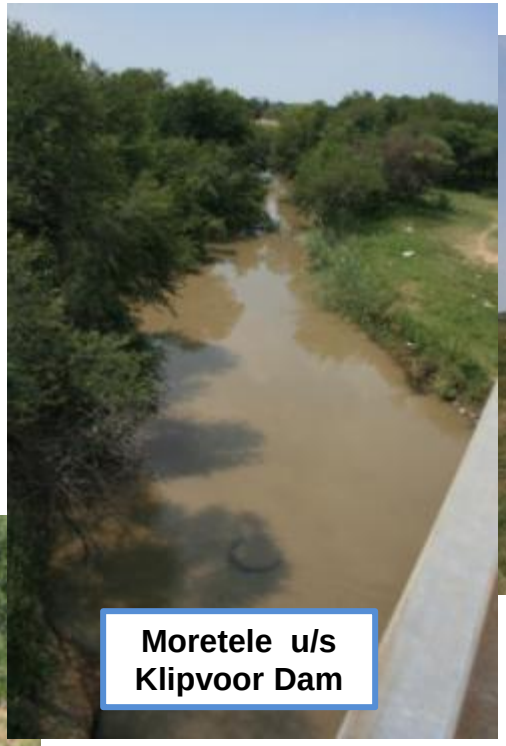
Pans on the R52 near Koster in Eland River catchment

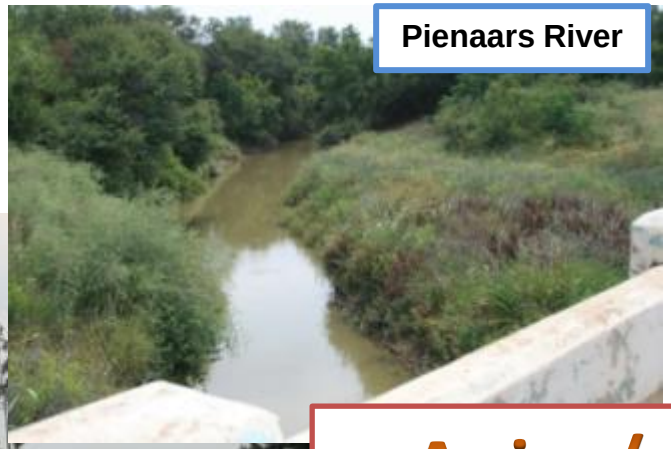


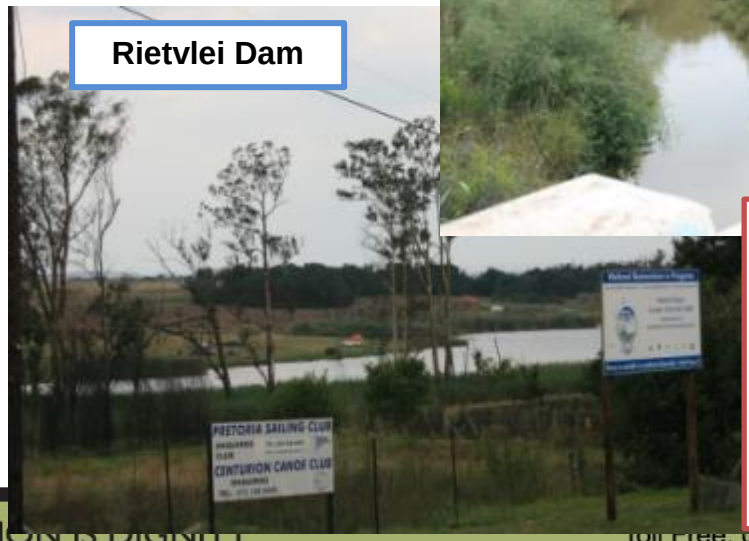
Elands River

Koster River

Elands River in Swartruggens

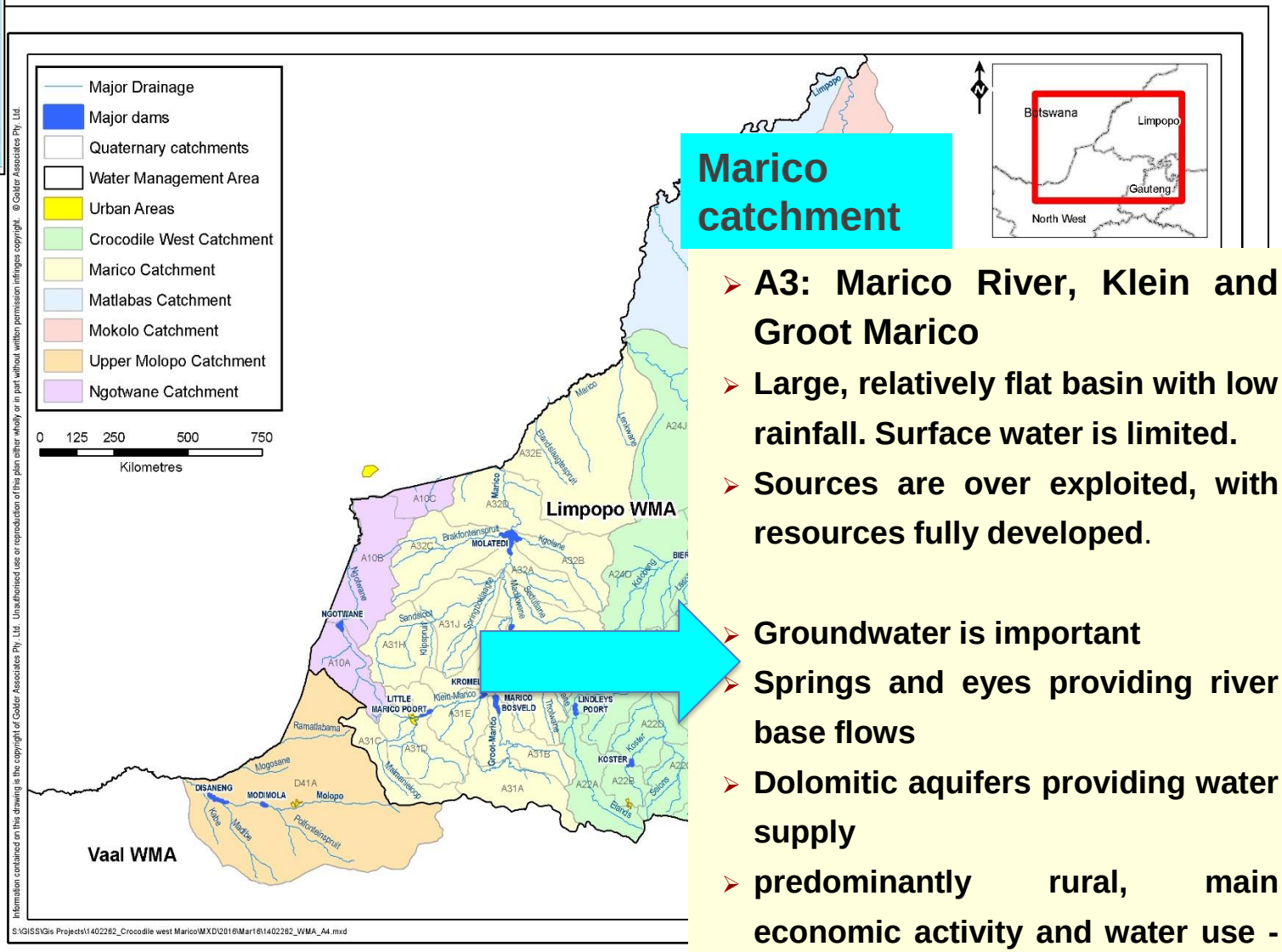






Apies/ Pienaars (A23)

STUDY AREA: MARICO SUB-CATCHMENT

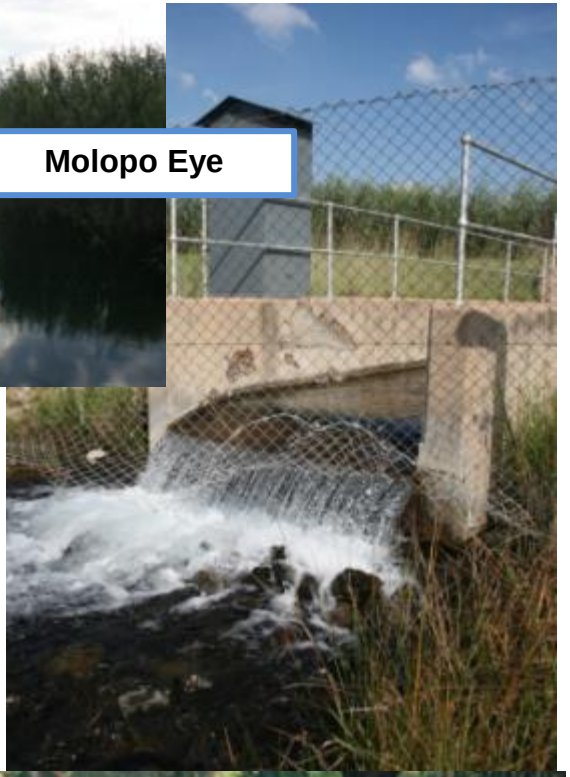


Marico catchment

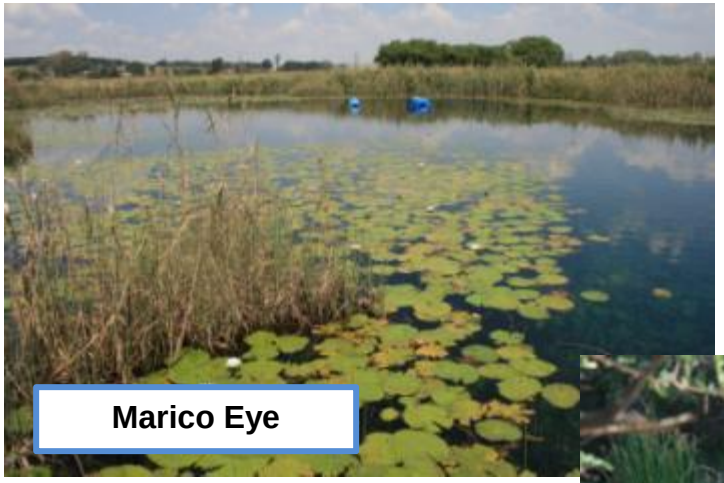
- **A3: Marico River, Klein and Groot Marico**
- **Large, relatively flat basin with low rainfall. Surface water is limited.**
- **Sources are over exploited, with resources fully developed.**
- **Groundwater is important**
- **Springs and eyes providing river base flows**
- **Dolomitic aquifers providing water supply**
- **predominantly rural, main economic activity and water use - irrigated agriculture, some mining.**
- **Zeerust and Marico**

Rietspruit

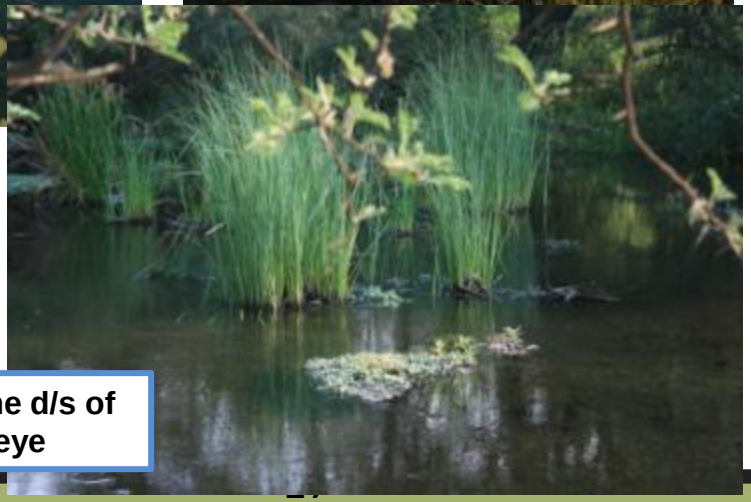
Molopo Eye



Kaal-oog-se Loop



Marico Eye



Malemane d/s of the eye

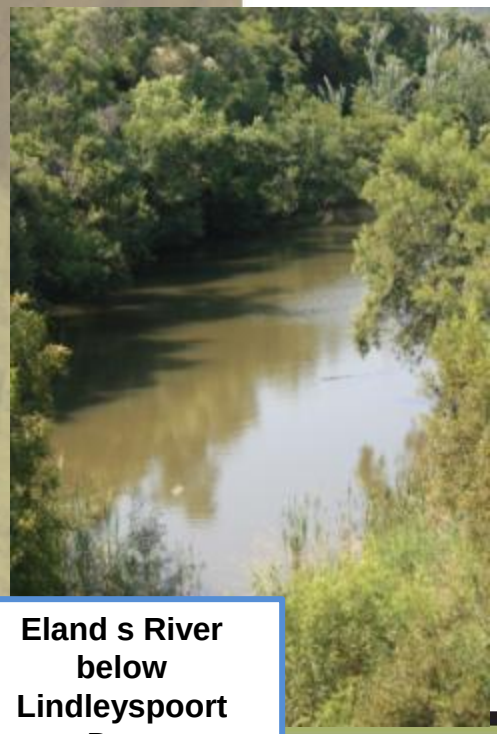
Marico (A31 and A32)

Marico (A31 and A32)

Groot-Marico d/s of the dam

Eland s River below Pilanesberg

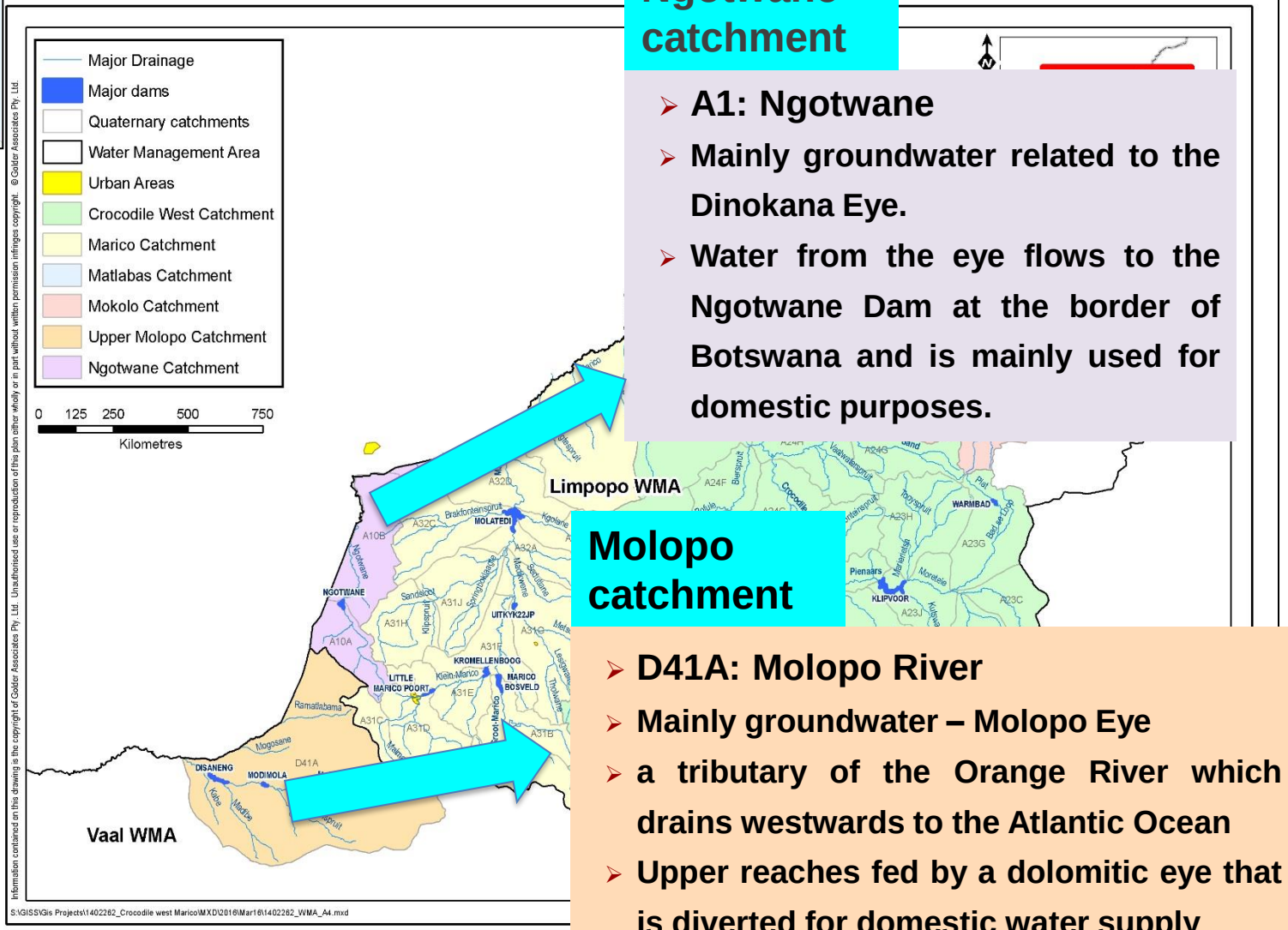
Selons above the confluence with the Elands



Eland s River below Lindleyspoort Dam

Bierspruit at Anglo Platinum

STUDY AREA: MOLOPO AND NGOTWANE SUB-CATCHMENTS



Ngotwane catchment

- **A1: Ngotwane**
- **Mainly groundwater related to the Dinokana Eye.**
- **Water from the eye flows to the Ngotwane Dam at the border of Botswana and is mainly used for domestic purposes.**

Molopo catchment

- **D41A: Molopo River**
- **Mainly groundwater – Molopo Eye**
- **a tributary of the Orange River which drains westwards to the Atlantic Ocean**
- **Upper reaches fed by a dolomitic eye that is diverted for domestic water supply**
- **Lower reaches important wetlands**
- **WQ impacts – Mafikeng**

4.3 PROCESS OF RESOURCE QUALITY OBJECTIVES DETERMINATION

STUDY PROCESS

This process

Step 1: Delineate the integrated units of analysis and define the resource units;

Step 2: Establish a vision for the catchment and integrated units of analysis;

Partly through WRCS

Step 3: Prioritise and select preliminary resource units for RQO determination;

We are here

Step 4: Prioritise sub-components for RQO determination and select indicators for monitoring;

Step 5: Develop draft resource quality objectives and numerical limits;

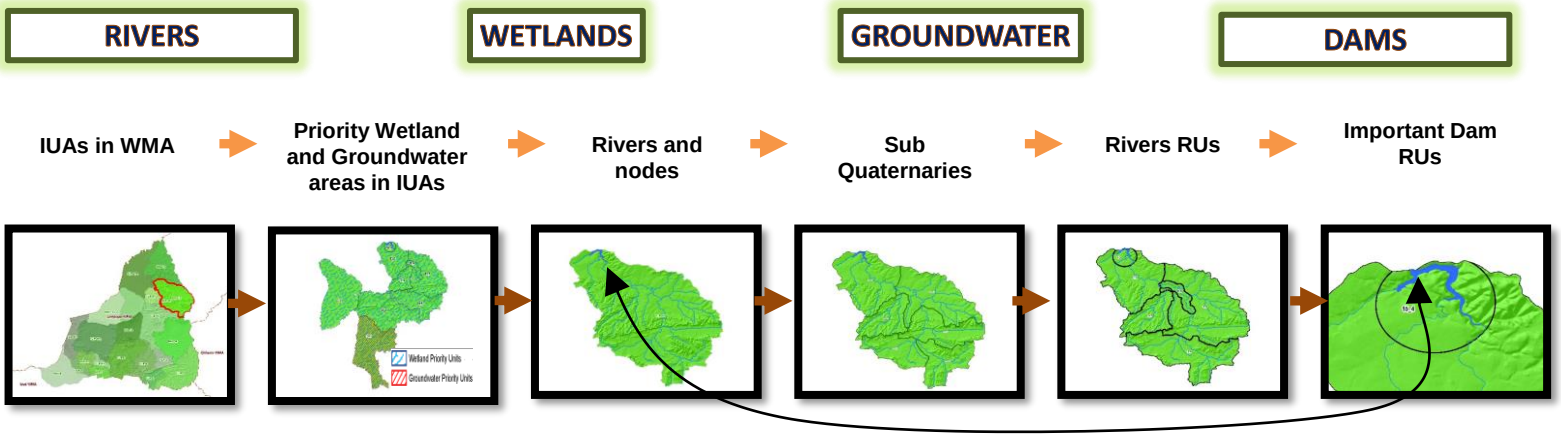
Step 6: Agree on resource units, RQOs and numerical limits with stakeholders;

Step 7: Finalise and gazette RQOs.

1& 3 Delineate and Prioritise RUs

RQOs DETERMINATION

- **Water Resource components** → Rivers, Wetlands, Groundwater and Dams



- **Scale of RQOs**
  - **Rivers → Resource Units (RUs)**
  - **Wetlands → Important systems within River RU scale**
  - **Groundwater → Important systems with River RU scale and Aquifer systems on regional scale**
  - **Dams → Priority units (Dam RUs)**

4.4 RESOURCE UNITS DELINEATION

RQOs ARE DETERMINED FOR A RESOURCE UNIT

DELINEATION OF RESOURCE UNITS (RU)

Integrated Units of Analysis - IUAs

- **Based on the Water Resource Classification (WRC)**
  - **IUAs for the catchment area were delineated**
- **Based on the Preliminary Reserve**
  - **the EWR sites and nodes were specified.**
- **These IUAs form the basis for the RQO determination, and primarily for the RU definition .**

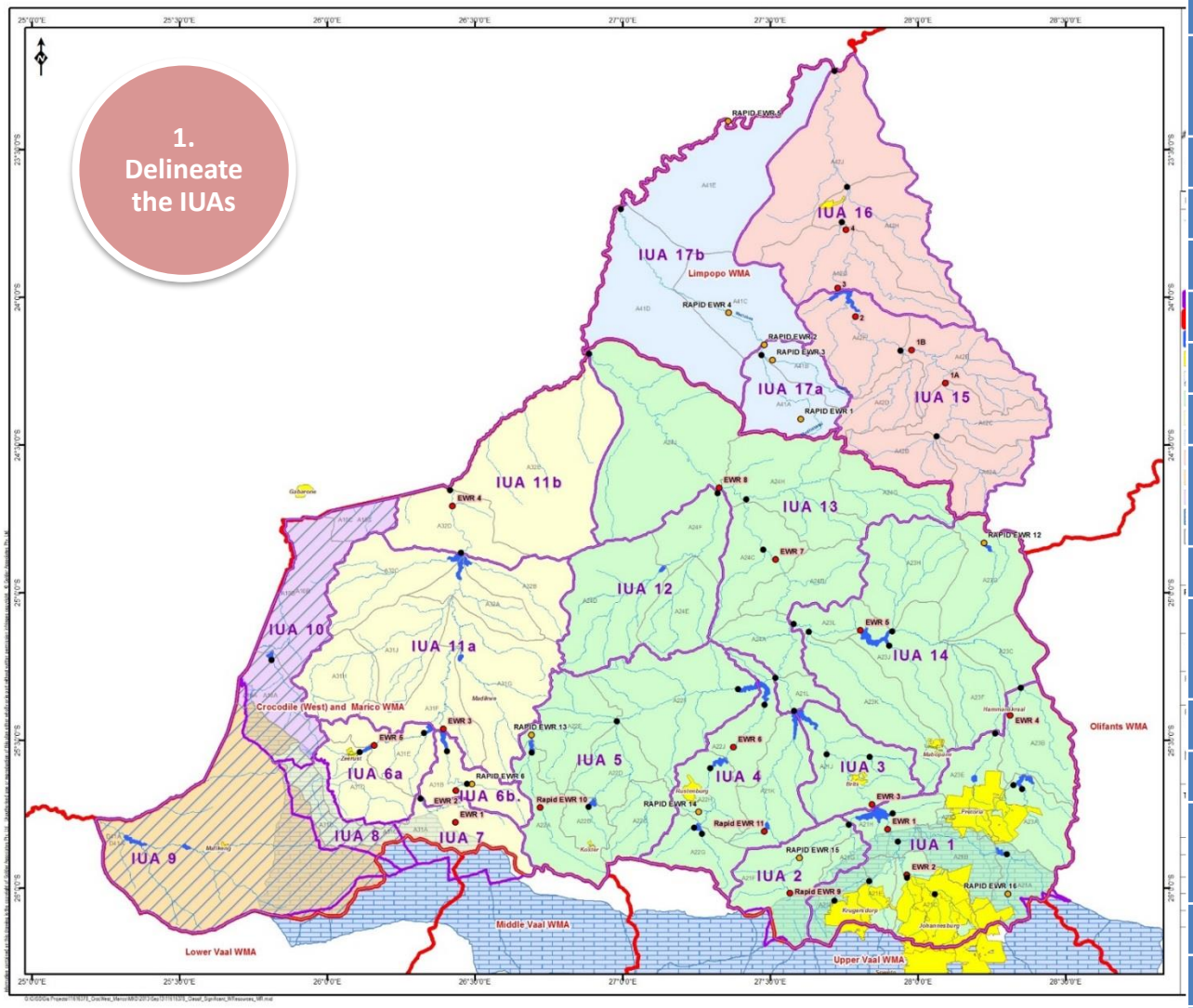
DELINEATION OF RESOURCE UNITS

Integrated Units of Analysis - IUAs

- **Each integrated unit of analysis (IUAs) represents a homogenous catchment area of similar impacts which must be considered in the determination of RQOs.**
- **In terms of the Mokolo, Matlabas, Crocodile (West) and Marico WRC study, 20 IUAs were delineated**

INTEGRATED UNITS OF ANALYSIS (IUAs)

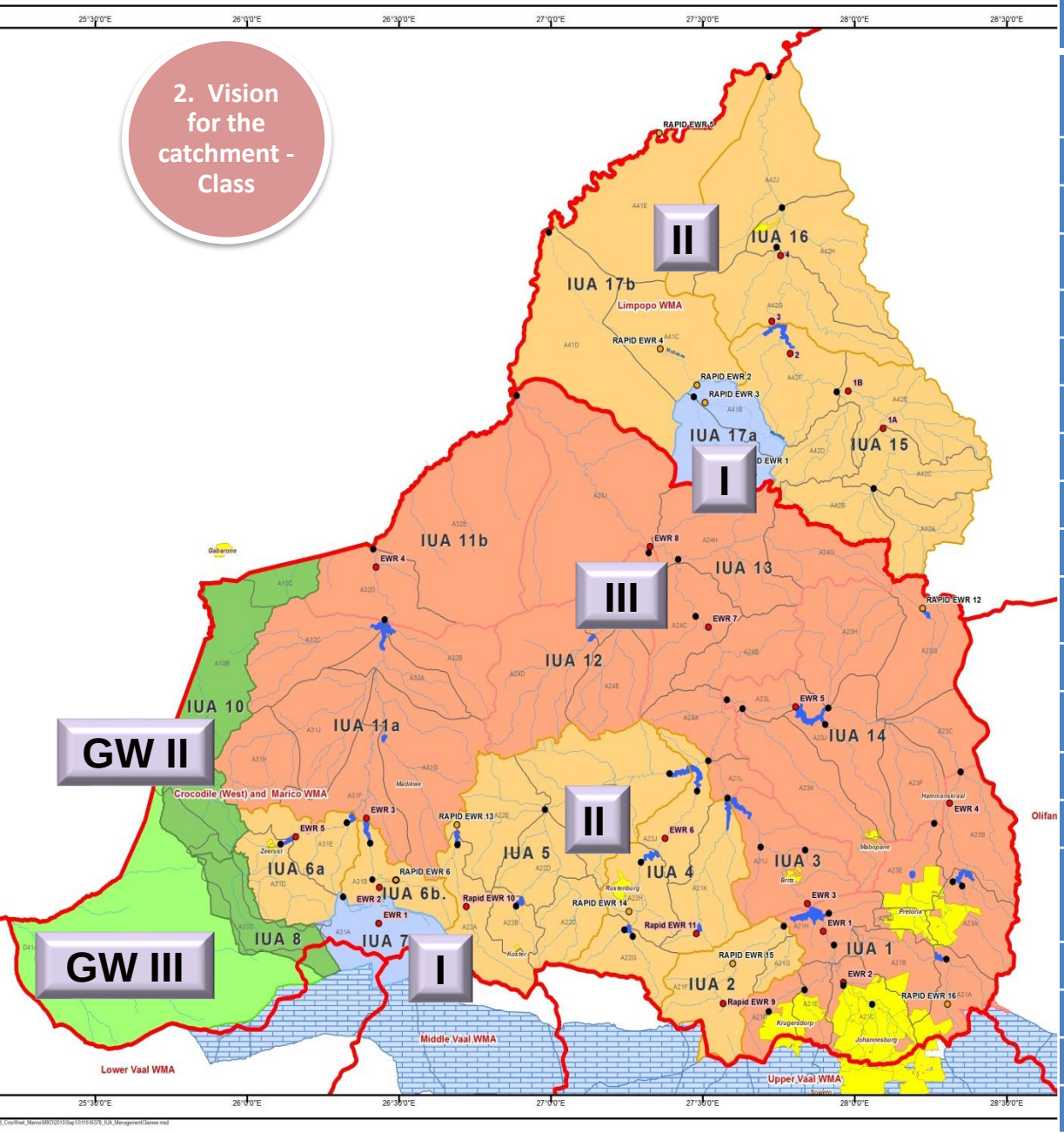
1. Delineate the IUAs



IUA No.	Main river system/ IUA name
1	Upper Crocodile/Hennops/ Hartebeespoort
2	Magalies
3	Crocodile/Roodekopjes
4	Hex/Waterkloofspruit/ Vaalkop
5	Elands/Vaalkop
6a	Klein Marico
6b	Groot Marico
7	Kaaloog-se-Loop
8	Malmaniesloop
9	Molopo
10	Dinokana Eye/Ngotwane Dam
11a	Groot Marico/Molatedi Dam
11b	Groot Marico/seasonal tributaries
12	Bierspruit
13	Lower Crocodile
14	Tolwane/Kulwane/Moretele/ Klipvoor
15	Upper Mokolo
16	Lower Mokolo
17a	Mothlabatsi/Mamba
17b	Matlabas

Proposed Water Resource Classes

2. Vision for the catchment - Class

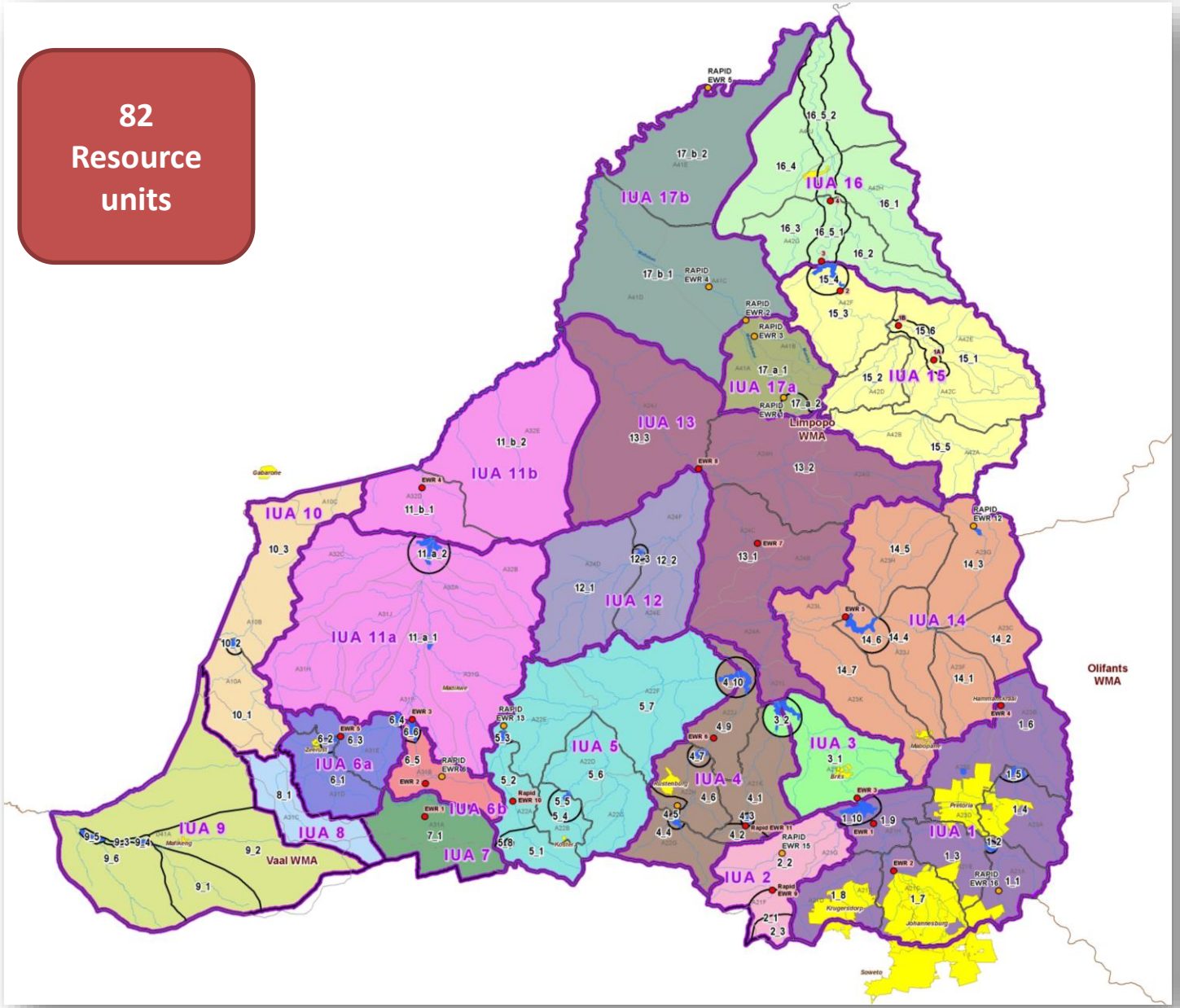


IUA No.	IUA and (Class)
1	Upper Crocodile/Hennops/ Hartebeespoort (III)
2	Magalies (II)
3	Crocodile/Roodekopjes (III)
4	Hex/Waterkloofspruit/ Vaalkop (II)
5	Elands/Vaalkop (II)
6a	Klein Marico (II)
6b	Groot Marico (II)
7	Kaaloog-se-Loop (I)
8	Malmaniesloop (GW II)
9	Molopo (GW III)
10	Dinokana Eye/Ngotwane Dam (GW II)
11a	Groot Marico/Molatedi Dam (III)
11b	Groot Marico/seasonal tributaries (III)
12	Bierspruit (III)
13	Lower Crocodile (III)
14	Tolwane/Kulwane/Moretele/Klipvoor (III)
15	Upper Mokolo (II)
16	Lower Mokolo (II)
17a	Mothlabatsi/Mamba (I)
17b	Matlabas (II)

DELINEATION OF RESOURCE UNITS

- A RU is a section of a water resource within an IUA that is sufficiently ecologically distinct to warrant its own specification of RQOs.
- 82 resource units delineated
  - for the Mokolo, Matlabas, Crocodile (West) and Marico catchments
    - 61 RUs – rivers, groundwater priority areas and priority wetlands/wetland clusters
    - 21 dam RUs

82
Resource
units



RQO PROCESS

Step 1: Delineate the integrated units of analysis and define the resource units;

Step 2: Establish a vision for the catchment and integrated units of analysis;

Step 3: Prioritise and select preliminary resource units for RQO determination;

Step 4: Prioritise sub-components for RQO determination and select indicators for monitoring;

Step 5: Develop draft resource quality objectives and numerical limits;

Step 6: Agree on resource units, RQOs and numerical limits with stakeholders;

Step 7: Finalise and gazette RQOs.

4.4 RESOURCE UNITS PRIORITISATION

WHERE SHOULD RQOs BE SET? (Priority)

PRIORITISATION OF RESOURCE UNITS

- **RQOs for each resource unit:**
  - **May not always possible due the potentially large number of RUs that could be delineated for a catchment.**
- **A rationalisation process has therefore been developed as part of the RQO Determination Procedure (DWA, 2011)**
- **Resource Unit Prioritisation Tool**
  - incorporates a multi criteria decision analyses approach to assess the importance of monitoring each RU as part of management operations to identify important RUs
- **Objective – to prioritise and select the most useful RUs for RQO determination**
- **Present today and agree on RUs for RQO development**

PRIORITISATION OF RESOURCE UNITS

Criterion	Sub-criteria rating (0: low, 0.5: moderate or 1:high) per criterion per RU
Position of RU within IUA	• Resource Units located on large main stem river at the downstream end of the IUA (IUA outlet node)
Assessment of the importance of each Resource Unit to users	• Resource units which provide important cultural services to society • Resource units which are important in supporting livelihoods of significant vulnerable communities • Resource units which are important in meeting strategic requirements and international obligations • Resource units that provide supporting and regulating services • Resource units most important in supporting activities contributing to the economy (GDP & job creation) in the catchment (e.g. commercial agriculture, industrial abstractions and bulk abstractions by water authorities)
Level of threat posed to the water resource quality for users	• Level of threat posed to users
Ecological importance	• Ecological Importance and Sensitivity Categories (EIS) • Present Ecological State (PES) and Nested Ecological category (NEC) • National Freshwater Ecosystem Priority Areas • Priority habitats/species identified in provincial conservation plans
Threat posed to the water resource quality for the environment	• Level of threat posed to the ecological components of the resource unit
Management considerations	• Resource Units with PES lower than a D category or lower than the accepted gazetted category (NEC)
Practical considerations	• Availability of EWR site data or other monitoring data (RHP, DWA gauging weirs) located within reach • Accessibility of resource units for monitoring • Safety risk associated with monitoring resource unit

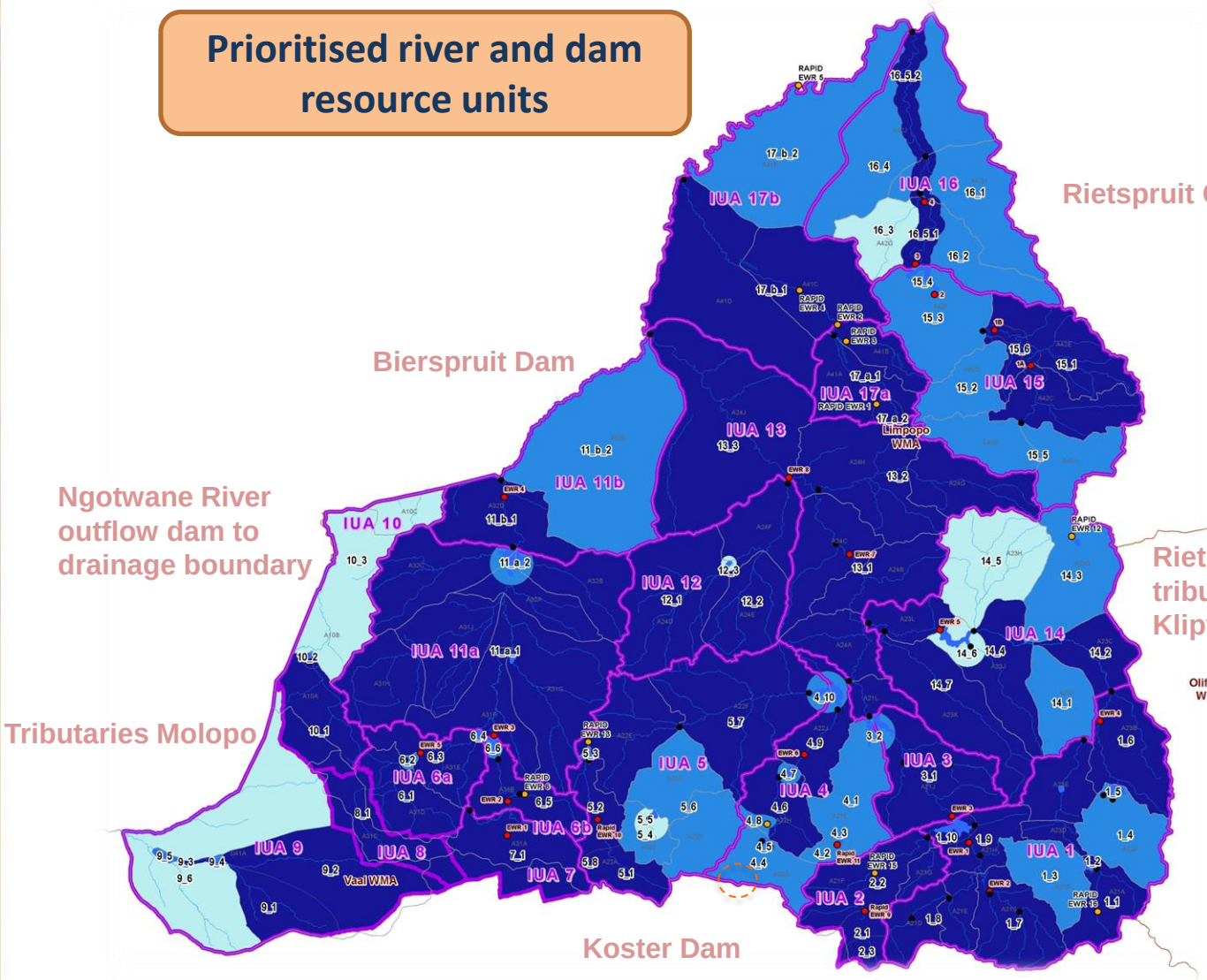
RESOURCE UNIT PRIORITISATION

Not prioritised

Medium Priority

High Priority

Prioritised river and dam resource units

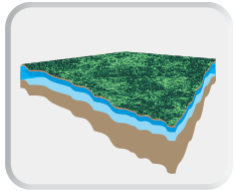


Groundwater Priority Systems

PRIORITISATION OF GROUNDWATER RESOURCE UNITS

- **Resource Unit Prioritisation Protocol - Aquifers with:**
  - **Potential for supplying Good Water Quality; and having a**
  - **Moderate to Significant Ratings (*i.e.* high recharge potential).**
- **Objective – to prioritise and select the most useful RUs for groundwater RQO determination:**
  - **Potential to over-utilise aquifer (*i.e.* high yielding aquifers); and**
  - **Potential to pollute aquifer system (mining/industrial/irrigation) and**
  - **Interaction with other water resources (*i.e.* stream depletion factors).**
- **Key parameters/considerations:**
  - **Aquifer water quality (hydrochemistry);**
  - **Aquifer saturation levels (i.e. water level / water level elevations);**
  - **Abstraction rates versus aquifer recharge (Stress Index); and**
  - **Land use activities on Moderate to Significant Aquifers (Rating).**

GROUNDWATER
RQO DETERMINATION



Criteria considered:

- **Importance to users**
- **Threat posed to users**
- **Practical considerations, and**
- **Degree of surface-groundwater interaction**

PRIORITISATION OF GROUNDWATER RESOURCE UNITS

- **Four Main Aquifer Types and focus of RQOs:**
  - **Alluvial (Intergranular) Aquifers (major drainages) – Focus on:**
    - **Abstraction Yields and generating Return Flows to streams, in**
      - **Lower Marico, Lower Crocodile (West) and Lower Mokolo Rivers**
  - **Dolomite Water Areas (Karst aquifers*) – Focus on:**
    - **Abstraction Rates (balanced with catchment recharge values);**
    - **Water quality protection (highly vulnerable to pollution); and**
    - **Recreational value (Dolomitic Eyes and associated Wetlands).**
  - **Intergranular and Fractured Aquifers (Basement Rocks, Granitiods and Younger Karoo Sediments) –**
    - **Abstraction Rates (balanced with local recharge values); and**
    - **Water quality impact as the result of large scale irrigation/mining.**
  - **Fractured Aquifers (quartzites, sandstones and volcanic formations) –**
    - **Abstraction Rates (balanced with local recharge values); and**
    - **Water quality impact as the result of industrial/mining activities.**

Alluvial aquifer systems along major drainage channels (shown the lower Crocodile (West) river between Thabazimbi and Limpopo Confluence.

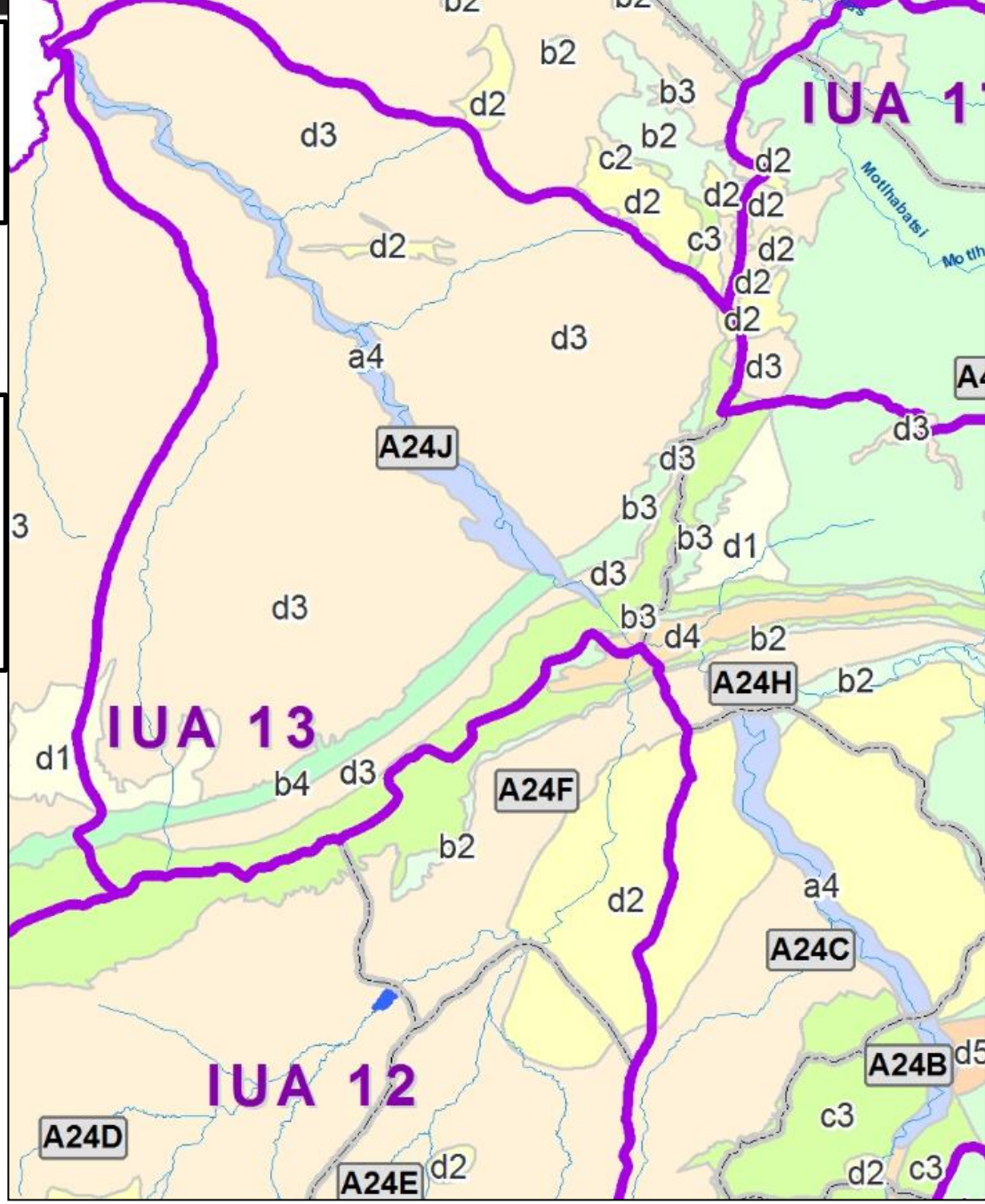
RQOs:

Water supply protection;

Impacts: Industrial pollution;

Impacts: Over-utilizing;

Impacts: Ground stability.



Delineation of the Centurion, Pretoria and Rietvlei-Kempton Park dolomite resources

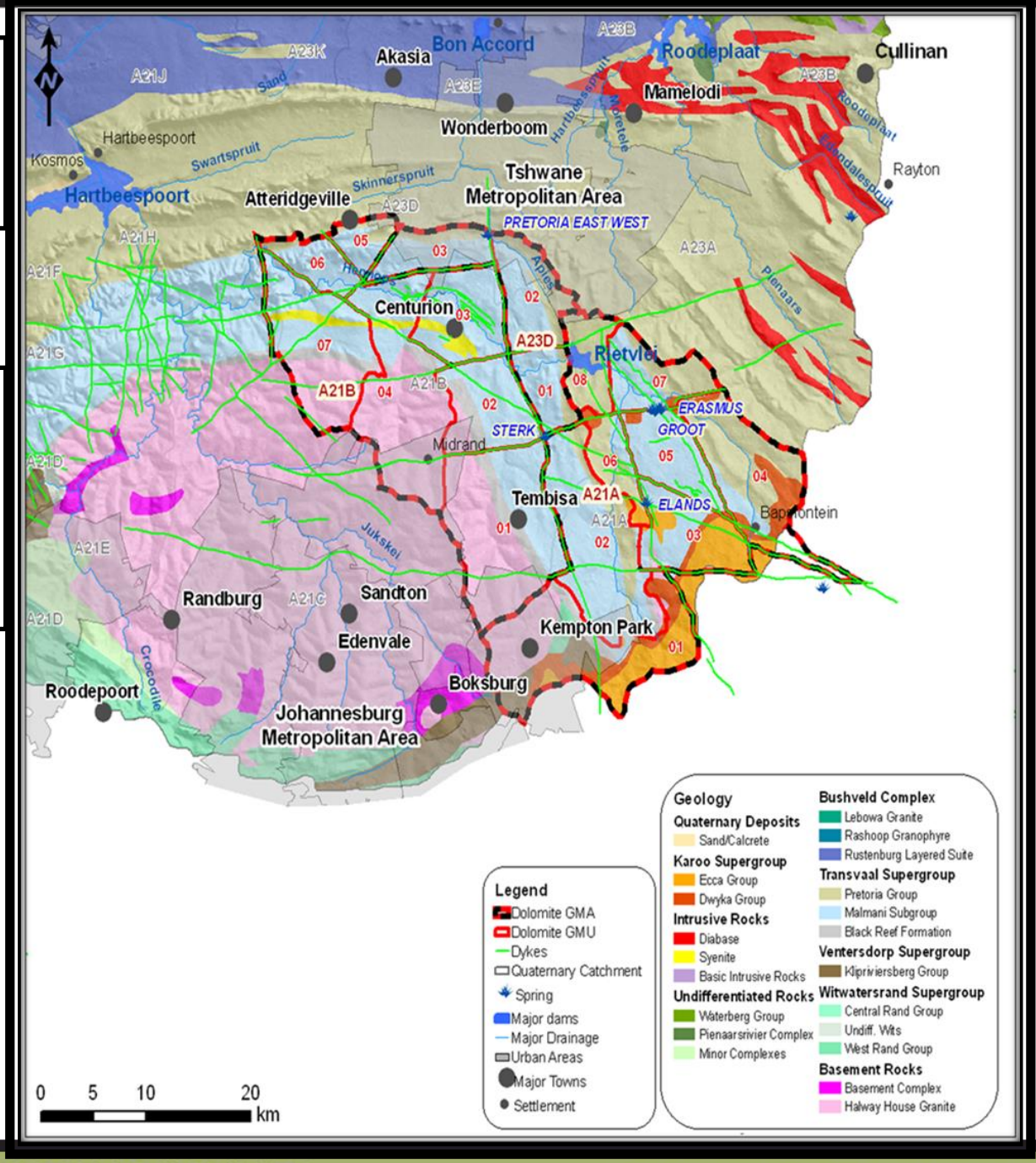
RQOs:

Water supply protection;

Impacts: Industrial pollution;

Impacts: Over-utilization;

Impacts: Ground stability;

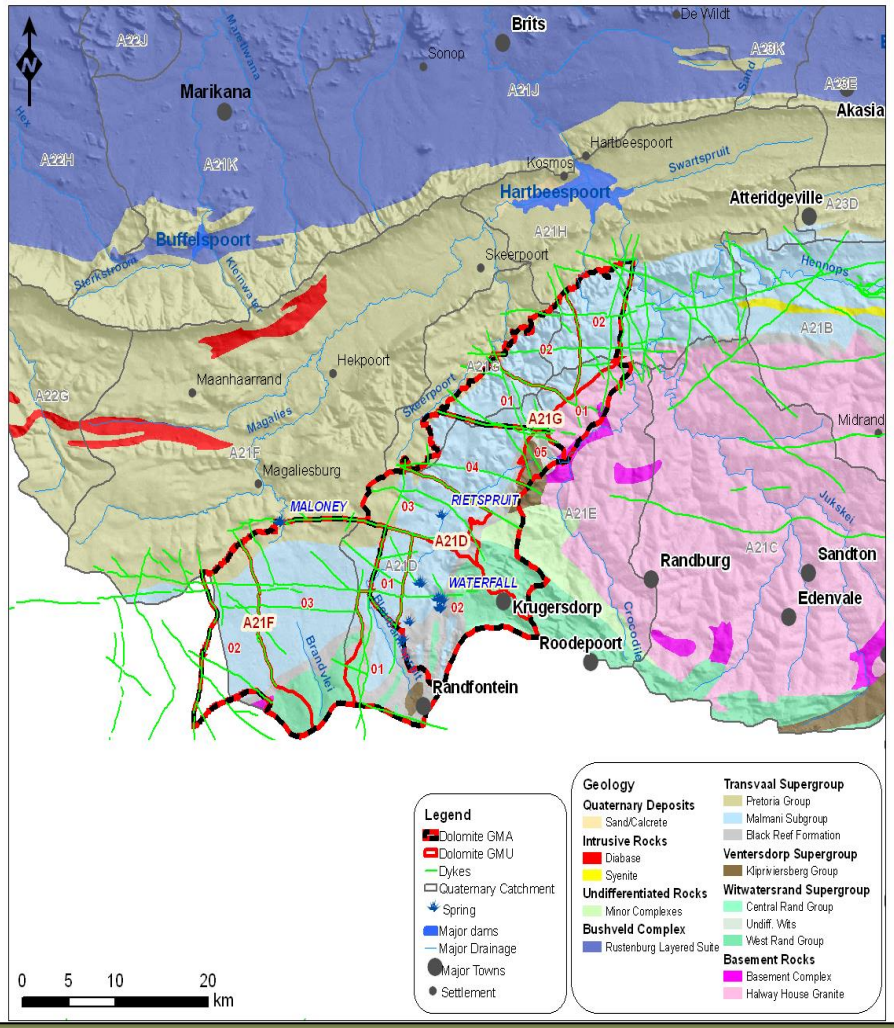


Maloney's Eye (Steenkoppies Catchment and Tarlton dolomite resources

RQOs:

Water supply protection and specified discharges (Maloney's Eye) downstream of Eyes.

Impacts: Industrial pollution and Over-utilization.



Upper-Molopo Catchment, Marico/Holpan and Dinokana-Zeerust dolomite resources

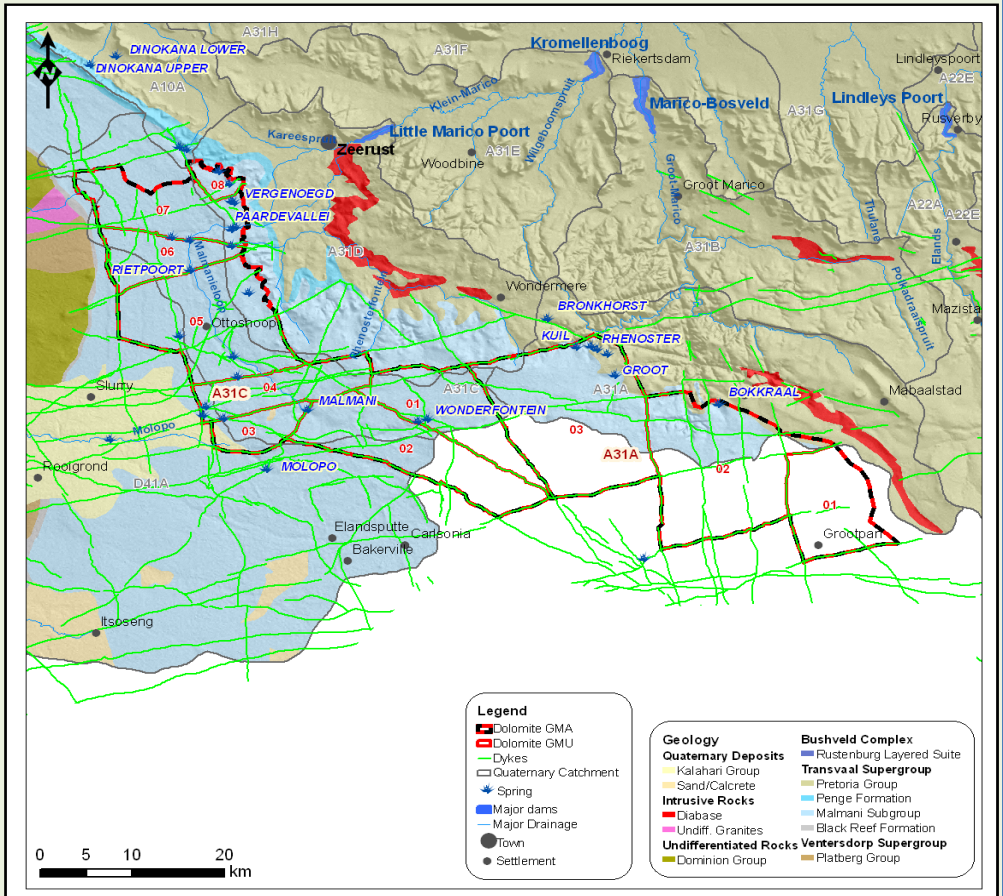
RQOs:

Water supply protection and discharges to downstream users.

Impacts: Mining/domestic pollution;

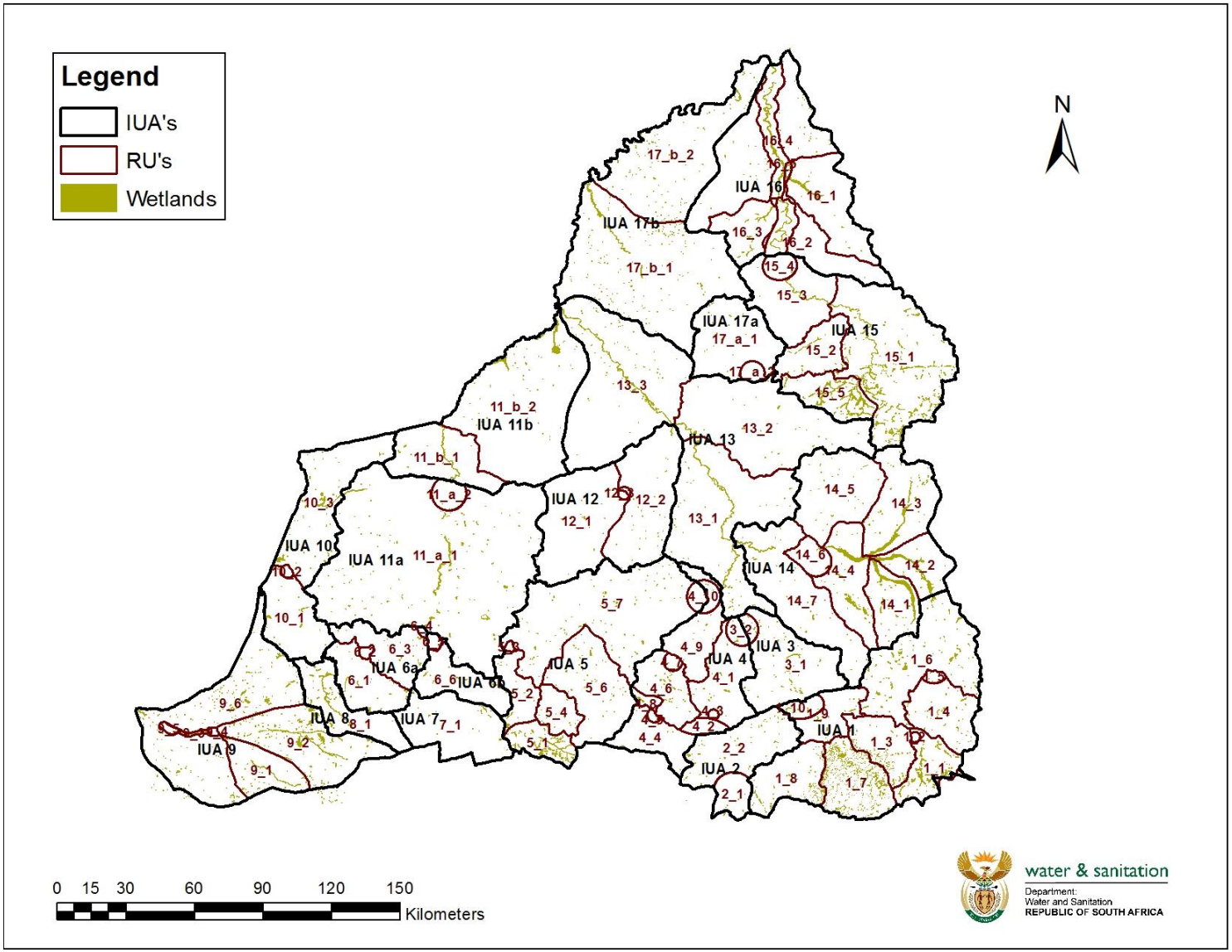
Impacts: Regional over-utilization of resources;

Impacts: Deterioration of major wetland areas.



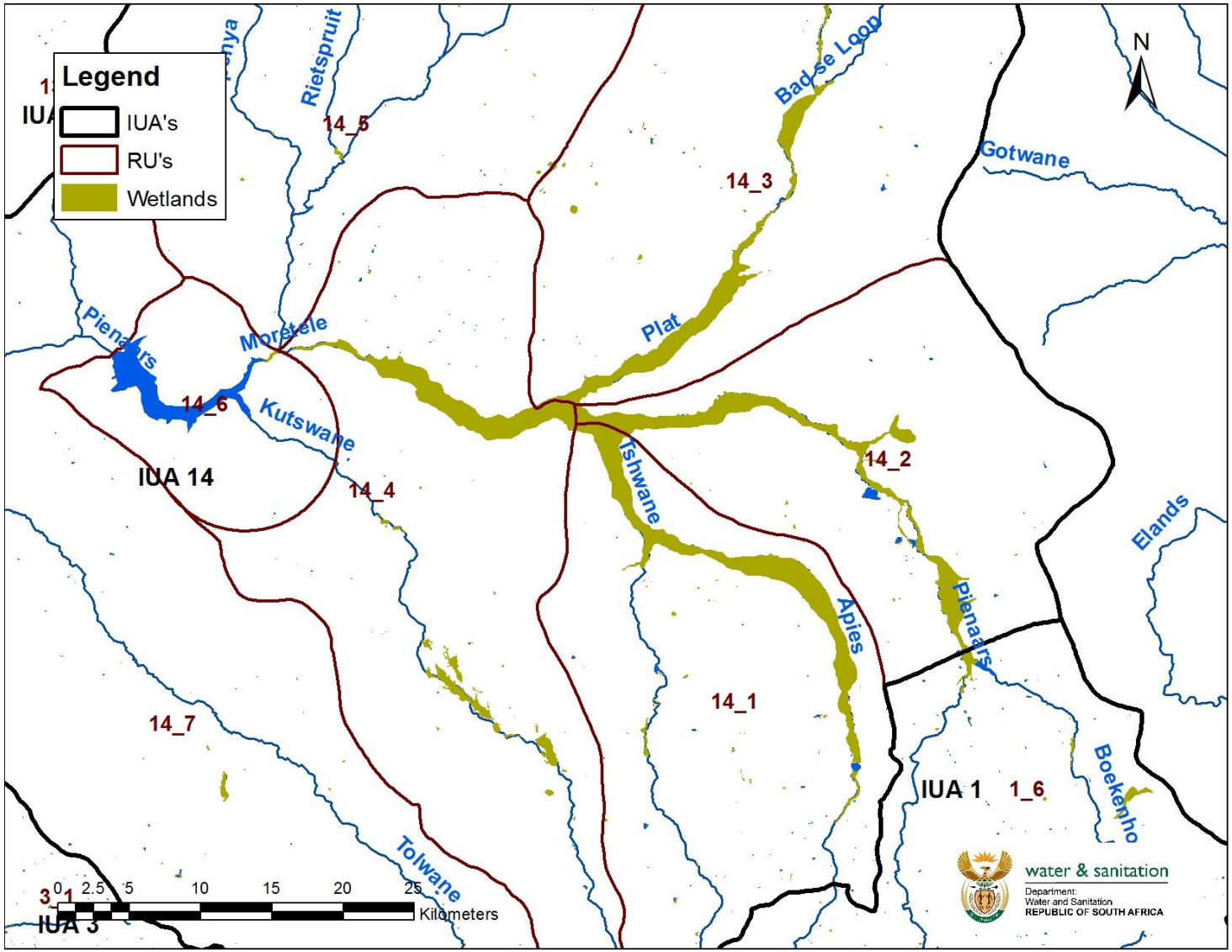
Wetland Priority Systems

Priority Wetland Systems/Clusters



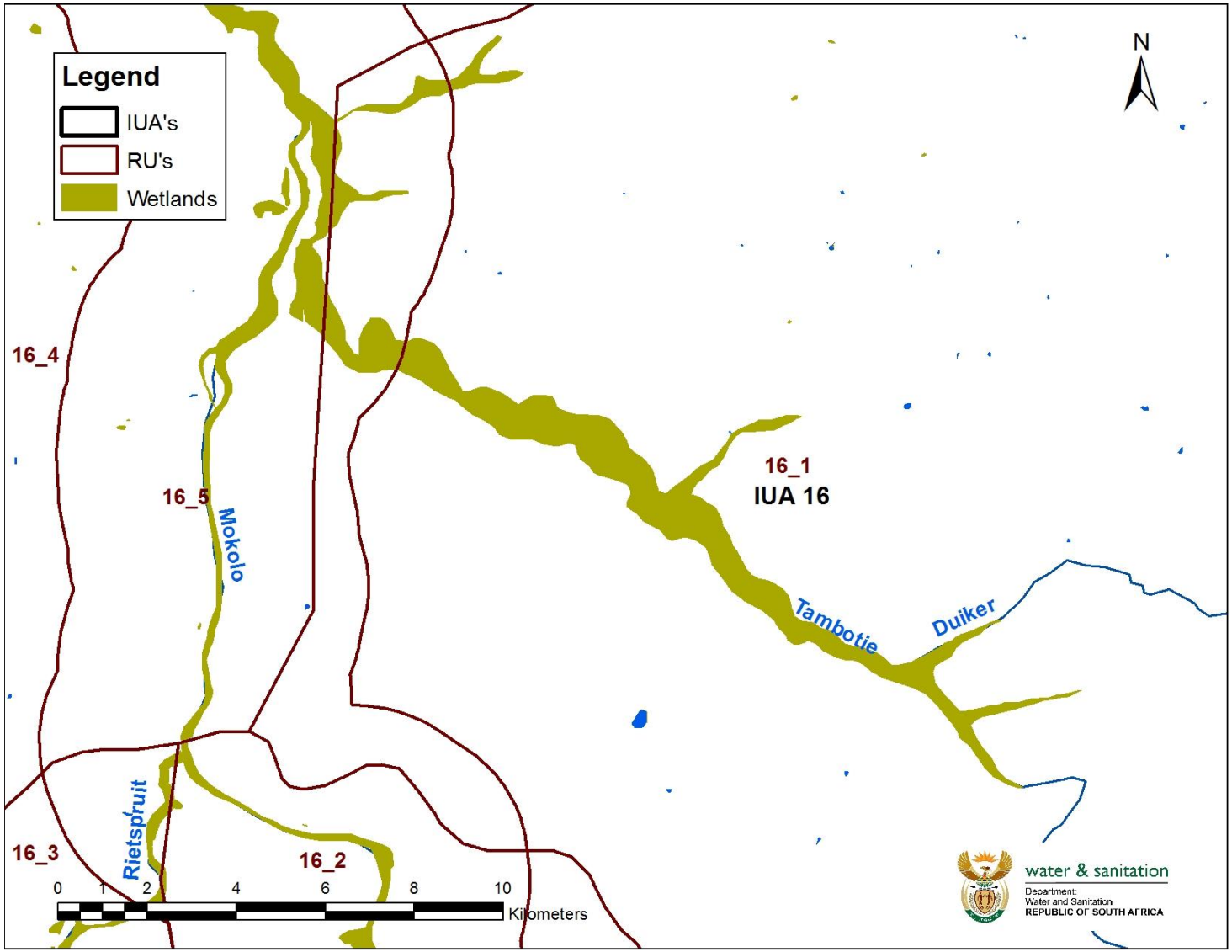
Priority Wetlands

Moretele River Floodplain



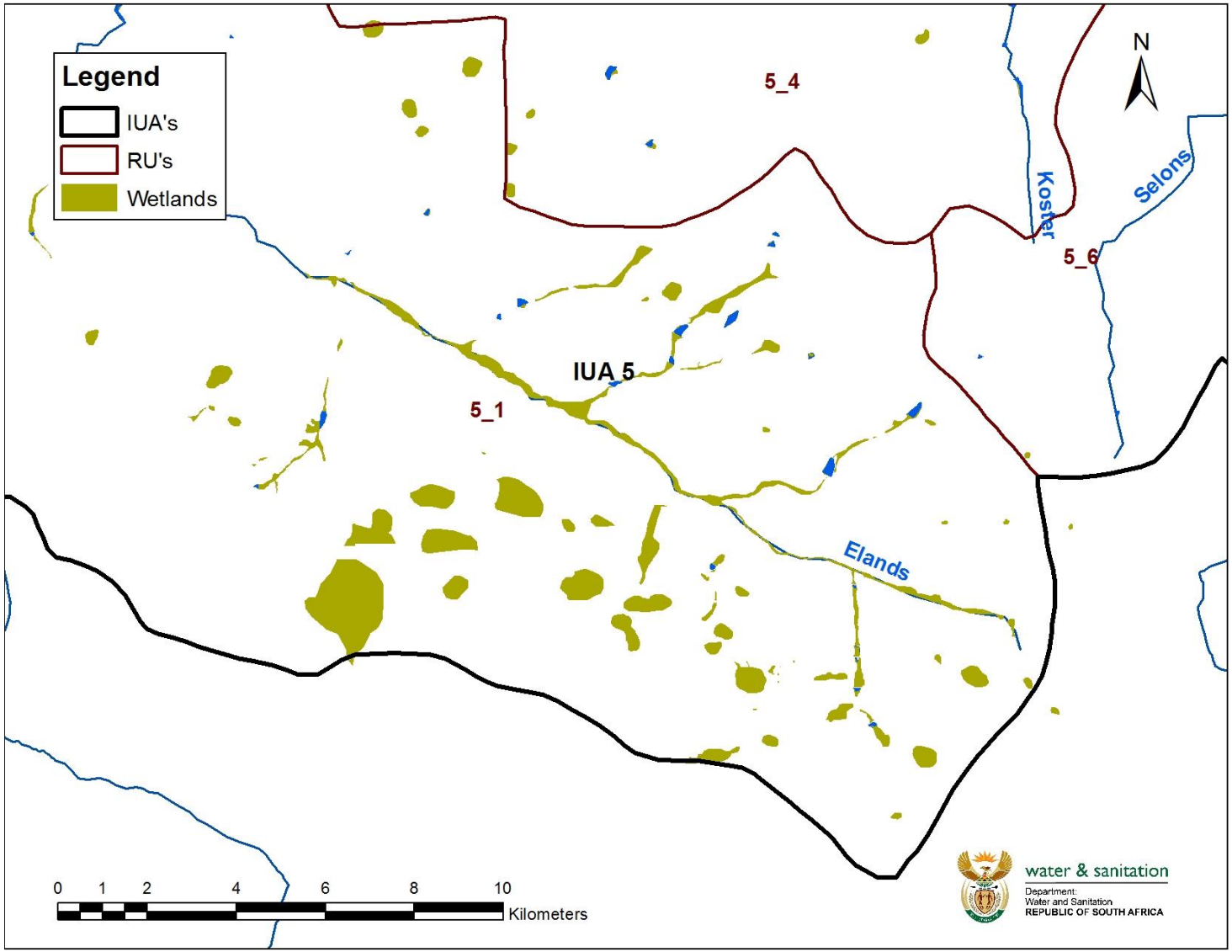
Priority Wetlands

Tambotie River Floodplain



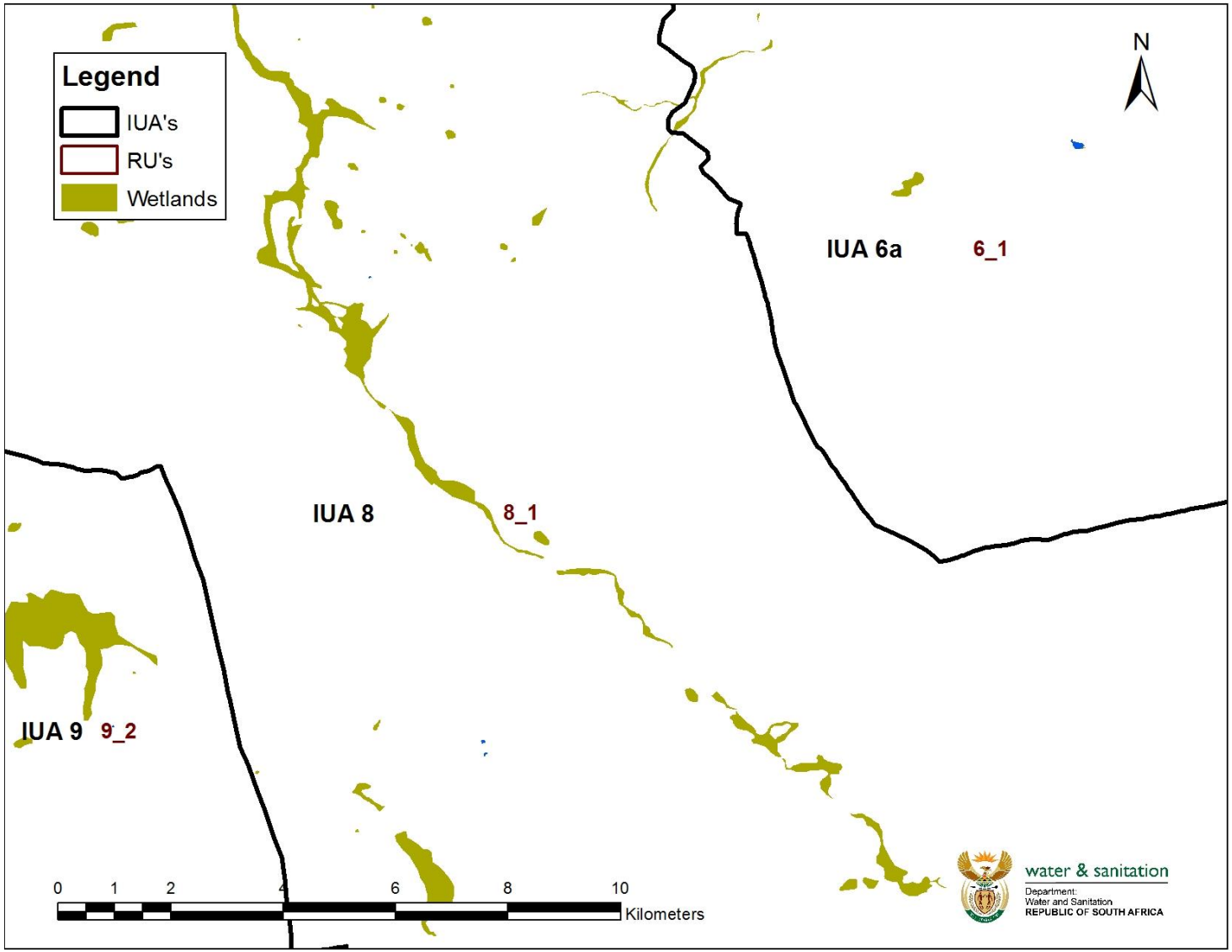
Priority Wetlands

Pan complex – headwaters of the Elands River



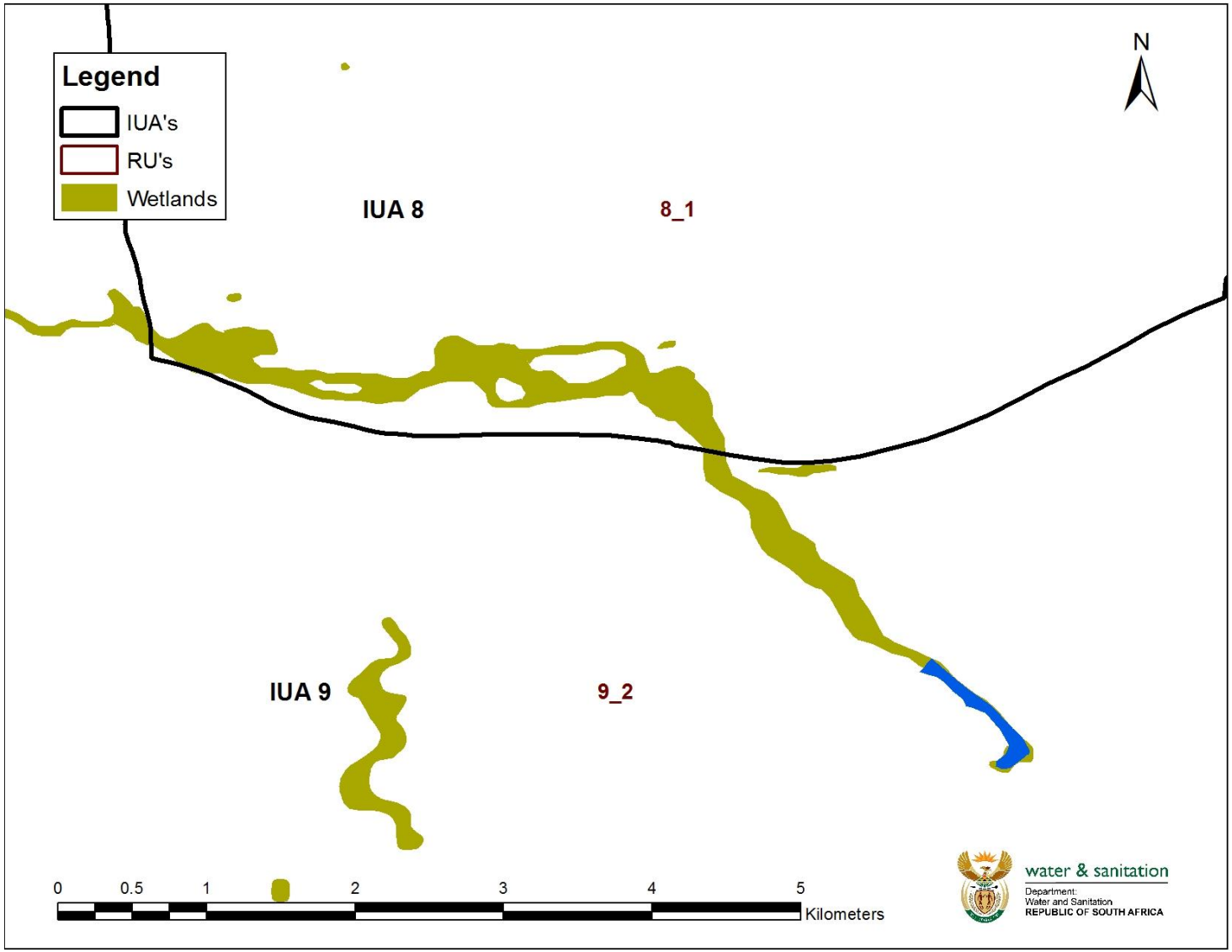
Priority Wetlands

Upper Malmanie River – peatland system



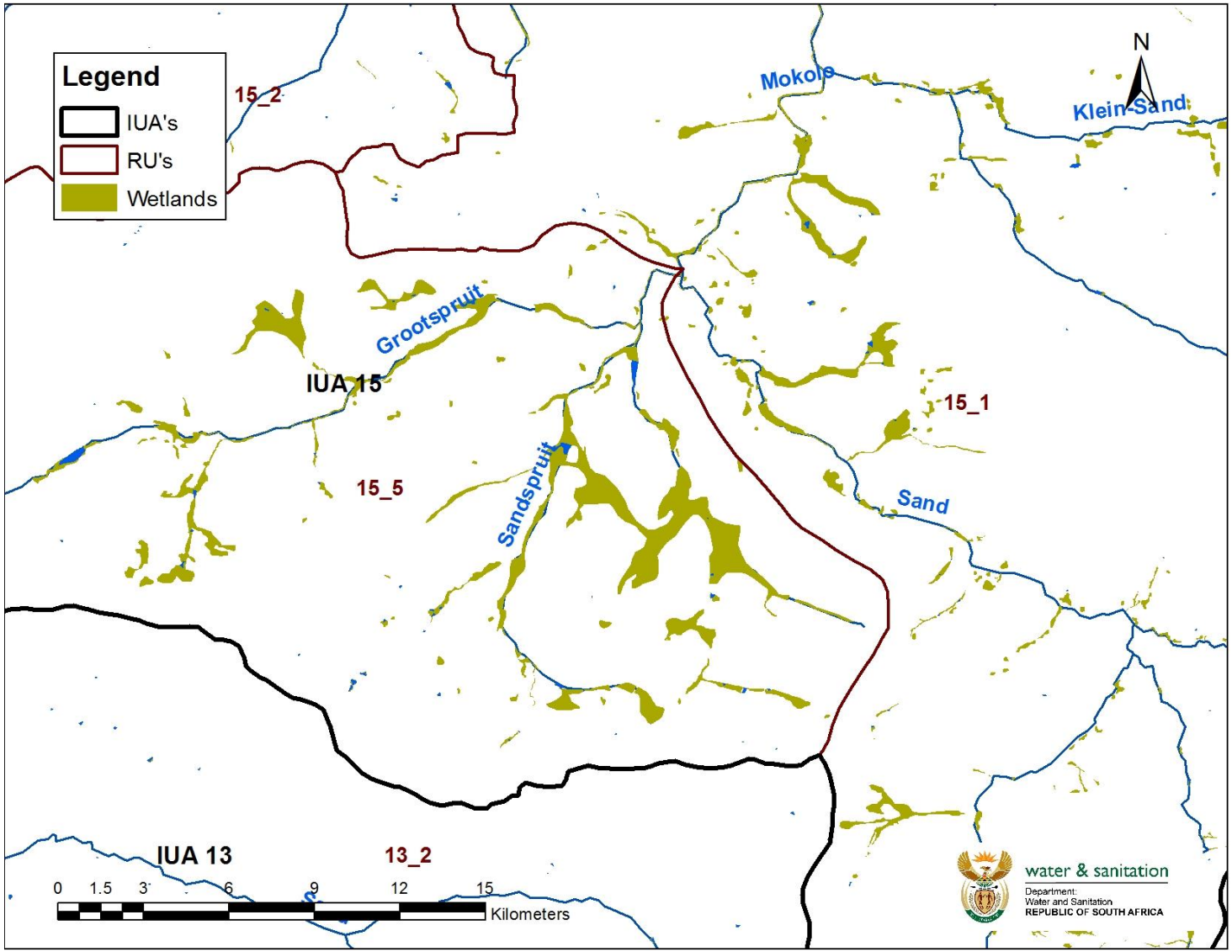
Priority Wetlands

Upper Molopo River – peatland system



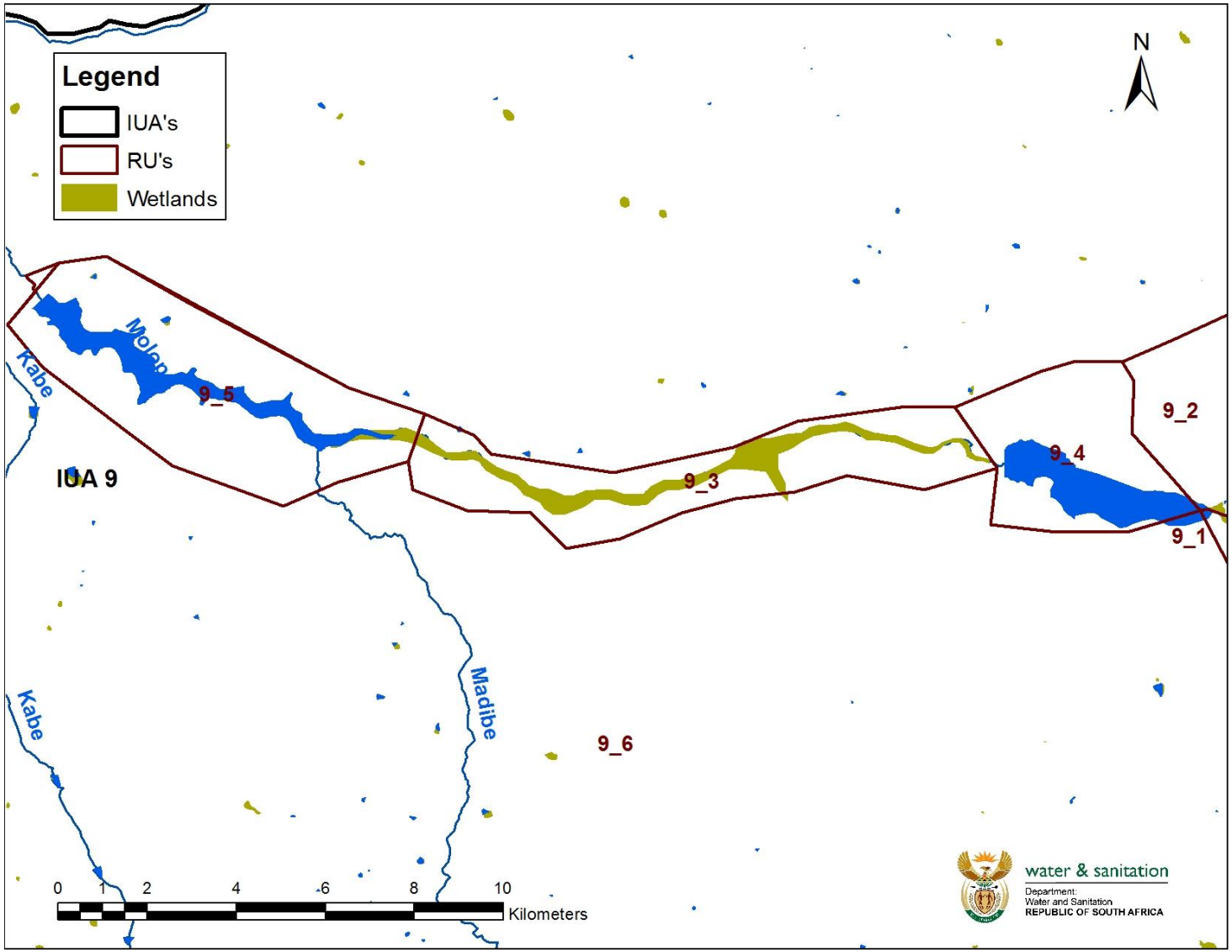
Priority Wetlands

Wetland complex - headwaters of the Mokolo River



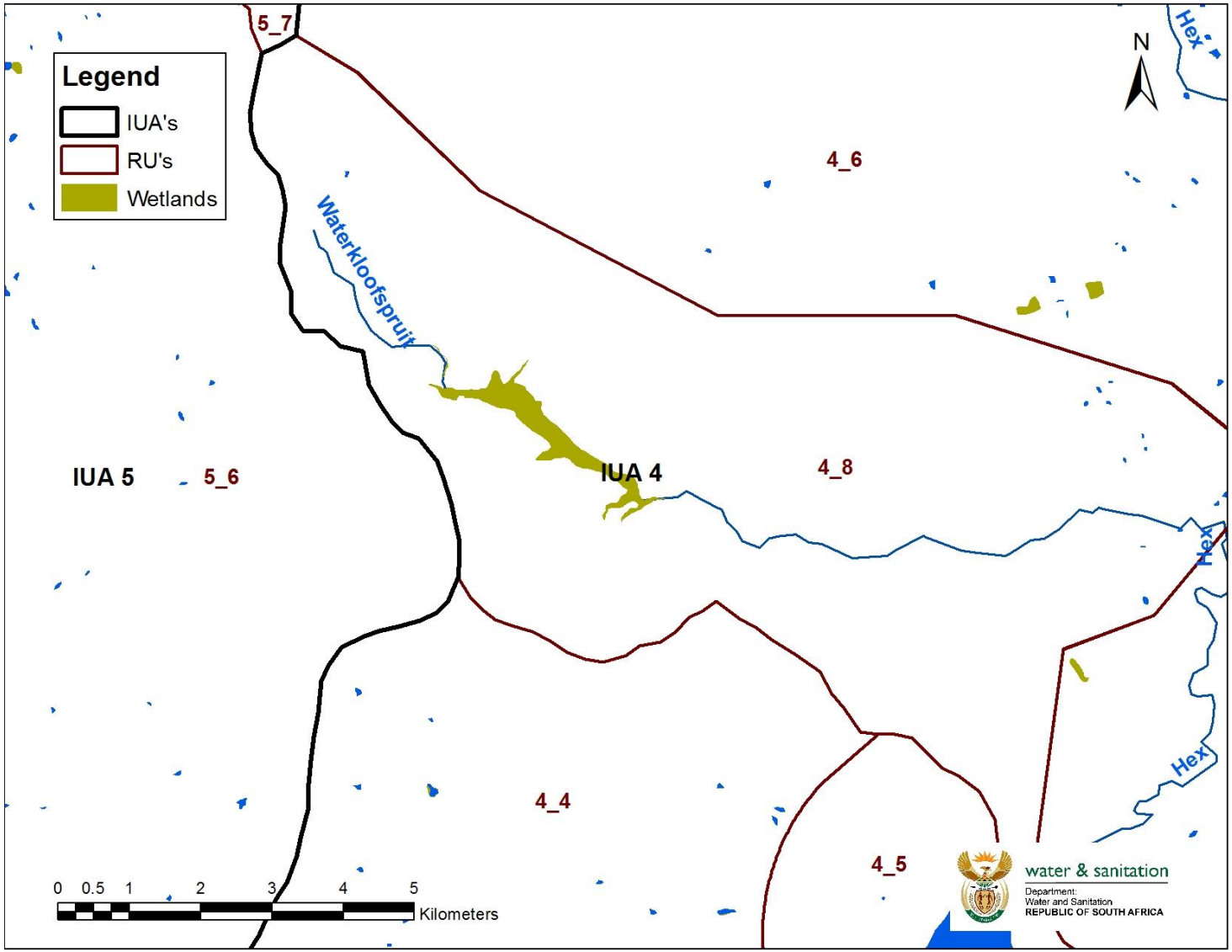
Priority Wetlands

Wetland system – lower reaches of the Molopo River



Priority Wetlands

Waterkloofspruit peatland



Priority Wetlands

Other systems

IUA	RU	Wetland	Type	Unique features
IUA 1	1_1	Rietvlei wetland complex	Peatland	Peatlands
	1_4	Colbyn Valley wetland	Peatland	Peatlands
IUA 2	2_1	Maloney's eye	Dolomitic eye and peatland	Dolomitic eye
IUA 7	7_1	Marico eye (Kaaloog se Loop)	Valley bottom Peatland	Dolomitic eye
IUA 9	9_1	Bodibe peatland	Unchannelled valley bottom wetlands	Potfontein eye and Bodibe peatland.
IUA 10	10_1	Ngotwana Wetland	Unchannelled valley bottom wetland and spring	High biodiversity wetland in semi-arid climate with its source in Botswana. Important grazing and water resource for local community
	10_1	Dinokana eye and Wetland	Unchannelled valley bottom, spring and hillslope seepage wetlands	High biodiversity wetland and important for water supply
IUA 11b	11_b_1	Lower Marico River	Riparian zone and floodplains	Old growth riparian forest assemblages, floodplain features, paleo-channels as well as backwater features
	11_b_2	Lengope la Kgamanyane River	Floodplain	-
	11_b_2	Lenkwane River	Floodplain	-
IUA 13	13_3	Sections of the Crocodile River	Riparian zone, off-channel wetlands, backwaters and floodplains	Riparian zone, floodplain and off-channel features
IUA 14	14_4	Tswaing Crator	Depression	Unique endorheic system
IUA 16	16_5	Mokolo River and floodplain	Floodplain	Old growth riparian forest assemblages, alluvial aquifer and floodplain as well as backwater features
IUA 17b	17_b_1	Lower Matlabas River	Valley bottom wetland	-
	17_b_1	Aslaagte	Valley bottom wetland	-
	17_b_2	Limpopo River and associated riparian zone and floodplain features	Riparian zone and floodplains	Old growth riparian forest assemblages, floodplain features, paleo-channels as well as backwater features
	17_a_2	Matlabas Peatland/Mire	Valley bottom wetland	Peatland in the headwaters of a tributary of the Motlhabatsi River

Wetlands

- Review of the categorisation of the priority systems (condition and ecological importance and sensitivity) – for those where this information is available.
- Consider and recommend targeted Ecological Categories for the priority wetlands where possible. This will largely be based on information already available but revised where necessary based on site visits to the priority systems.
- Recommend ecological specifications (protection, management, mitigation and monitoring measures) for the priority systems and where possible.
- RQOs will be determined where sufficient data are available for this purpose. At this stage it is considered likely that this will be based mostly on generic measures with reference to specific measures where appropriate or where suitable information exists for this purpose.

RQO PROCESS

Step 1: Delineate the integrated units of analysis and define the resource units;

Step 2: Establish a vision for the catchment and integrated units of analysis;

Step 3: Prioritise and select preliminary resource units for RQO determination;

Step 4: Prioritise sub-components for RQO determination and select indicators for monitoring;

Step 5: Develop draft resource quality objectives and numerical limits;

Step 6: Agree on resource units, RQOs and numerical limits with stakeholders;

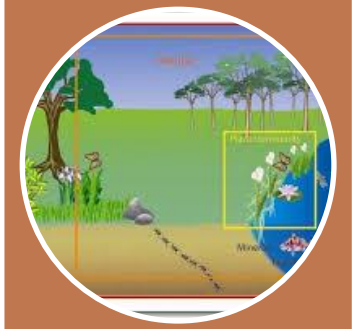
Step 7: Finalise and gazette RQOs.

4.5 SUB-COMPONENT PRIORITISATION AND INDICATOR SELECTION

WHAT SHOULD RQOs BE SET FOR?

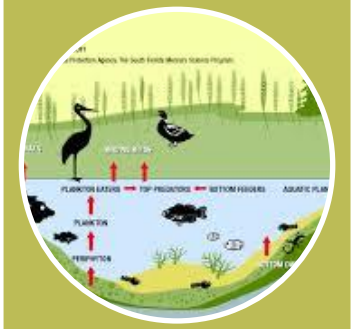
PRIORITISATION OF SUB-COMPONENTS AND SELECTION OF INDICATORS

There are a wide range of sub-components for which RQOs can be set

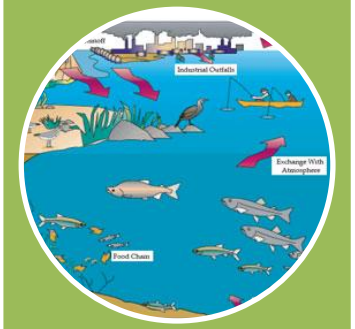


Not practical to set RQOs for all components and indicators of a water resource

Need to identify and prioritise the components (*viz*. habitat, quantity, quality, biota) that maybe important to users or the functionality and sustainability of a water resource;



Also requires selection of those sub-components and associated indicators (e.g. flow, salinity) for which RQOs and numerical limits should be developed.



Requires consideration of impacts and land based activities on the water resource.

Apply the Resource Unit Evaluation Tool

TOOL:

Used to determine level of threat posed to each of the components by impacting activities in the catchment

Used to identify which sub-components should be protected – to support activities, maintain integrity and ecological functioning

Although tool can be applied using desktop information, local knowledge and thorough understanding of the catchment is required.

COMPONENTS AND SUB COMPONENTS
(RIVERS, DAMS, WETLANDS)

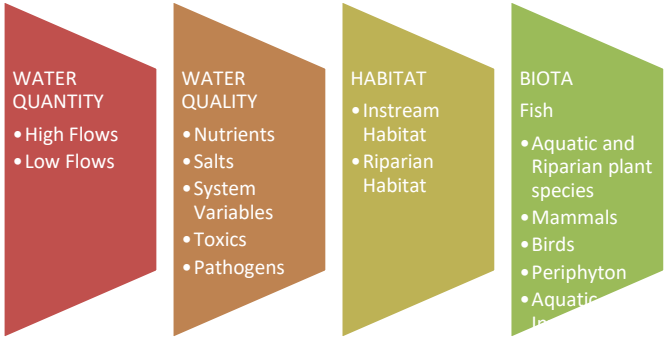
WATER QUANTITY
- High Flows
- Low Flows

WATER QUALITY
- Nutrients
- Salts
- System Variables
- Toxics
- Pathogens

HABITAT
- Instream Habitat
- Riparian Habitat

BIOTA
- Fish
- Aquatic and Riparian plant species
- Mammals
- Birds
- Amphibians and reptiles
- Periphyton
- Aquatic Invertebrates
- Diatoms

COMPONENTS AND SUB COMPONENTS



INDICATORS (Examples): Rivers and Dams

Flows	Quality	Instream/ Riparian Habitat	Biota
Maintenance flows, Drought Flow	Phosphate, Electrical Conductivity, Sulphate, *E.coli*, pH, Heavy Metals, Turbidity	Indices and scores (Habitat Assessments, Vegetation Assessments), Hydraulics	Indices and scores of biotic health (fish, invertebrates, diatoms), Presence of species (surveys), Health of system

COMPONENTS AND SUB COMPONENTS

WETLANDS

Ecological Specifications

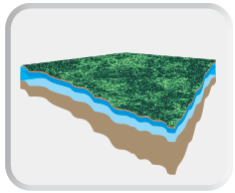
Protection, management, mitigation and monitoring measures

RU level / regional RQO's for wetlands

Individual Wetland RQO's

Quantity	Quality	Habitat	Biota
Water distribution and retention patterns (depends on hydrogeomorphic type)	**Wetland or river water (some valley bottom systems) quality indicators**	**Indices and scores (Habitat Assessments, Vegetation Assessments)** Vegetation module of Wet-Health for systems where this is appropriate	**Indices and scores of biotic health (such as bird species, macro-invertebrates, diatoms, special plants)**

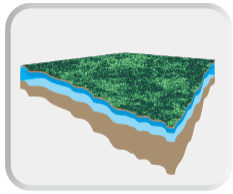
COMPONENTS AND SUB COMPONENTS (GROUNDWATER)



Measurable parameters including:

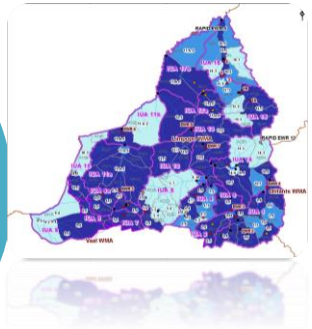
- **Quantity (Abstraction),**
- **Aquifer Water Level,**
- **Water Quality, and**
- **Protection Zones (related to a localised borehole as a means of protecting the basic human needs and the ecological Reserve**).

COMPONENTS, SUB COMPONENTS, INDICATORS GROUNDWATER

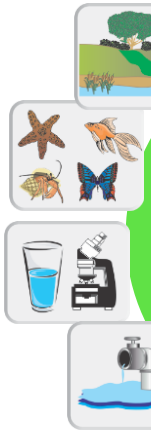


Quantity	Water Level - Depth to groundwater level Time series water level monitoring (Monthly)
Quantity	Abstraction - Abstraction rate (Volume; Q) Continuous Flow measurement at Eye
Quality	Nutrients - Nitrate
	Salts - Electrical Conductivity
	Toxics – trace metals
Protection Zone	Radius of influence (r)
	Distance from river (L)
	Distance from wetland (L)

TOWARDS RQOs DEVELOPMENT



Prioritisation of RUs for RQO Development

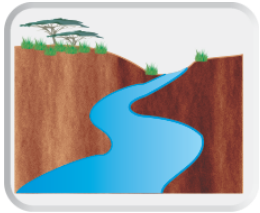


Selection of Components (Habitat, Biota, Quality, Quantity) per RU

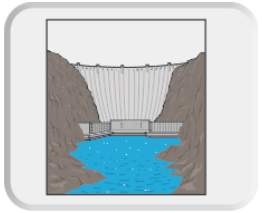
Selection of Sub-components and Indicators

- Fish, Aquatic Invertebrates, Aquatic birds, diatoms
- Instream, Riparian, Dam Habitat
- Salts, Nutrients, Pathogens, Toxics, pH, Turbidity
- Low flow, High Flow
- Water Level, Abstraction, Water Quality, Protection Zones

wetlands

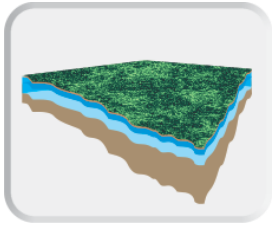


rivers



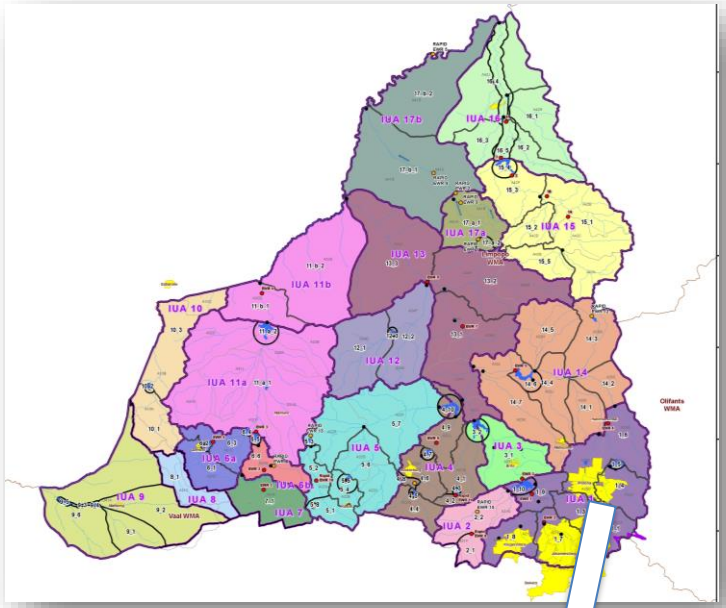
dams

groundwater



IUA1: Upper Crocodile/Hennops/Hartebeespoort

RU Number	Delineation Description	Quaternary Catchment
1_1	Upper Hennops and Rietvlei Rivers to inflow to Rietvlei Dam	A21A
1_2	Rietvlei Dam	A21A
1_3	Hennops River from outflow Rietvlei Dam to the A21B catchment	A21B
1_4	Upper Pienaars River, Edendalespruit and Moretlele Rivers to Roodeplaat Dam	A23A
1_5	Roodeplaat Dam	A23A
1_6	Upper and middle reaches of Apies River, Skinnerspruit, Pienaars River from outflow Roodeplaat Dam to Boekenhoutpruit confluence, Roodeplaatspruit, Boekenhoutspruit	A23B, A23D, A23E
1_7	Jukskei, Klein Jukskei, Modderfonteinspruit	A21C
1_8	Upper reaches of Crocodile River and Bloubank Spruit	A21D, A21E
1_9	Crocodile River from Jukskei confluence to inflow Hartebeespoort Dam, Swartspruit	A21H
1_10	Hartebeespoort Dam	A21H



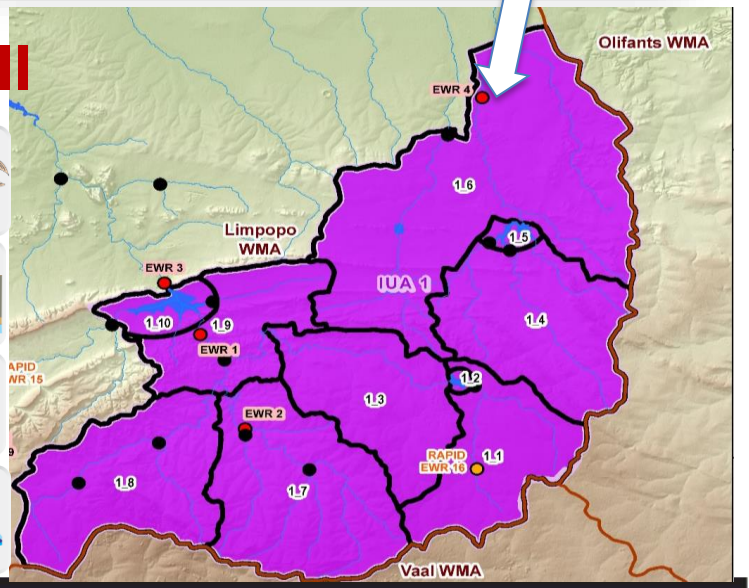
Class III

Biota

Habitat

Quality

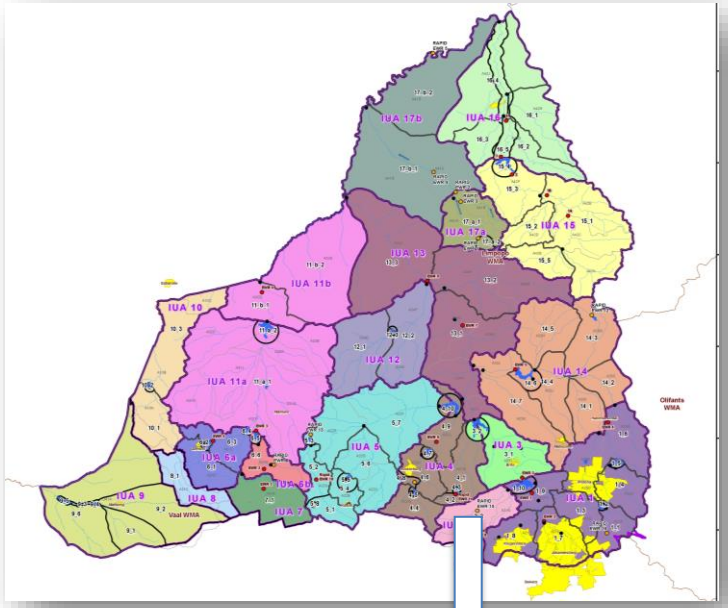
Quantity



Handout 3

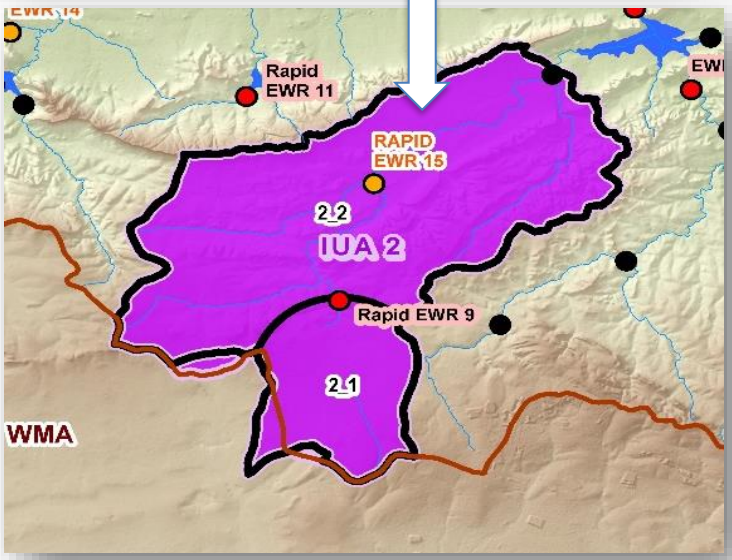
IUA 2: MAGALIES CATCHMENT AREA

RU Number	Delineation Description	Quaternary Catchment
2_1	Maloneys Eye	South eastern portion of A21F
2_2	Magalies River, Klein Magalies, Bloubank, Skeerpoort Rivers	A21F, A21G



Class II

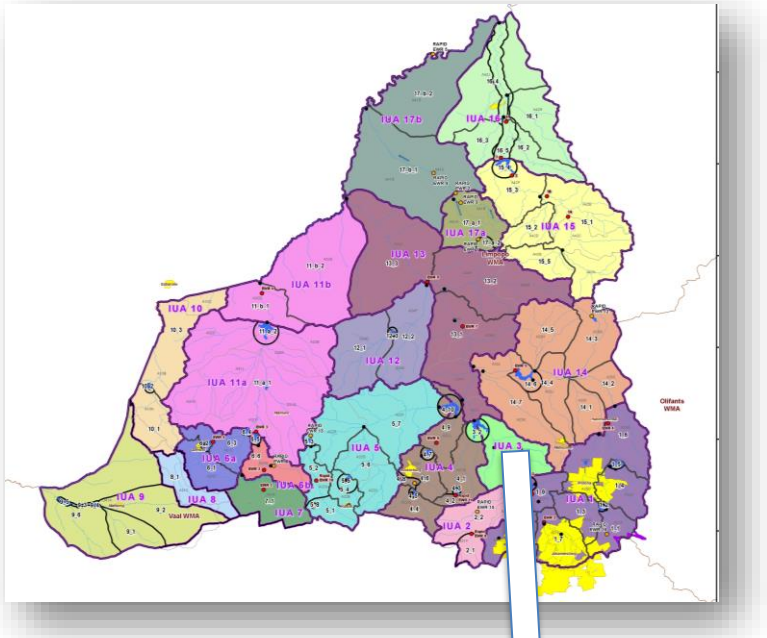
- Biota
- Habitat
- Quality
- Quantity



Handout 3

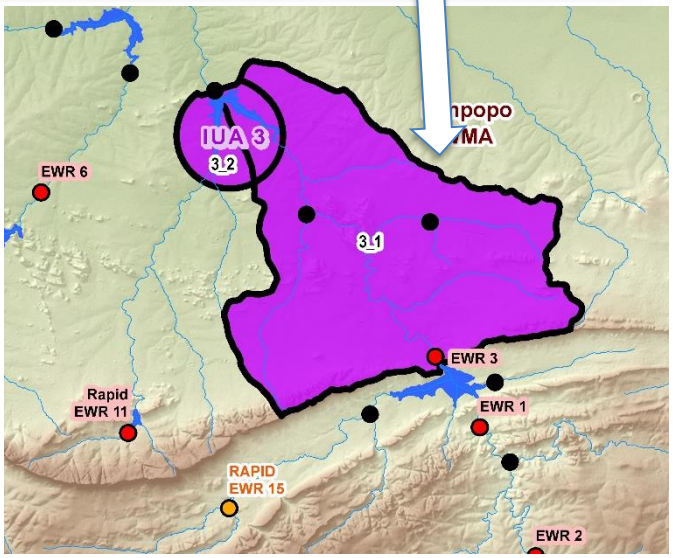
IUA 3: CROCODILE/ROODEKOPJES CATCHMENT

RU Number	Delineation Description	Quaternary Catchment
3_1	Crocodile River from outflow Hartebeespoort Dam to inflow Roodekopjes Dam, Rosespruit, Ramogatla and Kareespruit	A21J
3_2	Roodekopjes Dam	A21J



Class III

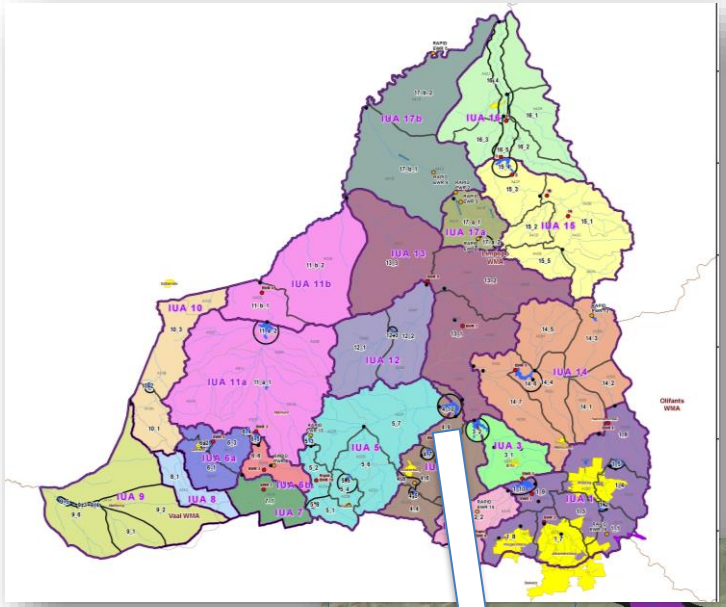
- Biota
- Habitat
- Quality
- Quantity



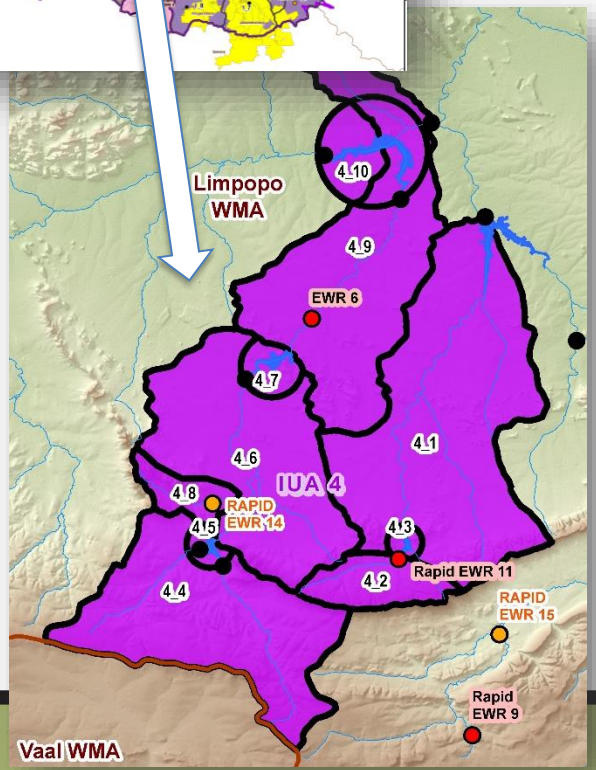
Handout 3

IUA 4: HEX/WATERKLOOFSPRUIT/VAALKOP

RU Number	Delineation Description	Quaternary Catchment
4_1	Sterkstroom from outflow Buffelspoort Dam to inflow Roodekopjes Dam, Maretwane, Tshukutswe	A21K middle and lower catchment below dam
4_3	Buffelspoort Dam	A21K
4_2	Upper reaches of Sterkstroom to inflow Bueffelspoort Dam , Kleinwater	A21K upper catchment to dam
4_4	Upper Hex River to Olifantsnek Dam, Rooikloofspruit	A22G
4_5	Olifantsnek Dam	A22G
4_6	Hex River outflow Olifantsnek Dam to inflow Bospoort Dam, Sandspruit	A22H
4_7	Bospoort Dam	A22H
4_8	Water Kloofspruit tributary catchment	A22H
4_9	Hex River outflow Bospoort Dam to inflow Vaalkop Dam	A22J
4_10	Vaalkop Dam	A22J



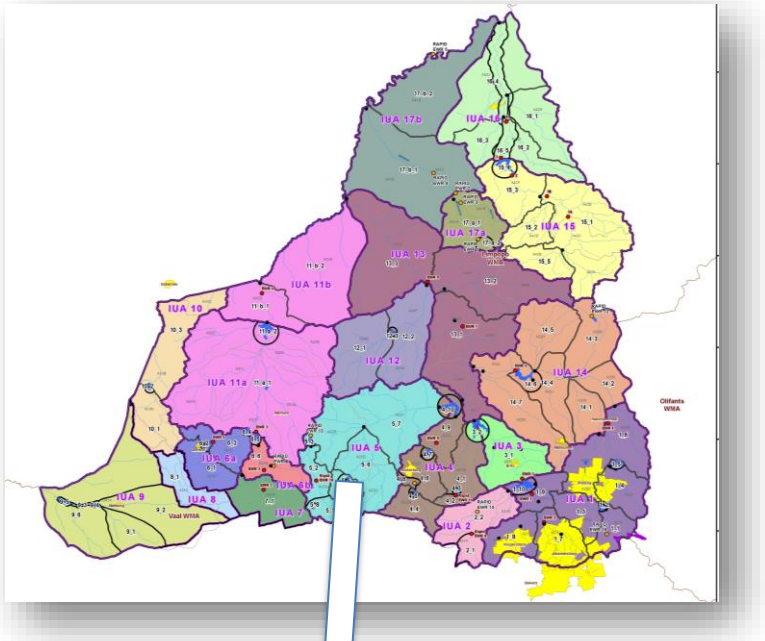
Class II



Handout 3

IUA 5: ELANDS/VAALKOP

RU Number	Delineation Description	Quaternary Catchment
5_1	Upper reaches of Elands to Swartruggens Dam	A22A south eastern portion
5_2	Elands river downstream Swartruggens Dam to Lindleyspoort Dam	A22A
5_3	Lindleyspoort Dam	A22A
5_4	Upper Koster River to Koster Dam	A22B
5_5	Koster Dam	A22B
5_6	Selons River, Kodoespruit, Dwarsspruit, lower Koster River	A22C, A22D
5_7	Elands River outflow Lindleyspoort Dam to inflow Vaalkop Dam, Brakkloofspruit, Roosspruit, Sandspruit Mankwe. Leragane, Molapongwamongana	A22E, A22F
5_8	Swartruggens Dam	



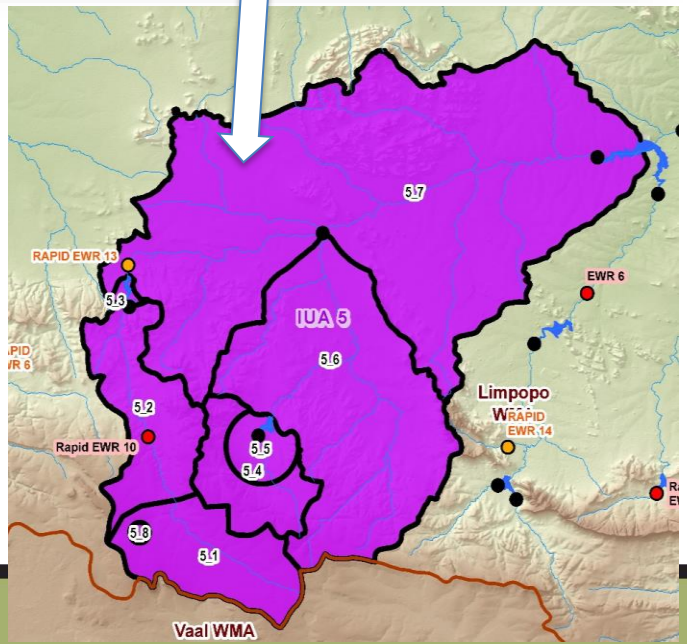
Class II

Biota

Habitat

Quality

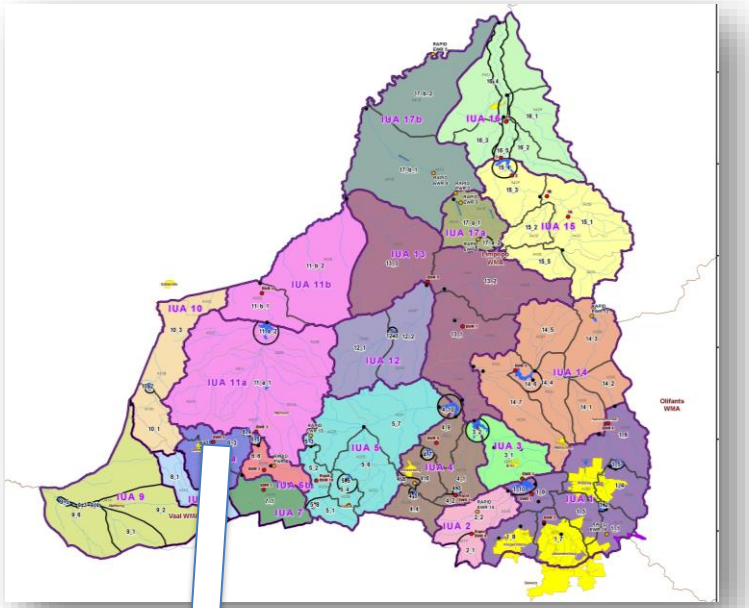
Quantity



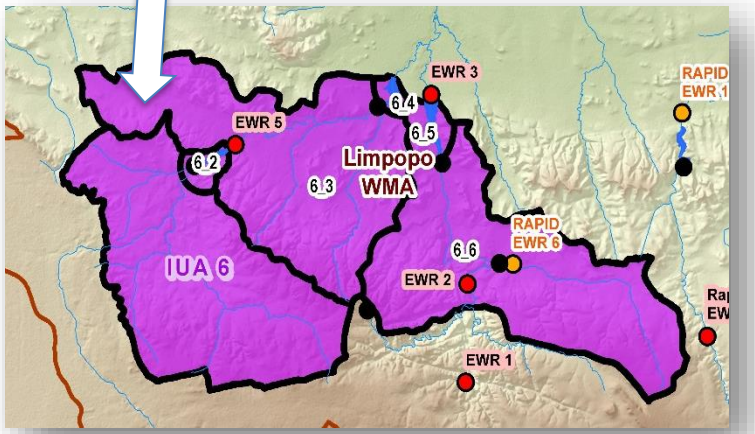
Handout 3

IUA 6a: KLEIN MARICO CATCHMENT

RU Number	Delineation Description	Quaternary Catchment
6_1	Upper Klein Marico to inflow Klein Maricopoort dam, Rhenosterfonteinspruit, Malmanieloop, Kareespruit	A31D
6_2	Klein Maricopoort dam	A31D
6_3	Klein Marico downstream Klein Maricopoort Dam to Kromellenboog Dam, Wilgeboomspruit	A31E
6_4	Kromellenboog Dam	A31E



Class II



Biota

Habitat

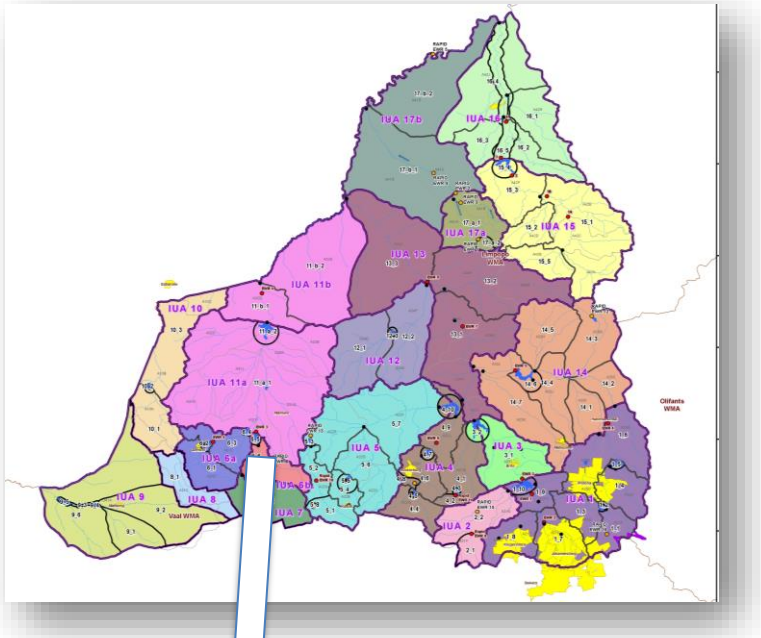
Quality

Quantity

Handout 3

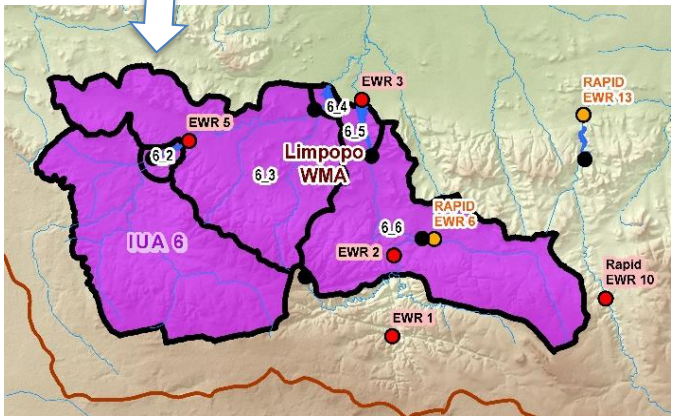
IUA 6b: GROOT MARICO

RU Number	Delineation Description	Quaternary Catchment
6_5	Marico Bosveld Dam	A31B
6_6	Groot Marico, Polkadraaispruit	A31B



Class II

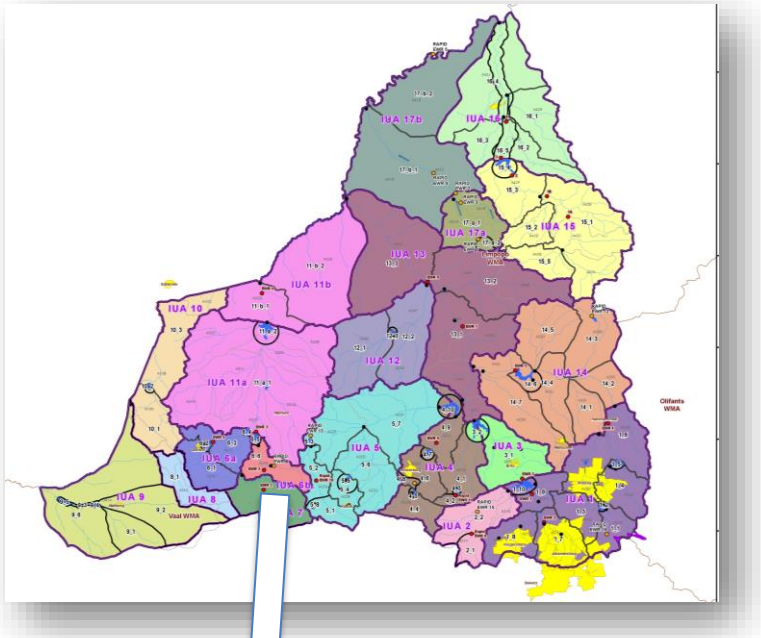
- Biota
- Habitat
- Quality
- Quantity



Handout 3

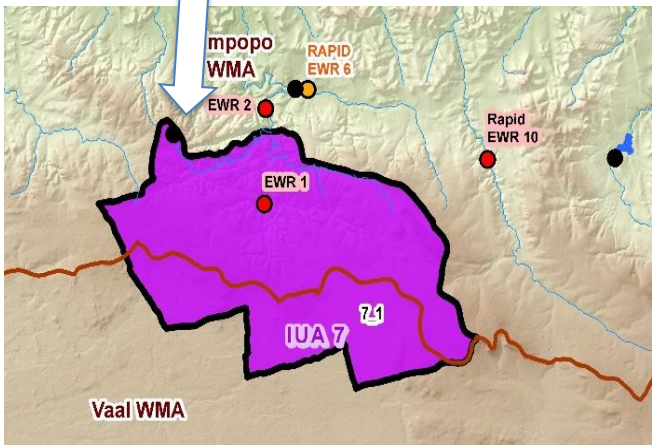
IUA 7: KAALOOG-SE- LOOP

RU Number	Delineation Description	Quaternary Catchment
7_1	Marico Eye, Kaaloog-se-Loop, Bokkraal-se-Loop, Ribbokfontein-se-Loop	A31A



Class I

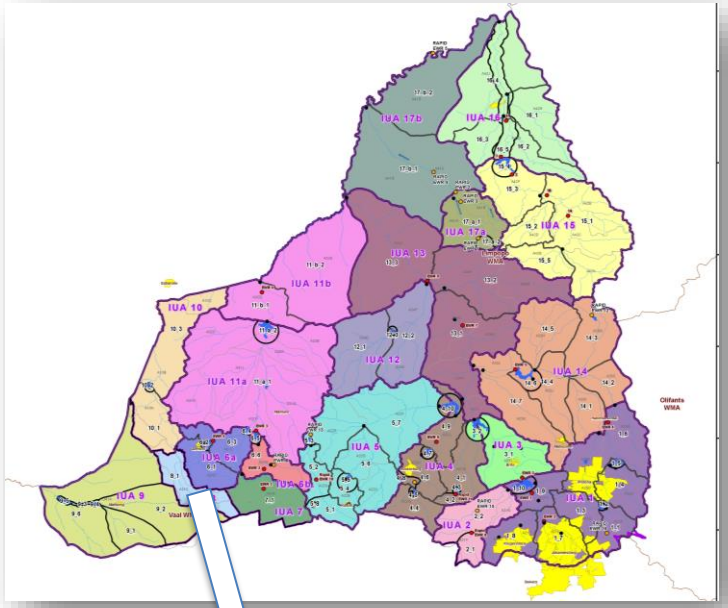
- Biota
- Habitat
- Quality
- Quantity



Handout 3

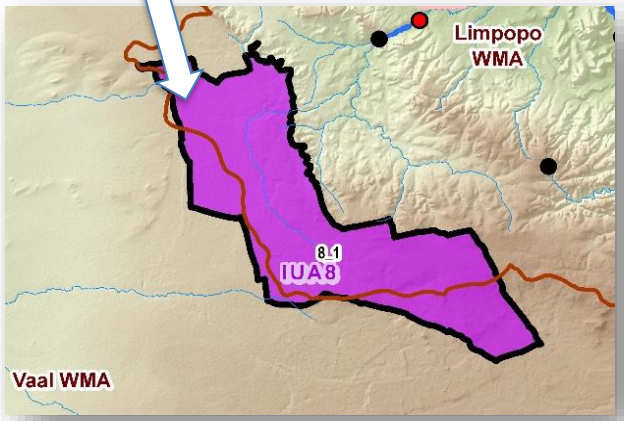
IUA 8: MALMANIESLOOP

RU Number	Delineation Description	Quaternary Catchment
8_1	Malmanie Eye, Dolomites	A31C



GW Class II

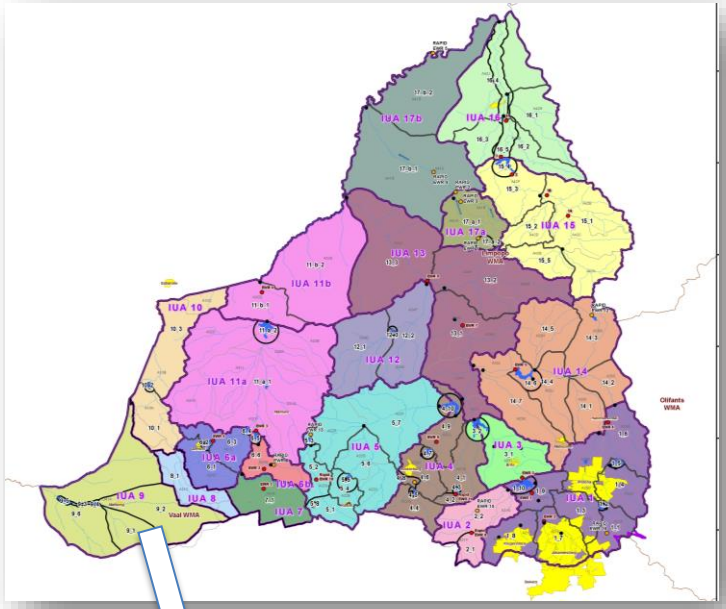
- Biota
- Habitat
- Quality
- Quantity



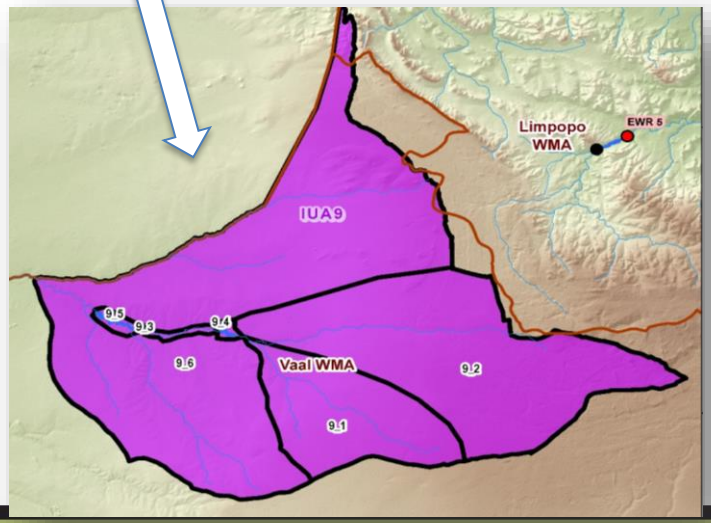
Handout 3

IUA 9: MOLOPO

RU Number	Delineation Description	Quaternary Catchment
9_1	Bodibe Eye	D41A (Polfonteinspruit and Lotlhakane tributary catchment area)
9_2	Molopo Eye, Grootfontein Eye, Molopo headwaters to inflow Modimola dam	D41A
9_3	Molopo River mainstem only from Modimola Dam to Disaneng Dam	D41A (main stem)
9_4	Modimola Dam	D41A
9_5	Disaneng Dam	D41A
9_6	All remaining tributaries - Madibe, Kabe, Mogosane	D41A



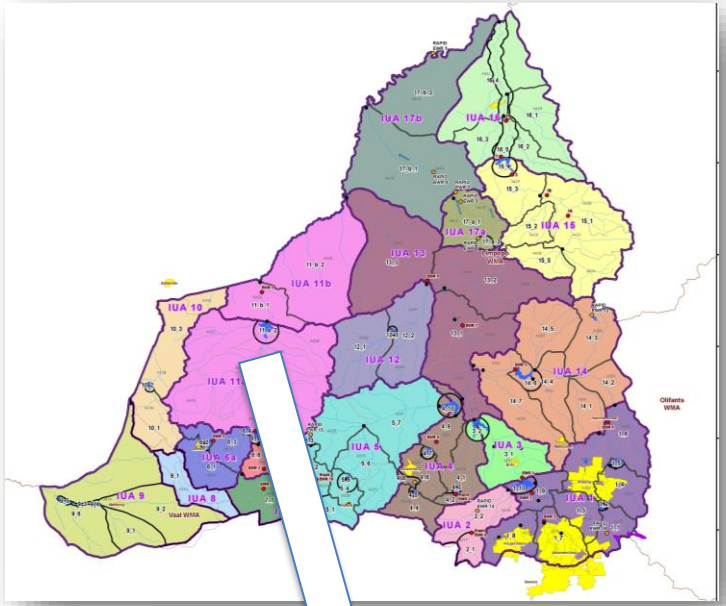
GW Class III



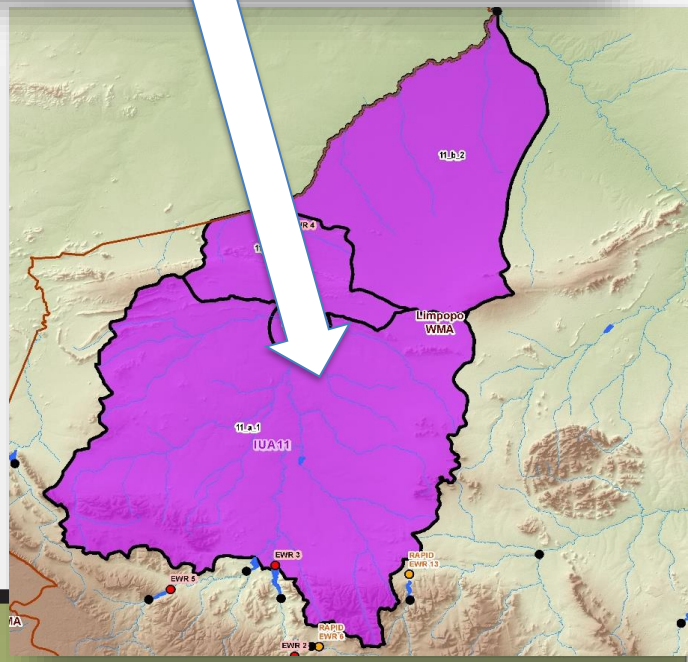
Handout 3

IUA 11a: GROOT MARICO/MOLATEDI DAM

RU Number	Delineation Description	Quaternary Catchment
11a_1	Groot Marico from outflow Marico Bosveld Dam to Molatedi Dam, all tributaries: Elandslaagtespruit, Lengope la Kgamanyane, Lenkwane	A31G, A31H, A31F, A31J, A32A, A32B, A32C
11a_2	Molatedi Dam	A32A, A32B, A32C



Class III

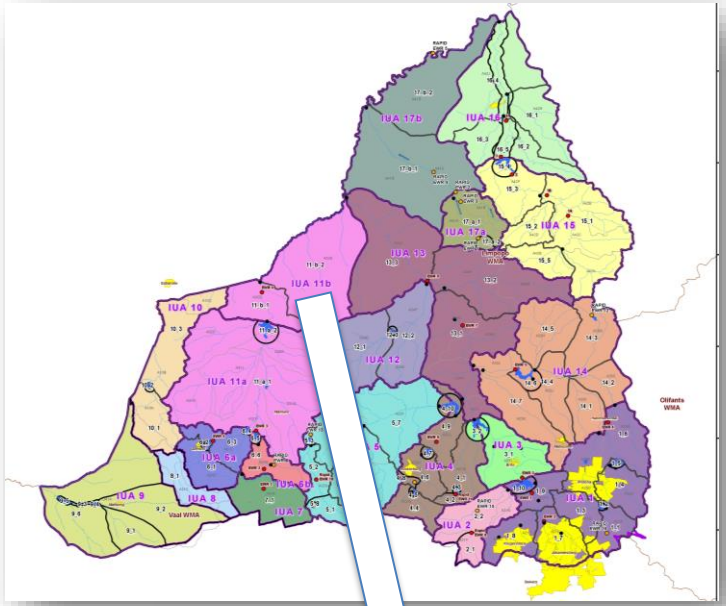


- Biota
- Habitat
- Quality
- Quantity

Handout 3

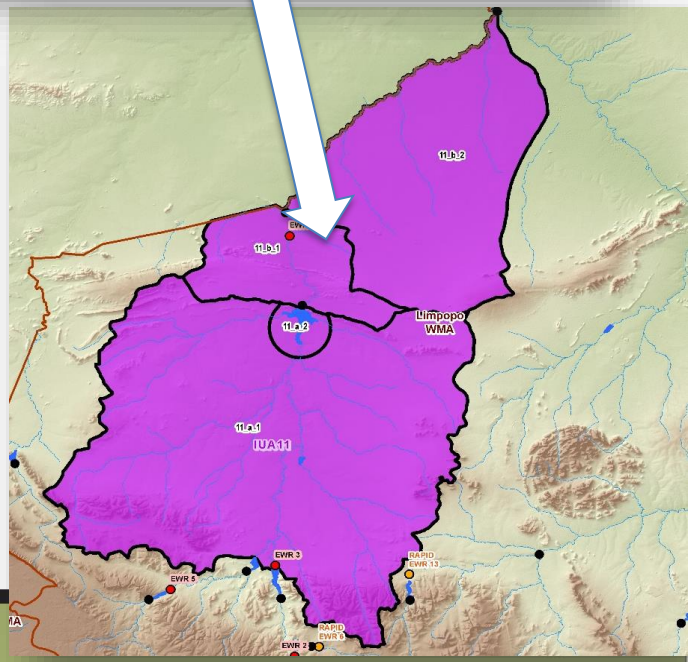
IUA11b: GROOT MARICO/ SEASONAL TRIBUTARIES

RU Number	Delineation Description	Quaternary Catchment
11b_1	Lower Marico River	A32D
11b_2	Rasweu, Maselaje rivers	A32E



Class III

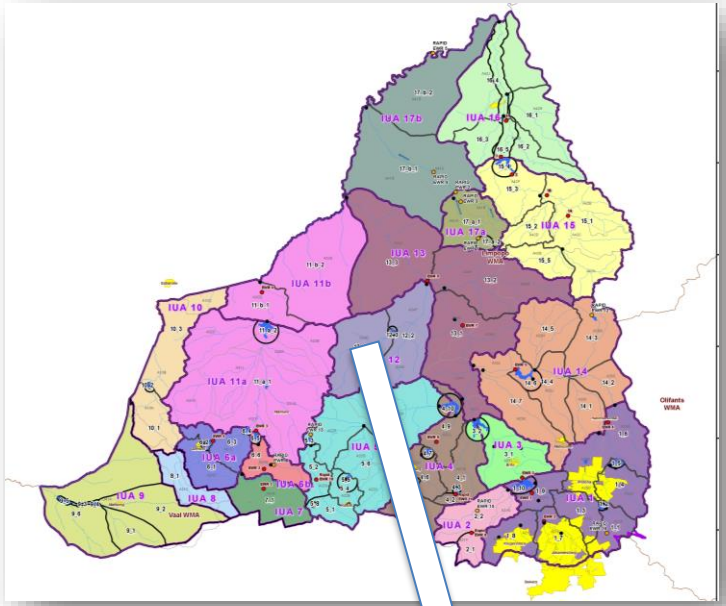
- Biota
- Habitat
- Quality
- Quantity



Handout 3

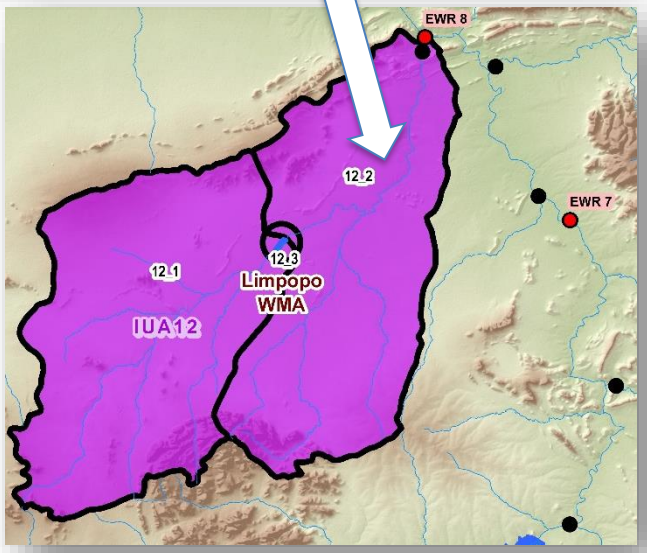
IUA 12: BIERSPRUIT

RU Number	Delineation Description	Quaternary Catchment
12_1	Wilgespruit, Bofule, Kolobeng, Magoditshane	A24D
12_2	Bierspruit oultfloe Bierspruit Dam to confluence with the Crocodile River, Brakspruit, Phufane, Sefatlhane, Lesobeng	A24E, A24F
12_3	Bierspruit Dam	A24D



Class III

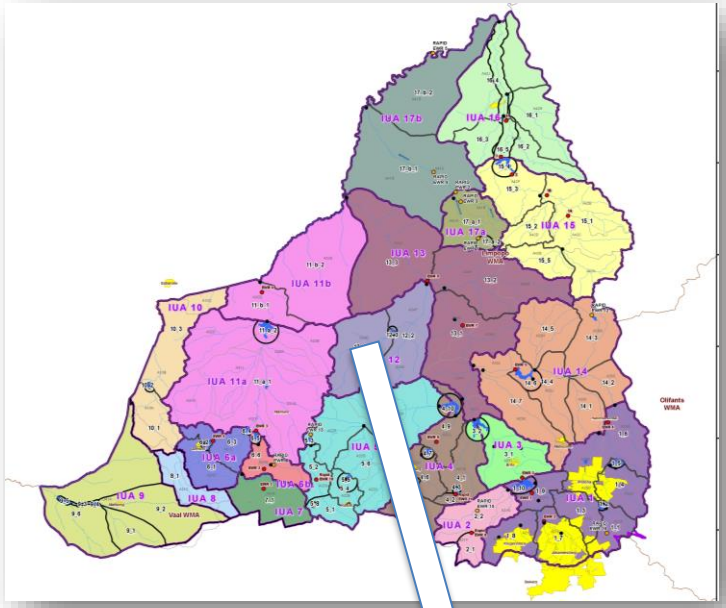
- Biota
- Habitat
- Quality
- Quantity



Handout 3

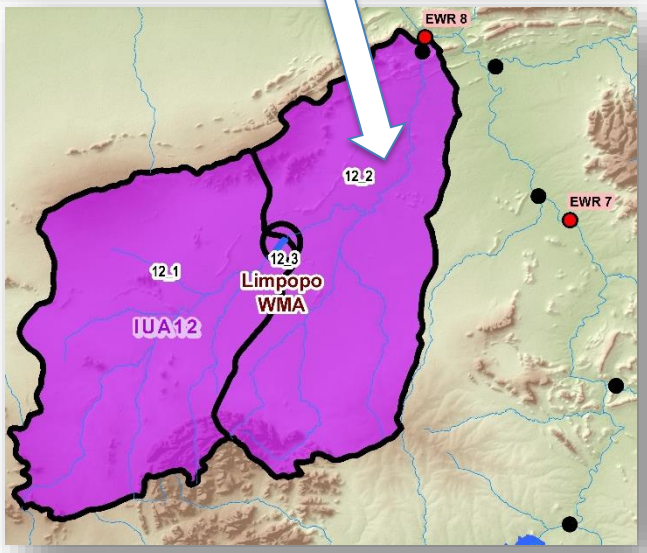
IUA 13: LOWER CROCODILE

RU Number	Delineation Description	Quaternary Catchment
13_1	Crocodile River outflow Roodekopjes Dam to upstream Sand River confuence, Motlhabe, Sleepfonteinspruit, Klipspruit tributaries	A21L, A24A, A24B, A24C
13_2	Sand River to confluence with the Crocodile River to Bierspruit confluence, Sondags, Vaalwaterspruit and Monyagole tributaries	A24G, A24H
13_3	Lower Crocodile from Bierspruit confluence to the Botswana border (Limpopo River)	A24J



Class III

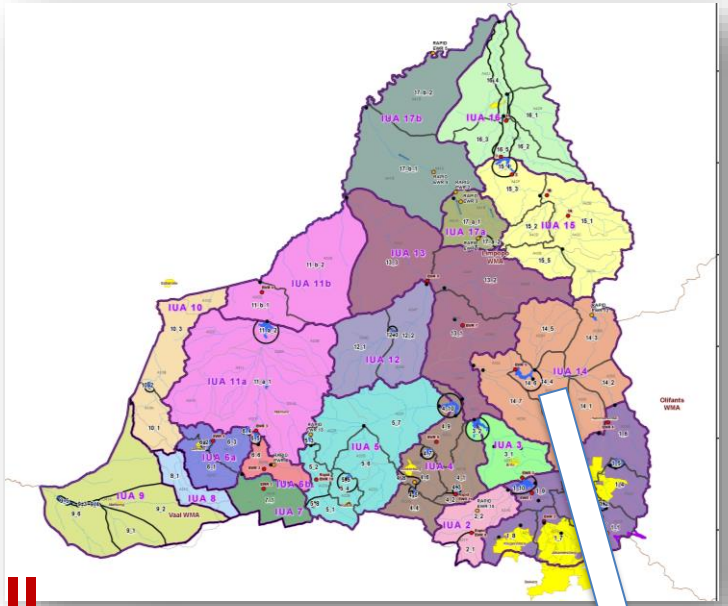
- Biota
- Habitat
- Quality
- Quantity



Handout 1, Page?

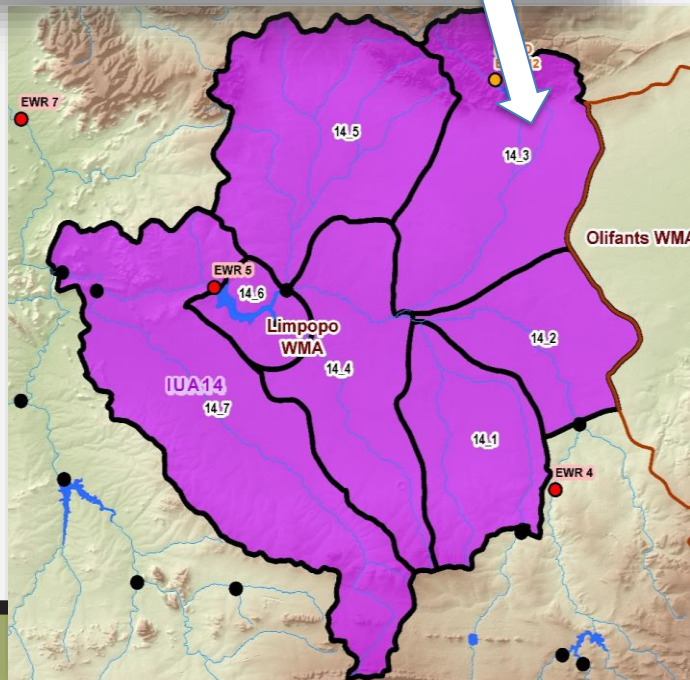
IUA 14: TOLWANE/KULWANE/MORETELE/KLIPVOOR

RU Number	Delineation Description	Quaternary Catchment
14_1	Apies River, Tshwane tributary	A23F
14_2	Pienaars River from Boekenshout confluence to Apies River confluence	A23C
14_3	Plat River	A23G
14_4	Moretele (Pienaars) River from Plat River confluence to Klipvoor Dam, Kutswane to Klipvoor Dam	A23J
14_5	Rietspruit and all tributaries	A23H
14_6	Klipvoor Dam	A23J
14_7	Pienaars River from Klipvoor Dam to Crocodile River confluence, Tolwane tributary	A23K, A23L



Class III

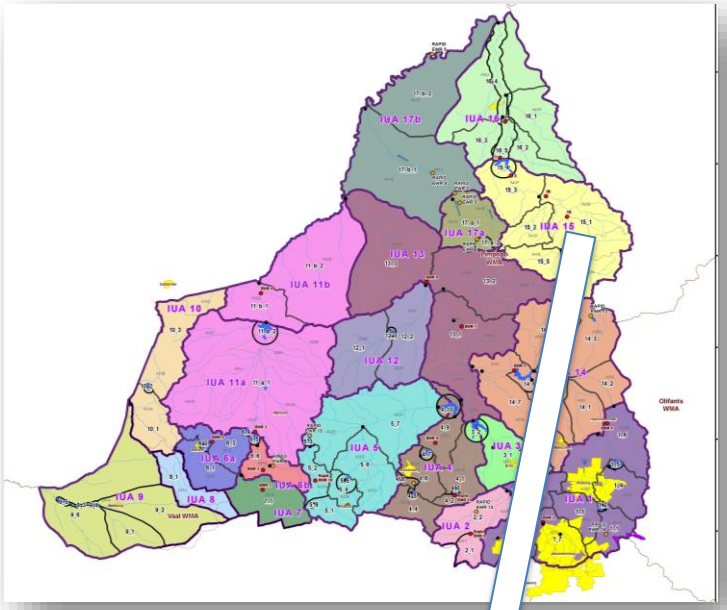
- Biota
- Habitat
- Quality
- Quantity



Handout 3

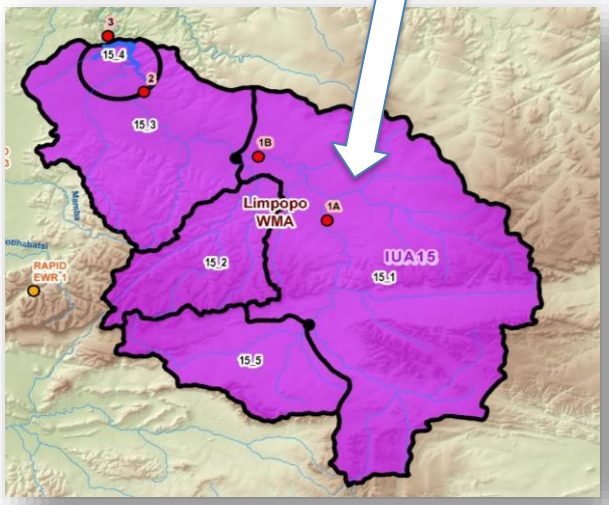
IUA 15: UPPER MOKOLO

RU Number	Delineation Description	Quaternary Catchment
15_1	Moloko River in A42A, C, E, Sand River and Klein Sand, Brakspruit, Sondagsloop, Heuningspruit, Dwars, Jim se loop tributaries	A42A, A42C
15_2	Sterkstroom, Frikkiesloon,	A42D, A42E
15_3	Mokolo River in A42F to inflow Mokolo Dam, Taaibosspruit, Malmanies and Bulspruit tributaries	A42F
15_4	Mokolo Dam	A42F
15_5	Grootspruit and Sandspruit tributaries (Mokolo headwater catchment)	A42B



Class II

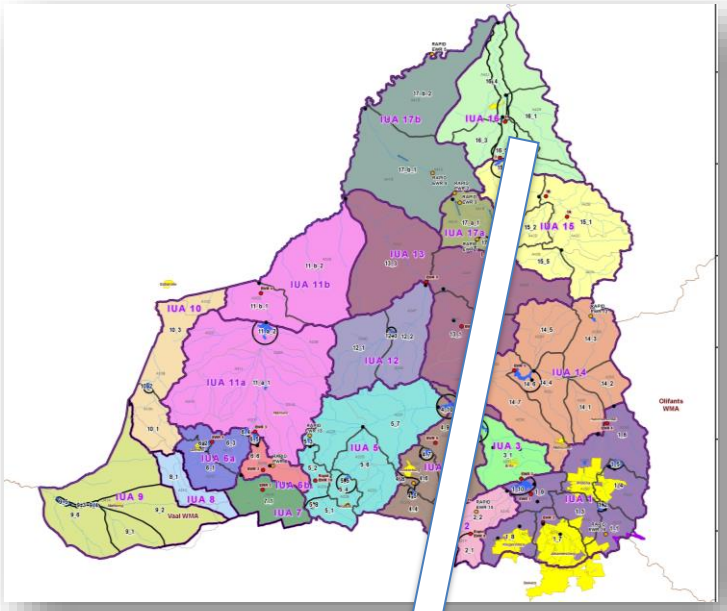
- Biota
- Habitat
- Quality
- Quantity



Handout 3

IUA 16: LOWER MOKOLO

RU Number	Delineation Description	Quaternary Catchment
16_1	Tambotie river catchment	A42H (major portion - eastern)
16_2	Poer se Loop catchment	A42G
16_3	Rietspruit catchment	A42G (south western portion)
16_4	Sandloop	A42J and remaining portion of A42H
16_5	Mokolo mainstem	A42 G, A42H, A42J (along main stem river)



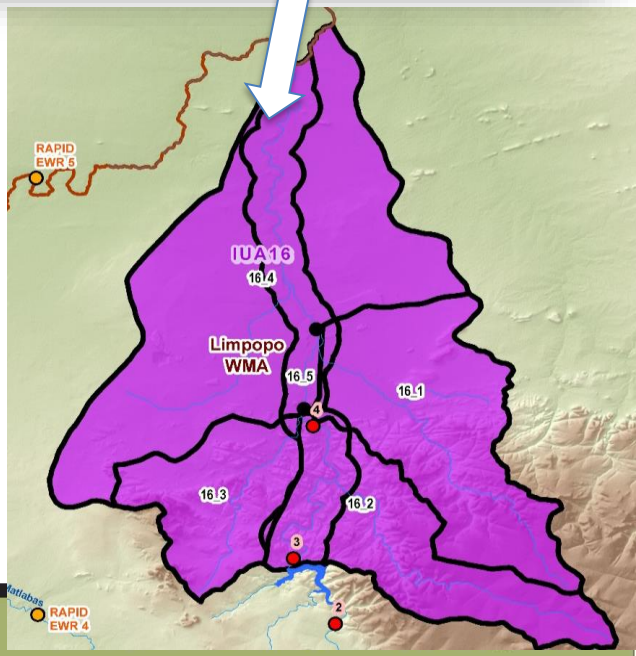
Class II

Biota

Habitat

Quality

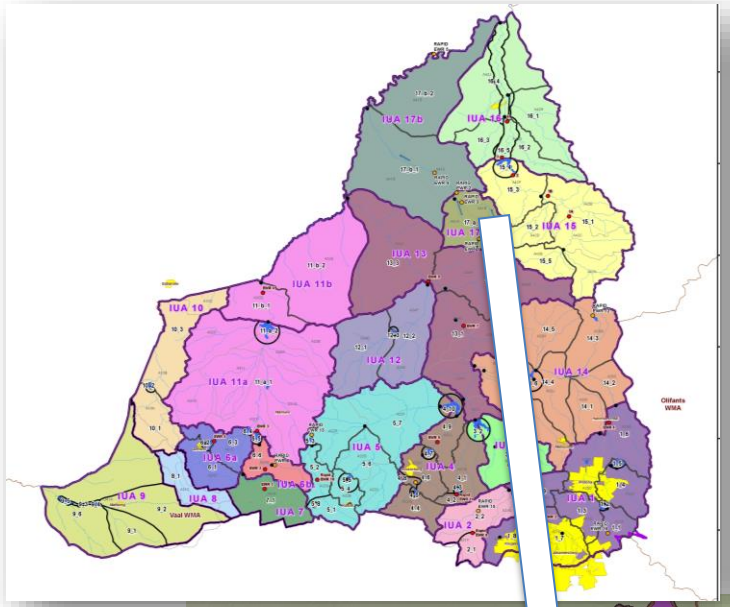
Quantity



Handout 1, Page?

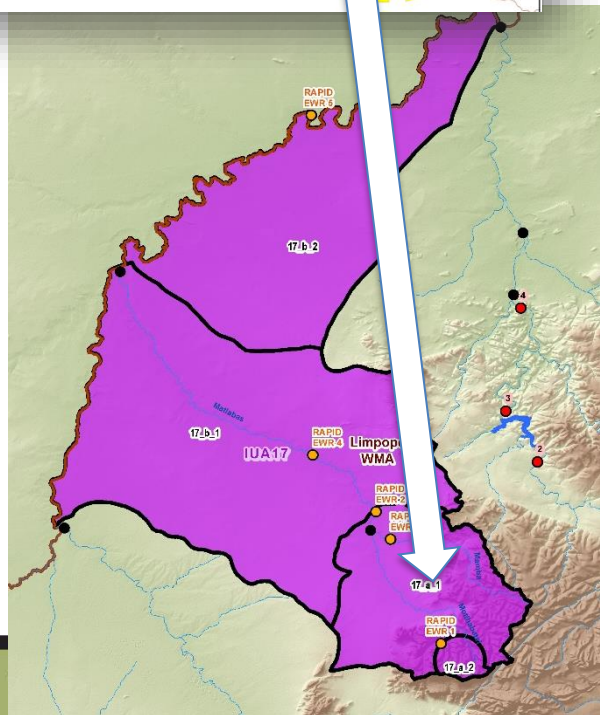
IUA 17a: MOTHLABATSI/MAMBA

RU Number	Delineation Description	Quaternary Catchment
17a_1	Mothlabatsi, Mamba Rivers	A41A, A41B
17a_2	Headwaters Mothlabatsi (peatlands)	A41A (south eastern)



Class I

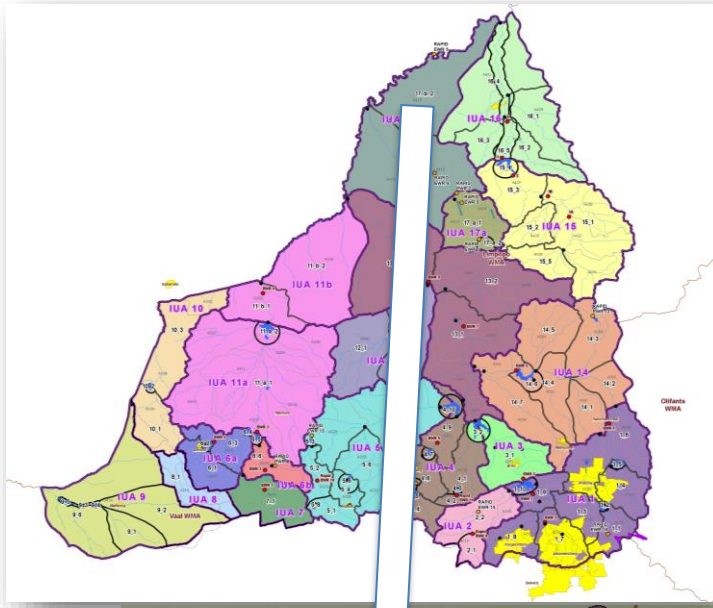
- Biota
- Habitat
- Quality
- Quantity



Handout 3

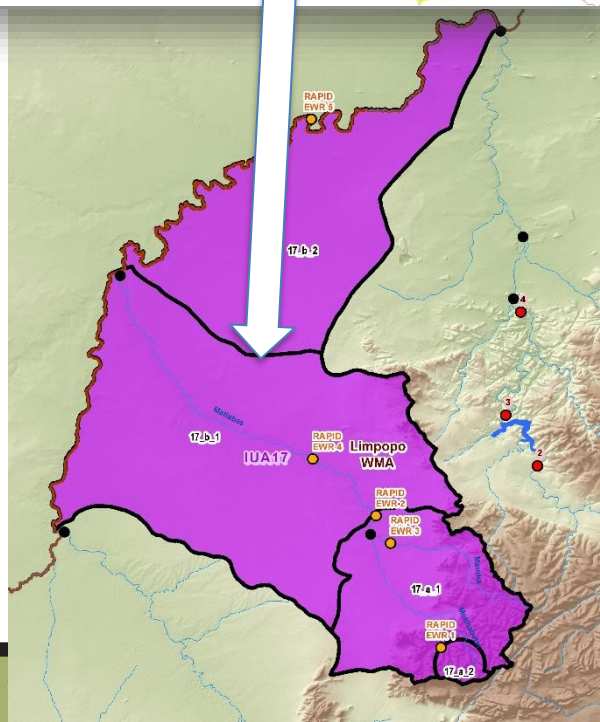
IUA 17b: MATLABAS

RU Number	Delineation Description	Quaternary Catchment
17b_1	Matlabas	A41D, A41C
17b_2	Steenbokpan and catchment area	A41E



Class II

- Biota
- Habitat
- Quality
- Quantity



Handout 3

4.6 UPCOMING ACTIVITIES

- **Finalisation based consultation and feedback (October 2016):**
  - **Resource Unit Prioritisation**
  - **Sub-component and indicator identification – finalisation**
- **Development of draft RQOs and numerical limits**
- **Presentation of draft RQOs at next PSC Meeting (February/March 2017)**
- **Finalise RQOs and numerical limits based on feedback (April to July 2017)**
- **Implementation plan development (May/June 2017)**
- **Gazetting Process – August/September 2017**