INKOMATI-USUTHU
CATCHMENT MANAGEMENT AGENCY

ANNUAL WATER QUALITY STATUS REPORT FOR THE INKOMATI-USUTHU WMA

2017/18 FINANCIAL YEAR

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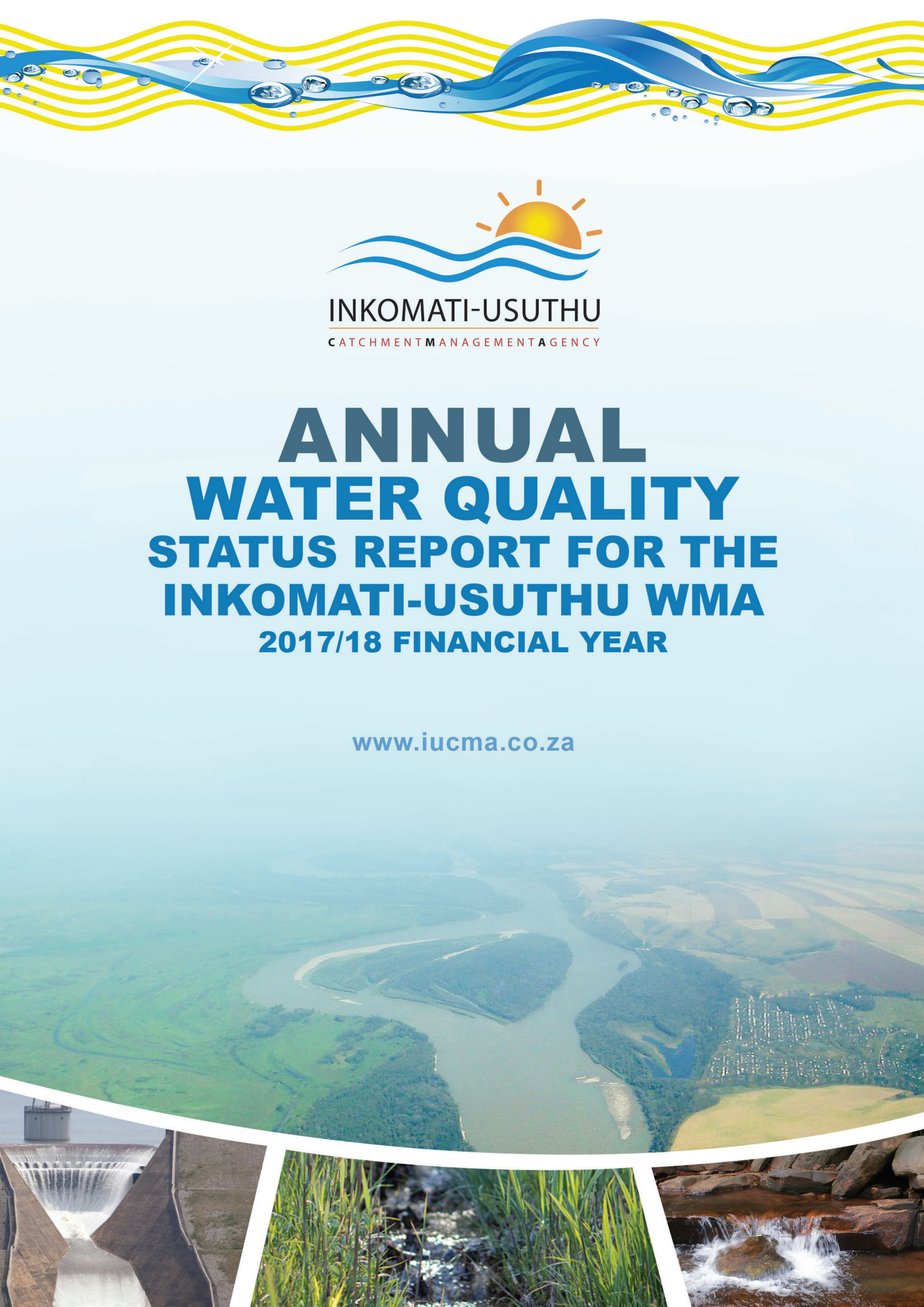

VISION

Water for all in Inkomati-Usuthu

MISSION

Our mission is of a pioneering catchment management system that empowers stakeholders to engage in consensual and adaptive decision making, to achieve reform, and to promote persistent social, economic, and environmental justice across the Inkomati-Usuthu catchment.

- The Inkomati-Usuthu CMA supports the co-operative management of the Inkomati basin as an internationally shared water course
- The decision-making environment of the Inkomati-Usuthu CMA, including delegated functions, enables collaborative action towards equity, sustainability and efficiency in a continually evolving socio-economic system
- The Inkomati-Usuthu CMA manages the resources adaptively, co-operatively and progressively to achieve social, economic and environmental justice, and promote healthy living

VALUES

- The Inkomati-Usuthu CMA acknowledges the interdependence of our responsibilities for caring for the resource and there is explicit recognition of the diversity achieved by what individual/ group contributes to promoting equity, efficiency, and sustainability as defined in the National Water Act
- Decisions, actions and outcomes are subject to performance evaluation against measurable goals, indicators and timeframes
- The Inkomati-Usuthu CMA strives for a trusting, transparent and corrupt-free system of catchment management that is cognisant of existing agreements and promotes fairness before the law, environment and economic development
- Management is adaptive, open to critique and outcomes driven, with solutions being practical, achievable and implement able
- The Inkomati-Usuthu CMA practices problem solving that embraces:
- Ethics of Ubuntu (our humanity is defined by how others experience our behaviour), Simunye (we are one) and Batho-pele (people first)
- Consensus driven stakeholder participation
- Decision within our mandate are made and are justified on the basis of the best available social, technical, economic, environmental and governance knowledge

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 and the classification 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 social-economic growth and development.

The purpose of conducting monitoring is to establish whether the quality of the water resources complies with the management class as set by the Department of Water and Sanitation, as well as its associated reserve and resource quality objectives. Furthermore, the intention is to also monitor the compliance of waste discharges to the conditions of authorisation. Lastly, since the Inkomati-Usuthu Water Management Area is part of an international basin, it is also important to monitor compliance to international agreements. Since this report provides the water quality status, its focus is on the compliance to the resource quality objectives associated with the set management class, and thus exclude effluent discharge qualities.

Overall, the report shows that 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 relatively good.

However, the microbial pollution remains as indicated by *Escherichia coli* (*E. coli*) counts poses a serious course for concern. This situation is not localised in a specific area but is widespread throughout the water management area. *E. coli* is an indicator of faecal contamination and poses human health risks associated with diarrhoea and other water borne disease, especially in the vulnerable rural communities that at times have to use the river water for domestic, religious, cultural and recreational purposes. This deteriorating trends needs to be abated soon to avoid a total collapse of the system and widespread outbreaks of disease in the water management area.

Table of Contents

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 Analytical Standards
U/S	Up Stream
D/S	Down Stream
EC	Electrical Conductivity
mS/m	millisiemens per meter
mg/l	milligrams 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	Sulphates
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 basin called the Incomati 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.

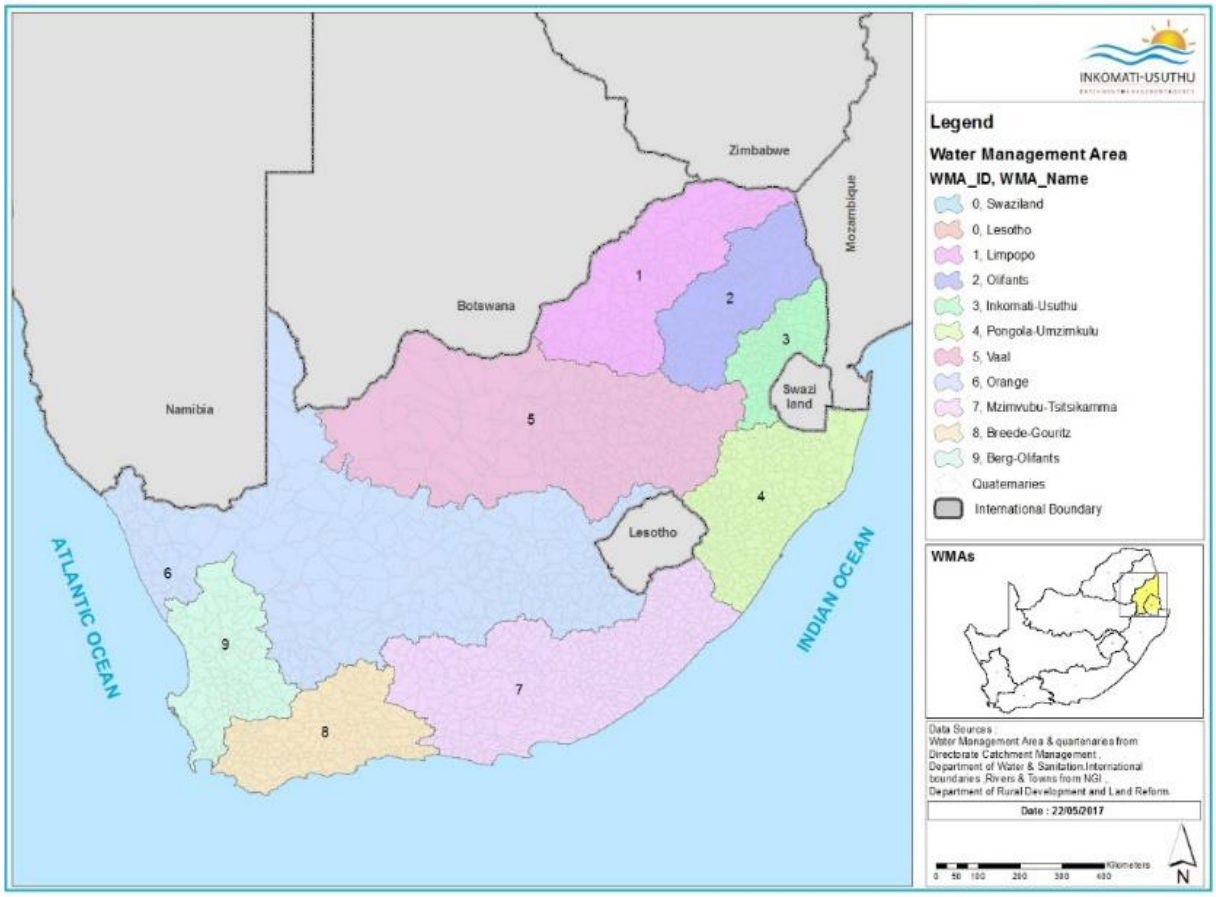

Figure 1: Map of South Africa indicating the nine WMA.

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) conduct the 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 Standards (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 quality of the water resource as well as at the discharge points 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 were selected as indicated in **APPENDIX A**, since it would not have been practical to report on all 259 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 (NH3)	

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 Inco-Maputo Agreement between Republic of Mozambique, Republic of South Africa (RSA) and the Kingdom of Swaziland.

2. Objectives

To determine the water quality trends within the Inkomati Usuthu water management area for the year of 2017.

To determine compliance of Ecological Water Requirements (EWR) Sites with Resource Quality Objectives (RQOs).

3. Methodology

3.1 Study Area

The chemical and microbiological sampling of water resources takes place within the jurisdiction of the Inkomati-Usuthu Water Management Area 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 Swaziland in the south-east. The water management area extends over several parallel river catchments which all drain in a general easterly direction, and flow to Mozambique forming the Incomati basin which discharges into the Indian Ocean immediately north of Maputo at Villa Laisa as well as the Maputo basin to the South.

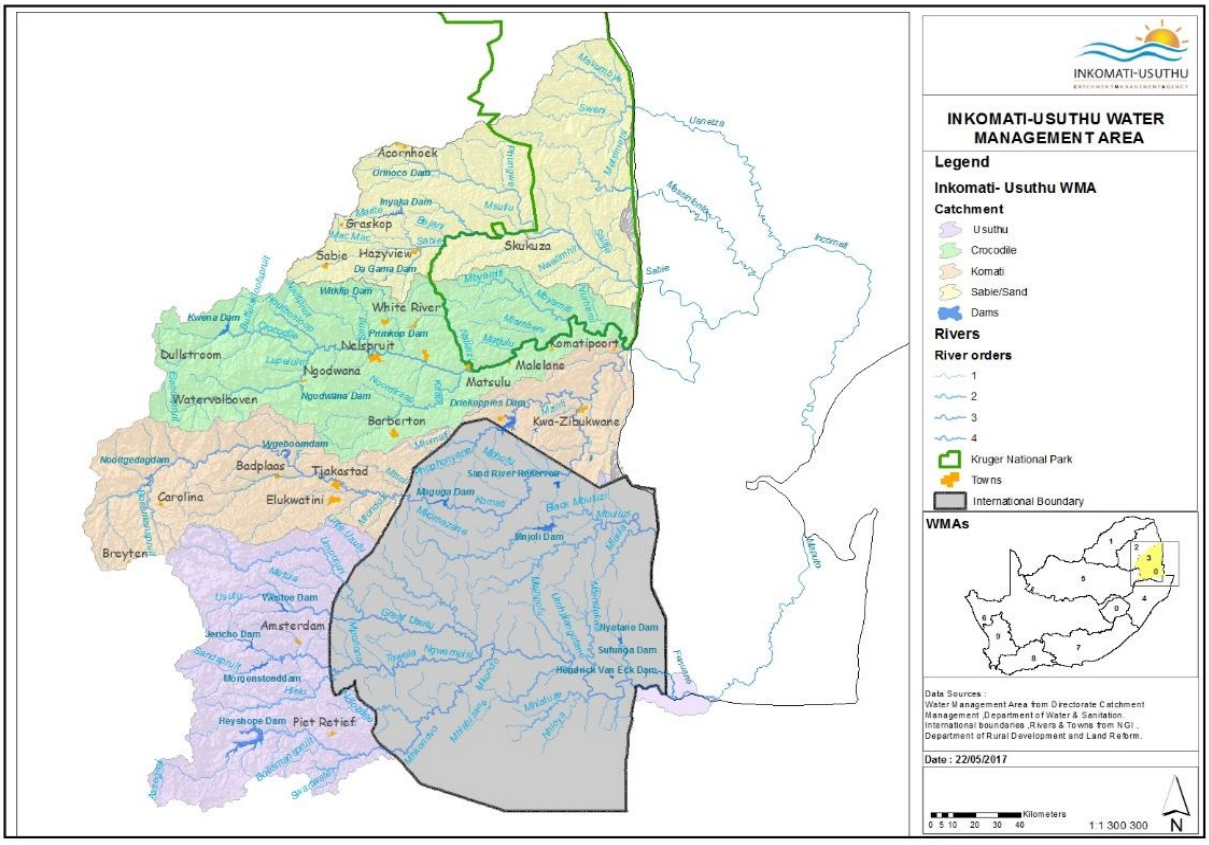

Figure 2: Inkomati-Usuthu Water Management Area

3.2 Materials and Methods

The water quality sample bottles were marked with the site code, date and time of collection using a permeant 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. The samples taken on the bridges, using a bucket and the bailer. The bucket was rinsed three times before collecting the sample and filling the sampling bottles.

The 1litre 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 South African National Accreditation Standards (SANAS) accredited laboratory for analysis and microbiological samples were delivered within 12 hours to the Laboratory.The HydroNet system was 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 (photo taken by Andile Nkosi)

Figure 4: IUCMA official taking water quality chemical sample at tributary of Seekoeispruit in Komati Catchment (photo taken by Andile Nkosi)

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

A total number of 69 monitoring points in the Crocodile River and its tributaries were monitored as shown in Figure 5: Water quality monitoring points within Crocodile Catchment.

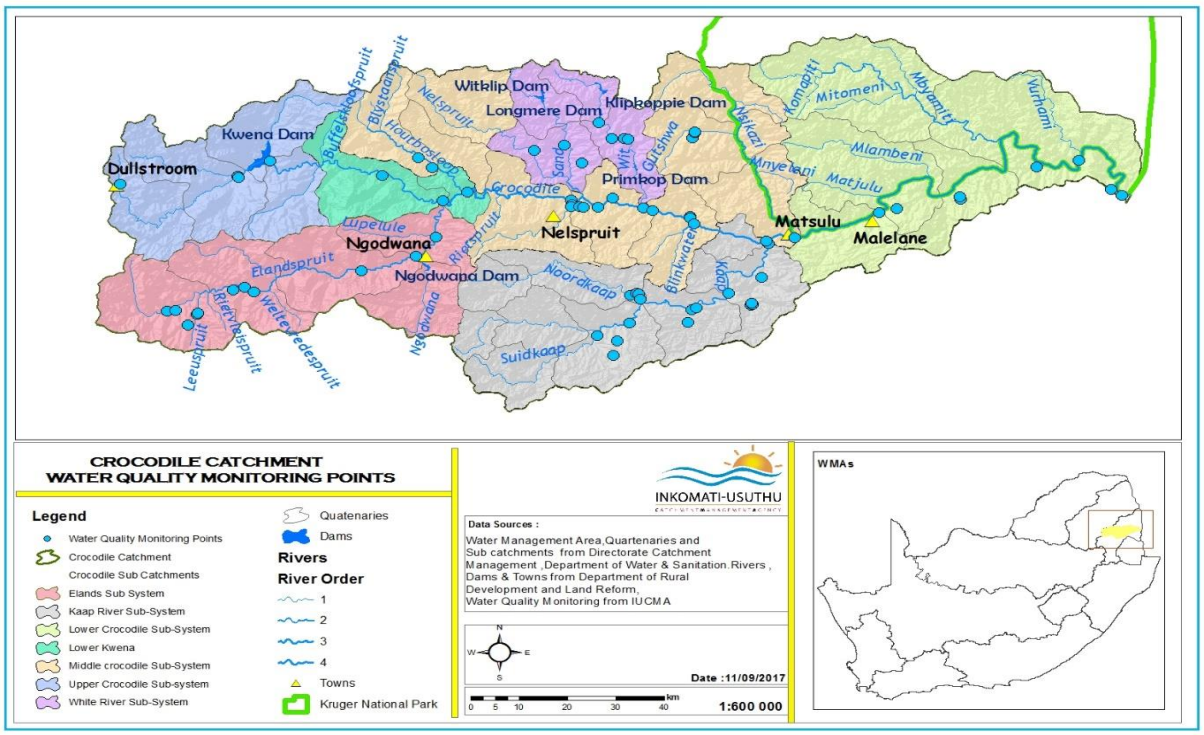

Figure 5: Water quality monitoring points within Crocodile Catchment.

1.3 Resource Quality Objectives and Target Water Quality Guideline limits

The compliance of these 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) provided the RQOs were not available.

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	30	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

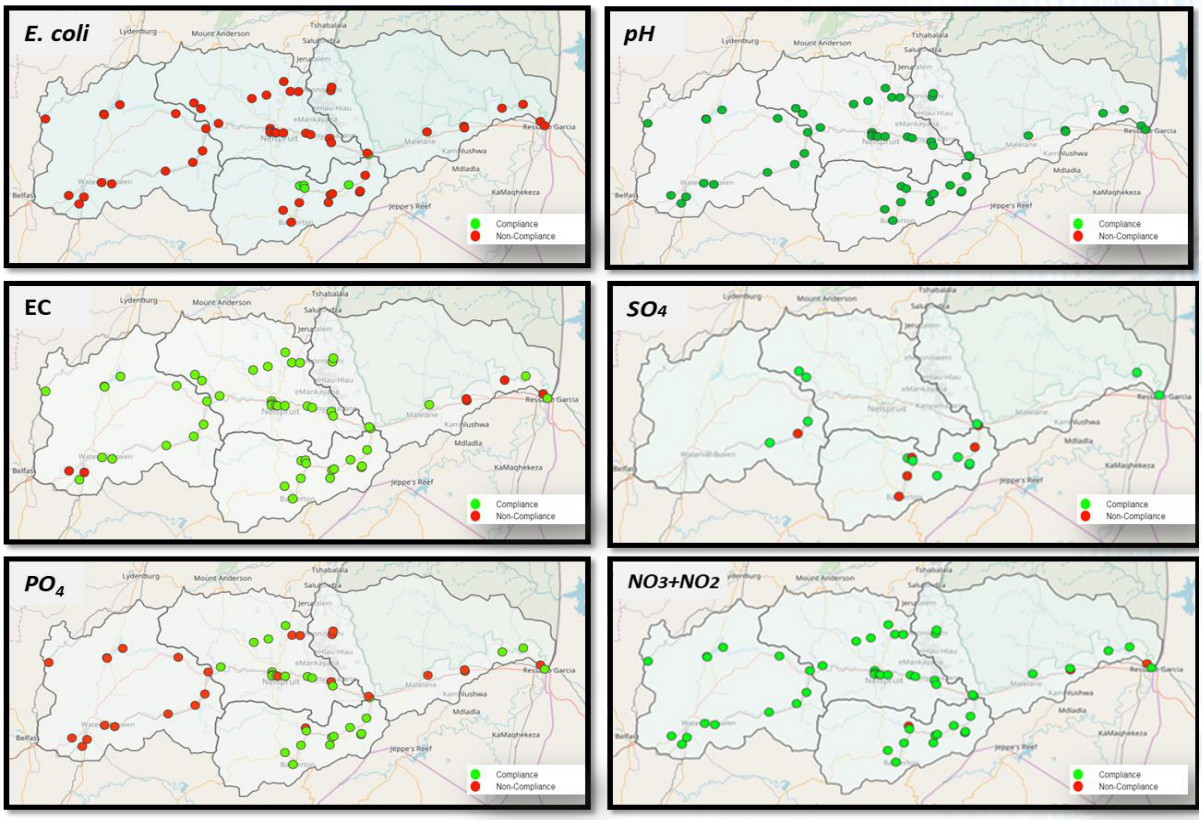

Figure 6: Water quality status within Crocodile Catchment showing Microbiological (E coli), physical (pH), Salts (EC and SO_4), Nutrients (PO_4 and NO_3+NO_2) concentrations.

1.5 Discussion of Results

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

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

Electrical Conductivity complied with the RQOs (Aquatic Ecosystem drivers), except in the Leeuspruit@D/S of Enthonjeni WWTWs, Elands @U/S of Mill's WWTWs, 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 the Kaap River Catchment due to Mine activities in the area.

Ortho-Phosphate concentrations complied with the RQOs (Aquatic Ecosystem drivers) for most of the time except in the Besterspruit, downstream of White River, U/S & D/S of Kabokweni and Hectorspruit WWTWs as well as in the Kanyamazane stream. The upper Crocodile River and Elands River shows non-compliance however, this is largely attributed to low detection limit which occurred before the laboratory started using more sensitive methods able to detect lower concentrations of phosphate.

Nitrates/Nitrites concentrations complied with the TWQG (Domestic -Human consumption) throughout the catchment, except tributary of Noord-Kaap at new consort mine stream, tributary of Crocodile River at upstream of Hectorspruit WWTW as well as downstream of Komati WWTW.

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

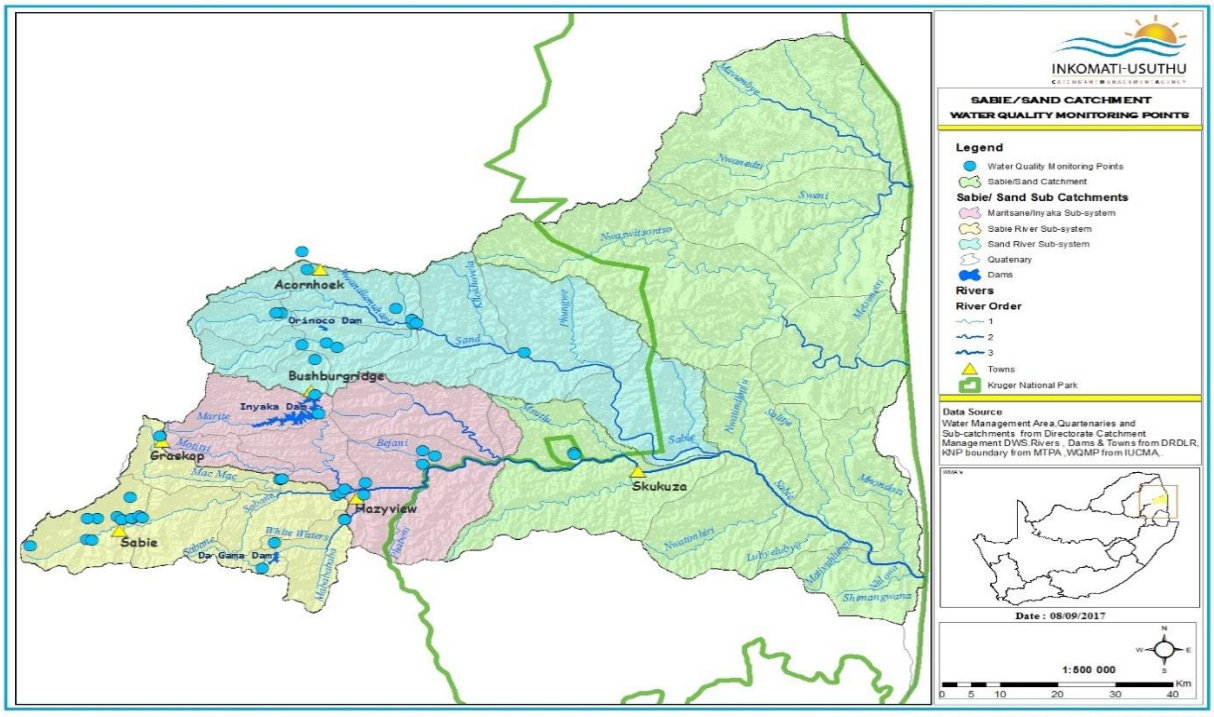

Figure 7: Water quality monitoring points within the Sabie Catchment

2.3 Resource Quality Objectives (RQOs)

The compliance of these 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) provided the RQOs were not available. 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 Swaziland were used at last points that drains 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)

Variables/Parameters	**Target Water Quality Guideline limits (TWQG)**
pH	6.5-8.5 (Recreation -full contact)
Nitrates/Nitrites (mg/l)	6 (Domestic -Human consumption)
Ammonia (mg/l)	1 (Domestic -Human consumption)

2.4 Water Quality Status

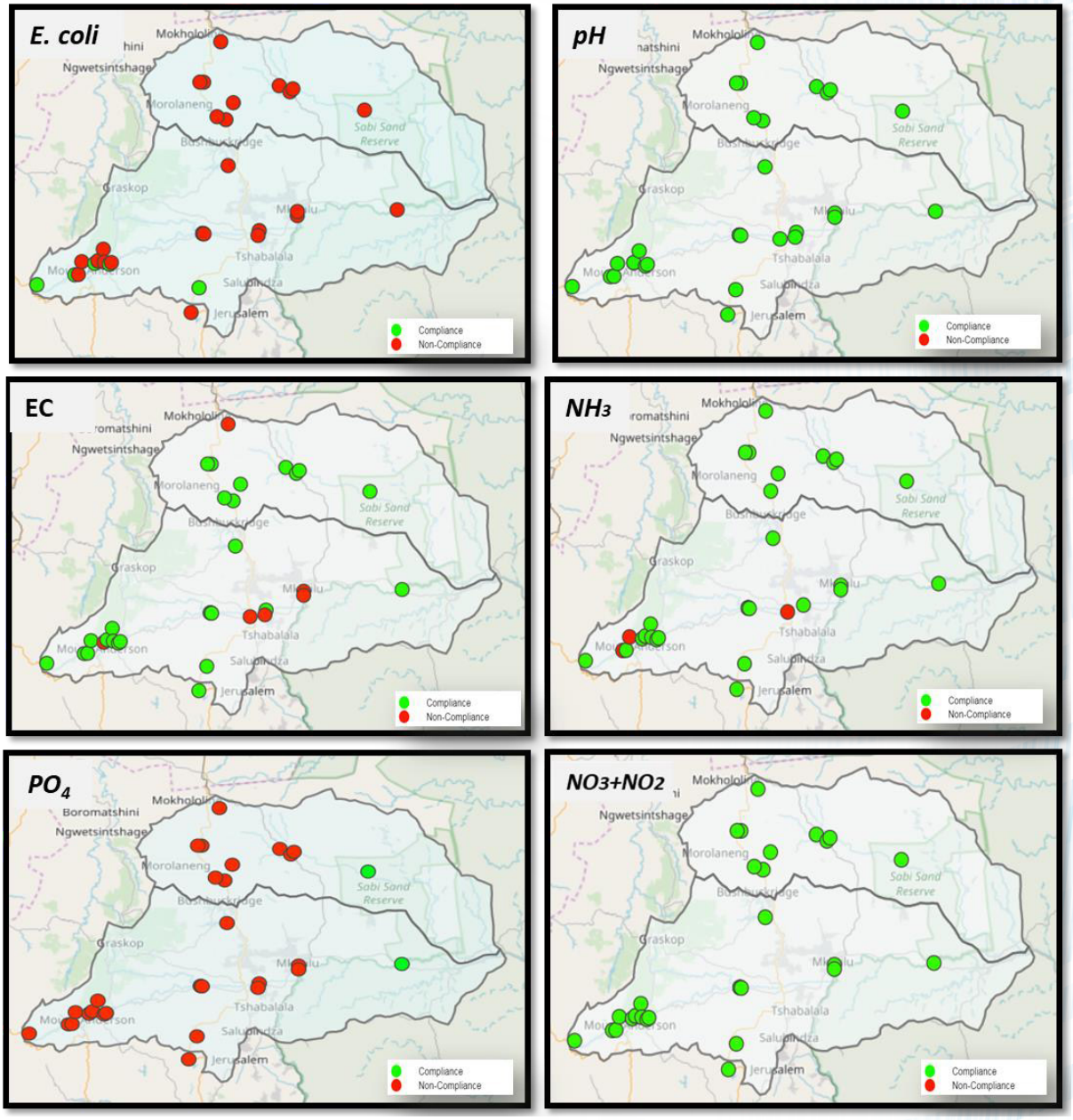

Figure 8: Water quality status within Sabie/sand Catchment showing Microbiological (E coli), physical (pH), Salts(EC) and Nutrients (PO_4, NO3+NO2 and NH_3) concentrations.

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 and Da-Gama Dam also complied with the set RQOs limit of 130 (cfu/100ml), however the areas downstream of Sabie River showed high *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 Vertroosting River, Sabie River downstream of Hazyview WWTW and sewer pump station and Bega River downstream of Mkhuhlu settlement and piggery Project.

Ammonia concentrations complied with the TWQG (Domestic -Human consumption) throughout the catchment except Lone Creek River, Sabie River at Sabie Saw Mill and downstream of Hazyview WWTW.

Ortho-Phosphate indicated non-compliance with the RQOs for all points within Sabie/Sand Catchment. However, this is largely attributed to low detection limit which occurred before the laboratory started using more sensitive methods able to detect lower concentrations of phosphate.

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

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 Swaziland 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 Swaziland will be referred to as the Upper Komati and downstream of Swaziland, it will be referred to as the Lower Komati

3.2 Water Quality Monitoring Points

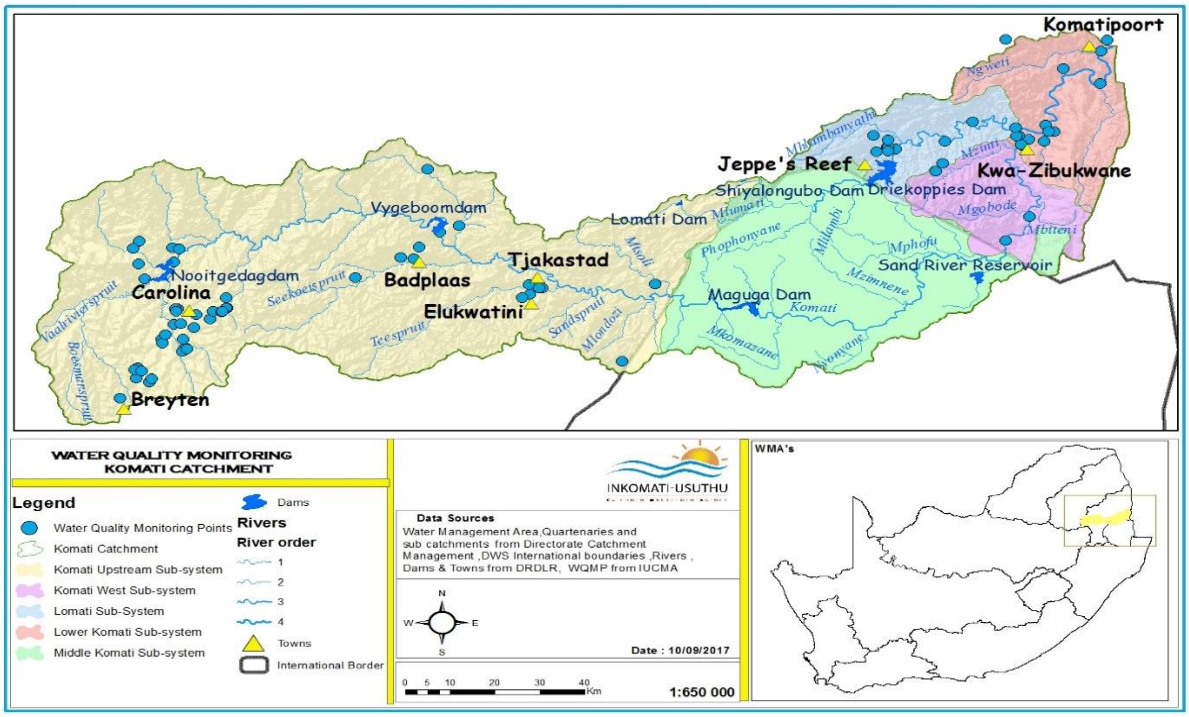

Figure 9: Water quality Monitoring points in the Komati Catchment.

3.3 Resource Quality Objectives (RQOs)

The compliance of these 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) only if the RQOs were not available. 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 Swaziland 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

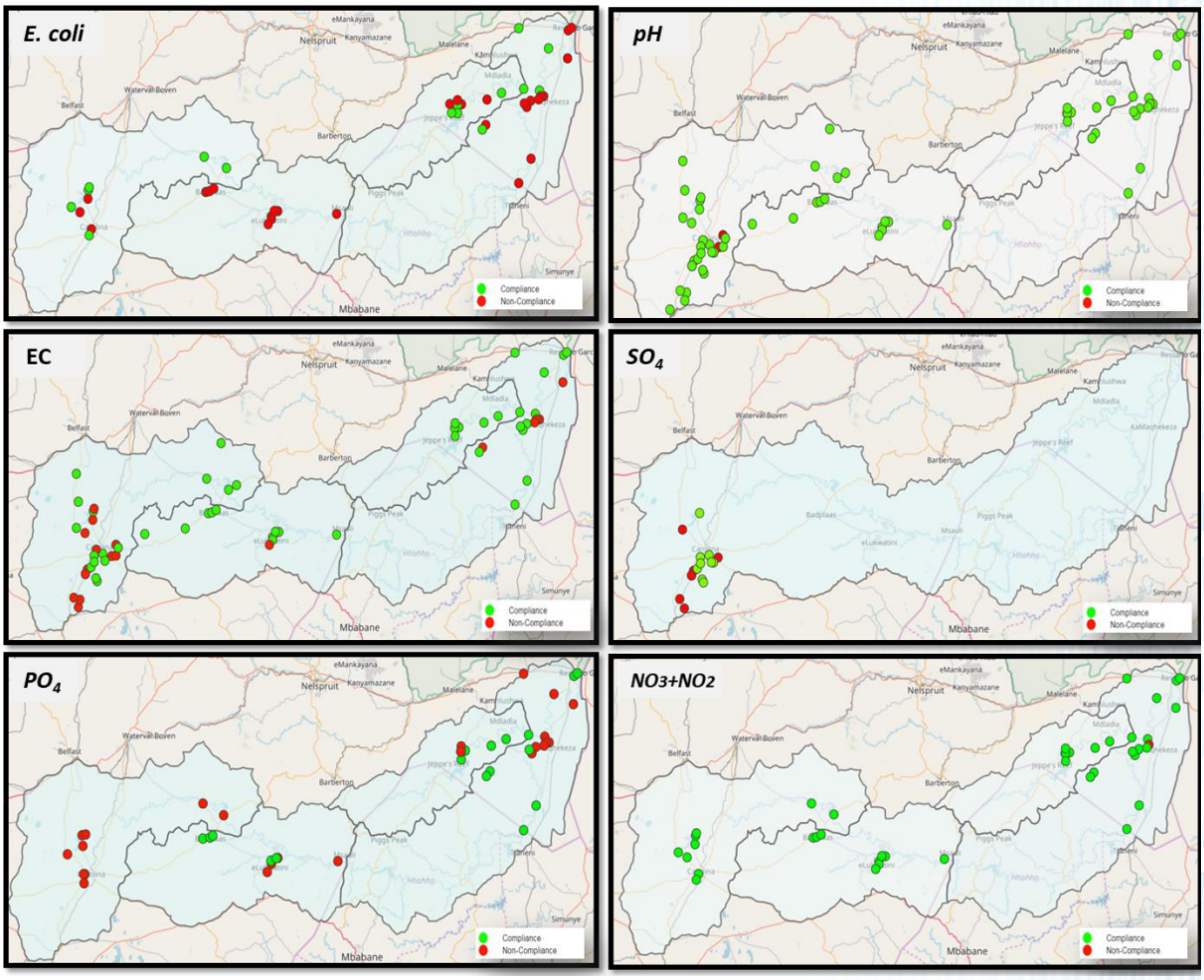

Figure 10: Water quality status within Komati Catchment showing Microbiological (E coli), physical (pH), Salts (EC and SO_4) and Nutrients (PO_4 and NO3+NO2) concentrations.

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 high *E. coli* counts which from time to time exceeded the set RQOs of Recreation (full contact).

pH complied with the RQO, with the exception of the point upstream of Droogvallei Coal Mine which is acidic, due to the decanting mine water.

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 RQO.

Sulphate concentration show non-compliance with the priority resource units (RU) limit of 80 (mg/l) and 30 mg/l in the Boesmanspriut and Vaalwaterspruit 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 non-compliance with the RQOs for most of the points within upper Komati Sub-catchment. However, this may be due to the low detection limit as mentioned above in the report.

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

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 Swaziland and 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 Swaziland. Consequently, it has independent rivers that start at the source and flow directly into a neighbouring country before confluencing with the main stem. While the main stem is the Usuthu River, the other tributaries confluence with the Usuthu River in Swaziland. These tributaries are the Mpuluzi, bordering the Usuthu River to the North, and Sandspruit immediately south of the Usutu River, followed by the Hlelo and Assegaai consecutively to the south.

The major activities in the catchment include forestry, mining and 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

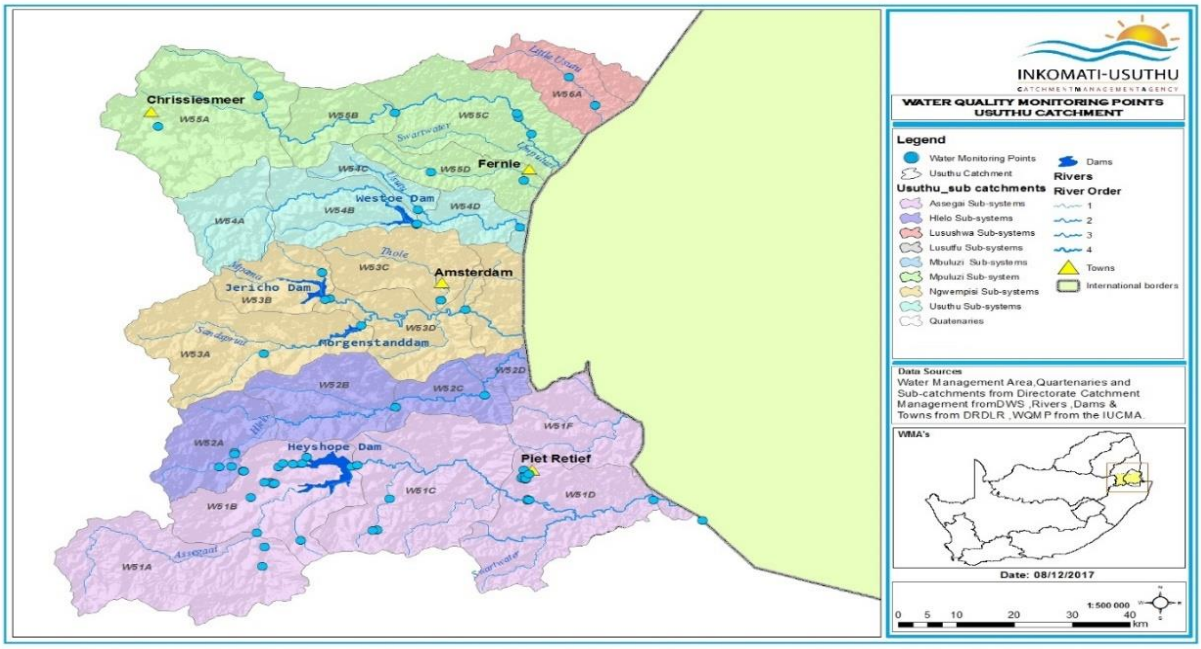

Figure 11: Water quality monitoring points in the Usuthu Catchment.

4.3 Target Water Quality Guideline and International Water Quality Guideline

The compliance of these 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 Swaziland only on the last monitored points that drains into the neighbouring countries.

Table 9: Target Water Quality Guideline limits 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 (Recreation -full contact)	6.5-8.5
Nitrates/Nitrites (mg/l)	6 (Domestic -Human consumption)	50
Ammonia (mg/l)	1 (Domestic -Human consumption)	1

N/A=Not available

4.4 Water Quality Status

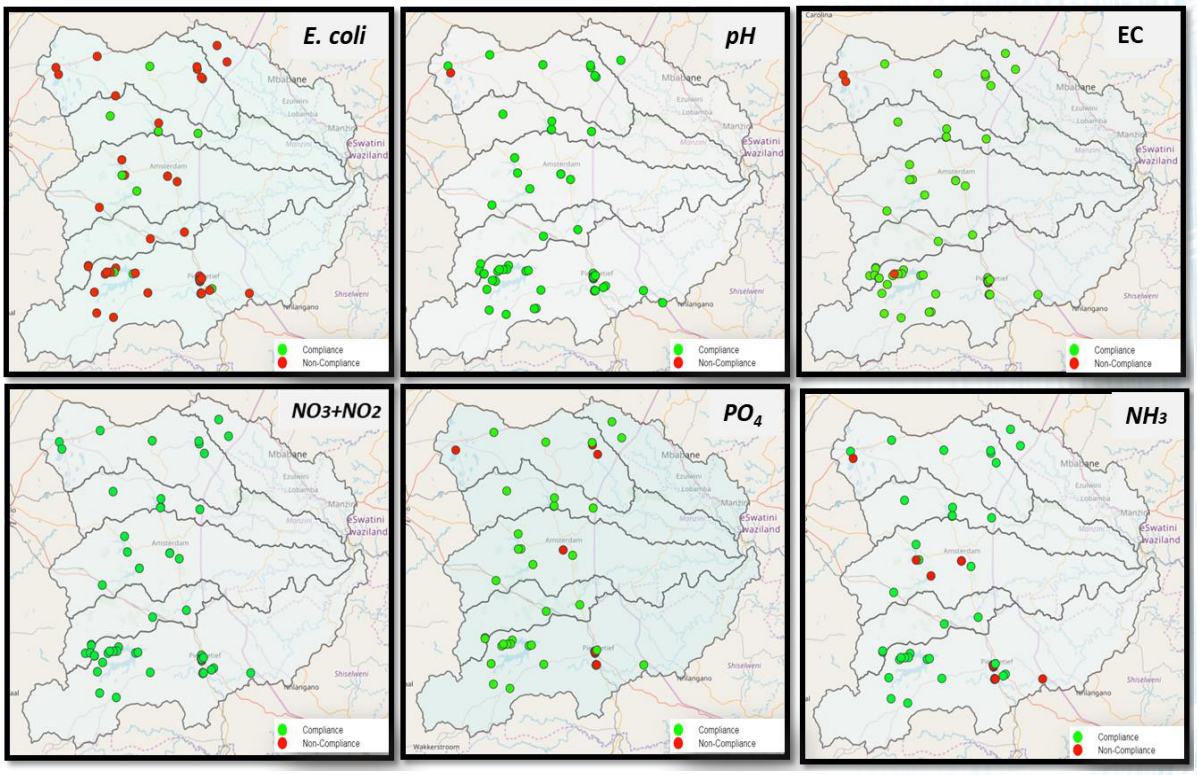

Figure 12 : Water quality status within Komati Catchment showing Microbiological (E coli), Salts (EC) and Nutrients (PO_4) concentrations.

4.5 Discussion of Results

E. coli counts in the Usuthu Catchment did not comply with the TWQG limits of 130 (cfu/100ml). The *E. coli* may occur in water resource because of the point sources (overflow of domestic sewage) or nonpoint sources of human and animal waste within the Catchment. 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 Oxidation Ponds which is alkaline.

Electrical Conductivity complied with the TWQG limits within the Usuthu Catchment except for two points upstream and downstream of Chrissiessmeer Oxidation Ponds and Ngulane River.

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 WWTW as well as the points on

Klipmisselspruit. Furthermore, as indicated above in this report, the problem of low detection limit which was resolved in September 2017

Ammonia concentrations complied with the TWQG (Domestic -Human consumption) throughout the catchment except Jerico and Morgenstond Dam, downstream of Amsterdam and Chrissiessmeer WWTW as well as the points on Klipmisselspruit.

CHALLENGES /IMPACTS AFFECTING WATER QUALITY WITHIN IUWMA

Figure 13: Some of the Impacts affecting Water quality within Water Management Area

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).

RECOMMENDATIONS

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

- **Implementation of Waste Discharge Charge System.**
- **Continuous stakeholder awareness workshops.**
- **Compliance Monitoring and Enforcement:**

  It is recommended that the CME division investigate the following critical areas and ensure that the necessary corrective actions are taken to achieve resource protection.

Catchment	Water Resource and Area	Parameters of concern
Crocodile Catchment	Crocodile River at Hectorspruit, Komatipoort and Tenbosch	EC
	Besterspruit, White River and Gutshwa and Crocodile River at Hectorspruit and Komatipoort	PO4
Sabie Sand Catchment	Sabie River at Hazyview and Bega River at Mkhuhlu	EC
	Sabie River at Hazyview and Bega River at Mkhuhlu	PO_4
Upper Komati Catchment	Boesmanspruit and its tributaries	Sulphates, pH
	Vaalwaterspruit	Sulphates
	Tributary of Boesmaspruit at Carolina, Teespruit at Elukwatini and Seekoespruit at Badplaas	PO4 (Nutrients)
Lower Komati Catchment	Sikwakwa River	EC
	Komati River and its tributaries at Tonga and KaMaqhekeza	PO4 (Nutrients)
Usuthu Catchment	Chrissiessmeer lake and Ngulane River tributary of Heyshope Dam	EC
	Chrissiessmeer lake	PO4 (Nutrients)

The presence of *E coli* bacteria 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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Department of Water and Sanitation. June 2013. National Water Resource Strategy. 2nd ed. Pretoria.

Department of Water and Sanitation. May 1996. South African Water Quality Guidelines Volume 8 Field Guide. 2nd ed. Pretoria.

Government Notice No.1616, December 2016, Gazette, National Water Act, 1998(No 36 of 1998): Classes of Water Resources and Resource Quality Objectives for the Catchments the Inkomati.

Republic of South Africa. August 1998. National Water Act (Act 36 of 1998). Pretoria.

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APPENDIX A

WATER QUALITY DATA ON CROCODILE CATCHMENT

Ecological Water Requirement (EWR) Sites C1

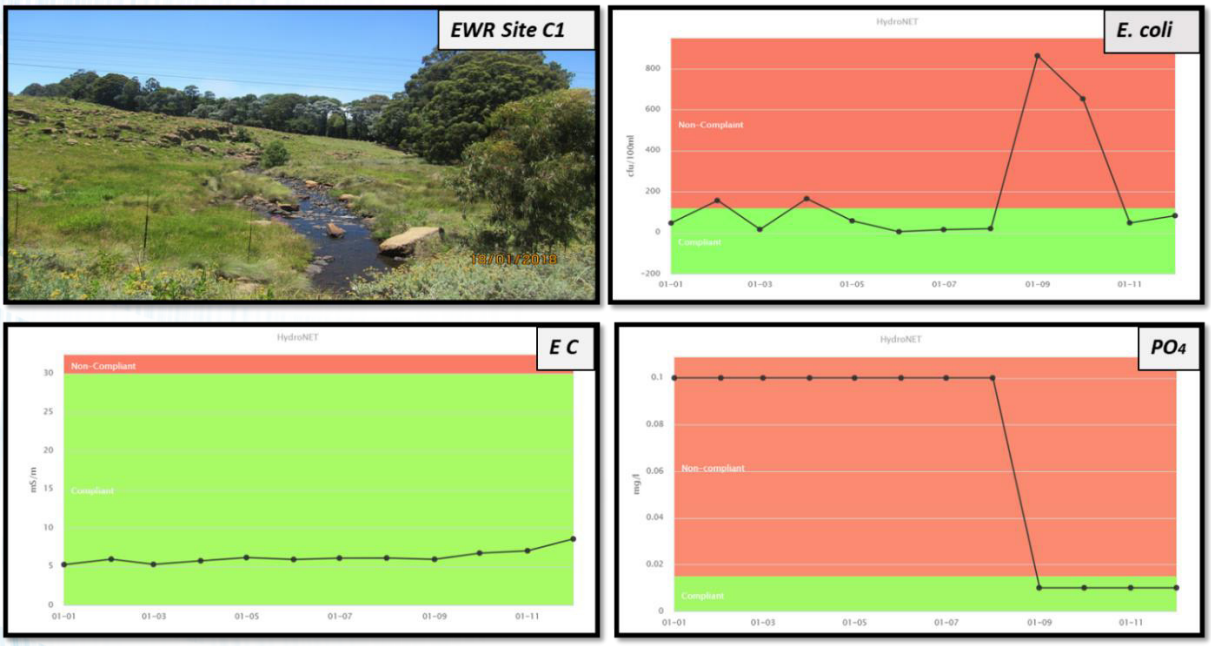


*Figure 14: Charts showing compliance or non-compliance at **Ecological Water Requirement (EWR) Sites C1** on Crocodile River @Dullstroom.*

Discussion of Results at EWR C1

E coli

The RQO for recreation at full contact is **120 counts per 100mℓ** at EWR C1 site (headwaters of Crocodile River) and it indicated non-compliance in February 2017, April 2017 and September -October 2017.

Electrical Conductivity

The EWR C1 (headwaters) site complied with RQOs of **30 (mS/m)** throughout the reporting period and shows less than 10 (mS/m).

Ortho-Phosphate

The EWR C1 (headwaters) complied with the acceptable limits as the RQOs aquatic ecosystem drivers of **0.015 (mg/l)** in September -December 2017. The Ortho-Phosphate from January 2017-August 2017 shows noncompliance, due to inconclusive measurements resulting from low detection limit

Ecological Water Requirement (EWR) Sites C2

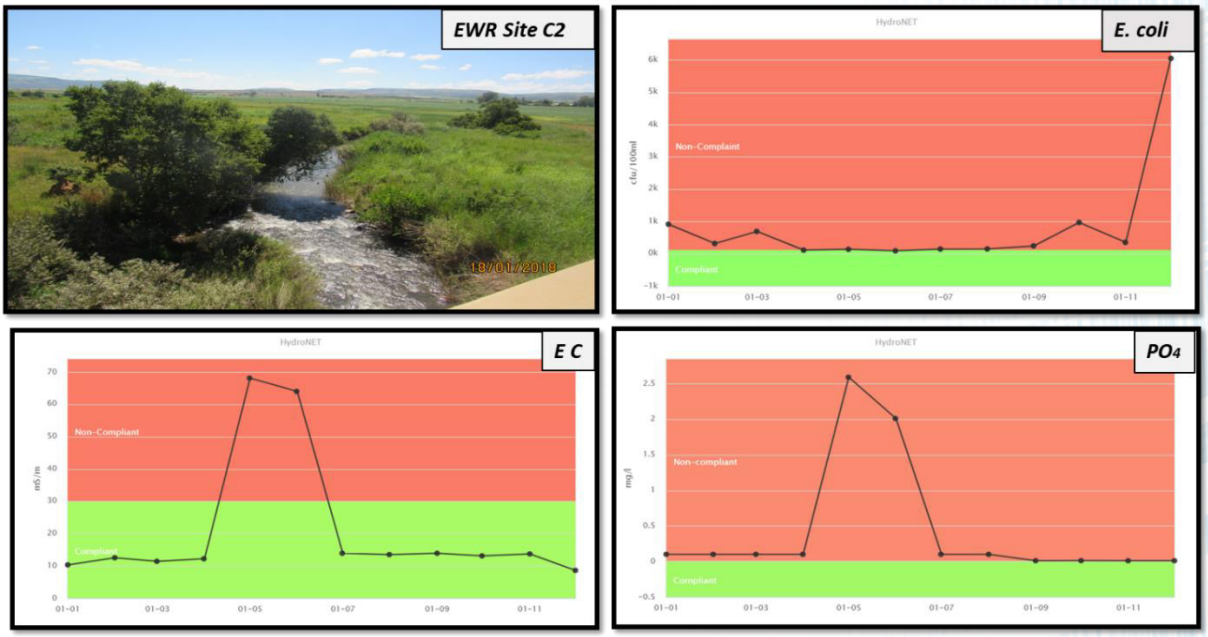


*Figure 15: Charts showing compliance or non-compliance at **Ecological Water Requirement (EWR) Sites C2** Crocodile River U/S of Kwena Dam*

Discussion of Results at EWR C2

E coli

The RQO for recreation at full contact is **130 counts per 100mℓ** at EWR C2 site and it indicated non-compliance from January to March 2017 as well as from July to December 2017.

Electrical Conductivity

The EWR C2 site complied with the RQOs of **30 (mS/m)** throughout the reporting period and is below 20 (mS/m), except May and June 2017.

Phosphate

The EWR C2 site complied with the acceptable limits as the RQOs aquatic ecosystem drivers of **0.025 (mg/l)** in September- December 2017. The Ortho-Phosphate from January 2017-August 2017 shows non-compliance, due to inconclusive measurements resulting from low detection limit.

Ecological Water Requirement (EWR) Sites C3

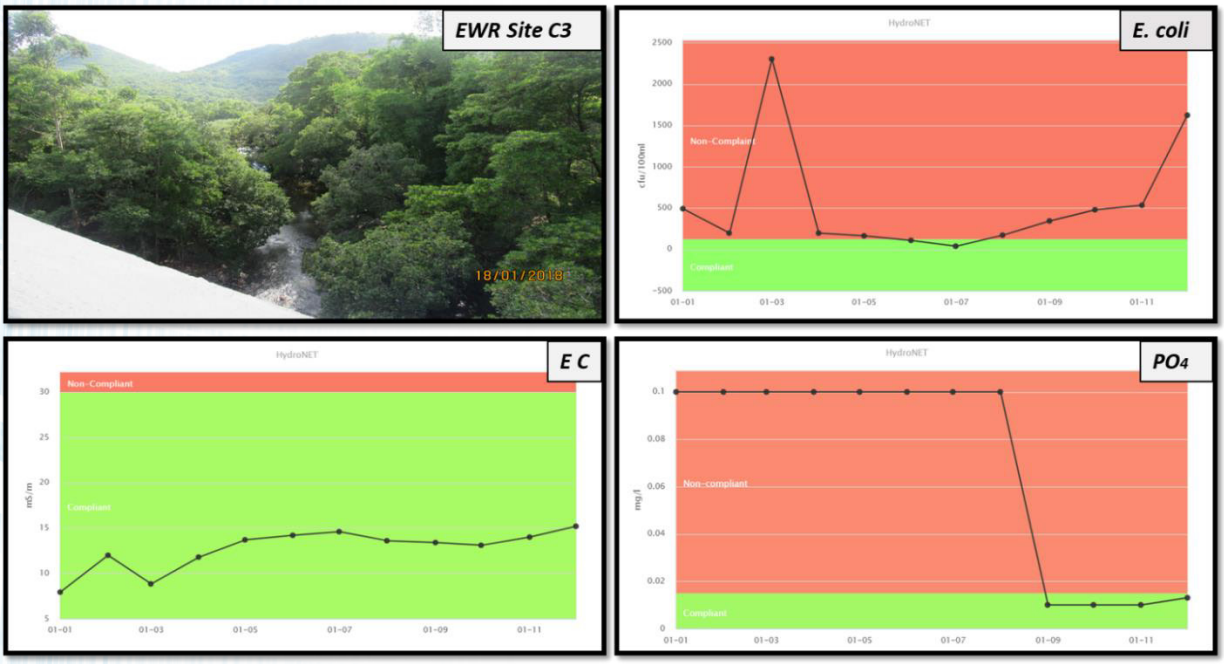


*Figure 16: Charts showing compliance or non-compliance at **Ecological Water Requirement (EWR) Sites C3** Crocodile River at Crocodile River@ Montrose.*

Discussion of Results EWR C3

E coli

The EWR C3 site indicated non-compliance throughout the reporting period, except June and July 2017.

Electrical Conductivity

The EWR C3 site complied with the RQOs of **30 (mS/m)** throughout the reporting period.

Phosphate

The EWR C3 site did not comply with the RQOs for aquatic ecosystem drivers of **0.015 (mg/l)** except in September -December 2017. The Ortho-Phosphate from January 2017-August 2017 shows non-compliance, due to inconclusive measurements resulting from low detection limit.

Ecological Water Requirement (EWR) Sites C4

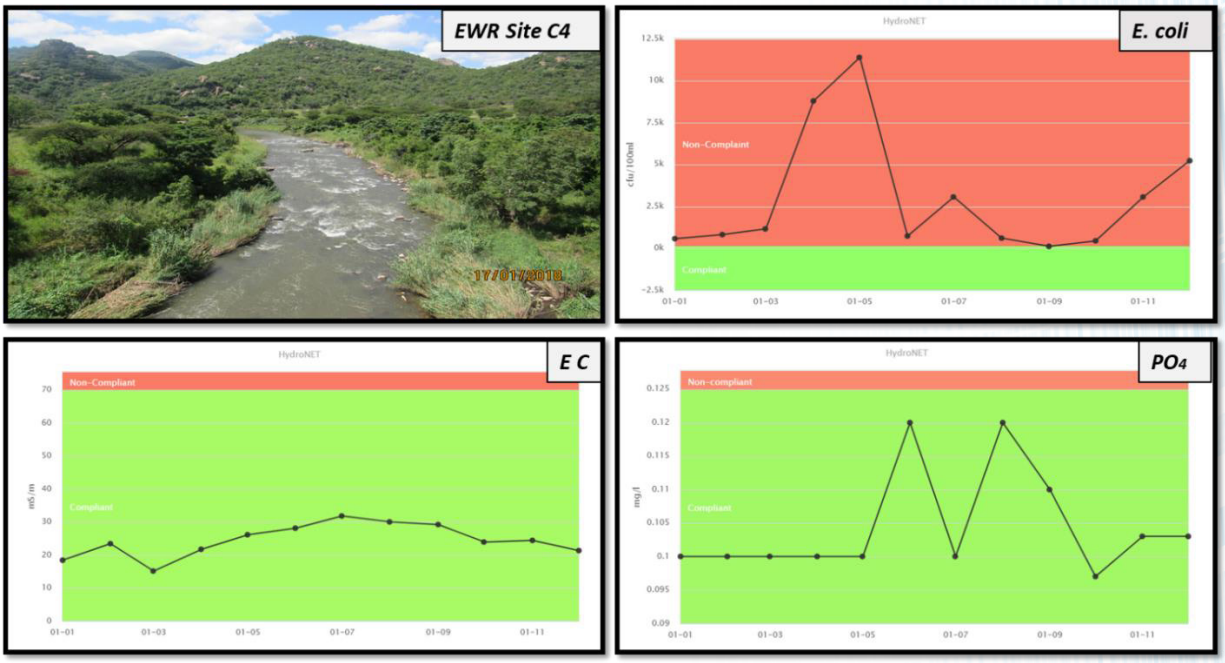


*Figure 17: Charts showing compliance or non-compliance at **Ecological Water Requirement (EWR) Sites C4** Crocodile River@ Kanyamazane Bridge N4.*

Discussion of Results EWR C4

E coli

The EWR C4 site indicated non-compliance throughout the reporting period, except in September 2017. This point is down stream of White River, Nelspruit and Kanyamazane.

Electrical Conductivity

The EWR C4 site complied with RQOs of **70 (mS/m)** throughout the reporting period.

Phosphate

The EWR C4 site complied with the RQOs for aquatic ecosystem drivers of **0.125 (mg/l)** throughout the reporting period.

Ecological Water Requirement (EWR) Sites C5

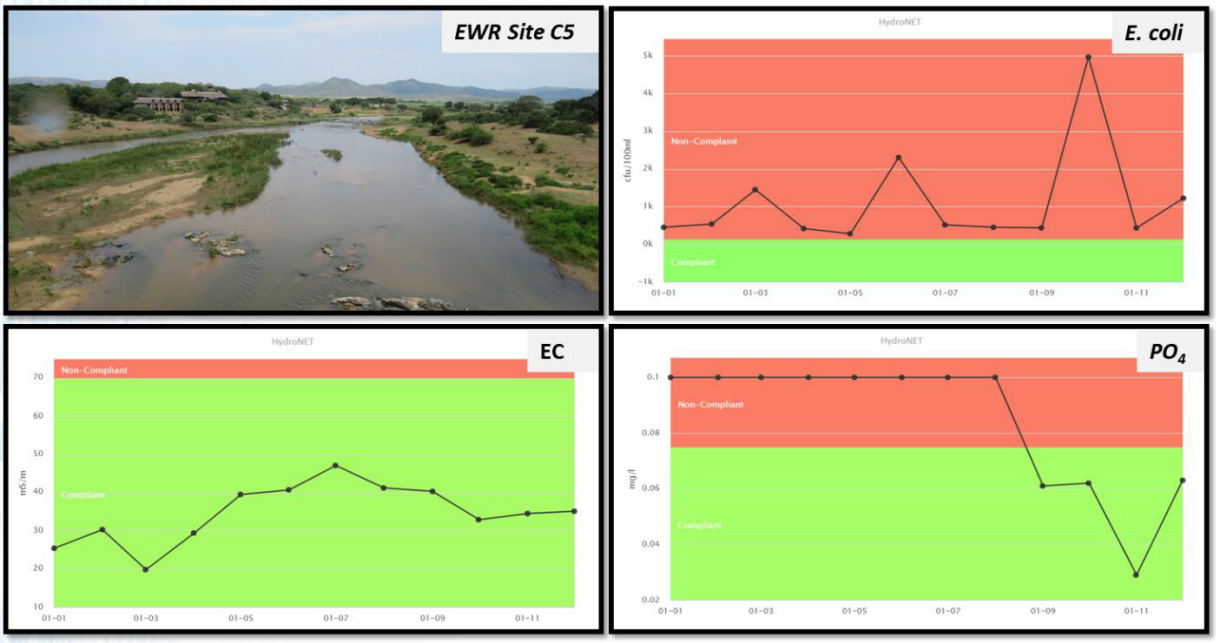


Figure 18: Charts showing compliance or non-compliance at ***Ecological Water Requirement (EWR) Sites C5*** *Crocodile River@ Malelane Gate Bridge.*

Discussion of Results EWR C5

E coli

The EWR C5 site indicated non-compliance throughout the reporting period. This point is down stream of Kabokweni, Matsulu, Mhlatiplaas and Mhlatikop WWTWs and the animal feacal (Hippos) as the river passes through Kruger Nation Park.

Electrical Conductivity

The EWR C5 site complied with the RQOs of **70 (mS/m)** throughout the reporting period.

Phosphate

The EWR C5 site complied with the RQOs for aquatic ecosystem drivers of **0.075 (mg/l)** from September to December 2017. The Ortho-Phosphate from January 2017-August 2017 shows noncompliance, due to inconclusive measurements resulting from low detection limit.

Ecological Water Requirement (EWR) Sites C6

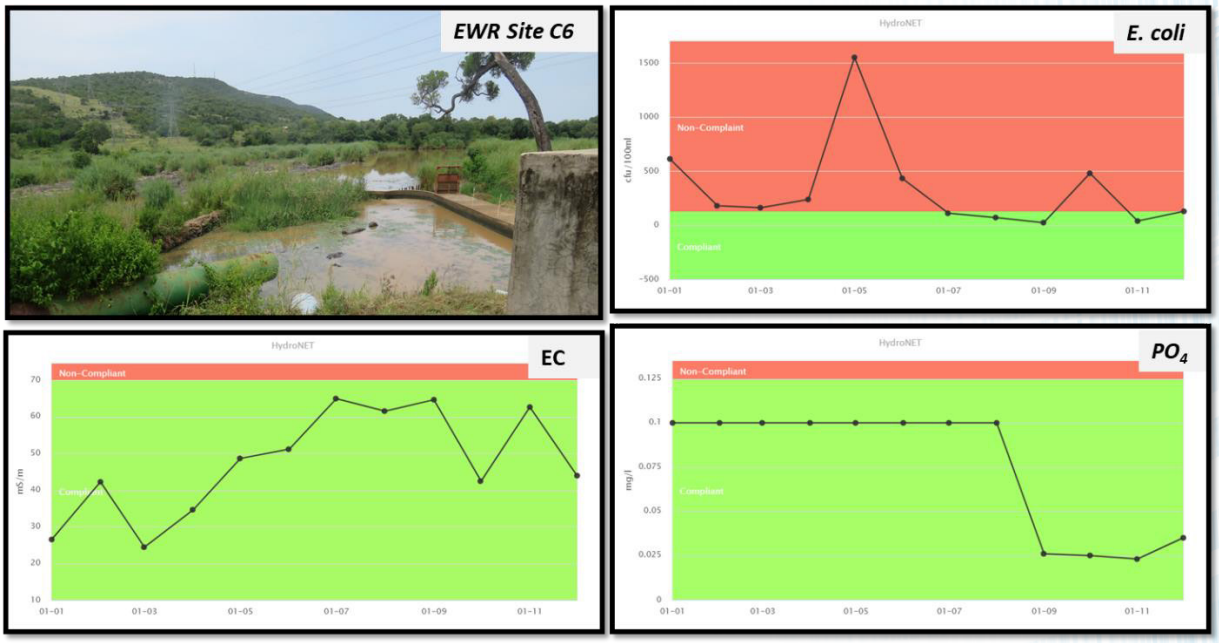


*Figure 19: Charts showing compliance or non-compliance at **Ecological Water Requirement (EWR) Sites C6** Crocodile River@ D/S of Komatipoort Golf Course*.

Discussion of Results EWR C6

E coli

The EWR C6 site indicated non-compliance throughout the reporting period, except in July - September 2017. This point is down stream of Komati WWTW and Crocodile sewer pump station and the animal feacal (Hippos) as the river passes through Kruger Nation Park.

Electrical Conductivity

The EWR C6 site complied with the RQOs of **70 (mS/m)** throughout the reporting period, however an increase in trend has been observed from April 2017 onwards.

Phosphate

The EWR C6 site complied with the RQOs for aquatic ecosystem drivers of **0.125 (mg/l)** for ortho-phosphate throughout the reporting period.

Ecological Water Requirement (EWR) Sites C7

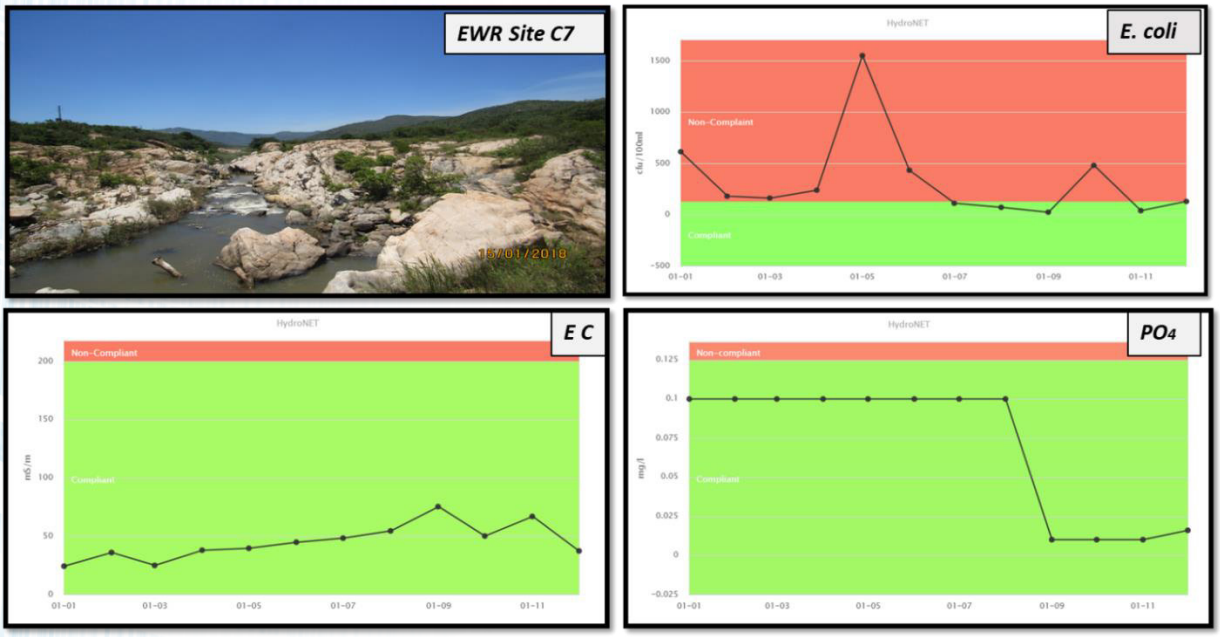


*Figure 20: Charts showing compliance or non-compliance at **Ecological Water Requirement (EWR) Sites C7** at Kaap River @Honeybird.*

Discussion of Results EWR C7

E coli

The EWR C7 site indicated compliance throughout the reporting period, except in January, March, May and October 2017.

Electrical Conductivity

The EWR C7 site complied with the RQOs of **200 (mS/m)** throughout the reporting period, however the increase of trend has been observed from April 2017 onwards.

Phosphate

The EWR C7 site complied with the RQOs aquatic ecosystem drivers of **0.125 (mg/l)** throughout the reporting period.

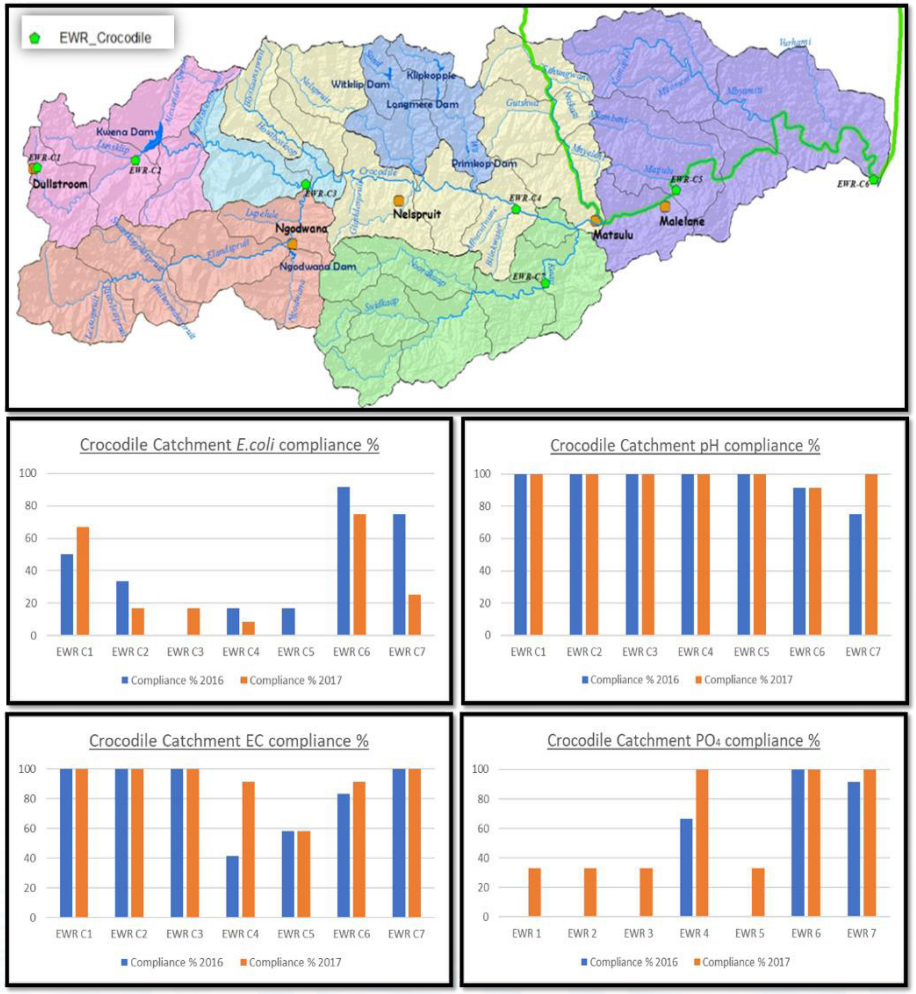


Figure 21: The compliance % of E coli, pH, EC and PO_4 concentrations on EWR sites in the Crocodile Catchment for year 2016 and 2017.

E. coli

The results above show that compliance in the Crocodile Catchment has deteriorated since the previous reporting year of 2016. Improvement was recorded at only two EWR sites C1 and C3 with an increase of 20% and 16.7% respectively.

pH

The pH in the Crocodile Catchment has been constant at 100% compliance for EWR sites C1-5, while EWR site C6 has remained constant at 90% compliance throughout the reporting period of 2016/17. Compliance improvement of below 80% to a 100% compliance was recorded at EWR site C7.

Electrical Conductivity

The Electrical Conductivity in the Crocodile catchment has remained constant at 100% compliance for the following EWR sites C1-3 & C7, while EWR site C5 has remained constant at 60% throughout the reporting period of 2016/17. Improvement was recorded at EWR sites C4 and C6

Phosphate

The phosphate compliance in the Crocodile Catchment has generally improved compared to 2016. EWR C4, 6 &7 sites recorded a compliance of 100%. The non-compliance recorded may result from Lab's inability to detect lower phosphates limits; the matter was resolved on September 2017.

WATER QUALITY DATA ON SABIE/SAND CATCHMENT

Ecological Water Requirement (EWR) Sites **S5** has no monitoring points and will be developed in the next financial year.

Ecological Water Requirement (EWR) Sites S1

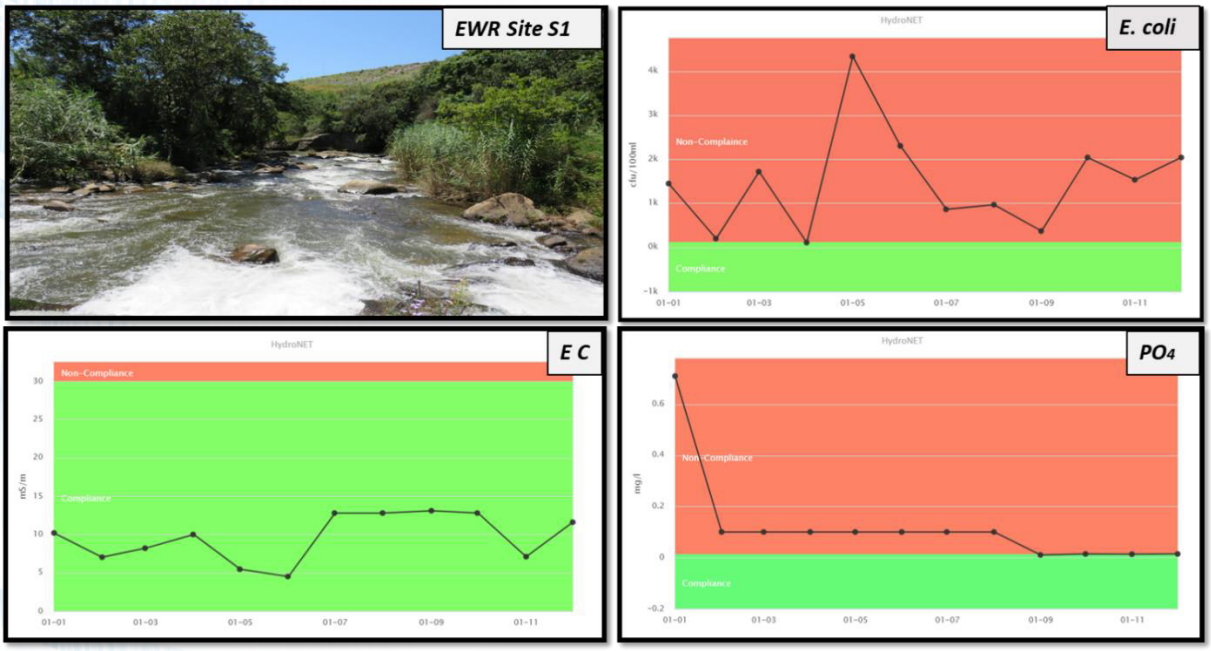


*Figure 22: Charts showing compliance or non-compliance at **Ecological Water Requirement (EWR) Sites S1** at Sabie River D/S of Sabie WWTW.*

Discussion of Results EWR S1

E coli

The EWR S1 site indicated non-compliance throughout the reporting period, except April 2017.

Electrical Conductivity

The EWR S1 site complied with the RQOs of **30 (mS/m)** throughout the reporting period.

Phosphate

The EWR S1 site indicate non-complied with the RQOs for aquatic ecosystem drivers of **0.015 (mg/l)** throughout the reporting period, except September -December 2017. The Ortho-Phosphate from February 2017-August 2017 shows non-compliance due to inconclusive measurements resulting from low detection limit.

Ecological Water Requirement (EWR) Sites S2

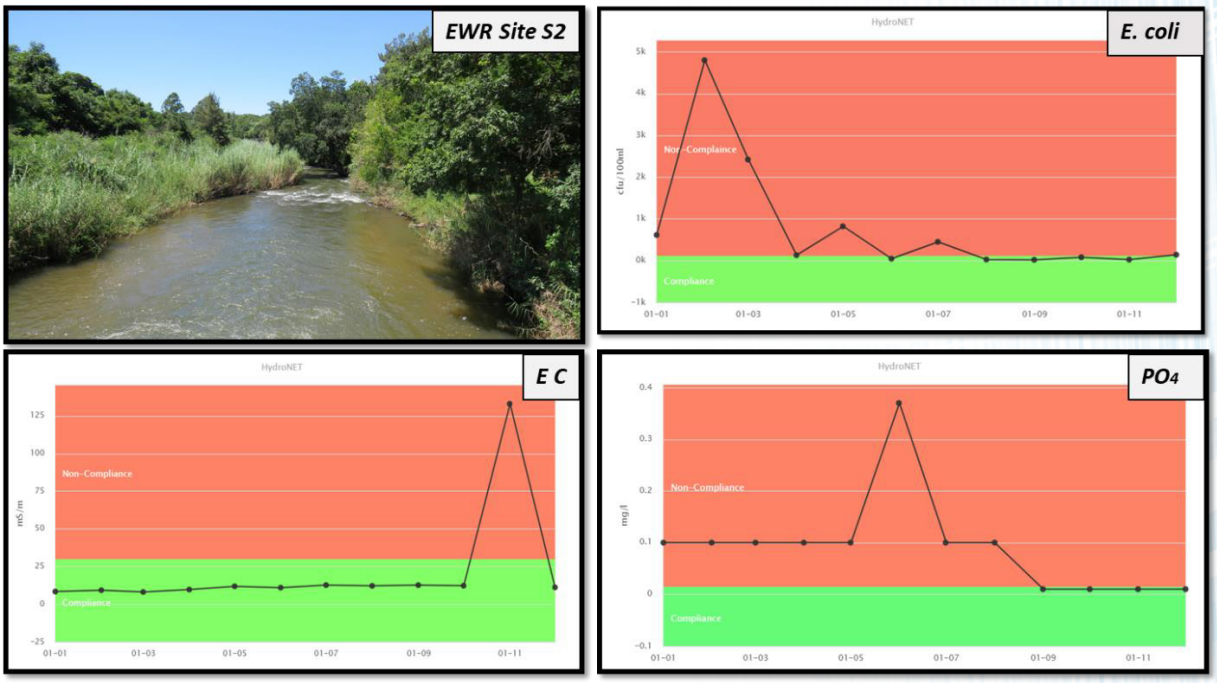


Figure 23: Charts showing compliance or non-compliance at ***Ecological Water Requirement (EWR) Sites S2*** *at Sabie River after Confluence with Mac-Mac River.*

Discussion of Results EWR S2

E coli

The EWR S2 site indicated non-compliance throughout the reporting period, except April, June and August to November 2017.

Electrical Conductivity

The EWR S2 site complied with the RQOs of **30 (mS/m)** throughout the reporting period except in November 2017.

Phosphate

The EWR S2 site did not comply with the RQOs for aquatic ecosystem drivers of **0.015 (mg/l)** throughout the reporting period, except September-December 2017. The Ortho-Phosphate from January 2017-August 2017 shows non-compliance, due to inconclusive measurements resulting from low detection limit.

Ecological Water Requirement (EWR) Sites S3

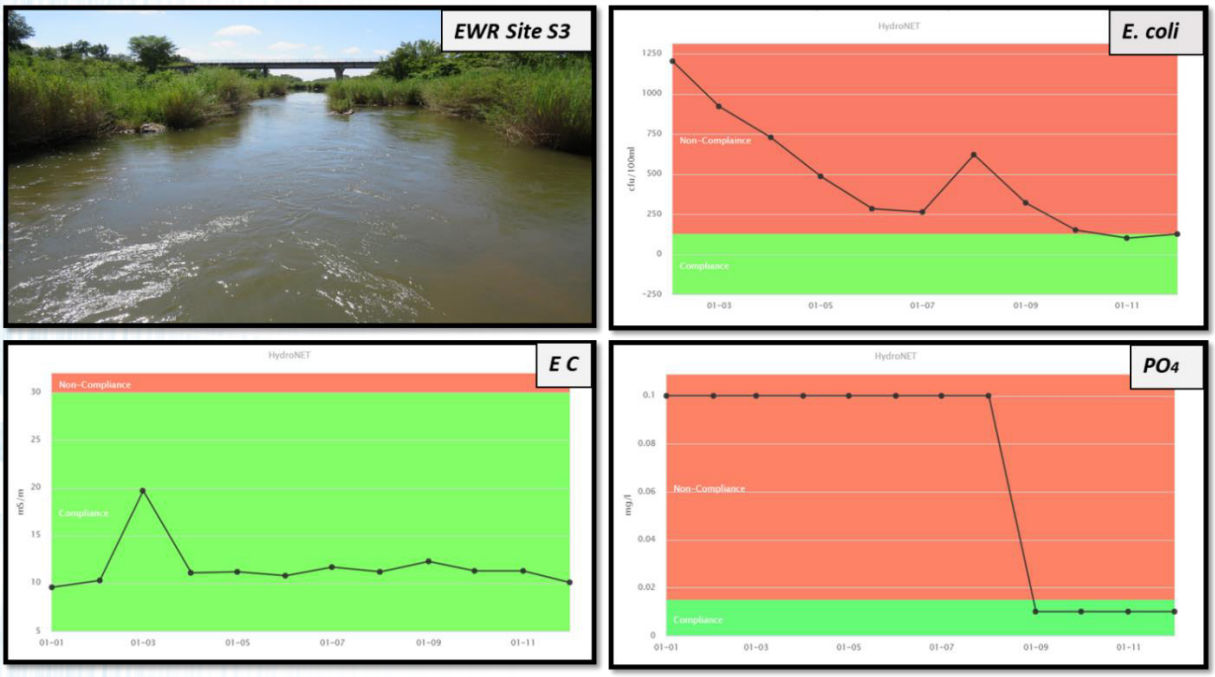


*Figure 24: Charts showing compliance or non-compliance at **Ecological Water Requirement (EWR) Sites S3** at Sabie River@Hoxani Weir.*

Discussion of Results EWR S3

E coli

The EWR S3 site indicated non-compliance throughout the reporting period, except in November 2017.

Electrical Conductivity

The EWR S3 site complied with the RQOs of **30 (mS/m)** throughout the reporting period.

Phosphate

The EWR S3 site did not comply with the RQOs for aquatic ecosystem drivers of **0.015 (mg/l)** throughout the reporting period, except September-December 2017. The Ortho-Phosphate from January 2017-August 2017 shows non-compliance, due to inconclusive measurements resulting from low detection limit.

Ecological Water Requirement (EWR) Sites S4

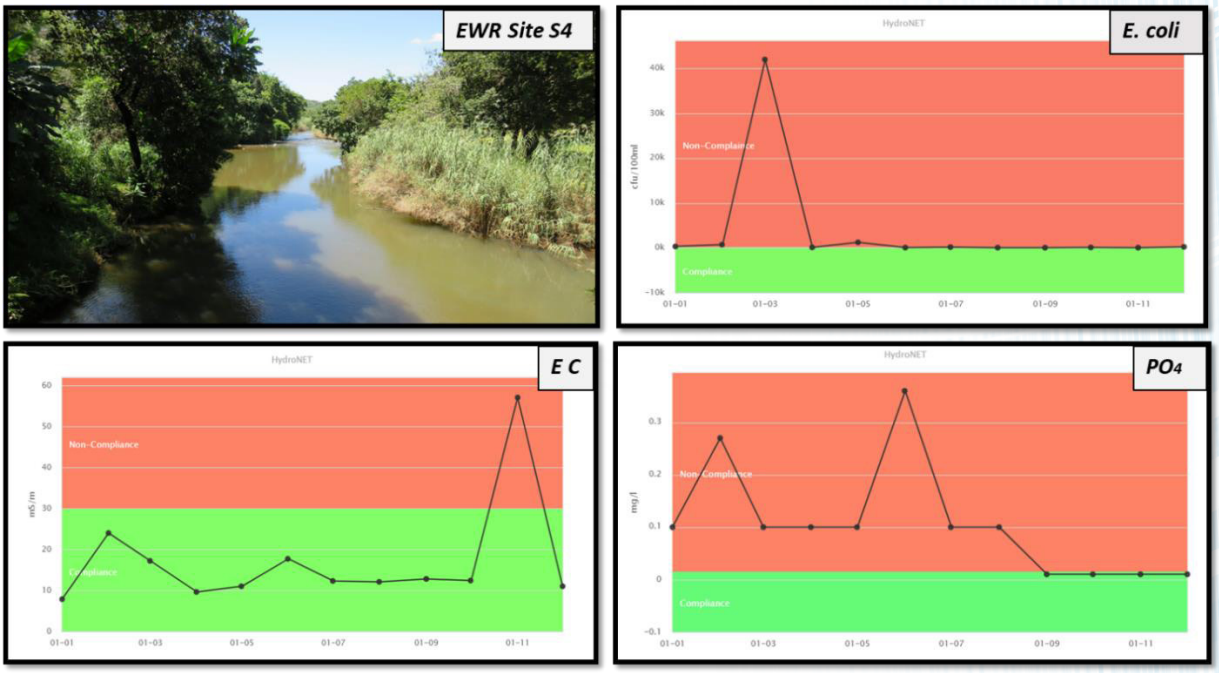


*Figure 25: Charts showing compliance or non-compliance at **Ecological Water Requirement (EWR) Sites S4** at Sabana River.*

Discussion of Results EWR S4

E coli

The EWR S4 site indicated compliance throughout the reporting period, except January - March and May 2017.

Electrical Conductivity

The EWR S4 site complied with the RQOs limit of **30 (mS/m)** throughout the reporting period, except a spike in November 2017.

Phosphate

The EWR S4 site shows non-compliance with the tolerable limits as the RQOs aquatic ecosystem drivers of **0.015 (mg/l)** throughout the reporting period, except September-December 2017. The Ortho-Phosphate from January 2017-August 2017 shows non-compliance, due to inconclusive measurements resulting from low detection limit.

Ecological Water Requirement (EWR) Sites S6

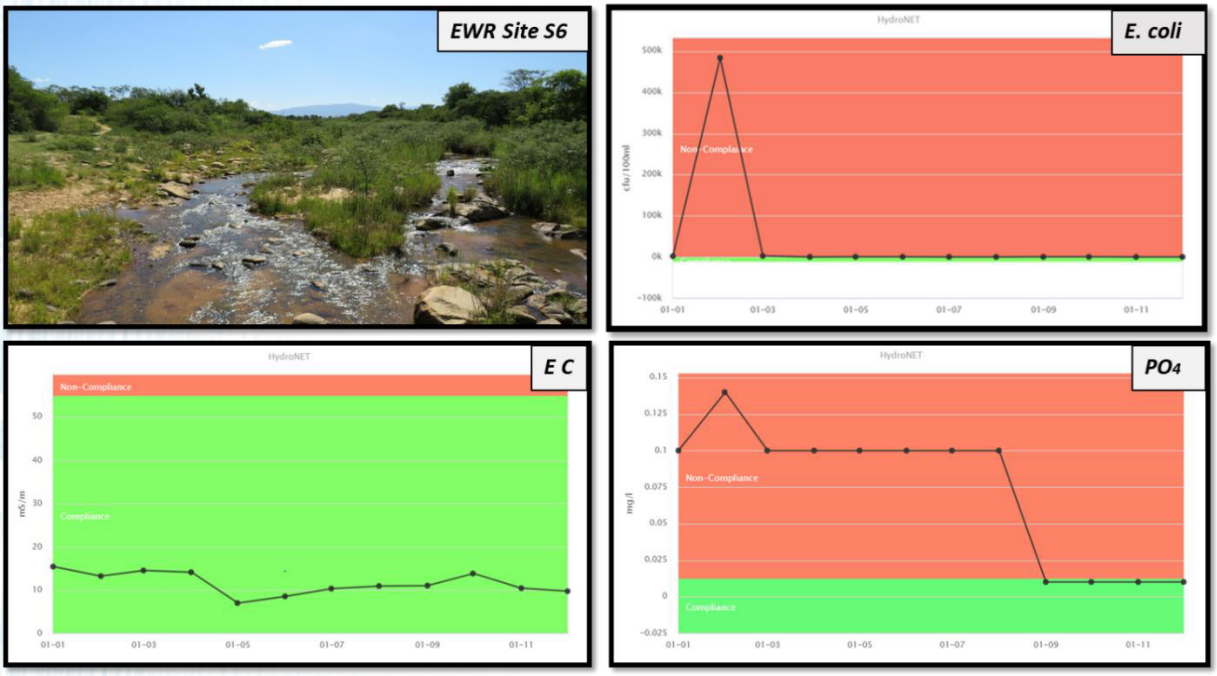


*Figure 26: Charts showing compliance or non-compliance at **Ecological Water Requirement (EWR) Sites S6** at Mutlumuvi River@Tsuvulani Bridge.*

Discussion of Results EWR S6

E coli

The EWR S6 site indicated compliance throughout the reporting period, except January - March and May-June 2017.

Electrical Conductivity

The EWR S6 site complied with the RQOs of **30 (mS/m)** throughout the reporting period.

Phosphate

The EWR S6 site did not comply with the RQOs for aquatic ecosystem drivers of **0.015 (mg/l)** throughout the reporting period, except September -December 2017. The Ortho-Phosphate from January 2017-August 2017 shows noncompliance, due to inconclusive measurements resulting from low detection limit.

Ecological Water Requirement (EWR) Sites S7

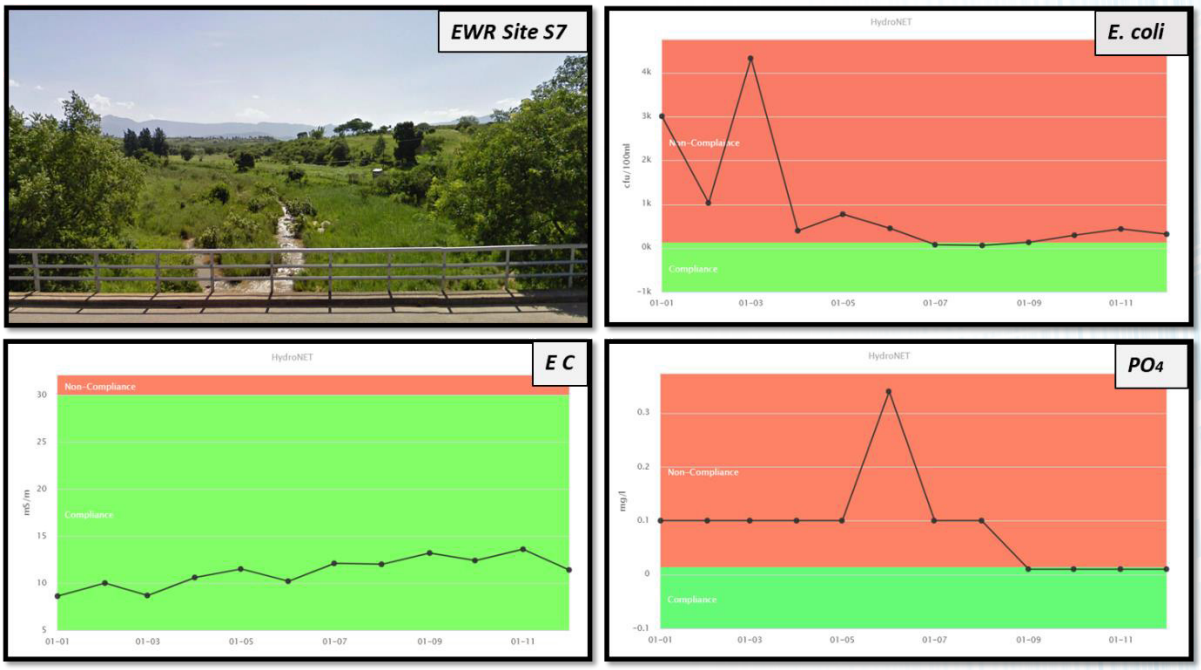


*Figure 27: Charts showing compliance or non-compliance at **Ecological Water Requirement (EWR) Sites S7** at Sand River@R40 Bridge.*

Discussion of Results EWR S7

E coli

The EWR S7 site indicated non-compliance throughout the reporting period, except in August 2017.

Electrical Conductivity

The EWR S7 site complied with the RQOs of **30 (mS/m)** throughout the reporting period.

Phosphate

The EWR S7 site did not comply with the RQOs for aquatic ecosystem drivers of **0.015 (mg/l)** throughout the reporting period, except September- December 2017. The Ortho-Phosphate from January 2017-August 2017 shows non-compliance, due to inconclusive measurements resulting from low detection limit.

Ecological Water Requirement (EWR) Sites S8

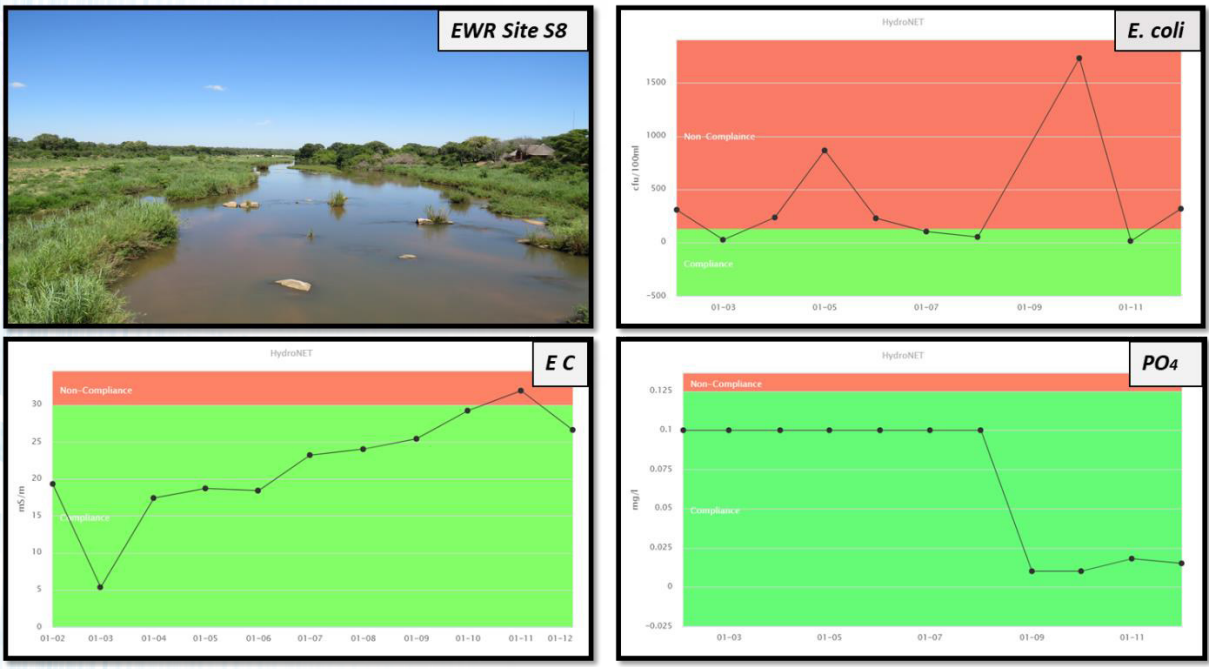


*Figure 28: Charts showing compliance or non-compliance at **Ecological Water Requirement (EWR) Sites S8** at Sand River@ Exeter Kruger National Park.*

Discussion of Results EWR S8

E coli

The EWR S8 site indicated non-compliance with the RQOs of **130 (cfu/100ml)** throughout the reporting period, except in March, July, August and November 2017.

Electrical Conductivity

The EWR S8 site complied with the RQOs of **30 (mS/m)** throughout the reporting period, except in November 2017.

Phosphate

The EWR S8 site complied with the RQOs for aquatic ecosystem drivers of **0.125 (mg/l)** throughout the reporting period.

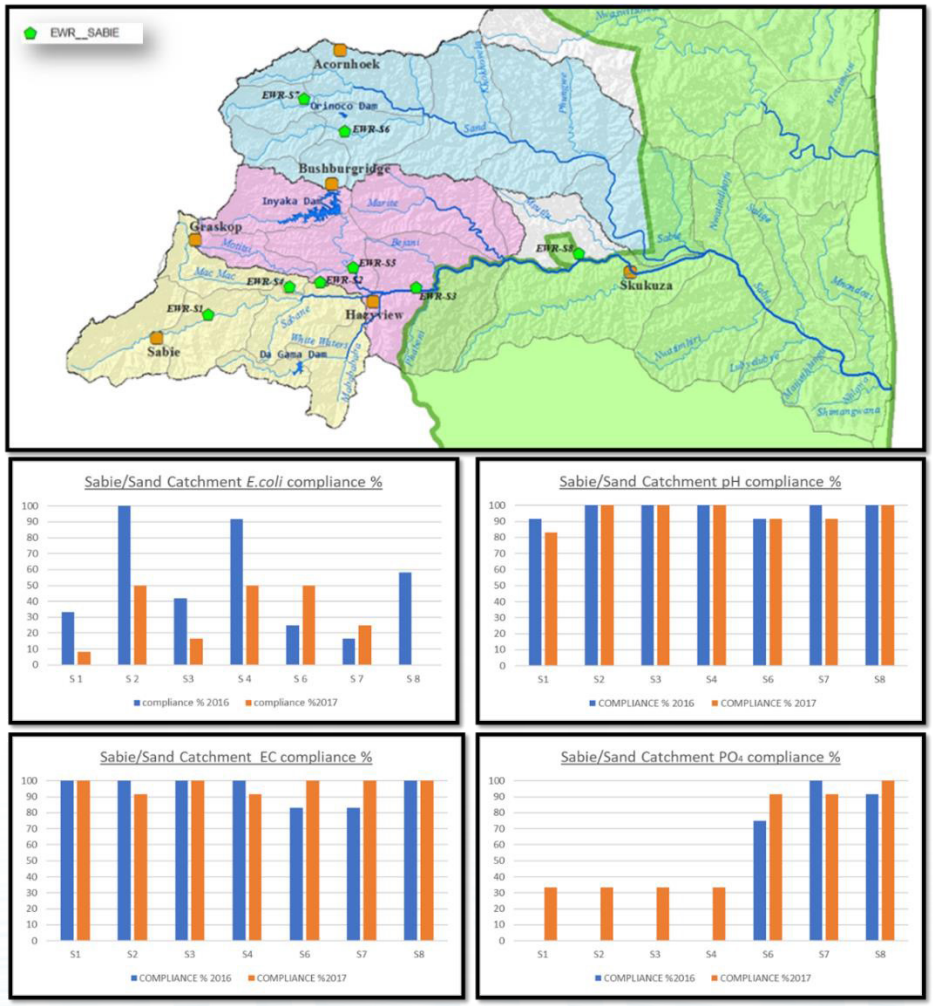


Figure 29: The compliance % of E coli, pH, EC and PO_4 concentrations on EWR sites in the Sabie/Sand Catchment for year 2016 and 2017.

E. coli

The results indicate that compliance for *E. coli* in the Sabie/Sand Catchment has deteriorated in most of the EWR sites, except EWR sites S6 & S7. However, the improvement recorded for EWR S6 and EWR S7 was 50% and below 30% respectively in 2017.

pH

Deterioration in compliance was recorded at EWR site S1 and EWR site S7, while EWR site S2, S3 S4 and S8 remained 100% compliant in 2016-2017. EWR site S6 remained 90% compliant and EWR site S7 deteriorated from 100% to 90% compliance in 2016-2017.

Electrical Conductivity

EWR sites S6 & S7 indicated improvement in compliance to 100% in 2017, while EWR sites S2 & S4 indicated deterioration to 90% compliance compared to 2016 and EWR site S1, S3 and S7 remained 100% compliance in 2016-2017.

Phosphates

EWR sites S1-4, 6 & 8 indicated improvement and EWR site S7 has deteriorated in compliance. The non-compliance recorded may result from Lab's inability to detect lower phosphates limits; the matter was resolved in September 2017.

Ecological Water Requirement (EWR) Sites K1

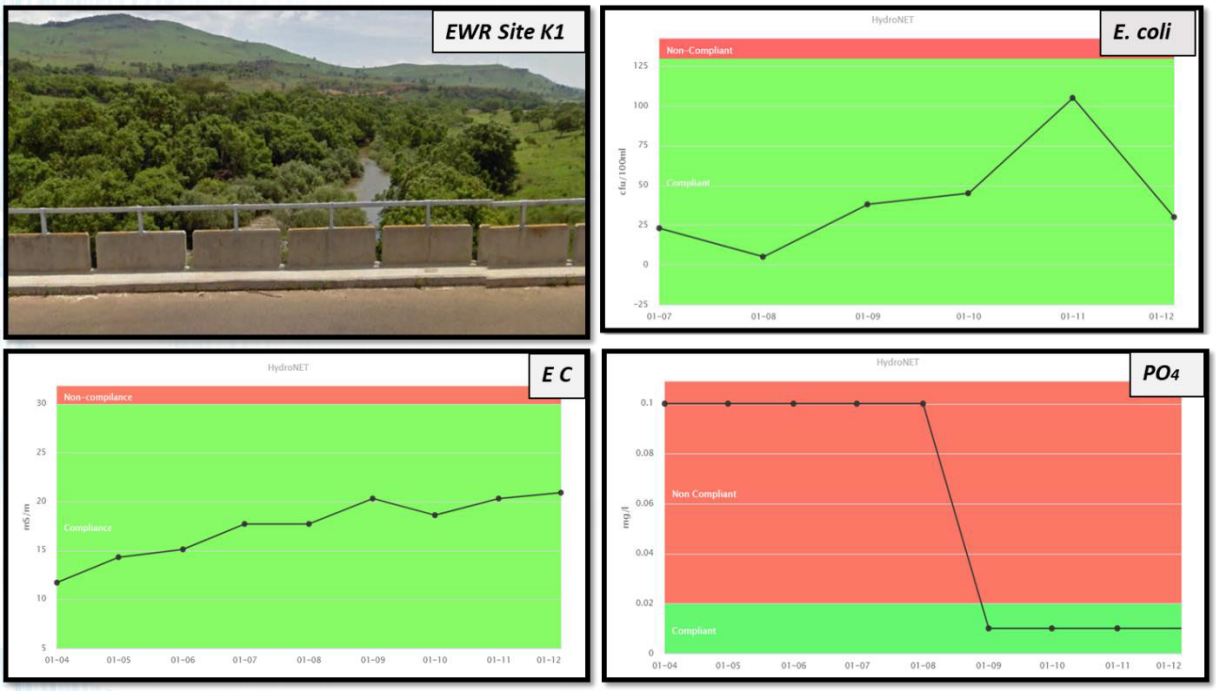


*Figure 30: Charts showing compliance or non-compliance at **Ecological Water Requirement (EWR) Sites S8** at Komati River D/S of Nooitgedacht and U/S of Vygeboom Dam.*

Discussion of Results EWR K1

E coli

The EWR K1 site complied with the RQOs of **130 (cfu/100ml)** throughout the reporting period.

Electrical Conductivity

The EWR K1 site complied with the RQOs of **30 (mS/m)** throughout the reporting period.

Phosphate

The EWR K1 site did not comply with the RQOs for aquatic ecosystem drivers of **0.02 (mg/l)** throughout the reporting period, except September -December 2017. The Ortho-Phosphate from January 2017-August 2017 shows non-compliance, due to inconclusive measurements resulting from low detection limit.

Ecological Water Requirement (EWR) Sites G1

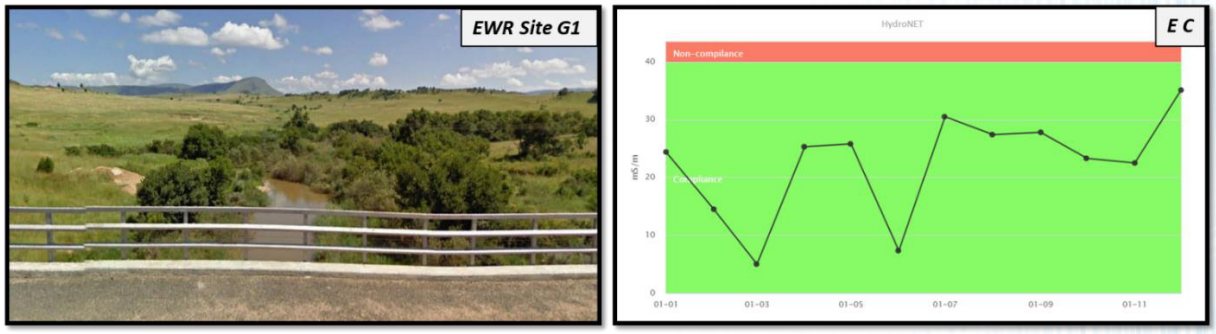


Figure 31: Charts showing compliance or non-compliance at ***Ecological Water Requirement (EWR) Sites G1*** *at Gladdespruit River @D/S of Nkomati Mine.*

Discussion of Results EWR G1

E coli

The *E. coli* not analyzed at this monitoring point, however it will be analyzed in the next financial year.

Electrical Conductivity

Th EWR G1 site complied with the TWQGs limit of **40 (mS/m)** throughout the reporting period. The activities upstream of this monitoring points is mining and agriculture.

Phosphate

The ortho-phosphate not analyzed at this monitoring point, however it will be analyzed in the next financial year.

Ecological Water Requirement (EWR) Sites T1

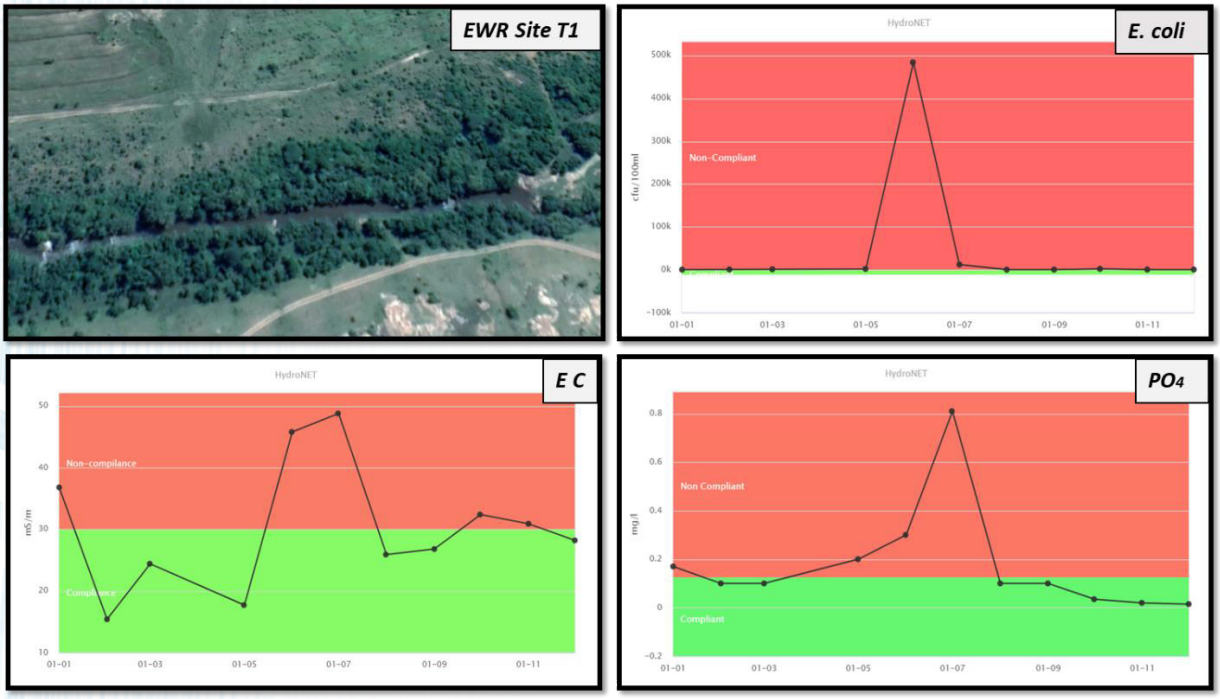


*Figure 32: Charts showing compliance or non-compliance at **Ecological Water Requirement (EWR) Sites T1** at Tweespruit River@D/S of Elukwatini WWTW.*

Discussion of Results EWR T1

E. coli

The EWR T1 site indicated non-compliance throughout the reporting period.

Electrical Conductivity

The EWR T1 site complied with the RQOs of **30 (mS/m)** throughout the reporting period, except in January, June and July, October and November 2017.

Phosphate

The EWR T1 site complied with the RQOs for aquatic ecosystem drivers of **0.125 (mg/l)** throughout the reporting period, except in January and May-July 2017.

Ecological Water Requirement (EWR) Sites K2

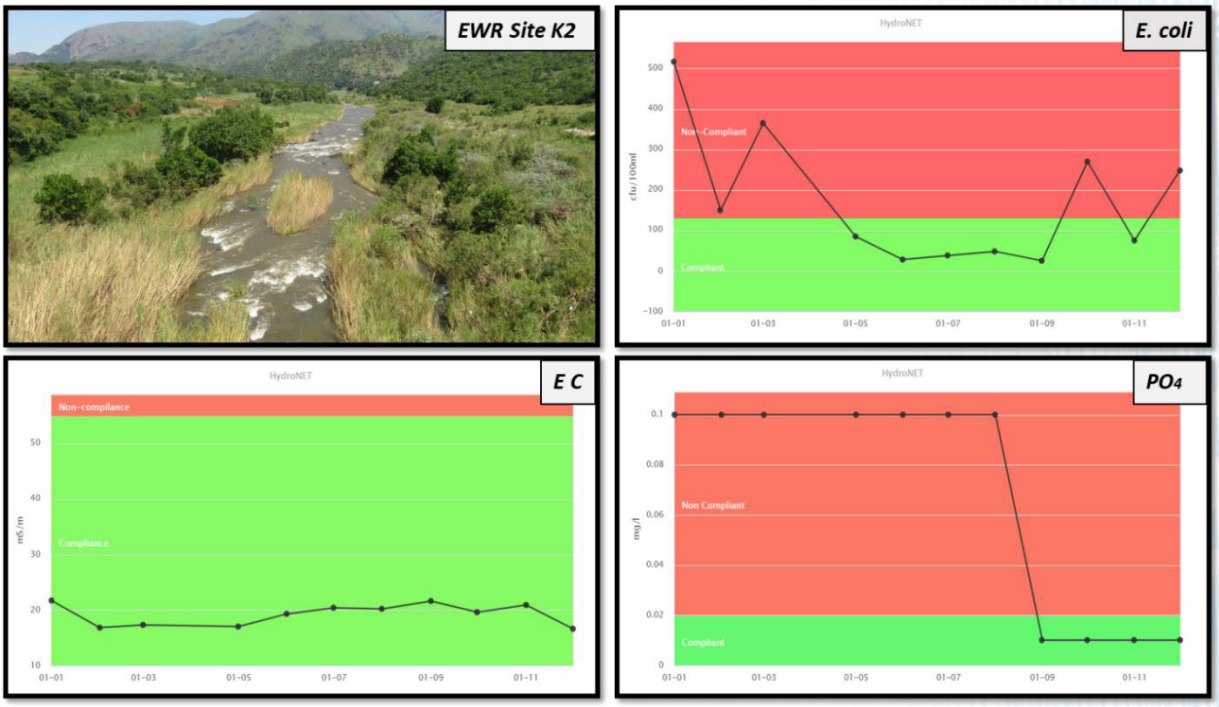


*Figure 33: Charts showing compliance or non-compliance at **Ecological Water Requirement (EWR) Sites K2** at on Komati River@Ekulindeni Bridge Swazi Border.*

Discussion of Results EWR K2

E coli

The EWR K2 site indicated compliance throughout the reporting period, except in January - March 2017 and October and December 2017.

Electrical Conductivity

The EWR K2 site complied with the set ideal RQOs limit of **55 (mS/m)** throughout the reporting period.

Phosphate

The EWR K2 site did not comply with the RQOs for aquatic ecosystem drivers of **0.02 (mg/l)** throughout the reporting period, except September-December 2017. The Ortho-Phosphate from January 2017-August 2017 shows non-compliance, due to inconclusive measurements resulting from low detection limit.

Ecological Water Requirement (EWR) Sites L1

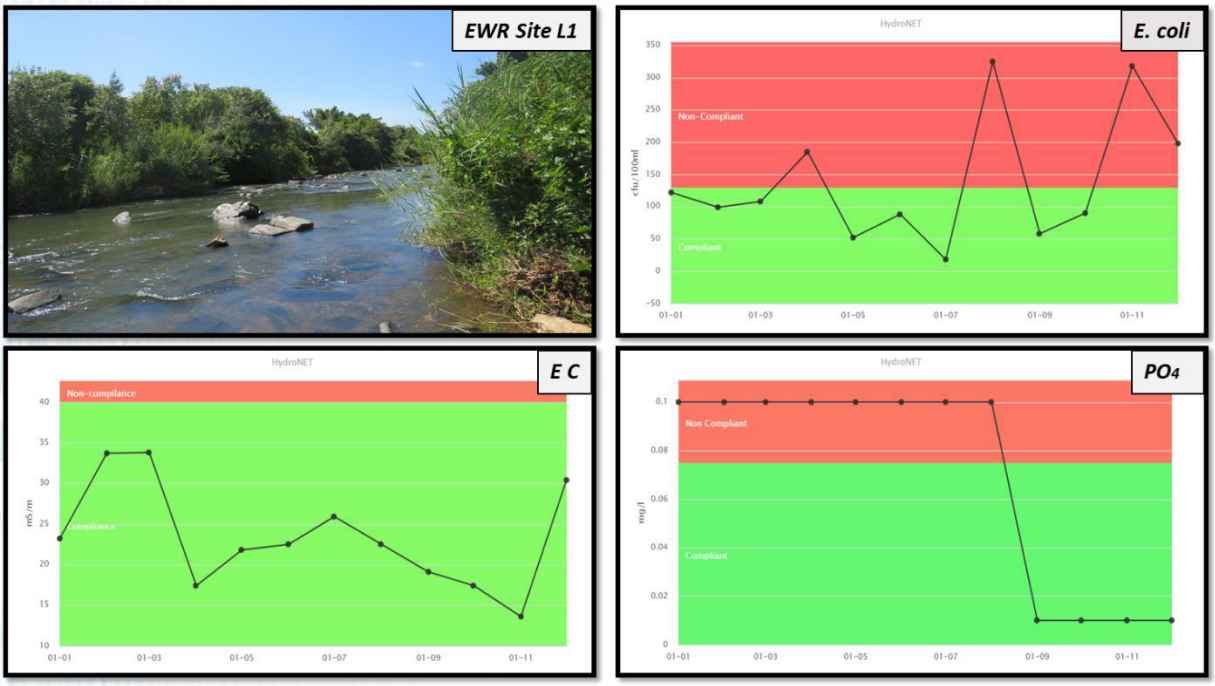


*Figure 34: Charts showing compliance or non-compliance at **Ecological Water Requirement (EWR) Sites L1** at Lomati River @Langeloop.*

Discussion of Results EWR L1

E coli

The EWR L1 site indicated compliance throughout the reporting period, except in March, August November and December 2017.

Electrical Conductivity

The EWR L1 site complied with the RQOs of **40 (mS/m)** throughout the reporting period.

Phosphate

The EWR L1 site did not comply with the RQOs for aquatic ecosystem drivers of **0.075 (mg/l)** throughout the reporting period, except September -December 2017. The Ortho-Phosphate from January 2017-August 2017 shows non-compliance, due to inconclusive measurements resulting from low detection limit.

Ecological Water Requirement (EWR) Sites K3

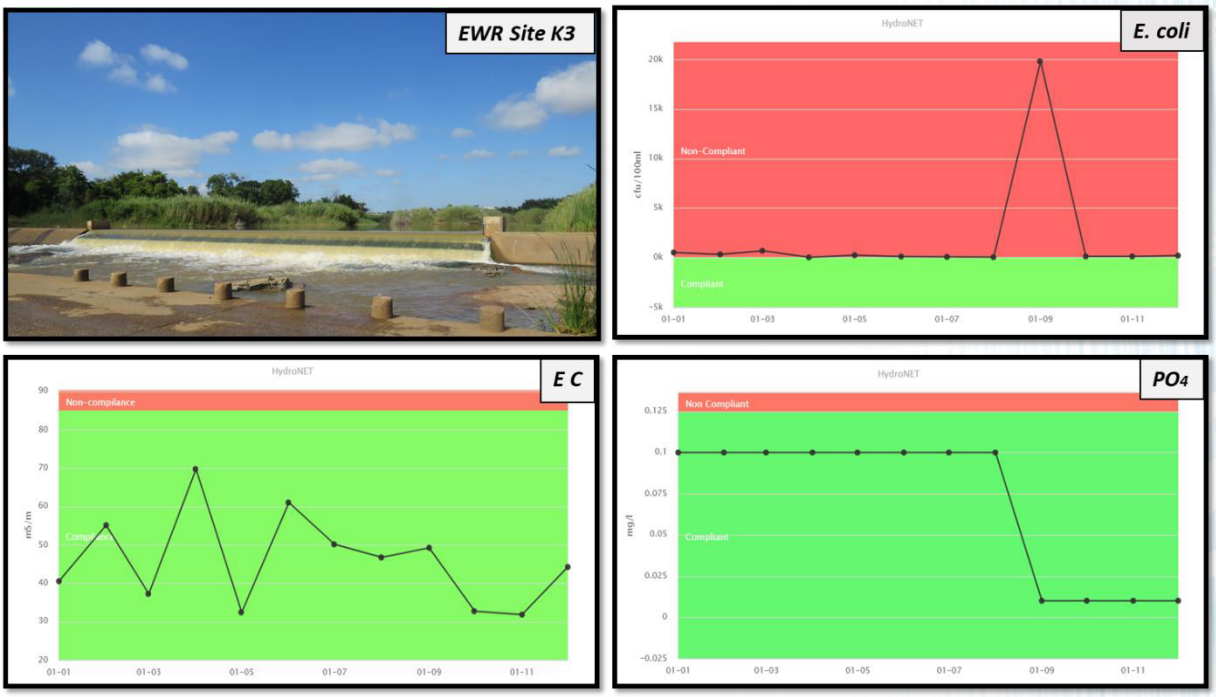


*Figure 35: Charts showing compliance or non-compliance at **Ecological Water Requirement (EWR) Sites K3** at on Komati River@Tonga Bridge.*

Discussion of Results EWR K3

E coli

The EWR K3 site indicated compliance throughout the reporting period, except in January, March and September 2017.

Electrical Conductivity

The EWR K3 site complied with the RQOs of **85 (mS/m)** throughout the reporting period.

Phosphate

The EWR K3 site complied with the RQOs for aquatic ecosystem drivers of **0.125 (mg/l)** throughout the reporting period.

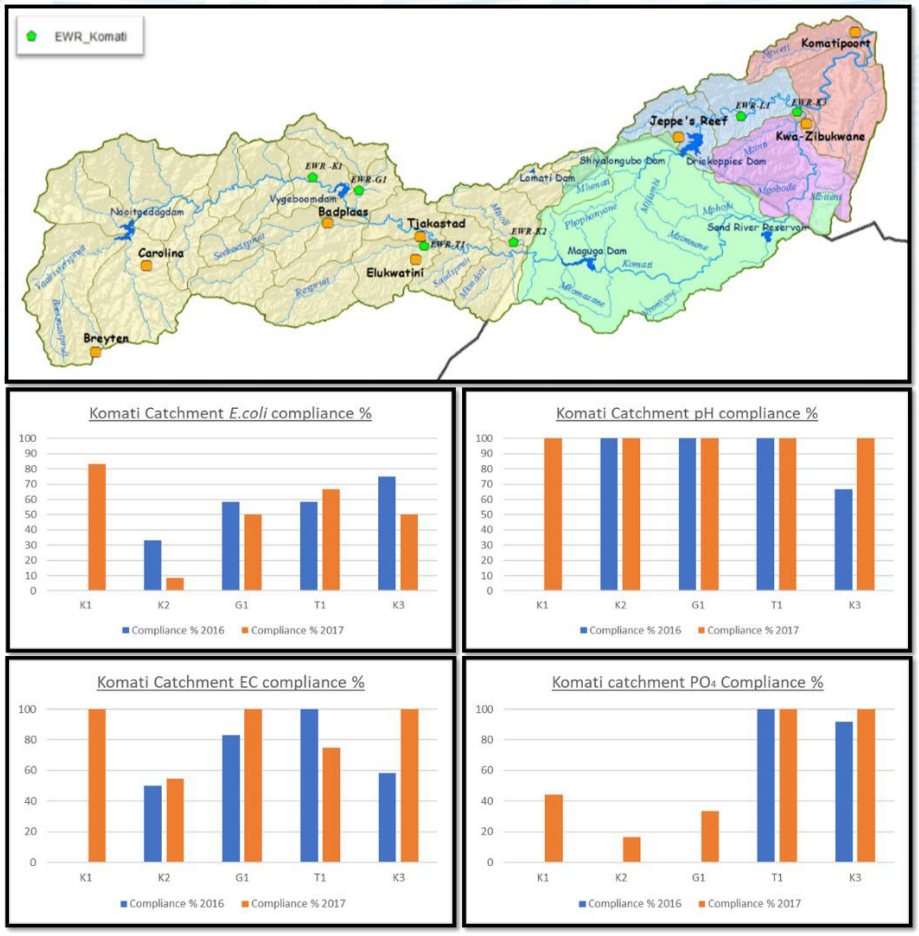


Figure 36: *The compliance % of E coli, pH, EC and PO_4 concentrations on EWR sites in the Komati Catchment for year 2016 and 2017.*

E. coli

The results indicate that compliance in the Komati Catchment has deteriorated. The EWR sites K1 and T1 are the only sites that indicate improvement in compliance percentage for the reporting period of 2016/17.

pH

The Komati Catchment pH compliance percentage has remained constant at 100% compliance throughout the reporting period of 2016 and 2017 with an improvement recorded at EWR K3 where compliance was below 70% in 2016 to 100% compliance in 2017.

Electrical Conductivity

The results above show that the EC compliance in the Komati Catchment has improved. Most EWR sites in the Komati Catchment indicate improvement in compliance with an exception for one EWR site T1 which has deteriorated from 100% compliance to 70% compliance.

Phosphates

The phosphates compliance in the Komati Catchment has improved with EWR site T1 remaining constant at 100% compliance throughout the reporting period. Improvement in compliance was recorded in 2017. The non-compliance recorded may result from Lab's inability to detect lower phosphates limits; the matter was resolved on September 2017.

Lusushwana River

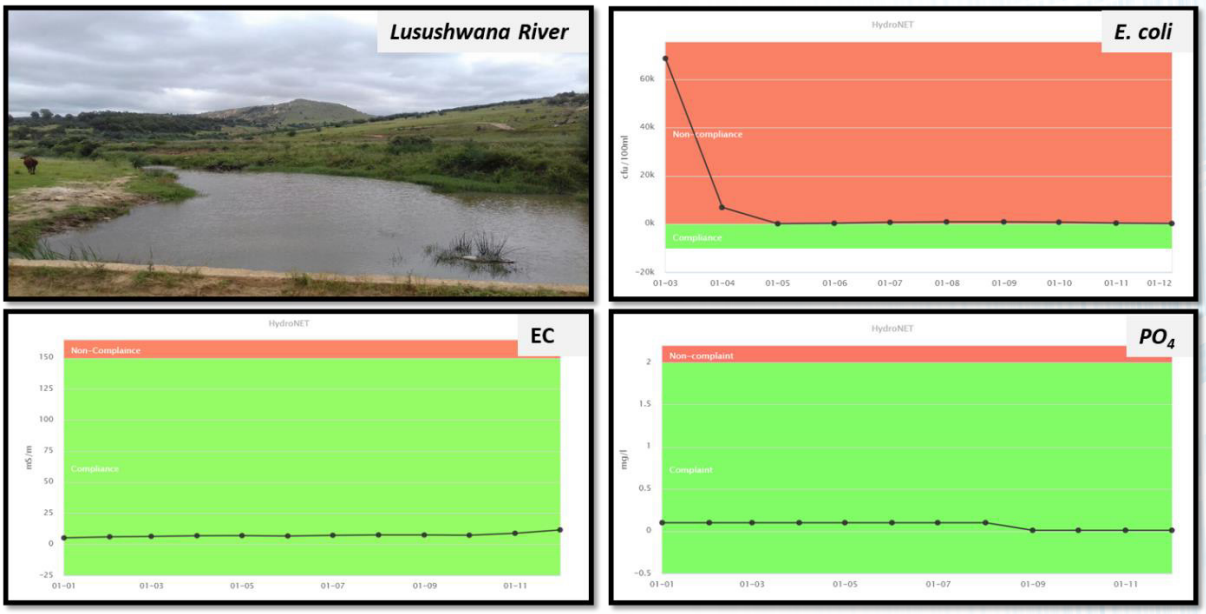


Figure 37: Charts showing compliance or non-compliance at Lusushwana River@Zwalunest Village b4 Swazilamd Border.

Discussion of Results

E coli

The *E. coli* counts shows non-compliance with the Target Water Quality Guideline limit throughout the reporting period in March- December at Lusushwana River@Zwalunest Village b4 Swaziland Border, except in May 2017 where it was 103 (cfu/100ml).

Electrical Conductivity

The EC levels at this point complied with the International Water Quality Guidelines limit throughout the reporting period.

Phosphate

The phosphate levels at this point complied with the International Water Quality Guidelines limit throughout the reporting period.

Mpuluzi River

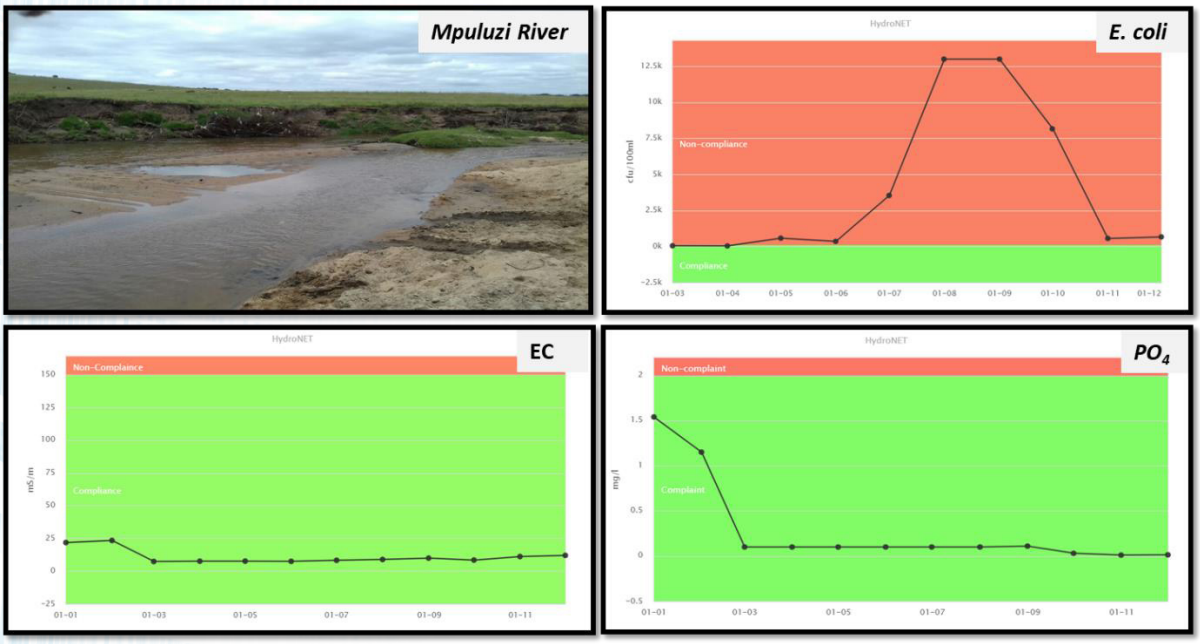


Figure 38: Charts showing compliance or non-compliance at Mpuluzi River D/S of Mpuluzi WWTW.

Discussion of Results

E coli

The *E. coli* counts show non-compliance with the Target Water Quality Guideline limit throughout the reporting period except from March- December at Mpuluzi River D/S of Mpuluzi WWTW.

Electrical Conductivity

The EC levels at this point complied with the International Water Quality Guidelines limit throughout the reporting period.

Phosphate

The phosphate levels at this point complied with the International Water Quality Guidelines limit throughout the reporting period.

Usuthu River

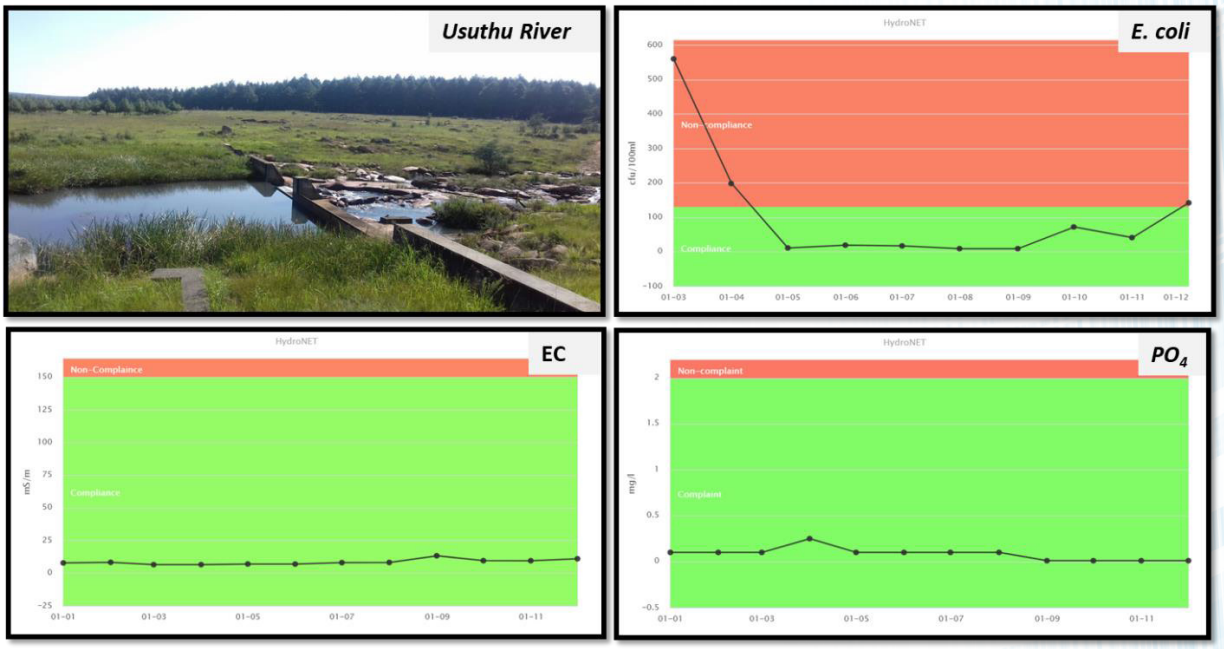


Figure 39: Charts showing compliance or non-compliance at Usuthu River at the Weir B4 Nerston Border Gate.

Discussion of Results

E coli

The *E. coli* counts complied with the Target Water Quality Guideline limit throughout the reporting period, except in March-April and December 2017 at Usuthu River at the Weir B4 Nerston Border Gate.

Electrical Conductivity

The EC levels at this point complied with the International Water Quality Guidelines limit throughout the reporting period.

Phosphate

The phosphate levels at this point complied with the International Water Quality Guidelines limit throughout the reporting period.

Ngwempisi River

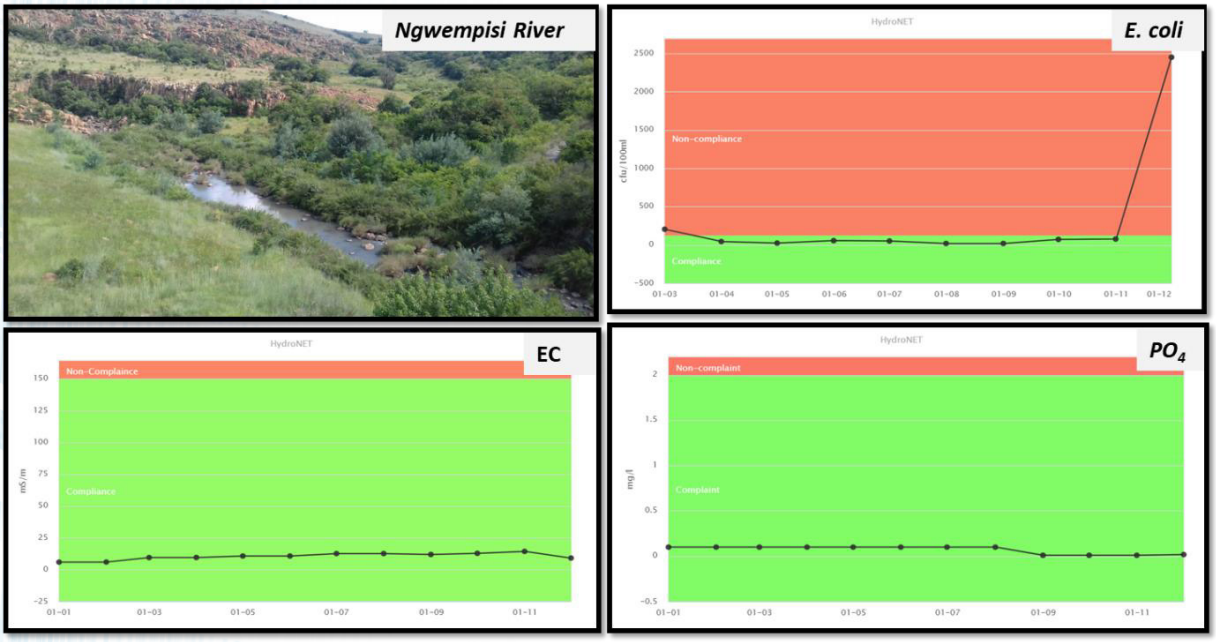


Figure 40: Charts showing compliance or non-compliance at Ngwempisi River at R33 Road Bridge to Amsterdam.

Discussion of Results

E coli

The *E. coli* counts complied with the Target Water Quality Guideline limit throughout the reporting period, except in January and December 2017 at Ngwempisi River at R33 Road Bridge to Amsterdam.

Electrical Conductivity

The EC levels at this point complied with the International Water Quality Guidelines limit throughout the reporting period.

Phosphate

The phosphate levels at this point complied with the International Water Quality Guidelines limit throughout the reporting period.

Hlelo River

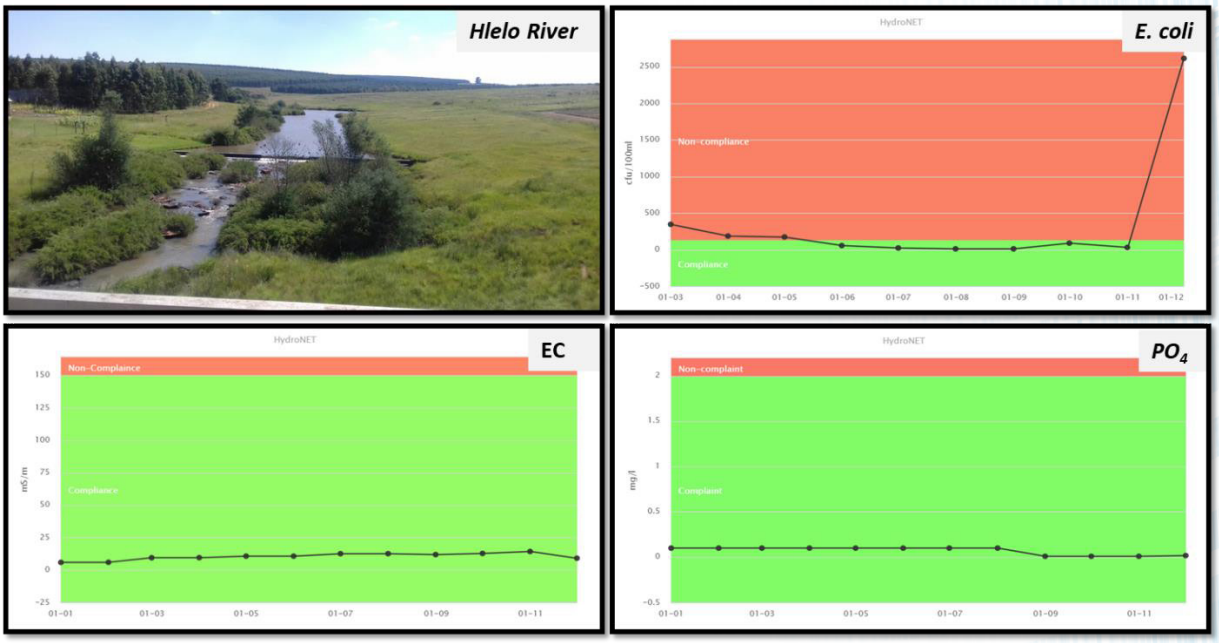


Figure 41: Charts showing compliance or non-compliance at Hlelo River at R33 Road Bridge to Amsterdam.

Discussion of Results

E coli

The *E. coli* counts complied with the Target Water Quality Guideline limit throughout the reporting period, except in January-March and December 2017 at Hlelo River at R33 Road Bridge to Amsterdam.

Electrical Conductivity

The EC levels at this point complied with the International Water Quality Guidelines limit throughout the reporting period.

Phosphate

The phosphate levels at this point complied with the International Water Quality Guidelines limit throughout the reporting period.

Assegaai River

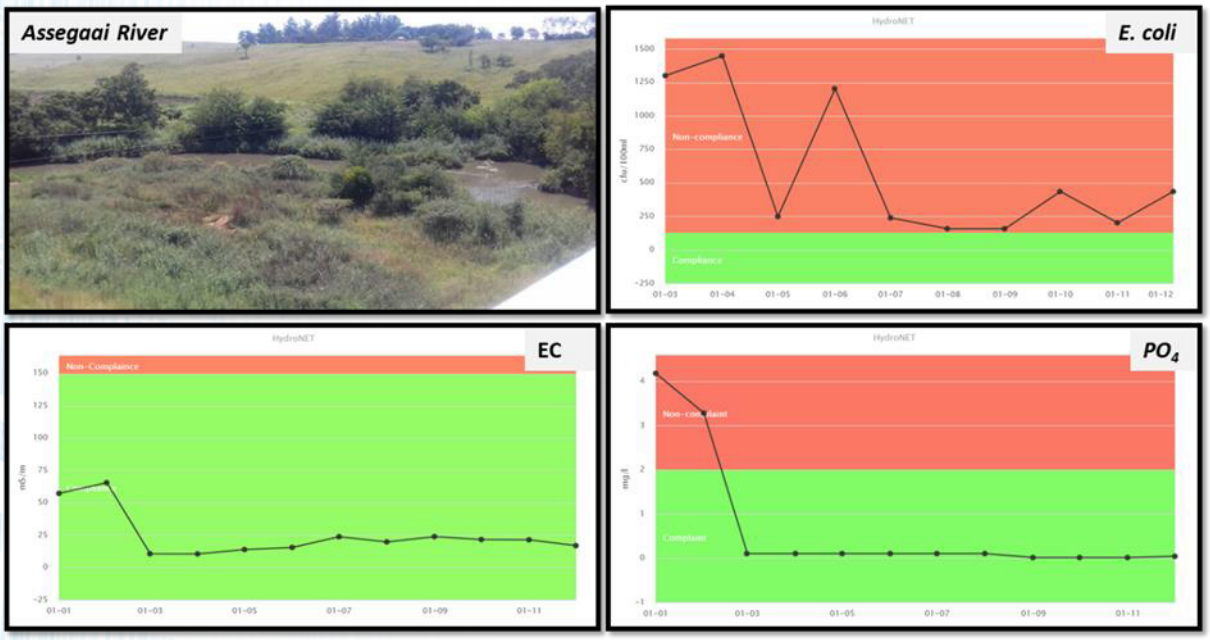


Figure 42: Charts showing compliance or non-compliance at Assegaai River at R543 Road Bridge to Mahamba Boarder Gate.

Discussion of Results

E coli

The *E. coli* counts shows non-compliance with the Target Water Quality Guideline limit throughout the reporting period at Assegaai River at R543 Road Bridge to Mahamba Boarder Gate.

Electrical Conductivity

The EC levels at this point complied with the International Water Quality Guidelines limit throughout the reporting period.

Phosphate

The phosphate levels at this point complied with the International Water Quality Guidelines limit throughout the reporting period, except in January and February 2017.

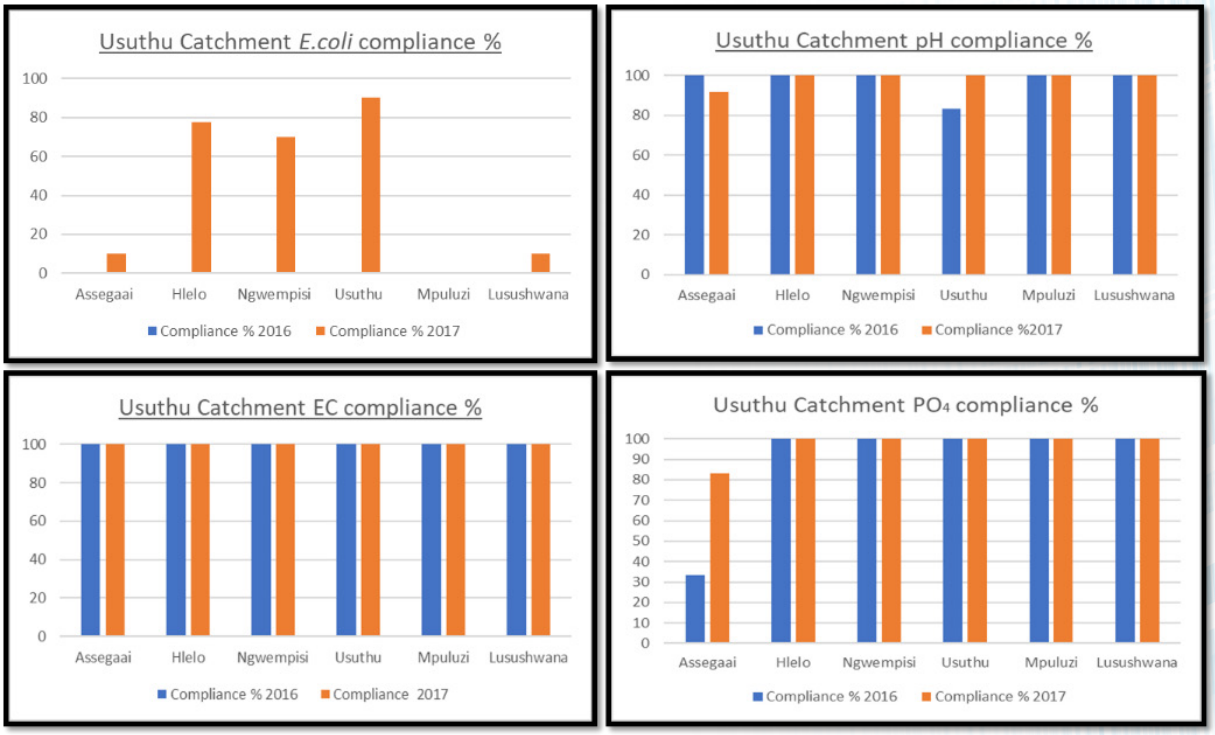


Figure 43: The compliance % of E coli, pH, EC and PO_4 concentrations on international Obligation points sites in the Usuth Catchment for year 2016 and 2017.

E coli

The Usuthu Catchment had an overall compliance percentage of 50% on the set of TWQG limit for *E. coli* in the reporting period of 2017 since the data from the previous year was not recorded, however the Mpuluzi River show 0% compliance in 2017.

pH

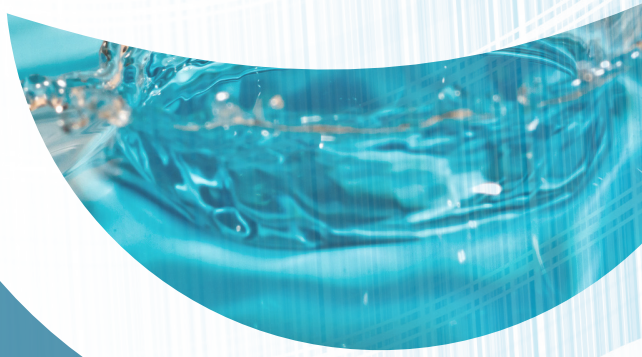
Hlelo, Ngwempisi, Mpuluzi and Lusushwana River complied 100% to the set IWQG limit for pH throughout the reporting period of 2016/17, except Assegaai River which indicates deterioration and Usuthu River which indicates improvement.

Electrical Conductivity

The Usuthu Catchment complied 100% to the set IWQG limit for EC throughout the reporting period.

Phosphates

The results above indicate the Usuthu Catchment complied with the set IWQG limit for phosphate throughout the reporting period, except Assagaai River has shown improvement in the compliance percentage from that of below 40% in 2016 compliance to above 80% in 2017.



"IUCMA, YOUR PARTNER IN WATER MANAGEMENT"

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