




INKOMATI-USUTHU

CATCHMENT MANAGEMENT AGENCY

ANNUAL WATER QUALITY STATUS REPORT

FOR THE INKOMATI-USUTHU WMA

2018/19 FINANCIAL YEAR

www.iucma.co.za

VISION

Sufficient, equitable and quality water resources for all in the Inkomati-Usuthu Water Management Area

MISSION

To efficiently manage water resources by empowering our stakeholders in our quest to contribute towards transformation by promoting equal access to water and protecting our environment

VALUES

Integrity
Customer Orientation (Batho pele)
Efficiency
Accountability
Diversity
Transparency

ANNUAL WATER QUALITY STATUS REPORT FOR THE INKOMATI-USUTHU WATER MANAGEMENT AREA

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EXECUTIVE SUMMARY

Chapter 3 of the NWA prescribes the protection of water resources through resource-directed measures including the classification, Resource Quality Objectives and the Reserve of water resources. These are measures which together are intended to ensure the protection of the water resource as well as measures to regulate and control the impacts of land based activities by ensuring pollution prevention and remedying the effects of pollution. It is further required that the protection of water resources is balanced with the need to use water as a factor of production to enable socio-economic growth and development.

The challenges affecting water quality in the Inkomati-Usuthu WMA have always been mainly due to industrial and mining activities and the poor state of water services authorities' sewage infrastructure. Pollution of the resource is caused due to contamination of sewage (e.g. from overflows, spills and leakages or by discharge of untreated/partially treated sewage into the resource); and decanting of mining effluents or leachate into the water resources as well as solid waste especially nappies.

The microbial pollution remains a human health risk, especially to the vulnerable rural communities that at times have to use the river water for domestic, religious, cultural and recreational purposes. Deteriorating water quality on certain Ecological Water Requirements sites especially microbiological quality has largely been attributed to in effective compliance, monitoring and enforcement, weak co-operative governance, absence of regulation and failure to implement the Waste Discharge Charge System.

The surface water quality in the Inkomati-Usuthu WMA complied with the Resource Quality Objectives (RQOs), South African Target Water Quality Guideline limits (SATWQG) and International Water Quality Guideline limits (IWQG) for most of the monitored points and this showed that the water quality within the WMA is in a relatively good state.

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ACRONYMS AND ABBREVIATIONS

NWA	National Water Act, Act 36 of 1998
IUCMA	Inkomati-Usuthu Catchment Management Agency.
IUWMA	Inkomati Usuthu Water Management Area
RQOs	Resource Quality Objectives
RSA	Republic of South Africa
DWS	Department of Water and Sanitation.
WWTWs	Wastewater Treatment Works.
CFU	Colony-forming unit.
E. coli	*Escherichia coli*.
KNP	Kruger National Park.
EWR	Ecological Water Requirements sites
CME	Compliance Monitoring and Enforcement
SANAS	South African National Accreditation System
U/S	Up Stream
D/S	Down Stream
EC	Electrical Conductivity
mS/m	milli siemens per meter
mg/l	milli-grams per liter
TWQG	Target Water Quality Guide
WMA	Water Management Area
SATWQG	South African Target Water Quality Guidelines
IWQG	International Water Quality Guidelines
PO_4	Phosphate
NO_3+NO_2	Nitrates and nitrites
pH	Acid base relation
SO_4	Sulphate
NH_3	Ammonia

1. INTRODUCTION AND BACKGROUND

1.1 Introduction

The Inkomati-Usuthu Catchment Management Agency (IUCMA) is the responsible authority within the jurisdiction of the Inkomati-Usuthu Water Management Area (WMA). The WMA is located in the eastern part of the country and falls wholly within the Mpumalanga Provincial boundary as depicted in Figure 1 below as WMA three (3) of the nine (9) demarcated WMAs. The WMA is part of an international basins called the Incomati River Basin and Maputo River Basin. The water resources in the area are strategically important for international obligations as well as inter-basin transfers for power generation. As an authority, the IUCMA is responsible for managing, controlling, protecting and monitoring water resources in its area of responsibility.

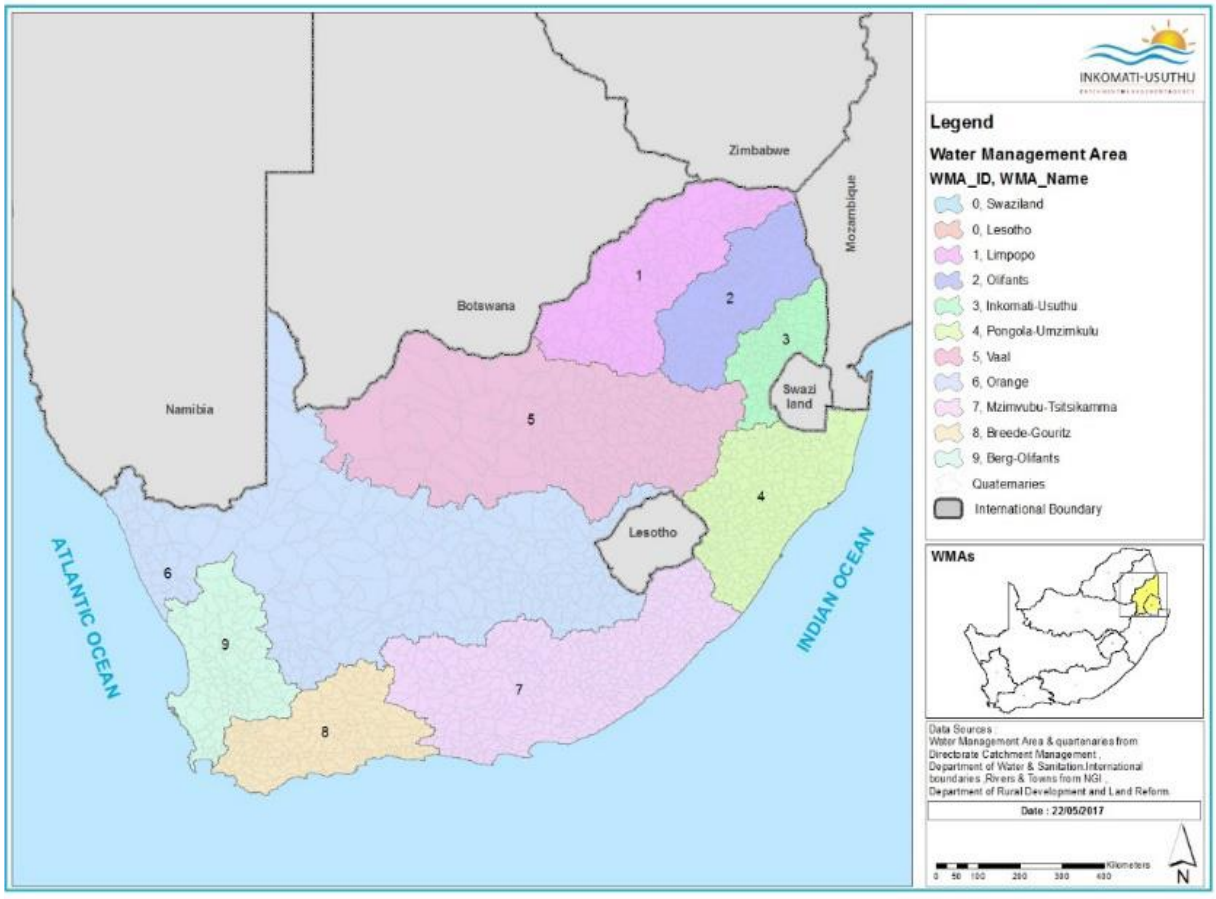


Figure 1: Map of South Africa indicating the nine WMA.

1.2 Background

National Water Act, Act 36 of 1998 (NWA) of South Africa Chapter 14: Requires the Minister to establish national monitoring systems for the collection of appropriate data and information that is adequate and responsive to the present and future challenges of efficient management of the country's water resources. The Inkomati-Usuthu Catchment Management Agency (IUCMA) conducts regional monitoring in the Inkomati-Usuthu WMA which feeds into the national monitoring system.

In-stream water quality within Inkomati-Usuthu WMA is measured by means of Chemical and Microbiological monitoring conducted monthly through grab sampling. The samples are then submitted to a South African National Accreditation System (SANAS) accredited laboratory for analysis. The variables of concern differ from catchment to catchment and are based on the types of activities occurring within a specific catchment. Monitoring is conducted both in-stream to determine the water resource quality as well as at the discharge points for Compliance Monitoring and Enforcement (CME) purposed to establish the water users' compliance to the conditions of their respective authorisations or set standards.

For this report, the in-stream water quality monitoring points for Ecological Water Requirement (EWR) Sites and International Obligation have been selected for reporting purposes, since it would not have been practical to report on all 261 monitoring sites. The data reported was collected over a period of 12 Months within the WMA. The seven (7) indicator variables that were selected are indicated in

Table 1.

Table 1: Seven indicator variables selected for reporting purpose

Variables	Catchment
pH	All catchments within WMA
Sulphates (SO_4)	
Escherichia coli (*E. coli*)	
Electrical Conductivity (EC)	
Ortho-phosphate (PO_4)	
Nitrates/Nitrites (NO_3+NO_2)	
Ammonia (NH_3)	

The compliance of these indicator parameters was compared with the Resource Quality Objectives published in a Government Gazette dated 30 December 2016, the Target Water Quality Guideline limits (TWQG) and International Water Quality Guideline limits as per the

Tripartite Interim Agreement between Republic of Mozambique, Republic of South Africa (RSA) and the Kingdom of eSwatini.

2. Objectives

- To determine the water quality trends within the Inkomati-Usuthu Water Management Area for the year of 2018.
- To determine compliance at Ecological Water Requirements (EWR) Sites with Resource Quality Objectives (RQOs).
- To determine compliance with International Obligation.

3. Methodology

3.1 Study Area

The chemical and microbiological sampling of water resources takes place within the jurisdiction of the Inkomati-Usuthu WMA and comprises of Sabie/Sand Catchment, Crocodile Catchment, Komati Catchment and Usuthu Catchment. The IUWMA is situated in the north-eastern part of South Africa in the Mpumalanga Province. It borders on Mozambique in the east and on eSwatini in the south-east. The water management area extends over several parallel river catchments which all drain in a general easterly direction, and flow together at the border with Mozambique or within Mozambique, to form the Incomati River which discharges into the Indian Ocean immediately North of Maputo at Villa Laisa, while the Usuthu River confluences with the Maputo River to form the Maputo basin which also discharges into the Indian Ocean South of Maputo.

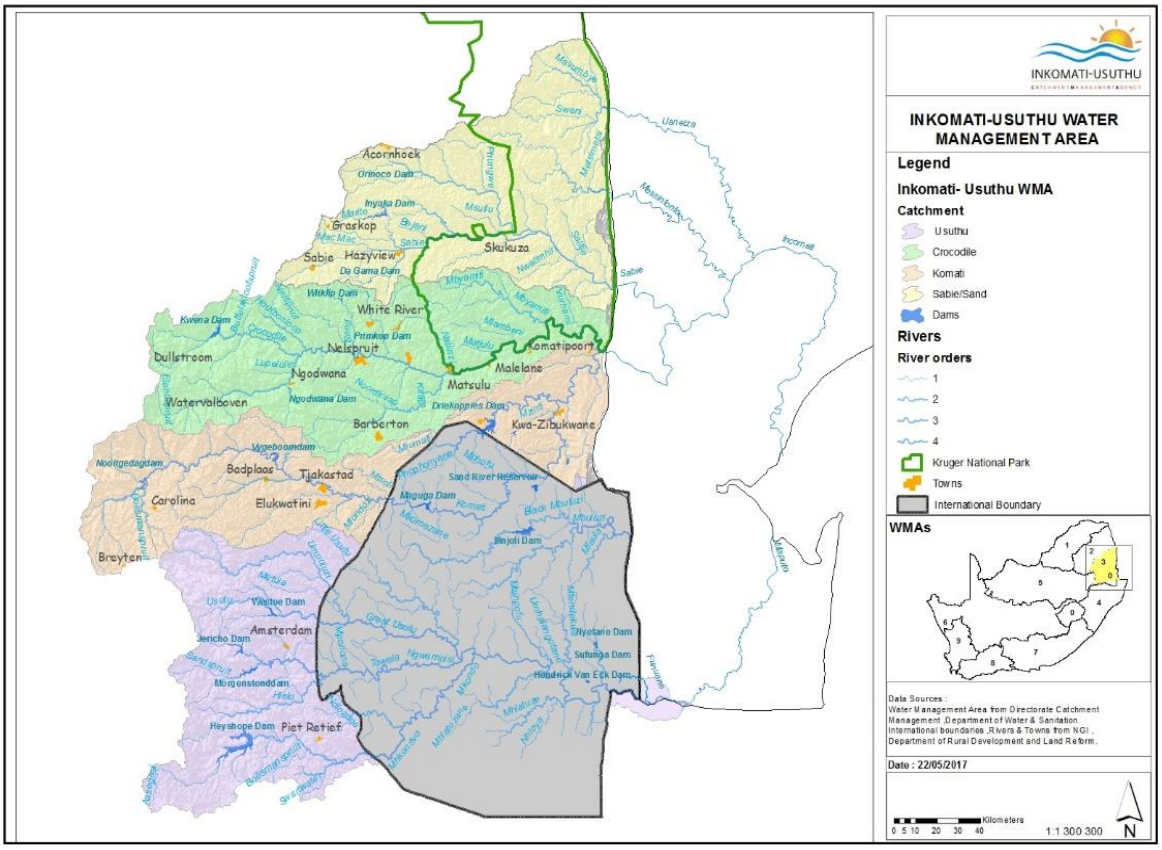


Figure 2: Inkomati-Usuthu Water Management Area

3.2 Materials and Methods

The water quality sample bottles were mark with the site code, date and time of collection using a permanent marker. Additives were only introduced in the microbial sample collecting bottles as they were pre-sterilized. The grab sample method is used for chemical and microbiological sampling. The caps of the bottles were not removed until the sample was ready to be taken. Some of the samples were taken on bridges using a bucket and bailer. The bucket was rinsed three times before collecting the sample and filling the sampling bottles.

One (1) litre chemical sample collecting bottles were rinsed three times before they were filled. The 100ml microbial sample collecting bottles were not rinsed since they were sterilized, ample air space was left in the sample bottle to facilitate mixing by shaking.

Both chemical and microbial water quality samples were stored in two separate cooler boxes and preserved with ice packs or cubes. The samples were then submitted to a SANAS accredited laboratory for analysis and microbiological samples were delivered within 12 hours to the Laboratory. The HydroNet and Hydstra systems were used to display and interpret the average of 12 months water quality data for the sites monitored.

Figure 3: Chemical and Microbiological samples taken at Komati River downstream of Vygeboom Dam@R38 bridge using the bailer and the bucket

Figure 4: IUCMA official taking water quality chemical sample at tributary of Seekoeispruit in Komati Catchment

Chapter 1: Crocodile Catchment

1.1 Introduction

The Crocodile River catchment originates near Dullstroom, where it flows into the Kwena Dam and eastwards through Nelspruit and confluences with the Komati River before entering Mozambique at the Lebombo Border Gate. The Elands River and Kaap River are two large tributaries of the Crocodile River system. The other smaller tributaries of the Crocodile River include the Lunsklip River, Nels River, Houtbosloop, Gladdespruit, White River and Besterspruit. The Significant Dams include the Kwena Dam, Ngodwana Dam, Witklip Dam, Klipkoppie Dam, Longmere Dam & Primkop Dam. The Crocodile River Catchment is dominated by agricultural activities (pasture, dry land, or irrigated cultivation), forestry, rural and urban settlements. The middle region of the Crocodile River is characterized by increased urbanization. The river flows through the major towns of Nelspruit, Kaapmuiden and Malelane as well as commercial farming activities (sugar cane, fruit orchards, and vegetables) which are important characteristics of this catchment. There are also mining activities in the Kaap River and the Sappi Mill in the Elands River sub-catchment. Illegal sand mining is posing a severe water quality problem in the middle regions of the Crocodile River catchment area around Kanyamazane area.

1.2 Water Quality Monitoring Points

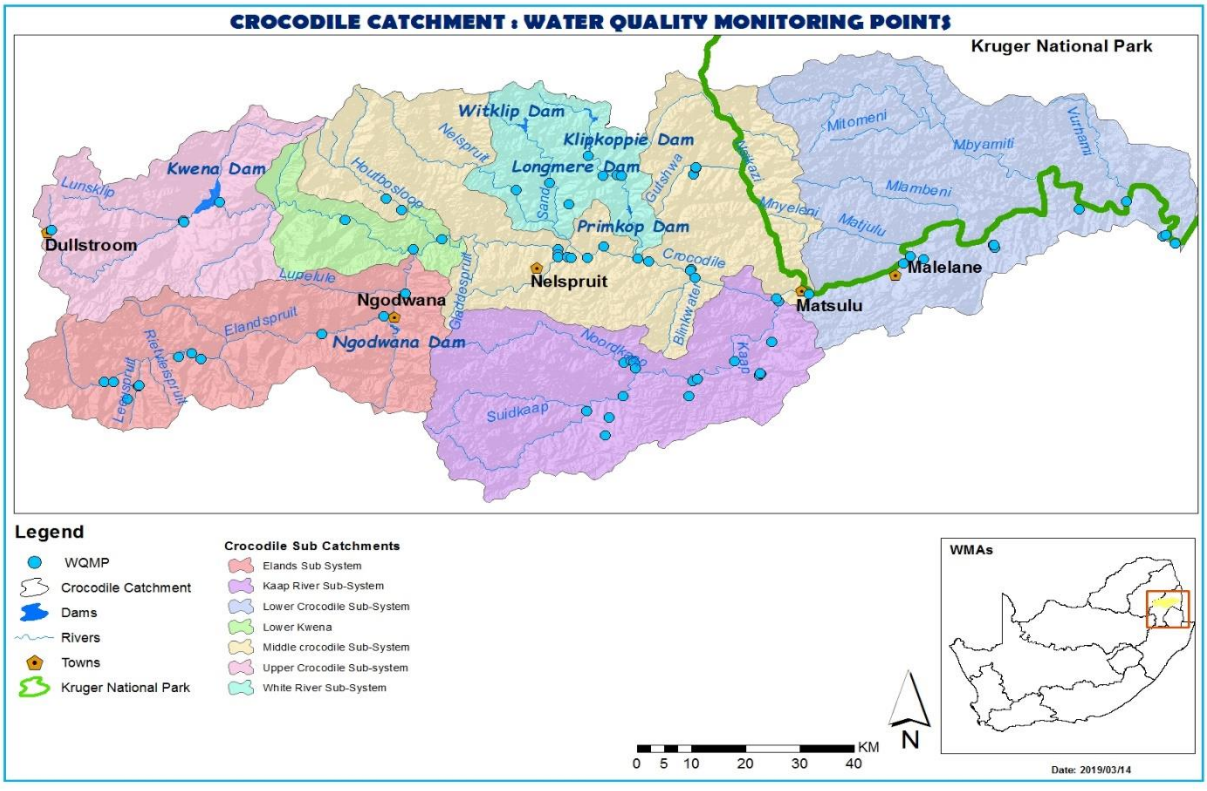


Figure 5: Water quality monitoring points in the Crocodile Catchment.

1.3 Resource Quality Objectives and Target Water Quality Guideline limits

The compliance of the indicator parameters was compared with the Resource Quality Objectives published in a Government Gazette dated 30 December 2016 or the Target Water Quality Guideline limits (TWQG) where the RQOs were not available or set.

Table 2: Resource Quality Objectives within Crocodile Catchment

Variables/ Parameters	**RQOs**						
	Ecological Water Requirement (EWR) Sites						
	EWR-C1	**EWR-C2**	**EWR-C3**	**EWR-C4**	**EWR-C5**	**EWR-C6**	**EWR-C7**
E. coli (cfu/100ml)	120	130	N/A	130	130	130	130
Electrical Conductivity (mS/m)	30	30	30	70	70	70	200
Phosphate (mg/l)	0.015	0.025	0.015	0.125	0.075	0.125	0.125

N/A=Not available

Table 3: Target Water Quality Guideline limits (TWQG)

Variables/Parameters	**Target Water Quality Guideline limits (TWQG)**
Sulphates (mg/l)	80 (Industrial -category 2)
pH	6.5-8.5 (Recreation -full contact)
Nitrates/Nitrites (mg/l)	6 (Domestic -Human consumption)

1.4 Water Quality Status

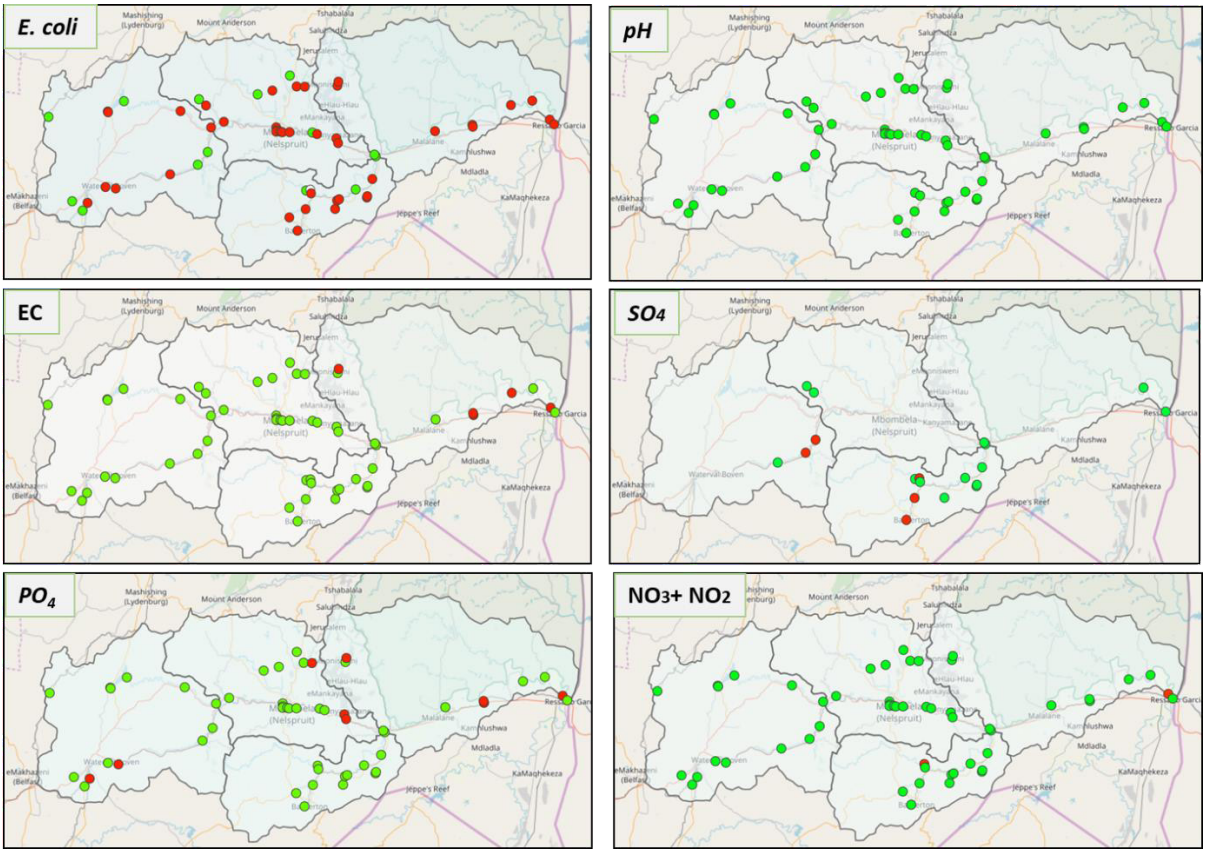


Figure 6: Water quality status within Crocodile Catchment showing Microbiological (E coli), physical (pH), Salts (EC and SO_4), Nutrients (PO_4 and NO_3+NO_2) concentrations.

1.5 Discussion of Results

E. coli counts in the Crocodile Catchment show elevated counts which from time to time exceeded the set RQOs of 130 (cfu/100ml). The non-compliance from the upper, middle and lower parts of the Crocodile River and its tributaries such as the Elands River, White River, Nels River and Kaap River is due to contamination of human faecal material or/and other animals. Only thirteen (13) points in the catchments complied with the 130 (cfu/100ml).

pH levels complied with the TWQG (Recreation -full contact) throughout the catchment.

Electrical Conductivity complied with the RQOs (Aquatic Ecosystem drivers), except in the tributary of Gutshwa River, Crocodile River@Tenbosch, and up and down stream of Hectorspruit WWTWs as well as in the tributary of Crocodile River downstream of Komati WWTW.

Sulphate concentrations complied with the TWQG (Industrial -category 2) in the Crocodile catchment except in the Kaap River Sub-Catchment due to Mine activities in the area and Elands River down-stream of Ngodwana Mill.

Ortho-Phosphate concentrations complied with the RQOs (Aquatic Ecosystem drivers) for most of the time except downstream of Emthonjeni, Waterval Boven, White River and Kabokweni WWTWs, downstream & upstream of Hectorspruit WWTWs as well as in the Kanyamazane stream and Crocodile River at Kanyamazane N4 Bridge.

Nitrates/Nitrites concentrations complied with the TWQG (Domestic -Human consumption) throughout the catchment, except tributary of Noord-Kaap at new consort Mine stream and tributary of Crocodile River downstream of Komatipoort WWTW.

1.6 Ecological Water Requirements (EWR) Sites

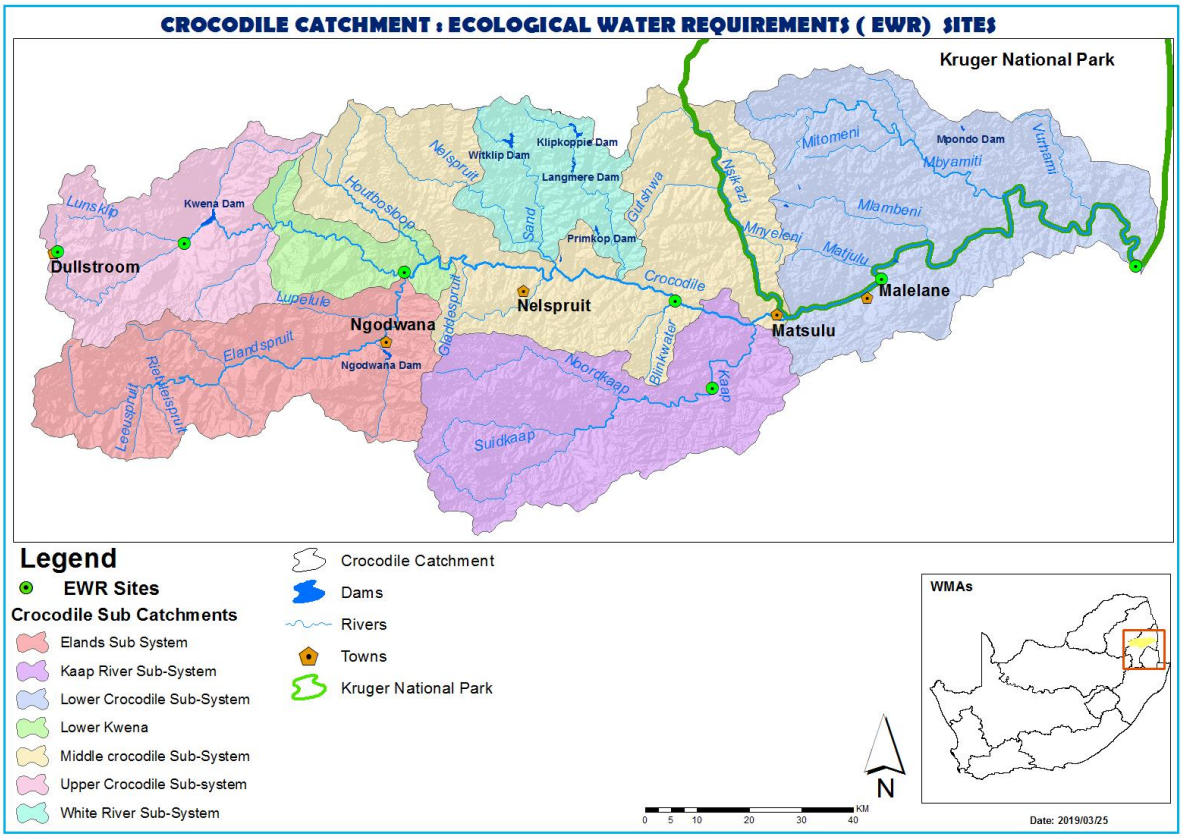


Figure 7: Ecological Water Requirements (EWR) Sites in the Crocodile Catchment

Ecological Water Requirement (EWR) Site C1: Compliance **(✓)** or non-compliance **(X)** in the Crocodile River at Dullstroom

Narrative RQO	Numerical RQO	Notes
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than **0.015 mg/L** PO_4-P (aquatic ecosystems: driver).	✓
Ensure that electrical conductivity (salt) levels are within Ideal limits.	95th percentile of the data must be less than or equal to **30 mS/m** (Aquatic ecosystems: driver).	✓
Ensure that *E coli* (microbial) levels are within Recreation at full contact limits	Meet the TWQR of **0 - 120 counts per 100ml** (Recreation at full contact)	X

Ecological Water Requirement (EWR) Site C2: Compliance **(✓)** or non-compliance **(X)** in the Crocodile River upstream of Kwena Dam.

Narrative RQO	Numerical RQO	Notes
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than **0.025 mg/L** PO_4-P (aquatic ecosystems: driver).	✓
Ensure that electrical conductivity (salt) levels are within Ideal limits.	95th percentile of the data must be less than or equal to **30 mS/m** (Aquatic ecosystems: driver).	✓
Ensure that *E coli* (microbial) levels are within Recreation at full contact limits	Meet the TWQR of **0 - 130 counts per 100ml** (Recreation at full contact)	X

Ecological Water Requirement (EWR) Site C3: Compliance **(✓)** or non-compliance **(X)** in the Crocodile River at Montrose N4 Bridge.

Narrative RQO	Numerical RQO	Notes
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than **0.015 mg/L** PO_4-P (aquatic ecosystems: driver).	✓
Ensure that electrical conductivity (salt) levels are within Ideal limits.	95th percentile of the data must be less than or equal to **30 mS/m** (Aquatic ecosystems: driver).	✓
Ensure that *E coli* (microbial) levels are within Recreation at full contact limits	**Not Available**	

Ecological Water Requirement (EWR) Site C4: Compliance **(✓)** or non-compliance **(X)** in the Crocodile River at Kanyamazane N4 Bridge.

Narrative RQO	Numerical RQO	Notes
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than **0.125 mg/L** PO_4-P (aquatic ecosystems: driver).	X
Ensure that electrical conductivity (salt) levels are within Ideal limits.	95th percentile of the data must be less than or equal to **30 mS/m** (Aquatic ecosystems: driver).	✓
Ensure that *E coli* (microbial) levels are within Recreation at full contact limits	Meet the TWQR of **0 - 130 counts per 100ml** (Recreation at full contact)	X

Ecological Water Requirement (EWR) Site C5: Compliance **(✓)** or non-compliance **(X)** in the Crocodile River at Malelane KNP Gate Bridge.

Narrative RQO	Numerical RQO	Notes
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than **0.075 mg/L** PO_4-P (aquatic ecosystems: driver).	✓
Ensure that electrical conductivity (salt) levels are within Ideal limits.	95th percentile of the data must be less than or equal to **70 mS/m** (Aquatic ecosystems: driver).	✓
Ensure that *E coli* (microbial) levels are within Recreation at full contact limits	Meet the TWQR of **0 - 130 counts per 100ml** (Recreation at full contact)	X

Ecological Water Requirement (EWR) Site C6: Compliance **(✓)** or non-compliance **(X)** in the Crocodile River downstream of Komatipoort Golf Course.

Narrative RQO	Numerical RQO	Notes
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than **0.125 mg/L** PO_4-P (aquatic ecosystems: driver).	✓
Ensure that electrical conductivity (salt) levels are within Ideal limits.	95th percentile of the data must be less than or equal to **70 mS/m** (Aquatic ecosystems: driver).	✓
Ensure that *E coli* (microbial) levels are within Recreation at full contact limits	Meet the TWQR of **0 - 130 counts per 100ml** (Recreation at full contact)	X

Ecological Water Requirement (EWR) Site C7: Compliance **(✓)** or non-compliance **(X)** in the Kaap River at Honeybird.

Narrative RQO	Numerical RQO	Notes
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than **0.125 mg/L** PO_4-P (aquatic ecosystems: driver).	✓
Ensure that electrical conductivity (salt) levels are within Ideal limits.	95th percentile of the data must be less than or equal to **200 mS/m** (Aquatic ecosystems: driver).	✓
Ensure that *E coli* (microbial) levels are within Recreation at full contact limits	Meet the TWQR of **0 - 130 counts per 100ml** (Recreation at full contact)	X
Ensure that Arsenic (As) levels are within Ideal limits.	95th percentile of the data must be within **0.02 mg/L** As (Aquatic ecosystems: driver).	✓
Ensure that Cyanite (Cn) levels are within Ideal limits.	95th percentile of the data must be less than **0.004 mg/L** Cn (Aquatic ecosystems: driver).	

N: B- Cn maybe non-compliant or Compliant with the RQOs of 0.004 (mg/l), since the results throughout the year were <0.07(mg/l) and this is the detection limit of the Laboratory.

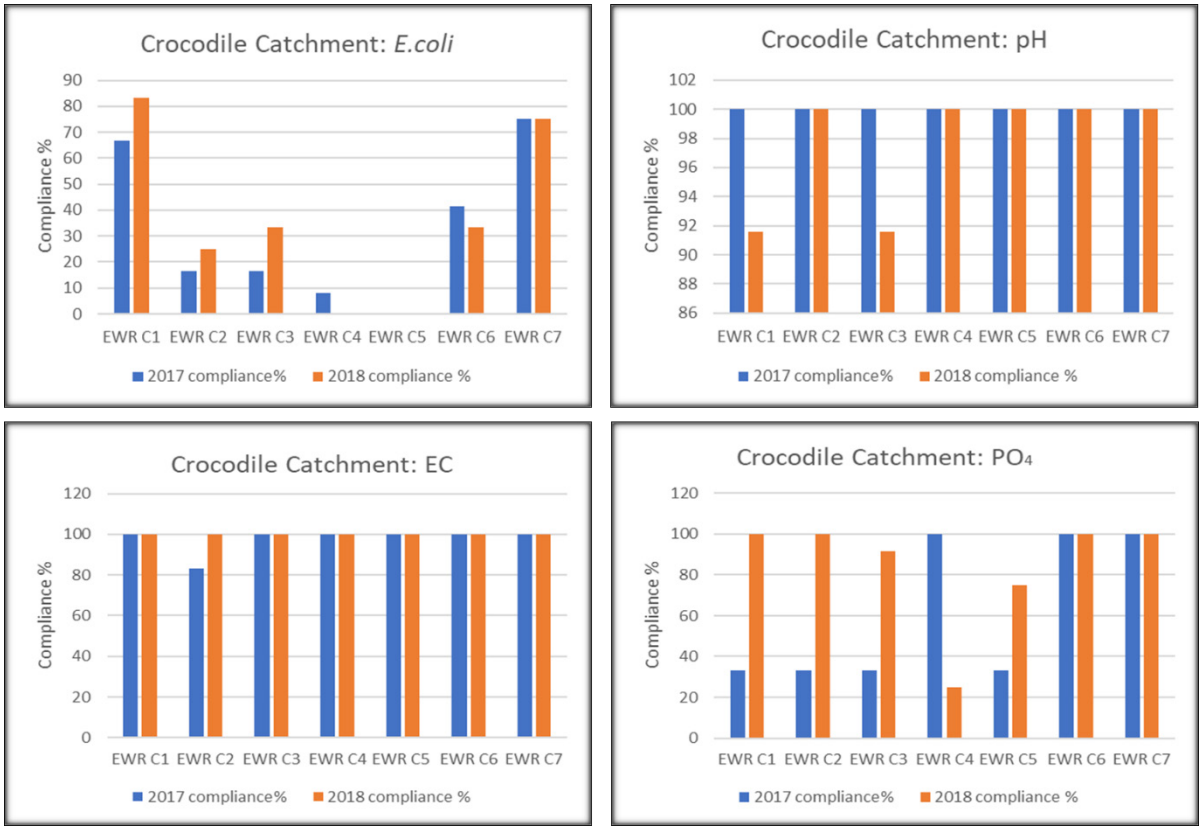


Figure 8: The compliance % of E coli, pH, EC and PO_4 concentrations on EWR sites in the Crocodile Catchment for year 2017 and 2018.

E. coli

The results above do not show 100% compliance in the Crocodile Catchment with the RQOs or TWQG for all EWR sites. However, improvement was recorded in 2018 at EWR sites C1, C2 and C3 and EWR Sites C 4 and C6 indicated deterioration. While EWR sites C5 and C7 remained constant with 0% and 75% compliance,respectively.

pH

The pH in the Crocodile Catchment has been constant at 100% compliance for most EWR sites except for EWR site C1 and C3 in 2018 where it indicate 91% compliance..

Electrical Conductivity (EC)

The EC in the Crocodile catchment has remained constant at 100% compliance for the all EWR sites in 2017 and 2018 , except for EWR C2 which indicate 83% compliance in 2017 and improved to 100% compliance in 2018.

Phosphate

The phosphate compliance in the Crocodile Catchment has generally improved in 2018 compared to 2017. However, deterioration was observed at EWR C4 which reduced to 25% in 2018.

Chapter 2: Sabie/ Sand Catchment

2.1 Introduction

The Sabie River originates in the upper reaches of the Sabie Town and passes through Sabie where industries such as York Timber Sawmill and the defunct underground gold mines of the Transvaal Gold Mine Estate (TGME) are situated. The Sabie River further flows through Hazyview and Mkhuhlu and other residential areas before it enters the Kruger National Park, Mozambique and the Indian Ocean respectively. The main tributaries of the Sabie River are Mac-Mac River, Klein Sabie River, Noord-Sand River, Bega River, Sand River and Mutlumuvi River. The Sand River confluences with the Sabie River inside the Kruger National Park. There are five main dams in the Sabie Sand Catchment, namely: Inyaka Dam, Da-Gama Dam, Eidenburg Dam, Mahleve Dam and the Swartfontein Dam. The catchment is dominated by trout farming, forestry at the upper reaches of the catchment and housing development such as guest houses, lodges and hotels. The wastewater treatment works are poorly maintained. The middle reaches from the Hazyview to Kruger National Park are affected mostly by agriculture, eco-adventure tourism, irrigation, water abstraction and urban development while the lower reaches of the catchment are inside the Kruger National Park which is a protected area.

2.2 Water Quality Monitoring Points

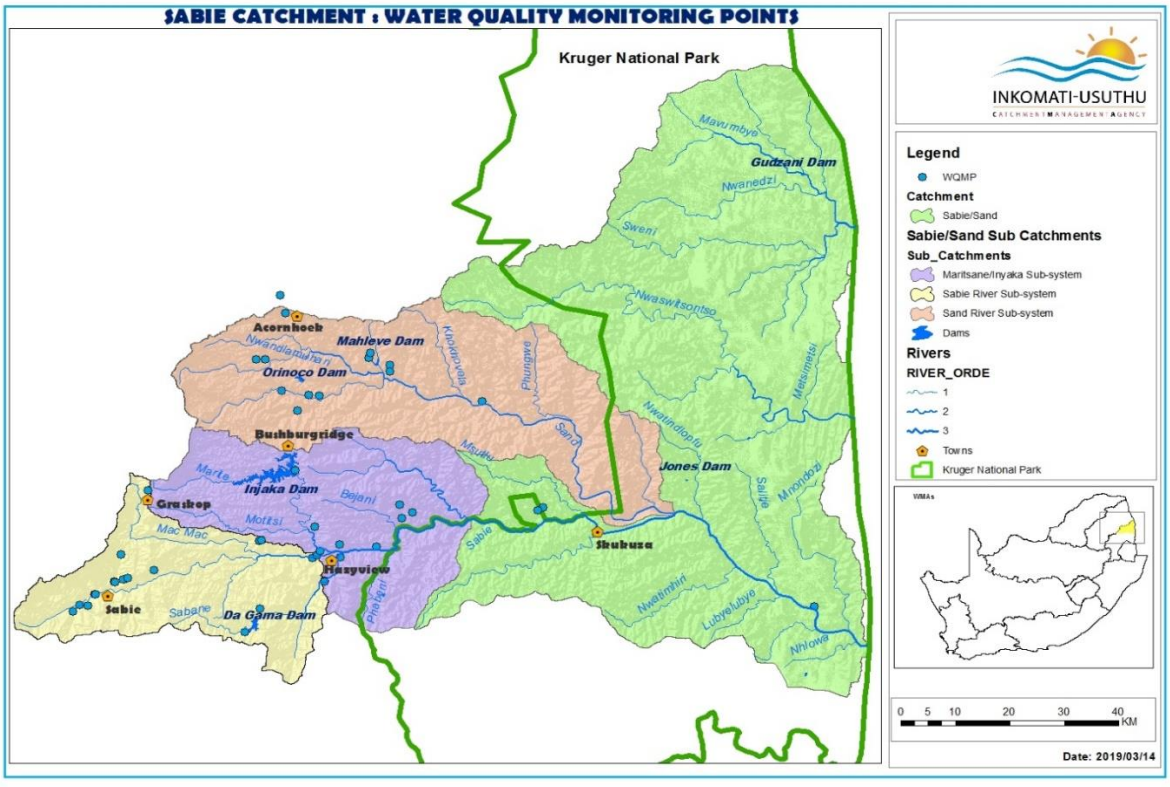


Figure 9: Water quality monitoring points in the Sabie Catchment

2.3 Resource Quality Objectives (RQOs)

The compliance of the indicator parameters was compared with the Resource Quality Objectives published in a Government Gazette dated 30 December 2016 or the Target Water Quality Guideline limits (TWQG) where the RQOs were not available or set. The International Water Quality Guidelines Limit as per the Tripartite Interim Agreement between Republic of Mozambique, Republic of South Africa (RSA) and the Kingdom of eSwatini were used at exit points that drain into the neighbouring countries.

Table 4: Resource Quality Objectives within Sabie/Sand Catchment

Variables/Parameters	**RQOs**							
	Ecological Water Requirement (EWR) Sites							
	EWR-S1	**EWR-S2**	**EWR-S3**	**EWR-S4**	**EWR-S5**	**EWR-S6**	**EWR-S7**	**EWR-S8**
***E. coli* (cfu/100ml)**	130	130	130	N/A	130	130	130	130
Electrical Conductivity (mS/m)	30	30	30	N/A	30	55	42	N/A
Phosphate (mg/l)	0.015	0.015	0.015	N/A	0.015	0.125	0.125	0.125

N/A=Not available

Table 5: Target Water Quality Guideline limits (TWQG) and International Obligation limits

Variables/Parameters	**Target Water Quality Guideline limits (TWQG)**	**International Water Quality Guidelines Limit**
E coli (Cfu/100ml)	130	2000
Electrical Conductivity (mS/m)	40	150
Phosphate (mg/l)	0.02	2
pH	6.5-8.5	6.5-8.5
Nitrates/Nitrites (mg/l)	6	50
Ammonia (mg/l)	1	1

2.4 Water Quality Status

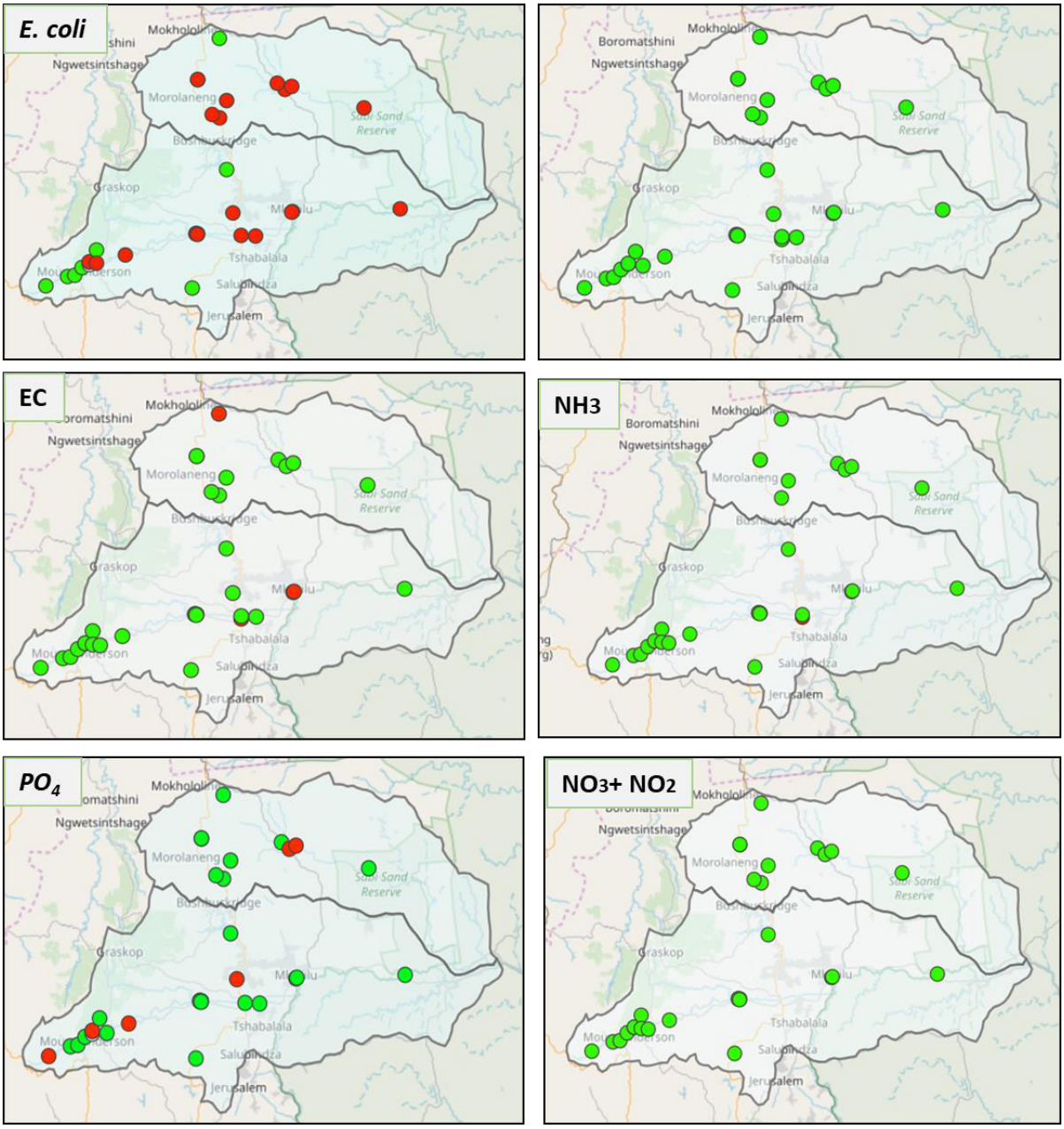


Figure 10: Water quality status within Sabie/sand Catchment showing Microbiological (E coli), physical (pH), Salts(EC) and Nutrients (PO_4, NO_3+NO_2 and NH_3) concentrations.

2.5 Discussion of Results

E. coli counts in the Sabie Catchment show compliance in the headwaters of the Sabie Rivers. The Mac-Mac and Sabaan Rivers, Inyaka Dam, Mahleve Dam and Da-Gama Dam also complied with the set RQOs limit of 130 (cfu/100ml), however the areas downstream of Sabie and Sand River showed elevated *E. coli* counts which from time to time exceeded the set RQOs for Recreation (full contact).

pH concentrations complied with the TWQG (Recreation -full contact) throughout the catchment.

Electrical Conductivity complied with RQOs (Aquatic Ecosystem drivers), except in the, Sabie River downstream of Hazyview WWTW and sewer pump station and the Bega River downstream of Mkhuhlu settlement and piggery Project as well as Mahleve Dam.

Ammonia concentrations complied with the TWQG (Domestic -Human consumption) throughout the Sabie Sand catchment except downstream of Hazyview WWTW.

Ortho-Phosphate indicated compliance with the RQOs for all points within Sabie/Sand Catchment except four points on the Sabie River and two points on the Mutlumuvi River indicated non-compliance.

Nitrates/Nitrites concentrations complied with the TWQG (Domestic -Human consumption) throughout the catchment.

2.6 Ecological Water Requirements (EWR) Sites

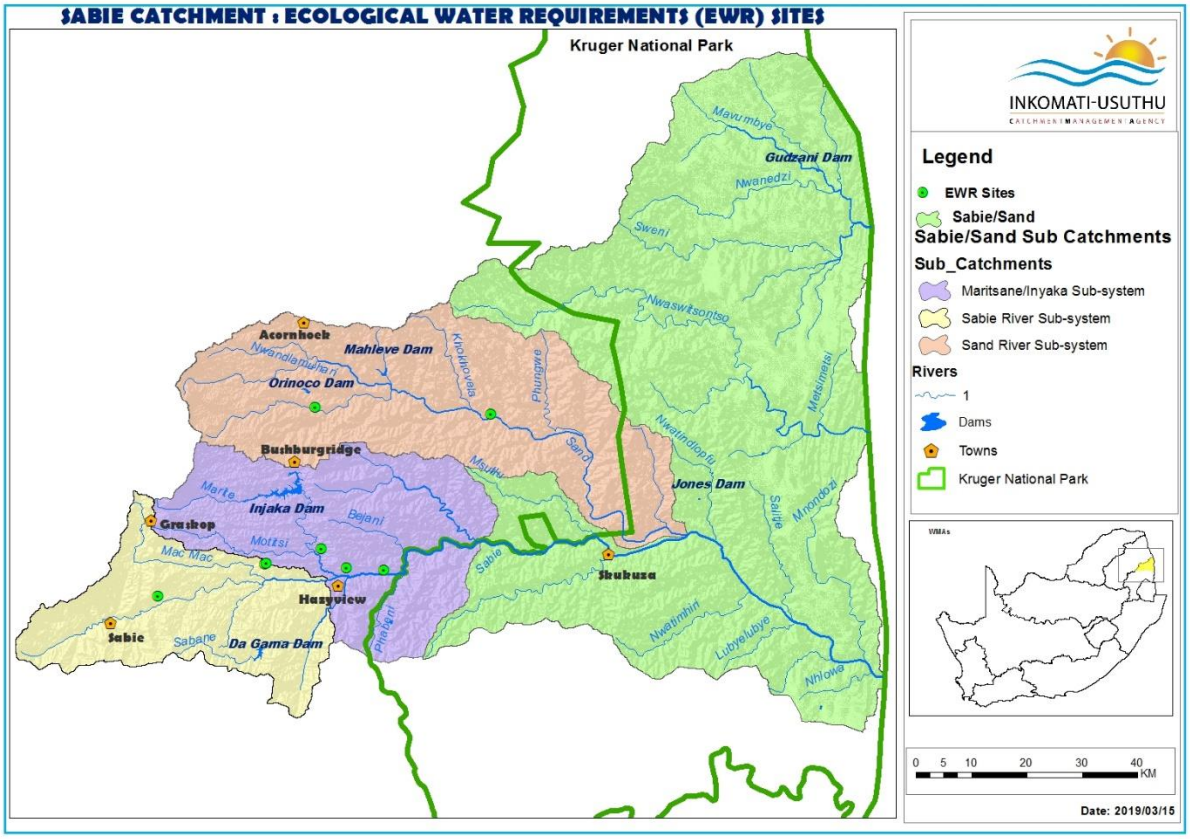


Figure 11: Ecological Water Requirements (EWR) Sites in the Sabie/Sand Catchment

Ecological Water Requirement (EWR) Site S1: Compliance (✓) or non-compliance (X) in the Sabie River downstream of Sabie WWTW

Narrative RQO	Numerical RQO	Notes
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than **0.015 mg/L** PO_4-P (aquatic ecosystems: driver).	X
Ensure that electrical conductivity (salt) levels are within Ideal limits.	95th percentile of the data must be less than or equal to **30 mS/m** (Aquatic ecosystems: driver).	✓
Ensure that *E coli* (microbial) levels are within Recreation at full contact limits	Meet the TWQR of **0 - 130 counts per 100ml** (Recreation at full contact)	X

Ecological Water Requirement (EWR) Site S2: Compliance (✓) or non-compliance (X) in the Sabie River after confluence with Mac-Mac River

Narrative RQO	Numerical RQO	Notes
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than **0.015 mg/L** PO_4-P (aquatic ecosystems: driver).	✓
Ensure that electrical conductivity (salt) levels are within Ideal limits.	95th percentile of the data must be less than or equal to **30 mS/m** (Aquatic ecosystems: driver).	✓
Ensure that *E coli* (microbial) levels are within Recreation at full contact limits	Meet the TWQR of **0 - 130 counts per 100ml** (Recreation at full contact)	X

Ecological Water Requirement (EWR) Site S3: Compliance (✓) or non-compliance (X) in the Sabie River at Hoxani weir.

Narrative RQO	Numerical RQO	Notes
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than **0.015 mg/L** PO_4-P (aquatic ecosystems: driver).	✓
Ensure that electrical conductivity (salt) levels are within Ideal limits.	95th percentile of the data must be less than or equal to **30 mS/m** (Aquatic ecosystems: driver).	✓
Ensure that *E coli* (microbial) levels are within Recreation at full contact limits	Meet the TWQR of **0 - 130 counts per 100ml** (Recreation at full contact)	X

Ecological Water Requirement (EWR) Site S4: Compliance (✓) or non-compliance (X) in the Sabana River

Narrative RQO	Numerical RQO	Notes
Ensure that nutrient levels are within Acceptable limits.	**Not Available**	
Ensure that electrical conductivity (salt) levels are within Ideal limits.	**Not Available**	
Ensure that *E coli* (microbial) levels are within Recreation at full contact limits	**Not Available**	

Ecological Water Requirement (EWR) Site S5: Compliance (✓) or non-compliance (X) in the Marite River downstream of Inyaka Dam

Narrative RQO	Numerical RQO	Notes
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than **0.015 mg/L** PO_4-P (aquatic ecosystems: driver).	✓
Ensure that electrical conductivity (salt) levels are within Ideal limits.	95th percentile of the data must be less than or equal to **30 mS/m** (Aquatic ecosystems: driver).	✓
Ensure that *E coli* (microbial) levels are within Recreation at full contact limits	Meet the TWQR of **0 - 130 counts per 100ml** (Recreation at full contact)	X

Ecological Water Requirement (EWR) Site S6: Compliance (✓) or non-compliance (X) in the Mutlumuvi River at Tsuvulani Bridge

Narrative RQO	Numerical RQO	Notes
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than **0.125 mg/L** PO_4-P (aquatic ecosystems: driver).	✓
Ensure that electrical conductivity (salt) levels are within Ideal limits.	95th percentile of the data must be less than or equal to **55 mS/m** (Aquatic ecosystems: driver).	✓
Ensure that *E coli* (microbial) levels are within Recreation at full contact limits	Meet the TWQR of **0 - 130 counts per 100ml** (Recreation at full contact)	X

Ecological Water Requirement (EWR) Site S7: Compliance (✓) or non-compliance (X) in the Sand River at R40 Bridge

Narrative RQO	Numerical RQO	Notes
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than **0.125 mg/L** PO_4-P (aquatic ecosystems: driver).	✓
Ensure that electrical conductivity (salt) levels are within Ideal limits.	95th percentile of the data must be less than or equal to 42 **mS/m** (Aquatic ecosystems: driver).	✓
Ensure that *E coli* (microbial) levels are within Recreation at full contact limits	Meet the TWQR of **0 - 130 counts per 100ml** (Recreation at full contact)	X

Ecological Water Requirement (EWR) Site S8: Compliance (✓) or non-compliance (X) in the Sand River at Exeter Kruger National Park

Narrative RQO	Numerical RQO	Notes
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than **0.125 mg/L** PO_4-P (aquatic ecosystems: driver).	✓
Ensure that electrical conductivity (salt) levels are within Ideal limits.	**Not Available**	
Ensure that *E coli* (microbial) levels are within Recreation at full contact limits	Meet the TWQR of **0 - 130 counts per 100ml** (Recreation at full contact)	X

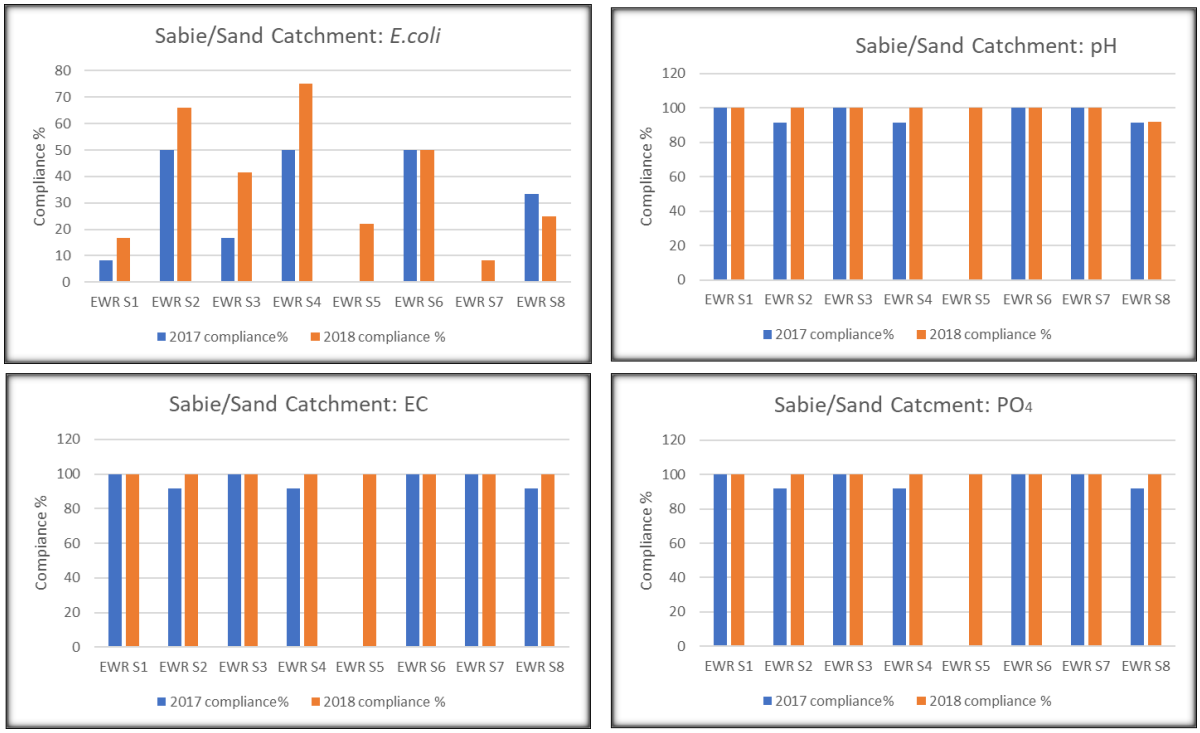


Figure 12: The compliance % of E coli, pH, EC and PO_4 concentrations on EWR sites in the Sabie/Sand Catchment for year 2017 and 2018.

E. coli

The results above do not show 100% compliance in the Sabie/Sand Catchment with the RQOs or TWQG for all EWR sites. However, improvement was recorded in 2018 for all EWR sites except for EWR site S8 which indicated deterioration. The EWR site S5 was not monitored in 2017.

pH

The pH in the Sabie/Sand Catchment has been constant at 100% compliance for most EWR sites except for EWR site S8. However, improvement was recorded in 2018 for EWR sites S2 and S4. EWR site S8 remained constant at 91% compliance in 2017 and 2018. The EWR site S5 was not monitored in 2017, however indicated 100% compliance in 2018.

Electrical Conductivity

Electrical conductivity in Sabie/Sand catchment showed improvement in all EWR sites as they all indicate 100% compliance in 2018 compared to 2017 The EWR site S5 was not monitored in 2017.

Phosphates

Phosphates in Sabie/Sand catchment showed improvement in all EWR sites in 2018 and indicated 100% compliance. The EWR site S5 was not monitored in 2017.

Chapter 3: Komati Catchment

3.1 Introduction

The Komati River originates from the outflow of the Nooitgedacht dam next to Carolina, Mpumalanga province. The catchment of the Nooitgedacht dam includes the Boesmanspruit and the Vaalwaterspruit tributaries that feed directly into the dam. The most unique feature of the Komati River is that it starts in South Africa and flows through eSwatini in a North-easterly direction and comes back to South Africa at the Mananga Border Gate. It then confluences with the Crocodile River (one of its main tributaries) at Komatipoort before it enters Mozambique where it confluences with the Sabie River which is another one of its main tributaries. After entering Mozambique, the Komati River is referred to as the Incomati River, and flows into the Indian Ocean at Maputo Bay. From source to mouth, the length of the Inkomati River is 480 kilometers. The Komati Catchment consists of Chief Albert Luthuli and Nkomazi Local Municipalities. These municipalities have Wastewater Treatment Works (WWTW) that discharge wastewater into the Komati River and some of its tributaries. The WWTWs are poorly maintained. The catchment is dominated by coal mining in the upper reaches of the catchment and irrigation agriculture in the lower reaches of the catchment. For the purposes of this report the Komati River upstream of eSwatini will be referred to as the Upper Komati and downstream of eSwatini, it will be referred to as the Lower Komati.

3.2 Water Quality Monitoring Points

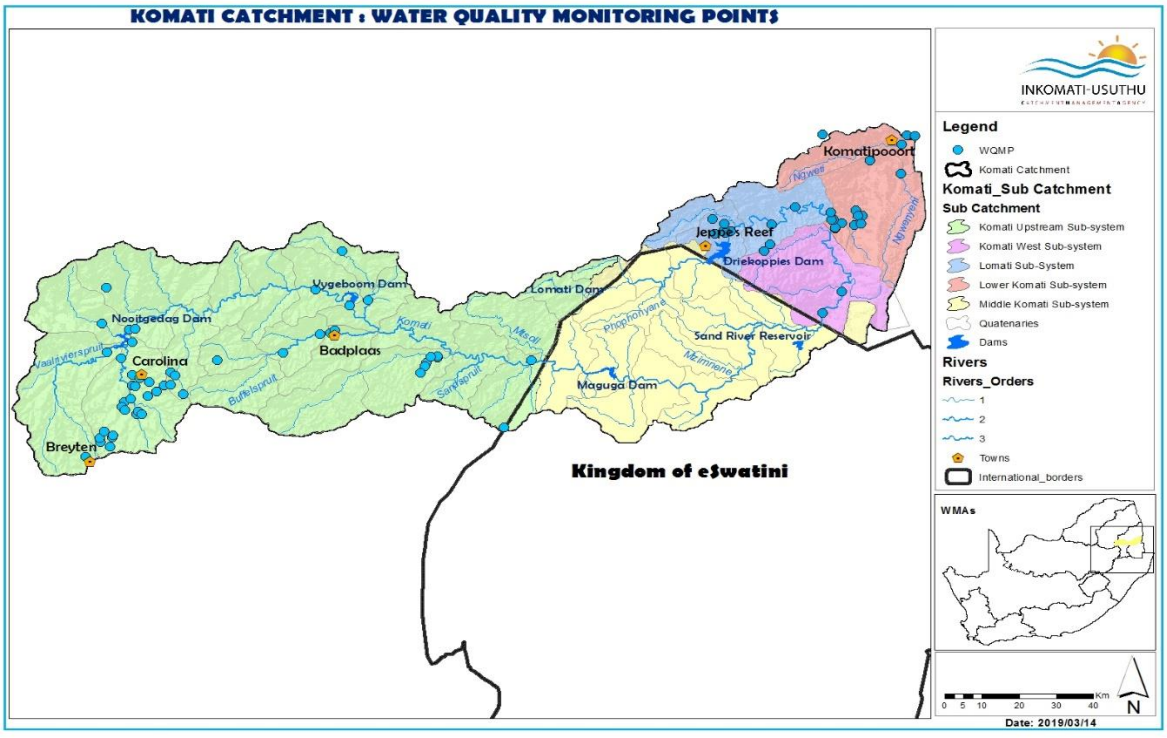


Figure 13: Water quality Monitoring points in the Komati Catchment.

3.3 Resource Quality Objectives (RQOs)

The compliance of the indicator parameters was compared with the Resource Quality Objectives published in a Government Gazette dated 30 December 2016 or the Target Water Quality Guideline limits (TWQG) where the RQOs were not available or set. The International Water Quality Guidelines Limit as per the Tripartite Interim Agreement between Republic of Mozambique, Republic of South Africa (RSA) and the Kingdom of ESwatini were used at last points that drains into the neighbouring countries.

Table 6: Resource Quality Objectives within Komati Catchment

Variables/Parameters	RQOs					
	Ecological Water Requirement (EWR) Sites					
	EWR-K1	EWR-K2	EWR-G1	EWR-T1	EWR-K3	EWR-L1
E. coli (cfu/100ml)	N/A	130	N/A	130	130	130
Electrical Conductivity (mS/m)	50	55	N/A	N/A	85	40
Phosphate (mg/l)	0.02	0.02	0.02	0.125	0.125	0.075

N/A=Not available

Table 7: Water Quality Priority RUs within Komati Catchment

Variables/Parameters	RQOs			
	Water Quality Priority Rus			
	RUK1-X11A	RUK2-X11B	RUK3-X11C-D	RUK2-X11E
Sulphate (mg/l)	30	80	30	N/A
pH	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
Electrical Conductivity (mS/m)	30	30	30	30

Table 8: Target Water Quality Guideline limits (TWQG)

Variables/Parameters	**Target Water Quality Guideline limits (TWQG)**
Nitrates/Nitrites (mg/l)	6 (Domestic -Human consumption)
Electrical Conductivity (mS/m)	40

3.4 Water quality status

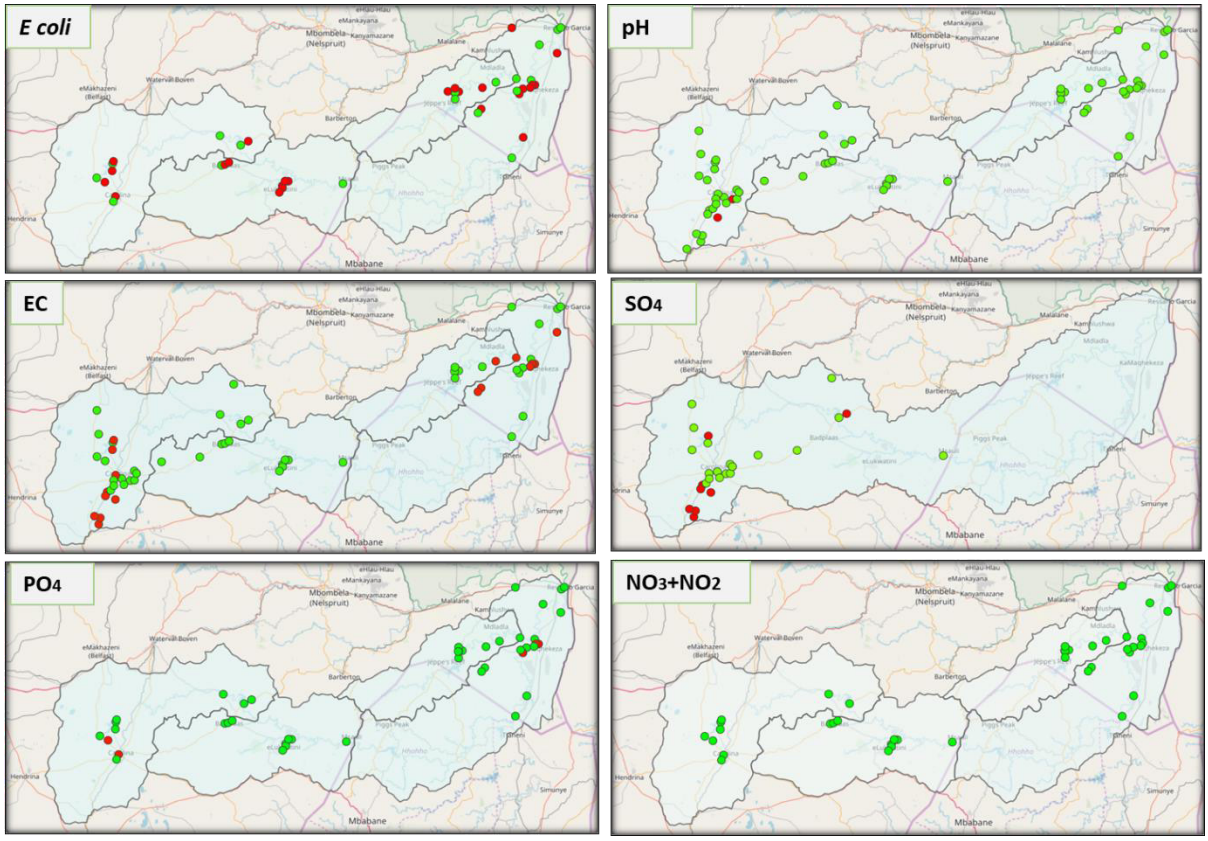


Figure 14: Water quality status within Komati Catchment showing Microbiological (E coli), physical (pH), Salts (EC and SO_4) and Nutrients (PO_4 and NO_3+NO_2) concentrations.

3.5 Discussion of Results

E. coli counts in the Komati Catchment complied with the RQO of 130 (cfu/100ml) except in Carolina, Badplaas and Elukwatini areas within the Upper Komati sub-catchment and Tonga, Skoonplaas, KaMaqhekeza and Buffelspuit settlement within Lower Komati sub-catchment which showed elevated *E. coli* counts which from time to time exceeded the set RQOs of Recreation (full contact).

pH complied with the RQO, except for two points within Upper Komati sub-catchment which is acidic, this may be due to the decanting mine water from active mines and defunct mines.

Electrical Conductivity was compliant at most monitoring points with the RQOs (Aquatic Ecosystem drivers) set within the Komati Catchment. There were a few points where the EC did not comply with the set RQOs in the Upper Komati sub-catchment especially on the Boesmaspruit which is dominated by coal mines. In the Lower Komati sub-catchment, there were also a few monitoring points where EC did not comply with set RQOs.

Sulphate concentration showed non-compliance with the priority resource units (RU) limit of 80 (mg/l) and 30 mg/l in the Boesmanspriut and Gladdespruit, respectively. These resource units are dominated by coal mines and the high levels of sulphates are mostly attributed to active mines and defunct mines some of which are decanting.

Ortho-Phosphate showed compliance with the RQOs for most of the points within Upper Komati sub-catchment, except for two (2) points. Similarly, in the Lower Komati sub-catchment there only two monitoring points where phosphate did not comply.

Nitrates/Nitrites concentrations complied with the TWQG (Domestic -Human consumption) throughout the catchment.

3.6 Ecological Water Requirements(EWR) Sites

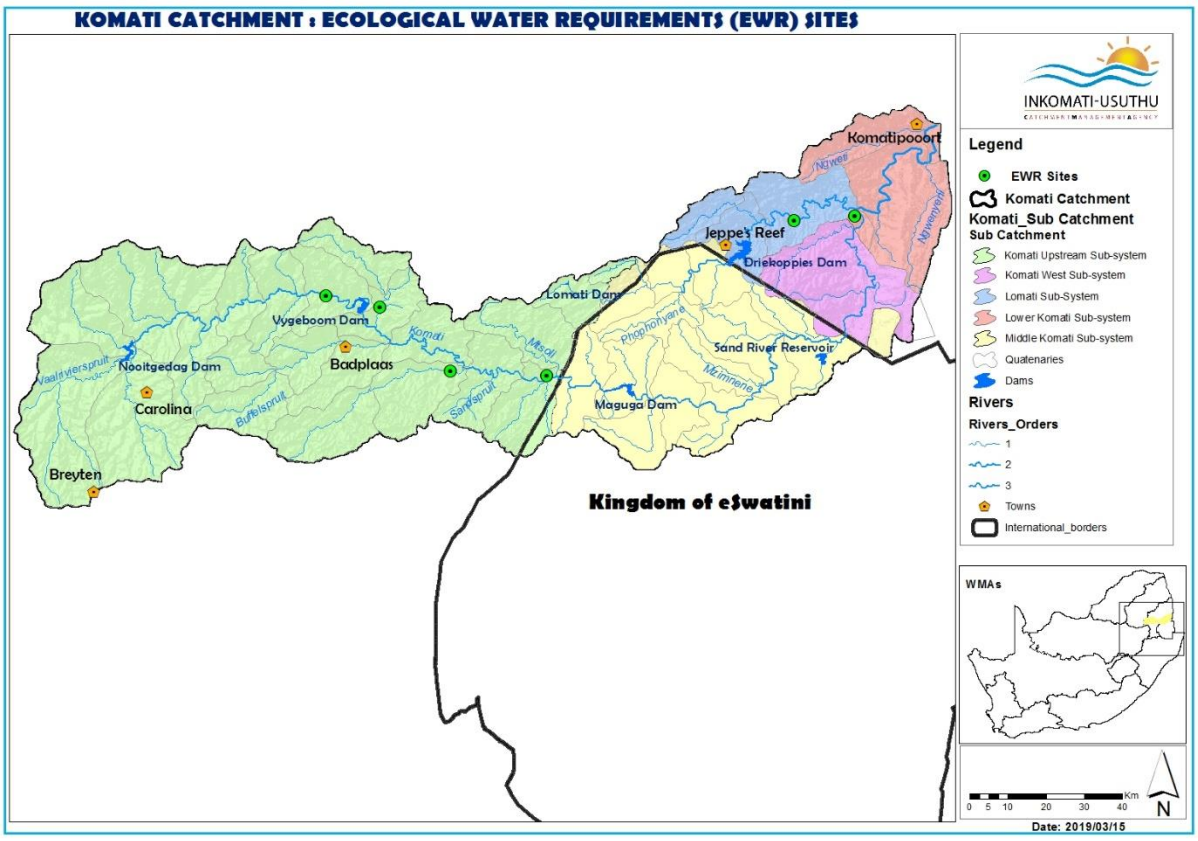


Figure 15: Ecological Water Requirements(EWR) Sites within Komati Catchment

Ecological Water Requirement (EWR) Site K1: Compliance (✓) or non-compliance (X) in the Komati River between Nooitgedacht and upstream of Vygeboom Dam at R541 Bridge.

Narrative RQO	Numerical RQO	Notes
Ensure that nutrient levels are within Acceptable limits.	**NOT AVAILABLE**	
Ensure that electrical conductivity (salt) levels are within Ideal limits.	95th percentile of the data must be less than or equal to **50 mS/m** (Aquatic ecosystems: driver).	✓
Ensure that *E coli* (microbial) levels are within Recreation at full contact limits	**NOT AVAILABLE**	

Ecological Water Requirement (EWR) Site G1: Compliance (✓) or non-compliance (X) in the Gladdespruit

Narrative RQO	Numerical RQO	Notes
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than **0.02 mg/L** PO_4-P (aquatic ecosystems: driver).	✓
Ensure that electrical conductivity (salt) levels are within Ideal limits.	**NOT AVAILABLE**	
Ensure that *E coli* (microbial) levels are within Recreation at full contact limits	**NOT AVAILABLE**	

Ecological Water Requirement (EWR) Site T1: Compliance (✓) or non-compliance (X) in the Teespruit downstream of Elukwatini WWTW

Narrative RQO	Numerical RQO	Notes
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than **0.125 mg/L** PO_4-P (aquatic ecosystems: driver).	✓
Ensure that electrical conductivity (salt) levels are within Ideal limits.	**NOT AVAILABLE**	
Ensure that *E coli* (microbial) levels are within Recreation at full contact limits	Meet the TWQR of **0 - 130 counts per 100ml** (Recreation at full contact)	X

Ecological Water Requirement (EWR) Site K2: Compliance (✓) or non-compliance (X) in the Komati River at Ekulindeni Bridge near the Swazi Border

Narrative RQO	Numerical RQO	Notes
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than **0.02 mg/L** PO_4-P (aquatic ecosystems: driver).	✓
Ensure that electrical conductivity (salt) levels are within Ideal limits.	95th percentile of the data must be less than or equal to **55 mS/m** (Aquatic ecosystems: driver).	✓
Ensure that *E coli* (microbial) levels are within Recreation at full contact limits	Meet the TWQR of **0 - 130 counts per 100ml** (Recreation at full contact)	X

Ecological Water Requirement (EWR) Site L1: Compliance (✓) or non-compliance (X) in the Lomati River at Langeloop

Narrative RQO	Numerical RQO	Notes
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than **0.075 mg/L** PO_4-P (aquatic ecosystems: driver).	✓
Ensure that electrical conductivity (salt) levels are within Ideal limits.	95th percentile of the data must be less than or equal to **40 mS/m** (Aquatic ecosystems: driver).	✓
Ensure that *E coli* (microbial) levels are within Recreation at full contact limits	Meet the TWQR of **0 - 130 counts per 100ml** (Recreation at full contact)	X

Ecological Water Requirement (EWR) Site K3: Compliance (✓) or non-compliance (X) in the Komati River at Tonga Bridge.

Narrative RQO	Numerical RQO	Notes
Ensure that nutrient levels are within Acceptable limits.	50th percentile of the data must be less than **0.125 mg/L** PO_4-P (aquatic ecosystems: driver).	✓
Ensure that electrical conductivity (salt) levels are within Ideal limits.	95th percentile of the data must be less than or equal to **85 mS/m** (Aquatic ecosystems: driver).	✓
Ensure that *E coli* (microbial) levels are within Recreation at full contact limits	Meet the TWQR of **0 - 130 counts per 100ml** (Recreation at full contact)	X

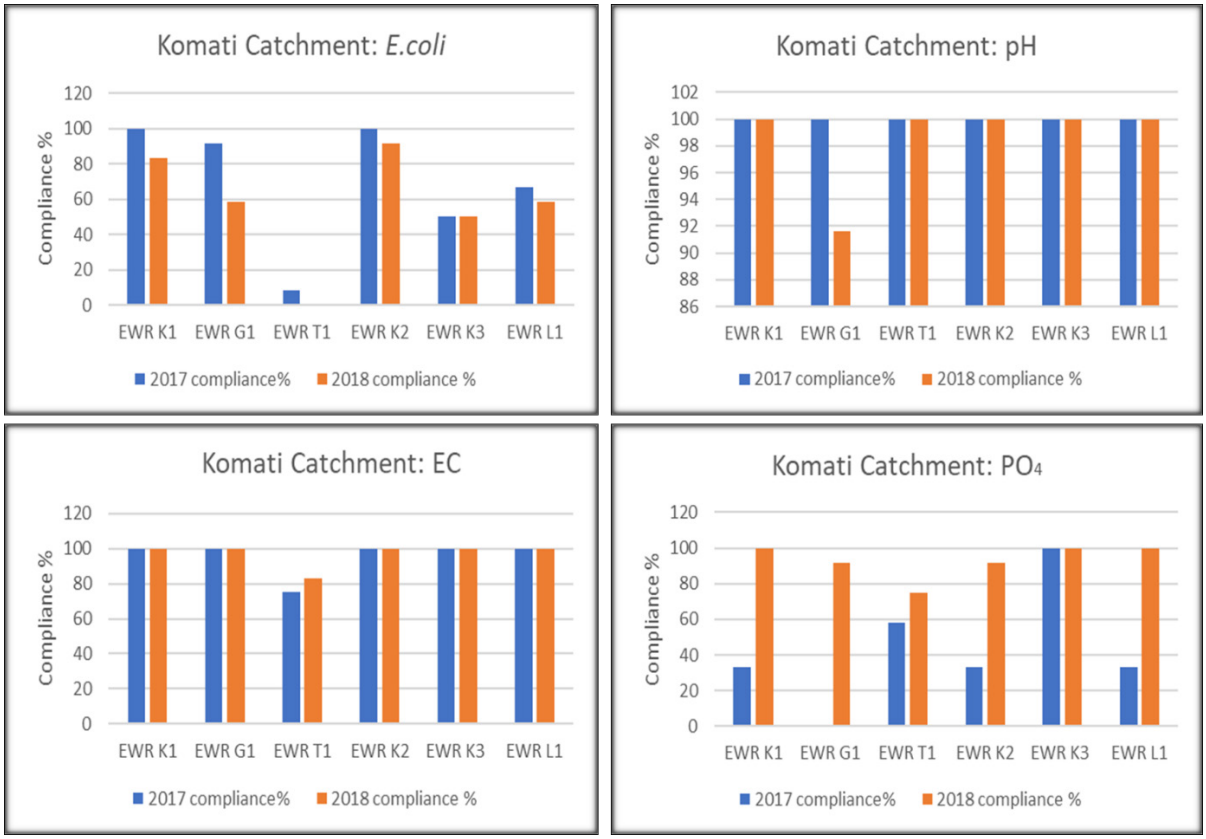


Figure 16: The compliance % of E coli, pH, EC and PO_4 concentrations on EWR sites in the Komati Catchment for year 2017 and 2018.

E. coli

The results above do not show 100% compliance with the RQOs or TWQG for all EWR sites in the Komati Catchment. The *E. coli* counts deteriorated in 2018 for all EWR sites except for EWR K3 which remained constant at 50%.

pH

The pH in the Komati Catchment has been constant at 100% compliance for most of EWR sites except for EWR site G1 which indicated deterioration from 100% in 2017 to 91% in 2018.

Electrical Conductivity

Electrical conductivity in Komati Catchment has been constant at 100% compliance for most of EWR sites except for EWR site T1 which showed improvement from 75% in 2017 to 83.3% in 2018.

Phosphates

Phosphates in Komati Catchment showed improvement in all EWR sites in 2018 except for EWR site K3 which remained constant at 100% in both 2017 and 2018.

3.7 Results from Water Quality Probes

Four water quality Probes were installed within Komati Catchment and they measure and record the actual conductivity (µS/cm), temperature (˚C) and salinity (PSU) after every 12 minutes. Actual conductivity data is transmitted to Zednet via network and other variables are downloaded through Win-Situ software. The actual conductivity for Hooggenoeg and Lembobo stations complied with the international standard/obligation of 1 500 (µS/cm) (equivalent to 150 mS/m) throughout the reporting period. The Tonga and Vygeboom stations complied with the RQOs of 850 (µS/cm) (equivalent to 85 mS/m) and TWQR of 400 (µS/cm) (equivalent to 40 mS/m) respectively. It was also noted that the quality improved when the flow was high and when the flow was low as shown in figure 14-17 below.

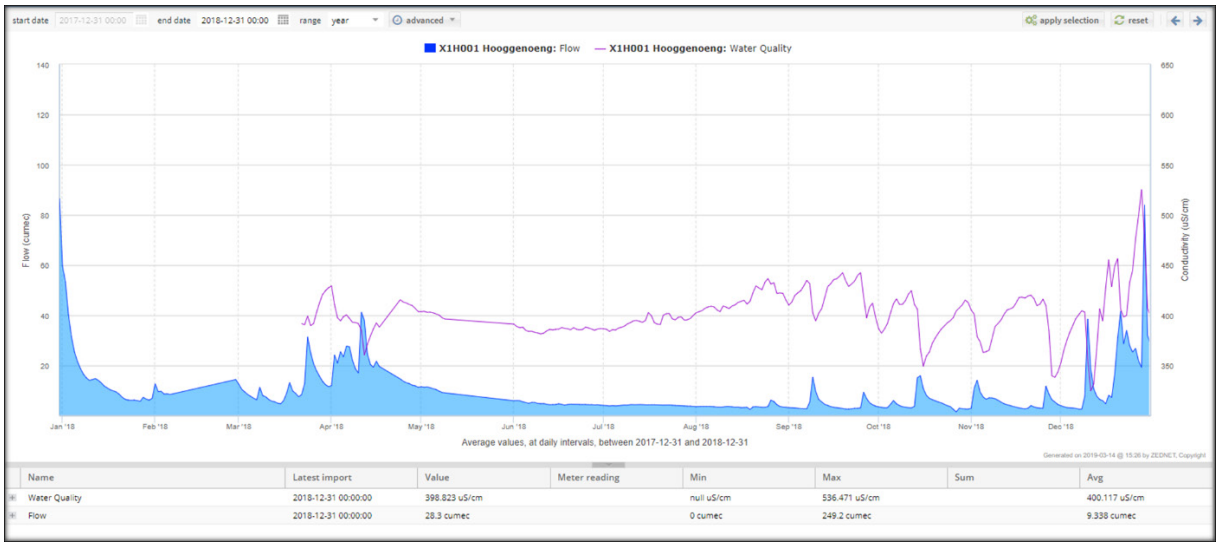


Figure 17: The actual conductivity and water flow at Hooggenoeg station (Komati River)

Figure 18: The actual conductivity and water flow at Tonga station (Komati River)

On 11 October 2018 ZedNet indicated the malfunction of the probes. The site inspection was conducted, and it was found that the Water Quality Probe in the Komati River at Tonga was vandalised as shown in the pictures below (see figure 14): The probe was restored on 16 January 2019. Consequently, the collection of data was interrupted from October 2018 to December 2018.

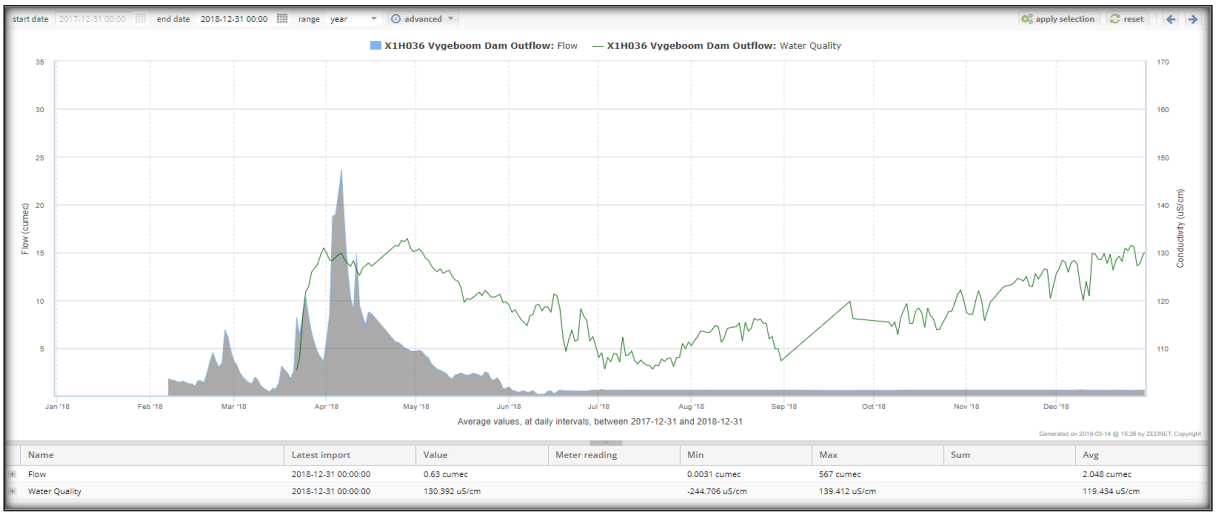


Figure 19: The actual conductivity and water flow at Vygeboom Dam Station (Komati River)

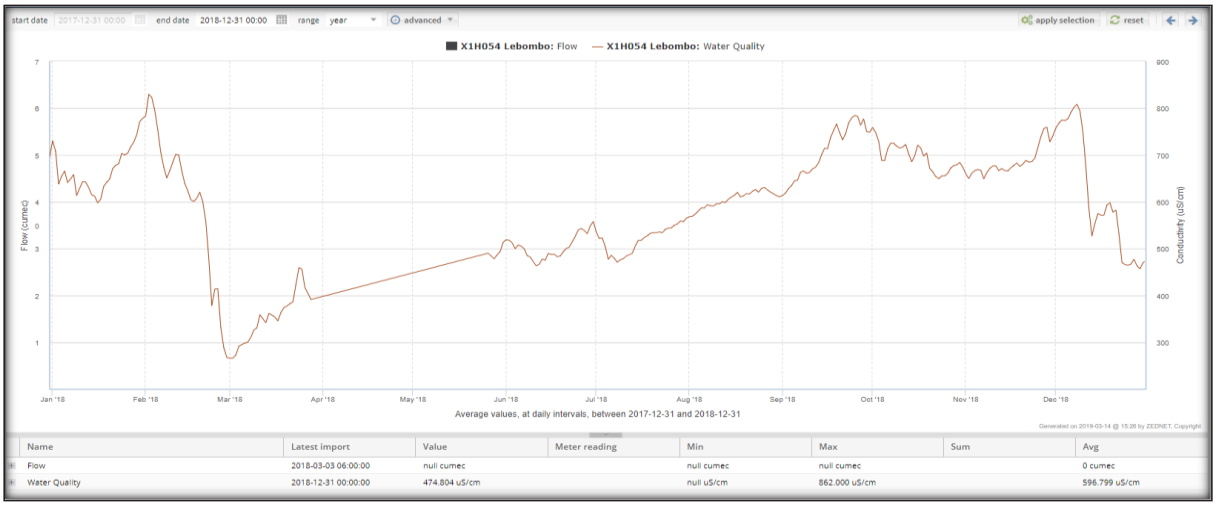


Figure 20: Actual conductivity data at Lebombo station (Komati River)

Chapter 4: Usuthu Catchment

4.1 Introduction

The headwaters of the Usutu River emerge from the highlands of Amsterdam, Mpumalanga province, flow through the Kingdom of eSwatini and the Republic of Mozambique before entering the Indian Ocean. The Usuthu Catchment is unique from the other three catchments due to the short distance from the headwaters to the border with eSwatini. Consequently, it has independent rivers that start at the source and flow directly into a neighbouring country before confluence with the main stem. While the main stem is the Usuthu River, the other tributaries confluence with the Usuthu River in eSwatini. These tributaries are the Lusushwana, Mpuluzi, bordering the Usuthu River to the North, and Sandspruit immediately south of the Usuthu River, followed by the Ngwempisi, Hlelo and Assegai consecutively to the south.

The major activities in the catchment include forestry, mining, agricultural activities and municipal wastewater treatment works. The Usuthu catchment is characterised by large transfers out of the catchment (and out of the WMA) to the Vaal and Olifants Water Management Areas mainly for cooling purposes at ESKOM power stations but also for other economically important activities. Four large dams in the Usuthu support these transfers, namely; Heyshope, Morgenstond, Westoe and Jericho dams. Pollution of these strategic water resources will significantly impact on power generation and the economy of the country at large. There are currently no RQOs for the Usuthu sub-catchment. Thus, the South African Target Water Quality Guidelines (SATWQG) were used to benchmark the water quality data for all variables.

4.2 Water Quality Monitoring Points

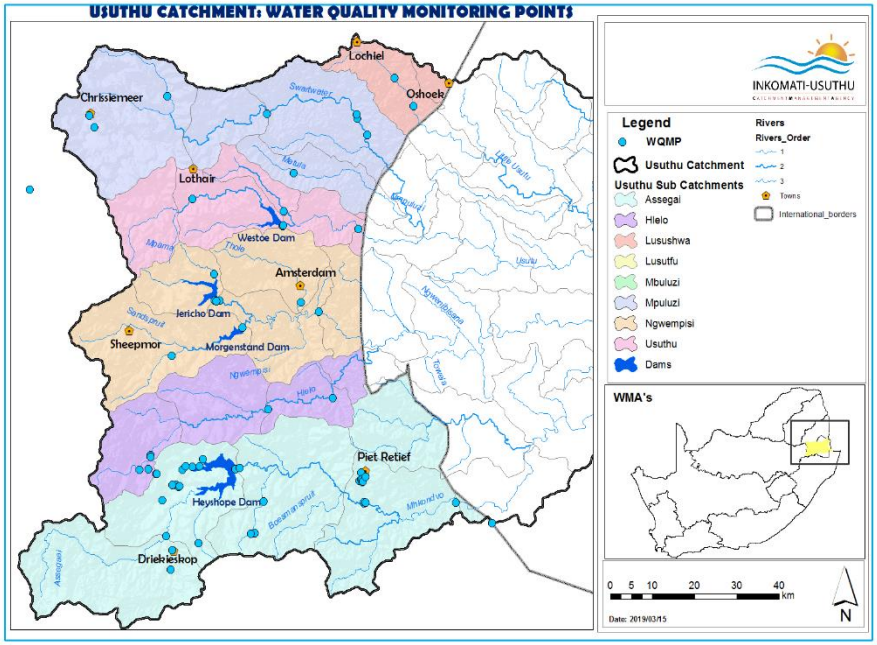


Figure 21: Water quality monitoring points in the Usuthu Catchment.

4.3 Target Water Quality Guideline and International Water Quality Guideline

The compliance of the indicator parameters was compared with the Target Water Quality Guideline Limits (TWQG) as well as International Water Quality Guideline Limits as per the Tripartite Interim Agreement between Republic of Mozambique, Republic of South Africa (RSA) and the Kingdom of eSwatini only at the last monitored points that drain into the neighbouring countries.

Table 9: Target Water Quality Guideline and International Water Quality Guideline limits

Variables/Parameters	Target Water Quality Guideline Limits (TWQG)	International Water Quality Guidelines Limits
E. coli (cfu/100ml)	130	N/A
Electrical Conductivity (mS/m)	40	150
Phosphate (mg/l)	0.025	2
pH	6.5-8.5	6.5-8.5
Nitrates/Nitrites (mg/l)	6	50
Ammonia (mg/l)	1	1

4.4 Water Quality Status

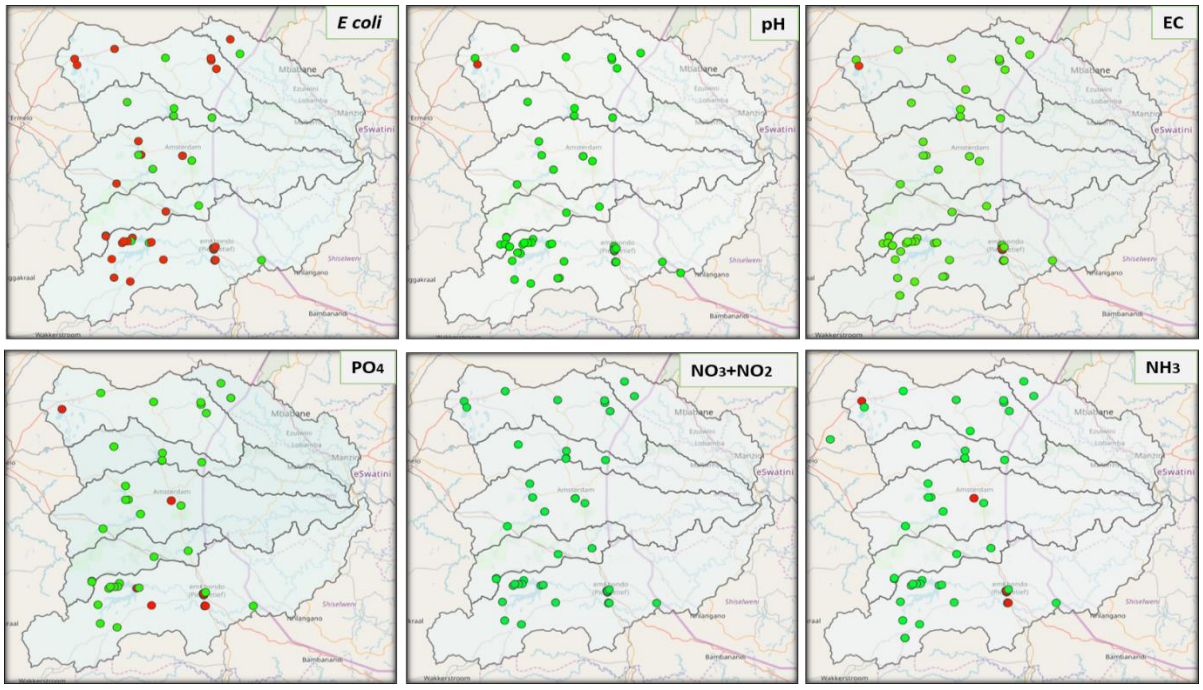


Figure 22 : Water quality status within Komati Catchment showing Microbiological (E coli), physical (pH), Salt (EC) and Nutrients (PO_4, NO_3+NO_2 and NH_4) concentrations.

4.5 Discussion of Results

E. coli counts in the Usuthu Catchment did not comply with the TWQG limits of 130 (cfu/100ml). The non-compliance can mostly be attributed to the WWTW which discharge untreated or partially treated wastewater into the streams, non-point sources such as illegal waste dumping and agricultural activities.

pH complied with the TWQG limit, except for the point downstream of Chrissiessmeer WWTWs which is alkaline.

Electrical Conductivity complied with the TWQG limits within the Usuthu Catchment except for downstream of Chrissiessmeer Oxidation Ponds and five points at Klipmisselspruit and its tributaries.

Nitrates/Nitrites concentrations complied with the TWQG (Domestic -Human consumption) throughout the catchment.

Ortho-Phosphate concentrations complied with the TWQG for all points within Usuthu Catchment, except the downstream points of Chrissiessmeer and Amsterdam WWTWs, Heyshope Dam wall, Annysspruit and five points on Klipmisselspruit and its tributaries as well as Assegai River after confluence with Klipmisselspruit.

Ammonia concentrations complied with the TWQG (Domestic -Human consumption) throughout the catchment except downstream of Amsterdam and Chrissiessmeer WWTW, five points on Klipmisselspruit and its tributaries as well as Assegai River after confluence with Klipmisselspruit.

Chapter 5: International Obligations

5.1 Introduction

The Inkomati-Usuthu Water Management Area is comprised of two basins, namely Incomati River Basin and Maputo River Basin. The Incomati River Basin is located in the eastern region of southern Africa and is shared by South Africa, eSwatini and Mozambique. The basin is 480 kilometres long, with drainage basin 50,000 square kilometres in size.

The headwater of Maputo River Basin originates in South Africa, Usuthu River in Mpumalanga Province, and flows easterly through eSwatini and the River is called Great Usuthu or Lusutfu, where it enters the Republic of Mozambique and it is called Maputo River flowing into the estuary in Maputo Bay. The 13 km gorge (Valley) forms the boundary between Kingdom of eSwatini and Republic of South Africa and approximately twenty kilometres forms the border between South Africa (province of KwaZulu-Natal) and the Republic of Mozambique. The land area of the Maputo River basin is about 30 000 km^2.

Water is used by forest plantations and for domestic and industrial use, while irrigation is the major water user in both basins. The governments of the Republic of Moçambique, the Republic of South Africa and the Kingdom of eSwatini have been collaborating in the exchange of information, agreements on sharing of water, and in joint studies that are of mutual interest and benefit. These initiatives have been done through the Tripartite Permanent Technical Committee (TPTC), which was formally established on 17 February 1983.

The TPTC is responsible for providing advice to the shared watercourse States on equitable utilisation and management of the shared waters. It was identified in the Interim IncoMaputo Agreement (IIMA), (August 2002) that a “Comprehensive Agreement” is required in order for the watercourse states to participate more effectively in the utilisation, development and protection of the shared waters.

5.2 International Water Quality Monitoring Points

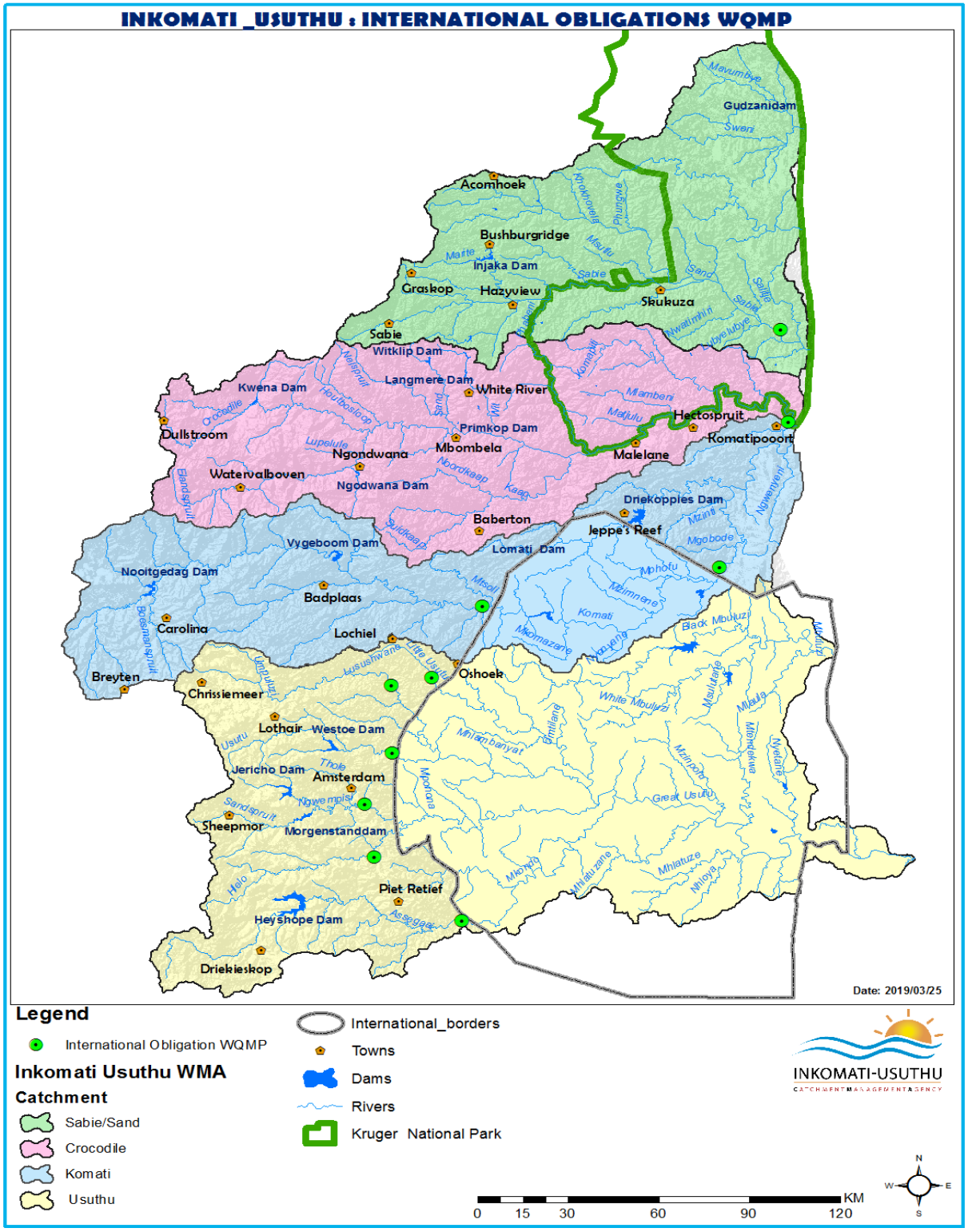


Figure 23: International Obligation water quality monitoring points in the Inkomati-Usuthu WMA

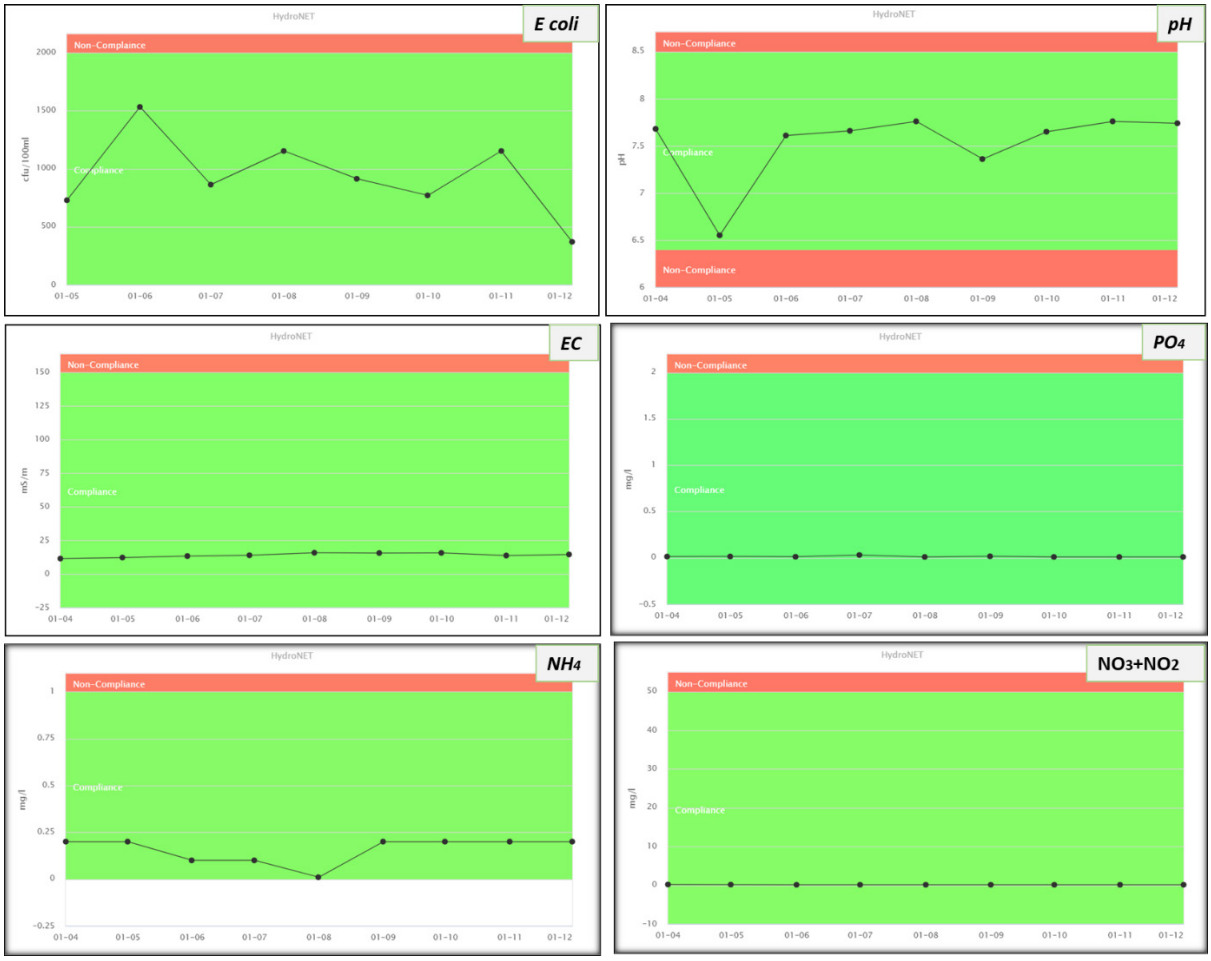
5.3 International Water Quality Guideline limits

Table 10: International Water Quality Guideline limits

Variables/Parameters	International Water Quality Guidelines Limits
E. coli (cfu/100ml) Faecal coliforms (cfu/100ml)	N/A 2 000
Electrical Conductivity (mS/m)	150
Phosphate (mg/l)	2
pH	6.5-8.5
Nitrates/Nitrites (mg/l)	50
Ammonia (mg/l)	1

5.4 Water Quality Status

Sabie River (Flowing from Republic of South Africa to Republic of Mozambique)

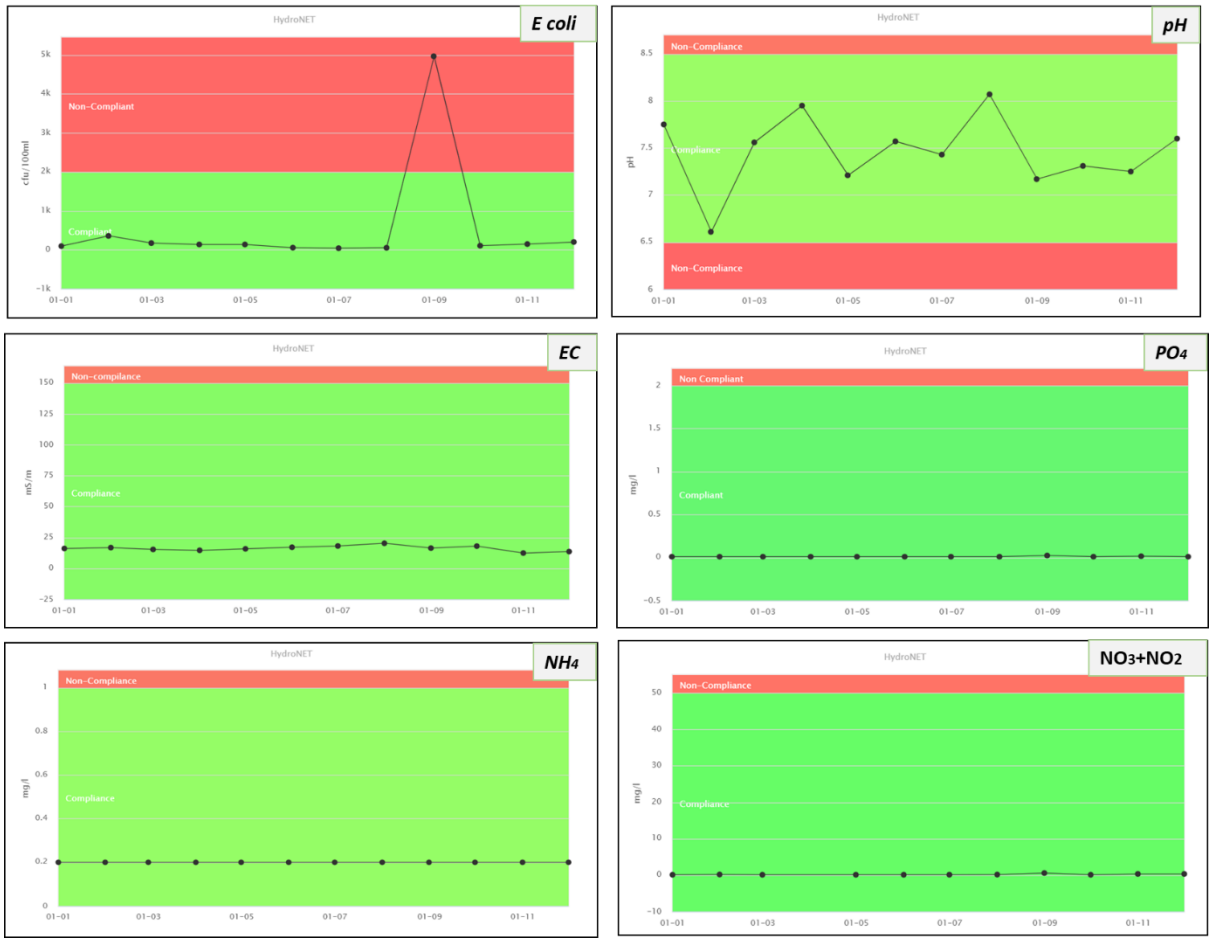


Charts showing compliance in the Sabie River in the Lower Sabie Rest Camp Kruger National Park.

Discussion of Results

All variables reported complied with the international water quality guidelines limit as per the Tripartite Interim Agreement between Republic of Mozambique, Republic of South Africa (RSA) and the Kingdom of eSwatini. The Republic of South Africa therefore complied with the water quality limits discharged (allowed to flow) in to the Republic of Mozambique at Sabie River as per the international obligation agreement throughout the reporting period.

Komati River (Flowing from Republic of South Africa to Kingdom of eSwatini)

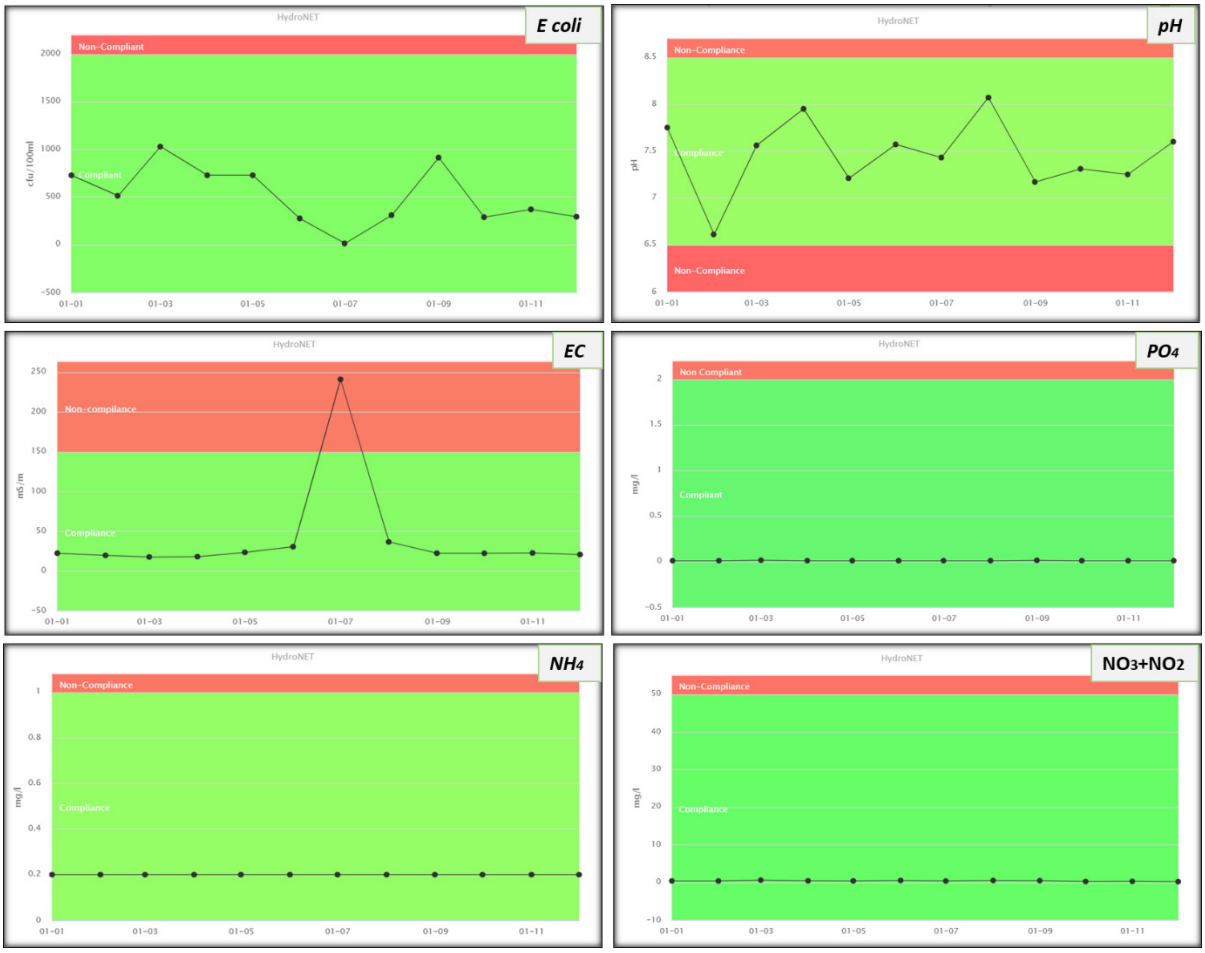


Charts showing compliance or non-compliance in the Komati River at Ekulindeni Bridge.

Discussion of Results

All variables reported complied with the international water quality guidelines limit as per the Tripartite Interim Agreement between Republic of Mozambique, Republic of South Africa (RSA) and the Kingdom of eSwatini. The Republic of South Africa therefore complied with the water quality limits discharged (allowed to flow) in to the Kingdom of eSwatini at Komati River as per the international obligation agreement throughout the reporting period, except *E. coli* in September 2018 which did not comply.

Komati River (Flowing from Kingdom of eSwatini to Republic of South Africa)

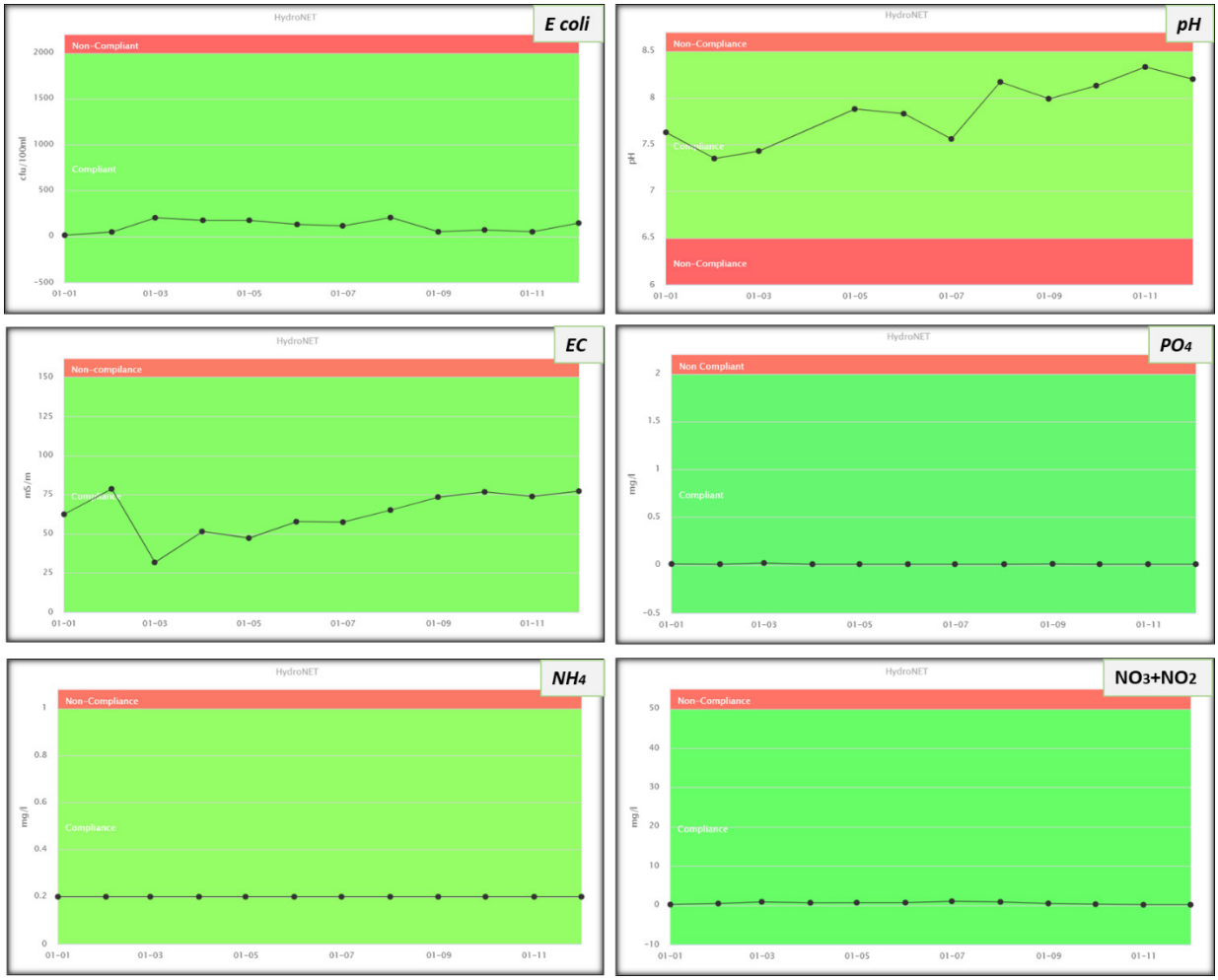


Charts showing compliance or non-compliance in the Komati River at Mananga Border Gate.

Discussion of Results

All variables reported complied with the international water quality guidelines limit as per the Tripartite Interim Agreement between Republic of Mozambique, Republic of South Africa (RSA) and the Kingdom of eSwatini. The Kingdom of eSwatini therefore complied with the water quality limits discharged (allowed to flow) in to the Republic of South Africa at Komati River as per the international obligation agreement throughout the reporting period, except EC in July 2018 which did not comply.

Komati River (Flowing from Republic of South Africa to Republic of Mozambique)

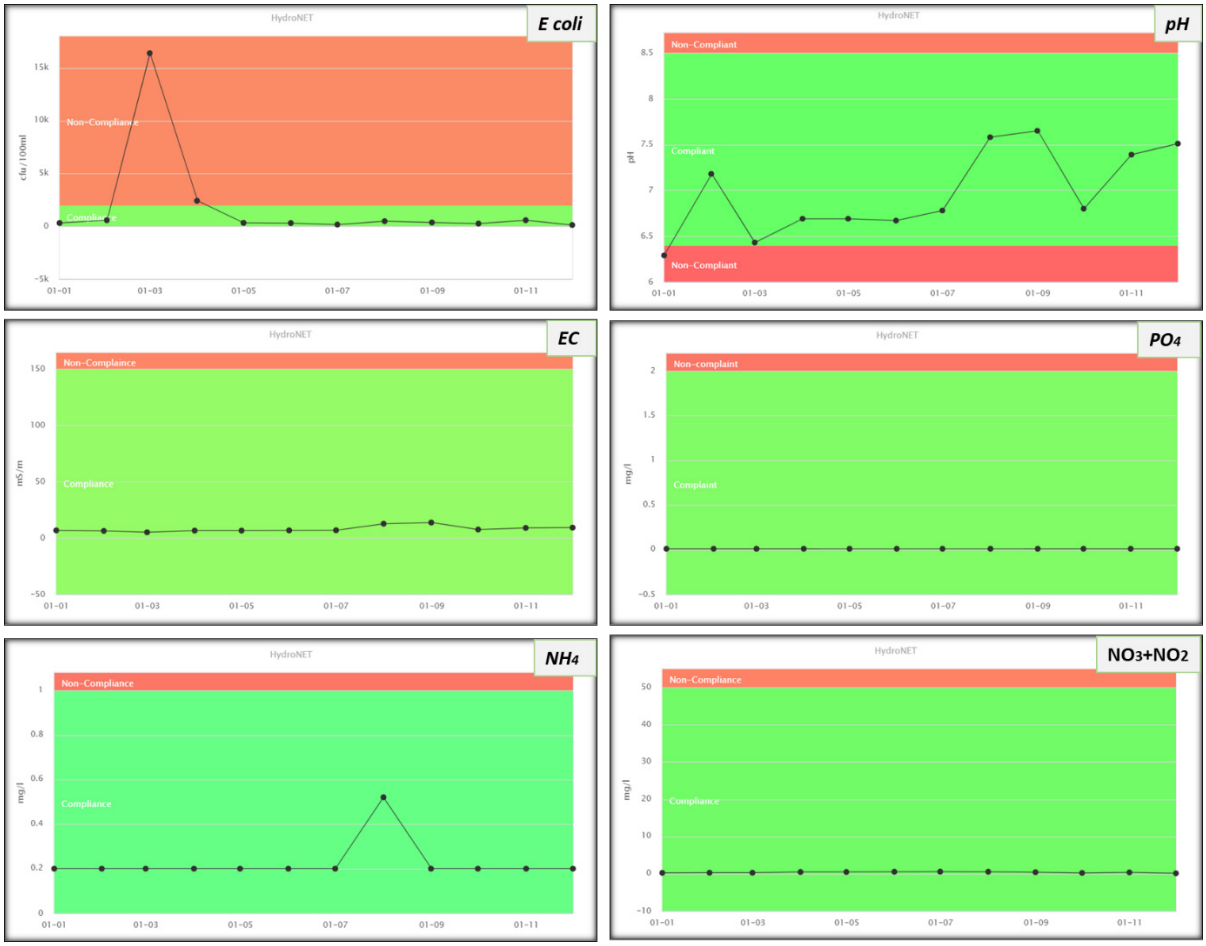


Charts showing compliance or non-compliance in the Komati River at Komatipoort Border.

Discussion of Results

All variables reported complied with the international water quality guidelines limit as per the Tripartite Interim Agreement between Republic of Mozambique, Republic of South Africa (RSA) and the Kingdom of eSwatini. The Republic of South Africa therefore complied with the water quality limits discharged (allowed to flow) in to the Republic of Mozambique at Komati River as per the international obligation agreement throughout the reporting period.

Lusushwana River (Flowing from Republic of South Africa to Kingdom of eSwatini)

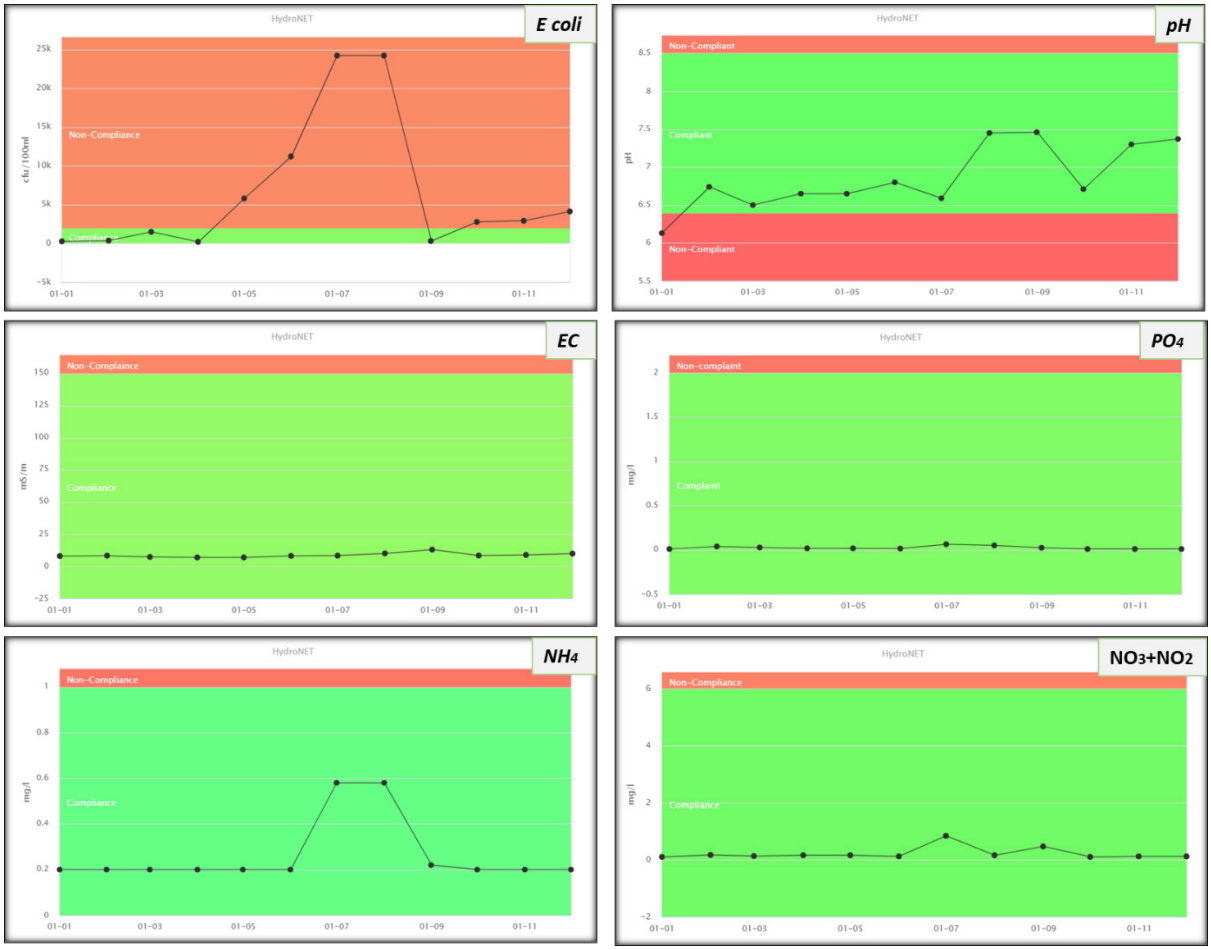


Charts showing compliance or non-compliance in the Lusushwana River at Zwalunest Village before eSwatini Border.

Discussion of Results

All variables reported complied with the international water quality guidelines limit as per the Tripartite Interim Agreement between Republic of Mozambique, Republic of South Africa (RSA) and the Kingdom of eSwatini. The Republic of South Africa therefore complied with the water quality limits discharged (allowed to flow) in to the Kingdom of eSwatini at Lusushwana River as per the international obligation agreement throughout the reporting period, except for *E coli* and pH in March and January 2018 respectively, which did not comply.

Mpuluzi River (Flowing from Republic of South Africa to Kingdom of eSwatini)

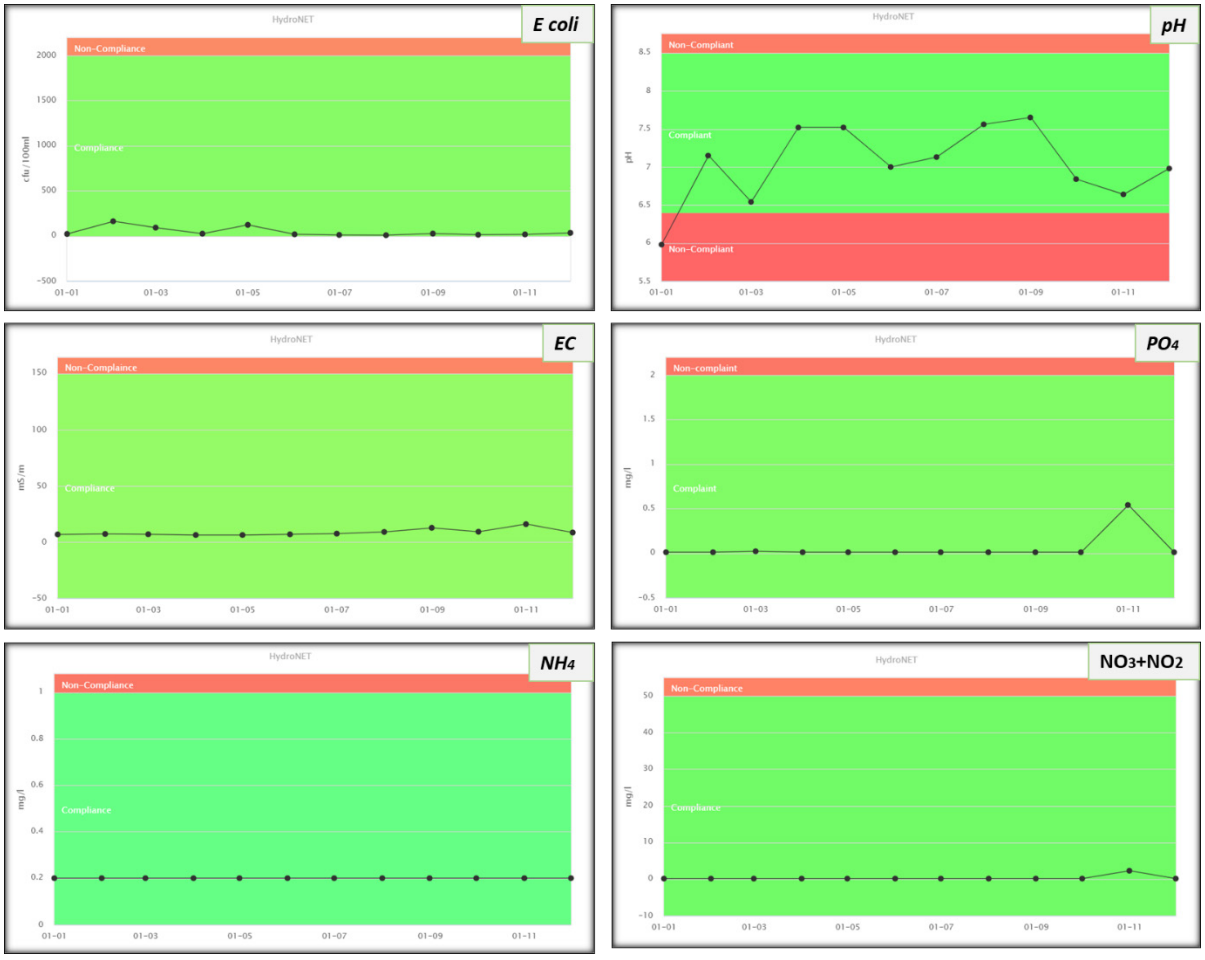


Charts showing compliance or non-compliance in the Mpuluzi River downstream of Mpuluzi WWTW.

Discussion of Results

All variables reported complied with the international water quality guidelines limit as per the Tripartite Interim Agreement between Republic of Mozambique, Republic of South Africa (RSA) and the Kingdom of eSwatini. The Republic of South Africa therefore complied with the water quality limits discharged (allowed to flow) in to the Kingdom of eSwatini at Mpuluzi River as per the international obligation agreement throughout the reporting period, except for *E coli* for almost seven months and pH in January 2018 which did not comply.

Usuthu River (Flowing from Republic of South Africa to Kingdom of eSwatini)

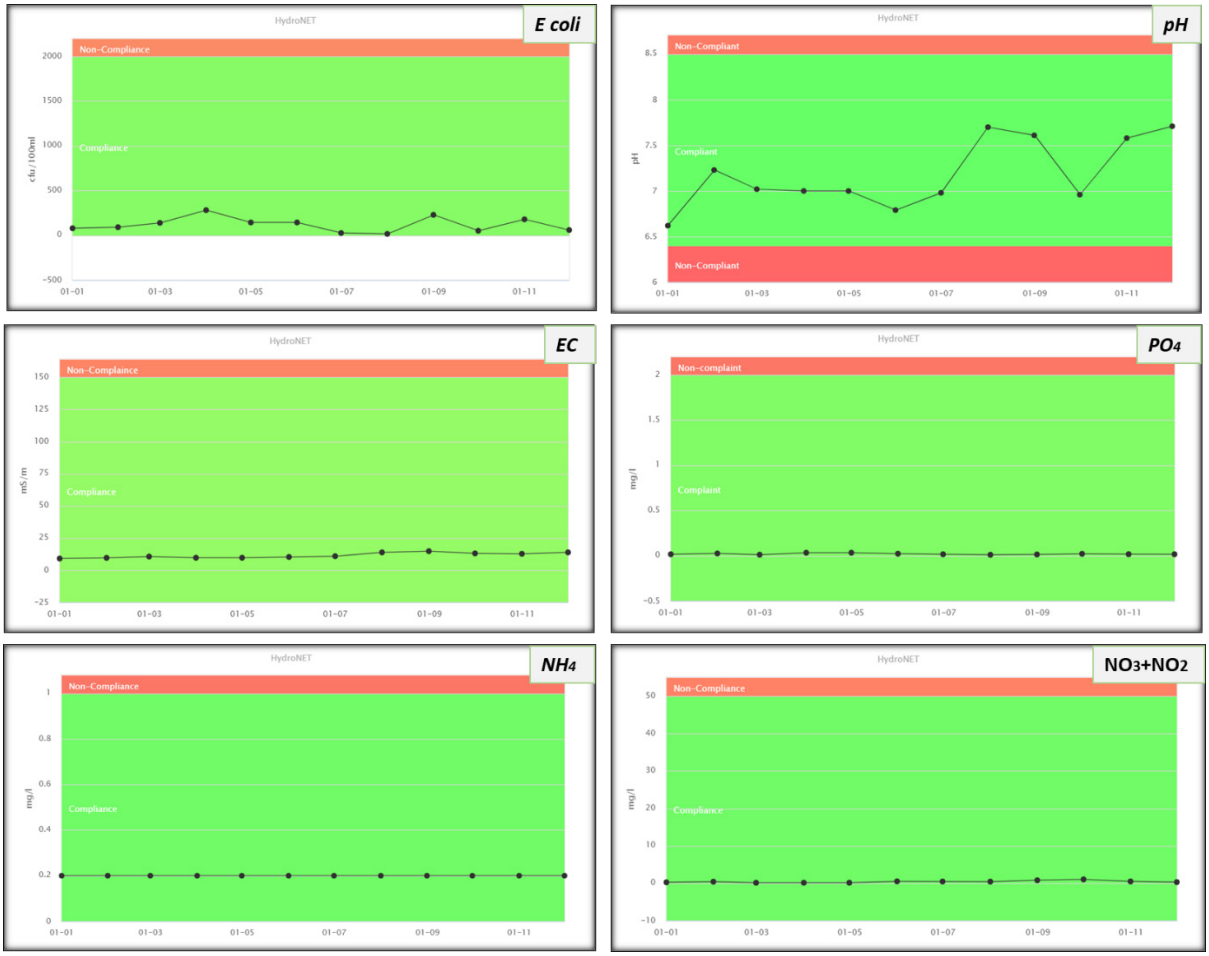


Charts showing compliance or non-compliance in the Usuthu River at the Weir before Nerston Border Gate.

Discussion of Results

All variables reported complied with the international water quality guidelines limit as per the Tripartite Interim Agreement between Republic of Mozambique, Republic of South Africa (RSA) and the Kingdom of eSwatini. The Republic of South Africa therefore complied with the water quality limits discharged (allowed to flow) in to the Kingdom of eSwatini at Usuthu River as per the international obligation agreement throughout the reporting period, except for pH in January 2018 which did not comply.

Ngwempisi River (Flowing from Republic of South Africa to Kingdom of eSwatini)

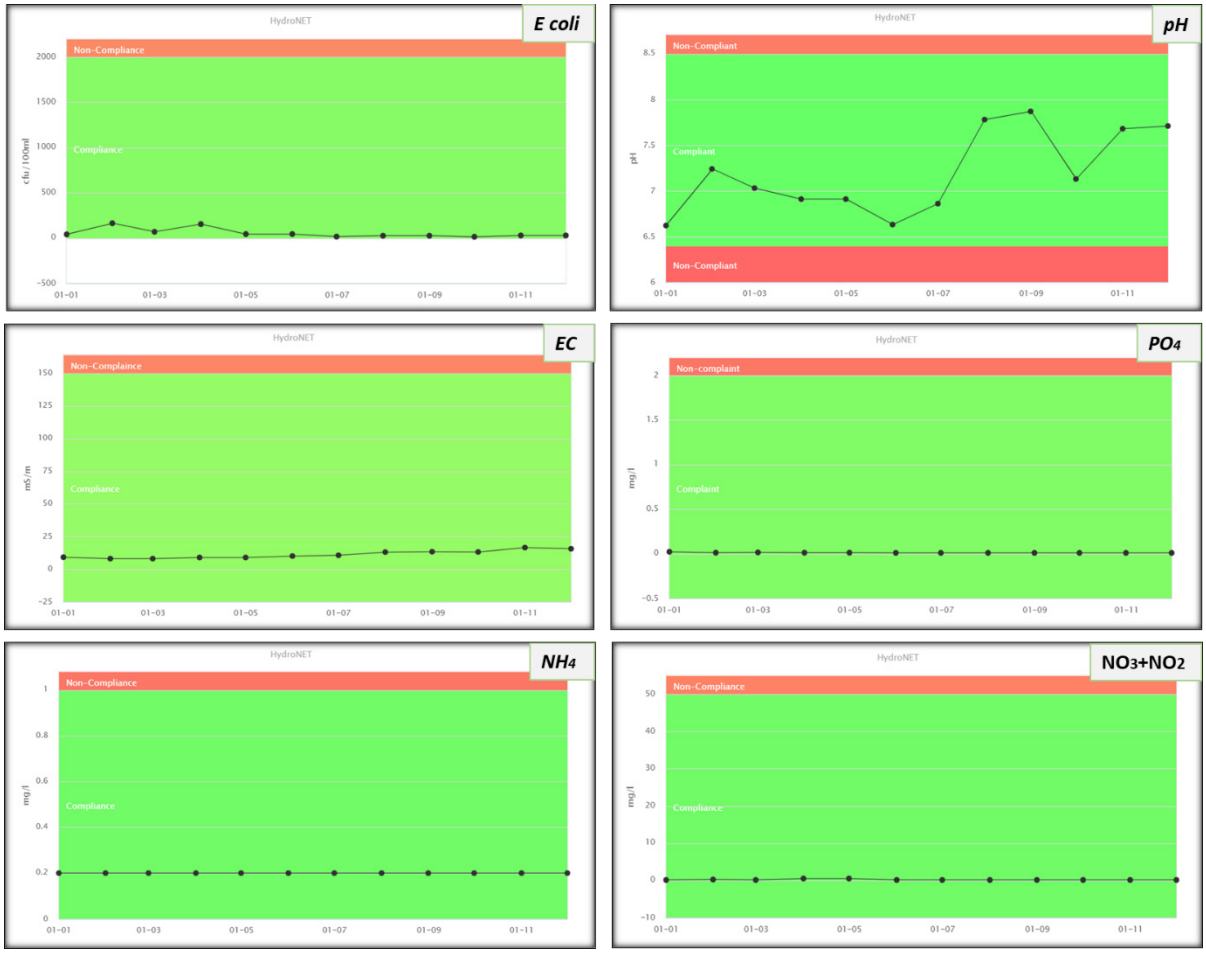


Charts showing compliance or non-compliance in the Ngwempisi River at R33 Road Bridge to Amsterdam.

Discussion of Results

All variables reported complied with the international water quality guidelines limit as per the Tripartite Interim Agreement between Republic of Mozambique, Republic of South Africa (RSA) and the Kingdom of eSwatini. The Republic of Soujt Africa therefore complied with the water quality limits discharged (allowed to flow) in to the Kingdom of eSwatini at Ngwempisi River as per the international obligation agreement throughout the reporting period.

Hlelo River (Flowing from Republic of South Africa to Kingdom of eSwatini)

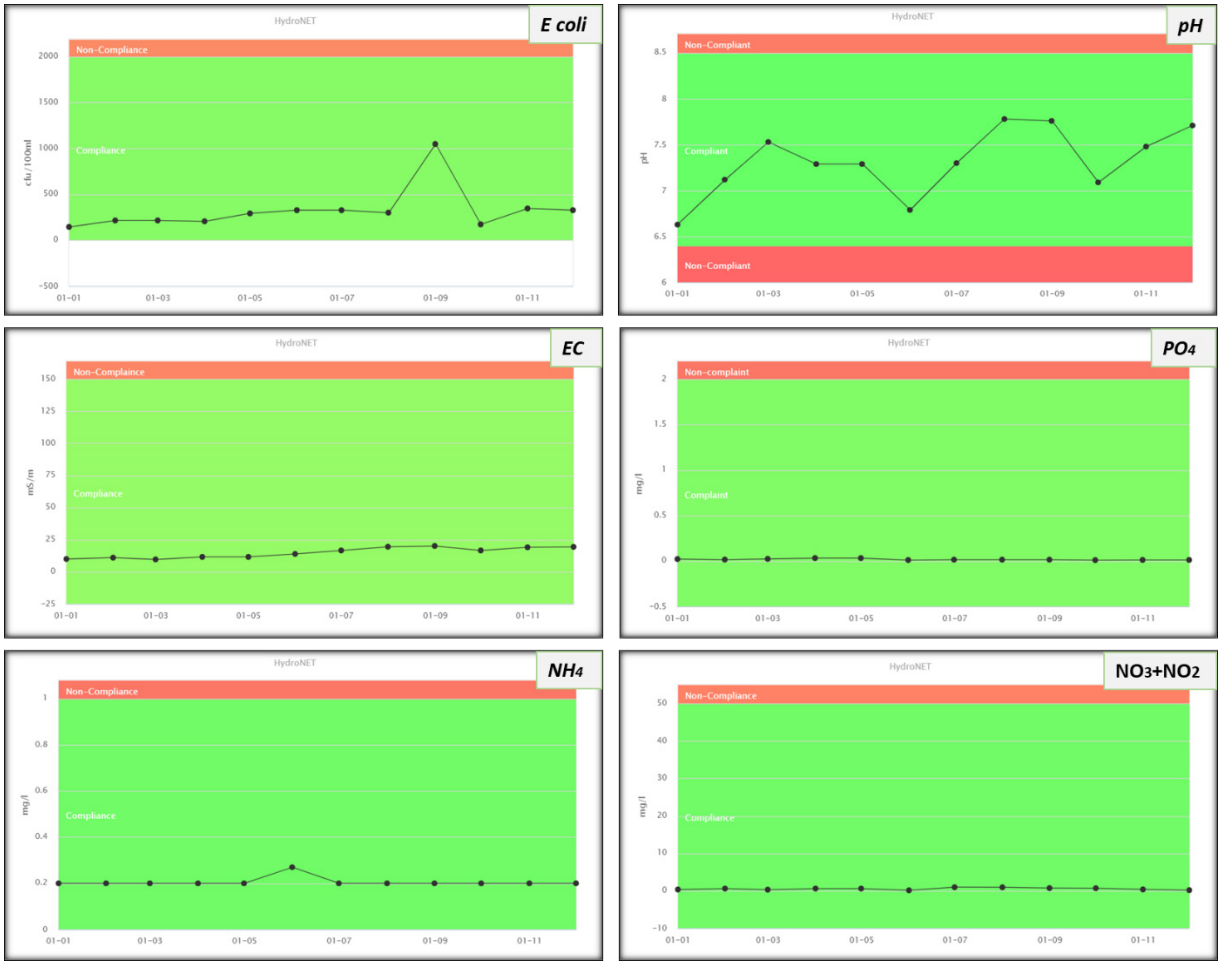


Charts showing compliance or non-compliance in the Hlelo River at R33 Road Bridge to Amsterdam.

Discussion of Results

All variables reported complied with the international water quality guidelines limit as per the Tripartite Interim Agreement between Republic of Mozambique, Republic of South Africa (RSA) and the Kingdom of eSwatini. The Republic of South Africa therefore cmplied with the water quality limits discharged (allowed to flow) in to the Kingdom of eSwatini at Hlelo River as per the international obligation agreement throughout the reporting period.

Assegaai River (Flowing from Republic of South Africa to Kingdom of eSwatini)



Charts showing compliance or non-compliance in the Assegaai River at R543 Road Bridge to Mahamba Boarder Gate.

Discussion of Results

All variables reported complied with the international water quality guidelines limit as per the Tripartite Interim Agreement between Republic of Mozambique, Republic of South Africa (RSA) and the Kingdom of eSwatini. The Republic of South Africa therefore complied with the water quality limits discharged (allowed to flow) in to the Kingdom of eSwatini at Assegaai River as per the international obligation agreement throughout the reporting period.

CONCLUSION

Surface Water Quality in the Inkomati-Usuthu WMA complied with the RQOs, TWQG and IWQG limits for most of the monitored points and this showed that the water quality within the WMA is relatively good. However, there are challenges with other variables in the water resources.

The presence of *E coli* in water resource indicates that the water has been contaminated with human faecal material or other animals and this is a challenge in the entire water management area. The presence of *E coli* contamination has a potential health risk for individuals who use water directly from the resource which may also lead to waterborne diseases for those people and is a threat for crop production, especially those crops eaten raw. It is also reported that the presence of *E coli* tends to affect humans more than it does aquatic organisms, though not exclusively.

Electrical Conductivity and Phosphate are not a major cause for concern in the catchment. It is only in selected areas where the water quality status related to these parameters is punctuated by non-compliance.

The Upper Komati Catchment on the Boesmanspruit is being threatened by heavy metal especially the Sulphates and low pH arising from mining activities (active mines, defunct mines and decanting mines).

The Republic of South Africa complied with the international water quality limits discharged (allowed to flow) into Kingdom of eSwatini as well as Republic of Mozambique per the international agreement throughout the reporting period.

RECOMMENDATIONS

The following recommendations are made in dealing with the resource quality as indicated:

- **Implementation of Waste Discharge Charge System.**
- **Continuous stakeholder awareness workshops.**
- **Modelling of point and non-point sources of water quality and review of existing and new water use authorisations.**
- **Compliance Monitoring and Enforcement:**

  It is recommended that the CME division investigate the critical areas and ensure that the necessary corrective actions are taken to achieve resource protection. The presence of *E coli* in water resource is a huge challenge throughout the entire water management area. It is therefore recommended that the activities contributing *E. coli* be prioritised for Compliance, Monitoring and Enforcement.

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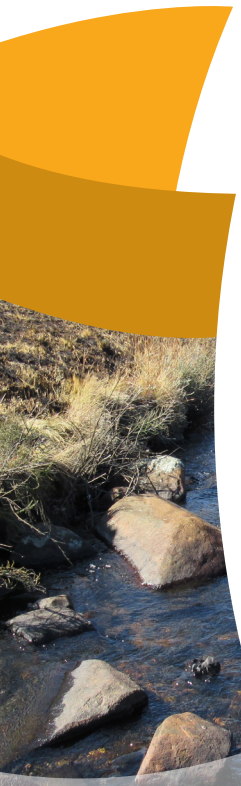

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