

Resource water quality status of the Crocodile West Catchment

MW (Lebo) Mosoa

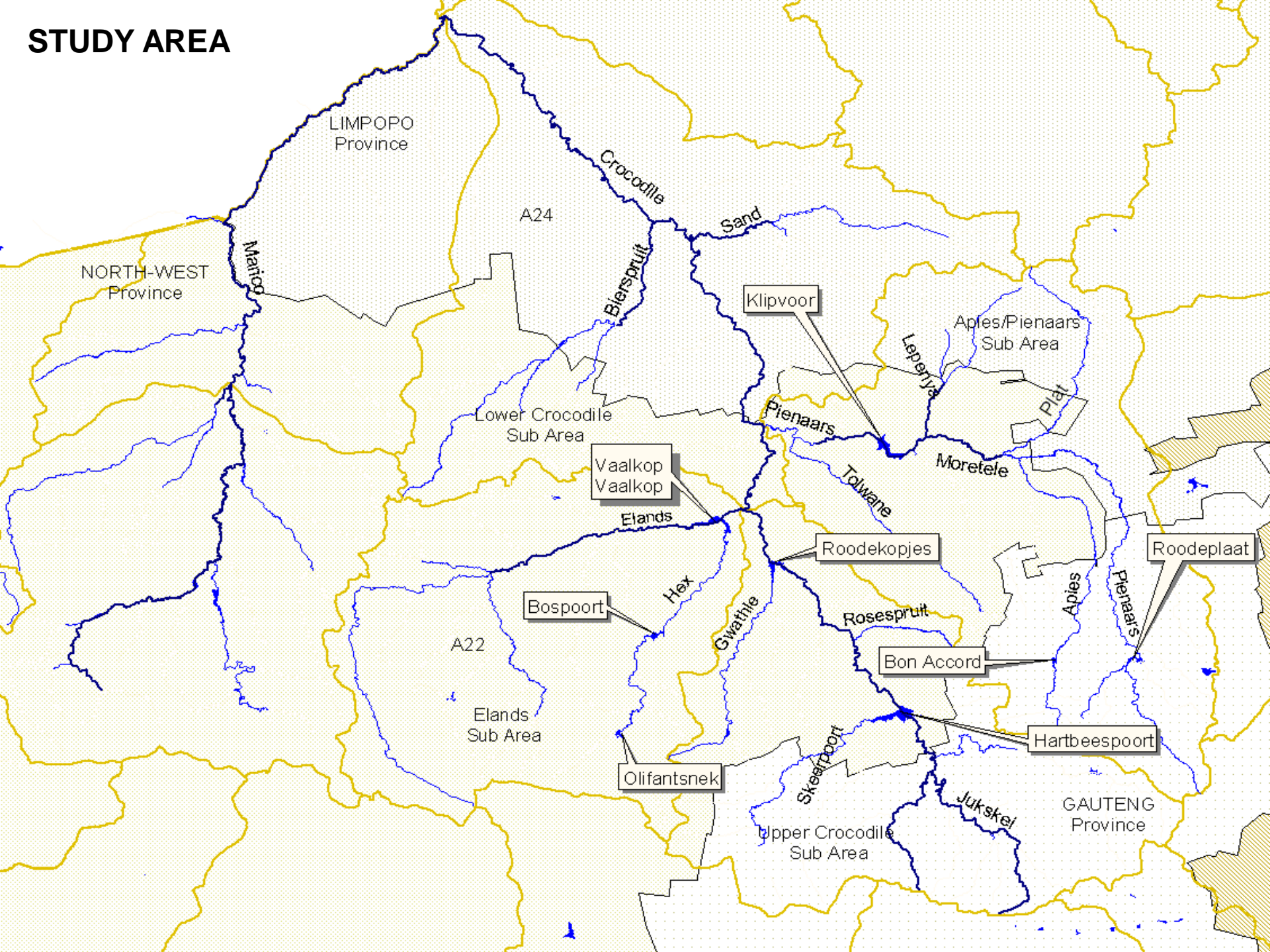


Overview of the presentation

- Study area.
- Background: RWQOs
- Background: Determination of water quality compliance and status.
- Water quality compliance & current status.
- Recommendations & way forwards
- Current Water quality initiative: Harties Metsi a me project



STUDY AREA



Background:

Determination of Water Quality Compliance and Status

(Resource Water Quality Objectives)

According to the National Water Act (Act 36 of 1998)

- Minister is required to use the classification system established in Part 1 to determine the class and resource quality objectives of all or part of water resources considered to be significant.
- *RQOs: clear goals relating to the quality of the relevant water resources*
- *RWQOs: It is the water quality component of the RQOs outlining water user needs with respect to WQ as well as their needs with respect to the disposal of water containing waste to the resource*



Background:

Determination of Water Quality Compliance and Status

- The following water users (SAWQG, 1996) were considered in determining the fitness for use: BHN, domestic, agricultural, industrial, and ecological requirements.
- The variables of concern and importance in the catchment:
 - Electrical Conductivity / TDS- indicator of salinisation
 - Chlorides
 - Sulphates- indicator of mining impacts
 - Phosphates & Nitrates- indicator of nutrient levels
 - Ammonia- indicator of toxicity
 - pH- indicator for mining impacts



Water Quality Compliance to RWQOs

Key box

-Compliance to RWQOs map-

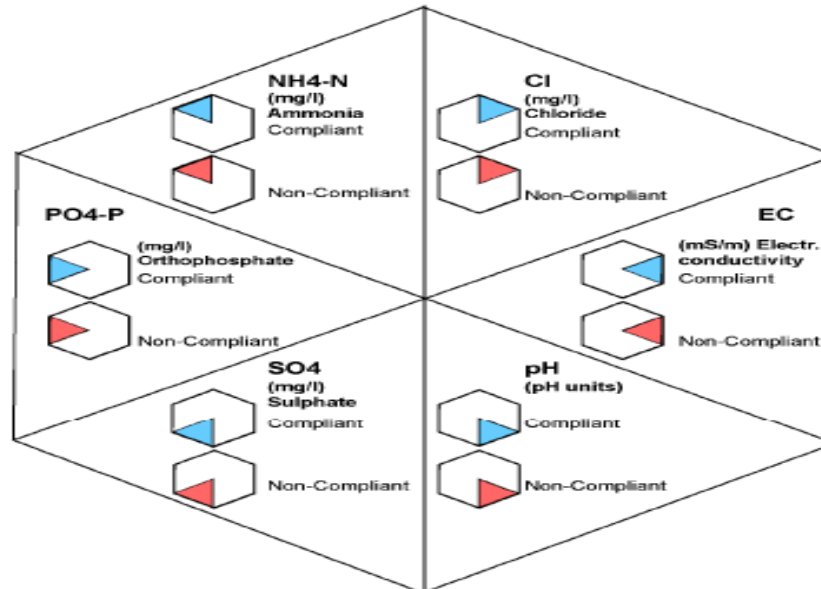
Map Description

This water quality data has been collated from data available on the Water Management System (WMS). A process of monitoring point selection was undertaken in order to select appropriate water quality sites per secondary drainage region.





The water quality data per monitoring point was compared to the water quality objectives derived for WMA 3 [Crocodile (West) and Marico]. The water quality compliance to objectives was derived using data for the period 1 January 2004 to 31 December 2008 (5 years). The water quality trend was derived using data for the same period.

Water Quality Compliancy Chart

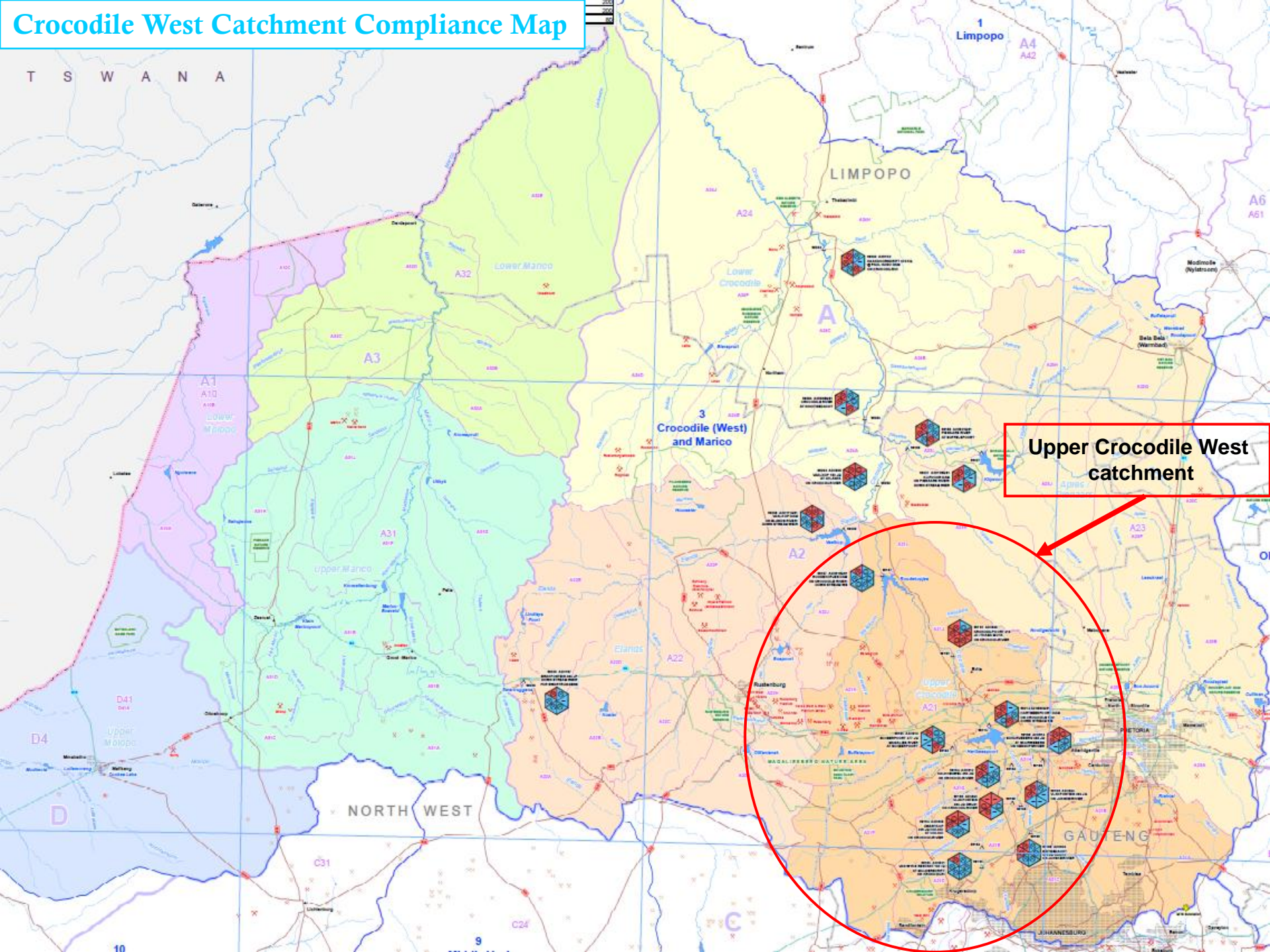
See compliancy table for compliancy limits



Water Quality Trend

-  Water quality deteriorating (Concentration levels are increasing)
-  Water quality improving (Concentration levels are decreasing)
-  Water quality stable (Concentration levels are stable)
-  Blank Hexagon: No historical data available to show trend

Crocodile West Catchment Compliance Map



Upper Crocodile West catchment

3 Crocodile (West) and Marico

NORTH WEST

LIMPOPO

GAUTENG

T S W A N A

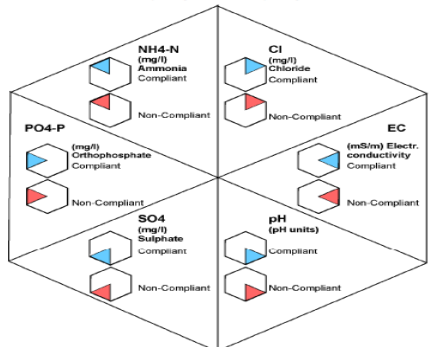
90167 A2H019Q01
ROODEKOPJES DAM
ON CROCODILE RIVER:
DOWN STREAM WE



Upper Crocodile West Catchment Compliance Map

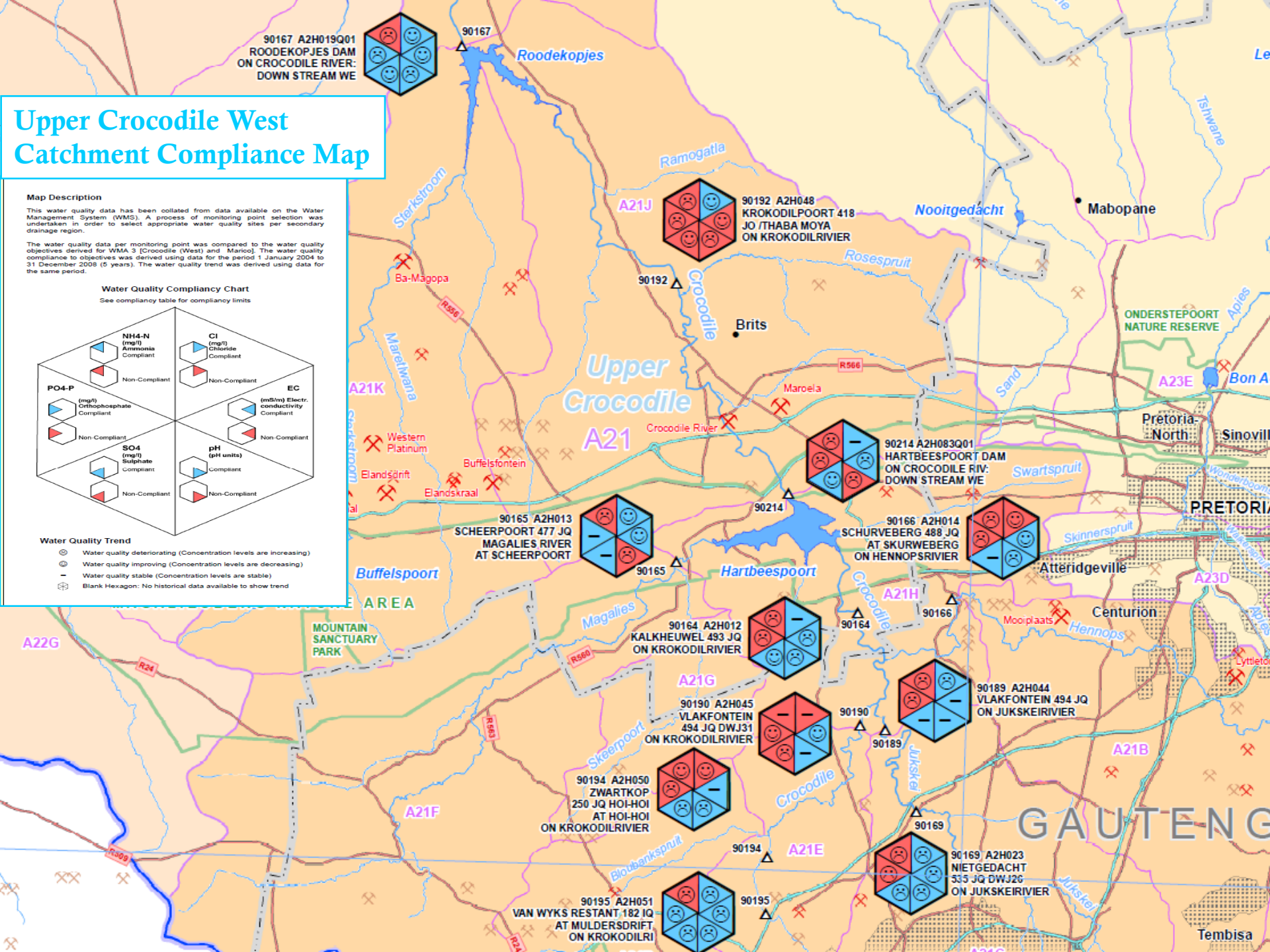
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Water Quality Compliance Chart
See compliance table for compliance limits



Water Quality Trend

- ☹️ Water quality deteriorating (Concentration levels are increasing)
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Upper Crocodile A21

GAUTENG



Current Water Quality Status

Water Quality Status (cont...)

- Water quality is a driver of the status of the water resources in the catchment.
 - Main water quality concerns are related to:
 - Nutrient status
 - Salinity impacts
 - Microbial contamination
- Due to waste water discharges
&
flow regulation

Water Quality Status (cont...)

Catchment Area	Driver of Water Quality status	Water Quality status	Variables of Concern
Upper Crocodile River	Urbanisation & waste Water discharges	Poor WQ	High levels of nutrients & salt concentration
Magalies	Land based activities	localised impacts	None identified
Elands	mining activities & erosion	middle and lower reaches have fair WQ	high sediment load
Hex River	intensive irrigation activities	poor	elevated concentration of salts, nutrients & toxicants

Water Quality Status (cont...)

Catchment Area	Driver of Water Quality status	Water Quality status	Variables of Concern
Apies/ Pienaars (lower catchment)	Discharges from industries & WWTW	Poor	nutrients & salinisation
Apies/ Pienaars (upper catchment)	Urban return flows, WWTW & land based activities	Poor & deteriorating further	high pH
Lower crocodile	Urbanisation, industrial diffuse sources & high agricultural return flows	Deteriorating WQ	salts & nutrients • toxicants (in the middle reaches of the river)

Recommendations & way forward

Poor WQ has serious environmental impacts & can limit potential for water re-use.

- Salinity impacts needs to be managed.
- Eutrophication due to increased nutrient concentrations needs to receive attention.
- Detailed & comprehensive RWQOs needs to be set for major rivers and impoundments. To reconcile the need to protect and the need to use the water resource.
- Management options should be investigated towards achieving those RWQOs.
- Appropriate remedial measures needs to be taken to lessen the impacts in affected streams and impoundments.

Current Water Quality Initiative in DWA

Harties, Metsi a me “My water”

HARTBESPOORT DAM
INTEGRATED BIOLOGICAL REMEDIATION PROGRAMME

DWA Project leader: Mr. Petrus Venter

Tel: (012) 207 9911

Fax: (012) 207 9914

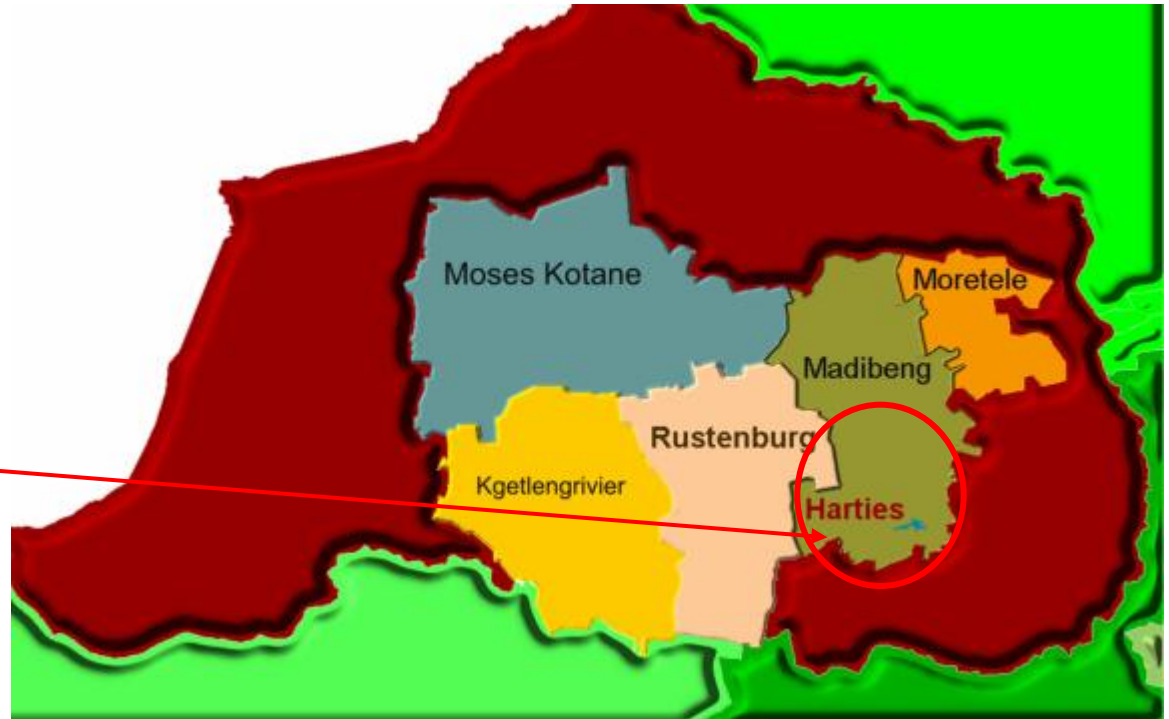
E-mail: harties@dwaf.gov.za

Acknowledge the involvement of Rand Water in the project

Geographical location

Republic of South Africa

- Crocodile West Marico Catchment
- Hartbeespoort Dam
- Bojanala District Municipality
- Madibeng Local Municipality



Problem statement

- The Hartbeespoort Dam was identified as being in a **hypertrophic state**
 - which means there are excessive nutrients like phosphate and nitrogen in the dam due to a combination of factors

Some of the WQ drivers and symptoms at Hartbeespoort dam

Drivers

- Urbanisation:
 - 700+ Mega Liters of purified sewage p/d
 - 280+ tons of phosphate p/a
- Exotic fish -Mainly bottom dwelling fish (Carp, Barbel, Canary Kurper)

Symptoms

- Depleted riparian variation & in-stream habitat
- Shrinking wetlands
- Toxic microcystis algal blooms
- Exotic water plants (Hyacinths)
- Distorted food web and fish population
- Depleted diversity in catchment and dam

HARTBEESSPOORT DAM TOTAL PHOSPHATE MASS BALANCE

USAGE FROM DAM

Volume = 176 mil m³
 Concentration total P = 0.17 mg/l
 Load total P = **29 920 kg/a**

IN HARTEBEESSPOORT DAM: Full level

Volume = 205 mil m³
 Concentration total P = 0.122 mg/l
 Load total P = **25 010 kg**

MAGALIES RIVER

Volume = 18 mil m³
 Concentration total P = 0.0582 mg/l
 Load total P = **1047 kg/a**

HARTEBEESSPOORT DAM SEDIMENTS

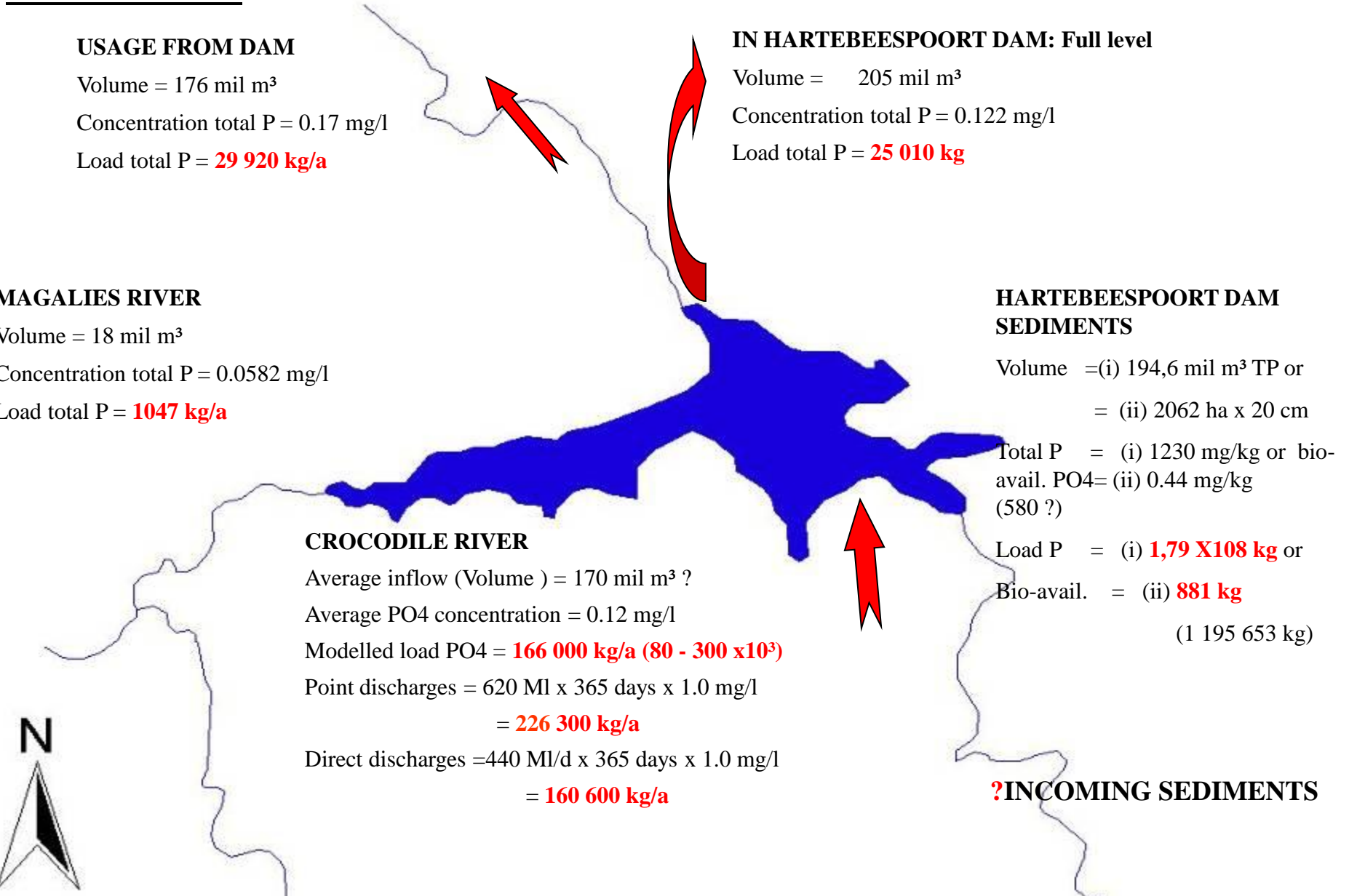
Volume = (i) 194,6 mil m³ TP or
 = (ii) 2062 ha x 20 cm
 Total P = (i) 1230 mg/kg or bio-avail. PO₄ = (ii) 0.44 mg/kg (580 ?)
 Load P = (i) **1,79 X108 kg** or
 Bio-avail. = (ii) **881 kg**
 (1 195 653 kg)

CROCODILE RIVER

Average inflow (Volume) = 170 mil m³ ?
 Average PO₄ concentration = 0.12 mg/l
 Modelled load PO₄ = **166 000 kg/a (80 - 300 x10³)**
 Point discharges = 620 MI x 365 days x 1.0 mg/l
 = **226 300 kg/a**
 Direct discharges = 440 MI/d x 365 days x 1.0 mg/l
 = **160 600 kg/a**

?INCOMING SEDIMENTS

N



Main Objectives of the programme

- Implement IWRM principles in Catchment to enhance Growth, Development and Work Creation.
- Determine, Optimise & Manage Physical and Biological conditions in the dam to ensure reduction in algae (blue-green) and biomass.
- The remediation programme is focusing on projects with short term results and will be implementing them in parallel with longer term challenges

Project Goals

- The establishment of symptomatic treatment, restorative action and creation of biological self-cleaning balanced ecosystem in the dam basin.
- Restoring and protecting the natural filters (wetlands and riverbanks) in the immediate catchment of the Hartbeespoort Dam.
- The regulation of water use in greater Hartbeespoort Dam catchment.
 - Including the development of a Resource Management Plan (RMP) for the dam that may become the blueprint for similar plans for other impoundments. (The RMP project was launched in September 2007)

Thank you



water affairs

Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA