BLUE DROP

Watch Report

2023

"Water is Life, Sanitation is Dignity"

water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

2030 NDP

blue drop
CERTIFICATION
drinking water quality
REGULATION

BLUE DROP WATCH REPORT 2023:
TECHNICAL ASSESSMENT OF THE CONDITION OF MUNICIPAL DRINKING WATER TREATMENT AND DISTRIBUTION SYSTEMS IN SOUTH AFRICA

FOREWORD by HONOURABLE MINISTER

It gives me great pleasure to present the 2022/23 Blue Drop Watch Report. This Watch Report is a once-off reports as I undertook to keep the sector and the country informed on the status of drinking water and wastewater systems during the release of the 2021/22 Drops Reports. The Blue Drop Watch Report provides interim insights, while the 2022/23 Blue Drop Audit Cycle and Green Drop PAT Cycle is underway. The full 2022/23 Blue Drop report will be released in July 2023 whilst the Green Drop progress assessment report will be made available.

During the 2022/23 Blue Drop audit, technical assessments were conducted and therefore the Blue Drop Watch Report focuses on the current condition of drinking water infrastructure and treatment processes from a technical perspective. This report is published prior to the release of the Blue Drop Report 2023 report and comprises of a technical overview of the country's drinking water supply.

As with the Green Drop report release in 2022 there has been a decline in the status of our water supply services but I am nonetheless encouraged by the response to the 2021/22 Green Drop and Blue Drop Progress Reports and I want to maintain the momentum that has been generated through the process.

Access to safe and reliable drinking water is embedded in our Constitution and we want to protect consumers from potentially unsustainable and unsafe services. Equally, wastewater management and sanitation, in general, are paramount to the dignity of our people and integrity of the environment. We want to raise the standard requirements of our water services institutions and to ensure that we strive for excellence in these fields. We recognise that this requires partnerships and are encouraged by the support from municipalities, our waterboards and the private sector, who all heeded the call to action in their efforts to bring about improvements.

We need to build on the good work being done through the Drops Programme but must ensure that it does not become our only catalyst for change. We have to ensure that we remain constantly engaged, monitor, report and improve in the period between the Drops reports. Reports such as the Watch Report, are therefore extremely valuable. I am nonetheless looking forward to the release of the Blue Drop Report in July 2023 and commencement of the next cycle of the Drops Programme.

Minister for Water and Sanitation: Mr Senzo Mchunu

Date: 19/05/2023

BLUE DROP WATCH REPORT 2023 INDEX

ACRONYMS

ACRONYM	DESCRIPTION	ACRONYM	DESCRIPTION
AC	Asbestos Cement	**mm**	Milli metre
Alk	Alkalinity	**MM**	Metropolitan Municipality
BD	Blue Drop	**Mn**	Manganese
BD PAT	Blue Drop Progress Assessment Tool	**MSDS**	Material Safety Data Sheet
BDRR	Blue Drop Risk Rating	**MWh**	Mega Watt hour
C&I	Control & Instrumentation	**NA**	Not Assessed or Not Applicable
CM	Centimetres	**NCP**	National Chemical Products
Cl2	Free Chlorine	**NI**	No Information
Cl	Chlorine	**NTU**	Turbidity Unit
CLRF	Clari-flocculator	**O&M**	Operation and Maintenance
CSIR	Council for Scientific and Industrial Research	**OHS**	Occupational Health and Safety
Cu.m	Cubic Metres	**PAC**	Poly-aluminium Chloride
CWW	Clear Water Well	**PC**	Process Controller
DAF	Dissolved Air Flotation	**PFD**	Process Flow Diagram
DFFE	Department of Forestry, Fishery, and Environment	**pH**	Potential of Hydrogen
DM	District Municipality	**PLC**	Programable Logic Controller
DPD	Diethyl–P-Phenylenediamine	**PMU**	Project Management Unit
DW	Drinking Water	**PPE/C**	Personal Protective Equipment/ Clothing
DWQ	Drinking Water Quality	**PRV**	Pressure Reducing Valve
DWS	Department of Water and Sanitation	**PS**	Pump Station
EC	Electrical Conductivity	**PST**	Primary Settling Tank
Fe	Iron	**PTS**	Participatory Testing Scheme
FIFO	First in First out	**PVC**	Polyvinyl Chloride
FW	Final Water	**RO**	Reverse Osmosis
G	Gram	**RSA**	Republic of South Africa
GAC	Granular Activated Carbon	**RW**	Raw Water
GD	Green Drop	**RWPS**	Raw Water Pump Station
GRP	Glass Reinforced Plastic	**SANS**	South African National Standards
HMI	Human Machine Interface	**SCADA**	Supervisory Control and Data Acquisition
HoW	Head of Works	**SHEQ**	Safety Health Environment Quality
HPC	Heterotrophic Plate Count	**SIV**	System Input Volume
HTH	High Test Hypochlorite	**SLA**	Service Level Agreement
IMP	Incident Management Protocol	**SO4**	Sulphate
IRIS	Integrated Regulatory Information System	**SOP**	Standard Operating Procedure
Kg	Kilogram	**t**	Ton
Kl	Kilolitre	**TDS**	Total Dissolved Solids
Km	Kilometre	**TSA**	Technical Site Assessment
kW	Kilowatt	**UV**	Ultra Violet
KPa	Kilo Pascal	**VROOM**	Very Rough Order of Measurement
KPA	Key Performance Area	**VSD**	Variable Speed Drive
l	Litre	**WaSP**	Water Safety Plan
l/h	Litres per hour	**WB**	Water Board
l/s	Litres per second	**WCDM**	West Coast DM/ Water Conservation Demand Management
LIMS	Laboratory Information Management System	**WQ**	Water Quality
LM	Local Municipality	**WSA**	Water Services Authority
m	Metre	**WRC**	Water Research Council
M&R	Maintenance and Repairs	**WSI**	Water Services Institution

ACRONYM	DESCRIPTION	ACRONYM	DESCRIPTION
MCC	Motor Control Centre	**WSP**	Water Services Provider
mg	Milligram	**WSS**	Water Supply System
mJ	Milli Joules	**WTW/P**	Water Treatment Works/Plant
ml	Milli litres	**WUL**	Water Use License
Ml	Mega litre	**WWTW/P**	Wastewater Treatment Works/ Plant
Ml/d	Mega litres per day		
Provinces			
EC	Eastern Cape	**MP**	Mpumalanga
FS	Free State	**NW**	North West
GP	Gauteng	**NC**	Northern Cape
KZN	KwaZulu Natal	**WC**	Western Cape
LP	Limpopo		

GLOSSARY

Chemical Compliance: The chemical acute health and chronic health quality is measured against the requirements of SANS 241: 2015 and must comply with SANS 241: 2015 as per the excellent requirements set by the Blue Drop Programme.

DWQ: Drinking water quality compliance is measured against the requirements of SANS 241: 2015.

Microbiological compliance: The acute health microbiological quality is measured against the requirements of SANS 241: 2015 and must comply with SANS 241: 2015 as per the excellent requirements set by the Blue Drop Programme.

WSI: A Water Services Institution is defined as "...an entity, utility, or authority that provides water services to consumers or to another water services institution, and thereby is subject to compliance with the water laws of South Africa. WSI also means a Water Services Authority, a Water Services Provider, a Water Board, and a Water Services Committee or Entity..."

***WSA*:** A Water Services Authority is any District, Metropolitan or Local Municipality that is responsible for providing water services to end users.

***WSP*:** A Water Services Provider is a public- or private entity that support or provide a service to a WSA. Such service may include operations and maintenance of the water network, treatment, and/or distribution system and depends on the agreement between the WSA and WSP. Waterboards are regarded as WSPs.

Water Supply System: A water supply system comprises of the delivery network, the treatment works, and the distribution system that supplies treated and potable water to towns, cities, or water supply areas (industrial, commercial, and residential) for consumption or use. The types of water supply systems are categorised as basic, common, or advanced.

Water Delivery Network: This is either an independent Bulk Water Supplier and/or the WSA that abstracts and delivers raw water (via pumps or gravity flow) from various water resources (dams, rivers, boreholes, springs) via pipeline/s to the water treatment works.

Water Treatment Works: A water treatment facility that receives the raw water at the inlet works and treats the raw water through a series of process units (flocculation, phase separation, and disinfection), stores and distributes the treated and potable water for use by the populations it supplies water to. The treatment technologies available are categorised as conventional technologies, advanced technologies or other.

Water Distribution Network: The distribution of treated potable water from command reservoir/s or tower/s via a pipe network to and within towns, cities, or water supply areas (industrial, commercial, and residential) for consumption or use.

IRIS: The Integrated Regulatory Information System (IRIS) is a web-based application used by the Department of Water and Sanitation to facilitate the relationship between Regulation and Management of water supply and wastewater systems, while also keeping relevant stakeholders informed on compliance trends of registered supply systems. Information is uploaded by the Water Services Institution onto IRIS to allow the Inspector to assess evidence before, during and after the audit event. IRIS contains an inventory of information on all registered water supply systems, tracks historic system performance, and provides the platform to register water treatment works and operations staff.

VROOM: The Very Rough Order of Measurement (VROOM) is an estimation of the funding required to restore existing treatment infrastructure to its original design capacity and operations, by addressing civil, mechanical, and electrical and instrumental defects. A singular VROOM cost is determined by assessing 1-2 plants, to calculate a cost per system. The cost is derived through an algorithm that uses the Blue Drop Inspector's impression of the condition of the hardware, based on a model that considers the size of the hardware and the market/ industry cost indications, to estimate the cost to repair, refurbish or replace the dysfunctional infrastructure. The singular VROOM costs are extrapolated, in relation to the total Blue Drop scores and systems' SIVs, to derive an aggregated score for all treatment works within the WSI.

1. EXECUTIVE SUMMARY

Blue Drop Certification

Incentive based regulation is an innovative and uniquely South African response to challenges in the water sector. The Blue Drop programme seeks to induce changes in behaviour of individuals and institutions to facilitate continuous improvement and adoption of best practice management and drinking water compliance throughout the drinking water value chain – abstraction, treatment, delivery, distribution, and end use. Subsequently, the Regulator responds by recognising and rewarding progressive improvement and excellent performance by well performing Water Services Institutions, whilst putting non-performing institutions under regulatory watch. The Blue Drop 2023 audit report will be released in July 2023 and will provide detailed diagnostics to assist Water Services Institutions to focus on specific areas to restore functionality of water supply systems and improve drinking water quality.

Blue Drop Watch Report 2023

The Blue Drop Watch Report focuses on the current condition of drinking water infrastructure and treatment processes from a technical perspective. This report gives an overview of the field work and technical assessments by Blue Drop inspectors during the period November 2022 to February 2023. This report is published prior to the release of the Blue Drop Report 2023 and comprises of a technical overview of pipe networks, pumpstations, storage and treatment facilities involved in drinking water supply.

The Blue Drop Watch report is **not** the Blue Drop audit report, but purely an *interim report*, to keep the public and stakeholders informed on the current status of drinking water, and to provide the regulator with information to enact the appropriate enforcement and rectification interventions.

The Blue Drop Watch Report comprises of the three (3) Watch Areas:

1. ***Technical Site Assessments (TSA) scores:*** Physical appearance of terrains and buildings, raw water abstraction and delivery networks, treatment plants, chemical handling, water processing units, bulk delivery systems, and distribution pumpstations and pipe network.

2. ***VROOM:*** The Very Rough Order of Measurement provides an estimate funding required to restore existing treatment infrastructure to its original design capacity and operations, by addressing civil, mechanical, electrical and instrumentation defects.

3. ***DWQ:*** Drinking water quality compliance is measured against the requirements of SANS 241: 2015 and is reported in terms of the microbiological and chemical quality of drinking water (IRIS, 28 March 2023).

Summary of Results

A total of 151 Water Supply Systems (WSS) were inspected, and the findings offer a representative overview of systems owned and operated by 140 municipalities and 26 water boards and bulk water service providers. An average TSA of 69% was achieved for the 151 systems assessed, which indicates that infrastructure and processes are on average "*partially functional with an average performance"*.

Out of 151 WSS, 128 (85%) is found to be in '*average, good, and excellent*' condition, whilst 23 (15%) is found to be in '*poor and critical*' condition. The best overall performing water supply systems are found in Gauteng, followed by Western Cape and Eastern Cape. WSSs in poor and critical state are located in the Free State, Limpopo, Northern Cape, and North West.

The associated VROOM costs needed to restore and refurbish dysfunctional systems amount to almost R1.5 billion, with the bulk of investment needed for Free State and KwaZulu Natal.

Drinking water quality analyses indicate that 38% and 11% of systems achieve excellent and good microbiological quality, respectively, whilst the balance of 51% has poor to bad microbiological water quality status. Chemical compliance analyses show that 16% and 14% have excellent and good water quality, respectively, whilst the vast majority of plants fail to achieve chemical compliance (71%). 13 WSS have no water quality data reported (No Information), or no data has been uploaded or available at the time of the audit to enable analysis on compliance (4 of these in the FS province, 1 each in Gauteng and Limpopo, 3 in Mpumalanga, and 4 in Northern Cape. Lack of monitoring or information automatically translate to zero compliance.

The Way Forward

The Department of Water and Sanitation notes with concern the overall poor water quality that is produced and distributed to the consumer. A balanced view is also taken on the results from the technical assessments, showing systems that ranges from excellent to critical. The Blue Drop Watch will be used as a basis to inform appropriate regulatory and support with the objective to facilitate correction, restoration, and improvement of water services to consumers. The report further serves to inform stakeholders and government departments as to the current status of drinking water infrastructure in the field, with the intent to mobilise rectification measures without having to wait for the release of the Blue Drop audit report.

The Regulator will continue to monitor performance in terms of Section 62 of the Water Services Act and will engage together with CoGTA, SALGA and MISA, all water institutions that fail to meet safe drinking water standards. Should corrective actions fail, the Department will consider civil action together with actions contemplated under section 63 of the Water Services Act (Act 108 of 1997) to ensure that Ministerial directives are issued with timeframes for implementation. Failure to respond will trigger remedial action be taken at cost of the non-complying entity or municipality. The Department will take steps to improve its capacity to respond more effectively in this duty, in ensuring visible and measurable improvement in drinking water services. The Department of Cooperative Governance and National Treasury will be engaged to explore ways of utilising conditional grants for the purpose of remedial intervention.

All Water Services Institutions are urged to take note of their TSA and DWQ status and commence with corrective measures. The Blue Drop audit report will provide further material content to the overall management of drinking water services across South Africa, upon its release mid-2023.

2. INTRODUCTION

Blue Drop Certification

The Blue Drop programme seeks to induce changes in behaviour of individuals and institutions to facilitate continuous improvement and adoption of best practice management and drinking water compliance throughout the drinking water value chain – abstraction, treatment, delivery, distribution, and end use. Subsequently, progressive improvement and excellent performance are recognised and rewarded, whilst regress and poor performance is penalised. The Blue Drop 2023 audit report will be released in July 2023 and will provide diagnostics to assist Water Services Institutions (WSIs) to focus on specific areas to restore functionality of their water supply systems and improve water quality.

Blue Drop Watch Report 2023

The Blue Drop Watch Report is an interim report leading up to the full Blue Drop audit report. It draws attention to the current condition of drinking water infrastructure, treatment processes and water quality, from a technical perspective, by drawing on the audit findings of the field work by Blue Drop inspectors during November 2022 to February 2023. The Blue Drop Watch report is **not** a Blue Drop audit report, and the latter will only be published mid-2023 once the DWS and quality control processes have been satisfied, to ensure accurate and credible reporting of drinking water services. The Watch Report seeks to keep the public and stakeholders updated and informed on the current status of drinking water, to ensure that the necessary interventions are fast-tracked without delay.

As part of the Blue Drop audit, technical site inspections were done at 1 to 2 systems per WSI to confirm the findings of the desktop audit. The TSA score (%) reflects the physical condition of the raw water handling system (abstraction, pumping, and pipe network), the water treatment plant (water and sludge treatment units), and delivery and distribution systems (reservoirs, pumpstations, pipe networks and user connections).

During the TSA inspection, a VROOM cost estimation is also done, noting that this value is limited to the treatment facility only, given the vast variances involved in the costing of refurbishment of a water collection and distribution system.

Drinking Water Systems

144 Water Services Authorities in South Africa provides drinking water for domestic, commercial, and business use via 1186 water supply systems. IRIS 2023 confirms that 1067 water supply areas are registered, and managed by 144 WSAs, supported by 26 WSPs (including Water Boards) (BD 2021 PAT Report).

The graph below shows the number of WSA's and supply systems per province that were audited in the Blue Drop audits of 2022 – 2023 (Blue Drop 2021 PAT Report, Chapter 2 Figure 2 Page 25).

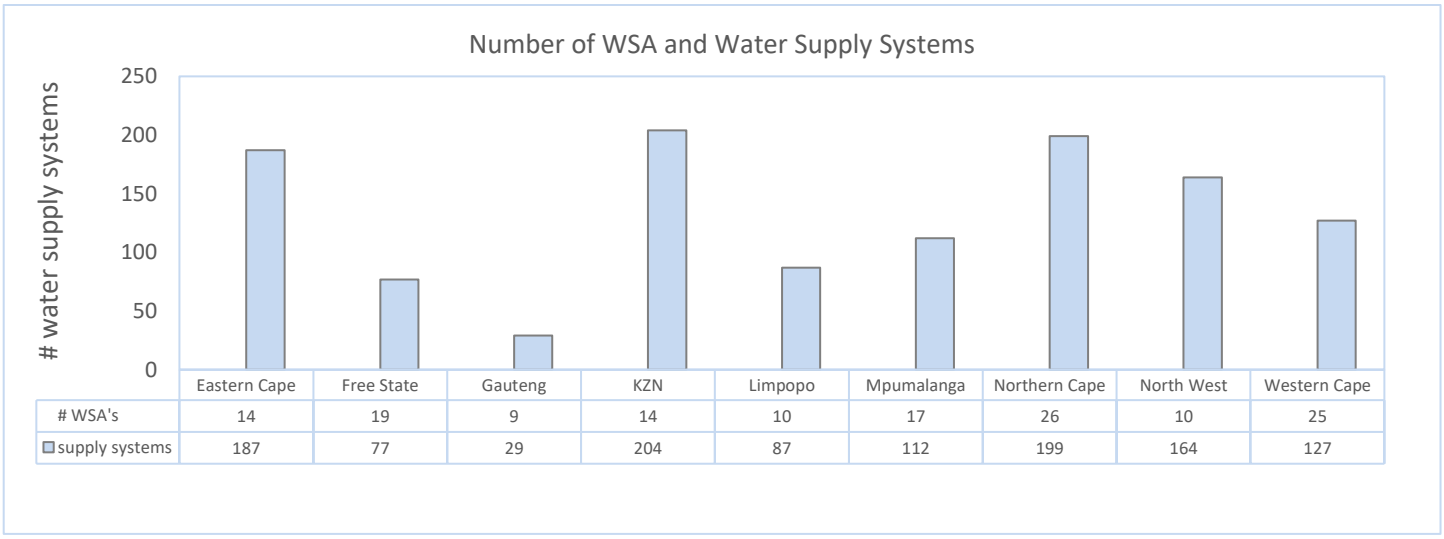


Figure 1 - Graph of # WSA's and Supply systems for 2021 BDPAT assessments

The results show Gauteng's WSAs have the smallest number of supply systems (29) and KZNs WSAs have the largest number of supply systems (204). EC, KZN and NW have a large number of supply systems (>150) with low number of WSAs.

This number is indicative of large district municipalities who are responsible for providing water to large number of smaller, rural schemes either directly as WSA or managing water service provision through local municipalities which operate as WSPs. The DWS regulatory system, IRIS, also confirms that a total of 26 WSPs is responsible for the treatment bulk supply of water to municipalities, who then distributes to the water to end users. These arrangements differ across different organisations, with many variations in terms of roles and responsibilities. WSAs and WSPs were separately audited and subject to individual site inspections, in order to provide the Regulator with an individual- and collective view of the performance of municipalities (WSAs) and their associated bulk water services providers and water boards (WSPs).

The BD PAT report of 2022 reported that 1,307 WTWs are operated by WSAs across South Africa with a combined capacity of 31 911 Ml/d, and average design capacity of 63.3 Ml/d. The largest plant in the country has a design capacity of 4 800 Ml/d and smallest plant 0.001 Ml/d. The plant size distribution are as follows: 42% ≤ 0.5 Ml/d, 22% 0.5 - 2 Ml/d, 20% 2 – 10 Ml/d, 7 % 10 - 25 Ml/d and 8% >25 Ml/d. Only 1% of plants could not provide design capacity during the Blue Drop PAT assessment. A total of 62% of plants are categorised as small plants (<2 Ml/d) and these include boreholes and rural systems.

Blue Drop Reporting

The Blue Drop series of reports uphold the Department's commitment to provide the water sector and its stakeholders with ongoing, current, accurate, verified, and relevant information on the status of water services in South Africa. The Regulator is effecting its pledge through the release of the following:

- Blue Drop Progress (PAT) Report 2022 – released April 2022
- Blue Drop Watch Report 2023 – released April 2023
- Blue Drop Report 2023 - to be released mid-2023.

In keeping with the Department's undertaking to provide system-specific results, the Blue Drop Watch Report 2023 provides information on three levels:

1. ***System specific*** information pertaining to the status of specific drinking water supply systems at WSI level
2. ***Province specific*** data and information that highlight the strengths and shortcomings of WSI at provincial level, as relating to the WSIs within a Province (WSA)
3. ***National overview*** that collates the findings from a provincial level to give an aggregated national perspective of the technical status of drinking water systems.

3. BLUE DROP WATCH AREAS

Watch Area 1: Technical Site Assessment [TSA]

The intention of a TSA is to verify the evidence presented by a WSI during the desktop Blue Drop audit by undertaking a physical inspection of the selected water networks and treatment sites. These inspections consider the following:

- General aspects, housekeeping, and the physical appearance of the plant terrain and buildings
- Raw water handling pump stations, pipe network, inlet works and flow splitting
- Chemical dosing and storage
- Functionality and condition of the respective process units – flocculation, phase separation (clarification/settling, dissolved air flotation, sand filtration, membrane filtration, granular activated carbon), and disinfection
- Sludge treatment and disposal
- Functionality and condition of high lift pumpstations, bulk pipe network from plant to command reservoirs and booster pumpstations.

The TSA score indicates the functionality and status of the water network and treatment system that has been inspected and assessed. The scoring legend is as follows:

	≥95-100%	Ideal performance and full functional infrastructure and processes
	≥80-<95%	Fully functional infrastructure and processes, with minor corrections to be made
	≥50-<80%	Partially functional infrastructure and processes, and average performance
	≥31-<50%	Partial functionality and unsatisfactory performance, with major corrections to be made
	0-<31%	Partial functionality and unsatisfactory performance, with major corrections to be made

The TSA scorecard is made up by the following criteria. Each sub-criterion is described, and photographic evidence taken of the status and condition of the infrastructure or process in the field. The sub-sets of Watch Area 1 are listed hereunder and are used as basis to report the condition of the 151 TSAs in the chapters following.

WATCH AREA 1: GENERAL ASPECTS

No.	Audit Element
1	Display of Classification Certificate
2	Maintenance and repairs logbook with updated and relevant entries
3	Operational logbook with daily entries to date
4	Operation and Maintenance manual available
5	Incident management procedures available and contact list displayed
6	Drawing or Process Flow Diagram displayed
7	Process monitoring equipment is functional and calibrated
8	Jar test equipment on site and tests performed on a regular basis
9	Electricity meter is working, and electricity use by plant is recorded

WATCH AREA 2: PHYSICAL APPEARANCE OF THE PLANT

No.	Audit Element
1	Entrance is signposted
2	State and tidiness of the garden and terrain
3	State and tidiness of the workers' bathroom, lockers, and lunch facility
4	Note any 2 serious OHS contraventions in the past year
5	Roads are in good condition - chemicals are delivered at their usage point with ease
6	General workplace satisfaction
7	Facility is fenced and no access to public and animals is evident
8	Relevant safety signs are posted

WATCH AREA 3: RAW WATER HANDLING

3.1 Raw water pumpstation/ gravity fed

No.	Audit Element
1	Screens in-place and cleaned regularly
2	All installed pumps are in working condition
3	More than 50% standby pumpset arrangement

3.2 Raw water pipeline

No.	Audit Element
1	Process Controller impression of raw water pipeline with regard to leakages, cathodic protection, maintenance done, undersized, etc.
2	Inflow measuring device in-place and in working condition
3	Flow rate/ volume is recorded, converted, and interpreted

3.3 Inlet works and flow splitting

No.	Audit Element
1	Flow splitting is evenly taking place at the structure
2	Flash mixing is effective in terms of turbulent conditions at point of dosing
3	Chemical feed and dosing conditions at the inlet works can be monitored (e.g. visual dripping of flocculant, lime)

WATCH AREA 4: CHEMICAL DOSING AND STORAGE

4.1 Flocculant

No.	Audit Element
1	All dosing pumps installed are in working condition
2	There are 100% standby for the dosing pumps
3	Dosing area is neat, and spillage can be contained
4	The storage volume is sufficient for 30 days - name the flocculant
5	Storage area is bunded
6	Emergency wash area is nearby

4.2 Alkaline

No.	Audit Element
1	All dosing units (pumps, dry feeders) installed are in working condition
2	There are 100% standby for all the dosing units
3	General housekeeping, bags dry and off the floor, used on first in first out, masks, messy
4	The storage volume is sufficient for 30 days - name the alkaline used

4.3 Chlorine

No.	Audit Element
1	All dosing units (pumps, dry feeders) installed are in working condition, gas free flowing in flow meter
2	There are 100% standby for all the dosing units
3	Monitoring of specifically chlorine gas in the cylinders - scale is working and switch-over device in place
4	Safety equipment available and working (alarm, detector, extractor fan, masks)
5	The storage volume is sufficient for 30 days - name the type of disinfectant/oxidant used

4.4 Other

No.	Audit Element
1	All dosing units (pumps, dry feeders) installed are in working condition
2	There are 100% standby for all the dosing units
3	General housekeeping, bags dry and off the floor, used on first in first out, masks, messy
4	The storage volume is sufficient for 30 days - name the chemical used

WATCH AREA 5: FLOCCULATION

No.	Audit Element
1	Flocs are visible at the end of the flocculation process
2	General condition of the flocculation unit, e.g. scum accumulation, walls covered with algae, sludge settling

WATCH AREA 6: PHASE SEPARATION

6.1 Clarification

No.	Audit Element
1	Limited floc carry over at the weirs of the clarifier
2	Regular de-sludging is taking place
3	The weirs/ discharge holes are in good condition allowing for even overflow. No growth visible which limits flows

6.2 Dissolved Air Flotation

No.	Audit Element
1	All recycle pumps installed are in working condition
2	There are 100% standby for all the recycle pumps
3	All air compressors installed are in working condition
4	There are 100% standby for all the compressor
5	The "white water" shows fine bubbles with limited signs of larges isolated bubbles
6	Regular de-sludging of the sludge layer is done
7	Saturator has been serviced in the last 12 months

6.3 Sand Filtration

No.	Audit Element
1	All backwash pumps installed are in working condition
2	There are 100% standby for all the backwash pumps
3	All air blowers installed are in working condition
4	There are 100% standby for all the air blowers
5	Even flow splitting to all filters observed at the outlet boxes
6	Even bubble distribution during backwash is seen
7	Frequency of backwashing (< 48 hours)
8	Filter media surface is smooth with no signs of cracks or mounds
9	General housekeeping — hosing down of walls, handrails around filters, etc.

6.4 Membrane

No.	Audit Element
1	All feed pumps installed are in working condition
2	There are 100% standby for all the feed pumps
3	All backwash pumps installed are in working condition

No.	Audit Element
4	There are 100% standby for all the backwash pumps
5	Membrane integrity monitoring system in place and operational
6	Chemical cleaning facility in good order, no spillages, sufficient storage, dosing pumps operational

6.5 Granular Activated Carbon

No.	Audit Element
1	All backwash pumps installed are in working condition
2	There are 100% standby for all the backwash pumps
3	GAC reactivation done within the past 5 years. State the frequency of reactivation
4	Even flow splitting to all filters — check outlet boxes
5	Even bubble distribution during backwash is seen
6	General housekeeping — under roof, handrails around filters, etc.

WATCH AREA 7: DISINFECTION

7.1 Clear Water Well

No.	Audit Element
1	Contact time in on-site reservoir is more than 30 minutes
2	Free chlorine measurement is done at the correct place - explain where and how

7.2 Ultraviolet Irradiation

No.	Audit Element
1	Average flux more than 40 mJ/cm^2

7.3 Ozone

No.	Audit Element
1	Check production figures vs rating of ozonator
2	Safety equipment in place (alarms, detector, masks)

WATCH AREA 8: HIGH LIFT PUMPSTATION

No.	Audit Element
1	All installed pumps are in working condition
2	More than 50% standby pumpset arrangement
3	Final flow measuring device in-place and in working condition
4	Flow rate/ volume is recorded, converted, and interpreted

WATCH AREA 9: SLUDGE TREATMENT

9.1 Thickening in Sludge Dams

No.	Audit Element
1	Sludge dams are well maintained
2	Sludge dams have been emptied in the past two years
3	If recycling of water is done, are all pumps in working condition
4	More than 50% standby pumpset arrangement

9.2 Dewatering by Centrifuging

No.	Audit Element
1	What flocculent is used, dosing schedule available and followed
2	The centrifuge(s) are in working order
3	The feed to the presses is measured and recorded
4	A maintenance schedule is in available and followed

WATCH AREA 10: BULK PIPELINE FROM PLANT TO COMMAND RESERVOIR

No.	Audit Element
1	Process Controller impression of final water pipeline with regard to leakages, cathodic protection, maintenance done, undersized, etc
2	Valve chamber inspected

WATCH AREA 11: COMMAND RESERVOIR

No.	Audit Element
1	Reservoir secure in terms of gate and fence
2	Telemetry in place and operational at command reservoir(s)
3	Final flow measuring device in-place and in working condition
4	Structure is leak free and closed at the top to prevent access from people or birds

WATCH AREA 12: BOOSTER PUMPSTATION

No.	Audit Element
1	All installed pumps are in working condition
2	More than 50% standby pumpset arrangement
3	The building is secure, signage in place, and adequately fenced with sufficient ventilation
4	The Motor Control Centres (MCC) are in good condition and accessible

Watch Area 2: VROOM Refurbishment Cost

The VROOM is an estimation of the funding required to restore existing treatment infrastructure to its original design capacity and operations, by addressing civil, mechanical, and electrical and instrumental defects. For each of the 151 technical assessments, a VROOM cost is determined, based on an algorithm that uses the Blue Drop Inspector's impression of the asset condition, the size or capacity of the hardware and market/ industry cost indicators. The resultant cost estimates the funds required to repair, refurbish, or replace the dysfunctional infrastructure. As a rule of thumb, a lower TSA score will be associated with a higher restoration cost.

Watch Area 3: Drinking Water Quality Compliance

The drinking water quality is reported in accordance with the SANS 241:2015 drinking water standards and reflects the Institutional Water Quality Compliance (% Microbiological and % Chemical) for all the water supply systems assessed at end March 2023 as part of the Technical Site Assessments. Systems will no monitoring information are marked with NI (No Information) and a zero compliance allocated.

The scoring legend is as follows:

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

4. NATIONAL OVERVIEW OF MUNICIPAL DRINKING WATER SYSTEM'S FUNCTIONALITY

Background

The Blue Drop Watch Report is informed by the Technical Site Assessments (TSA), which were done at 1 to 2 systems per WSA/WSP, as part of the Blue Drop audit process. The purpose of the TSA is to verify the findings of the (desktop) audit with the status on the ground (physical inspections). The TSA score (%) reflects the condition of the raw water handling system (abstraction, pumps, pipe network), the water treatment plants (inlet works to disinfection and sludge treatment), delivery system (command reservoirs, bulk pipe network and pumpstations) and distribution systems (pump and pipe networks). A high TSA score (100%) indicates that the infrastructure, equipment, and processes are in excellent condition, whilst a low TSA score (0%) indicates failure and dysfunctional process and infrastructure. The TSA inspections cover each process unit of the treatment facility, coupled with randomly selected checkpoints of the delivery and distribution network. The VROOM cost covers only the treatment facility, as too many variables exist to accurately estimate network refurbishment costs.

Results of the Technical Site Assessments

During the period December 2022 to February 2023, 151 water supply systems were inspected, offering a representative overview of systems owned and operated by municipalities, water boards and water service providers. The assessments covered all 140 municipalities, as well as 27 water boards and bulk water service providers. Detailed TSA reports with photographic evidence and VROOM costs have been generated to assess the condition and status of treatment facilities and gain insight into randomly selected pipe network and pumpstation across the water distribution networks. The following table summarises the TSA scores of the water supply systems that were assessed.

Table 1 - National Summary of TSA Water Supply Systems informing the Watch Report

Province	# WSAs	# TSA WSSs	# TSA WTWs-	# WSP/WB (and Names)	Average % TSA
Eastern Cape	14	15	15	1 (Amatola Water)	79%
Free State	19	21	21	4 (Bloem Water)	63%
Gauteng	6*	8	8	3 (Rand Water, Magalies Water)	82%
KwaZulu Natal	14	15	15	7 (Novubu, Zana Manzi, Mhlathuze Water, Umgeni Water, uThukela Water)	71%
Limpopo	10	11	11	6 (Lepelle Water, EXXARO, Magalies Water)	59%
Mpumalanga	16*	17	17	None	69%
Northern Cape	26	27	27	None	58%
North West	10	10	10	1 (Midvaal Water, Magalies Water)	60%
Western Cape	25	27	27	5 (Klein Karoo WSS, WCDM Bulk Water Supplier, Overberg WB)	79%
National totals	**140**	**151**	**151**	**27**	**69%**

** 3 WSAs in GP and 1 WSA in MP have no TSA Reports, as their bulk water supply and treatment is done by Water Boards*

An average TSA of 69% was achieved for the 151 systems assessed, which means that infrastructure and processes are deemed to be '*partially functional with an average performance'*. The best overall performing WSI was located in Gauteng, followed by Western Cape and Eastern Cape. The water boards involved in the bulk water supply played a significant role in municipal performance, as can be seen by the detailed TSA reports following in this report.

The average TSA score per WSA in South Africa is reflected in the following graph. Gauteng has the highes average TSA score of 82% showing an overall good performance and status of the water system assessed, with the Eastern Cape and Western Cape both attaining average TSA scores of 79%. The remaining provinces are showing performances ranging from an average TSA of 58% to 79%.

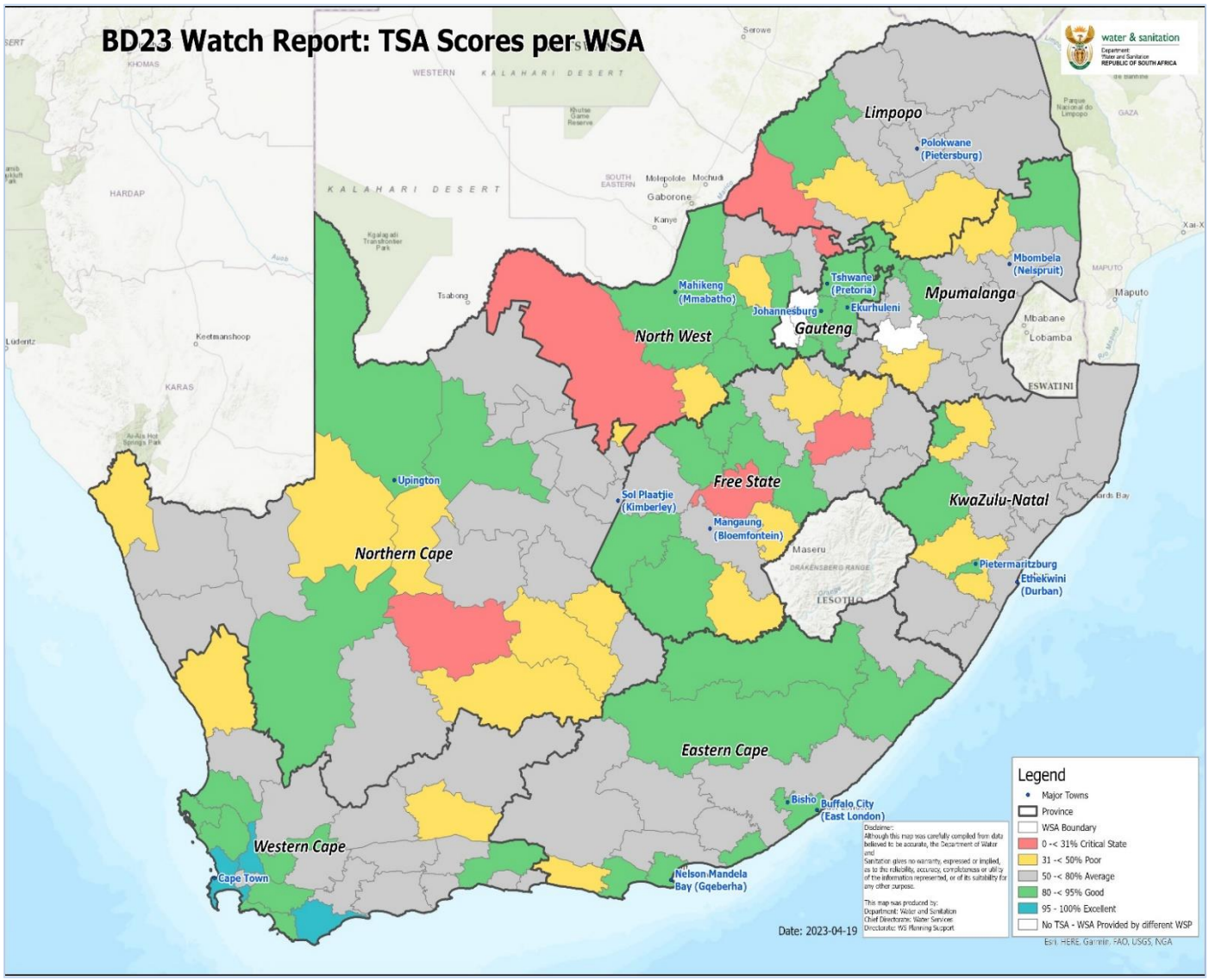


Figure 2 - Average TSA scores for water supply systems across 9 Provinces

The Regulator observed the following predominant challenges, risks and needs that contribute to sub-optimal TSA scores:
Facility management

- No jar testing facilities, no or limited testing water quality testing equipment or laboratory chemicals
- Back-up power supply during load shedding
- Vandalism of buildings or facilities or fencing
- No notice board to display or no display of the PFD or other relevant notices and/or documents (e.g. O&M manuals) on site
- Refurbishment of buildings or facilities, concrete structures, offices, process control room, staff ablutions
- Maintenance or replacement of perimeter/boundary fencing and access gate
- No drinking water on site
- No calibration or verification of flow meters
- Improve administration and monitoring templates
- Supply emergency showers or wash areas/ facilities
- Signage at entrance gate and safety signs across plant
- Housekeeping and tidying up of terrain, paintwork at treatment works, pumpstations, and reservoirs
- Sites not cleaned-up after construction projects
- Road rehabilitation and road accessibility especially for the safe delivery of chemicals
- Flooding of plant or at the various process units
- Illegal connections inside and outside the treatment works.

Water treatment system

- Cleaning schedule of the settling tanks to limit algae growth, lime dosing and storage room need to be improved

- No flow meters installed or dysfunctional flow meters (abstraction, WTW, and command reservoirs), and flow meters not calibrated
- Refurbishment or upgrade of one or more of the various process units (civil, mechanical, electrical and instrumentation)
- Dysfunctional or inefficient process units that have to be rectified, e.g. inlet works, flocculation, clarifiers, filters, etc
- Reinstatement of all automatic/ PLC related control in settling and filter units
- Treatment chemicals, e.g. no bunding, limited stock, storage, dosing requirements
- Retention time for flocculation is not sufficient
- No or limited no. standby pumps or dysfunctional pumps, e.g. flocculant and chemical dosing, backwashing, high lift, leaks
- No or limited air blowers and/or compressors or dysfunctional blowers and compressors
- Sand filters, e.g. repairs required, sand to be replaced, sand volume
- A new centrifuge or alternative dewatering system is required
- The need to use the UV system for Iron removal is to be investigated
- Chlorination unit not operational or not fully operational, e.g. limited stock in place, no or limited standby units, no automatic switch over, no chlorine scales, no or limited safety signs and systems (alarms, fans, masks, detectors)
- Oxygen provision for ozone production defect, air valves are rusted and require corrosion protection
- Limited disinfection contact time in the clear water well or ineffective disinfection taking place
- Sludge dams/ponds or beds, e.g. none in place, not operation, maintenance (cleaning), dysfunctional sludge pumps and no or limited standby, no recycling taking place
- SCADA and telemetry systems are not in place, dysfunctional, limited or no understanding of the systems
- Lack of operational know-how
- Supervisors and Process Controllers need plant-based process management training
- Vandalism and theft of pumps, buildings, valves, and other mechanical and electrical assets.

Water abstraction and distribution networks

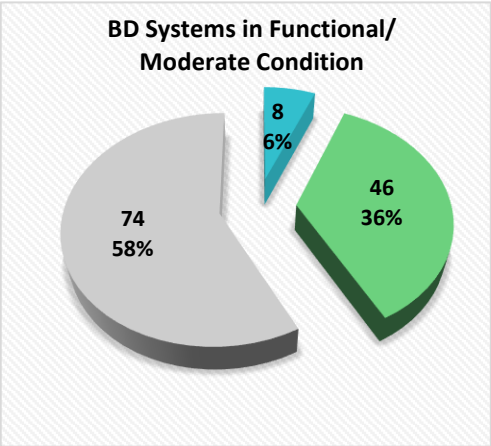
- Flooded or dysfunctional borehole/s or not adequately protected
- Raw water pipe network and/or pumps at abstraction facility to be refurbished or upgraded or repaired
- Install cathodic protection on the raw and final water pipe network or metal components
- Repair leakages in pipe network, pipe fittings, valve boxes, and/or command reservoirs
- Replace final water pipeline from WTW to command reservoir/s
- No telemetry at reservoir and level indicator or not operational
- Valve chamber flooded
- Install new fencing or repair fencing
- Vandalism and theft of pumps, valves, manholes, fencing and other mechanical and electrical assets
- Site at reservoirs to be cleared and landscaped.

Systems Observed to be in Functional/Good State based on Technical Site Inspections

Water supply systems that achieved ≥50% TSA score are summarised as follows. Standard deviations are shown in brackets to give the reader a sense of the deviation of all systems from the average value.

Table 2 - National Summary of the TSA Water Supply Systems in the Excellent to Average Performance Categories

Province	TSA of ≥95-100% [Excellent]		TSA of ≥80-<95% [Good]		TSA of ≥50-<80% [Average]	
	# of WTWs assessed	Average % TSA (±SD)	# of WTWs assessed	Average % TSA (±SD)	# of WTWs assessed	Average % TSA (±SD)
Eastern Cape	None	None	9	86% (6%)	6	67% (12-17%)
Free State	1	95% (0%)	5	83% (2-5%)	9	67% (8-12%)
Gauteng	1	97% (0%)	5	86% (5-8%)	2	63% (10%)
KwaZulu Natal	1	95% (0%)	4	86% (4-6%)	9	64% (14-15%)
Limpopo	None	None	1	86% (0%)	8	63% (13%)
Mpumalanga	None	None	5	87% (3-5%)	10	64% (13-14%)
Northern Cape	None	None	4	88% (6-8%)	15	61% (10-14%)
North West	1	95% (0%)	3	88% (6-7%)	2	59% (1-2%)
Western Cape	4	96% (1-2%)	10	87% (7%)	13	68% (11-18%)
National totals	**8**		**46**		**74**	



Out of a total of 128 systems that fall in the 50-100% bracket, the following performance and condition status was found:

- 8 systems (6%) in excellent condition
- 46 systems (36%) in good condition
- 74 systems (58%) in average condition.

Figure 3 - No. BD Systems in Functional/ Moderate Condition

The top 3 to 4 top performing water supply systems per province, are summarised in the table following.

Table 3 - National Summary of the Top 3 or 4 Performing TSA Water Supply Systems per Province

#	Province	WSA	WSP/ Water Board	TSA WTW	%TSA
1	EC	Ndlambe LM		Cannon Rocks/Boknes	92%
2		Kouga LM		Jeffreys Bay	91%
3		Nelson Mandela Bay MM		Linton	87%
4	FS	Kopanong LM		Bethulie	95%
5		Matjhabeng LM	Bloem Water	Virginia	88%
6		Nala LM	Bloem Water	Balkfontein	82%
7		Tswelopele LM		Hoopstad	82%
8	GP	Emfuleni LM	Rand Water	Vereeniging	97%
9		City of Tshwane MM	Magalies Water	Cullinan	94%
10		City of Johannesburg MM		Illovo Command Reservoirs	89%
11	KZN	Msunduzi LM	Umgeni Water	Umsunduzi	95%
12		Mhlathuze LM	Mhlathuze Water	Nsezi	90%
13		uThukela DM		Ladysmith	87%
14		Newcastle LM	uThukela Water	Ngagane	87%
15	LP	Lephalale LM	EXXARO	Zeeland	86%
16	MP	City of Mbombela		Nelspruit New	92%
17		Thembisile Hani LM		Bundu	88%
18		Steve Tshwete LM		Vaalbank	87%
19	NC	Tsantsabane LM	Bloem Water	Vaal Gamagara	94%
20		Hantam LM		Calvinia	94%
21		David Kruiper LM		AH September	84%
22	NW	City of Matlosana LM	Midvaal Water	Midvaal	95%
23		JB Marks LM		Potchefstroom	94%
24		Ngaka Modiri Molema DM		Mmabatho	88%
25	WC	City of Cape Town MM		Faure	98%
26		Cape Agulhas LM		Bredasdorp	96%
27		Drakenstein LM		Welvanpas	96%
28		Saldanha Bay LM	WCDM Bulk Supplier	Withoogte	95%

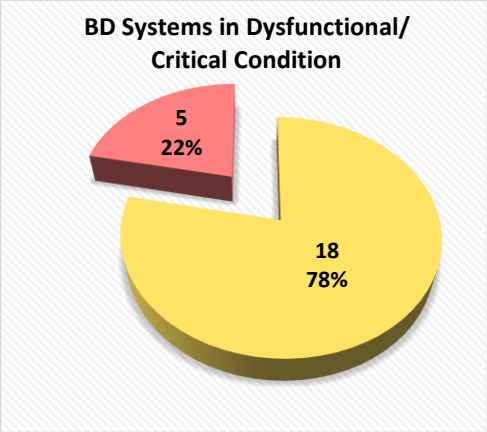
System identified to be excellent condition (95-97%) are Bethulie managed by Kopanong, Vereeniging managed by Rand Water, Umsunduzi managed by Umgeni Water, Midvaal managed by Midvaal Water, Faure managed by City of Cape Town, Bredasdorp managed by Cape Agulhas, Welvanpas managed by Drakenstein, and Witgehoogte managed by WCDM Bulk Water Supplier.

Systems Observed to be in Dysfunctional/ Critical State based on Technical Site Inspections

Drinking water supply systems which failed to achieve at least a TSA score of 50%, are identified as follows.

Table 4 -National Summary of the TSA Water Supply Systems in the Poor and Critical Performance Categories

Province	TSA of ≥31-<50% [Poor]		TSA of 0-<31% [Critical]	
	# of WTWs assessed	Average % TSA (±SD)	# of WTWs assessed	Average % TSA (±SD)
Eastern Cape	None	None	None	None
Free State	4	39% (3-5%)	2	29 (1%)
Gauteng	None	None	None	None
KwaZulu Natal	1	49% (0%)	None	None
Limpopo	1	34% (0%)	1	24% (0%)
Mpumalanga	2	47% (1-2%)	None	None
Northern Cape	7	40% (5-8%)	1	28% (0%)
North West	3	37% (6-7%)	1	18% (0%)
Western Cape	None	None	None	None
National totals	**18**		**5**	



The following conclusion was reached from the inspection of 23 systems in the poor/critical performance bracket:

- 18 systems (78%) in poor condition
- 5 systems (22%) in critical state.

Figure 4 - No. BD Systems in Dysfunctional/ Critical Condition

The performing water supply systems, as indicated by TSA scores in critical state (<31%) are summarised as follows.

Table 5 - National Summary of the TSA Water Supply Systems in Critical Condition per Province

#	Province	WSA	WSP/ Water Board	TSA WTW	%TSA
-	EC	None			
1	FS	Nketoana LM		Reitz	28%
2		Masilonyana LM		Winburg	30%
-	GP	None			
-	KZN	None			
3	LP	Thabazimbi LM	Magalies Water	Thabazimbi	24%
-	MP	None			
4	NC	Kareeberg LM		Carnarvon Borehole	28%
5	NW	Dr Ruth S Mompati DM		Bogosing	18%
-	WC	None			

Five of the 151 systems assessed (3.3%) were found to be in a critical state. These systems are located in WSAs found in the Free State, Limpopo, Northern Cape, and North West. No critical state systems were identified for the other provinces.

VROOM Costs

The Very Rough Order of Measurement (VROOM) is an estimation of the funding required to restore existing treatment infrastructure to its original design capacity and operations, by addressing civil, mechanical, electrical and instrumentation defects.

A singular VROOM cost is determined by assessing 1-2 treatment facilities per municipality and calculated as cost per system. The cost is derived through an algorithm that uses the Blue Drop Inspector's impression of the asset condition, the size and capacity of the asset, and the market/ industry cost indicators. The resultant VROOM cost is an estimation of the cost to repair, refurbish or replace dysfunctional treatment infrastructure. Subsequently, a singular VROOM cost is extrapolated, in relation to the total Blue Drop scores and systems' SIVs, to derive an aggregated VROOM score for all treatment plants in the WSI.

***Note:** VROOM does not constitute a specification, schedule of quantities or a definite refurbishment figure, but rather an indicative amount to inform a budget and hardware requirements. **Also,** the VROOM cost is specific to the treatment plant and does not attempt to cost the network delivery and distribution network, as it contains to many variables.*

The VROOM costs are summarised as following, noting these values comprises the cost of repairs of the SINGLE water treatment system assessed, NOT the extrapolated collective cost to repair all the treatment facilities in a WSI. The VROOM cost is made up by mechanical, electrical, and civil cost elements, which can be seen in the detailed TSA sections following in the report.

Table 6 -National Summary of the VROOM Costing

Province	Total # TSA WTWs assessed	Total VROOM Cost (Rand)
Eastern Cape	15	R43,420,300
Free State	21	R497,422,500
Gauteng	8	R51,579,000
KwaZulu Natal	15	R372,608,500
Limpopo	11	R115,173,300
Mpumalanga	17	R103,406,600
Northern Cape	27	R146,228,937
North West	10	R55,163,900
Western Cape	27	R113,611,300
National totals	**151**	**R1,498,614,337**

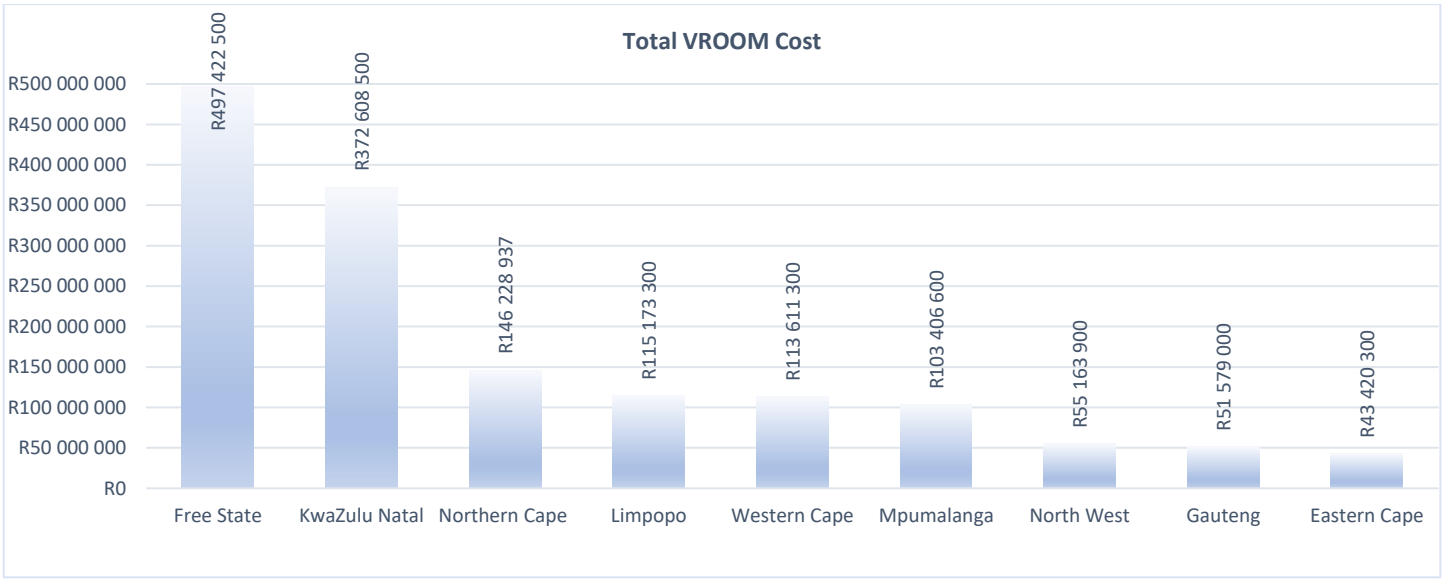


Figure 5 - Total VROOM Cost for the BD Systems Assessed

The associated VROOM costs for the 151 water supply systems assessed amounts to almost R1.5 billion, with the bulk of investment needed for WSAs in the Free State and KwaZulu Natal.

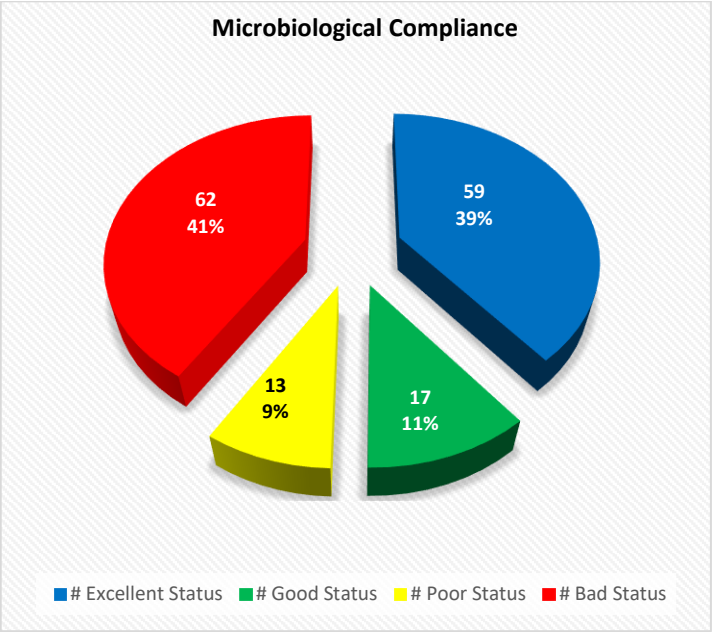
Drinking Water Quality Status

The Institutional Water Quality Compliance, as measured against SANS 241 standards, is reflected in the table below (IRIS, 28 March 2023).

Table 7 - National Summary of the Drinking Water Quality Status

Province	Total # WTWs assessed	Microbiological Compliance				Chemical Compliance			
		# Excellent Status	# Good Status	# Poor Status	# Bad Status	# Excellent Status	# Good Status	# Poor Status	# Bad Status
Eastern Cape	15	6	2	1	6	2	0	2	11
Free State	21	7	5	1	8 (4*)	2	6	2	11 (4*)
Gauteng	8	5	0	0	3	5	0	1	2
KwaZulu Natal	15	9	2	1	3	3	3	1	8
Limpopo	11	5	1	1	4(1*)	0	1	3	7 (1*)
Mpumalanga	17	2	1	1	13 (3*)	2	2	1	12 (3*)
Northern Cape	27	7	0	4	16 (3*)	3	2	3	19 (3*)
North West	10	4	1	1	4	0	3	3	4
Western Cape	27	14	5	3	5	8	3	7	9
National totals	**151**	**59**	**17**	**13**	**62**	**25**	**20**	**23**	**83**

**number of WTWs with no information*



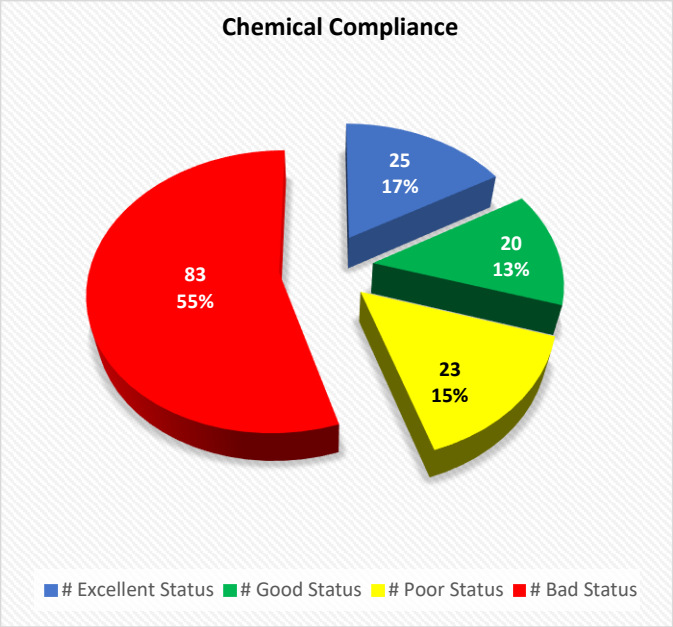


Figure 6 - Drinking Water Quality Status of all the TSA Water Supply Systems

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

The TSA and water quality results depict a vastly different picture. The national TSA shows the average WSS to be *partially dysfunctional and average performance*, whilst the water quality compliance shows that the majority of systems *fails to produce compliant final water quality*. This means that whilst the infrastructure condition showed partial functionality, the treatment plants failed to produce high quality drinking water. The conclusion being that a *fully functional* treatment plant, with adequate process control, is crucial to produce safe final water.

Out of 151 treatment plants, 59 systems (39%) achieved excellent microbiological quality and 17 systems (11%) achieved good microbiological quality. A total of 13 systems (9%) have a poor microbiological water quality status and 62 systems (41%) have a bad microbiological water quality status. The water from these 62 systems poses a serious acute health risk to the users. WSAs with poor microbiological water quality status must be monitored to ensure suitable rectification measures are taking to safeguard communities. The direct cause of microbiological failures can be linked to the TSA sub-watch area 7, which has a relatively low contribution to the overall TSA score. Failure to produce water that complies with the SANS E. coli standard can be linked to poor operation, defect infrastructure, incorrect dosing rates, absence of disinfection chemicals, lack of monitoring, or lack of operating and chemistry knowledge.

Chemical compliance shows that only 25 systems (17%) achieved excellent water quality and 20 systems (13%) have good water quality, whilst 106 systems (70%) failed to achieve chemical compliance. A concerning 83 systems (55%) and 23 systems (15%) of water treatment plants are in critical state, with bad and poor water quality compliance respectively.

The microbiological compliance per WSA is reflected in the following map. KwaZulu Natal has the highest overall microbiological compliance with 11 of 15 (73.3%) systems with excellent and good status, followed by the Western Cape with 19 of 27 (70.4%) systems and Gauteng with 5 of 8 (62.5%) systems. Similarly, Mpumalanga has the highest overall microbiological non-compliance with 14 of 17 (82.4%) systems with poor and bad status, followed by the Northern Cape with 20 of 27 (74%) systems.

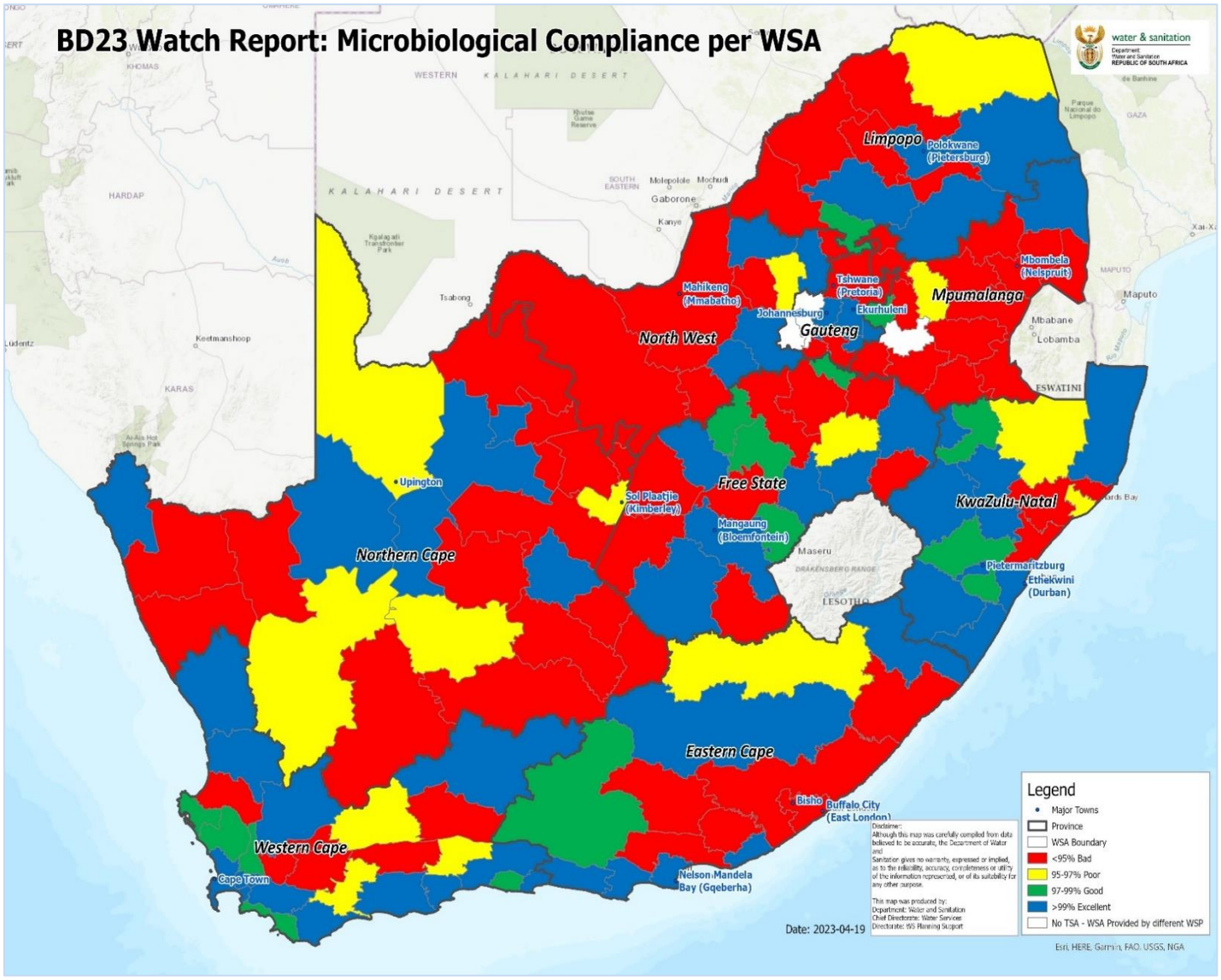


Figure 7 - Microbiological Compliance per WSA TSA Systems in South Africa

The chemical compliance per WSA is reflected in the map below. Gauteng has the highest overall chemical compliance with 5 of 8 (62.5%) systems with excellent and good status, followed by the Western Cape with 11 of 27 (40.7%) systems and KwaZulu Natal with 6 of 15 (40%) systems. Allthough Gauteng, Western Cape and KwaZulu Natal obtained the highest chemical compliance profile, the Regulator does not regard 40-62% compliance as acceptable. On the non-compliance side, Limpopo has the highest overall chemical non-compliance with 10 of 11 (90.9%) systems with poor and bad status, followed by the Eastern Cape with 13 of 15 (86.7%) systems and Northern Cape with 22 of 27 (81.5%) systems.

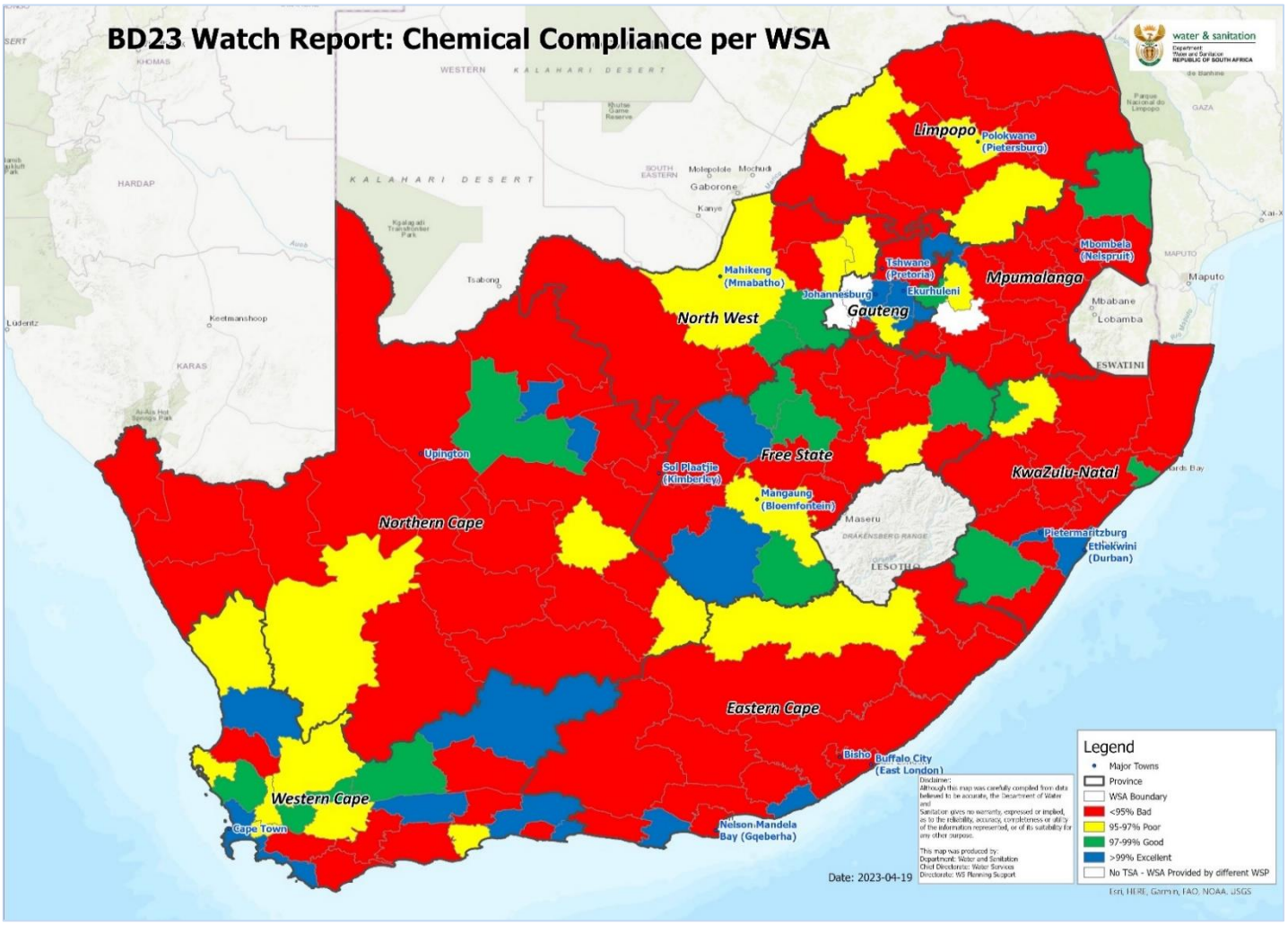


Figure 8 - Chemical Compliance per WSA TSA Systems in South Africa

Concluding Remarks

The Department of Water and Sanitation notes with concern the overall poor water quality that is produced and distributed to the consumer. A balanced view is also taken on the results from the technical assessments, showing systems that ranges from excellent to critical. The Blue Drop Watch will be used as a basis to inform appropriate regulatory and support with the objective to facilitate correction, restoration, and improvement of water services to consumers. The report further serves to inform stakeholders and government departments as to the current status of drinking water infrastructure in the field, with the intent to mobilise interventions without having to wait for the release of the Blue Drop audit report. The Blue Drop Watch results stresses the importance of drinking water supply and quality to be a primary focus area of government. Already, the Department has developed the Water Services Improvement Programme for systems in critical state, and at systems where particular concerns were reported. Blue Drop performance trends will be used to determine repetitive poor performance, to inform a radical approach to ensure turnaround and compliance. This could include facilitating long term intervention by either a capacitated water board or any other suitable mode of water services support. The determination of the 'very rough order of estimates' (VROOM) was done to give an estimation of the capital requirement for the functionality restoration drive. This will be effected with the support from the National Treasury.

The Regulator will continue to monitor performance in terms of Section 62 of the Water Services Act and will engage together with CoGTA and SALGA, WSAs for corrective action plan development and implementation and offer support. Should these actions fail, the Department will consider civil action together with actions contemplated under section 63 of the Water Services Act (Act 108 of 1997) to ensure that Ministerial directives are issued with timeframes for implementation. Failure to respond will trigger remedial action be taken at cost of the non-complying entity or municipality. The Department will take steps to improve its capacity to respond more effectively in this duty, in ensuring visible and measurable improvement in drinking water services. The Department of Cooperative Governance and National Treasury will be engaged to explore ways of utilising conditional grants for the purpose of remedial rectification.

All Water Services Institutions are hereby urged to take note of their TSA status and commence with corrective measures. The full Blue Drop audit report will provide further material content to the overall management of drinking water services across South Africa, upon its release mid-2023.

5. EASTERN CAPE: MUNICIPAL DRINKING WATER SYSTEM'S FUNCTIONALITY

Background

Leading up to the release of the full Blue Drop report, the Regulator draws attention by publishing the *Blue Drop Watch Report*, which comprises of a technical overview of pipes, pumps, reservoirs, processes and water quality of water treatment plants and distribution networks. The Blue Drop Watch report is **not** the Blue Drop audit report, which will only be published once the verification and quality control processes by DWS have been satisfied, to ensure accurate and credible reporting of drinking water services across South Africa. The Watch Report seeks to keep the public and stakeholder updated and informed on the status of drinking water infrastructure, water quality, and the indicative cost to restore functionality.

The Blue Drop Watch Report is informed by the Technical Site Assessments (TSA), which were done at 1 to 2 systems per WSA/WSP, as part of the Blue Drop audit cycle. The purpose of the TSA is to verify the findings of the (desktop) audit with the status on the ground (physical inspections). The TSA score (%) reflects the condition of the raw water handling system (abstraction, pumps, pipe network), the water treatment plants (inlet works to disinfection and sludge treatment), delivery system (commend reservoirs, bulk pipe network and pumpstations) and distribution systems (pump and pipe networks). A high TSA score (100%) indicates that the infrastructure, equipment, and processes are in excellent condition, whilst a low TSA score (0%) indicates failure and dysfunctional process and infrastructure. The TSA inspections cover each process unit of the treatment facility, coupled with randomly selected checkpoints of the delivery and distribution network. The VROOM cost covers only the treatment facility, as too many variables exist to accurately estimate network refurbishment costs.

Results of the Technical Site Assessments

During the period December 2022 to February 2023, 15 water supply systems were inspected, offering a representative overview of systems owned and operated by municipalities, water boards and water service providers. The assessments covered 14 municipalities, as well as 1 Water Board. Detailed TSA reports with photographic evidence and VROOM costs have been generated to assess the condition and status of treatment facilities and gain insight into randomly selected pipe network and pumpstation across the water distribution networks. The table following summarises the TSA scores of the water supply systems that were assessed.

Table 8 - Eastern Cape Summary of the all the TSA Water Supply Systems

#	Municipality (WSA)	TSA WSS	TSA WTW	WSP/ WB	%TSA
1	Alfred Nzo DM	Mount Ayliff	Mount Ayliff		79%
2	Amathole DM	Morgans Bay	Morgans Bay		79%
3	Blue Crane LM	Somerset East	Orange Fish		64%
4	Buffalo City MM	Mdantsane	Nahoon	Amatola WB	86%
5	Buffalo City MM	Umzonyana	Umzonyana		85%
6	Chris Hani DM	Intsika Yethu	Tsomo		85%
7	Dr Beyers Naude LM	Graaf Reinet	Graaf Reinet		80%
8	Joe Gqabi DM	Barkley East	Barkley East		83%
9	Kouga LM	Jeffreys Bay	Jeffreys Bay		91%
10	Koukamma LM	Kareedouw	Kareedouw		50%
11	Makana LM	Grahamstown	James Kleynhans		68%
12	Ndlambe LM	Cannon Rocks	Cannon Rocks/Boknes		92%
13	Nelson Mandela Bay MM	Nelson Mandela Bay	Linton		87%
14	OR Tambo DM	Thornhill	Thornhill		86%
15	Sundays River LM	Addo	Addo Nomathamsanqa		63%
	Totals		**15**	**1**	**79%**

An average of 79% was achieved for the 15 systems assessed, which means that infrastructure and processes are deemed '*partially functional with an average performance*'. The best overall performance was found for Ndlambe, followed by Kouga and Nelson Mandela Bay. The water board supplying Buffalo City is one of the better performing systems. On average, lesser performance was observed for Kareedouw, Addo, and Orange Fish (Somerset East).

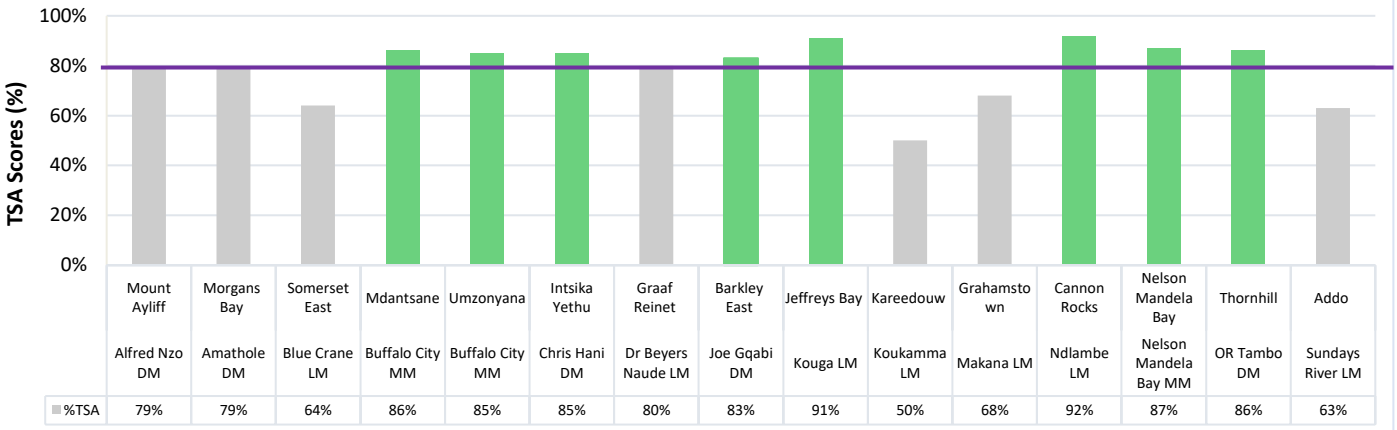


Figure 9 - EC TSA scores for all the BD Systems

95 – 100% Excellent	
80-<95% Good	
50-<80% Average	
31-<50% Poor	
0-<31% Critical state	

The Regulator observed the predominant challenges and risks pertaining to the water supply system:

Facility management

- No notice board to display the PFD or other relevant notices and/or documents required on site
- Refurbishment or upgrade and/or construction of buildings or facilities, concrete structures, offices and/or process control room, staff ablutions
- Improve administration and monitoring templates
- No jar testing done, no or limited testing water quality testing equipment and/or lab chemicals, no calibration of meters
- Supply emergency showers or wash areas/ facilities
- Back-up power supply during load shedding
- Signage at entrance gate and safety signs across plant
- Housekeeping and tidying up of terrain, paintwork at treatment works, pumpstations, and reservoirs, clean-up sites after construction projects
- Road rehabilitation/ upgrade/ construction and road accessibility especially for the safe delivery of chemicals
- Staff safety and signage improvement
- Vandalism of buildings or facilities or fencing
- Flooding at plant or at the various process units.

Water treatment system

- No flow meters installed or dysfunctional flow meters (abstraction, WTW, and Command Reservoirs), and flow meters not calibrated
- Refurbishment or upgrade of one or more of the various process units (civil, mechanical, electrical and instrumentation)
- Treatment chemicals, e.g. no bunding, limited stock
- No or limited no. standby pumps or dysfunctional pumps, e.g. flocculant and/or chemical dosing, backwashing, high lift, etc
- No or limited air blowers and/or compressors or dysfunctional blowers and compressors
- Replacement of filter sand and nozzles
- Sand filters, e.g. repairs required, sand to be replaced
- Chlorination unit not operational or not fully operational, e.g. limited stock in place, no or limited standby units, no automatic switch over, no chlorine scales, no or limited safety systems (alarms, fans, masks, detectors)
- Limited disinfection contact time in the clear water well
- Sludge dams/ponds or beds, e.g. not operation, maintenance (cleaning), dysfunctional sludge pumps and no or limited standby, no recycling taking place
- SCADA and telemetry systems, e.g. not in place, dysfunctional, limited or no understanding of the systems
- Vandalism and theft of pumps, buildings, valves, and other mechanical and electrical assets.

Water distribution networks

- Repair leakages in pipe network and/or command reservoirs

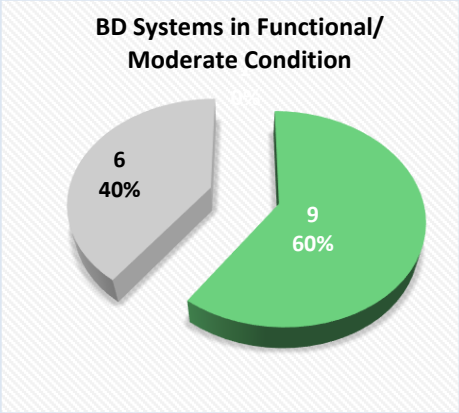
- Site at reservoirs to be cleared and landscaped.

Systems Observed to be in Functional/Moderate Condition based on Technical Site Inspections

Water supply systems which achieved ≥50% TSA score, are summarised as follows.

Table 9 - Provincial Summary of the TSA Water Treatment Systems in the Excellent to Average Performance Categories

Municipality (WSA)	WSP/ WB	TSA of ≥95-100% [Excellent]		TSA of ≥80-<95% [Good]		TSA of ≥50-<80% [Average]	
		Name of WTW	% TSA	Name of WTW	% TSA	Name of WTW	% TSA
Alfred Nzo DM		None	None			Mount Ayliff	79%
Amathole DM						Morgans Bay	79%
Blue Crane LM						Orange Fish (Somerset East)	64%
Buffalo City MM	Amatola WB			Nahoon	86%		
Buffalo City MM				Umzonyana	85%		
Chris Hani DM				Tsomo	85%		
Dr Beyers Naude LM				Graaf Reinet	80%		
Joe Gqabi DM				Barkley East	83%		
Kouga LM				Jeffreys Bay	91%		
Koukamma LM						Kareedouw	50%
Makana LM						James Kleynhans	68%
Ndlambe LM				Cannon Rocks/Boknes	92%		
Nelson Mandela Bay MM				Linton	87%		
OR Tambo DM				Thornhill	86%		
Sundays River LM						Addo Nomathamsanqa	63%
Totals	**1**	**0**		**9**		**6**	



Of the 15 systems in the excellent to average performance categories it was found that:
- 9 systems (60%) were in good condition
- 6 systems (40%) were in average condition.

Figure 10 - No. BD Systems in Functional/ Moderate Condition

The best performing water supply systems, as indicated by the TSA scores, are summarised hereunder.

Table 10 - Provincial Summary of the Top Performing TSA Water Treatment Systems

#	WSA	WSP/ WB	TSA WTW	%TSA
1	Ndlambe LM		Cannon Rocks/Boknes	92%
2	Kouga LM		Jeffreys Bay	91%
3	Nelson Mandela Bay MM		Linton	87%
4	Buffalo City MM	Amatola WB	Nahoon	86%
5	OR Tambo DM		Thornhill	86%
6	Buffalo City MM		Umzonyana	85%
7	Chris Hani DM		Tsomo	85%

The top three systems with good condition (80-<95%) are Cannon Rocks/Boknes managed by Ndlambe, Jeffreys Bay managed by Kouga, and Linton managed by Nelson Mandela Bay.

Systems Observed to be Dysfunctional/Critical Condition based on Technical Site Inspections

No drinking water supply systems where Technical Site Assessments were undertaken were observed to be in a dysfunctional or in a critical condition.

VROOM Costs

The Very Rough Order of Measurement (VROOM) is an estimation of the funding required to restore existing treatment infrastructure to its original design capacity and operations, by addressing civil, mechanical, electrical and instrumentation defects. A singular VROOM cost is determined by assessing 1-2 treatment facilities per municipality and calculated as cost per system. The cost is derived through an algorithm that uses the Blue Drop Inspector's impression of the asset condition, the size and capacity of the asset, and the market/ industry cost indicators. The resultant VROOM cost is an estimation of the cost to repair, refurbish or replace dysfunctional treatment infrastructure. Subsequently, a singular VROOM cost is extrapolated, in relation to the total Blue Drop scores and systems' SIVs, to derive an aggregated VROOM score for all treatment plants in the WSI.

Note: *VROOM does not constitute a specification, schedule of quantities or a definite refurbishment figure, but rather an indicative amount to inform a budget and hardware requirements.* ***Also,*** *the VROOM cost is specific to the treatment plant and does not attempt to cost the network delivery and distribution network, as it contains to many variables.*

The VROOM costs are summarised as following, noting these values comprises the cost of repairs of the SINGLE water treatment system assessed, NOT the extrapolated collective cost to repair all the treatment facilities in a WSI. The VROOM cost is made up by mechanical, electrical, and civil cost elements, which can be seen in the detailed TSA sections following in the report.

Table 11 - Provincial Summary of the VROOM Costing

Municipality (WSA)	TSA WSS	TSA WTW	WSP/ WB	Total VROOM Cost (Rand)
Alfred Nzo DM	Mount Ayliff	Mount Ayliff		R60,500
Amathole DM	Morgans Bay	Morgans Bay		R1,873,300
Blue Crane LM	Somerset East	Orange Fish		R2,926,000
Buffalo City MM	Mdantsane	Nahoon	Amatola WB	R1,325,500
Buffalo City MM	Umzonyana	Umzonyana		R7,497,600
Chris Hani DM	Intsika Yethu	Tsomo		R837,100
Dr Beyers Naude LM	Graaf Reinet	Graaf Reinet		R1,655,500
Joe Gqabi DM	Barkley East	Barkley East		R4,380,200
Kouga LM	Jeffreys Bay	Jeffreys Bay		R2,146,100
Koukamma LM	Kareedouw	Kareedouw		R2,596,000
Makana LM	Grahamstown	James Kleynhans		R63,800
Ndlambe LM	Cannon Rocks	Cannon Rocks/Boknes		R150,700
Nelson Mandela Bay MM	Nelson Mandela Bay	Linton		R558,800
OR Tambo DM	Thornhill	Thornhill		R11,038,500
Sundays River LM	Addo	Addo Nomathamsanqa		R6,310,700
Totals		**15**	**1**	**R43,420,300**

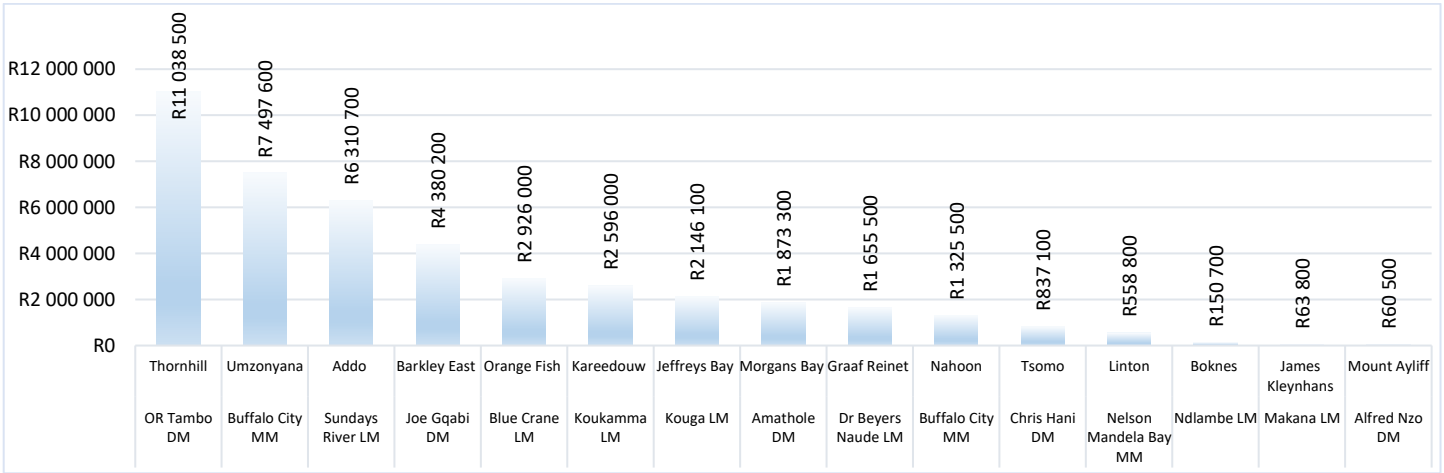


Figure 11 - Total VROOM Cost for the BD Systems Assessed

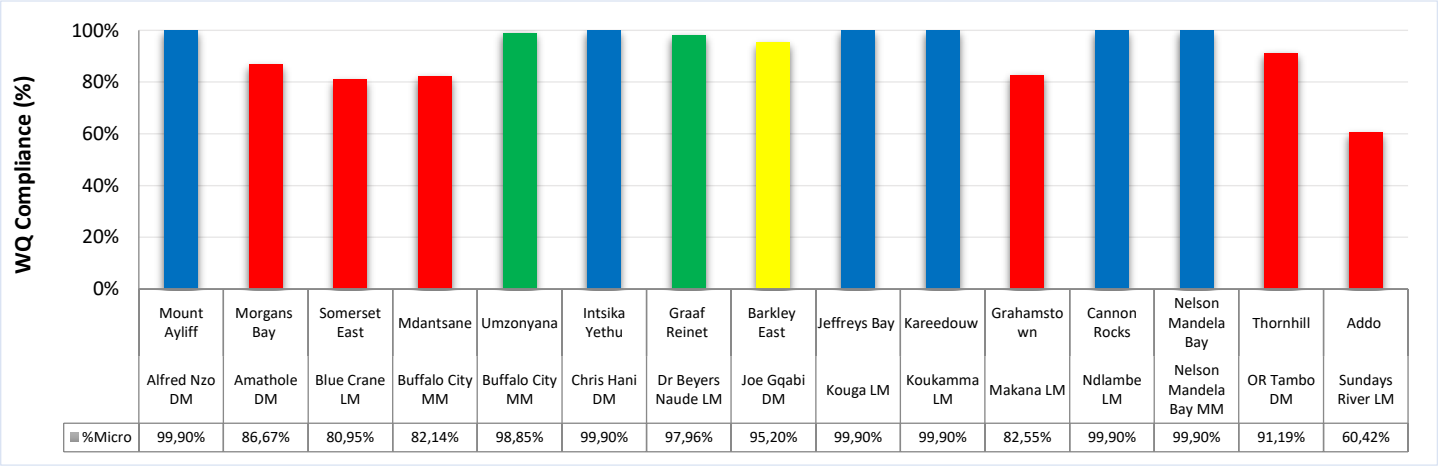
The associated VROOM costs for the 15 water supply systems assessed amount to R43.4 million, with the bulk of investment needed for Thornhill (OR Tambo), Umzonyana (Buffalo City) and Barkley East (Joe Gqabi).

Drinking Water Quality Status

The Institutional Water Quality Compliance, as measured against SANS 241 standards, is reflected in the table below (IRIS, 28 March 2023).

Table 12 - Eastern Cape Summary of the Drinking Water Quality Status of all the TSA Water Supply Systems

#	Municipality (WSA)	TSA WSS	TSA WTW	Microbiological Compliance	Chemical Compliance
1	Alfred Nzo DM	Mount Ayliff	Mount Ayliff	>99.90%	94.08%
2	Amathole DM	Morgans Bay	Morgans Bay	86.67%	91.57%
3	Blue Crane LM	Somerset East	Orange Fish	80.95%	82.14%
4	Buffalo City MM	Mdantsane	Nahoon	82.14%	95.44%
5	Buffalo City MM	Umzonyana	Umzonyana	98.85%	90.18%
6	Chris Hani DM	Intsika Yethu	Tsomo	99.90%	91.07%
7	Dr Beyers Naude LM	Graaf Reinet	Graaf Reinet	97.96%	87.14%
8	Joe Gqabi DM	Barkley East	Barkley East	95.20%	96.25%
9	Kouga LM	Jeffreys Bay	Jeffreys Bay	>99.90%	99.90%
10	Koukamma LM	Kareedouw	Kareedouw	>99.90%	80.00%
11	Makana LM	Grahamstown	James Kleynhans	82.55%	80.96%
12	Ndlambe LM	Cannon Rocks	Cannon Rocks/Boknes	>99.90%	>99.90%
13	Nelson Mandela Bay MM	Nelson Mandela Bay	Linton	>99.90%	87.20%
14	OR Tambo DM	Thornhill	Thornhill	91.19%	89.71%
15	Sundays River LM	Addo	Addo Nomathamsanqa	60.42%	68.06%



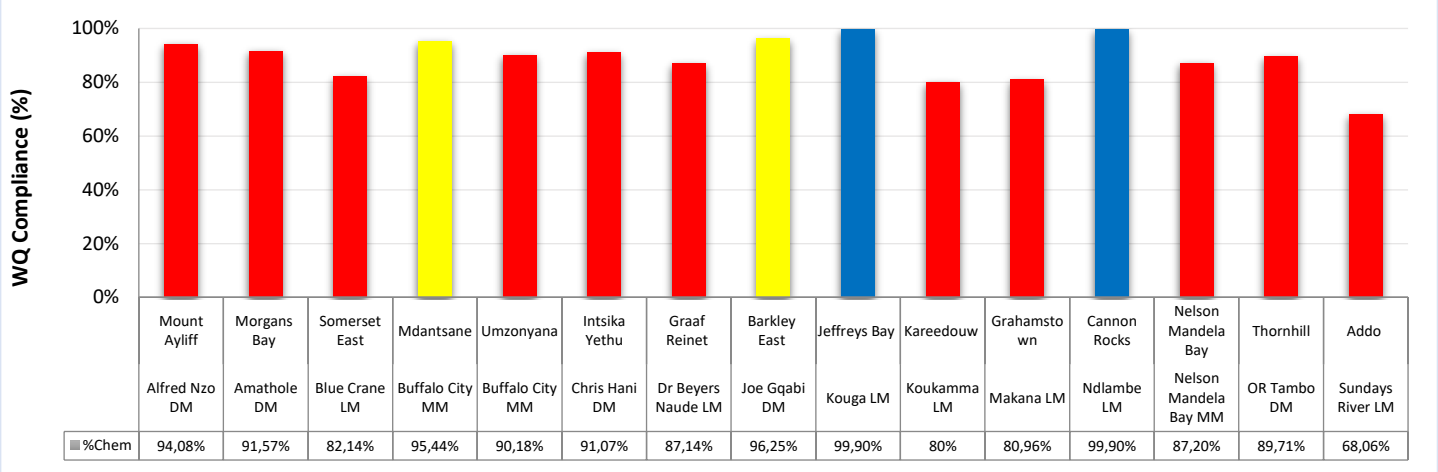


Figure 12 - EC Drinking Water Quality Status of all the TSA Water Supply Systems

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

The TSA and water quality results depict a different picture. The TSA shows the water supply systems to be in the *good and average performance category*, and the water quality compliance shows that most of the systems *fail to produce compliant final water quality*.

Out of 15 treatment plants, only 6 (40%) and 2 (13%) of systems achieve excellent and good microbiological quality. 1 (7%) system has a poor and 6 (40%) systems have a bad microbiological water quality status. The water in these systems poses a serious acute health risk to the community. WSAs with poor microbiological water quality status must be assessed to confirm status in all systems to ensure rectification measures are comprehensive to safeguard communities. The direct cause of microbiological failures can be linked to the TSA sub-watch Area 7, which has a low contribution to the overall TSA score. The failure to produce water that meets E. coli standards can be linked back to poor operations, defective infrastructure, dosing rates, absence of disinfection chemicals, lack of monitoring, or lack of operating and chemistry knowledge. WSIs that are not monitoring the final water quality at the outlet of the treatment plant or at specific end use points must develop a monitoring programme and resume with compliance monitoring as a matter of urgency.

Chemical compliance shows that 2 (13%) and no (0%) have excellent and good water quality, whilst the vast majority of systems fail to achieve chemical compliance. A total of 2 (13%) and 11 (74%) systems have a poor and bad chemical water quality status.

Concluding Remarks

The Blue Drop Watch results stresses the importance of drinking water supply and quality to be a primary focus area of government. Already, the Department has developed the Water Services Improvement Programme for systems in critical state, and at systems where particular concerns were reported. Blue Drop performance trends will be used to determine repetitive poor performance, to inform a radical approach to ensure turnaround and compliance. This could include facilitating long term intervention by either a capacitated water board or any other suitable mode of water services support. The determination of the 'very rough order of estimates' (VROOM) was done to give an estimation of the capital requirement for the functionality restoration drive. This will be effected with the support from the National Treasury.

The Regulator will continue to monitor performance in terms of Section 62 of the Water Services Act and will engage together with CoGTA and SALGA, WSAs for corrective action plan development and implementation and offer support. Should these actions fail, the Department will consider civil action together with actions contemplated under section 63 of the Water Services Act (Act 108 of 1997) to ensure that Ministerial directives are issued with timeframes for implementation. Failure to respond will trigger remedial action be taken at cost of the non-complying entity or municipality. The Department will take steps to improve its capacity to respond more effectively in this duty, in ensuring visible and measurable improvement in drinking water services. The Department of Cooperative Governance and National Treasury will be engaged to explore ways of utilising conditional grants for the purpose of remedial rectification.

All Water Services Institutions are hereby urged to take note of their TSA status and commence with corrective measures. The full Blue Drop audit report will provide further material content to the overall management of drinking water services across South Africa, upon its release in July 2023.

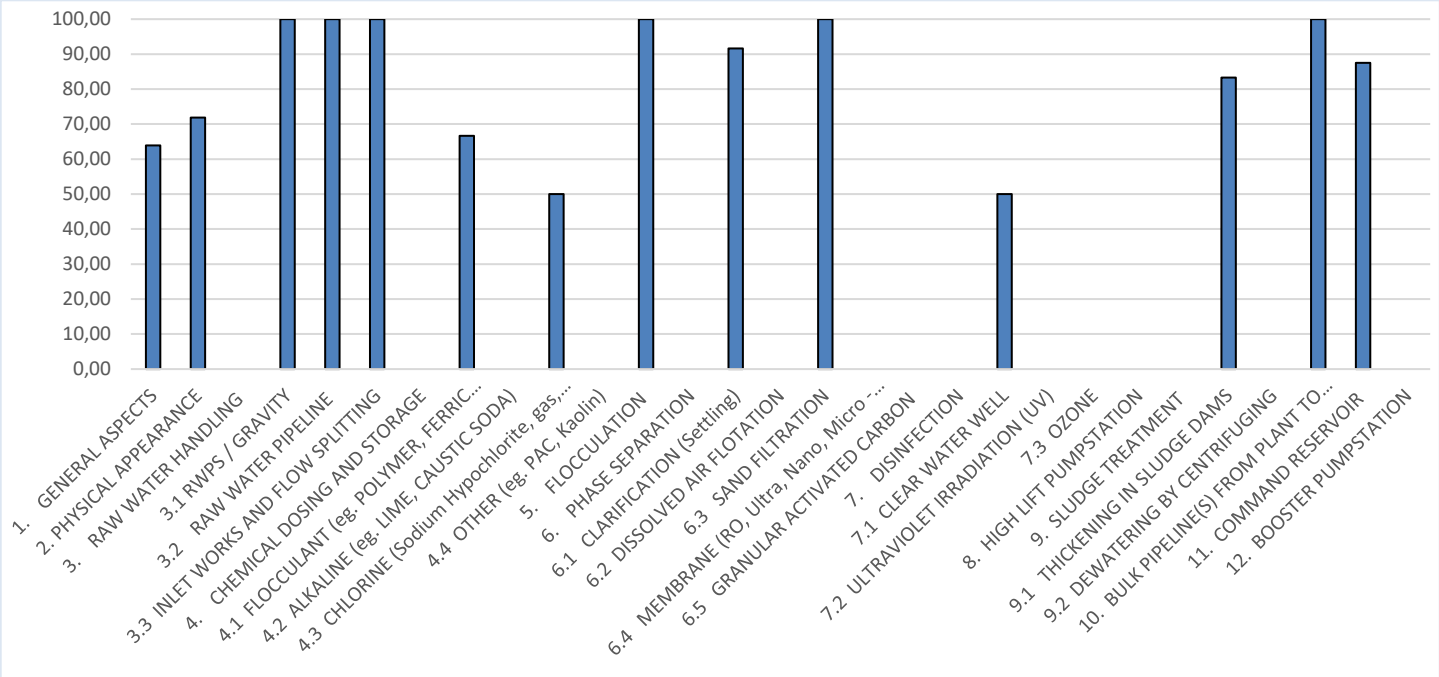
5.1 Alfred Nzo District Municipality

The Mount Ayliff water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

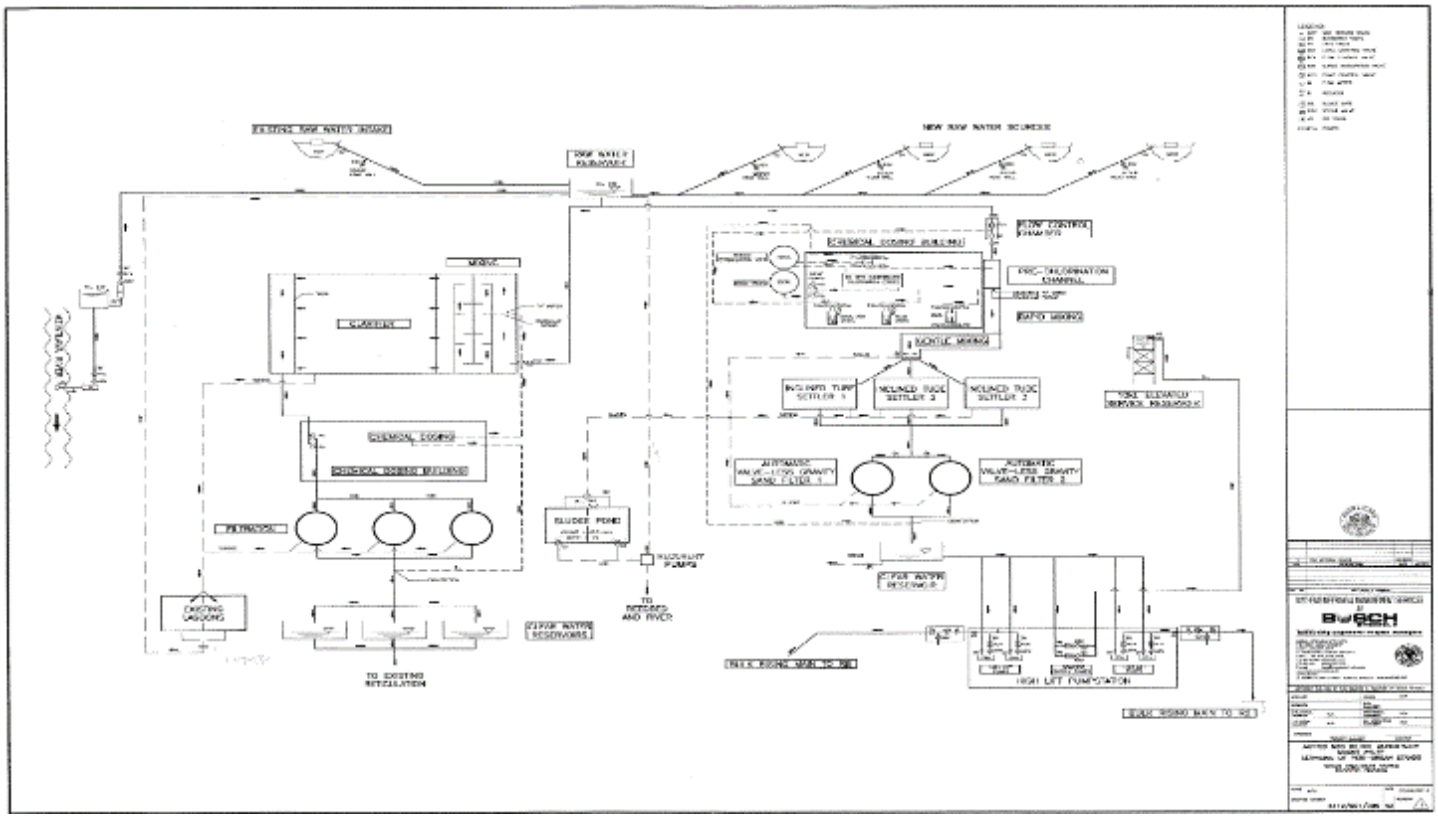
Mount Ayliff TSA Score: 79%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	63.8	Class B plant, repairs and maintenance loaded suing job cards, daily log sheet with operations monitoring is in place, there was no notice board in place to display the PFD or other relevant notices. No signage at the gate as this was in the process of being replaced by the contractor doing the refurbishment, with contact no. of staff.
2	**Physical appearance**	71.8	Access to the works was easy with a newly paved road. Some general housekeeping was required, other than that the facility was in a good condition
3	**Raw water handling**		
3.1	Gravity line	100.0	The system is gravity fed, and screens are cleaned regularly. The raw water line was in a very good condition as it was installed <1-year ago
3.2	Raw water pipeline	100.0	
3.3	Inlet works and flow splitting	100.0	
4	**Chemical dosing and storage**		
4.1	Flocculant (e.g. Polymer, ferric chloride, alum)	66.6	All dosing pumps are working and in a good condition as they are new. The system is operated with 2 pumps with one on duty and the other standby. Dosing area is clean, and a bund wall is in place to contain spillages. No emergency wash areas were available at the works.
4.3	Chlorine (sodium hypochlorite, gas, HTH) or chlorine dioxide)	50.0	Chlorine gas has been installed, however was not yet in operation during the site visit. As such, the sodium hypochlorite was used until the Chlorine gas comes online. Only 50% standby pump arrangement was in place. 100 days stock was available for sodium hypochlorite
5	**Flocculation**	100.0	Could not observe as this was taking place in a pipeline, however as noted previously when looking at the process units down the line it was noted that even floc dosing was indeed taking place as limited carryover was observed.
6	**Phase separation**		
6.1	Clarification (settling)	91.6	The settling tanks are in a good condition as they were recently built, and the weirs were in a good condition with clear flow and no algae build-up. Desludging is done daily and twice a day when inflow high turbidity conditions
6.3	Sand filtration	100.0	All pumps and air blowers installed are in a very good condition. Even flow splitting was noted at the filters. Backwashing is done every 48-Hours, but under high turbidity conditions this is done every 24-hours
7	**Disinfection**		
7.1	Clear water well	50.0	Contact time was limited at only 10-minutes. Free chlorine is tested in the on-site lab from the clear water well and the final reservoir
9	**Sludge treatment**		
9.1	Thickening in sludge dams	83.3	General maintenance around the sludge dams was required. Sludge dams were desludged in September 2022. No recycling was being done and only a 50% standby pump arrangement was in place
10	**Bulk pipeline(s) from plant to command reservoir(s)**	100.0	Process controllers indicated that the raw water pipeline is in a good condition with no leakages etc. as the pipeline was recently installed / refurbished
11	**Command reservoir**	87.5	The facility was fenced, telemetry was in place at the command reservoirs. Final flow measuring was in place; however it was unclear how when last the flow meter was calibrated – it was due to be replaced as part of the refurbishment. The structure us closed and cannot be accessed by unauthorised persons or animals
	Total	**79%**	

High risk areas OR Key Hardware Risks/ Defects

1. No emergency wash facilities
2. Limited flocculant stock was in place
3. Disinfection dosing room did not have an alarm or fan installed
4. Process units are offline during load shedding and there is no back up power.

VROOM Refurbishment Cost Estimate

Civil Works	R14,300	24%
Mechanical Works	R41,800	69%
Electrical Works (Incl C&I)	R4,400	7%
Total VROOM Cost	R60,500	**100%**
R million / MLD		**0.02**

Regulatory Impression

The Mount Ayliff water supply system was recently refurbished and still in a very good condition, as such all processes remained functional, and PC staff were found to be competent. An updated Water Safety Plan was not available for this system. Water quality results indicate microbiological quality was in accordance with SANS 241 standards, however chemical monitoring needed attention.

The Regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro, but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	94.08%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

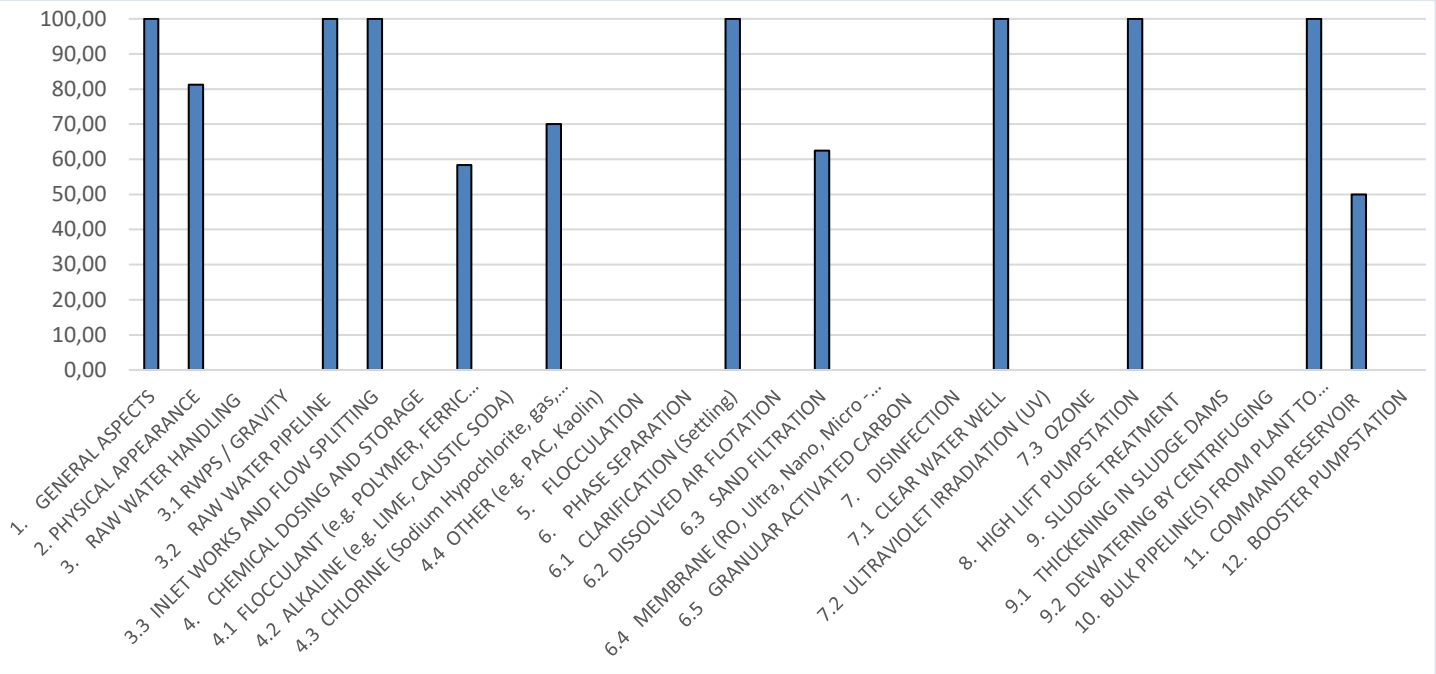
5.2 Amathole District Municipality

The Morgans Bay water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

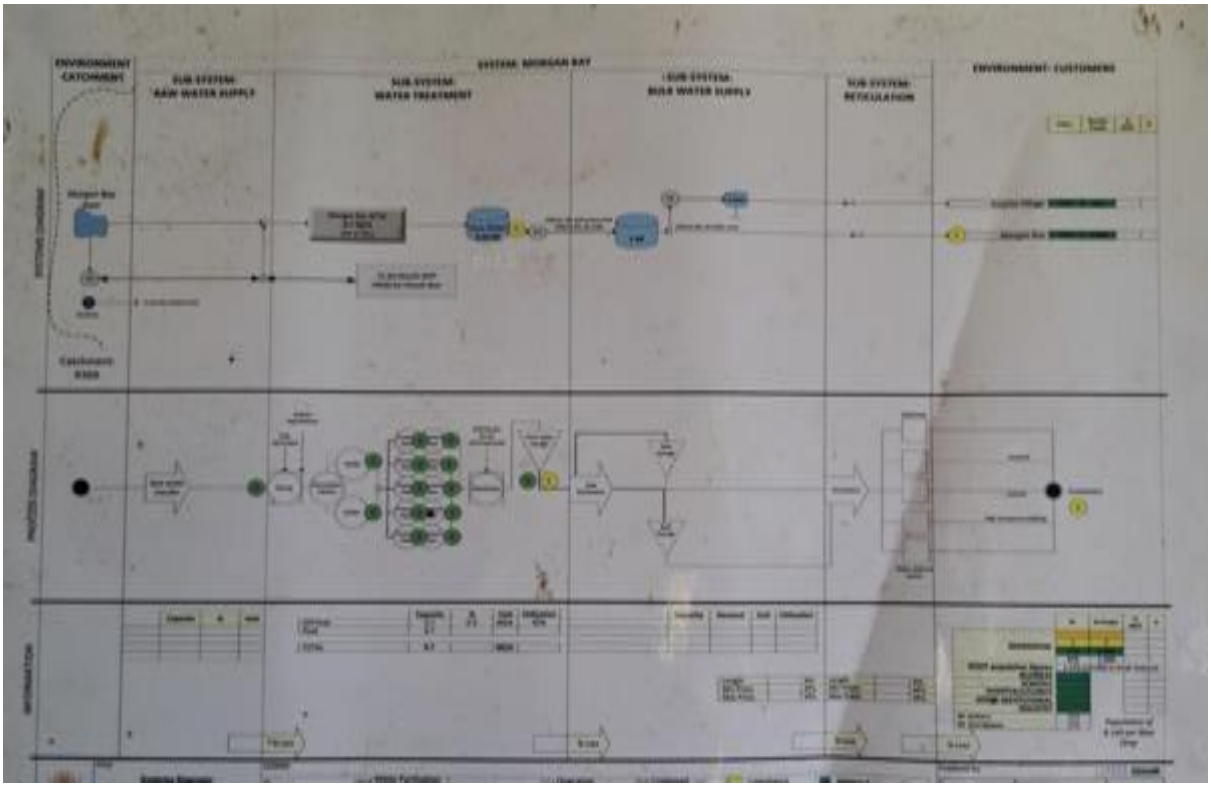
Morgans Bay WTW TSA Score: 79%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and require urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	94.4	Class D plant, Classification Certificate and PFD. Logbooks up to date. Process monitoring equipment functional and calibrated, electricity consumption recorded.
2	**Physical appearance of plant**	81.3	Plant is fenced, gated and entrance is signposted. Good housekeeping, high workplace satisfaction. No OHS contraventions.
3	**Raw water handling**		
	Raw water pipeline	100	Gravity supply from the Morgans Bay Dam. Flow meter is operational, and flow is recorded.
	Inlet works	100	Inline flocculant dosing and mixing.
4	**Chemical dosing and storage**		
	Flocculant	58.3	Duty and standby dosing systems operational Adequate storage capacity for treatment chemicals but area not bunded. Emergency wash station non-operational.
	Chlorine	70.0	Duty/standby chlorine gas dosing units operational with scales but no automatic change over. Limited chlorine gas stocks on site due to the national shortage of chlorine gas - HTH used as interim measure.
6	**Phase Separation**		
	Clarification (settling)	100	Limited floc carry-over, daily de-sludging, weirs are clean with even overflow. Concrete structure requires refurbishment.
	Sand filtration	62.5	Pressure filtration, single pump provided, filters backwashed daily, some leakages from pipes and valves. Filter sand in poor condition.
7	**Disinfection**		
	Clear water well	100.0	Contact time in the 0.5 Ml reservoir is >30 minutes, Residual Cl_2 monitoring at outlet. Concrete structure requires refurbishment.
8	**High lift pumpstation**	100.0	Duty and standby pump set operational, final flow measured and recorded.
9	**Sludge treatment**		No sludge treatment is taking place - sludge is diverted to a nearby stream.
	Thickening in sludge dams	0	
10	**Bulk pipeline from plant to command reservoir**	100.0	No leaks detected by process controllers or maintenance team.
11	**Command reservoir**	50.0	Reservoir is secure, structure is in good condition. Telemetry is not operational
	Total	**79%**	

High risk areas OR Key Hardware Risks/ Defects

1. Refurbishment of buildings and concrete structures
2. Replacement of non-return and isolation valves
3. Upgrade of treatment chemical storage area to include bunding
4. Repair of telemetry installation
5. Replacement of filter sand and nozzles and installation of standby filter pump.

VROOM Refurbishment Cost Estimate

Civil Works	R1,109,900	59%
Mechanical Works	R738,100	39%
Electrical Works (Incl C&I)	R25,300	1%
Total VROOM Cost	**R1,873,300**	**100%**
R million / MLD		**2.68**

Regulatory Impression

The Morgans Bay water system has functional treatment processes and competent staff. Operational monitoring is taking place and abstraction and production flows are recorded. Some deterioration of concrete structures and buildings has occurred over time and provision needs to be made for refurbishment of civil infrastructure. Selected mechanical infrastructure needs replacement and filters need mechanical refurbishment and sand replacement. Appropriate chemical storage facilities including bunding need to be provided. The command reservoir is secure with no leakages, but the telemetry is not operational. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	86.67%
Chemical Compliance	91.57%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



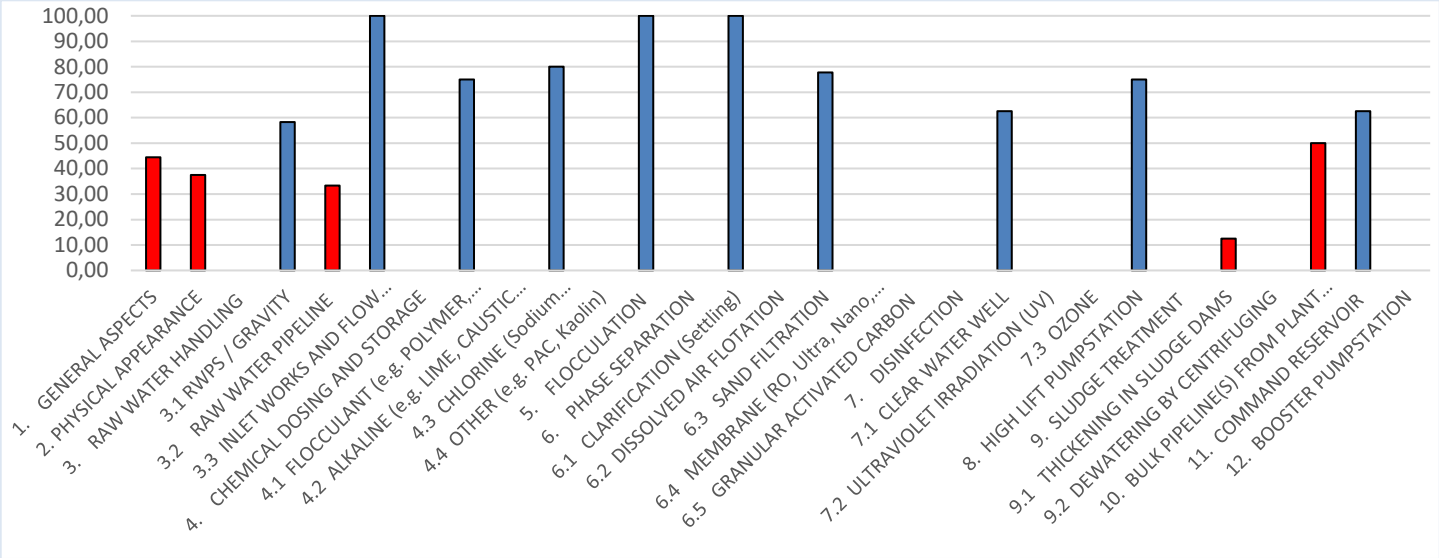

5.3 Blue Crane Local Municipality

The Orange Fish WTW (Somerset East) system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

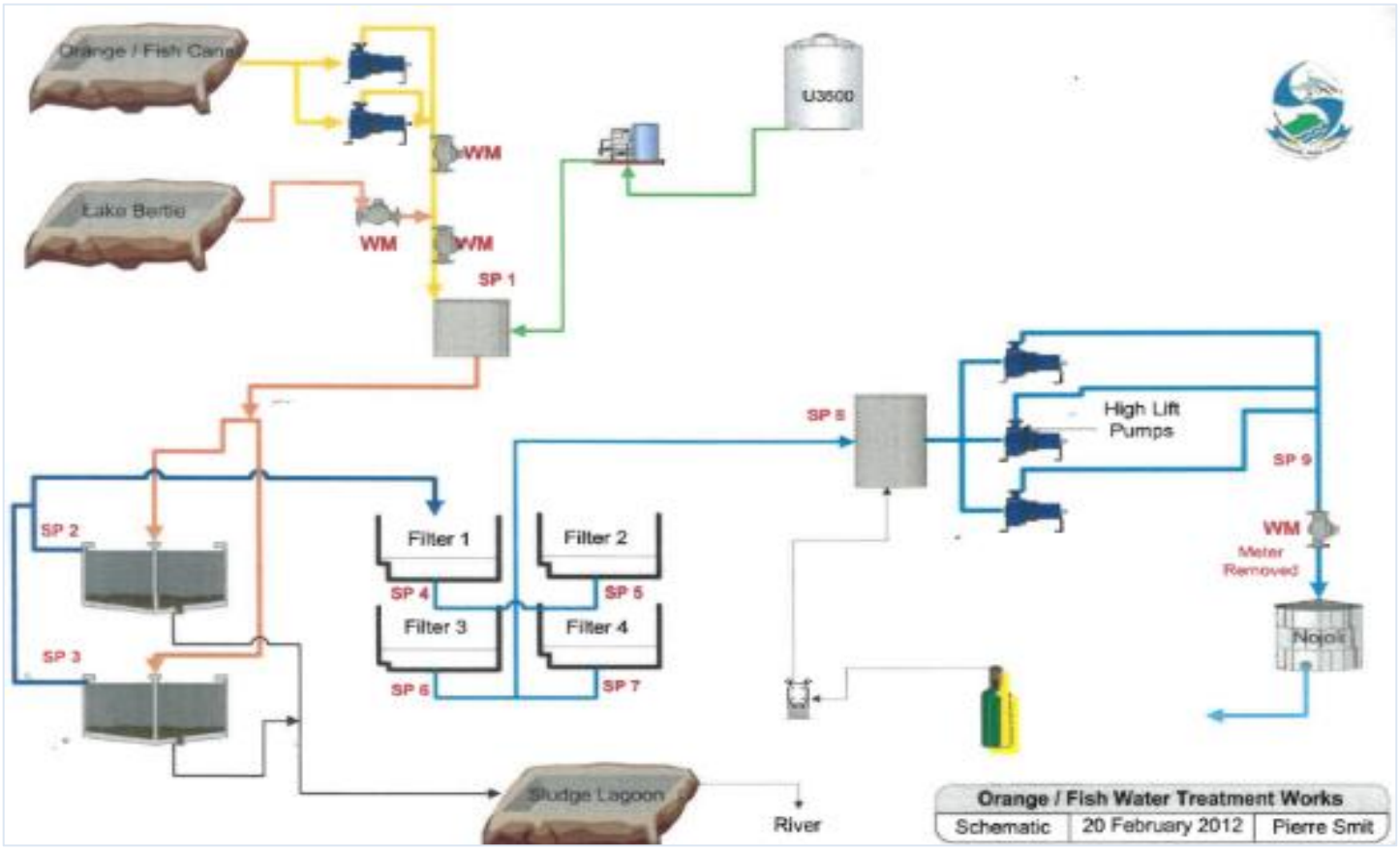
Orange Fish WTW (Somerset East): 64%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	44.4	There is some form of administration taking place at the works. The works needs to focus on getting a proper lab setup and calibrate equipment that is there. The works also has had an upgrade to the filters. WSP captures the PFD as 2012 and needs updating. WSA needs to focus also on getting a workable administration system for all PCs to understand
2	**Physical appearance of plant**	37.5	Bulk civil works needs to focus on the construction of offices and ablution facilities as well as formal roads around the works for proper chemical and other deliveries. It's a small works however these aspects contribute to the effectiveness of operation of the works and staff satisfaction.
3	**Raw water handling**		
	Raw water pumpstation / gravity feed	58.3	The works pumps raw water and has gravitational flow. PCs were unsure when the screens were cleaned and inspected. Flow metered into the works were also not functional. The inlet works is adequately designed for proper flash mixing and visual dripping of flocculants.
	Raw water pipeline	33.3	
	Inlet works	100.0	
4	**Chemical dosing and storage**		An alternative dosing unit is in place awaiting the completion of the new dosing unit which on observation of work to date will comply with TSA requirements. The new storage area is well bunded however more warning and description signage is required once construction is complete
	Flocculant	75.0	
	Chlorine (Sodium Hypochlorite, gas, HTH) or Chlorine Dioxide	80.0	The chlorination unit is also under construction. The new unit has sufficient storage, metering, and dosing in place and will function well post construction. DWS needs to monitor the final commission of both the flocculation and chlorination units as the temporary structures are not acceptable to TSA requirements and prolonged use could lead to bad quality water
5	**Flocculation**	100.0	Channels are in good condition and free of scum and algae. The was visible flocculation taking place during site inspection
6	**Phase Separation**		
	Clarification (settling)	100.0	The settling tanks is well constructed and in good condition. The launders, weir plates and V-notches were clean and without algal growth. On of the clarifiers bridge was being repaired during the site inspection
	Sand Filtration	77.7	At time of inspection one filter was out of commission for refurbishment. Flow filters are operated at constant level and varying flow rate. The flow distribution to the filters is therefore controlled by the resistance of the filter media. Backwash was every 12 hours and even bubble distribution was overserved during the backwash process. Stand by for the backwash pumps and blowers is a concern
7	**Disinfection**		As construction is still being done to the chlorination unit HTH tables are dropped into the clear water sump. It is assumed based on size of pump and distance to command reservoir that adequate contact time for disinfection is provided for. Grab samples are taken however monitoring equipment was not working during inspection
	Clear water well	62.5	
8	**High Lift Pump Station**	75.0	3 High lift pumps are in place with two operational and one for standby a flow meter is in place on the outgoing line and although being read not evidence was observed of interpretation
9	**Sludge Treatment**		
	Thickening in Sludge Dams	12.5	Sludge dam is overgrown and clearly indicates that no maintenance is being undertaken. No recycling is also taking place
10	**Bulk pipeline from plant to command reservoir**	50.0	Impressions from the PCs and operational staff indicate that pipework is in good condition, no valve inspection was done
11	**Command reservoir**	62.5	The command reservoir is not fenced off and is offsite. Regular inspections are taking place and flow meters in and out are recorded and operational. Structure is a closed concrete reservoir with concrete roof however vandalism is a challenge.
12	**Booster Pump Station**	n/a	
	Total	**64%**	

High risk areas OR Key Hardware Risks/ Defects

1. Improved Administration on all administration and monitoring templates
2. More backup for the backwash and blowers
3. The construction of proper office and dual toilet facilities need to be considered
4. Commissioning of the chlorination and flocculation units
5. Reconstruction of the sludge dams and roads is required.

VROOM Refurbishment Cost Estimate

Civil Works	R1,943,700	66%
Mechanical Works	R564,300	19%
Electrical Works (Incl C&I)	R418,00	14%
Total VROOM Cost	**R2,926,000**	**100%**
R million / MLD		**0.91**

Regulatory Impression

The works staff seems dedicated to their works; however workplace satisfaction can be improved if proper ablution and office facilities are in place. The works is well fenced, however minor grass cutting maintenance is required. The construction of the new chlorination and flocculation units is essential for this works to attain optimal operation. The filters are still in good order, but back-up pumps and standby air blowers need to be considered by the municipality. The calibration and functionality of the flow meters needs to be resolved and the sludge dam needs a complete reconstruction considering its poor present condition. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	80.95%
Chemical Compliance	82.14%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



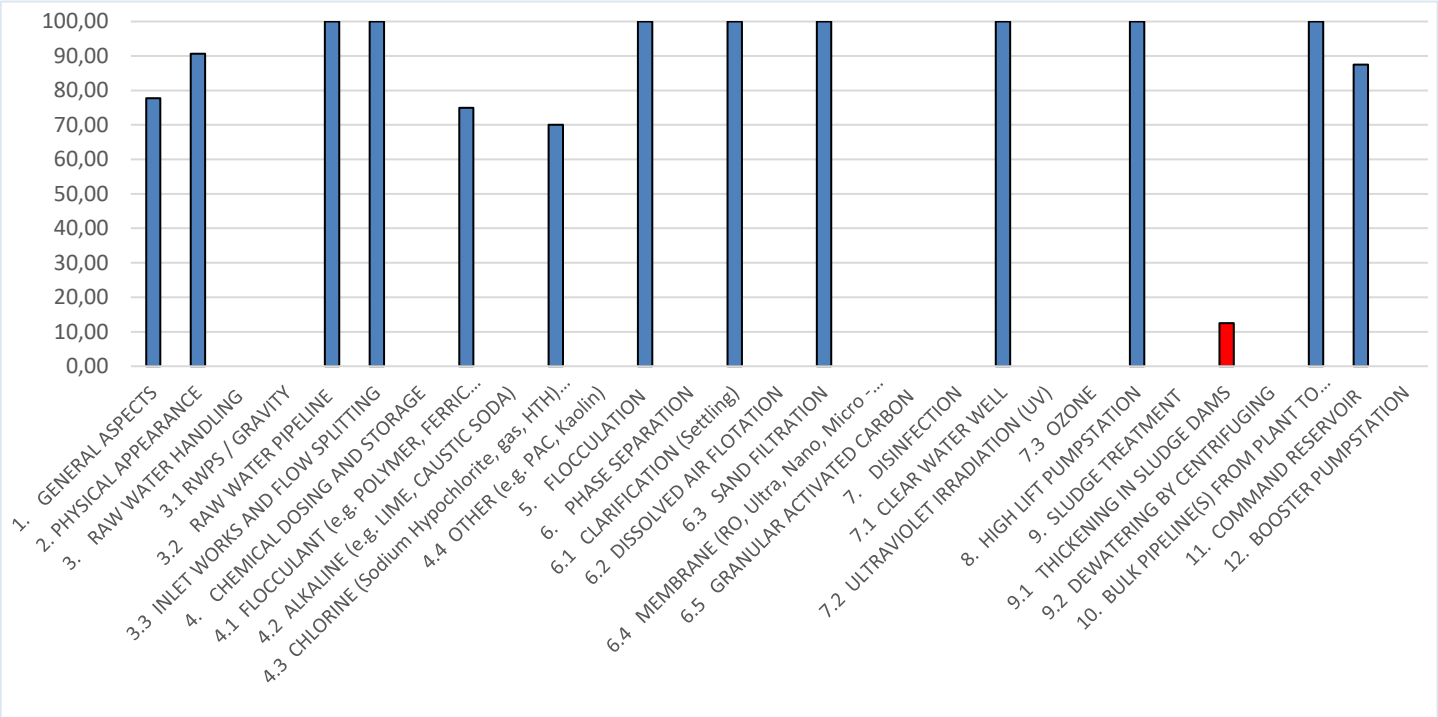

5.4 Buffalo City Metropolitan Municipality

The Nahoon water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

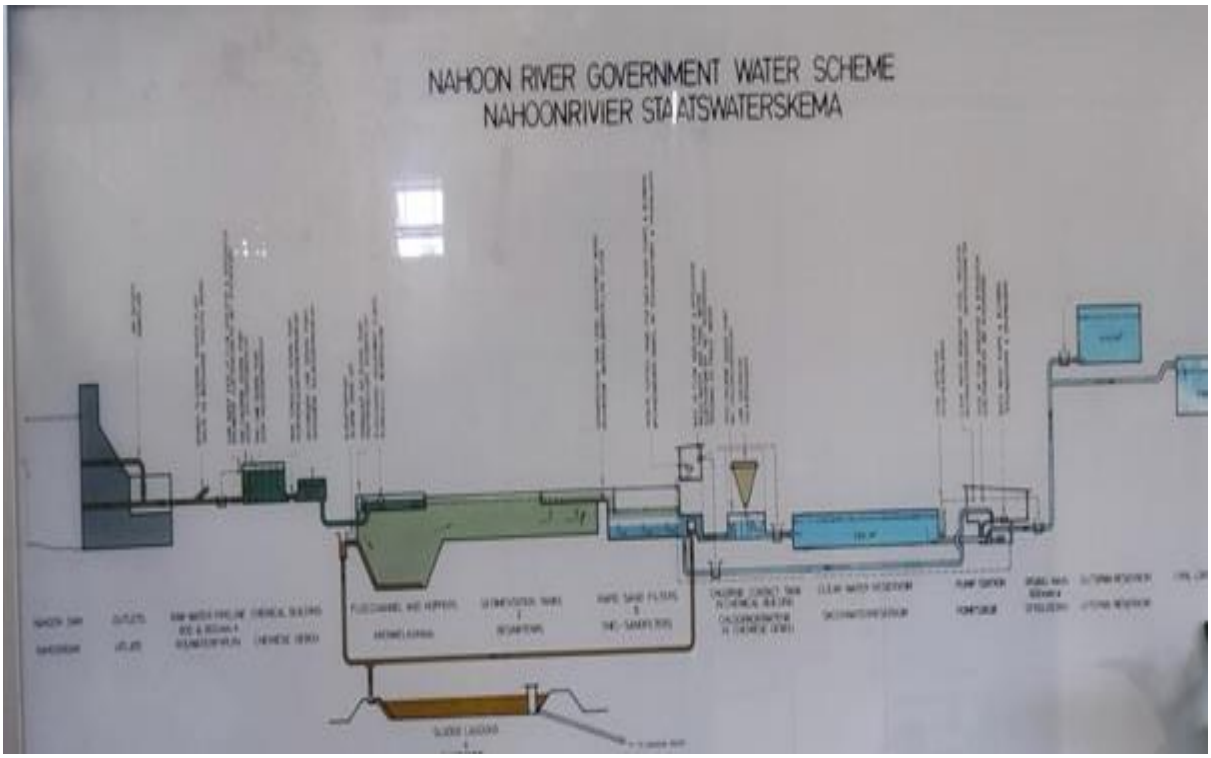
Nahoon WTW TSA Score: 86%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and require urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	77.8	Class C plant, Classification Certificate and PFD. Logbooks up to date. Process monitoring equipment is functional and calibrated.
2	**Physical appearance of plant**	90.6	Plant is fenced, gated and entrance is signposted. Good housekeeping, high workplace satisfaction. No OHS contraventions. Garden maintenance required.
3	**Raw water handling**		
	Raw water pipeline	100	Gravity supply from the Nahoon Dam. Flow meter operational and flow is recorded.
	Inlet works	100	Flocculant dosing operational but system may require refurbishment. Flash mixing sufficient.
4	**Chemical dosing and storage**		
	Flocculant	75.0	Duty and standby dosing systems operational Adequate storage capacity for treatment chemicals in bunded area. Emergency wash station non-operational.
	Chlorine	70.0	Duty/standby chlorine gas dosing units operational with automatic change over. Limited chlorine gas stocks on site due to the national shortage of chlorine gas.
5	**Flocculation**	100.0	Good floc-formation observed, and concrete structure in good condition.
6	**Phase Separation**		
	Clarification (settling)	100.0	Limited floc carry-over, de-sludging twice daily.
	Sand filtration	100.0	Duty/standby pumps and blowers operational, even bubble distribution during backwash, filter sand in good condition.
7	**Disinfection**		
	Clear water well	100.0	Contact time in the 2 ML reservoir >30 minutes, Residual Cl_2 monitoring at reservoir outlet.
8	**High lift pumpstation**	100.0	Duty and standby pump set operational, final flow measured and recorded.
9	**Sludge treatment**		
	Thickening in sludge dams	12.5	Sludge dams poorly maintained; no supernatant recycle.
10	**Bulk pipeline from plant to command reservoir**	100	No leaks detected by process controllers or maintenance team.
11	**Command reservoir**	87.5	Reservoir is secure, telemetry is operational, structure is in good condition.
	Total	**86%**	

High risk areas OR Key Hardware Risks/ Defects

1. Chemical dosing facility to be refurbished
2. Repair leakages on command reservoir
3. Clean sludge ponds.

VROOM Refurbishment Cost Estimate

Civil Works	R716,100	54%
Mechanical Works	R519,200	39%
Electrical Works (Incl C&I)	R90,200	7%
Total VROOM Cost	**R1,325,500**	**100%**
R million / MLD		**0.04**

Regulatory Impression

The Nahoon water system is well maintained, with functional treatment processes and competent staff. Operational monitoring is taking place and abstraction and production flows are recorded. Chlorine stock on site was low at the time of inspection due to a nationwide shortage of chlorine gas. Provision should be made for an alternative disinfectant. Concrete structures are in good condition (except for some leakages at the command reservoir) and mechanical equipment is well maintained. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	82.14%
Chemical Compliance	95.44%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

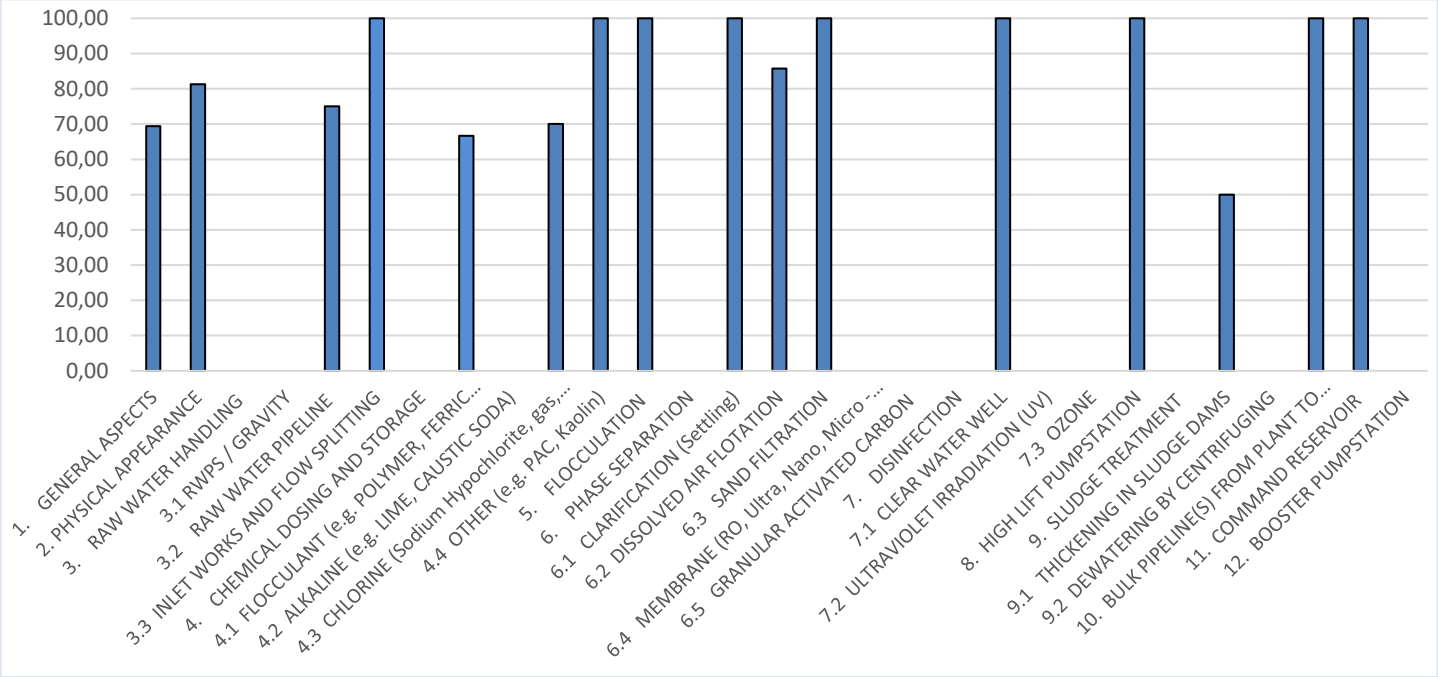



The Umzonyana water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

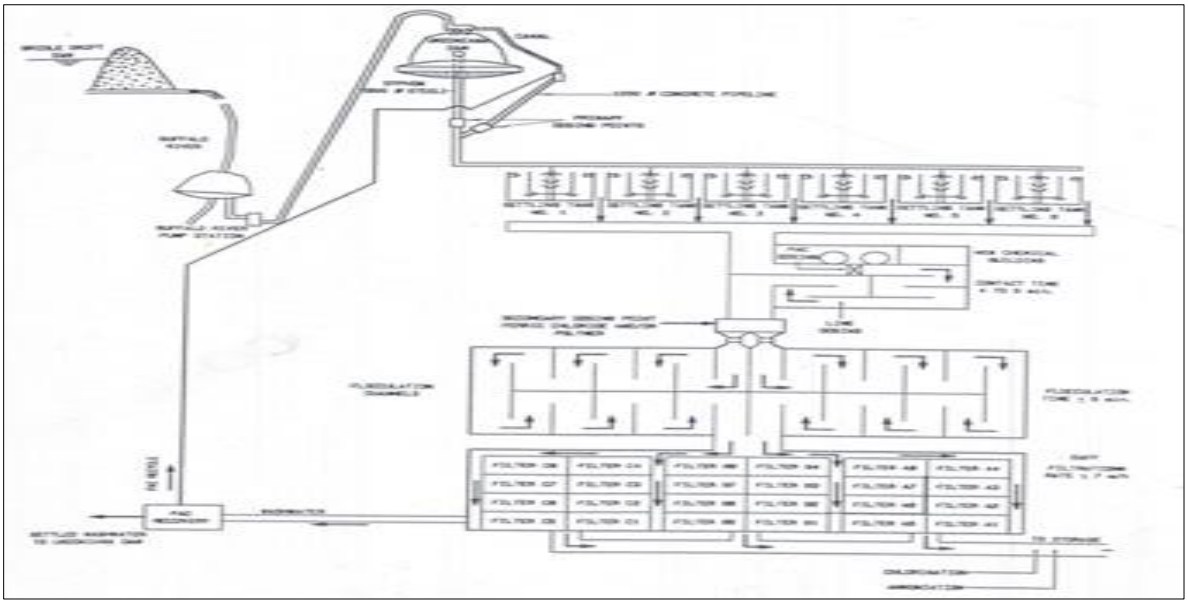
Umzonyana WTW TSA Score: 85%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and require urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	69.4	Class B plant with no classification certificate. PFD in place. Logbooks with daily entries. Process monitoring equipment is functional and calibrated. Electricity consumption not recorded.
2	**Physical appearance of plant**	81	Plant is fenced and gated and under 24-hour camera surveillance. No OHS contraventions. Garden maintenance poor. Tar roads in fair condition. Process controllers satisfied with workplace conditions.
3	**Raw water handling**		
	Raw water pipeline	75.0	Gravity supply from the Umzonyana Dam. No pipe leakages. Flow recorded and plotted on SCADA but not used for process optimisation.
	Inlet works	100.0	Inlet structure is a closed unit. Chemical dosing rates from the bulk storage tanks are monitored via a digital inline flocculent flow meter on an hourly basis. Concrete structure requires minor refurbishment.
4	**Chemical dosing and storage**		
	Flocculant	66.7	Duty and standby flocculant dosing systems operational. Dosing area neat and spillages contained. Adequate storage capacity for treatment chemicals but area not bunded. No emergency wash station.
	Chlorine	70.0	Duty/standby chlorine gas dosing units operational with automatic change over. Limited chlorine gas stock on site due to the national shortage of chlorine gas - HTH used as interim measure.
	Other (PAC, Kaolin, etc.)	100.0	Bentonite dosing facility currently not in operation, but all equipment operational.
5	**Flocculation**	100.0	Good floc-formation observed and concrete structure in good condition.
6	**Phase Separation**		
	Clarification (settling)	100.0	Limited floc carry-over, daily de-sludging. Clarifiers undergoing refurbishment.
	Dissolved air floatation (DAF)	85.7	Duty/standby mechanical equipment operational and process performance visually good. DAF units undergoing refurbishment.
	Sand filtration	100.0	Duty/standby pumps and blowers operational. Even bubble distribution during backwash. Filter sand in good condition.
7	**Disinfection**		
	Clear water well	100.0	Contact time in the pipeline is >30 minutes. Residual Cl_2 monitoring at outlet.
8	**High lift pumpstation**	100.0	Duty and standby pump set operational and well maintained. Final flow measured and recorded.
9	**Sludge treatment**		
	Thickening in sludge dams	50.0	Supernatants recycle operational. Sludge dams operational but require cleaning. Additional sludge dam required.
10	**Bulk pipeline from plant to command reservoir**	100.0	No leaks on the line. Portion of the pipeline adjacent to the reservoir undergoing refurbishment.
11	**Command reservoir**	100.0	Reservoir is secure, telemetry is operational, structure is in good condition.
	Total	**85%**	

High risk areas OR Key Hardware Risks/ Defects

1. Refurbishment of inlet works
2. Refurbishment and upgrade of treatment chemical storage area to include bunding
3. Supply of emergency shower
4. Civil and mechanical refurbishment of clarifiers & DAF units in process
5. Construction of additional sludge dam and cleaning of current dams.

VROOM Refurbishment Cost Estimate

Civil Works	R7,381,000	98%
Mechanical Works	R116,600	2%
Electrical Works (Incl C&I)	-	0%
Total VROOM Cost	**R7,497,600**	**100%**
R million / MLD		**0.06**

Regulatory Impression

The Umzonyana water system is well maintained, with functional treatment processes, and competent staff. Operational monitoring is taking place and inlet- and production flows are recorded. No chlorine gas was available on site at the time of inspection due to a national shortage of chlorine gas, but HTH was being used as an interim measure. Concrete structures are in good condition and mechanical equipment is well maintained. The DAF units and clarifiers are undergoing refurbishment. The inlet structure is a closed unit, but treatment chemical dose rates are monitored via inline meters. Additional sludge management capacity is required, and the existing sludge dams need cleaning. Supernatant from the sludge dams is recycled.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	98.85%
Chemical Compliance	90.18%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



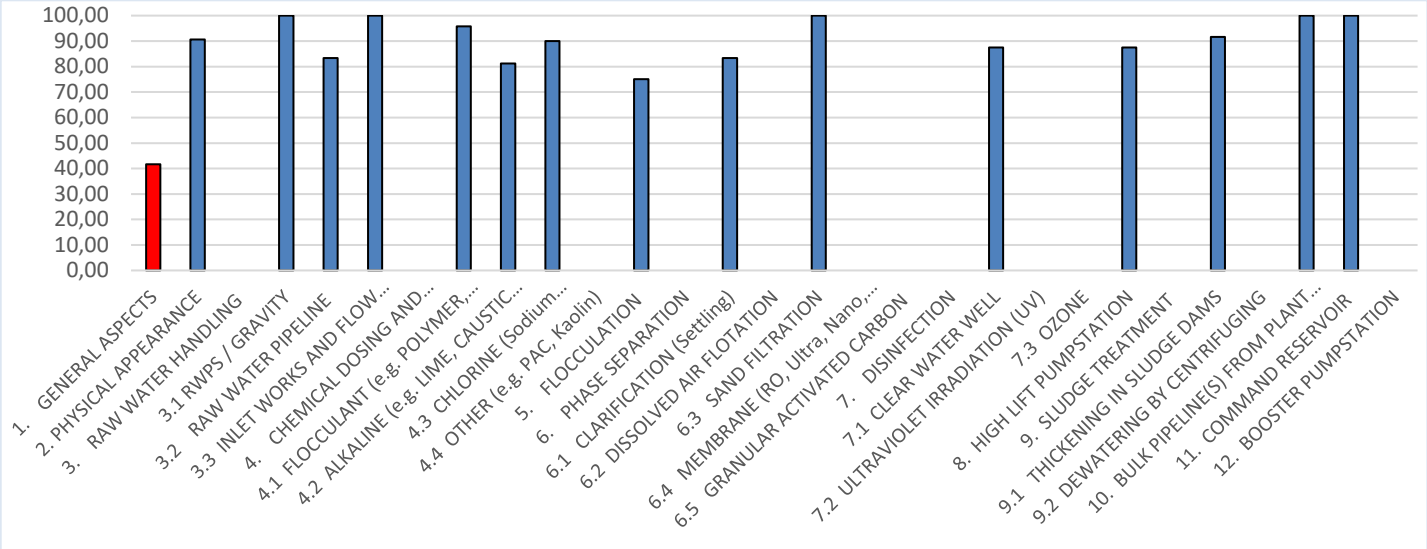

5.5 Chris Hani District Municipality

The Tsomo system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

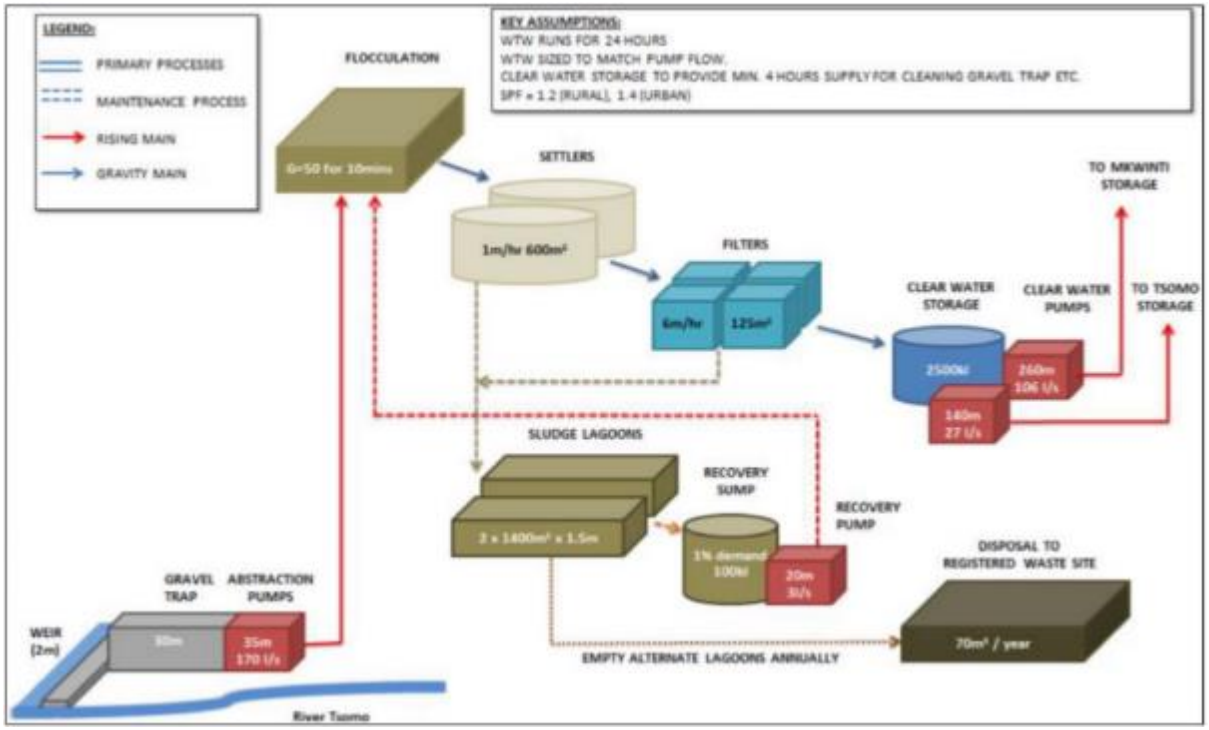
Tsomo Water Treatment Works: 85%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Note: Inspection took place during loadshedding which was in duration for one week at the time of inspection. Observations are based on visual observation, as the works is relatively newly constructed.

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	41.6	Inspection took place during a loadshedding event, and all functionalities could not be observed. However the works has been recently constructed and on visual examination most items are in place. A second visit by DWS is encouraged when the works is fully commissioned and operational. Most of the system is run off the Scada system. Process monitoring equipment is in place, however, again is Scada based. O&M also electronic. So, without the Scada in place the system cannot be managed effectively.
2	**Physical appearance of plant**	90.6	The works is brand new, and the terrain and garden are well kept with paved roads for the delivery of chemicals and other equipment. Evidence of a construction snag list is still noticeable and needs to be completed.
3	**Raw water handling**		Screens are in place and checked. Six raw water pumps in place with 50% standby in place. Sluice gates are also automated. Inflow meters are in place and recorded on the Scada system. No evidence of interpretation could be viewed. The works is designed to operate as two individual works with flocculation, settling and filtration and disinfection taking place. One side of the works can be placed out of commission, and this is based on the flow that the works is receiving. Flow splitting and flocculation can serve both modules with even flow splitting in place.
	Raw water pumpstation / gravity feed	100.0	
	Raw water pipeline	83.3	
	Inlet works	100.0	
4	**Chemical dosing and storage**		ACS 0000 flocculant is used. Two dosing pumps in place and functional. 100% standby is in place. The dosing area is neat, and spillage can be contained with bunded walls in place. There are 2x 20litles tanks of flocculant and both were half full. The available chemical can last for more than 30 days.
	Flocculant	95.8	
	Alkaline (e.g. Lime, Caustic Soda)	81.2	A fully functional lime unit is in place and has 100% standby. The area is well cleaned however the unit is not in process currently. The amount of lime required for 30 days is not known. It is unlikely that the bags around the lime dosing system would hold 30 day's supply.
	Chlorine (Sodium Hypochlorite, gas, HTH) or Chlorine Dioxide	90.0	Chlorine gas used on system. No observation of functioning of dosing system was possible due to power failure. When chlorine gas is not available HTH tablets are placed directly into the clear water well as form of disinfectant. All units seem operational. The national shortage of chlorine is impacting ordering and delivery of gas to the works and alternative actions are being implemented to ensure disinfections take place. HTH tablets.
5	**Flocculation**	75.0	According to process controller flocculation it is good. The design of the channel allows for proper flocculating to take place. The channels are in a very good condition. Minor maintenance is required to keep the non-functional channel clean.
6	**Phase Separation**		
	Clarification (settling)	83.3	Carry over could not be seen because of loadshedding. However, no residue was visible in clarifiers. According to the process controller desludging is done once per day. The frequency should be a function of the amount of sludge produced which will be determined by the turbidity of their raw water. The weirs / discharge holes are in good condition allowing for even overflow.
	Sand Filtration	100.0	Three backwash pumps are in place and two air blowers with 100% standby. Due to loadshedding backwashing was not visible however infrastructure in place indicates that this can be achieved from both sides of the works. Filter media is also new, so no visible cracking is visible. Note again the working process could not be observed.
7	**Disinfection**		Approximate capacity of clean water reservoir which equates some 60 minutes contact time at a treated water volume. Chlorine is dosed at the clear water wells then to the reservoir and measured at the tank about 35m away by inline and manual monitoring.
	Clear water well	87.5	
8	**High Lift Pump Station**	87.5	Two pumps set of two pumps each are installed. In each set the pump with larger capacity feeds the high lying areas via reservoirs while the smaller pumps supply the town. Backup and flow monitoring is in place.
9	**Sludge Treatment**		
	Thickening in Sludge Dams	91.6	The sludge from settling tanks is discharged into two concrete lined sludge collecting dams. Minor maintenance required. Recycling of the sludge water gets pumped to the flocculation channels again. Sludge is carried by contractor trucks to the landfill site.
10	**Bulk pipeline from plant to command reservoir**	100.0	Pipework is new and the impression from the process controller is that they are still in good condition.
11	**Command reservoir**	100.0	A command concrete reservoir is in place within the works. Flow metering is in place and monitored on the Scada system.
12	**Booster Pump Station**	n/a	
	Total	**85%**	

High risk areas OR Key Hardware Risks/ Defects

1. Proper generators need to be looked at to minimally run the works during loadshedding
2. Administration of the Scada system needs more interpretation and analysis to assist the operation of the works- this also needs a standby function
3. Signage could be improved in certain areas and construction snag list completed.

VROOM Refurbishment Cost Estimate

Civil Works	R743,600	89%
Mechanical Works	R55,000	7%
Electrical Works (Incl C&I)	R38,500	5%
Total VROOM Cost	**R837,100**	**100%**
R million / MLD		**0.03**

Regulatory Impression

This works appears to be well constructed, however the inspection team could not view the works in operation, due to loadshedding for five consecutive days for 24 hours at a time. Also, the challenges started to overflow into the communities that were organising strike action during the time of our inspection. The works itself has got a highly functional SCADA system that can control most aspects on the works. The challenge is when the power goes off the works stands still. Nothing is operational and this is a challenge not only in this province. There are small standby generators in place however the municipality needs to look at alternative standby solutions. I am confident that if the power was on the works would have scored higher in their TSA. Being relatively new the works has the latest technology to produce high quality of water. Again, the works appeared well run from a purely visual perspective as operations could not be audited. It is proposed that DWS review this works in the short-term future again and examine the operation in terms of producing SANS 241 water.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	91.07%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



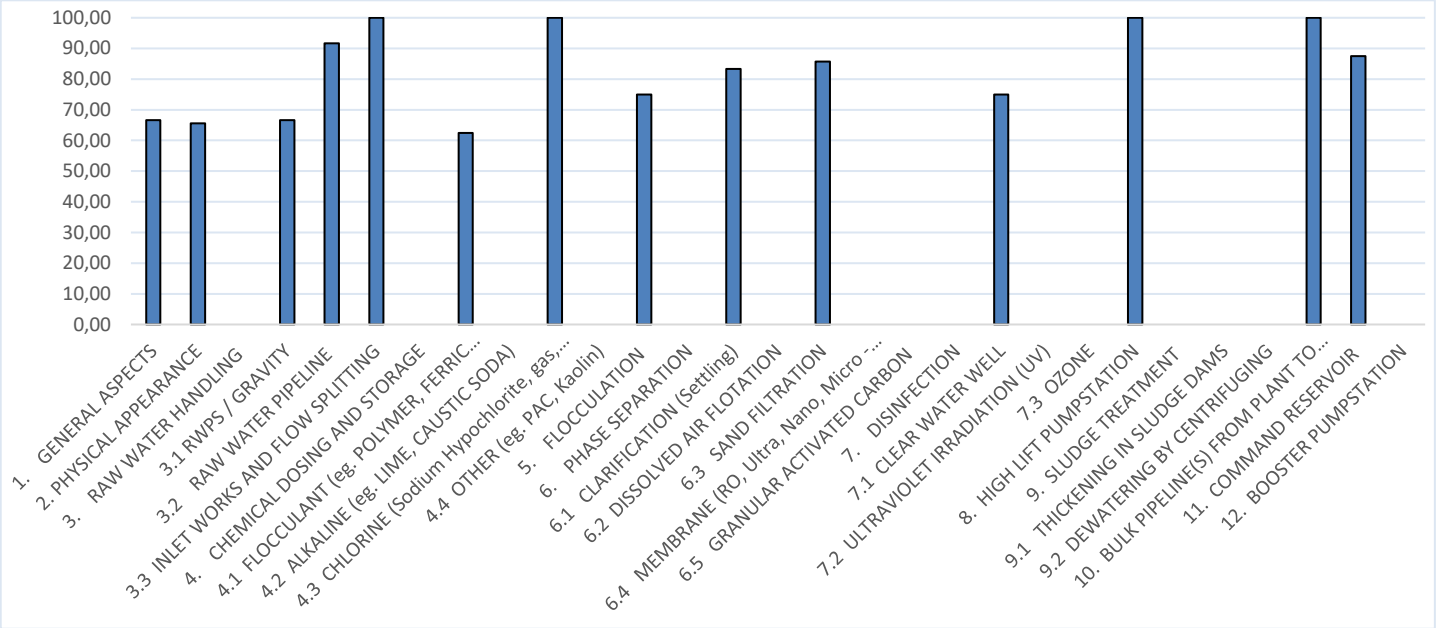

5.6 Dr Beyers Naude Local Municipality

The Graaf Reinet water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

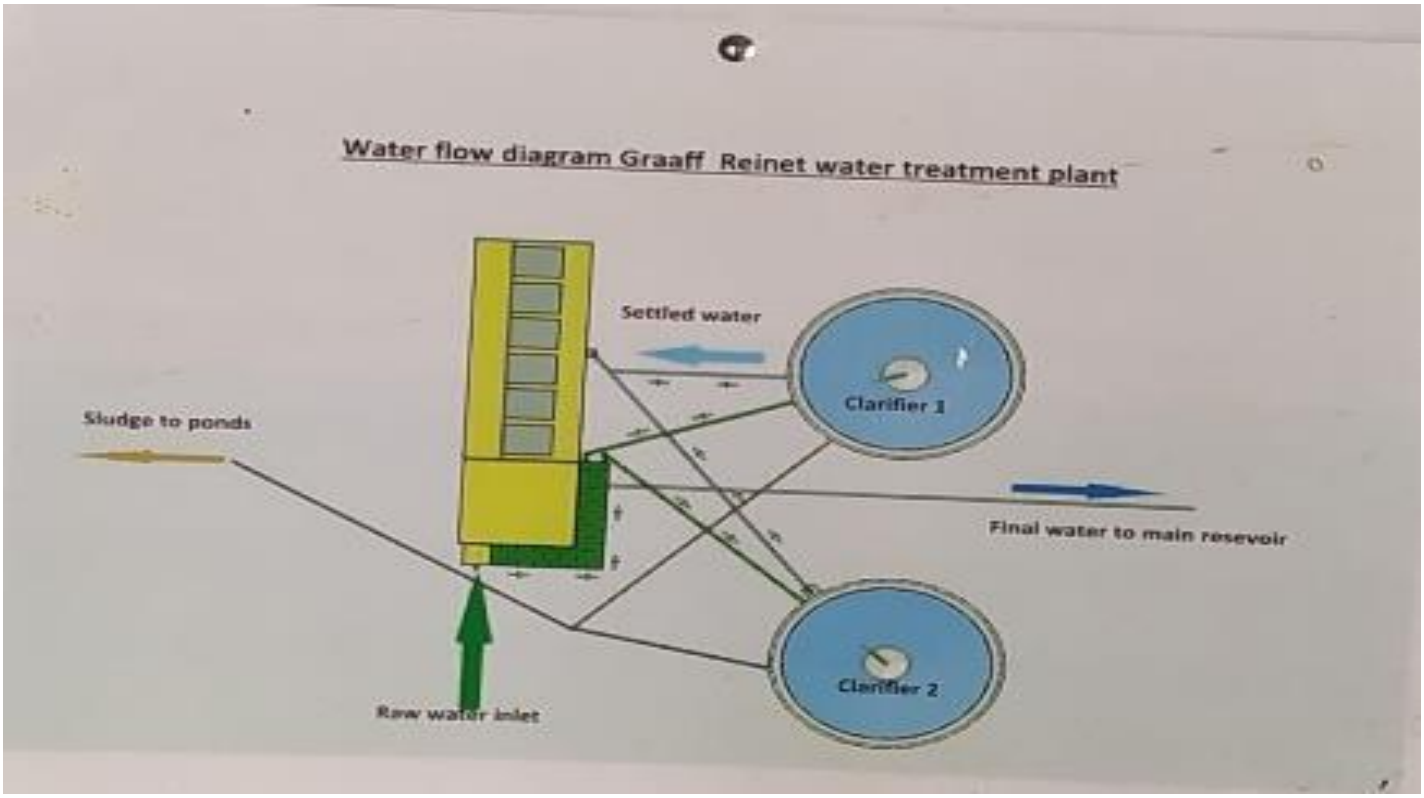
Graaf Reinet TSA Score: 80%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	66.6	Class B plant, maintenance and repairs are captured on the Job Card system, daily operations logbook is in place with relevant entries, Operations and maintenance manual was available. A notice board was available and included flow conversions. Limited signage at the entrance was noted, with only the plant name on the gate
2	**Physical appearance**	65.6	The facility was fenced, however the gate at the reservoir facility was stolen. Minor housekeeping such as grass cutting was required. Worker's facilities were in a good condition. It was noted that animals such as cows are accessing the works as cow dung was observed.
3	**Raw water handling**		
3.1	Gravity	66.6	No Screens are in place at the raw water inlet. All pumps are working, 3 x pumps installed with one working on a standby
3.2	Raw water pipeline	91.6	The process controllers indicated that the raw water pipeline was still in a very good condition. There is an electronic meter at the dam wall and the manually at the plant by using measurement stick.
3.3	Inlet works and flow splitting	100.0	Even flow splitting is in place, however due to loadshedding the audit team could not observe this process. Flash mixing is in place and turbulent conditions can be achieved.
4	**Chemical dosing and storage**		
4.1	Flocculant (e.g. polymer, ferric chloride, alum)	62.5	Dosing area is neat, and no spillages were noted, however in the event of a spillage chemicals cannot be contained as there is no bund wall around the doing facility. 45 days stock was available during the site visit i.e. 6 tonnes is kept on site
4.3	Chlorine (sodium hypochlorite, gas, HTH) or chlorine dioxide)	100.0	HTH granular is dosed, Safety equipment is available and a working alarm. 2 x dosing pumps with a swich over device are in place, the pumps alternate, as soon as one pump starts, the other one stops and act as a standby.
5	**Flocculation**	75.0	This processed could not be observed due to load shedding and no back up power on site. Algae was noted on the floor of the zig-zag channel
6	**Phase separation**		
6.1	Clarification (settling)	83.3	Limited floc carry over, but some algal growth was noted at the weirs. Regular de-sludging since it is a fully automatic system, it desludges after rotating for 45 minutes
6.3	Sand filtration	87.7	Backwash pumps are in working condition, however three were offline during the site visit for maintenance. All blowers are in working order, and are operated on a 7-day cycle and then alternated
7	**Disinfection**		
7.1	Clear water well	75.0	Contact time is limited to 15-minutes. Samples for chlorine analysis are collected from the tap as pictured and tested on site. The tap is allowed to run for 2-minutes before the sample is collected
8	**High lift pumpstation**	100.0	All pumps are working and are operated on a 1 x duty pump and 1 x standby pump basis and alternate daily.
10	**Bulk pipeline(s) from plant to command reservoir(s)**	100.0	A new pipeline is in place is <1 year old. Valve chamber is inspected by Process controllers
11	**Command reservoir**	87.5	The reservoir was fenced however there was no gate as it was stolen. Telemetry is in place and operational at the command reservoir. The structure was in excellent condition and could not be accessed by birds
	Total	**80%**	

High risk areas OR Key Hardware Risks/ Defects

1. Bund wall for chemicals is not installed
2. On site flow meter needs to be installed
3. Generator set is required as the works cannot operate during load shedding
4. Sand filters needed repairs.

VROOM Refurbishment Cost Estimate

Civil Works	R95,700	6%
Mechanical Works	-	0%
Electrical Works (Incl. C&I)	R1,559,800	94%
Total VROOM Cost	**R1,655,500**	**100%**
R million / MLD		**0.10**

Regulatory Impression

The Graaf Reinet water system is well maintained, with functional treatment processes, and competent staff. The chemical storage area was not bunded and as such in the event of a chemical spills could not be contained. During periods of loadshedding all process cease as there is no back-up power supply. There is no risk management plan in place.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro, but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	97.96%
Chemical Compliance	87.14%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



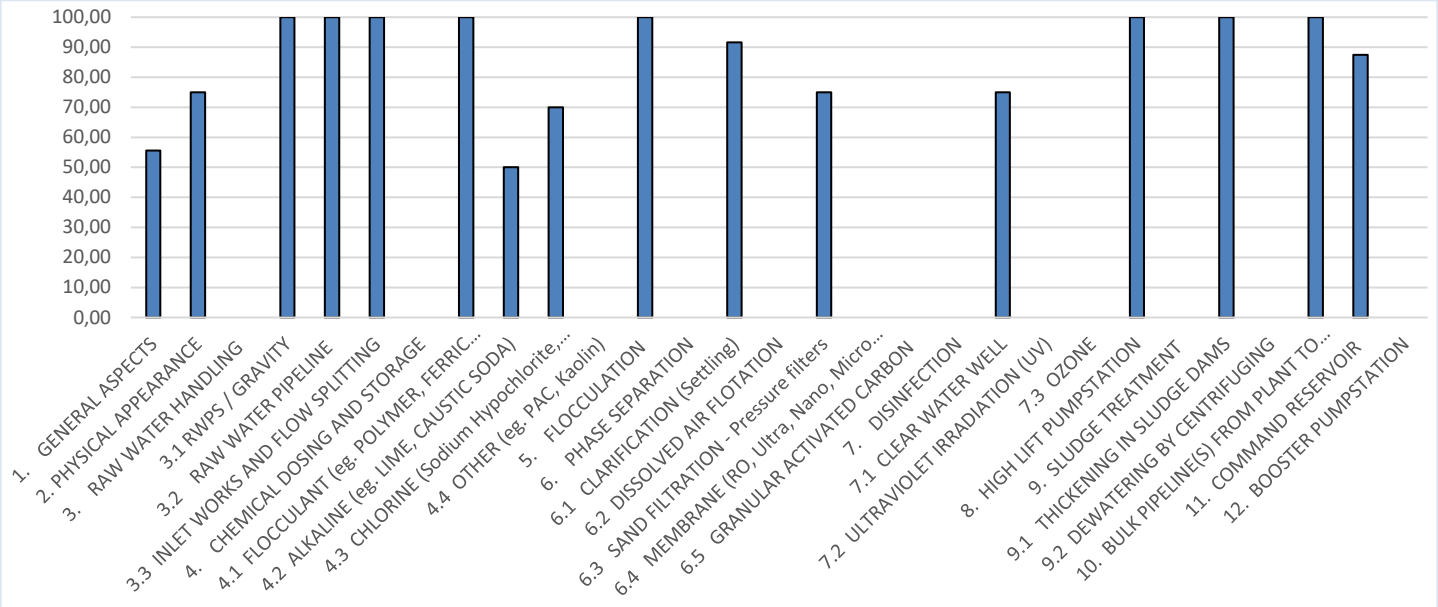

5.7 Joe Gqabi District Municipality

The Barkley East water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

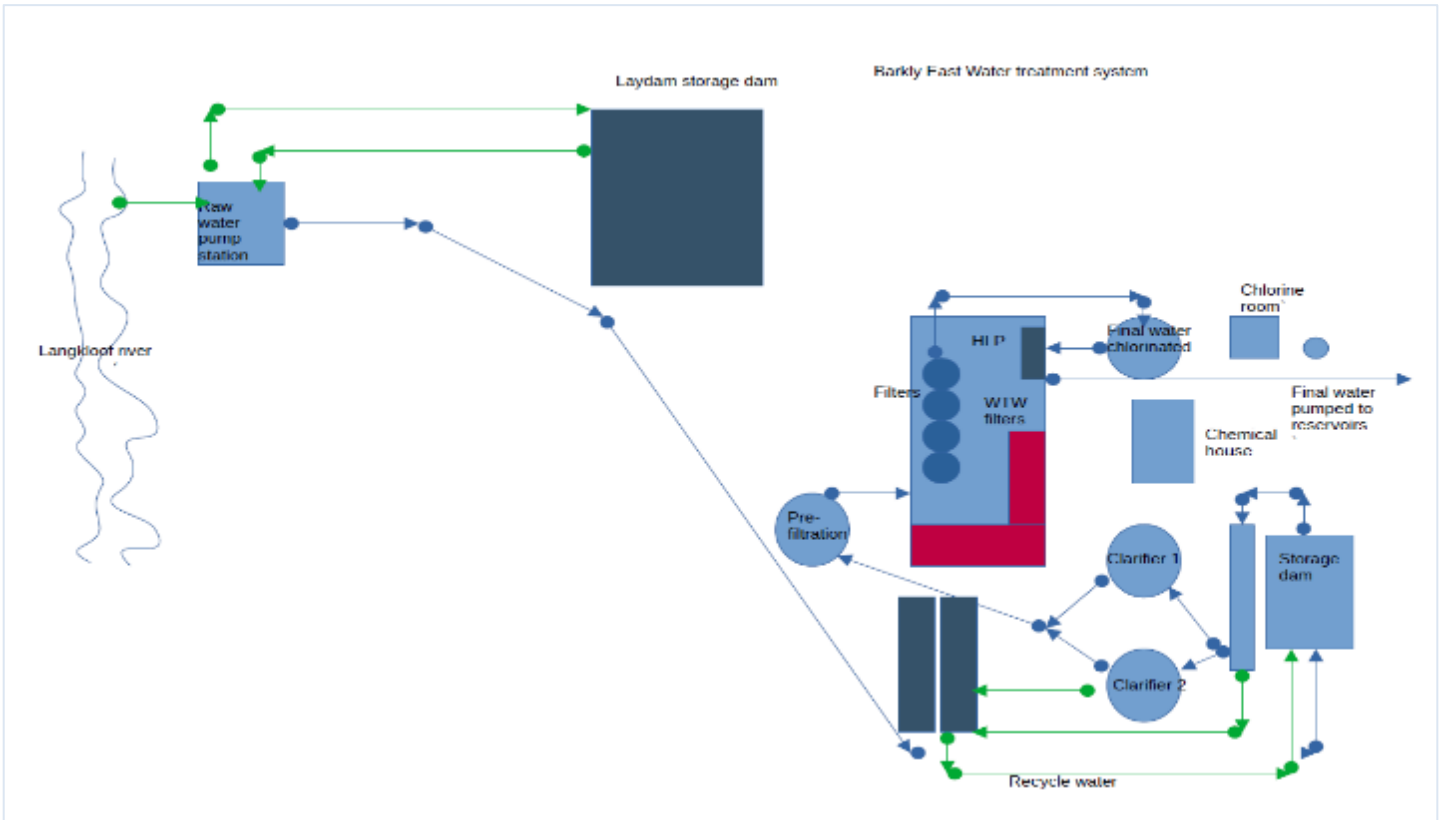
Barkley East TSA Score: 83%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	55.5	Class C plant, logbooks in place and maintenance and repairs are captured using job cards, no notice board was in place displayed
2	**Physical appearance**	75.0	Entrance has a sign with the name of the WTW and included some safety information. Some minor housekeeping such as grass cutting was required. Roads require some maintenance as it is basically a dirt road with a high prevalence of potholes, however delivery vehicles can still reach the site with minimum difficulty
3	**Raw water handling**		
3.1	Rwps / gravity	100.0	Screens are in place and regularly cleaned. Yes, there are three pumps in place and operate with 1 x duty pump, 2 x standby pumps
3.2	Raw water pipeline	100.0	Very good condition as it was <1 year old. A flow meter is in place at the abstraction point and is in working order. Flow is recorded every 2-hours and is interpreted
3.3	Inlet works and flow splitting	100.0	Even flow splitting is in place Flash mixing is in place and turbulent conditions can be achieved. Chemical dosing can be monitored at the inlet
4	**Chemical dosing and storage**		Duty and standby pump set in good condition, no spill control at flocculant, wash station is available.
4.1	Flocculant (e.g. polymer, ferric chloride, alum)	100.0	Dosing pumps are in working condition, U3800 Polymer is used for flocculation purposes. There are 4 pumps 2 x duty pump and 2x standby pump. Pumps are alternated weekly. Dosing area is neat, and spillages can be contained. The site can store 10 tonnes available in stock which equates to 3x months' supply. However, only 2xmonths stock was available
4.2	Alkaline (e.g. lime, caustic soda)	50.0	This process was in place but was not yet online
4.3	Chlorine (sodium hypochlorite, gas, HTH) or chlorine dioxide)	70.0	2 x dosing pumps with a switch over device are in place, however the switch over device is not functional as one the scales needed to be repaired at the time of the site visit. 7kg x 2 used at a time and 10 bottles are kept on site i.e. 2 to 3 weeks supply depending on dosing requirements
5	**Flocculation**	100.0	Visible floc was observed during the site visit, and the process is working optimally
6	**Phase separation**		
6.1	Clarification (settling)	91.6	Limited floc carryover, Desludging is done twice a day at the start of each shift i.e. 7:30am and 5:45pm, and weirs are in a good condition
6.3	Sand filtration	75.0	Backwash pumps are in working condition, but no backwash standby pumps in place. Pressure filters are in working order, with flow splitting monitored using pressure gauges.
7	**Disinfection**		
7.1	Clear water well	75.0	Contact time is 15-minutes. Manual tests are done, samples are collected from the well and tested on site
8	**High lift pumpstation**	100.0	All pumps are working and operate on a 1 x duty pump and 1 x standby pump basis and alternate daily
9	**Sludge treatment**		
9.1	Thickening in sludge dams	100.0	3 x Sludge drying beds are in place and were emptied in December 2022.
10	**Bulk pipeline(s) from plant to command reservoir(s)**	100.0	A new pipeline is in place is <1 year old, and the valve chamber is inspected by Process controllers
11	**Command reservoir**	87.5	The reservoir was not fenced as it was stolen the previous year. Telemetry is in place and operational at the command reservoir. The structure was in excellent condition and could not be accessed by birds
	Total	**83%**	

High risk areas OR Key Hardware Risks/ Defects

1. Vandalism issues were noted
2. Electricity meter needs to be rewired as it not compliant with quality workmanship
3. Chlorine scale needs to be replaced
4. Emergency wash shower and basin pipe needs to be fixed as it was turned off at the valve due to pipe leakage.

VROOM Refurbishment Cost Estimate

Civil Works	R298,100	7%
Mechanical Works	R3,709,200	85%
Electrical Works (Incl C&I)	R372,900	9%
Total VROOM Cost	**R4,380,200**	**100%**
R million / MLD		**0.91**

Regulatory Impression

The Barkley East water system is well maintained and was recently refurbished. Issues of vandalism have recently become a problem with fencing around the reservoirs stolen and equipment in valve chambers being at risk of theft and vandalism. Access roads may be problematic, as it is a dirt road and potholes are prevalent. An outdated risk management plan is in place. Both the chemical quality and microbiological quality does not meet SANS 241 standards.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	95.20%
Chemical Compliance	96.25%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



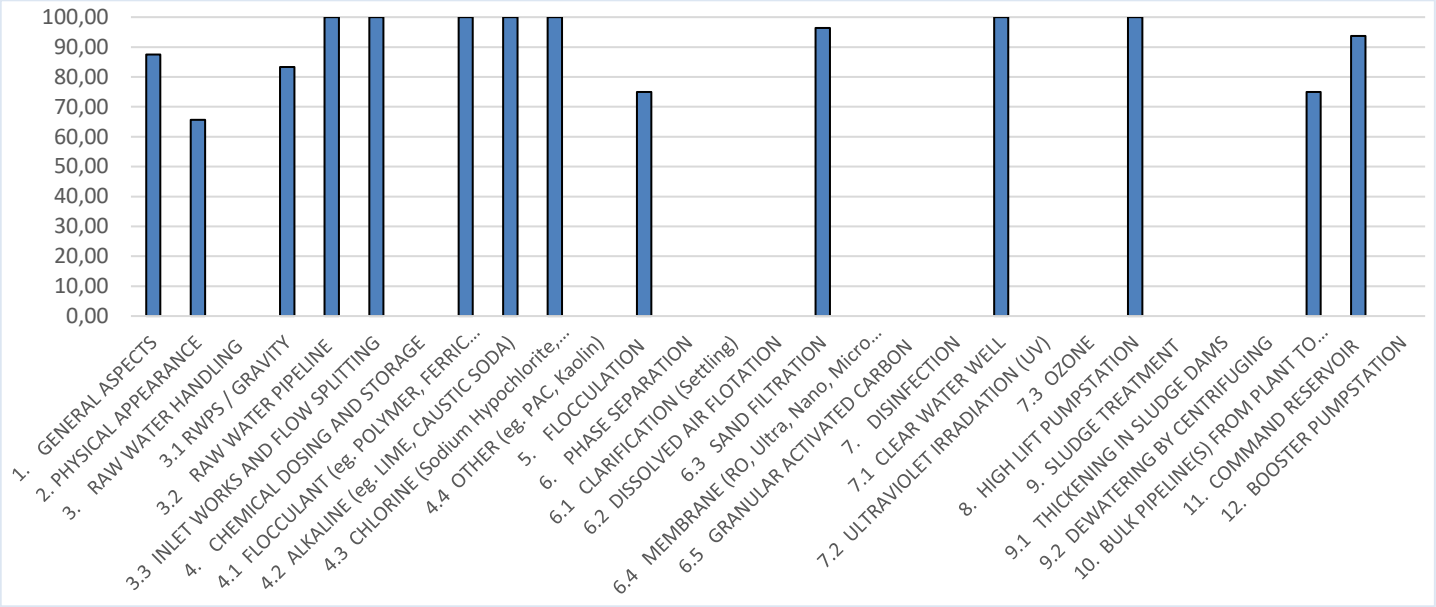

5.8 Kouga Local Municipality

The Jeffreys Bay Water Treatment Works system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

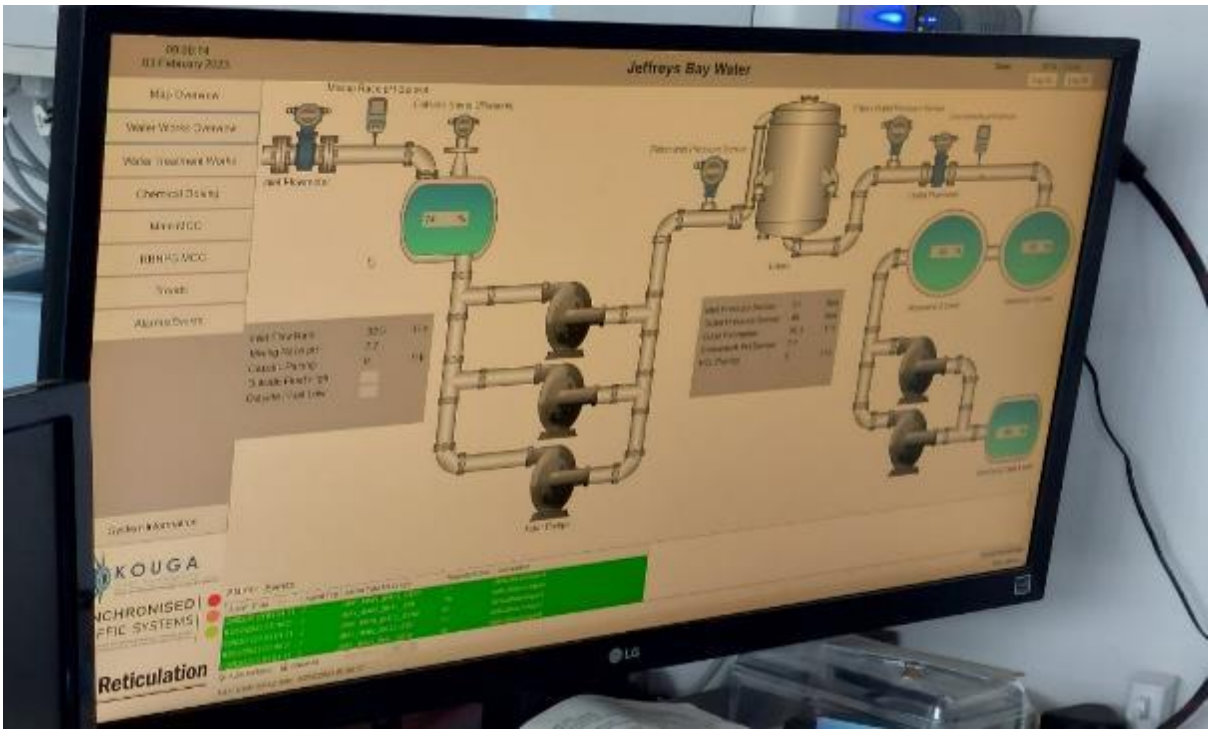
Jeffreys Bay Water Treatment Works: 91%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Note: Jeffreys Bay runs most of its administration systems through Scada - PFD is displayed on the wall as well

Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	87.5	The Jeffreys Bay WTW has good administration in place both on paper and on Scada. It is noted that a secondary pilot plant water purification process where the iron and manganese is removed from the water is being tested in a 6 Ml/d plant. Based on preliminary results it would be possible to incorporate this plant into the existing plant and increase the design capacity to 10 Ml/d.
2	**Physical appearance of plant**	65.6	The works itself is well fenced off with paving and enough area for circle turning and delivery of chemicals and other required equipment for the site. The works is not sign posted and the road leading to the works is a gravel road that could use attention if large vehicles need to reach the site. Also, the construction of the new works has left construction debris around the site which needs removal
3	**Raw water handling**		Screens are in place; this could not be assessed but it is reported to be cleaned. Raw water from Boreholes abstracted from all areas (8 boreholes operated) monitored on the telemetric system. All pumps are operational however not all boreholes are in operation. A total of 8 are operational and some are not being used to replenish ground water levels. Boreholes yield is 55kl/s. Flow meters are in place but need to be calibrated. Single flow channel in the inlet where floc can be added which then creates even split through the maize walls
	Raw water pumpstation / gravity feed	83.3	
	Raw water pipeline	100.0	
	Inlet works	100.0	
4	**Chemical dosing and storage**		Poly-aluminium being used, and sufficient storage is available and used as required and as per Scada monitoring analysis
	Flocculant	100.0	
	Alkaline (e.g. Caustic Soda)	100.0	Sodium hydroxide/Caustic Soda is used to increase the pH to precipitate iron and manganese. The storage volume is sufficient for 30 days' consumption. Addition supply in a 1000l tank available
	Chlorine (Sodium Hypochlorite, gas, HTH) or Chlorine Dioxide	100.0	Disinfection is done with chorine gas. All back systems, switch over and scales are in place as well as safety equipment. Signage to this unit is well done and is an example of a good functioning system. All safety equipment and shower units are in place
5	**Flocculation**	75.0	No flocculation was done at this time however the channels are in good condition and inducive to proper mixing and floc formation
6	**Phase Separation**		
	Clarification (settling)	n/a	
	Sand Filtration	96.4	Five pressure filters are installed. Two back wash pumps are installed and in working condition and interchangeable. 1 standby, 1 operating and another on standby. 100 % standby backwash pumps available. Three air blowers. One in use, one out for repair and one on standby. The Filters are enclosed however the system allows for even flow to the units based on the pipework
7	**Disinfection**		Chlorine is dosed at the entry of the clear water wells. Flows through reservoir and then measured at the end of the tank, just before being pumped away to command reservoir
	Clear water well	100.0	
8	**High Lift Pump Station**	100.0	Two Pumps are in place however these pumps to an elevated reservoir so cannot be considered as a complete high lift pump station. One operational one standby
9	**Sludge Treatment**		
	Thickening in Sludge Dams	n/a	No sludge dam in place and recycled water is returned to the works and sludge is deposited on an adjacent field
10	**Bulk pipeline from plant to command reservoir**	75.0	Bulk lines are in good condition according to the process controllers. Additional lines are being added by the pilot study. Valve chamber in good condition however needs to be covered
11	**Command reservoir**	93.7	Two reservoirs and elevated tank are fenced in the works and are secure and is monitored and operated by the Scada system. Flow meters are in place and monitored and analysed
12	**Booster Pump Station**	n/a	None
	Total	**91%**	

High risk areas OR Key Hardware Risks/ Defects

1. Commissioning of the pilot project to add 6Ml and closing of open pipe trenches which were left open during testing phase.
2. Repair to backwash systems and possible alternative solution to back up systems, especially on the air blowers.
3. Site at reservoirs to be cleared and landscaped post construction.

VROOM Refurbishment Cost Estimate

Civil Works	R1,039,500	48%
Mechanical Works	R745,800	35%
Electrical Works (Incl C&I)	R360,800	17%
Total VROOM Cost	**R2,146,100**	**100%**
R million / MLD		**0.48**

Regulatory Impression

Officials at Kouga are extremely dedicated to the operation and supply of safe drinking water. We even continued audits when loadshedding occurred. They were open to their challenges and relationships with Nelson Mandela Bay Municipality. In terms of the works itself there is pride in the officials as they want to show the inspectors all the works and took time to discuss each unit process. Even the manager Haroon Prins was available to answer questions especially surrounding the pilot site and the inspectors even got to experience the pilot site with the contractor themselves. The enlarging of the design capacity of this works can change how water is distributed within the Kouga area. The inspectors were very impressed by not only the welcome and participation received by the head of department and political officials but also the officials want to learn how they can improve their operation to achieve Blue Drop.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	99.90%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



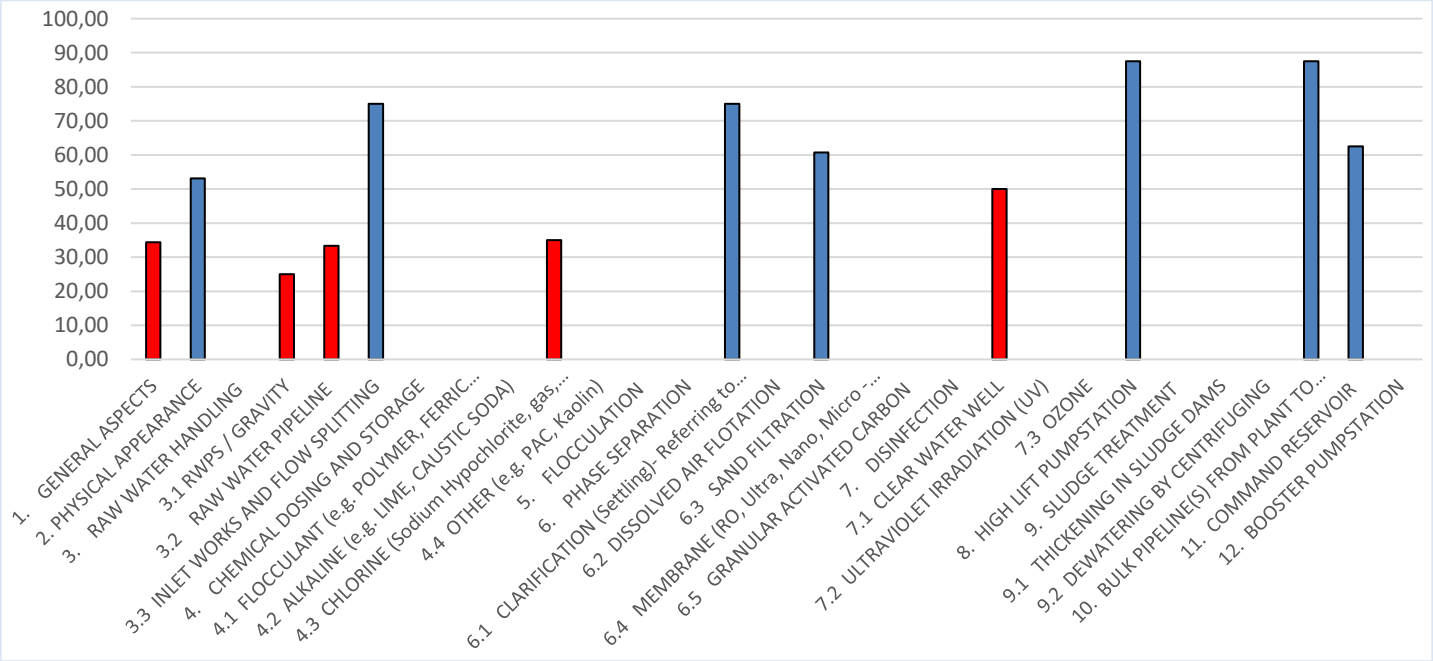

5.9 Koukamma Local Municipality

The Kareedouw water supply system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

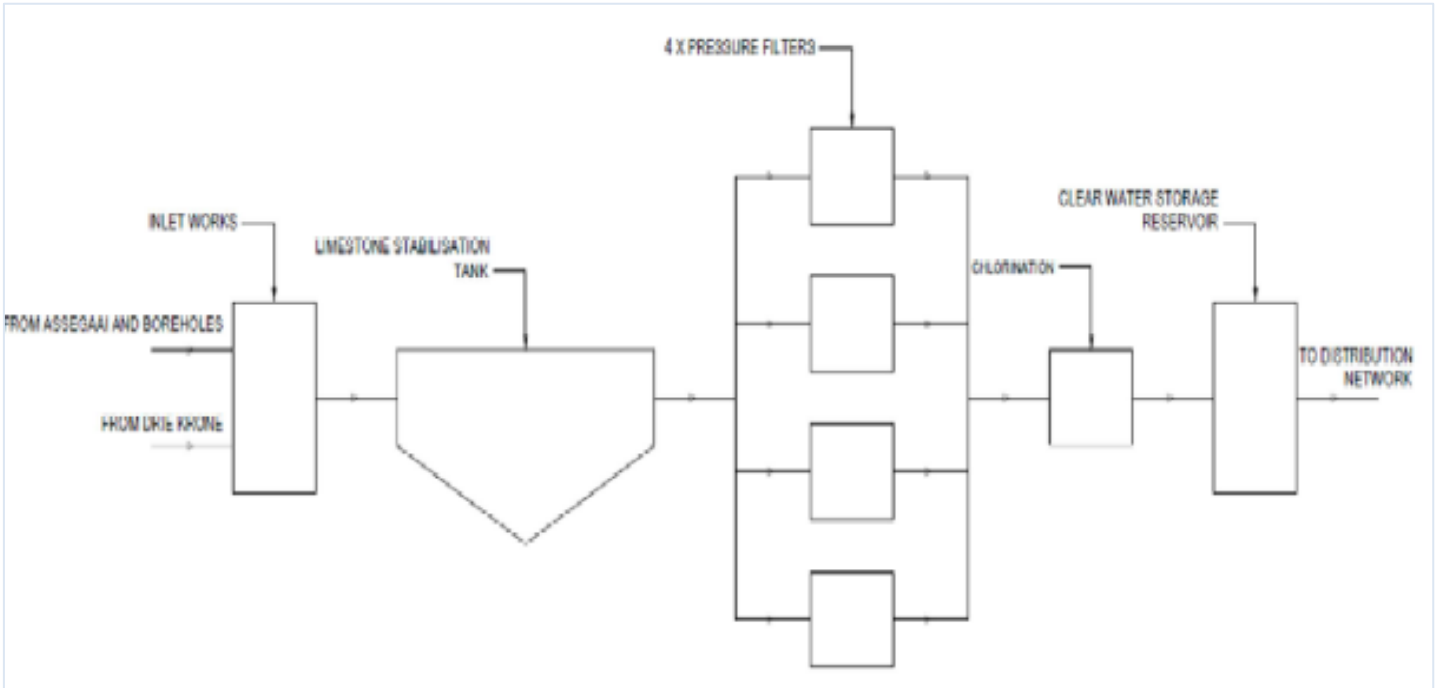
Kareedouw Water Treatment Works: 50%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	34.3	This is a major concern as most administration not in place of being recorded even operational monitoring. O&M manuals and other related documents are still at the main office and no logbook is in place to check the works activities
2	**Physical appearance of plant**	53.1	Although the terrain is clear there are no formal road in place for delivery. There is one toilet that serves as a storage area and office space is limited and used for storage as well. The works is however well fenced off but with no entrance sign post.
3	**Raw water handling**		Raw water is a combination of Gravity and Borehole pumps of 4, could not be viewed during site inspection. Screens are in place however not observed during site inspection and PC does not know when last these were cleaned. No backup is in place for the boreholes. Raw water pipe network seem well protected and in good condition. Flow meters are in place but not operational.
	Raw water pumpstation / gravity feed	25.0	
	Raw water pipeline	33.3	
	Inlet works	75.0	
4	**Chemical dosing and storage**		No Flocculation is taking place. A full process audit needs to be conducted to determine whether lime stabilisation and other chemical dosing is required
	Flocculant	n/a	
	Chlorine (Sodium Hypochlorite, gas, HTH) or Chlorine Dioxide	35.0	Chlorine gas dosing has been stopped some 10 months ago due to a chlorine leak on the dosing system. Dosing equipment is in place but not in use. The infrastructure is still in good condition. Only HTH and HTH Tablets are being used at present therefore the minimum storage cannot be calculated because of ad hoc dosing
5	**Flocculation**	n/a	
6	**Phase Separation**		
	Clarification (settling)	75.0	Clarification is taking place and the weirs are in good condition with minimum algae growth present the water is clear at this point already which indicates the quality of the raw water
	Sand Filtration	60.7	There are 4 inline pressure filters in place with backwash in place from the overhead reservoir. Only one backwash pump in place. Also, although the MCC board show two blowers there is only one in place. These units are sealed tanks however the design and pipework indicate that even flow can be achieved.
7	**Disinfection**		Approximate capacity of clean water reservoir where chlorine is dosed equates to some 60 minutes contact time. Free Chlorine is not measured
	Clear water well	50.0	
8	**High Lift Pump Station**	87.5	Two Pumps are in place with one running and one standby. The flow meter here is in operation and although recorded, results are not interpreted
9	**Sludge Treatment**		
	Thickening in Sludge Dams	0.0	Sludge dams need major attention and reconstruction. The dams are fully overgrown and should be made into concrete lined dams as sludge water is being emptied into open field outside the works as well. No recycling is taking place
10	**Bulk pipeline from plant to command reservoir**	87.5	Impressions from officials is that the bulk line are in good condition and valves seem in good condition however need more regular maintenance
11	**Command reservoir**	62.5	There are two reservoirs in place and concrete reservoir with concrete roof and rectangle reservoir with tile roof. Both are fenced within the works. Flow measurement is in place however there is a leak on the rectangle reservoir. This seems to be the case for some time and PC indicated that he is waiting for repairs to take place
12	**Booster Pump Station**	n/a	None
	Total	**50%**	

High risk areas OR Key Hardware Risks/ Defects

1. Chlorination unit be repaired and fully operational
2. Back up and standby for all pumps is crucial
3. Sludge bed reconstruction
4. Leakage at rectangle command reservoir to be fixed
5. Full Process audit is required.

VROOM Refurbishment Cost Estimate

Civil Works	R1,195,700	46%
Mechanical Works	R862,400	33%
Electrical Works (Incl C&I)	R537,900	21%
Total VROOM Cost	**R2,596,000**	**100%**
R million / MLD		**1.08**

Regulatory Impression

This works has the required infrastructure to deliver good quality water. However due to process units not functioning, no flocculation/lime stabilisation, improper chlorination, and lack of monitoring of any kind, the works relies on visual aspects only. Chlorine is dosed in an ad hoc manner and with little administration in place management or PCs are not sure that the works is functioning. The raw water seems to be of a good quality however the works is basically running on unit processes that work and relying on the pressure filters to do most of the purification. The recently appointed manager of Bramwill Prinsloo is aware of these challenges and is trying to systematically rectify them. Bramwill showed that he is dedicated to improving the water operations in Kou-Kamma and even travelled to the airport to deliver on information requested from the inspectors as connectivity is virtually non-existent and IRIS is a major issue for them. The works observed needs a full process audit to determine how to optimally manage the works and identify items that can be fixed in the short to medium term.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro, but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	80.00%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



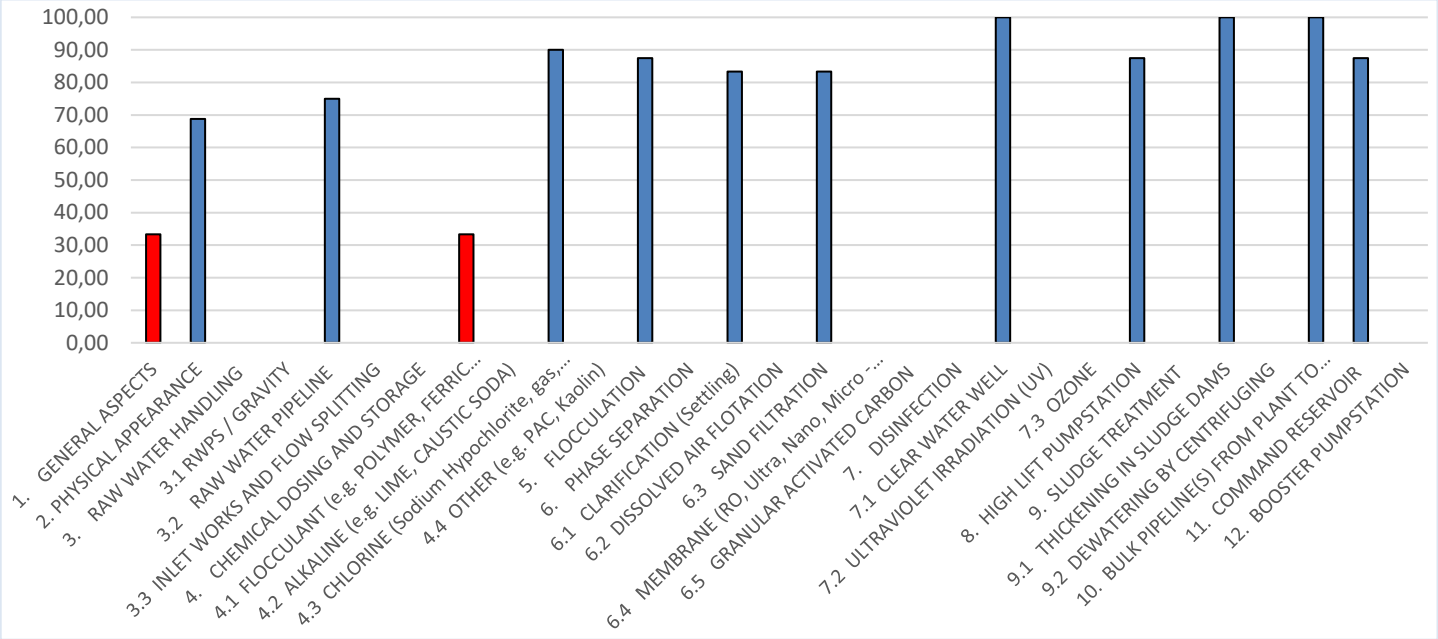

5.10 Makana Local Municipality

The James Kleynhans water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

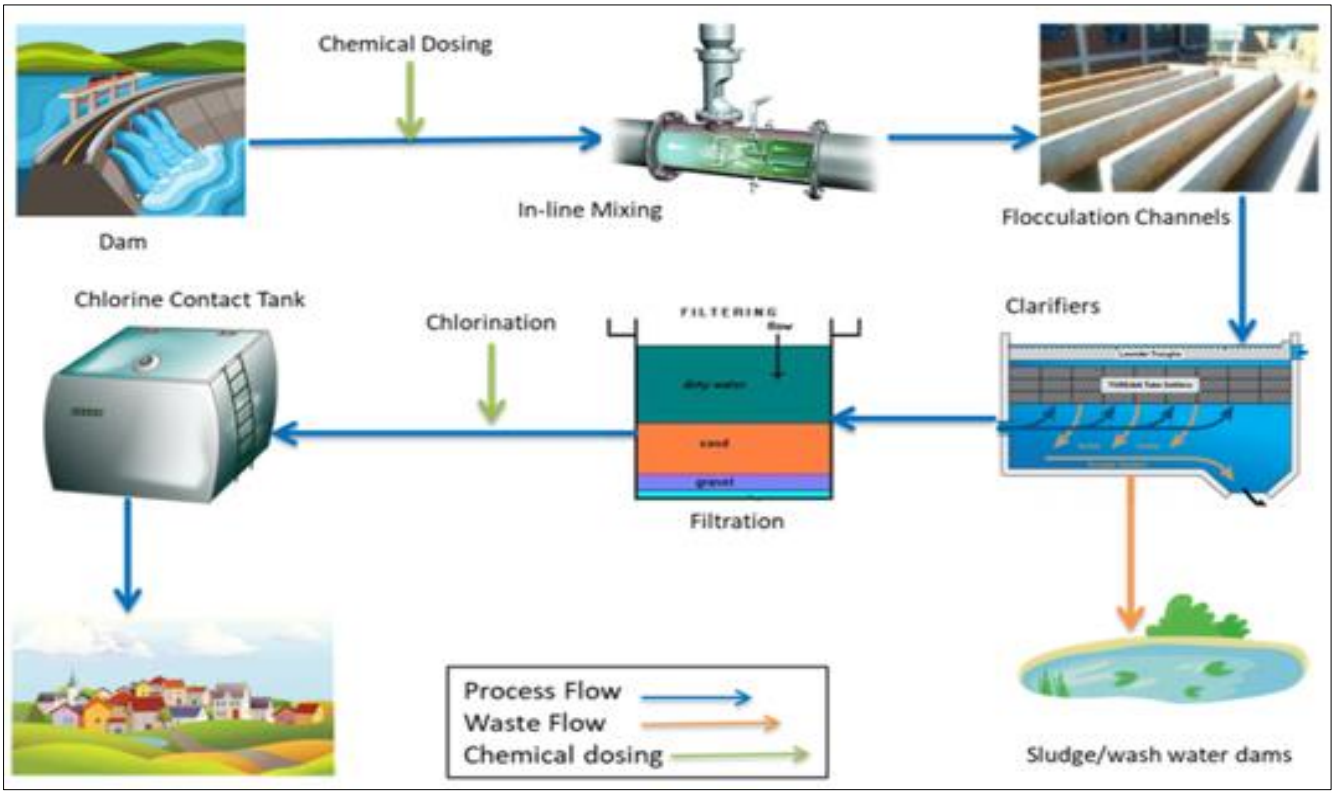
James Kleynhans WTW TSA Score: 68%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and require urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	27.8	Class C plant, no PFD, O&M Manual, or classification certificate displayed. Logbook with daily entries. Process monitoring equipment is functional but not calibrated. Electricity consumption not recorded.
2	**Physical appearance of plant**	68.8	Plant is fenced and gate and entrance signposted. Good housekeeping, high workplace satisfaction. Garden maintenance poor. Construction site limits safe access to process units.
3	**Raw water handling**		
	Raw water pipeline	75.8	Gravity supply from the Howiesonspoort Dam. No pipe leakages were observed. Flow records captured and plotted at the SCADA but not used for process optimisation.
	Inlet works	0.0	Inlet works temporarily bypassed due to upgrading of plant - impacting on treatment efficiency.
4	**Chemical dosing and storage**		
	Flocculant	33.3	Duty and standby flocculant dosing systems operational. Dosing area clean but spillages cannot be contained. Inadequate storage capacity for treatment chemicals and area not bunded. No emergency wash station.
	Chlorine	90.0	Duty and standby chlorine gas dosing units operational with automatic change-over. No chlorine gas stock on site due to national shortage of chlorine gas - HTH used as an interim measure.
5	**Flocculation**		Good floc-formation is observed, concrete structure in good condition. Additional flocculation channel under construction.
6	**Phase Separation**		
	Clarification (settling)	87.5	Limited floc carry-over, daily de-sludging. concrete structure in good condition. Additional clarifier under construction.
	Sand filtration	67.5	Duty/standby pumps operational, no standby for blower. Even bubble distribution during backwash but blower appears to be over-rated and “aggressive” bubbling results in sand wash-out. Filter sand in good condition.
7	**Disinfection**		
	Clear water well	100.0	Contact time in 2 ML onsite reservoir is >30 minutes, Residual Cl_2 monitoring at outlet.
8	**High lift pumpstation**	87.5	Duty and standby pump set operational and well maintained. Production flow recorded but no interpretation.
9	**Sludge treatment**		
	Thickening in sludge dams	100.0	Four newly constructed sludge dams in operation.
10	**Bulk pipeline from plant to command reservoir**	100.0	No leaks detected by process controllers or maintenance team.
11	**Command reservoir**	87.5	Reservoir is secure, telemetry is operational, structure is in good condition.
	Total	**68%**	

High risk areas OR Key Hardware Risks/ Defects

1. Extension and refurbishment of plant is currently underway
2. Construction site limits access to unit processes
3. Review rating of current air blower and install standby unit.

VROOM Refurbishment Cost Estimate

Civil Works	-	0%
Mechanical Works	R63,800	100%
Electrical Works (Incl C&I)	-	0%
Total VROOM Cost	**R63,800**	**100%**
R million / MLD		**0.01**

Regulatory Impression

The James Kleynhans WTW is being extended/refurbished and the construction site limits safe access to process units and influences the treatment efficiency of some process units. Process controllers are satisfied with the workplace conditions. Operational monitoring is taking place and inlet and production flows are recorded, but not used for process optimisation and determination of chemical dosage rates.

No chlorine gas was available on site at the time of inspection due to a national shortage of chlorine gas, but HTH was being used as an interim measure. Existing concrete structures are in a good condition. Since the plant is already in process of refurbishment, funding is not required other than a small provision for a standby blower. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	82.55%
Chemical Compliance	80.96%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



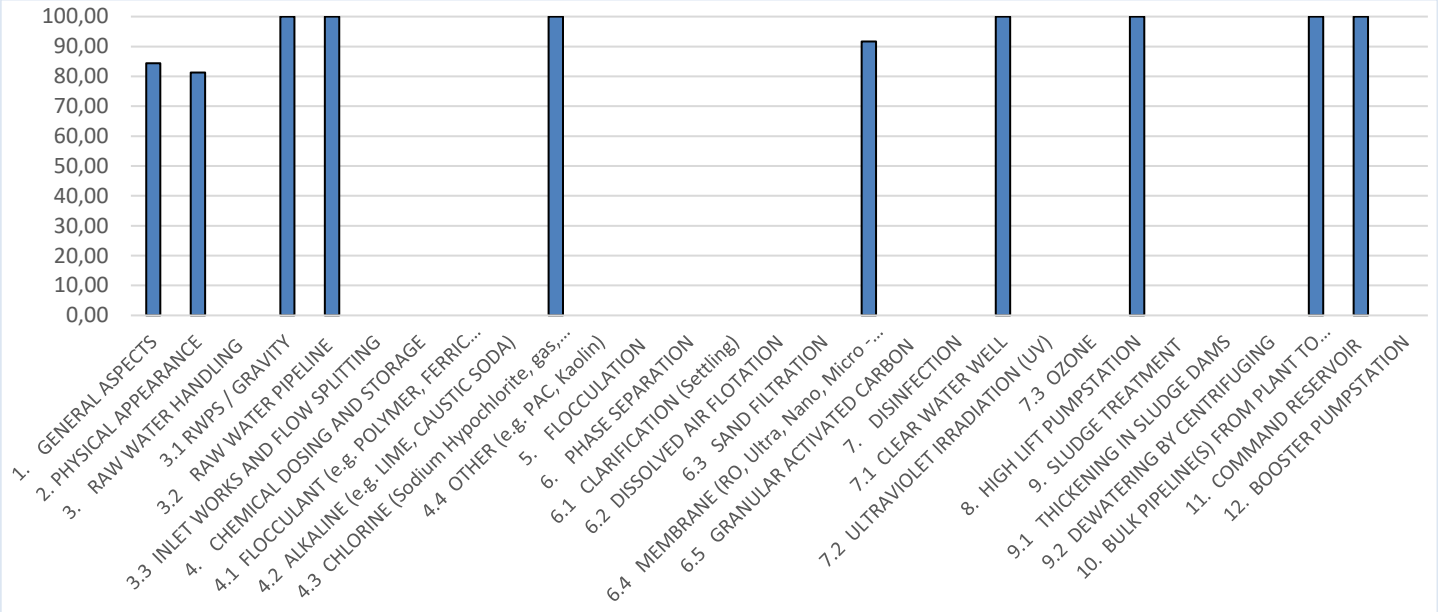

5.11 Ndlambe Local Municipality

The Cannon Rocks/Boknes water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

Cannon Rocks/Boknes WTW TSA Score: 92%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and require urgent intervention.



Process Flow Diagram

Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	84.3	Class C plant, Classification Certificate and PFD on SCADA. Logbooks with daily entries. Process monitoring equipment is functional but not calibrated. Electricity consumption is recorded.
2	**Physical appearance of plant**	81.3	The site is neat, plant is fenced, gated but not signposted. Good housekeeping in RO building, high workplace satisfaction. No OHS contraventions. Process control room and ablutions to be refurbished.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	100.0	Water from boreholes is pumped directly to the plant.
	Raw water pipeline	100.0	No leakages on pipes to raw water storage reported. Flow meter operational and captured on the SCADA.
4	**Chemical dosing and storage**		
	Chlorine	100.0	Duty/standby sodium hypochlorite dosing system operational, more than 30 days storage available.
6	**Phase Separation**		
	Membrane	91.7	Duty/standby dosing and CIP facilities for RO system operational and in good order. Adequate storage capacity for necessary chemicals, but storage area not bunded.
7	**Disinfection**		
	Clear water well	100.0	Contact time in the 2 ML reservoir is >30 minutes, Residual Cl_2 monitoring at outlet.
8	**High lift pumpstation**	100.0	Pumps operated in a duty/standby configuration, flow meter in-place and operational, flow records captured on the SCADA.
9	**Brine disposal**	100.0	Brine wasted to ocean - Water Use License in place.
10	**Bulk pipeline from plant to command reservoir**	100.0	No leaks detected by process controllers or maintenance team.
11	**Command reservoir**	100.0	Reservoir is secure, structure is in good condition. Telemetry operational.
	Total	**92%**	

High risk areas OR Key Hardware Risks/ Defects

1. Minor refurbishment of process control room & ablutions scheduled
2. Construct bund wall for chemical dosing and storage area.

VROOM Refurbishment Cost Estimate

Civil Works	R150,700	100%
Mechanical Works	0	0%
Electrical Works (Incl C&I)	0	0%
Total VROOM Cost	**R150,700**	**100%**
R million / MLD		**0.09**

Regulatory Impression

The Cannon Rocks/Boknes water system is an automated reverse osmosis (RO) treatment system. The process is exceptionally well maintained, and staff are appropriately trained. The site and building are well kept, although minor refurbishment of the process control room and ablutions are required. Process controllers are satisfied with the workplace conditions. Operational monitoring is taking place and inlet and production flows as well as water quality and dosing are recorded and controlled via the SCADA. Additional operational monitoring is taking place, although equipment is not calibrated. Mechanical and civil infrastructure is in excellent condition and no leakages from water retaining structures were observed.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	>99.90%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



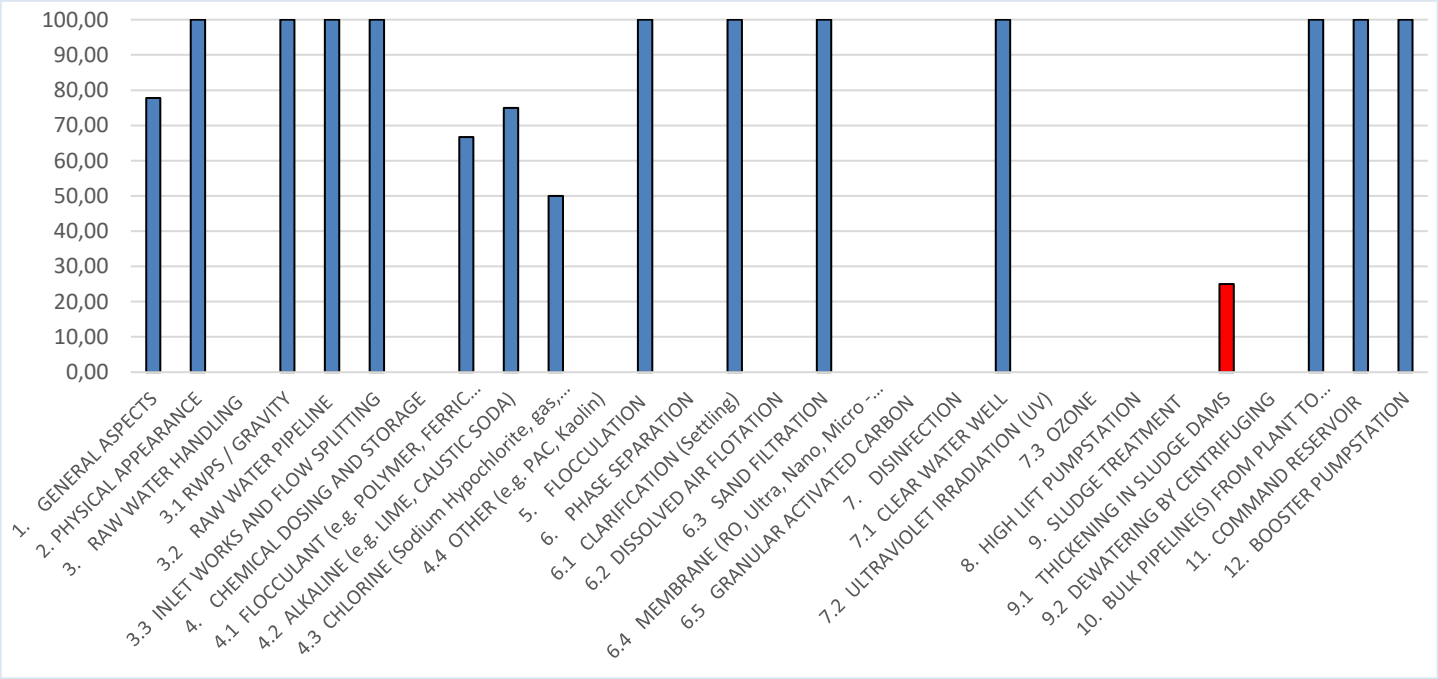

5.12 Nelson Mandela Bay Metropolitan Municipality

The Linton water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

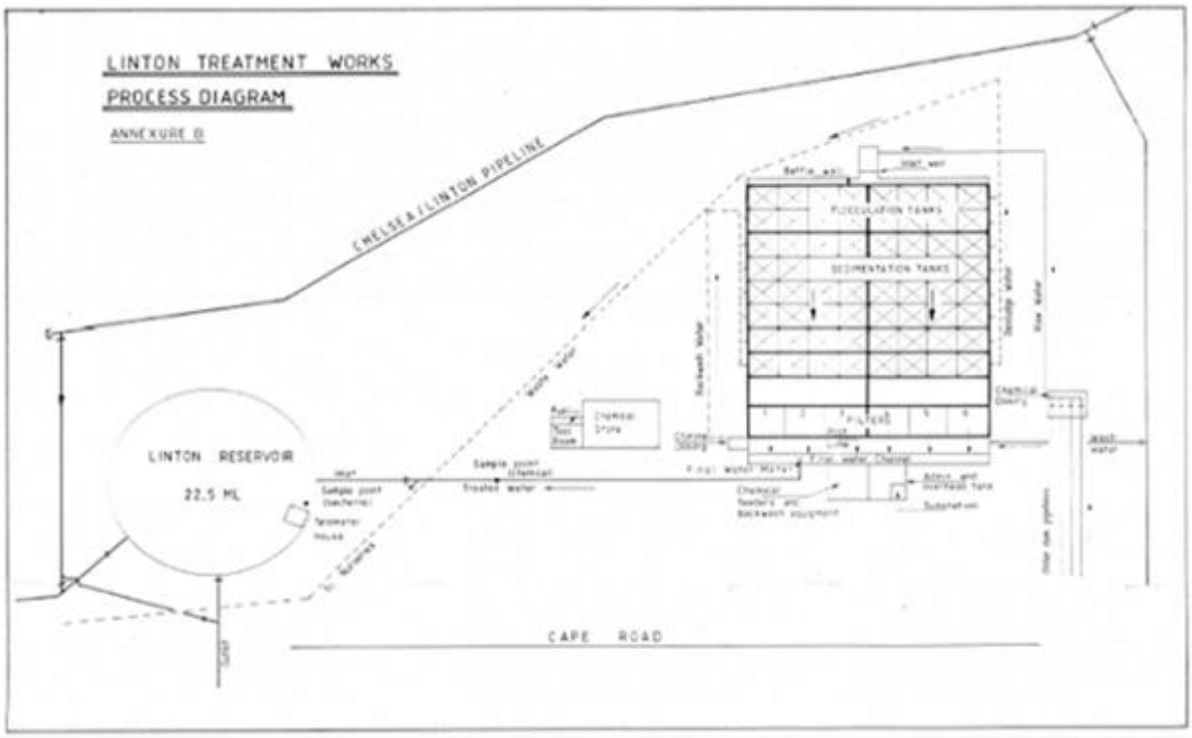
Linton WTW TSA Score: 87%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and require urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	77.8	Class C plant, Classification Certificate and PFD. Logbooks with daily entries. Process monitoring equipment is functional and calibrated. Electricity consumption not recorded.
2	**Physical appearance of plant**	100.0	Plant is fenced, gated and entrance is signposted. Good housekeeping, high workplace satisfaction. No OHS contraventions. Garden maintenance excellent.
3	**Raw water handling**		
	Raw water pipeline	100.0	Gravity supply from the Bulkriver Dam. Flow meter operational.
	Inlet works	100.0	Flocculant dosing visible but infrastructure requires refurbishment. Flash mixing sufficient.
4	**Chemical dosing and storage**		
	Flocculant	66.7	Duty and standby flocculant dosing systems operational. Dosing area not clean and spillages cannot be contained. Adequate storage capacity for treatment chemicals and area bunded. Emergency wash station non-operational
	Alkaline	66.7	New installation of three dry lime dosing units in process of commissioning.
	Chlorine	50.5	Chlorine gas dosing unit operational, no standby. Limited chlorine gas stock on site due to national shortage of chlorine gas - HTH used as interim measure.
5	**Flocculation**	100.0	Good floc-formation observed and concrete structure in good condition.
6	**Phase Separation**		
	Clarification (settling)	100.0	Limited floc carry-over, de-sludging twice daily. Concrete weirs are clean with even overflow.
	Sand filtration	100.0	Duty/standby mechanical equipment operational, even bubble distribution during backwash, filter sand recently replaced. Good housekeeping and concrete structure in good condition.
7	**Disinfection**		
	Clear water well	100.0	Contact time in the 22.5 ML reservoir is >30 minutes, Residual Cl_2 monitoring at outlet.
8	**High lift pumpstation**	100.0	Treated water gravitates to command reservoir.
9	**Sludge treatment**		
	Thickening in sludge dams	25.0	No sludge management facilities provided; sludge is discharged to the municipal sewer.
10	**Bulk pipeline from plant to command reservoir**	100.0	No leaks detected by process controllers or maintenance team.
11	**Command reservoir**	50.0	Reservoir is secure, structure is in good condition. Telemetry operational
12	**Booster pumpstation**	100.0	Duty and standby pump set operational, pumpstation fenced and locked, MCC in good condition.
	Total	**87%**	

High risk areas OR Key Hardware Risks/ Defects

1. Refurbishment of dosing infrastructure
2. Refurbishment and upgrade of treatment chemical storage area to include bunding
3. Refurbishment and upgrade of chlorine gas system to include complete standby unit with automatic switch-over and safety systems
4. Provision of suitable infrastructure for sludge management.

VROOM Refurbishment Cost Estimate

Civil Works	R273,900	49%
Mechanical Works	R279,400	50%
Electrical Works (Incl C&I)	R5,500	1%
Total VROOM Cost	**R558,800**	**100%**
R million / MLD		**0.03**

Inlpb9b

Regulatory Impression

The Linton water system is exceptionally well maintained, with functional treatment processes and competent, engaging staff. Housekeeping of site and buildings reflects the pride of the process controllers in their daily duties. Operational monitoring is taking place and inlet- and production flows are recorded. All operational and maintenance functions are logged om a centralised system. No chlorine gas was available on site at the time of inspection due to a national shortage of chlorine gas, but HTH was being used as an interim measure. The Linton WTW was constructed in 1936 and it is commendable that concrete structures are in good condition and mechanical equipment – mostly original - is operational due to diligent maintenance.

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro, but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	87.20%

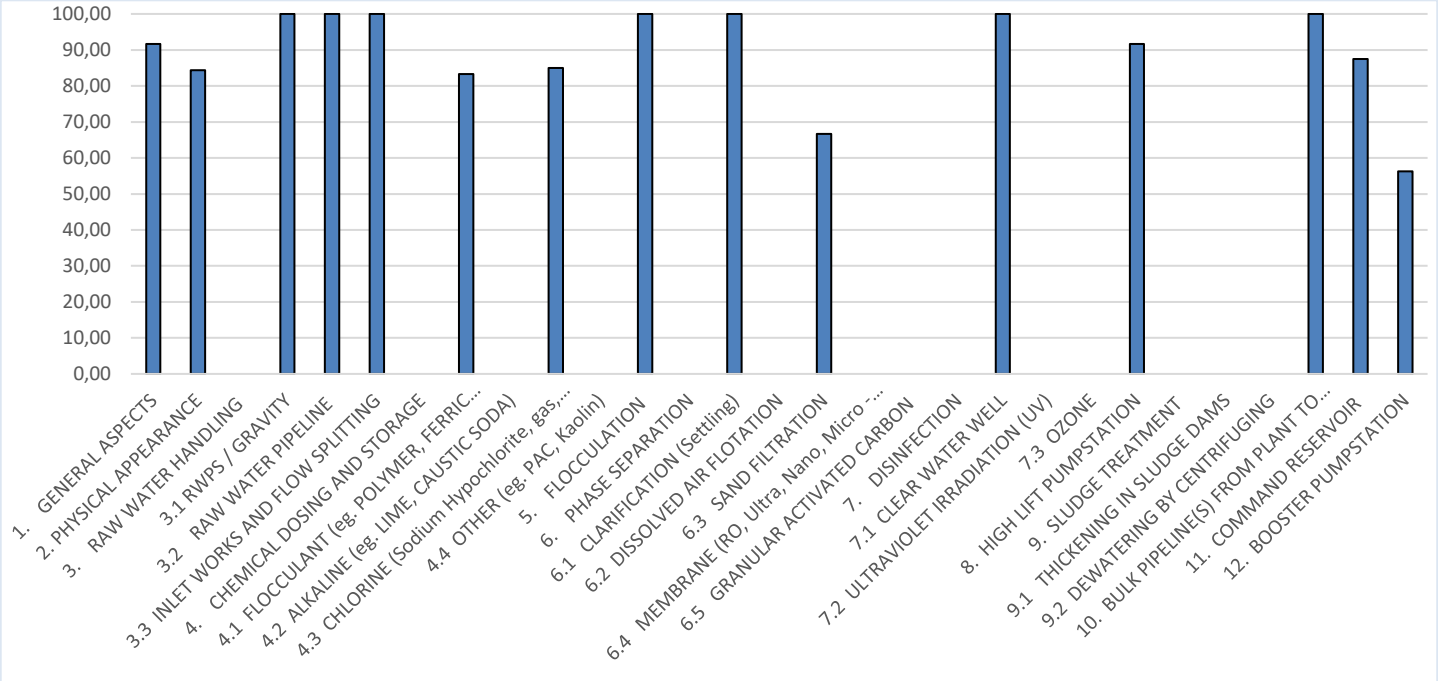
5.13 OR Tambo District Municipality

The Thornhill water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

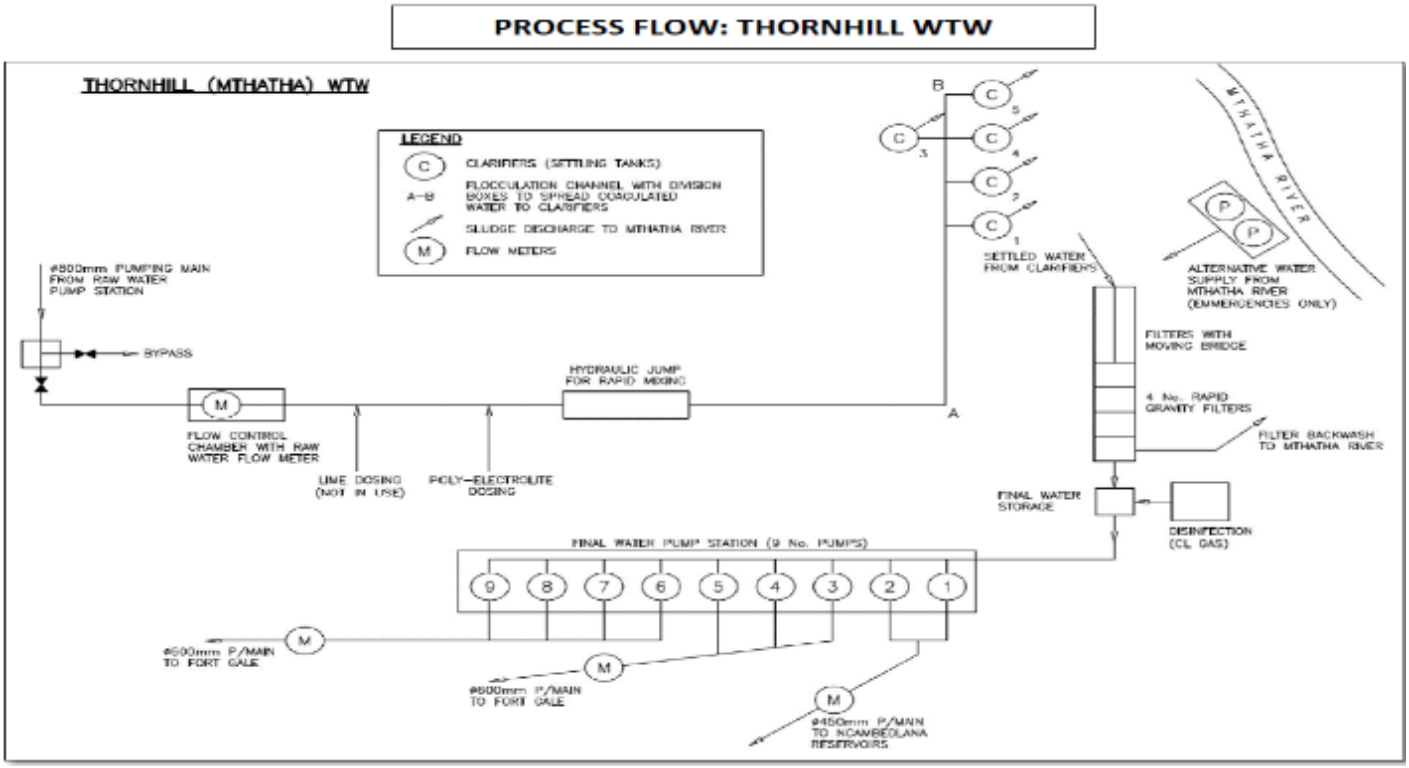
Thornhill TSA Score: 86%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	91.6	Class C plant, maintenance and repairs are captured using the Job card system, Operational log was available with up-to-date entries, IMP was available, and the gate had adequate signage
2	**Physical appearance**	84.3	The works required some minor maintenance such as grass cutting and the removal of trash bags. Worker's facilities were being renovated at the time of the site visit. Roads require some minor maintenance as there are potholes that need to be filled, however delivery vehicles can reach the works with relative ease
3	**Raw water handling**		
3.1	Rwps / gravity	100.0	When flow is high enough then gravity flow is used, however when flow is too low the pumps are used. All pumps are in working condition. The inlet works was flooded during the site visit.
3.2	Raw water pipeline	100.0	Process controller impression of the Raw water pipeline is good as it was installed about 3-years ago
3.3	Inlet works and flow splitting	100.0	Flow splitting is taking place, flash mixing process is effective, chemical feed dosing can be monitored
4	**Chemical dosing and storage**		
4.1	Flocculant	83.3	3 x 24-tonnes of Rheophilic 5498X1 was available which equated to 30days stock in place. 3 dosing pumps are in place with one offline at the time of the site visit. Pumps operate 1 x duty and 2 x standby basis.
4.3	Chlorine	85.0	2 scales are in place. However only one was working at the time of the site visit, and the switch over device is in place however as 1 scale is offline it is not being used. The Process controllers monitoring chlorine daily
5	**Flocculation**	50.0	No visible floc was observed during the sit visit
6	**Phase separation**		
6.1	Clarification (settling)	100.0	Weirs are clear and allow for even flow
6.3	Sand filtration	66.6	there are 5 air blowers in total, and one was offline at the time of the site visit. Filter media was not smooth in all filters and depressions were noted in some filters
7	**Disinfection**		
7.1	Clear water well	100.0	Free chlorine is sample collected at the 3 onsite reservoirs where the sample point is located, and is measured on site
8	**High lift pumpstation**	91.6	9 pumps are installed 8 are operational and in working order and 1 was sent off repairs. Pumps are operated as 4 x duty and 5 on standby.
10	**Bulk pipeline(s) from plant to command reservoir(s)**	100.0	Condition of the line is good as it was installed in 2-years ago with no leaks or major pipe bursts noted. Valve chamber is inspected by process controllers
11	**Command reservoir**	87.5	Reservoir facility is fenced Telemetry is in place but only 50% operational
12	**Booster pumpstation**	56.2	Only 1 of 4 pumps were in working order as the others were being refurbished. Building is secure with relevant signage post. MCC are accessible and in good condition
	Total	**86%**	

High risk areas OR Key Hardware Risks/ Defects

1. Issues with pumps needing repairs or refurbishment was noted at various processes
2. Flooding at the inlet as noted
3. Sand filters had depressions during the site visit.

VROOM Refurbishment Cost Estimate

Civil Works	R257,400	2%
Mechanical Works	R10,777,800	98%
Electrical Works (Incl C&I)	R3,300	0%
Total VROOM Cost	**R11,038,500**	**100%**
R million / MLD		**0.14**

Regulatory Impression

The Thornhill water system is well maintained; however it was noted that at various process pumps need repairs/replacement. Some of the sand filters were noted as having depressions in them. There was no water safety plan in place. Chemical compliance meets SAN241 standards, however Microbiological requires some attention. Some flooding was noted at the inlet during the site visit. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	91.19%
Chemical Compliance	89.71%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



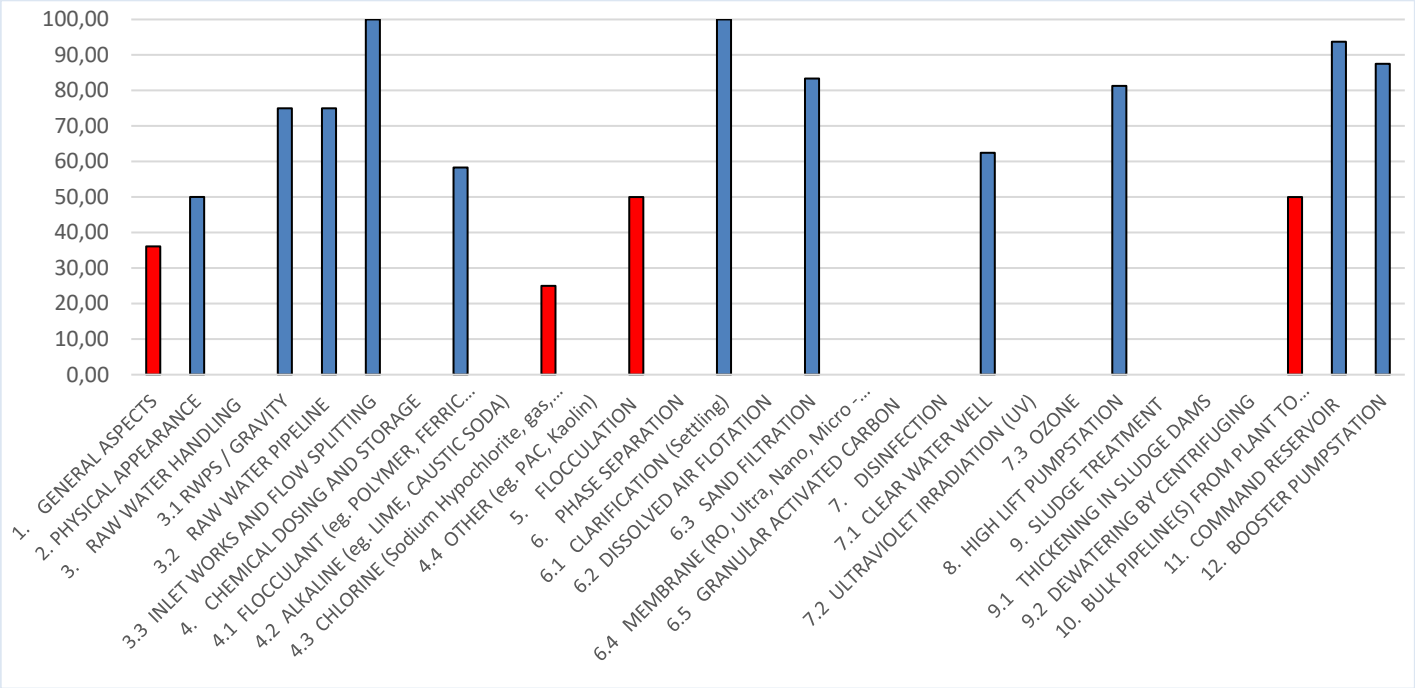

5.14 Sunday River Valley Local Municipality

The Addo Nomathamsanqa WTW system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

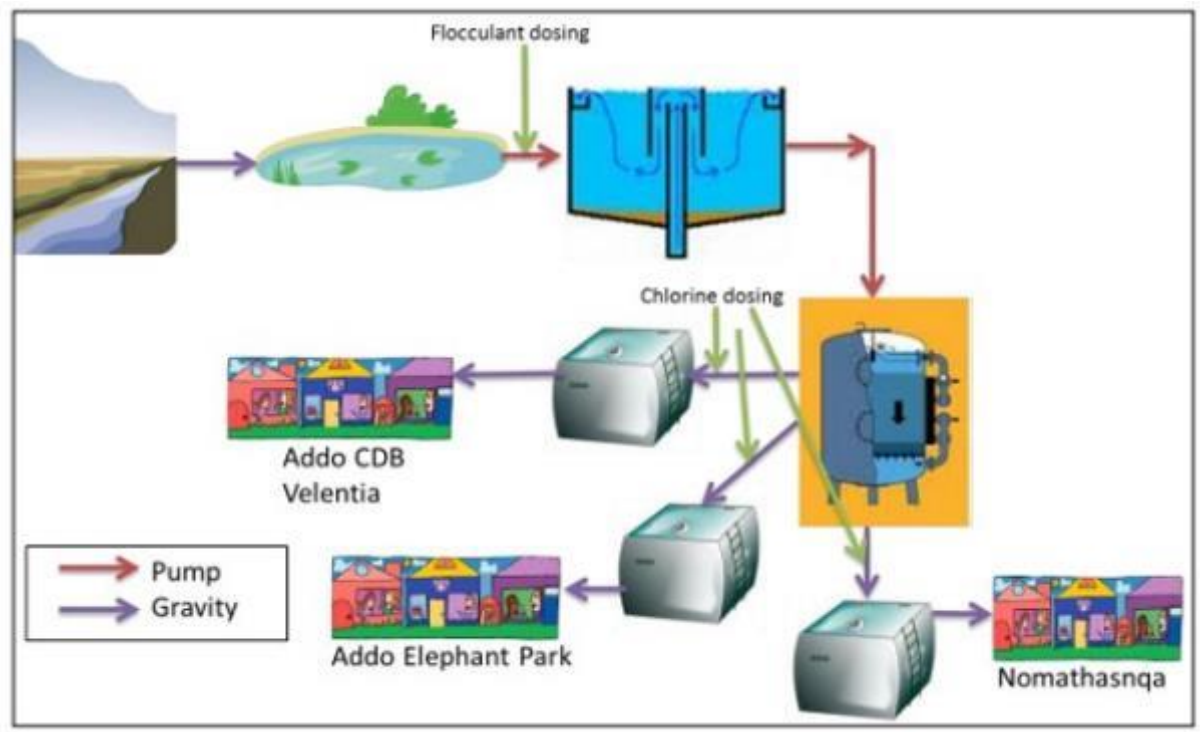
Addo Nomathamsanqa WTW: 63%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	36.1	There is a considerable amount of administration work that needs to be undertaken at the works. The templates are available however not being used to the works' advantage. The PFD is also rudimentary and should be more detailed in nature as it does not correctly capture the unit processes. Monitoring equipment needs to be fixed and put into operation
2	**Physical appearance of plant**	50.0	Some civil mechanical and electrical works needs attention. The Chemical dosing both for chlorine (under construction) and flocculation unit need attention to bring up to safety standards. General electrical work is also required as some doors are not in place and areas have extremely high temperatures that can affect the electrical systems.
3	**Raw water handling**		The inlet screens need to be adapted to accommodate the increase solid removal. Also, general, and regular maintenance on the pumps is critical to ensure life span and operational guarantee. General maintenance on the MCC boards is also required. Management administration needs improvement. Dosing Point and pumps need maintenance attention and service. Two pumps one on standby.
	Raw water pumpstation / gravity feed	75.0	
	Raw water pipeline	75.0	
	Inlet works	100.0	
4	**Chemical dosing and storage**		Current storage unit is badly constructed and placed. Filling up the tanks means that the trucks stand outside the works and pipe over the fence.
	Flocculant	58.3	
	Chlorine (Sodium Hypochlorite, gas, HTH) or Chlorine Dioxide	25.0	Currently the final construction phase in is process for a new chlorination station. Present dosing is unexpectable and also storage is near pumps which is affected by heat from the pumps. DWS is encouraged to revisit this site after construction to ensure that all OHS of dangerous facilities is adhered to.
5	**Flocculation**	50.0	Flocculation unit is non-operational and part of the new construction
6	**Phase Separation**		
	Clarification (settling)	100.0	One of the settling tanks was being repaired at the time of the inspection. This needs to be expedited for full operation of the works. The rest of the clarification seems to be functional
	Sand Filtration	83.3	Sand filtration is completely according to the TSA requirements and backwashing was observed during the inspection. Only noted concern was the backup for the air blowers is required.
7	**Disinfection**		A makeshift chlorination process is in place until the construction of the new unit is completed. None of the present system complies to the OHS
	Clear water well	62.5	
8	**High Lift Pump Station**	81.2	Most infrastructure is in place with three pump system and monitoring. One of the three was in for repairs however a two operational on standby setup exists
9	**Sludge Treatment**		
	Thickening in Sludge Dams	0.0	A lot of work is to be undertaken at the sludge dams so much so that the municipality should consider the reconstruction of the sludge dams in concrete line units. No recycling is taking place
10	**Bulk pipeline from plant to command reservoir**	50.0	Main bulk lines feed to the three reservoirs and the high reservoirs in the system to allow for gravity feeding to the community. No leakages or maintenance was indicated by the officials. Valve chambers could not be inspected
11	**Command reservoir**	93.7	Three concrete command reservoirs are housed in the works perimeter and is secure with flow measurement in place
12	**Booster Pump Station**	87.5	Two Booster pumps are in place with one operation and on standby. The unit is well housed and clean and MCC board is operational with flow control
	Total	**63%**	

High risk areas OR Key Hardware Risks/ Defects

1. Flocculation unit needs to be reconstructed and allow for direct access for safe delivery of chemicals.
2. The inlet to Caesar dam is to be redesigned to accommodate the high amount of waste received from the irrigation channel.
3. Chlorination construction needs to be completed as a matter of urgency as at present unit is a danger to works personnel and surrounding area.

VROOM Refurbishment Cost Estimate

Civil Works	R3,265,900	52%
Mechanical Works	R2,357,300	37%
Electrical Works (Incl C&I)	R687,500	11%
Total VROOM Cost	**R6,310,700**	**100%**
R million / MLD		**0.81**

Regulatory Impression

The works has the necessary infrastructure to operate on a high level. However, the construction and associated debris around the works needs immediate attention. In addition, parts of the works is being used as a storage area for trucks and a caravan and general maintenance is required for the entire site. The Flocculation and Chlorination construction and repair is a major concern. Also in addition the administration of the works needs more structure and monitoring by senor personnel. The linkage between municipality and the Irrigation board needs to be facilitated to minimise the waste entering the channel and being transferred into the fresh water source. In terms of Blue Drop Criteria a lot of administration work needs to be done for all systems and the municipality should use this time to get structured systems in place. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	60.42%
Chemical Compliance	68.06%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%




6. FREE STATE: MUNICIPAL DRINKING WATER SYSTEM'S FUNCTIONALITY

Background

Leading up to the release of the full Blue Drop report, the Regulator draws attention by publishing the *Blue Drop Watch Report*, which comprises of a technical overview of pipes, pumps, reservoirs, processes and water quality of water treatment plants and distribution networks. The Blue Drop Watch report is **not** the Blue Drop audit report, which will only be published once the verification and quality control processes by DWS have been satisfied, to ensure accurate and credible reporting of drinking water services across South Africa. The Watch Report seeks to keep the public and stakeholder updated and informed on the status of drinking water infrastructure, water quality, and the indicative cost to restore functionality.

The Blue Drop Watch Report is informed by the Technical Site Assessments (TSA), which were done at 1 to 2 systems per WSA/WSP, as part of the Blue Drop audit cycle. The purpose of the TSA is to verify the findings of the (desktop) audit with the status on the ground (physical inspections). The TSA score (%) reflects the condition of the raw water handling system (abstraction, pumps, pipe network), the water treatment plants (inlet works to disinfection and sludge treatment), delivery system (commend reservoirs, bulk pipe network and pumpstations) and distribution systems (pump and pipe networks). A high TSA score (100%) indicates that the infrastructure, equipment, and processes are in excellent condition, whilst a low TSA score (0%) indicates failure and dysfunctional process and infrastructure. The TSA inspections cover each process unit of the treatment facility, coupled with randomly selected checkpoints of the delivery and distribution network. The VROOM cost covers only the treatment facility, as too many variables exist to accurately estimate network refurbishment costs.

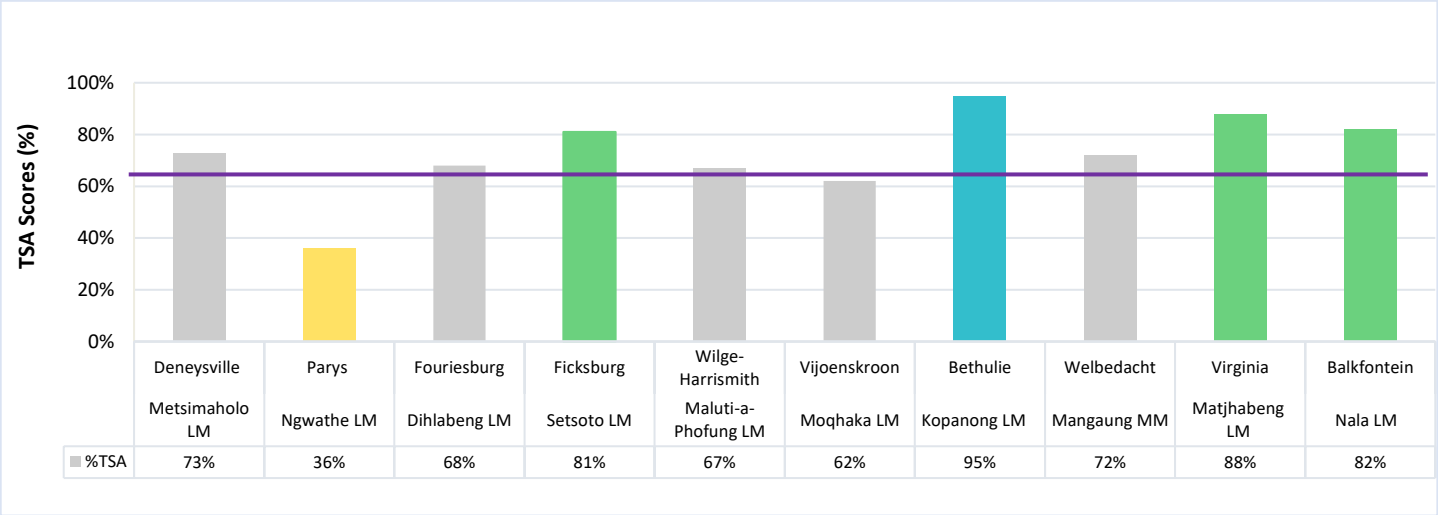
Results of the Technical Site Assessments

During the period December 2022 to February 2023, 21 water supply systems were inspected, offering a representative overview of systems owned and operated by municipalities, water boards and water service providers. The assessments covered 19 municipalities, as well as 1 Water board. Detailed TSA reports with photographic evidence and VROOM costs have been generated to assess the condition and status of treatment facilities and gain insight into randomly selected pipe network and pumpstation across the water distribution networks. The table following summarises the TSA scores of the water supply systems that were assessed.

Table 13 - Free State Summary of the all the TSA Water Supply Systems

#	Municipality (WSA)	TSA WSS	TSA WTW	WSP/ WB	%TSA
1	Metsimaholo LM	Deneysville	Deneysville		73%
2	Ngwathe LM	Parys	Parys		36%
3	Dihlabeng LM	Fouriesburg	Fouriesburg		68%
4	Setsoto LM	Ficksburg	Ficksburg		81%
5	Maluti-a-Phofung LM	Harrismith	Wilge-Harrismith		67%
6	Moqhaka LM	Vijoenskroon	Vijoenskroon		62%
7	Kopanong LM	Bethulie	Bethulie	Bloem Water	95%
8	Mangaung MM	Bloemfontein, Dewetsdorp, Wepener	Welbedacht	Bloem Water	72%
9	Matjhabeng LM	Virginia	Virginia	Bloem Water	88%
10	Nala LM	Balkfontein	Balkfontein	Bloem Water	82%
11	Nketoana LM	Reitz	Reitz		28%
12	Dihlabeng LM	Clarens	Clarens		68%
13	Letsemeng LM	Jacobsdal	Jacobsdal		81%
14	Mantsopa LM	Ladybrand	Genoa		36%
15	Masilonyana LM	Winburg	Winburg		30%
16	Mohokare LM	Zastron	Zastron		40%
17	Mangaung MM	Bloemfontein	Maselspoort		62%
18	Tswelopele LM	Hoopstad	Hoopstad		82%
19	Mafube LM	Frankfort	Frankfort		44%
20	Phumelela LM	Vrede	Vrede		55%
21	Tokologo LM	Hertzogville	Hertzogville		75%
	Totals		**21**	**4**	**63%**

An average of 63% was achieved for the 21 systems assessed, which means that infrastructure and processes are partially functional with an average performance. The best overall performance was found for Kopanong, followed by Matjhabeng, Nala and Tswelopele. The water boards provided most of the better performing systems. Lower performances were observed for Reitz and Winburg.



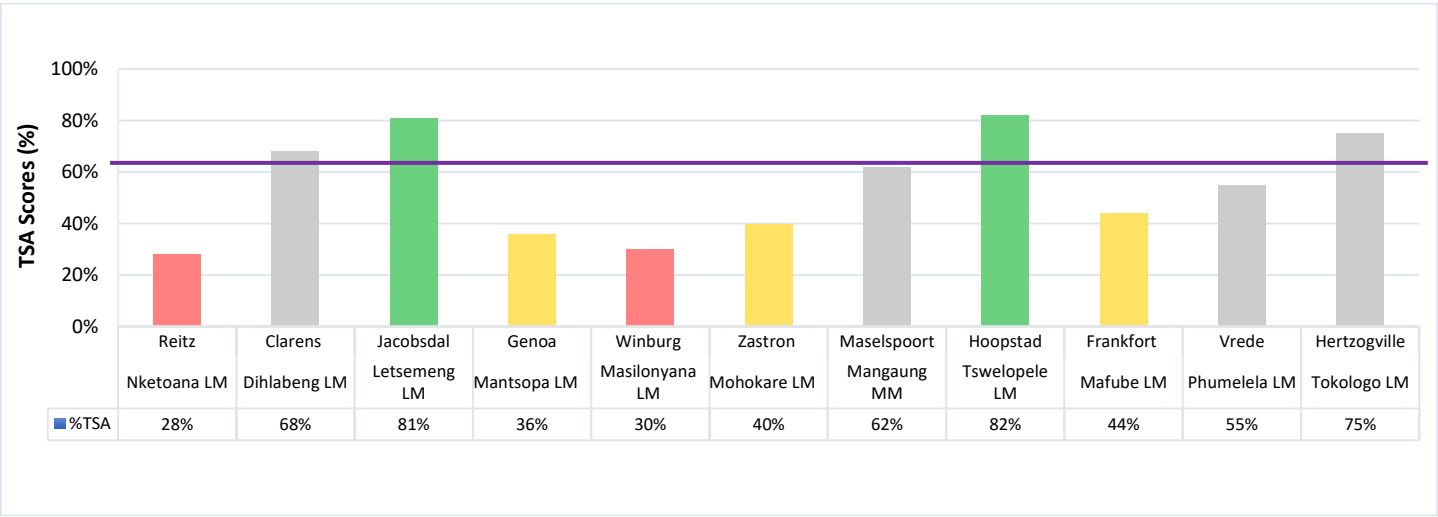


Figure 13 - FS TSA scores for all the BD Systems

95 – 100% Excellent
80-<95% Good
50-<80% Average
31-<50% Poor
0-<31% Critical state

The Regulator observed the predominant challenges and risks pertaining to the water supply system:

Facility management

- No notice board to display or no display of the PFD or other relevant notices and/or documents required on site
- Refurbishment or upgrade and/or construction of buildings or facilities, concrete structures, offices and/or process control room, staff ablutions; maintenance or replacement of perimeter/boundary fencing and/or access gate
- No drinking water on site
- No jar testing done, no or limited testing water quality testing equipment and/or lab chemicals, no calibration of meters
- Improve administration and monitoring templates
- Supply emergency showers or wash areas/ facilities
- Signage at entrance gate and safety signs across plant
- Housekeeping and tidying up of terrain, paintwork at treatment works, pumpstations, and reservoirs, clean-up sites after construction projects
- Road rehabilitation/ upgrade/ construction and road accessibility especially for the safe delivery of chemicals
- Staff safety and signage improvement
- Flooding at plant or at the various process units.

Water treatment system

- Raw water pipe network and/or pumps at abstraction facility to be refurbished or upgraded or repaired
- No flow meters installed or dysfunctional flow meters (abstraction, WTW, and Command Reservoirs), and flow meters not calibrated
- Refurbishment or upgrade of one or more of the various process units (civil, mechanical, electrical and instrumentation)
- Dysfunctional or inefficient process units that have to be rectified, e.g. inlet works, clarifiers, filters, etc
- Reinstatement of all automatic/ PLC related control in settling and filter units
- Treatment chemicals, e.g. no bunding, limited stock, storage
- No or limited no. standby pumps or dysfunctional pumps, e.g. flocculant and/or chemical dosing, backwashing, high lift, leaks, etc
- No or limited air blowers and/or compressors or dysfunctional blowers and compressors
- Replacement of filter sand and nozzles
- Sand filters, e.g. repairs required, sand to be replaced, sand volume
- Chlorination unit not operational or not fully operational, e.g. limited stock in place, no or limited standby units, no automatic switch over, no chlorine scales, no or limited safety signs and systems (alarms, fans, masks, detectors)
- Limited disinfection contact time in the clear water well or ineffective disinfection taking place
- Sludge dams/ponds or beds, e.g. none in place, not operation, maintenance (cleaning), dysfunctional sludge pumps and no or limited standby, no recycling taking place
- SCADA and telemetry systems, e.g. not in place, dysfunctional, limited or no understanding of the systems
- Process Controllers to be trained on quality assurance in operational laboratory
- Vandalism and theft of pumps, buildings, valves, and other mechanical and electrical assets.

Water distribution networks

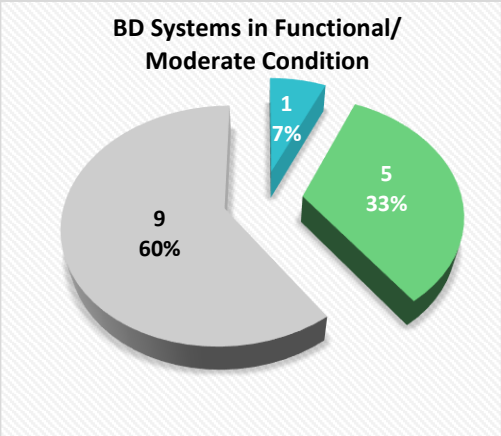
- Repair leakages in pipe network, valve boxes, and/or command reservoirs
- No telemetry at reservoir and level indicator.

Systems Observed to be in Functional/Moderate Condition based on Technical Site Inspections

Water supply systems which succeeded to achieve ≥50% TSA score, are summarised as follows.

Table 14 - Provincial Summary of the TSA Water Treatment Systems in the Excellent to Average Performance Categories

Municipality (WSA)	WSP/ WB	TSA of ≥95-100% [Excellent]		TSA of ≥80-<95% [Good]		TSA of ≥50-<80% [Average]	
		Name of WTW	% TSA	Name of WTW	% TSA	Name of WTW	% TSA
Metsimaholo LM						Deneysville	73%
Dihlabeng LM						Fouriesburg	68%
Setsoto LM				Ficksburg	81%		
Maluti-a-Phofung LM						Wilge-Harrismith	67%
Moqhaka LM						Vijoenskroon	62%
Kopanong LM	Bloem Water	Bethulie	95%				
Mangaung MM	Bloem Water					Welbedacht	72%
Matjhabeng LM	Bloem Water			Virginia	88%		
Nala LM	Bloem Water			Balkfontein	82%		
Dihlabeng LM						Clarens	68%
Letsemeng LM				Jacobsdal	81%		
Mangaung MM						Maselspoort	62%
Tswelopele LM				Hoopstad	82%		
Phumelela LM						Vrede	55%
Tokologo LM						Hertzogville	75%
Totals	**3**	**1**		**5**		**9**	



Of the 15 systems in the excellent to average performance categories it was found that:

- 1 system (7%) was in excellent good condition
- 5 systems (33%) were in good condition
- 9 systems (60%) were in average condition.

Figure 14 - No. BD Systems in Functional/ Moderate Condition

The best performing water supply systems, as indicated by the TSA scores, are summarised hereunder.

Table 15 - Provincial Summary of the Top Performing TSA Water Treatment Systems

#	WSA	WSP/ WB	TSA WTW	%TSA
1	Kopanong LM		Bethulie	95%
2	Matjhabeng LM	Bloem Water	Virginia	88%
3	Nala LM	Bloem Water	Balkfontein	82%
4	Tswelopele LM		Hoopstad	82%
5	Setsoto LM		Ficksburg	81%
6	Letsemeng LM		Jacobsdal	81%

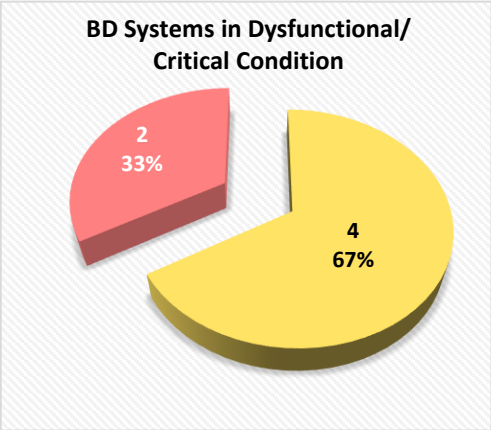
The top four systems with the best condition are Bethulie managed by Kopanong (excellent 95-100%); Virginia managed by Bloem Water, Balkfontein managed by Nala, and Hoopstad managed by Tswelopele (good 80-<95%).

Systems Observed to be Dysfunctional/Critical Condition based on Technical Site Inspections

Drinking water supply systems which failed to achieve at least a TSA score of 50%, are identified as follows.

Table 16 - Provincial Summary of the TSA Water Supply Systems in the Poor and Critical Performance Categories

Municipality (WSA)	WSP/ WB	TSA of ≥31-<50% [Poor]		TSA of 0-<31% [Critical]	
		Name of WTW	% TSA	Name of WTW	% TSA
Ngwathe LM		Parys	36%		
Nketoana LM				Reitz	28%
Mantsopa LM		Genoa	36%		
Masilonyana LM				Winburg	30%
Mohokare LM		Zastron	40%		
Mafube LM		Frankfort	44%		
Totals		**4**		**2**	



Of the 6 systems in the poor and critical performance category it was found that:

- 4 systems were in poor condition
- 2 systems were in critical state.

Figure 15 - No. BD Systems in Dysfunctional/ Critical Condition

Table 17 - Provincial Summary of the TSA Water Supply Systems in Critical Condition

#	Municipality (WSA)	WSP/ WB	WSS	%TSA
1	Nketoana LM		Reitz	28%
2	Masilonyana LM		Winburg	30%

Two of the 21 systems assessed (9.5%) were found to be in a critical state.

VROOM Costs

The Very Rough Order of Measurement (VROOM) is an estimation of the funding required to restore existing treatment infrastructure to its original design capacity and operations, by addressing civil, mechanical, electrical and instrumentation defects. A singular VROOM cost is determined by assessing 1-2 treatment facilities per municipality and calculated as cost per system. The cost is derived through an algorithm that uses the Blue Drop Inspector's impression of the asset condition, the size and capacity of the asset, and the market/ industry cost indicators. The resultant VROOM cost is an estimation of the cost to repair, refurbish or replace dysfunctional treatment infrastructure. Subsequently, a singular VROOM cost is extrapolated, in relation to the total Blue Drop scores and systems' SIVs, to derive an aggregated VROOM score for all treatment plants in the WSI.

***Note:** VROOM does not constitute a specification, schedule of quantities or a definite refurbishment figure, but rather an indicative amount to inform a budget and hardware requirements. **Also,** the VROOM cost is specific to the treatment plant and does not attempt to cost the network delivery and distribution network, as it contains to many variables.*

The VROOM costs are summarised as following, noting these values comprises the cost of repairs of the SINGLE water treatment system assessed, NOT the extrapolated collective cost to repair all the treatment facilities in a WSI. The VROOM cost is made up by mechanical, electrical, and civil cost elements, which can be seen in the detailed TSA sections following in the report.

Table 18 - Provincial Summary of the VROOM Costing

Municipality (WSA)	TSA WSS	TSA WTW	WSP/ WB	Total VROOM Cost (Rand)
Metsimaholo LM	Metsimaholo LM	Deneysville		R606,100
Ngwathe LM	Ngwathe LM	Parys		R33,119,900
Dihlabeng LM	Dihlabeng LM	Fouriesburg		R3,075,600
Setsoto LM	Setsoto LM	Ficksburg		R8,907,800
Maluti-a-Phofung LM	Maluti-a-Phofung LM	Harrismith		R3,379,200
Moqhaka LM	Moqhaka LM	Vijoenskroon		R5,410,900
Kopanong LM	Kopanong LM	Bethulie	Bloem Water	R184,000
Mangaung MM	Mangaung MM	Bloemfontein, Dewetsdorp, Wepener	Bloem Water	R36,907,200
Matjhabeng LM	Matjhabeng LM	Virginia	Bloem Water	R66,181,500
Nala LM	Nala LM	Balkfontein	Bloem Water	R115,468,100
Nketoana LM	Nketoana LM	Reitz		R67,543,300
Dihlabeng LM	Dihlabeng LM	Clarens		R828,300
Letsemeng LM	Letsemeng LM	Jacobsdal		R1,562,000
Mantsopa LM	Mantsopa LM	Ladybrand		R16,341,600
Masilonyana LM	Masilonyana LM	Winburg		R10,397,200

Municipality (WSA)	TSA WSS	TSA WTW	WSP/ WB	Total VROOM Cost (Rand)
Mohokare LM	Mohokare LM	Zastron		R5,446,100
Mangaung MM	Mangaung MM	Bloemfontein		R101,982,100
Tswelopele LM	Tswelopele LM	Hoopstad		R1,221,000
Mafube LM	Mafube LM	Frankfort		R5,073,200
Phumelela LM	Phumelela LM	Vrede		R13,143,900
Tokologo LM	Tokologo LM	Hertzogville		R643,500
Totals				**R497,422,500**

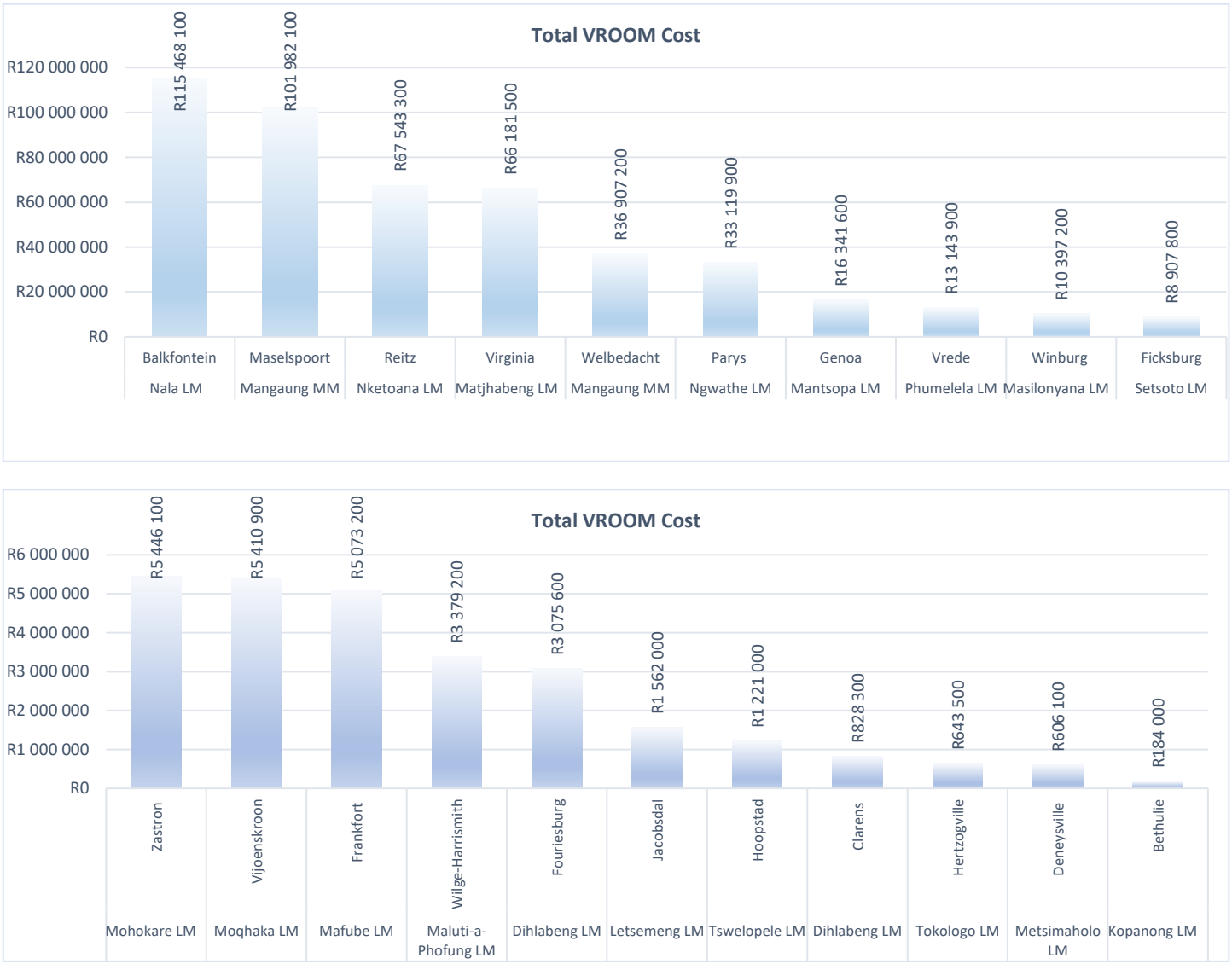


Figure 16 - Total VROOM Cost for the BD Systems Assessed

The associated VROOM costs for the 21 water supply systems assessed amounts to R497.4 million, with the bulk of investment needed for Balkfontein (Nala), Bloemfontein (Mangaung), Reitz (Nketoana), and Virginia (Matjhabeng).

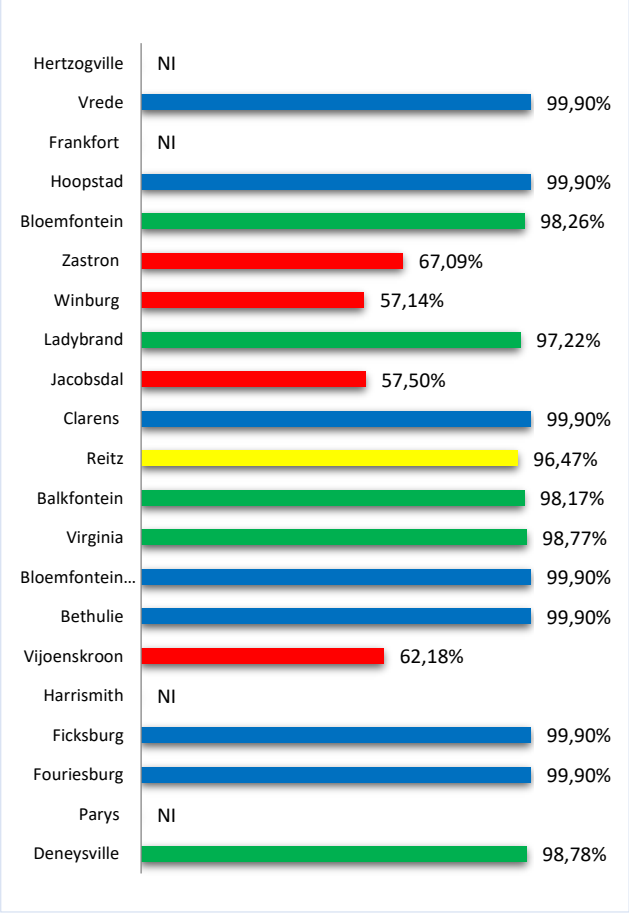
Drinking Water Quality Status

The Institutional Water Quality Compliance, as measured against SANS 241 standards, is reflected in the table below (IRIS, 28 March 2023).

Table 19 - Free State Summary of the Drinking Water Quality Status of all the TSA Water Supply Systems

#	Municipality (WSA)	TSA WSS	TSA WTW	Microbiological Compliance	Chemical Compliance
1	Metsimaholo LM	Deneysville	Deneysville	98.78%	87.85%
2	Ngwathe LM	Parys	Parys	NI	NI

#	Municipality (WSA)	TSA WSS	TSA WTW	Microbiological Compliance	Chemical Compliance
3	Dihlabeng LM	Fouriesburg	Fouriesburg	>99.90%	97.29%
4	Setsoto LM	Ficksburg	Ficksburg	>99.90%	85.06%
5	Maluti-a-Phofung LM	Harrismith	Wilge-Harrismith	NI	NI
6	Moqhaka LM	Vijoenskroon	Vijoenskroon	62.18%	85.95%
7	Kopanong LM	Bethulie	Bethulie	>99.90%	>99.90%
8	Mangaung MM	Bloemfontein, Dewetsdorp, Wepener	Welbedacht	>99,90%	97.39%
9	Matjhabeng LM	Virginia	Virginia	98.77%	98.45%
10	Nala LM	Balkfontein	Balkfontein	98.17%	98.25%
11	Nketoana LM	Reitz	Reitz	96.47%	93.31%
12	Dihlabeng LM	Clarens	Clarens	>99.90%	95.28%
13	Letsemeng LM	Jacobsdal	Jacobsdal	57.50%	92.25%
14	Mantsopa LM	Ladybrand	Genoa	97.22%	76.80%
15	Masilonyana LM	Winburg	Winburg	57.14%	80.00%
16	Mohokare LM	Zastron	Zastron	67.09%	97.65%
17	Mangaung MM	Bloemfontein	Maselspoort	98.26%	95.32%
18	Tswelopele LM	Hoopstad	Hoopstad	>99.90%	99.30%
19	Mafube LM	Frankfort	Frankfort	NI	NI
20	Phumelela LM	Vrede	Vrede	>99.90%	97.81%
21	Tokologo LM	Hertzogville	Hertzogville	NI	NI



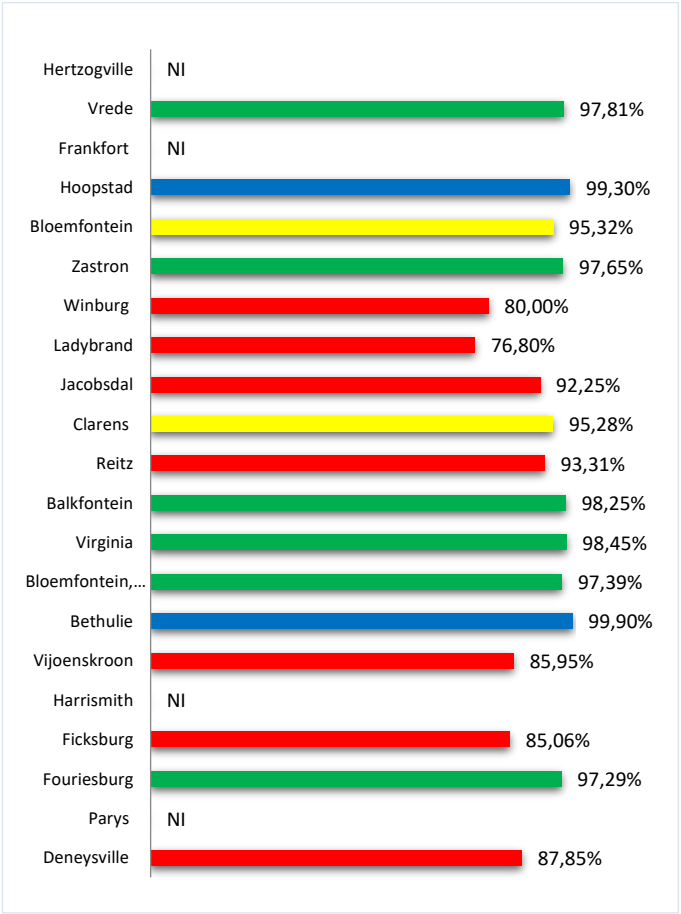


Figure 17 – FS Drinking Water Quality Status of all the TSA Water Supply Systems

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

The TSA and water quality results depict a different picture. The TSA shows 15 of the 21 water supply systems to be in the *excellent to average performance category*, and the water quality compliance shows that 43-62% of the systems *fail to produce compliant final water quality*.

Out of 21 treatment plants, 7 (33%) and 5 (24%) of systems achieve excellent and good microbiological quality. A total of 1 (5%) system has a poor microbiological water quality status and 8 (38%) systems have bad microbiological water quality status. The water in these systems poses a serious acute health risk to the community. WSAs with poor microbiological water quality status must be assessed to confirm status in all systems to ensure rectification measures are comprehensive to safeguard communities. The direct cause of microbiological failures can be linked to the TSA sub-watch Area 7, which has a low contribution to the overall TSA score. The failure to produce water that meets E. coli standards can be linked back to poor operations, defective infrastructure, dosing rates, absence of disinfection chemicals, lack of monitoring, or lack of operating and chemistry knowledge. WSIs that are not monitoring the final water quality at the outlet of the treatment plant or at specific end use points must develop a monitoring programme and resume with compliance monitoring as a matter of urgency.

Chemical compliance shows that 2 (10%) and 6 (28%) have excellent and good water quality, whilst the majority of systems fail to achieve chemical compliance. A total of 2 (10%) and 11 (52%) systems have a poor and bad chemical water quality status.

Concluding Remarks

The Blue Drop Watch results stresses the importance of drinking water supply and quality to be a primary focus area of government. Already, the Department has developed the Water Services Improvement Programme for systems in critical state, and at systems where particular concerns were reported. Blue Drop performance trends will be used to determine repetitive poor performance, to inform a radical approach to ensure turnaround and compliance. This could include facilitating long term intervention by either a capacitated water board or any other suitable mode of water services support. The determination of the 'very rough order of estimates' (VROOM) was done to give an estimation of the capital requirement for the functionality restoration drive. This will be effected with the support from the National Treasury.

The Regulator will continue to monitor performance in terms of Section 62 of the Water Services Act and will engage together with CoGTA and SALGA, WSAs for corrective action plan development and implementation and offer support. Should these actions fail, the Department will consider civil action together with actions contemplated under section 63 of the Water Services Act (Act 108 of 1997) to ensure that Ministerial directives are issued with timeframes for implementation. Failure to respond will trigger remedial action be taken at cost of the non-complying entity or municipality. The Department will take steps to improve its capacity to respond more effectively in this duty, in ensuring visible and measurable improvement in drinking water services. The Department of Cooperative Governance and National Treasury will be engaged to explore ways of utilising conditional grants for the purpose of remedial rectification.

All Water Services Institutions are hereby urged to take note of their TSA status and commence with corrective measures. The full Blue Drop audit report will provide further material content to the overall management of drinking water services across South Africa, upon its release in July 2023.

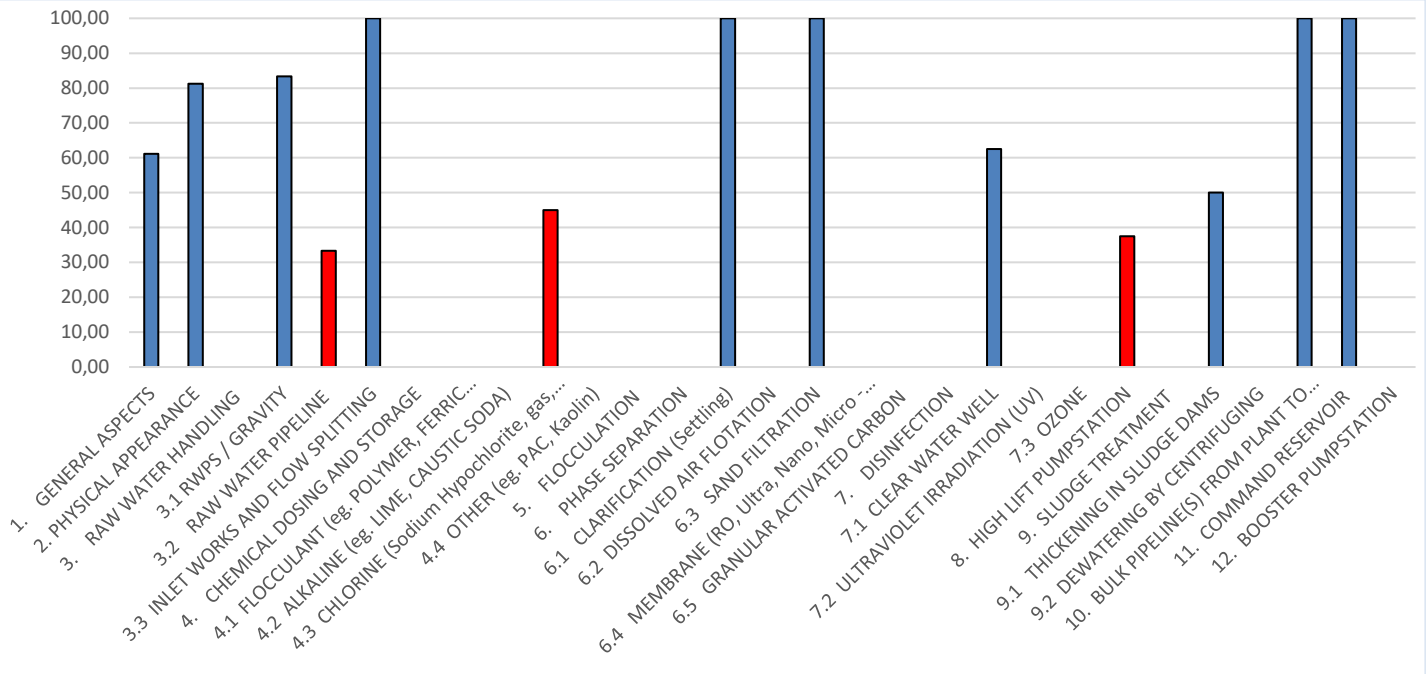
6.1 Dihlabeng Local Municipality

The Clarens water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

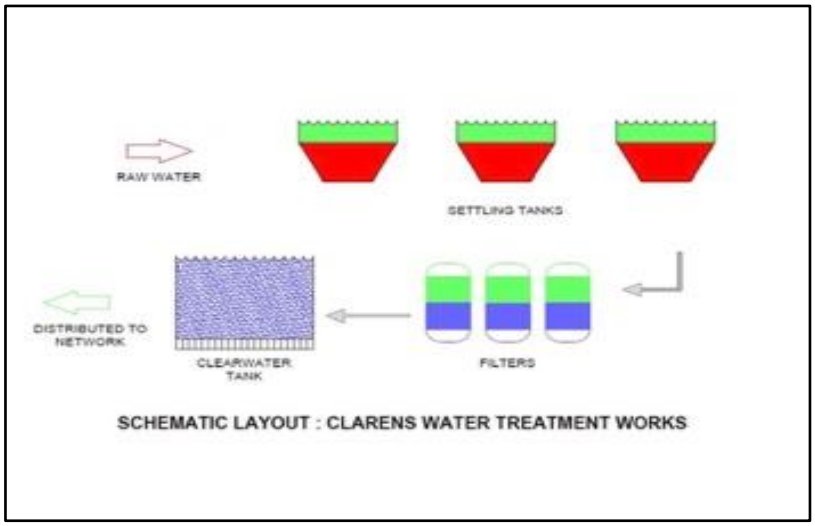
Clarens WTW TSA Score: 68%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	61.1	Plant Classification certificate is displayed. Logbooks with operational monitoring results and various shift entries, O&M manual, and emergency contact numbers available.

Watch #	Process Unit Assessed	% TSA	Observations
2	**Physical appearance of plant**	81.2	Entrance is signposted, boundary fence in place with access control. Site is well maintained, but no safety signs erected. Housekeeping at ablution facility and office to improve.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	83.3	Standby equipment installed at the river but not at the LHTS (Tunnel).
	Raw water pipeline	33.3	Pipeline is 30 years old and undersized. Inflow measuring device not functional, but new meters have been received and will be installed.
	Inlet works	100.0	Low turbidity water, with no chemical dosing for a long time. Mixer not working.
4	**Chemical dosing and storage**		
	Flocculant	NA	No flocculant dosed.
	Chlorine	45.0	Chlorine gas used as disinfectant, no standby equipment, no scale, and insufficient safety measures. Stock is kept at the Saulspoort WTW.
5	**Flocculation**	NA	No flocculant dosed
6	**Phase Separation**		
	Clarification (settling)	100.0	No floc carry-over. Low sludge production. De-sludging once per day.
	Sand filtration	100.0	Three pressure filters are installed with automatic backwash sequence.
7	**Disinfection**		
	Clear water well	62.5	Capacity of contact tank, situated chlorine dosing room, is unknown.
8	**High lift pumpstation**	37.5	Two pumprooms equipped with duty and standby pump sets. Two standby pumps sent for repairs: but no information on status. Flow meters dysfunctional. New meters purchased and on site, will be installed.
9	**Sludge treatment**		
	Thickening in sludge dams	50.0	Sludge and Filter backwash water is discharged into a pond on site. The ponds are not maintained, overgrown with weeds.
10	**Bulk pipeline from plant to command reservoir**	100.0	No leaks on the two lines or at the valves.
11	**Command reservoir**	100.0	Clarens and Kanana Reservoirs are fenced. Kgubetswana reservoirs are inside a fenced municipal area. No leaks and inspection manholes closed.
12	**Booster pumpstation**	na	
	Total	**68%**	

High risk areas OR Key Hardware Risks/ Defects

A new plant is under construction and findings on the day of inspection will be addressed through the project.

1. Two high lift standby pumps were sent for repairs
2. Process Controllers to be trained on quality assurance in operational laboratory
3. Maintenance at the Townsend Dam to be attended to.

VROOM Refurbishment Cost Estimate

Civil Works	R34,100	4%
Mechanical Works	R635,800	77%
Electrical Works (Incl C&I)	R158,400	19%
Total VROOM Cost	**R828,300**	**100%**
R million / MLD		**0.83**

Regulatory Impression

A new WTW is under construction and findings will be addressed through the project. The municipal team is highly passionate, enthusiastic, and committed. Recordkeeping systems are in place but recommended that templates be drafted for the various sets of records. Despite construction work on site, the site is well maintained.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro, but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	95.28%

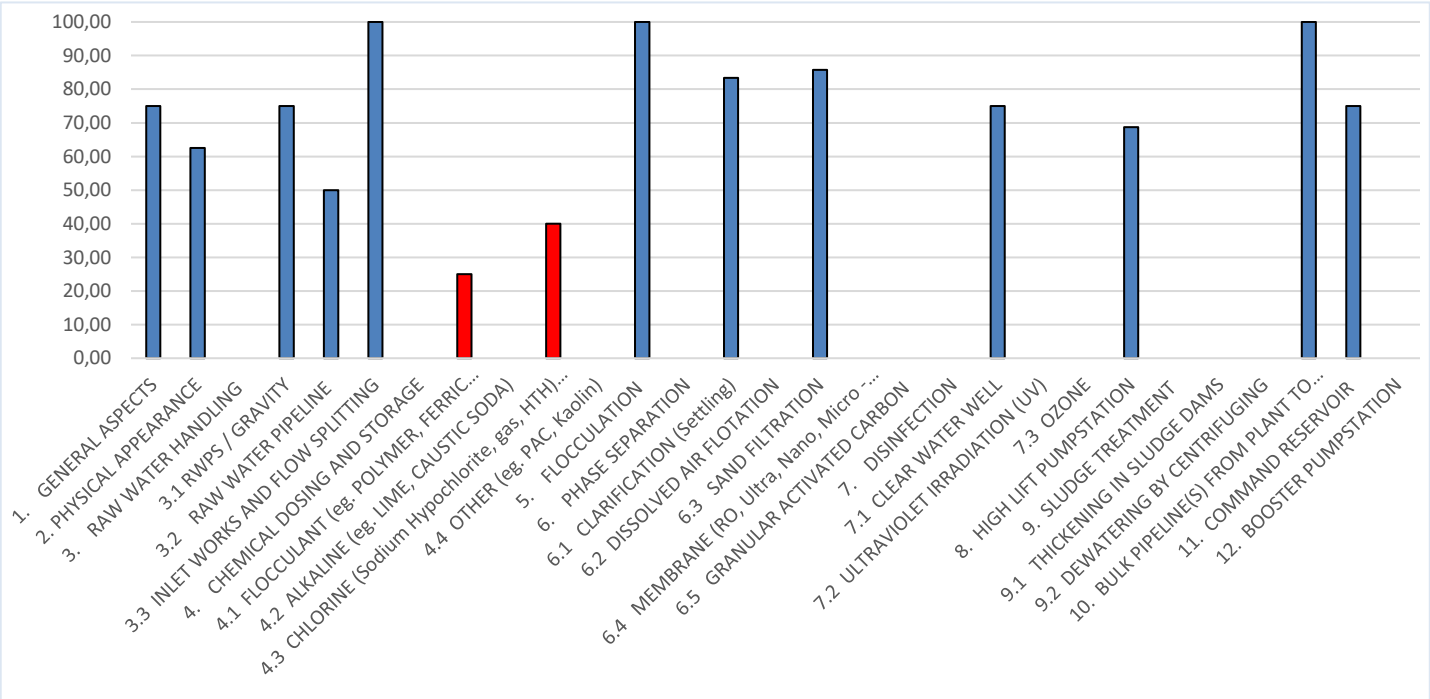
Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

The Fouriesburg water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

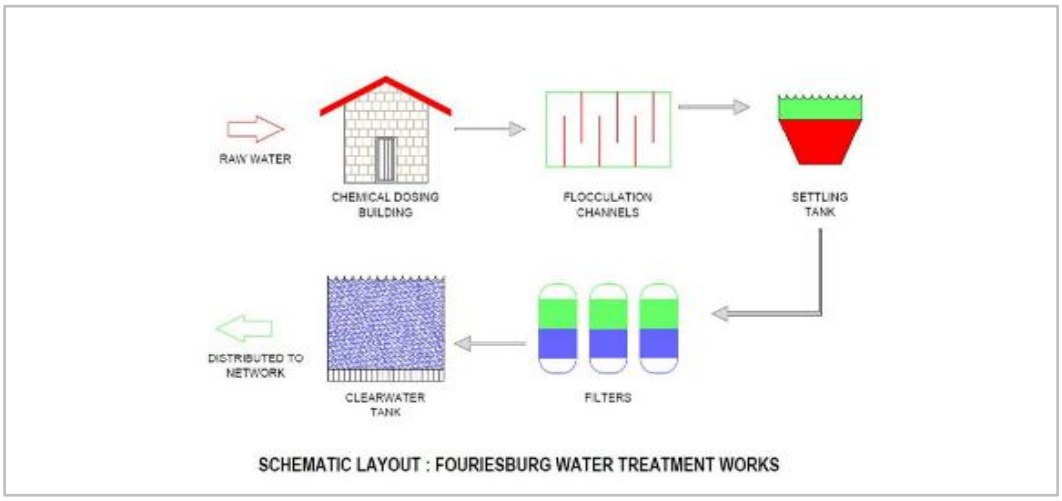
Fouriesburg TSA Score: 68%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



SCHEMATIC LAYOUT : FOURIESBURG WATER TREATMENT WORKS

Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	75.0	Plant registration and Process Controllers' certificates displayed at the plant. IMP, Logbooks with operational data (including jar test results), defects reported and repaired, and visitor's register are available. Process Controllers perform pH, Turbidity, Electrical Conductivity, and free chlorine analyses.
2	**Physical appearance of plant**	62.5	Good support by management. The plant is fenced, and the gate kept locked. No institutional information is displayed at the entrance and no safety signs on the plant. Tidiness of the workers' facilities need improvement.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	75.0	Duty and standby pump sets installed at the Caledon River and the Carolina Booster pump station. Screens installed at the abstraction points are regularly inspected.
	Raw water pipeline	50.0	AC pipeline from Caledon River to the plant will be replaced. The pipeline from Meiringskloof Dam is at risk of being damaged by mud slides. The inflow meter was replaced recently, and inflow volumes were estimated.
	Inlet works	100.0	Adequate mixing energy is provided through the hydraulic jump just after the chemical dosing point. Dripping of the flocculent from a PVC manifold is visible.
4	**Chemical dosing and storage**		
	Flocculant	25.0	Only one dosing pump installed. The dosing area was untidy, showing evidence of spillages. Adequate storage capacity, but not bunded.
	Chlorine	40.0	The water is disinfected using chlorine gas. No standby equipment was available. PPE not sufficient and no safety equipment is installed. The stock available on site was not sufficient for 30 days.
5	**Flocculation**	100.0	Flocs were observed, with no accumulation of scum or algal growth present.
6	**Phase Separation**		
	Clarification (settling)	83.3	De-sludging is done manually, normally once per day. No floc carry-over noticed. The weir was damaged by the revolving scraper. It was also submerged in water and the cause needs to be investigated.
	Sand filtration	85.7	Swan filters, with duty and standby backwash equipment available. Filters are backwashed twice per shift, which needs to be investigated. Media surface appeared even with no cracks observed. Some nozzles may be broken.
7	**Disinfection**		
	Clear water well	75.0	At the current flow adequate contact time, but not sufficient at design flow. The sampling point for measuring the free chlorine was from a tap on site.
8	**High lift pumpstation**	68.8	Two pump sets installed, and in working condition, to transfer water from clear water well to the galvanised reservoir on site. Four pump sets installed to pump water from the galvanised reservoir to Fouriesburg and the township. One standby pump has been sent for repairs. The outflow meter was replaced recently, and outflow was estimated.
9	**Sludge treatment**	NA	Sludge and filter backwash water are discharged to the Caledon River
10	**Bulk pipeline from plant to command reservoir**		AC and uPVC pipes. No major issues were reported.
11	**Command reservoir**	75.0	Water is distributed into the network from reservoirs in Fouriesburg and Mashaeng.
12	**Booster pumpstation**	NA	No booster pump stations in the network.
	Total	**68%**	

High risk areas OR Key Hardware Risks/ Defects

1. Raw water pipe network should be upgraded to ensure uninterrupted supply to the Fouriesburg communities
2. Chemical storage tanks must be bunded
3. The chlorine dosing facility is not conforming with the required regulations and should be upgraded
4. The sedimentation tank weir, scraper, and desludge valves should be refurbished.
5. Filter nozzles to be replaced.

VROOM Refurbishment Cost Estimate

Civil Works	R2,185,700	71%
Mechanical Works	R507,100	16%
Electrical Works (Incl C&I)	R3,82 800	12%
Total VROOM Cost	**R3,075,600**	**100%**
R million / MLD		**0.59**

Regulatory Impression

The plant is registered as Class C, but still to be reviewed. The design capacity is 5.18 ML/d. 75% of registered Process Controllers registered follow Draft Regulation 813 requirements. Compliant supervisory capacity is available. Inspectors wish to commend the highly passionate, enthusiastic, and committed officials for their efforts to achieve excellence. Although not meeting all the Brue Drop requirements, a WaSP and Process Audit report were compiled and presented. Operational and compliance monitoring programmes were in place during the assessment period. Flow meters were replaced, and only estimated flows are available for the assessment period. Recordkeeping must improve in various areas. It is recommended that templates for log sheets and registers be drafted and standardized as far as possible, for implementation. This will ensure that important recordings are not omitted.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	97.29%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



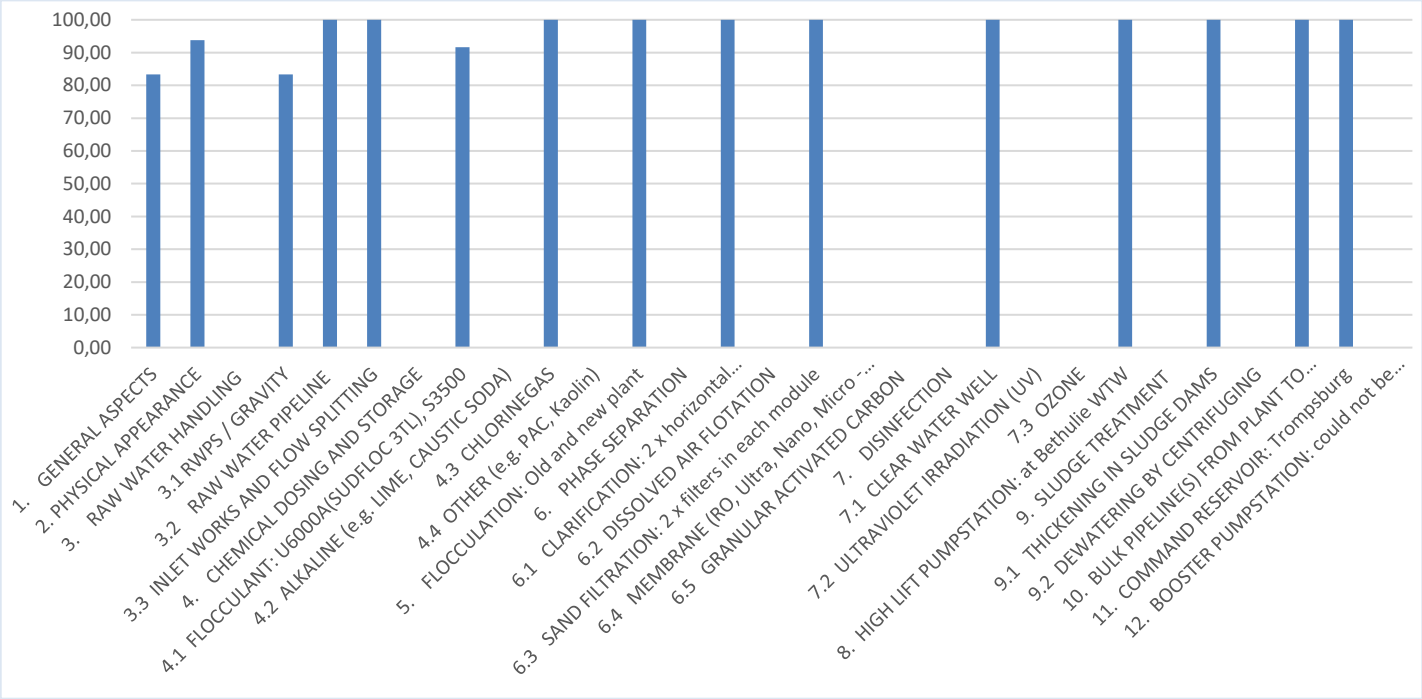

6.2 Kopanong Local Municipality

The Bethulie water supply system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality. The Bethulie WTW is owned and operated by Bloem Water and supplies water to several water supply systems in Kopanong Local Municipality namely Bethulie, Trompsburg and Springfontein.

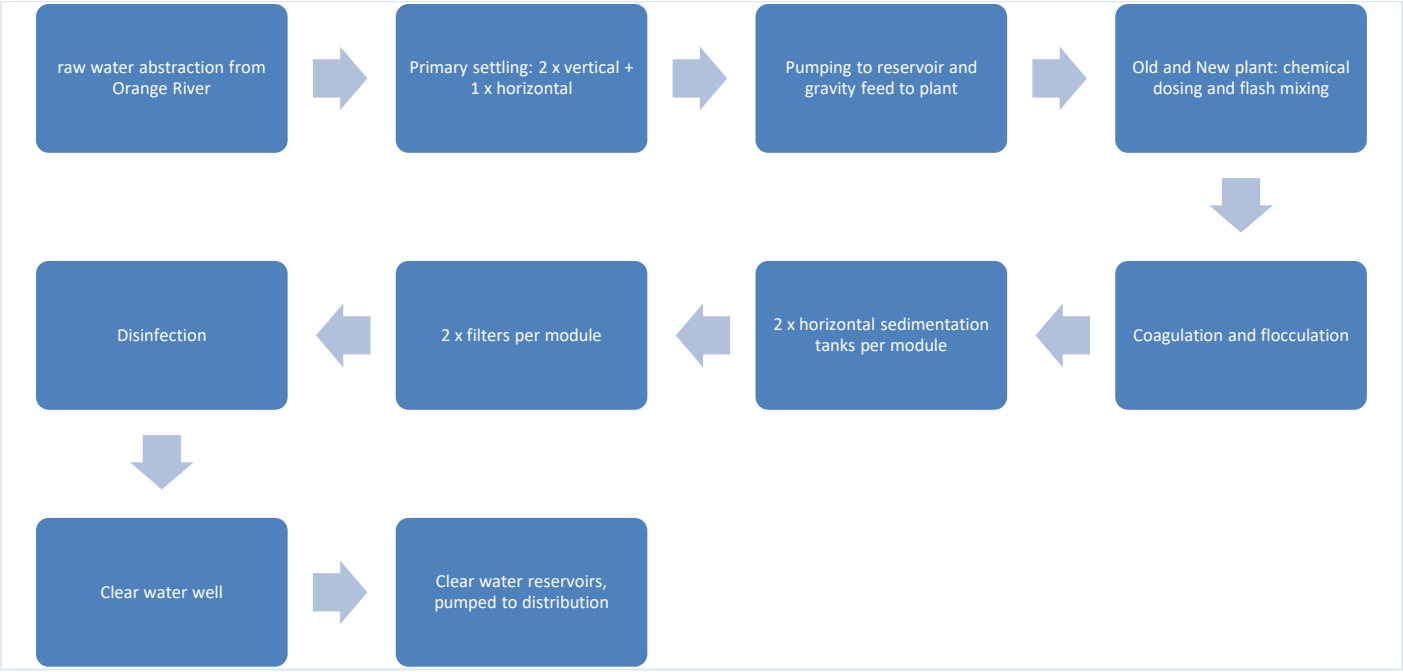
Bethulie TSA Score: 95%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1.	**General aspects**	83.3	Class B plant, telemetry system for to record reservoirs levels, daily log sheets for operational monitoring, flowmeters, stock levels, pumps. Process layout not displayed; Jar Test only conducted every three/four months.
2.	**Physical appearance**	93.7	24 hr access control, Fenced. Neat terrain, excellent facilities for staff, high workplace satisfaction. Lack of safety signs around site except for chlorine and chemical dosing rooms.
3.	**Raw water handling**		Raw water screens in place, Backup abstraction pumps is in store, Inflow meters in place, even flow splitting at inlet into two modules, visual dripping of flocculant at point of highest turbulence.
	Rwps / gravity	83.3	
	Raw water pipeline	100.0	
	Inlet works and flow splitting	100.0	
4	**Chemical dosing and storage**		Chemical dosing in excellent condition, clean, MSDS sheet displayed, bunded walls, emergency eyewash, sufficient stock on site, measuring cylinder. 50% backup for dosing pump with additional backup in store.
	Flocculant	91.6	
	Chlorine gas	100.0	Duty standby chlorinators, balance scales, sufficient stock on hand for 30 days, Safety signs and equipment available. Process controller uses gas mask to change cylinders.
5	**Flocculation**	100.0	Good floc formation observed, channels are clean, subject to annual cleaning in winter.
6	**Phase separation**		
	Clarification:	100.0	Manual desludge conducted once per shift in response to NTU limit of 5 NTU, clear overflow, weirs are clean.
	Sand filtration	100.0	Backwashing in response to final water NTU (<1NTU limit) or in response to filter head loss, even flow splitting, even bubble distribution, sand in good condition, filter gallery very clean, backup blower.
7	**Disinfection**		
	Clear water well	100.0	Sufficient contract time in reservoir. Free chlorine sample collected before delivery to network.
8	**High lift pumpstation**	100.0	Sufficient backup pumps. Final flow meter in place and working. PLC in place to stop/start pumps and shows reservoirs levels, monitor valve pressure, pump running hours.
9	**Sludge treatment**		
	Thickening in sludge dams	100.0	2 sludge dams, use on rotational basis, backup for sludge pumps.
10	**Bulk pipeline(s) from plant to command reservoir(s)**	100.0	Pipeline in good condition, routine maintenance plan for pipe network, valve chambers and reservoirs.
11	**Command reservoir**	100.0	24 hr security, fenced, level indicators connected to telemetry system that records raw, final, reservoirs levels at all main and secondary reservoirs and flow through pumpstations.
	Total	**95%**	

High risk areas OR Key Hardware Risks/ Defects

There are no hardware risks as the plant is in an excellent condition. There is high risk is theft and vandalism at abstraction tower situated at Hennie Steyn Bridge and owned by SA Railways.

VROOM Refurbishment Cost Estimate

Civil Works	R184,000	100%
Mechanical Works	R0	0
Electrical Works (Incl C&I)	R0	0
Total VROOM Cost	**R184,000**	**100%**
R million / MLD		**0.02**

Regulatory Impression

The Bethulie water treatment plant is in excellent condition with all unit processes operating effectively, onsite maintenance teams, competent staff, and dedicated management team. There is excellent housekeeping, operational monitoring, routine maintenance of all equipment and routine inspections of infrastructure. Installation of safety signs at chlorine room and chemical dosing is excellent but missing at other unit processes. The plant is however only operating at 18% of design due to restricted flow to the municipality due to lack of payment. This results in water shortages in the municipality with routine water shedding taking place.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	>99.90%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



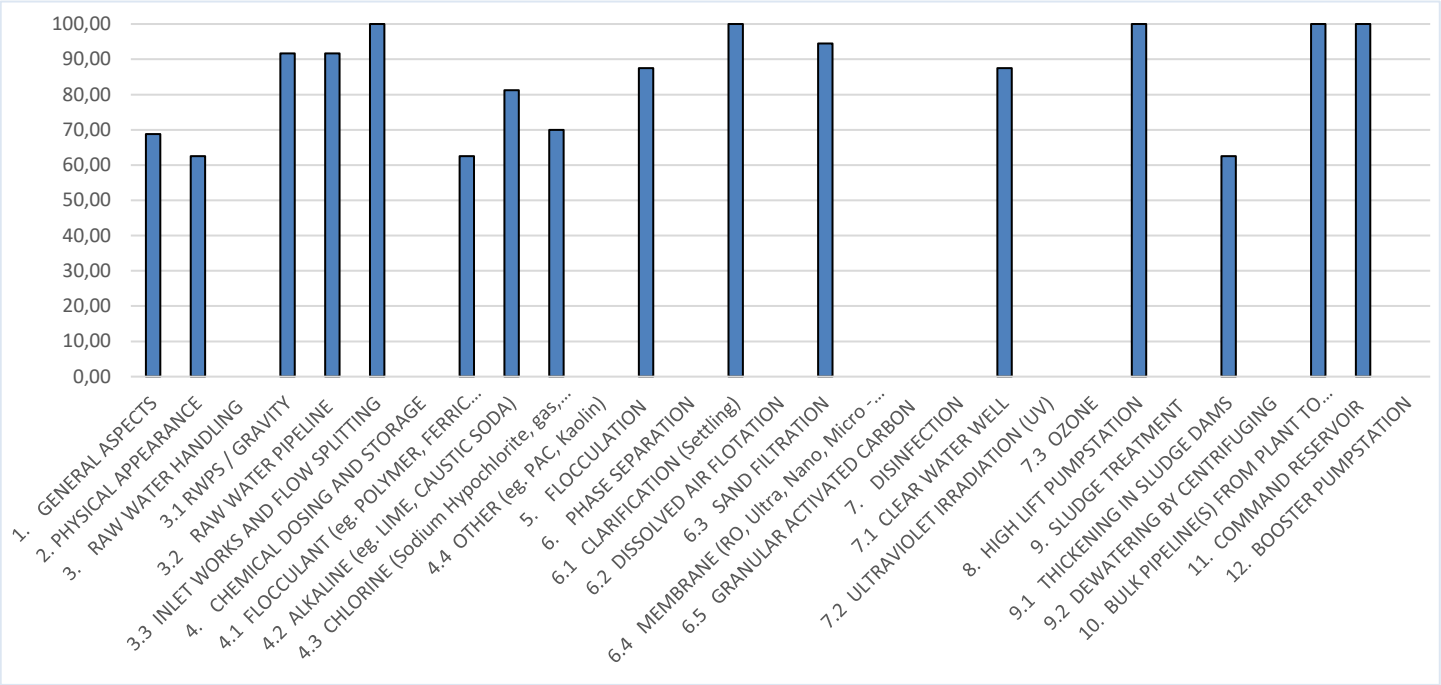

6.3 Letsemeng Local Municipality

The Jacobsdal water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

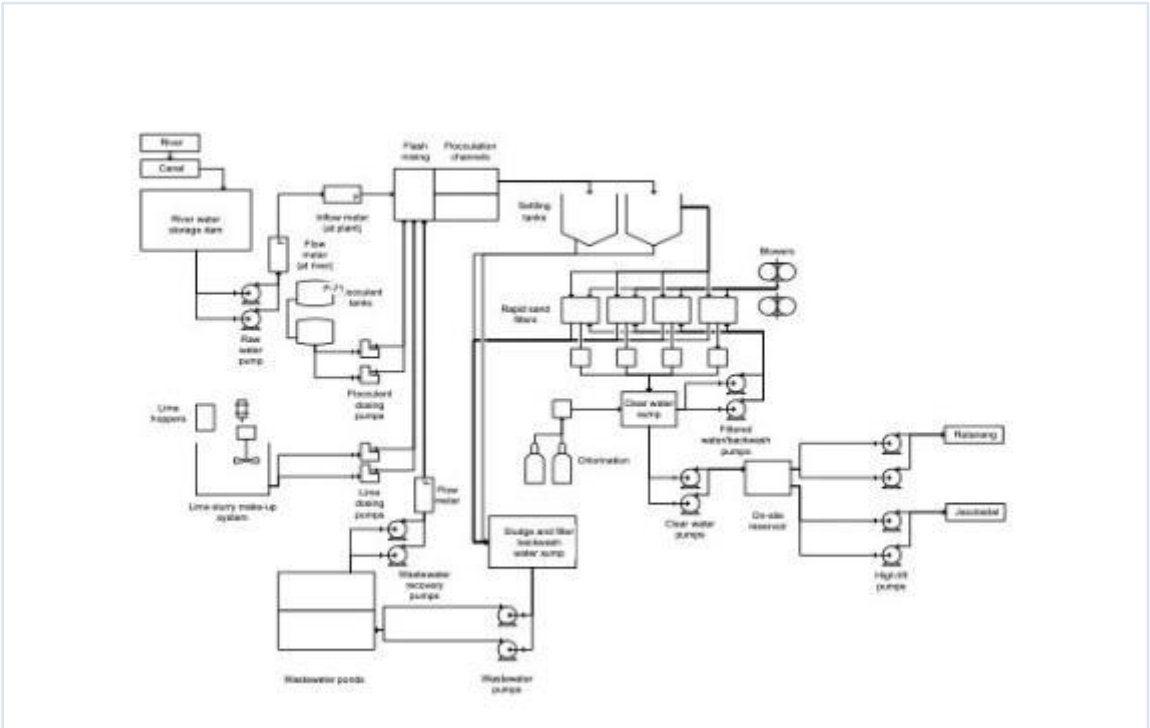
Jacobsdal WTW TSA Score: 81%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	68.8	At the time of the inspection the plant registration was not finalised yet. All operational monitoring is done in-line and results are available on daily report from Scada. Equipment is available for verification of in line measurements but no evidence that analyses are performed. Jar test equipment is available, but no records of tests done. IMP and O&M manuals are available on site.
2	**Physical appearance of plant**	62.5	The WTW is fenced with access control. The entrance is not signposted. The terrain and garden are overgrown with weeds. The bathroom was not clean, and no consumables were available. Process Controllers use the Control Room to eat and drink.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	91.7	A coarse screen is installed and cleaned by the WUA. The sieve at the raw water dam is cleaned monthly by Process Controllers. Two pumps are installed to pump the raw water from the dam to the plant. Both pumps are functional.
	Raw water pipeline	91.7	The line from the dam to the plant was installed two years ago and is in good condition. Meters are installed at the raw water dam and at the plant. Flow measurement is displayed on the Scada.
	Inlet works	100.0	Chemical dosing is done at the hydraulic jump at the inlet. Dripping of the coagulant was visible.
4	**Chemical dosing and storage**		
	Flocculant	62.5	Sudfloc is dosed at the plant. The stock tanks are kept in a bunded area. Two dosing pumps are installed, both in working condition. The dosing area was untidy with evidence of spillages. The availability of stock is a challenge as stock is sometimes shared between plants. There have been incidents when stock was not available. The only emergency wash area is at the chlorine room.
	Alkaline	81.3	Dosing units are installed for the dosing of lime. The facility was commissioned but has never been used.
	Chlorine	70.0	Chlorine gas is used as disinfectant. Two dosing units and two scales are in place. The one scale needs to be repaired. Two cylinders are connected but switch-over is done manually by the Process Controllers. Safety equipment is installed and operational. Insufficient stock was available on site.
5	**Flocculation**	87.5	Good floc formation was observed with slight accumulation of scum towards the end of the channel.
6	**Phase Separation**		
	Clarification (settling)	100.0	De-sludging is done automatically and discharged to the on-site ponds. Floc carry-over was not a concern, and no algal growth was observed.
	Sand filtration	94.4	Duty and standby backwash equipment are installed and in working condition. Even bubble distribution was observed during backwashing. High backwash frequency needs to be investigated. The plant has been in operation for less than 2 years and no obvious cracks and moulds were observed.
7	**Disinfection**		
	Clear water well	87.5	A 5-ML concrete reservoir is on site providing for adequate chlorine contact time before water is pumped into the network. Free chlorine is measured in line and results are displayed on Scada.
8	**High lift pumpstation**	100.0	Two transfer pumps is installed to pump water from the clear water well to the 5 ML reservoir. The pump station at the reservoir is equipped with four pumps, duty, and standby arrangement for each pump line. Water is pumped to a I ML on-site reservoir and two elevated linked reservoirs at Ratanang and Sander's Hoogte reservoirs. Flow is measured on both outgoing lines and displayed on the Scada. A daily report is printed.
9	**Sludge treatment**		
	Thickening in sludge dams	62.5	Two sludge dams (ponds) are on site. They are almost full, and build-up of sludge was clearly visible. The supernatant is re-cycled. The volume is measured and available on the Scada.
10	**Bulk pipeline from plant to command reservoir**	100.0	Pipeline to concrete reservoir on site is in good condition.
11	**Command reservoir**	100.0	The 5 ML reservoir is within the boundary fence. The reservoir level can be obtained from the Scada
12	**Booster pumpstation**	NA	Refer to Point 8. The four pump sets used to pump water to the network reservoirs are referred to as the high lift pumps.
	Total	**81%**	

High risk areas OR Key Hardware Risks/ Defects

1. The need for the current backwash frequency must be investigated
2. The sludge dams must be cleaned
3. No safety warnings at the dam.

VROOM Refurbishment Cost Estimate

Civil Works	R1,549,900	99%
Mechanical Works	R12,100	1%
Electrical Works (Incl C&I)	-	0%
Total VROOM Cost	**R1,562,000**	**100%**
R million / MLD		**0.37**

Regulatory Impression

The plant has been in operation for less than two years. At the time of the inspection the registration of the plant and Process Controllers were not finalised. The situation has since changed. The Supervisor is not registered but three of the four registered Process Controllers complies with Regulation 2834. Duty and standby equipment are installed and functional. All measurements are available on the Scada, and a daily report is printed. It was disheartening to notice that Process Controllers are not using the information and were not able to provide daily average flow information. Operational monitoring results are not used by Process Controllers to observe trends and affect the necessary changes when required. Risk management has not been implemented and although compliance monitoring programmes are uploaded on the IRIS, no evidence of a water quality risk assessment is available. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	57.50%
Chemical Compliance	92.25%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





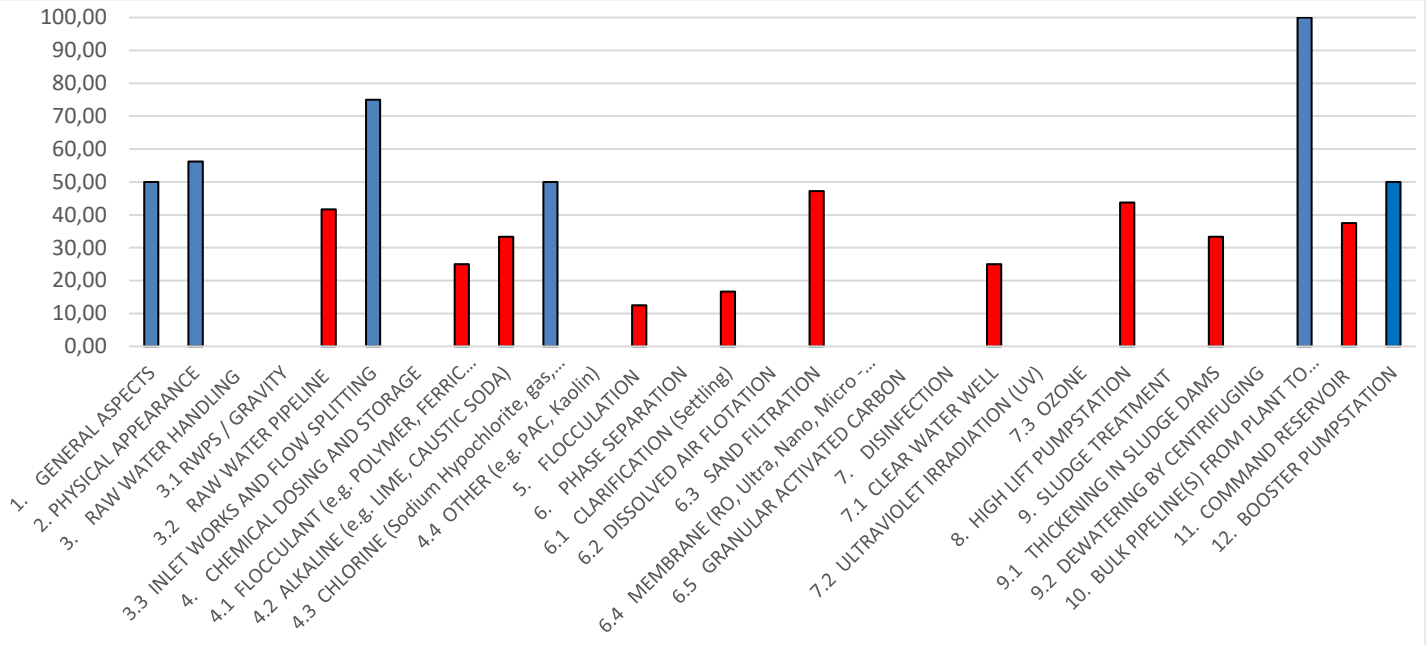

6.4 Mafube Local Municipality

Frankfort water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

Frankfort WTW TSA Score: 44%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram

None

Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	50.0	The Classification certificate is not displayed. The maintenance and repairs logbook were not available. Operational Logbook is available. The O&M is available. The incident management procedure is not available, and the emergency contact list is not displayed. The process flow diagram is not displayed onsite. The monitoring equipment was on site on the top floor of the filter gallery, these were all working, and readings were being recorded. The Process controller indicated that jar testing is done however the testing equipment was not observed. Access to Eskom infrastructure not allowed.
2	**Physical appearance of plant**	56.2	The entrance is signposted albeit an old Project notice board. The state of the garden and terrain was not good. The facility was in a fair condition. There were no serious OHS in the past year, but there are several OHS non compliances i.e., open manholes pump and motor guards not in place and old clear water sump access and cover not safe. The general workplace condition is not good as far as the unkept terrain, poor lighting at night (Process controller's having to use their own torched to move around the plant) certain process unit not easily accessible and the admin building that good be refurbished with and in including new furniture and equipment. There is a fence around the facility. Relevant Safety signs are posted in the Chlorine room.
3	**Raw water handling**		
	Raw water pipeline	41.6	There are no reported leakages at the raw water pipeline. The inflow meter is not operational but installed. The volumes are not recorded.
	Inlet works	75.0	The flow is splitting at the outlet to the flocculation channel before clarifiers. Unable to determine even distribution. The mixing is sufficient. Visual dripping of the flocculant is observed.
4	**Chemical dosing and storage**		
	Flocculant	25.0	The one dosing pump is in good working condition, but the installation is very poor. The dosing area is not neat and there are spillages. The storage volume is sufficient for 30 days. Rheofloc 643xl. The storage area is not bunded. The is no shower available.

Watch #	Process Unit Assessed	% TSA	Observations
	Alkaline	33.3	The pumps were not observed onsite. The bags of lime are place on the cement floor. Exposed to rising damp and moisture though door opening that has no doors. There is sufficient stock. Lime is used for the pH correction when required.
	Chlorine	50.0	There was only one dosing pump installed and available. No safety equipment observed. The storage volume is sufficient for 30 days.
5	**Flocculation**	12.5	This was difficult to observe i.t.o the flocculation circular configuration and at the splitter box. The flocculation unit is in a bad state and the plaster band on top of the walls and on the sides were disintegrating to the extent that some of the walls a have lot rows of bricks from the top. The is scum accumulation and minimal algae growth present.
6	**Phase Separation**		
	Clarification (settling)	16.6	his was not determined as there was no access i.e., ladders and or steps to get to these units. But from photos taken from the floc unit it is clear that the units ae not functioning correctly and are hydraulic overloaded to the extent that the launders ae under water. the cause of this can be several issues, from no regular desludging and of inflow greater that design capacity. There is no desludging schedule. Not Assessed, under water inaccessible.
	Sand filtration	47.2	There are two backwash pumps. The is only one blower pump that is working. This could not be observed as load shedding had just been reinstated. The filter beds were all very low with water and there seemed to be two little sand in each. Pipes for blower function were exposed and in one filter the exposed sand had cracks forming and there was an uneven surface observed. No backwashing in place. Backwashing depends on the Raw water inflow. There were handrails around the filters and the housekeeping is good.
7	**Disinfection**		
	Clear water well	25.0	Contact time in on-site reservoir is more than 30 minutes this could not be determined. Free chlorine is done at the contact tank, which is the clear water reservoir through the hole in the top cover. Clear water well observation units were in a relatively good state.
8	**High lift pumpstation**	43.7	All installed pumps are in average condition. Final flow measuring device is not available. Flow rate / volume is not recorded.
9	**Sludge treatment**		
	Thickening in sludge dams	33.3	There is a sludge lagoon. The sludge dam has been empty for the past two years.
10	**Bulk pipeline from plant to command reservoir**	100.0	In good condition there are no leaks, within the plant area. Valve chamber was not inspected.
11	**Command reservoir**	37.5	The reservoir is inside the plant and there is fence around the plant. The final inflow meter was not observed. The structure has leaks coming from the onsite elevated reservoir that needs urgent attention.
12	**Booster pumpstation**	50.0	No, there is only one pump running to feed the Villiers community that is frequently without water. None at present, pump has been removed for repair and this has been a long period without replacement. Yes, separate to main plant but within the premises. The Motor Control Centres (MCC) In a fair condition.
	Total	**44%**	

High risk areas OR Key Hardware Risks/ Defects

1. Repair, refurbishment of the intake works chemical buildings, inclusive of bunding walls for all chemical holding containers
2. The flocculation unit need a major refurbishment on the civil works
3. The problem of the clarifiers / settling units needs investigation and rectification
4. The sand filtration units although fairly new, have to have the filter beds investigated and rectification into sand volume
5. Blower pressure and backwash pumps flow to get the filter working efficiently and effectively
6. A more effective means of disinfection needs investigation.

VROOM Refurbishment Cost Estimate

Civil Works	R3,412,200	67%
Mechanical Works	R1,230,900	24%
Electrical Works (Including C&I)	R430, 100	8%
Total VROOM Cost	**R5,073,200**	**100%**
R million / MLD		**0.35**

Regulatory Impression

The Frankfort water system can be maintained better than its current state, with strained flocculation and settling treatment processes. The staff are knowledgeable and have the desire to have the plant fully functional. Overall health and safety of the plant can be improved to improve the workplace satisfaction.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	NI
Chemical Compliance	NI

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

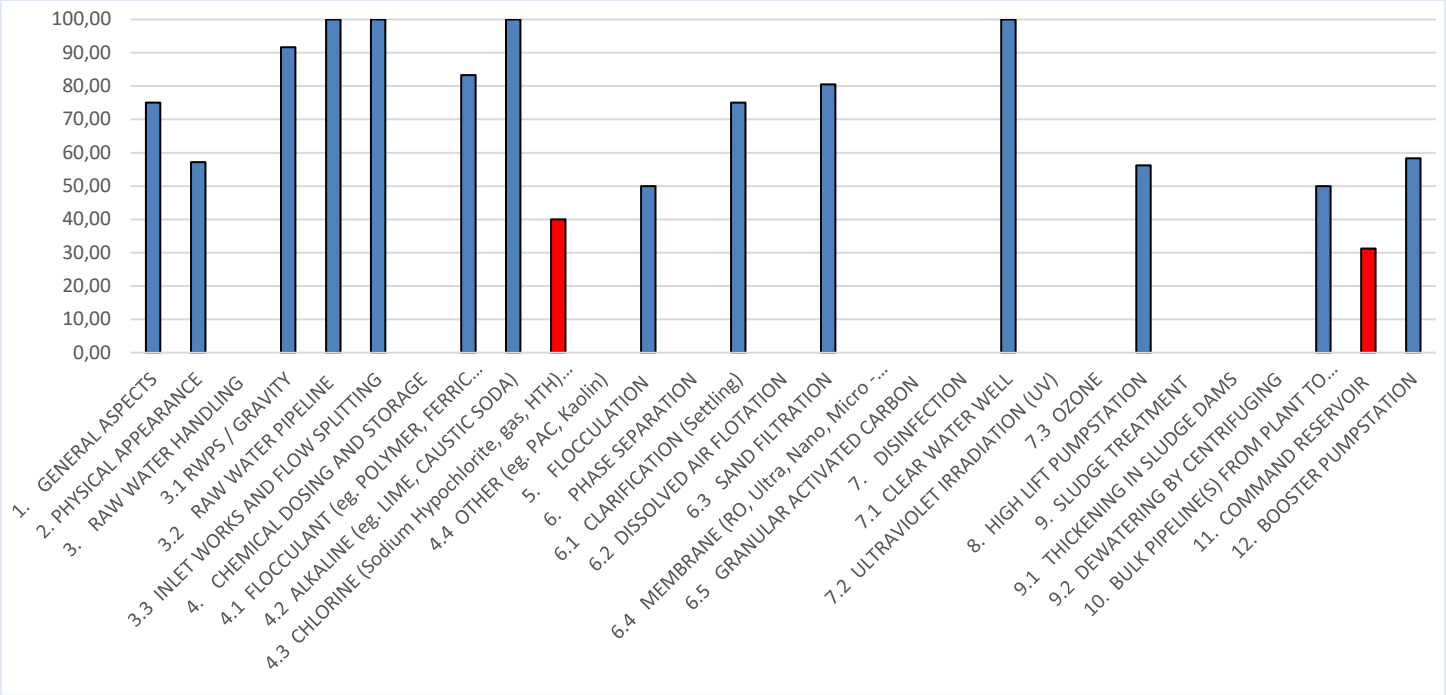
6.5 Maluti-A-Phofung Local Municipality

The Wilge (Harrismith) water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

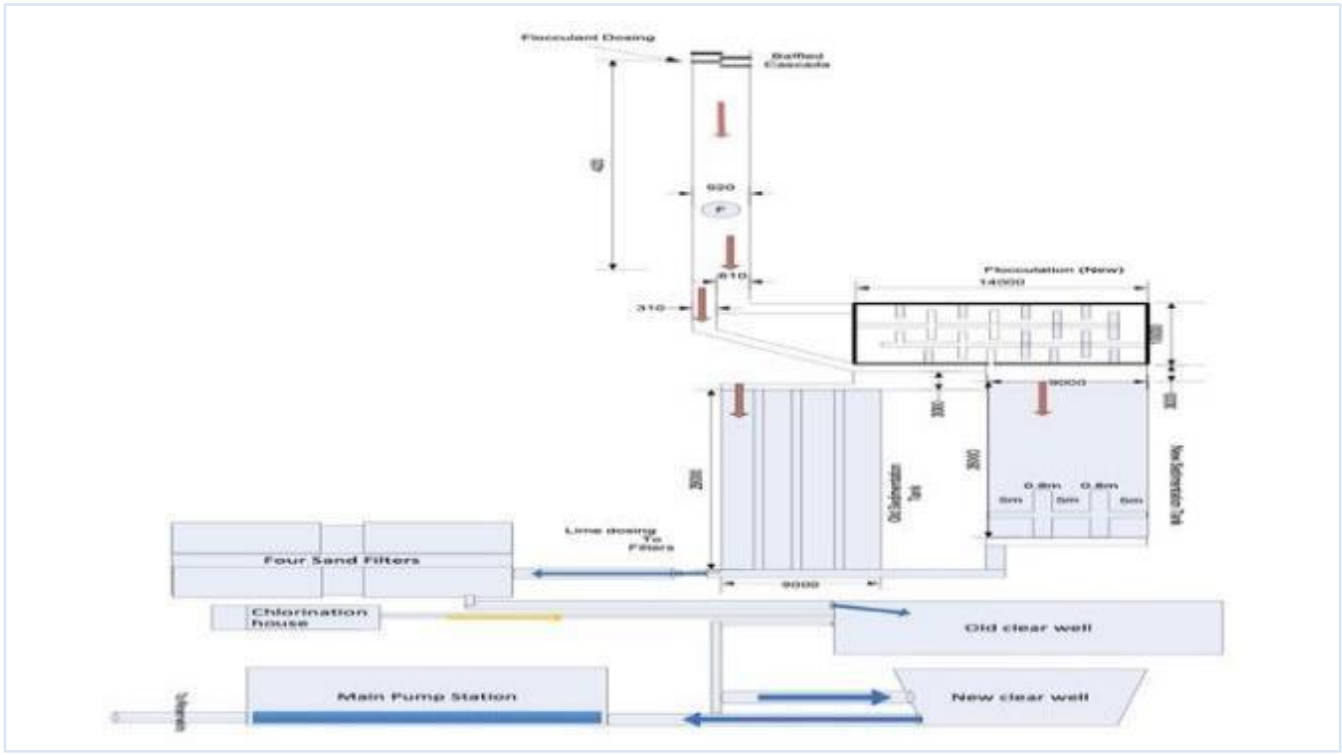
Wilge WTW TSA Score: 67%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	75.0	Process monitoring equipment is available but no proof of calibration. Manuals and various logbooks with shift entries, repairs by maintenance team and electricity readings were presented.
2	**Physical appearance of plant**	57.1	The entrance is clearly signposted, the facility is fenced, and the gate kept closed. The terrain is overgrown with grass. The bathroom and office facility are in poor condition.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	91.7	A new 2nd raw water pump was received on site and will be installed. The strainer installed at the pump station is cleaned monthly
	Raw water pipeline	100.0	The Process Controllers are not aware of any leaks on the pipeline.
	Inlet works	100.0	The flocculent is added at the hydraulic jump in the inlet channel. The chemical feed is visible and can be monitored by the Process Controllers.
4	**Chemical dosing and storage**		
	Flocculant	83.3	U3500 is stored in 2 x 5000 L bulk tanks, with adequate capacity for more than 30 days. The area is bunded. Two dosing pumps are installed, both in working condition. The dosing area was clean with no spillage observed. There is no emergency shower nearby.
	Alkaline	100.0	The system was not in use. Bags with hydrated lime are kept in stock and are stored on an elevated level.
	Chlorine	40.0	Chlorine gas is used as disinfectant and adequate stock was available on site. Both load cells were not functional. Safety at the chlorine facility is of concern. Installed safety equipment was not working, PPE is not adequate and / or not inspected annually.
5	**Flocculation**	50.0	Good floc formation was observed. Of concern is however the severe water leakage at the inlet to the channels, which has been the case for the last three years.
6	**Phase Separation**		
	Clarification (settling)	75.0	Floc carry-over was visible at the 2nd tank. Another leak was noted at the inlet to the 2nd tank. De-sludging is done manually, twice per day.
	Sand filtration	80.6	Media surface appeared to be uneven and disturbed. One backwash pump has been out of operation for five months prior to the inspection. The control panels are not in working condition.
7	**Disinfection**		
	Clear water well	100.0	There are two clear water wells of unknown capacity. Water was leaking from the one. WSA must attend to the water losses observed at the plant.
8	**High lift pumpstation**	56.2	Six high-lift pump sets are installed and all functional. This provides for 100% standby capacity. Flow meters have not been working for an extended period and Process Controllers use the pump hours to calculate the volumes pumped.
9	**Sludge treatment**		
	Thickening in sludge dams	0.0	Sludge and Filter backwash water are discharged into a pond at the site. The pond is not maintained.
10	**Bulk pipeline from plant to command reservoir**	50.0	There are three pipe network from the plant into the network. The pipeline to Botanical Gardens has excessive leaks and was taken out of operation. The affected areas are supplied from the Bergsig reservoir.
11	**Command reservoir**	31.2	Treated water discharges to three reservoirs of which only the Bergsig reservoir is fenced. The reservoir at Botanical Gardens was not in operation at the time of the inspection. No leakage at the reservoirs.
12	**Booster pumpstation**	58.3	There are two booster pump stations with 100% standby arrangement, but only one pump functional at each pump station.
	Total	**67%**	

High risk areas OR Key Hardware Risks/ Defects

1. The plant is operated at >150% of the design capacity
2. Excessive leaks were observed and must be attended to urgently
3. No risk management in place
4. Monitoring programmes aligned with SANS 241 must be implemented immediately
5. Outflow meters must be repaired. Standby pumps at the booster pump stations must be repaired / replaced
6. Safety at the chlorine dosing facility needs urgent attention. Scales must be repaired.

VROOM Refurbishment Cost Estimate

Civil Works	R1,608,200	48%
Mechanical Works	R1,522,400	45%
Electrical Works (Incl C&I)	R248,600	7%
Total VROOM Cost	**R3,379,200**	**100%**
R million / MLD		**0.30**

Regulatory Impression

The DWS Blue Drop Team was received by an enthusiastic municipal team, reporting that there is a lack of support from management. The Wilge WTW is classified as a Class B plant. The plant has a design capacity of 11.2 Ml/d and is currently operated at >150% of the design capacity. Excessive water losses from leaks in civil structures were noted. Some of these leaks have been there for more than three years. These water losses must receive urgent attention. The Supervisor is compliant with Reg 813. Process controlling capacity however does not meet regulatory requirements. Operational monitoring has been implemented. The WSA has not compiled a WaSP and there is no evidence of risk management. It was extremely disconcerting to see that a water quality risk assessment has not been done and that no information is available on the bacteriological quality of the water supplied to consumers. The WSA has not implemented a compliance monitoring program and intervention is required. The site is not maintained and facilities available to Process Controller are appalling. Standby pumps are to be replaced/ repaired. The telemetry system is dysfunctional and reservoir levels are reported by the maintenance team.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	NI
Chemical Compliance	NI

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





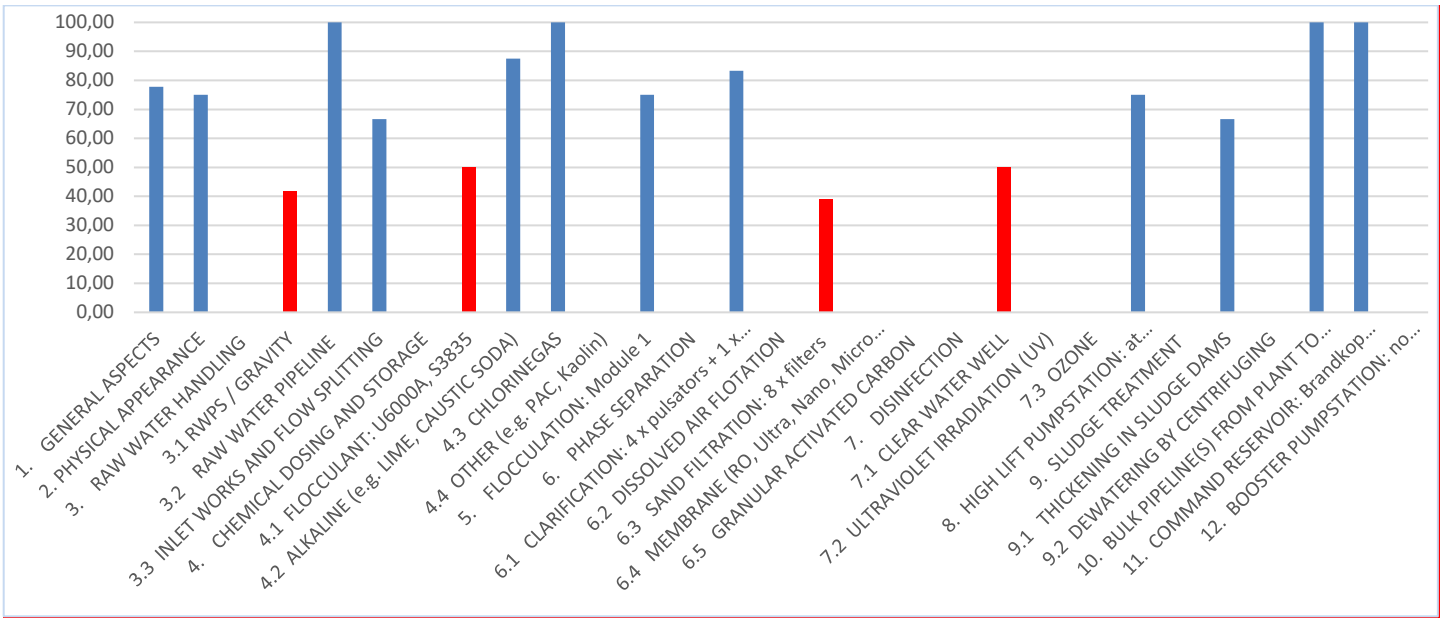

6.6 Mangaung Metropolitan Municipality

The Welbedacht water treatment works was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality. The Welbedacht WTW is owned and operated by Bloem Water and supplies water to several water supply systems in Mangaung Metropolitan Municipality namely Bloemfontein, Wepener and Dewetsdorp.

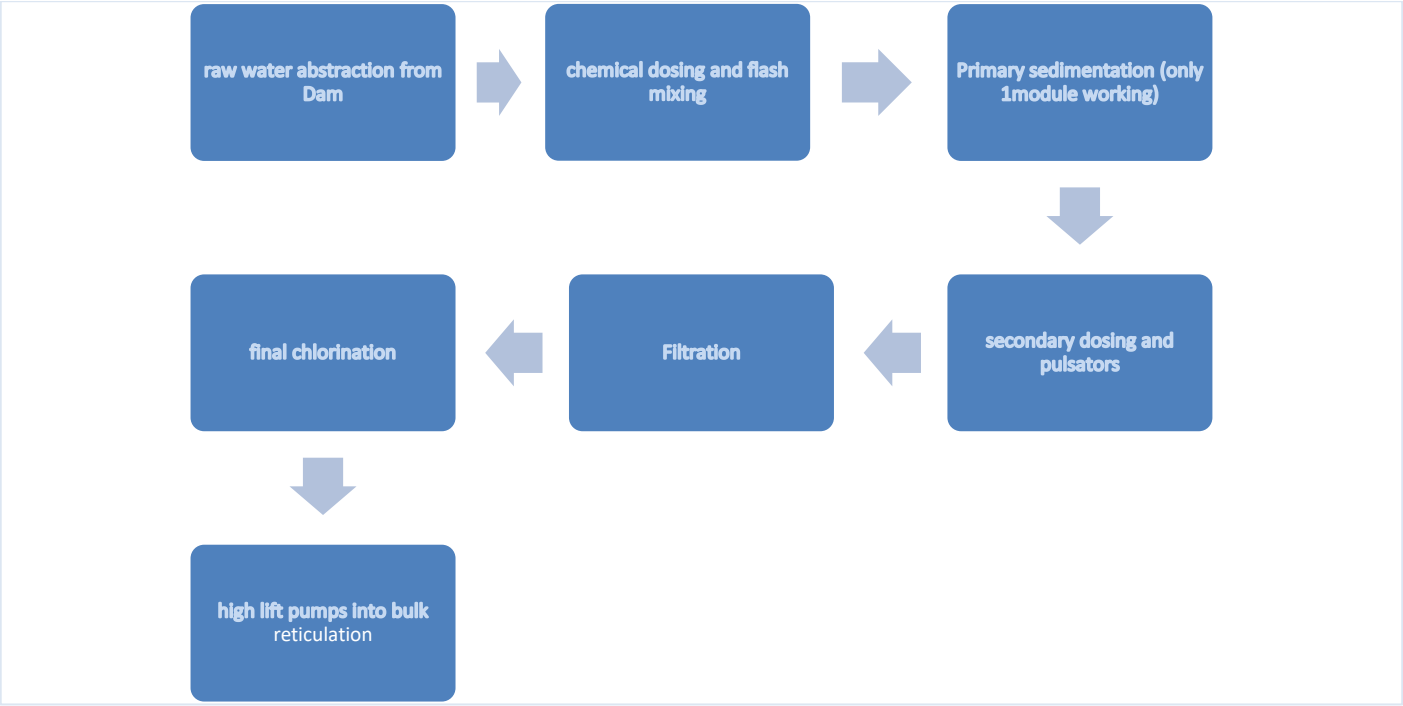
Welbedacht TSA Score: 72%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1.	**General aspects**	77.7	Class A plant, telemetry system for to record reservoirs levels, daily log sheets for operational monitoring, flowmeters, stock levels, pumps, etc. O&M manual not provided and Jar Test equipment not working
2.	**Physical appearance**	77.5	24 hr access control, Fenced. Neat terrain, excellent facilities for staff, high workplace satisfaction. SHEQ Officer on site, however several OHS risks observed on site (missing railing, lack of safety signs around tanks, chemical dosing tank damaged), one fatality during audit period.
3.	**Raw water handling**		Raw water screens in place: horizontal screens cannot be cleaned due to high siltation in the dam. Backup abstraction pumps removed for damage due to high silt load. Inflow meters in place, even flow splitting at inlet, visual dripping of flocculant but not measured and not at point of highest turbulence
	Rwps / gravity	41.6	
	Raw water pipeline	100.0	
	Inlet works and flow splitting	66.6	
4	**Chemical dosing and storage**		Chemical dosing in poor state: spillages, no duty/ standby pump for S385, no standby pumps for secondary dosing of both flocculants, S3835 tank is balancing between wall of mixing tank and can fall at any time, loos pipes around secondary dosing, no bunded walls around primary dosing.
	Flocculant (polymer)	50.0	
	Lime	87.5	2 lime dosing units, adequate stock on site. However water on the floor and no signs to show old and new stock.
	Chlorine gas	100.0	Duty standby chlorinators, balance scales, sufficient stock on hand for 30 days, Safety signs and equipment available.
5	**Flocculation**	75.0	No flocculation after primary dosing as clari-flocculator is under refurbishment, visible flocs after secondary flocculation, loose dosing pipes around flocculation channels.
6	**Phase separation**		
	Clarification: 4 x pulsators + 1 x clari-flocculator	83.3	Clari-flocculator under refurbishment. 1 Pulsator not working, signs of carryover due to overloading, weirs in good condition. Lack of safety railing and safety signs.
	Sand filtration: 8 x filters	38.8	2/8 filters not working, lack of backup for backwash pumps and blowers (broken), sand is uneven, bubble distribution is uneven. Backwashing every 70hrs or in response to final water NTU, only monitor NTU of 1 filter daily and final water fails <1NTU turbidity limit (1% compliance for audit period).
7	**Disinfection**		
	Clear water well	50.0	Sufficient contract time in reservoir. Free chlorine sample collected at onsite reservoir: however sample bottle is left open on the reservoir and the reservoir lid was rusted.
8	**High lift pumpstation: at Welbedacht WTW**	75.0	Sufficient backup pumps. Final flow meter is not working. OHS accident during installation of final water flowmeter resulting in death of maintenance team member.
9	**Sludge treatment**		
	Thickening in sludge dams	66.7	4 sludge dams, use on rotational basis, no recycling of wash water.
10	**Bulk pipeline(s) from plant to command reservoir(s): Bloem water**	100.0	Pipeline in good condition, routine maintenance plan for pipe network, valve chambers and reservoirs.
11	**Command reservoir: Brandkop (Bloem water)**	100.0	24 hr security, fenced, good condition with lids, no visible cracks or leaks, flow meters in place, Telemetry system to monitor reservoir levels, control pumps.
	Total	**72%**	

High risk areas OR Key Hardware Risks/ Defects

1. Repairs to horizontal screens at inlet and desilting of dam
2. Refurbishment of chemical dosing facility: both primary and secondary
3. Refurbishment of filters
4. Installation of standby pumps/equipment: raw water pumps, chemical dosing pumps, backwash pumps, backwash blower
5. Replacement of final water flowmeter and lid for final water reservoir.

VROOM Refurbishment Cost Estimate

Civil Works	R9,416 000	26%
Mechanical Works	R21,672 200	59%
Electrical Works (Incl C&I)	R5,819 000	16%
Total VROOM Cost	**R36,907 200**	**100%**
R million / MLD		**0.25**

Regulatory Impression

The Welbedacht water treatment plant is in need to maintenance to ensure delivery of safe drinking water. There is an excellent mechanical workshop fully equipped for manufacture of valves, pipe network, gasket, etc, electrical workshop and fully stocked spares room. However most unit processes need repairs/refurbishment i.e. clari-flocculator is in process of refurbishment, 1 pulsator not working, 2 filters are not working, chemical dosing facility in a very poor state, reservoir lid is rusted, etc. At may processes, standby equipment is removed for repairs. Management must ensure the extensive maintenance resources at the plant are used effectively to ensure all process units are always operational with sufficient backup of critical equipment. Bloem Water is commended for full time SHEQ officer and commitment to OHS. However several OHS risks were observed on site and there is a lack of safety signs around pulsators and sedimentation tanks. Acknowledgement is given for the installation of conduit hydropower plant at Brandkop to generate around 800 MWH /year which is used to power office and UPS system for telemetry. This excellent initiative should be extended to other reservoirs to generate renewable energy. DWS is responsible for maintenance of the dam wall. The issue of dam siltation must be addressed as the current dam capacity is estimated at 5% of the total capacity and high silt load has damaged horizontal screens, inlet pumps and leads to blockages of inlet pipeline.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	97.39%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

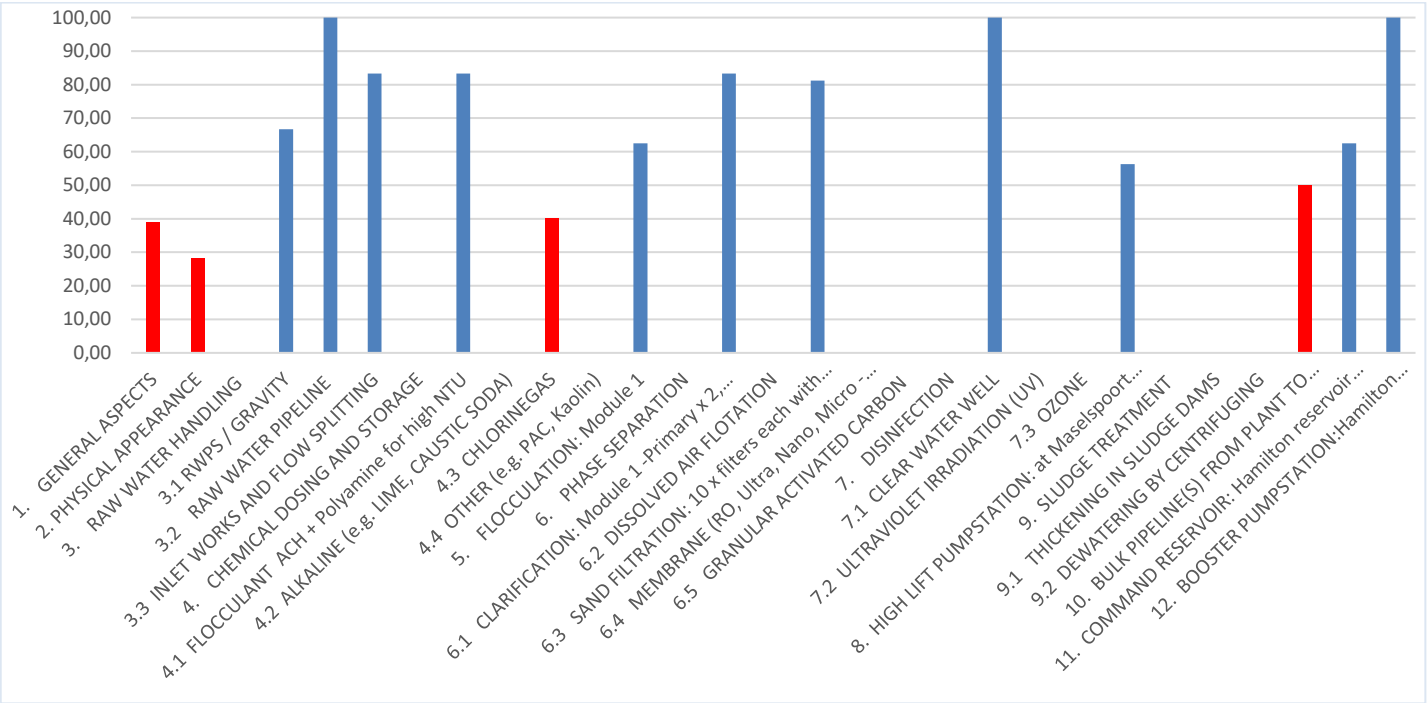



The Maselspoort water treatment works was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality. The Maselspoort WTW is owned and operated by Mangaung Metropolitan Municipality and supplies water to Bloemfontein.

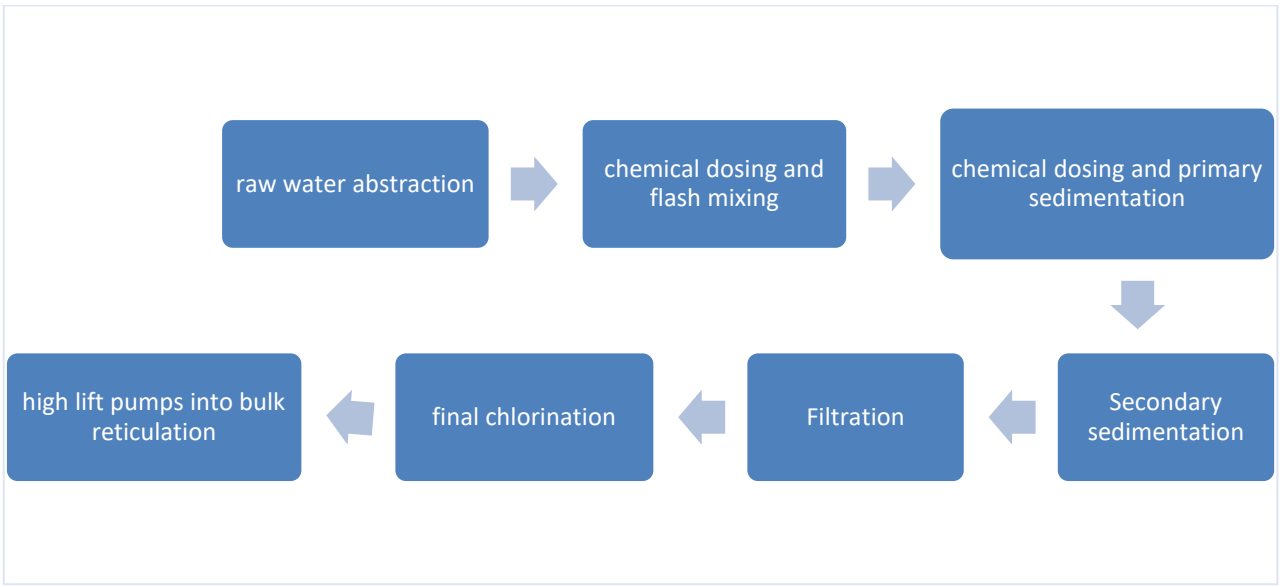
Maselspoort TSA Score: 62%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1.	**General aspects**	38.8	Certificate not displayed, no record of maintenance, no emergency contact lists, no record of calibration for monitoring equipment, no record of jar test results, O&M manual only for new chemical dosing.
2.	**Physical appearance**	28.1	No signpost, site is untidy with old equipment lying around, water leaks, cracks in concrete structures and long grass. Worker's facilities in poor condition: kitchen has no water or electricity, broken chairs, one toilet and shower, no facilities for female staff. Workers are dissatisfied with facilities. 24-hour security and fenced, but plant can be accessed by members of public at resort. Lack of safety signs.
3.	**Raw water handling**		Screens are in place but cannot be cleaned as access bridge is old, entrance covered with vegetation, spindles and sluice gates, duty, and standby pumps in place. Inflow meters in place, even flow splitting at inlet, visual dripping of flocculant, secondary dosing not at point of highest turbulence
	Rwps / gravity	66.6	
	Raw water pipeline	100.0	
	Inlet works and flow splitting	83.3	
4	**Chemical dosing and storage**		New chemical dosing facility in good condition with backup dosing pumps, measuring cylinder, telemetry to control and monitor chemical levels. Internal bulk tanks bunded with emergency wash. Outside bulk tanks not bunded, spillages evident.
	Flocculant (polymer)	83.3	

Watch #	Process Unit Assessed	% TSA	Observations
	Chlorine gas	40.0	Only I chlorinator, balance scales are not working, no automatic switchover, only one tank is connected. Leak detector is not working, no alarms/safety signs, no gas mask on site, one extraction fan in place, cylinders are stored outside. Sufficient stock on site.
5	**Flocculation**	62.5	Poor condition. Some of the dividing walls are cracked and there are weeds in and around channels.
6	**Phase separation**		
	Clarification: Primary and secondary (2)	83.3	Weirs in good condition, no sign of floc carryover, desludging of secondary sedimentation tanks every three months or when >6NTU
	Sand filtration: 10 x filters	81.2	Uneven flow splitting as two filters are not working. Backup in place for backwash pumps and blowers. Filter gallery is in fair condition. Very old building, pressure gauges not working, No hosing of walls. Backwash and sand could not be observed due to low light.
7	**Disinfection**		
	Clear water well	100.0	Free Chlorine measured after high lift pumpstation: sufficient contact time in reservoir.
8	**HIGH LIFT PUMPSTATION: at Maselspoort WTW**	56.2	2 pumps not working, no standby in place, flow meter is working.
9	**Sludge treatment**		
	Thickening in sludge dams	0.0	No wash water recycling taking place.
10	**Bulk pipeline(s) from plant to command reservoir**	50.0	Pipeline in good condition, routine maintenance plan for pipe network, valve chambers and reservoirs.
11	**Command reservoir: Naval hill reservoir**	62.5	Structure in good condition, lids in place. Lack of housekeeping as grass is very long. Fenced but not secure as booster chlorination unit has also been vandalised. Telemetry system e to show reservoir levels not working. Excellent daily records of reservoir levels, depths, pump running hours: information is used to calculate flows and draw up water balance
12	**Booster pumpstation: Hamilton pumpstation**	100.0	Duty standby pumps, MCC panel in place, fenced and secure.
	Total	**62%**	

High risk areas OR Key Hardware Risks/ Defects

1. 2/10 filters are not working due to mechanical issues thereby reducing capacity of the treatment plant
2. Walkway, spindles need repairs to allow for access to submersible pumps, repairs to dam sluice gates
3. Leaks in sedimentation tank (Module 2) which is reducing plant capacity as Module 2 is not operational and compromising structure of old filter house
4. Network telemetry system and reservoir level indicators are not working
5. Lack of facilities for staff: kitchen, bathrooms, office, and lack of railings around sedimentation tanks.

VROOM Refurbishment Cost Estimate

Civil Works	R68,008,600	67%
Mechanical Works	R18,965,100	19%
Electrical Works (Incl C&I)	R15,008,400	15%
Total VROOM Cost	**R101,982,100**	**100%**
R million / MLD		**0.70**

Regulatory Impression

The Maselspoort water treatment plant is in need to routine maintenance and housekeeping to ensure functionality. Lack of safety signs, safety equipment and facilities for staff are a major concern as this negatively impacts on staff safety and morale. Process controllers must be trained to conduct operational monitoring and use the results to optimist the treatment process. The lack of general workers at the plant has resulted in the poor state of the terrain and process units (flocculation channels). The lack of routine maintenance schedules and maintenance records must be addressed to ensure effective asset management. The leak to the sedimentation unit in Module 2 is negatively impacting on the old filter gallery as well and reducing the capacity of the plant. This must be addressed if the plant is to regain it design capacity. The recently upgraded chemical dosing facility is in excellent condition; similar upgrade is required for the chlorine dosing facility to ensure effective disinfection of final water. The network telemetry system must be repaired as the current practise of visiting each reservoir to verify reservoir levels leads to overflowing of reservoirs during the night thereby increasing water losses.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro, but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	98.26%
Chemical Compliance	95.32%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



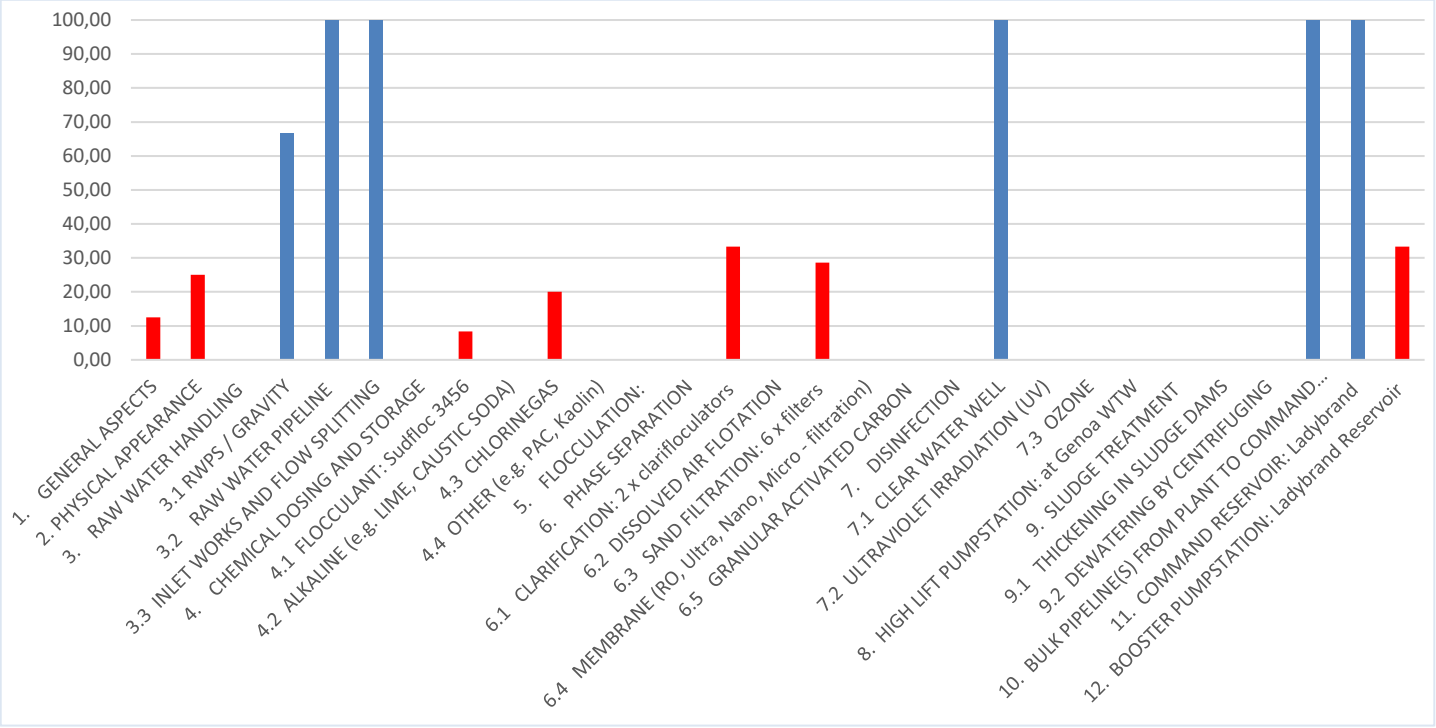

6.7 Mantsopa Local Municipality

The Genoa water treatment works was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality. The Genoa WTW is owned and operated by Manstopa LM and supplies water to the town of Ladybrand.

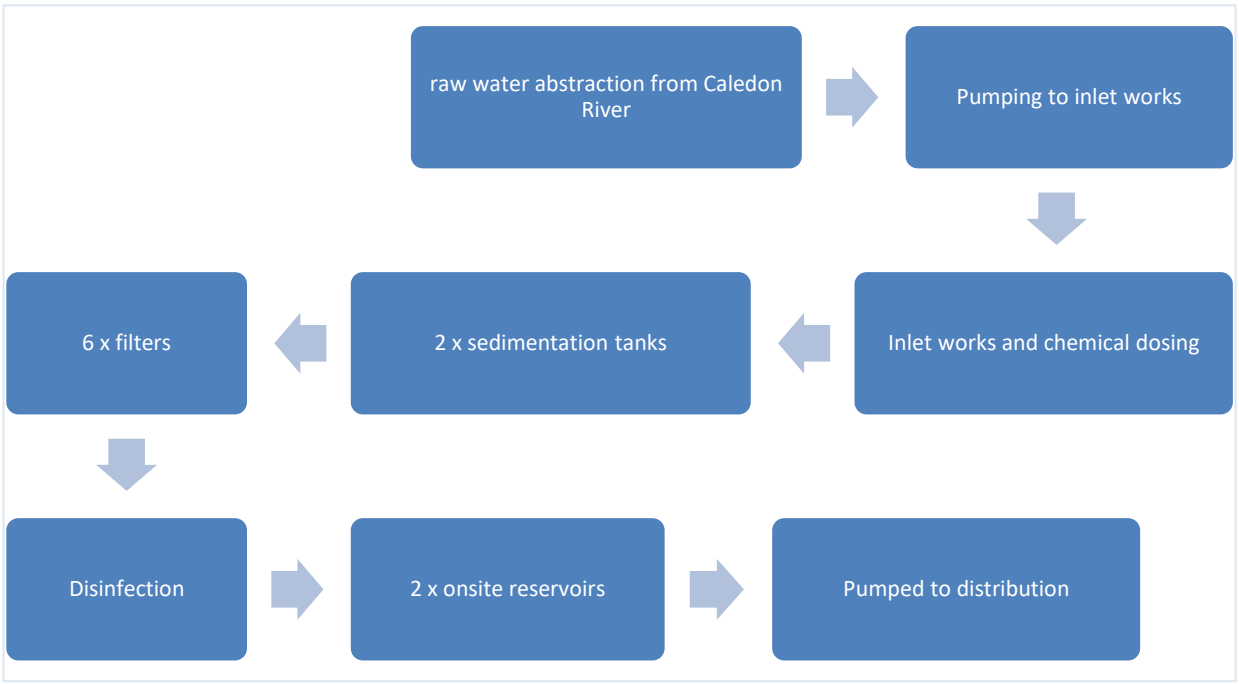
Genoa TSA Score: 36%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1.	**General aspects**	12.5	Lack of documents: Classification certificate, process layout, O&M manual, emergency contact list, maintenance records. Daily logbooks and operational log sheets in place. Only Free Cl_2 measured, meter not calibrated, NTU meter not used as it has not been calibrated.
2.	**Physical appearance**	25	The site and garden is very poor: terrain is covered with litter, old equipment, long grass, and bags of filter sand which have spilled open. Staff dissatisfied with lack of facilities: There are no toilets or bathrooms on site, office and kitchen has broken furniture and old equipment. Dirty Kitchen with broken shelves serves as Lab. Lack of safety signs and equipment.
3.	**Raw water handling**		Screens installed, no standby raw water pump, flow meter in place and calibrated, coagulant dosed at point of highest turbulence.
	Rwps / gravity	66.7	
	Raw water pipeline	100.0	
	Inlet works and flow splitting	100.0	
4	**Chemical dosing and storage**		The chemical dosing room is very dirty and untidy: walls covered with spider webs, floor dirty, broken equipment lying around and chemical spillage around tanks. No backup dosing pump, no bunded walls, no eyewash., incorrect MSDS sheet.
	Flocculant (polymer)	8.3	
	Chlorine gas	20.0	Lack of standby chlorinator, balance scales, automatic switchover, safety signs and safety equipment.
5	**Flocculation**		Inline flocculation
6	**Phase separation**		
	Clarification	33.3	Clear signs of carryover as one clari-flocculator had not been desludged for a long time. Process Controllers indicated second clari-flocculator cannot be desludged as manual desludge is blocked. However, upon inspection it was found that manual desludge valve was not blocked.
	Sand filtration:	28.7	2/6 filters not working, no standby for blower, uneven flow splitting, uneven filter media with cracks, filter remains dirty after backwash. The filter gallery is dirty, empty chlorine holders dumped in room adjacent to filters.
7	**Disinfection**		
	Clear water well	100.0	2 reservoirs on site, size is not known and therefore cannot calculate retention time, good condition.
8	**High lift pumpstation: at WTW**	0.0	No standby pump, no flow meter, Pumpstation was flooded due to leaking pipes as well as rainwater and mud washed into pumpstation from recent rains
9	**Sludge treatment**		
	Thickening in sludge dams	0.0	No sludge treatment, all backwash returned to river.
10	**Bulk pipeline(s) from plant to command reservoir**	100.0	Pipeline in adequate condition, inspection sheets provided for routine inspections of valve chambers/reservoir/pipes
11	**Command reservoir:** Ladybrand	100.0	2 reservoirs in good condition with lids, no leaks. No recent incidents of theft and vandalism.
12	**Booster pumpstation:** Ladybrand reservoir	33.3	Only one pump working, no standby, building locked, no security and no fence.
	Total	**36%**	

High risk areas OR Key Hardware Risks/ Defects

1. Chemical dosing room needs upgrade: install new pumps with measuring cylinders, build bunded walls around tanks, install level indicators in tanks, install emergency eye wash
2. Filters need refurbishment: replace sand, check nozzles, install standby blower
3. Upgrade chlorination unit: Repair balance scales, install automatic switchover, instal standby chlorinator, install safety signs and procure safety equipment
4. Final water Pumpstation to be refurbished: install drainage channels, repair pumps and pipes, secure electrical wires
5. Upgrade staff facilities: build ablution facilities, refurbish office and kitchen.

VROOM Refurbishment Cost Estimate

Civil Works	R9,180,600	56%
Mechanical Works	R4,917,000	30%
Electrical Works (Incl C&I)	R2,244,000	14%
Total VROOM Cost	**R16,341,600**	**100%**
R million / MLD		**1.51**

Regulatory Impression

The Genoa water treatment plant needs maintenance, operations, and housekeeping to ensure delivery of safe water to consumers. The chemical dosing facility and chlorine dosing facility need urgent upgrade to always ensure delivery of safe water. Urgent intervention is required to clean the final water pumpstation, repair leaking pipes and prevent future flooding as this is critical to continuous supply of water to the community. Installation of flow meters and repairs to all backup pumps (including final water pumps) must be prioritised to ensure continuous supply of water. The poor state of worker facilities must be addressed, construction of toilet and bathrooms. While upgrade of workers offices, kitchen and eating area is critical, process controllers must be held accountable for always keeping all facilities and the terrain clean. Currently all process optimisation is conducted by the senior process controller: process controllers must be trained to conduct operational monitoring, perform daily duties such as desludging clarifiers and optimise the treatment process. While the WSA is commended for capital project to build new reservoirs to guarantee supply of water, the WSA must urgently implement project to address all performance-limiting risks to ensure the quality of water produced by the treatment plant is safe and does not present health risk to consumers.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	97.22%
Chemical Compliance	76.80%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



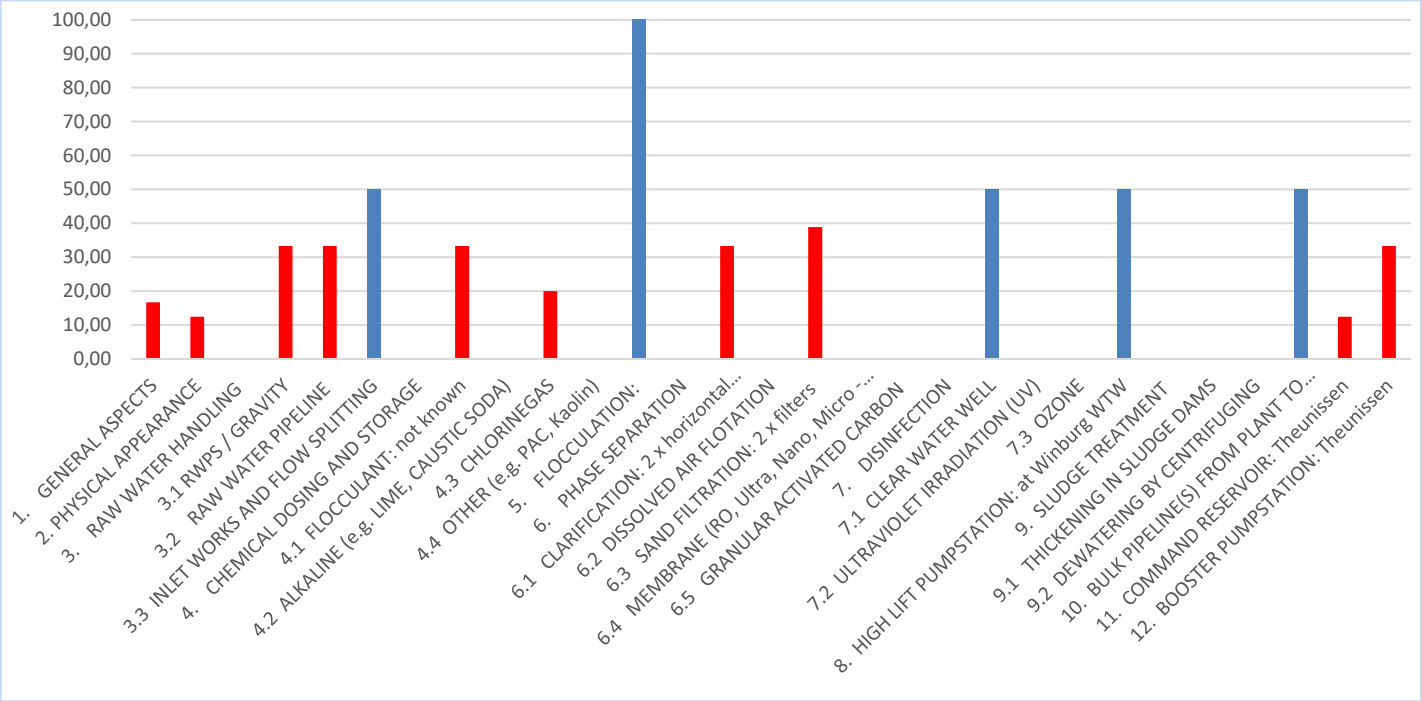

6.8 Masilonyana Local Municipality

The Winburg water system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality. The Winburg WTW is owned and operated by Masilonyana LM and supplies water to the town of Winburg.

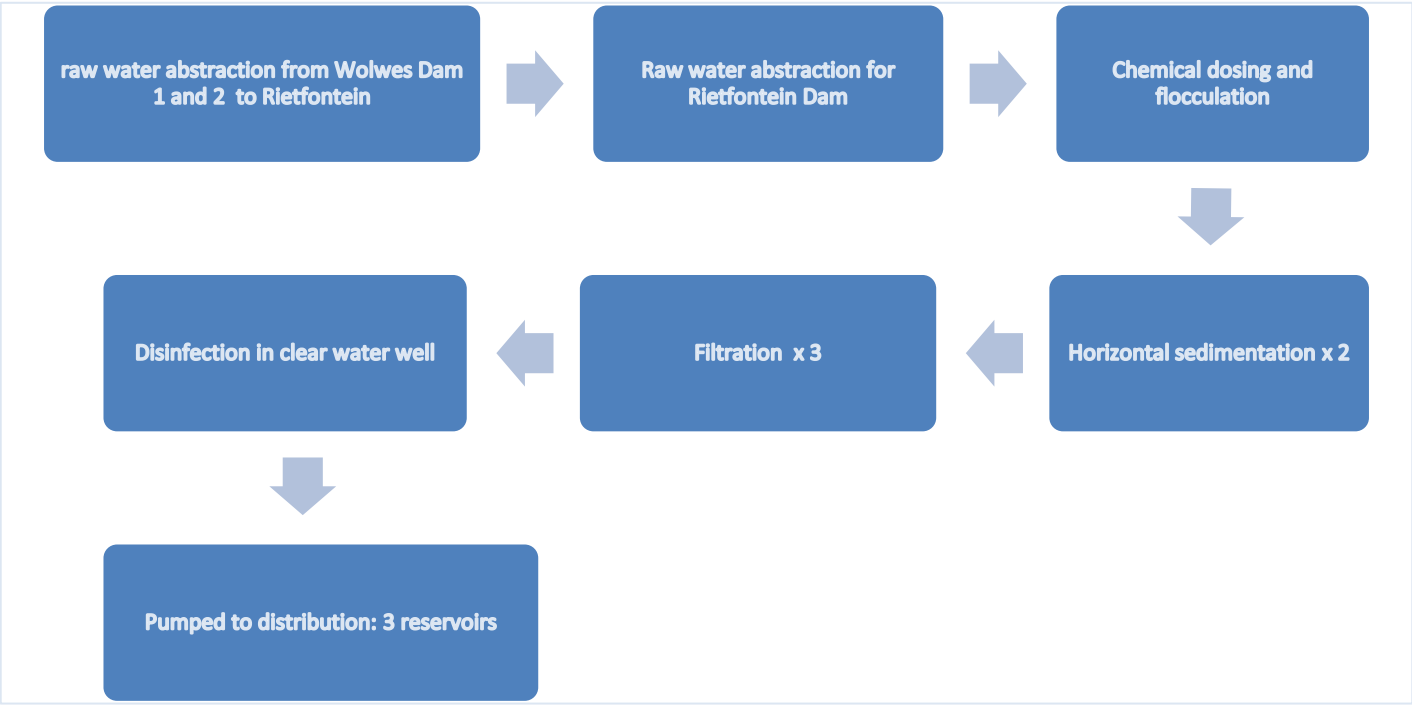
Winburg TSA Score: 30%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1.	**General aspects**	16.6	Lack of documents: certificate, O&M manual, maintenance records, Process flow diagram, emergency contact details. Ph meter, Turbidity meter and chlorine meter on site, No proof of calibration. Jar test conducted but no proof of results
2.	**Physical appearance**	12.5	The site and garden are extremely bad: overgrown with vegetation, large holes, building rubble, old equipment and pipes, empty chemical containers, litter. No safety signs or safety equipment. Worker's facilities are in an extremely bad condition: one toilet and shower that is flooded, no lights.
3.	**Raw water handling**		No screens in place, lack of standby submersible pump, lack of inflow meter, dosing not taking place at highest turbulence.
	Rwps / gravity	33.3	
	Raw water pipeline	33.3	
	Inlet works and flow splitting	50.0	
4	**Chemical dosing and storage**		New chemical dosing unit not been commissioned. Old chemical dosing house in extremely bad condition: only 1 dosing pump, day tank not covered, filled with empty chemical containers, building rubble, broken equipment, no bunded walls, no emergency eye wash.
	Flocculant (polymer)	33.3	
	Chlorine gas	20.0	The chlorine facility is in total disrepair: broken windows, walls covered with mould, building foundation is cracking, only I chlorinator, no safety signs, no balance scales, no chlorine gas on site and using sodium hypochlorite dosed directly from drum.
5	**Flocculation**	100.0	Good floc formation observed, and second flocculation channel was drained for cleaning.
6	**Phase separation**		
	Clarification	33.3	"New Clari-flocculator" stripped for refurbishment. Old sedimentation tanks show floc carryover, algal growth on weir plates, and high sludge blanket.
	Sand filtration:	38.8	Filter/chlorination building in extremely bad state: mould covered walls, filled with old rusty equipment and many empty chemical dosing drums. Filter media cracked and uneven bubble distribution
7	**Disinfection**		
	Clear water well	50.0	Clear water well is in room adjacent to the filter gallery. Walls are covered in mould; room is filled with empty chemical containers and rusted equipment. Clear water well is left open; there is very high risk of contamination of water!
8	**High lift pumpstation: at WTW**	50.0	Duty standby pumps, no flow meter.
9	**Sludge treatment**		
	Thickening in sludge dams	0.0	No wash water recycling, sludge lagoons have never been cleaned.
10	**Bulk pipeline(s) from plant to command reservoir**	50.0	Pipeline in adequate condition, no inspections of valve chambers
11	**Command reservoir: Theunissen**	12.5	No security. Fence is broken and there have been incidents of theft and vandalism, all telemetry components stolen, no flow meters, one reservoir is not in use due to leaking. Lids in place. High lift tower no longer in use.
12	**Booster pumpstation: Theunissen**	33.3	Only 1 pump. Building was locked, no signage in place.
	Total	**30%**	

High risk areas OR Key Hardware Risks/ Defects

1. New filter gallery to be built, current building is structurally not sound
2. New Chemical dosing facility to be completed and commissioned
3. Chlorine dosing facility to be built, current facility is totally broken
4. Sedimentation tank to be refurbished; currently using old sedimentation tanks
5. Inlet work to be upgraded with hydraulic jump and flocculation channels.

VROOM Refurbishment Cost Estimate

Civil Works	R5,575,900	54%
Mechanical Works	R2,669,700	26%
Electrical Works (Incl C&I)	R2,151,600	21%
Total VROOM Cost	**R10,397,200**	**100%**
R million / MLD		**4.33**

Regulatory Impression

The Winburg water treatment plant is in a very poor state and the final water presents serious health risk to consumers. Despite R21 million spent in 2021 to upgrade plant, the work was not completed: new bathrooms not completed, bulk tanks in new chemical dosing unit are not connected to dosing pumps and there is no drainage from bunded resulting in accumulation of rainwater in bunded area. The "New" Sedimentation tank and new filter gallery has not been completed (contractor abandoned site due to lack of payment). This indicates lack of project management and must be addressed as this represents wasteful expenditure. The plant terrain is extremely bad and resembles building site with old equipment, long grass, litter, large holes, exposed pipes, and total lack of housekeeping. The staff facilities need urgent attention and operational monitoring equipment is not calibrated. The Filter house/chlorination unit is in a very bad state and must be refurbished immediately; walls covered with mould, broken windows/doors, exposed foundation, and chlorination equipment totally non-functional. However the highest risk at this plant is the uncovered clear water well which is surrounded by rusty equipment and empty chemical drums with no control of disinfection dosage. This presents a serious health risk to consumers and must be addressed as a matter of urgency. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	57.14%
Chemical Compliance	80.00%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



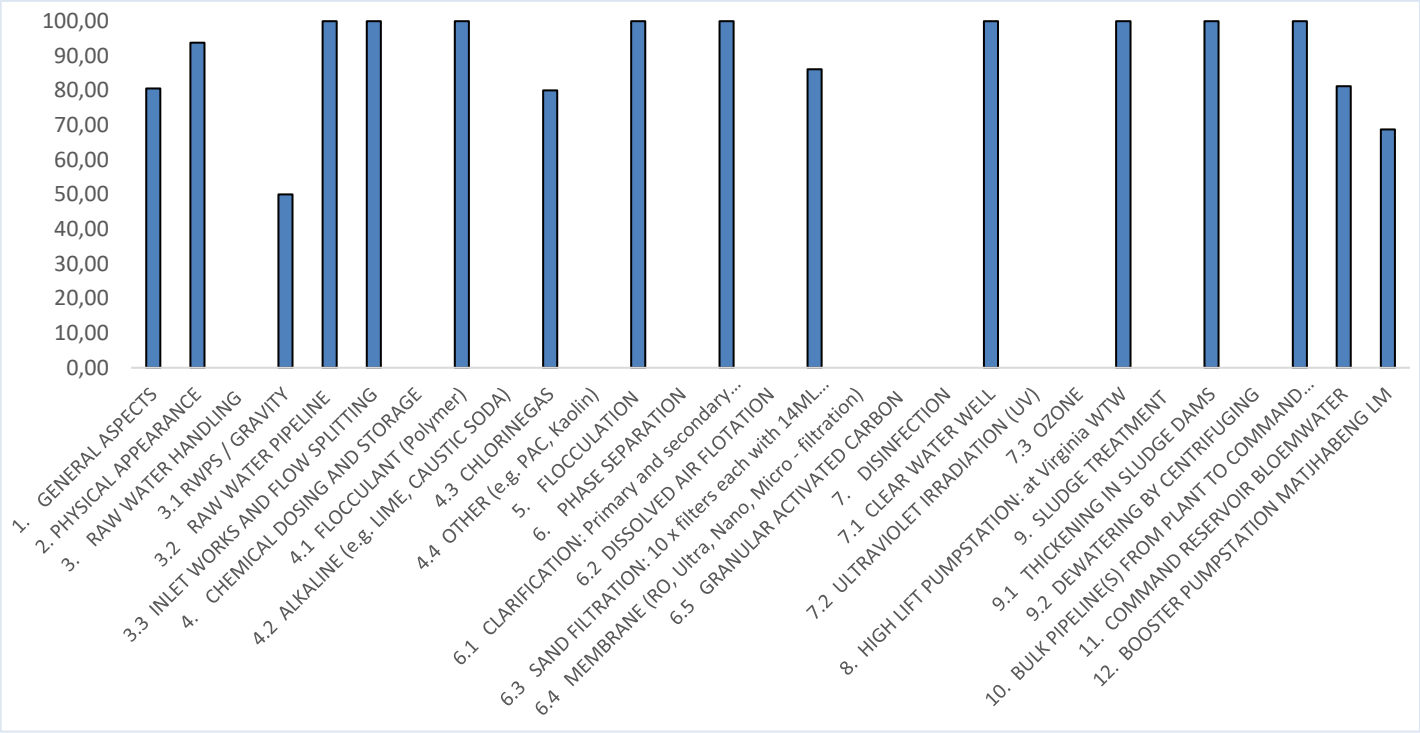

6.9 Matjhabeng Local Municipality

The Virginia water treatment works was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality. The Virginia WTW is owned and operated by Bloem Water and supplies wate to the Virginia water supply system in Matjhabeng Local Municipality

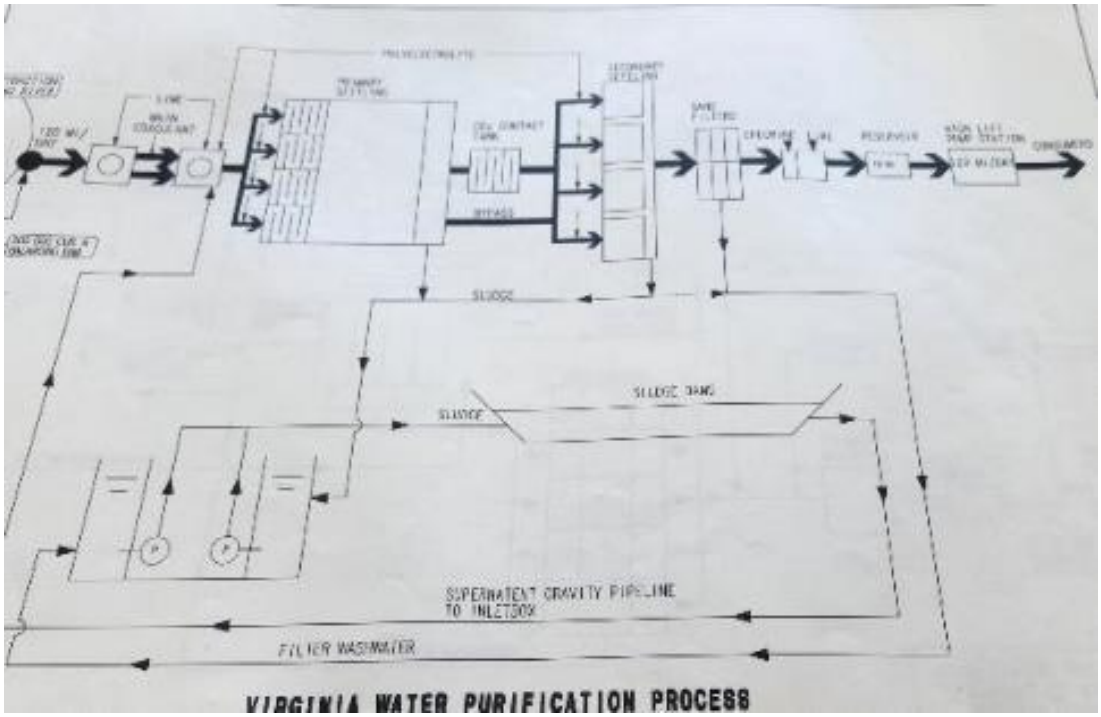
Virginia TSA Score: 88%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1.	**General aspects**	80.9	Class A plant, Excellent telemetry system for whole plant with detailed log sheets for flowmeters, stock levels, reservoir levels, pumps, etc, operational monitoring in place. Process flow diagram not displayed
2.	**Physical appearance**	93.7	Excellent signage, 24 hr access control, Fenced. Neat terrain, excellent facilities for staff, high workplace satisfaction, safety signs in place and no OHS issues. Road leading to plant is filled with potholes.
3.	**Raw water handling**		Raw water screens in placed, inflow meters in place, even flow splitting at inlet, visual dripping of flocculant. Lack of standby pumps due to recent theft of all equipment at pumpstation by armed illegal miners, full time armed guards employed to guard pumpstation.
	Rwps / gravity	50.0	
	Raw water pipeline	100.0	
	Inlet works and flow splitting	100.0	
4	**Chemical dosing and storage**		Duty standby coagulant dosing pumps, sufficient stock on site for 30 days, bunded walls around tanks and emergency eyewash in place
	Flocculant (polymer)	100.0	
	Chlorine gas	80.0	Duty standby chlorinators, balance scales, sufficient stock on hand for 30 days, Safety signs and equipment available. No automatic switchover and leak detector not working.
5	**Flocculation**	100.0	Flocculation units in good condition, clean, visible floc formation at end of unit.
6	**Phase separation**		
	Clarification: Primary and secondary sedimentation	100.0	Clear overflow, weirs in good condition, regular desludging in response to turbidity limits.
	Sand filtration: 10 x filters x 14ML capacity each	86.1	50% backup for backwash pumps, 100% backup for blowers, regular backwashing in response to turbidity, even bubble distribution, sand in good condition, filter gallery in excellent condition, routine disinfection of filters. 4/10 filters are not working.
7	**Disinfection**		
	Clear water well	100.0	Sufficient contract time in reservoir, final sample collected before distribution
8	**HIGH LIFT PUMPSTATION: at Virginia WTW**	100.0	Duty standby pumps, final water flow meters and telemetry system to control pumps.
9	**Sludge treatment**		
	Thickening in sludge dams	100.0	4 sludge dams, use two at a time, duty standby sludge pumps to return supernatant to head of works
10	**Bulk pipeline(s) from plant to command reservoir(s): Bloemwater**	100.0	Pipeline in good condition, routine maintenance plan for pipe network, valve chambers and reservoirs.
11	**Command reservoir Bloemwater**	81.2	24 hr security, fenced, good condition with lids, no visible cracks or leaks, flow meters in place, Telemetry system to monitor reservoir levels, control pumps. Requires grass cutting, cannot access reservoir.
12	**Booster pumpstation Matjhabeng**	68.7	No standby pump fenced but electric fence is not working, MCC panel in place, reservoir level indicator controls pumps.
	Total	**88%**	

High risk areas OR Key Hardware Risks/ Defects

1. 4/10 filters are not working due to mechanical issues thereby reducing capacity of the treatment plant.
2. Lack of standby raw water pumps- due to cable theft
3. Lack of standby chlorine booster pump at command reservoir.
4. Lack of standby compressor for instrument air.
5. Lack of standby pump at Matjhabeng High lift pumpstation.

VROOM Refurbishment Cost Estimate

Civil Works	R14,251,600	22%
Mechanical Works	R39,266,700	59%
Electrical Works (Incl C&I)	R12,663,200	19%
Total VROOM Cost	**R66,181,500**	**100%**
R million / MLD		**0.55**

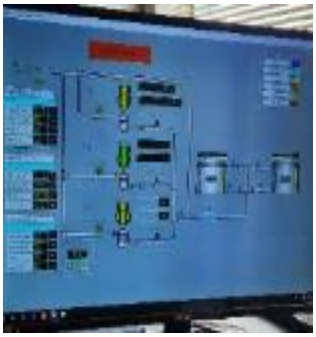
Regulatory Impression

The Virginia water treatment plant is well maintained, with functional treatment processes, and competent staff. Plant is commended for excellent O&M capabilities. There are various departments on site with required personnel: full mechanical, electrical workshop for all equipment including vehicles. In addition there is a stock room with extensive range of spares with computerised stock control system. There is a high risk of theft from armed illegal miners who recently stole all equipment at raw water pumpstation. Full time armed guards have been employed to guard against such incidents. There are several outstanding maintenance issues which have not been addressed since merger with Bloem Wate due to insufficient budget. This is due to lack of payment by Matjhabeng LM and has resulted in reduced supply to the municipality. Bloem water must prioritise repairs to critical equipment such as back up raw water pumps and repairs to filters to ensure the plant is able to operate and maintain excellent water quality.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	98.77%
Chemical Compliance	98.45%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

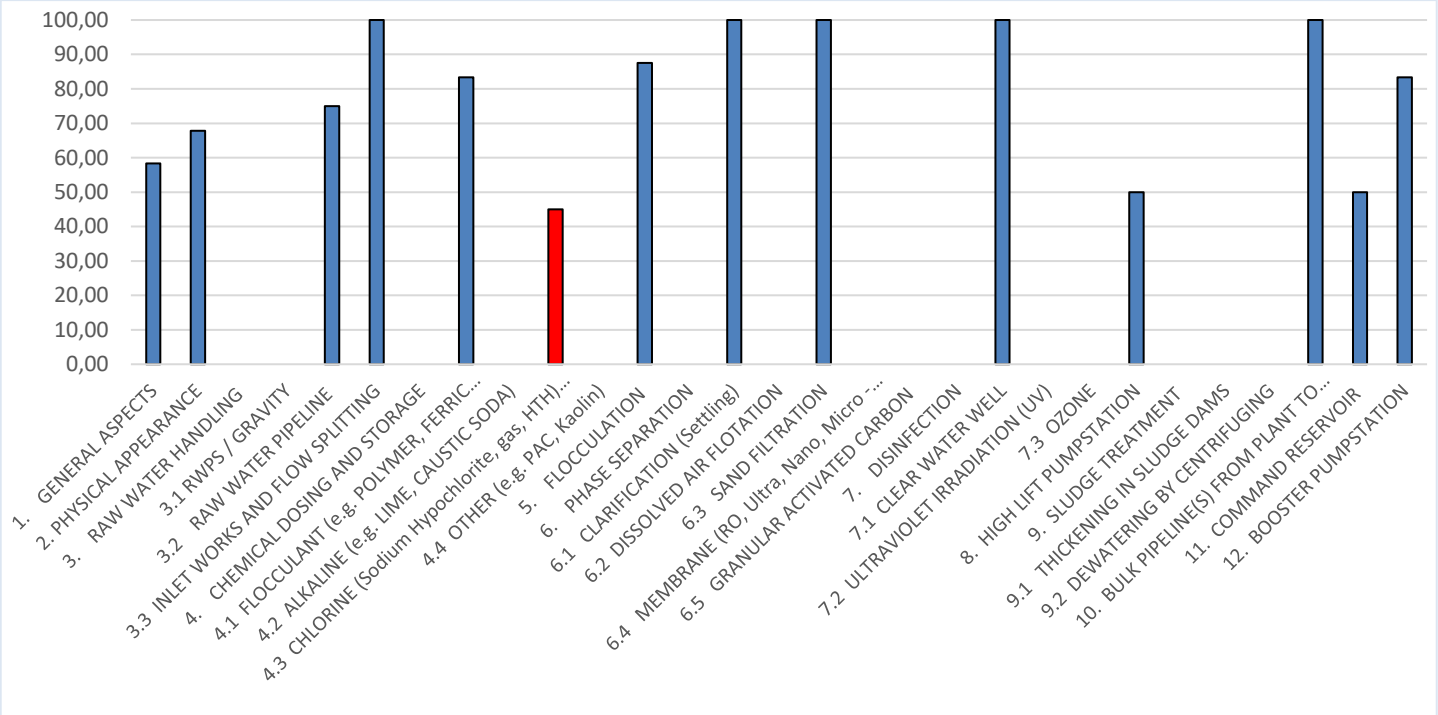
6.10 Metsimaholo Local Municipality

The Deneysville water treatment works was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

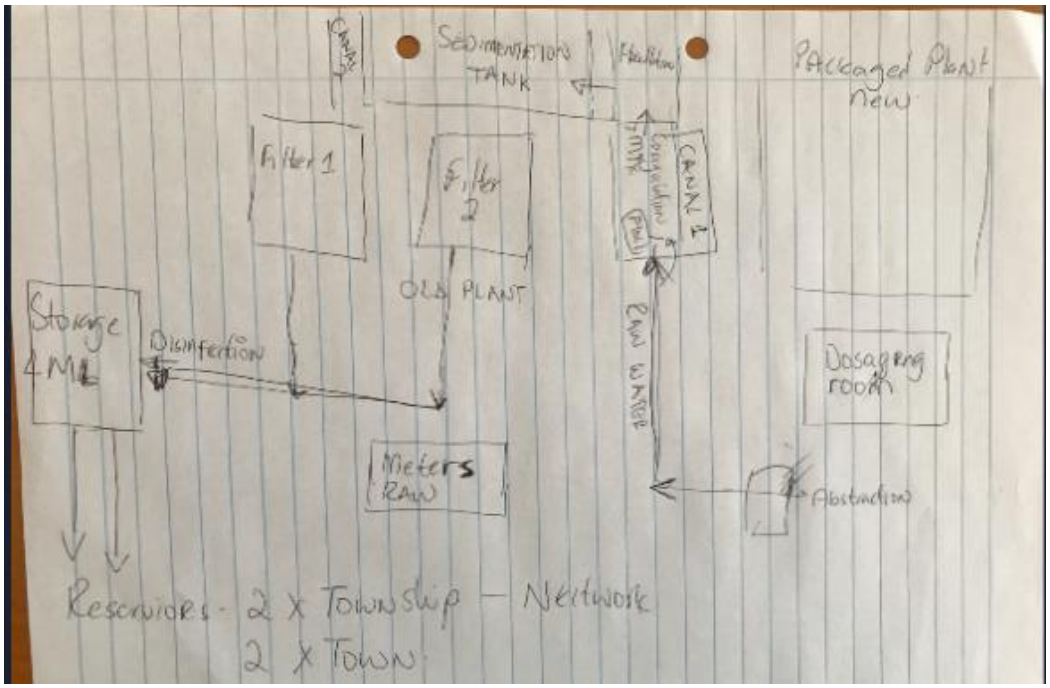
Deneysville TSA Score: 73%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	58.3	Class C plant. No drawings of the plant available. O&M manual and IMP available. Operational logbook with recent entries. No Maintenance and Repairs logbook. Turbidity and Chlorine meters on site, Jar tester at main laboratory.
2	**Physical appearance of plant**	67.9	Access to the plant is restricted. All roads are paved. Site is fairly clean, but grass should be cut. Grass growing on pavement to be removed. Only a few safety signs are visible at relevant areas on the plant.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	NA	The raw water pump is at the Vaal Dam and managed by DWS.
	Raw water pipeline	75.0	The pipe is underground, but no faults / leaks were reported. Both flow meters functional, but not calibrated. Flow rate is recorded daily but not converted and interpreted or used for process control purposes.
	Inlet works	100.0	No splitting at the inlet work. Valves are opened when new packaged plant is used during times of high demand. Hydraulic jump where flow enters the works – sufficient turbulence at the contact point. Visual dripping of flocculant could be seen at the hydraulic jump.
4	**Chemical dosing and storage**		
	Flocculant	83.3	Only one dosing pump is used and in a working condition. Feeding tube to be replaced. A standby dosing pump is available on site. The area is neat, clean and any spillages are cleaned by hand should they occur. Bunded area available. Storage facility of 15 tons sufficient for 8 to 10 weeks. An emergency wash is situated outside the storage and dosing facility.
	Chlorine	45.3	Sodium Hypochlorite. Order a new delivery as soon as previous order is delivered. Dosing pump installed in a working order, dose granular HTH at filter outlets as standby measure. Only standard PPE available, closest shower available at main building.
5	**Flocculation**	87.5	Good floc formation with little scum at the wall of the flocculation unit.
6	**Phase Separation**		
	Clarification (settling)	100.0	No floc carry-over during the site visit. Desludging of the units are done daily, with sludge removal once per month. The weirs are in a good condition with even overflow.
	Sand filtration	100.0	The filters and filter media are in good condition - all handrails in place. Backwashing frequency of every morning, more often with high turbidity. Backwash was performed during the site visit with even bubble distribution. Backwash pumps and air blowers are installed and in working condition with a 100% standby available.
7	**Disinfection**		
	Clear water well	100.0	At 9,9 Ml/d should the package plant is used to capacity, the contact time for the 4 Ml reservoir is 9 hours. Chlorine is dosed at entry of filtered water into CWW. Flows through reservoir and then measured at an outside tap.
8	**High lift pumpstation**	50.0	Six pumps installed, 2 not functional. Water is pumped to two reservoirs, with only 2 pumps available for each line. Standby pumps not available. Flow meter operational but not calibrated, flow records captured daily but not used.
9	**Sludge treatment**		
	Thickening in sludge dams	0.0	Sludge pond downstream of the Vaal Dam wall, overflown and drains into the river.
10	**Bulk pipeline from plant to command reservoir**	100.0	Pipe network reported to be in a good condition.
11	**Command reservoir**	50.0	Water is pumped directly to two reservoirs in the distribution system. Reservoirs visited secure. No telemetry, level indicator of older reservoir not working. Level indicated by water leaking from the reservoir. Flow meter in place but almost impossible to read.
12	**Booster pumpstation**	83.3	The pumpstation is situated at the reservoirs, fenced and with security. Three pumps installed, two was running at time of the visit. Leaks visible at both pumps. A 50% standby available.
	Total	**72.%**	

High risk areas OR Key Hardware Risks/ Defects

1. Liquid chlorine dosing facility not working at all
2. Two of the six high lift pumps not operational restricting pumping capacity during high demand
3. No sludge handing - sludge ponds downstream of the Vaal Dam wall overflows directly into the river
4. Major water leakages at pumpstation visited, some at the pumps and others in the valve box
5. No maintenance logging procedure to inform the maintenance team of breakdowns, deficiencies, etc.
6. No telemetry at reservoir and level indicator of old reservoir not working. Flow meter at the outflow of the reservoir not accessible.

VROOM Refurbishment Cost Estimate

Civil Works	R108,900	18%
Mechanical Works	R435,600	72%
Electrical Works (Incl C&I)	R61,600	10%
Total VROOM Cost	**R606,100**	**100%**
R million / MLD		**0.13**

Regulatory Impression

The Deneysville water treatment works is in a fair condition. There is an old conventional plant as well as a new package plant which was not in operation during the plant visit. It is apparently only used in times of high demand. The LM should re-instate service supply contracts including maintenance of the water infrastructure as well as the supply of chemicals and treatment consumables.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	98.78%
Chemical Compliance	87.85%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



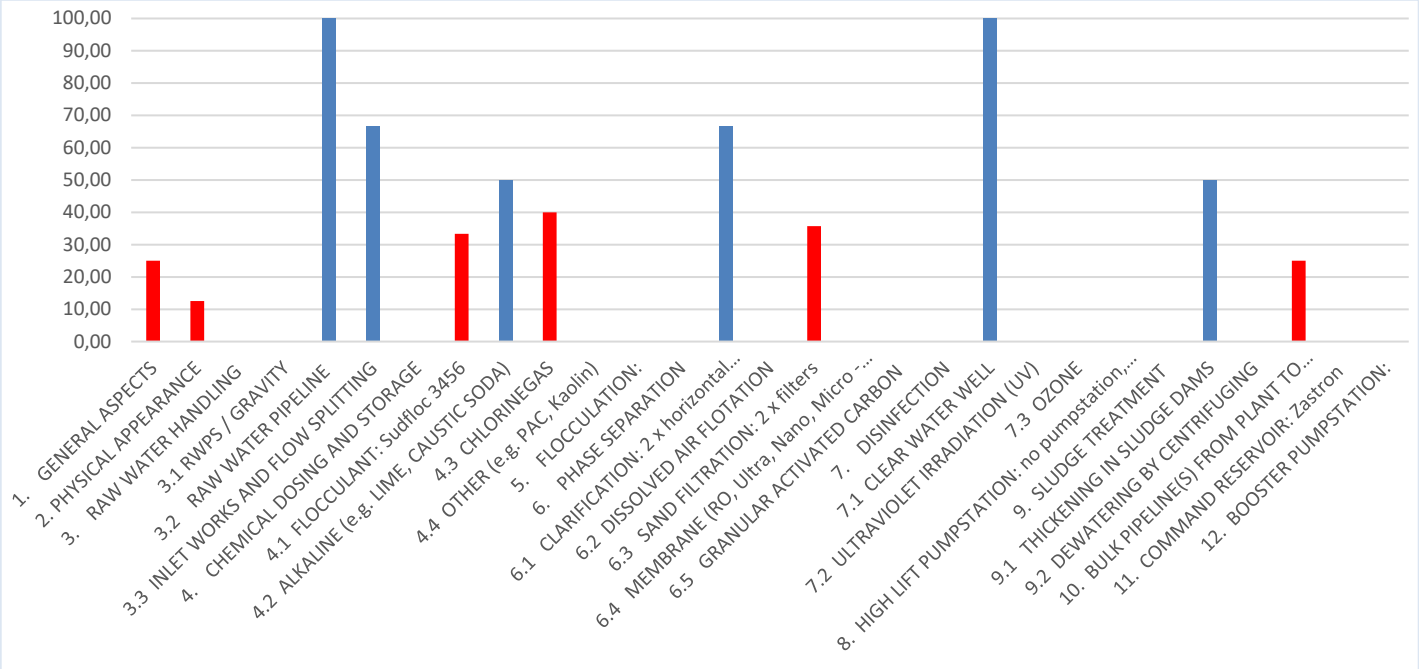

6.11 Mohokare Local Municipality

The Zastron water treatment works was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality. The Zastron WTW is owned and operated by Mohokare LM and supplies water to the town of Zastron.

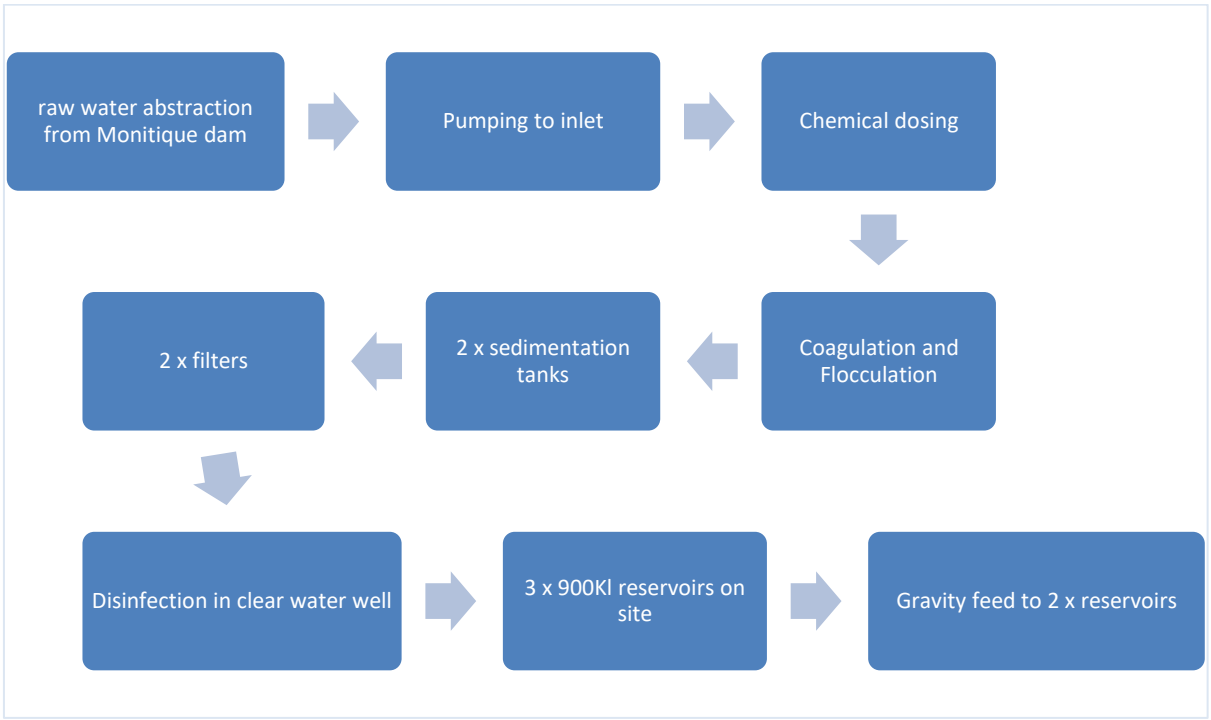
Zastron TSA Score: 40%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1.	**General aspects**	25.0	Certificate and O&M Manual provided. Lack of following documents: maintenance records, Process flow diagram, emergency contact details. Only one log sheet on site, Turbidity and Free Chlorine meter working, Colour/EC/PH meter not working, no record of calibration, no Jar Tests.
2.	**Physical appearance**	12.5	The site and garden in poor condition, no general workers so grass is not cut, old equipment lying around, heaps No security, gate is always open, and cows grazing on site. Worker's facilities are in very poor condition: one toilet with no door, office. No bathrooms, kitchen, place to eat. There is no drinking water on site!
3.	**Raw water handling**		New pipeline recently constructed with inflow meter. Dosing takes place at inlet but not at point of highest turbulence.
	Raw water pipeline	100.0	
	Inlet works and flow splitting	66.7	
4	**Chemical dosing and storage**		New dosing pumps are not working and dosing taking place from drum placed over inlet channel. Dosing areas is clean, but signs of spillage as process controller manually fill day tank from which coagulant is dosed without any dosing pump. No eyewash on site, insufficient stock on site.
	Flocculant (polymer)	33.3	
	Lime	50.0	Lime bags stored on wooden plinth together with old equipment and chlorine gas, no walls or concrete floor, Floor is wet due to rains, no signs to show first in, no masks. No pH measurement to determine dosage.
	Chlorine gas	40.0	Lack of standby chlorinator, balance scales, automatic switchover, safety signs and safety equipment.
5	**Flocculation**		Good floc formation observed, and second flocculation channel was drained for cleaning.
6	**Phase separation**		
	Clarification	66.7	Clari-flocculator in good working condition with clear overflow. Clarifier 2 is filled with sludge and clear signs of floc carryover: automatic desludge not working, process controllers indicated manual desludge not working but was found to be operational.
	Sand filtration:	35.7	Lack of backup blower, uneven bubble distribution, uneven flow splitting, filter media is cracked and has mounds. Bags of silica sand lying around on site but not used to replace filter sand.
7	**Disinfection**		
	Clear water well	100.0	3 x 900kl reservoir on site with lids; require upgrade to repair civil structure.
8	**High lift pumpstation: at WTW**	0.0	Gravity feed to network, no flow meters in place to verify plant production.
9	**Sludge treatment**		
	Thickening in sludge dams	50.0	Two wash water basins filled with sludge, drying beds filled with sludge and weeds.
10	**Bulk pipeline(s) from plant to command reservoir**	25.0	Pipeline in adequate condition, no inspections of valve chambers
	Total	**40%**	

High risk areas OR Key Hardware Risks/ Defects

1. Chemical dosing pumps to be repaired
2. Automatic desludge on sedimentation tank to be repaired and routine desludging to resume in response to turbidity
3. Chlorination unit must be upgraded: install balance scales, standby chlorinators, automatic switchover, safety signs and equipment
4. Filters to be refurbished: repair/replace broken nozzles, replace sand, install backup for blowers
5. Build staff facilities: toilet, bathroom with supply of water, kitchen, change rooms.

VROOM Refurbishment Cost Estimate

Civil Works	R2,896,300	53%
Mechanical Works	R1,723,700	32%
Electrical Works (Incl C&I)	R826,100	15%
Total VROOM Cost	**R5,446,100**	**100%**
R million / MLD		**1.80**

Regulatory Impression

The Zastron water treatment plant needs routine maintenance and effective operations to ensure the delivery of safe drinking water. The WSA has spent R 37 million on upgrades to the treatment plant which included new pipeline to plant, new chemical dosing facility and wash water recovery unit + sludge drying beds. However, due to lack of routine maintenance, the chemical dosing facility is not working as both pumps are broken/blocked. The wash water recovery unit and sludge beds are filled with sludge as process controllers are not operating this “new infrastructure” and they view it as additional tasks. Staff dissatisfaction is exacerbated by lack of suitable facilities such as toilet, bathrooms and drinking water. In addition, there are no clearly outlined roles and responsibilities resulting in conflict between staff members regarding responsibility for operational monitoring and process optimisation. The WSA must first address staffing issues before proceeding with Phase 2 of plant refurbishment as staff dissatisfaction will lead to neglect of new infrastructure. Clearly outlined roles and responsibilities coupled with site-specific training will ensure process optimisation and beneficial use of assets. Currently, tankers abstract water directly from the clear water tank using pipe which is left outside. This present potential source of contamination of final water and a more permanent, safer options must be provided. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for chemical but not for micro. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	67.09%
Chemical Compliance	97.65%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

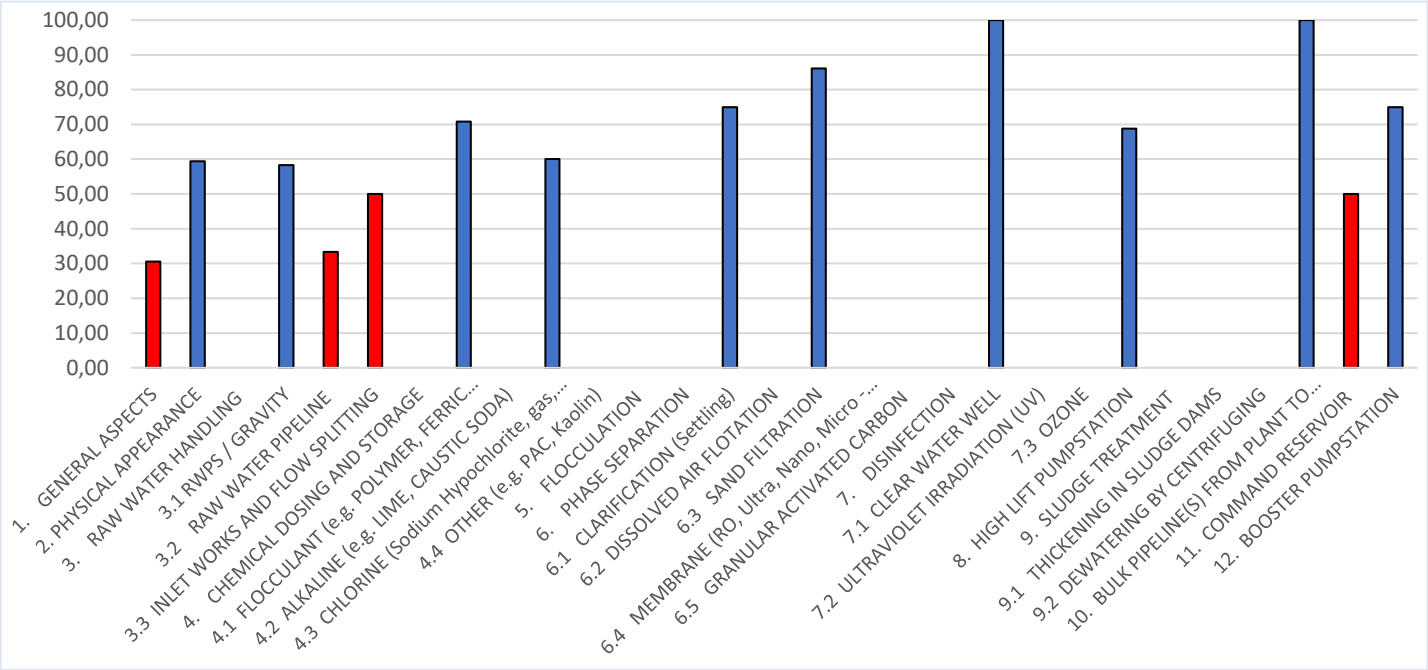
6.12 Moqhaka Local Municipality

VIljoenskroon water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

VIljoenskroon WTW TSA Score: 62%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram

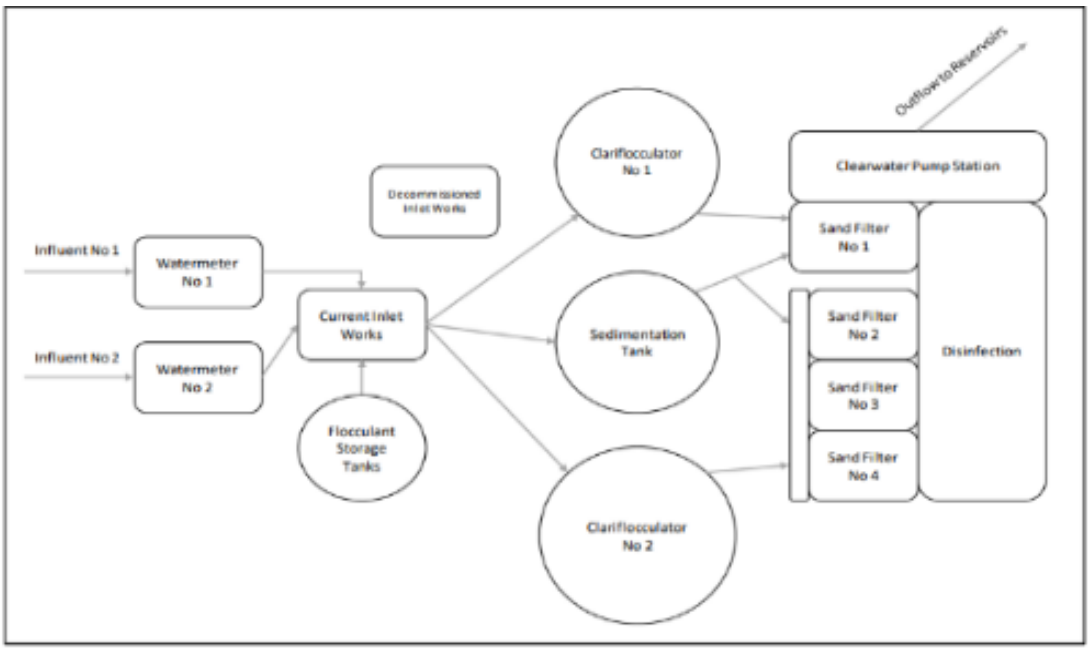


Figure 10: Flow diagram of the Viljoenskroon water treatment works

Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	30.5	Class C plant, repairs logbook not available, Operational logbook is available, The O&M manual and process flow diagram are not available onsite. The emergency contact list was displayed onsite. The monitoring equipment are available and operational, not calibrated. Jar testing is not done onsite. Electricity meter is not available as this belongs to Eskom
2	**Physical appearance of plant**	59.3	The state and tidiness of the garden and terrain is in good condition. There were no serious OHS contraventions in the past year. The plant is fenced. Safety signs are displayed mainly around the Chlorine room.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	58.3	There are screens at the pumpstation but partially underwater. One pump at the pumpstation is operational.
	Raw water pipeline	33.3	The Raw water pipeline is in good condition. Two inflow meters and are not in operation. The inflow volumes are not recorded.
	Inlet works	50.0	The flow is splitting evenly, and it was observed onsite, into vertical pipe that goes to each of the clari-flocculators and old settling tank. Flash mixing is not effective. Flocculent was observed but seemed too high with a continuous flow and not dripping
4	**Chemical dosing and storage**		
	Flocculant	70.8	There are four dosing pumps however only one pump is used at time. The dosing area was neat. The storage volume can last up to 30 days. Dosing with Polymer. The emergency shower is closer to the chlorine dosing area
	Chlorine	60.0	All the dosing units are in operation. Redundant equipment needs to be removed. The two pumps placed on top of each other need proper installation. e scale is not in operation, no auto changeover. There is no alarm or detector, extractor fan is installed but not operational. A mask is available but not in a good condition and filter missing. No BA equipment. Sufficient for 30 days. Chlorine gas is used for dosing. They also have an alternative disinfection system with the use of HTH chips. This installation is over a clear well and not acceptable
6	**Phase Separation**		
	Clarification (settling)	75.0	There was minimal floc observed at weirs to all three units. Desludging is done automatic, except for the old settling tank. The weirs are in good condition (level) and there is some scum and algal growth observed.
	Sand filtration	86.1	There is one backwash pump and in operation. There are two blowers installed and working, however the one blower does not have its air filter installed. Even flow splitting was observed into all filter beds. Backwashing is dependent on the Raw water turbidity, but generally done daily here are no cracks however there are small impressions left on the surface after backwashing. This could be caused but the blower flow and or pressure and or the backwash pump volume or pressure being too high.
7	**Disinfection**		
	Clear water well	100.0	Contact time in on-site reservoir is more than 30 minutes. The free chlorine is measured from the pipeline and used as final sample point of works
8	**High lift pumpstation**	68.7	There are a total of four pumps. The combination is two smaller pumps and two larger pumps, the configuration is one duty and one standby. One of the larger pumps have been removed and therefore non-operational. Final flow meter is operational. The flow volume is recorded but no interpretation.
10	**Bulk pipeline from plant to command reservoir**	100.0	The Raw water pipe network are in good condition.
11	**Command reservoir**	50.0	The reservoir is in a fenced secure area with security guard. Telemetry is not in place. No final meter at the reservoir. There are no cracks on the structure.
12	**Booster pumpstation**	75.0	The pump configuration is two duty and one standby. There was loadshedding at the time therefore running condition undetermined, hearsay. The building is secure, signage in place, and adequately fenced with sufficient ventilation. The MCC is in good condition.
	Total	**62%**	

High risk areas OR Key Hardware Risks/ Defects

1. Raw water abstraction needs upgrading to secure water supply to the plant therefore the community
2. The clear (final) water reservoir leak needs urgent attention as plant cannot run at full capacity.

VROOM Refurbishment Cost Estimate

Civil Works	R2,744,500	51%
Mechanical Works	R2,400,200	44%
Electrical Works (Including C&I)	R266,200	5%
Total VROOM Cost	**R5,410,900**	**100%**
R million / MLD		**0.78**

Regulatory Impression

The VIljoenskroon water system is well maintained, with functional treatment processes, and competent staff. Water quality is monitored according to SANS 241 and is of high quality. Consumers may use the water with high level of confidence. No Directives have been issued by the Regulator. The raw water abstraction infrastructure is at risk of flooding and the necessary redesign / reconfiguration of this infrastructure needs to be done. A Water Safety Plan is in place but need more in-depth analysis of water quality risks need assessment for implementation. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	62.18%
Chemical Compliance	85.95%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

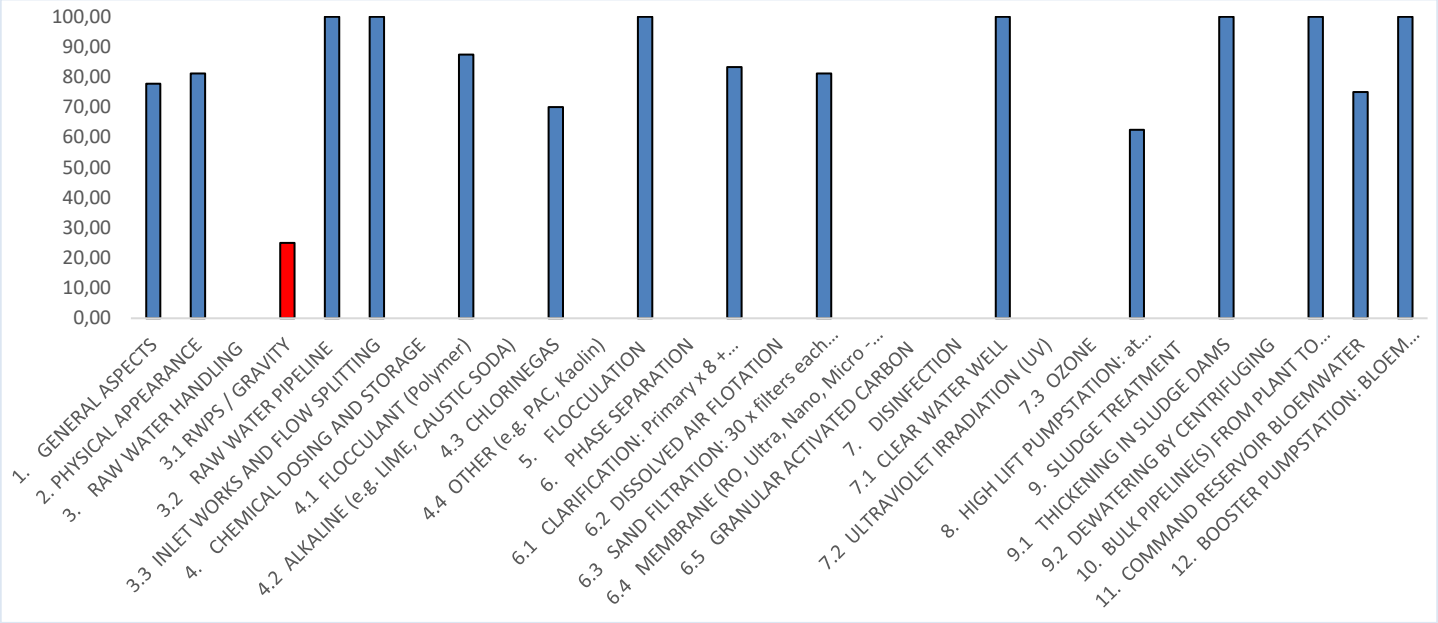
6.13 Nala Local Municipality

The Balkfontein water treatment works was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality. The Balkfontein WTW is owned and operated by Bloem Water and supplies water to the Nala Local Municipality as well as some water supply system in Matjhabeng Local Municipality

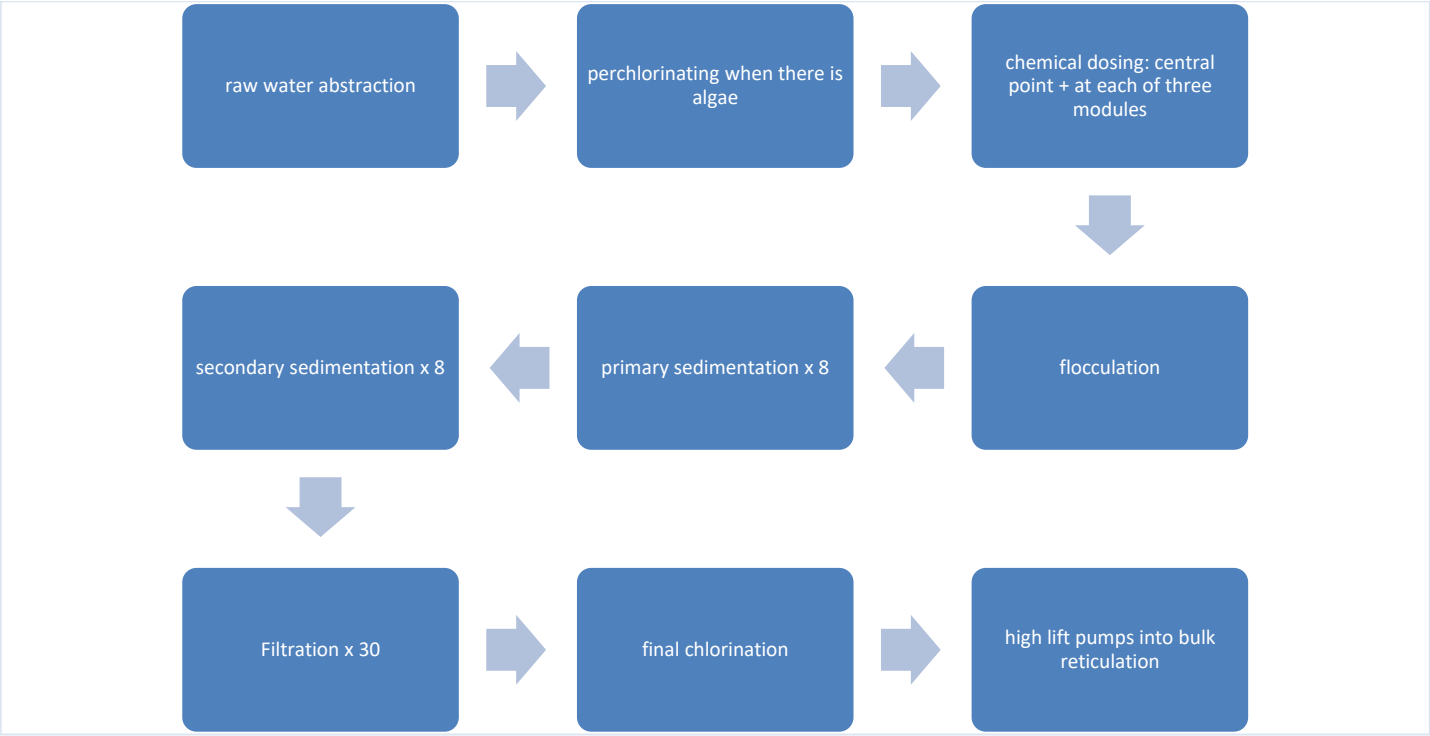
Balkfontein TSA Score: 82%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1.	**General aspects**	77.8	Class A plant, Excellent telemetry system for whole plant with detailed log sheets for flowmeters, stock levels, reservoir levels, pumps, etc, operational monitoring in place. Process flow diagram not displayed
2.	**Physical appearance**	81.2	24 hr access control, Fenced. Neat terrain, excellent facilities for staff, high workplace satisfaction, no recent OHS issues but lack of safety signs in place. Road leading to plant is filled with potholes.
3.	**Raw water handling**		Raw water screens in place but are not cleaned due to faulty control valves. inflow meters in place, even flow splitting at inlet, visual dripping of flocculant. 3 pumps not working at old inlet, 2 not working at new inlet.
	Rwps / gravity	25.0	
	Raw water pipeline	100.0	
	Inlet works and flow splitting	100.0	
4	**Chemical dosing and storage**		Duty standby coagulant dosing pumps, sufficient stock on site for 30 days, bunded walls around tanks and emergency eyewash in place
	Flocculant (polymer)	87.5	
	Chlorine gas	70.0	Duty standby chlorinators, balance scales, sufficient stock on hand for 30 days, Safety signs and equipment available. No automatic switchover and leak detector not working.
5	**Flocculation**	100.0	Flocculation units in good condition, clean, visible floc formation at end of unit.
6	**Phase separation**		
	Clarification: Primary and secondary sedimentation	83.3	Clear overflow, weirs in good condition, regular desludging in response to turbidity limits. Poor housekeeping around units.
	Sand filtration: 30 x filters x 14ML capacity each	81.2	50% backup for backwash pumps and blowers, regular backwashing in response to turbidity, even bubble distribution, sand in good condition, filter gallery in excellent condition, routine disinfection of filters. 6/30 filters are not working.
7	**Disinfection**		
	Clear water well	100.0	Sufficient contract time in reservoir, final sample collected before distribution
8	**High lift pumpstation: at Balkfontein WTW**	62.5	Insufficient backup as 3 pumps not working, final water flow meters and telemetry system in place to control pumps.
9	**Sludge treatment**		
	Thickening in sludge dams	100.0	4 sludge dams, use two at a time, duty standby sludge pumps to return supernatant to head of works
10	**Bulk pipeline(s) from plant to command reservoir(s): Bloem water**	100.0	Pipeline in good condition, routine maintenance plan for pipe network, valve chambers and reservoirs.
11	**Command reservoir: Bloem water**	75.0	24 hr security, fenced, good condition with lids, no visible cracks or leaks, flow meters in place, Telemetry system to monitor reservoir levels, control pumps. Requires grass cutting, cannot access reservoir.
12	**Booster pumpstation: Bloem water**	100.0	Duty standby pumps, fenced, MCC panel in place, telemetry system to monitor reservoirs and operate pumps
	Total	**82%**	

High risk areas OR Key Hardware Risks/ Defects

1. 6/30 filters are not working due to mechanical issues thereby reducing capacity of the treatment plant
2. Faulty screen valves and lack of backup for raw water pumps
3. Lack of working leak detector and automatic switchover, leaks in chlorination pipework
4. Lack of standby final water pumps
5. Lack of sufficient standby for backwash pumps and blowers.

VROOM Refurbishment Cost Estimate

Civil Works	R14,271,400	12%
Mechanical Works	R68,883,100	60%
Electrical Works (Incl C&I)	R32,313,600	28%
Total VROOM Cost	**R115,468,100**	**100%**
R million / MLD		**0.32**

Regulatory Impression

The Balkfontein water treatment plant is well maintained, with functional treatment processes, and competent staff. Plant is commended for excellent O&M capabilities. There are various departments on site with required personnel: full mechanical, electrical workshop for all equipment including vehicles. In addition there is a stock room with extensive range of spares with computerised stock control system. There are several outstanding maintenance issues which have not been addressed since merger with Bloem Wate due to insufficient budget, in particular repairs to filters and backup pumps to ensure the plant is able to operate optimally and maintain excellent water quality. Budget constraints are affecting frequency of E. coli testing due to lack of reagents; this is a high risk as the plant is supplies water to a large population including Matjhabeng LM.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	98.17%
Chemical Compliance	98.25%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

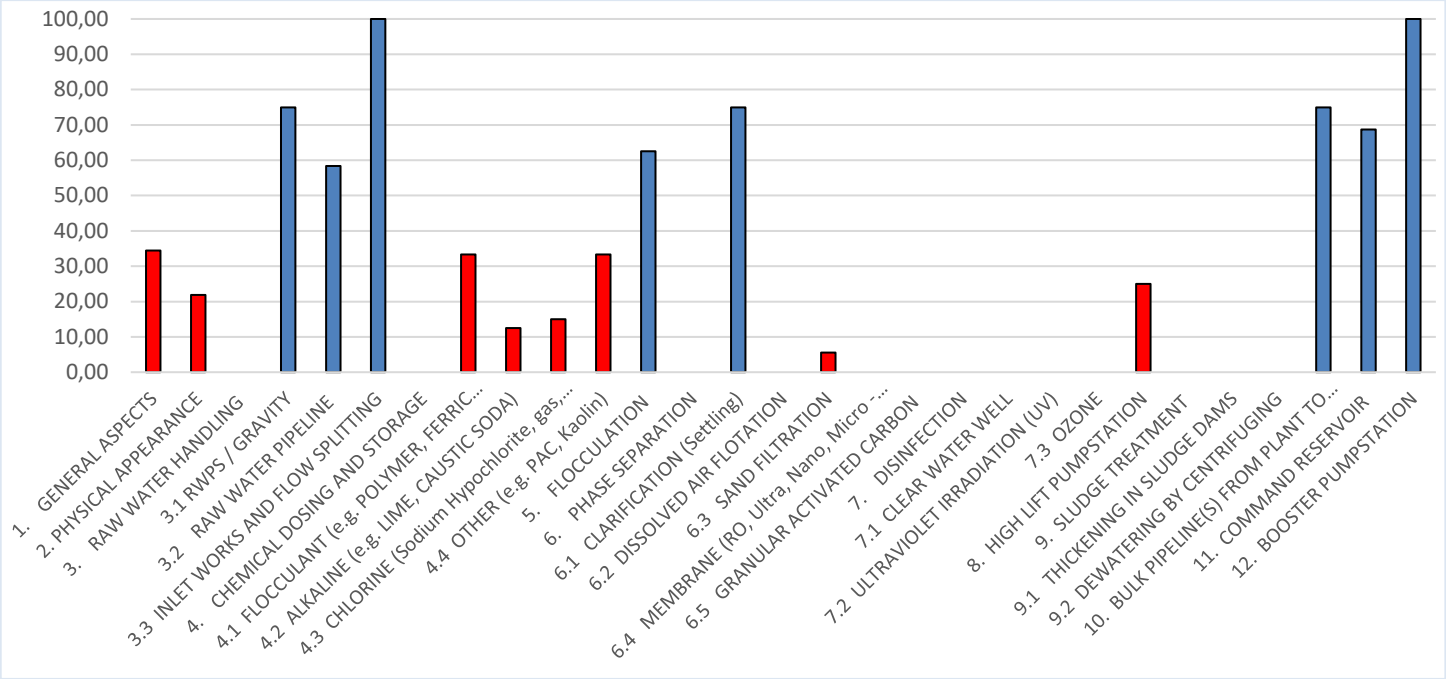
6.14 Ngwathe Local Municipality

The Parys water treatment works was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

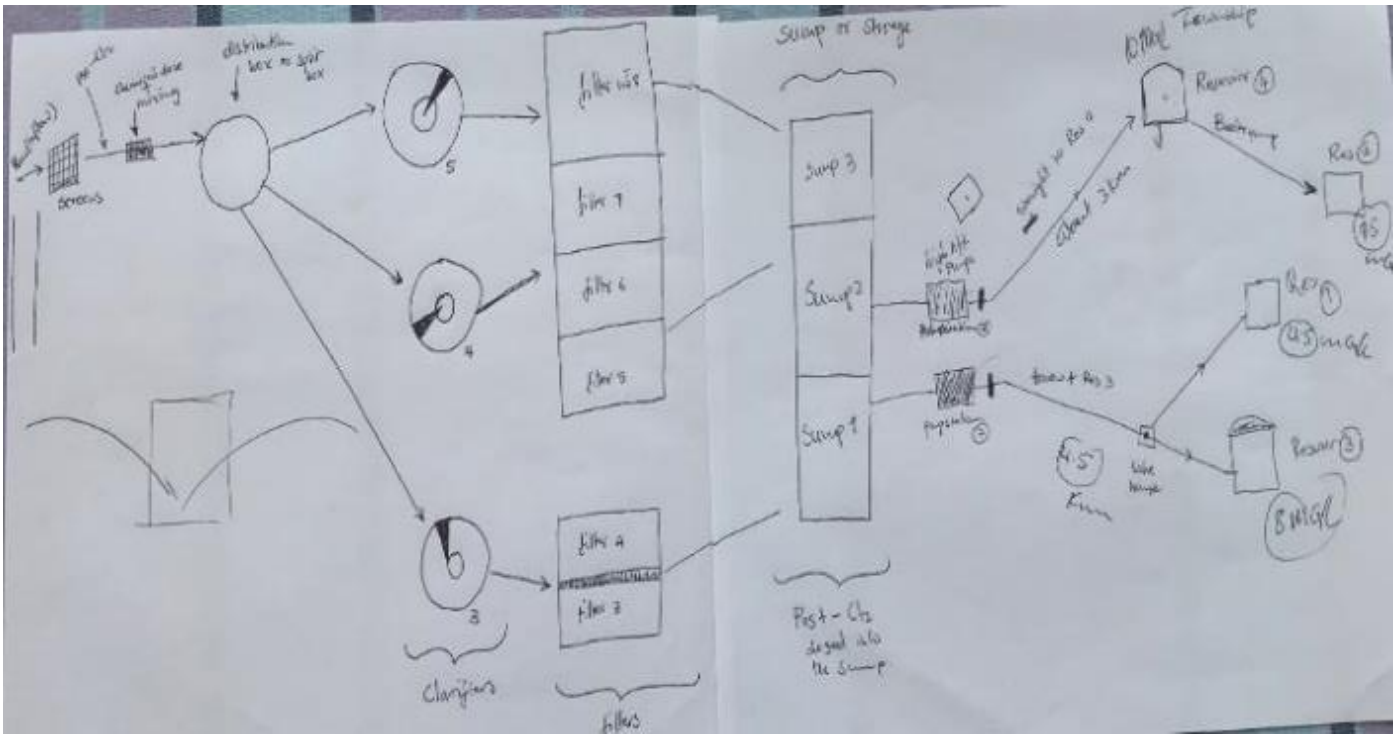
Parys TSA Score: 36%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	34.4	Class B plant. Operational logbook available with recent entries. O&M manual, IMP, and PFD not available. Some monitoring instruments functional, no proof of calibration. A newly build laboratory equipped with new instruments and reagents on site, but not in use.
2	**Physical appearance of plant**	21.9	Fence needs maintenance, but site is not accessible to public or stray animals. Refurbishment of the plant not completed, contractor left the site and processes not optimal, causing frustration under staff. The site is not maintained although equipment is available.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	75.0	Screen needs to be replaced, cleaned daily, hyacinth growth evident after screens. Pump in working condition but not in use currently (gravity fed), with 100% standby available.
	Raw water pipeline	58.3	Pipeline in a good condition. No flow meter, measure the height of the water. Results are recorded and converted daily, but no indication that the flow data is interpreted and used to adjust processes.
	Inlet works	100.0	Flow splitting even between clarifiers. Hydraulic jump provides sufficient turbulent conditions. Visual dripping of flocculant. No lime / PAC dosed during the site visit.
4	**Chemical dosing and storage**		
	Flocculant	33.3	The dosing area still needs serious maintenance. This was already mentioned in the Water Master Plan in 2017 and did not receive the attention it needs during the past 5 years. The result of spilled chemicals visible throughout the dosing area. Seven digital and 4 new manual dosing pumps are installed. There is no emergency wash area nearby.
	Alkaline	12.5	Only one hopper is functional, used for lime, soda ash and PAC. In need of refurbishment. Bags are normally stored on the floor.
	Chlorine	15.0	The chlorine gas dosing not working, use chips.
	Other (PAC, Kaolin, etc.)	33.3	Only one hopper is functional, used for lime, soda ash and PAC. In need of refurbishment. Bags are normally stored on the floor. Two cylinders on scales and 4 in store, gives sufficient storage volume, however, not in use. Safety shower in place was not working, masks in safety box.
5	**Flocculation**	62.5	The units are cleaned once a week. It was raining and flocs broke up -with only fine flocs visible.
6	**Phase Separation**		
	Clarification (settling)	75.0	Weirs at old plant good, new plant needs some replaced. Settling is good with limited floc carry-over. Desludging is done manually, every two hours for 15 minutes.
	Sand filtration	5.56	Refurbishment project on the filters not complete. Contractor left the site. Flow not split evenly with some filters overflowing and others half-full.
7	**Disinfection**		
	Clear water well	0.0	Contact time of chlorine not known, chlorine chips used, no information on the dosing. Chlorine is tested at the tap in the control room, no proper disinfection taken place.
8	**High lift pumpstation**	25.0	Two pumps installed and in working condition, with no standby available. There are no flow meters, volumes are calculated based on pump hours.
9	**Sludge treatment**		
	Thickening in sludge dams	0.0	No sludge management, sludge ponds drain into Vaal River and overflow with high level of river.
10	**Bulk pipeline from plant to command reservoir**	75.0	Contractors are busy refurbishing the pipeline. The valve chamber is newly refurbished.
11	**Command reservoir**	68.75	The two main reservoirs fenced with security in place, the structures are in a good condition. Telemetry is in place with daily levels send to PC. Outflow not metered.
12	**Booster pumpstation**	100.0	There are 4 booster pumpstations with 2 pumps each at the reservoirs.
	Total	**36%**	

High risk areas OR Key Hardware Risks/ Defects

1. Less than 60% of the installed capacity at the WTW is currently available to treat water, compromising the quantity and quality of the water severely
2. Both the sand filtration and gas chlorination units are dysfunctional
3. There is no sludge management. Sludge ponds drain into the Vaal River and overflow/flood with high river levels
4. WTW in a poor condition and in desperate need of refurbishment
5. No flow metering and limited WQ monitoring - not conducive for proper process control.

VROOM Refurbishment Cost Estimate

Civil Works	R8,411,700	25%
Mechanical Works	R21,463,200	65%
Electrical Works (Incl C&I)	R3,245,000	10%
Total VROOM Cost	**R33,119,900**	**100%**
R million / MLD		**2.21**

Regulatory Impression

The Parys WTW is in poor condition and in desperate need of refurbishment and maintenance, coupled with operational know-how. Less than 60% of the installed capacity at the WTW is currently available to treat water, compromising both the quantity and quality of the water. Both the sand filtration and chlorination units are dysfunctional. No sludge management is in place. No flow metering and limited water quality monitoring is not conducive for proper process control. No information (NI) is available on the final water quality, which presents a major risk for the water users of the municipality. Urgent and major interventions are required to correct the dysfunctional state of the water infrastructure and processes.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	NI
Chemical Compliance	NI

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



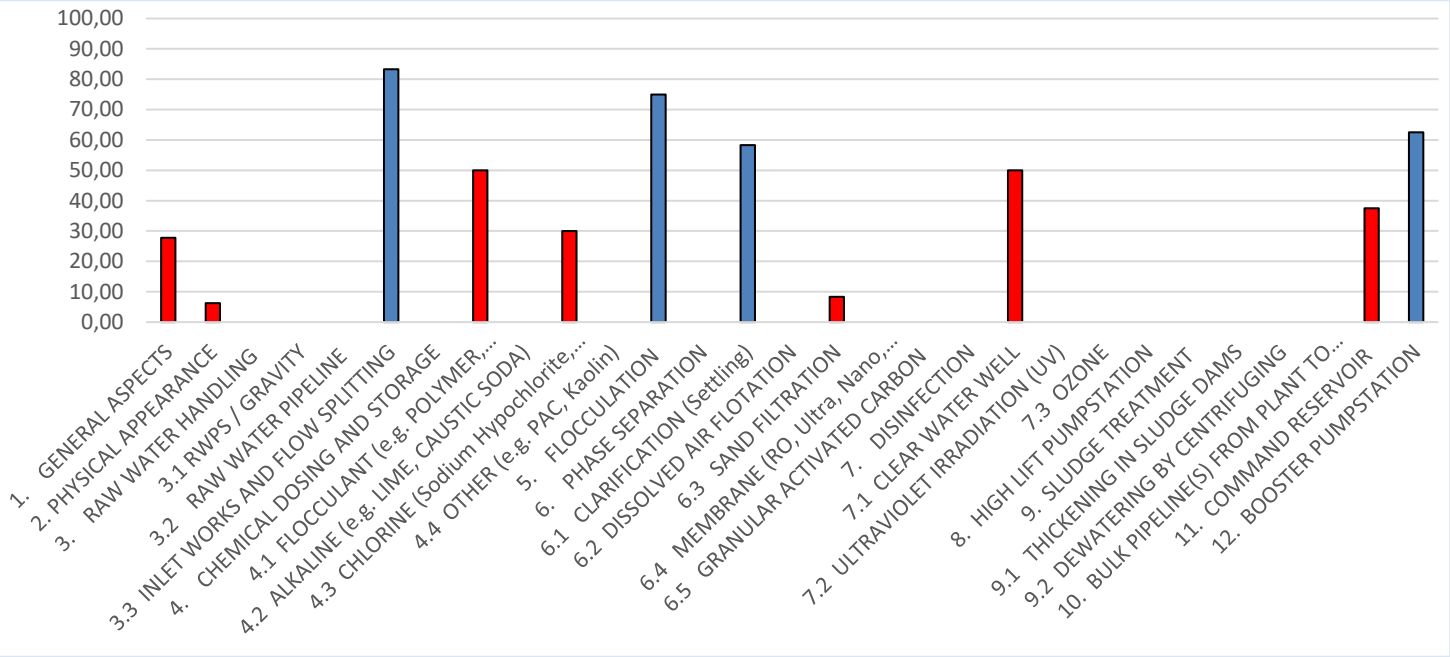

6.15 Nketoana Local Municipality

The Reitz water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

Reitz TSA Score: 28%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram

None

Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	27.7	Class C plant, logbooks in place but no signage at entrance.
2	**Physical appearance of plant**	6.2	Critical dysfunctional structures and equipment. Site negligence is severe, obvious signs of lack of O&M and general care by plant staff, disabled environment.
3	**Raw water handling**		This whole raw water abstraction point needs urgent attention to deal with operational as well as OHS aspects. Besides what is said above the electrical conductors that feed the emergency and permanent PS are not according to required standards.
	Raw water pumpstation / gravity feed	0.0	
	Raw water pipeline	0.0	
	Inlet works	83.3	
4	**Chemical dosing and storage**		Duty and standby pump set in good condition although the installation seem temporary and a mor permanent sound installation is required. The building housing the chemicals is in poor condition with visible spillage all over, no wash station on-site.
	Flocculant	50.0	
	Chlorine	30.0	
5	**Flocculation**	75.0	U3-500 is used. There are flocs visible at the end of the two of the working floc channels.
6	**Phase Separation**		There are two clari-flocculators and one old settling tank in use. The top surface of the tanks where the rotating platform rotates is crumbling in places and has been rectified by the installation of flat steel rails. This should be seen as a short-term solution and a more permanent solution needs to be considered.
	Clarification (settling)	58.3	Backwashing is done based on turbidity but done manually because automated system not functioning.
	Sand filtration	8.3	There are two filter plants.
7	**Disinfection**		It is difficult to measure contact time based on observations made. Free chlorine is measured at the final water.
	Clear water well	50.0	
10	**Bulk pipeline from plant to command reservoir**	-	The bulk temporary line from the raw water to plant is a uPVC pipe and is above ground. It was also not properly anchored. This will drastically decrease its life span.

Watch #	Process Unit Assessed	% TSA	Observations
11	**Command reservoir**	37.5	Fenced and gated. General area at the reservoir is unkept and needs cleaning and removal of unused equipment and spares.
11	**Booster pumpstation**	62.5	There are two pumpstations on site, one for the elevated reservoir that has two pump sets, this station is in a poor condition and needs urgent attention. The other pumpstation has two working pump sets working with OHS noncompliance.
	Total	**28%**	

High risk areas OR Key Hardware Risks/ Defects

1. The raw water abstraction unit needs refurbishment with OHS
2. Inlet structure including flocculation channels need civil refurbishment, unused new third floc channel needs to be incorporated into processing unit
3. The reinstatement of all automatic / PLC related control in settling and filter units
4. All the major leaks in filter house and final water well need repair
5. General plant housekeeping of all electrical mechanical installations need cleaning and neatening up. floor areas where electrical equipment need to be dried and sealed.

VROOM Refurbishment Cost Estimate

Civil Works	R24,579,500	36%
Mechanical Works	R29,415,100	44%
Electrical Works (Including C&I)	R13,548,700	20%
Total VROOM Cost	**R67,543,300**	**100%**
R million / MLD		**4.50**

Regulatory Impression

The Reitz water system is maintained to basic standards, with an operational treatment process, and competent and willing staff. Water quality is monitored according to SANS 241 and is of good quality. Consumers may use the water with a level of confidence. No Directives have been issued by the Regulator. The high-risk areas as mentioned above need urgent attention to elevate the plant's ability to achieve higher standards of excellence.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	96.47%
Chemical Compliance	93.31%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



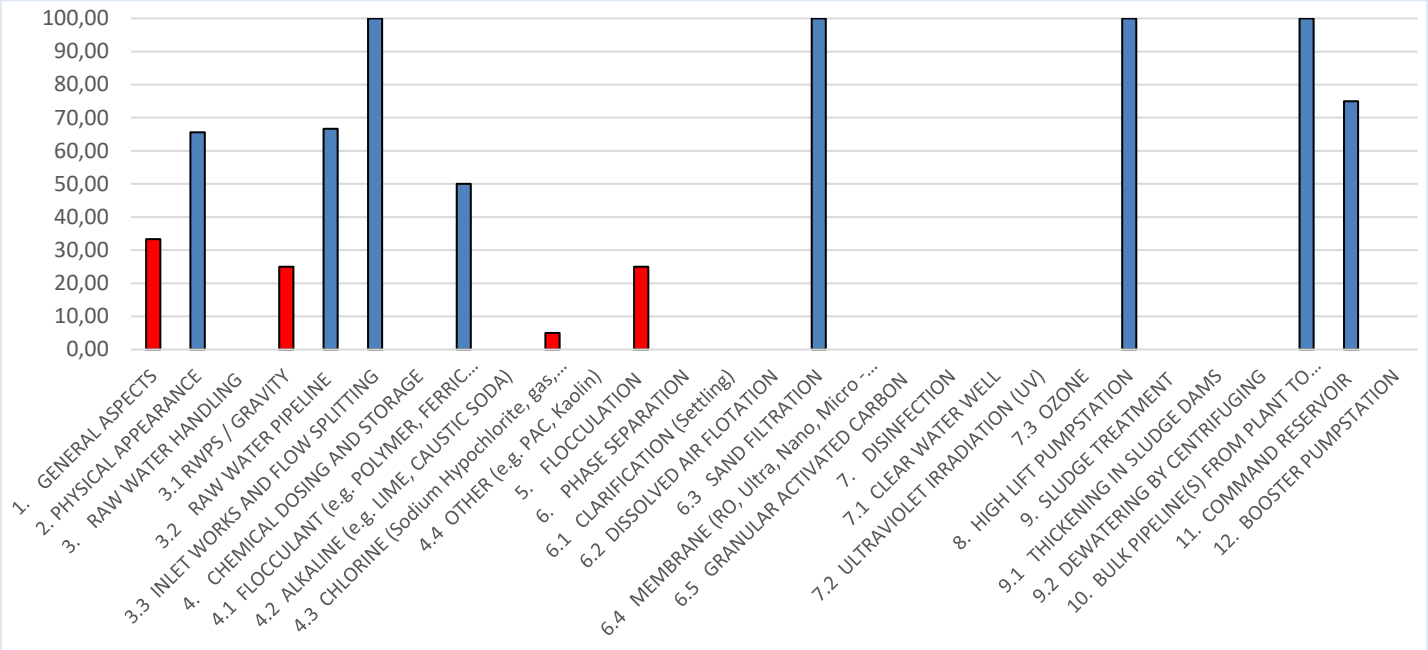

6.16 Phumelela Local Municipality

The Vrede water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

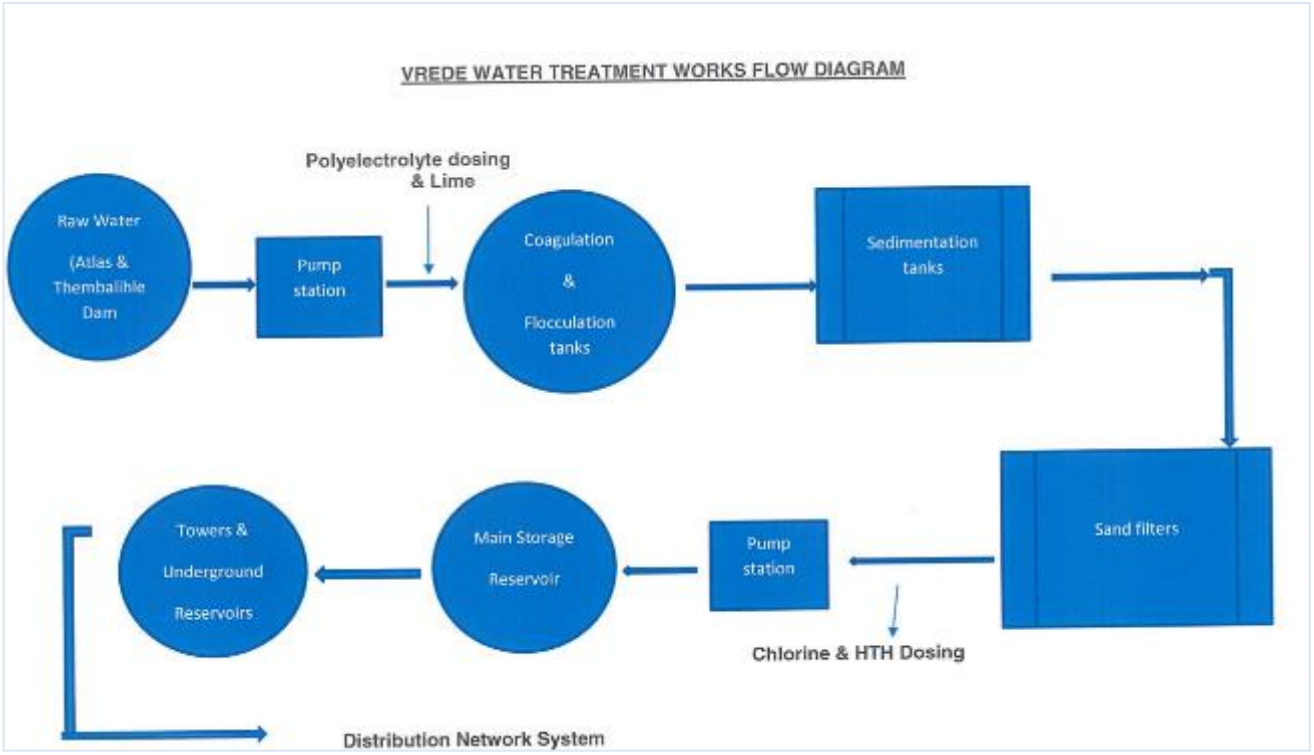
Vrede TSA Score: 55%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	33.3	Class C plant, operational logbooks in place but no signage at entrance.
2	**Physical appearance of plant**	65.6	The state of the garden and terrain is not good. Only certain areas where they normally have to have access is kept clean & tidy otherwise the area within the plant is unkept.
3	**Raw water handling**		The main pump station is in very poor state with paint peeling off the walls. Only one pump set of two pump sets installed is working. The raw water pipeline is new therefore there are no leakages.
	Raw water pumpstation / gravity feed	25.0	
	Raw water pipeline	66.6	
	Inlet works	100.0	
4	**Chemical dosing and storage**		The dosing area is not neat and there are signs of spillages and lime powder.
	Flocculant	50.0	
	Chlorine	5.00	
5	**Flocculation**	25.0	M70 POLY is used. The flocculation unit has some algae growth and sludge settling is taking place.
6	**Phase Separation**		The settling tank is battling and at risk. It is overloaded with sludge build-up scum formation, lamella plated totally overloaded with sludge. There is an original alternative clari-flocculator and settling unit that is not being use and believe this needs to be reinstated and assist with the current ineffective process unit and can run in parallel.
	Clarification (settling)	58.3	Backwashing is done twice per shift
	Sand filtration	8.3	Two backwash pumps in good working condition, One in operation, one on standby.
7	**Disinfection**		Not assessed
	Clear water well	-	
8	**High lift Pumpstation**	100.0	All pumps are in good working condition and the outflow meter is operational
9	**Sludge Treatment**	0.0	Dewatering is taking place in a small sump next to the filter building. This unit is unkept and overgrown with gras
10	**Bulk pipeline from plant to command reservoir**	-	The raw water pipeline has no leakages, this is within the plant area
11	**Command reservoir**	75.0	The reservoir is fenced as part of the treatment plant. The final flow meter is available and working. There are no leakages on the structure
11	**Booster pumpstation**	-	Not assessed
	Total	**55%**	

High risk areas OR Key Hardware Risks/ Defects

1. A total refurbishment of the raw water pump station at the dam
2. The inlet works dosing building need an upgrade/ refurbishment
3. The flocculation and settling units need investigation and upgrade/ refurbishment.

VROOM Refurbishment Cost Estimate

Civil Works	R3,670,700	28%
Mechanical Works	R6,536,200	50%
Electrical Works (Including C&I)	R2,937,000	22%
Total VROOM Cost	**R13,143,900**	**100%**
R million / MLD		**0.38**

Regulatory Impression

The Vrede water system is in a fair state, with operational treatment processes, and capable staff. Water quality is monitored according to SANS 241 and is of good quality. Consumers may use the water with good level of confidence. A Water Safety Plan is in place but needs more in-depth analysis and implementation. The plant could do with some general maintenance and upkeep to improve the workplace satisfaction. High risk areas mentioned above need attention.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	97.81%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





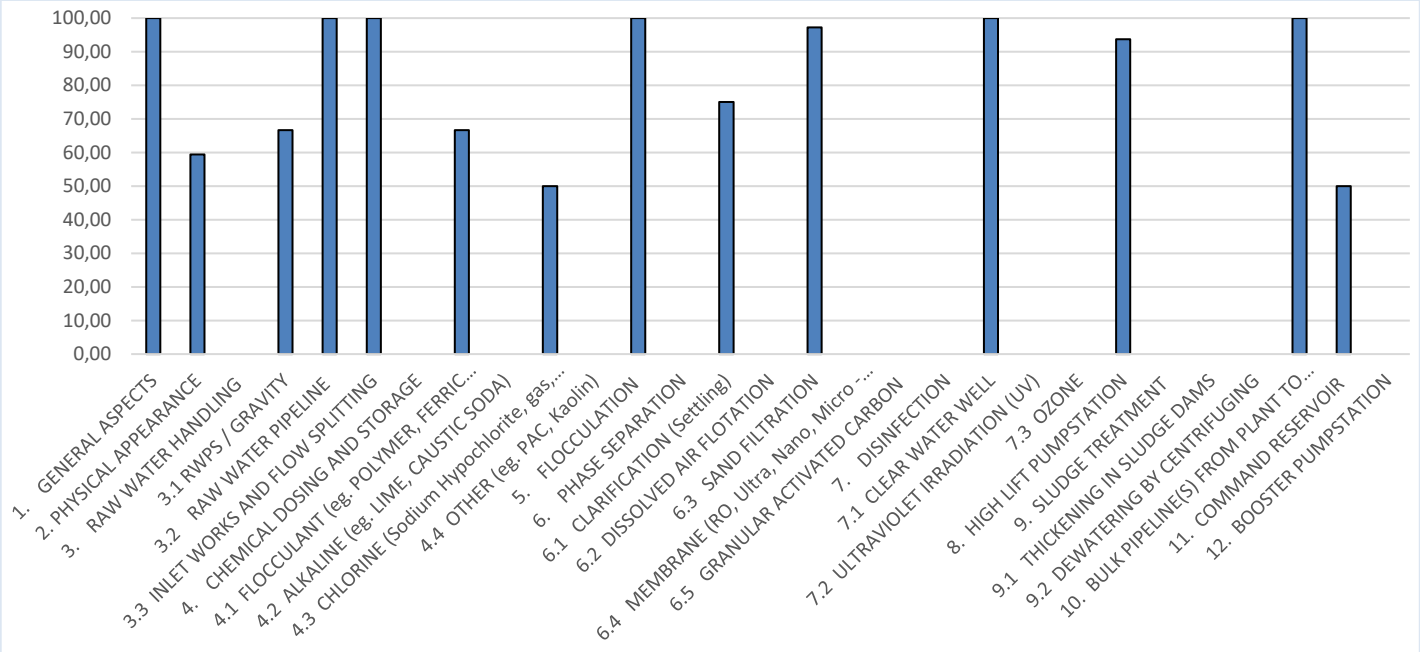

6.17 Setsoto Local Municipality

The Ficksburg water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

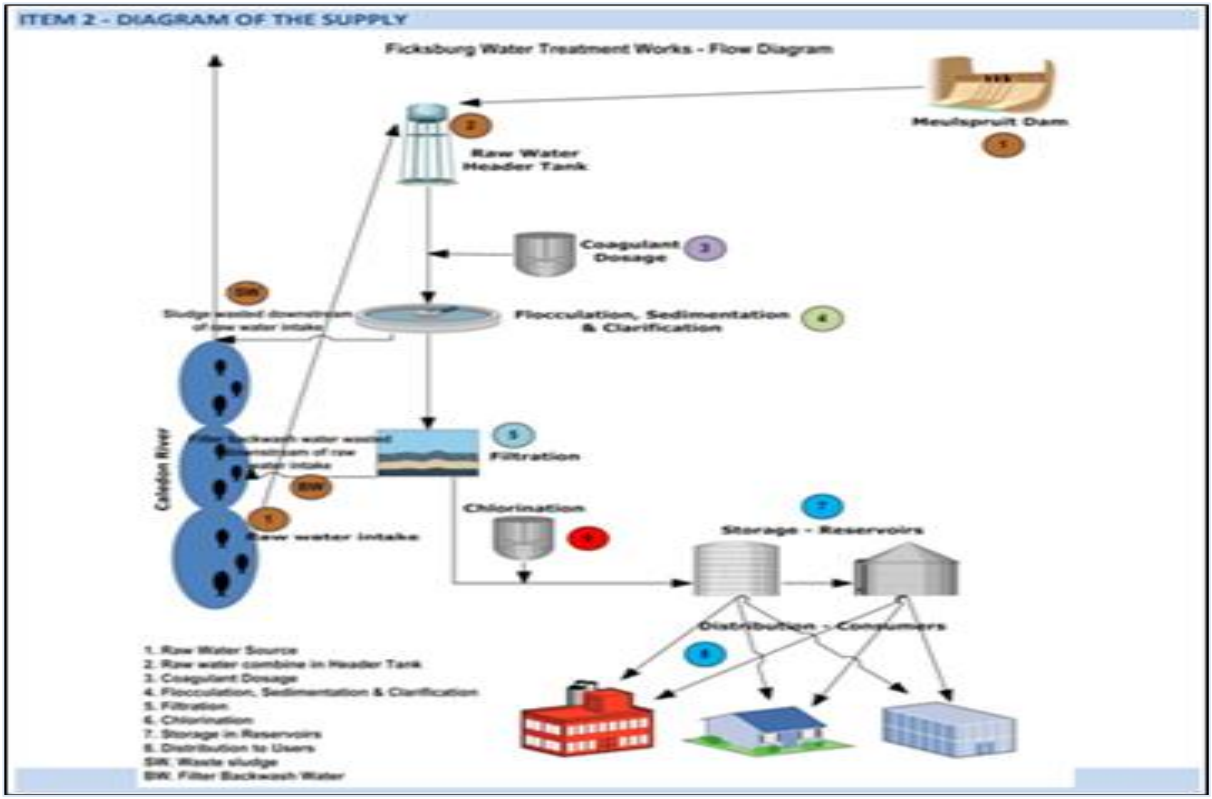
Ficksburg WTW TSA Score: 81%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	100.0	The recordkeeping at the plant is commendable. All logbook entries were up to date, information systematically filed and quarterly reports available. The plant classification certificate, IMP with contact numbers and PFD all displayed. Laboratory equipment is available, calibrated and results recorded. Jar tests are conducted, and results reported.
2	**Physical appearance of plant**	59.4	The access road to the plant poses challenges during rainy season. The plant is fenced with access control. No institutional information is provided at the entrance. Safety signage at the plant is not sufficient. Bathrooms and lunch facilities were clean and tidy, except for items stored on top of lockers. Maintenance of the site needs improvement.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	66.7	Screens are installed at both abstraction points. Standby arrangements are in place at both the Caledon and Meulspruit pump stations. At the Caledon pump station two pumps have been out of service for an extended period. These pumps need to be repaired urgently.
	Raw water pipeline	100.0	Raw water pipe network reported to be in good condition. Abstraction is measured and recorded. No evidence is available for calibration / verification of the meters.
	Inlet works	100.0	The outlets from the two on-site raw water reservoirs merge into a single inlet to the plant. Chemical dosing is done in line. Dosing pump delivery is verified.
4	**Chemical dosing and storage**		
	Flocculant	66.7	Two different coagulants are kept on site due to variations in raw water turbidity. Each system is fitted with a dosing pump, which is inter-changeable. The dosing area was clean and tidy with no evidence of spillage. Adequate stock was available on site. The area is not bunded. An emergency shower must be provided close to the dosing area.
	Chlorine	50.0	Gaseous chlorine is dosed. Only one cylinder was connected, and no standby equipment is available. The scale is in working condition and the mass is recorded daily. Safety equipment is installed and in working condition. The door of the chlorine room must be kept locked.
5	**Flocculation**	100.0	Clari-flocculators are used. Floc formation is monitored at the splitter box to clari-flocculators, by doing a beaker test. Good floc formation was observed.
6	**Phase Separation**		
	Clarification (settling)	75.0	Stirrers and automatic de-sludging are not in working condition. Erosion caused by sand in raw water source is experienced at gate valves, nuts, and shafts. Weirs are in good condition and cleaned according to a routine maintenance schedule. No floc carry-over was observed.
	Sand filtration	97.2	One Moore filter has been out of operation for a long time due to a crack in the structure. Duty and standby backwash equipment are installed and in working condition. Filters are backwashed once every 24 hours. Even bubble distribution was observed during backwash, no cracks were observed, and the media surface appeared even. A schedule is in place for cleaning.
7	**Disinfection**		
	Clear water well	100.0	The estimated contact time at design capacity is 42 minutes. Free chlorine is measured at a tap after the contact tanks.
8	**High lift pumpstation**	93.8	All pumps installed are in working condition with a standby arrangement. The three pumps on the line to the Northern Reservoirs are in very poor condition. Construction of a new line has commenced in October 2022 and pumps and motors are on order, expecting delivery within 3 months. Flow meters installed on the two lines are functional and flow readings are recorded. No proof of calibration / verification was available.
9	**Sludge treatment**	NA	Sludge and Filter backwash water are discharged into the Caledon River. No alternative option has ever been provided.
10	**Bulk pipeline from plant to command reservoir**	100.0	The main bulk line feeding the command reservoir is in a good condition.
11	**Command reservoir**	50.0	The reservoirs are fenced and structurally in good condition. All inspection manholes are properly closed. Telemetry was vandalised at the Northern Reservoirs and out of order at the Meqheleng reservoir. Overflows are experienced at the Meqheleng reservoir.
12	**Booster pumpstation**	NA	There is a booster pump station and elevated tank at the Northern Reservoirs, but never commissioned (this was provided for a planned new development, which never realised)
	Total	**81%**	

High risk areas OR Key Hardware Risks/ Defects

1. Raw water abstraction pumps at the Caledon River must be repaired
2. Storage area to be bunded
3. Telemetry must be repaired (water losses from overflowing reservoir)
4. Pave the access road to the plant
5. Stirrers and automatic de-sludging to be repaired
6. Alternative arrangements for discharge of sludge and filter backwash water to be investigated.

VROOM Refurbishment Cost Estimate

Civil Works	R2,718,100	31%
Mechanical Works	R5,082,000	57%
Electrical Works (Incl C&I)	R1,107,700	12%
Total VROOM Cost	**R8,907,800**	**100%**
R million / MLD		**0.28**

Regulatory Impression

The Ficksburg WTW is classified as a Class C plant with a design capacity of 32 Ml/d. The average raw water abstraction for the assessment period was 21.73 Ml/d. The SIV for the same period was 18.17 Ml/d. The water use is authorised. The WSA complies with Regulation 2834. It is however disappointing that no training initiatives are in place to work towards meeting the requirements of draft Regulation 813. The plant registration certificate, IMP, emergency numbers and plant diagram were all displayed. The municipality is commended on the excellent record keeping system in place. Detailed information on maintenance, with tracking of progress, is available. Except for site maintenance that needs improvement and the delay with repair of pumps at the Caledon River pump station, the plant is well maintained. It was evident from findings on site that the staff operate as a team. Process Controllers are satisfied with working conditions on site.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	85.06%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





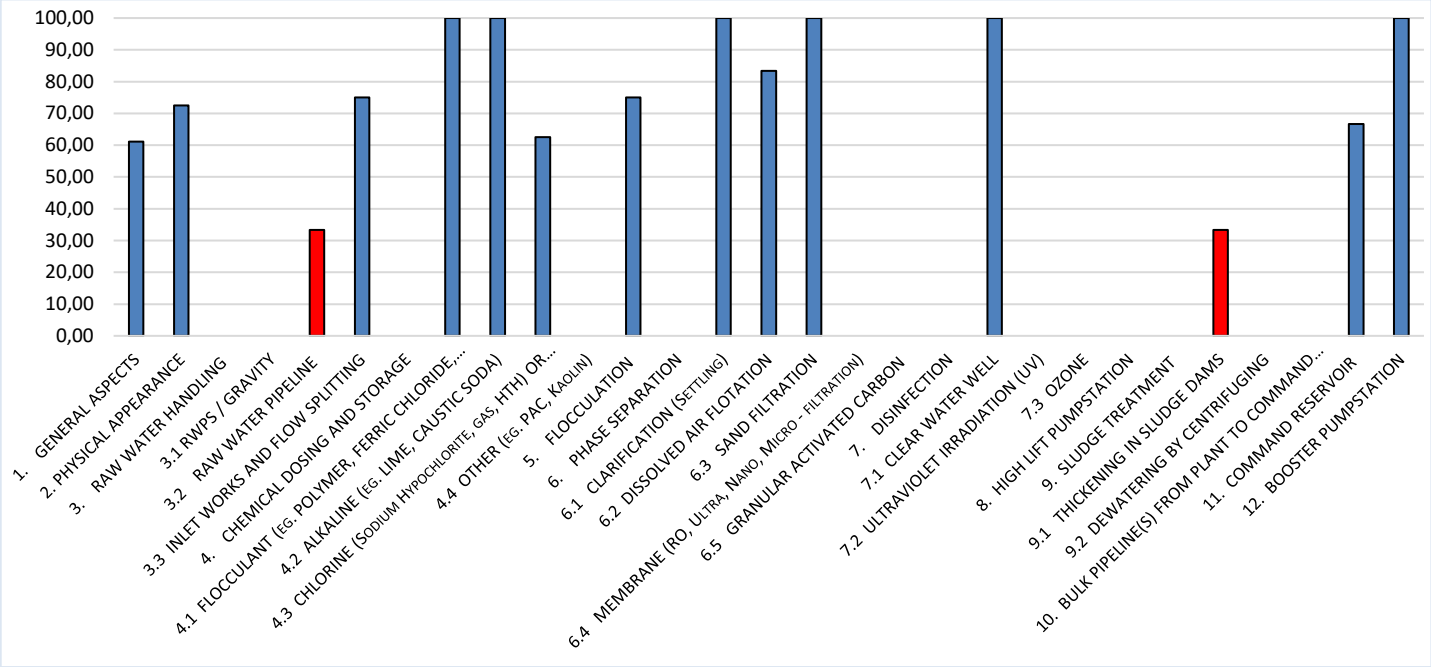

6.18 Tokologo Local Municipality

When the 2022 Blue Drop assessment team or auditors completes the documentation verification with a Water Services Authority, then the final step of the assessment or audit is to choose one or two Water Purification Plant of the Municipality for physical inspection. Hertzogville Water Purification Plant is one of the works that was chosen under Tokologo Local Municipality. The inspection was conducted on 27 January 2023.

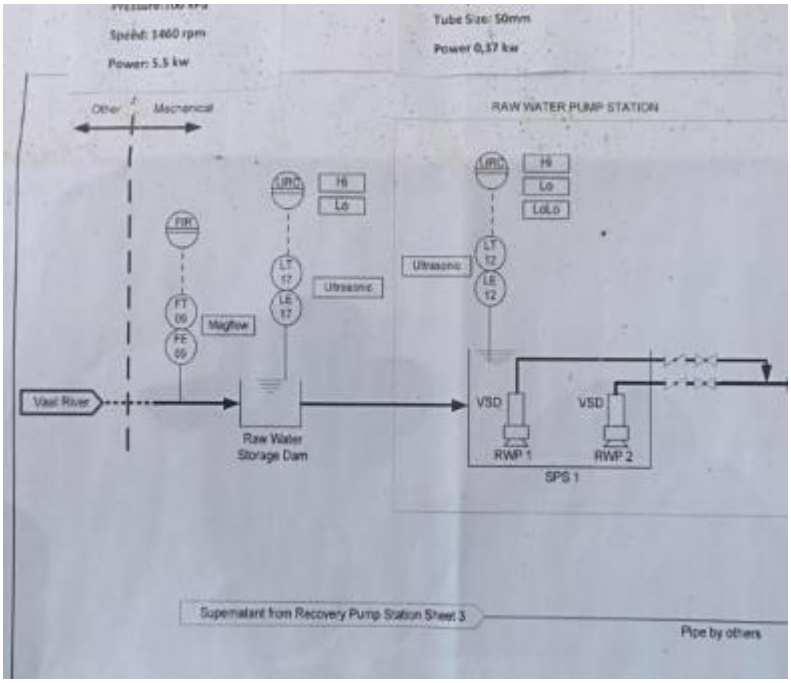
Hertzogville TSA Score: 75%

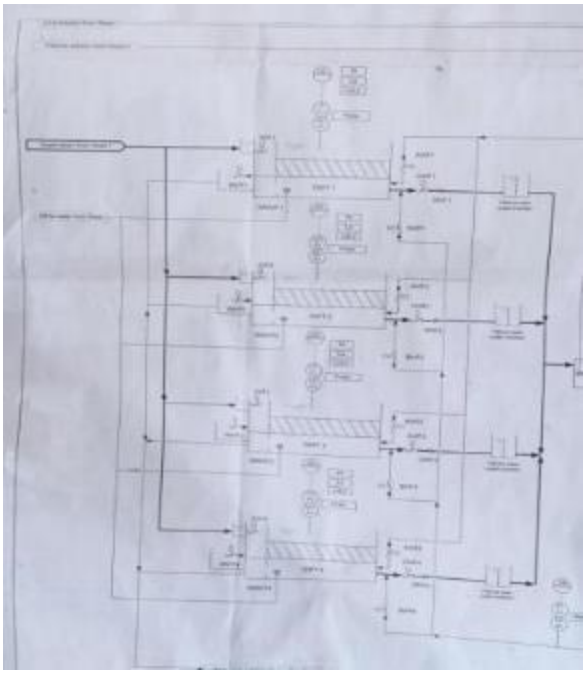
Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram





Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	61.0	This is a Class C plant. Of the general aspects inspected, process monitoring that should assist the operation of the plant was noted to be the main challenge. The fact that monitoring equipment (e.g., water quality monitoring equipment and jar test) is available but not utilised, is worrying. The ability of the process controller is not a question because the process controller on duty was trained in how to use the equipment and interpret the data. In addition, the aspect of operational monitoring is a regulated one in terms of SANS 241 specification and each water treatment plant is required to do operational monitoring.
2	**Physical appearance of plant**	72.0	Of the items inspected under Physical appearance: Key items that did not comply to Blue Drop standards is the signage at the entrance. Some parts of the plant have the grass cut and neat whilst some are overgrown with grass and untidy. The road to the plant is tarred, however, continuous heavy rains could easily change the situation.
3	**Raw water handling**		The raw water handling is generally good. Raw water is stored in a holding dam on site. Raw water pipes are still new as the plant was constructed in 2014. An inlet flow meter is installed though it was not operational on the day of assessment. It was noted that it has not been functioning for about a week. Flows are not recorded though there is an inlet flow meter. Flocculant dosing is conducted manually due to the dosing pumps that are not functioning. The manual dosing is via buckets with holes drilled at the bottom. Monitoring of this process is poor because is not based on the amount of water coming in or the quality of the water.
	Raw water pipeline	33.0	
	Inlet works	75.0	
4	**Chemical dosing and storage**		Lime dosing is only practiced when there is a need e.g., after heavy rains. Pre-chlorination is conducted manually using HTH granules solution that are mixed in 25L buckets. The solution is dosed via dripping through drilled buckets at the bottom.
	Flocculant	63.0	
	Alkaline e.g., Lime	100.0	
	Chlorine	83.0	
5	**Flocculation**	75.0	Sudfloc 3465 is used. Floc dosing pumps are not functioning, therefore dose manually. Very small flocs were observed. Flocculation channels are cleaned every 3 months.
6	**Phase Separation**		
	Clarification (settling)	100.0	All the necessary equipment e.g., recycle pumps, compressors, exists with backups, and they are all functional. It is only the saturator that is not functional. It has never been serviced such that the pressure gauge was not working during assessments. There are four filter beds, of which one of them was not operational. The filter bed cannot backwash, therefore was isolated for maintenance. An urgent maintenance of the filter should be carried out to be able to meet the demand.
	Dissolved Air Flotation	83.0	
	Sand filtration	100.0	
7	**Disinfection**		Chlorine gas is used for post chlorination. Chlorine properly stored in a room with an extractor fan and always sufficient. Do have appropriate PPE on site. The size of the on-site clear water reservoir is 3ML. A 30minutes contact time is estimated to be achieved. However, the assessors were satisfied that disinfectant residual operational test is done via the on-line equipment and results recorded on the log book.
	Clear water well	100.0	
8	**High Lift pump station**	NA	Not applicable: From the onsite reservoir, water is pumped to the network reservoirs.
9	**Sludge Treatment**		
	Thickening in sludge dams	33.0	This is one of the poorly performing categories. Sludge ponds were overgrown with grass and weeds such that it was not easily accessible. Sludge ponds have not been emptied in the past 2 years. Maintenance of the sludge ponds should be improved.
10	**Bulk pipeline from plant to command reservoir**	-	It is difficult to access the pipe route. Therefore not inspected.
11	**Command reservoir**	67.0	The township Malebogo reservoirs was visited. The site is fenced with a locked gate. Flow measurement is conducted at the distribution pump station pumping water out of the reservoir on-site to the network reservoirs. Flows are recorded daily for water going to the township line and to town line. Steel and concrete reservoirs are in good condition.
11	**Booster pumpstation**	100.0	There are four pumps in total - 2 on duty and 2 standbys. All the pumps were in a working condition.
	Total	**75%**	

High risk areas OR Key Hardware Risks/ Defects

1. There is water quality testing equipment on-site that is not utilised, yet insufficient monitoring is taking place. The only readings taken are through the on-line equipment for raw and final. There is no monitoring at other unit processes. The use of the existing monitoring equipment should be considered.
2. Chemicals such as coagulant and HTH granules for pre-chlorination are dosed manually via dripping method. There are no measured adjustments on the amount dosed because the jar test is not conducted. There is, however, jar test equipment onsite that is not utilised. It is recommended that a jar test is conducted to work out the amount of chemicals to be added.
3. Recording of flows (both inlet and outlet) is not carried out. There is an inlet flow meter, however records are not taken. There is no outlet flow meter. Daily flow records should be taken.
4. Sludge ponds need some maintenance, they are overgrown with grass, weeds, and reeds as a result they are not easily accessible.
5. Tokologo Local Municipality does not do compliance monitoring and upload data onto IRIS system. The Department of Water and Sanitation has been writing non-compliance letters to the Municipality. The Municipality conducts compliance monitoring and upload the data.

VROOM Refurbishment Cost Estimate

Civil Works	R57,200	9%
Mechanical Works	R440,000	68%
Electrical Works (Including C&I)	R146,300	23%
Total VROOM Cost	**R643,500**	**100%**
R million / MLD		**0.21**

Regulatory Impression

The Hertzogville Water Supply System is well operated by staff whom the assessors met and found them knowledgeable of the plant with good hospitality. The process controller on duty during assessment is a very enthusiastic grown-up man by the name of Moses Rantsieng, who is passionate about his work and was part of the construction team. The plant is kept very neat inside. If there are processes that are not functioning according to the design of the plant or due to maintenance, he makes a plan. It was noted that management support is strongly needed for guidance and attending to issues. The items which currently need the attention of the Local Municipality is the flow recordings as well as the flocculant and pre-chlorination dosing pumps. In addition, though Tokologo Local Municipality is doing partial operational monitoring, compliance monitoring is not carried out. The municipality must urgently address the non-compliance with SANS 241:2015 and resume with compliance monitoring. This is non-compliance with the Water Services Act.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	NI
Chemical Compliance	NI

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





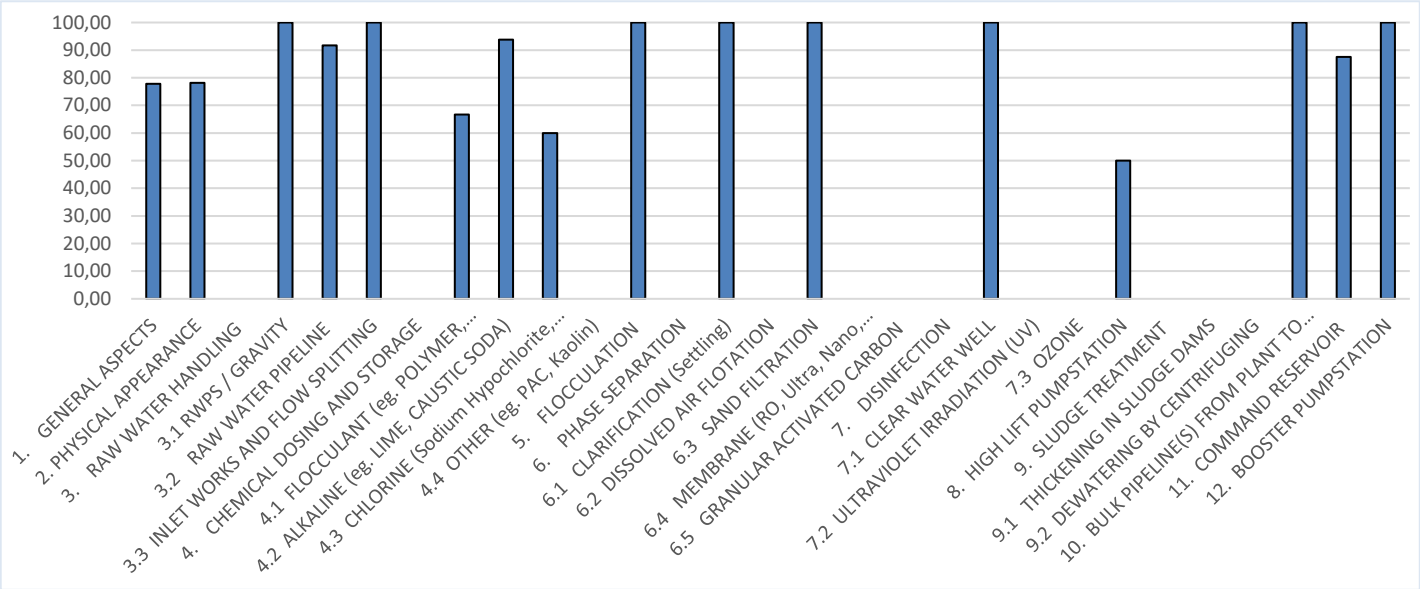
6.19 Tswelopele Local Municipality

The Hoopstad water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

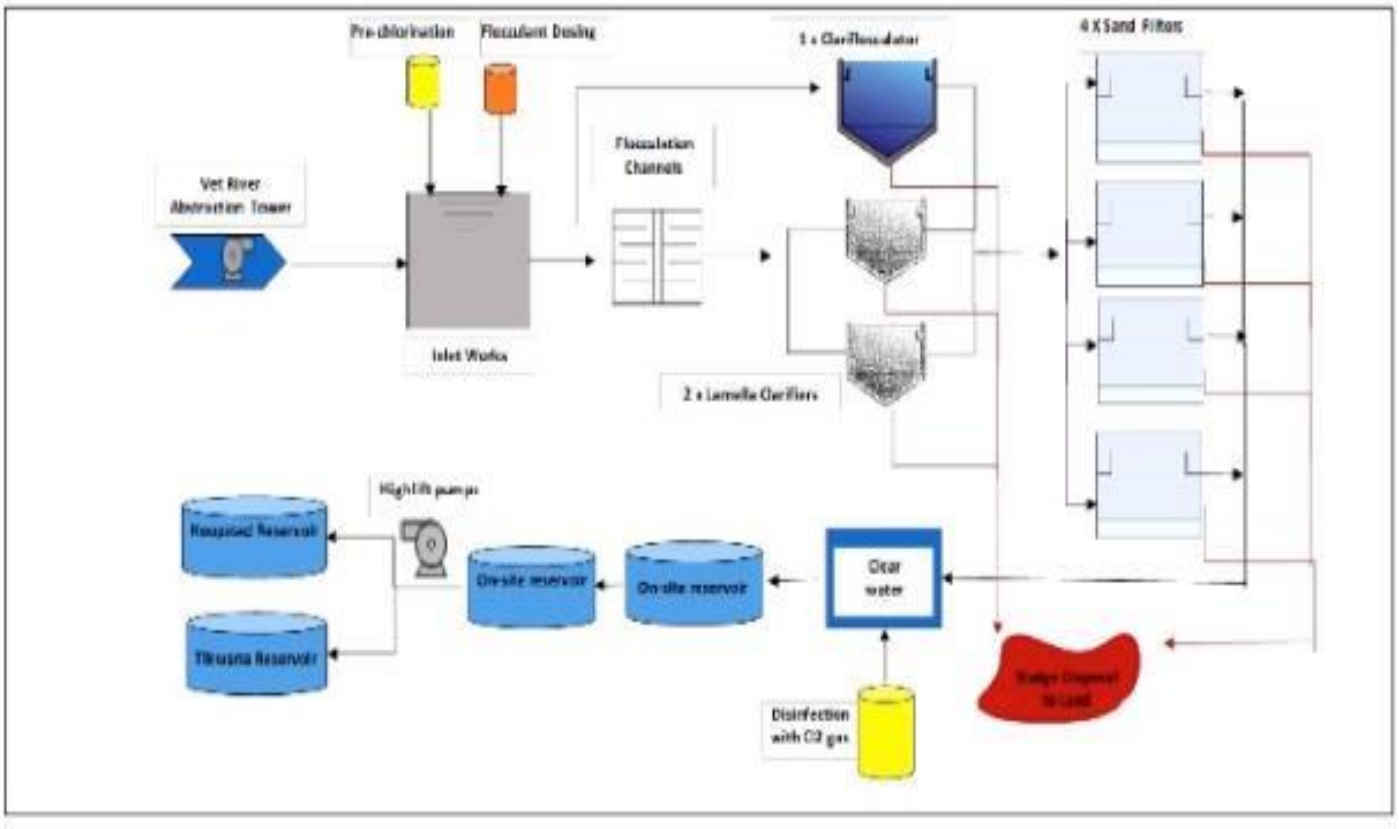
Hoopstad WTW TSA Score: 82%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	77.8	Certificates and IMPs were all displayed. Excellent recordkeeping is in place. Operational monitoring has been implemented, however lacking quality control as standards have expired and instruments have not been calibrated recently.
2	**Physical appearance of plant**	78.1	The Process Controllers are satisfied with working conditions, and it was evident that a good working relationship exists. Safety signage was visible throughout the plant. The entrance is not signposted. The boundary fence is in a good condition with the gate slightly damaged.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	100.0	No screens, but self-cleaning sieves. Two 45kw submersible pumps are installed and in working condition.
	Raw water pipeline	91.7	The 200mm asbestos line was replaced four years ago. Process Controllers walk the line once every three months. The flow meter is in working condition and readings are recorded.
	Inlet works	100.0	Sudfloc 3465 is dosed at the hydraulic jump at the start of the inlet chamber. Dripping of coagulant was observed. Equipment for measuring the flow rate is installed and used by Process Controllers.
4	**Chemical dosing and storage**		
	Flocculant	66.7	Three dosing pumps are installed, all functional. The area was clean and neat. All stock tanks are clearly marked, and adequate storage volume is available. The area is however not bunded. An emergency wash area will be provided.
	Alkaline	93.8	There is one dry lime dosing unit installed but not in operation at the time of the inspection. Adequate stock was available. The bags must be stored on pellets.
	Chlorine	60.0	Dosing equipment was in working condition. Only one cylinder was connected. Adequate stock was available on site. A scale has been delivered and will be installed. Safety measures need urgent attention. No safety equipment is installed, and the cartridge of gas mask has expired in Sept 2020.
5	**Flocculation**	100.0	Settling tests are performed to observe the settling ability, ensuring immediate corrective action. Good floc formation was observed.
6	**Phase Separation**		
	Clarification (settling)	100.0	1 x lamellae settling tank with two sections and one circular tank installed. Even overflow and no growth or floc carry-over present.
	Sand filtration	100.0	Moore airlift filters installed, two compressors and two blowers available. Filters are backwashed every 12 hours. Even bubble distribution was observed during backwash. Filter media was replaced in January 2022. HTH is used to deep clean the filters. Good housekeeping in place.
7	**Disinfection**		
	Clear water well	100.0	Chlorine is dosed where water is entering the clear water well. Adequate contact time provided.
8	**High lift pumpstation**	50.0	Duty and standby pump sets installed. One motor was out on repairs and confirmed that it was installed the following week. The outflow meter is not functional. The meter at the Tikwane line is in operation. The replacement of flow meters is included in the current refurbishment project
9	**Sludge treatment**		
	Thickening in sludge dams	0.0	There is a sludge dam next to the plant but overgrown with weeds. Sludge and filter backwash water mostly discharge into the veld.
10	**Bulk pipeline from plant to command reservoir**	100.0	The 250 mm PVC line to Hoopstad is a new line. The 250mm PVC line to Tikwane is in good condition. A network inspection was done, and the information is also captured in the report.
11	**Command reservoir**	87.5	Busy with construction work on site and the reservoirs were not inspected. Information was provided by consultant and information also obtained from network inspection report. The two reservoirs balance out and the level of one reservoir is displayed at the plant. Flow measurement is only on the Tikwane line.
12	**Booster pumpstation**	100.0	Information as obtained from consultant: Two booster pump stations with two newly installed pump sets each.
	Total	**82%**	

High risk areas OR Key Hardware Risks/ Defects

1. Mandatory safety equipment must be installed and provided at the chlorine dosing facility
2. A bundwall must be constructed in the chemical storage room
3. Separate areas must be provided for Process Controllers to perform analyses, to have lunch and as office space.

VROOM Refurbishment Cost Estimate

Civil Works	R1,026,300	84%
Mechanical Works	R158,400	13%
Electrical Works (Incl C&I)	R36,300	3%
Total VROOM Cost	**R1,221,000**	**100%**
R million / MLD		**0.20**

Regulatory Impression

The Hoopstad WTW is in exceptionally good condition. The site appeared neat and tidy. Abstraction is authorized. The plant is well maintained. Good recordkeeping systems are in place and Process Controllers are all well informed. The municipality is commended for the preparedness of the Team. The good relationship between process controlling personnel and their principals was obvious. Two Process Controllers were given the opportunity to lead the Blue Drop Team during the site inspection. They displayed good knowledge of the plant and its operation. The WSA does not comply with Regulation 2834/813 with regards to the process controlling staff. An Inspector is registered for weekly inspections. The WSA must address planning for the training and development of staff to meet regulatory requirements. A water quality risk assessment was done and potential risks determinands identified. The identified determinands must be registered on the IRIS as part of the risk defined monitoring programme. A capital budget is provided for refurbishment/ upgrades within the supply system. Some of the matters identified through the risk assessment have already been addressed.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	99.30%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%







7. GAUTENG: MUNICIPAL DRINKING WATER SYSTEM'S FUNCTIONALITY

Background

Leading up to the release of the full Blue Drop report, the Regulator draws attention by publishing the *Blue Drop Watch Report*, which comprises of a technical overview of pipes, pumps, reservoirs, processes and water quality of water treatment plants and distribution networks. The Blue Drop Watch report is **not** the Blue Drop audit report, which will only be published once the verification and quality control processes by DWS have been satisfied, to ensure accurate and credible reporting of drinking water services across South Africa. The Watch Report seeks to keep the public and stakeholder updated and informed on the status of drinking water infrastructure, water quality, and the indicative cost to restore functionality.

The Blue Drop Watch Report is informed by the Technical Site Assessments (TSA), which were done at 1 to 2 systems per WSA/WSP, as part of the Blue Drop audit cycle. The purpose of the TSA is to verify the findings of the (desktop) audit with the status on the ground (physical inspections). The TSA score (%) reflects the condition of the raw water handling system (abstraction, pumps, pipe network), the water treatment plants (inlet works to disinfection and sludge treatment), delivery system (commend reservoirs, bulk pipe network and pumpstations) and distribution systems (pump and pipe networks). A high TSA score (100%) indicates that the infrastructure, equipment, and processes are in excellent condition, whilst a low TSA score (0%) indicates failure and dysfunctional process and infrastructure. The TSA inspections cover each process unit of the treatment facility, coupled with randomly selected checkpoints of the delivery and distribution network. The VROOM cost covers only the treatment facility, as too many variables exist to accurately estimate network refurbishment costs.

Results of the Technical Site Assessments

During the period December 2022 to February 2023, 8 water supply systems were inspected, offering a representative overview of systems owned and operated by municipalities, water boards and water service providers. The assessments covered 6 municipalities, as well as two Water Boards. Detailed TSA reports with photographic evidence and VROOM costs have been generated to assess the condition and status of treatment facilities and gain insight into randomly selected pipe network and pumpstation across the water distribution networks. The table following summarises the TSA scores of the water supply systems that were assessed.

Table 20 - Gauteng Summary of the all the TSA Water Supply Systems

#	Municipality (WSA)	TSA WSS	TSA WTW	WSP/ WB	%TSA
1	City of Ekurhuleni MM	Ekurhuleni	Impala Park Reservoirs		84%
2	Lesedi LM	Lesedi Main	Heidelberg Command Reservoirs	Rand Water	53%
3	City of Johannesburg MM	Greater Johannesburg	Illovo Command Reservoirs		89%
4	City of Tshwane MM	Pretoria Temba	Temba		73%
5	Emfuleni LM	Emfuleni WSS	Vereeniging	Rand Water	97%
6	Emfuleni LM	Vaaloewer	Vaaloewer		81%
7	City of Tshwane MM	Cullinan	Cullinan	Magalies Water	94%
8	Midvaal LM	Vaal Marina	Vaal Marina		81%
9	Merafong LM			Rand Water	No TSA
10	Mogale City LM			Rand Water	No TSA
11	Rand West LM			Rand Water	No TSA
	Totals		**8**	**3**	**82%**

An average of 82% was achieved for the 8 systems assessed, which means that infrastructure and processes are partially functional with a good to average performance. The best overall performance was found for Emfuleni Rand Water, followed by City of Tshwane Magalies Water, and City of Johannesburg. The water boards provided the top two best performing systems. The lowest performance was observed for the Heidelberg Command Reservoirs managed by Rand Water.

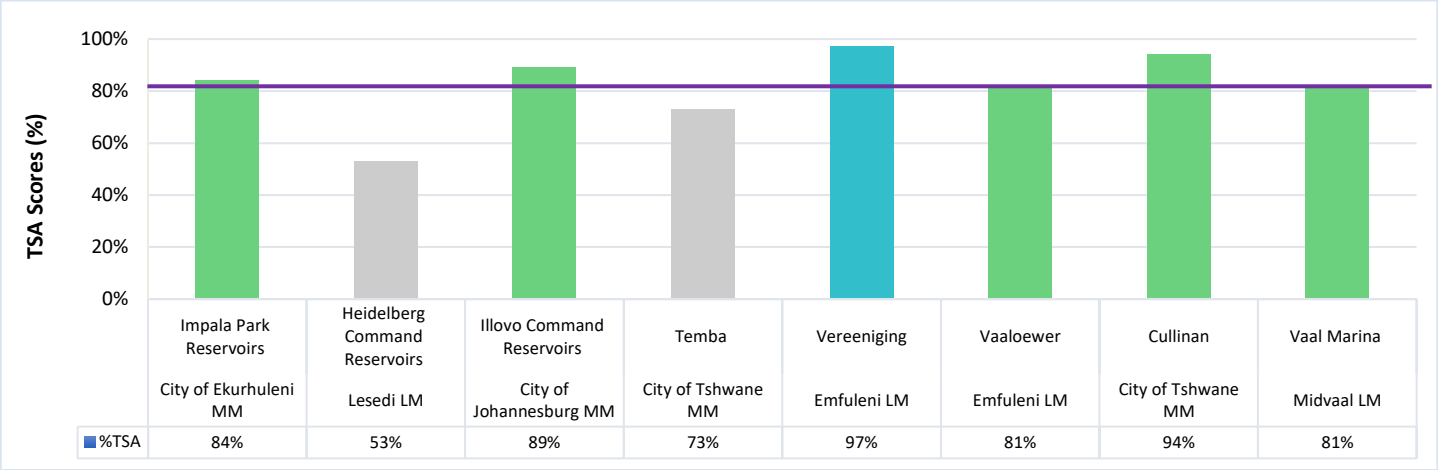


Figure 18 - GP TSA scores for all the BD Systems

95 – 100% Excellent	
80-<95% Good	
50-<80% Average	
31-<50% Poor	
0-<31% Critical state	

The Regulator observed the predominant challenges and risks pertaining to the water supply system:

Facility management

- No notice board to display or no display of the PFD or other relevant notices and/or documents required on site
- Refurbishment or upgrade and/or construction of buildings or facilities, concrete structures, offices and/or process control room, staff ablutions; maintenance or replacement of perimeter/boundary fencing and/or access gate
- Housekeeping and tidying up of terrain, paintwork at treatment works, pumpstations, and reservoirs, clean-up sites after construction projects
- Road rehabilitation/ upgrade/ construction and road accessibility especially for the safe delivery of chemicals
- Staff safety and signage improvement

Water treatment system

- Raw water pipe network and/or pumps at abstraction facility to be refurbished or upgraded or repaired
- Oxygen provision for ozone production should be prioritised air valves are rusted and require corrosion protection
- Cleaning schedule of the settling tanks to limit algae growth, lime dosing and storage room need to be improved
- No flow meters installed or dysfunctional flow meters (abstraction, WTW, and Command Reservoirs), and flow meters not calibrated
- Refurbishment or upgrade of one or more of the various process units (civil, mechanical, electrical and instrumentation)
- Dysfunctional or inefficient process units that have to be rectified, e.g. inlet works, clarifiers, filters, etc
- No or limited no. standby pumps or dysfunctional pumps, e.g. flocculant and/or chemical dosing, backwashing, high lift, leaks, etc
- Sand filters, e.g. repairs required, sand to be replaced, sand volume
- Chlorination unit not operational or not fully operational, e.g. limited stock in place, no or limited standby units, no automatic switch over, no chlorine scales, no or limited safety signs and systems (alarms, fans, masks, detectors)
- SCADA and telemetry systems, e.g. not in place, dysfunctional, limited or no understanding of the systems

Water distribution network

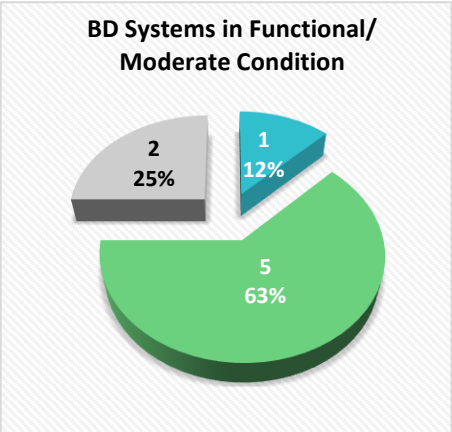
- Repair leakages in pipe network, valve boxes, and/or command reservoirs
- No telemetry at reservoir and level indicator
- Valve chamber flooded
- Install new fencing
- Site at reservoirs to be cleared and landscaped.

Systems Observed to be in Functional/Moderate Condition based on Technical Site Inspections

Water supply systems which succeeded to achieve ≥50% TSA score, are summarised as follows.

Table 21 - Provincial Summary of the TSA Water Treatment Systems in the Excellent to Average Performance Categories

Municipality (WSA)	WSP/ WB	TSA of ≥95-100% [Excellent]		TSA of ≥80-<95% [Good]		TSA of ≥50-<80% [Average]	
		Name of WTW	% TSA	Name of WTW	% TSA	Name of WTW	% TSA
City of Ekurhuleni MM				Impala Park Reservoirs	84%		
Lesedi LM	Rand Water					Heidelberg Command Reservoirs	53%
City of Johannesburg MM				Illovo Command Reservoirs	89%		
City of Tshwane MM						Temba	73%
Emfuleni LM	Rand Water	Vereeniging	97%				
Emfuleni LM				Vaaloewer	81%		
City of Tshwane MM	Magalies Water			Cullinan	94%		
Midvaal LM				Vaal Marina	81%		
Totals	**3**	**1**		**5**		**2**	



Of the 8 systems in the excellent to average performance categories it was found that:

- 1 system (12%) was in excellent good condition
- 5 systems (63%) were in good condition
- 2 systems (25%) were in average condition.

Figure 19 - No. BD Systems in Functional/ Moderate Condition

The best performing water supply systems, as indicated by the TSA scores, are summarised hereunder.

Table 22 -Provincial Summary of the Top Performing TSA Water Treatment Systems

#	WSA	WSP/ WB	TSA WTW	%TSA
1	Emfuleni LM	Rand Water	Vereeniging	97%
2	City of Tshwane MM	Magalies Water	Cullinan	94%
3	City of Johannesburg MM		Illovo Command Reservoirs	89%
4	City of Ekurhuleni MM		Impala Park Reservoirs	84%
5	Emfuleni LM		Vaaloewer	81%
6	Midvaal LM		Vaal Marina	81%

The top three systems with the best condition are Vereeniging managed by Rand Water (excellent 95-100%); Cullinan managed by Magalies Water, and Illovo Command Reservoirs managed by City of Johannesburg MM (good 80-<95%).

Systems Observed to be Dysfunctional/Critical Condition based on Technical Site Inspections

No drinking water supply systems where Technical Site Assessments were undertaken were observed to be in a dysfunctional or in a critical condition.

VROOM Costs

The Very Rough Order of Measurement (VROOM) is an estimation of the funding required to restore existing treatment infrastructure to its original design capacity and operations, by addressing civil, mechanical, electrical and instrumentation defects.

A singular VROOM cost is determined by assessing 1-2 treatment facilities per municipality and calculated as cost per system. The cost is derived through an algorithm that uses the Blue Drop Inspector's impression of the asset condition, the size and capacity of the asset, and the market/ industry cost indicators. The resultant VROOM cost is an estimation of the cost to repair, refurbish or replace dysfunctional treatment infrastructure. Subsequently, a singular VROOM cost is extrapolated, in relation to the total Blue Drop scores and systems' SIVs, to derive an aggregated VROOM score for all treatment plants in the WSI.

***Note:** VROOM does not constitute a specification, schedule of quantities or a definite refurbishment figure, but rather an indicative amount to inform a budget and hardware requirements. **Also,** the VROOM cost is specific to the treatment plant and does not attempt to cost the network delivery and distribution network, as it contains to many variables.*

The VROOM costs are summarised as following, noting these values comprises the cost of repairs of the SINGLE water treatment system assessed, NOT the extrapolated collective cost to repair all the treatment facilities in a WSI. The VROOM cost is made up by mechanical, electrical, and civil cost elements, which can be seen in the detailed TSA sections following in the report.

Table 23 -Provincial Summary of the VROOM Costing

Municipality (WSA)	TSA WSS	TSA WTW	WSP/ WB	Total VROOM Cost (Rand)
City of Ekurhuleni MM	Ekurhuleni	Impala Park Reservoirs		R510,400
Lesedi LM	Lesedi Main	Heidelberg Command Reservoirs	Rand Water	R1,382,700
City of Johannesburg MM	Greater Johannesburg	Illovo Command Reservoirs		R1,443,200
City of Tshwane MM	Pretoria Temba	Temba		R24,888,600
Emfuleni LM	Emfuleni WSS	Vereeniging	Rand Water	R12,831,500
Emfuleni LM	Vaaloewer	Vaaloewer		R333,300
City of Tshwane MM	Cullinan	Cullinan	Magalies Water	R1,595,000
Midvaal LM	Vaal Marina	Vaal Marina		R8,594,300
Totals				**R51,579,000**

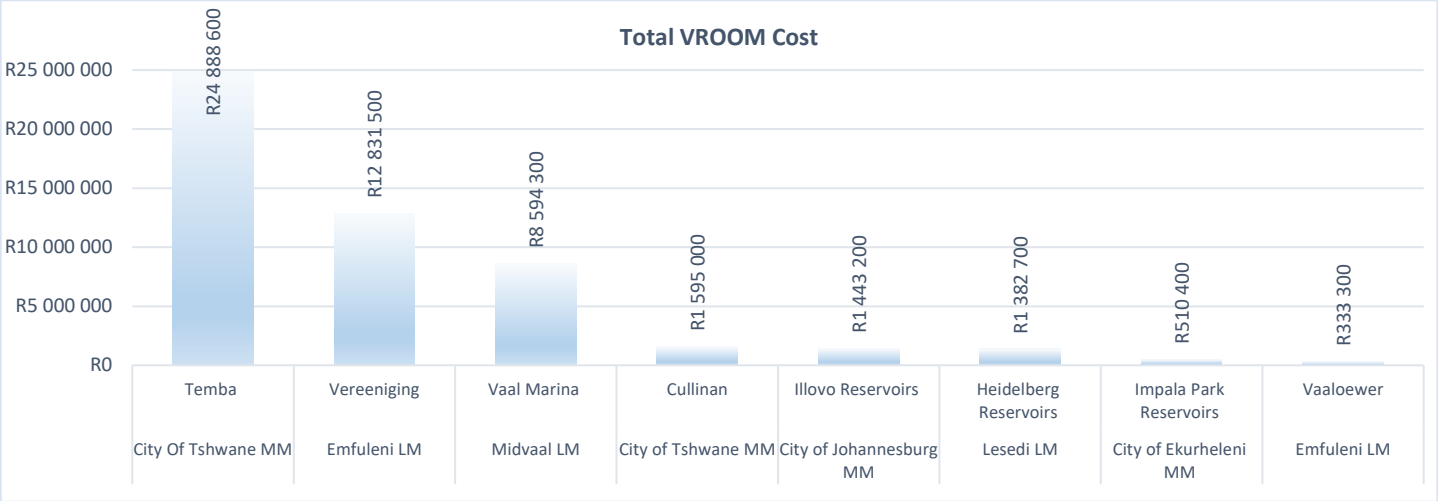


Figure 20 - Total VROOM Cost for the BD Systems Assessed

The associated VROOM costs for the 8 water supply systems assessed amounts to R51.6 million, with the bulk of investment needed for Temba (City of Tshwane) and Vereeniging (Emfuleni).

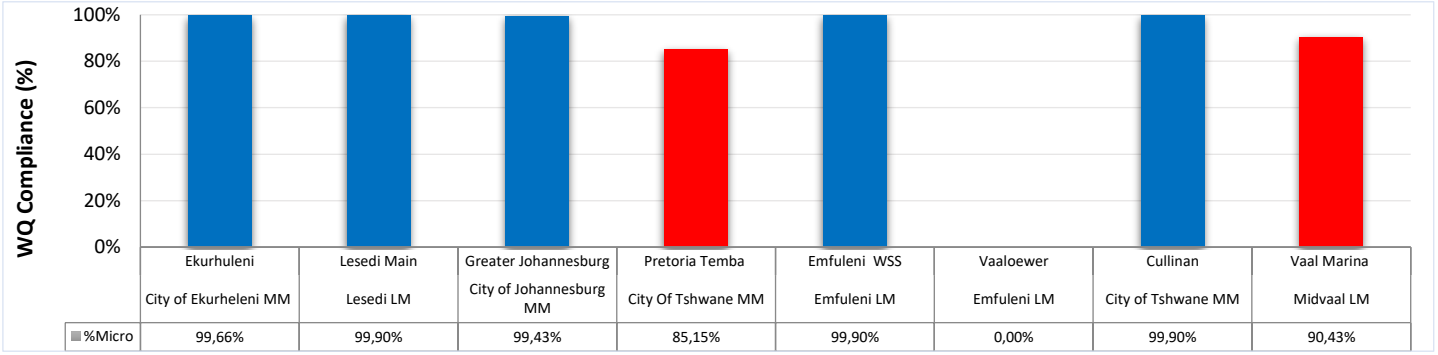
Drinking Water Quality Status

The Institutional Water Quality Compliance, as measured against SANS 241 standards, is reflected in the table below (IRIS, 28 March 2023).

Table 24 - Gauteng Summary of the Drinking Water Quality Status of all the TSA Water Supply Systems

#	Municipality (WSA)	TSA WSS	TSA WTW	Microbiological Compliance	Chemical Compliance
1	City of Ekurhuleni MM	Ekurhuleni	Impala Park Reservoirs	99.66%	99.46%
2	Lesedi LM	Lesedi Main	Heidelberg Command Reservoirs	>99.90%	99.51%
3	City of Johannesburg MM	Greater Johannesburg	Illovo Command Reservoirs	99.43%	99.54%

#	Municipality (WSA)	TSA WSS	TSA WTW	Microbiological Compliance	Chemical Compliance
4	City of Tshwane MM	Pretoria Temba	Temba	85.15%	80.20%
5	Emfuleni LM	Emfuleni WSS	Vereeniging	99.90%	99.91%
6	Emfuleni LM	Vaaloewer	Vaaloewer	0.00%	0.00%
7	City of Tshwane MM	Cullinan	Cullinan	>99.90%	99.30%
8	Midvaal LM	Vaal Marina	Vaal Marina	90.43%	95.88%



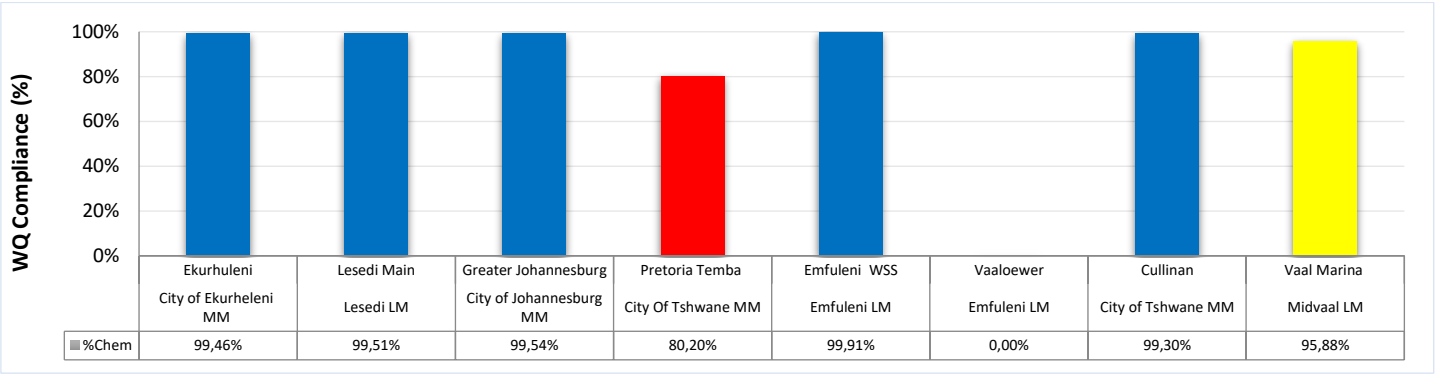


Figure 21 - GP Drinking Water Quality Status of all the TSA Water Supply Systems

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

The TSA and water quality results depict a vastly a different picture. The TSA shows all 8 water supply systems to be in the *excellent to average performance category*, and the water quality compliance shows that about 37% of the systems *fail to produce compliant final water quality*. Out of 8 treatment plants and reservoirs, 5 (63%) systems achieve excellent microbiological quality. A total of 3 (37%) systems have a bad microbiological water quality status. The water in these systems poses a serious acute health risk to the community. WSAs with poor microbiological water quality status must be assessed to confirm status in all systems to ensure rectification measures are comprehensive to safeguard communities. The direct cause of microbiological failures can be linked to the TSA sub-watch Area 7, which has a low contribution to the overall TSA score. The failure to produce water that meets E. coli standards can be linked back to poor operations, defective infrastructure, dosing rates, absence of disinfection chemicals, lack of monitoring, or lack of operating and chemistry knowledge. WSIs that are not monitoring the final water quality at the outlet of the treatment plant or at specific end use points must develop a monitoring programme and resume with compliance monitoring as a matter of urgency.

Chemical compliance shows that 5 (63%) have excellent water quality, whilst the minority of systems fail to achieve chemical compliance. A total of 1 (13%) and 2 (25%) systems have a poor and bad chemical water quality status.

Concluding Remarks

The Blue Drop Watch results stresses the importance of drinking water supply and quality to be a primary focus area of government. Already, the Department has developed the Water Services Improvement Programme for systems in critical state, and at systems where particular concerns were reported. Blue Drop performance trends will be used to determine repetitive poor performance, to inform a radical approach to ensure turnaround and compliance. This could include facilitating long term intervention by either a capacitated water board or any other suitable mode of water services support. The determination of the 'very rough order of estimates' (VROOM) was done to give an estimation of the capital requirement for the functionality restoration drive. This will be effected with the support from the National Treasury.

The Regulator will continue to monitor performance in terms of Section 62 of the Water Services Act and will engage together with CoGTA and SALGA, WSAs for corrective action plan development and implementation and offer support. Should these actions fail, the Department will consider civil action together with actions contemplated under section 63 of the Water Services Act (Act 108 of 1997) to ensure that Ministerial directives are issued with timeframes for implementation. Failure to respond will trigger remedial action be taken at cost of the non-complying entity or municipality. The Department will take steps to improve its capacity to respond more effectively in this duty, in ensuring visible and measurable improvement in drinking water services. The Department of Cooperative Governance and National Treasury will be engaged to explore ways of utilising conditional grants for the purpose of remedial rectification.

All Water Services Institutions are hereby urged to take note of their TSA status and commence with corrective measures. The full Blue Drop audit report will provide further material content to the overall management of drinking water services across South Africa, upon its release in July 2023.

.

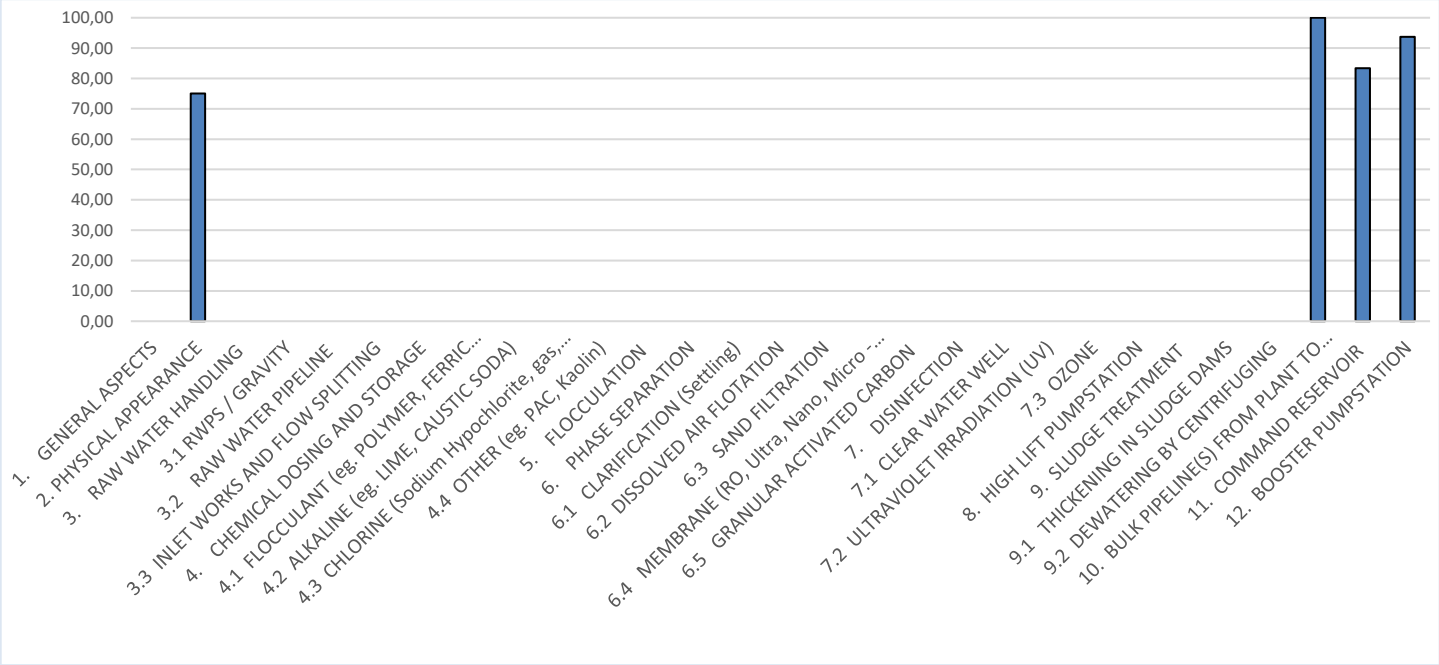
7.1 City of Ekurhuleni

The Impala Park Reservoir system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

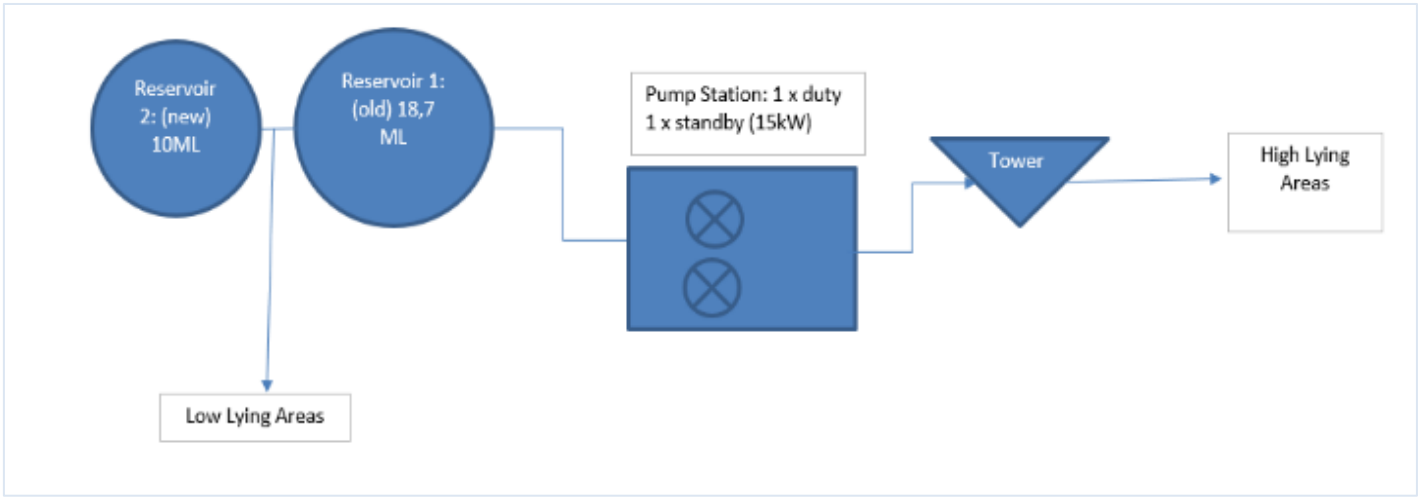
Impala Park Reservoirs TSA Score: 84 %

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
2	**Physical Appearance**	75.0	Old paving requires maintenance/weed control. Pump House requires good cleaning schedule. Sump Pump is not maintaining water removal from pump station and requires repair / replacement. Telemetry is not operational due to contract expiry in 2020.
10	**Bulk pipeline from plant to command reservoir**	100.0	One on site valve chamber cover requires repair/replacement. Does not hold a water quality risk.
11	**Command reservoir**	83.3	Weed control required around reservoirs to prevent damage to reservoir aprons and drainage channels.

Watch #	Process Unit Assessed	% TSA	Observations
12	**Booster Pumpstation**	93.7	Telemetry in place but due to contract expiration the system has not been taken over fully yet by CoE. Gradual implementation and takeover of the telemetry system
	Total	**84%**	

High risk areas OR Key Hardware Risks/ Defects

1. Telemetry contract has expired so no telemetry is currently operational.
2. Housekeeping can be improved and the sump pump to maintain the pump station needs to be replaced/ repaired as the pump station floor is wet.
3. Weed control required around reservoirs to prevent damage to reservoir aprons and drainage channels.

VROOM Refurbishment Cost Estimate

Civil Works	R117,700	23%
Mechanical Works	R147,400	29%
Electrical Works (Incl C&I)	R245,300	48%
Total VROOM Cost	R510,400	**100%**
R million / MLD		**0.02**

Regulatory Impression

The Impala Park Reservoirs are in good condition although some attention to housekeeping is required in terms of grass maintenance around reservoirs to prevent damage to reservoir aprons and drainage channels. In addition, the condition of the sump pump should be checked to ensure that the pump station remains dry. The sampling point is in good condition and the team has a rigorous monitoring program and incident register in place which indicates that the City can respond to any potential water quality problems. Water quality is monitored according to SANS 241 and is of high quality and consumers may use the water with high level of confidence. A good Water Safety Plan is in place, with good records of non- compliant results and consumer complaints. In future reviews of the WSP, measurable control measures should be included to ensure that tracking the effect of these control measures is possible.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	99.66%
Chemical Compliance	99.46%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

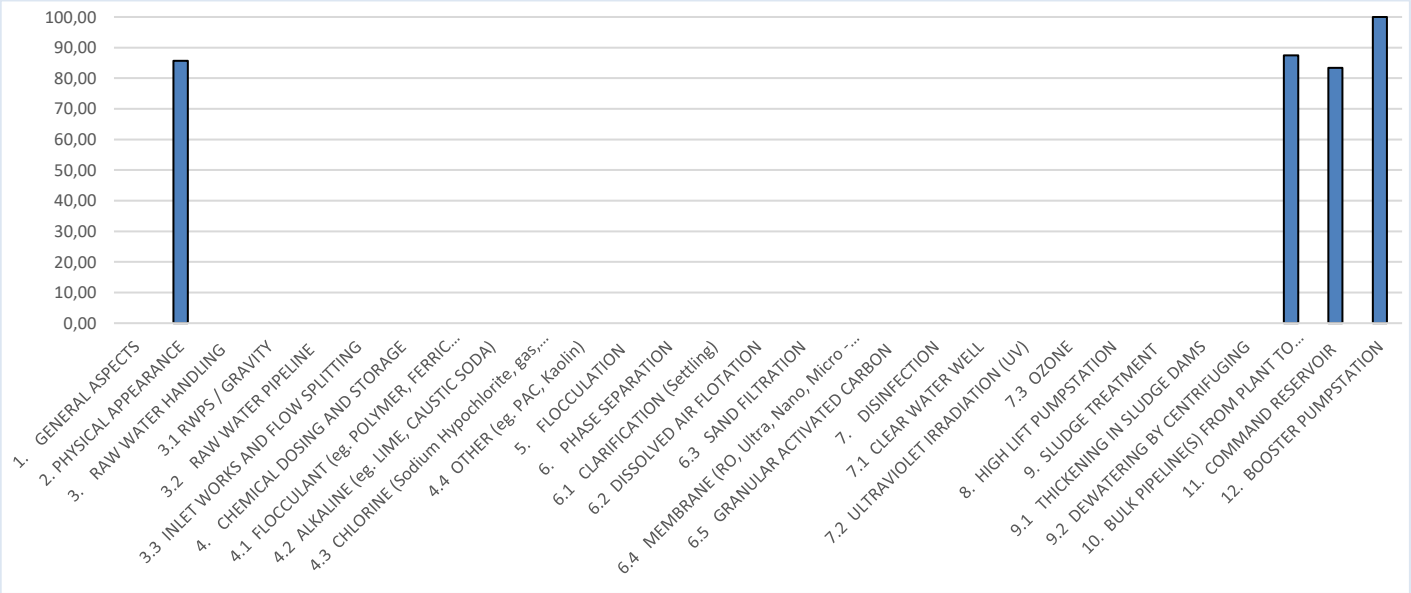
7.2 City of Johannesburg Metropolitan Municipality

The Illovo Command Reservoir system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

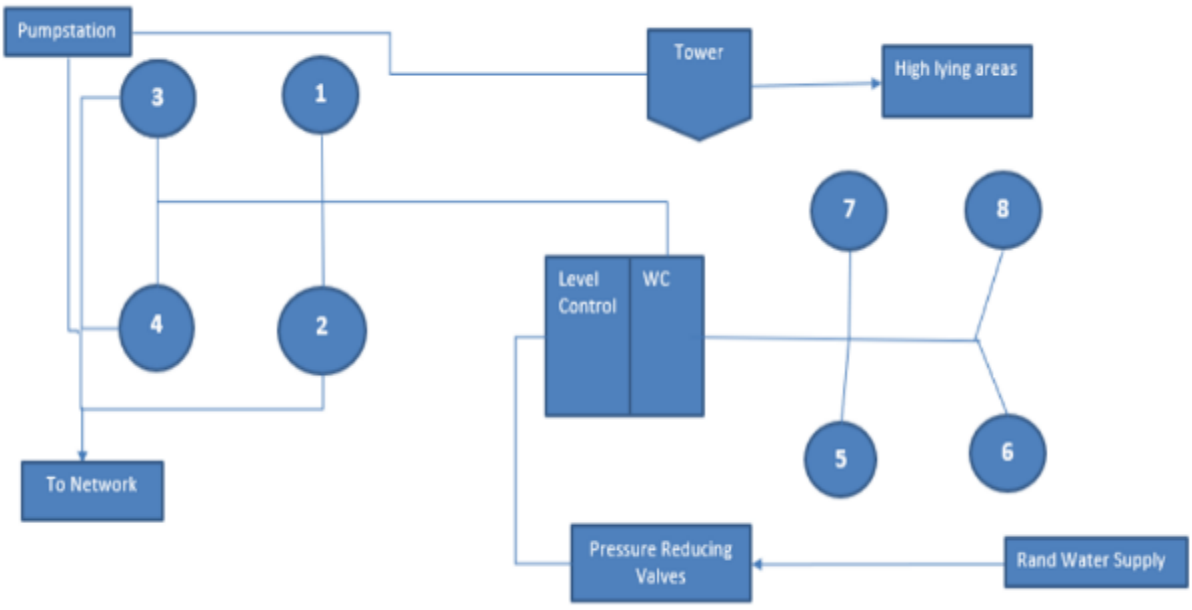
Illovo Command Reservoirs TSA Score: 89%

Performance Profile of the Illovo Command Reservoir System

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
2	**Physical Appearance of the plant**	85.7	Trees are growing very close to many reservoirs which may damage infrastructure, causing water quality issues and leaks. General maintenance required (Joint sealing, paving, maintenance of manholes and painting)
10	**Bulk Pipe network to command reservoir**	87.5	Reservoir capacity is required for future water demand and there is a business plan in place which indicates that 13 reservoirs need to be built within the next 3 years. PRV chamber is

Watch #	Process Unit Assessed	% TSA	Observations
			in good condition, note that the pressure from bulk supply has reduced over the last few years.
11	**Command reservoir**	83.3	Reservoir joint seals require attention. Gravel placed on reservoir roof slab need to be cleaned and replaced. Manhole covers need to be replaced with covers that will prevent rain-water access. Sampling point is not in good condition and requires refurbishment as this will lead to inaccurate sample analysis i.e., turbidity, HPC and iron non-compliance.
12	**Booster Pump Station**	100.0	This pumpstation is installed to pump water to the tower which feeds the high lying areas of Illovo and Sandton. Good condition.
	Total	**89%**	

High risk areas OR Key Hardware Risks/ Defects

1. Trees damaging reservoir structures due to root ingress.
2. Sampling point needs refurbishment as the current condition may impact on water quality measurement compliance.
3. Manholes require refurbishment and painting as they do not seal well and may allow for rainwater ingress.
4. Some cracks evident in reservoirs which require attention.
5. Air valves are rusted and require corrosion protection.

VROOM Refurbishment Cost Estimate

Civil Works	R1,443,200	100%
Mechanical Works	-	0%
Electrical Works (Incl C&I)	-	0%
Total VROOM Cost	**R1,443,200**	**100%**
R million / MLD		**0.02**

Regulatory Impression

The Illovo Command Reservoir system is in a good condition however many large trees grow around these reservoirs and should be removed to prevent root ingress and leaks. In addition, it is evident that some housekeeping and maintenance of the infrastructure in terms of joint sealing, paving and maintenance of air valves and manholes is required and is already planned for during the current year. All pumps are operational with sufficient standby, and the pump station is fortified with good security measures including and motion sensor cameras and response units. The sampling point set up to monitor the water quality of this area, is not in a good condition and this could lead to problematic water quality results if not attended to timeously. The City of Joburg has a large and technically competent team. The Water Safety Plan should be reviewed with a view to identifying the risks that the City of Johannesburg experiences with their distribution network. Regular, rigorous water quality monitoring of the distribution network and excellent results allow the consumers within the City of Johannesburg to drink tap water with confidence.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	99.43%
Chemical Compliance	99.54%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



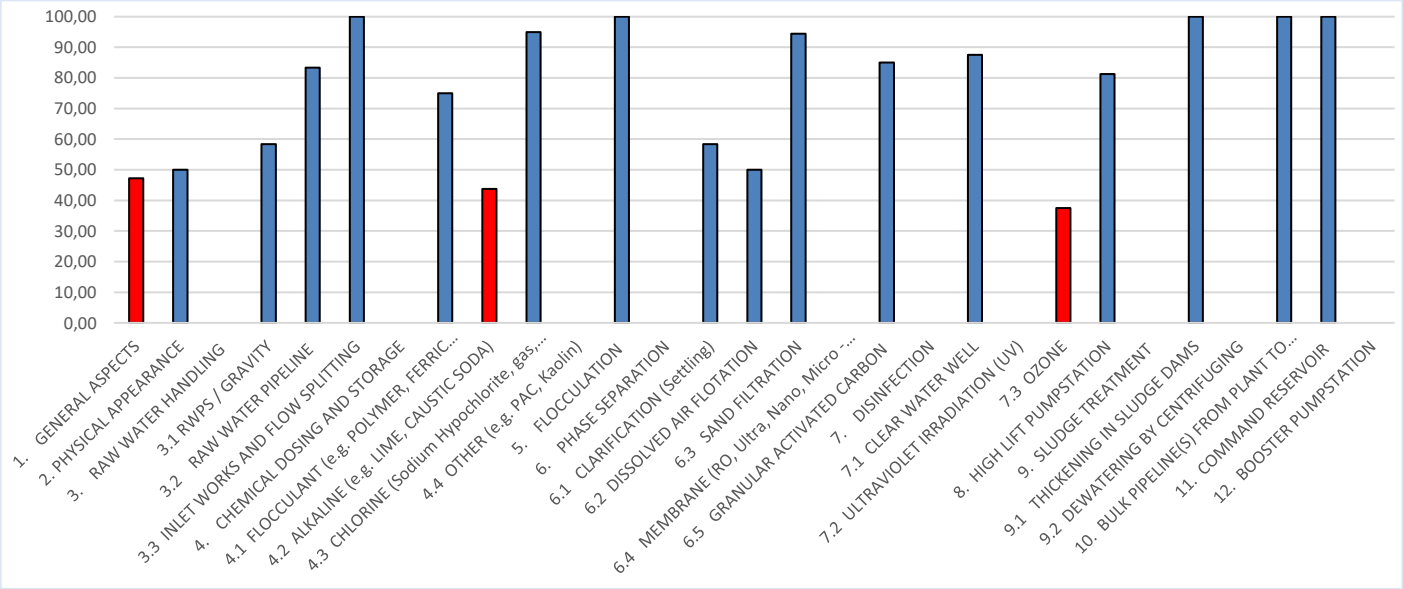
7.3 City of Tshwane Metropolitan Municipality

The Temba Water Treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

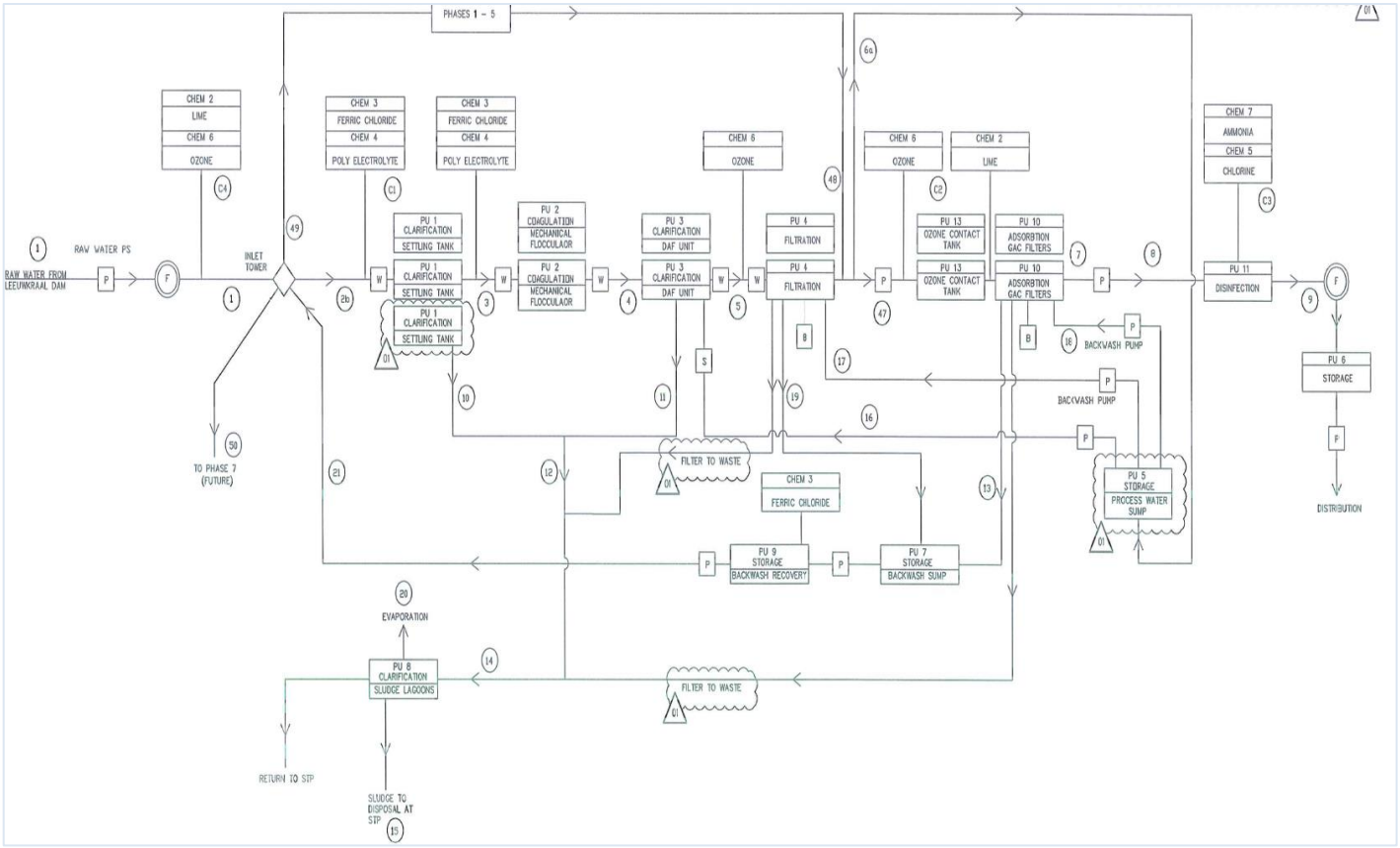
Temba Water Treatment Works TSA Score: 73 %

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	General Aspects	47.2	Phase 6 inspected
2	Physical Appearance of the plant	50.0	Housekeeping and general appearance of the plant can be improved. Chlorine tank lifting gear capacity should be downgraded to 1.5 ton same as cross beam capacity. Roads should be maintained and kept clear/clean
3	Raw Water Handling		
3.1	Raw Water Pump Station/ Gravity	58.3	Leeukraal dam is significantly silted up and therefore has a reduced capacity. This area has so much silted material there is vegetation growing on top of it.
3.2	Raw Water Pipeline	83.3	Cathodic protection in place, no visible leaks. Flow records are captured, meters operational.
3.3	Inlet works and Flow splitting	100.0	Hydraulic jump where flow is split in two – sufficient turbulence at the contact point. Flocculant dosed into the pipe with mechanical flocculator
4	Chemical Dosing and Storage		
4.1	Flocculant	75.0	Minor leaks observed at chemical dosing pumps and poor housekeeping evident. Plans to refurbish old ferric tank storage areas. Significant leakage of polymer on bund floor causing safety hazard.
4.2	Alkaline	43.7	Single dry lime dosing unit installed -not working due to moisture entering the storage silo and clogging the feeder; emergency plan for lime dosing in place The storage silo is in a good condition but requires cleaning, no backup available.
4.3	Chlorine	95.0	Sufficient chlorine available for the daily use at the plant. Safety hazard noted in chorine tank storage room. Lifting gear (2t) rated more than the crawl beam (1.5t).
5	Flocculation	100.0	Mechanical flocculation cannot be assessed
6	Phase Separation		
6.1	Clarification (Settling)	58.3	Some floc carryover is evident and de-sludging is performed automatically every 4 hours. Some sludge and scum build up is evident which indicates that the desludging process may be insufficient. Some lamella plates are loose and require replacement. Roof repairs are required as a section of the roof has been blown off.
6.2	Dissolved Air Flotation	50.0	Not operational at the time of the site inspection - recycle pump pipe burst needs immediate attention, workers were busy on site. Facility requires a way to keep the birds out. This section of the plant is full of birds and presents a zoonosis risk.
6.3	Sand Filtration	94.4	One filter out of commission - 1 actuator shared for two filters for backwash. Bubble distribution is good however filter backwash does not clean the filter sufficiently. Filter backwash optimisation is recommended to reduce water consumption and improve filter backwashing protocol
6.5	Granular Activated Carbon	85.0	All pumps and compressors operational and carbon is being replaced on an ad-hoc basis.
7	Disinfection		
7.1	Clear water well	87.5	At current flow rate, free chlorine should be measured after first reservoir of 10ML to allow for minimum (4 hours) contact time; 8 hours is too long at the current flow rate. Some motive water pumps are not working and require replacement
7.3	Ozone	37.5	Ozone is currently not operational due to the lack of a tender for oxygen provision. However due to the nature of the water quality from Leeukraal Dam, the Ozone is important to maintain water quality within the distribution network and should be prioritised.

Watch #	Process Unit Assessed	% TSA	Observations
8.	High Lift Pumpstation	81.2	Allow one pump to be reinstated - some pipework is corroded and also need to be refurbished/replaced
9	Sludge Treatment		
9.1	Thickening in Sludge Dams	100.0	Sludge dams are cleaned once a year and both recycle pumps are operational.
10	Bulk Pipe network to command reservoir	100.0	On site – reservoirs which pump to Hammanskraal and Sekapaneng areas. Good condition.
11	Command reservoir	100.0	Situated on the same site as the WTP and linked via SCADA with double flow meters available. Structures are in a good condition with no evidence of leaks.
	Total	73%	

High risk areas OR Key Hardware Risks/ Defects

1. Repair of the recycle pipeline pump at DAF to restore flotation.
2. Leeukraal dam silt removal.
3. Raw water pumps should be repaired / replaced / refurbished and one high lift pump to be reinstated.
4. Oxygen provision for ozone production should be prioritised air valves are rusted and require corrosion protection.
5. Repair of roof at sedimentation tanks.

VROOM Refurbishment Cost Estimate

Civil Works	R6,589,000	26%
Mechanical Works	R15,997,300	64%
Electrical Works (Incl C&I)	R2,302,300	9%
Total VROOM Cost	**R24,888,600**	**100%**
R million / MLD		**0.21**

Regulatory Impression

The Temba WTW has had numerous upgrades over the years and is now upgraded with both GAC and Ozone. Regular operational monitoring is evident although jar tests are not performed although the equipment is available. At the time of the site inspection the pipeline from the recycling pumps had broken, which impacted on the operation of the DAF unit. In addition, it was noted that the sedimentation tanks displayed carryover and that a portion of the roof had blown off. The Ozonation facility can operate but is standing due to a lack of oxygen supply due to delays in the tender process which will have a significant impact on the water quality produced. Maintenance is only done on an ad-hoc/ emergency basis and it is evident that budget constraints prevent the operator from doing many essential routine maintenance activities. The City of Tshwane is struggling to maintain the momentum of their previous performance at blue drop audits. Of concern, is the lack of a full drinking water quality assessment (SANS 241) for the cities own water sources which prevents a robust risk assessment and water safety planning process from being undertaken. As such, the Water Safety Planning process requires extensive review as the current process does not adequately identify or address all the risks or identify control measures. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	85.15%
Chemical Compliance	80.20%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

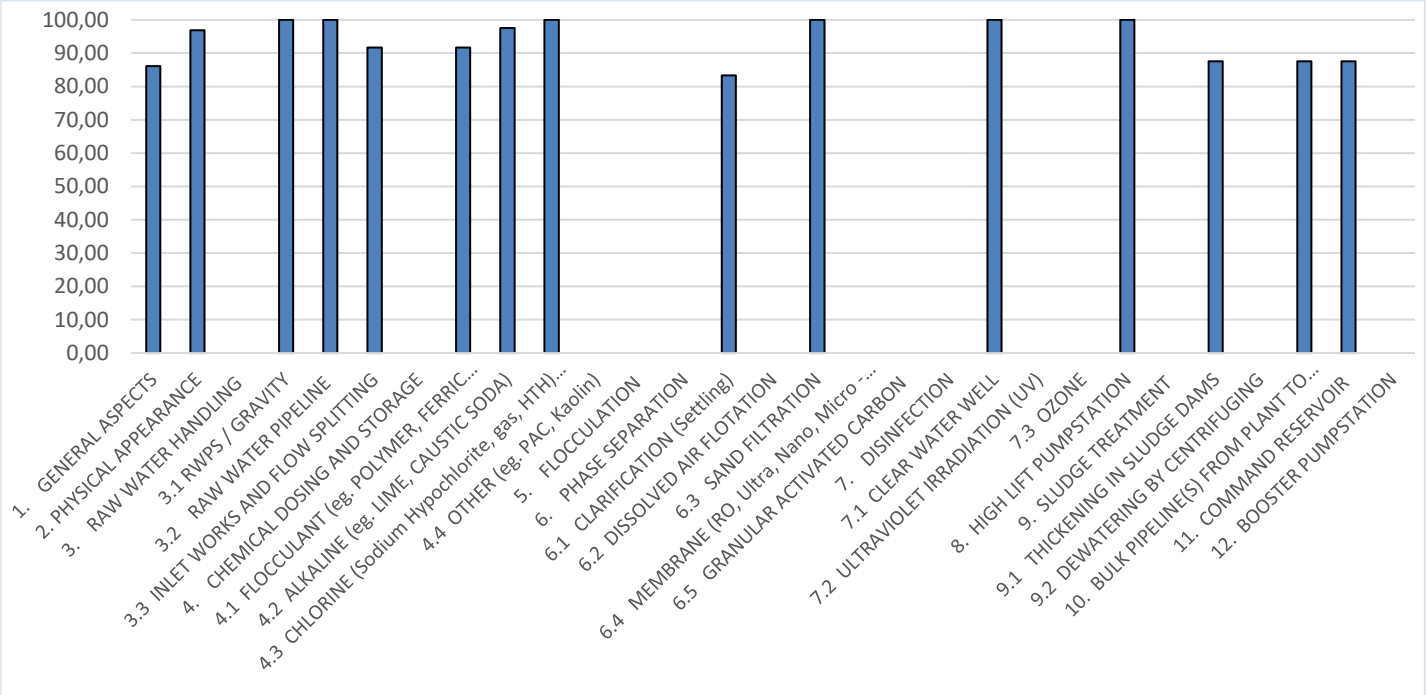


The Cullinan water treatment works was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

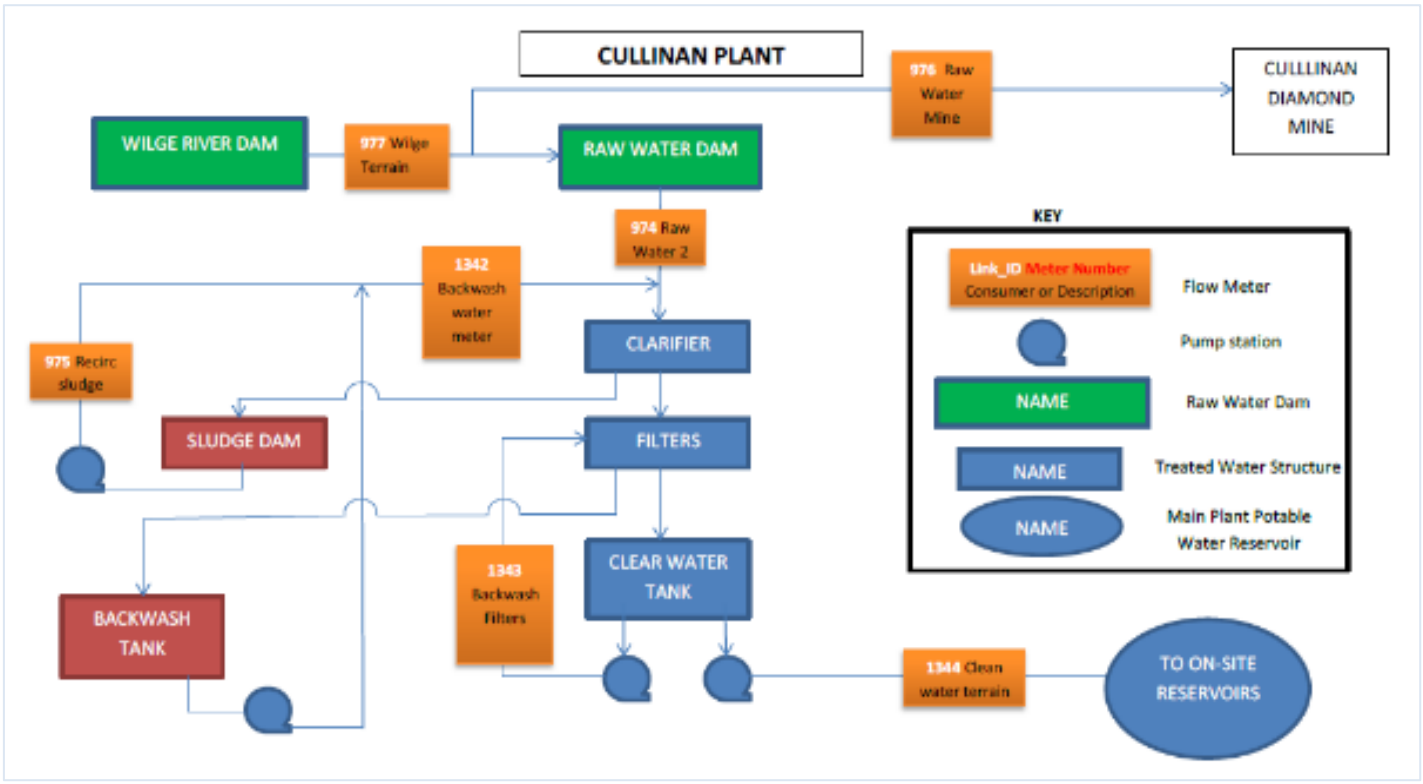
Cullinan TSA Score: 94%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	86.1	The water treatment works is classified as a Class A works. The Maintenance and Repairs logbook are on site and with regular entries indicated in the logbook. Standard Operating Procedures are available. The IMP is onsite with the incident register completed and is up to date. Relevant contact details are visibly displayed. Turbidity, EC, and pH meter on site - all in working condition and calibrated. Jar tests frequency depends on raw water quality changes. In cases of poor water quality, jar tests are conducted every 4 hours. Process Controllers are well trained in the use of the Jar test equipment. Electricity consumption meter is accessible, and metering is done on a frequent basis. Meter is fully operational, and readings are recorded.
2	**Physical appearance of plant**	96.9	Facility is fenced with gated entrance, fence in good condition and armed security during the night and over weekends. The site is neat and well kept. Grass is cut and the paving is clean and void from grass. A broken window and cracked paint were noted, and this should be repaired. Workers have dedicated room for preparing lunches. Wash facilities are available. Ablution facilities are neat and clean. All the roads are paved and in good condition. Sufficient safety signs are visible at all relevant areas on the plant.
3	**Raw water handling**		
	Raw water pumpstation/gravity fed	100.0	Screens are in place; this could not be assessed but it is reported to be cleaned on a regular basis. Two pumps working and one standby - 50% standby, and all are in working condition.
	Raw water pipeline	100.0	Process Controller has the impression that leakages are minimal and regular pipeline inspections are undertaken and maintenance is continuous. Pipe networks have cathodic protection to prevent corrosion. Flow meter is operational. Flow records are captured, and records are kept.
	Inlet works and flow splitting	91.7	Even flow splitting could be seen at the distribution structure. There is sufficient flash mixing. Visual dripping of flocculant could not be seen as it is dosed in-line (pipe) however lime dosing was visible, and it is at the highest point of turbulence and dosing conditions can be monitored.
4	**Chemical dosing and storage**		
	Flocculant	91.7	The dosing pumps are configured for one to be in use and the other to serve as a standby pump, which is sufficient. The area is neat, clean and any spillages can be contained within the storage facility-area is bunded. An emergency wash is situated outside the dosing room.
	Alkaline	97.5	Two dry lime dosing units installed - both were fully operational at the time of the inspection with 100% standby available. Units are generally clean aside from minor lime traces. Bags are dry and are stored off the floor. Minor cleaning to be done. Each PC has their own mask for safety. The current stock is sufficient to last more than 30 days.
	Chlorine	100.0	Four rotameters operational during audit - both flowing free. Two chlorinators are being used and four dosing units available. Standby available for each unit. Two scales are being used to monitor gas levels in the cylinders. Both are fully operational and automatic switch over is in place. Two, 925 Kg cylinders, available as stock, equivalent of 51 days of stock available.
5	**Flocculation**	na	
6	**Phase Separation**		
	Clarification	83.3	Two clarifiers in use, there is limited floc carry over observed. Desludging of the units are done every 4 hours or as needed. The de-sludging takes place automatically. The weirs are in good condition and allow for an even overflow. Algae growth was visible in the launders and the cleaning schedule should be optimized.
	Sand filtration	100.0	Two backwash pumps and two blowers are installed and all in working condition to service the 4 filters used at the WTW, with a 100% standby available. An even overflow at all the outlet boxes are seen which indicates good flow distribution. Even bubble distribution was observed during the backwash process. Backwashing frequency of every filter is 3 times a day. Media looks in good condition with no visible signs of cracks. No mounds or uneven distribution of media was seen. The filter gallery is in good condition - all handrails are in place. Walls are hosed down after backwashing.
7	**Disinfection**		
	Clear water well	100.0	Inflow is 118 L/s, and the contact volume is 10 Kl. The contact time in the on-site reservoir is more than 30 minutes. Chlorine is dosed at entry of filtered water into CWW. Flows through reservoir (baffled) and then measured at the end of the tank, just before being pumped away.
8	**High lift pumpstation**	100.0	Three pumps are installed, and all are operational. The pumps switch on/off in sequence, with a 50% standby. Manual and electric flow meter was seen, and both were operational. Measures flow to Rayton reservoir and nearby houses. Flowmeter reading are totalised and recorded in the log sheet.
9	**Sludge treatment**		
	Thickening in sludge dams	87.5	High visibility of reeds and housekeeping does need to be done around the sludge dams. One pond has just been cleared. Two recycle pumps in position - both operational with a 100% standby available.
10	**Bulk pipeline from plant to command reservoir**	87.5	The main bulk line feeding the command reservoir is equipped with cathodic protection. Pipes are in good condition and minimal leakages are experienced. One valve chamber was

Watch #	Process Unit Assessed	% TSA	Observations
			inspected and found to be secure and safe condition. The place is secured however there is a missing manhole cover.
11	**Command reservoir**	87.5	The 25 ML reservoir is gated, and the fence is in good condition. No security at the gate and some vandalism has occurred. The structure is in a good condition. The process controller reported that the telemetry is operational and controlled. Flow meter was seen to be operational. The total flow is compared to the total flow pumped from the WTP on a weekly basis.
12	**Booster pumpstation**	na	None
	Total	**94.1%**	

High risk areas OR Key Hardware Risks/ Defects

1. Minor maintenance/refurbishment to be done to repair the broken window and to improve the appearance of the paint work at the works.
2. Repair of the chlorine cylinder connection.
3. Cleaning schedule of the settling tanks to limit algae growth, lime dosing and storage room need to be improved.
4. Backwashing needs to be made automatic to allow for timeous and reliable backwashing to take place.
5. Housekeeping needs to be done at the sludge lagoons and install handrails for safety purposes.

VROOM Refurbishment Cost Estimate

Civil Works	R375,100	24%
Mechanical Works	R1 219,900	76%
Electrical Works (Incl C&I)	R0	0%
Total VROOM Cost	**R1,595,000**	**100%**
R million / MLD		**R0.10**

Regulatory Impression

The Temba WTW has had numerous upgrades over the years and is now upgraded with both GAC and Ozone. Regular operational monitoring is evident although jar tests are not performed although the equipment is available. At the time of the site inspection the pipeline from the recycling pumps had broken, which impacted on the operation of the DAF unit. In addition, it was noted that the sedimentation tanks displayed carryover and that a portion of the roof had blown off. The Ozonation facility is able to operate but is standing due to a lack of oxygen supply due to delays in the tender process which will have a significant impact on the water quality produced. Maintenance is only done on an ad-hoc/ emergency basis and it is evident that budget constraints prevent the operator from doing many essential routine maintenance activities. The City of Tshwane is struggling to maintain the momentum of their previous performance at blue drop audits. Of concern, is the lack of a full drinking water quality assessment (SANS 241) for the cities own water sources which prevents a robust risk assessment and water safety planning process from being undertaken. As such, the Water Safety Planning process requires extensive review as the current process does not adequately identify or address all the risks or identify control measures.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	99.30%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

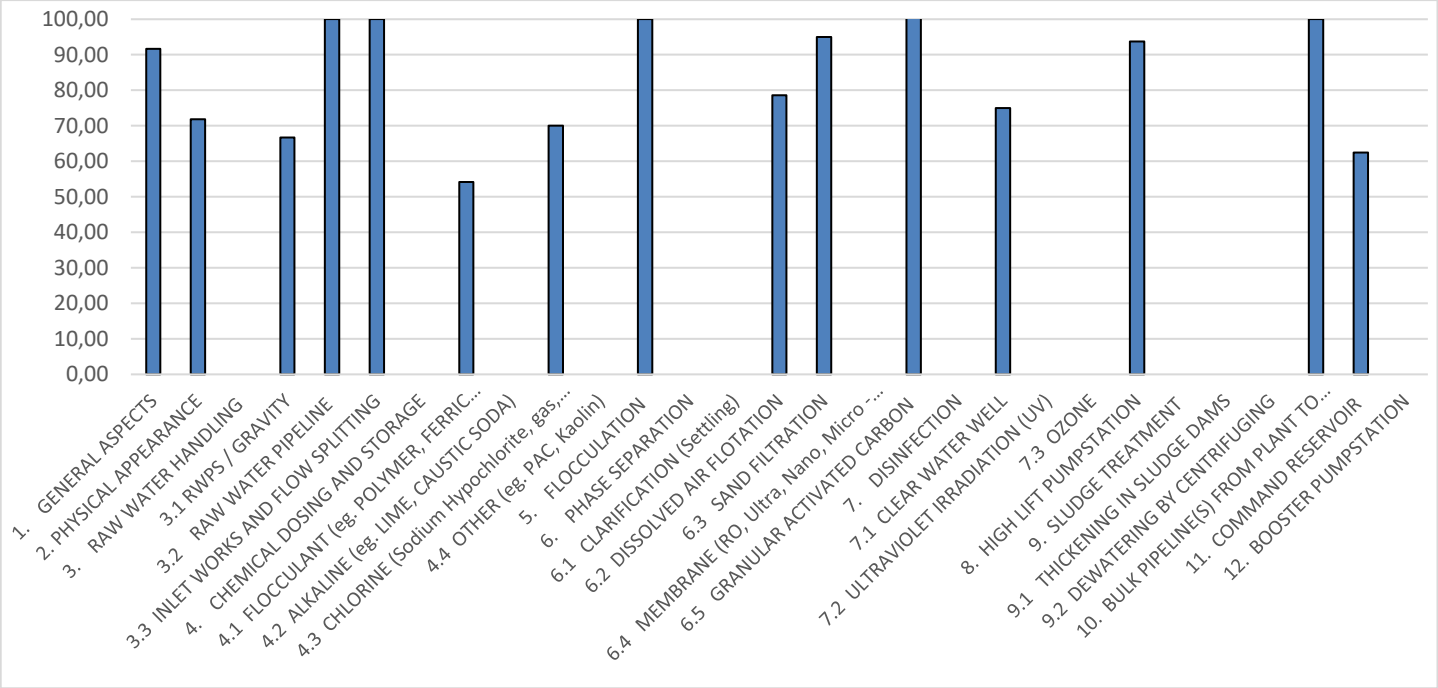
7.4 Emfuleni Local Municipality

The Vaaloewer water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

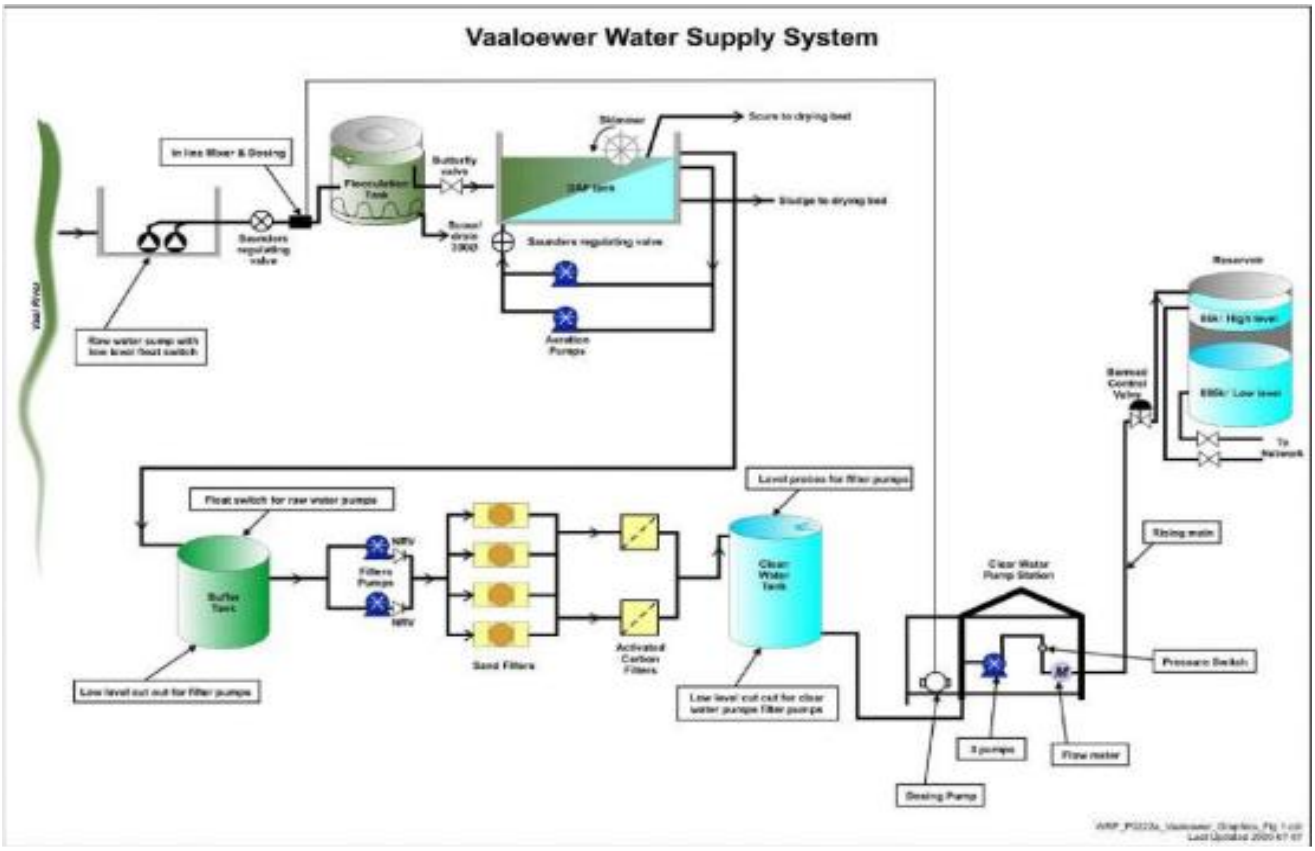
Vaaloewer WTW TSA Score: 81%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	91.6	Class D plant, logbooks and O&M manual are in place. Incident management protocol and contact list are on display. Necessary lab equipment is available. No process flow diagram is displayed, although the SADA HMI shows the process. Flow diagram available in water safety plan.
2	**Physical appearance of plant**	71.8	Entrance is clearly signposted and is adequately fenced with no animal access. Additional office and toilet facilities should be provided for operators, as current facilities are adequate. Grass and bushes are overgrown and should be kept cut. Improved safety signage is required.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	66.6	Installed submersible abstraction pumps were in working order, one standby pump is available. No screens are in place on the raw water abstraction, installation could reduce debris entering plant.
	Raw water pipeline	100.0	There are no leaks on the raw water pipeline, it is adequately sized and is in good condition. The incoming flow meter was operational.
	Inlet works	100.0	There is a single line into the plant with no flow splitting. There is a venturi at the point of in-line dosing to ensure adequate mixing.
4	**Chemical dosing and storage**		
	Flocculant	54.1	Two flocculant dosing pumps are available on site, both are in working order. operating as duty/standby. The old pump being run to failure then will be repaired as a spare. Pumps are not being alternated in duty/standby mode. The area is neat and clean, although there is no bund for the dosing tank and there is a spillage risk should the tank be damaged. The storage area is not bunded, so spillages will not be contained. There is no emergency shower available.
	Chlorine	70.0	One chlorine gas dosing unit is operational, but the standby dosing system is not operational. Scales are not operational. The gas monitoring system and extractor fan are operational and there are safety masks available.
5	**Flocculation**	100.0	Unable to visualise flocs due to tank being closed. Flocculation tank is closed so flocs could not be visualised, but area is clean and neat with no signs of leaks or spillage.
6	**Phase Separation**		
	Dissolved air floatation (DAF)	78.5	Two recycle pumps are installed and both in working condition, one duty and one stand-by. There is a single operational compressor available, with no standby. There was good fine bubble dispersion, with regular batch-wise desludging. Saturator should be checked for service requirements.
	Sand filtration	95.0	Three backwash pumps are installed, all in working condition. One duty and 2 stand-by available. Closed sand filters have recently had media replaced and are in good condition. SCADA system is successfully controlling backwash based on pressure. Pipe configuration needs to be modified so that DAF overflow water is not drawn into filter backwash water

Watch #	Process Unit Assessed	% TSA	Observations
			which is impacting final turbidity compliance. Areas around the sand filters are clean and neat. No leaks or spillages evident
	Granular activated carbon (GAC)	100.0	Three backwash pumps are installed, and all are operational. Backwash system shared with sand filters. Closed GAC filters have recently had media replaced and are in good condition. SCADA system is successfully controlling backwash based on pressure. As with the sand filters, the pipe configuration needs to be modified so that DAF overflow water is not drawn into filter backwash water, which impacts final turbidity compliance.
7	**Disinfection**		
	Clear water well	75.0	The clean water tank on site has sufficient capacity for 30min retention. The tank is not properly covered and there is the potential for ingress of dust or birds. The tank should be properly sealed. Free chlorine is measured on site from samples taken at the final sample point next to the clean water tank.
8	**High lift pumpstation**	93.7	Three high lift pumps are installed, all are in working order, although one pump requires refurbishment or replacement. One pump is on duty and the other two on standby. Final flow meter is operational. Flow readings are captured and converted in the onsite logbook.
9	**Sludge treatment**		
	Thickening in sludge dams	0.0	There are no sludge dams in place, provision should be made to install a sludge handling facility on site.
10	**Bulk pipeline from plant to command reservoir**	100.0	Bulk pipeline is reported to be in good condition, a new line was installed two years ago.
11	**Command reservoir**	62.5	The operators have to manually check the reservoir levels daily. Telemetry should be installed to automate this function. The reservoir outgoing flow meters are not operational and should be repaired. The civil structure condition of the reservoir is good, and it is securely fenced. Signage is required.
	Total	**81%**	

High risk areas OR Key Hardware Risks/ Defects

1. No screens on incoming raw water line.
2. Pipeline reconfiguration required to prevent DAF overflow from entering backwash water line.
3. Staff office, lab, kitchen, and hygiene facilities are poor and require upgrade.
4. Clear water tank is not properly covered.
5. Telemetry and flow metering not available at command reservoir.

VROOM Refurbishment Cost Estimate

Civil Works	R202,400	61%
Mechanical Works	R116,600	35%
Electrical Works (Incl C&I)	R14,300	4%
Total VROOM Cost	**R333,300**	**100%**
R million / MLD		**1.11**

Regulatory Impression

The Vaaloewer WTW is generally well maintained and operated, under the management guidance of Rand Water. The plant staff are enthusiastic and motivated, and there is a strong learnership programme in place managed by Rand Water. Staff would benefit from improved office, kitchen, and toilet facilities. Some minor plant upgrades and maintenance activities, such as reconfiguring the piping to prevent DAF overflow from entering backwash water line, replacing the clear water tank, and repairing the standby chlorine dosing system would reduce non-compliance risk. A Water Safety Plan is in place for the Vaaloewer system, and risk mitigation should be implemented for continuous improvement. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	0.00%
Chemical Compliance	0.00%

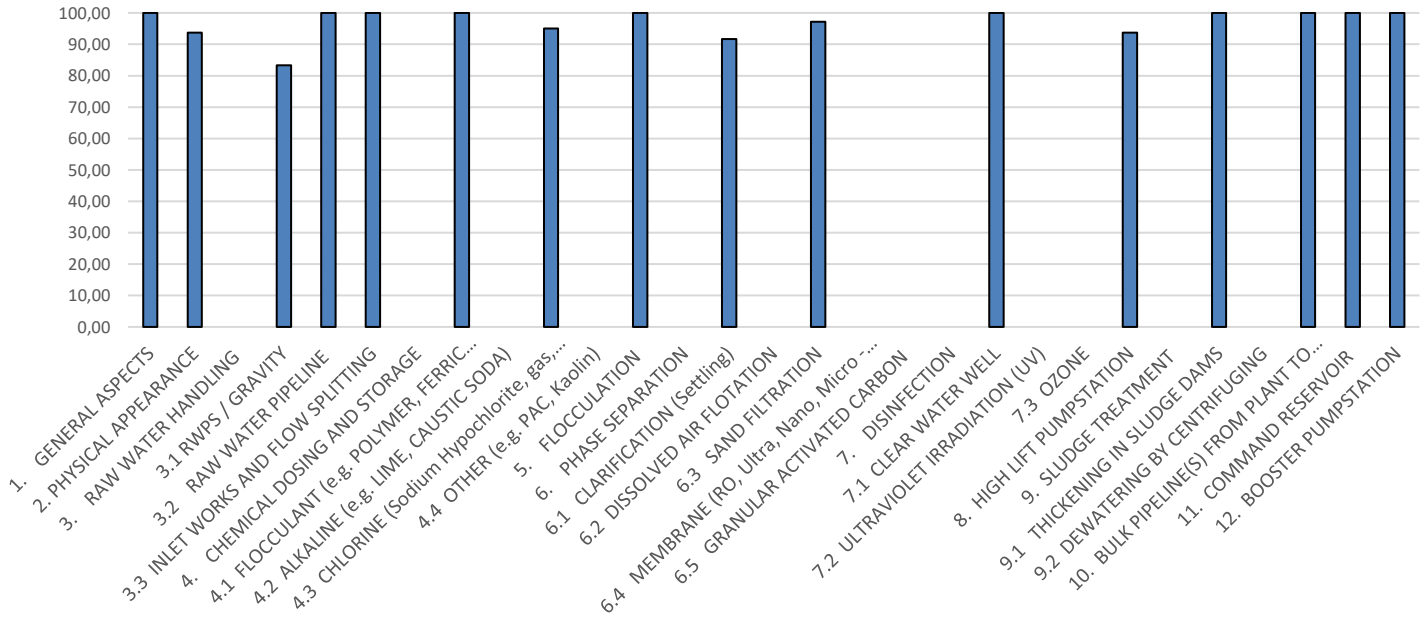
Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

The Vereeniging Water Treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

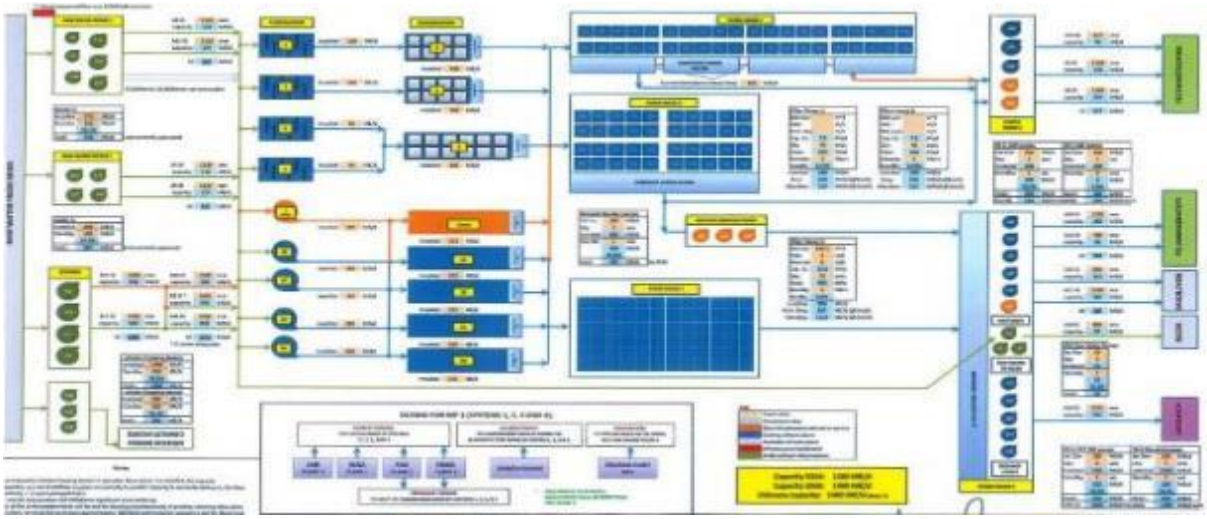
Vereeniging Water Treatment Works TSA Score: 97 %

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General Aspects**	100.0	Phase 6 inspected
2	**Physical Appearance of the plant**	93.7	The condition of this site is good. Some paving needs to be repaired and replaced. Some trench covers require attention.
3	**Raw Water Handling**		
3.1	Raw Water Pump Station/ Gravity	83.3	Raw water is withdrawn from the Vaal River at the Lethabo Weir - pumped to Vereeniging WTP
3.2	Raw Water Pipeline	100.0	Cathodic protection in place, flow records are captured, meters operational.
3.3	Inlet works and Flow splitting	100.0	Currently some maintenance work is taking place at one flocculator.
4	**Chemical Dosing and Storage**		
4.1	Flocculant	100.0	Water leak noted at the building for the polyelectrolyte dosage, evidence provided to show this has been logged with maintenance.
4.3	Chlorine	95.0	Sufficient chlorine available for the daily use at the plant.
5	**Flocculation**	100.0	Maintenance on one flocculator is evident at the time of inspection. Wash water from the filters is pumped back into the flocculators (recycled).
6	**Phase Separation**		
6.1	Clarification	91.6	Internal turbidity standards are maintained after clarification according to the records. Desludging occurs every 8-12 hours. Some larger plant materials are not removed by the bridge. Some leakage evident on sedimentation tank weir plates which requires sealing and fixing. Some corrosion noted on concrete weir structure
6.3	Sand Filtration	97.2	Inspected Gallery 1. Turbidity meters are installed at each filter outlet which provides historical turbidity for each filter. No maintenance backwashing takes place. Filters are washed on a timer and excellent signage and good maintenance is evident.
7	**Disinfection**		
7.1	Clear water well	100.0	During the assessment the back-up chlorinator was in use, due to a breakdown. Sufficient chlorine is available, and deliveries occur regularly to ensure sufficient supply of chlorine gas
8.	**High Lift Pumpstation**	93.7	Palmiet Pump Station inspected. 3 duty/2 standby pumps @300ML/day. Flow meter readings captured and plotted by SCADA and disinfection adjustments made here by a dedicated team prior to ammonia dosing.
10	**Bulk Pipe network to Command Reservoir**	100.0	Pipe networks are underground but cathodic protection installed and maintenance checks and flow balance are available.
11	**Command Reservoir**	100.0	Kliprivierburg Reservoir is the main command reservoir for RW.2 x 600 ML capacity. 24-hour security present
12	**Booster Pump Station**	100.0	Palmiet Pumping Station was inspected. Here chlorine and ammonia are dosed to generate monochloramine into each line (B4, B6 and B13) independently. Chlorine dosage is determined via a chart and a measured value. Chlorine use - 2 cylinders per day-delivery every 5-6 days. Ammonia 28 tons of ammonia solution is delivered every 7 days. Maintenance and scientific services staff available on a daily basis.
	Total	**97%**	

High risk areas OR Key Hardware Risks/ Defects

1. Water leak at Chemical Dosing.

VROOM Refurbishment Cost Estimate

Civil Works	R8,292,900	65%
Mechanical Works	R3,924, 800	31%
Electrical Works (Incl C&I)	R613,800	5%
Total VROOM Cost	**R12,831,500**	**100%**
R million / MLD		**0.0092**

Regulatory Impression

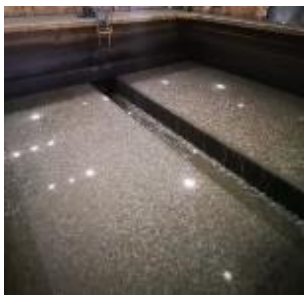
The Vereeniging WTW is in a good condition and there is evidence of regular routine maintenance on site. No significant operational or maintenance issues were noted on site and the water leak at the chemical plant was already logged for the maintenance team to attend to. Both the operational and compliance water quality data show that this plant is producing water which complies with the drinking water standard. The Rand Water team was able to show how all divisions of the utility are able to maintain the water treatment processes as efficiently as possible with a large team. Rand Water makes use of a Water Quality Management System which aims to breach the gaps between the various departments of this large utility. The documentation provided allowed the audit team to drill down to the water quality results as well as up to identify the control measures and the risks carried by the utility. As such, the Rand Water team is to be commended on a job well done.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	>99.91%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



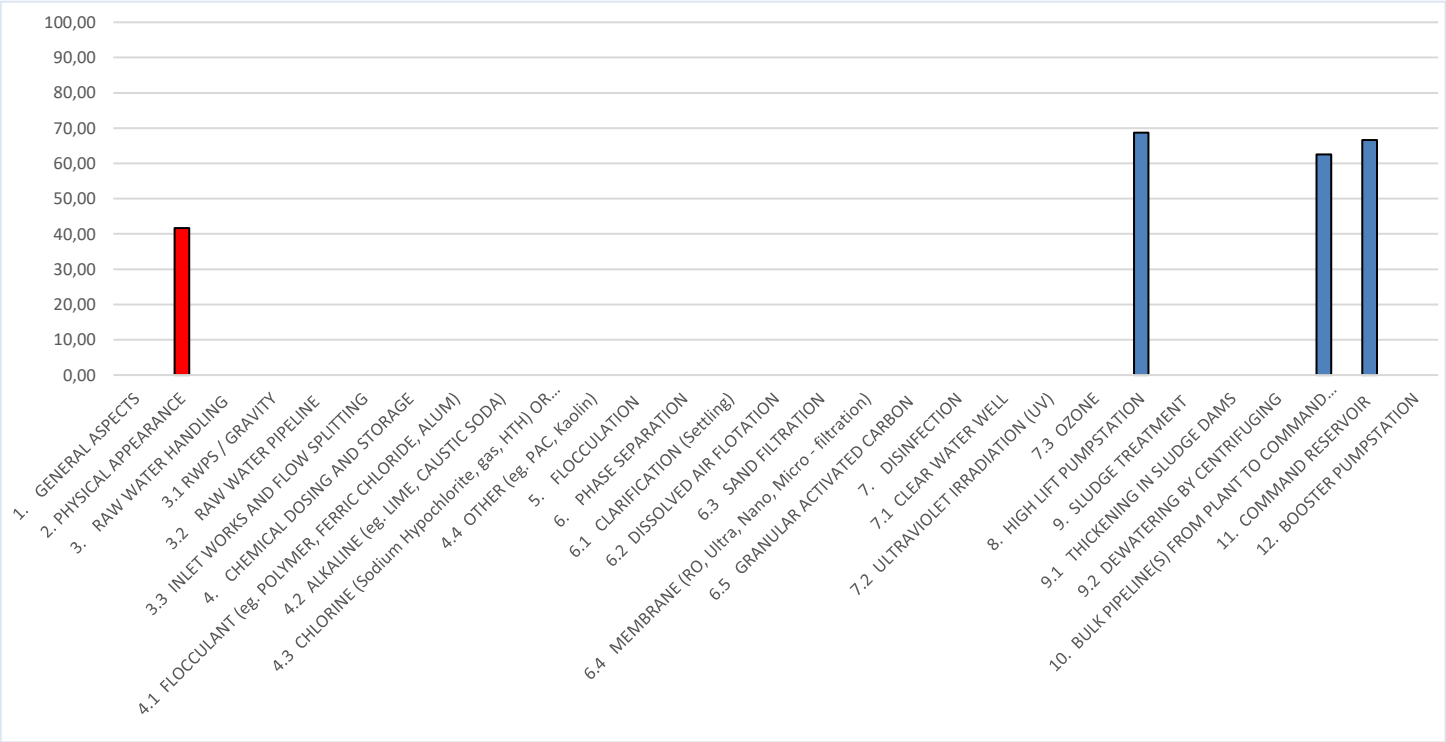
7.5 Lesedi Local Municipality

The Heidelberg Command Reservoir system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

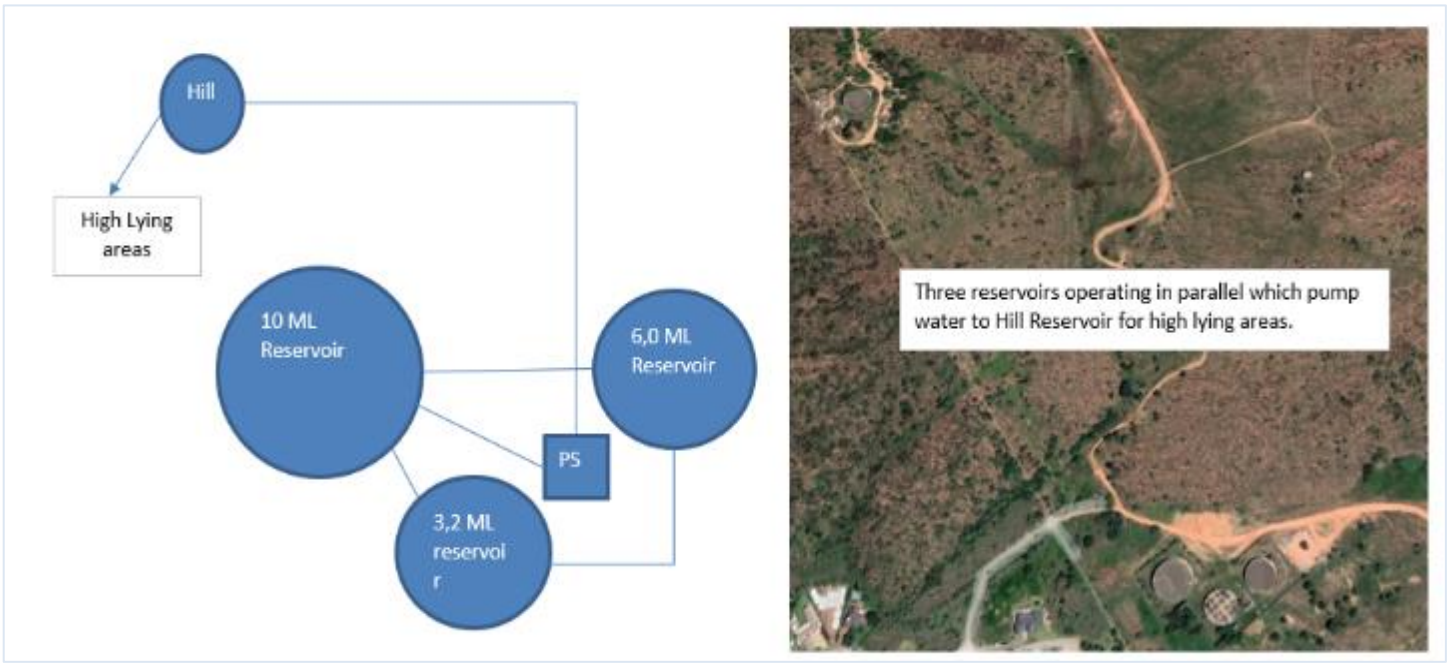
Heidelberg Command Reservoirs TSA Score: 53 %

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	General aspects	41.6	Site is generally shabby and requires rigorous inspection and site maintenance
8	High lift pumpstation	43.7	Back-up generator is installed (200L diesel capacity) to allow for maintenance of reservoir levels during loadshedding. Gland leakage water to be effectively maintained and drained to drainage sump. Disposal/routing of gland leakage water to be attended to outside the pump station.
10	Bulk pipeline from plant to command reservoir	62.5	Valve chamber flooded; this needs to be investigated and rectified.
11	Command reservoir	83.3	Maintenance required in terms of replacement of rusty manhole covers, ladders and vents etc.
	Total	**53%**	

High risk areas OR Key Hardware Risks/ Defects

1. Valve chamber flooded; this needs to be investigated and rectified.
2. Reservoir site is generally shabby and requires rigorous inspection and site maintenance.
3. Maintenance required in terms of replacement of rusty manhole covers, ladders and vents etc.
4. A suitable pump gland packing drainage system needs to be installed.

VROOM Refurbishment Cost Estimate

Civil Works	R181,500	13%
Mechanical Works	R636,900	46%
Electrical Works (Incl C&I)	R564,300	41%
Total VROOM Cost	**R1,382,700**	**100%**
R million / MLD		**0.07**

Regulatory Impression

The Heidelberg Command Reservoir system requires a rigorous inspection and maintenance to protect the available infrastructure already in place. A standby generator is installed to provide electricity during loadshedding. Maintenance is required at the reservoir site, which is evident by the rusting manhole covers, vents and ladders and lack of operational flow meters at the reservoir site. Suitable drainage systems should be installed at the pump station to ensure that gland leakage water is drained. In addition, the main valve chamber from the bulk supplier is flooded and this needs to be investigated and rectified. The Lesedi Local municipality is very dependent on the bulk supplier for all aspects of water quality monitoring and control. It is of concern that only *E. coli* is monitored by the Lesedi Local Municipality and this monitoring program should be expanded to ensure proper coverage of the prescribed minimum process indicators as prescribed in the SANS 241. However, the bulk supply water quality is good and no acute health risk failures were noted. The Water Safety Plan requires extensive review to ensure that the risk which is within the Lesedi LM is managed appropriately by sufficient and competent personnel.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	99.51%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

7.6 Merafong Local Municipality

There is no TSA as there is no WTW situated in this municipality treating water. They receive 100% of their water as bulk from Rand Water.

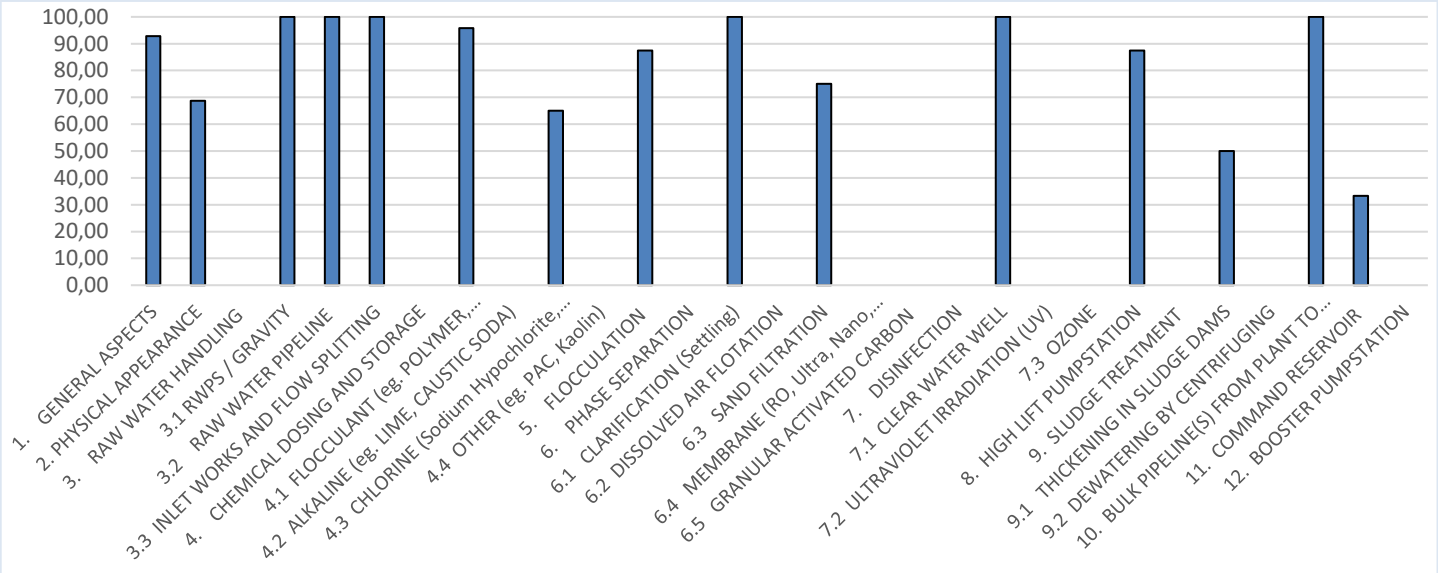
7.7 Midvaal Local Municipality

The Vaal Marina water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

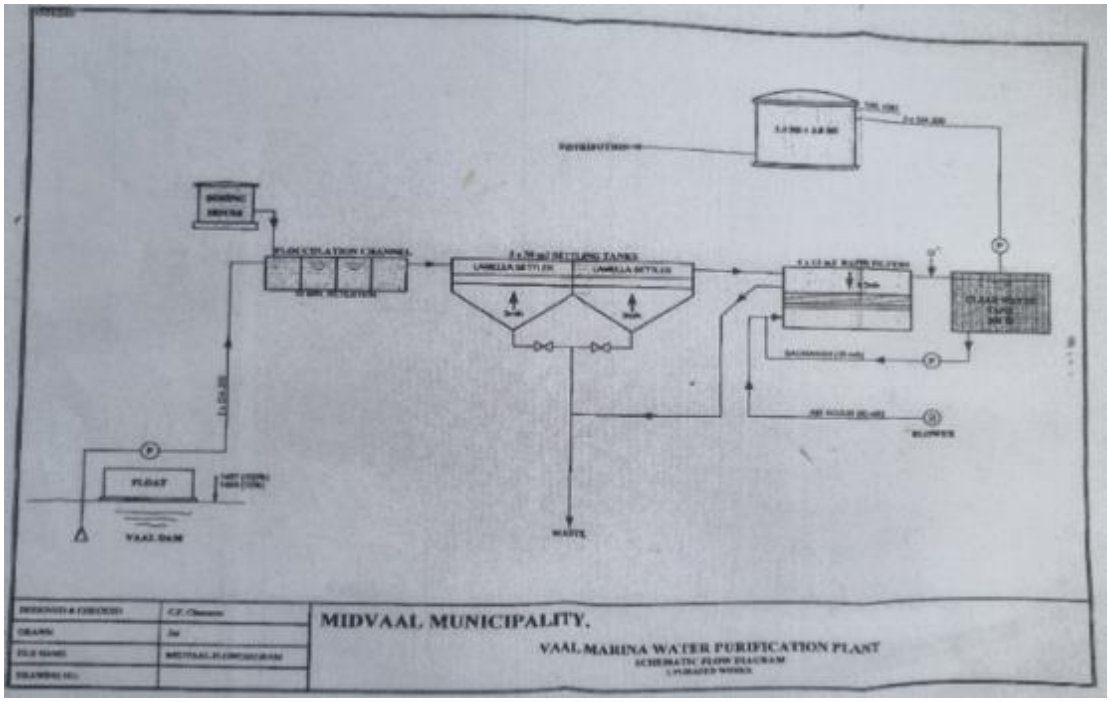
Vaal Marina WTW TSA Score: 81%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	92.8	Class C plant, logbooks and O&M manual are in place. Emergency contact list is on display but there is no incident management protocol available. Necessary lab equipment is available. Flow diagram is displayed.
2	**Physical appearance of plant**	68.7	Entrance is not signposted, but plant is adequately fenced with no animal access. Site is neat and paving in good condition although requires weeding. Staff facilities require maintenance and provision should be made to upgrade the office/lab/kitchen facilities, as there is currently only one small multi-purpose room. Information and safety signs should be posted at all required points to indicate risks, hazards and required PPE.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	100.0	Two submersible abstraction pumps are installed and operational. Screens and raw water abstraction pumps are in good condition, operating in duty/standby mode. Operators would benefit from telemetry on the pump starters as they have to start the pumps manually at the abstraction point.
	Raw water pipeline	100.0	The raw water pipeline is in good condition. The flow meter is functional but is not electronic and is located at the abstraction point. The plant operators would benefit from an upgrade to the flow meter to include telemetry.
	Inlet works	100.0	There is a single line into the plant with no flow splitting. There is even flow over the inlet weir and turbulent mixing at the point of flocculent dosing.
4	**Chemical dosing and storage**		
	Flocculant	95.8	There are two dosing pumps available, operating as duty/stand-by. A small containment bund should be installed at the flocculant dosing areas to contain spills. The bund area for the flocculent storage is sufficient. Safety shower is in place and functional.
	Chlorine	65.0	The chlorine gas dosing system is not operational, and plant is currently dosing sodium hypochlorite. The gas dosing system should be repaired, and gas monitoring and safety equipment tested.
5	**Flocculation**	87.5	There is good floc formation and flocs are visible. Flocculant tank is in good condition and walls are clean with no scum build up. Sludge settles in the basin because the flocculation channel is long, this needs to be manually cleaned on a regular basis. Some minor damage to walls requiring maintenance.
6	**Phase Separation**		
	Clarification (Settling)	100.0	There are two lamella settlers, only one is in use due to low flow to the plant. Solids are effectively removed in the lamella plates and clear water flows through the discharge holes in the surface pipe. There is limited floc carry over at the discharge holes. Desludging is done regularly.
	Sand filtration	75.0	There are four rapid sand filters installed, two new and two old, and one backwash pump. Only two filters are in operation due to low flow. There is no standby backwash pump. There is one operational blower installed, with no standby blower or air pump. Provision should be made to procure stand-by pump and blower. There is even flow splitting to the filters and even bubble distribution during backwashing. The area around the filters is clean and neat although there are some cracks in the concrete that require maintenance, and some algae grown on the walls that requires cleaning. The handrails are in place and in good condition.
7	**Disinfection**		
	Clear water well	100.0	The clean water tank on site has sufficient capacity for 30min retention. There are some surface cracks on the tank that require maintenance. Free chlorine is measured on site from samples taken at the final sample point.
8	**High lift pumpstation**	87.5	There are 3 clear water pumps installed to pump water to the reservoir. The larger 132 kW pump is operational and pumping water to the reservoir. One of the two 45kW pumps is operational and on standby, the other has been removed for repairs. Final flow meter is operational.
9	**Sludge treatment**		
	Thickening in sludge dams	50.0	There are sludge ponds situated outside the plant to the north. Sludge dams are full and need to be emptied. There is a sludge pump to recycle water back to the head of works, but no standby pump available.
10	**Bulk pipeline from plant to command reservoir**	100.0	Bulk pipeline is reported to be in good condition.
11	**Command reservoir**	33.3	Reservoir is not properly fenced and is occasionally accessed by the public. A new secure fence should be installed. There is no telemetry in place at the command reservoir, and operators have to check the levels manually. There are no flow meters at the reservoirs. The old reservoir structures are in good condition, fully covered with no leaks. The newly constructed reservoir has leaks and is still being repaired.
	Total	**81%**	

High risk areas OR Key Hardware Risks/ Defects

1. Raw water abstraction pumps cannot be started remotely from the treatment works; telemetry should be installed at the abstraction pump station. A digital raw water flow meter with telemetry should also be installed.
2. The flocculation basin, sand filters and clear water tank require maintenance for surface cracks and brickwork damage.
3. There is no standby for sand filter backwashing.
4. The chlorine gas dosing system is not operational.
5. There is no telemetry on the command reservoir, and a new fence is required.

VROOM Refurbishment Cost Estimate

Civil Works	R917,400	11%
Mechanical Works	R6,971,800	81%
Electrical Works (Incl C&I)	R705,100	8%
Total VROOM Cost	**R8,594,300**	**100%**
R million / MLD		**0.86**

Regulatory Impression

The Vaal Marina WTW is generally in good condition, operated on behalf of the Midvaal LM by Rand Water. The site is neat and clean and paving in good condition, although an entrance signboard is required. Staff are motivated and carry out their duties with good attention to detail. Staff would benefit from improved office, kitchen, and laboratory facilities, as there is currently only on small multi-purpose room for this. The plant requires some minor maintenance to repair cracks in the concrete of the flocculation basin, sand filters and clean water tank. Stand-by backwash pump and blower are required for the sand filters. A Water Safety Plan is in place for the Midvaal LM, which includes the Vaal Marina supply system. The chlorine gas dosing system was operational during the period under audit but should be repaired to have better control of the chlorine dosing, which is currently manual hypochlorite dosing. There are occasional non compliances in the distribution network relating to turbidity and low chlorine residuals. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	90.43%
Chemical Compliance	95.88%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





7.8 Mogale City Local Municipality

There is no TSA as there is no WTW situated in this municipality treating water. The municipality receives 100% of their water as bulk from Rand Water.

7.9 Rand West Local Municipality

There is no TSA as there is no WTW situated in this municipality treating water. The municipality receives 100% of their water as bulk from Rand Water.

8. KWAZULU NATAL: MUNICIPAL DRINKING WATER SYSTEM'S FUNCTIONALITY

Background

Leading up to the release of the full Blue Drop report, the Regulator draws attention by publishing the *Blue Drop Watch Report*, which comprises of a technical overview of pipes, pumps, reservoirs, processes and water quality of water treatment plants and distribution networks. The Blue Drop Watch report is **not** the Blue Drop audit report, which will only be published once the verification and quality control processes by DWS have been satisfied, to ensure accurate and credible reporting of drinking water services across South Africa. The Watch Report seeks to keep the public and stakeholder updated and informed on the status of drinking water infrastructure, water quality, and the indicative cost to restore functionality.

The Blue Drop Watch Report is informed by the Technical Site Assessments (TSA), which were done at 1 to 2 systems per WSA/WSP, as part of the Blue Drop audit cycle. The purpose of the TSA is to verify the findings of the (desktop) audit with the status on the ground (physical inspections). The TSA score (%) reflects the condition of the raw water handling system (abstraction, pumps, pipe network), the water treatment plants (inlet works to disinfection and sludge treatment), delivery system (commend reservoirs, bulk pipe network and pumpstations) and distribution systems (pump and pipe networks). A high TSA score (100%) indicates that the infrastructure, equipment, and processes are in excellent condition, whilst a low TSA score (0%) indicates failure and dysfunctional process and infrastructure. The TSA inspections cover each process unit of the treatment facility, coupled with randomly selected checkpoints of the delivery and distribution network. The VROOM cost covers only the treatment facility, as too many variables exist to accurately estimate network refurbishment costs.

Results of the Technical Site Assessments

During the period December 2022 to February 2023, 15 water supply systems were inspected, offering a representative overview of systems owned and operated by municipalities, water boards and water service providers. The assessments covered 14 municipalities, as well as 7 Water boards and Water Service Providers. Detailed TSA reports with photographic evidence and VROOM costs have been generated to assess the condition and status of treatment facilities and gain insight into randomly selected pipe network and pumpstation across the water distribution networks. The table following summarises the TSA scores of the water supply systems that were assessed.

Table 25 - KwaZulu Natal Summary of the all the TSA Water Supply Systems

#	Municipality (WSA)	TSA WSS	TSA WTW	WSP/ WB	%TSA
1	Harry Gwala DM	Kokstad	Kokstad		73%
2	uMgungundlovu DM	Impendle Spring	Impendle Spring Protection		50%
3	uMkhanyakude DM	Mtubatuba	Mtubatuba	Novubu	57%
4	uThukela DM	Ladysmith	Ladysmith		87%
5	Zululand DM	Ulundi Nkonjeni	Ulundi	Zana Manzi	68%
6	Amajuba DM	Durnacol	Durnacol		49%
7	Mhlathuze LM	Mzingazi	Umzingazi		64%
8	King Cetshwayo DM	Greater Mthonjaneni	Greater Mthonjaneni	Umgeni Water	61%
9	Mhlathuze LM	Nsezi	Nsezi	Mhlathuze Water	90%
10	Newcastle LM	Newcastle	Ngagane	uThukela Water	87%
11	Umzinyathi DM	Nqutu	Vants Drift		80%
12	Msunduzi LM	Umsunduzi	Midmar	Umgeni Water	95%
13	Ugu DM	Bhobhoyi	Bhobhoyi		60%
14	iLembe DM	Sundumbili	Sundumbili		68%
15	eThekwini MM	eThekwini Main (Umgeni, Kloof, Mdhloti)	Kloof	Umgeni Water	79%
	Totals		**15**	**7**	**71%**

An average of 71% was achieved for the 15 systems assessed, which means that infrastructure and processes are partially functional with an average performance. The best overall performance was found for Msunduzi Umgeni Water, followed by Mhlathuze, uThukela and Newcastle uThukela Water. The WSP/WBs provided three of the best performing systems. The lowest performance was observed for Durnacol and Impendle Spring Protection.

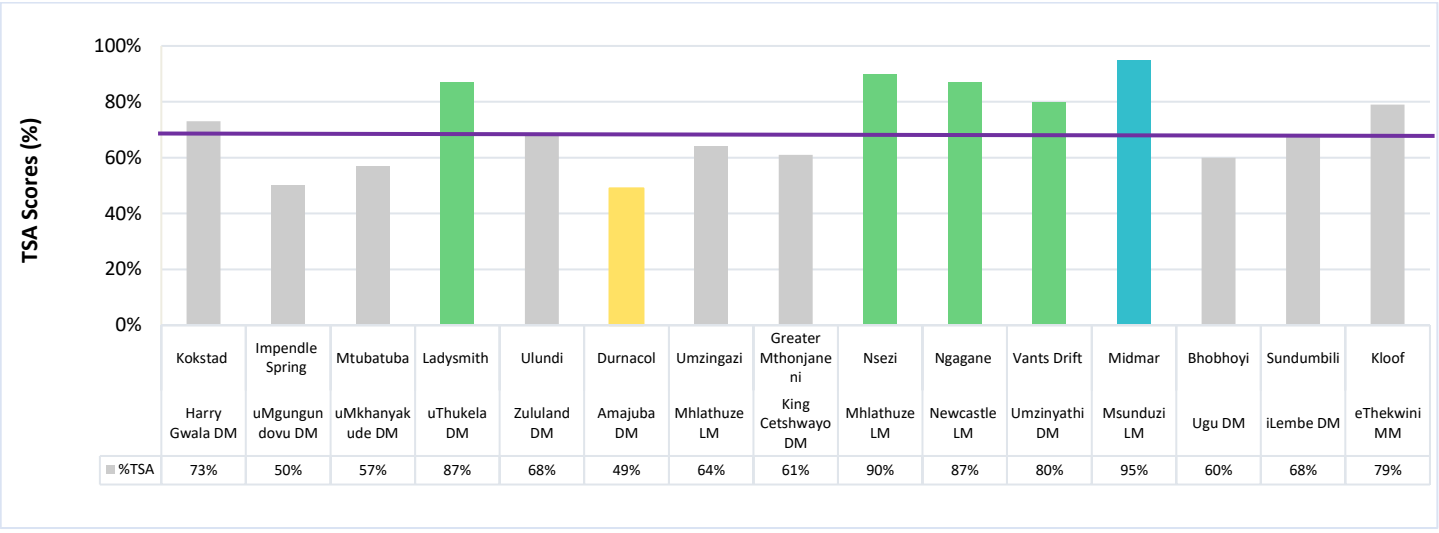


Figure 22 - KZN TSA scores for all the BD Systems

95 – 100% Excellent	
80-<95% Good	
50-<80% Average	
31-<50% Poor	
0-<31% Critical state	

The Regulator observed the predominant challenges and risks pertaining to the water supply system:

Facility management

- No notice board to display or no display of the PFD or other relevant notices and/or documents required on site
- Refurbishment or upgrade and/or construction of buildings or facilities, concrete structures, offices and/or process control room, staff ablutions; maintenance or replacement of perimeter/boundary fencing and/or access gate; Aging infrastructure
- No jar testing done, no or limited testing water quality testing equipment and/or lab chemicals, no calibration of meters
- Supply emergency showers or wash areas/ facilities
- Back-up power supply during load shedding
- Signage at entrance gate and safety signs across plant
- Housekeeping and tidying up of terrain, paintwork at treatment works, pumpstations, and reservoirs, clean-up sites after construction projects
- Road rehabilitation/ upgrade/ construction and road accessibility especially for the safe delivery of chemicals
- Staff safety and signage improvement

Water treatment system

- Raw water pipe network and/or pumps at abstraction facility to be refurbished or upgraded or repaired
- Install cathodic protection on the raw and final water pipe network
- No flow meters installed or dysfunctional flow meters (abstraction, WTW, and Command Reservoirs), and flow meters not calibrated
- Refurbishment or upgrade of one or more of the various process units (civil, mechanical, electrical and instrumentation)
- Dysfunctional or inefficient process units that have to be rectified, e.g. inlet works, clarifiers, filters, etc
- Treatment chemicals, e.g. no bunding, limited stock, storage
- No or limited no. standby pumps or dysfunctional pumps, e.g. flocculant and/or chemical dosing, backwashing, high lift, leaks, etc
- No or limited air blowers and/or compressors or dysfunctional blowers and compressors
- Sand filters, e.g. repairs required, sand to be replaced, sand volume
- A new centrifuge or alternative dewatering system is required
- Chlorination unit not operational or not fully operational, e.g. limited stock in place, no or limited standby units, no automatic switch over, no chlorine scales, no or limited safety signs and systems (alarms, fans, masks, detectors)

Water distribution network

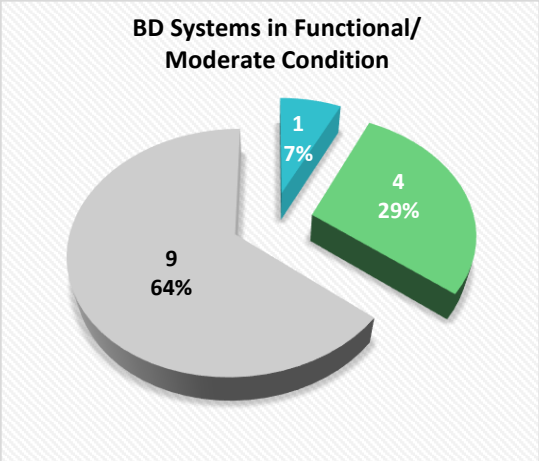
- No telemetry at reservoir and level indicator
- Install new fencing or repair fencing
- Vandalism and theft of pumps, valves, manholes, fencing and other mechanical and electrical assets
- Site at reservoirs to be cleared and landscaped.

Systems Observed to be in Functional/Moderate Condition based on Technical Site Inspections

Water supply systems which succeeded to achieve ≥50% TSA score, are summarised as follows.

Table 26 - Provincial Summary of the TSA Water Treatment Systems in the Excellent to Average Performance Categories

Municipality (WSA)	WSP/ WB	TSA of ≥95-100% [Excellent]		TSA of ≥80-<95% [Good]		TSA of ≥50-<80% [Average]	
		Name of WTW	% TSA	Name of WTW	% TSA	Name of WTW	% TSA
Harry Gwala DM						Kokstad	73%
uMgungundlovu DM						Impendle Spring Protection	50%
uMkhanyakude DM	Novubu					Mtubatuba	57%
uThukela DM				Ladysmith	87%		
Zululand DM	Zana Manzi					Ulundi	68%
Mhlathuze LM						Umzingazi	64%
King Cetshwayo DM	Umgeni Water					Greater Mthonjaneni	61%
Mhlathuze LM	Mhlathuze Water			Nsezi	90%		
Newcastle LM	uThukela Water			Ngagane	87%		
Umzinyathi DM				Vants Drift	80%		
Msunduzi LM	Umgeni Water	Midmar	95%				
Ugu DM						Bhobhoyi	60%
iLembe DM						Sundumbili	68%
eThekwini MM	Umgeni Water					Kloof	79%
Totals	**7**	**1**		**4**		**9**	



Of the 14 systems in the excellent to average performance categories it was found that:

- 1 system (7%) was in excellent good condition
- 4 systems (29%) were in good condition
- 9 systems (64%) were in average condition.

Figure 23 - No. BD Systems in Functional/ Moderate Condition

The best performing water supply systems, as indicated by the TSA scores, are summarised hereunder.

Table 27 - Provincial Summary of the Top Performing TSA Water Treatment Systems

#	WSA	WSP/ WB	TSA WTW	%TSA
1	Msunduzi LM	Umgeni Water	Umsunduzi	95%
2	Mhlathuze LM	Mhlathuze Water	Nsezi	90%
3	uThukela DM		Ladysmith	87%
4	Newcastle LM	uThukela Water	Ngagane	87%
5	Umzinyathi DM		Vants Drift	80%

The top four systems with the best condition are Umsunduzi managed by Umgeni Water (excellent 95-100%); Nsezi managed by Mhlathuze Water, Ladysmith managed by uThukela, and Ngagane managed by uThukela Water (good 80-<95%).

Systems Observed to be Dysfunctional/Critical Condition based on Technical Site Inspections

Drinking water supply systems which failed to achieve at least a TSA score of 50%, are identified as follows.

Table 28 - Provincial Summary of the TSA Water Supply Systems in the Poor and Critical Performance Categories

Municipality (WSA)	WSP/ WB	TSA of ≥31-<50% [Poor]		TSA of 0-<31% [Critical]	
		Name of WTW	% TSA	Name of WTW	% TSA
Amajuba DM		Durnacol	49%		
Totals		**1**			

Durnacol failed to achieve at least a TSA score of ≥50%.

VROOM Costs

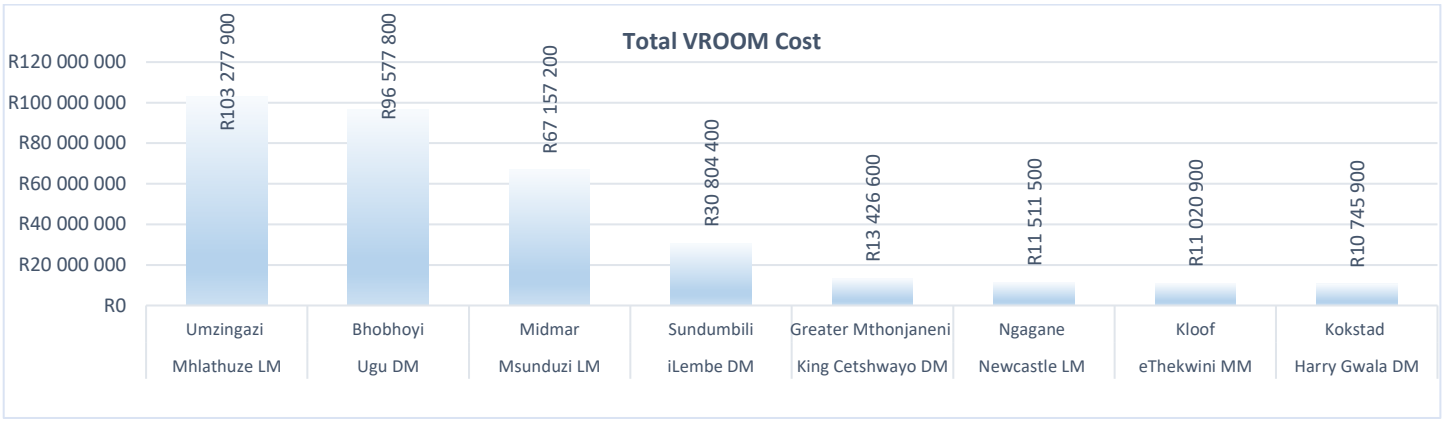
The Very Rough Order of Measurement (VROOM) is an estimation of the funding required to restore existing treatment infrastructure to its original design capacity and operations, by addressing civil, mechanical, electrical and instrumentation defects. A singular VROOM cost is determined by assessing 1-2 treatment facilities per municipality and calculated as cost per system. The cost is derived through an algorithm that uses the Blue Drop Inspector's impression of the asset condition, the size and capacity of the asset, and the market/ industry cost indicators. The resultant VROOM cost is an estimation of the cost to repair, refurbish or replace dysfunctional treatment infrastructure. Subsequently, a singular VROOM cost is extrapolated, in relation to the total Blue Drop scores and systems' SIVs, to derive an aggregated VROOM score for all treatment plants in the WSI.

***Note:** VROOM does not constitute a specification, schedule of quantities or a definite refurbishment figure, but rather an indicative amount to inform a budget and hardware requirements. **Also,** the VROOM cost is specific to the treatment plant and does not attempt to cost the network delivery and distribution network, as it contains to many variables.*

The VROOM costs are summarised as following, noting these values comprises the cost of repairs of the SINGLE water treatment system assessed, NOT the extrapolated collective cost to repair all the treatment facilities in a WSI. The VROOM cost is made up by mechanical, electrical, and civil cost elements, which can be seen in the detailed TSA sections following in the report.

Table 29 - Provincial Summary of the VROOM Costing

Municipality (WSA)	TSA WSS	TSA WTW	WSP/ WB	Total VROOM Cost (Rand)
Harry Gwala DM	Kokstad	Kokstad		R10,745,900
uMgungundlovu DM	Impendle Spring	Impendle Spring Protection		R931,700
uMkhanyakude DM	Mtubatuba	Mtubatuba	Novubu	R8,093,800
uThukela DM	Ladysmith	Ladysmith		R4,485,800
Zululand DM	Ulundi Nkonjeni	Ulundi	Zana Manzi	R2,434,300
Amajuba DM	Durnacol	Durnacol		R3,615,700
Mhlathuze LM	Mzingazi	Umzingazi		R103,277,900
King Cetshwayo DM	Greater Mthonjaneni	Greater Mthonjaneni	Umgeni Water	R13,426,600
Mhlathuze LM	Nsezi	Nsezi	Mhlathuze Water	R6,674,800
Newcastle LM	Newcastle	Ngagane	uThukela Water	R11,511,500
Umzinyathi DM	Nqutu	Vants Drift		R1,850,200
Msunduzi LM	Umsunduzi	Midmar	Umgeni Water	R67,157,200
Ugu DM	Bhobhoyi	Bhobhoyi		R96,577,800
iLembe DM	Sundumbili	Sundumbili		R30,804,400
eThekwini MM	eThekwini Main (Umgeni, Kloof, Mdhloti)	Kloof	Umgeni Water	R11,020,900
Totals				**R372,608,500**



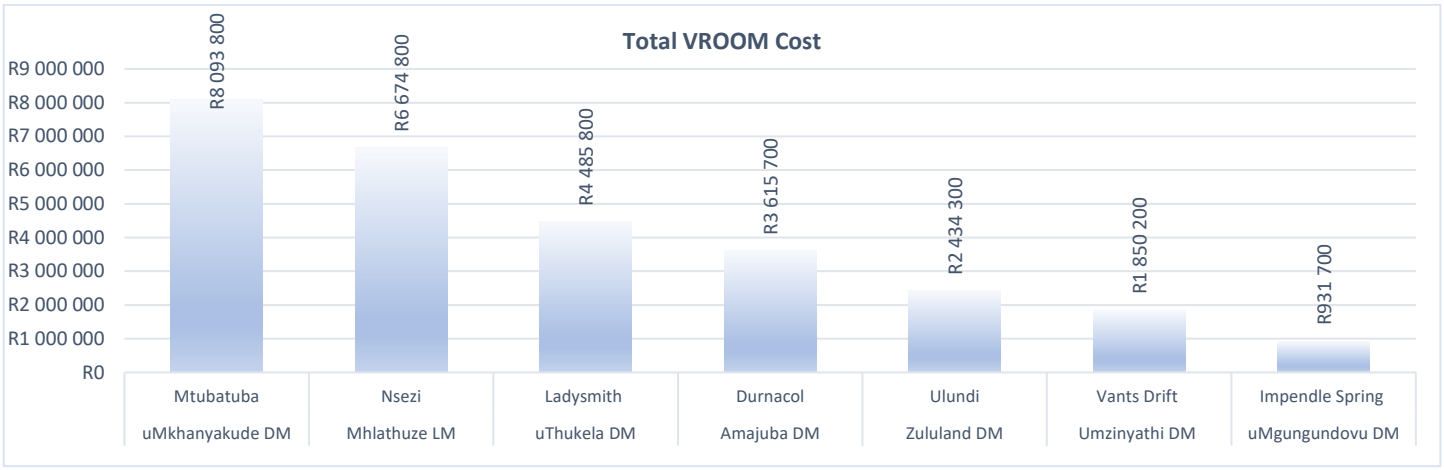


Figure 24 - Total VROOM Cost for the BD Systems Assessed

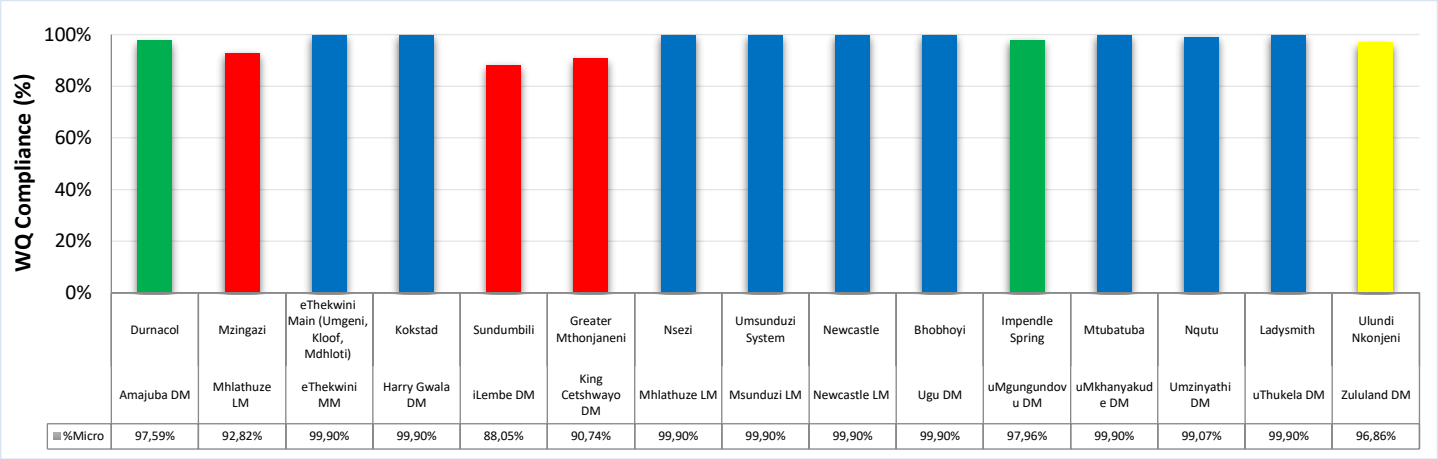
The associated VROOM costs for the 15 water supply systems assessed amounts to R372.6 million, with the bulk of investment needed for Umzingazi (Mhlathuze), Bhobhoyi (Ugu) and Midmar (Umgeni Water).

Drinking Water Quality Status

The Institutional Water Quality Compliance, as measured against SANS 241 standards, is reflected in the table below (IRIS, 28 March 2023).

Table 30 - KwaZulu Natal Summary of the Drinking Water Quality Status of all the TSA Water Supply Systems

#	Municipality (WSA)	TSA WSS	TSA WTW	Microbiological Compliance	Chemical Compliance
1	Harry Gwala DM	Kokstad	Kokstad	>99.90%	98.88%
2	Umgungundlovu DM	Impendle Spring	Impendle Spring Protection	97.96%	94.24%
3	uMkhanyakude DM	Mtubatuba	Mtubatuba	>99.90%	94.12%
4	uThukela DM	Ladysmith	Ladysmith	>99.90%	69.77%
5	Zululand DM	Ulundi Nkonjeni	Ulundi	96.86%	85.31%
6	Amajuba DM	Durnacol	Durnacol	97.59%	96.80%
7	Mhlathuze LM	Mzingazi	Umzingazi	92.82%	97.33%
8	King Cetshwayo DM	Greater Mthonjaneni	Greater Mthonjaneni	90.74%	92.78%
9	Mhlathuze LM	Nsezi	Nsezi	>99.90%	99.88%
10	Newcastle LM	Newcastle	Ngagane	>99.90%	98.91%
11	Umzinyathi DM	Nqutu	Vants Drift	99.07%	94.24%
12	Msunduzi LM	Umsunduzi	Midmar	>99.90%	99.93%
13	Ugu DM	Bhobhoyi	Bhobhoyi	>99.90%	86.89%
14	iLembe DM	Sundumbili	Sundumbili	88.05%	91.67%
15	eThekwini MM	eThekwini Main (Umgeni, Kloof, Mdhloti)	Kloof	>99.90%	99.77%



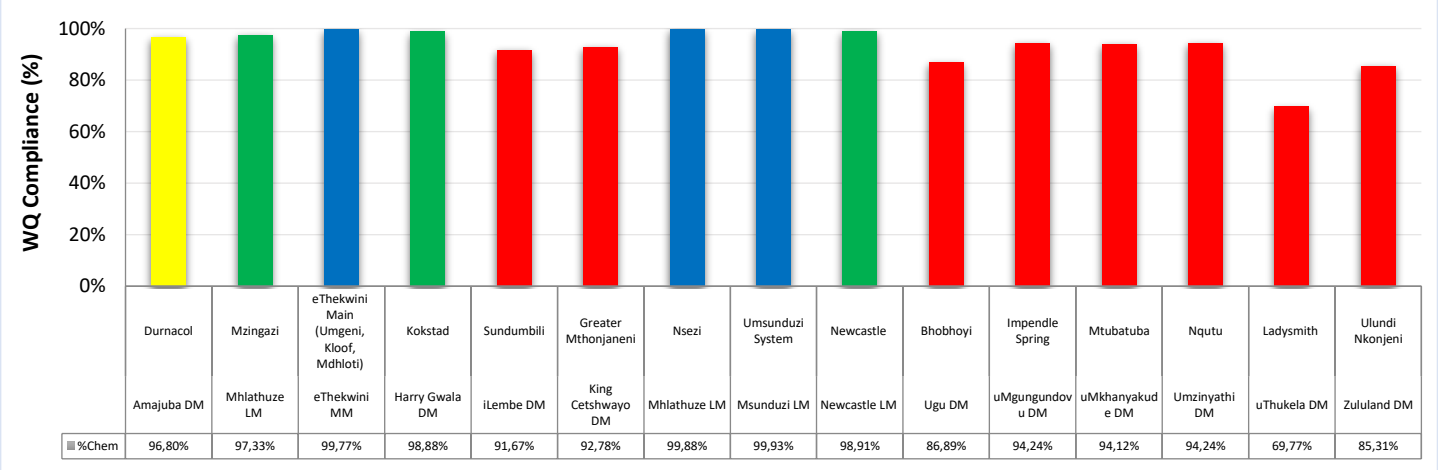


Figure 25 - KZN Drinking Water Quality Status of all the TSA Water Supply Systems

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

The TSA and water quality results depict a different picture. The TSA shows 14 of the 15 water supply systems to be in the *excellent to average performance category*, and the water quality compliance shows that 27-60% of the systems *fail to produce compliant final water quality*.

Out of 15 treatment plants, 9 (66%) and 2 (13%) of systems achieve excellent and good microbiological quality. A total of 1 (7%) system has poor microbiological quality and 3 (20%) systems have bad microbiological water quality status. The water in these systems poses a serious acute health risk to the community. WSAs with poor microbiological water quality status must be assessed to confirm status in all systems to ensure rectification measures are comprehensive to safeguard communities. The direct cause of microbiological failures can be linked to the TSA sub-watch Area 7, which has a low contribution to the overall TSA score. The failure to produce water that meets E. coli standards can be linked back to poor operations, defective infrastructure, dosing rates, absence of disinfection chemicals, lack of monitoring, or lack of operating and chemistry knowledge. WSIs that are not monitoring the final water quality at the outlet of the treatment plant or at specific end use points must develop a monitoring programme and resume with compliance monitoring as a matter of urgency.

Chemical compliance shows that 3 (20%) and 3 (20%) have excellent and good water quality, whilst the majority of systems fail to achieve chemical compliance. A total of 1 (7%) and 8 (53%) systems have a poor and bad chemical water quality status.

Concluding Remarks

The Blue Drop Watch results stresses the importance of drinking water supply and quality to be a primary focus area of government. Already, the Department has developed the Water Services Improvement Programme for systems in critical state, and at systems where particular concerns were reported. Blue Drop performance trends will be used to determine repetitive poor performance, to inform a radical approach to ensure turnaround and compliance. This could include facilitating long term intervention by either a capacitated water board or any other suitable mode of water services support. The determination of the 'very rough order of estimates' (VROOM) was done to give an estimation of the capital requirement for the functionality restoration drive. This will be effected with the support from the National Treasury.

The Regulator will continue to monitor performance in terms of Section 62 of the Water Services Act and will engage together with CoGTA and SALGA, WSAs for corrective action plan development and implementation and offer support. Should these actions fail, the Department will consider civil action together with actions contemplated under section 63 of the Water Services Act (Act 108 of 1997) to ensure that Ministerial directives are issued with timeframes for implementation. Failure to respond will trigger remedial action be taken at cost of the non-complying entity or municipality. The Department will take steps to improve its capacity to respond more effectively in this duty, in ensuring visible and measurable improvement in drinking water services. The Department of Cooperative Governance and National Treasury will be engaged to explore ways of utilising conditional grants for the purpose of remedial rectification.

All Water Services Institutions are hereby urged to take note of their TSA status and commence with corrective measures. The full Blue Drop audit report will provide further material content to the overall management of drinking water services across South Africa, upon its release in July 2023.

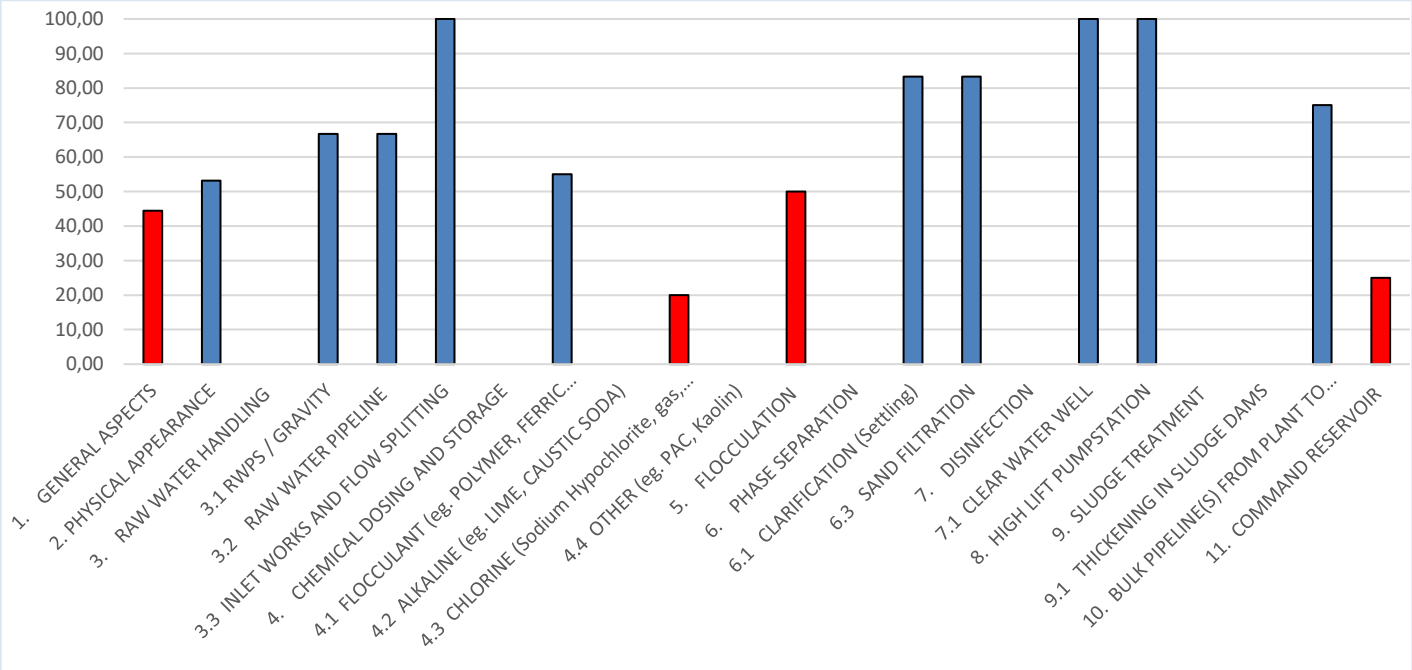
8.1 Amajuba District Municipality

The Durnacol water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

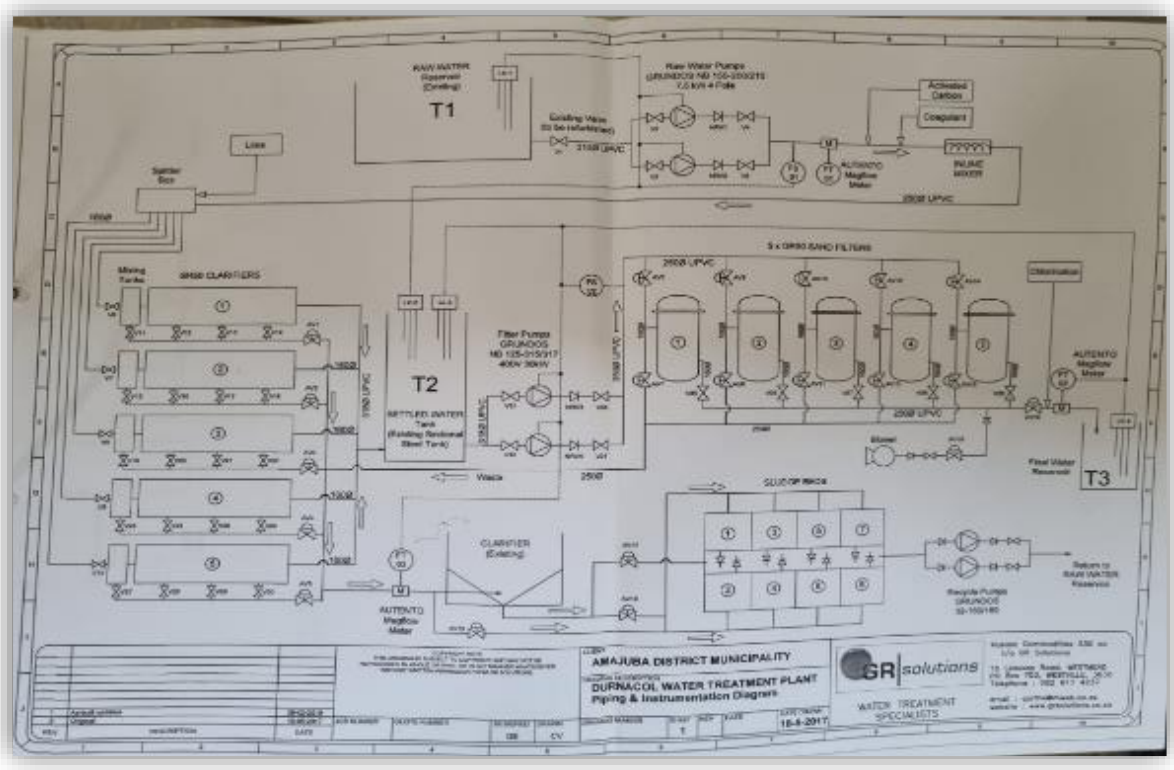
Durnacol TSA Score: 49%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	44.4	The works classification and process flow diagram are not displayed, maintenance and repairs logbook are not on-site. No records of electricity consumption. Attention is required on administrative requirements.
2	**Physical appearance of plant**	53.1	The entrance is sign posted; however, safety signs are not sufficient in most process units. Electrical cable should be isolated, and general tidiness needs to be improved. The road in the plant premises should be paved or tarred, chemicals such as poly should be properly stored with safety precautions to avoid incidents.
3	**Raw water handling**		Inlet pumps appears to be in good working condition. The Process controller indicated that part of raw water lines requires attention as its prone to breakages, inflow meters require calibration and flow rate is recorded.
	Raw water pumpstation / gravity feed	66.6	
	Raw water pipeline	66.6	
	Inlet works	100.0	
4	**Chemical dosing and storage**		2nd dosing pump to be fixed as it is non-operational. Bund for poly storage is required.
	Flocculant	55.0	
	Alkaline (Lime)	0.0	Lime dosing not taking place, the system needs to be re-instated, two 25kg half full dehydrated lime bags were observed.
	Chlorine	20.0	Although the works is not old - a lot of housekeeping and general maintenance and fixing of the unit is required at the chlorine dosing area. None of the equipment was working adequately at the chlorine room.
	Other (e.g., pac, kaolin)	0.0	The works is equipped with activated carbon, and it is not functional and general maintenance and fixing of the equipment is required to put the system in operation again.
5	**Flocculation**	50.0	2 out of the 5 flash floc stirrers were non-operational due to mechanical breakdown. It was explained that 4 were not operational due to the faulty bridge that they were connected to. All Mechanical and Electrical components need to be attended to and the two stirrers should be brought back into correct operation.
6	**Phase separation**		
	Clarification (settling)	83.3	No floc carry-over observed, clear water, only general maintenance and cleaning required.
	Sand Filtration	83.3	Two pumps for backwashing and all pumps in good working condition. Only one blower installed no standby/backup.
7	**Disinfection**		
	Clear water well	100.0	Final water samples are taken at a final tap and analysed for free chlorine; analysis records demonstrated onsite.
8	**High lift pump station**	100.0	The high lift pumpstations were in good condition. The latest (and biggest) pumpstation was commissioned in 2022 and is very impressive.
9	**Sludge treatment**		
	Thickening in sludge dams	0.0	Sludge dams not maintained, sludge thickening dams with overgrown weeds and not being operated.
10	**Bulk pipeline from plant to command reservoir**	75.0	There was no evidence of cathodic protection or maintenance done.
11	**Command reservoir**	25.0	The command reservoir is inside premises, telemetry not working and no flow measurements from command reservoir to distribution.
	Total	**49%**	

High risk areas OR Key Hardware Risks/ Defects

1. Chlorine, PAC, poly, and lime dosing pumps/units to be addressed and prioritised for effective system functionality.
2. Safety signs not sufficient around the works.
3. Sludge dams are not accessible due to overgrown vegetation.

VROOM Refurbishment Cost Estimate

Civil Works	R2,169,200	60%
Mechanical Works	R1,301,300	36%
Electrical Works (Incl. C&I)	R145,200	4%
Total VROOM Cost	**R3,615,700**	**100%**
R million / MLD		**0.72**

Regulatory Impression

Durnacol Water Treatment Works is a well-built package plant. However, there are some areas that needs attention on the housekeeping, equipment, maintenance and operations side and other administrative requirements. No directives have been issued by the regulator. Water quality is monitored according to SANS 241 and is of high quality. Consumers may use the water with high level of confidence.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical but only just. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	97.59%
Chemical Compliance	96.80%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

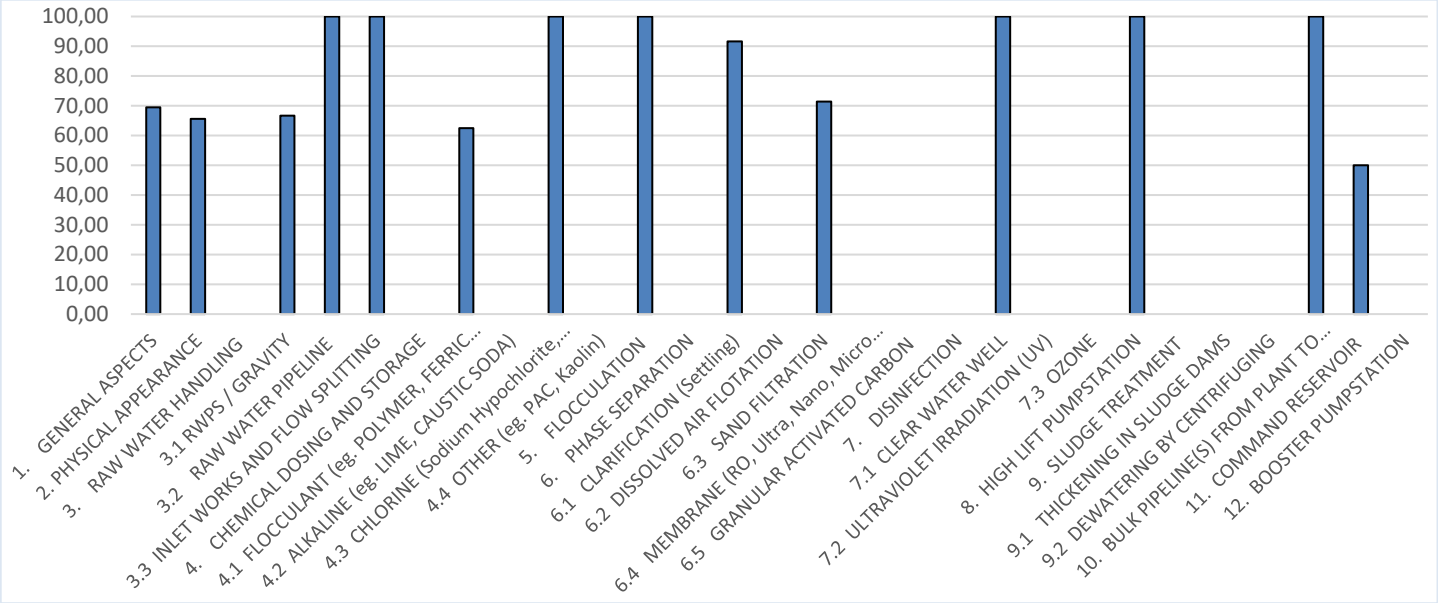
8.2 eThekwini Metropolitan Municipality

The Kloof water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

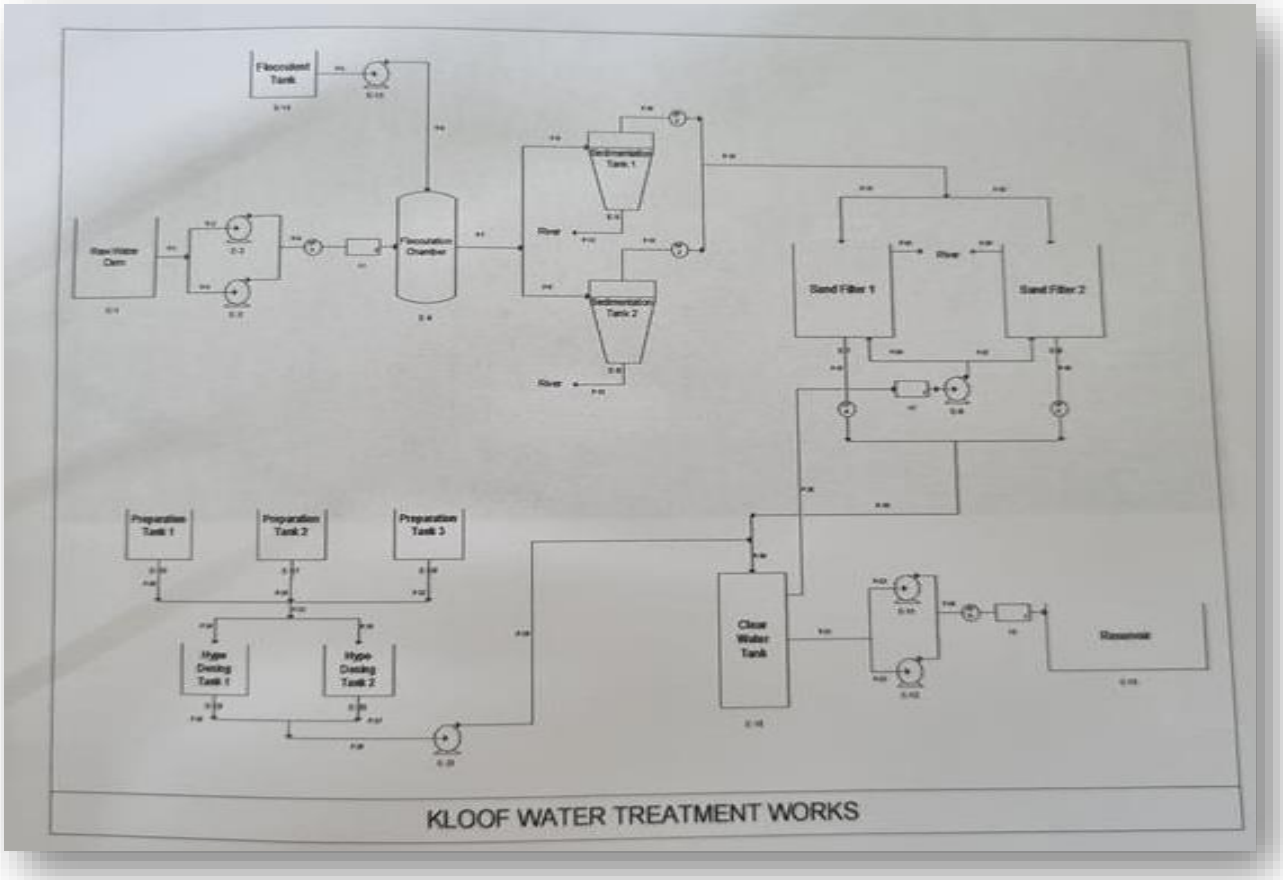
Kloof TSA Score: 79%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	69.4	Class C plant, logbooks in place, no PFD displayed, and O&M manuals are not complete.
2	**Physical appearance of plant**	59.4	Fenced and signposted. Infrastructure is showing its age. Safety signage is generally missing.
3	**Raw water handling**		Raw water is abstracted from the Kranskloof Dam via high-lift pumps. One pump is removed for repair which is a risk as there is only one duty pump available at the time of the audit. Raw water pipeline and inlet infrastructure are functional with sufficient mixing.
	Raw water pumpstation / gravity feed	66.7	
	Raw water pipeline	100.0	
	Inlet works	100.0	
4	**Chemical dosing and storage**		Sufficient flocculant storage (6 months), but no bunding. Duty and standby dosing equipment functional.
	Flocculant	70.8	
	Chlorine	100.0	Disinfection is through onsite sodium hypochlorite generation by means of electrolysis of salt. This is an excellent technology for this site and there are no raw material shortages.
5	**Flocculation**	100.0	The flocculation channel may be too small, and the concrete is ageing.
6	**Phase Separation**		
	Clarification (settling)	91.7	Water from clarifiers was very clear. Desludging occurs once a week. The concrete is corroded but there is no sign of growth on the surface.
	Sand Filtration	81.2	Filters are backwashed daily using a feed line from high-lift pumps. Only one blower is operational.
7	**Disinfection**		Contact time is estimated at 45 minutes.
	Clear water well	100.0	
8	**High Lift Pumpstation**	100.0	Both duty and standby pumps are in operation.
10	**Bulk pipeline from plant to command reservoir**	75.0	The main pipeline to the command reservoir had reported no breakages. However, it does not have cathodic protection.
11	**Command reservoir**	62.5	Fenced and gated with 24-hour security, telemetry fitted and reporting to head office. Manholes are not locked and could allow ingress if the roof is flooded. There are no visible leaks.
	Total	**79%**	

High risk areas OR Key Hardware Risks/ Defects

1. Raw water pumps need an overhaul, and the one pump needs to be re-installed.
2. An additional filter blower is required as currently there is no standby.
3. Concrete on the clarifier is badly corroded.
4. Most of the civil and building infrastructure is in need to a major refurbishment.
5. The road on the site needs to be repaired and resurfaced.

VROOM Refurbishment Cost Estimate

Civil Works	R3,881,900	40%
Mechanical Works	R5,075,400	52%
Electrical Works (Incl C&I)	R851,400	9%
Total VROOM Cost	**R9,808,700**	**100%**
R million / MLD		**1.96**

Regulatory Impression

The Kloof water system is in good functional condition although the infrastructure is showing signs of ageing. The staff are competent staff and well supported. Water quality is monitored according to SANS 241 and is of high quality. Consumers may use the water with a high level of confidence. No Directives have been issued by the Regulator. A Water Safety Plan is in place. The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	99.77%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

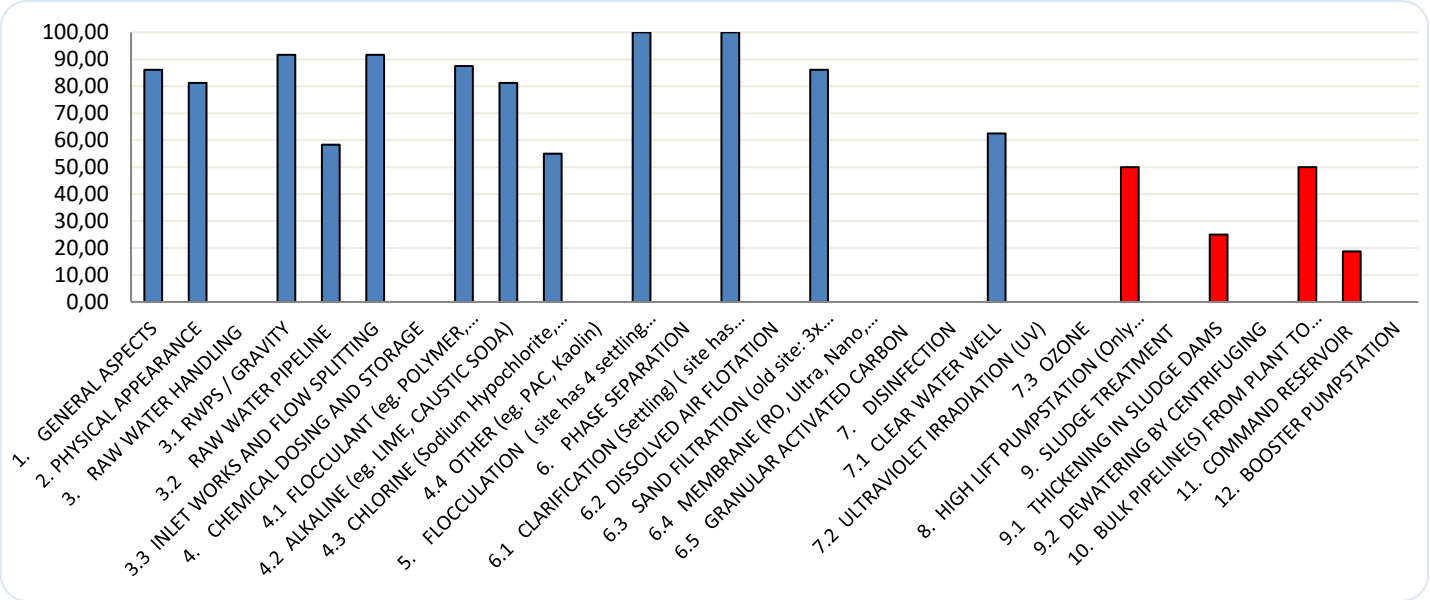
8.3 Harry Gwala District Municipality

The Kokstad water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

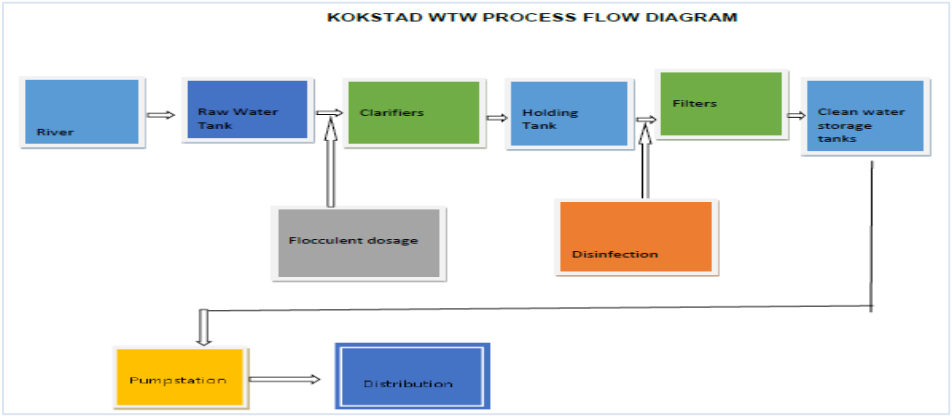
Kokstad WTP TSA Score: 73%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	86.1	Class C plant, logbooks in place. IMP in place with contact numbers of staff. Electrical meter area needs cleaning and generator needs major servicing or replacement due to frequent breakages
2	**Physical appearance of plant**	81.2	Fenced, neat terrain, good housekeeping, high workplace satisfaction in the new building sections, except for resident staff's kitchen (ill-used). Civil refurbishment of the old plant buildings etc is required and may need substantial work, ito ceilings, plaster work, tiles, sealing and painting.
3	**Raw water handling**		
	Raw water pumpstation / gravity feed	91.6	2 sources: Mzintlava PS, major refurbishment being completed. Will need replace current small generator with adequately sized generator. Flow meter is on site but not yet installed, part of existing refurb contract. Flow meter is on site but not yet installed, part of existing refurb contract. Crystal Springs Dam gravity feed (mainly winter or dry season source)
	Raw water pipeline	58.3	Rising main Galv Steel, and Gravity main AC (will need replacing). Pipe conditions fair. Each pipe line has its own flow meter, flows are not recorded or captured on logbook, recommend reinstating non-functioning SCADA
	Inlet works	91.6	HoW and dosing in same building. Even flow splitting and effective flash mixing observed. Basic & preventative mech maintenance required on pipe and valves, likewise for civil maintenance on doors, outside roof.
4	**Chemical dosing and storage**		
	Flocculant	87.5	Duty and standby pump set in good condition, Area partially bunded. Dosage / room need some civil maintenance (, day tank standing on wooden pallet, rusting pipe work needs attention)
	Alkaline (Lime)	81.2	Two dry lime dosing units installed (1 duty & 1 standby) needs some preventative maintenance. Bag area dry, raised off floor. Area wet and little bit lime spillages on the floor. Sufficient storage for 30 days and lime is not daily in use.
	Chlorine	55.0	1 chlorinator, New section's Chlorine dosing installation must be completed, still waiting for appointment of service provider. Old Emergency wash area (shower) not well maintained, new emergency shower excellent condition.
5	**Flocculation**	100.0	Floc Blanket Pulsators - Less flocs were visible (some very small floc/ turbidity), but mostly settled at bottom. Good condition of flocculation units as no scum were not accumulating, normal settlement on walls.
6	**Phase Separation**		
	Clarification (settling)	100.0	4 Settling tanks, Limited Floc/scum carry over only where weir needs adjusting (raising). Civil - Condition - basins starting to show age, some remedial concrete work required (cracked sections); no visible leaks, safety barriers good to fair condition; Visual WQ looks excellent in launders
	Sand Filtration	86.1	Old site: 3x Rapid gravity filters & new site: 3x Rapid gravity filters. Backwash pumps and air blowers in good condition. Even overflow at outlet boxes, media, and filter galleries in good condition. Old building boxes need cleaning and some preventative maintenance.
7	**Disinfection**		Inline chlorine gas dosing (>30 min contact time). Chlorine final dosing is currently located at old filter building, where the 2 treatment streams combine. Chlorine is tested at the outlet to reservoir and recorded in the site logbook. Critical to get new building's Chlorine dosing section also operational
	Clear water well	62.5	
8	**High lift pump stations**	50.0	Only high lift PS is the Raw water pump Station and flow measurement installation needs to be completed.
9	**Sludge treatment**		There is no sludge dam, clarifier desludging takes place to water course. Backwash water desludging takes place to backwash recovery lagoon (earthen dam – needs cleaning). The supernatant is recycled and pumped back HoW. Need to establish a Sludge Pond to effectively manage and compliantly dispose of the clarifier sludge, also need to provide adequate back-up pump for the recycled supernatant to HoW.
	Thickening in sludge dams	25.0	
10	**Bulk pipeline from plant to command reservoir**	50.0	Distribution and reticulation pipes are galv steel, AC & PVC, mostly AC. Many leaks experienced on Galv Steel and AC line. Recommend replacing Galv Steel and AC with PVC where possible.
11	**Command reservoirs**	18.7	Gated (secure) and sign posted. Site has Reservoir, pump room, security room. Substantial theft of palisade fencing by community leading to community having full access to premises (major risk). Poor ground keeping and telemetry and flow meter not functional. Reservoir structure in fair condition, but drainage / scouring problematic.
	Total	**73%**	

High risk areas OR Key Hardware Risks/ Defects

1. No metering at command reservoir and no telemetry.
2. Chlorination needs to be resolved.
3. More effective preventative and remedial maintenance (Civil & Mechanical).
4. No backwash monitoring (backwash is manually managed) and no sludge management.
5. Commend Reservoir site - Need to prevent community theft of palisade fencing and access to reservoir.

VROOM Refurbishment Cost Estimate

Civil Works	R6,741,900	63%
Mechanical Works	R2,930,400	27%
Electrical Works (Incl C&I)	R1,073,600	10%
Total VROOM Cost	**R10,745,900**	**100%**
R million / MLD		**0.60**

Regulatory Impression

The Kokstad WTP water system has effective functional treatment processes, however more effective disinfection management, sludge disposal management, functional flow metering, flow recordkeeping, from a distribution perspective, is required. The WSA also needs to ensure that staffing of PC is as per regulatory requirements. More attention ito preventative maintenance, specifically civil & mech on old building is recommended. Of concern is the disuse of the telemetry system and the WSA is urged to review their need for effective telemetry. At a DM level, there appears to be a disconnect between the various management areas, specifically ito of finances and operations as they relate to the WSA function. The finance dept and O&M dept do not inform each other during budgeting and financial reporting. Recommend that the System O&M Budget are also expressed in R/m^3. It is also recommended that the WSA determine cost reflective water tariffs which must be done in consultation with Finance and O&M depts, reviewed and implemented annually. Critical attention needs to be given to ensure adequate and correct WQ compliance data submission (specifically ito disinfection) is correctly uploaded onto IRIS. Other areas needing more attention and support are microbiological WQ compliance and operational WQ monitoring. No Directives have been issued by the Regulator. A Water Safety Plans and Process Audits are in place but require more financial support in implementing the recommendations such as using compliance results to optimize treatment works process etc. No WCDM Plan/Strategy no water balance reporting in place, this hinders the WSA from identifying areas where there are water losses and reducing non-revenue water.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	98.88%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



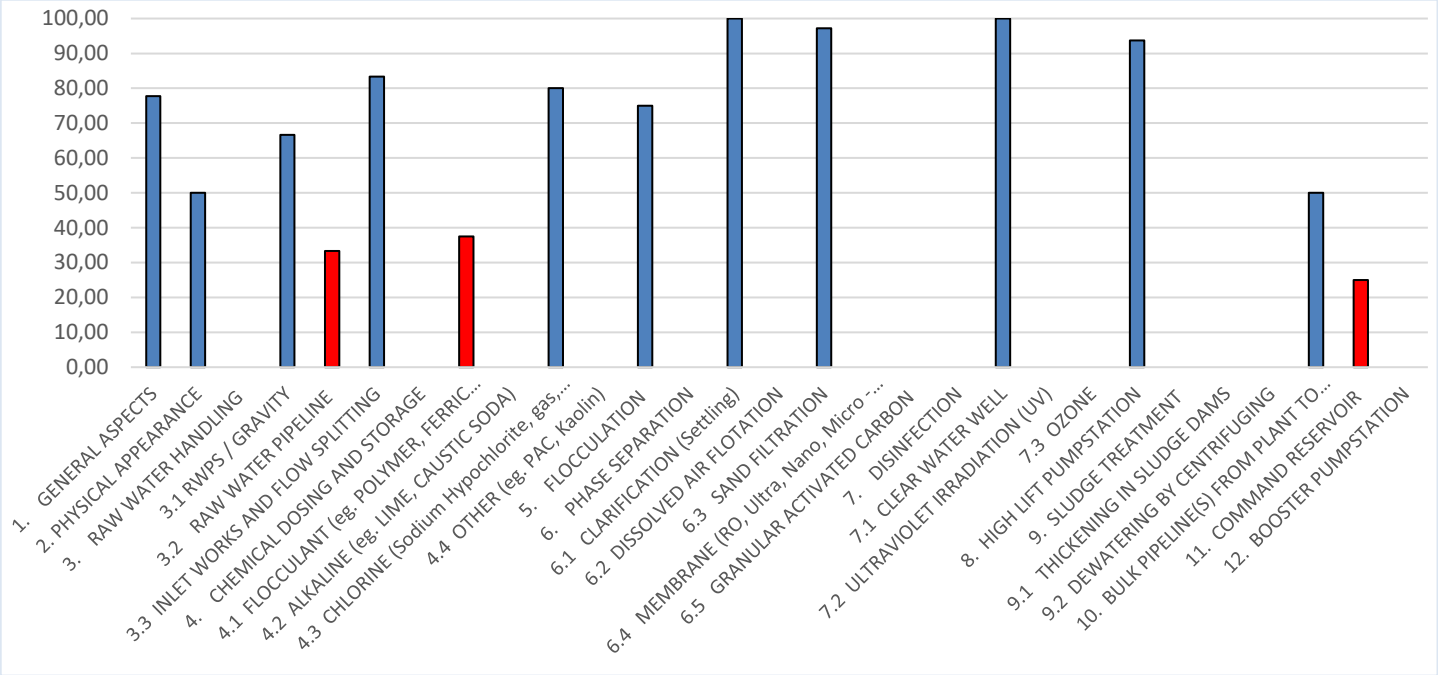

8.4 iLembe District Municipality

The Sundumbili water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

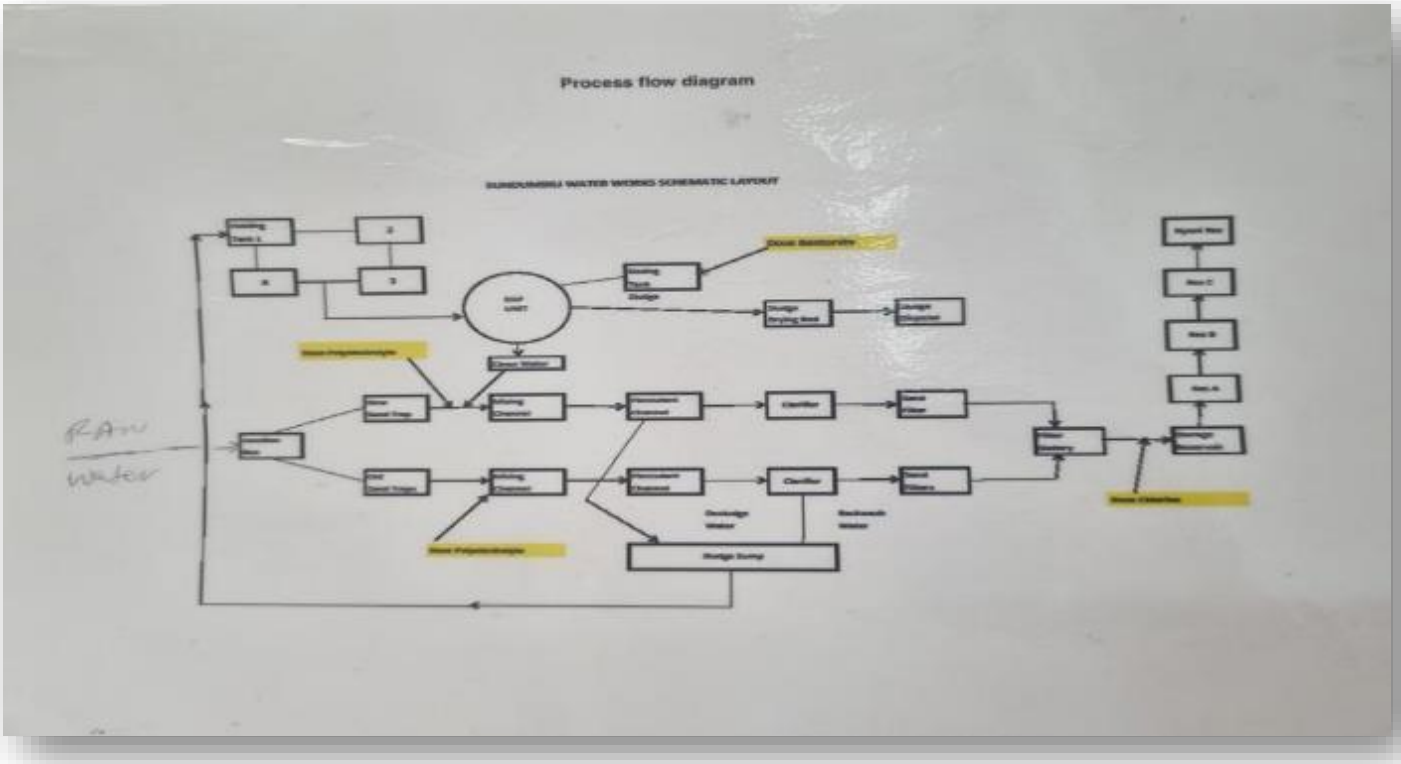
Sundumbili TSA Score: 68%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	77.7	Class A plant. The 2018 certificate is displayed. All logbooks, maintenance schedules, IMP, PFD, and monitoring equipment plus calibration is in place. The original O&M manuals are on site but need to be updated.
2	**Physical appearance of plant**	43.7	The entrance is clearly marked with a sign. The garden and terrain are not well kept, and the buildings and roads is also in a state of disrepair, with many water leaks around the site. The bathroom facilities are not in a good state. The safety rails on the tower walkway are missing.
3	**Raw water handling**		There are no screens at the pump station, but debris hasn't caused any pump failures because the draw-off level can be adjusted. Two out of three pumps are functioning. When this pump is operational, there is a 50% standby capacity. The main supply flow meter is not operational, but the supply pipeline is in good condition. Flow splitting is not taking place evenly as there is too much turbulence at the splitter box causing an overflow.
	Raw water pumpstation / gravity feed	33.3	
	Raw water pipeline	33.3	
	Inlet works	83.3	
4	**Chemical dosing and storage**		The one installed flocculant dosing pump is operational and there is no standby. There is no bunding of the storage tanks and flocculant storage is not sufficient in summer when the raw turbidity is high.
	Flocculant	37.5	
	Chlorine	80.0	There is only one operational gas chlorine dosing unit. There is more than 30 days storage of gaseous chlorine on site. The scale is working, and the gas weight is displayed via Bluetooth to the PCs tablets.
5	**Flocculation**	75.0	Flash mixing is sufficient and floc formation was evident at the end of the flocculation channels.
6	**Phase Separation**		
	Clarification (settling)	91.6	Clarification appears to be effective and desludging schedules are adequate. Structure and weirs are in a good condition.
	Sand Filtration	97.2	All backwash pumps and blowers are operational and there is sufficient standby. Backwash aeration is even across the beds and backwash frequencies are adequate.
7	**Disinfection**		There is approximately 45 minutes of contact time on site.
	Clear water well	100.0	
8	**High Lift Pumpstation**	93.7	There are 2 duty and one standby high lift pump in operation. Flow measurement is operational.
10	**Bulk pipeline from plant to command reservoir**	87.5	No leaks were reported, and the valve chamber inspected was in adequate condition.
11	**Command reservoir**	25.0	There is poor security at the command reservoir, and the telemetry and flow meter to the next reservoir is not working. Some seepage leaks can be seen on the reservoir structure.
	Total	**68%**	

High risk areas OR Key Hardware Risks/ Defects

1. General building refurbishment.
2. Replacement of the raw water standby pump.
3. New chlorine doser.
4. New polyelectrolyte dosing pump.
5. Modification to splitter box to prevent leakage.

VROOM Refurbishment Cost Estimate

Civil Works	R9,386,300	30%
Mechanical Works	R7,365,600	24%
Electrical Works (Incl C&I)	R14,052,500	46%
Total VROOM Cost	**R30,804,400**	**100%**
R million / MLD		**0.77**

Regulatory Impression

The Sundumbili water system is in a functional condition although the civil infrastructure and buildings require refurbishment. The staff are competent and well supported. Water quality is mostly monitored according to SANS 241 although micro and chemical monitoring could improve. The microbiological compliance should be improved with better disinfection control. Consumers may use the water with a limited level of confidence. A Water Safety Plan is in place. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	88.05%
Chemical Compliance	91.67%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



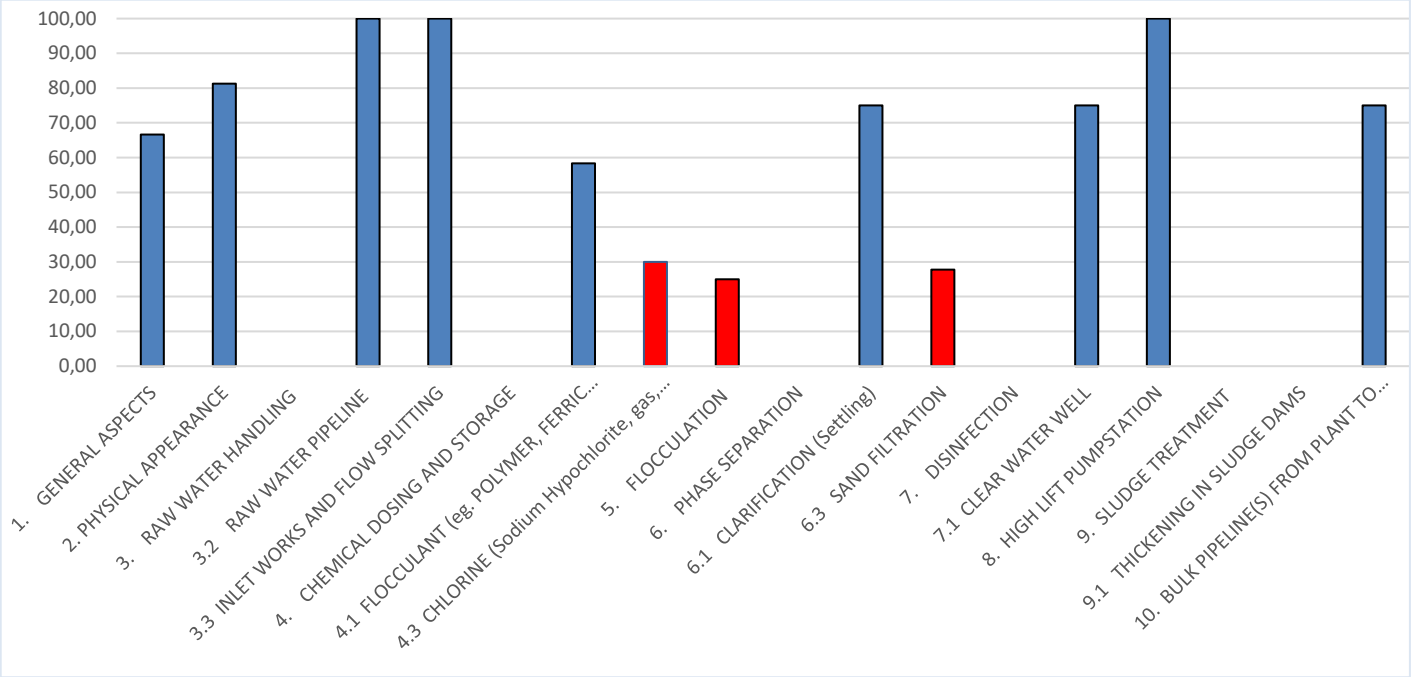

8.5 King Cetshwayo District Municipality

The Greater Mthonjaneni water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

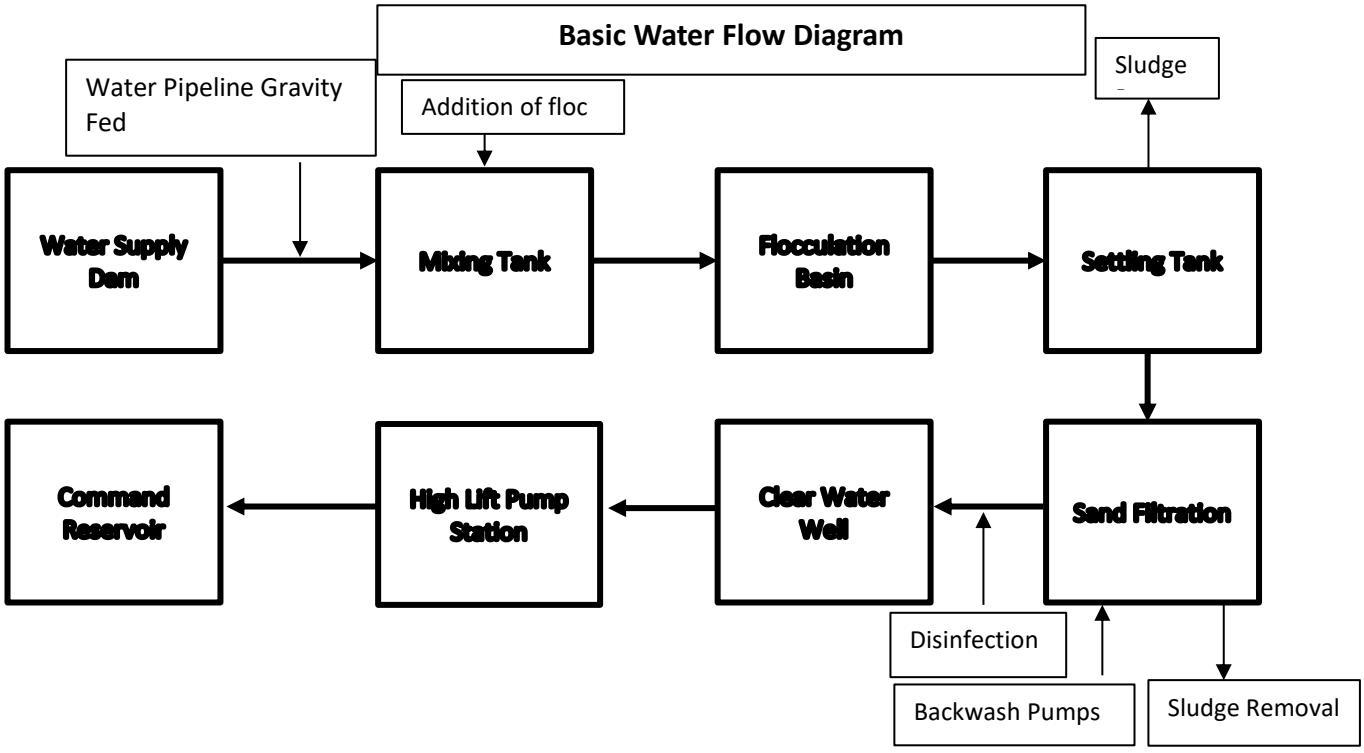
Greater Mthonjaneni TSA Score: 61%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	66.6	Class B plant, logbooks in place, SOP manuals are available for each of the process units. However, there is no maintenance manual. There was no process flow diagram at the WTW (provisional PDF has been created for this report).
2	**Physical appearance of plant**	81.2	The entrance is sign posted. Facility is fenced and access at entry points is controlled by security personnel. Sufficient safety signs are visible at all relevant areas on the plant. The housekeeping in the chlorine area was poor.
3	**Raw water handling**		Raw water pipeline is a gravity feed from the dam. Where the pipe was visible it appeared in good condition. Flow rates recorded every 2 hours in operational monitoring logbook. Flash mixing taking place at dosing point due to high turbulence.
	Raw water pumpstation / gravity feed	na	
	Raw water pipeline	100.0	
	Inlet works	100.0	
4	**Chemical dosing and storage**		The works has only two operating dosing pumps - one duty and one standby. The alternate dosing system (presumably pH) was not operational, and the pumps had been removed. The dosing area is neat. However, spills cannot be contained since the area is not bunded.
	Flocculant	58.3	
	Alkaline (Lime)	na	
	Chlorine	30.0	Works has two chlorine booster dosing pumps that were both not operational during the audit due to a faulty electric panel. Two chlorine booster pumps installed but also not operational - 1 duty and 1 standby. Dosing currently done manually using sodium hypochlorite due to non-functional chlorine gas system. Although the works is not old - a lot of housekeeping and general fixing is required at the chlorine dosing area. There was a serious water leak at the motive water pumps and rust on the rollers and scales. The electrical panel and control system was not working.
	Other (e.g., pac, kaolin)	n/a	
5	**Flocculation**	25.0	Seven out of the eight flash floc stirrers were non-operational. due to the faulty bridge that connects them. All mechanical and electrical components need to be attended to and the flocculation system should be brought back into correct operation.
6	**Phase separation**		
	Clarification (settling)	75.0	There were very few flocs that carried over into the clarifier. Only one of the two clarifiers was functional. De-sludging is done once a day due to low raw water turbidity. The v-notch weirs were in good condition and there was even overflow along the peripheries of both clarifiers.
	Sand Filtration	27.8	Three backwash pumps but one was non-operational. There is only one air blower, but it was not working due to a control system failure. There are 5 filters but only 3 were operational. The backwashing process at the works is not automated and must be performed manually. However, the personnel at the plant are not capable of carrying out the process manually. The plant is not old, so it is in good civil condition. However, the Mechanical and Electrical equipment has not been looked after well and needs maintenance and attention.
7	**Disinfection**		
	Clear water well	75.0	Due to the non-functional chlorine dosing pumps, sodium hypochlorite is used for disinfection. Final water samples are taken at a final tap and analysed for free chlorine.
8	**High lift pump station**	100.0	The works has three high lift pumpstations that pump water to different areas. They were all observed to be in a fair condition. The new high lift pumpstation was only commissioned in 2022 and was very impressive.
9	**Sludge treatment**		
	Thickening in sludge dams	0.0	The dams were not being emptied or maintained. Thickening sludge overgrown.
10	**Bulk pipeline from plant to command reservoir**	75.0	The pipe to the command reservoir appeared in good condition. There was no evidence of cathodic protection or maintenance done. Flow metering was happening, and chamber was clean.
		61%	

High risk areas OR Key Hardware Risks/ Defects

1. Chlorine dosing to be fixed.
2. Backwashing system is not working adequately.
3. Seven out of the eight flash floc stirrers were non-operational.
4. Two chlorine booster dosing pumps that were both not operational during the audit due to a faulty electric panel.

VROOM Refurbishment Cost Estimate

Civil Works	R1,762,200	13%
Mechanical Works	R5,830,000	43%
Electrical Works (Incl. C&I)	R5,834,400	43%
Total VROOM Cost	**R13,426,600**	**100%**
R million / MLD		**0.67**

Regulatory Impression

Greater Mthonjaneni WTW is a well-designed conventional treatment plant with necessary equipment on site and capable process controllers. However, there are several unit processes that are not functioning as required. The treatment works requires more operations and maintenance attention. Impressively though is that the water quality produced by the treatment works meets the SANS 241 standards. To maintain this quality operations and maintenance needs to be addressed as soon as possible. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	90.74%
Chemical Compliance	92.78%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

8.6 Msunduzi Local Municipality

There is no TSA as there is no WTW situated in this municipality treating water. They receive 100% of their water as bulk from the Umgeni Water WTW situated in Midmar in the uMgungundlovu DM.

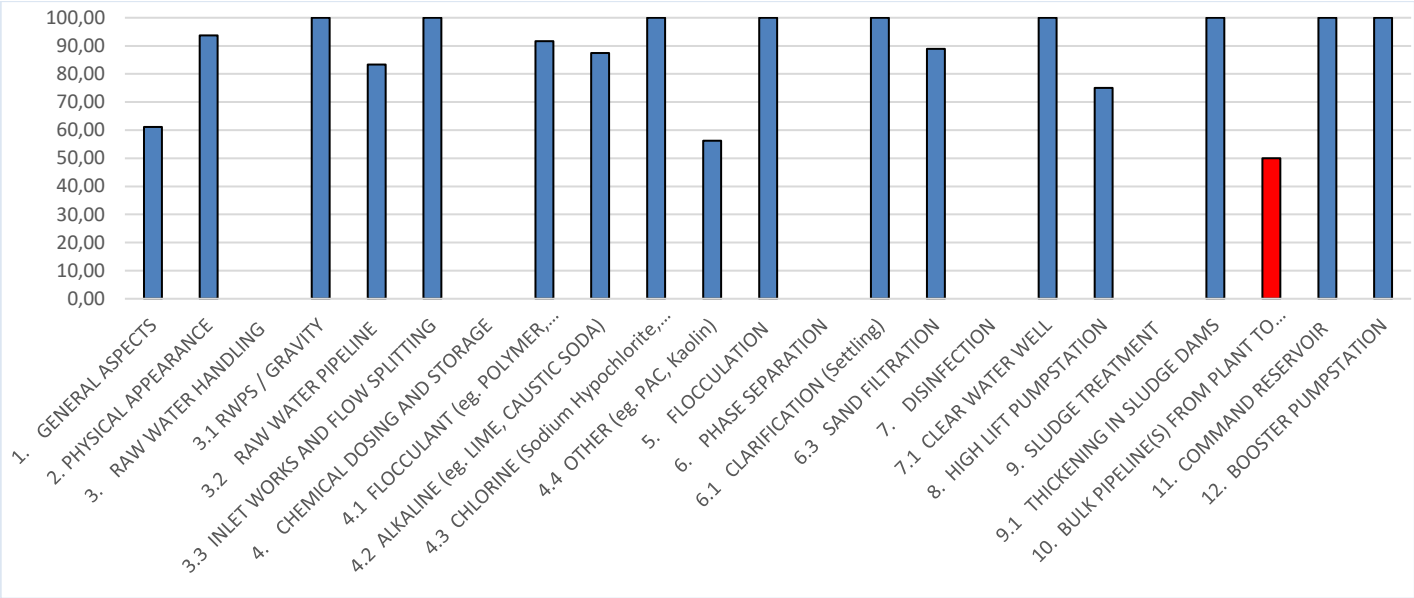
8.7 Newcastle Local Municipality

The Ngagane water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

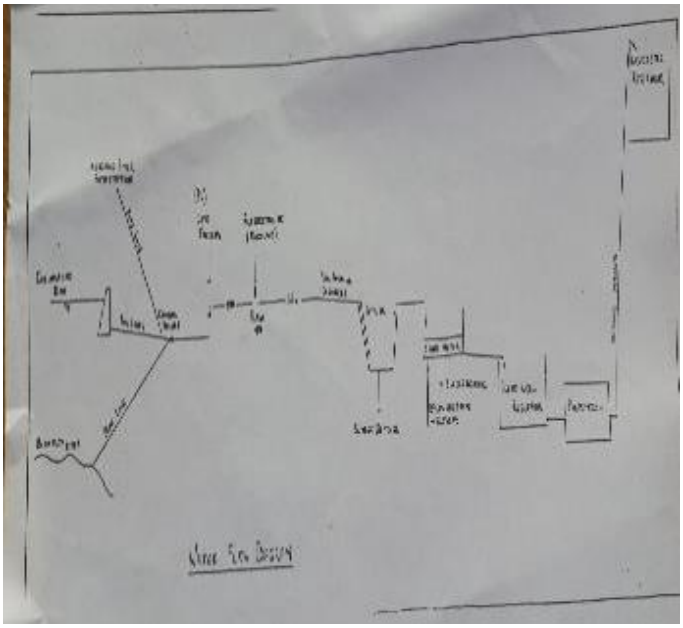
Ngagane TSA Score: 87%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	61.1	Class A plant, logbooks in place, SOP manuals are available for each of the process units. Logbooks in place and updated. Excellent demonstration of daily shift entries clearly indicated on site.
2	**Physical appearance of plant**	93.7	Garden needs to be attended to and general weeding and upkeep required. Sufficient safety signs are visible at all relevant areas on the plant.
3	**Raw water handling**		Three pumps have been installed at the Ngagane river pump station. One of the pumps had been dismantled for maintenance while the other two were in good working condition. Cathodic protection of raw water line available. Inlet works in good functional condition.
	Raw water pumpstation / gravity feed	100.0	
	Raw water pipeline	83.3	
	Inlet works	100.0	
4	**Chemical dosing and storage**		Each module has two dosing pumps, one standby and one duty dosing pump. The dosing area was found to be in a good condition, clean and without spillage.
	Flocculant	91.6	
	Alkaline (Lime)	87.5	There are two lime feeders that were in good working condition. Both dosing units were in use but only one feeder available. There was adequate stock to last 30 days operations.
	Chlorine	100.0	Rotameters all observed to be in good condition and working. The works uses chlorine gas with enough stock to last up to 30 days at any given time.
	Other (e.g., pac, kaolin)	56.2	A proper PAC dosing system should be considered as there is none available currently.
5	**Flocculation**	100.0	There are three modules with zig zag flocculation channels where flocs were observed. All of the flocculation units were observed to be in good working condition.
6	**Phase separation**		
	Clarification (settling)	100.0	The plan has 3 modules with a total of 28 clarifiers. There was limited floc carryover at the clarifiers at module 1 and 3. The static clarifiers at module 2 were observed to have a lot of flocs which had accumulated at the units, but these are designed to be periodically desludged. No carry-over of floc over the weirs. Desludging of the clarifiers is done once/day at module 2 (and full emptying monthly) and twice/day at module 1 and 3.
	Sand Filtration	88.8	The backwash pumps are installed, and all in working condition. The non-operational blower needs to be either repaired or replaced. Two blowers available but only one was working.
7	**Disinfection**		
	Clear water well	100.0	Free chlorine measurements are taken using a sample from the WTW final tap.
8	**High lift pump station**	75.0	Eight pumps are installed but two are not working. Two pumps working and two standby - 100% standby. Normally but currently only 50%. Flow meter was seen to be operational - 360 l/s measured.
9	**Sludge treatment**		
	Thickening in sludge dams	100.0	Six sludge dams full of reeds. The sludge dams are cleaned and emptied once a year. No recycling of water.
10	**Bulk pipeline from plant to command reservoir**	50.0	The final water pipeline to the command reservoirs was not assessed. However, it was indicated that the bulk line to Hilldrop has cathodic protection, and the maintenance team does regular spot checks on all the bulk pipe network. Valve chambers were inspected and found to be in secure and safe condition. One valve chamber was flooded (rain/ground water ingress).
11	**Command reservoir**	100.0	The reservoirs were surrounded by a fence and a gated entrance. Telemetry at the command reservoirs is operational and can be observed from the operations room at the WTW. The reservoirs were observed to be leak free.
12	**Booster pumpstation**	100.0	100% standby with one pump normally in operation. In general, the pumpstation security is up to standard - fenced and locked. The pump station also has an alarm system.
	Total	**87%**	

High risk areas OR Key Hardware Risks/ Defects

1. Some housekeeping, grass cutting and weeding needed.
2. The high-lift pumps and blower in plant room to be repaired.
3. Poly storage tanks, pipework and valve chambers need maintenance.
4. A permanent PAC dosing system to be considered.
5. Handrails on filters and settlers are being attended to (maintenance orders being implemented).

VROOM Refurbishment Cost Estimate

Civil Works	R48,400	0.4%
Mechanical Works	R11,463,100	99.6%
Electrical Works (Incl C&I)	R0	0.0%
Total VROOM Cost	**R11,511,500**	**100%**
R million / MLD		**0.09**

Regulatory Impression

The Ngagane WTW site is impressively well managed and operated by experienced and dedicated process controllers. Water quality is monitored according to SANS 241 and is of high quality. Consumers may use the water with high level of confidence. No Directives have been issued by the Regulator. Administrative documents are well kept and updated accordingly which indicates a good practice by both management and process controllers.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	98.91%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

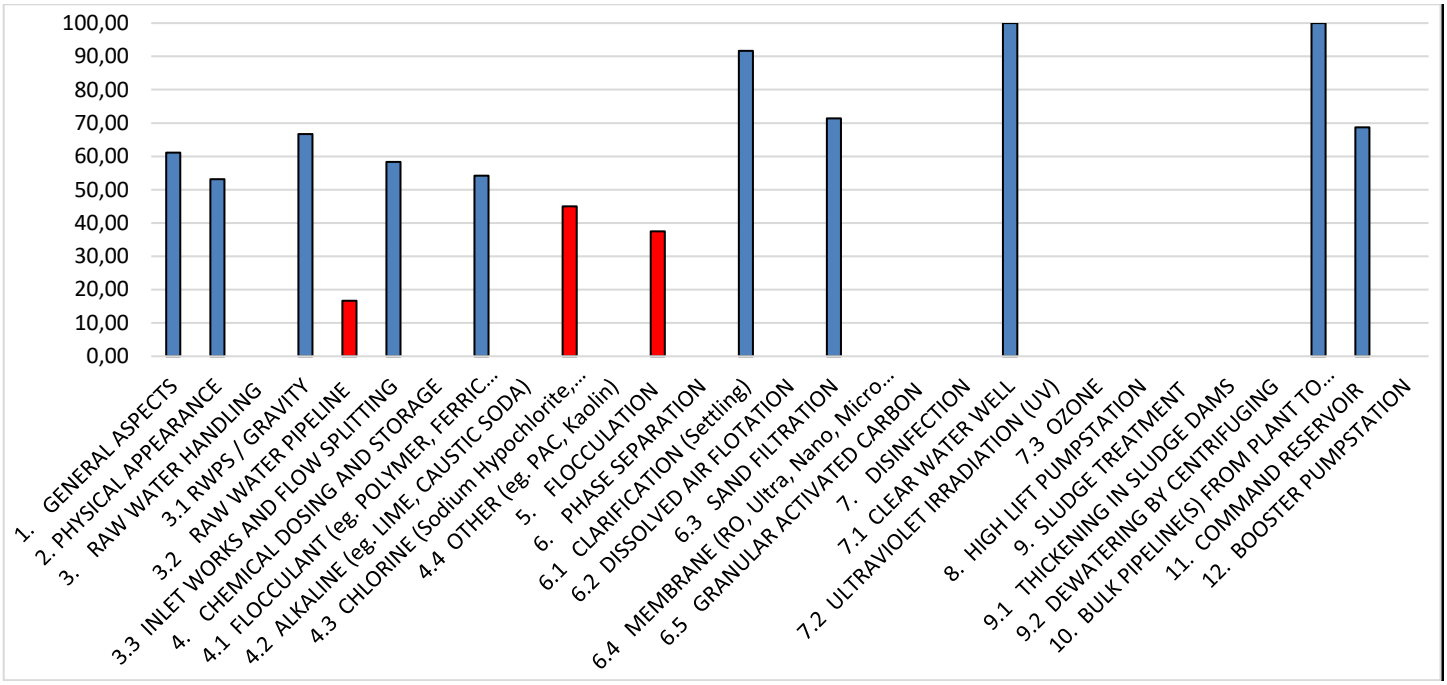
8.8 Ugu District Municipality

The Bhobhoyi water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

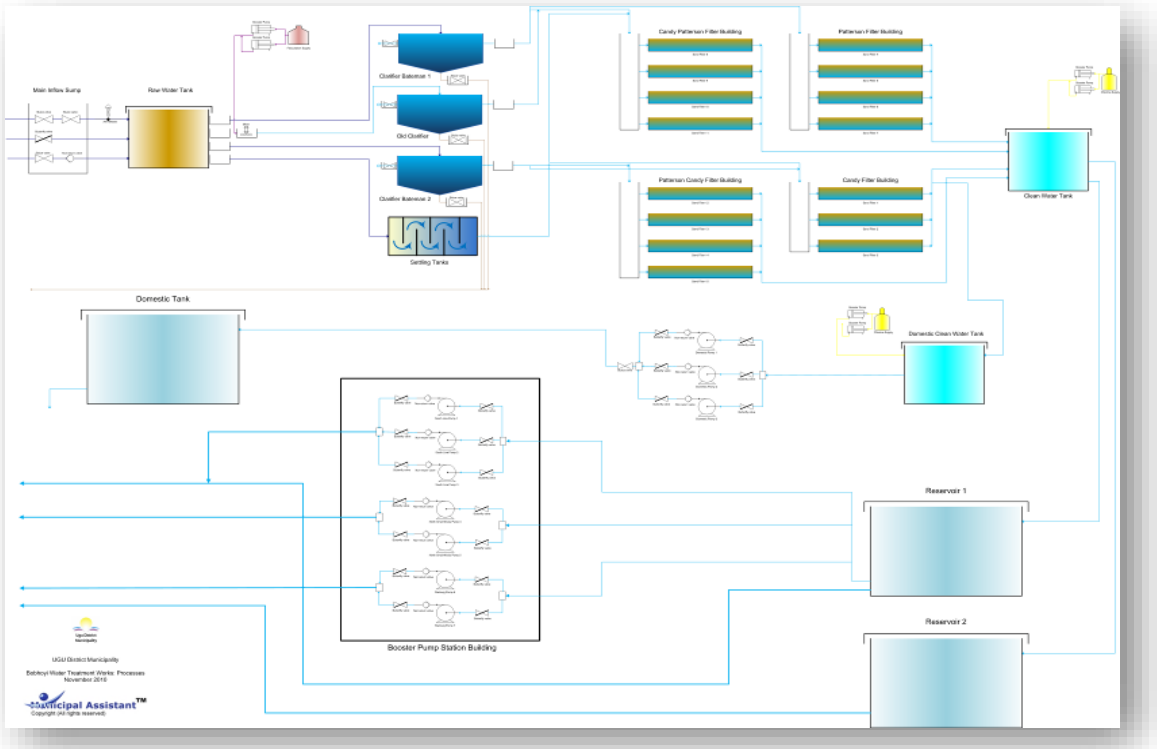
Bhobhoyi TSA Score: 60%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	61.1	Class B certificate is on display and the O&M manual is on site. Monitoring equipment is operational but there are no calibration records, PFD, or IMP.
2	**Physical appearance of plant**	53.1	Site is poorly signposted and entrance roads require repair. Site is generally in an untidy state and infrastructure is old and deteriorated. There is 24-hour security. Sufficient safety signs are visible at all relevant areas on the plan
3	**Raw water handling**		Inlet works is operating well, and screens are well maintained. The system requires 3 of the high lift pumps to deliver the required 108 Ml/d. With only 4 in operation, there is not sufficient standby capacity. The rising main is in a good condition, but the gravity section has many leaks. There is no flow meter on site.
	Raw water pumpstation / gravity feed	66.7	
	Raw water pipeline	16.6	
	Inlet works	58.3	
4	**Chemical dosing and storage**		The mechanical mixer requires refurbishment. One of the dosing pumps is not operating and there is thus insufficient standby. There is over 40 days of storage of flocculant. There is no emergency shower.
	Flocculant	54.1	
	Chlorine	45.0	Disinfection is by means of chlorine gas. One booster pump and one regulator are not working. The scale is not working, and cylinders are replaced when the pressure drops. There is more than 30 days of storage of gas on site.
5	**Flocculation**	37.5	Flocculation times are different for each module as the pipe lengths of different. This results in differing clarifier performance.
6	**Phase Separation**		
	Clarification (settling)	91.6	Flow splitting to each clarifier is not even and it is not possible to split to flow in proportion to the clarifier size. The de-sludging frequency varies seasonally and on water availability in the reservoir. There is algae growth on the weirs, but it is not affecting the flow distribution yet. Staff were observed cleaning the weirs.
	Sand Filtration	60.7	Backwash is done using a gravity fed high-level tank. There is sufficient pressure and volume to achieve fluidisation of the bed. Some air blowers are in urgent need of repair. The filter bed is not smooth, and some air nozzles are clogged. The walls are washed down during backwashing.
7	**Disinfection**		The contact time in the clear well is more than 1 hour and can be as much as 3 hours. Final sampling is undertaken from the pipe to the distribution network.
	Clear water well	100.0	
10	**Bulk pipeline from plant to command reservoir**	100.0	The command reservoir is on site. No bulk pipeline issues to report. Valves are operational.
11	**Command reservoir**	68.7	Telemetry is operational. The final flow is measured on each distribution line. There is no obvious location for a bulk meter on site. Some minor seepage was observed on the external reservoir walls.
	Total	**60%**	

High risk areas OR Key Hardware Risks/ Defects

1. General civil and building infrastructure requires refurbishment.
2. Some of the older blowers require replacement.
3. Standby chlorine dosing is required.
4. The standby poly dosing pumps need to be replaced.
5. The mechanical equipment on the clarifiers needs replacement.

VROOM Refurbishment Cost Estimate

Civil Works	R26,814,700	28%
Mechanical Works	R53,521,600	55%
Electrical Works (Incl C&I)	R16,241,500	17%
Total VROOM Cost	**R96,577,800**	**100%**
R million / MLD		**1.19**

Regulatory Impression

The Bhobhoyi water system is in a functional condition although the infrastructure is generally old and needs urgent refurbishment. The staff are competent but need infrastructure upgrades to perform their functions better. Water quality is monitored according to SANS 241 and is of adequate quality. Consumers may use the water with some confidence although chemical and aesthetic compliance is <90%. No Directives have been issued by the Regulator. A Water Safety Plan is in place but requires improvement.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	86.89%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



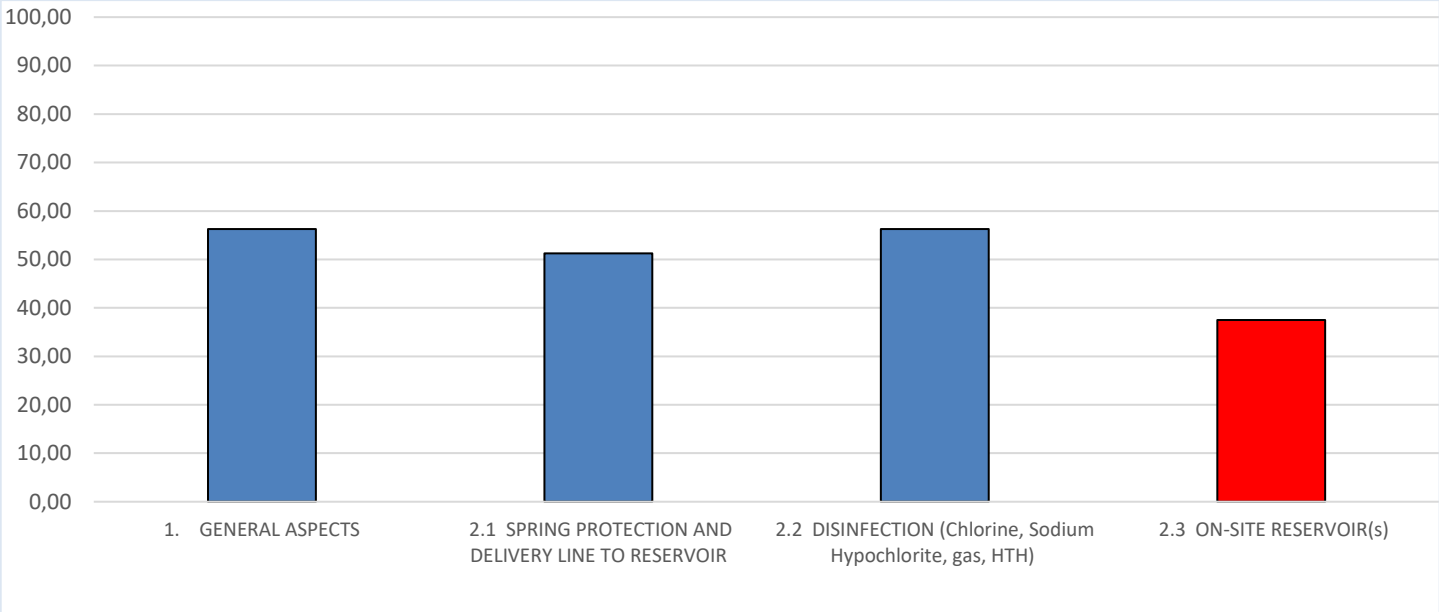

8.9 uMgungundlovu District Municipality

The Impendle Spring Protection water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

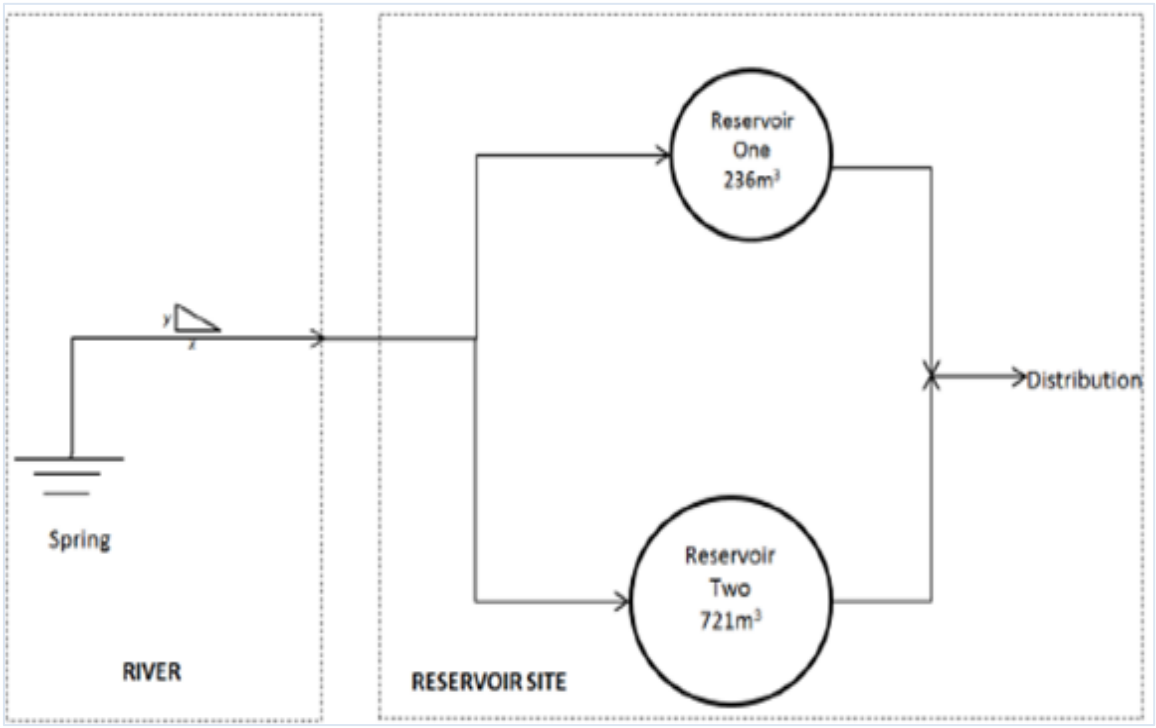
Impendle Spring Protection TSA Score: 50%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	56.2	No O&M Manual provided, but Logbook, Class of Works and PC Certificates and IMP with full contact details - Provided and kept in site bakkie with PC. Shared Container storage yard with full ablutions is fenced and secure. Containers need refurbishment. The walking route to the protection and actual spring protection box needs some form of safety railings and steps, specifically in wet weather
2	**Technical**		
2.1	Spring Protection and delivery line to reservoir	51.2	The system consists of galv steel pipes from the protection site to Reservoir site. Recommend protecting exposed pipe sections from damage by human and animal foot traffic. Inflow meter is required.
2.2	Disinfection	56.2	Old HoW vandalised. New HoW needed with effective dosing mechanism, also consider utilising a sodium hypochlorite dosing systems rather than HTH tablets for more manageable/ controlled dosing. Would also recommend PC training regarding dosing and dosing management
2.3	On-site reservoir	37.5	The Command Reservoirs and disinfection unit are within a fenced area, but the entrance gate is broken. (RES1 -oldest & not functional - in urgent need of refurbishment or replacement; RES2 also needs some refurbishment, mainly around valve chambers, valves, etc, (showing signs of damage due to vandalism and age). Bulk flow meters at reservoir outlets and reservoir level meters recommended. Telemetry (solar powered) could be advantageous.
	Total	**50%**	

High risk areas OR Key Hardware Risks/ Defects

1. Flow metering at inlet and outlets
2. New HoW & dosing system
3. Refurbish/ rebuild 2nd reservoir (smaller older reservoir) and repair gate.

VROOM Refurbishment Cost Estimate

Civil Works	R905,300	97%
Mechanical Works	R17,600	2%
Electrical Works (Incl C&I)	R8,800	1%
Total VROOM Cost	**R931,700**	**100%**
R million / MLD		**4.27**

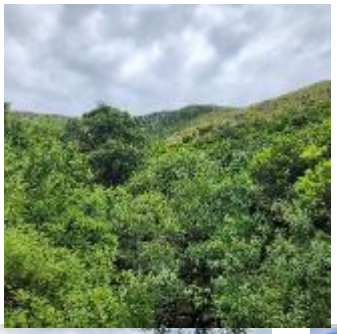
Regulatory Impression

The Impendle Spring Protection water system provides an excellent example of a cost-effective water solution with minimal treatment processes required. Critical attention needs to be given to ensure adequate and correct WQ compliance, specifically ito disinfection, managing turbidity and ensuring effective corrective action is taken timeously. Critical attention should also be given in improving the access route of the abstraction point as accessibility is a challenge for the PCs. The WSA also need to attend to the installation of flow meters at point of abstraction. Installation of reservoir level measuring apparatus to monitor the level of water inside the reservoir to inform the need for water shedding if required during periods of low flows from the spring. No Directives have been issued by the Regulator. A Water Safety Plan (2016) is in place but needs updating and effective timeous implementation. Record keeping should also be improved.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	97.96%
Chemical Compliance	94.24%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



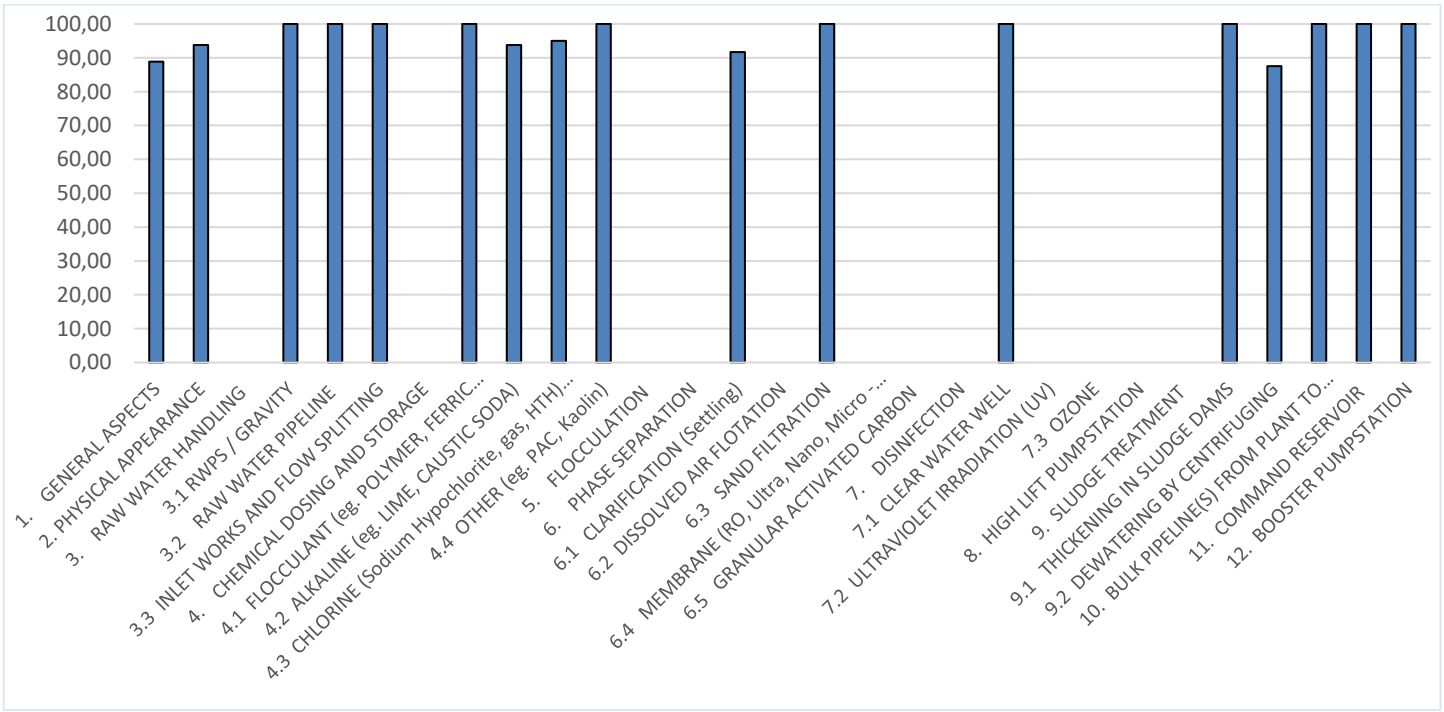


The Midmar water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

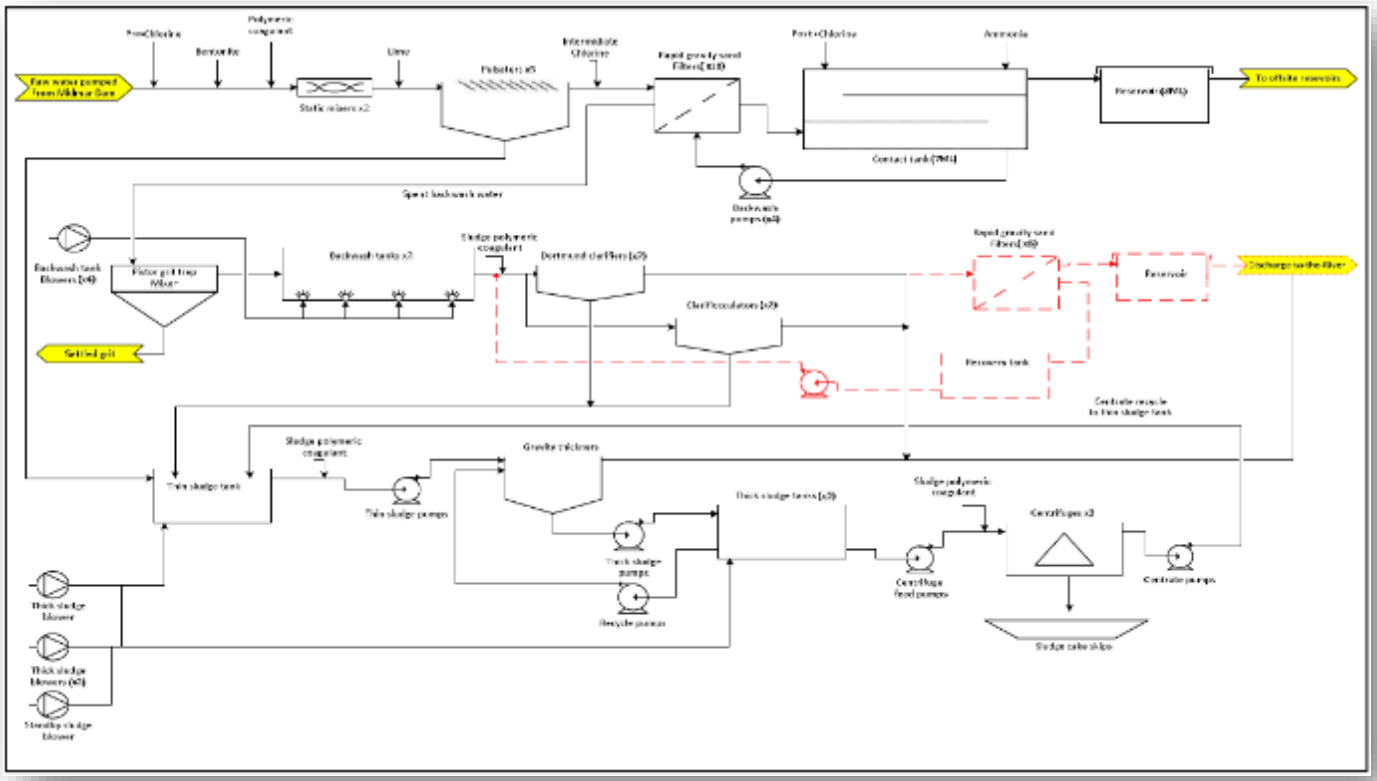
Midmar TSA Score: 95%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	88.8	Class A works. All logbooks, manuals, monitoring equipment and calibration certificates are in good order and available/displayed in the admin building. The only shortfall is the lack of monitoring of electricity usage.
2	**Physical appearance of plant**	93.7	The site is in a very well-kept state, and it is evident that the staff are proud to work on this site. Buildings, garden, security, and H&S is of a high standard. The safety shower needs repair.
3	**Raw water handling**		All the aspects of the raw water handling are in prime condition and well maintained. No faults of non-conformances could be noted. There is more than sufficient standby capacity and all monitoring equipment is in a good condition.
	Raw water pumpstation / gravity feed	100.0	
	Raw water pipeline	100.0	
	Inlet works	100.0	
4	**Chemical dosing and storage**		All duty and standby pumps are operational and there is more than 30 days of storage on site. Storage tanks are bunded. An emergency shower is missing.
	Flocculant	83.3	
	Alkaline	93.7	There are two duty and one standby lime hoppers, but one unit was in for a service at the time of the audit. The feeder area is tidy. Empty bags are arranged in an organized manner and good housekeeping is practised. A FIFO system is used, and bags are stored on pallets off the floor. There is more than 30 days of storage on site.
	Chlorine	95.0	There are 4 duty and 3 standby dosing units for gaseous chlorine. There are more than 30 days of storage on site and stock is well maintained. Safety equipment could not easily be accessed during the audit.
	Other (Bentonite)	100.0	Two duty and 2 standby dosing pumps are in place and operational. There are more than 30 days of storage, and the area is neat and well managed.
6	**Phase Separation**		
	Clarification (settling)	91.6	Clarifiers are in good condition and desludging is automated by the SCADA. The water at the discharge points is clear. A build-up of sediments and floc is partially obstructing the discharge openings.
	Sand Filtration	100.0	Two duty and two standby pumps are operational as are all three blowers. Backwashing showed even aeration and good bed maintenance. The backwashing frequency (automated) of 48 hours is adequate.
7	**Disinfection**		Three is more than 30 minutes of contact time in the clear well.
	Clear water well	100.0	
8	**High Lift Pumpstation**	100.0	All four high lift pumps (2 duty and 2 standby) are operational and in good condition.

Watch #	Process Unit Assessed	% TSA	Observations
9	**Sludge Treatment**		
	Thickening in sludge dams	100.0	Sludge treatment occurs through settlement and centrifuge thickening. Settling is adequate and the supernatant is discharged to the river.
	Dewatering by centrifuging	87.5	Three centrifuges are installed, but at the time of this audit, one had been out of commission for more than a month.
10	**Bulk pipeline from plant to command reservoir**	100.0	Cathodic protection is installed on the primary steel bulk line feeding the command reservoir. There were no known leaks. The valve chamber was found to be in good condition
11	**Command reservoir**	100.0	The command reservoirs are in excellent condition and are well maintained. Remote monitoring is working, and the system is well controlled. There is adequate security.
12	**Booster Pumpstation**	100.0	All booster pumps are operational and there is sufficient standby capacity. The building is secure.
	Total	**95%**	

High risk areas OR Key Hardware Risks/ Defects

1. A new centrifuge or alternative dewatering system is required.
2. Some minor civil refurbishments to keep infrastructure up to the current high standard.
3. Reinstatement and repair of the emergency showers.

VROOM Refurbishment Cost Estimate

Civil Works	R7,020,200	10%
Mechanical Works	R58,366,000	87%
Electrical Works (Incl C&I)	R1,771,000	3%
Total VROOM Cost	**R67,157,200**	**100%**
R million / MLD		**0.17**

Regulatory Impression

The Midmar water system is in excellent condition and is very well managed. The staff are competent and well supported. Water quality is monitored according to SANS 241 and is of high quality. Consumers may use the water with a high level of confidence. No Directives have been issued by the Regulator. A Water Safety Plan is in place.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	99.93%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

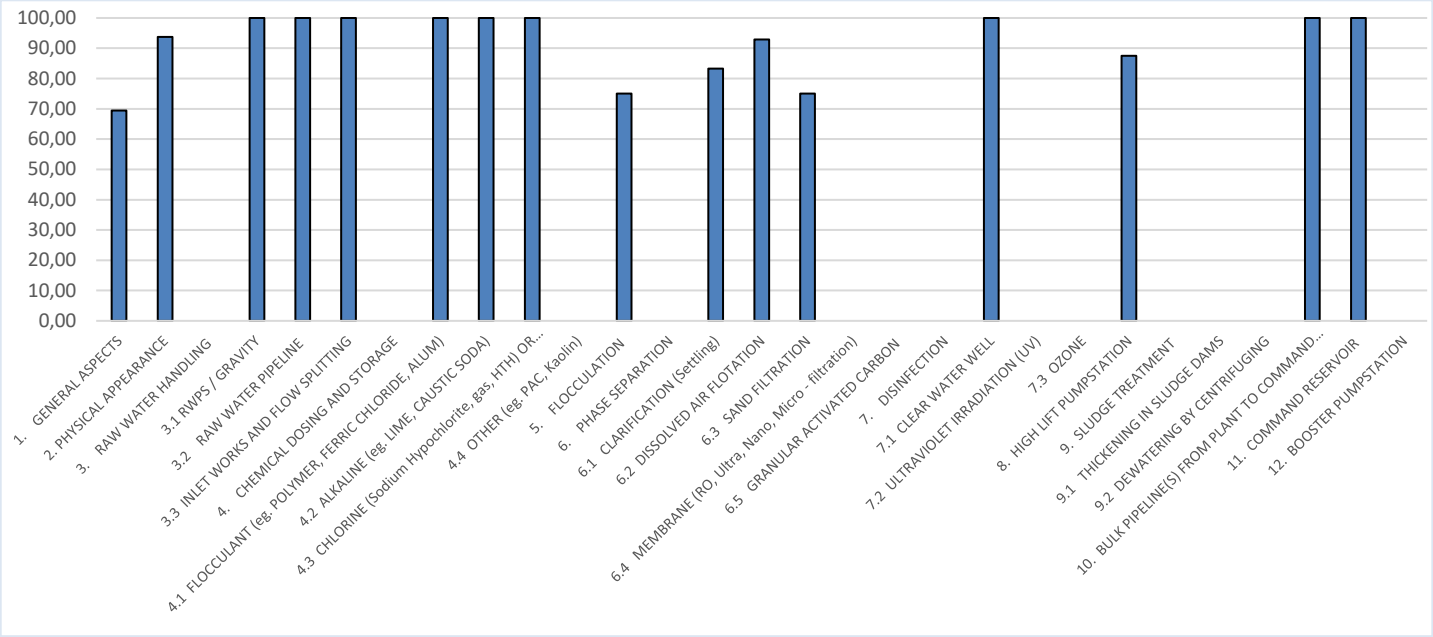
8.10 City of uMhlathuze Local Municipality

The Nsezi water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

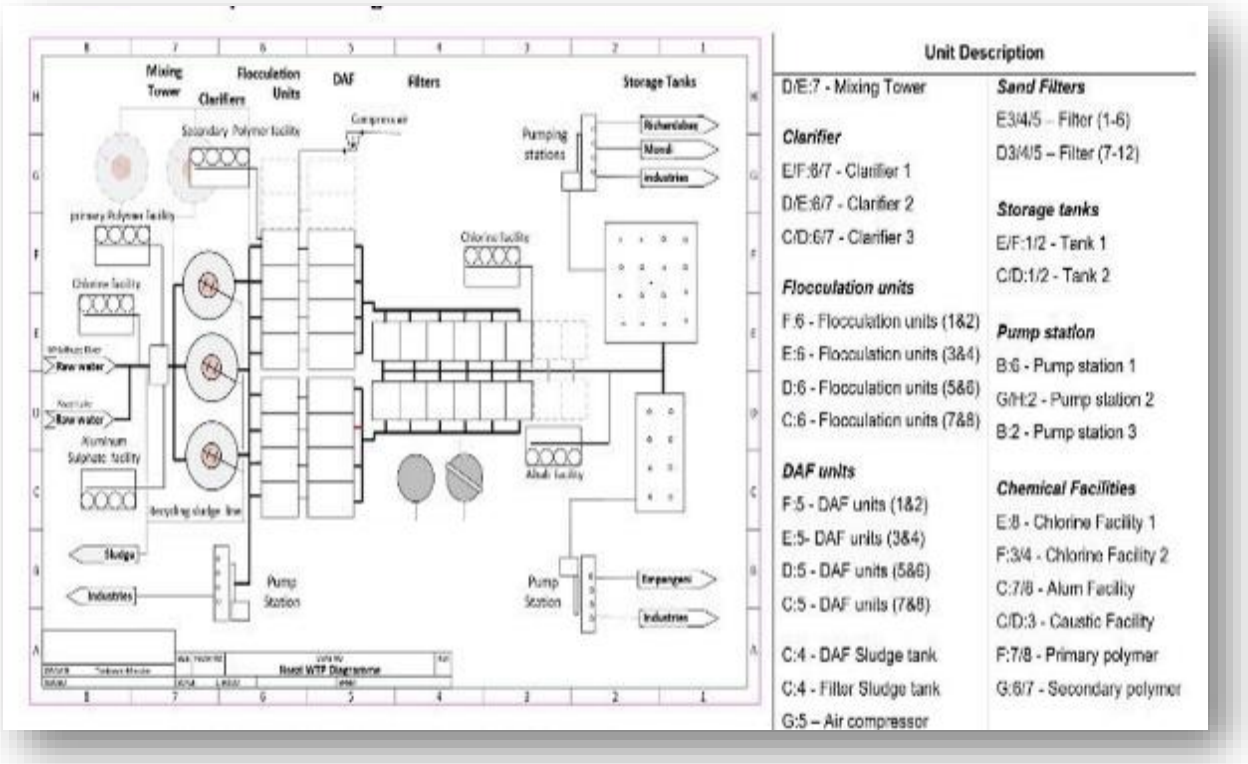
Nsezi TSA Score: 90%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	69.4	Class A plant, logbooks in place, no display area noted for PFD, but SCADA displays the PFD on site. No O & M manuals on site, but operational procedures posted on the wall.
2	**Physical appearance of plant**	93.7	The entrance is clearly marked with a signpost. Site has a controlled gate, fence in good condition and security during the night and over weekends. There are sufficient safety signs visible at all relevant areas on the plant.
3	**Raw water handling**		2 duty pumps & 2 standby. All pumps in working good condition. Pipeline appears to be in good condition - servitude in place with concrete vents and manholes. Even cathodic protection analysis was being undertaken. A large flow splitting tower with 'cascade' to each clarifier with even flow splitting.
	Raw water pumpstation / gravity feed	100.0	
	Raw water pipeline	100.0	
	Inlet works	100.0	
4	**Chemical dosing and storage**		The dosing pumps are configured to be used as backup for each other there is sufficient standby. The area is neat, clean and any spillages are contained and managed adequately.
	Flocculant	100.0	
	Alkaline (Lime)	100.0	Caustic dosing for pH correction - Very neat - all operational. Duty + Standby pumps. All dosing units operational and standby 100 %.
	Chlorine	100.0	Two systems - motive pumps and injectors both fully operational. 100% standby dosing unit. Chlorine gas (bulk) used - there was sufficient storage for approx. 2-3 months. Repair broken scales and an addition of one chlorinator for backup is necessary.
	Other (e.g., pac, kaolin)	na	
5	**Flocculation**	75.0	Good floc formation both at clarifiers as well as before DAF, however, floc mixers before DAF need re-design and replacement. Some scum build-up before DAF was noticed during the site visit.
6	**Phase separation**		
	Clarification (settling)	83.3	The one clarifier was overloaded due to plant capacity issues; however, current expansion of the plant is expected to resolve that. Loadshedding is also adding to over-capacity issues in plant (can only pump for certain hours).
	Dissolved air flotation (daf)	92.8	Six recycle pumps are installed and are new and in good condition. Saturator was serviced in the last 12 months; it was noted to be serviced at least every 2 - 3 years nevertheless it is in good working condition.
	Sand filtration (pressure sand filters)	75.0	Three backwash pumps are installed and in working condition. Media will require replacement as well as few touch-ups on pipes and mechanical equipment (slight rust).
7	**Disinfection**		
	Clear water well	100.0	Chlorine is dosed directly in-line and the contact occurs in the under-ground sump before high-lift PS. Free chlorine residual is measured every hour at the final treated water.
8	**High lift pumpstation**	87.5	Six pumps are installed - all in working good condition. Online flow metering in place. Flow records captured and plotted at the SCADA.
9	**Sludge treatment**		
	Thickening in sludge dams	na	Sludge is pumped to Mondi WWTW.
10	**Bulk pipeline(s) from plant to command reservoir(s)**	100.0	The main bulk feeding Monde reservoirs, valve chambers and WSAs reservoirs were noted to be in good condition.
11	**Command reservoir**	100.0	The reservoirs were surrounded by a fence and a gated entrance. Telemetry at the command reservoirs is operational and can be observed from the operations room at the WTW. The reservoirs were observed to be leak free.
	Total	**90%**	

High risk areas OR Key Hardware Risks/ Defects

1. Media to be replaced.
2. One clarifier was overloaded due to plant capacity issues; however, the current expansion is expected to address it.
3. Loadshedding destructs the pumping (can only pump for certain hours).

VROOM Refurbishment Cost Estimate

Civil Works	R1,691,800	25%
Mechanical Works	R4,983,000	75%
Electrical Works (Incl C&I)	R0	0%
Total VROOM Cost	**R6,674,800**	**100%**
R million / MLD		**0.03**

Regulatory Impression

Nsezi WTW was visited to verify the Mhlathuze Water Blue Drop findings. Overall, the site inspection impression was very good with suitable drinking water quality management practices undertaken with great management and dedicated skilled process controllers. Water quality is monitored according to SANS 241 and is of high quality. Consumers supplied by this system may use the water with high level of confidence.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	99.88%

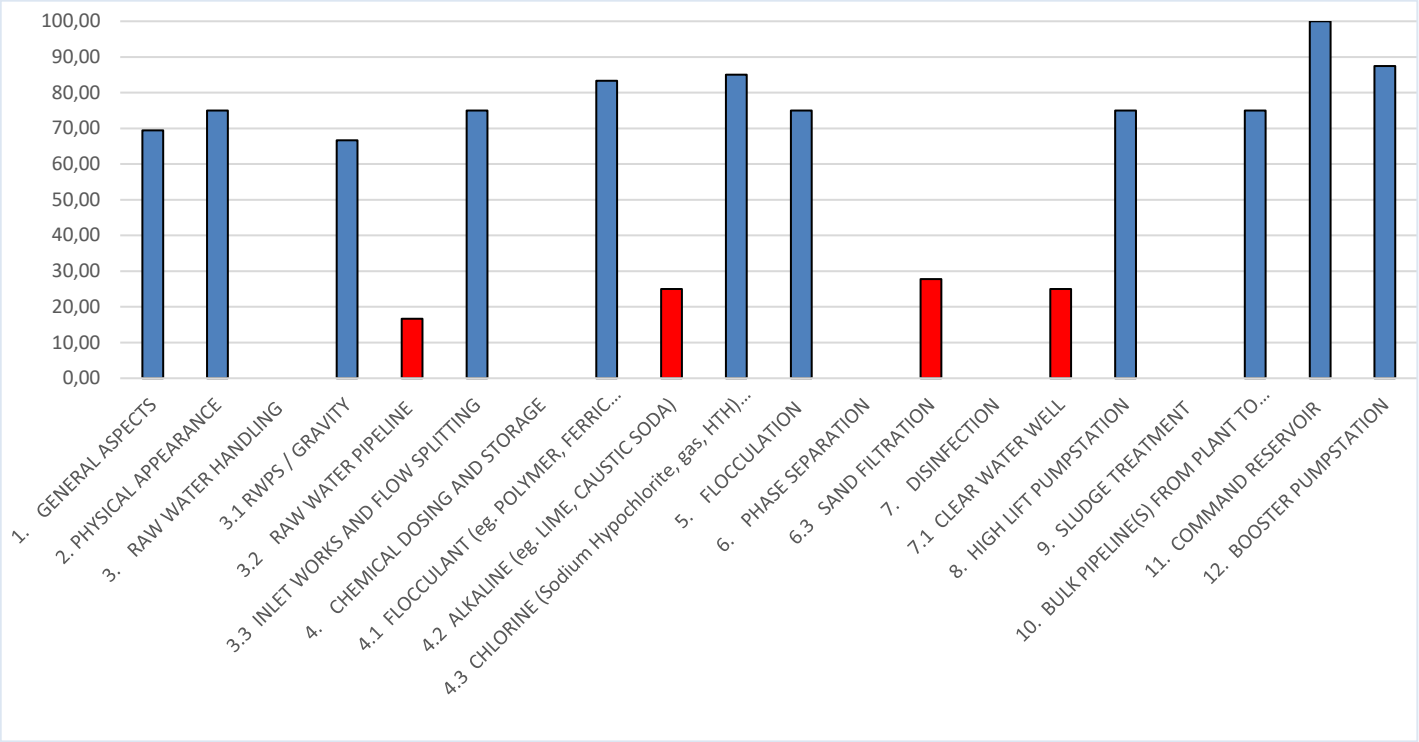
Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

The uMzingazi water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

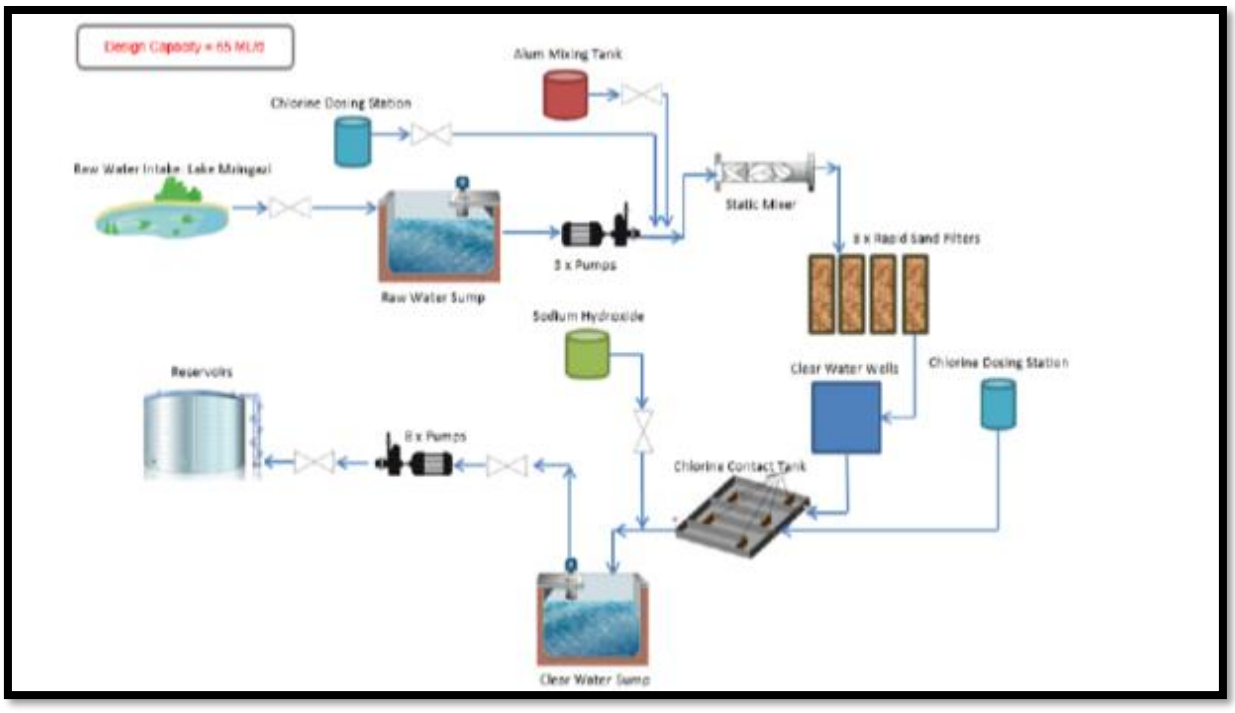
Mzingazi TSA Score: 64%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	69.4	Class B plant, logbooks in place, SOP manuals are available for each of the process units. Logbooks in place and updated. Process flow diagram available in O&M manual but not displayed on the wall. Excellent signage at gate, with contacts.
2	**Physical appearance of plant**	75.0	The works is old, however functional. Grass was only partly cut in some areas. Many windows or doors broken. Poor condition due to age. Some of the hand railings are loose, external housekeeping such as grass cutting is required, filter media replacement, cracked stairs etc. Refurbishment of the existing units of this plant is necessary.
3	**Raw water handling**		No evidence of maintenance. The pipes are old, not painted and some rust on them. No sign of cathodic protection or maintenance. Flowmeter had been struck by lightning and was not working at the time of the site visit, however a new one had been ordered and was on site and needed to be installed. Chemical dosing pumps functional and in good condition.
	Raw water pumpstation / gravity feed	66.6	
	Raw water pipeline	16.6	
	Inlet works	75.0	
4	**Chemical dosing and storage**		Two pumps installed and both working. Alum sufficient for >30 days. Due to good inlet quality, the alum dosing is kept at minimal. The storage area is bunded and any spillages can be contained.
	Flocculant	83.3	
	Alkaline (Lime)	25.0	The caustic is dosed in a manhole, but this is not visible. Furthermore, a manhole (in which the pump is situated) for caustic dosing is not good practice and should be altered. The offloading and storage area was reasonably tidy considering the old infrastructure.
	Chlorine	85.0	Three chlorinators, all in good mechanical condition and operating (recently repaired / upgraded). There is pre- and post-chlorination taking place. The scale is installed but does not appear to be in good condition although it is working. There were ample cylinders (>10) on site. Noted to be around 60 days of supply on site.
	Other (e.g., PAC, Kaolin)	na	
5	**Flocculation**	75.0	Flash mixing occurred underground (static mixer) and there were no above ground floc-maturation tanks. There are no sedimentation tanks. However, there was almost no flocs detectable in the water. In general, the raw water quality is of good quality.
6	**Phase separation**		
	Clarification (settling)	na	
	Sand Filtration	27.7	Only 7 of the 8 filters were operational (one out of service). The filter sand had not been replaced in 50 years (since plant was commissioned) and it is therefore visibly hard and lumpy. According to PC, the filters cannot be backwashed individually - the entire plant needs to be switched off and then all filters need to be backwashed. This only gets done once every 2 weeks and is very unpractical. The backwash that was witnessed by the team was poor (they tried to backwash without shutting down the entire works) - the air was almost not evident, and the media was blocked.
7	**Disinfection**		
	Clear water well	25.0	There is no contact tank for disinfection. The chlorine is dosed on the line connected to the final tank. Currently free chlorine is measured at the network due to setup of the system. It is recommended to have a dedicated clear well for chlorine contact and measurement.
8	**High lift pump station**	75.0	There are 2 sets of pumps, one set transports water to Meer-en-see (3 pumps but only 1 is working) and another set of pumps transports water to town and other areas (all 6 pumps working condition). Due to aging of the pump's breakages are occurring more frequently.
9	**Sludge treatment**		
	Thickening in sludge dams	na	
10	**Bulk pipeline from plant to command reservoir**	75.0	These lines are underground and difficult to visually inspect. However, at the plant outlet manhole the condition appears as though attention is required as it appears that there has been no maintenance.
11	**Command reservoir**	100.0	Flowmeter on outlet of plant was operational. The SCADA gave evidence that reservoir levels are determinable. The visible structure of the reservoir appears to be in a good condition.
12	**BOOSTER PUMPSTATION**	87.5	Four pumps - all operational. The booster pumpstation is in good condition than the WTW. However, there is no signage on the pumpstation.
	Total	**64%**	

High risk areas OR Key Hardware Risks/ Defects

1. General plant refurbishment is necessary.

2. Electrical equipment replacement
3. Replacement of the filter media
4. Leakage at CWW need to be repaired.

VROOM Refurbishment Cost Estimate

Civil Works	R31,981,400	31%
Mechanical Works	R57,385,900	56%
Electrical Works (Incl C&I)	R13,910,600	13%
Total VROOM Cost	**R103,277,900**	**100%**
R million / MLD		**1.59**

Regulatory Impression

Mzingazi WTW was built more than 50years ago. Although it is still functional, it is an old plant, and it is currently in a desperate need of an upgrade / refurbishment. Of important to note is that despite the challenges of aging infrastructure the process controllers and maintenance team are doing a very good job at keeping the mechanical / process equipment running at its best to produce acceptable water quality that is not of acceptable SANS 241 standard. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for chemical but not for micro. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	92.82%
Chemical Compliance	97.33%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



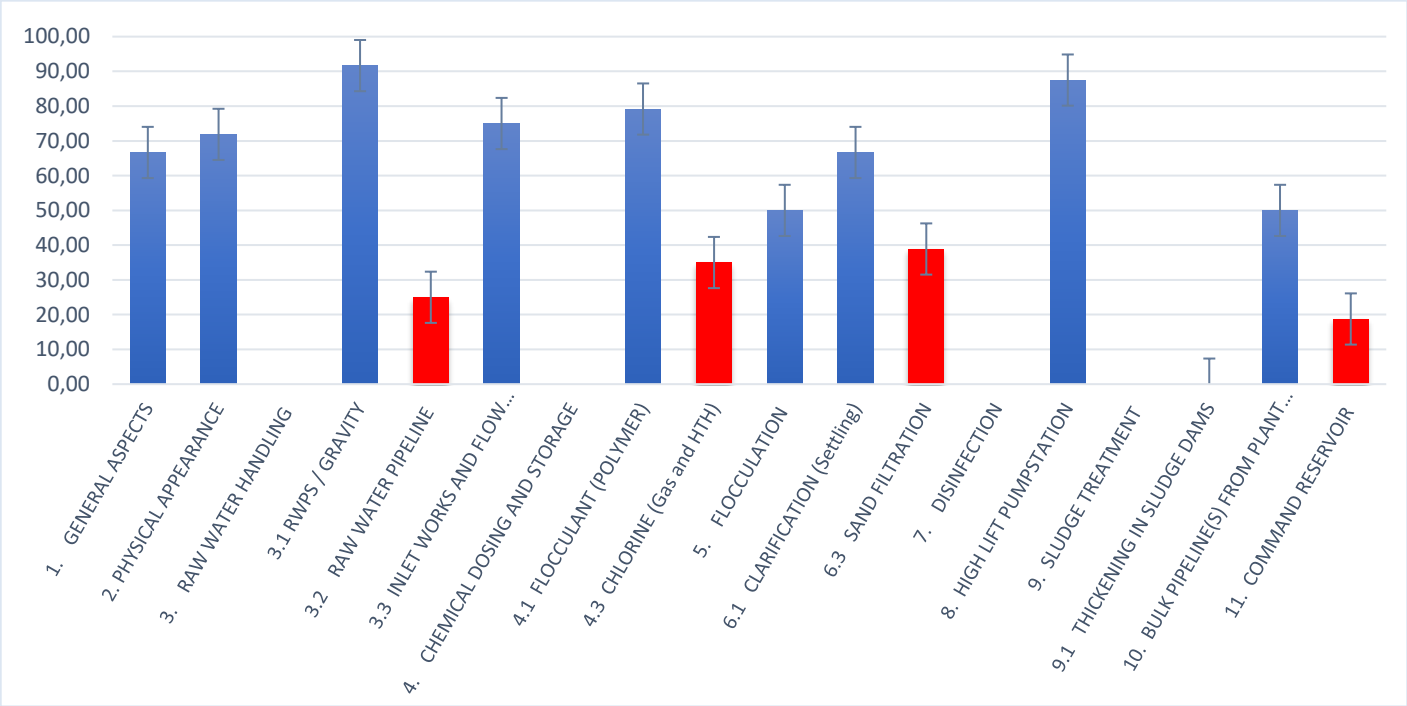
8.11 uMkhanyakude District Municipality

The Mtubatuba water treatment system in the delivery network was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

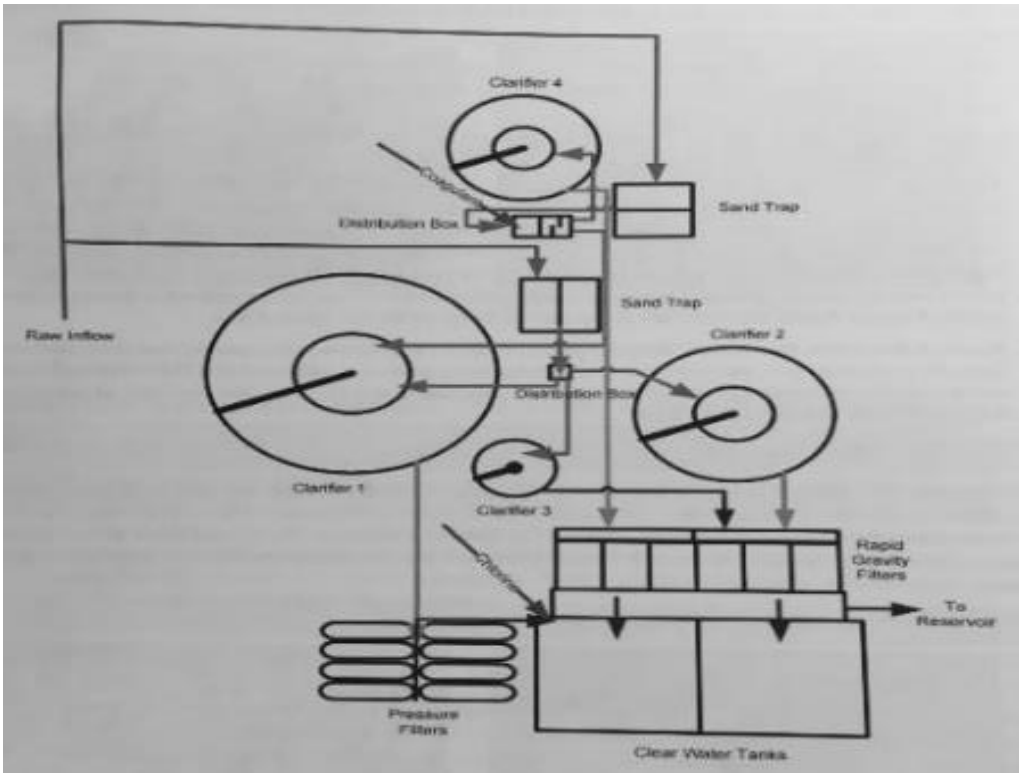
Mtubatuba TSA Score: 57%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	66.7	Class B plant, logbooks in place, old O&M manual with new being developed, PFD available but not displayed on wall, IMP for DWQ and contact list displayed, process monitoring equipment is functional and calibrated except no pH testing for RW & FW, electricity meter is working but locked up and not recorded
2	**Physical appearance of plant**	71.9	Signage at gate, fenced, the access road and parking areas are not surfaced and hampers the delivery of chemicals, terrain neat but some mechanical & other equipment lying around to be removed/stored, signage predominantly good overall, good housekeeping, good workplace satisfaction, only minor OHS issues, the workers bathroom & shower facility to be renovated
3	**Raw water handling**		Raw water abstraction from the Wit Mfolozi River, screens submersed and could not be viewed, pumps in working condition and standby is sufficient; no leakages evident, pipe size ok, no cathodic protection, maintenance is done, RW measuring device and flow transmitter not functional; the sand trap is operational and flow splitting is performed by the eye, flow control required as the 4 no. clarifiers have differing diameters
	Raw water pumpstation/ gravity feed	91.7	
	Raw water pipeline	25.0	
	Inlet works	75.0	
4	**Chemical dosing and storage**		Flocculant duty and standby pumps in good condition, dosing area is neat and contained, storage volume is sufficient for 30 days and is bunded, no functional emergency wash area nearby; 1 of 2 Chlorine dosing units operational with no standby, the storage volume is not sufficient for 30 days and foresee delivery and storage problems in future, safety equipment available except the extractor fans looked like they were not operational
	Flocculant	79.1	
	Chlorine	35.0	
5	**Flocculation**	50.0	Flocs visible at the clarifier inlet box, the new floc unit added adjacent to the rapid mix zone is a design issue as insufficiently sized and turbulent conditions evident, the old floc unit does not have a floc channel, improve regularity of jar testing for better floc formation
6	**Phase Separation**		Desludging takes place every shift or 2 hrs depending on the Turbidity range, 3 of the 4 clarifier automated bridges are functional, automated bridge for clarifier 4 and the stilling basin in good condition, automated bridge for clarifiers 1 and 3 and clarifier 3 stilling basin to be refurbished, concrete outer ring wall structure for clarifiers 1 and 3 to be refurbished, the cracks on the civil overflows to be repaired, clarifier 1 automated bridge has broken scraper arms and should be refurbished/replaced and cleaned out, clarifier 2 automated bridge operates with some noise but is dysfunctional and should be replaced/refurbished, overflow weirs on 2 of the clarifiers to be installed; No backwash pumps installed scour airflow only, gravity filters – 1 of 2 blowers operational with no standby, backwashing 1 per shift, pressure filters – 1 blower operational with no standby, backwashing every 1 or 2 days, design issue with the new gravity filters media to be remedied
	Clarification (settling)	66.7	
	Sand filtration	38.9	
7	**Disinfection**		Old and new reservoirs is 10 Ml total, contact time is 20 min and insufficient (< 30 min), Free Cl_2 measurement is taken from the water basin tap in the main office and ranges between 0.1 to 2 mg/l
	Clear water well	75.0	
8	**High lift pumpstation**	87.5	All pumps in working condition with sufficient standby, the final flow measuring device is functional for only 1 of the 2-pipe network
9	**Sludge treatment**		The sludge dam is not functional and has not been emptied only pipe blockages are sorted out, no recycling of the water
	Thickening in sludge dams	0.0	
10	**Bulk pipeline from plant to command reservoir**	50.0	Old asbestos pipeline has leaks but they are remedied, the new steel pipeline has no leaks, no cathodic protection for both pipe network, maintenance done on both pipe network and are adequately sized, the valve chamber viewed had missing manhole covers, one chambers exhibited rainwater ingress/flooding, no vent pipes mesh to prevent ingress of birds and animals
11	**Command reservoir**	18.8	Appear to be leak free, predominantly not closed at top as slabs/covers are almost all missing and not replaced to make secure from people and animals/birds, the fence has numerous gaps for easy access onto the site so 24 hr security in place, telemetry system not functional, no final flow measuring device in place
	Total	**57.3%**	

High risk areas OR Key Hardware Risks/ Defects

1. No backup generator at the plant
2. Raw water flow meter not functional
3. Flocculation channel design for new (retention time too short) and flocculation channel for the old
4. 2 of 4 clarifiers automated bridges are dysfunctional.
5. New gravity filters media design correction; Replace standby blower; Investigate a backwash pump for bed expansion.

6. Chlorination unit is dysfunctional; Chlorine delivery and storage requires proper roads and access; Supply chain of 70 kg cylinders are soon to be replaced by 1-ton drums.
7. Install cathodic protection on the raw and final water pipe network; Fencing and manhole replacement to secure access and ensure adequate safety at the command reservoirs.

VROOM Refurbishment Cost Estimate

Civil Works	R4,191,000	52%
Mechanical Works	R2,820,400	35%
Electrical Works (Incl C&I)	R1,082,400	13%
Total VROOM Cost	**R8,093,800**	**100%**
R million / MLD		**0.40**

Regulatory Impression

The Mtubatuba water system is fairly well maintained. The treatment processes are predominantly functional with some attention to be given to the key hardware risks/defects listed above. The plant has competent staff but the status of the Class V Supervisor whether permanent at this works or shared with other works still needs to be established. The water quality is monitored according to SANS 241 and is of high quality. However, the required microbiological monitoring in the distribution network and the risk defined compliance does require some attention as currently not complying adequately. No Notices, Pre-Directives and/or Directives have been issued by the Regulator. A Water Safety Plan and Risk Register are in place but need more in-depth analysis and implementation. The WaSP can be considered to be too generic and seems like a guideline document instead of a working tool. The WaSP may tick all the marks for compliance reasons, but the implementation of the WaSP may prove to be troublesome as it is an all-in-one document and not system specific for ease of managing the specifics linked to each water supply system.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	94.12%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





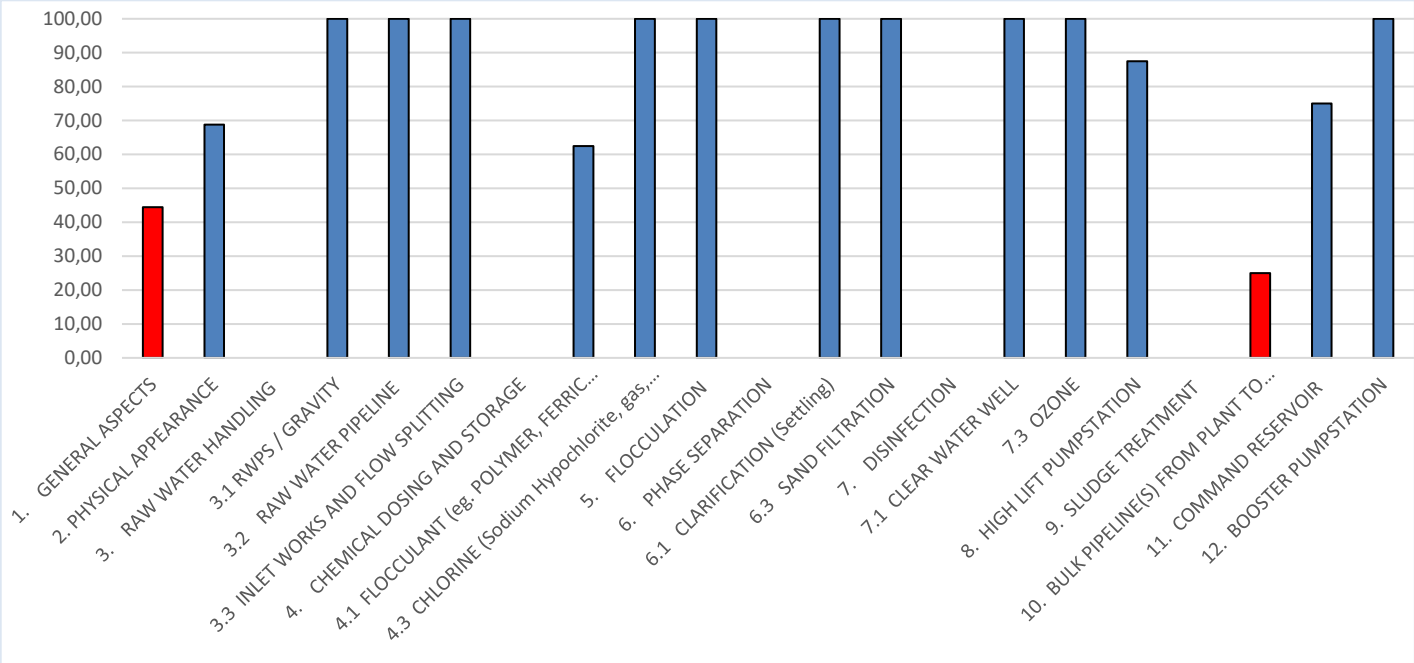

8.12 uMzinyathi District Municipality

The Vants Drift water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

Vants TSA Score: 80%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram

Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	44.4	Works not classified. Maintenance logbook, operational logbook and a basic incident management is displayed with contact numbers. The process monitoring equipment is functional, but not calibrated up to date. Electricity consumption meter is not accessible to the onsite process controllers.
2	**Physical appearance of plant**	68.7	The entrance is marked with a signpost. A descent ablution facility with change house and eating facilities is required on the site. The roads require refurbishment.
3	**Raw water handling**		There are 4 deep-well submersible pumps that are all in good working condition. The civils and electrical panel are also in good working condition, and adequate pump set standby is available. The raw water pipeline is in fair condition, this gets maintained and painted timeously however, there is no cathodic protection. Flow is measured and recorded throughout the data is recorded on the operational logbook.
	Raw water pumpstation / gravity feed	100.0	
	Raw water pipeline	100.0	
	Inlet works	100.0	
4	**Chemical dosing and storage**		Flash mixing is done through an 'in-line' hydraulic flash-mixing and the poly is dosed in the line just before the flash mixer. Floc is formed in the settling tanks prior to the clarifiers. The inlet, flash mixing and dosing point does not need any attention. The dosing area is in the inlet pumpstation, and it is neat with no spillage visible, however there is no mechanism to control spillages it occurs. No emergency eyewash was present
	Flocculant	62.5	
	Alkaline (Lime)	na	
	Chlorine	100.0	All sodium hypochlorite dosing pumps are working with adequate standby. The storage is in JoJo tanks in a bunded area. There is sufficient storage capacity for >30days.
	Other (e.g., pac, kaolin)	100.0	
5	**Flocculation**	100.0	Process takes place in a closed floc-tank just before the settlers. The system is in good condition.
6	**Phase separation**		
	Clarification (settling)	100.0	There are a series of package lamella settlers which are all clean and in operating condition. There is no floc carryover. Desludging of the units are done regularly.
	Sand Filtration	100.0	There are only 4 sand filters, and they appear to be operating very well. There are no backwash pumps, the system works on hydraulic head flows to create a backwash flow the system is working well. Two air blowers are in good working condition.
7	**Disinfection**	100.0	
	Clear water well	100.0	Chlorine contact occurs in the final on-site reservoir and there is sufficient contact time. Chlorine is measured at the outlet of the reservoir using online chlorine meter. Additional chlorine dosing stations are present at the bulk reservoirs in case there is no residual chlorine in the system (this is being checked regularly).
8	**High lift pump station**	87.5	There are 3 high-lift pumps all have/are getting new motors and refurbished. Flows are recorded.
9	**Sludge treatment**		
	Thickening in sludge dams	na	
10	**Bulk pipeline from plant to command reservoir**	25.0	The outlet pipework from the high lift pumpstation and to the control reservoirs require maintenance due to rust.
11	**Command reservoir**	75.0	A 20 Ml reservoir - fenced with a pumpstation and a full-time security guard. Telemetry is in place but not working.
12	**Booster pumpstation**	100.0	Pumps are installed and in good working condition, however refurbishment is underway to replace with new pumps with adequate standby pump.
	Total	**80%**	

High risk areas OR Key Hardware Risks/ Defects

1. Construction of the plant expansion is underway, therefore sit is not organised due to construction.
2. Pipework at outlet of the high lift pumpstation (and valve chambers) requires attention.
3. Emergency eye wash, chemical storage area is not bunded therefore chemical spillage is not adequately controlled if it happens.
4. Improvement of the ablutions, change facilities and staff area is necessary.

VROOM Refurbishment Cost Estimate

Civil Works	R478,500	26%
Mechanical Works	R1,371,700	74%
Electrical Works (Incl. C&I)	R0	0%
Total VROOM Cost	**R1,850,200**	**100%**
R million / MLD		**0.23**

Regulatory Impression

Vants Drift WTW is a generally well operated and functioning system with package clarifiers and rapid gravity filters. The 'old' plant capacity was 8 Ml/d and current upgrades will increase the capacity to 12 Ml/d. The work currently done on the plant also includes of upgrading electrical components and pipe network. Of importance to note enthusiasm of Mr Pieter and Adeep for their commitment to functioning of the Water treatment works processes.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	99.07%
Chemical Compliance	94.24%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

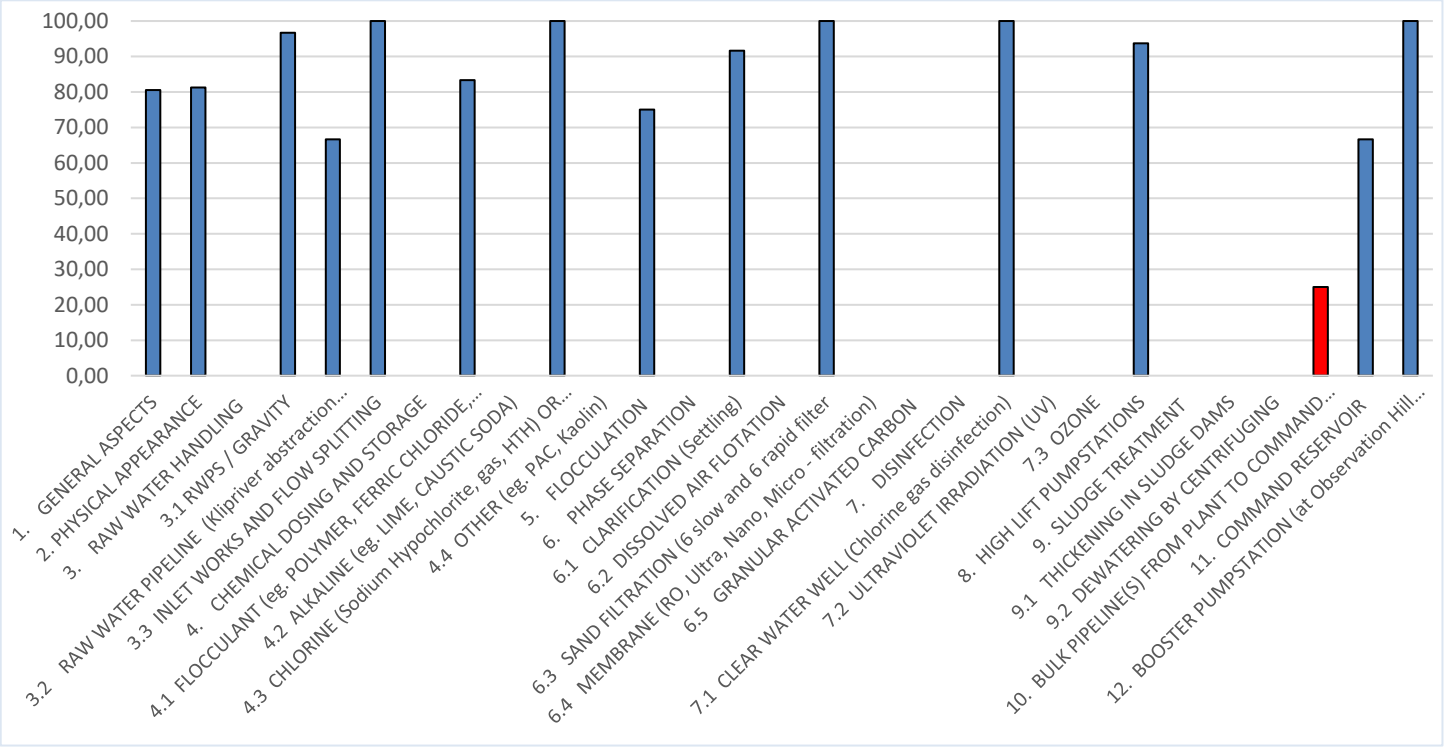
8.13 uThukela District Municipality

The Ladysmith water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

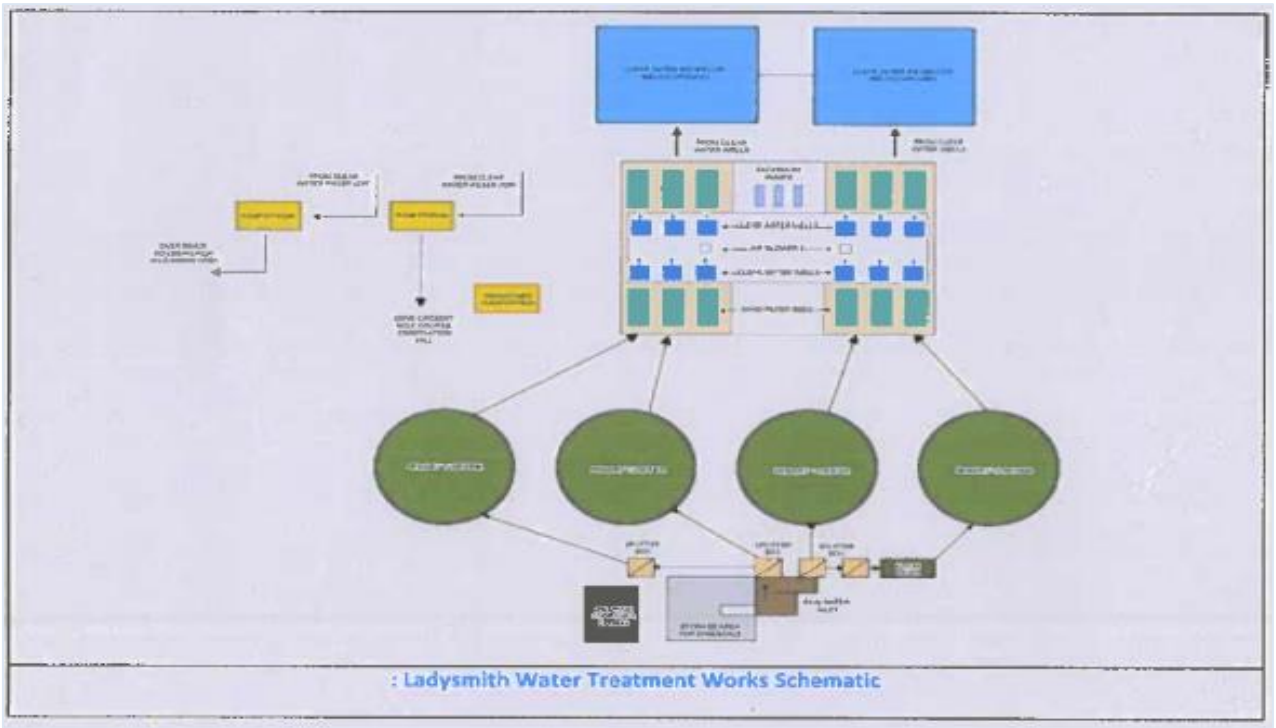
Ladysmith WTP TSA Score: 87%

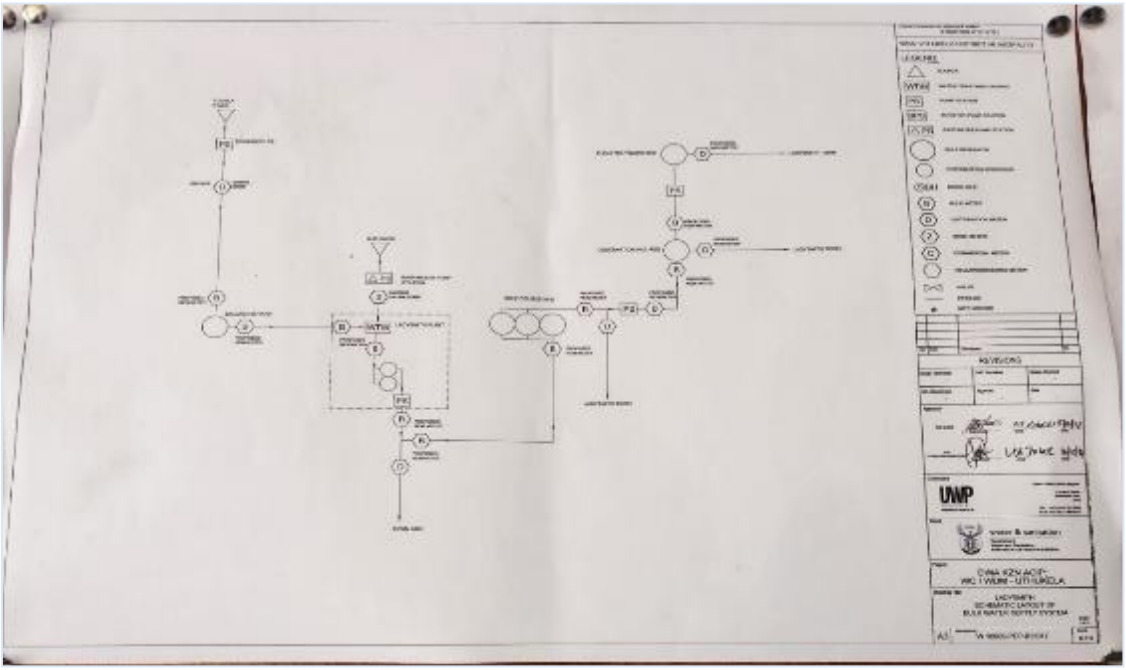
Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram





Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	80.5	Class C plant, Final stages of refurbishment, temporary display area noted for PFD or notices, logbooks in place. IMP in place with contact numbers of staff.
2	**Physical appearance of plant**	81.2	Fenced, neat terrain, good housekeeping, high workplace satisfaction, except for staff housing needing further repairs, minor OHS corrections (grids over open channels at filtration section to prevent fall-in and cautionary safety barricade at entrance (has been done subsequently).
3	**Raw water handling**		
	Raw water pumpstation / gravity feed	96.6	The telemetry of the Klipriver pump house is functional and in good condition. The 2 larger pumps functioning nearly fulltime. The 2 smaller pumps are being upgraded to function as effective back-ups for both larger pumps.
	Raw water pipeline	66.6	No flow meter on Klipriver section (flow is calculated), but Spioenkop Dam section has flow meter. Although lines are old, they are in good functional order at present. More comprehensive metering installation and management had been proposed (2014), but funding is awaited.
	Inlet works	100.0	Even flow splitting, multi-drip dosing line and excellent mixing
4	**Chemical dosing and storage**		
	Flocculant	83.3	Duty and standby pump set in good condition, no spill control at flocculant, wash station is available. Some of the electrical on/off switches need to be relocated to unobstructed wall sections to make them more easily and safely accessible
	Chlorine	100.0	2 chlorinators, two dosing points, automatic switchover. Piping is such that it can be used as standby for each unit. Pressure gauges indicate tank capacity and available gas – more than 30 days storage
5	**Flocculation**	75.0	Limited Floc formation was seen. Due to high turbidity, some scum accumulation and build-up in walls noticed. It could also be due to overdosing to counteract turbidity. Needs to be cleaned more regularly.
6	**Phase Separation**		
	Clarification (settling)	91.6	Limited Floc/scum carry over only where weir needs adjusting (raising). Good condition for most CLRFs could be seen. CLFR3 gearbox not working (no mixing) around 2 weeks to finalise repair, using a back-up mixer in mean time. Visual WQ looks excellent in launders
	Sand Filtration	100.0	Recently refurbished. Backwash pumps and air blowers in good condition. Even overflow at outlet boxes, media, and filter galleries in good /excellent condition.
7	**Disinfection**		Inline chlorine gas dosing (>30 min contact time). Cl_2 is tested at the outlet and recorded in the site logbook Some concrete remedial work required on the edges of the tanks
	Clear water well	100.0	
8	**High lift pump stations**	93.7	2 Bulk water pump stations at WTW: Four pumps are installed (2 per PS): only 3 working, and 4th being replaced. One PS (with Pumps 6&7) needs some refurbishment, other PS in good condition with new MCC board. Flow meters operational. Flow records captured on the SCADA with reservoir stands (all info in app version ("Open things") also available on Supervisors & PC phones), daily static reading also taken at 08h00
10	**Bulk pipeline from plant to command reservoir**	25.0	Very old infrastructure (1963), specifically AC portions, and needing replacement (AC breakages), steel in relatively good condition, but no cathodic protection. Total bulk lines for system - 18.7 km and 41.7 km distribution lines

Watch #	Process Unit Assessed	% TSA	Observations
11	**Command reservoirs**	66.6	Fenced and gated, telemetry fitted on top of reservoir. Both sites poor ground keeping (funding problems). Telemetry is operational and controlled by the WTW site or manually by the operator. Most of the round reservoir structures are in a fair condition, evidence of repaired leaks, but rectangular reservoir (Golf Course) need more urgent civil attention
12	**Booster pump station**	100.0	Located at Observation Hill Reservoir site. Both pumps working (100% standby with only 1 pump working at a time) Located at the reservoir site - groundskeeping needs more regular attention (constraints are funding)
	Total	**87%**	

High risk areas OR Key Hardware Risks/ Defects

1. Old bulk & distribution system with AC pipes need replacement (1963).
2. Bulk meters & distribution meters at all relevant identified points
3. Water leak outside pump station (Golf Course Res)
4. Unbunded flocculant storage area, civil maintenance on high lift pump station building.
5. Grounds keeping at Reservoirs and pump stations.

VROOM Refurbishment Cost Estimate

Civil Works	R2,369,400	53%
Mechanical Works	R2,113,100	47%
Electrical Works (Incl C&I)	R3,300	0%
Total VROOM Cost	**R4,485,800**	**100%**
R million / MLD		**0.20**

Regulatory Impression

Despite very constrained finances within the District, the Ladysmith WTP has functional treatment processes. The WSA has an outsourced UTDM Reactive, Preventative and Refurbishment Maintenance contractor (WTW only) which greatly assist in ensuring effective maintenance of the water infrastructure. At a DM level, there appears to be a disconnect between the various management areas, specifically ito of finances, PMU, and operations as they relate to the WSA function. At present the water services are being managed in a combined manner which leads to difficulty in BD vs GD reporting, e.g. System O&M Budget could not readily be expressed in R/m^3. Critical attention needs to be given to ensure adequate and correct WQ compliance data submission, specifically ito disinfection. Other areas needing more attention and support are microbiological WQ compliance and operational WQ monitoring as the WSA does not have an accredited laboratory to conduct its full SANS 241 analysis. No Directives have been issued by the Regulator. A Water Safety Plan is in place but outdated and needs revision, coupled with an in-depth analysis and effective implementation of mitigation measures. Having effective and proper Process Audits undertaken by professional qualified persons to facilitate effective process management at all systems is recommended. The WSA is unable to fully comply with regulatory prescripts due to financial constraint (as the WSA is under administration).

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	69.77%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



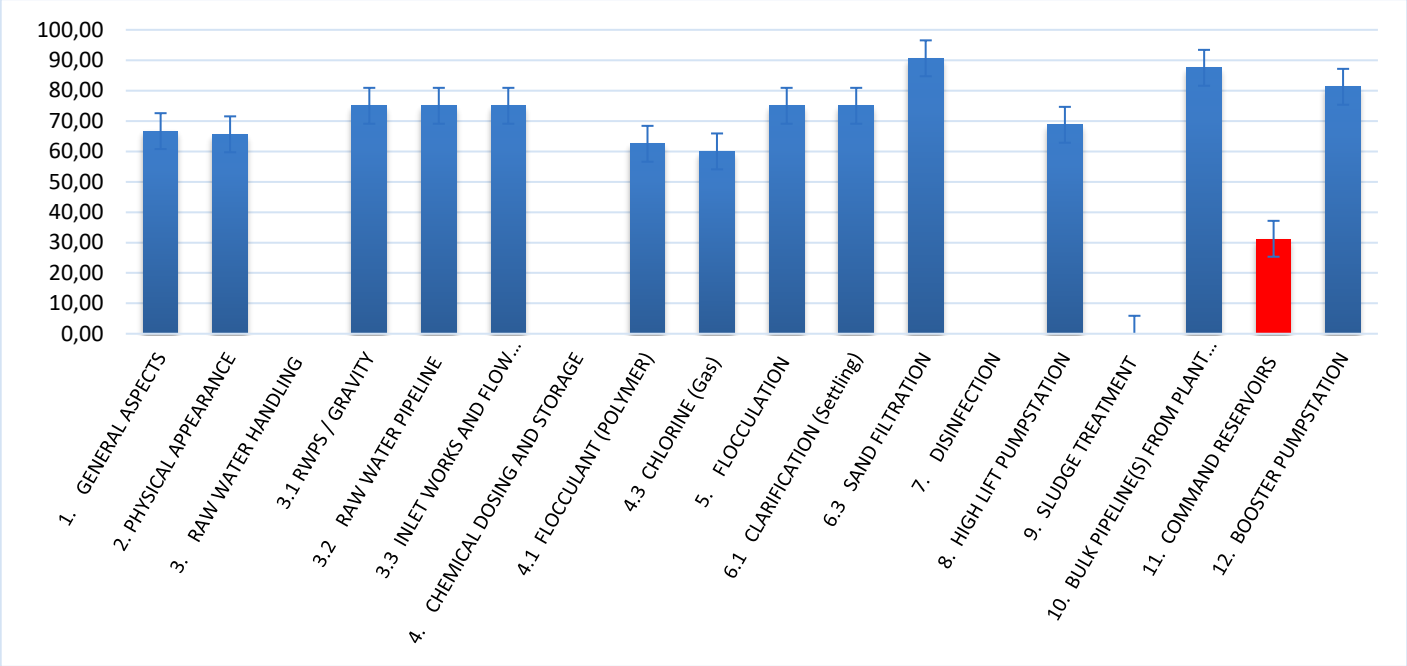

8.14 Zululand District Municipality

The Ulundi water treatment system in the delivery network was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

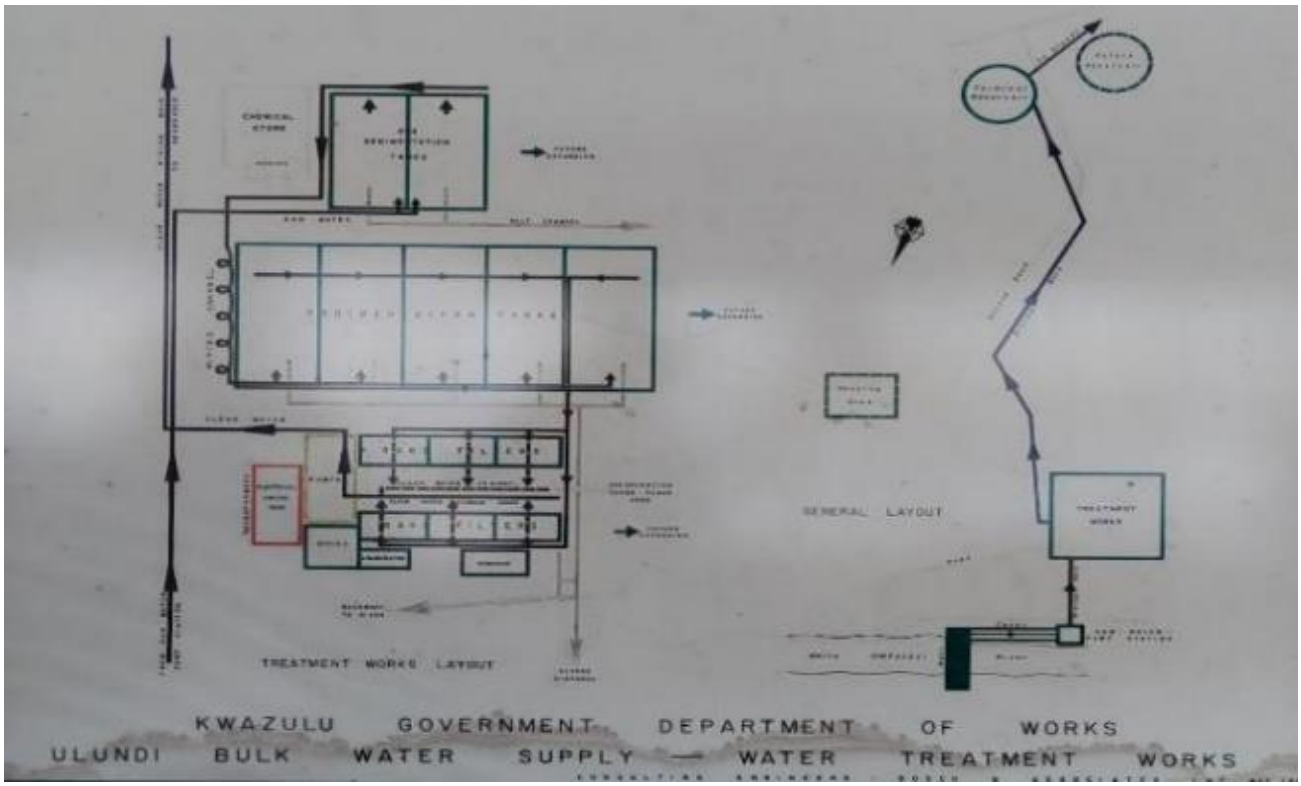
Ulundi TSA Score: 68%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	66.7	Class B plant, operational logbook in place except M&R logbook could not be viewed, O&M manual volume 1 of 2 only available, PFD available and displayed on wall, no IMP available but contact list displayed, process monitoring equipment is functional and calibrated, electricity meter is working and recorded in the daily logbook per shift
2	**Physical appearance of plant**	65.6	No signage at gate lying on the ground close by, fenced but old, terrain neat but some mechanical and other equipment lying around to be removed/stored, signage predominantly good overall, good housekeeping, good workplace satisfaction, minor OHS issues with exception of loose railings in dangerous fall areas, the workers ablution facility to be renovated
3	**Raw water handling**		Raw water abstraction from the Wit Mfolozi River, screens submersed and could not be viewed, pumps in working condition and standby is at 33% only; small section of the RW pipeline was viewed at the WTW leading to the presettling tanks and it needs to be refurbished/replaced, no leakages evident, pipe size ok, has cathodic protection, maintenance is done, RW measuring device is functional and flow rate is recorded only; even flow splitting is taking place and flash mixing is effective just that the sloping channel needs to be cleaned regularly, chemical feed via an open aluminium channel not ideal design option
	Raw water pumpstation/ gravity feed	75.0	
	Raw water pipeline	75.0	
	Inlet works	75.0	
4	**Chemical dosing and storage**		Flocculant duty and standby pumps in good condition, dosing area is neat but not adequately contained against splashes and spills, storage volume is sufficient for 30 days but is not bunded with a chemical spill evident, functional but not ideal emergency shower nearby; Both Chlorine dosing units operational, standby installed but not operational, the storage volume is not sufficient for 30 days, all safety equipment available and working, a new chlorination building is being constructed
	Flocculant	62.5	
	Chlorine	60.0	
5	**Flocculation**	75.0	Very fine flocs visible at the end of the floc channel, re-utilise the streaming current detector for improved floc size, condition of the floc channel is fairly good
6	**Phase Separation**		Some floc carryover observed, desludging takes place every shift with some scum evident, weirs in good condition allowing even overflow but the discharge holes are quite small and collection in the channel is uneven; backwash pumps and air blowers operational with sufficient standby, backwashing 1 per day in AM shift, some of the railings are loose and dangerous and need to be repaired asap
	Clarification (settling)	75.0	
	Sand filtration	90.6	
7	**Disinfection**		Underground sump estimated to be 1.6 to 1.8 Ml/d (about 2 hrs to fill up, so 20--22 Ml/d pumped daily up to the command reservoirs), contact time is at least 30 min and insufficient, Free Cl_2 measurement is taken from the water basin tap at the lab and ranges between 0.75 to 1.5 mg/l
	Clear water well	87.5	
8	**High lift pumpstation**	68.8	3 of 4 pumps in working condition with 1 standby (33%) that has gone in for repairs so no standby at time of the site visit, the final flow measuring device is functional, the flow rate is recorded but not converted and interpreted by the plant staff
9	**Sludge treatment**		No sludge treatment or supernatant recycling taking place, the backwash and sludge are discharged to the Wit Mfolozi river downstream of the dam
	Thickening in sludge dams	0.0	
10	**Bulk pipeline from plant to command reservoir**	87.5	Old pipeline correctly sized with cathodic protection, leak observed at one of the pipe joins, maintenance done, new pipeline constructed and to be commissioned this year, the valve chamber at the command reservoir inspected in good condition
11	**Command reservoir**	31.3	Both reservoirs appear to be leak free, 1 reservoir not adequately closed at the top to make secure from animals/birds, both fences had access problems with numerous gaps for easy access onto the sites, no telemetry system but the current upgrade will see the installation of telemetry, only 1 of 2 final flow measuring devices operational, flow totaliser for the gravity line not operational, ladders to have lockable access to prevent access to the roof from the public
12	**Booster pumpstation**	81.3	All 4 pumps operational but only 1 standby pump (33%), locked gate but gaps in the concrete palisade fencing for easy access to the site but the building is well secured, signage in place and the building is adequately ventilated, the MCC in good condition and functional
	Total	**68%**	

High risk areas OR Key Hardware Risks/ Defects

1. About 30m of raw water pipeline at the WTW leading to the presettling tanks in poor condition
2. Aluminium alloy flocculation channels to be closed to avoid exposure.
3. Chemical storage and dosing areas to be bunded with the provision of drainage, and the Polymer delivery and spillage handling to be improved.
4. Chlorine storage cradles required, and standby dosing required to ensure continuous disinfection.
5. No sludge treatment or supernatant recycling taking place.
6. Standby highlift pump motor replacement to be expedited.

7. Security fencing and lighting at the command reservoirs not functional, and the reservoir roof hatches, and access ladder should be locked.

VROOM Refurbishment Cost Estimate

Civil Works	R1,929,400	79%
Mechanical Works	R493,900	20%
Electrical Works (Incl C&I)	R11,000	0%
Total VROOM Cost	**R2,434,300**	**100%**
R million / MLD		**0.09**

Regulatory Impression

The Ulundi water system is well maintained. A new pipeline in the delivery system is almost complete and will replace the old pipeline. A tender is in place for further upgrades planned in the delivery system from abstraction to the command reservoirs. The treatment processes are functional with some attention to be given to some of the key hardware risks/defects listed above. The plant has competent staff. The Supervisor needs to be permanently placed at this plant and not shared with other water treatment works. The water quality is monitored according to SANS 241 and is of high quality. However, the risk defined compliance and the treatment (operational) efficiency index does require some attention as currently not complying adequately. No Notices, Pre-Directives and/or Directives have been issued by the Regulator. A Water Safety Plan and Risk Register are in place, but the current versions are incomplete and not comprehensive. They lack a detailed system assessment informed by a technical site assessment, the process audit, a water reticulation inspection/ assessment, and the IWA water balance. No proof of implementation of the WaSP and the use of the WaSP as a living working implementation tool with responsible person/s, timelines, and approved budgets.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	96.86%
Chemical Compliance	85.31%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%






9. LIMPOPO: MUNICIPAL DRINKING WATER SYSTEM'S FUNCTIONALITY

Background

Leading up to the release of the full Blue Drop report, the Regulator draws attention by publishing the *Blue Drop Watch Report*, which comprises of a technical overview of pipes, pumps, reservoirs, processes and water quality of water treatment plants and distribution networks. The Blue Drop Watch report is **not** the Blue Drop audit report, which will only be published once the verification and quality control processes by DWS have been satisfied, to ensure accurate and credible reporting of drinking water services across South Africa. The Watch Report seeks to keep the public and stakeholder updated and informed on the status of drinking water infrastructure, water quality, and the indicative cost to restore functionality.

The Blue Drop Watch Report is informed by the Technical Site Assessments (TSA), which were done at 1 to 2 systems per WSA/WSP, as part of the Blue Drop audit cycle. The purpose of the TSA is to verify the findings of the (desktop) audit with the status on the ground (physical inspections). The TSA score (%) reflects the condition of the raw water handling system (abstraction, pumps, pipe network), the water treatment plants (inlet works to disinfection and sludge treatment), delivery system (commend reservoirs, bulk pipe network and pumpstations) and distribution systems (pump and pipe networks). A high TSA score (100%) indicates that the infrastructure, equipment, and processes are in excellent condition, whilst a low TSA score (0%) indicates failure and dysfunctional process and infrastructure. The TSA inspections cover each process unit of the treatment facility, coupled with randomly selected checkpoints of the delivery and distribution network. The VROOM cost covers only the treatment facility, as too many variables exist to accurately estimate network refurbishment costs.

Results of the Technical Site Assessments

During the period December 2022 to February 2023, 11 water supply systems were inspected, offering a representative overview of systems owned and operated by municipalities, water boards and water service providers. The assessments covered 10 municipalities, as well as 3 Water Boards and Water Service Providers. Detailed TSA reports with photographic evidence and VROOM costs have been generated to assess the condition and status of treatment facilities and gain insight into randomly selected pipe network and pumpstation across the water distribution networks. The table following summarises the TSA scores of the water supply systems that were assessed.

Table 31 - Limpopo Summary of the all the TSA Water Supply Systems

#	Municipality (WSA)	TSA WSS	TSA WTW	WSP/ WB	%TSA
1	Capricorn DM	Mogwadi	Mogwadi		58%
2	Polokwane LM	Mankweng	Ebenhezer	Lepelle Northern Water	58%
3	Lephalale LM	Zeeland	Zeeland	EXXARO	86%
4	Mogalakwena LM	Mokopane Mahwelereng	Dooringdraai	Lepelle Northern Water	75%
5	Mopani DM	Giyani	Giyani		61%
6	Polokwane LM	Molepo	Molepo		59%
7	Sekhukhune DM	Groblersdal	Groblersdal		50%
8	Bela Bela LM	Bela Bela/Magalies Water	Bela Bela	Magalies Water	69%
9	Modimolle-Mookgophong LM	LIM365: Modimolle/Magalies Water	Donkerpoort	Magalies Water	34%
10	Thabazimbi LM	The Greater Thabazimbi-Magalies	Thabazimbi Chlorination Plant	Magalies Water	24%
11	Vhembe DM	Nzhelele	Khalavha		76%
			11	**6**	**59%**

An average of 59% was achieved for the 11 systems assessed, which means that infrastructure and processes are partially functional with an average performance. The best overall performance was found for Lephalale EXXARO, followed by Vhembe, and Mogalakwena. The WB/WSPs provided some of the better performing systems. On average, lesser performance was observed for Thabazimbi Chlorination Plant and Donkerpoort.

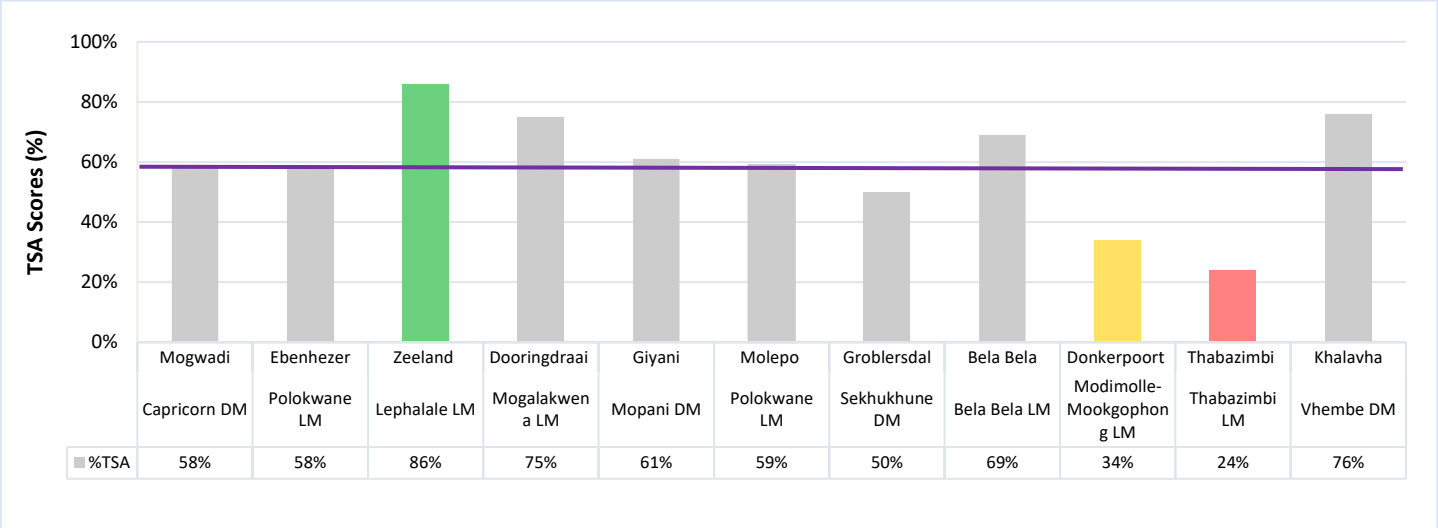


Figure 26 - LP TSA scores for all the BD Systems

95 – 100% Excellent	
80-<95% Good	
50-<80% Average	
31-<50% Poor	
0-<31% Critical state	

The Regulator observed the predominant challenges and risks pertaining to the water supply system:

Facility management

- No notice board to display or no display of the PFD or other relevant notices and/or documents required on site
- Refurbishment or upgrade and/or construction of buildings or facilities, concrete structures, offices and/or process control room, staff ablutions; maintenance or replacement of perimeter/boundary fencing and/or access gate; Aging infrastructure
- No jar testing done, no or limited testing water quality testing equipment and/or lab chemicals, no calibration of meters
- Back-up power supply during load shedding
- Signage at entrance gate and safety signs across plant
- Housekeeping and tidying up of terrain, paintwork at treatment works, pumpstations, and reservoirs, clean-up sites after construction projects
- Road rehabilitation/ upgrade/ construction and road accessibility especially for the safe delivery of chemicals
- Staff safety and signage improvement

Water treatment system

- Raw water pipe network and/or pumps at abstraction facility to be refurbished or upgraded or repaired
- No flow meters installed or dysfunctional flow meters (abstraction, WTW, and Command Reservoirs), and flow meters not calibrated
- Refurbishment or upgrade of one or more of the various process units (civil, mechanical, electrical and instrumentation)
- Dysfunctional or inefficient process units that have to be rectified, e.g. inlet works, flocculation, clarifiers, filters, etc
- Treatment chemicals, e.g. no bunding, limited stock, storage
- No or limited no. standby pumps or dysfunctional pumps, e.g. flocculant and/or chemical dosing, backwashing, high lift, leaks, etc
- No or limited air blowers and/or compressors or dysfunctional blowers and compressors
- Sand filters, e.g. repairs required, sand to be replaced, sand volume
- Chlorination unit not operational or not fully operational, e.g. limited stock in place, no or limited standby units, no automatic switch over, no chlorine scales, no or limited safety signs and systems (alarms, fans, masks, detectors)
- Limited disinfection contact time in the clear water well or ineffective disinfection taking place
- Sludge dams/ponds or beds, e.g. none in place, not operation, maintenance (cleaning), dysfunctional sludge pumps and no or limited standby, no recycling taking place
- Supervisors and Process Controllers need plant-based process management training

Water distribution network

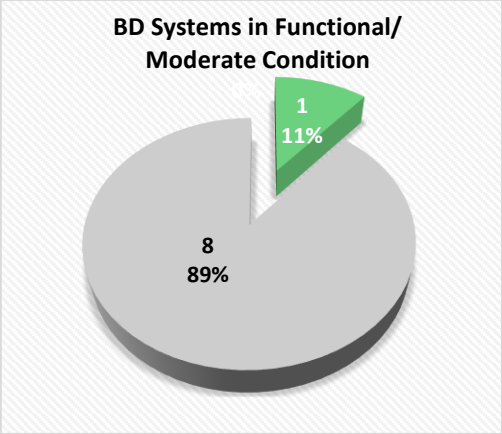
- Repair leakages in pipe network, valve boxes, and/or command reservoirs
- No telemetry at reservoir and level indicator or not operational.

Systems Observed to be in Functional/Moderate Condition based on Technical Site Inspections

Water supply systems which succeeded to achieve ≥50% TSA score, are summarised as follows.

Table 32 - Provincial Summary of the TSA Water Treatment Systems in the Excellent to Average Performance Categories

Municipality (WSA)	WSP/ WB	TSA of ≥95-100% [Excellent]		TSA of ≥80-<95% [Good]		TSA of ≥50-<80% [Average]	
		Name of WTW	% TSA	Name of WTW	% TSA	Name of WTW	% TSA
Capricorn DM		None				Mogwadi	58%
Polokwane LM	Lepelle Northern Water					Ebenhezer	58%
Lephalale LM	EXXARO			Zeeland	86%		
Mogalakwena LM	Lepelle Northern Water					Doorndraai	75%
Mopani DM						Giyani	61%
Polokwane LM						Molepo	59%
Sekhukhune DM						Groblersdal	50%
Bela Bela LM	Magalies Water					Bela Bela	69%
Vhembe DM						Khalavha	76%
Totals	**4**	**0**		**1**		**8**	



Of the 9 systems in the excellent to average performance categories it was found that:

- 1 system (11%) was in good condition
- 8 systems (89%) were in average condition.

Figure 27 - No. BD Systems in Functional/ Moderate Condition

The best performing water supply systems, as indicated by the TSA scores, are summarised hereunder.

Table 33 - Provincial Summary of the Top Performing TSA Water Treatment Systems

#	WSA	WSP/ WB	TSA WTW	%TSA
1	Lephalale LM	EXXARO	Zeeland	86%

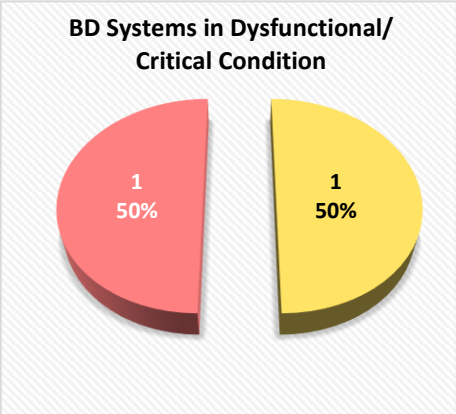
Only one system managed by EXARRO was found to be in good condition.

Systems Observed to be Dysfunctional/Critical Condition based on Technical Site Inspections

Drinking water supply systems which failed to achieve at least a TSA score of 50%, are identified as follows.

Table 34 - Provincial Summary of the TSA Water Supply Systems in the Poor and Critical Performance Categories

Municipality (WSA)	WSP/ WB	TSA of ≥31-<50% [Poor]		TSA of 0-<31% [Critical]	
		Name of WTW	% TSA	Name of WTW	% TSA
Modimolle-Mookgophong LM	Magalies Water	Donkerpoort	34%		
Thabazimbi LM	Magalies Water			Thabazimbi Chlorination Plant	24%
Totals	**2**	**1**		**1**	



Of the 2 systems in the poor and critical performance category it was found that:

- 1 system was in poor condition
- 1 system was in critical state.

Figure 28 - No. BD Systems in Dysfunctional/ Critical Condition

Table 35 - Provincial Summary of the TSA Water Supply Systems in Critical Condition

#	Municipality (WSA)	WSP/ WB	WSS	%TSA
1	Thabazimbi LM	Magalies Water	Thabazimbi	24%

One of the 11 systems assessed (9.1%) was found to be in a critical state.

VROOM Costs

The Very Rough Order of Measurement (VROOM) is an estimation of the funding required to restore existing treatment infrastructure to its original design capacity and operations, by addressing civil, mechanical, electrical and instrumentation defects. A singular VROOM cost is determined by assessing 1-2 treatment facilities per municipality and calculated as cost per system. The cost is derived through an algorithm that uses the Blue Drop Inspector's impression of the asset condition, the size and capacity of the asset, and the market/ industry cost indicators. The resultant VROOM cost is an estimation of the cost to repair, refurbish or replace dysfunctional treatment infrastructure. Subsequently, a singular VROOM cost is extrapolated, in relation to the total Blue Drop scores and systems' SIVs, to derive an aggregated VROOM score for all treatment plants in the WSI.

***Note:** VROOM does not constitute a specification, schedule of quantities or a definite refurbishment figure, but rather an indicative amount to inform a budget and hardware requirements. **Also,** the VROOM cost is specific to the treatment plant and does not attempt to cost the network delivery and distribution network, as it contains to many variables.*

The VROOM costs are summarised as following, noting these values comprises the cost of repairs of the SINGLE water treatment system assessed, NOT the extrapolated collective cost to repair all the treatment facilities in a WSI. The VROOM cost is made up by mechanical, electrical, and civil cost elements, which can be seen in the detailed TSA sections following in the report.

Table 36 - Provincial Summary of the VROOM Costing

Municipality (WSA)	TSA WSS	TSA WTW	WSP/ WB	Total VROOM Cost (Rand)
Capricorn DM	Mogwadi	Mogwadi		R1,967,900
Polokwane LM	Mankweng	Ebenhezer	Lepelle Northern Water	R26,986,300
Lephalale LM	Zeeland	Zeeland	EXXARO	R21,110,100
Mogalakwena LM	Mokopane Mahwelereng	Dooringdraai	Lepelle Northern Water	R651,200
Mopani DM	Giyani	Giyani		R26,125,000
Polokwane LM	Molepo	Molepo		R8,270,900
Sekhukhune DM	Groblersdal	Groblersdal		R22,168,300
Bela Bela LM	Bela Bela/Magalies Water	Bela Bela	Magalies Water	R6,724,300
Modimolle-Mookgophong LM	LIM365: Modimolle/Magalies Water	Donkerpoort	Magalies Water	R29,336,700
Thabazimbi LM	The Greater Thabazimbi-Magalies	Thabazimbi Chlorination Plant	Magalies Water	R213,400
Vhembe DM	Nzhelele	Khalavha		R955,900
Totals				**R144,510,000**

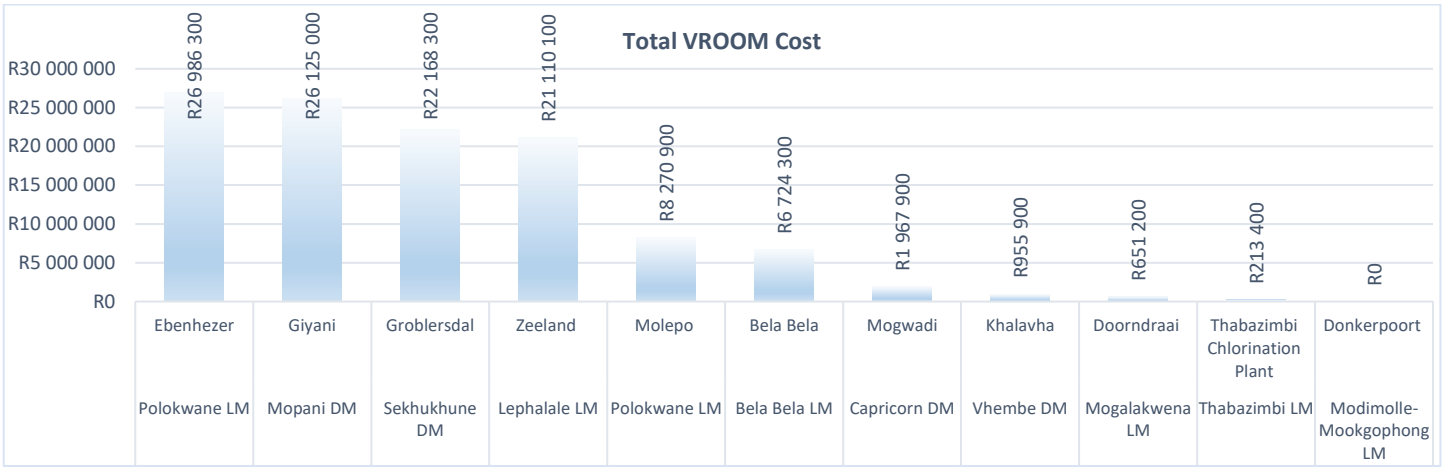


Figure 29 - Total VROOM Cost for the BD Systems Assessed

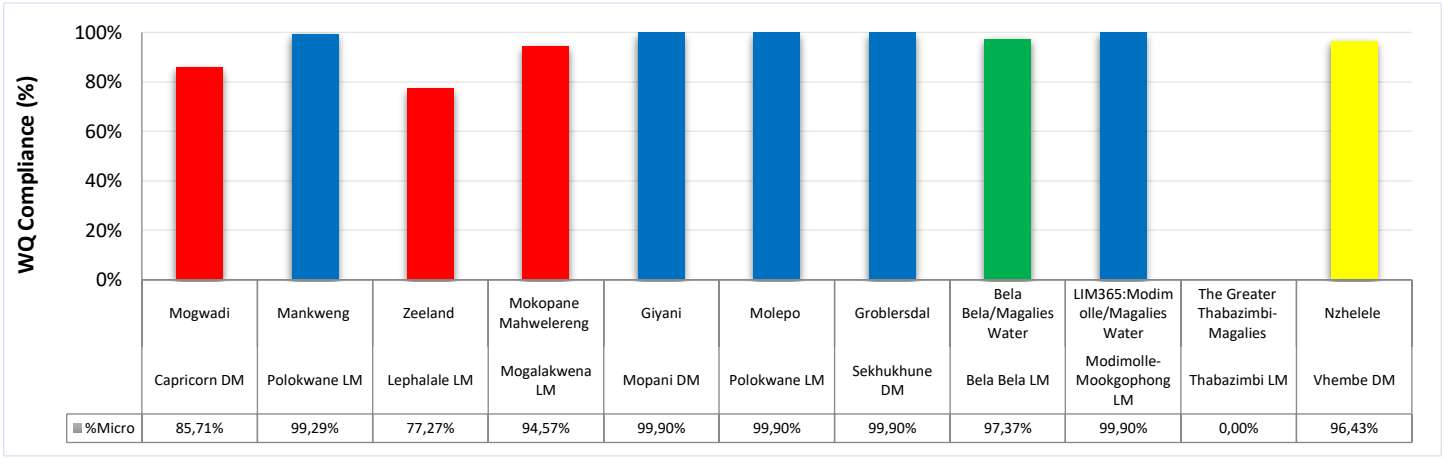
The associated VROOM costs for the 11 water supply systems assessed amounts to R144.5 million, with the bulk of investment needed for Donkerpoort (Modimolle-Mookgophong), Giyani (Mopani) and Ebenhezer (Polokwane).

Drinking Water Quality Status

The Institutional Water Quality Compliance, as measured against SANS 241 standards, is reflected in the table below (IRIS, 28 March 2023).

Table 37 - Limpopo Summary of the Drinking Water Quality Status of all the TSA Water Supply Systems

#	Municipality (WSA)	TSA WSS	TSA WTW	Microbiological Compliance	Chemical Compliance
1	Capricorn DM	Mogwadi	Mogwadi	85.71%	74.07%
2	Polokwane LM	Mankweng	Ebenhezer	99.29%	96.94%
3	Lephalale LM	Zeeland	Zeeland	77.27%	95.12%
4	Mogalakwena LM	Mokopane Mahwelereng	Dooringdraai	94.57%	89.63%
5	Mopani DM	Giyani	Giyani	>99.90%	90.38%
6	Polokwane LM	Molepo	Molepo	>99.90%	97.04%
7	Sekhukhune DM	Groblersdal	Groblersdal	>99.90%	95.65%
8	Bela Bela LM	Bela Bela/Magalies Water	Bela Bela	97.37%	94.86%
9	Modimolle-Mookgophong LM	LIM365: Modimolle/Magalies Water	Donkerpoort	>99.90%	81.82%
10	Thabazimbi LM	The Greater Thabazimbi-Magalies	Thabazimbi Chlorination Plant	NI	NI
11	Vhembe DM	Nzhelele	Khalavha	96.43%	91.12%



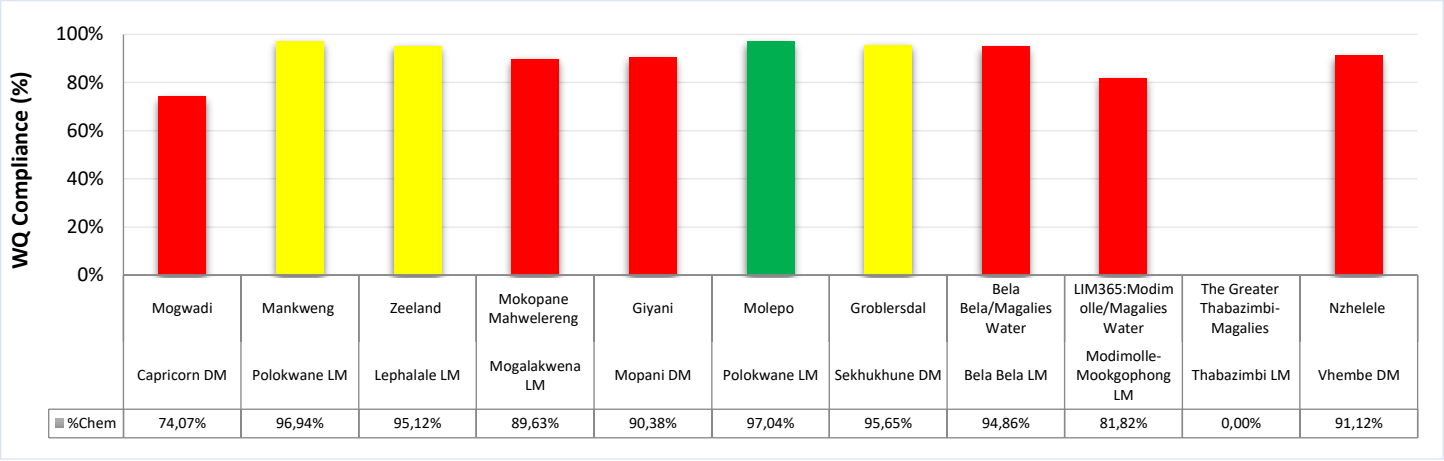


Figure 30 - LP Drinking Water Quality Status of all the TSA Water Supply Systems

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

The TSA and water quality results depict a vastly different picture. The TSA shows 9 of the 11 water supply systems to be in the *excellent to average performance category*, and the water quality compliance shows that 46-91% of the systems *fail to produce compliant final water quality*.

Out of 11 treatment plants, 5 (45%) and 1 (9%) of systems achieve excellent and good microbiological quality. A total of 1 (9%) system has poor microbiological water quality status and 4 (37%) systems have a bad microbiological water quality status. The water in these systems poses a serious acute health risk to the community. WSAs with poor microbiological water quality status must be assessed to confirm status in all systems to ensure rectification measures are comprehensive to safeguard communities. The direct cause of microbiological failures can be linked to the TSA sub-watch Area 7, which has a low contribution to the overall TSA score. The failure to produce water that meets E. coli standards can be linked back to poor operations, defective infrastructure, dosing rates, absence of disinfection chemicals, lack of monitoring, or lack of operating and chemistry knowledge. WSIs that are not monitoring the final water quality at the outlet of the treatment plant or at specific end use points must develop a monitoring programme and resume with compliance monitoring as a matter of urgency.

Chemical compliance shows that 1 (9%) has good water quality, whilst the majority of systems fail to achieve chemical compliance. A total of 3 (27%) and 7 (64%) systems have a poor and bad chemical water quality status.

Concluding Remarks

The Blue Drop Watch results stresses the importance of drinking water supply and quality to be a primary focus area of government. Already, the Department has developed the Water Services Improvement Programme for systems in critical state, and at systems where particular concerns were reported. Blue Drop performance trends will be used to determine repetitive poor performance, to inform a radical approach to ensure turnaround and compliance. This could include facilitating long term intervention by either a capacitated water board or any other suitable mode of water services support. The determination of the 'very rough order of estimates' (VROOM) was done to give an estimation of the capital requirement for the functionality restoration drive. This will be effected with the support from the National Treasury.

The Regulator will continue to monitor performance in terms of Section 62 of the Water Services Act and will engage together with CoGTA and SALGA, WSAs for corrective action plan development and implementation and offer support. Should these actions fail, the Department will consider civil action together with actions contemplated under section 63 of the Water Services Act (Act 108 of 1997) to ensure that Ministerial directives are issued with timeframes for implementation. Failure to respond will trigger remedial action be taken at cost of the non-complying entity or municipality. The Department will take steps to improve its capacity to respond more effectively in this duty, in ensuring visible and measurable improvement in drinking water services. The Department of Cooperative Governance and National Treasury will be engaged to explore ways of utilising conditional grants for the purpose of remedial rectification.

All Water Services Institutions are hereby urged to take note of their TSA status and commence with corrective measures. The full Blue Drop audit report will provide further material content to the overall management of drinking water services across South Africa, upon its release in July 2023.

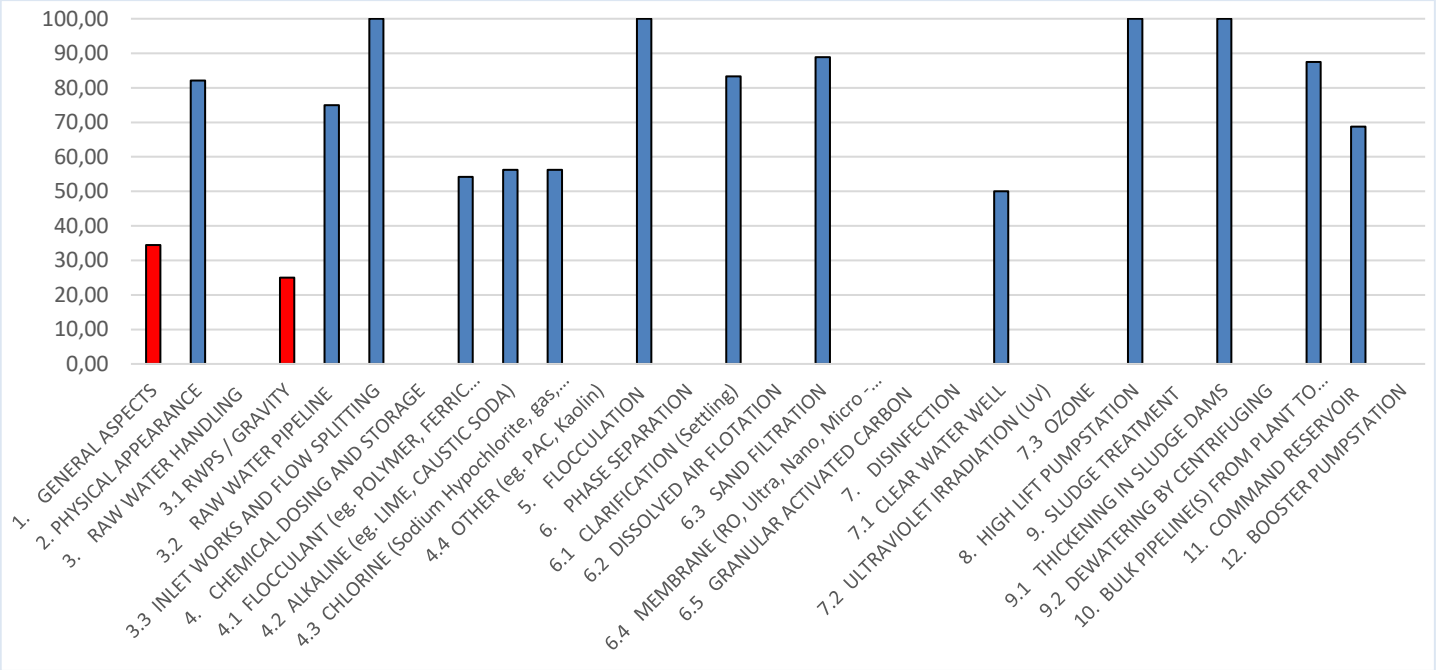
9.1 Bela Bela Local Municipality

The Bela Bela water supply system (Magalies Water) was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

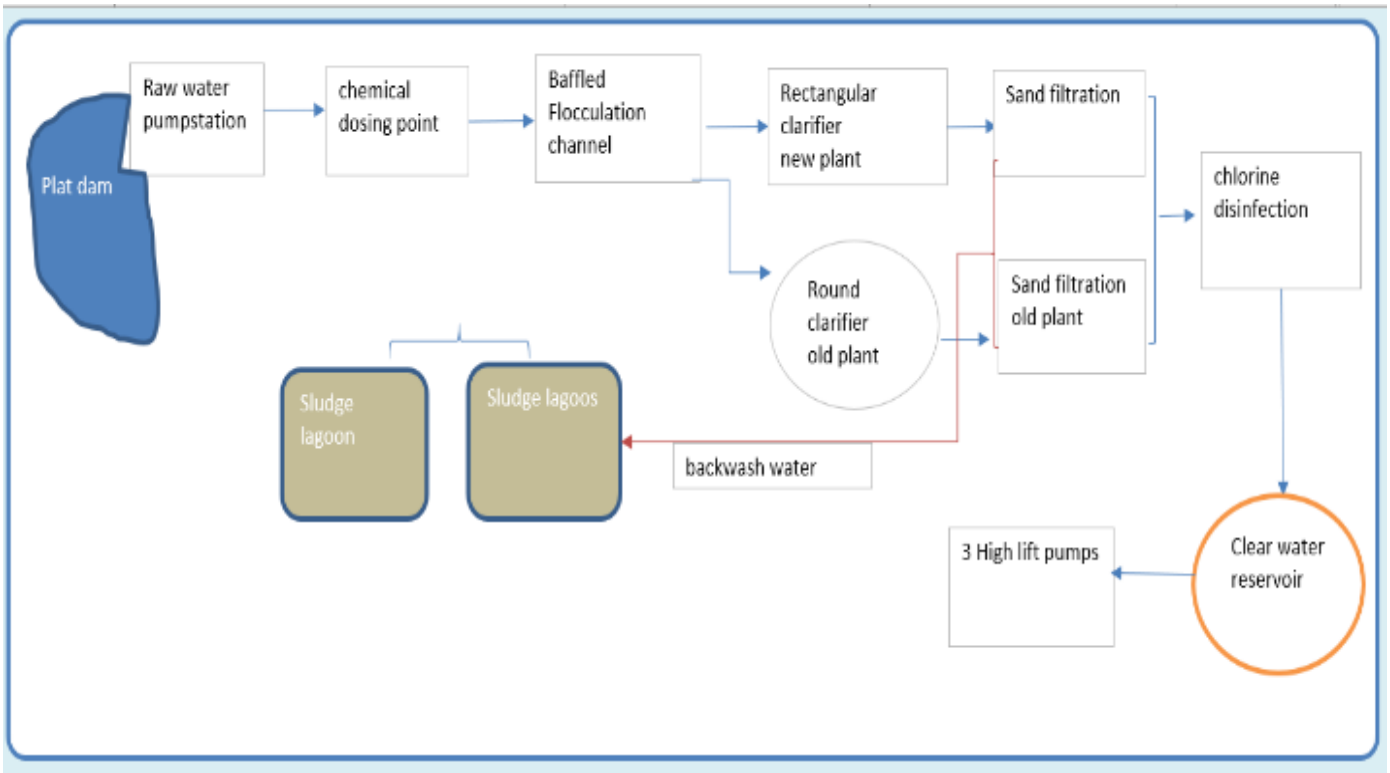
Bela Bela WTW TSA Score: 69%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	34.4	Class C certificate clearly display in the admin room. There is no logbook for maintenance and repairs. Operational logbook available onsite. Process Flow Diagram is not available and there is no O&M manual
2	**Physical appearance of plant**	82.1	The entrance is signposted. The surrounding is fairly clean. There is some vegetation in the yard, but there is still room for improvement. Well fenced and proper access control. Security guard available onsite. Safety signs in place however they are not adequate.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	25.0	Two pumps installed and only one is working.
	Raw water pipeline	75.0	There are 350mm steel pipe network that are in good condition. No major leaks were reported. Flow meter is available and in working order.
	Inlet works	100.0	Effective flash mixing was observed. Visual dripping of flocculant could be seen, and chemical feed can be monitored.
4	**Chemical dosing and storage**		
	Flocculant	54.2	Only one pump installed, and it is operational. It was dosing 6l/h and operating at 25%. Standby is not connected. The backup pumps were presented in the office and were stored in the cupboards. The functionality of the pumps could not be tested. Emergency shower at ground level, some distance away from the chemical dosing room but near the storage room.
	Alkaline	56.3	The pump and dry feeder are in place and in working condition. The bags are packed on-top of pallets and on an order of 1st in 1st out basis. The masks are provided however the treatment works personnel do not wear them. There was enough stock in-place. The water treatment works doses 6 bags of lime daily and there were more than 180 bags onsite during the assessment.
	Chlorine	56.3	Chlorine dosing unit is in working condition. No standby chlorinator. Chlorine chips is used and there were 57 buckets of 25 kg containers full.
5	**Flocculation**	100.0	Flocs were visible at the end of the channel. The channels were clean and there was no scum on the surface however, minor cracks were observed.
6	**Phase Separation**		
	Clarification (settling)	83.3	There was no carry over flocs and good settling was observed. De-sludge only once per day. Weirs from the rectangular clarifier were detached and may prevent even and free flow. Weirs at the round clarifies were in good condition.
	Sand filtration	88.9	Two backwash pumps installed, and both were operational. One duty and one pump on standby. Only one air blower installed per module. New module is equipped with one and the recently refurbished old plant also equipped with one blower. The housekeeping around the filters is impressive
7	**Disinfection**		
	Clear water well	50.0	There is an onsite reservoir which serves as a contact tank and the contact time is more than 30 minutes. There is no evidence of free chlorine analysis presented during the site inspection.
8	**High lift pumpstation**	100.0	Three high lift pumps in working condition. Two pumps working and one standby - 100% standby and are alternated.
9	**Sludge treatment**		
	Thickening in sludge dams	100.0	Two sludge lagoons not in use. Currently not in use but the sludge dams are in good condition and not filled with sludge.
10	**Bulk pipeline from plant to command reservoir**	87.5	Not assessed. Process controller reported that the steel pipe is in good condition. The pipe is underground. Valve chamber is in good condition.
11	**Command reservoir**	68.8	There are 2 command reservoirs: 12 Ml/d for Magalies Water and 6.7 Ml/d for Bela Bela LM. The reservoirs are secured and fully fenced with a lockable key. There is a telemetry in place however is not operational and Process Controllers reported that it has been hit by a lightning. The structure is leak free however the lid was opened by network team who takes reservoir level manually.
	Total	**69%**	

High risk areas OR Key Hardware Risks/ Defects

1. Two raw water pumps installed and only one was operational and may impact on the shortage of water supply.
2. There is a no back-up generator, the treatment facility is affected by load shedding.
3. There is insufficient operational water quality monitoring. Unavailability of calibration standards for turbidity and pH meters.
4. The works needs improvement as the infrastructure is aging and minor cracks were observed.
5. Only one blower was available for each backwashing and no standby existed for the lime and chlorine dosing equipment.

VROOM Refurbishment Cost Estimate

Civil Works	R402,600	6 %
Mechanical Works	R6,317,300	94 %
Electrical Works (Incl C&I)	R4,400	0 %
Total VROOM Cost	**R6,724,300**	**100%**
R million / MLD		**0.96**

Regulatory Impression

Bela Bela Water Treatment Works was upgraded from 5 Ml/d to 7.2 Ml/d in 2009. according to the WSA, the old plant was refurbished except for one sand filter which is isolated and not functional. The water from Bela Bela WTW blends with Water from Magalies Klipdrift Water Treatment Works, however, the water quality from Bela Bela WTW is constantly failing with turbidity and Heterotrophic Plate Count. There other challenge is unavailability of backup generator at the plant and load shedding occurs frequently and it also impact on the purification of water. The raw water pump which is abstracting raw water from Plat is currently running with one pump without a standby. They are running a risk of mechanical breakdown which will pose a risk of water shortage. The cost of repairing the backup pump must be budgeted for. Good housekeeping was observed in all unit processes including the lime room and filter outlet boxes.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	97.37%
Chemical Compliance	94.86%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





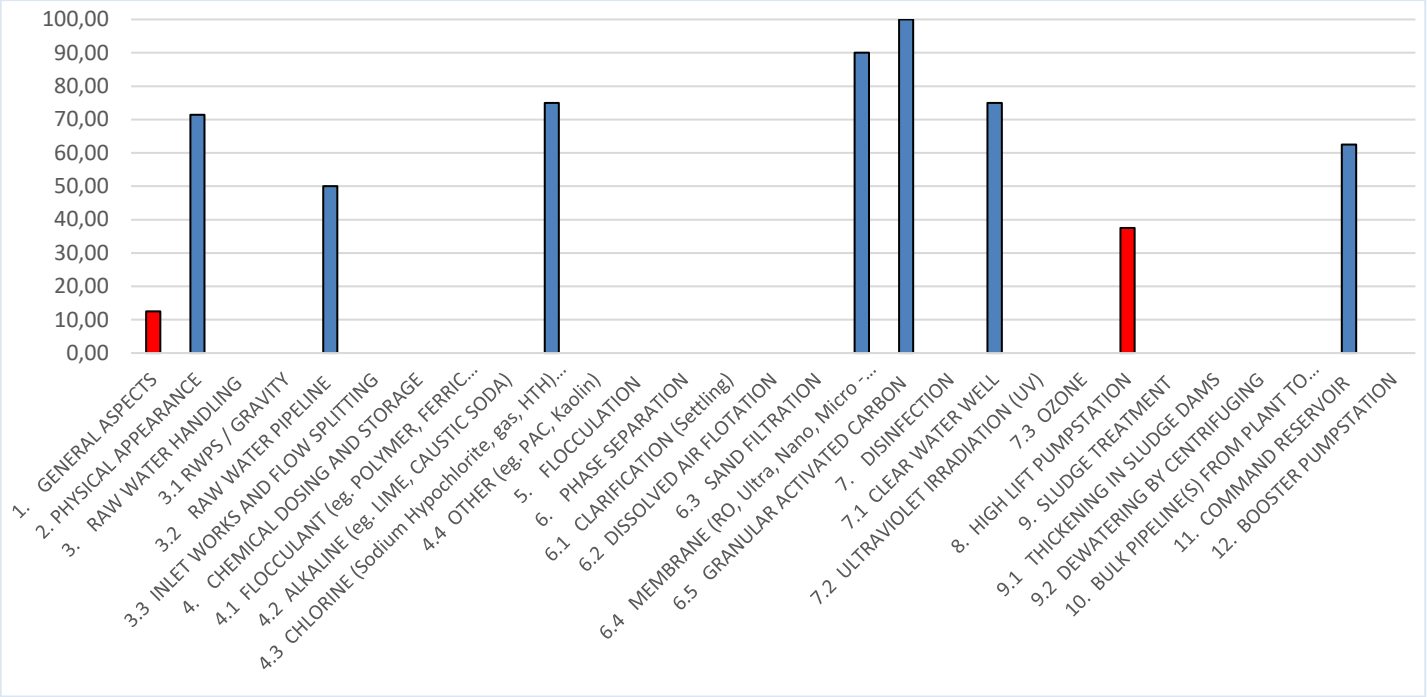

9.2 Capricorn District Municipality

The Mogwadi water treatment works (Reverse Osmosis) was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

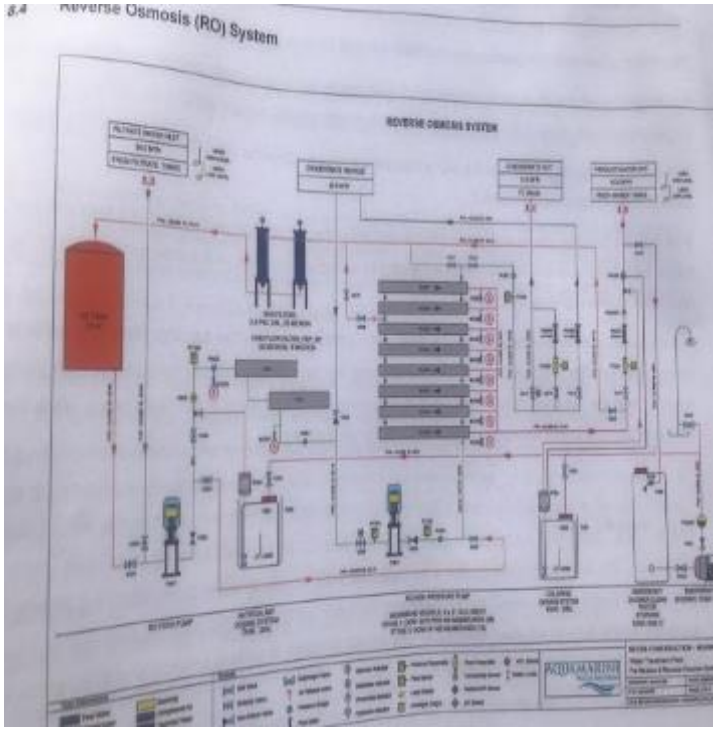
Mogwadi TSA Score: 58%

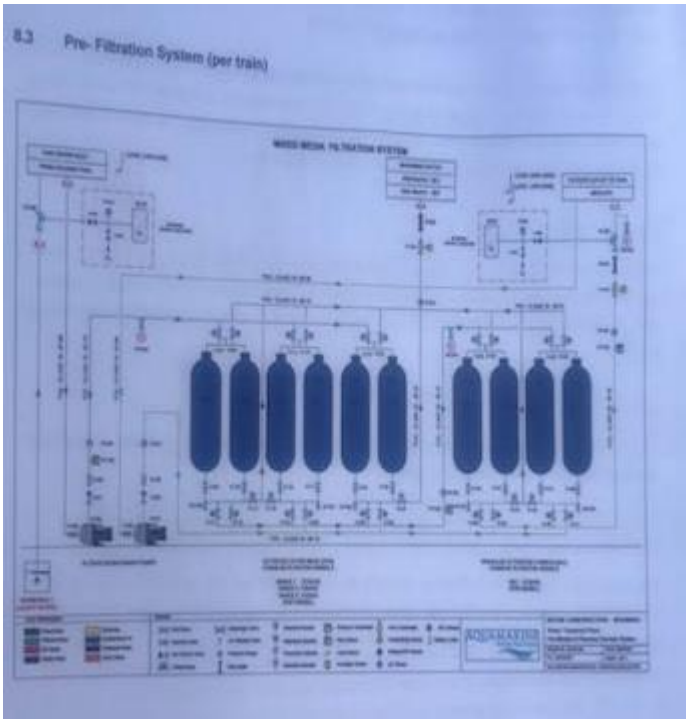
Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram





Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	12.5	No documents available at the WTW. Only a conductivity meter is available on site. It is not calibrated or verified.
2	**Physical appearance of plant**	71.4	The facility is fenced. Roads in good condition. In- and exterior of containers in good condition. Natural grass should be cut inside the fenced area. General housekeeping can improve. Open manholes a safety risk. Safety signs in place.
3	**Raw water handling**		Water is pumped from several boreholes to plant.
	Raw water pipeline	50.0	Inflow meter in place but not verified. Meter readings is taken once per shift, but no interpretations are done.
4	**Chemical dosing and storage**		
	Chlorine	75.0	Dosing Sodium Hypo chloride for disinfection. All units are in working condition with standby dosing pump available. PPE and other related safety material not visibly available. Safety signs missing and ventilation poor.
5	**Flocculation**	na	
6	**Phase Separation**		
	Membrane	90.0	All feed pumps and Backwash pumps are in working conditions with 100% standby available. Membrane integrity monitoring system operational but not calibrated.
	Granular activated carbon (GAC)	100.0	Pumps in working condition with a 100% standby available.
7	**Disinfection**		
	Clear water well	75.0	Water is pumped to final water reservoir. Free Chlorine is only tested at outlet of final reservoir and not at inlet.
8	**High lift pumpstation**	37.5	The pumps in working condition but pumpstation needs urgent attention! Standby pumps are 100 %. Final flow meter in place but not verified. No Flow records are available.
9	**Sludge treatment**	na	No sludge produced.
10	**Bulk pipeline from plant to command reservoir**	na	
11	**Command reservoir**	62.5	Free Chlorine is only tested at outlet of final reservoir and not at inlet. No Telemetry available. No flow measuring or level indication. No obvious leaks.
12	**Booster pumpstation**	na	
	Total	**58.3%**	

High risk areas OR Key Hardware Risks/ Defects

1. Occupation Health and Safety inspection should be done to verify safety sign relevance and positions.
2. Access control and relevant security should be implemented.
3. Standard Operating Procedures and Logbooks should be available on site to ensure sustainable operations of the plant.
4. Housekeeping can improve.

VROOM Refurbishment Cost Estimate

Civil Works	R815,100	41%
Mechanical Works	R1,046,100	53%
Electrical Works (Incl C&I)	R106,700	6%
Total VROOM Cost	**R1,967,900**	**100%**
R million / MLD		**1.97**

Regulatory Impression

Lepelle Northern Water operates the bulk water treatment and delivery systems in the Capricorn District Municipality. Although, the services, its present operation, maintenance, and management in the Capricorn area is sustainable for the short-term future, Lepelle Northern Water is encouraged to take a much stronger risk approached, based not only in terms of water quality, but in terms of providing a long-term bulk service. Specific area which could be focussed on is as follows:

- Ensuring that the treatment technology used is well maintained, timeously repaired, and updated.
- Process Controllers should be encouraged to apply good process control practices and to continuously optimise treatment and distribution processes.

- Water Safety Planning should be the way of doing business and should include all risks in terms of providing a water service.

From the state of readiness for the assessment and level of participation throughout the whole assessment process, it is evident that Capricorn DM does not have the capacity to operate a sustainable water business. This can be summarised by the following points:

- The non-alignment between systems reported on then BDPAT of 2022 and the systems registered on IRIS.
- The non-compliance to SANS 241 with microbiological compliance (44% at Alldays), poor chemical quality and monitoring compliance. This is a significant risk for community health in the Capricorn WSA area of responsibility.
- The absence of any information on how the water business is operated and managed indicate a total lack of corporate governance with regards a basic human right.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	85.71%
Chemical Compliance	74.07%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





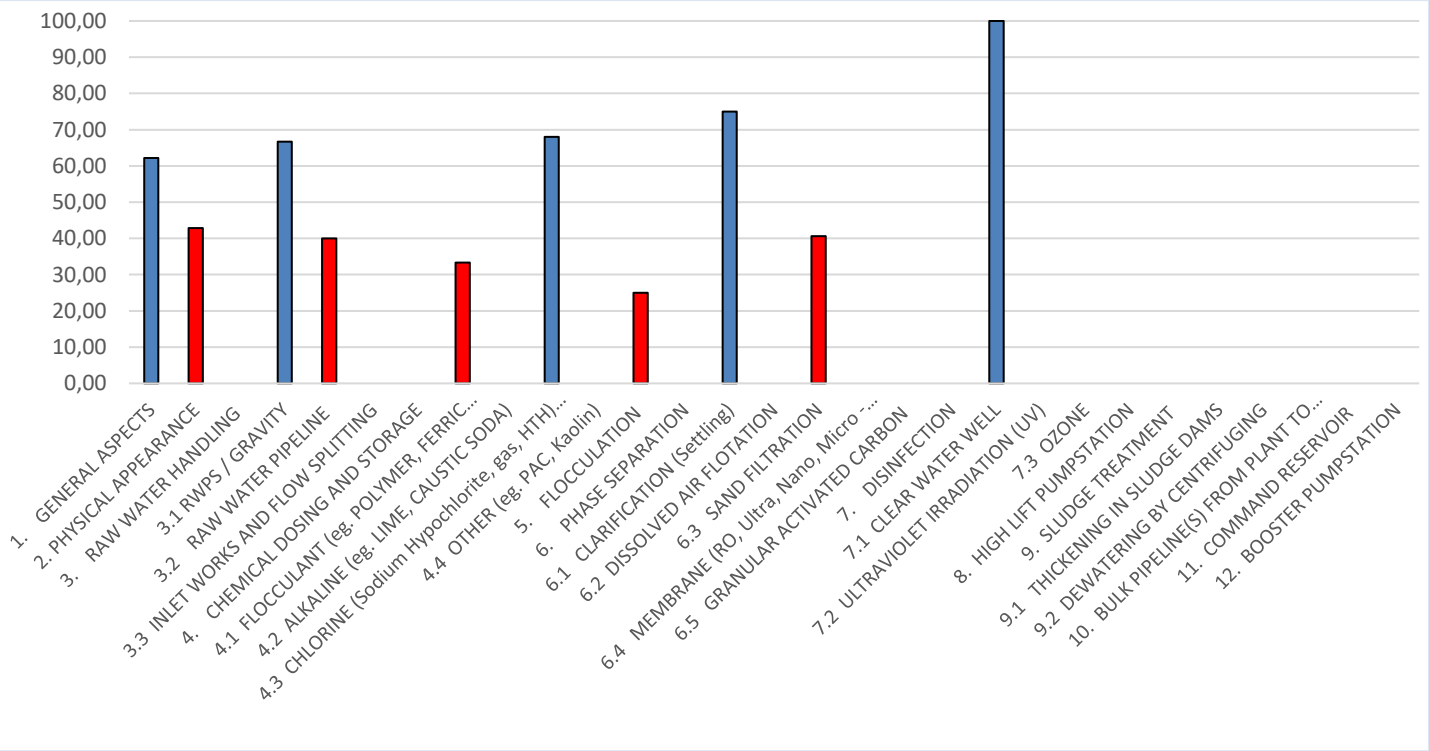

9.3 Greater Sekhukhune District Municipality

The Groblersdal water treatment works was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

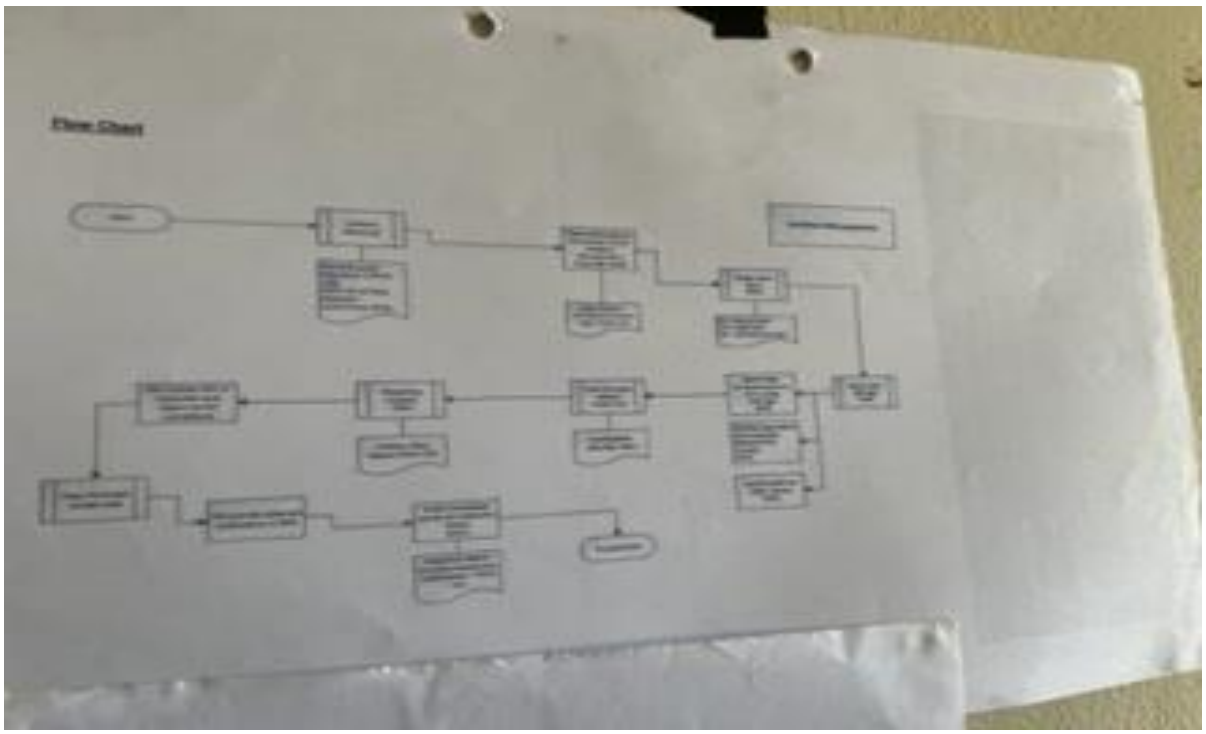
Groblersdal TSA Score: 50%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	62.2	Class C WTW. Most of the relevant documentation were available and displayed. The process controllers have not been adequately trained in process monitoring and handling of the equipment. During the technical site assessment, the process monitoring equipment was not operational due to leakage of battery acid into the equipment. The jar test equipment was in place. The process controller, however, lacks knowledge of how and when to conduct a jar test. Process controllers lack knowledge of how much electricity is used in a plant. The WSA is urged to capacitate the process controller on matters pertaining to water treatment.
2	**Physical appearance of plant**	42.9	Poorly fenced and there is access to public and animals. The WSA is encouraged to practice proper housekeeping around the treatment facility. Old pumps, lying around the treatment facility should be relocated. Demolished construction materials should be removed from the site to avoid the risks associated with personnel safety.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	66.7	Screen were not assessed due to poor housekeeping. The installed pumps of the operational module were operational. Three pumps are installed in the operational module. Two pumps were on duty and 1 was serving as a standby.
	Raw water pipeline	40.0	The inflow measuring device was in place and working. However, there were no records for calibration or verification done. Flow meter readings were recorded, but not converted and not interpreted.
	Inlet works	0.0	Flash mixing is not effective. Chemical feed cannot be monitored due to the design of the inlet
4	**Chemical dosing and storage**		
	Flocculant	33.3	The WSA must ensure that there is a bunded area around the place where chemical is stored and dosed. There should be an emergency wash in place to comply with OHS requirements and for the safety of people. The traces of floc spillages were observed during inspection. There are two floc dosing pumps. One pump is operational while the other pump is serving as a standby.
	Chlorine	68.0	The installed dosing pumps were working with 100% standby available. There is no switch-over device. The scale is in place. The safety equipment is available. However, the cartridge on the mask has expired. The fire extinguisher has not been service. There was one full cylinder and one empty cylinder which represent insufficient stock.
5	**Flocculation**	25.0	The channel was dirty with attachments on the wall. The visibility of the flocs could not be assessed due to the design of the process unit. However, it was evident that the coagulant was overdosed
6	**Phase Separation**		
	Clarification (settling)	75.0	Large flocs were observed at the sedimentation basin and were carrying over through weirs to sand filtration. Desludging is done once per day. Weirs were in good condition.
	Sand filtration	40.6	Housekeeping is not practiced. The walls are dirty. Hosing down of walls is not done. There were signs of lack of sand. Uneven sand surface and poor backwashing procedures. There are two backwash pumps, one is serving as standby, but is in poor condition. Currently there is no standby blower. The standby blower is not working and has been left lying on the floor at the pump control room. Flow is split to operational sand filters evenly. Backwashing is done once a day.
7	**Disinfection**		
	Clear water well	100.0	The contact time to reservoir is more than 30 minutes.
8	**High lift pumpstation**	na	Not assessed due to time constraints
9	**Sludge treatment**		
	Thickening in sludge dams	na	Not assessed due to time constraints
10	**Bulk pipeline from plant to command reservoir**	na	Not assessed due to time constraints
11	**Command reservoir**	na	Not assessed due to time constraints
12	**Booster pumpstation**	na	Not assessed due to time constraints
	Total	**49.6%**	

High risk areas OR Key Hardware Risks/ Defects

1. Chlorine gas dosing plant is not complying to legislation.
2. Leakages of floc at the dosing area with associated coagulant overdose.
3. Lack of optimised filter backwash procedures and infrastructure to backwash filter accordingly.
4. Chemical dosing could not be monitored or observed.
5. Limited chemical stock onsite associated with the absence of financial and stock management procedures.

VROOM Refurbishment Cost Estimate

Civil Works	R5,512,100	25%
Mechanical Works	R11,585,200	52%
Electrical Works (Incl C&I)	R5,071,000	23%
Total VROOM Cost	**R22,168,300**	**100%**
R million / MLD		**1.58**

Regulatory Impression

Sekhukhune District Municipality operates twenty water supply systems that provide the community with basic water services. The Water Service Authority receives bulk water from Lepelle Northern Water to service four water supply systems, which are Burgersfort, Flag Boshielo East, Hlogotlou, Marble and Steelpoort. Water services issues do not have a priority for the management of the District Municipality based on their response/interest in water business. The Department of Water and Sanitation identified a challenge of collaboration between the Water Service Authority and the Water Service Provider during the 2014 Blue Drop Audit. This still seems to be the case. The assessment session was dominated by the absence of information from the WSA mainly due to the absence of managerial and administrative capacity to operate a water business, the lack of water business associated financial and asset management and limited technical related water knowledge. There was a decline in the performance of this WSS due to a lack of a water safety plan. This also resulted from poor microbiological compliance with drinking water quality standards, and an inadequate microbiological monitoring system. Compliance with technical skills has also resulted in a high BDRR. The microbiological failures of the Marble Hall Water Supply System were not communicated to consumers, and no boil water notice was issued. The other water supply systems managed by Lepelle Northern Water performed better than those managed by the Greater Sekhukhune District Municipality. The WSA`s operation and maintenance budget and expenditures have not been ringfenced for water only. The various cost drivers have not been budgeted for. In other water supply systems, the WSA was failing to provide operation and maintenance budget and expenditure information. Audited asset register information has not been provided. The WSA is encouraged to have a budget for operation and maintenance that is ringfenced for water-only and to consider making it system-specific. Water reticulation inspections for all water supply systems within the district municipality have not been conducted. As a result, the condition or state of the reticulation network is not known. Water safety plans have not been developed for all water supply systems. The district municipality has experienced poor capacity management at its treatment facilities. The Process Controllers, Maintenance Team, Engineering, and Scientific Management have not fully complied with the regulatory requirements. It is imperative that the WSA normalize the training of its process controllers to improve their knowledge of the water treatment business. For drinking water quality compliance analysis, the WSI should utilize a laboratory that is accredited and that participate in a proficiency scheme. For analysis of drinking water quality compliance, WSAs are encouraged to use accredited laboratories. The WSA does not take part in the publication of drinking water quality results. Water conservation and water demand management are not in place, and as a result, water losses are not known.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	95.65%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





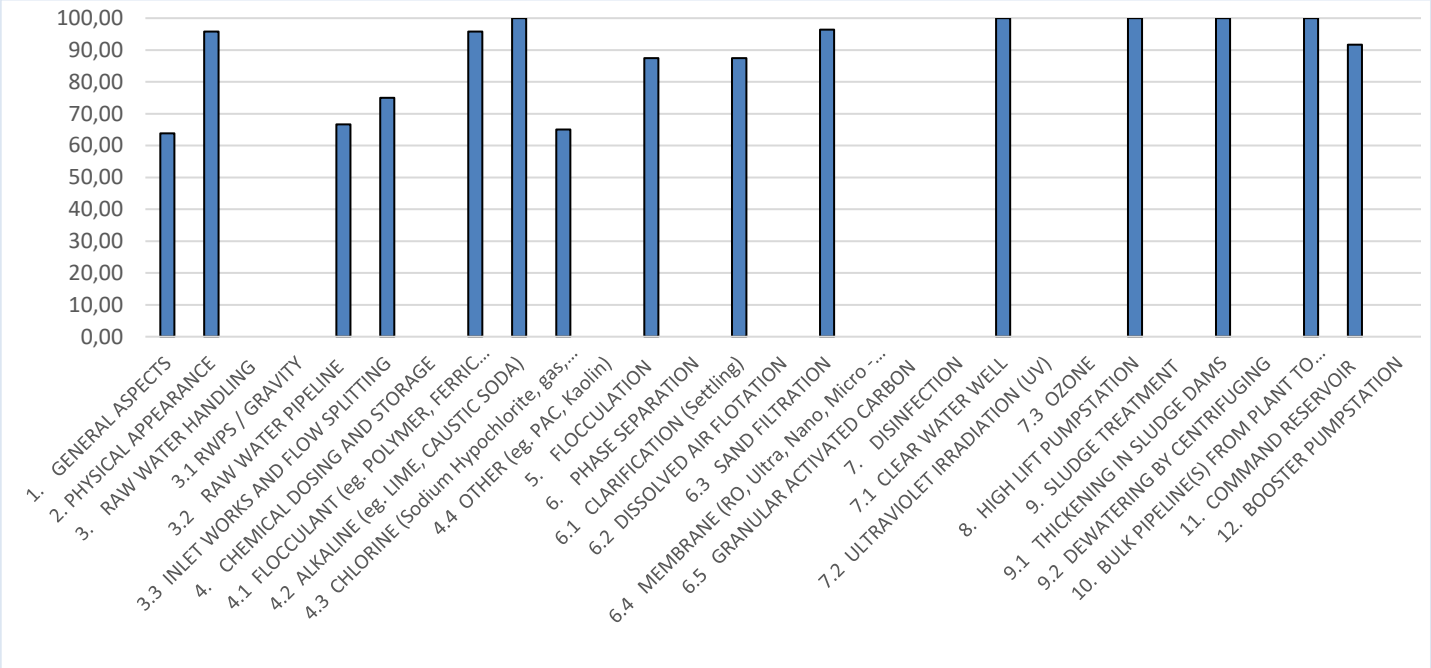
9.4 Lephalale Local Municipality

The Zeeland water treatment works, operated, and maintained by EXXARO, was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

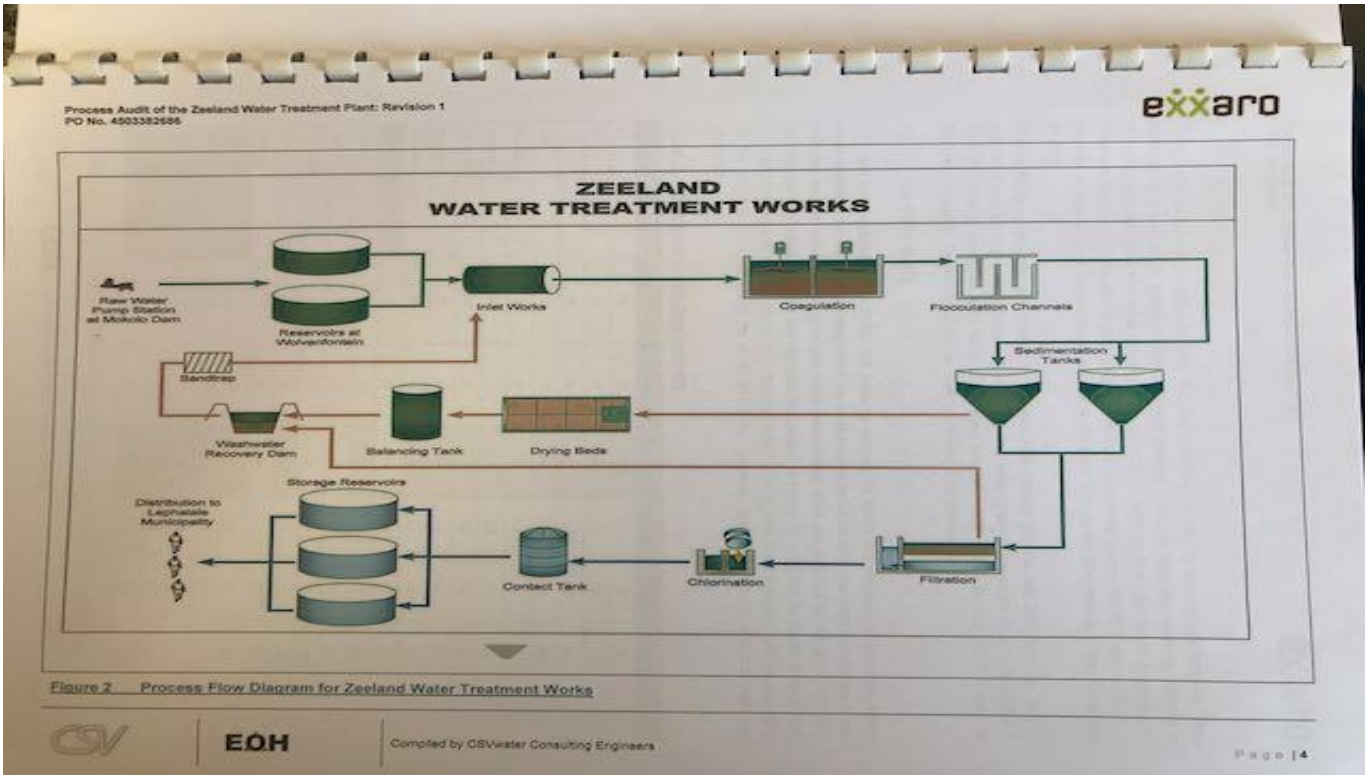
Zeeland TSA Score: 86%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	63.9	The plant is classified as Class B. An automated preventative maintenance system generates job cards for infrastructure maintenance that is signed off after successful completion of the job. Shift handover indicated in a logbook but not all the activities were indicated during shift. Only a turbidity meter and free chlorine meter are available in the process laboratory. These instruments are not calibrated. Overdosing of Ferric indicative of Jar tests not done to optimise dosing.
2	**Physical appearance of plant**	95.8	General housekeeping can improve. interior of buildings in good condition. Roads in good condition. Facility is well fenced. Safety signs in place.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	na	Pumps at source (50 km from the plant) not assessed.
	Raw water pipeline	66.7	Pipeline in a good condition. Inflow meter in place but not verified. Just meter reading is taken once per shift, but no interpretation.
	Inlet works	75.0	Flash mixing is effective. Chemical feed can be monitored but the operational records does not indicate that it is monitored.
4	**Chemical dosing and storage**		
	Flocculant	95.8	Two pumps installed, one on standby. Dosing area is clean and neat and bunded. Ferric Chloride stock sufficient for more than 30 days. Emergency shower in place but needs to be serviced.
	Alkaline	100.0	All units are in working condition, with a 100% standby. Very tidy and dust free. More than 30 days lime stock available.
	Chlorine	65.0	All units are in working condition, with standby in place. Scale is giving incorrect reading and no switch-over device in place. Safety equipment available but status of it is unknown. Oxygen cylinder and mask not visible. Chlorine gas sufficient for 30 days.
5	**Flocculation**	87.5	Flocs visible. Scum at the end of the flocculation chambers may be indicative of the overdose of Ferric Chloride.
6	**Phase Separation**		
	Clarification (settling)	87.5	Desludging once per day until clear water is discharged. Weir structures are in good condition but covered with sludge that may prevent even and free flow.
	Sand filtration	96.4	Two backwash pumps installed, with one on standby. Air blowers installed with one on standby. Filter backwashing once per day. Media surface is even. Some filter walls dirty, in some cases, weeds are growing in the filters. The filter used for backwashing, filter 1, is not washed down during backwashing.
7	**Disinfection**		
	Clear water well	100.0	Contact tank and three 10 ML reservoirs result in contact time of more than 30 minutes.
8	**High lift pumpstation**	100.0	Three pumpstations in working condition. In each pump station: Two pumps working and two standby - 100% standby. Final flow meter in place but not verified. Flow records captured.
9	**Sludge treatment**		
	Thickening in sludge dams	100.0	Six sludge dams available and well maintained. Supernatant recycled to the plant. All pumps are working.
10	**Bulk pipeline from plant to command reservoir**	100.0	Pipeline is a good condition.
11	**Command reservoir**	91.6	Reservoirs within the fenced area of the plant. No signs of any leaks. Two flow meters in place but verification status unknown
	Total	**86.2%**	

High risk areas OR Key Hardware Risks/ Defects

1. Ferric chloride overdosed and may result in unnecessary expenditure.
2. Occupational Health and Safety audit needs to be done to mark unsafe conditions at the plant.
3. Process Control Procedures need to be confirmed and the staff competence needs to be confirmed.

VROOM Refurbishment Cost Estimate

Civil Works	R1,628,000	8%
Mechanical Works	R17,447,100	82%
Electrical Works (Incl C&I)	R2,035,000	10%
Total VROOM Cost	**R21,110,100**	**100%**
R million / MLD		**0.53**

Regulatory Impression

Both bulk water suppliers operate the bulk water treatment and delivery systems. Although, the services, its present operation, maintenance, and management in the Lephalale area is sustainable for the short-term future, both bulk suppliers are encouraged to take a much stronger risk approached, based not only in terms of water quality, but in terms of providing a long-term bulk service. Specific area which could be focussed on is as follows:

- Ensuring that the treatment technology used at the water treatment works, is well maintained, timeously repaired, and updated.
- Process Controllers should be encouraged to apply good process control practices and to continuously optimise treatment and distribution processes.
- Water Safety Planning should be the way of doing business and should include all risks in terms of providing a water service.
- Although microbiological quality compliance at the Matimba system complies to SANS 241 the WSA and the bulk suppliers should take note of microbiological non-compliances, chemical non-compliances and monitoring non-compliances, attention needs to be given to chemical water quality and monitoring compliance.

From the state of readiness for the assessment and level of participation throughout the whole assessment process, it is evident that Lephalale WSA do not have the capacity to operate a sustainable water business: This can be summarised by the following points:

- The non-alignment between systems reported on then BDPAT of 2022 and the systems registered on IRIS.
- The non-compliance to SANS 241 with microbiological compliance, poor chemical quality, and monitoring compliance. This is a significant risk for community health in the Lephalale WSA area of responsibility.
- The absence of any information on how the water business is operated and managed indicate a total lack of corporate governance with regards a basic human right.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	77.27%
Chemical Compliance	95.12%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





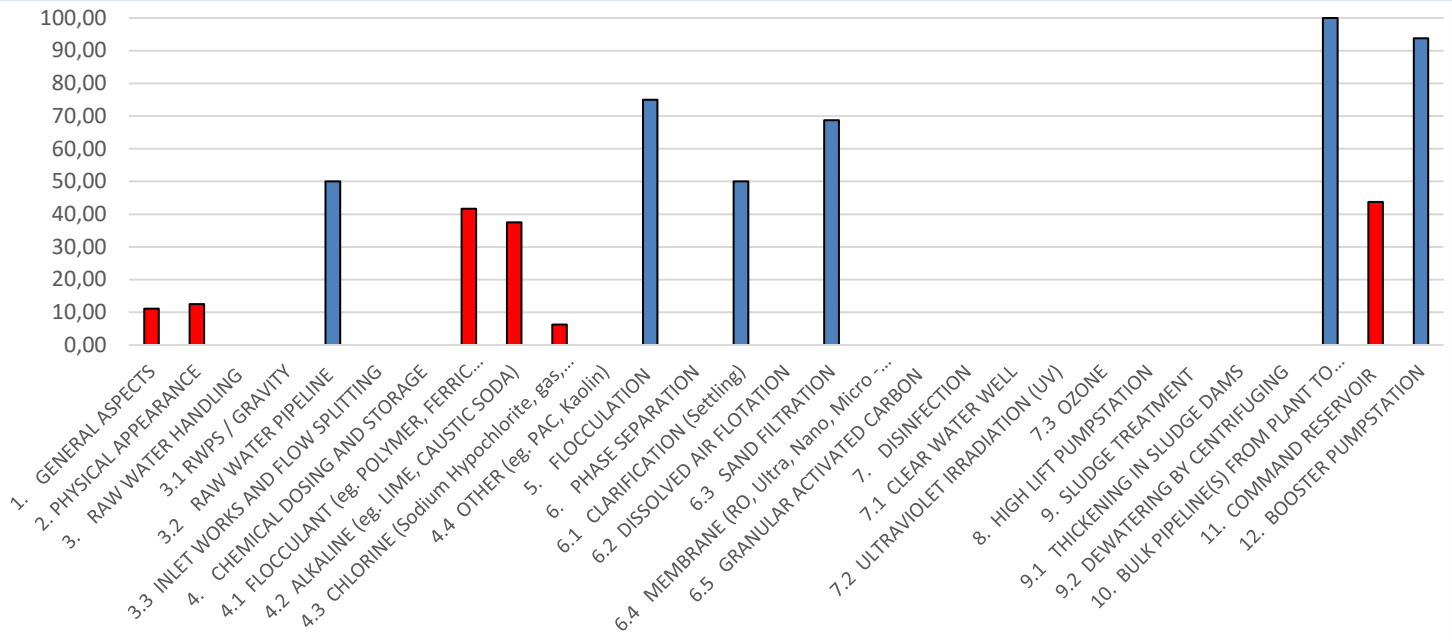

9.5 Modimolle-Mookgopong Local Municipality

The LIM365: Modimolle/Magalies water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

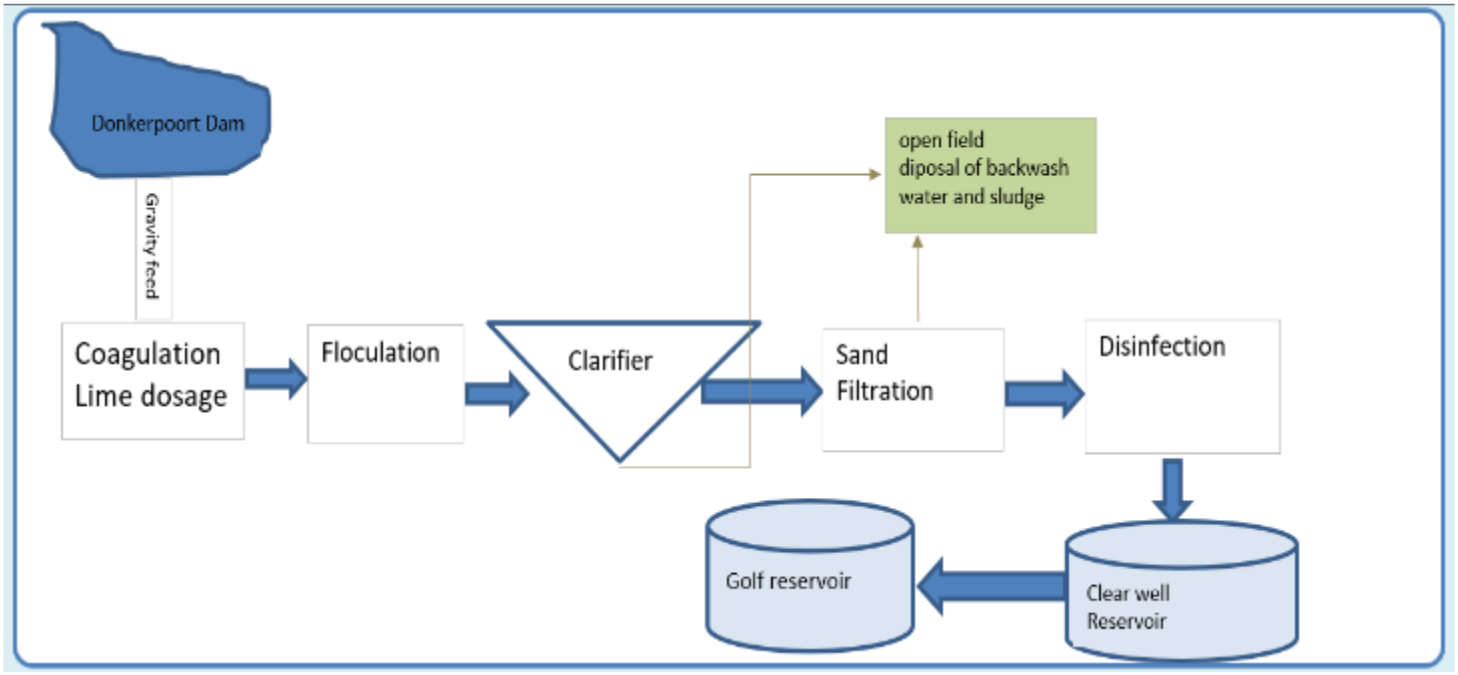
Donkerpoort WTW TSA Score: 34%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	11.1	Class C plant, there are no logbooks in place, no display area noted for PFD or notices. No adequate signage at gate and signages not available at the plant.
2	**Physical appearance of plant**	12.5	Fenced and security guards available on site, untidy terrain, poor housekeeping, low workplace satisfaction, major OSH corrections.
3	**Raw water handling**		Raw water abstraction from Donkerpoort Dam, the water is gravity fed into the plant by using three valves, unavailability of screen causing blockages of meter. flocculant chemical in stock, poor flash mixing conditions, flow meter absent.
	Raw water pumpstation/ gravity feed	0.0	
	Raw water pipeline	50.0	
	Inlet works	0.0	
4	**Chemical dosing and storage**		There are 2 dosing pumps and only 1 is working. Dosing area was neat and good housekeeping observed. The area is not bunded. There is no emergency shower.
	Flocculant	41.0	
	Alkaline	37%	Manual application is the uncontrolled dosing method used for lime. It is applied by a cup, so there is no proper mixing happening. There is no standby lime feeder. Lime room is clean and first in and first out is followed. There are no dry bags on the floor. There was enough stock in-place. The water treatment doses 1 bag of lime daily and there were more than 30 bags onsite during the assessment.
	Chlorine	6%	Chlorine granular is dosed manually as the feeding tank is not functioning properly. There is no standby chlorine dosing system or standby pump. The water treatment facility is dosing chlorine granular (HTH)
5	**Flocculation**	75.0	Flocs were visible at the end of the flocculation channel.
6	**Phase Separation**		There was no carry over and the channels were in good condition; however, the water was turbid. The clarifiers are quite old. De-sludge only once per day. The clarifiers do not have weirs and scum baffled is lacking.
	Clarification (settling)	50.0	
	Sand filtration	68.8	Two backwash pumps installed and only one is working. One of the 2 filters is cracked and should be fixed, though there were no signs of mounds observed on the filter media. It was observed that there is loss of sand material, and it was reported that it was last replaced in 2010.
7	**Disinfection**		
	Clear water well	0.0	There is one on-site reservoir. Contact time is not effective as the chlorine is dosed manually. Free chlorine not tested
8	**High lift pumpstation**	0.0	There are no high lift pumps; final water from the treatment works is gravity-fed into the Golf reservoirs. There is no outflow meter.
9	**Sludge treatment**		
	Thickening in sludge dams	0.0	The sludge and backwash water are pumped to the open field.
10	**Bulk pipeline from plant to command reservoir**	100.0	The Process Controller reported that the bulk water pipeline is in good condition and there no leaks reported.
11	**Command reservoir**	43.8	The reservoir is secure, there is a fence and a locked gate to ensure the security of the premises. The surrounding is overgrown with vegetation
12	**Booster pumpstation**	93.8	2 pumps installed and are in good working condition. The pump house is well maintained. The MCC is working and in good condition. it is situated in the pump house.
	Total	**34%**	

High risk areas OR Key Hardware Risks/ Defects

1. During load shedding, the water treatment works lacks backup power, posing a risk of water supply shortage.
2. The Donkerpoort water treatment plant is in disrepair, and there is no maintenance plan in place.
3. The operational and compliance water quality monitoring is not taking place and the quality that is supplied to the consumers is unknown, posing a health risk.
4. The facility is poorly maintained and untidy; there is also overgrown vegetation that poses a risk of being bitten by a snake.
5. Because the chlorine dosing system is not operational, HTH is dosed manually using a 250 ml cup, which is ineffective disinfection and poses a health risk to consumers.

VROOM Refurbishment Cost Estimate

Civil Works	R18,377,700	51%
Mechanical Works	R10,198,100	28%
Electrical Works (Incl C&I)	R7,609,800	21%
Total VROOM Cost	**R36,185,600**	**100%**
R million / MLD		**3.62**

Regulatory Impression

Since 2020 and throughout the assessment period, the municipality has not conducted any compliance monitoring. As a result, consumers' access to safe drinking water is unknown, posing a serious health risk. The municipality stated that they are in the process of acquiring a laboratory; however, this requires further investigation. Donkerpoort water treatment plant is in disrepair, and chlorine (HTH) is manually dosed every three hours, resulting in ineffective disinfection. Inadequate Process Controllers and general workers. Water is currently rationed due to shortage of water supply. Most of the difficulties stem from a lack of financial resources. The municipality is commended for keeping the pump house very clean without water leakages.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	81.82%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



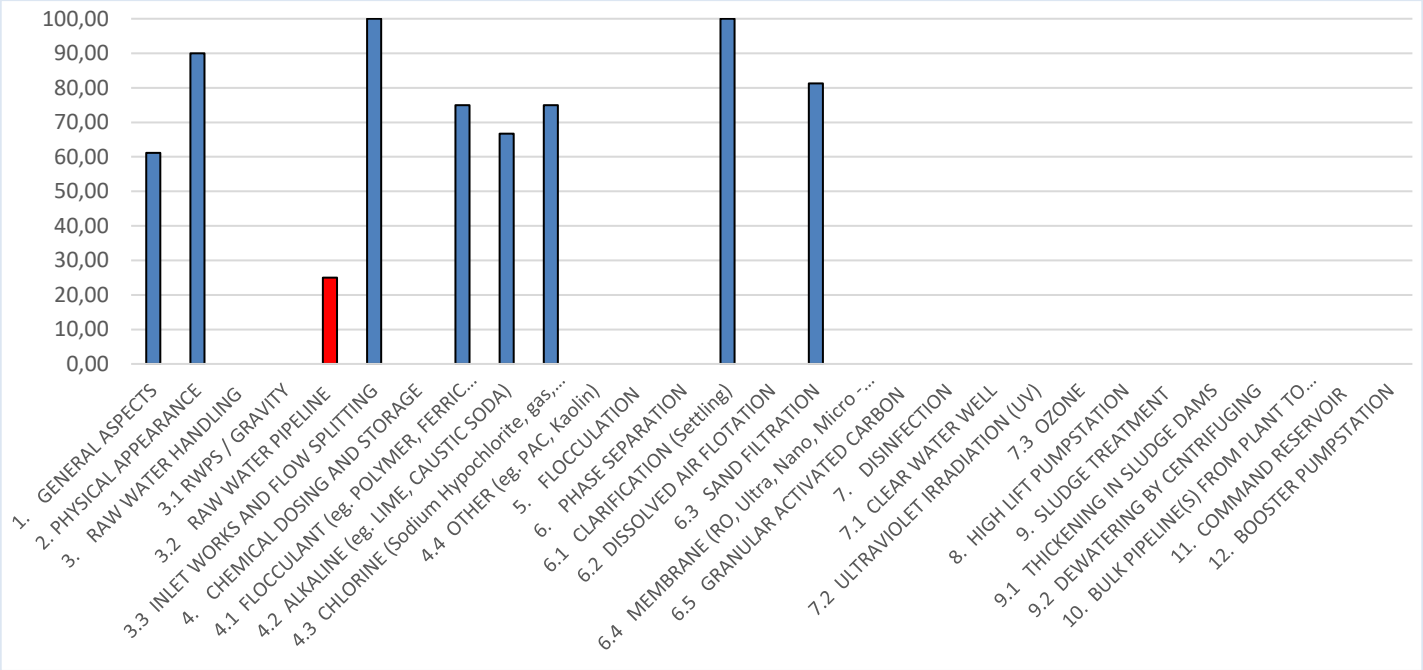

9.6 Mogalakwena Local Municipality

The Doorndraai water treatment works, operated by Lepelle Northern Water, was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

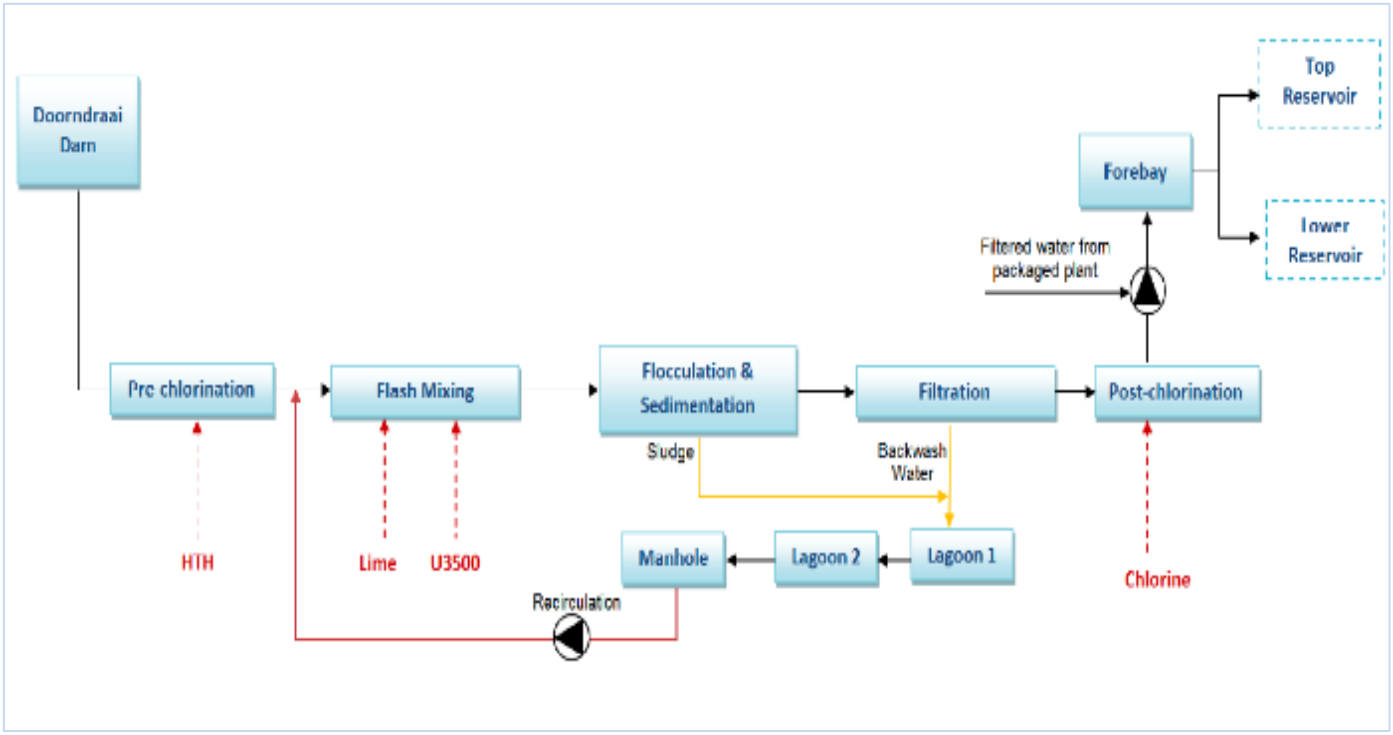
Doorndraai TSA Score: 75%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	61.1	The PFD and IMP were not displayed, all other documents available. The equipment is functional, but no proof of calibration was presented. We were informed that a jar test is performed as and when it is required, and not on a regular basis. All the apparatus to do the test is however not present. The audit team was informed that the electricity meter is available and that the use is recorded.
2	**Physical appearance of plant**	90.0	Facility is well fenced. The roads are in good condition. The facility is tidy however the grass was long and needs to be cut, also there were weeds growing on the pavement. Safety signs in place but is not covering all the areas of operation.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	na	Water gravitates to the plant.
	Raw water pipeline	25.0	Pipeline not assessed, however there was a leakage observed from the valve at the entrance to the plant. There is no replacement valve available. Inflow meter in place but not verified. Just meter reading is taken once per shift, but no interpretation.
	Inlet works	100.0	Flash mixing is effective. Chemical feed can be monitored.
4	**Chemical dosing and storage**		
	Flocculant	75.0	One dosing pump installed. No pump on standby. Housekeeping can improve. The area is bunded. The storage volume was sufficient for 30 days, the flocculant being used is Sudfloc 3265. Emergency shower nearby next to the dosing area.
	Alkaline	66.7	There are two lime feeders, one feeding the conventional plant and the other feeding the flow to the package plants. One of the lime feeders is not working due to electrical problems resulting in only the flow to the conventional plant was being dosed with lime. General housekeeping is good, bags are dry and used on a first in first out basis.
	Chlorine	75.0	All units are in working condition. Standby chlorinator available. Scale is working. Safety equipment available but status of it is unknown. Oxygen cylinder and mask was also available.
5	**Flocculation**	na	No flocculation facility available.
6	**Phase Separation**		
	Clarification (settling)	100.0	The water was clear with fish in the clarifier which is a good indication of the water quality. Regular de-sludging taking place. Weir structures are in good condition and free from growth.
	Sand filtration	81.3	Three pumps installed, one pump on standby. Air blowers installed. Filter media could not be assessed due to high turbidity water on the filter and no filter backwash demonstration. Housekeeping can improve.
7	**Disinfection**		
	Clear water well		Not assessed due to time constraints
8	**High lift pumpstation**		Not assessed due to time constraints
9	**Sludge treatment**		Not assessed due to time constraints
10	**Bulk pipeline from plant to command reservoir**		Not assessed due to time constraints
11	**Command reservoir**		Not assessed due to time constraints
12	**Booster pumpstation**		Not assessed due to time constraints
	Total	**75%**	

High risk areas OR Key Hardware Risks/ Defects

1. No standby lime feeder resulting in the package plant not being used.
2. No standby valves available in the store, resulting in leakages and water losses.
3. Flocculation channels are not provided for in the design of the plant.
4. No diesel is available for the onsite generator.
5. Occupational Health and Safety aspects of the gas chlorination plant needs urgent attention.

VROOM Refurbishment Cost Estimate

Civil Works	R210,100	32%
Mechanical Works	R438,900	67%
Electrical Works (Incl C&I)	R2,200	1%
Total VROOM Cost	**R651,200**	**100%**
R million / MLD		**0.04**

Regulatory Impression

Lepelle Northern Water operates the bulk water treatment and delivery systems. Although, the services, its present operation, maintenance, and management in the Mogalakwena area is sustainable for the short-term future, Lepelle Water is encouraged to take a much stronger risk approached, based not only in terms of water quality, but in terms of providing a long-term bulk service. Specific area which could be focussed on is as follows:

- Ensuring that the treatment technology used at Doorndraai Dam is well maintained, timeously repaired, and updated.
- Process Controllers should be encouraged to apply good process control practices and to continuously optimise treatment and distribution processes.
- Water Safety Planning should be the way of doing business and should include all risks in terms of providing a water service.
- Although the microbiological quality of the bilk water provided to the WSA complies to SANS 241, attention needs to be given to chemical water quality and monitoring compliance.

From the state of readiness for the assessment and level of participation throughout the whole assessment process, it is evident that Mogalakwena WSA do not have the capacity to operate a sustainable water business: This can be summarised by the following points:

- The non-alignment between systems reported on then BDPAT of 2022 and the systems registered on IRIS.
- The non-compliance to SANS 241 with microbiological compliance only at 75%, poor chemical quality and monitoring compliance. This is a significant risk for community health in the Mogalakweng WSA area of responsibility.
- The absence of any information on how the water business is operated and managed indicate a total lack of corporate governance with regards a basic human right.

The lack of information was said to be due the lack off a password. DWS Officials, with the assistance of the Blue Drop Help desk, provided the required documentation and provided a password to the WSA within 48 hours. Despite this assistance, at the date of consolidating the assessment report, no information relevant to the operation, maintenance, and management of the water business in the WSA was available on IRIS.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	94.57%
Chemical Compliance	89.63%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





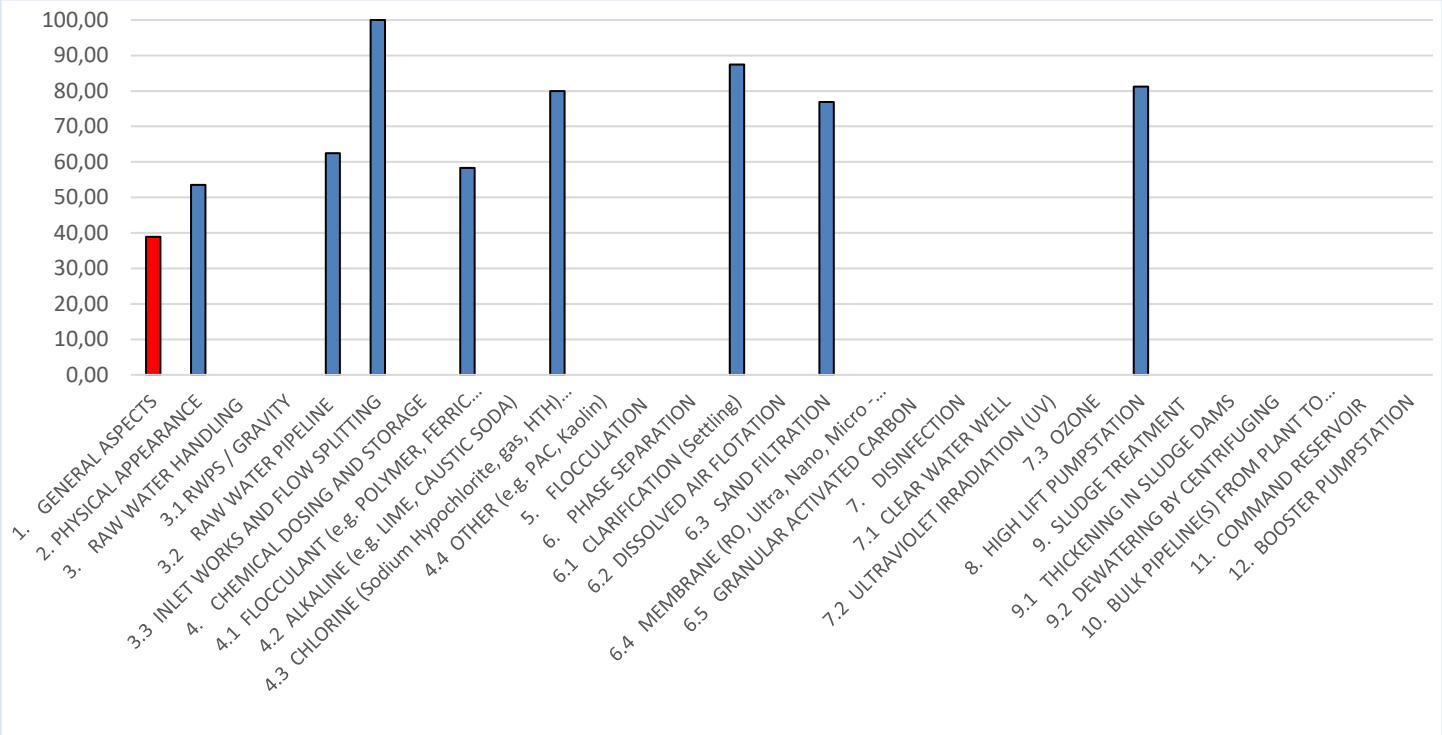
9.7 Mopani District Municipality

The Giyani water treatment works was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

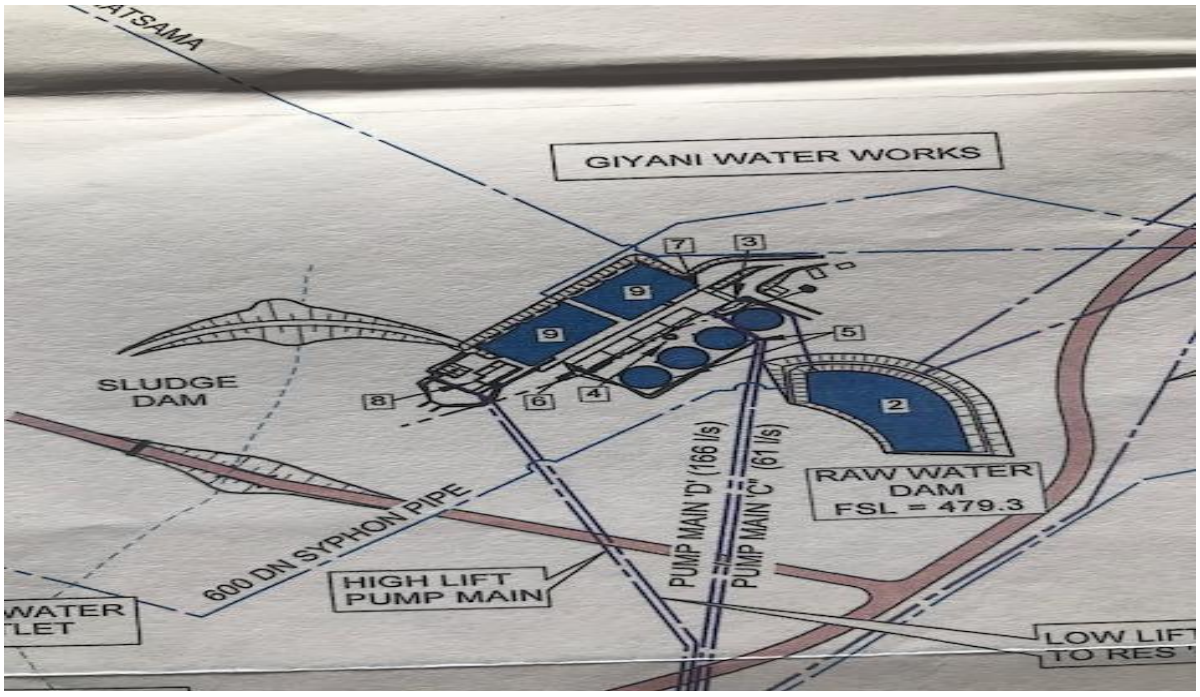
Giyani TSA Score: 61%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	38.9	The plants is classified as a Class B water treatment works. Operational logs and O&M manual are on site. No maintenance logbook, IMP of PFD are available / displayed. Process monitoring equipment is functional but no proof of calibration. Jar test is said to be done by main laboratory which was not assessed.
2	**Physical appearance of plant**	53.6	Facility is well fenced and the roads in a good condition. General housekeeping can improve. The interior of the buildings is in a good condition. Several open manholes were observed. The Oxygen Pack for Chlorine room is not secured, and basic Chlorine dosing room safety is not observed. Safety signage should improve significantly.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	na	Pumpstation could not be assessed during loadshedding.
	Raw water pipeline	62.5	Inflow meter in place but not verified. Just meter reading is taken once per shift, but no interpretation.
	Inlet works	100.0	Flash mixing is effective. Chemical feed can be monitored. Dropdown facility also available at the dosing pumps.
4	**Chemical dosing and storage**		
	Flocculant	58.3	Housekeeping in the dosing unit can improve. Present stock, Ultrafloc 3600 for 14 days. 30 Tons on order. No bunding area. Two pumps installed with dropdown testing unit. One pump on standby. Emergency shower not observed during the assessment.
	Alkaline	na	The plant was designed and build with lime dosing facilities which is no longer being used. No proper and scientific definition could be given for it other than that the pH is high enough. No mention was made about the stability of the water.
	Chlorine	80.0	All units are said to be in working condition. One standby chlorinator. Scale is working and switch-over device in place. Safety equipment available but status of it is unknown. Oxygen cylinder and mask in open cupboard outside the building. There is no compliance to occupational safety practices.
5	**Flocculation**	na	Loadshedding prevented observation regarding flocculation and floc formation in the round clarifiers.
6	**Phase Separation**		
	Clarification (settling)	87.5	De-sludging valve is said to work every time the bridge pass. It is not known of the valve opens long enough to remove all the sludge. Weir structures are in good condition but covered with biofilm.
	Sand filtration	76.9	Two backwash water pumps are installed but the up-flow capacity is questioned. One pump on standby. Air blower installed. Flow from the 4 clarifiers is evenly split to the sand filters. Good distribution of air during air scouring. Media surface is uneven and covered with thick layer of sludge and signs of cracks. Some filter walls are dirty. At Filter 8, backwashed during assessment, the presence of mudball is evident. This is due to improper backwash procedure and low up flow rate of during backwashing.
7	**Disinfection**		
	Clear water well	0.0	No information available on the CWW and Free Chlorine measurement.
8	**High lift pumpstation**	81.3	Nine pumps installed. Seven in working condition. Final flow meter in place but not verified. Flow records captured.
9	**Sludge treatment**		
	Thickening in sludge dams	0.0	Sludge dams have not been emptied in the past two years.
10	**Bulk pipeline from plant to command reservoir**	na	This unit could not be assessed due to time availability
11	**Command reservoir**	na	This unit could not be assessed due to time availability
12	**Booster pumpstation**	na	This unit could not be assessed due to time availability
	Total	**61%**	

High risk areas OR Key Hardware Risks/ Defects

1. Filter sand contains mudballs.
2. Filter backwash pump capacity needs to be confirmed.
3. Chlorine dosing facilities need to be tested and equipped with safety signs and steps.
4. Replace the Central Columns of clarifiers.
5. Arial photos show a 5th clarifier, that not in service.

VROOM Refurbishment Cost Estimate

Civil Works	R2,061,400	8%
Mechanical Works	R21,171,700	81%
Electrical Works (Incl C&I)	R2,891,900	11%
Total VROOM Cost	**R26,125,000**	**100%**
R million / MLD		**0.71**

Regulatory Impression

The WSA is commended for developing Water Safety Plans for most systems that were not developed in the previous BD report. However, the plans are in draft form and, implementation still must take place. The Incident Management Protocol has been implemented in many systems but the value of building up a history regarding incidents and how to manage it, is still missing. The WSA is advised to update the registers that detail all incidents. The WSA is also encouraged to promote the logging of activities on treatment plants in the treatment plant logbooks as part of building institutional memory. The chemical and microbiological water quality compliance for all systems is excellent. The microbiological quality of the water supplied to the residents of Nkambako, Thabina, Giyani, and Mapuve areas have shown a great improvement as compared to the previous 2014 report, the WSA is commended for that. However, the WSA is advised to improve their monitoring compliance, which is inadequate either due to not uploading data on IRIS as required or not following their monitoring programme. A lot of systems had unsatisfactory failure rates according to operational risk compliance, which is a sign that process control needs more attention. Regrettably, quick action is required to address the WSA failing to inform customers of DWQ Failures. The daily water treatment volumes for most systems are not recorded, and there doesn`t seem to be any evidence of the accuracy of meter readings. Most Process Audit reports were out-of-date. The WSA is encouraged to undertake the audits annually to ascertain the infrastructure`s functionality. The WSA is encouraged to ensure that the systems undergo at least an annual inspection of pump-stations, reservoirs, and the network in general, rather than just the pipe network as was done during the 2021/2022 assessment period. It is important to note that the report should include detailed system findings and recommendations, and the results should inform the water safety planning process, particularly the reservoirs.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	90.38%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

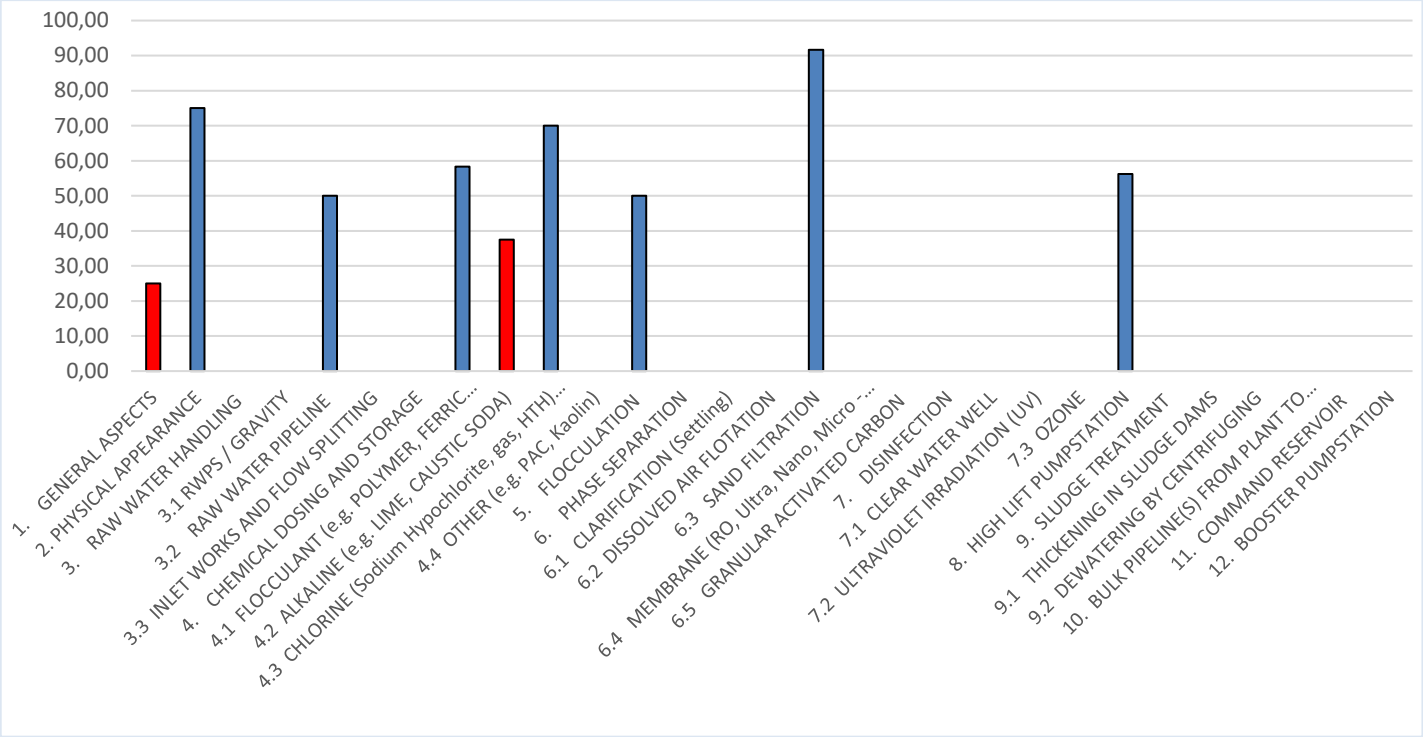
9.8 Polokwane Local Municipality

The Ebenhezer water treatment works was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

Ebenhezer Water Treatment Plant TSA Score: 58%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram

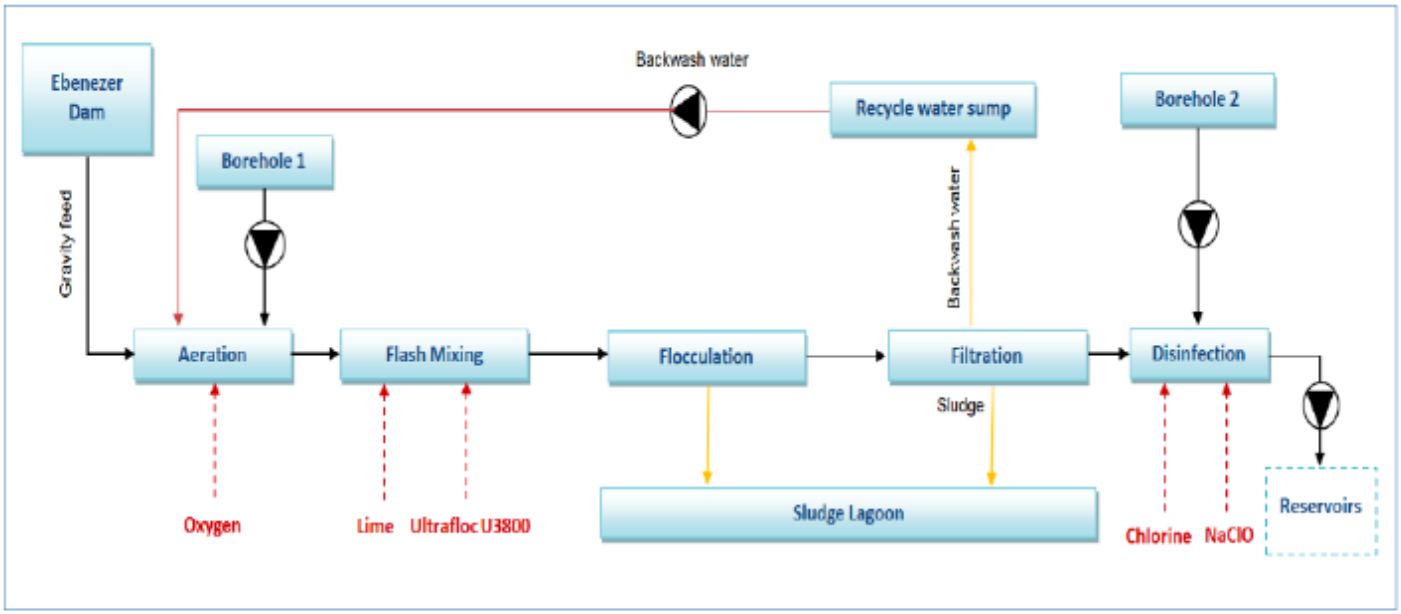


FIGURE 1: PROCESS BLOCK FLOW DIAGRAM OF THE EBENEZER WTP

Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	25.0	The plant was designed as a direct filtration plant. No process flow diagram and incident management protocol/ contact numbers are displayed on site. Other critical items for the sustainable operation of the plant are also missing. The electricity meter onsite and read by electrician but readings is not used to improve the efficiency of the plant.
2	**Physical appearance of plant**	75.0	The facility is fenced, and the roads are in a good condition. Natural grass should be cut inside the fenced area. General housekeeping can improve. At lime dosing facility, the grid corroded and presents a safety hazard. Safety signs are generally missing. Open electrical cables were observed at several places on the plant.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	na	Water is gravity fed from the Ebenezer Dam, but infrastructure could not be assessed.
	Raw water pipeline	50.0	Inflow meter in place but not verified. Meter readings is taken once per shift, but no interpretation is done in terms of dosage rates.
	Inlet works	0.0	Water enters a single camber into which chemicals are dosed. No flash mixing is taking place which is compromising effective floc formation. Chemical feed cannot be monitored.
4	**Chemical dosing and storage**		
	Flocculant	58.3	Two chemical dosing pumps are installed with one on standby. Housekeeping can improve. No bunding area. Emergency shower at ground level, some distance away from the chemical dosing room.
	Alkaline	37.5	Lime dosing worm turning but not dosing lime. No vibrator installed to ensure continuous dosing. No standby unit. Poor housekeeping in lime dosing area.
	Chlorine	70.0	All units are in working condition but no standby chlorinator. Scale is working and no switch-over device in place. Safety equipment available but status of it is unknown.
5	**Flocculation**	50.0	Poly added as a filtration aid. No micro flocs observed after flocculation period. The flocculation channel is clean.
6	**Phase Separation**		
	Sand filtration	91.7	Two backwash pumps are installed with one on standby. Air blower installed. Even flow splitting to all filters observed. Good distribution of air during air scouring. Signs of broken nozzles were observed during backwashing. Filter walls dirty, in some cases, weeds are growing in the filters. The only filter used, filter 1, is not washed down during backwashing. General Maintenance required.
7	**Disinfection**		
	Clear water well	na	Disinfection with chlorine gas is taking place, but the efficiency thereof was not assessed.
8	**High lift pumpstation**	56.3	Six pumps installed and in working condition with only 30 % on standby. Final flow meter in place but not verified. Flow records captured.
9	**Sludge treatment**		
	Thickening in sludge dams	na	Not assessed due to time limitation
10	**Bulk pipeline from plant to command reservoir**	na	Not assessed due to time limitation
11	**Command reservoir**	na	Not assessed due to time limitation
12	**Booster pumpstation**	na	Not assessed due to time limitation
	Total	**58.3%**	

High risk areas OR Key Hardware Risks/ Defects

1. The plant was designed without a flocculation and sedimentation unit.
2. Jar test should be adapted to test the filterability of the coagulated water.
3. Filter backwash SOP needs to be optimised.

VROOM Refurbishment Cost Estimate

Civil Works	R2,558,600	10%
Mechanical Works	R21,913,100	81%
Electrical Works (Incl C&I)	R2,514,600	9%
Total VROOM Cost	**R26,986,300**	**100%**
R million / MLD		**0.52**

Regulatory Impression

Lepelle Northern Water operates several the bulk water treatment and delivery systems in the Limpopo Province. The Ebenhezer Water Treatment Plant is just one example of such a treatment facility. Although, the services, its present operation, maintenance, and management is sustainable for the short-term future, Lepelle Water is encouraged to take a much stronger risk approached, based not only in terms of water quality, but in terms of providing a long-term bulk service. Specific area which could be focussed on is as follows:

- Ensuring that the treatment technology used is well maintained, timeously repaired, and updated.
- Process Controllers should be encouraged to apply good process control practices and to continuously optimise treatment and distribution processes.
- Water Safety Planning should be the way of doing business and should include all risks in terms of providing a water service.
- Although the microbiological quality of the bilk water provided to the WSA complies to SANS 241, attention needs to be given to chemical water quality and monitoring compliance.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	99.29%
Chemical Compliance	96.94%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



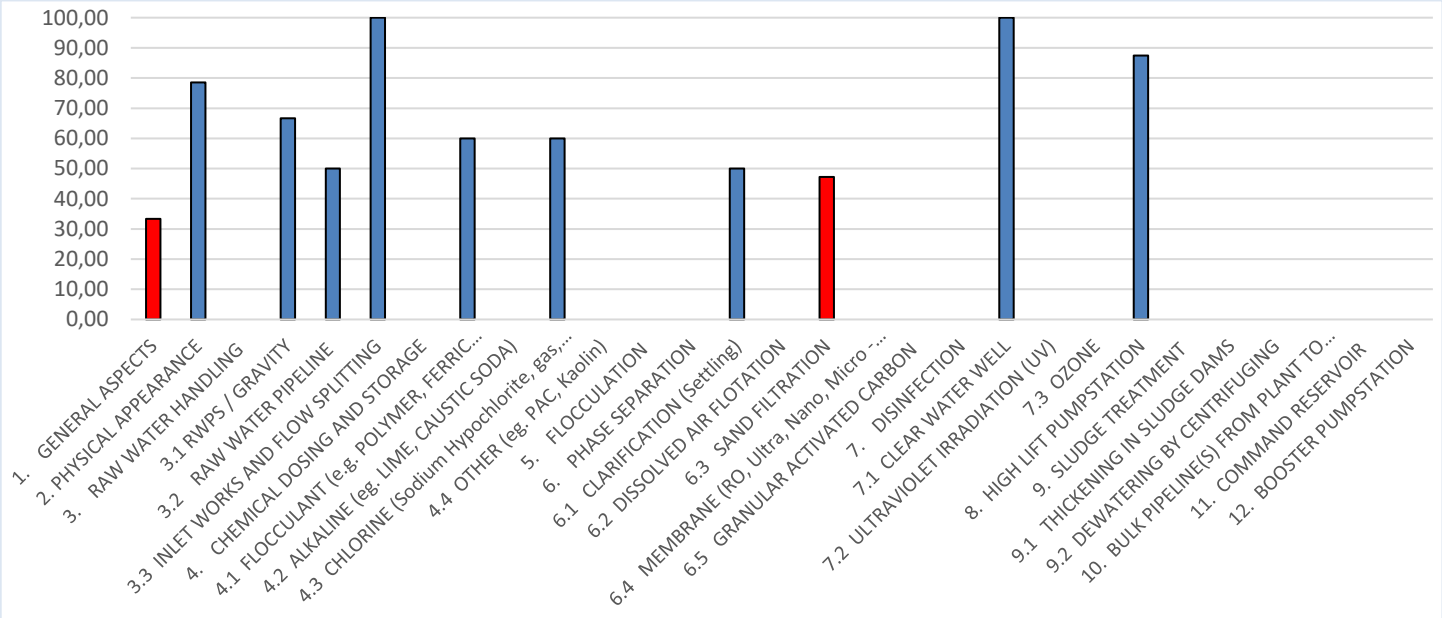



The Molepo water treatment works was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

Molepo TSA Score: 59%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram

None

Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	33.3	Class C WTW. Operational logbook on site, but no other documentation available. Turbidity meter and Chlorine meter on site but no proof of calibration. Glassware dirty. Jar tester in the laboratory but glassware to conduct the test with, is not available. No standard operating procedure available. Electricity meter available but not read.
2	**Physical appearance of plant**	78.6	The facility is well fenced. General housekeeping can improve. Inside of buildings in good condition. Roads in good condition. Open man holes. Oxygen cylinder for Chlorine room found inside the chlorine room and not in the outside container, open manholes. These issues seem not to receive attention. Safety signs in place.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	66.7	Inlet not assessable. Two pumps installed. Both in working condition and are operated alternatively.
	Raw water pipeline	50.0	Inflow meter in place but not verified. Just meter reading is taken once per shift, but no interpretation.
	Inlet works	100.0	Flash mixing is effective and chemical feed can be monitored. Coagulation can be improved by dosing the coagulant over the whole high energy area.
4	**Chemical dosing and storage**		
	Flocculant	60.0	Two pumps installed, one pump on standby. Bunded area required. The emergency shower should be relocated closer to the dosing facilities.
	Alkaline		One dosing unit for lime has been installed in the new section of the plant for post lime dosing. It has never been used.
	Chlorine	60.0	All units are in working condition, with no standby chlorinator. Scale is working but no switch-over device in place. Safety equipment available but status of it is unknown. Oxygen cylinder and mask was on the floor in the chlorine dosing room. Chlorine gas stock sufficient for 30 days.
5	**Flocculation**	0.0	No flocs visible and the unit is very dirty.
6	**Phase Separation**		

Watch #	Process Unit Assessed	% TSA	Observations
	Clarification (settling)	50.0	Due to poor floc formation, the water is not clear at the end of sedimentation with micro-flocs being present. De-sludge only once per week. Weir structures are in good condition but covered with sludge that may prevent even and free flow.
	Sand filtration	47.2	Two backwash pumps installed with 100% standby available. Only one air blower installed. Only one of bed of filter 1 can be backwashed with water. Good distribution of air during air scouring. Media surface is uneven and covered with thick layer of sludge. Filters are backwashed once per week. Filter wall dirty, in some cases, weeds are growing in the filters. The only filter used, filter 1, is not washed down during backwashing.
7	**Disinfection**		
	Clear water well	100.0	Contact time is 5 Ml reservoir is several hours. Free Cl2 tested at final water sample point.
8	**High lift pumpstation**	87.5	Two pumps working and two standby - 100% standby. Final flow meter in place but not verified. Flow records captured.
9	**Sludge treatment**		
	Thickening in sludge dams	na	Not assessed due to time constraints.
10	**Bulk pipeline from plant to command reservoir**	na	Not assessed due to time constraints.
11	**Command reservoir**	na	Not assessed due to time constraints.
12	**Booster pumpstation**	na	Not assessed due to time constraints.
	Total	**59%**	

High risk areas OR Key Hardware Risks/ Defects

1. Free ozone reading in water not possible.
2. Lime handling needs to be addressed.
3. Illegal connections need to be removed.
4. Leakage at the reservoirs need to be repaired.
5. Supervisor and Process controllers needs plant-based process management training.

VROOM Refurbishment Cost Estimate

Civil Works	R3,437,500	42%
Mechanical Works	R4,386,800	53%
Electrical Works (Incl C&I)	R446,600	5%
Total VROOM Cost	**R8,270,900**	**100%**
R million / MLD		**1.38**

Regulatory Impression

Polokwane Local Municipality is challenged with supplying water services a high growth point in Limpopo. Supported by Lepelle Northern Water, the WSA supply water services to seven 7 systems, some of which have complex configurations to supply water to all the consumers. The inspectors were welcomed by senior staff of the WSA who shared limited information available in hard copy freely during the assessment. The additional information, loaded onto the system, was however not sufficient to allocated relevant scoring in all KPA sections. Although the microbiological water quality compliance in most of the systems is assuring, the significant lower blue drop score obtained during this assessment compared to that of 2014, can be attributed to loss of institutional capacity to manage the water business as a business. The important link between risk management, technical management and financial management is missing. It is of paramount importance that the risks indicated in the Water Safety Plan to be included in the budget process and dealt with.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	97.04%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





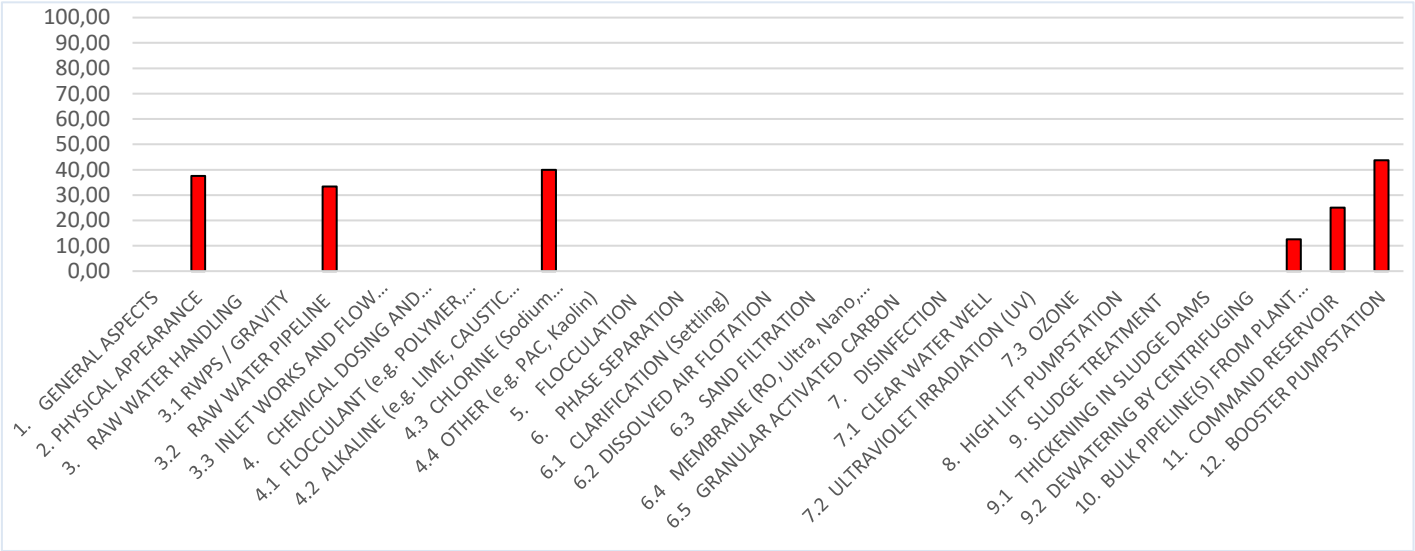
9.9 Thabazimbi Local Municipality

The Greater Thabazimbi-Magalies water supply/ treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

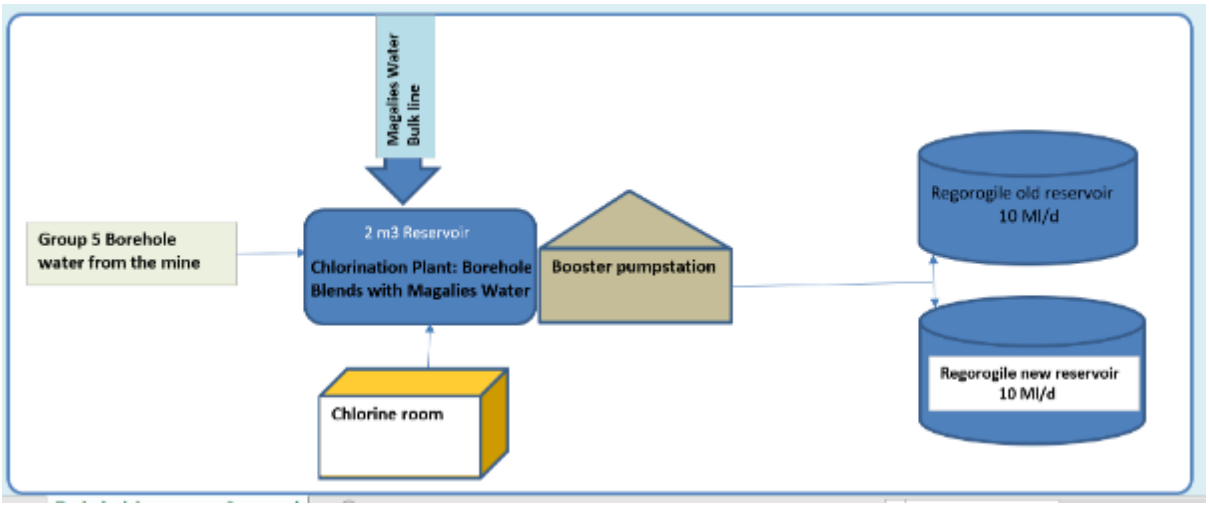
Thabazimbi Chlorination Plant TSA Score: 24%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	0.0	Not displayed on the wall and the classification is incomplete. There is no maintenance and repairs logbook at the chlorination plant. There is no operational logbook at the chlorination plant.
2	**Physical appearance of plant**	37.5	Entrance not signposted. The surrounding is fairly clean. Power cable exposed and near water in the pump station. The facility is fully fenced with lockable gate. There was a security guard on site with proper access control. The safety signs were displayed outside the chlorine room only.
3	**Technical**		
3.1	Borehole pumps and delivery line to reservoir	na	Not assessed as the pumps are in the property of the mine.
		33.3	Raw water pipeline is made of steel and is fairly in good condition. Municipal officials were unable to confirm whether they were leaking or not due to a lack of maintenance plan. Inflow meter for the borehole water is in place and operational.
3.2	Chlorine	40.0	Pumps are in good condition. Although the pumps are in good shape, the pipes are now blocked, and chlorine gas cannot flow freely because they have not been used for the past two years. There is a standby dosing unit which is not operational due to unavailability of chlorine gas. The chlorine gas cylinders were empty and was no available stock for the past 2 years.
3.4	On-site reservoir	0.0	The reservoir is 2m^3 in size and has a contact time of more than 30 minutes. The pipeline from the booster pump to the reservoir is 7 km long. however, chlorine is not dosed.
4	**High lift pumpstation**	na	The water is pumped to the command reservoir from the chlorination plant, which also serves as a booster pump station.
5	**Bulk pipeline from plant to command reservoir**	12.5	The bulk pipeline that runs from the booster pumpstation to the reservoirs has been reported to have significant leaks.
6	**Command reservoir**	25.0	There are two reservoirs in Regorogile: 10 Ml/d each. There is a security guard onsite as well as proper access control. The facility is fully fenced, and gate is lockable however the track rail was detached from the ground. There is no telemetry, and the reservoir are not operational
7	**Booster pumpstation**	43.7	Four booster pumps installed only two were operational. The standby pumps were not operational. The building is secured and there was sufficient ventilation. The pumpstation was flooded with water from the boreholes. MCC is in good condition.
	Total	**24%**	

High risk areas OR Key Hardware Risks/ Defects

1. The Thabazimbi LM personnel do not have control over the flow pumped from the mine to the chlorination plant, making it difficult to manage overflows and leaks.
2. The community receives water from water tankers because the two reservoirs don't have any water.
3. There chlorination plant has not been dosing the chlorine gas for the past 2 years due to unavailability of chlorine gas cylinders.
4. There is no regular bulk pipeline maintenance, and the bulk pipeline is said to be leaking and old.
5. There is no planned project/maintenance for the reservoirs to be operational.

VROOM Refurbishment Cost Estimate

Civil Works	R64,900	30%
Mechanical Works	R22,000	10%
Electrical Works (Incl C&I)	R126,500	59%
Total VROOM Cost	**R213,400**	**100%**
R million / MLD		**0.02**

Regulatory Impression

Borehole water is pumped from the mine into the municipal reservoir which has a booster pumpstation and then get chlorinated before being distributed to the community. In the reservoir, borehole water blends with Magalies Water. The reservoir volume is estimated to be 2 m3 and is old and has cracks in it and the inlet pipes were deteriorating and rusting.

The municipal official reported that, they have no control over the overflowing borehole water because the pumps are controlled inside the Mine premise, and due to poor communication, they are unable to notify the mine to close the water whenever there is power outage. The pumpstation was flooded, and a large amount of water was lost. There is no SLA between the mine and the municipality, and they are operating under a social labour plan. There was no disinfection was taking place and there are no backup chlorine gas cylinders either. The ward councillor reported that the bulk line from the booster pumpstation is old and leaking. He also reported that the pipeline is small. The bulk water from the chlorination plant was reported to be aging and leaking and cannot be fed into the reservoirs of the Thabazimbi LM. The surrounding of the reservoir is not well maintained and was overgrown with vegetation. There are two reservoirs in Regorogile, one is recently constructed, however, the reticulation system struggles with high water demand and low pressure. All reservoirs were dry, which contributed to a water shortage that required water tankers to be supply to the community. The civil structure of the reservoir under inspection was in good shape, and no cracks were observed. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	NI
Chemical Compliance	NI

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



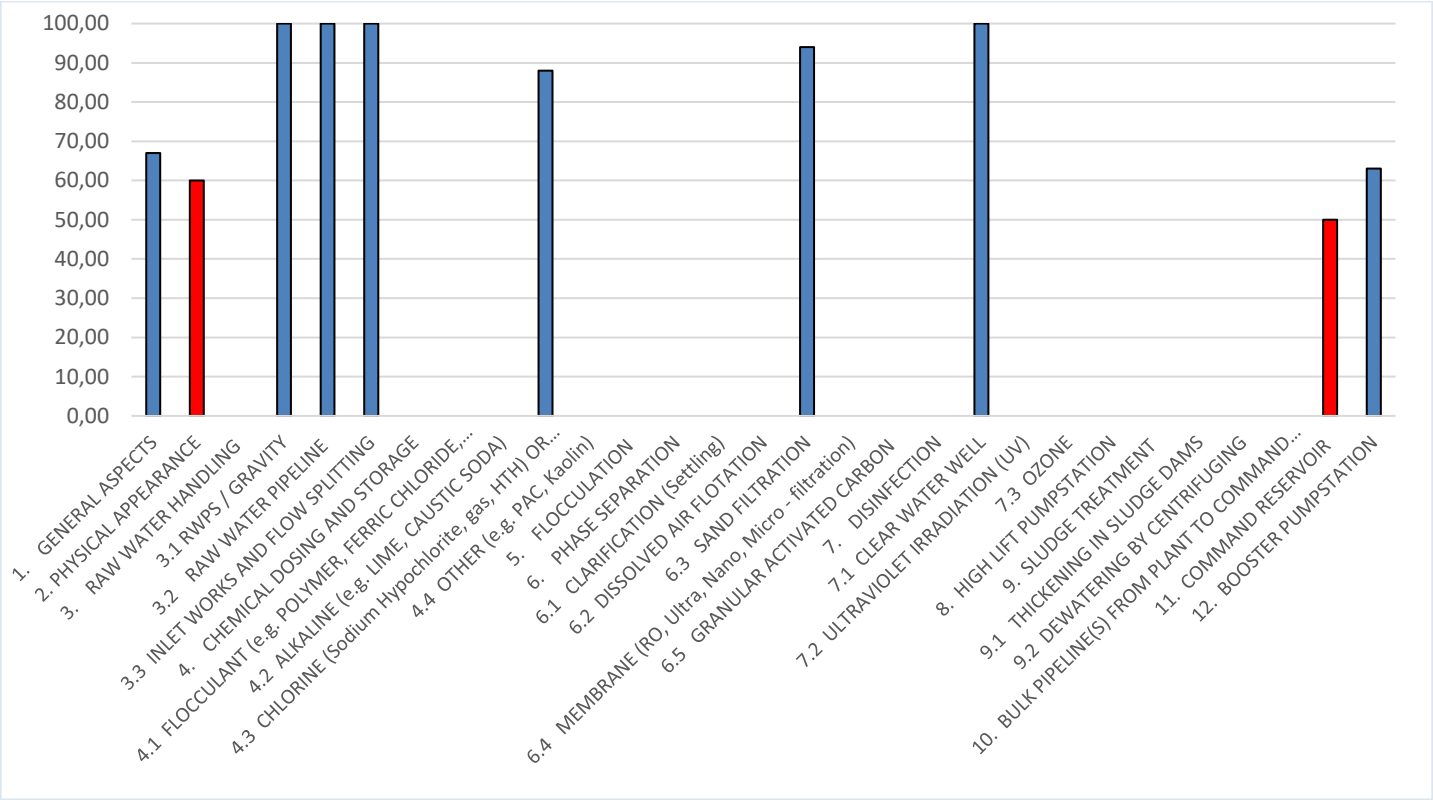

9.10 Vhembe District Municipality

When the 2022 Blue Drop assessment team or auditors completes the documentation verification with a Water Services Authority, then the final step of the assessment or audit is to choose one or two Water Purification Plant of the Municipality for physical inspection. Khalavha Water Purification Plant is one of the works that was chosen under Vhembe District Municipality. The inspection was conducted on 06 December 2022.

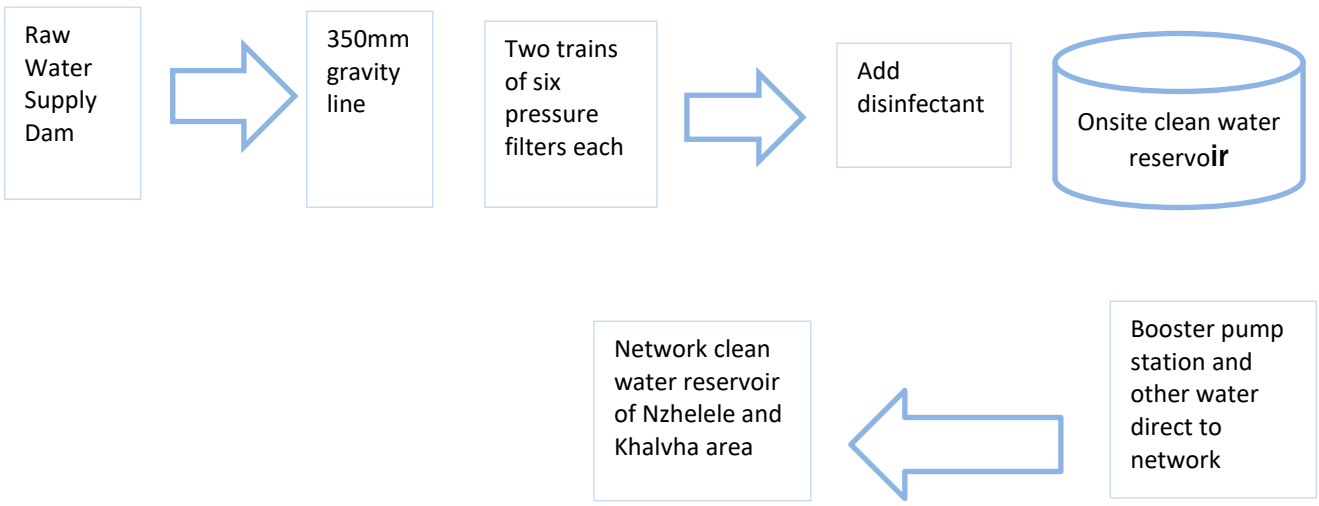
Khalavha TSA Score: 76%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	67.0	This is a Class C plant. Of the general aspects inspected, repairs logbook and process monitoring kit and Jar test were the only items which did not get full score of Blue Drop standard.
2	**Physical appearance of plant**	60.0	Of the items inspected under Physical appearance: Key items that did not comply to Blue Drop standards is the road access to the plant especially when it is raining because of the poor road surface and poor storm water management. This item is quite important for bulk delivery of water treatment chemicals to the plant and access to the staff working in the plant. It could lead to staff unsafety. In addition the two leaking pressure filters caused nuisance wetness and slippery conditions in the plant. Also there is no signage at the entrance of the plant.
3	**Raw water handling**		The raw water handling is generally good. Source is surface water dam; screens are in place and are cleaned regularly. The 350mm gravity line is steel new and in December 2022 a flow meter was installed and now the plant will record the flows which was not done in the period of assessment July 2021 till June 2022. This item scored less because there are no flow records in the assessment period. The Inlet works splits into two to each train of the pressure filters i.e. no pre-sedimentation here due to low turbidity water and only filtration and disinfection is done.
	Raw water pumpstation / gravity feed	100.0	
	Raw water pipeline	100.0	
	Inlet works	100.0	
4	**Chemical dosing and storage**		The only water treatment chemical used is a solution of HTH granules and water. The make-up tanks for it is 2 x 1000L tanks and each tank has its own stirrer and own dosing pump. However both stirrers are taken out for repairs resulting in staff using a stick to stir the solution make. It is a hazardous matter needing the attention of the Municipality for the stirrers to be fixed and returned back. The score of 100% does not reflect to the (OHS) hazard situation BUT to disinfectant dosage of purified water to community.
	Flocculant	na	
	Chlorine	88.0	
5	**Flocculation**	na	Not applicable i.e. no water treatment flocculent is added
6	**Phase Separation**	na	No phase separation
	Clarification (settling)	Na	No settling tanks
	Sand filtration	94.0	There are twelve pressure filters (in two trains of six). The filters were installed in 2018, However two are leaking and causing nuisance water on the floor surface of the warehouse in which the plant is housed. This is water wastage and hazard situation. The leaking two filters need urgent attention i.e. Filter No.5 and 6 in one train. The pressure filters have ONLY two backwash pumps i.e. a 1 x duty and 1 x standby no air blowers. In addition the Head from the raw water dam takes water through the filters to the clean water reservoir i.e. no pumping through the filters.
7	**Disinfection**		The size of the on-site clear water reservoir is not known. And could not calculate the disinfectant contact time. However, the assessors were satisfied that disinfectant residual operational test is done two hourly and results recorded on the log book.
	Clear water well	100.0	
8	**High Lift pump station**	na	Not applicable: The Head from raw water dam is enough to take through the water to filters as well to onsite clean water reservoir.
10	**Bulk pipeline from plant to command reservoir**	-	The Khalavha Water Supply System terrain in “hilly” and highly vegetated. It is difficult to access the pipe route. Therefore not inspected.
11	**Command reservoir**	50.0	The site is fenced though the gate is left open i.e. there a tap in which the nearby household do use it i.e. the District Municipality keeps the gate open for these purposes. And the assessors scored this 50% because community are not allowed in the yard of clean water reservoir, it is for Health and Hygiene purposes and safety.
12	**Booster pumpstation**	63.0	There are two submersible pumps. Only one is working and the standby is taken out for repairs. It is the only item that is noted and needed the attention of the Municipality at this Booster Pump Station at the time. However, in March 2023 the District Municipality confirmed that the pump is re-installed.
	Total	**76%**	

High risk areas OR Key Hardware Risks/ Defects

1. All flow meter the District Municipality must implement the best practice of verification or calibration as well keep records of flow. It is to ensure that the plant is not operated beyond the capacity and also to ensure water balance.
2. Pressure filters No.5 and No.6 that are leaking at gaskets of the “domes” must be fixed. It is causing water wastage and wet nuisance in the plant.
3. The road to the plant is not accessible by vehicles during rainy season. It would result in difficulties for deliveries as well the emergency services to access the plant.
4. All operational monitoring tests e.g. pH, Turbidity and Jar test must be checked regularly and as required by the Operation and Maintenance Manual of the plant and Blue Drop requirements.

5. The water treatment chemical stirrers that are not working need to be fixed. It is difficult for the staff to mix the water treatment chemical and it may result to poor water quality leaving the plant. The stirrers are for the disinfectant (HTH granules) mixing tank.
6. The Vhembe District Municipality Laboratory which is analysing compliance monitoring samples for Khalavha WTW need to participate successfully with a PTS Scheme. The last Z-scores for PTS were greater (> 3), therefore unsatisfactory.

VROOM Refurbishment Cost Estimate

Civil Works	R124,300	13%
Mechanical Works	R662,200	69%
Electrical Works (Including C&I)	R169,400	18%
Total VROOM Cost	**R955,900**	**100%**
R million / MLD		**0.14**

Regulatory Impression

The Khalavha Water Supply System is well operated by staff at this plant. On this visit, both the Supervisor and the staff where prepared to host the 2022 Blue Drop team. To mention but a few of the Process Control Staff, namely: M. Mphephu and P. Tshitimbi. The Vhembe District Municipality as a Water Services Authority must continue to use and adhere to Water Services Regulation; Blue Drop requirements; SANS 0241 and other related documents. The above-mentioned documents and requirements are set out in Water Services Act (No.108 of 1997).

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	96.43%
Chemical Compliance	91.12%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





10. MPUMALANGA: MUNICIPAL DRINKING WATER SYSTEM'S FUNCTIONALITY

Background

Leading up to the release of the full Blue Drop report, the Regulator draws attention by publishing the *Blue Drop Watch Report*, which comprises of a technical overview of pipes, pumps, reservoirs, processes and water quality of water treatment plants and distribution networks. The Blue Drop Watch report is **not** the Blue Drop audit report, which will only be published once the verification and quality control processes by DWS have been satisfied, to ensure accurate and credible reporting of drinking water services across South Africa. The Watch Report seeks to keep the public and stakeholder updated and informed on the status of drinking water infrastructure, water quality, and the indicative cost to restore functionality.

The Blue Drop Watch Report is informed by the Technical Site Assessments (TSA), which were done at 1 to 2 systems per WSA/WSP, as part of the Blue Drop audit cycle. The purpose of the TSA is to verify the findings of the (desktop) audit with the status on the ground (physical inspections). The TSA score (%) reflects the condition of the raw water handling system (abstraction, pumps, pipe network), the water treatment plants (inlet works to disinfection and sludge treatment), delivery system (commend reservoirs, bulk pipe network and pumpstations) and distribution systems (pump and pipe networks). A high TSA score (100%) indicates that the infrastructure, equipment, and processes are in excellent condition, whilst a low TSA score (0%) indicates failure and dysfunctional process and infrastructure. The TSA inspections cover each process unit of the treatment facility, coupled with randomly selected checkpoints of the delivery and distribution network. The VROOM cost covers only the treatment facility, as too many variables exist to accurately estimate network refurbishment costs.

Results of the Technical Site Assessments

During the period December 2022 to February 2023, 17 water supply systems were inspected, offering a representative overview of systems owned and operated by municipalities, water boards and water service providers. The assessments covered 16 municipalities. Detailed TSA reports with photographic evidence and VROOM costs have been generated to assess the condition and status of treatment facilities and gain insight into randomly selected pipe network and pumpstation across the water distribution networks. The table following summarises the TSA scores of the water supply systems that were assessed.

Table 38 - Mpumalanga Summary of the all the TSA Water Supply Systems

#	Municipality (WSA)	TSA WSS	TSA WTW	WSP/ WB	%TSA
1	City of Mbombela	Nelspruit	Nelspruit New		92%
2	City of Mbombela	White River Country Estate	White River Country Estate		66%
3	Dipaleseng LM	Greater Dipaleseng LM	Fortuna		52%
4	Victor Khanye LM	Victor Khanye	Delmas		64%
5	Chief Albert Luthuli LM	Carolina	Carolina		61%
6	Dr Pixley Ka Isaka Seme LM	Volksrust	Volksrust		55%
7	Emakhazeni LM	Belfast	Belfast		68%
8	Emalahleni LM	Witbank	Witbank		78%
9	Msukaligwa LM	Douglas dam	Ermelo North		51%
10	Nkomazi LM	Driekoppies/ Shoemansdal/ Buffelspruit/ Shongwe	Driekoppies		71%
11	Lekwa LM	Standerton	Standerton		45%
12	Mkhondo LM	Mkhondo	New Mkhondo Piet Retief		70%
13	Bushbuckridge LM	Inyaka	Inyaka		84%
14	Thaba Chweu LM	Lydenburg	Lydenburg		48%
15	Dr JS Moroka LM	Weltevreden	Weltevreden		86%
16	Thembisile Hani LM	Bomandu previously known as Machipe (Goederede)	Bundu		88%
17	Steve Tshwete LM	Middelburg/Mhluzi	Vaalbank		87%
18	Govan Mbeki LM	Nelspruit	None	Rand Water	No TSA
	Totals		**17**	**1**	**69%**

An average of 69% was achieved for the 17 systems assessed, which means that infrastructure and processes are partially functional with an average performance. The best overall performance was found for City of Mbombela, followed by Thembisile Hani, Steve Tshwete and Dr JS Moroka. Lower performances were observed for Standerton and Lydenburg.

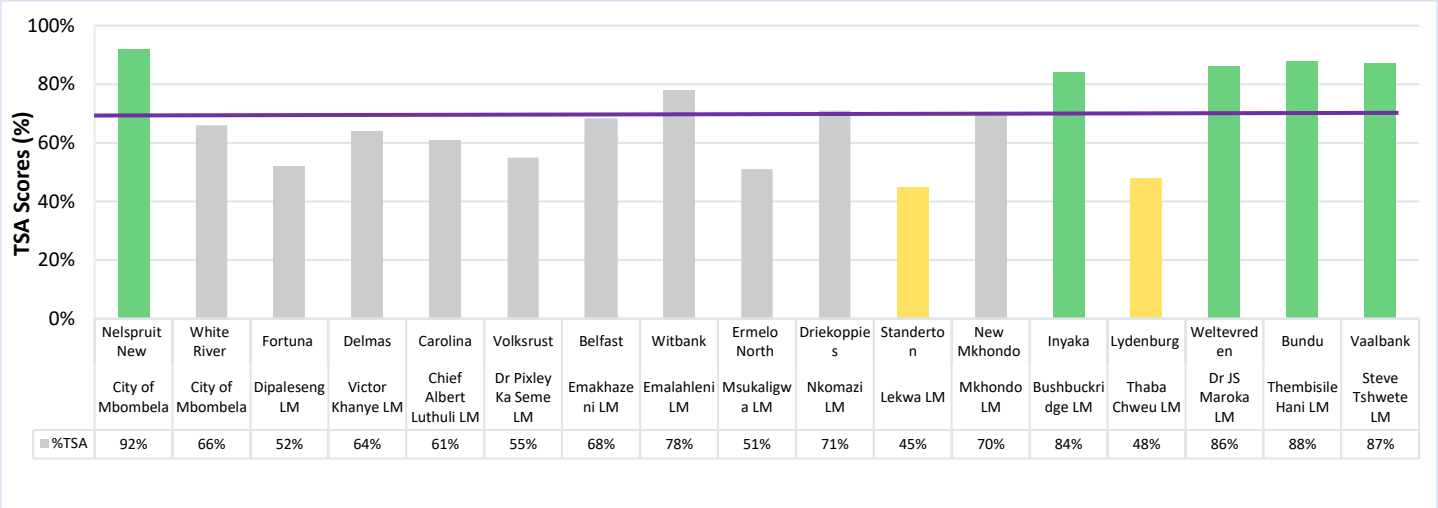


Figure 31 - MP TSA scores for all the BD Systems

95 – 100% Excellent	
80-<95% Good	
50-<80% Average	
31-<50% Poor	
0-<31% Critical state	

The Regulator observed the predominant challenges and risks pertaining to the water supply system:

Facility management

- No notice board to display or no display of the PFD or other relevant notices and/or documents required on site
- Refurbishment or upgrade and/or construction of buildings or facilities, concrete structures, offices and/or process control room, staff ablutions; maintenance or replacement of perimeter/boundary fencing and/or access gate; Aging infrastructure
- No jar testing done, no or limited testing water quality testing equipment and/or lab chemicals, no calibration of meters
- Improve administration and monitoring templates
- Supply emergency showers or wash areas/ facilities
- Back-up power supply during load shedding
- Signage at entrance gate and safety signs across plant
- Housekeeping and tidying up of terrain, paintwork at treatment works, pumpstations, and reservoirs, clean-up sites after construction projects
- Road rehabilitation/ upgrade/ construction and road accessibility especially for the safe delivery of chemicals
- Staff safety and signage improvement
- Flooding at plant or at the various process units.

Water treatment system

- Raw water pipe network and/or pumps at abstraction facility to be refurbished or upgraded or repaired
- No flow meters installed or dysfunctional flow meters (abstraction, WTW, and Command Reservoirs), and flow meters not calibrated
- Refurbishment or upgrade of one or more of the various process units (civil, mechanical, electrical and instrumentation)
- Dysfunctional or inefficient process units that have to be rectified, e.g. inlet works, flocculation, clarifiers, filters, etc
- Treatment chemicals, e.g. no bunding, limited stock, storage
- No or limited no. standby pumps or dysfunctional pumps, e.g. flocculant and/or chemical dosing, backwashing, high lift, leaks, etc
- No or limited air blowers and/or compressors or dysfunctional blowers and compressors
- Sand filters, e.g. repairs required, sand to be replaced, sand volume
- Chlorination unit not operational or not fully operational, e.g. limited stock in place, no or limited standby units, no automatic switch over, no chlorine scales, no or limited safety signs and systems (alarms, fans, masks, detectors)
- Sludge dams/ponds or beds, e.g. none in place, not operation, maintenance (cleaning), dysfunctional sludge pumps and no or limited standby, no recycling taking place
- Vandalism and theft of pumps, buildings, valves, and other mechanical and electrical assets.

Water distribution network

- Repair leakages in pipe network, valve boxes, and/or command reservoirs
- No telemetry at reservoir and level indicator or not operational
- Install new fencing or repair fencing
- Vandalism and theft of pumps, valves, manholes, fencing and other mechanical and electrical assets

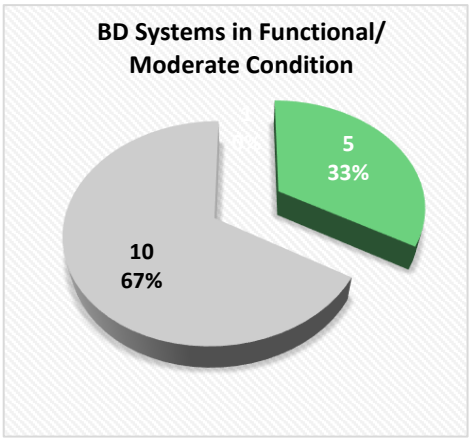
- Site at reservoirs to be cleared and landscaped.

Systems Observed to be in Functional/Moderate Condition based on Technical Site Inspections

Water supply systems which succeeded to achieve ≥50% TSA score, are summarised as follows.

Table 39 - Provincial Summary of the TSA Water Treatment Systems in the Excellent to Average Performance Categories

Municipality (WSA)	WSP/ WB	TSA of ≥95-100% [Excellent]		TSA of ≥80-<95% [Good]		TSA of ≥50-<80% [Average]	
		Name of WTW	% TSA	Name of WTW	% TSA	Name of WTW	% TSA
City of Mbombela		None		Nelspruit New	92%		
City of Mbombela						White River CE	66%
Dipaleseng LM						Fortuna	52%
Victor Khanye LM						Delmas	64%
Chief Albert Luthuli LM						Carolina	61%
Dr Pixley Ka Isaka Seme LM						Volksrust	55%
Emakhazeni LM						Belfast	68%
Emalahleni LM						Witbank	78%
Msukaligwa LM						Ermelo North	51%
Nkomazi LM						Driekoppies	71%
Mkhondo LM						New Mkhondo	70%
Bushbuckridge LM				Inyaka	84%		
Dr JS Moroka LM				Weltevreden	86%		
Thembisile Hani LM				Bundu	88%		
Steve Tshwete LM				Vaalbank	87%		
Totals				**5**		**10**	



Of the 15 systems in the excellent to average performance categories it was found that:
- 5 systems (33%) were in good condition
- 10 systems (67%) were in average condition.

Figure 32 - No. BD Systems in Functional/ Moderate Condition

The best performing water supply systems, as indicated by the TSA scores, are summarised hereunder.

Table 40 - Provincial Summary of the Top Performing TSA Water Treatment Systems

#	WSA	WSP/ WB	TSA WTW	%TSA
1	City of Mbombela		Nelspruit New	92%
2	Thembisile Hani LM		Bundu	88%
3	Steve Tshwete LM		Vaalbank	87%
4	Dr JS Moroka LM		Weltevreden	86%
5	Bushbuckridge LM		Inyaka	84%

The top three systems with the best condition are Nelspruit New managed by City of Mbombela, Bundu managed by Thembisile Hani, and Vaalbank managed by Steve Tshwete (good 80-<95%).

Systems Observed to be Dysfunctional/Critical Condition based on Technical Site Inspections

Drinking water supply systems which failed to achieve at least a TSA score of 50%, are identified as follows.

Table 41 - Provincial Summary of the TSA Water Supply Systems in the Poor and Critical Performance Categories

Municipality (WSA)	WSP/ WB	TSA of ≥31-<50% [Poor]		TSA of 0-<31% [Critical]	
		Name of WTW	% TSA	Name of WTW	% TSA
Lekwa LM		Standerton	45%	None	
Thaba Chweu LM		Lydenburg	48%		
Totals		**2**			

2 systems were found to be in poor condition (>31-<50%).

VROOM Costs

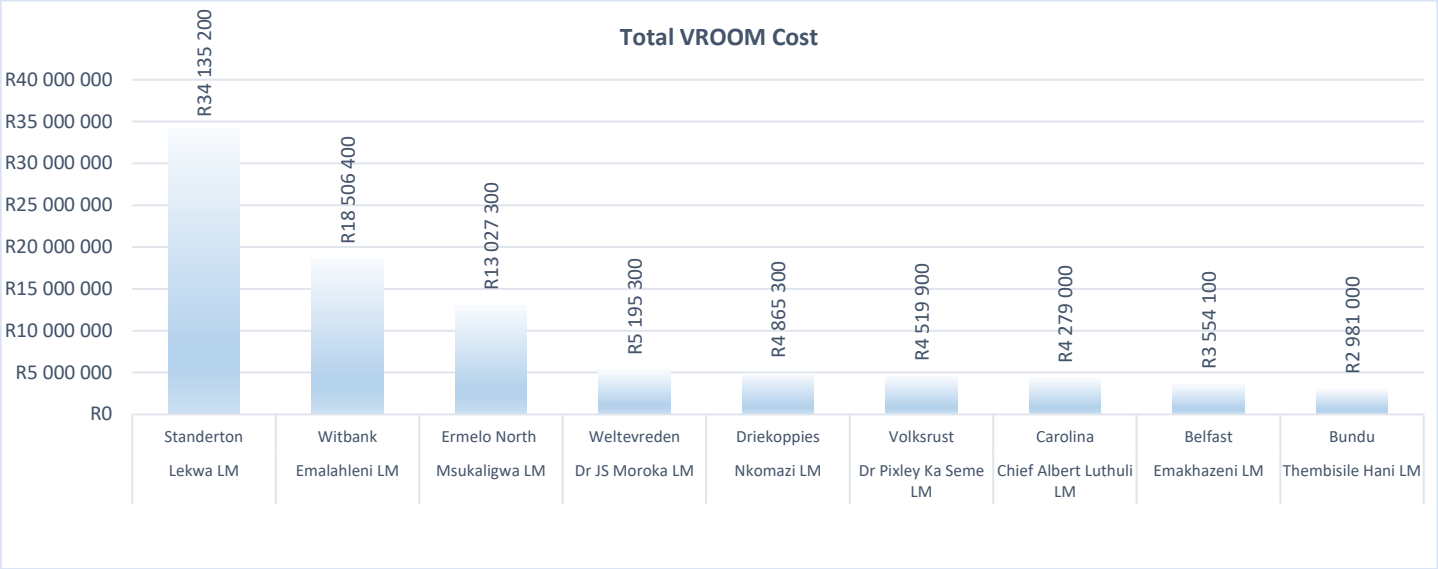
The Very Rough Order of Measurement (VROOM) is an estimation of the funding required to restore existing treatment infrastructure to its original design capacity and operations, by addressing civil, mechanical, electrical and instrumentation defects. A singular VROOM cost is determined by assessing 1-2 treatment facilities per municipality and calculated as cost per system. The cost is derived through an algorithm that uses the Blue Drop Inspector's impression of the asset condition, the size and capacity of the asset, and the market/ industry cost indicators. The resultant VROOM cost is an estimation of the cost to repair, refurbish or replace dysfunctional treatment infrastructure. Subsequently, a singular VROOM cost is extrapolated, in relation to the total Blue Drop scores and systems' SIVs, to derive an aggregated VROOM score for all treatment plants in the WSI.

***Note:** VROOM does not constitute a specification, schedule of quantities or a definite refurbishment figure, but rather an indicative amount to inform a budget and hardware requirements. **Also,** the VROOM cost is specific to the treatment plant and does not attempt to cost the network delivery and distribution network, as it contains to many variables.*

The VROOM costs are summarised as following, noting these values comprises the cost of repairs of the SINGLE water treatment system assessed, NOT the extrapolated collective cost to repair all the treatment facilities in a WSI. The VROOM cost is made up by mechanical, electrical, and civil cost elements, which can be seen in the detailed TSA sections following in the report.

Table 42 - Provincial Summary of the VROOM Costing

Municipality (WSA)	TSA WSS	TSA WTW	WSP/ WB	Total VROOM Cost (Rand)
City of Mbombela	Nelspruit	Nelspruit New		R2,564,100
City of Mbombela	White River Country Estate	White River Country Estate		R535,700
Dipaleseng LM	Greater Dipaleseng LM	Fortuna		R1,081,300
Victor Khanye LM	Victor Khanye	Delmas		R1,764,400
Chief Albert Luthuli LM	Carolina	Carolina		R4,279,000
Dr Pixley Ka Isaka Seme LM	Volksrust	Volksrust		R4,519,900
Emakhazeni LM	Belfast	Belfast		R3,554,100
Emalahleni LM	Witbank	Witbank		R18,506,400
Msukaligwa LM	Douglas dam	Ermelo North		R13,027,300
Nkomazi LM	Driekoppies/ Shoemansdal/ Buffelspruit/ Shongwe	Driekoppies		R4,865,300
Lekwa LM	Standerton	Standerton		R34,135,200
Mkhondo LM	Mkhondo	New Mkhondo Piet Retief		R1,325,500
Bushbuckridge LM	Inyaka	Inyaka		R1,333,200
Thaba Chweu LM	Lydenburg	Lydenburg		R996,600
Dr JS Moroka LM	Weltevreden	Weltevreden		R5,195,300
Thembisile Hani LM	Bomandu previously known as Machipe (Goederede)	Bundu		R2,981,000
Steve Tshwete LM	Middelburg/Mhluzi	Vaalbank		R2,742,300
Totals				**R103,406,600**



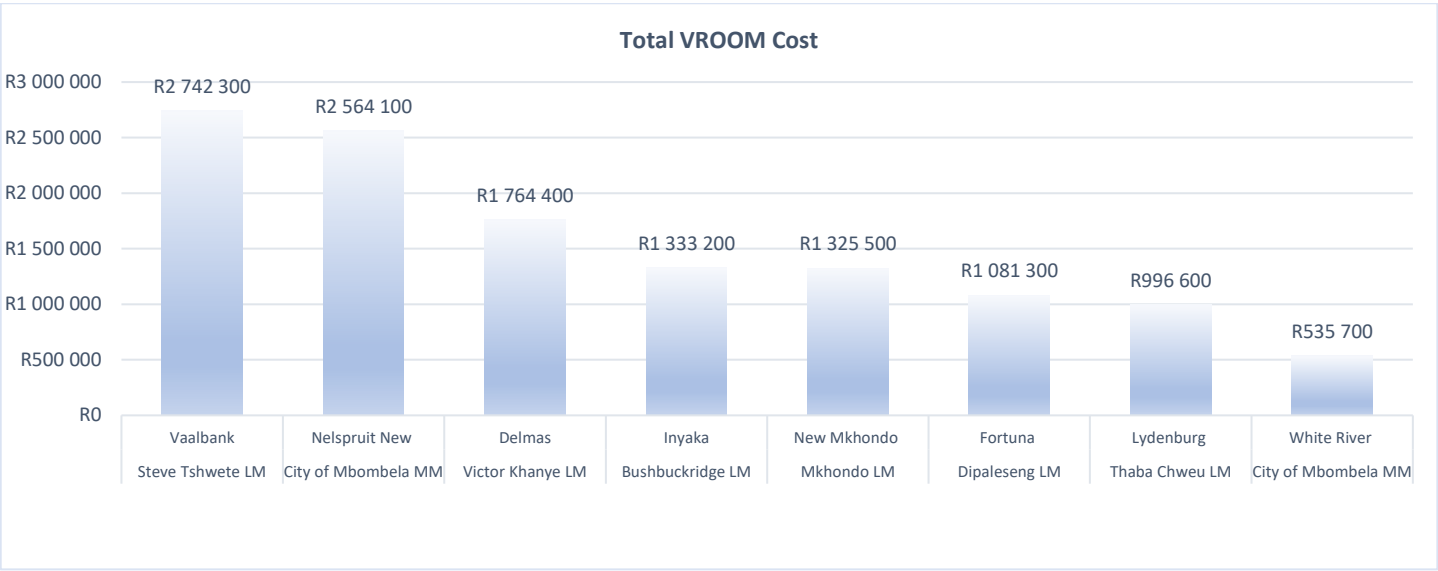


Figure 33 - Total VROOM Cost for the BD Systems Assessed

The associated VROOM costs for the 17 water supply systems assessed amounts to R103.4 million, with the bulk of investment needed for Standerton (Lekwa), Witbank (Emalahleni) and Ermelo North (Msukaligwa).

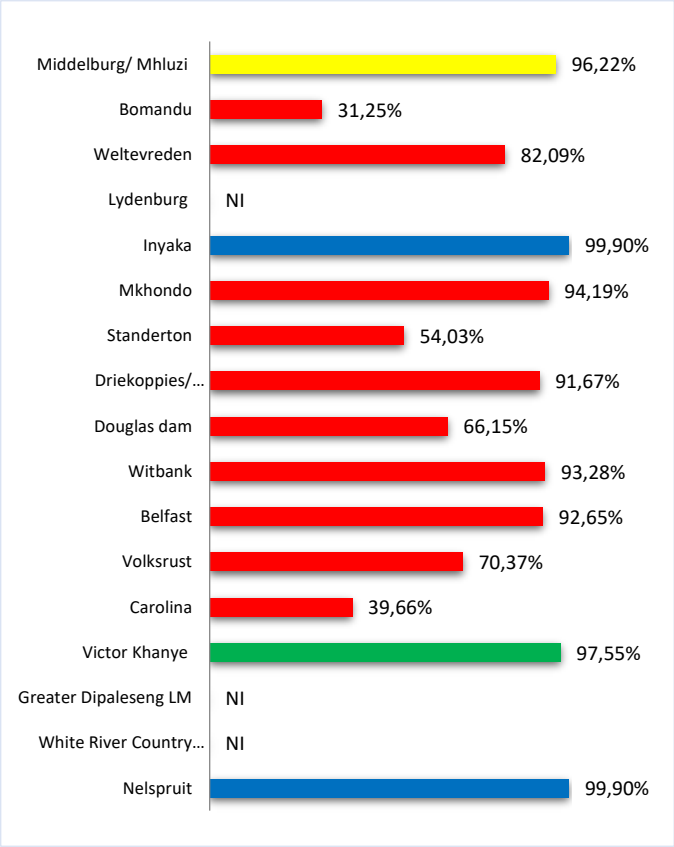
Drinking Water Quality Status

The Institutional Water Quality Compliance, as measured against SANS 241 standards, is reflected in the table below (IRIS, 28 March 2023).

Table 43 - Mpumalanga Summary of the Drinking Water Quality Status of all the TSA Water Supply Systems

#	Municipality (WSA)	TSA WSS	TSA WTW	Microbiological Compliance	Chemical Compliance
1	City of Mbombela	Nelspruit	Nelspruit New	>99.90%	99.30%
2	City of Mbombela	White River Country Estate	White River Country Estate	NI	NI
3	Dipaleseng LM	Greater Dipaleseng LM	Fortuna	NI	NI
4	Victor Khanye LM	Victor Khanye	Delmas	97.55%	98.12%
5	Chief Albert Luthuli LM	Carolina	Carolina	39.66%	76.54%
6	Dr Pixley Ka Isaka Seme LM	Volksrust	Volksrust	70.37%	93.50%
7	Emakhazeni LM	Belfast	Belfast	92.65%	80.15%
8	Emalahleni LM	Witbank	Witbank	93.28%	95.70%
9	Msukaligwa LM	Douglas dam	Ermelo North	66.15%	87.12%

#	Municipality (WSA)	TSA WSS	TSA WTW	Microbiological Compliance	Chemical Compliance
10	Nkomazi LM	Driekoppies/ Shoemansdal/ Buffelspruit/ Shongwe	Driekoppies	91.67%	86.23%
11	Lekwa LM	Standerton	Standerton	54.03%	71.50%
12	Mkhondo LM	Mkhondo	New Mkhondo Piet Retief	94.19%	94.21%
13	Bushbuckridge LM	Inyaka	Inyaka	>99.90%	98.17%
14	Thaba Chweu LM	Lydenburg	Lydenburg	NI	NI
15	Dr JS Moroka LM	Weltevreden	Weltevreden	82.09%	80.96%
16	Thembisile Hani LM	Bomandu previously known as Machipe (Goederede)	Bundu	31.25%	99.58%
17	Steve Tshwete LM	Middelburg/Mhluzi	Vaalbank	96.22%	87.74%



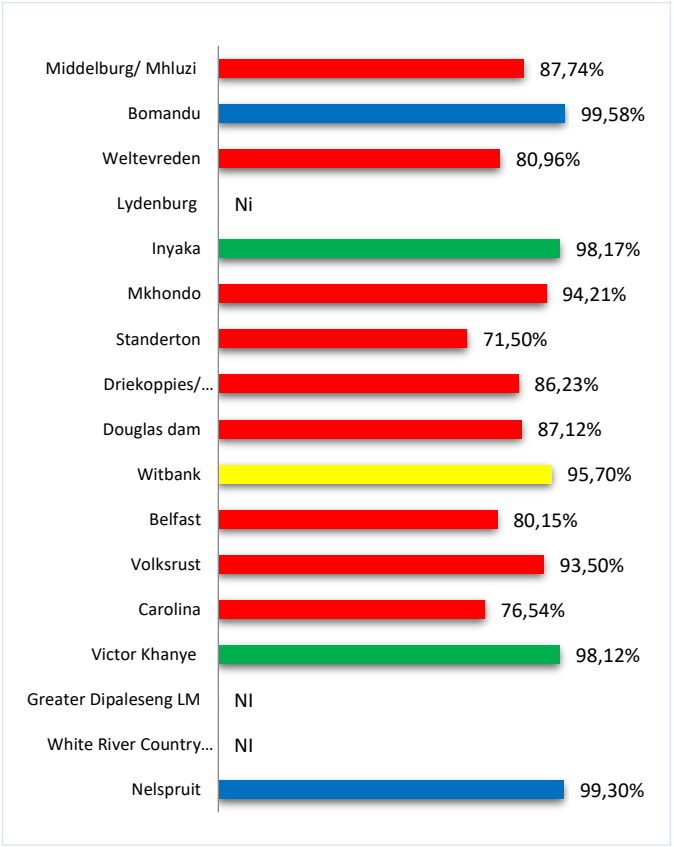


Figure 34 - MP Drinking Water Quality Status of all the TSA Water Supply Systems

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

The TSA and water quality results depict a vastly different picture. The TSA shows 15 of the 17 water supply systems to be in the *excellent to average performance category*, and the water quality compliance shows that 76-82% of the systems *fail to produce compliant final water quality*.

Out of 17 treatment plants, 2 (12%) and 1 (6%) of systems achieve excellent and good microbiological quality. A total of 1 (6%) system has poor and 13 (76%) systems have a bad microbiological water quality status. The water in these systems poses a serious acute health risk to the community. WSAs with poor microbiological water quality status must be assessed to confirm status in all systems to ensure rectification measures are comprehensive to safeguard communities The direct cause of microbiological failures can be linked to the TSA sub-watch Area 7, which has a low contribution to the overall TSA score. The failure to produce water that meets E. coli standards can be linked back to poor operations, defective infrastructure, dosing rates, absence of disinfection chemicals, lack of monitoring, or lack of operating and chemistry knowledge. WSIs that are not monitoring the final water quality at the outlet of the treatment plant or at specific end use points must develop a monitoring programme and resume with compliance monitoring as a matter of urgency.

Chemical compliance shows that 2 (12%) and 2 (12%) have excellent and good water quality respectively, whilst the majority of systems fail to achieve chemical compliance. A total of 1 (6%) and 12 (70%) systems have a poor and bad chemical water quality status respectively.

Concluding Remarks

The Blue Drop Watch results stresses the importance of drinking water supply and quality to be a primary focus area of government. Already, the Department has developed the Water Services Improvement Programme for systems in critical state, and at systems where particular concerns were reported. Blue Drop performance trends will be used to determine repetitive poor performance, to inform a radical approach to ensure turnaround and compliance. This could include facilitating long term intervention by either a capacitated water board or any other suitable mode of water services support. The determination of the 'very rough order of estimates' (VROOM) was done to give an estimation of the capital requirement for the functionality restoration drive. This will be effected with the support from the National Treasury.

The Regulator will continue to monitor performance in terms of Section 62 of the Water Services Act and will engage together with CoGTA and SALGA, WSAs for corrective action plan development and implementation and offer support. Should these actions fail, the Department will consider civil action together with actions contemplated under section 63 of the Water Services Act (Act 108 of 1997) to ensure that Ministerial directives are issued with timeframes for implementation. Failure to respond will trigger remedial action be taken at cost of the non-complying entity or municipality. The Department will take steps to improve its capacity to respond more effectively in this duty, in ensuring visible and measurable improvement in drinking water services. The Department of Cooperative Governance and National Treasury will be engaged to explore ways of utilising conditional grants for the purpose of remedial rectification.

All Water Services Institutions are hereby urged to take note of their TSA status and commence with corrective measures. The full Blue Drop audit report will provide further material content to the overall management of drinking water services across South Africa, upon its release in July 2023.

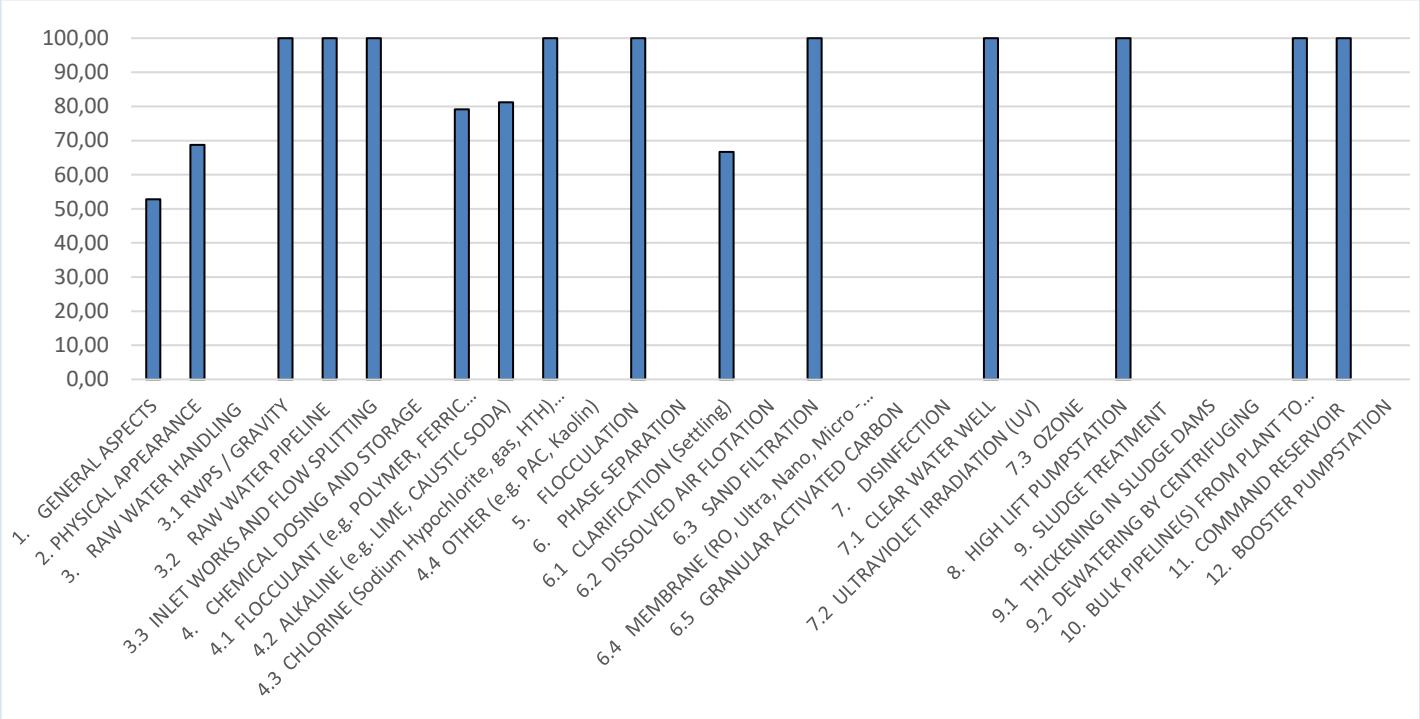
10.1 Bushbuckridge Local Municipality

Inyaka water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

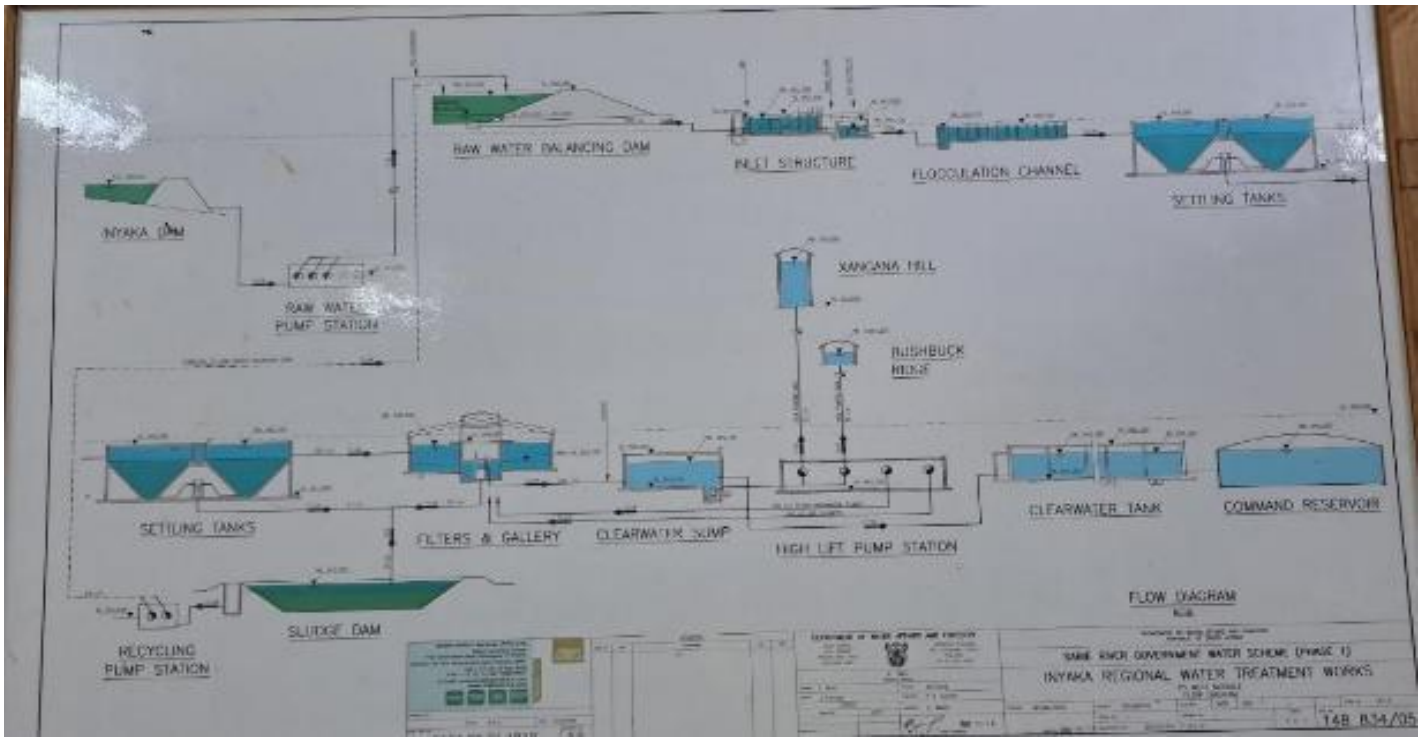
Inyaka WTW TSA Score: 84%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	52.7	Class B plant, repairs, and operational logbook not available, The O&M manual is not available onsite. The process flow diagram is displayed. The incident management procedures not available however the emergency contact list is displayed. Process monitoring equipment is available and calibrated. Jar testing is performed Electricity meter is not available.
2	**Physical appearance of plant**	68.7	The signpost is no longer visible. Housekeeping is average. The workers bathroom, lockers and lunch facility are in fair condition. There were no OHS contraventions in the past year. There is a good team spirit, and the staff are working a s team and were very participative in the site assessment. The team consisted of all PC's form all the other plants in the LM. The works is fenced. Safety signs are posted around the works, but more can be done to provide more and replace faded ones.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	100.0	The screens are at the abstraction point in the Inyaka Dam site not assessed. There are 5 pumps - 3 in operation and 2 on standby.
	Raw water pipeline	100.0	The raw water pipeline is in good condition. The inflow meter is operational. The volumes are recorded.
	Inlet works	100.0	The flow is splitting evenly. There are four (4) identical process trains at this plant each one @ 25ml/d. Flash mixing is effective. Visual dripping is observed.
4	**Chemical dosing and storage**		
	Flocculant	79.1	There are 10 dosing pumps and all in operation. The dosing area is not neat. Sufficient for 30ndays.Polydadmac U6050. The storage is bunded. The emergency shower is not available onsite.
	Alkaline	81.2	The dosing pumps are operational. The general housekeeping is not good. The storage volume is sufficient for 30 days. Lime is used for pH correction.
	Chlorine	100.0	The dosing unit are in good working condition. Monitoring of specifically chlorine gas in the cylinders - scale is working and switch-over device in place. Safety equipment available and working (alarm, detector, extractor fan, masks). Chlorine gas is used for disinfection.
5	**Flocculation**	100.0	Limited flocs are visible at the end of flocculation process. The flocculation unit is in a fair condition, there is sludge build-up and scum formation in channels. There is clear evidence of Iron in the water, due to the discoloration on the walls.
6	**Phase Separation**		
	Clarification (settling)	66.6	There's floc visible at the sedimentation tanks. Note loadshedding was in place at the time of site inspection and because the unit are enclosed there was very poor lighting and therefore not ideal to do observations and take photos. Regular de-sludging is done once per shift. There was minimal growth visible.
	Sand filtration	100.0	2 backwash pumps installed. 2 blowers installed. Even flow splitting was observed. Due to loadshedding no back washing was conducted. Backwashing is done once per day. There were no cracks in the surface of the filter. General housekeeping is good.
7	**Disinfection**		
	Clear water well	100.0	The contact time at the reservoir is more than 30 minutes. Free chlorine measurement is done at the reservoir.
8	**High lift pumpstation**	100.0	All pumps working and monitored on the SCADA. The final flow meter is not observed.
10	**Bulk pipeline from plant to command reservoir**	100.0	The raw water pipeline is in good condition. The valve chamber is not inspected.
11	**Command reservoir**	100.0	The reservoirs are inside the plant. Telemetry is coupled to the SCADA systems and monitored. The outflow meter was not inspected. The structure of the reservoir is still intact.
	Total	**84%**	

High risk areas OR Key Hardware Risks/ Defects

1. Nothing major that could not be done under normal operations and maintenance. The plant is undergoing an upgrade and refurbishment program at present.

VROOM Refurbishment Cost Estimate

Civil Works	R454,300	34%
Mechanical Works	R878,900	66%
Electrical Works (Including C&I)	R0	0%
Total VROOM Cost	**R1,333,200**	**100%**
R million / MLD		**0.01**

Regulatory Impression

The Inyaka water system is well maintained, with functional treatment processes, and competent staff. Water quality is monitored according to SANS 241 and is of high quality. Consumers may use the water with high level of confidence. A Water Safety Plan is in place but needs an annual risk assessment analysis with the subsequent review of their monitoring and sampling program and implementation.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	98.17%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

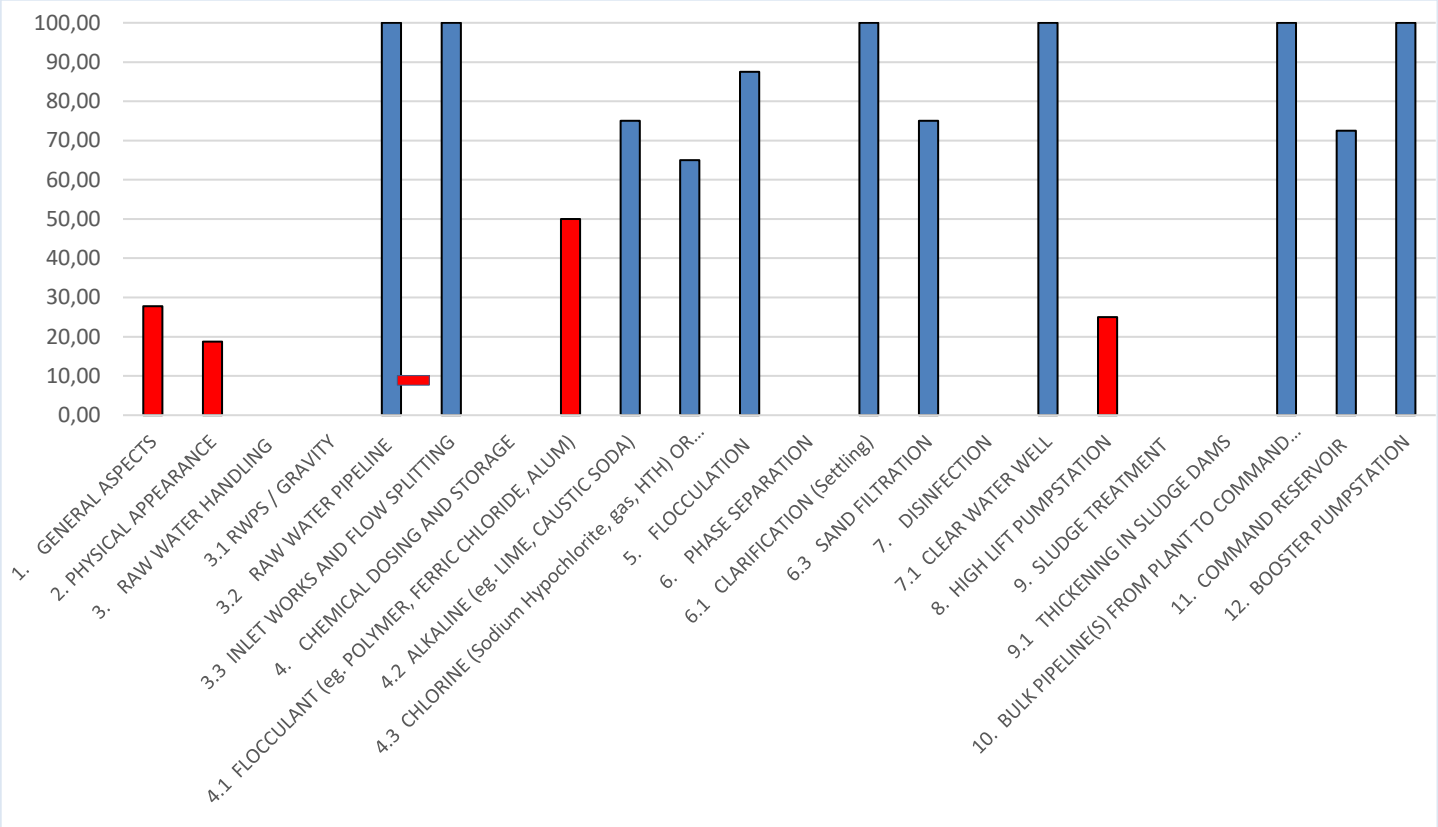
10.2 Chief Albert Luthuli Local Municipality

The Carolina water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

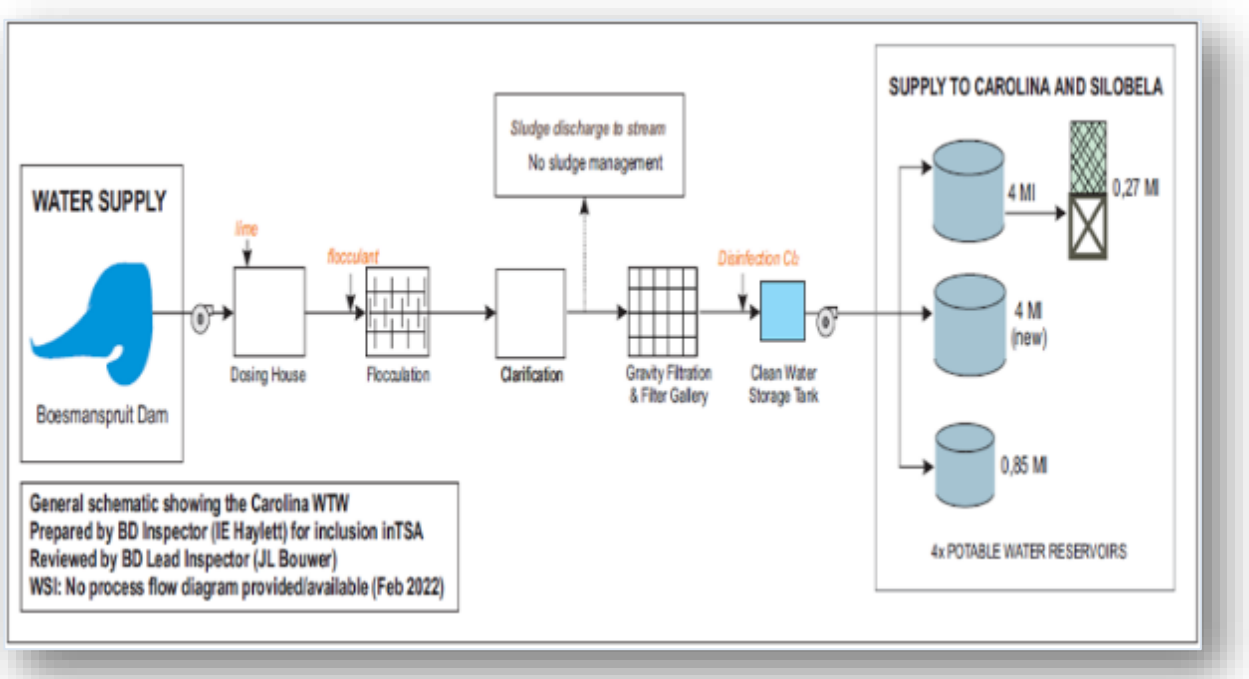
Carolina Water Treatment Works TSA Score: 61%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	27.8	Class B plant, maintenance, and repairs logbook not on site, hand-written logbooks are kept on-site, no O&M on site, no operational monitoring or jar-tests done, no PFD displayed, energy use must be recorded in plant logbooks and used for plant optimisation, the PCs need more equipment and/or tools as well as printed log-sheets which lists all the required aspects to be monitored on a daily basis.
2	**Physical appearance of plant**	18.8	The site is securely fenced but there is no signage, the access road is in a poor condition, there are construction activities on the site as the plant is being upgraded, there is however no effort to keep housekeeping in order even at the unit processes where the normal operation continues, there is no site management, the WSI was advised to urgently meet with the contractor and ECO and sort out the unacceptable state, no dedicated room for preparing lunches for PCs, the wash facilities and ablution were under water during the audit some OHS aspects were noted, *i.e.* falling and/or tripping hazards, chlorine handling, safety of female PCs, safety signs not adequate, fire extinguisher service date expired.
3	**Raw water handling**		
	Raw water pumpstation / gravity feed	0.0	Screens could not be assessed, abstraction point need to be investigated as there was a dead fish in the flocculation channels, not satisfactory.
	Raw water pipeline	100.0	A 340-mm raw water pipeline installed, the PC reported no problems, two functional inline flow meters, flow readings are recorded.
	Inlet works	100.0	Even flow splitting at the distribution structure, sufficient turbulence at the contact point, visual dripping of flocculant at the hydraulic jump.
4	**Chemical dosing & storage**		
	Flocculant	50.0	Two dosing pumps are installed and in working condition, The area is not neat or bunded and spillages cannot be contained, adequate flocculant volume for 30 days, emergency wash area needs attention, no shower at the chemical dosing point.
	Lime	75.0	Two dry lime dosing units installed, one for standby, lime not currently dosed due to construction in progress, units are dirty and signs of lime spillages, access door broken.
	Chlorine	65.0	Disinfection is done with chlorine gas, four rotameters installed, one in operation, three cylinders connected, and two chlorinators connected, adequate standby for all dosing units Installation of scales equipped for one-ton cylinders but 90 kg cylinders used with no automatic switch over, chlorine handling safety, emergency wash area and housekeeping need to be addressed.
5	**Flocculation**	87.5	Good floc formation, scum accumulation at the end of the channel.
6	**Phase Separation**		
	Clarification (settling)	100.0	No floc carry over, desludging done regularly, weirs are in good condition with even overflow.
	Sand Filtration	75.0	Three backwash pumps are installed and in working condition, some serious safety hazards include emergency stop of one pump damaged and missing safety covers, pump station is in a poor condition and inadequate housekeeping, two air blowers are in working condition but installation and maintenance not satisfactory, an even overflow at all the outlet boxes are seen which indicates good flow distribution but uneven bubble distribution noted in areas during backwash.
7	**Disinfection**		
	Clear water well	100.0	Contact time is more than 30 min, free chlorine measurement is done at the outlet point.
8	**High Lift Pump Station**	25.0	3 pumps are installed, 2 in working condition, no stand-by available which is a risk.
9	**Sludge Treatment**		
	Thickening in Sludge Dams	0.0	There is no sludge treatment, sludge is released directly into the stormwater system.
10	**Bulk pipeline from plant to command reservoir**	100.0	The PC indicated that there were no problems, valve chamber in good condition
11	**Command reservoir**	72.5	The site is fenced, and security available, no telemetry, one leak was observed.
12	**Booster Pump Station**	100.0	Two pumps installed, one in operation and one on standby, building is secure and within the security fencing of the reservoirs, MCC is in good condition.
	Total	**61%**	

High risk areas OR Key Hardware Risks/ Defects

1. Pump station maintenance and operation
2. There are no sludge treatment facilities and sludge are discharged to the stormwater system.
3. PCs facilities to be improved.
4. Access road and access for deliveries to be improved.
5. Lime dosing equipment not operational
6. Site management during construction activities

VROOM Refurbishment Cost Estimate

Civil Works	R2,446,400	57%
Mechanical Works	R1,520,200	36%
Electrical Works (Incl C&I)	R312,400	7%
Total VROOM Cost	**R4,279,000**	**100%**
R million / MLD		**0.95**

Regulatory Impression

The Carolina water treatment plant is operational, but the plant performance must be improved. Water quality is not monitored in accordance with SANS 241. The potable water is not microbiologically compliant and poses a serious acute health risk to the community. A Water Safety Plan was last done for the 2015-16 period and not strictly in line with the acceptable guidelines. The WSI is encouraged to immediately address water safety planning, not only for the Carolina WTW but for all water supply systems in the LM. Annual process and network inspections must be performed by a professionally qualified person(s) and the findings must be used to update the risk assessment in the Waster Safety Plan on a continuous basis. The monitoring programme needs to be updated with the correct determinands and sampling points. The WSI does not have a copy of the water use license and license conditions.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	39.66%
Chemical Compliance	76.54%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



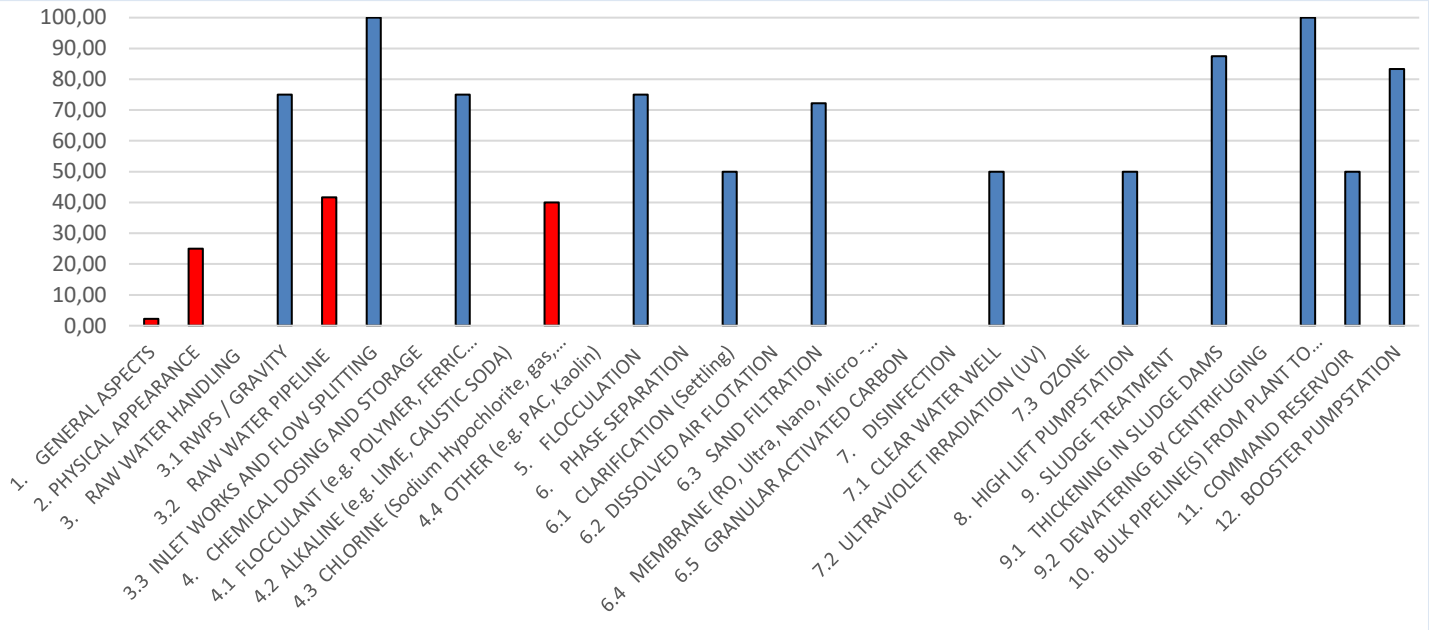

10.3 Dipaleseng Local Municipality

The Fortuna water treatment works was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

Fortuna TSA Score: 52%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram

None

Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	2.2	The WTW is not classified on IRIS. Very few operational entries are logged. Only free chlorine is measured using expired reagent and an old colour disc.
2	**Physical appearance of plant**	25.0	Facility is fenced but parts is gone, there is also no access control. Roads not in a very good condition. The terrain is not tidy, nor safe. There were no serious OHS contraventions in the past year. But during inspection manholes were not closed. Relevant safety signs are posted.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	75.0	Three pumps, one out of commission, one in use and one as standby.
	Raw water pipeline	41.7	The pipeline in a good condition. Inflow measuring device in place but not working.
	Inlet works	100.0	Good turbulence achieved. Dripping flocculant visible.
4	**Chemical dosing and storage**		
	Flocculant	75.0	Four dosing pumps all in working condition, two in use, two on standby. Dosing room in need of some maintenance. Storage area is bunded. Aquafloc 4000, storage sufficient for 2 to 3 weeks, delivery 2 days after order is placed. No emergency wash area is nearby.
	Chlorine	40.0	Two dosing pumps for liquid chlorine, one dosing unit leaking. No standby available. Stock monitored by visual inspection. No safety equipment available and working.
5	**Flocculation**	75.0	Flocs not clearly visible, evidence that the dosing rates of flocculant are not optimised. General condition of flocculation unit is good, some scum visible on the clarifier.
6	**Phase Separation**		
	Clarification (settling)	50.0	Flocs carry over at the weirs. Manual desludging takes place once per 8-hour shift. It was observed that the current schedule is not sufficient / followed. Weirs are clean and in a good condition.
	Sand filtration	72.2	Two backwash pumps installed and working, 1 in use, one on standby. 2 Air blowers installed, only one working. Bubbles not evenly distributed during backwash. Three filters backwashed per day, 1 in an 8-hour shift. Filter media replaced in 2022. Walls and handrails in a good condition.
7	**Disinfection**		

Watch #	Process Unit Assessed	% TSA	Observations
	Clear water well	50.0	No indication of the size of the clear water tank, however a 15 km pipeline to the main reservoir assist with contact time. Final sample point to be moved after completion of extension to the WTW.
8	**High lift pumpstation**	50.0	Three pumps installed, all three working, 1 in use, 2 on standby. No outflow meter available.
9	**Sludge treatment**		
	Thickening in sludge dams	87.5	Four sludge dams in good condition, terrain can be cleaned, and grass cut. Two dams cleaned recently. No recycling of supernatant.
10	**Bulk pipeline from plant to command reservoir**	100.0	According to DLM it is in a good condition.
11	**Command reservoir**	50.0	Newly built reservoir in a good condition, not fenced, telemetry in place, but no outflow meter.
12	**Booster pumpstation**	83.3	Pumps are in a working condition at both pumpstations. Only one pumpstation have standby pumps. Buildings secured.
	Total	**51.5%**	

High risk areas OR Key Hardware Risks/ Defects

1. The screens at the intake as well as the one pump should be replaced/ repaired.
2. Meters for both intake and final water to be installed/ repaired/ calibrated and laboratory equipment to be purchased to aid process controlling.
3. One chlorine tank to be stored underroof and dosing equipment to be repaired (pipe and pump leaking), as well as backup dosing pumps to be acquired.
4. Filter nozzles to be cleaned/ repaired to aid even bubble distribution. Standby air blower to be repaired.
5. Terrain to be cleaned, grass cut, and minor maintenance to building done.

VROOM Refurbishment Cost Estimate

Civil Works	R321,200	30%
Mechanical Works	R749,100	69%
Electrical Works (Incl C&I)	R11,000	1%
Total VROOM Cost	**R1,081,300**	**100%**
R million / MLD		**0.18**

Regulatory Impression

The Fortuna WTW has a design capacity of 6 Ml/d and is currently being upgraded. The WTW is functional, but processes can be optimized. There is no functional onsite laboratory equipment and no WQ monitoring data are available for both the WTW as well as the reticulation system of the Greater Dipaleseng LM. The civil structures at the plant are solid, but in need of general maintenance and housekeeping. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	NI
Chemical Compliance	NI

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





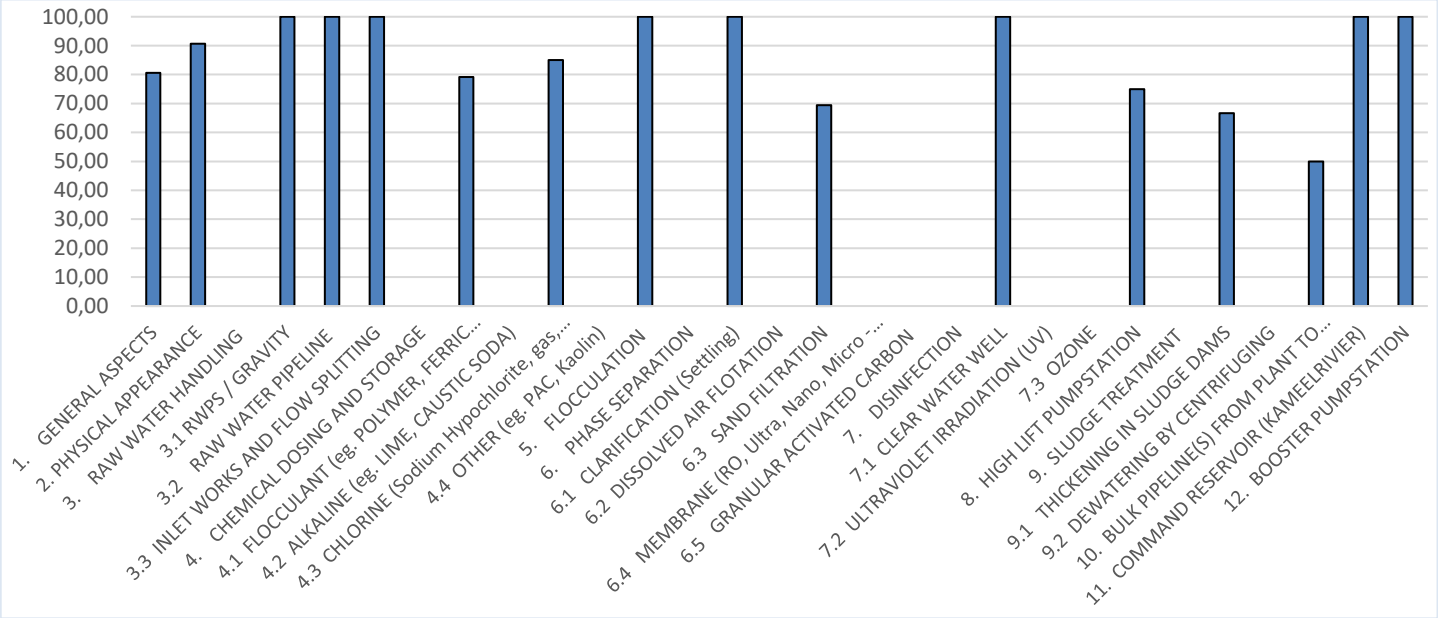
10.4 Dr JS Moroka Local Municipality

The Weltevreden water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

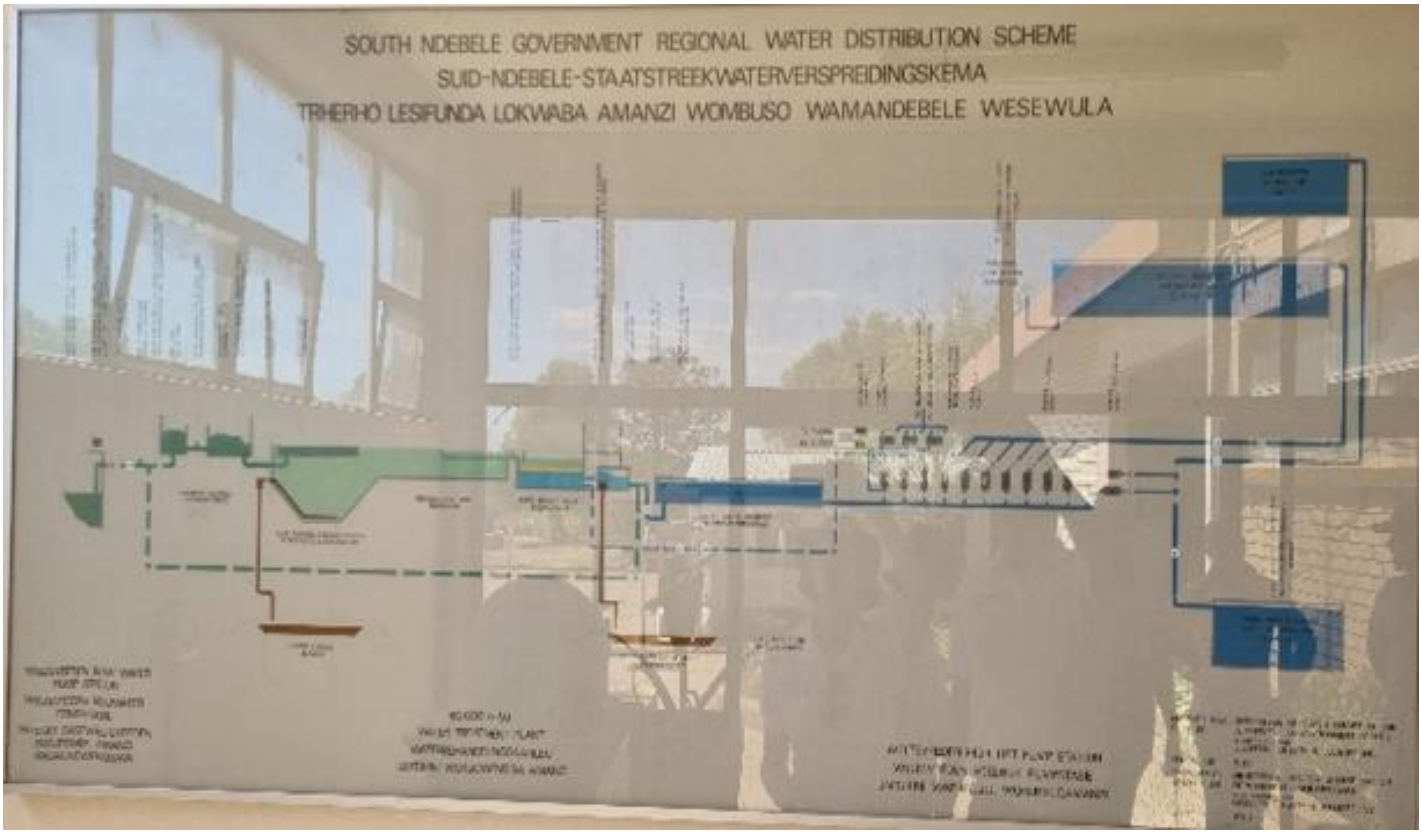
Weltevreden WTW TSA Score: 86%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	80.5	Class B plant, certificate on display and logbooks and O&M manual are in place. Emergency contact list is on display but there is no incident management protocol available. Necessary lab equipment is available. Flow diagram is displayed. Calibration solutions for pH meter are required. The plant would benefit from an onsite electricity meter to monitor consumption. The incident management protocol should be displayed in the office.
2	**Physical appearance of plant**	90.6	Entrance is not signposted. The plant site is neat, grass is mown, paving is in good condition and fence is new and secure. The abstraction pump station site is also neat with grass mown and secure fence. Staff facilities are in good condition. Necessary safety signs are posted. Vandalism of electrical equipment is common, and security should be increased.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	100.0	Screens and raw water abstraction pumps are in good condition, operating in duty/standby mode with an additional spare pump available.
	Raw water pipeline	100.0	Raw water pipeline and flow measurement instrumentation is in good condition. Pipeline was recently replaced.
	Inlet works	100.0	There is even flow splitting at the inlet structure. There is turbulent mixing at the point of flocculent dosing as well as at the pre-chlorination dosing point. Pre-lime dosing facility is available but not currently being used. Chemical dosing can be monitored visually.
4	**Chemical dosing and storage**		
	Flocculant	79.1	All dosing pumps are operational. There are two pumps available to pump flocculant from the storage tanks to the dosing area, and 4 pumps for flocculent dosing into the raw water. Two dosing pumps from the storage tanks are operated as duty/standby. One flocculent dosing pump is used to dose chemical into raw water, with remaining 3 pumps on stand-by. The bund area for the flocculent storage should be increased and the safety showers need to be repaired.
	Chlorine	85.0	Gas dosing unit is operational. There are 2 post chlorination dosing systems and one pre-chlorination system, with the post-chlorination system operating as duty/standby. There is 100% standby for the gas cylinders. There is no scale, but there is a functioning pressure gauge to monitor gas pressure. When pressure drops then cylinders are switched. Scales should be repaired to anticipate switch over and timeous stock order. Gas monitoring system is in place and operational, the extractor fan is operational and there are safety masks available.
5	**Flocculation**	100.0	Flocs are visible and there is good floc formation. Flocculant tank is in good condition and is clean with no scum build up. Handrails are in place and in good condition.
6	**Phase Separation**		
	Clarification (Settling)	100.0	There is limited floc carry over at the weirs. Desludging takes place daily. Discharge holes are clean and in good condition. There is no growth limiting flow.
	Sand filtration	69.4	There are 3 backwash pumps installed but only one is operational. 12 sand filters are installed, 6 have recently been refurbished. The other 6 are under repair to have the valves replaced. Only one pump is operational so there is no standby capacity currently. Only one blower is available the second is currently out for repair, so no stand-by available. There is even flow splitting to the sand filters, and even bubble distribution during the backwash cycle. Media is smooth and in good condition. Filters are clean, handrails are in place and in good condition.
7	**Disinfection**		
	Clear water well	100.0	There is a large onsite underground reservoir with >30 min contact time. Sample is taken for free chlorine at the final sample point and measurement is done in the on-site lab.
8	**High lift pumpstation**	75.0	8 of 12 high lift pumps are operational and pumping to 4 reservoirs. 4 pumps are under refurbishment. There is currently 50% standby capacity. There are 4 meters measuring the flow to the 4 command reservoirs. Only one of the 4 is operational due to vandalism of the electrical equipment. Maintenance is currently being done.
9	**Sludge treatment**		
	Thickening in sludge dams	66.6	Sludge dams are overgrown and could not be checked. Dams were emptied 2 years ago, there are plans to rehabilitate the area (capital project). There is provision for water to return from the sludge dams to the weir under gravity.
10	**Bulk pipeline from plant to command reservoir**	50.0	Bulk pipeline is reported to be in fair condition with occasional leaks, the old material is asbestos which is currently in the process of being replaced.
11	**Command reservoir**	100.0	Kameelrivier reservoir visited. The reservoir is fenced with a secure gate and sign in place. There are three reservoirs on the site, a 1 Ml steel tank and 2 * 6 Ml concrete reservoirs. There is an electronic level sensor in the reservoir that is operational, with telemetry. There is no flow meter at the reservoir, but it was reported that there is a flow meter at the first pump station that is operational. The structure is in good condition with no leaks and fully closed.

Watch #	Process Unit Assessed	% TSA	Observations
12	**Booster Pumpstation**	100.0	Both installed pumps were operational. Pumps are operated as duty/standby.
	Total	**86%**	

High risk areas OR Key Hardware Risks/ Defects

1. Final flow meters have been vandalised, in process of repair but security needs to be improved.
2. Half of the sand filters are offline for maintenance of the valves.
3. The sludge dams need to be cleaned, the area rehabilitated, and sludge handling facility upgraded.
4. Bulk pipe network are asbestos pipes that experience leaks but are in the process of replacement.
5. Flow metering not available at command reservoir.

VROOM Refurbishment Cost Estimate

Civil Works	R3,105,300	60%
Mechanical Works	R2,064,700	40%
Electrical Works (Incl C&I)	R25,300	0%
Total VROOM Cost	**R5,195,300**	**100%**
R million / MLD		**0.17**

Regulatory Impression

The Weltevreden WTW is neat and in good condition, with parts of the plant currently undergoing refurbishment. Operator staff are motivated and dedicated to good performance. A Water Safety Plan is in place for the Weltevreden supply system although requires implementation. There are frequent incidents of vandalism of the electrical equipment and security should be improved. The Weltevreden WTW produced water of bad quality due to non-compliances with respect to turbidity, chlorine, and microbiological. Operational monitoring should be used to improve control to reduce non-compliance. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	82.09%
Chemical Compliance	80.96%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





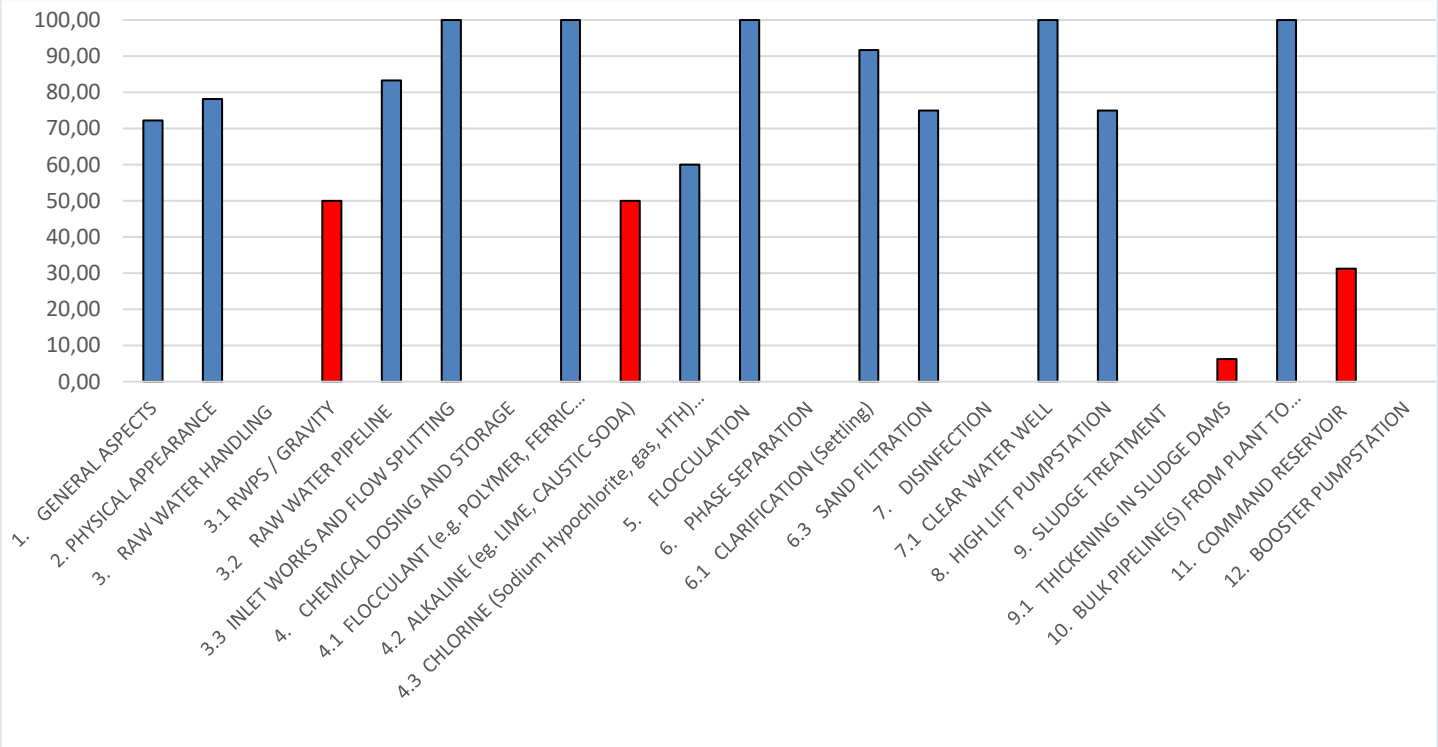

10.5 Emakhazeni Local Municipality

The Belfast water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

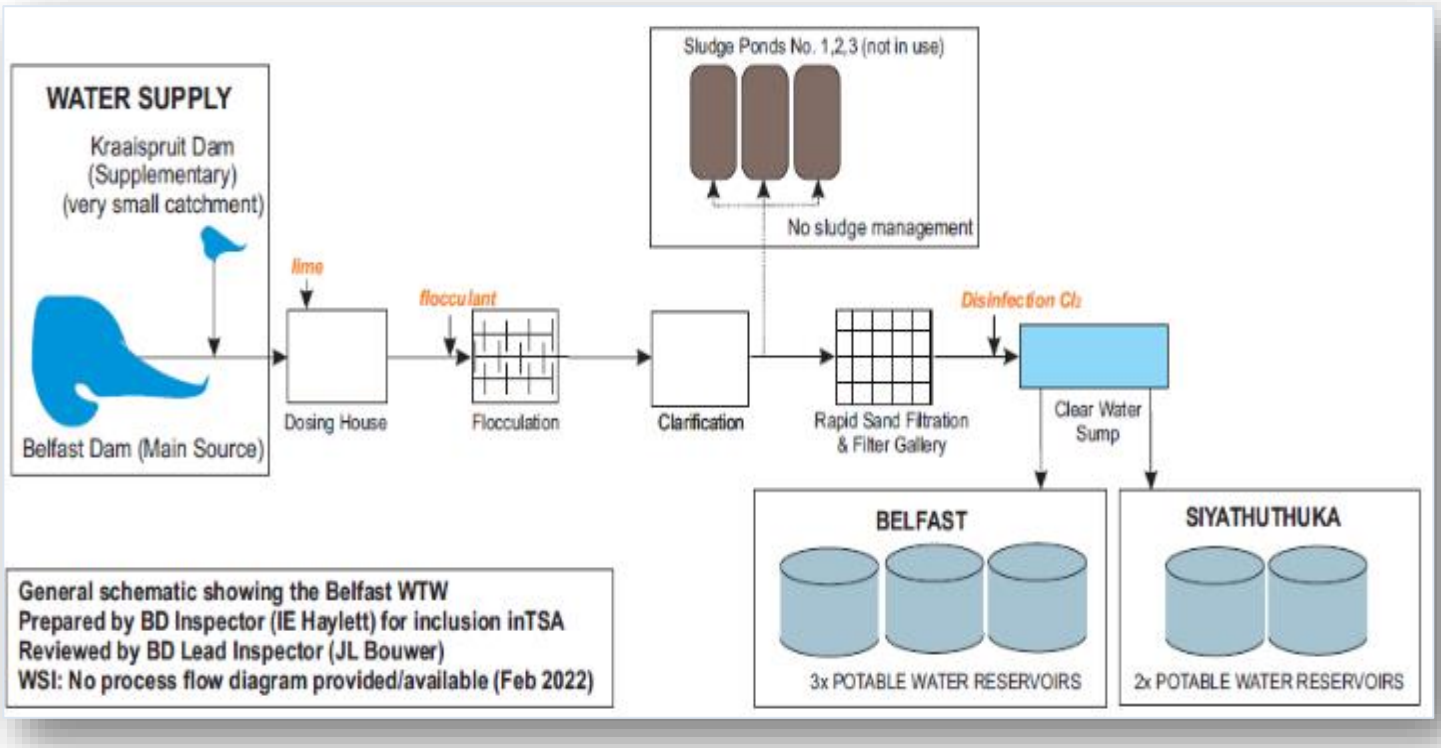
Belfast Water Treatment Works TSA Score: 68%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	72.2	Class C plant, hand-written logbooks are kept on-site, no O&M on site, no PFD displayed, signage at gate, energy use must be recorded in plant logbooks and used, the PCs need more equipment and/or tools as well as printed log-sheets which lists all the required aspects to be monitored daily.
2	**Physical appearance of plant**	78.1	Fenced, fairly neat terrain, access road needs to be addressed good housekeeping, OHS corrections at the WTW to include falling and/or tripping hazards and chlorine handling.
3	**Raw water handling**		
	Raw water pumpstation / gravity feed	50.0	The main source of raw water is the Belfast Dam which is just downstream from the Belfast WWTP and therefore the quality of raw water may be impacted, a small supplementary source is available from the Kraaispruit Dam OHS corrections required at the raw water pump station are numerous and range from electrical to tripping hazards, back-up pumps are not operational.
	Raw water pipeline	83.3	inline flowmeter is operational but submerged and the WSI need to ensure proper drainage in the flow meter box.
	Inlet works	100.0	Even flow splitting at the distribution structure, sufficient turbulence at the contact point, visual dripping of flocculant at the hydraulic jump.
4	**Chemical dosing and storage**		
	Flocculant	100.0	Flocculation dosing facilities adequate.
	Lime	50.0	Dry lime feeder has been out of operation for an unacceptable period of time, no standby available.
	Chlorine	60.0	Only one dosing pump operational, chlorine handling and safety needs to be addressed, an emergency wash area is available.
5	**Flocculation**	100.0	Good floc formation and velocity, very little scum observed.
6	**Phase Separation**		
	Clarification (settling)	91.7	No floc carry-over visible, desludging of the units is done daily, weirs are generally in a good condition. Some growth visible on the wall as some areas are difficult to clean.
	Sand Filtration	75.0	Two backwash pumps are installed, and one is in working condition, stand-by pump is not operational, air blower in operation but no stand-by available, two filters out of operation due to problems with inlet channel gates
7	**Disinfection**		
	Clear water well	100.0	Disinfection is done with chlorine gas and contact time is more than 30 minutes, free chlorine measurement is done at the discharge point from the clearwater sump
8	**High Lift Pump Station**	75.0	The high-lift pumpstation is 1,9 km away from the WTW site, four pumps are installed - two to Belfast and two to Siyathuthuka, two pumps in operation and two pumps are defective, no stand-by pumps available which poses a risk, inline flow meters operational, flow records captured daily. Risks need to be addressed in WaSP.
9	**Sludge Treatment**		
	Thickening in Sludge Dams	6.3	Sludge dams are overgrown and has never been used, no sludge treatment and management
10	**Bulk pipeline from plant to command reservoir**	100.0	Pipeline uPVC in good condition. One valve chamber was inspected and was found to be in a good condition.
11	**Command reservoir**	31.3	Siyathuthuka has two reservoirs and three elevated segmented steel tanks, fenced but not secure, gate house has been vandalised and there is no security in place. No telemetry.
12	**Booster Pump Station**	0.0	Pump station is within fenced area. But has been totally vandalised, MCC stripped. No security is in place.
	Total	**68%**	

High risk areas OR Key Hardware Risks/ Defects

1. Standby pumps and equipment
2. Sludge treatment
3. Site drainage
4. Reservoirs security
5. Lime dosing equipment dysfunctional

VROOM Refurbishment Cost Estimate

Civil Works	R1,280,400	36%
Mechanical Works	R2,106,500	59%
Electrical Works (Incl C&I)	R167,200	5%
Total VROOM Cost	**R3,554,100**	**100%**
R million / MLD		**0.89**

Regulatory Impression

The Belfast water treatment plant is operational, but the plant performance must be improved. Water quality is not monitored in accordance SANS 241 and in the audit period there were no chemical monitoring done. The potable water is not microbiologically compliant and poses an acute health risk to the community. The monitoring programme needs to be updated with the correct determinands and sampling points. A Water Safety Plan in line with the acceptable guidelines must be developed and implemented. Annual process and network inspections must be performed by a professionally qualified person(s). The WSI does not have a copy of the water use license and license conditions. The financial manager and executive management need to be more involved with all the aspects of water treatment to ensure that the business of water treatment and safe potable water supply are prioritised. The plant is operating at 60% of the design capacity and this may negatively impact adequate water supply. The effect of loadshedding will exacerbate water supply.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	92.65%
Chemical Compliance	80.15%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



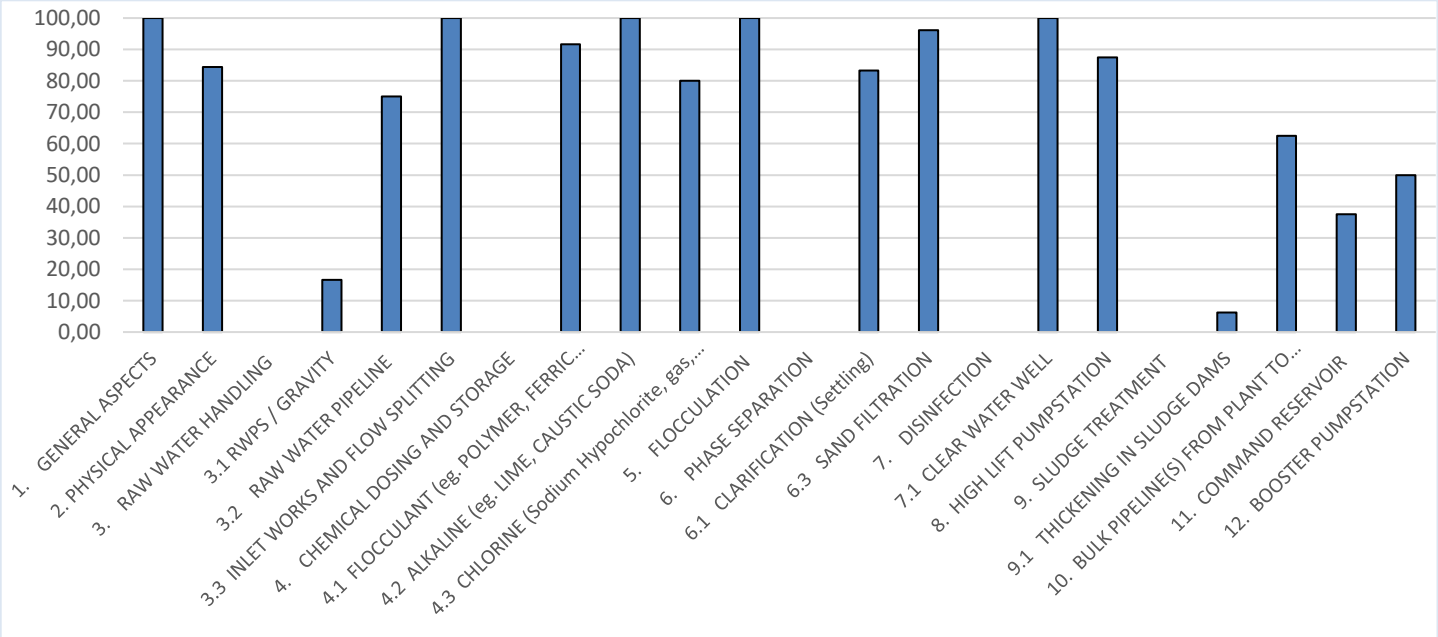

10.6 Emalahleni Local Municipality

The Witbank water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

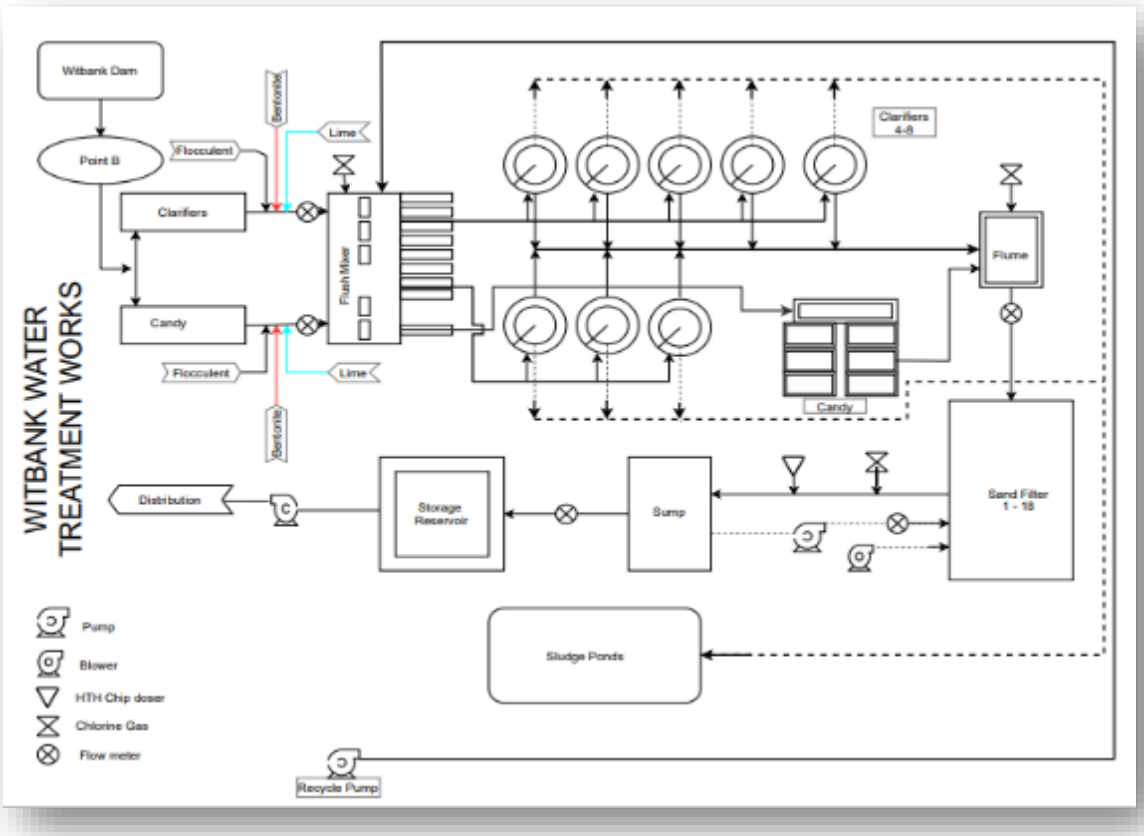
Witbank Water Treatment Works TSA Score: 78%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	100.0	Class B WTW with a capacity of 90 Ml/d, maintenance and repair logbook kept, operational logbook with daily shift entries clearly indicated, PFD displayed, all BD minimum requirements contained in incident management protocol, incident register completed and updated, NTU, EC and pH meters on site, in working condition and calibrated (although calibration certificates expired within the audit period) , in-house laboratory on site, jar test apparatus on-site and in working condition, flow metering done daily.
2	**Physical appearance of plant**	84.4	The site is within the town of Witbank accessible, internal roads are paved and in good condition, there are more than one entrance, one entrance with gate control, entrance is clearly marked but one of the other entrance gate were open and unattended, site is generally neat and well kept, grass is cut and the paving is clean and in good condition, workers have a dedicated room for preparing lunches, wash facilities and ablution are in good order, access to the sludge ponds not maintained and the area inaccessible, sufficient safety signage with the exception of the chlorination facilities which were not adequately signposted.
3	**Raw water handling**		
	Raw water pumpstation / gravity feed	16.7	Raw water is abstracted from the Witbank Dam, screens were not assessed, supposed to be four pumps in operation and two pumps on standby, only 2 pumps installed and in operation, no standby.
	Raw water pipeline	75.0	Rising main from Witbank Dam to raw water ponds in an acceptable condition., raw water pipe network from raw water ponds on the southern side of the N4 to the WTW are leaking underneath the N4 and need important maintenance - this has been a serious concern for many years, separate flow meters for the Candy Plant and the conventional Plant, both in working condition, flow recorded.
	Inlet works	100.0	Even flow splitting visible at the distribution structure, overflow from division results in sufficient turbulence at the contact point, chemical feed and dosing cannot be visually seen, other than indicated by the dosing pumps but not considered to be problematic.
4	**Chemical dosing and storage**		
	Flocculant	91.7	Four dosing pumps are installed - all of them in working condition, area is neat, clean and bunded. storage area is bunded and any spillages can be contained, an emergency wash station is installed, but not operational.
	Lime	100.0	Operational lime and bentonite feeders, all equipment and standby in working order, adequate stock.
	Chlorine	80.0	Two rotameters operational during audit, two chlorinators, two dosing points, two banks of 4-ton cylinders each, one bank in operation at a time with automatic switchover, safety shower in place but not working condition, every PC issued with a mask, adequate supply, storage is not ideal as cylinders are stacked in the open.
5	**Flocculation**	100.0	Clari-flocculators and Candy flocculation tanks are equipped with vertical stirrers and in good condition apart from some algae noted in the clari-flocculator launders and some scum in the centre stilling well
6	**Phase Separation**		
	Clarification (settling)	83.3	Two systems, eight circular clari-flocculators all in working order with no floc carry over noted and Candy system with six clarifiers with no floc carry over noted, short circuiting of launders problematic, desludging done during every shift. Clariflocculators have even overflow, launders on Candy system not level and leaking at joints causing short circuiting, units were newly painted and therefore any possible poor concrete conditions was not evident at the time of the TSA.
	Sand Filtration	96.1	Four backwash pumps are installed and all in working condition, coupling covers are not installed and leakages observed, electrical cabling not to spec, two air blowers installed and in working condition, even overflow at all the outlet boxes are seen which indicates good flow distribution, a few problem spots were noted during backwashing, and it is recommended that the filter floors be checked, media is in a good condition, filter gallery in good condition.
7	**Disinfection**		
	Clear water well	100.0	Two clearwater reservoirs on site with a combined capacity of 80 000 kl, contact time is adequate, free chlorine measurement takes place at the outlet of the reservoirs
8	**High Lift Pump Station**	87.5	Could not access the pump station, reported that 5 pumps are installed, all operational, standby not adequate, flow meter operational and flow recorded
9	**Sludge Treatment**		
	Thickening in Sludge Dams	6.25	Could not access the sludge ponds due to overgrowth, ponds, and pump station not operational, settled backwash water discharges into the municipal stormwater system.
10	**Bulk pipeline from plant to command reservoir**	62.5	Pipeline is in a fair condition, open manholes in a poor condition witnessed.

Watch #	Process Unit Assessed	% TSA	Observations
11	**Command reservoir**	37.5	Two reservoirs on site with a combined capacity of 80 000 kl, one conventional concrete reservoir 20 000 kl, and the other a reservoir with a floating roof 60 000 kl, fenced with a palisade fence which needs repairs in places and is not secure, gate house and security, telemetry installed but not in working condition, no final flow meter, reservoirs are closed at the top to prevent access from birds and people.
12	**Booster pump station**	50.0	Four pumps installed, two in working condition, no standby, pump station fenced and locked with 24 hours security in place., security for the generators can be improved, MCC is in a fair condition.
	Total	**78%**	

High risk areas OR Key Hardware Risks/ Defects

1. Raw water pipeline under N4 to be replaced.
2. Raw water standby pumps out of operation
3. Candy system settling tanks overflow weirs are short circuiting.
4. Sludge treatment facilities not operational
5. Open pipe channels with covers removed.

VROOM Refurbishment Cost Estimate

Civil Works	R13,021,800	70%
Mechanical Works	R4,543,000	25%
Electrical Works (Incl C&I)	R941,600	5%
Total VROOM Cost	**R18,506,400**	**100%**
R million / MLD		**0.21**

Regulatory Impression

The general impression of the Witbank water treatment plant is good although there are some minor repairs required to the buildings. There is a Water Safety Plan in place done by the CSIR and the WSI is reminded to update this document and the risks with the annual process and network inspections as performed by a professionally qualified person(s) on a continuous basis. The WSI is encouraged to address the excessive water losses as a matter of urgency. There is a concern with regards to the water quality results from the laboratory used to do the analysis. From these results it is very difficult to interpret the performance of the Plant. For example, according to these results there are no significant differences for some of the chemical determinands tested in the raw and final water. It is recommended that the WSI ensure that all sampling procedures, turnaround periods, methods of analysis and details indicated on the certificates of analysis is in line with the prescribed standards. This is applicable to all the WTWs in the municipality. The potable water produced by the Witbank WTW is not microbiologically safe and poses an acute health risk to the community. In addition, the complexities as it relates to the quality of the raw water in this specific area may warrant a look at introducing some new or other technology and/or treatment unit(s) into the configuration of the existing WTW. An additional supposed problem is that of inadequate reservoir management. The WSI does not have a copy of the water use license and license conditions but apparently the process of applying for a new water use license is underway. The current team seems eager to learn and improve and a special mention has to be made of the diligent efforts of Ms Lungisile Mchunu to rectify and improve the situation.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	93.28%
Chemical Compliance	95.70%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%




10.7 Govan Mbeki Local Municipality

There is no TSA as there is no WTW situated in this municipality treating water. The water is supplied from Rand Water outside of the municipal jurisdiction.

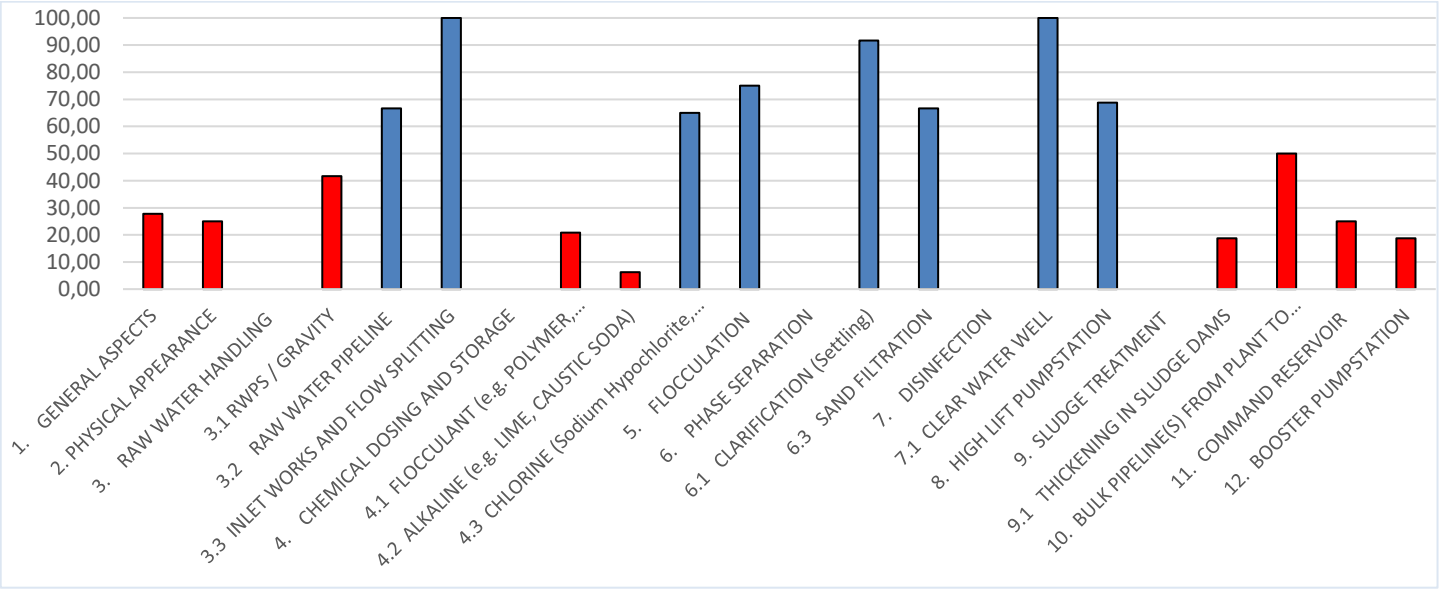
10.8 Lekwa Local Municipality

The Standerton water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

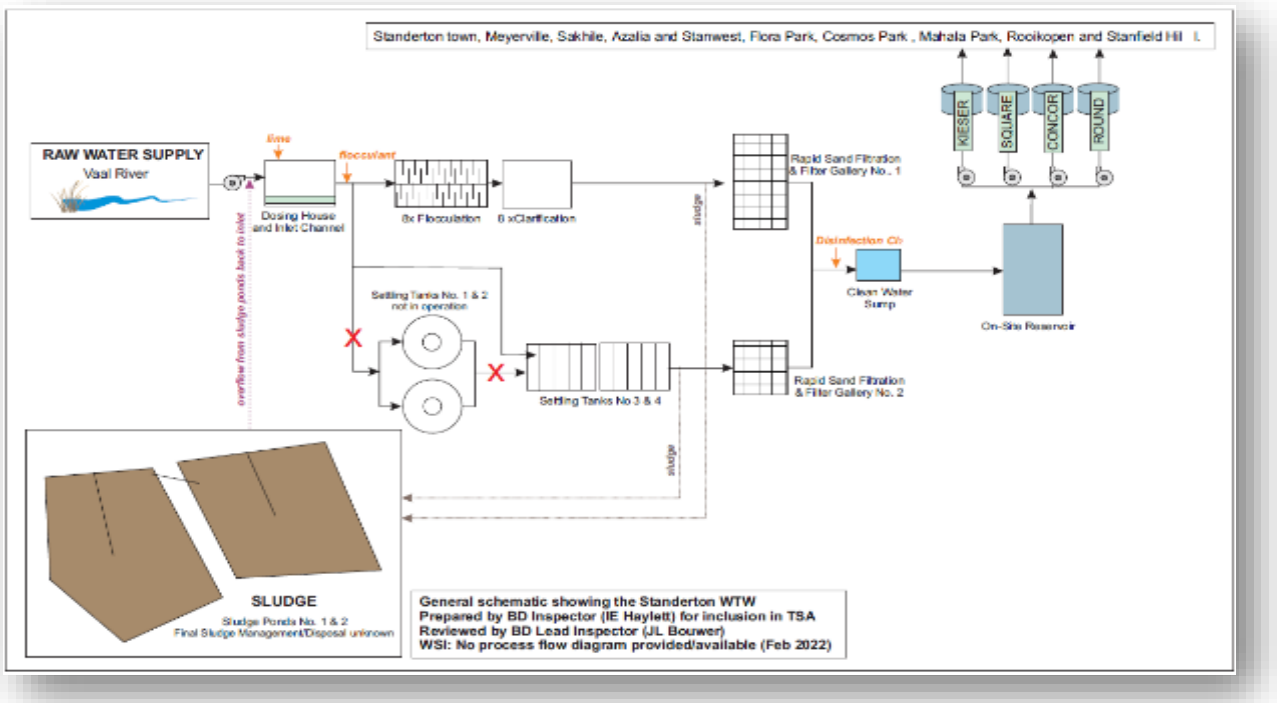
Standerton Water Treatment Works TSA Score: 45%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	27.8	The Standerton WTW has a capacity of 37 Ml/day, no maintenance and repairs logbook on site, no O&M manual on site, PFD n**ot** displayed, operational logbook with daily shift entries available, incident log sheets available but no contact list displayed, NTU, EC and pH meters on site but not in working condition, the WSI needs to address the daily operational requirements urgently, Jar tests equipment available and frequency of testing depends on raw water quality, Electricity consumption meter is not accessible and no schedule of metering is kept, energy use must be recorded in plant logbooks and used for plant optimisation.
2	**Physical appearance of plant**	25.0	Gravel access road needs, site is gated and fenced, gate was open and no adequate access control, fence can be breached, security available, entrance is not sign posted, housekeeping is very poor, the grass is not being cut and old and redundant equipment is scattered over the site and also at the reservoir areas, the WSI was instructed to address these issues, workers do not have a dedicated room for preparing lunches, wash facilities and ablution need upgrading, safety signs are visible at most relevant areas, the following OHS aspects were noted: walkways without railings, safety floating devices fastened on opposite side of tanks - and therefore of no effect, at the filter beds the placement of the railings are problematic, at the landing at top of the stairs the railing is not secure, various tripping hazards, chlorine building, handling a safety concern, PCs are not satisfied with the workplace condition, overall facilities are in a poor condition and are not maintained.
3	**Raw water handling**		
	Raw water pumpstation / gravity feed	41.7	Two pump stations with three vertical shaft pumps installed in one and two vertical shaft pumps in the other, pumping directly from the Vaal River, one of the pumps is under repair, two of the five pumps are on standby, standby not adequate, the vertical shaft pumps are installed very deep below ground level, screens could not be assessed, WSI indicated that during floods screens must repositioned.
	Raw water pipeline	66.7	PCs indicated that there are no concerns regarding the condition, inflow meter available and flow rate manually recorded on a daily basis.
	Inlet works	100.0	Two plants - Candy plant and conventional, even flow distribution, sufficient turbulence at contact point, visual dripping of flocculant at the hydraulic jump.
4	**Chemical dosing and storage**		
	Flocculant	20.8	One dosing pump in operation and one standby pump, facility requires urgent housekeeping, one doser removed. no standby, dosing area is not neat, and spillages are not contained, flocculant tanks are bunded, storage area is not bunded, no emergency shower is installed, the WSI is advised to address the overall lack of housekeeping as a matter of urgency.
	Lime	6.3	Two dry lime dosing units installed but none in working order, no lime dosing taking place, lime and activated carbon staked in a passage. Housekeeping here is also poor, storage space is adequate.
	Chlorine	65.0	Dosing units in operation, standby available for all dosing units, scales are not operational, switchover device in place, alarm, detector, extractor fan not in working order, emergency shower not in working order, masks available, very difficult to access the building and the key to the access door was not available, adequate supply, storage facility not adequate.
5	**Flocculation**	75.0	Good floc formation, no scum, growth of algae and scum on walls, civil works requires refurbishment, and the flocculation equipment needs upgrading.
6	**Phase Separation**		
	Clarification (settling)	91.7	No floc carry over, desludging takes place once a day, even overflow, some settlement in the Candy launders.
	Sand Filtration	66.7	Two backwash pumps and two air blowers installed, each serving 4 filters, all in working condition, no standby installed, even overflow at all the outlet boxes which indicates good flow distribution, even bubble distribution observed during backwash, daily backwashing, media in acceptable condition, again housekeeping is lacking, and the filter building is in a very poor condition and needs a total refurbishment.
7	**Disinfection**		
	Clear water well	100.0	Contact time exceeds 30 minutes, free chlorine is measured at the discharge point of the on-site reservoir
8	**High Lift Pump Station**	68.8	Four high-lift pump stations. Kieser pump station with 2 pumps installed, 1 operational, Square pump station with 3 pumps installed, 1 operational, Concor pump station with 3 pumps installed, 3 operational and Round pump station - 4 pumps installed, 3 operational, a total of 4 pumps not operational in 3 of the pump stations, flow meter in place and in working condition, flow recorded, pump stations are in a poor condition and requires urgent refurbishment.
9	**Sludge Treatment**		

Watch #	Process Unit Assessed	% TSA	Observations
	Thickening in Sludge Dams	18.8	Sludge is pumped to the sludge dam, there are two pump stations each with two pumps but none of the pumps are operational, sludge pond is overgrown with reeds, it then discharges into two large ponds from where recycled water gravitates back to the WTW, sludge dams have never been emptied.
10	**Bulk pipeline from plant to command reservoir**	50.0	The PC indicated that the pipeline is old and requires regular maintenance.
11	**Command reservoir**	25.0	Kieser reservoir visited, contractor has been appointed to construct the replacement of the reservoir due to structural problems and leaking, existing reservoir is fenced but not secure as the guard house is located at the back, the WSI was instructed to clean up the place from old rubbish, litter and discarded equipment, no telemetry in place.
12	**Booster Pump Station**	18.7	Two pumps installed and one in working condition, standby pump not in working condition, pump station is untidy and there is no housekeeping, security available but the pump station is not secure and not adequately fenced, broken windows have not been replaced and the access gate was not locked. Pump station is in a poor condition, MCC is in a very poor condition.
	Total	**45%**	

High risk areas OR Key Hardware Risks/ Defects

1. Raw water pump station safety measures
2. Dosing and standby equipment
3. MCCs and electrical installations
4. Pumping equipment
5. No emergency power supply
6. Sludge management
7. Filter building requires refurbishment.

VROOM Refurbishment Cost Estimate

Civil Works	R10,741,500	31%
Mechanical Works	R18,003,700	53%
Electrical Works (Incl C&I)	R5,390,000	16%
Total VROOM Cost	**R34,135,200**	**100%**
R million / MLD		**0.92**

Regulatory Impression

The Standerton water treatment plant is in a poor condition. The Water and Sanitation Manager seems overwhelmed, and it is our impression that there is not enough support from the other departments that are linked to the water treatment function of the WSI. During the audit a staff member responsible for asset management joined for a very short period and the financial person joined and even accompanied us to the site for a while which is commendable. It may well be that the relevant department now recognises the need for resources to be allocated to the business of water treatment, but only time will tell. The situation at the Standerton water treatment plant is a concern. Water quality is not monitored in accordance with SANS 241. The potable water is not microbiologically compliant and poses a very serious acute health risk to the community. There is no Water Safety Plan. The WSI is encouraged to immediately address water safety planning, not only for the Standerton WTW but also for the other WTW in its area of jurisdiction, the Morgenzon WTW. Annual process and network inspections must be performed by a professionally qualified person(s) and the findings must be used to update the risk assessment in the Water Safety Plan on a continuous basis. The monitoring programme needs to be updated with the correct determinands and sampling points. The WSI does not have a copy of the water use license and license conditions. In addition, the WSI is reminded to budget for assessments that must be conducted on an annual basis to ensure the delivery of adequate and safe water. The current situation must be improved, and it must start immediately with housekeeping and maintenance.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	54.03%
Chemical Compliance	71.50%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



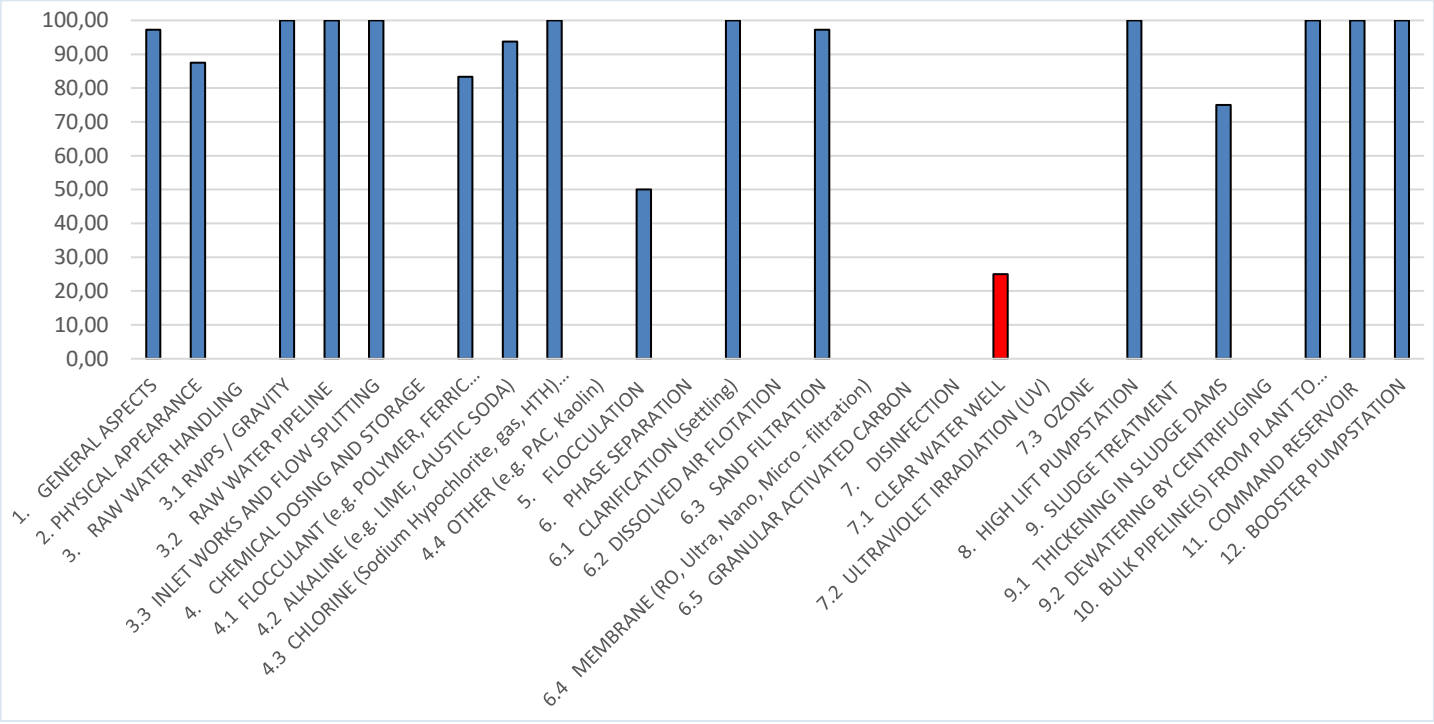

10.9 Mbombela Local Municipality

The Nelspruit New water treatment works was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

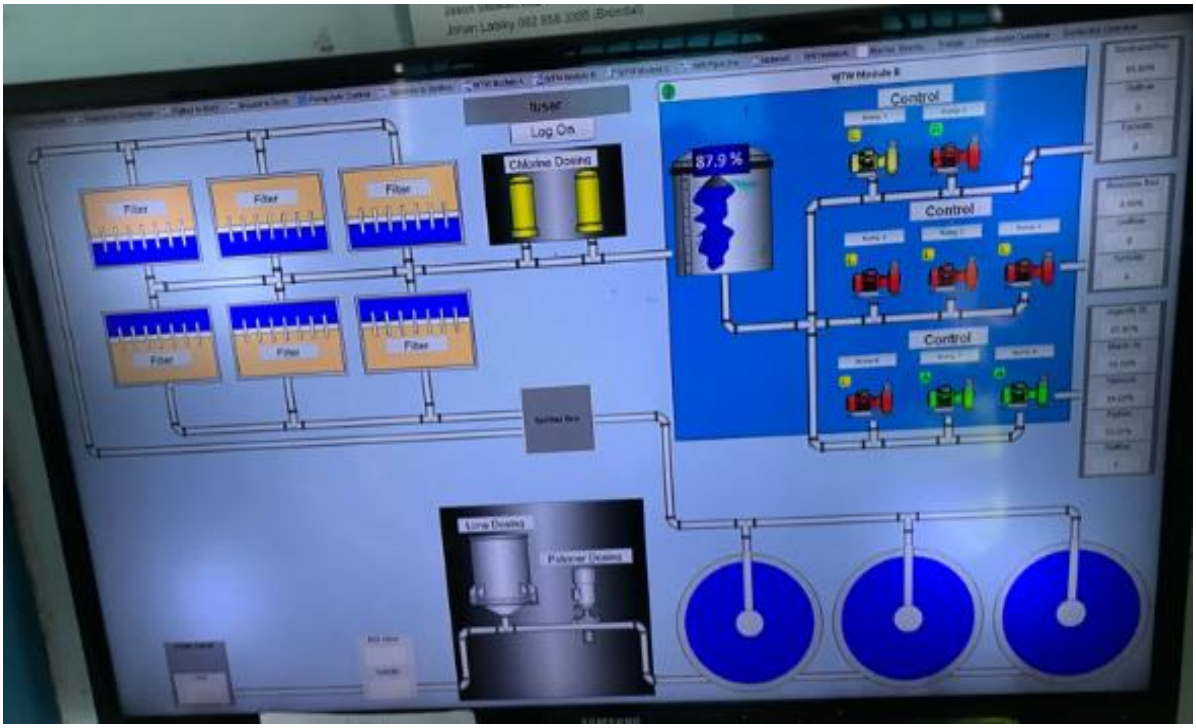
Nelspruit New TSA Score: 92%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram (No PFD – only schematics on SCADA system)



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	97.2	Class B WTW. All necessary documents on site and used as required. A PFD in not displayed on the wall. Process monitoring equipment is functional and calibrated with buffers and standards available. Jar tester available and used based on turbidity of raw water.
2	**Physical appearance of plant**	87.5	The WTW is fenced with access control and security patrols 24/7. The roads within the terrain are paved and still in a good condition. However, the grass should be removed. Access roads gravel with rain damage. The facilities are clean but insufficient and in need of maintenance. The terrain is neat although the grass is long. The grass was cut during the site visit. Signs are posted. The visiting team also received a safety introduction after arrival.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	100.0	Screens clean and in a good condition. Main inflow is gravity fed, only Module C is fed by pumping. Both pumps in a working condition, with sufficient standby available.
	Raw water pipeline	100.0	The pipe is in a good condition. The flow meter is in place, working and calibrated. The flow is recorded daily and used in process control.
	Inlet works	100.0	The flow is controlled. Mixing with lime and flocculant in sufficient turbulent conditions. Chemical feed and dosing conditions at the inlet works can be monitored.
4	**Chemical dosing and storage**		
	Flocculant	83.3	A total of six pumps installed and working. Three pumps in use, three on standby. Dosing area neat and cleaned once a week. Storage area is bunded with sufficient storage volume for 4 months. No emergency wash area nearby, but in future plans.
	Alkaline	93.8	Three feeders with only 1 in use. General housekeeping was good, bags dry and of the floor used on first in first out. There was a sign of water leakage where the bags were stored. Storage of lime sufficient for 1 month.
	Chlorine	100.0	All dosing pumps in a working condition with 100% standby. Cylinders on scales – working. Safety equipment available. All measures in place. Chlorine gas with stuffiest storage for more than a month.
5	**Flocculation**	50.0	Flocs not clearly visible. Some scum formation in unit 3. Pre-chlorination during algal blooms.
6	**Phase Separation**		
	Clarification (settling)	100.0	Limited floc carry-over. Desludging takes place every 2 hours. The weirs are in a good condition.
	Sand filtration	97.2	One of the filters has an air leakage that should be attended to. Backwash every filter within a 24-hour cycle. Even bubble distribution seen. Filter media in a good condition. Filters clean, handrails in place.
7	**Disinfection**		

Watch #	Process Unit Assessed	% TSA	Observations
	Clear water well	25.0	The chlorine is dosed at the outlet of the WTW - no information available on the contact time. Free chlorine monitoring done at the taps just after chlorination and not after CT of 30 minutes.
8	**High lift pumpstation**	100.0	Three pumpstations for each of the treatment trains. Pumps in a working condition with sufficient standby available. Each of the three modules has its own flow meter and is working. The volumes are recorded and used.
9	**Sludge treatment**		
	Thickening in sludge dams	75.0	The dams need maintenance but is due soon as the purchase order has already been received. Dams are emptied every six months.
10	**Bulk pipeline from plant to command reservoir**	100.0	Pipe network to reservoirs in a good condition with routine maintenance in place. Valve chambers inspected regularly.
11	**Command reservoir**	100.0	All reservoirs fenced with security measures in place. Telemetry operational for all reservoir levels - available on SCADA in control room. All main reservoirs have flow meters and working.
12	**Booster pumpstation**	100.0	Buildings of all booster pumpstations secure. All pumps in a working condition with a 1 in use / 1 on standby norm.
	Total	**91.9%**	

High risk areas OR Key Hardware Risks/ Defects

1. Install emergency wash area at chemical dosing unit.
2. Correct air leakage at one of the filters.
3. Update workers' facilities - replace tiles, lockers, etc.
4. Maintain terrain more frequently - grass cutting, cleaning of pavement roads, etc.
5. Sludge dam maintenance.

VROOM Refurbishment Cost Estimate

Civil Works	R559,900	22%
Mechanical Works	R2,004,200	78%
Electrical Works (Incl C&I)	R0	0%
Total VROOM Cost	**R2,564,100**	**100%**
R million / MLD		**0.04**

Regulatory Impression

The Nelspruit New WTW in managed by Silulumanzi. On arrival the Plant Manager gave the team a safety induction. The WTW is in an excellent condition with process control based on actual flow and water quality conditions. The dosing area for both lime and Ultra floc is cleaned once a week. The safe handling of chlorine is a priority at the plant. The chlorine contact time in the clear water well should be determined to ensure sufficient disinfection prior to distributing the water into the reticulation system.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	99.30%

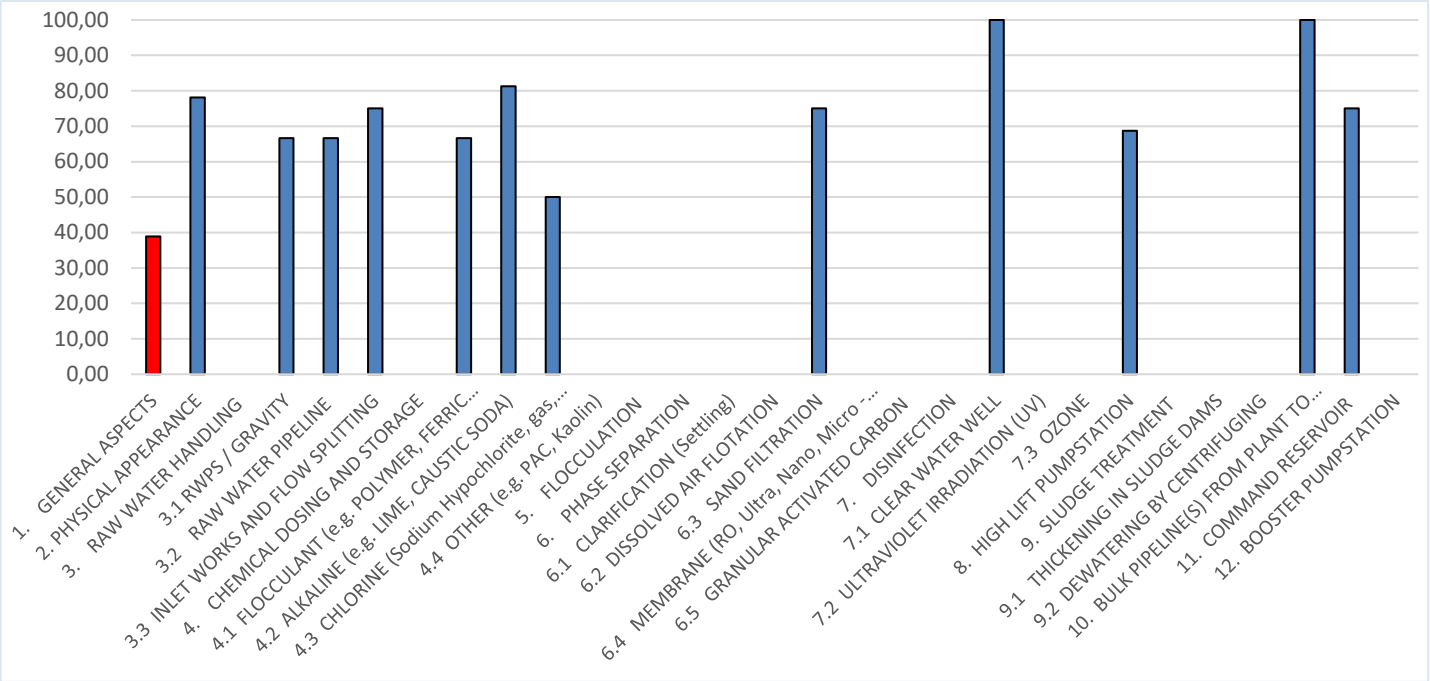
Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

The White River Country Estate water treatment works was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

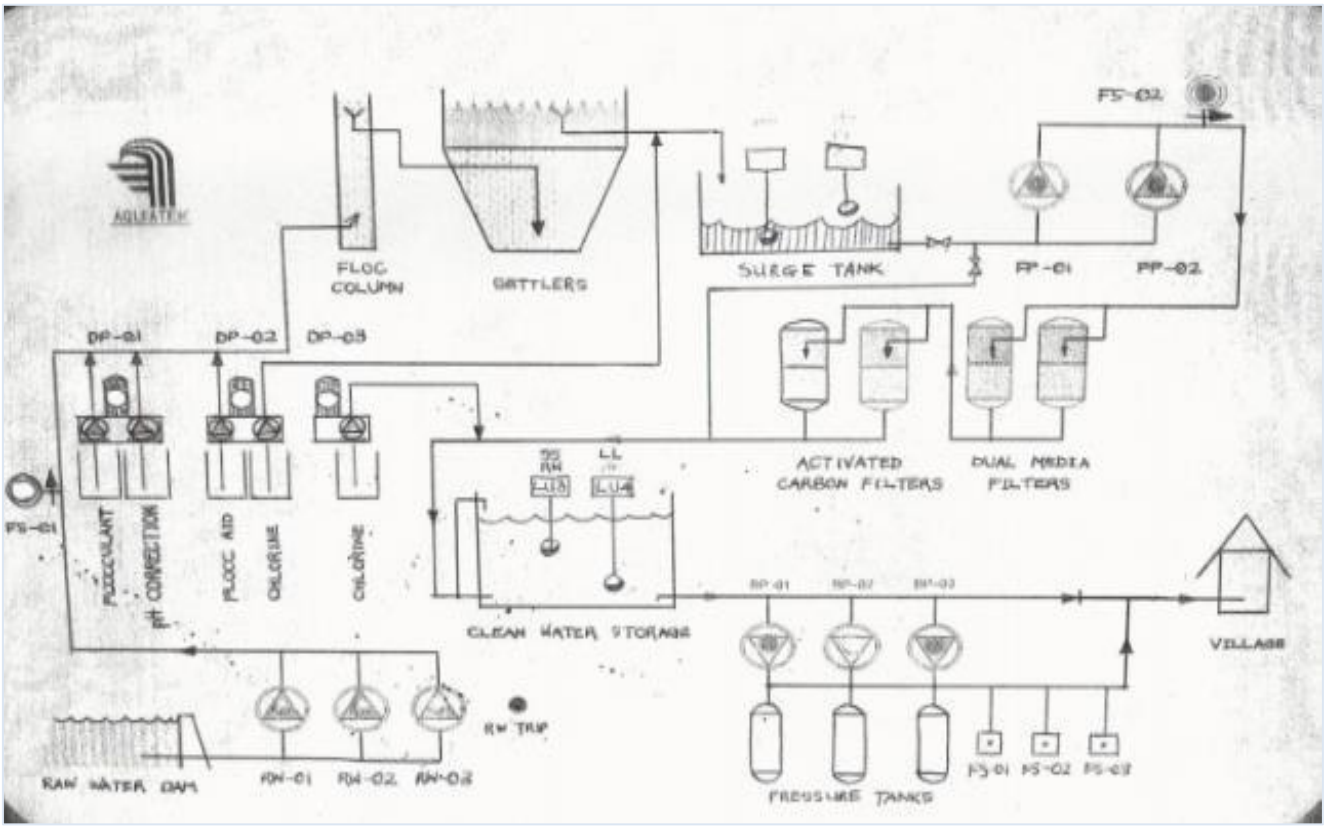
White River Country Estate TSA Score: 66%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	38.9	Class C WTW. Operational logbook available with recent entries. IMP available and displayed. Only pH and Chlorine done, Turbidity meter faulty. Jar test equipment not available on the plant. No maintenance logbook available.
2	**Physical appearance of plant**	78.1	Facility fenced with locked gate. Paved road in need of repairs. The terrain is not well maintained, the worker's facilities is tidy and clean. Relevant safety signs were posted in some parts of the plant.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	66.7	The intake pumps are at the river. Screens were in-place and not cleaned regularly by the maintenance team. Three raw water pumps, but one not functional. One pump in used and one on standby.
	Raw water pipeline	66.7	The raw water pipeline in need of repairs. Meter is available and read daily, with the flow rate summarised monthly. No proof that the meters are calibrated/ verified.
	Inlet works	75.0	No flow splitting at the inlet works. Mixers are in a working condition. Chemical feed cannot be monitored at a glance, the dosing pipe ends under the water surface.
4	**Chemical dosing and storage**		
	Flocculant	66.7	Dosing pumps working with sufficient standby capacity. Spills cannot be contained. The storage area in not bunded. An emergency shower is nearby.
	Alkaline	81.5	Two pumps available, 1 in use, one on standby. Housekeeping poor – Lime bags on the floor, caustic soda on pallets.
	Chlorine	50.0	Only 1 pump available and in a working condition. No masks or gloves apparent, only the first aid box in the facilities. Storage volume sufficient for more than a month.
5	**Flocculation**	na	
6	**Phase Separation**		
	Sand filtration	75.0	Two backwash pumps in working condition, one in use, one on standby. Only one compressor in a working condition, no standby available. Filters are backwashed once in a 12-hour shift. The filter media was replaced in 2021.
7	**Disinfection**		
	Clear water well	100.0	No clearwater well - water pumped directly in two reservoirs on site. Contact time in the reservoirs > 30 minutes. HTH is added just before the water goes into the reservoirs. Tap sample taken and analysed on site.
8	**High lift pumpstation**	67.8	Two booster pumps available one for each reservoir on site, but with no standby available. Final flow volumes are measured at the outlet of the reservoirs. Recorded daily and summarized monthly.
9	**Sludge treatment**		
	Thickening in sludge dams	0.0	No sludge dams, only a septic tank that has never been cleaned. Supernatant is not recycled.
10	**Bulk pipeline from plant to command reservoir**	100.0	No leaks reported, the valve chamber is open and in a good condition.
11	**Command reservoir**	75.0	Two reservoirs secured within the fenced WTW property. No telemetry. Final flow from the reservoirs recorded.
	Total	**65.7%**	

High risk areas OR Key Hardware Risks/ Defects

1. All monitoring equipment should be services/ calibrated, with sufficient reagent available to monitor the treatment process.
2. Raw water pump to be repaired and screens should be in place and regularly cleaned.
3. Spillages in the dosing area - dosing to be optimised and are cleaned regularly.
4. The chemicals storeroom untidy and storage of chemicals not optimal.

VROOM Refurbishment Cost Estimate

Civil Works	R277,200	52%
Mechanical Works	R256,300	48%
Electrical Works (Incl C&I)	R2,200	0%
Total VROOM Cost	**R535,700**	**100%**
R million / MLD		**0.54**

Regulatory Impression

This 1 Ml/d package plant treats water distributed to the White River Country Estate. Operational monitoring is done, however, there is no evidence that the laboratory equipment and meters are calibrated. The turbidity meter is faulty, posing a risk on contravening SANS standards, as the effectiveness of the filters cannot be monitored. The terrain is not well maintained, and storage of dry chemicals is not optimal. There is a generator on site, but not used during power failures. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	NI
Chemical Compliance	NI

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



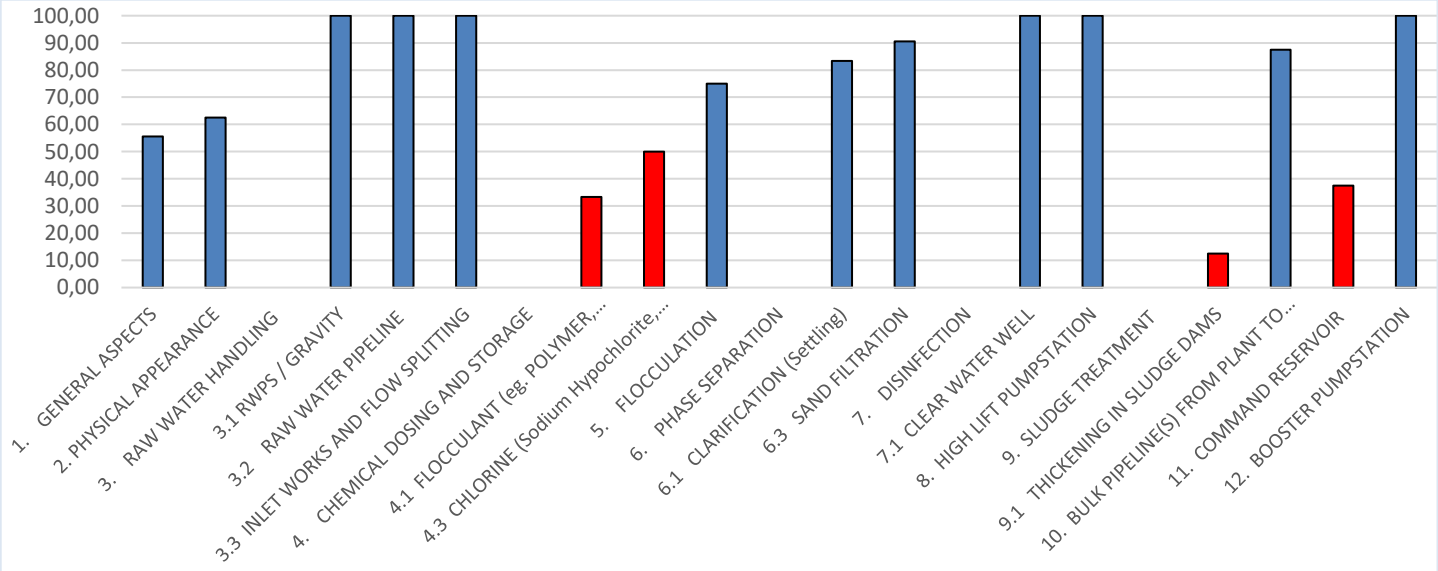

10.10 Mkhondo Local Municipality

The New Mkhondo (Piet Retief) water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

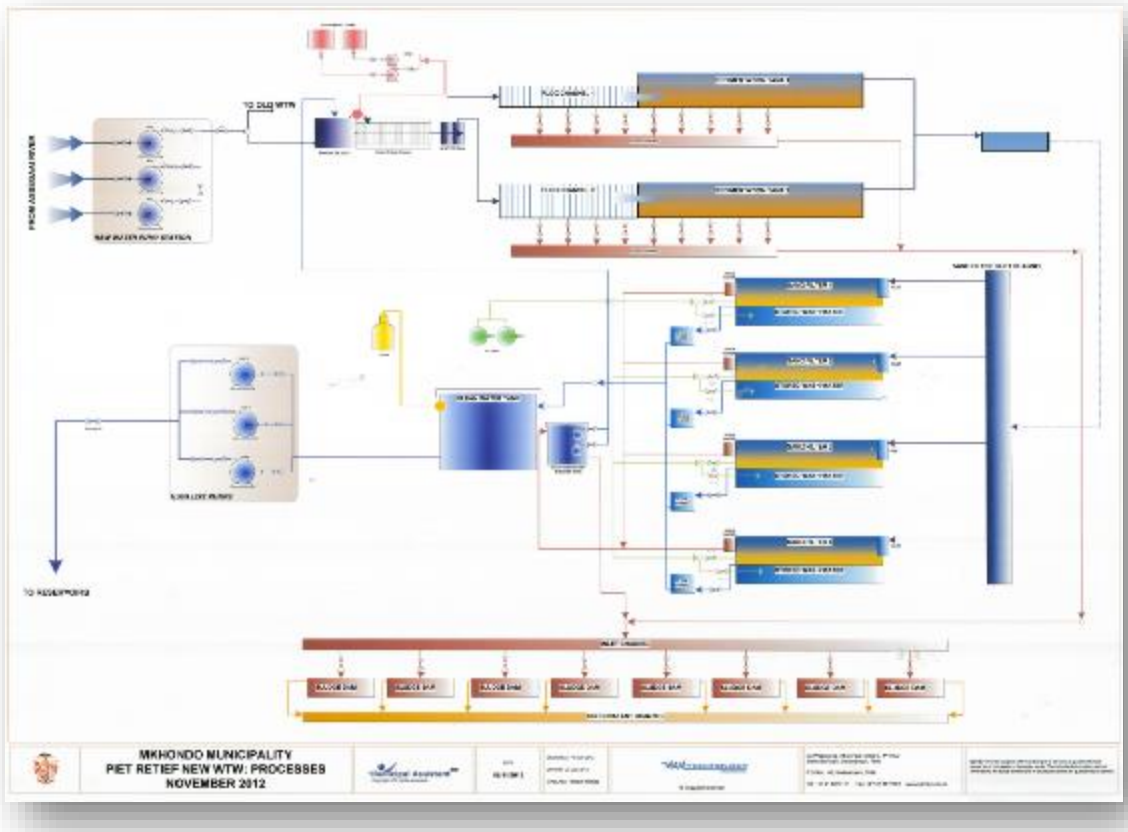
New Mkhondo Piet Retief Water Treatment Works TSA Score: 70%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	55.6	Maintenance and repair logs are adequate but need to be kept on site, operational logbooks and daily shift entries clearly indicated, no O&M manual available, no incident management procedures available or emergency contact list displayed, PFD displayed, NTU, EC and pH meters on site in working condition and calibrated, no Jar test equipment on site, energy consumption must be recorded in plant logbooks and used for plant optimisation.
2	**Physical appearance of plant**	62.5	Gravel access road is in a poor condition and has steep inclines, entrance is not signposted, gated entrance and fencing in good condition, security available, vegetation control need to be improved, safety problems as there are steep slopes, workers room for lunching is not furnished, wash facilities and ablution are in good order, sufficient safety signs, OHS aspects include tripping hazards, insufficient chlorine handling safety measures, *e.g.* no emergency shower, maintenance of the buildings and structures is generally lacking.
3	**Raw water handling**		
	Raw water pumpstation / gravity feed	100.0	Screens could not be assessed but it is reported to be in place and cleaned on a regular basis, three pumps are installed - all are in working condition.
	Raw water pipeline	100.0	The 400 m pipeline is reported to be in a good condition, flow meter operational and flow recorded.
	Inlet works	100.0	Even flow splitting at the distribution structure, sufficient turbulence at the contact point, visual dripping of flocculant at the hydraulic jump.
4	**Chemical dosing and storage**		
	Flocculant	33.3	Two dosing pumps are installed, one in working condition, standby pump is not operational, are neat and clean but spillages cannot be contained, adequate storage, storage area is not bunded, no emergency wash area in close proximity
	Chlorine	50.0	One rotameter in operation, no standby, one chlorinator installed, only one cylinder connected and waiting for supply at the time of the audit, automatic switchover equipment installed but not used, no scales, no emergency shower installed, fan is working, masks in safety box.
5	**Flocculation**	75.0	Good floc formation, scum accumulation, civil condition of channels a concern and remedial work required.
6	**Phase Separation**		
	Clarification (settling)	83.3	No carry over of flocs, desludging automatically on a routine basis, weirs in a good condition with even overflow.
	Sand Filtration	90.6	Two backwash pumps installed and in working condition, one gasket on a pipe joint on the rising main noted to leak considerably, air blowers in working condition, inlet to each filter controlled a Rotork valve, even flow to each filter, even bubble distribution, backwashing is done manually, media is in a good condition, filter gallery requires remedial work, one serious leak through the filter wall must urgently be repaired.
7	**Disinfection**		
	Clear water well	100.0	Adequate contact time in on-site clear water sump, free chlorine measured at a sampling tap connected to the rising main.
8	**High Lift Pump Station**	100.0	Three pumps are installed, all in working condition. Flow meter operational and flows recorded.
9	**Sludge Treatment**		
	Thickening in Sludge Dams	12.5	Sludge pond is used but sludge drying beds are bypassed, pond has not been emptied in the past two years, two recycle pumps installed but not operational, one duty and one standby pump installed. Sludge management need to be addressed.
10	**Bulk pipeline from plant to command reservoir**	87.5	PC reported that pipeline is in a good condition, one valve chamber was inspected, and significant leak detected.
11	**Command reservoir**	37.5	The reservoir is gated, and the fence is in good condition, but area not secured, no telemetry, the structure is in a fair condition and closed at the top.
12	**Booster Pump Station**	100.0	Two pump stations, each pump station equipped with two pumps, one in operation and one standby, pump stations are secure and within the security fenced area of the reservoir, MCC's are in good condition.
	Total	**70%**	

High risk areas OR Key Hardware Risks/ Defects

1. Dosing pump and bunding of the dosing tanks
2. Filter gallery wall must be repaired.
3. Chlorine dosing equipment and supply of chlorine
4. Sludge management and treatment
5. Corrosion protection of pipes
6. Flocculation channels remedial work required in the future.

VROOM Refurbishment Cost Estimate

Civil Works	R880,000	66%
Mechanical Works	R278,300	21%
Electrical Works (Incl C&I)	R167,200	13%
Total VROOM Cost	**R1,325,500**	**100%**
R million / MLD		**0.22**

Regulatory Impression

The Blue Drop Audit was well attended by management, staff from various departments and PCs from the various WSS in Mkhondo LM, it was evident that the WSI also see the audit as an opportunity for training. The potable water from this system is however not microbiologically compliant and therefore poses an acute health risk to the community. A Water Safety Plan and a Water Conservation & Demand Management Plan were available for the audit period. Annual process and network inspections must be performed by a professionally qualified person(s) and the findings must be used to update the risk assessment in the Water Safety Plan on a continuous basis. The current team has the potential to continue to make improvements in addressing Blue Drop requirements.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	94.19%
Chemical Compliance	94.21%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



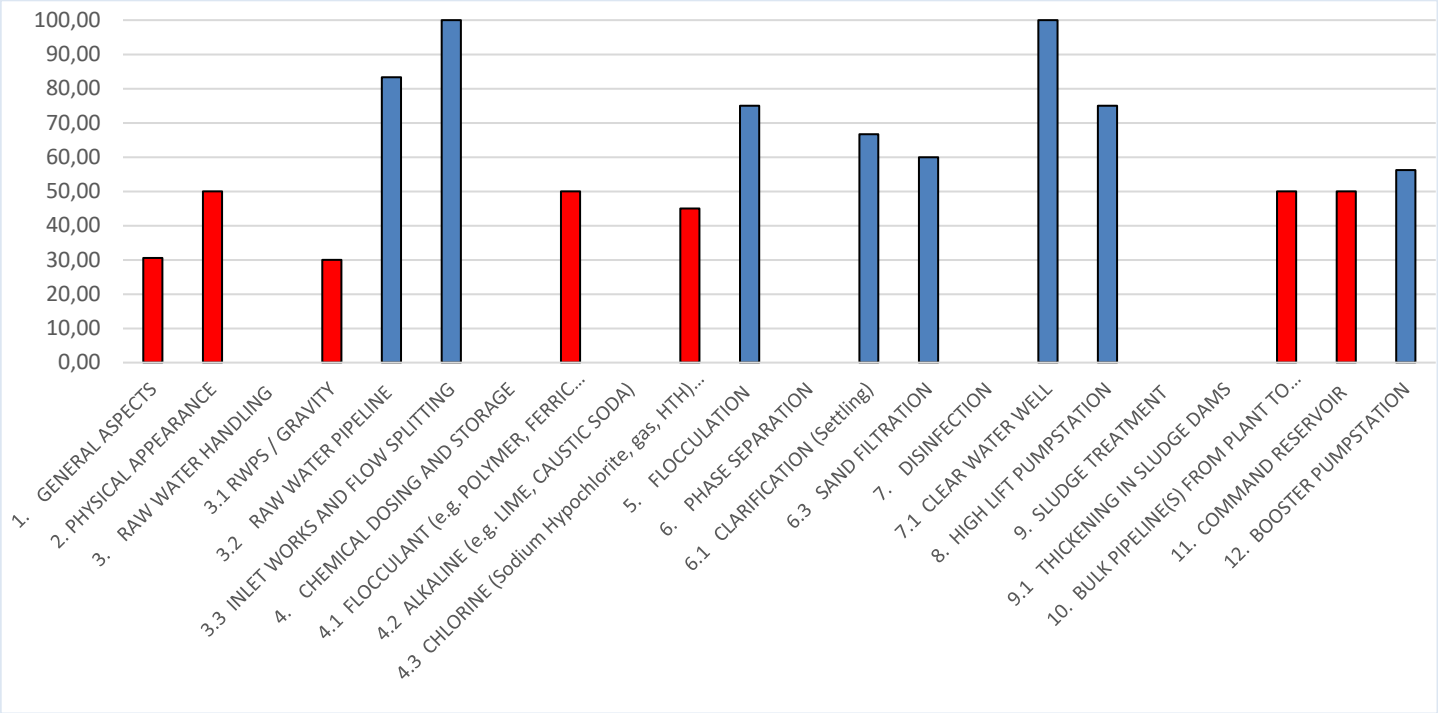

10.11 Msukaligwa Local Municipality

The Ermelo North water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

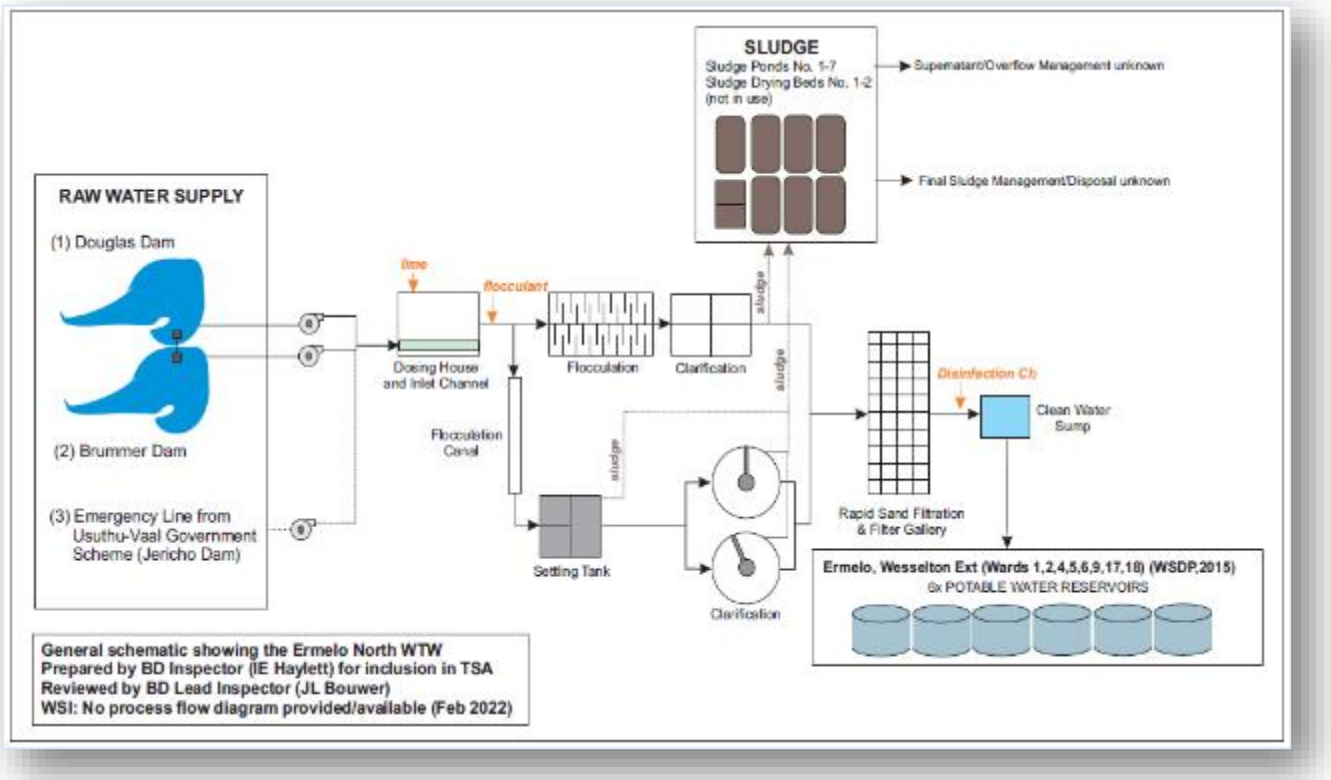
Ermelo North Treatment Works TSA Score: 51%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	30.6	No maintenance and repairs logbooks, O&M or incident registers on site but daily logbooks available, PFD not displayed, NTU, EC and pH meters all in working condition but has not been calibrated for some time,
2	**Physical appearance of plant**	50.0	Gravel access road is in a poor condition, gated entrance is marked with a no-entry sign only, security available, fence is not secure around the entire site, dedicated room for preparing lunches but facilities can be improved, wash facilities and ablutions must be improved, some OHS aspects include the need for appropriate signage, tripping hazards, electrical compliance and chlorine handling, alarm systems, ventilation and safety procedures need to be revised, PCs need the correct equipment and their specific requests need to be met by WSI supply chain management. During the first TSA various housekeeping and operational aspects that were lacking were discussed. On a second visit to Ermelo to look at the reservoir we were invited back to the site, less than a week after the first audit the site was now buzzling with activity and a cleaning team under the leadership of Mr Jabu Mkwanazi. This requires a special mention.
3	**Raw water handling**		
	Raw water pumpstation / gravity feed	30.0	Three pumps are installed, two in working condition, stand-by not operational, mechanical, and electrical equipment requires replacement and/or repairs.
	Raw water pipeline	83.3	PC noted leaking suction lines, steel rising mains not in a good condition, flow meter installed, and flow recordings done.
	Inlet works	100.0	Even flow splitting at the distribution structure, sufficient turbulence at the contact point, visual dripping of flocculant at the dosing point.
4	**Chemical dosing and storage**		
	Flocculant	50.0	Two dosing pumps installed and in working condition., adequate standby, the area is not neat and there no drainage system for spillages, sufficient flocculant storage, an emergency wash is required close to the dosing room.
	Lime	0.0	Two dry lime dosing units installed, none in operation, no standby, currently lime dosing comprises of a bottle with a lime mixture dripping into the inlet channel, very little stock, and storage not adequate, WSI advised to repair and commission lime dosing equipment.
	Chlorine	45.0	Two rotameters installed but only one operational, one regulator installed, only one 90 kg cylinders connected, no automatic switchover and no scale measurement, operational safety shower, fan not working, masks kept in the office, safety signs required, storage volume not adequate and poses a risk.
5	**Flocculation**	75.0	Two sets of flocculation channels, good floc formation, significant amount of accumulated sludge and scum noted on first TSA, Further inspection was done the following week, channels were cleaned, and housekeeping addressed, based on this practice the score was increased as incentive.
6	**Phase Separation**		
	Clarification (settling)	66.7	Two sets of settling tanks., the two circular tanks dysfunctional, no floc carry over, desludging of the units are done daily, desludging valves are leaking and difficult to repair, weirs in a good condition with even overflow.
	Sand Filtration	60.0	Maintenance and/or replacement of most of the mechanical equipment required, pump stations and blower rooms in a poor condition, filter buildings in a poor condition and requires urgent remedial work, even overflow at all the outlet boxes which indicates good flow distribution, even bubble distribution, media looks in good condition, WSI is advised to prioritise and provide budget in the next financial year for these aspects.
7	**Disinfection**		
	Clear water well	100	Contact time is more than 30 min, free chlorine measurement takes place at the discharge point of the clearwater sump.
8	**High Lift Pump Station**	75.0	Set of four pumps, three in working condition, electrical switchgear requires urgent maintenance, currently only one standby pump, mechanical and electrical equipment requires urgent attention, separate flow meters for each of the three lines, final flow meters in place and flow recorded.
9	**Sludge Treatment**		
	Thickening in Sludge Dams	0.0	Sludge ponds and sludge drying beds not utilised, no sludge management
10	**Bulk pipeline from plant to command reservoir**	50.0	Three rising mains, pipe breakages generally every 2 months, valve chambers at reservoir inspected and all flooded.
11	**Command reservoir**	50.0	Securely fenced with 24-hour security, no telemetry, structure is in a good condition and closed at the top.

Watch #	Process Unit Assessed	% TSA	Observations
12	**Booster Pump Station**	56.3	The pumpstation is within the fenced area of the reservoir, adequate signage, and ventilation, two pumps installed, one in working condition, no standby, MCC in good condition, emergency generator is not operational."
	Total	**51%**	

High risk areas OR Key Hardware Risks/ Defects

1. Raw water pump station to be upgraded.
2. Lime dosing equipment to be upgraded.
3. Chlorination equipment to be upgraded.
4. General maintenance and/or replacement of pumps
5. Urgent refurbishment of buildings required.

VROOM Refurbishment Cost Estimate

Civil Works	R4,130,500	32%
Mechanical Works	R7,142,300	55%
Electrical Works (Incl C&I)	R1,754,500	13%
Total VROOM Cost	**R13,027,300**	**100%**
R million / MLD		**0.93**

Regulatory Impression

The Blue Drop Audit and TSA was not attended by any senior or executive management from the WSI. Although the attending senior process controllers who attended the meeting are knowledgeable and willing to step up, it is our impression that the workload may well be excessive and the WSI is encouraged to alleviate some of the pressures by proper planning and putting maintenance schedules and systems in place that makes it easier to manage all. In addition, there must be adequate budget for the maintenance and operation of the WTW. Although the Water and Sanitation Manager apologised for not attending the meeting the WSI executive is further encouraged to fully participate in Blue Drop audits going forward and respond to request for information. In addition, the supply chain management is also encouraged to supply what is specifically requested from the PCs and supervisors. The WSI is encouraged to address this with their supply chain management and maybe invite them to the plants to provide insight into the day-to-day business of water treatment. The Ermelo North water treatment plant is operational, but the plant performance and the condition must be improved. The WSI should see the high risks areas listed above and the refurbishment of the buildings as urgent. Water quality is not monitored in accordance with SANS 241. The potable water is not microbiologically compliant and poses a serious acute health risk to the community. A Water Safety Plan is urgently required in line with acceptable guidelines and the WSI is encouraged to immediately address water safety planning, not only for the Ermelo North WTW but for all water supply systems in the LM. Annual process and network inspections must be performed by a professionally qualified person(s) and the findings must be used to update the risk assessment in the Water Safety Plan on a continuous basis. The monitoring programme needs to be updated with the correct determinands and sampling points. The WSI does not have a copy of the water use license and license conditions.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	66.15%
Chemical Compliance	87.12%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



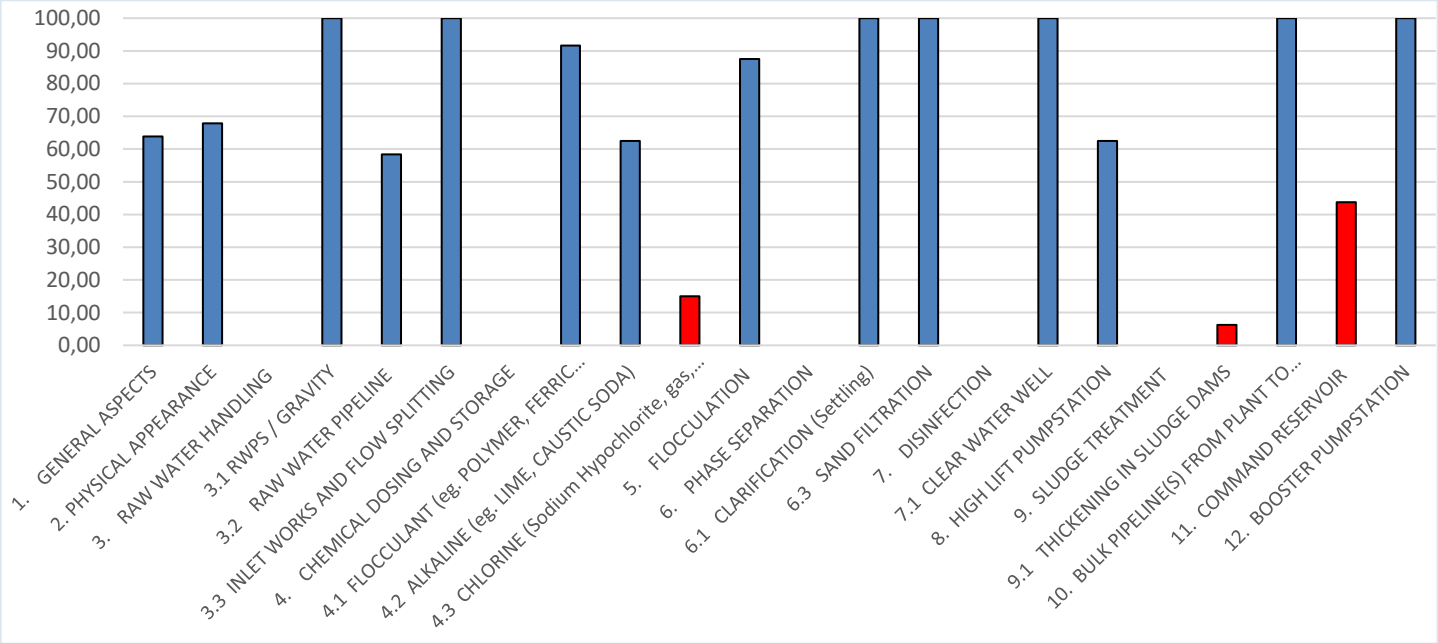

10.12 Nkomazi Local Municipality

The Driekoppies water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

Driekoppies Water Treatment Works TSA Score: 71%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram

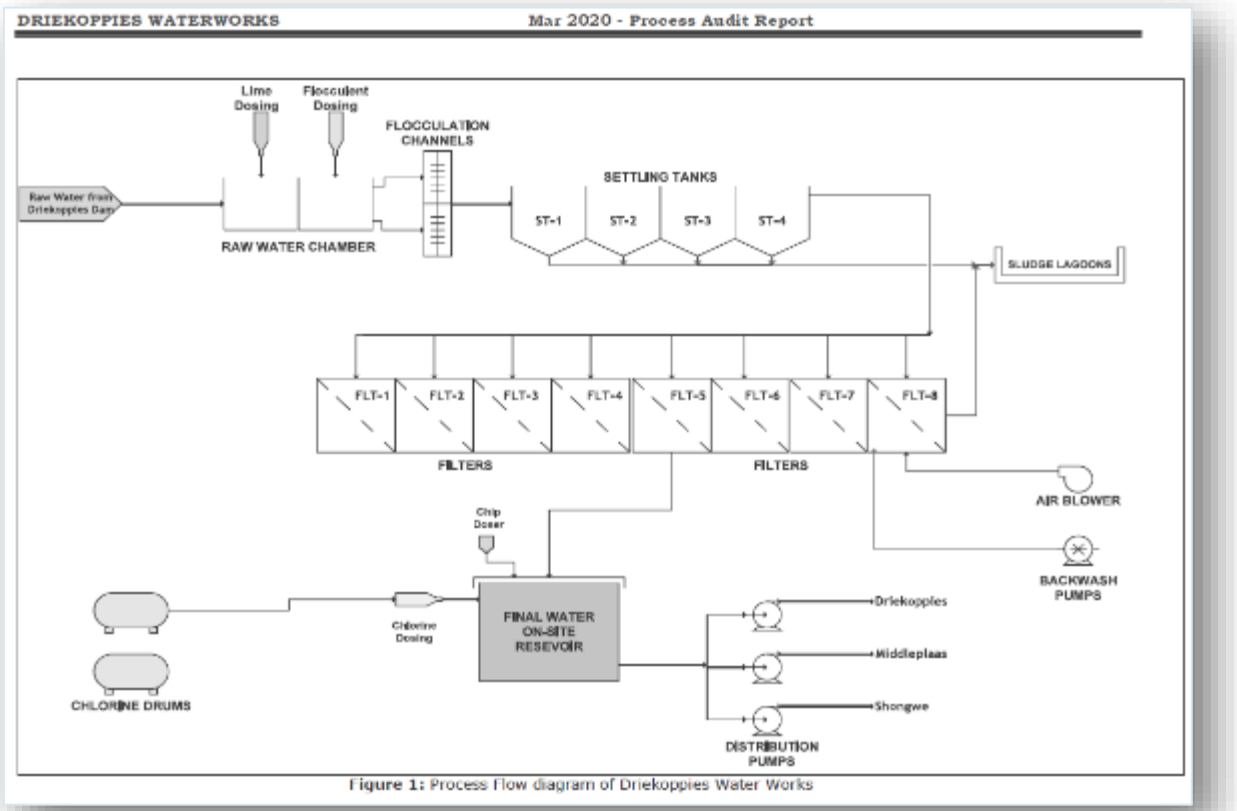


Figure 1: Process flow diagram of Driekoppies Water Works

Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	63.9	Logbook on site with daily shift entries, separate O&M manuals for electrical and mechanical dated 2003 available but the WSI is encouraged to update these documents and ensure an operating O&M is also available, the PFD is not displayed, incident register is kept up to date, process monitoring equipment is functional, but not calibrated, energy use must be recorded in plant logbooks and used for plant optimisation.
2	**Physical appearance of plant**	67.9	The gravel access road to the site is not in a good condition, site is fenced with security and gate control, entrance is not clearly marked but as the WTW is being upgraded new signage will be provided, ablutions are in good condition, kitchen available but no lounging facilities, safety signs are displayed but needs to be revised where needed and re-attached securely.
3	**Raw water handling**		
	Raw water pumpstation / gravity feed	100.0	Raw water is gravity fed from the Driekoppies Dam to the WTW, screens could not be assessed but the incoming raw water is of a very good quality without debris
	Raw water pipeline	58.3	The PC reported that the 500 m pipeline is in good condition, flow meter is not operational but will be replaced during upgrading.
	Inlet works	100.0	Even flow splitting at the distribution structure, sufficient turbulence at the contact point, visual dripping of flocculant at the hydraulic jump.
4	**Chemical dosing and storage**		
	Flocculant	91.7	Two banks with three dosing pumps each installed, one pump per bank on standby, all pumps in working condition, dosing area is neat and sloped towards a drainage point for spillages, storage area bunded, wash-station is not operational.
	Lime	62.5	Only one dosing pump, no standby available, not being operated at the time of the audit as the raw water is of high quality.
	Chlorine	15.0	Operational system but standby pump disconnected and not operational, automatic switchover and scales not operational, safety equipment not operational, one cylinder in stock, not adequate for 30 days.
5	**Flocculation**	87.5	Little floc formation due to the high quality of the raw water, concrete walls are corroded, little scum observed, no sludge settling.
6	**Phase Separation**		
	Clarification (settling)	100.0	No floc carry over, desludging are done daily, weirs in good condition with even overflow, leaking sludge valves to be serviced.
	Sand Filtration	100.0	Two backwash pumps installed and in working condition, one duty and one standby, both air blowers are in working condition, filter media and filter gallery in good condition.
7	**Disinfection**		
	Clear water well	100.0	Chlorine contact time exceeds 30 min, free chlorine is measured at the outlet of the clear water reservoir
8	**High Lift Pump Station**	62.5	Three sets of high-lift pumps pumping to different reservoirs installed at a distance of 5 km, standby pumps all in working order, final flow meter was not in operation and will be replaced during the upgrading.
9	**Sludge Treatment**		
	Thickening in Sludge Dams	6.3	Two ponds not accessible due to overgrowth and has never been desludged
10	**Bulk pipeline from plant to command reservoir**	100.0	PC indicated that the pipeline is in a good condition, one valve chamber was inspected and found to be in secure and safe condition.
11	**Command reservoir**	43.8	The 2 Ml reservoir is fenced and gated and has security on a full-time basis, no telemetry
12	**Booster Pump Station**	100.0	One pump in operation and one on standby, pump station is within the fenced area with 24-hour security, MCC in good condition.
	Total	**71%**	

High risk areas OR Key Hardware Risks/ Defects

1. Chlorine dosing equipment to be upgraded.
2. Lime dosing equipment to be improved.
3. Flow metering must be improved.
4. Corrosion of the flocculation channel walls to be addressed.
5. Sludge treatment ponds to be cleaned and equipment refurbished.

VROOM Refurbishment Cost Estimate

Civil Works	R2,877,600	59%
Mechanical Works	R1,556,500	32%
Electrical Works (Incl C&I)	R431,200	9%
Total VROOM Cost	**R4,865,300**	**100%**
R million / MLD		**0.22**

Regulatory Impression

The Driekoppies water treatment plant has an operational capacity of 22 Ml per day and is being upgraded. The Driekoppies WTW is part of the Driekoppies-Schoemansdal- Buffelspruit- Shongwe WSS. The potable water from this system is however not microbiologically compliant and therefore poses an acute health risk to the community. A Water Safety Plan was last done for the 2020 and it is recommended that the WSI update the document especially also in light of the upgrading and also in line with the current guidelines. Annual process and network inspections must be performed by a professionally qualified person(s) and the findings must be used to update the risk assessment in the Waster Safety Plan on a continuous basis. The WSI has good supporting documentation, protocols and registers in place and the overall impression is that the current team is capable to deal with all aspects of potable water treatment.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	91.67%
Chemical Compliance	86.23%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



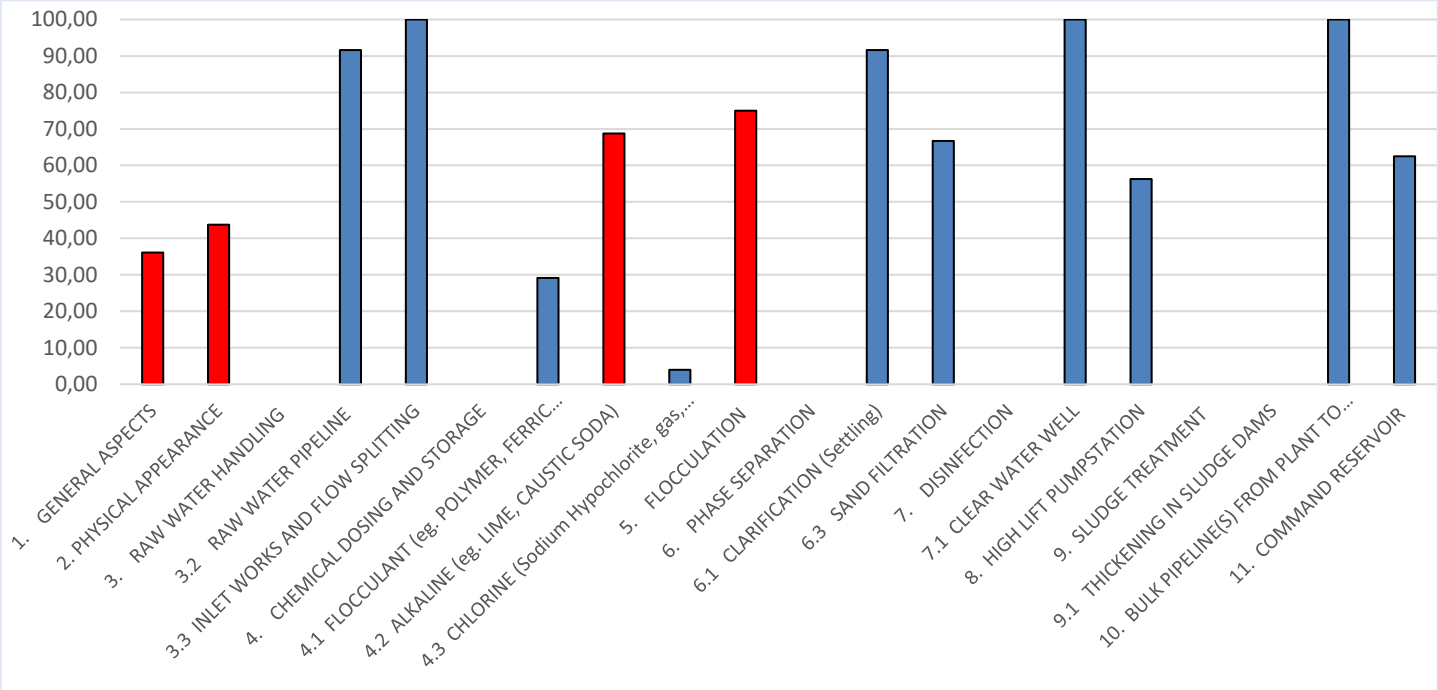

10.13 Pixley ka Seme Local Municipality

The Volksrust water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

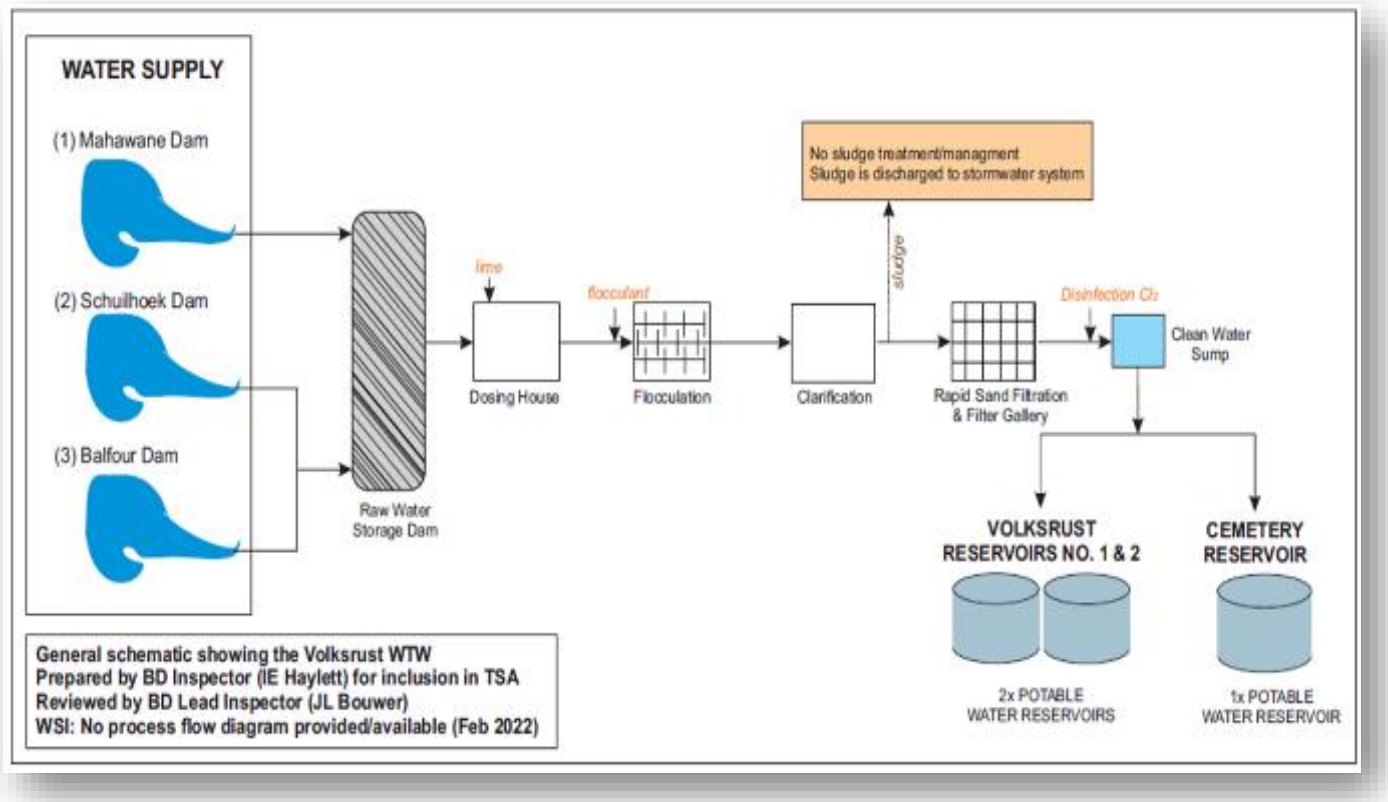
Volksrust Water Treatment Works TSA Score: 55%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	36.1	Maintenance and repair logbook was shown at the audit but not present on-site, operational with daily shift entries available, no O&M manual available, incident protocol and emergency contact list must be available on-site, no PFD displayed, process monitoring equipment is functional but not calibrated, Jar test equipment on site and tests performed regularly, electricity consumption meter is not accessible and no schedule of metering is kept, energy use must be recorded in plant logbooks and used for plant optimisation.
2	**Physical appearance of plant**	43.8	Site is easily accessible and within the town of Volksrust, entrance is clearly marked with adequate signage, locked gated entrance and fence in fair condition, no other security available, site is unkept and the grass is not cut, buildings and structures need urgent upgrading and remedial work, numerous broken windows, no dedicated room for preparing lunches, ablution available, no wash facilities other than a hand wash basin. PC has a very good attitude despite the working conditions but not satisfied with the facilities provided for washing and also expressed concern wrt the lack of maintenance and the current status of the site, the site is very unsafe and the following OHS aspects need to be addressed urgently: (1)extremely unsafe railings or no railings in places, (2)severe electrical non-compliance, (3)very unsafe chlorine safety and handling and facilities, only one fire extinguisher present and has expired, review of safety signage required.
3	**Raw water handling**		
	Raw water pipeline	91.7	Gravity fed from Schuilhoek and Balfour Dams, emergency supply from the Mahawane Dam. PC report that there are no leaks or problems, flow meter operational, flow meter box not safeguarded, flow recordings done daily.
	Inlet works	100.0	Even flow splitting at the distribution structure, sufficient turbulence at the contact point, lime dosing can be observed and visual dripping of flocculant at the hydraulic jump.
4	**Chemical dosing and storage**		
	Flocculant	29.2	Only one dosing pump installed, no standby, area is fairly clean, but spillages cannot be contained, adequate storage facilities but not adequate supply, storage area is not bunded, emergency wash is situated within the chlorine dosing room, which is totally unacceptable.
	Lime	68.8	One dry lime dosing unit installed and in working condition, no standby units.
	Chlorine	4.0	Only one chlorinator, no automatic switch over, no scale, no alarm, fan in working order, no masks, safety shower in wet area next to unbraced connected cylinder, emergency shower in the same area, water on the floor (hazard), poor installation.
5	**Flocculation**	75.0	Good floc formation, access along the flocculation channel is a safety hazard, no sludge settling observed, scum on surface of inlet channel to the sedimentation tanks, scum removed with a scoop and deposited adjacent to the channels, structural repairs required.
6	**Phase Separation**		
	Clarification (settling)	91.7	No floc carry over, access for operation is problematic, desludging done per shift, even flow observed.
	Sand Filtration	66.7	Two backwash pumps are installed one is in working condition, standby pump not operational, two air blowers, both in working condition, an even inflow observed, very uneven bubble distribution during backwash - definite problems with the nozzles, backwashing when required, at least every 24 hours. media in a fair condition, safety handrails not adequate, many unprotected openings, pipework and valves in the filter gallery are severely corroded.
7	**Disinfection**		
	Clear water well	100.0	Contact time more than 30 min, chlorine is dosed in the contact chamber below the plant.
8	**High Lift Pump Station**	56.3	Three pumps are installed, only 1 in working order, no standby in operation, installation of MCC incomplete, housekeeping of pump station poor and electrical compliance is a serious safety concern, flow meter operational, flow recorded, interpreted length of rising main measured to the Cemetery reservoir, distance 1,6 km.
9	**Sludge Treatment**		
	Thickening in Sludge Dams	0.0	No sludge dams, sludge is discharged into the stormwater system, and this needs to be addressed by the WSI as a matter of priority.
10	**Bulk pipeline from plant to command reservoir**	100.0	Two reservoirs fed by gravity and one by a rising main, no problems with the lines reported, one valve chamber was inspected and found to be in secure and safe condition.
11	**Command reservoir**	62.5	Reservoir area is fenced and gated, gate not locked and there is no security, housekeeping lacking, no telemetry, flow is metered at the WTW, two reservoirs, one

Watch #	Process Unit Assessed	% TSA	Observations
			very old, no leaks observed, reservoirs basically empty due to loadshedding, sediment visible on the floor and the WSI is encouraged to clean reservoirs.
	Total	**55%**	

High risk areas OR Key Hardware Risks/ Defects

1. Chlorine dosing equipment installation
2. MCCs and electrical installations need urgent attention.
3. No emergency power supply
4. Unprotected openings on walkways
5. Narrow walkways with handrailing protection only on one side
6. Standby pumps and equipment need replacement and/or repair.
7. No sludge treatment facilities, sludge is discharged to stormwater system.

VROOM Refurbishment Cost Estimate

Civil Works	R2,607,000	58%
Mechanical Works	R1,155,000	26%
Electrical Works (Incl C&I)	R757,900	17%
Total VROOM Cost	**R4,519,900**	**100%**
R million / MLD		**1.13**

Regulatory Impression

The Volksrust water treatment plant is in a poor condition with an obvious lack of housekeeping. There are very serious OHS violations which should be addressed by the WSI as a matter of urgency. Water quality is not monitored in accordance with SANS 241. The potable water is not microbiologically compliant and poses a very serious acute health risk to the community. There is a Water Safety Plan but is requires an urgent review and update as it contains contradictory information, is problematic to use and not in line with the accepted framework. The WSI is encouraged to immediately address water safety planning, not only for the Volksrust WTW but also for the other WTWs in its area of jurisdiction. Annual process and network inspections must be performed by a professionally qualified person(s) and the findings must be used to update the risk assessment in the Water Safety Plan on a continuous basis. The monitoring programme needs to be updated with the correct determinands, sampling points and sampling frequencies. The WSI does not have a copy of the water use license and license conditions. In addition, the WSI is reminded to budget for assessments that has to be conducted on an annual basis to ensure the delivery of adequate and safe water. The current situation must be improved, and it must start immediately with compliance with OHS, housekeeping and maintenance. The current team seems eager to learn and improve the situation and we wish them well.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	70.37%
Chemical Compliance	93.50%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

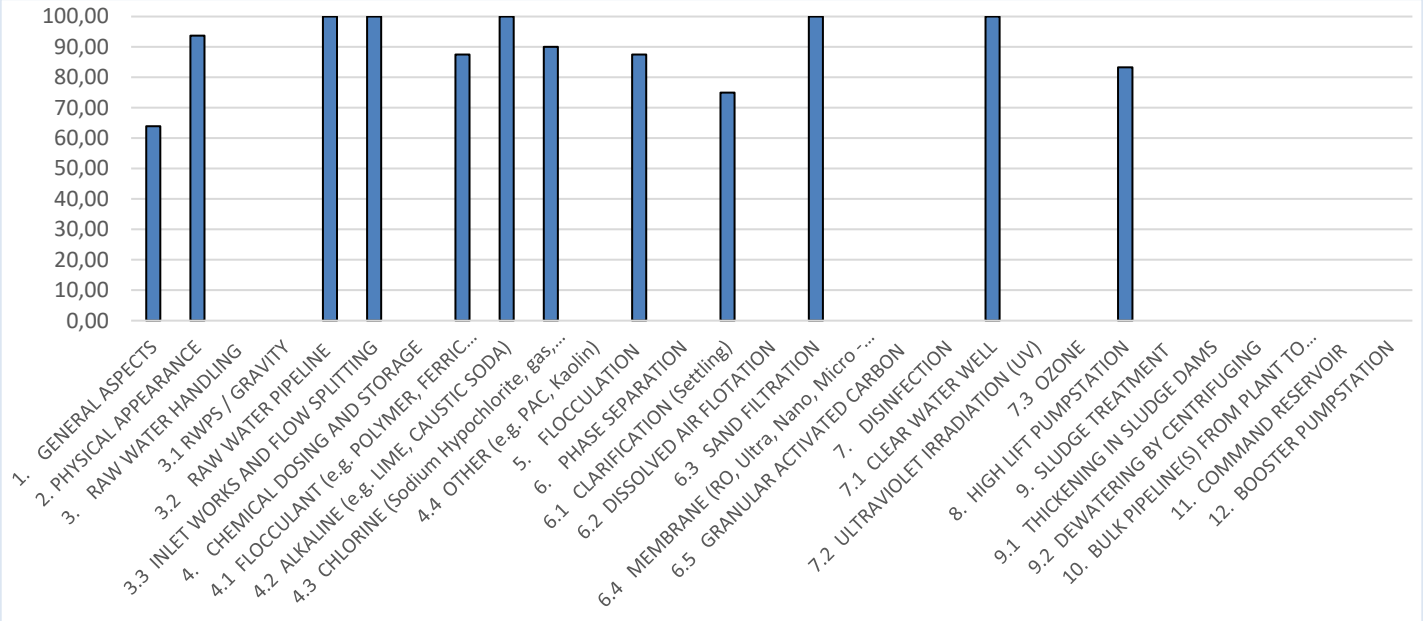
10.14 Steve Tshwete Local Municipality

The Vaalbank water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

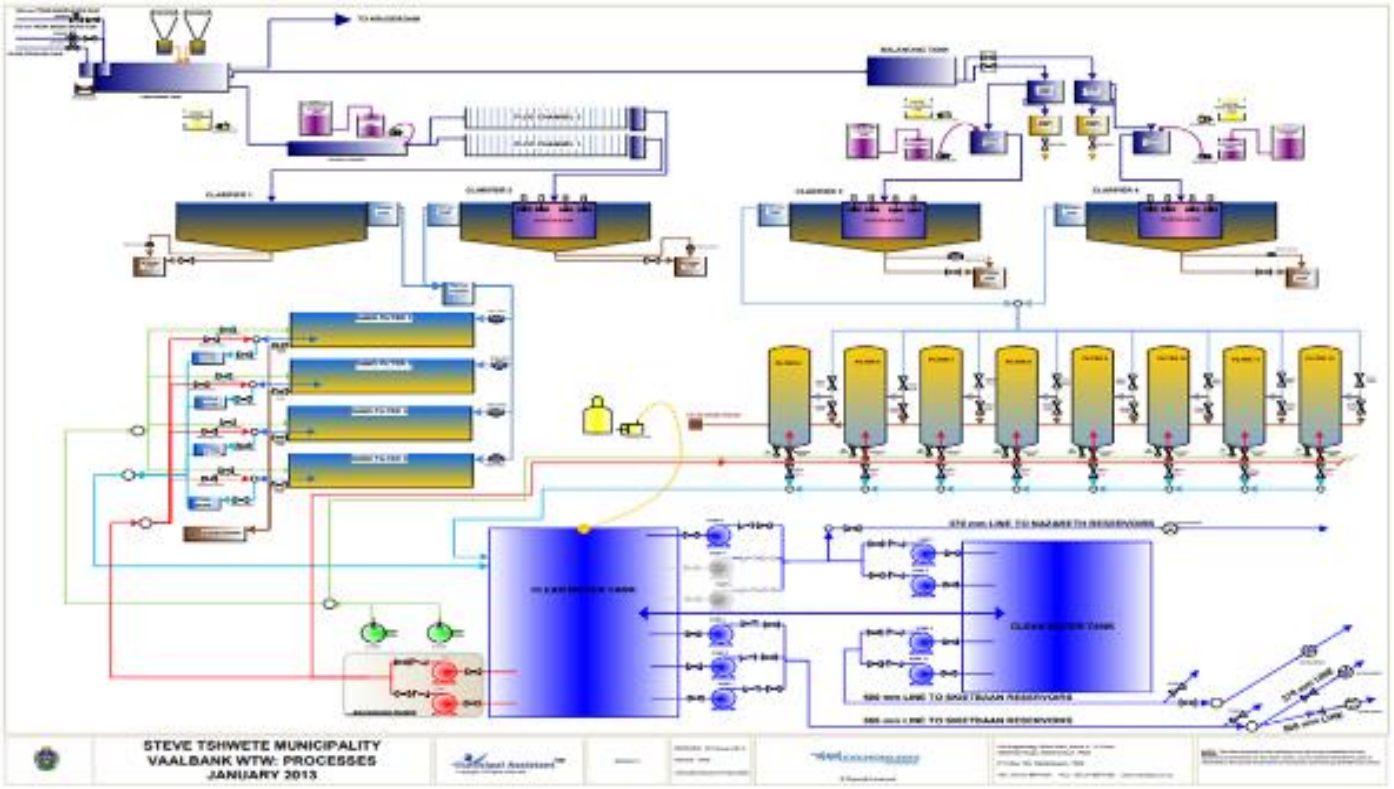
Vaalbank TSA Score: 87%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	63.8	Class C plant, logbooks in place, no display area noted for PFD or notices. Excellent signage at gate, with contact numbers of staff.
2	**Physical appearance of plant**	93.7	Critical dysfunctional structures and equipment. Site negligence is severe, obvious signs of lack of O&M and general care by plant staff, disabled environment.
3	**Raw water handling**		Raw water pump station was not assessed. The plant is fed from several sources of which there is the Middelburg Dam and the Pienaar's Dam, where the screens are in place.
	Raw water pumpstation / gravity feed		
	Raw water pipeline	100.0	
	Inlet works	100.0	
4	**Chemical dosing and storage**		There are 3 dosing pumps, all in good working condition. The dosing area is neat & Lime is used for pH correction. Emergency shower is available
	Flocculant	87.5	
	Alkaline (E.g., Lime, Caustic Soda)	100.0	
	Chlorine	90.0	
5	**Flocculation**	87.5	Sudfloc 860 is used. The wall of the flocculation unit is not in a good condition. The flocs are visible at end of chamber
6	**Phase Separation**		There's limited floc carry over
	Clarification (settling)	75.0	Backwashing is done twice per shift. The weirs are in good condition, level with slight build up and algae formation
	Sand filtration	100.0	Two air blower pumps, one in operation and one standby. The rapid gravity back wash filters for the fist process train are in good condition. The pressure filters in the 2nd train are in use and good condition.
7	**Disinfection**		Free chlorine is measured at the clean water tank. Contact time in on-site reservoir is more than 30 minutes.
	Clear water well	100.0	
8	**High Lift Pumpstation**	83.3	There is a total of ten (10) pump sets that pump to various supply zones. Therefore five (5) pairs of pump sets of these three (3) sets have the one pump sets removed for repairs. In terms of the pump configuration there is more than 50% standby
9	**Sludge Treatment**	-	The sludge dams are under construction
10	**Bulk pipeline from plant to command reservoir**	-	Not Assessed
11	**Command reservoir**	-	Not assessed
12	**Booster pumpstation**		Not assessed
	Total	**87%**	

High risk areas OR Key Hardware Risks/ Defects

1. To get the pump station, three removed pump set returned and installed asap.
2. Improve on the bunding of purification chemical storage.
3. Refurbish the broken concrete structure in the flocculation channel.
4. Make sure the chlorine gas facility conforms to all regulations and standards.
5. Clean up and neaten up all areas where there are electrical panels.

VROOM Refurbishment Cost Estimate

Civil Works	R1,221,000	45%
Mechanical Works	R1,014,200	37%
Electrical Works (Including C&I)	R507,100	18%
Total VROOM Cost	**R2,742,300**	**100%**
R million / MLD		**0.05**

Regulatory Impression

The Vaalbank water system is well maintained, with functional treatment processes and competent enthusiastic staff. Water quality is monitored according to SANS 241 and is not of high quality. The plant is undergoing an upgrade at present, where the sand filter bank is being modernised and there is also a RO process that will be added. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	96.22%
Chemical Compliance	87.74%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



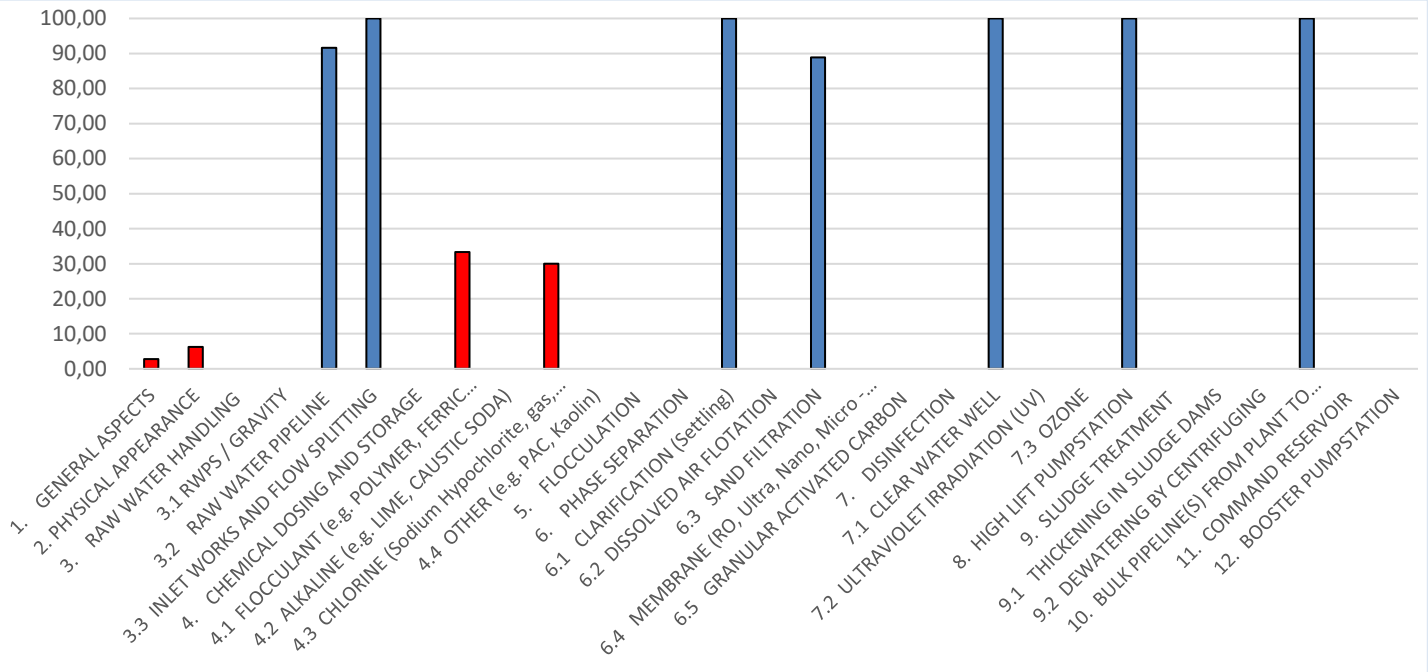

10.15 Thaba Chweu Local Municipality

The Lydenburg water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

Lydenburg TSA Score: 48%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram

None

Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	2.7	Class C plant, the classification certificate is not displayed onsite. The operational logbook is not available. The O&M is not available
2	**Physical appearance of plant**	6.2	This plant is in a general state of disrepair and most aspects are in a poor state.
3	**Raw water handling**		The raw water pipeline was reported to be in a good condition. The volumes are recorded at plant but converted and interpreted at the Municipal offices. Flow splitting is taking place
	Raw water pumpstation / gravity feed		
	Raw water pipeline	91.6	
	Inlet works	100.0	
4	**Chemical dosing and storage**		Floc S40 is used. There is one dosing pump and in operation with no standby pump. The storage is not bunded. There is no emergency wash area
	Flocculant	33.3	
	Alkaline (E.g. Lime, Caustic Soda)	-	
	Chlorine	30.0	
5	**Flocculation**		
6	**Phase Separation**		There is no floc carry over on the weirs, on both units
	Clarification (settling)	100.0	Backwashing is done once per morning shift. The weirs are in good condition, however the rotating platform on the clari-flocculator motor, gearbox with the wheels need re-alignment. There is clari-flocculator unit and a settling unit for the smelter
	Sand filtration	88.8	Two backwash pumps all in operation with 1 standby pump. Filters and nozzles were recently replaced
7	**Disinfection**		Free chlorine is measured at the clean water tank. Contact time in on-site reservoir is more than 30 minutes.
	Clear water well	100.0	
8	**High Lift Pumpstation**	100.0	All pumps installed and working. Flow volumes are recorded

Watch #	Process Unit Assessed	% TSA	Observations
9	**Sludge Treatment**	0.0	There is a sludge sump within the plant that is not properly operated, and functionality could not be verified
10	**Bulk pipeline from plant to command reservoir**	100.0	Not Assessed
11	**Command reservoir**	-	Not assessed
12	**Booster pumpstation**	-	Not assessed
	Total	**48%**	

High risk areas OR Key Hardware Risks/ Defects

1. Although, according to the scorecard audit elements, the plant is doing fine. There are many aspects to the installed infrastructure that need urgent attention, by replacing or refurbishing.
2. The use, thereof or not of the old second process train needs further investigation, and a rectification/ refurbishment business plan needs to be completed.
3. There are two standby generators on sit of which one is used for the current section of the plant that is in operation, but both are in a poor condition.
4. The housekeeping of the plant needs a major overall.
5. Sludge handling absent

VROOM Refurbishment Cost Estimate

Civil Works	R568,700	57%
Mechanical Works	R414,700	42%
Electrical Works (Including C&I)	R13,200	1%
Total VROOM Cost	**R996,600**	**100%**
R million / MLD		**0.09**

Regulatory Impression

The Lydenburg water system is not well maintained, with some partial functional treatment processes. The staff are doing what they can to maintain the system under current conditions. The general plant housekeeping is poor and can be improved to raise the workplace satisfaction. They have trainee Process controllers undergoing training there now and any work, maintenance, refurbishment would improve these trainees future outlook in working in the sector. The reinstatement of the second process train that used to be for the Aluminium smelter could go a long way in improving water quality and quantity, i.e., sustain the supply to meet the demand. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility. The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	NI
Chemical Compliance	NI

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



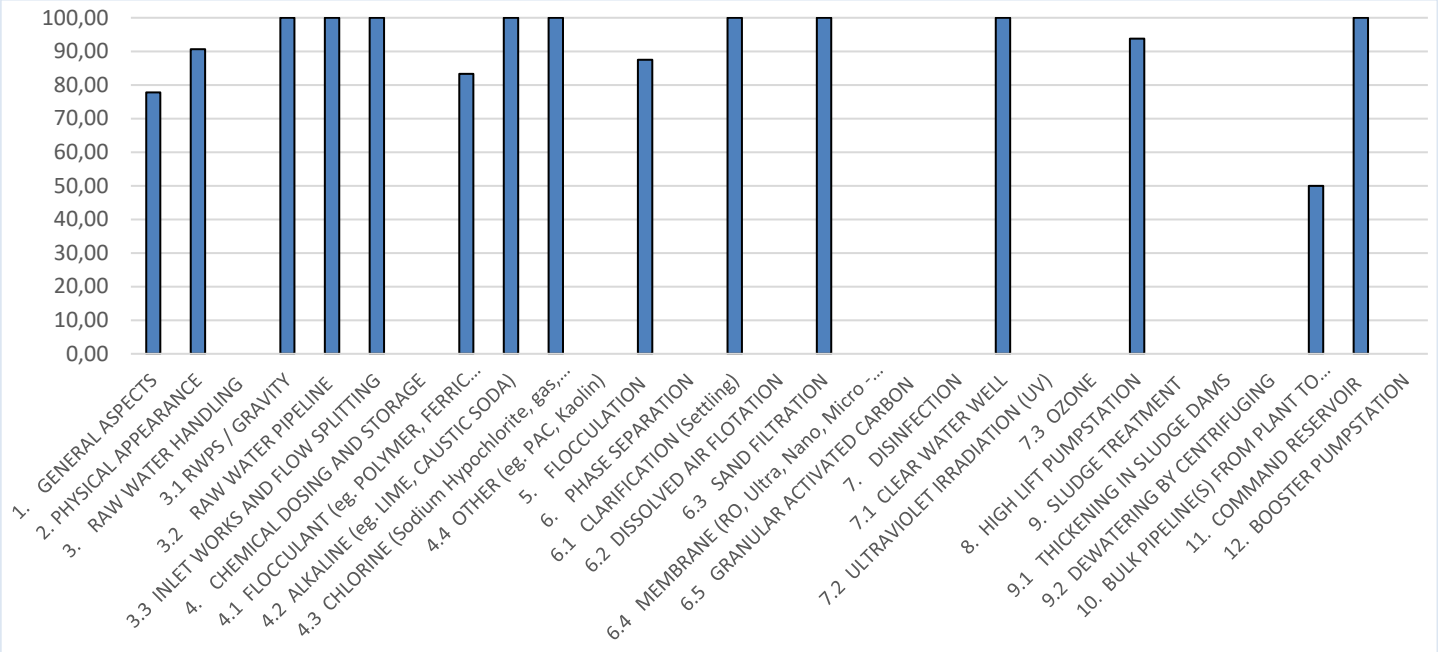

10.16 Thembisile Hani Local Municipality

The Bundu water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

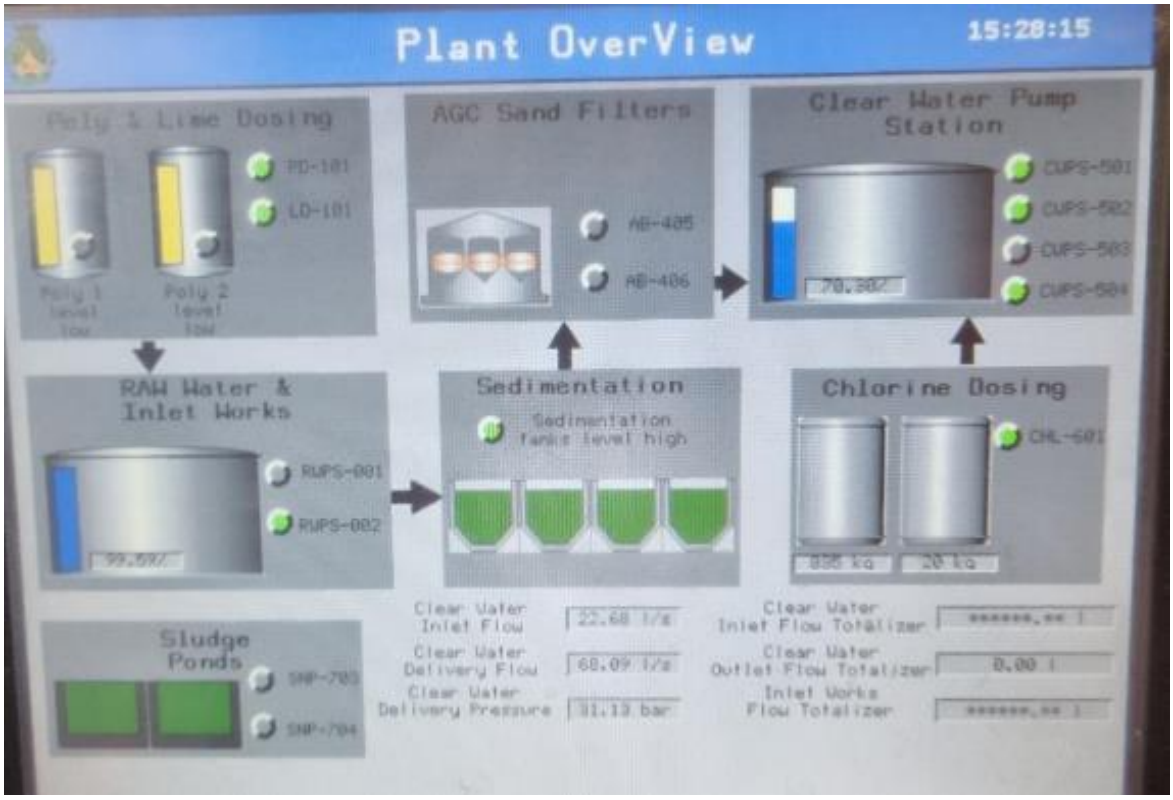
Bundu WTW TSA Score: 88%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	77.7	The plant Classification certificate is outstanding due to a delay in issuing the water use licence. The Incident management protocol and emergency contact list are not on display. Operational logbooks and O&M manual are available with the required information. The necessary lab equipment is available and operational and regular jar tests are conducted on site.
2	**Physical appearance of plant**	90.6	Entrance is signposted and plant is securely fenced with new razor wire fencing and a secure gate, with no animal access. Site is neat and paving is in excellent condition. The kitchen, office, lab, and staff toilets are new and in excellent condition. Information and safety signs are lacking and should be posted at all required points to indicate risks, hazards and required PPE.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	100.0	There are submerged strainers on the raw water abstraction line. They are cleaned regularly, especially after rain. Two submersible pumps are installed, and both are operational. The pumps operate as duty/stand-by, with 50% spare capacity.
	Raw water pipeline	100.0	Raw water pipeline is a new HDPE line and is in excellent condition. No leaks evident. There is pre-chlorination dosing in the raw water line. Incoming flow meter is operational and was recently replaced to deal with the reduced flows in the pipeline due to water restrictions in the area.
	Inlet works	100.0	There is a single line and process train at the inlet works with even flow over the inlet weir. There is turbulent mixing at the point of flocculant and lime dosing. Chemical dosing can be monitored visually.
4	**Chemical dosing and storage**		
	Flocculant	83.3	There are two dosing pumps installed and both are operational. Dosing pumps are operated as duty/stand-by, with 50% stand-by capacity. The area is very neat and clean, and spillages can be contained. The bund area for the flocculent storage should be increased to adequately contain spills and a safety shower should be installed close to the chemical handling area.
	Alkaline (lime)	100.0	Two dry feeders are installed, both are operational. Feeders are operated in duty/stand-by mode with 50% stand-by. Area is very clean and neat. Bags are neatly stored. The lime is neatly stored on pallets off the floor.
	Chlorine	100.0	Two dosing units are available, and both are operational. There is 100% stand-by for the dosing units, they are operated in duty/standby mode. The scales are functional and there is a mechanism to switch over. Gas monitoring system is in place and operational, the extractor fan is operational and there are safety masks available.
5	**Flocculation**	87.5	Flocs are visible and there is good floc formation. Flocculant tank is in good condition and is clean with no scum build up. Handrails are in place and in good condition. The basin walls are not plastered, and brickwork may erode over time. A few loose bricks were observed. Provision should be made to plaster the walls to preserve the integrity of the brickwork.
6	**Phase Separation**		
	Clarification (Settling)	100.0	There is limited floc carry over at the weirs. Desludging takes place twice daily, in the morning and the afternoon. Weirs are clean and in excellent condition. No growth or debris present that could limit flow. There are three settling tanks, each tank with the capacity of 2.5 Ml/d. The plant capacity is limited to 7.5 Ml/d by the clarification process and could be increased to 10 Ml/d by the addition of one additional basin if required.
	Sand filtration	100.0	There are four closed sand filters installed, all sand filters are operational. There are no backwash pumps, filters are backwashed using air washing. There are no blowers. There is even flow splitting to the sand filters. Filters are closed so this cannot be observed. Filters are backwashed automatically based on head loss through the filter, approximately every 48h. Backwashing can also be done manually if turbidity is out of spec. Media is new and in good condition. Area around filters is clean and neat, handrails are in place and in good condition.
7	**Disinfection**		
	Clear water well	100.0	The clean water tank is 2.5 Ml in capacity and has a 5-hour retention time. Sample is taken for free chlorine at the final sample point and measurement is done in the on-site lab.
8	**High lift pumpstation**	93.7	There are 4 clear water pumps installed. All are operational. Three pumps are running, and one is on standby, there is only 33% stand-by capacity. Final flow meter is operational.
9	**Sludge treatment**		
	Thickening in sludge dams	0.0	There is currently no sludge handling facility, the sludge dams still need to be constructed. Sludge is applied on the land adjacent to the plant. There is no provision for return of water back to the plant. Sludge dams should be installed with priority to limit environmental impacts. It was reported that a capital project is underway.

Watch #	Process Unit Assessed	% TSA	Observations
10	**Bulk pipeline from plant to command reservoir**	50.0	Bulk pipe network are problematic in places and budget should be allocated for replacement where necessary.
11	**Command reservoir**	100.0	It was not possible to visit the reservoir. Reported by plant operators that the reservoir is secure with fencing. Telemetry is in place with a level sensor, with an operational flow meter. Structure is reported to be leak free and in good condition.
	Total	**88%**	

High risk areas OR Key Hardware Risks/ Defects

1. Safety requirements: Safety and information signs required, increase in bund size for the flocculant storage, and safety shower for chemical handling area.
2. Walls of the flocculation basin should be plastered to protect brickwork.
3. There is only one stand-by pump for the three duty clean water pumps.
4. There is no sludge handling facility on site.
5. There are occasional pipe bursts and leaks on the bulk pipeline.

VROOM Refurbishment Cost Estimate

Civil Works	R2,207,700	74%
Mechanical Works	R583,000	20%
Electrical Works (Incl C&I)	R190,300	6%
Total VROOM Cost	**R2,981,000**	**100%**
R million / MLD		**0.4**

Regulatory Impression

The Bundu WTW is a new plant and is secure and in excellent condition. The plant is well operated, the staff are motivated and enthusiastic and are proud of their facility. The works is currently not registered due to an outstanding water use licence. The application has been submitted and Thembisile Hani LM are awaiting the licence. While the entrance is signposted, there is a lack of safety and information signage throughout the works which needs to be addressed. A water quality risk register is in place for the Bundu system, although the system would benefit from the implementation of a full water safety plan. Occasional microbiological non-compliance could be improved by applying on-site monitoring information to optimise chlorine dosing and disinfection residual. There are no sludge management facilities at the works, and installation of this facility should be prioritised to minimise environmental impacts. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for chemical but not for micro. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	31.25%
Chemical Compliance	99.58%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

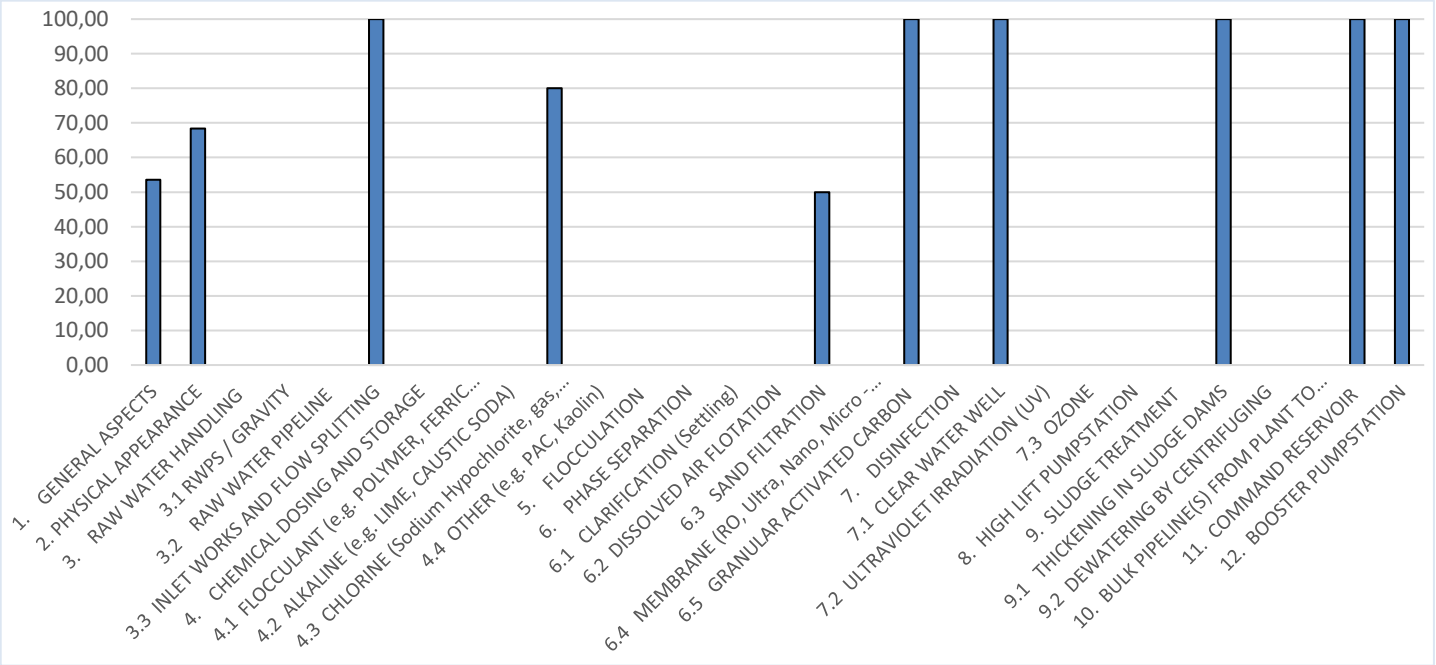
10.17 Victor Khanye Local Municipality

The Delmas water treatment works was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality. The Delmas WTW is currently being refurbished and not in use. Water from Rand Water is diverted to Botleng town.

Delmas TSA Score: 64%

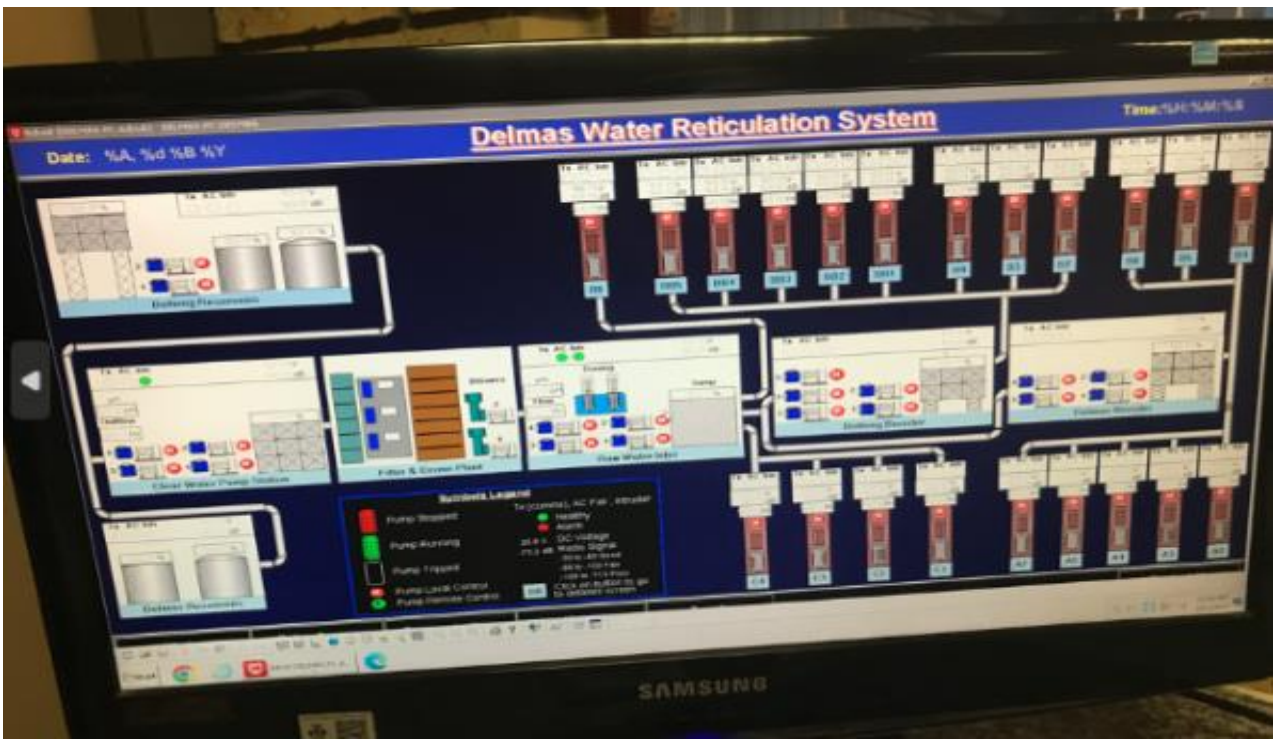
Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram

The process flow diagram is not available – the outlay on the SCADA system was presented.



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	53.6	Class C plant. Operational logbook was present with outdated entries due non-operation of the plant since 2021. Operation and Maintenance manual was not available as is the IMP. Newly acquired laboratory equipment available. Electricity meter was working but electricity used by the plant not recorded.
2	**Physical appearance of plant**	68.3	Facility is fenced with manned security at the gate. The terrain is clead and tidy, but the facilities available in need of some general maintenance. Rain damage visible on the gravel road leading to the WTW but generally in a good condition.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	na	Water pumped from boreholes, not all in use. A project is underway to refurbish all boreholes vandalised.
	Raw water pipeline	na	No information available on the raw water pipe network. The inflow meter installed, not calibrated.
	Inlet works	100.0	All water from the boreholes collected in the raw water reservoir. Six mixers installed mixing the raw water, in rotational use. Ozone is dosed - could not be assessed as the plant is currently not operational.
4	**Chemical dosing and storage**		
	Chlorine	80.0	Four dosing units reported to be working - not verified. Scales to be repaired. Safety equipment available and working. One chlorine gas cylinder is enough for 3 months, two available.
5	**Flocculation**		
6	**Phase Separation**		
	Sand filtration	50.0	The filters are in good condition - all handrails in place. Media in a good condition, replaced recently. Backwash pumps are installed but not in a working condition.
	Granular activated carbon (GAC)	100.0	The filters are in good condition - all handrails in place. None of the other aspects could be verified.
7	**Disinfection**		
	Clear water well	100.0	At 15 Ml/d should the plant is used to capacity, the contact time for the 1 Ml reservoir is >1 hour. Chlorine measurement not verified.
	Ozone	0.0	The ozone unit and processes could not be verified. Of concern is the lack of any safety equipment and signs.
8	**High lift pumpstation**	na	The plant is not in operation and no water is pumped. The installed pumps could not be verified.
9	**Sludge treatment**		
	Thickening in sludge dams	100.0	The sludge dams are in a good condition and was cleaned in 2017. Currently not in use.
10	**Bulk pipeline from plant to command reservoir**	na	Pipe network reported to be in a good condition - not assessed.
11	**Command reservoir**	100.0	Water is pumped directly to the reservoirs in the distribution system, within the fenced WTW.
12	**Booster pumpstation**	100.0	Two pumps installed at pumpstation lifting water to the elevated tank. There is a 100% standby.
	Total	**64.3%**	

High risk areas OR Key Hardware Risks/ Defects

1. Refurbish all boreholes and introduce security to prevent vandalism.
2. Refurbish the filter backwashing unit.
3. Water meters to be installed/ calibrated.
4. No maintenance logging procedure to inform the maintenance team of breakdowns, deficiencies, etc.
5. Replace all chlorine handling and ozone safety equipment.

VROOM Refurbishment Cost Estimate

Civil Works	R94,600	5%
Mechanical Works	R1,158,300	66%
Electrical Works (Incl C&I)	R511,500	29%
Total VROOM Cost	**R1,764,400**	**100%**
R million / MLD		**0.12**

Regulatory Impression

The Delmas water treatment works is well maintained. Treatment processes could not be assessed as the plant is currently being refurbished.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	97.55%
Chemical Compliance	98.12%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%




11. NORTH WEST: MUNICIPAL DRINKING WATER SYSTEM'S FUNCTIONALITY

Background

Leading up to the release of the full Blue Drop report, the Regulator draws attention by publishing the *Blue Drop Watch Report*, which comprises of a technical overview of pipes, pumps, reservoirs, processes and water quality of water treatment plants and distribution networks. The Blue Drop Watch report is **not** the Blue Drop audit report, which will only be published once the verification and quality control processes by DWS have been satisfied, to ensure accurate and credible reporting of drinking water services across South Africa. The Watch Report seeks to keep the public and stakeholder updated and informed on the status of drinking water infrastructure, water quality, and the indicative cost to restore functionality.

The Blue Drop Watch Report is informed by the Technical Site Assessments (TSA), which were done at 1 to 2 systems per WSA/WSP, as part of the Blue Drop audit cycle. The purpose of the TSA is to verify the findings of the (desktop) audit with the status on the ground (physical inspections). The TSA score (%) reflects the condition of the raw water handling system (abstraction, pumps, pipe network), the water treatment plants (inlet works to disinfection and sludge treatment), delivery system (commend reservoirs, bulk pipe network and pumpstations) and distribution systems (pump and pipe networks). A high TSA score (100%) indicates that the infrastructure, equipment, and processes are in excellent condition, whilst a low TSA score (0%) indicates failure and dysfunctional process and infrastructure. The TSA inspections cover each process unit of the treatment facility, coupled with randomly selected checkpoints of the delivery and distribution network. The VROOM cost covers only the treatment facility, as too many variables exist to accurately estimate network refurbishment costs.

Results of the Technical Site Assessments

During the period December 2022 to February 2023, 10 water supply systems were inspected, offering a representative overview of systems owned and operated by municipalities, water boards and water service providers. The assessments covered 10 municipalities, as well as 1 Water board. Detailed TSA reports with photographic evidence and VROOM costs have been generated to assess the condition and status of treatment facilities and gain insight into randomly selected pipe network and pumpstation across the water distribution networks. The table following summarises the TSA scores of the water supply systems that were assessed.

Table 44 - North West Summary of the all the TSA Water Supply Systems

#	Municipality (WSA)	TSA WSS	TSA WTW	WSP/ WB	%TSA
1	Madibeng LM	Hartbeespoort	Schoemansville		57%
2	Rustenburg LM	Rustenburg North	Bospoort		81%
3	City of Matlosana LM	City of Matlosana	Midvaal	Midvaal Water	95%
4	Kgetlengrivier LM	Koster	Koster		44%
5	Maquassi Hills LM	Leeudoringstad-Witpoort	Leeudoringstad Reservoir and Pumpstation		36%
6	Moretele LM	Temba	Mothibestad Booster Pumpstation and command reservoir		31%
7	JB Marks LM	Potchefstroom	Potchefstroom		94%
8	Moses Kotane LM	Madikwe	Madikwe		60%
9	Ngaka Modiri Molema DM	Mafikeng	Mmabatho		88%
10	Dr Ruth S Mompati DM	Bogosing	Bogosing		18%
	Totals		**10**	**1**	**60%**

An average of 60% was achieved for the 10 systems assessed, which means that infrastructure and processes are partially functional with an average performance. The best overall performance was found for City of Matlosana Midvaal Water, followed by JB Marks and Ngaka Modiri Molema. The water board provided for the best performing system. Lower performances were observed for Bogosing and Mothibestad Booster Pumpstation and command reservoir.

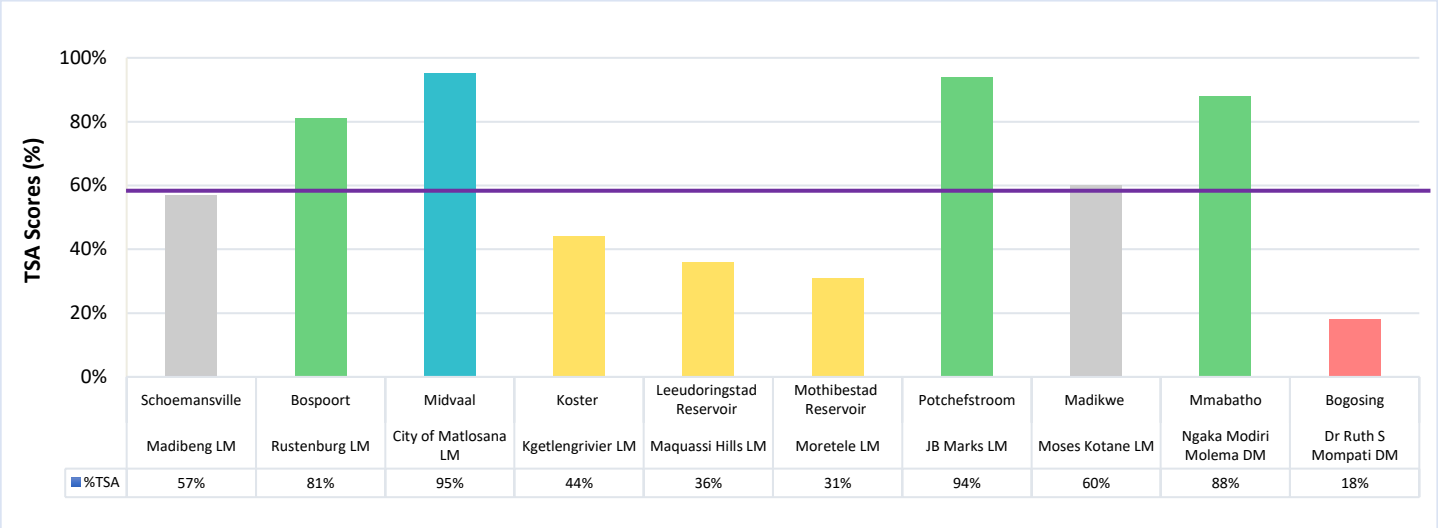


Figure 35 - NW TSA scores for all the BD Systems

95 – 100% Excellent	
80-<95% Good	
50-<80% Average	
31-<50% Poor	
0-<31% Critical state	

The Regulator observed the predominant challenges and risks pertaining to the water supply system:

Facility management

- No notice board to display or no display of the PFD or other relevant notices and/or documents required on site
- Refurbishment or upgrade and/or construction of buildings or facilities, concrete structures, offices and/or process control room, staff ablutions; maintenance or replacement of perimeter/boundary fencing and/or access gate; Aging infrastructure
- No jar testing done, no or limited testing water quality testing equipment and/or lab chemicals, no calibration of meters
- Signage at entrance gate and safety signs across plant
- Housekeeping and tidying up of terrain, paintwork at treatment works, pumpstations, and reservoirs, clean-up sites after construction projects
- Road rehabilitation/ upgrade/ construction and road accessibility especially for the safe delivery of chemicals
- Staff safety and signage improvement

Water treatment system

- Raw water pipe network and/or pumps at abstraction facility to be refurbished or upgraded or repaired
- No flow meters installed or dysfunctional flow meters (abstraction, WTW, and Command Reservoirs), and flow meters not calibrated
- Refurbishment or upgrade of one or more of the various process units (civil, mechanical, electrical and instrumentation)
- Dysfunctional or inefficient process units that have to be rectified, e.g. inlet works, flocculation, clarifiers, filters, etc
- Reinstatement of all automatic/ PLC related control in settling and filter units
- Treatment chemicals, e.g. no bunding, limited stock, storage
- No or limited no. standby pumps or dysfunctional pumps, e.g. flocculant and/or chemical dosing, backwashing, high lift, leaks, etc
- Sand filters, e.g. repairs required, sand to be replaced, sand volume
- Chlorination unit not operational or not fully operational, e.g. limited stock in place, no or limited standby units, no automatic switch over, no chlorine scales, no or limited safety signs and systems (alarms, fans, masks, detectors)
- Limited disinfection contact time in the clear water well or ineffective disinfection taking place
- Sludge dams/ponds or beds, e.g. none in place, not operation, maintenance (cleaning), dysfunctional sludge pumps and no or limited standby, no recycling taking place

Water distribution network

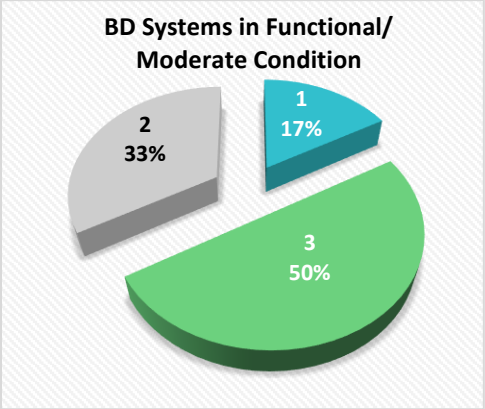
- Repair leakages in pipe network, valve boxes, and/or command reservoirs
- Replace final water pipeline from WTW to command reservoir/s
- No telemetry at reservoir and level indicator or not operational
- Install new fencing or repair fencing
- Site at reservoirs to be cleared and landscaped.

Systems Observed to be in Functional/Moderate Condition based on Technical Site Inspections

Water supply systems which succeeded to achieve ≥50% TSA score, are summarised as follows.

Table 45 - Provincial Summary of the TSA Water Treatment Systems in the Excellent to Average Performance Categories

Municipality (WSA)	WSP/ WB	TSA of ≥95-100% [Excellent]		TSA of ≥80-<95% [Good]		TSA of ≥50-<80% [Average]	
		Name of WTW	% TSA	Name of WTW	% TSA	Name of WTW	% TSA
Madibeng LM						Schoemansville	57%
Rustenburg LM				Bospoort	81%		
City of Matlosana LM	Midvaal Water	Midvaal	95%				
JB Marks LM				Potchefstroom	94%		
Moses Kotane LM						Madikwe	60%
Ngaka Modiri Molema DM				Mmabatho	88%		
Totals	**2?**	**1**		**3**		**2**	



Of the 6 systems in the excellent to average performance categories it was found that:

- 1 system (17%) was in excellent good condition
- 3 systems (50%) were in good condition
- 2 systems (33%) were in average condition.

Figure 36 - No. BD Systems in Functional/ Moderate Condition

The best performing water supply systems, as indicated by the TSA scores, are summarised hereunder.

Table 46 - Provincial Summary of the Top Performing TSA Water Treatment Systems

#	WSA	WSP/ WB	TSA WTW	%TSA
1	City of Matlosana LM	Midvaal Water	Midvaal	95%
2	JB Marks LM		Potchefstroom	94%
3	Ngaka Modiri Molema DM		Mmabatho	88%
4	Rustenburg LM		Bospoort	81%

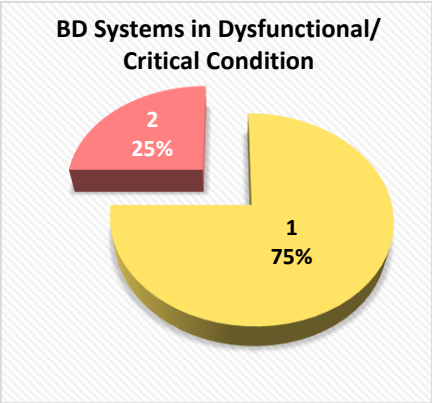
The top three systems with the best condition are Midvaal managed by Midvaal Water (excellent 95-100%); Potchefstroom managed by JB Marks, and Mmabatho managed by Ngaka Modiri Molema (good 80-<95%).

Systems Observed to be Dysfunctional/Critical Condition based on Technical Site Inspections

Drinking water supply systems which failed to achieve at least a TSA score of 50%, are identified as follows.

Table 47 - Provincial Summary of the TSA Water Supply Systems in the Poor and Critical Performance Categories

Municipality (WSA)	WSP/ WB	TSA of ≥31-<50% [Poor]		TSA of 0-<31% [Critical]	
		Name of WTW	% TSA	Name of WTW	% TSA
Kgetlengrivier LM		Koster	44%		
Maquassi Hills LM		Leeudoringstad Reservoir and Pumpstation	36%		
Moretele LM		Mothibestad Booster Pumpstation & command reservoir	31%		
Dr Ruth S Mompati DM				Bogosing	18%
Totals		**3**		**1**	



Of the 4 systems in the poor and critical performance category it was found that:

- 3 systems (75%) were in poor condition
- 1 system (25%) was in critical state.

Figure 37 - No. BD Systems in Dysfunctional/ Critical Condition

Table 48 - Provincial Summary of the TSA Water Supply Systems in Critical Condition

#	Municipality (WSA)	WSP/ WB	WSS	%TSA
1	Dr Ruth S Mompati DM		Bogosing	18%

Only one of the 10 systems assessed (10%) was found to be in a critical state.

VROOM Costs

The Very Rough Order of Measurement (VROOM) is an estimation of the funding required to restore existing treatment infrastructure to its original design capacity and operations, by addressing civil, mechanical, electrical and instrumentation defects. A singular VROOM cost is determined by assessing 1-2 treatment facilities per municipality and calculated as cost per system. The cost is derived through an algorithm that uses the Blue Drop Inspector's impression of the asset condition, the size and capacity of the asset, and the market/ industry cost indicators. The resultant VROOM cost is an estimation of the cost to repair, refurbish or replace dysfunctional treatment infrastructure. Subsequently, a singular VROOM cost is extrapolated, in relation to the total Blue Drop scores and systems' SIVs, to derive an aggregated VROOM score for all treatment plants in the WSI.

***Note:** VROOM does not constitute a specification, schedule of quantities or a definite refurbishment figure, but rather an indicative amount to inform a budget and hardware requirements. **Also,** the VROOM cost is specific to the treatment plant and does not attempt to cost the network delivery and distribution network, as it contains to many variables.*

The VROOM costs are summarised as following, noting these values comprises the cost of repairs of the SINGLE water treatment system assessed, NOT the extrapolated collective cost to repair all the treatment facilities in a WSI. The VROOM cost is made up by mechanical, electrical, and civil cost elements, which can be seen in the detailed TSA sections following in the report.

Table 49 - Provincial Summary of the of the VROOM Costing

Municipality (WSA)	TSA WSS	TSA WTW	WSP/ WB	Total VROOM Cost (Rand)
Madibeng LM	Hartbeespoort	Schoemansville		R4,158,000
Rustenburg LM	Rustenburg North	Bospoort		R5,039,100
City of Matlosana LM	City of Matlosana	Midvaal	Midvaal Water	R3,619,000
Kgetlengrivier LM	Koster	Koster		R37,360,400
Maquassi Hills LM	Leeudoringstad-Witpoort	Leeudoringstad Reservoir and Pumpstation		R0
Moretele LM	Temba	Mothibestad Booster Pumpstation and command reservoir		R0
JB Marks LM	Potchefstroom	Potchefstroom		R2,483,800
Moses Kotane LM	Madikwe	Madikwe		R440,000
Ngaka Modiri Molema DM	Mafikeng	Mmabatho		R270,600
Dr Ruth S Mompati DM	Bogosing	Bogosing		R1,793,000
Totals				**R55,163,900**

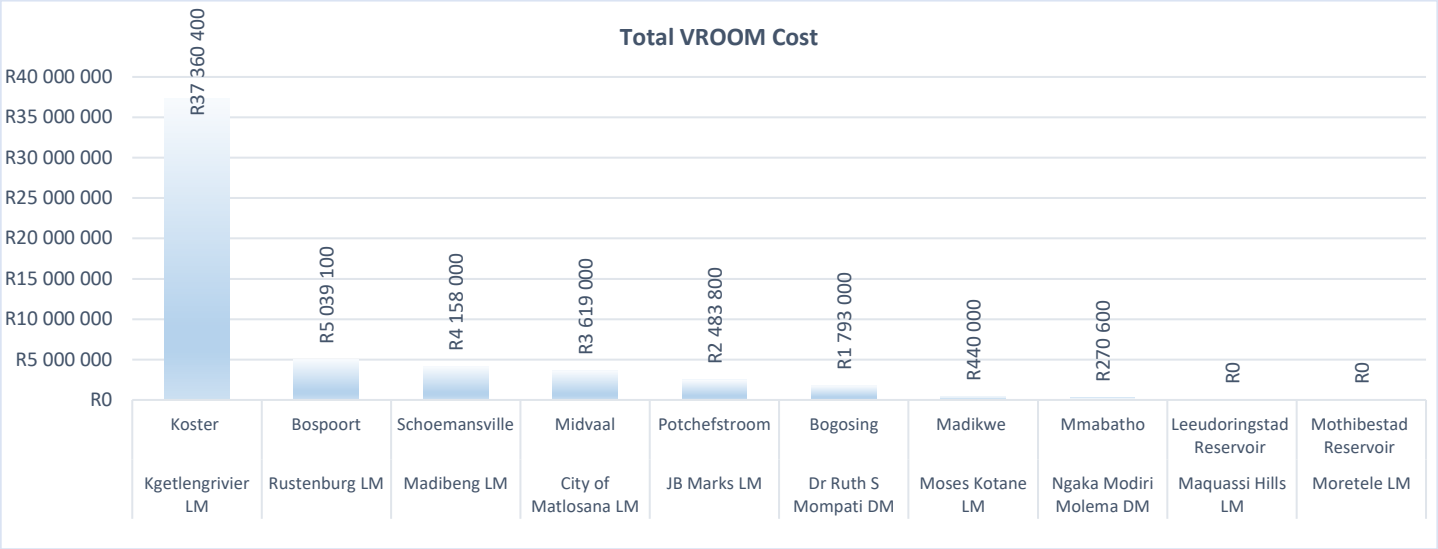


Figure 38 - Total VROOM Cost for the BD Systems Assessed

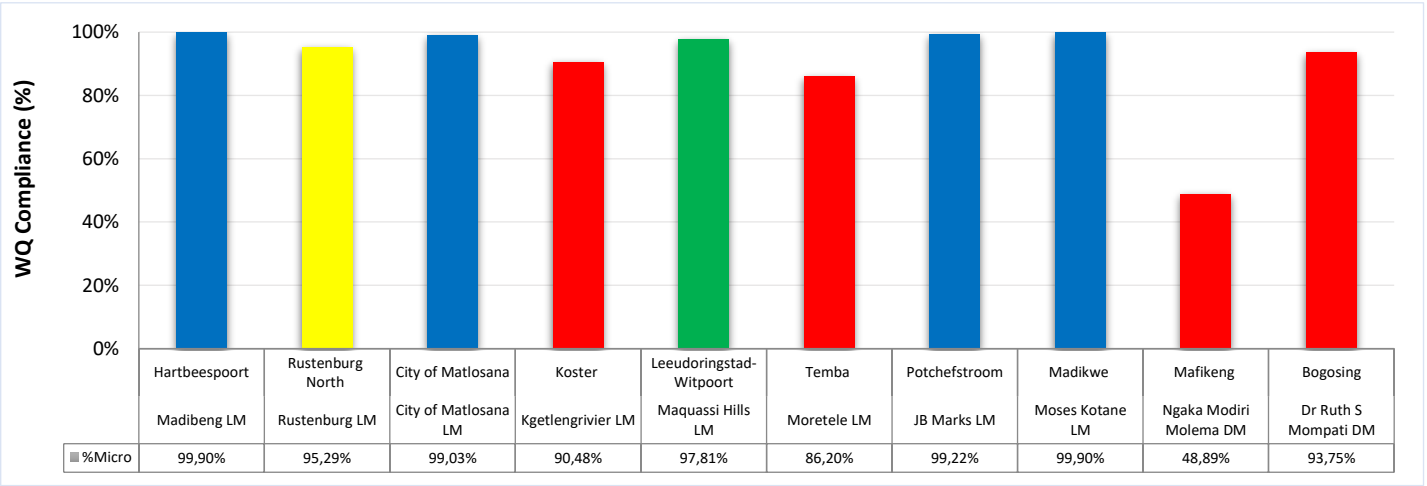
The associated VROOM costs for the 10 water supply systems assessed amounts to R55.2 million, with the bulk of investment needed for Koster (Kgetlengrivier).

Drinking Water Quality Status

The Institutional Water Quality Compliance, as measured against SANS 241 standards, is reflected in the table below (IRIS, 28 March 2023).

Table 50 - North West Summary of the Drinking Water Quality Status of all the TSA Water Supply Systems

#	Municipality (WSA)	TSA WSS	TSA WTW	Microbiological Compliance	Chemical Compliance
1	Madibeng LM	Hartbeespoort	Schoemansville	>99.90%	95.19%
2	Rustenburg LM	Rustenburg North	Bospoort	95.29%	95.96%
3	City of Matlosana LM	City of Matlosana	Midvaal	99.03%	98.74%
4	Kgetlengrivier LM	Koster	Koster	90.48%	93.31%
5	Maquassi Hills LM	Leeudoringstad-Witpoort	Leeudoringstad Reservoir and Pumpstation	97.81%	98.48%
6	Moretele LM	Temba	Mothibestad Booster Pumpstation and command reservoir	86.20%	84.15%
7	JB Marks LM	Potchefstroom	Potchefstroom	99.22%	98.30%
8	Moses Kotane LM	Madikwe	Madikwe	>99.90%	86.59%
9	Ngaka Modiri Molema DM	Mafikeng	Mmabatho	48.89%	95.70%
10	Dr Ruth S Mompati DM	Bogosing	Bogosing	93.75%	82.18%



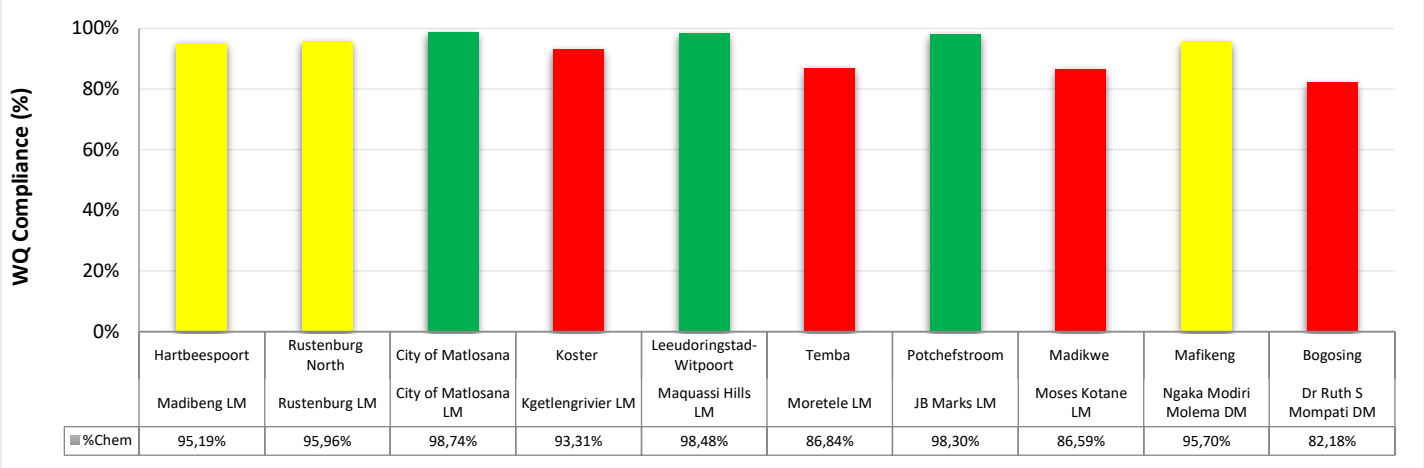


Figure 39 - NW Drinking Water Quality Status of all the TSA Water Supply Systems

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

The TSA and water quality results depict a different picture. The TSA shows 6 of the 10 water supply systems to be in the *excellent to average performance category*, and the water quality compliance shows that 60-80% of the systems *fail to produce compliant final water quality*.

Out of 10 treatment plants, 4 (40%) systems achieve excellent microbiological quality. A total of 1 (10%) system has poor and 5 (50%) systems have a bad microbiological water quality status. The water in these systems poses a serious acute health risk to the community. WSAs with poor microbiological water quality status must be assessed to confirm status in all systems to ensure rectification measures are comprehensive to safeguard communities. The direct cause of microbiological failures can be linked to the TSA sub-watch Area 7, which has a low contribution to the overall TSA score. The failure to produce water that meets E. coli standards can be linked back to poor operations, defective infrastructure, dosing rates, absence of disinfection chemicals, lack of monitoring, or lack of operating and chemistry knowledge. WSIs that are not monitoring the final water quality at the outlet of the treatment plant or at specific end use points must develop a monitoring programme and resume with compliance monitoring as a matter of urgency.

Chemical compliance shows that 2 (20%) have good water quality, whilst the majority of systems fail to achieve chemical compliance. A total of 3 (30%) and 5 (50%) systems have a poor and bad chemical water quality status.

Concluding Remarks

The Blue Drop Watch results stresses the importance of drinking water supply and quality to be a primary focus area of government. Already, the Department has developed the Water Services Improvement Programme for systems in critical state, and at systems where particular concerns were reported. Blue Drop performance trends will be used to determine repetitive poor performance, to inform a radical approach to ensure turnaround and compliance. This could include facilitating long term intervention by either a capacitated water board or any other suitable mode of water services support. The determination of the 'very rough order of estimates' (VROOM) was done to give an estimation of the capital requirement for the functionality restoration drive. This will be effected with the support from the National Treasury.

The Regulator will continue to monitor performance in terms of Section 62 of the Water Services Act and will engage together with CoGTA and SALGA, WSAs for corrective action plan development and implementation and offer support. Should these actions fail, the Department will consider civil action together with actions contemplated under section 63 of the Water Services Act (Act 108 of 1997) to ensure that Ministerial directives are issued with timeframes for implementation. Failure to respond will trigger remedial action be taken at cost of the non-complying entity or municipality. The Department will take steps to improve its capacity to respond more effectively in this duty, in ensuring visible and measurable improvement in drinking water services. The Department of Cooperative Governance and National Treasury will be engaged to explore ways of utilising conditional grants for the purpose of remedial rectification.

All Water Services Institutions are hereby urged to take note of their TSA status and commence with corrective measures. The full Blue Drop audit report will provide further material content to the overall management of drinking water services across South Africa, upon its release in July 2023.

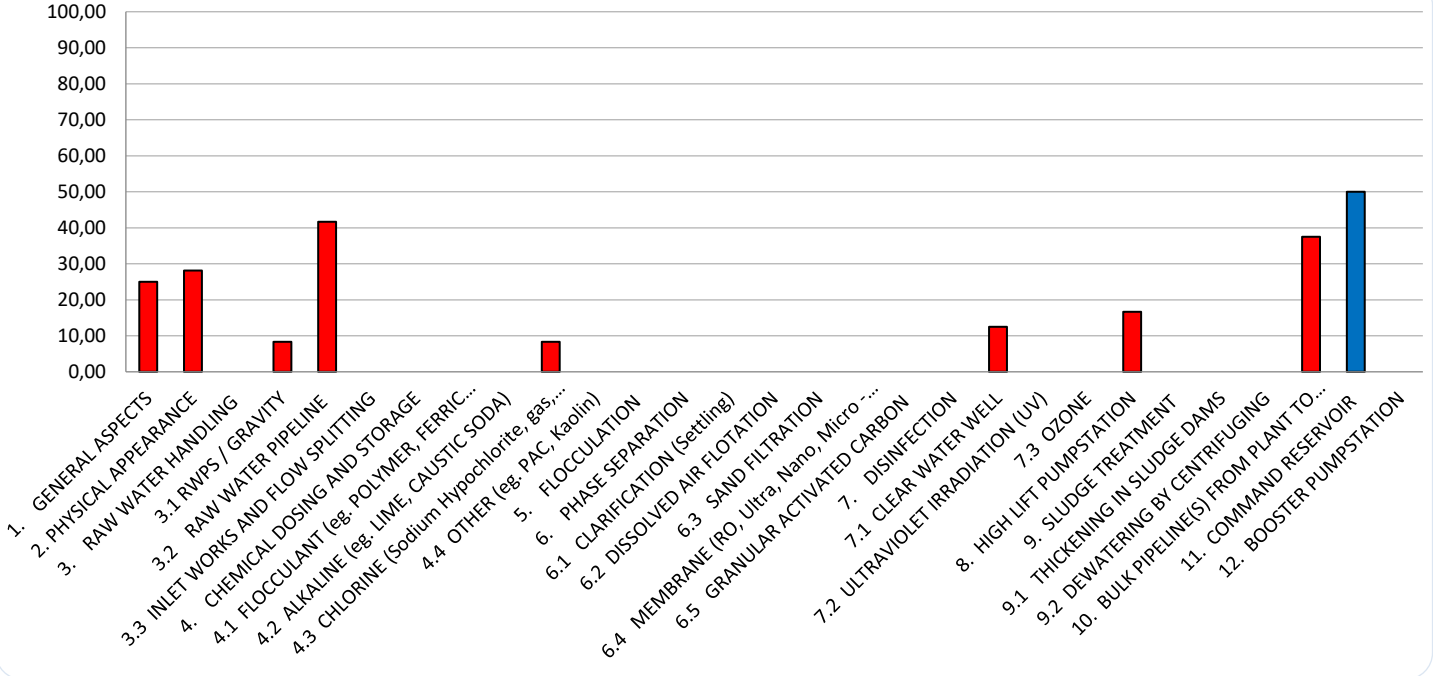
11.1 Dr Ruth S Mompati District Municipality

The Bogosing water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

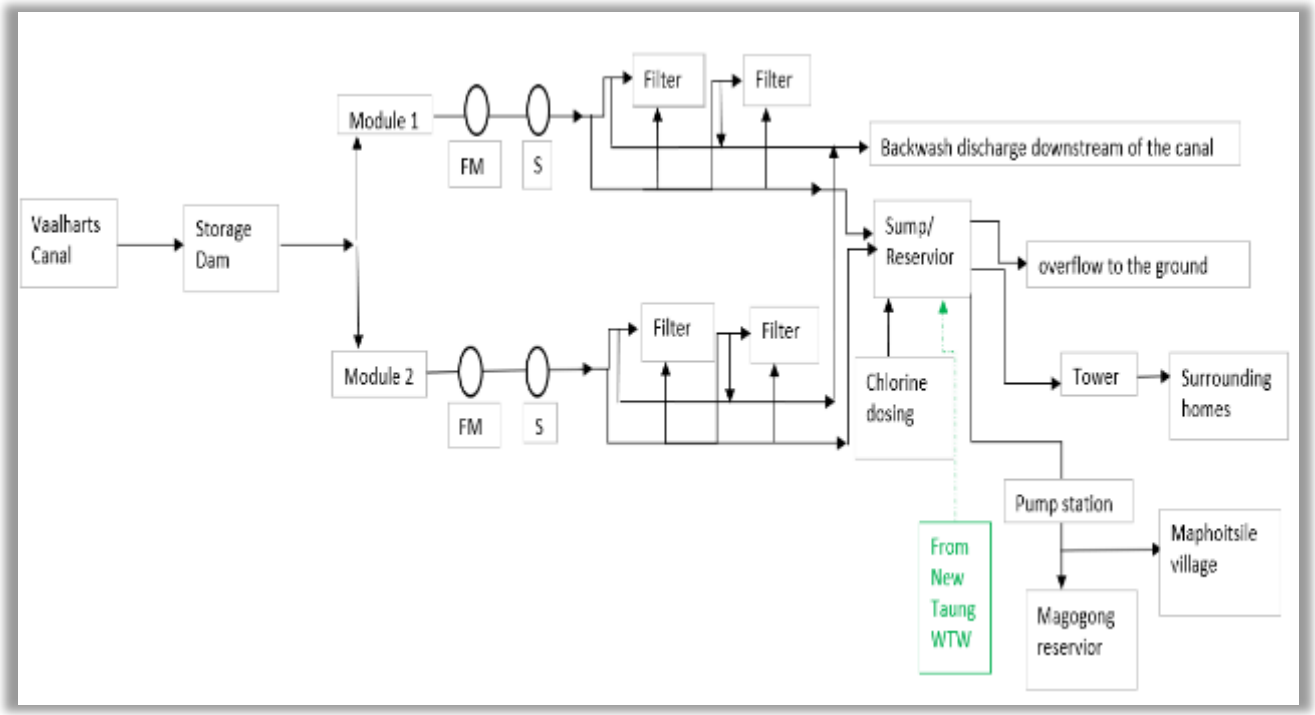
Bogosing Water Treatment Works TSA Score: 18%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	25.0	A Class C certificate was displayed on-site but little other information relating to the plant design was available. Daily operational logbook containing observations and shift logs was available. Process monitoring data was kept on the desktop computer on-site but there were significant gaps in the data due to non-functional monitoring equipment.
2	**Physical appearance of plant**	28.0	The site was not easily accessible due to the condition of access road. The site was fenced but not signposted and generally did not have the required safety signage and equipment available. General housekeeping and facilities for process controllers/workers was in a poor state.
3	**Raw water handling**		Raw water was gravity-fed from the Vaalharts canal into the raw water dams. The level of the off take from the canal was inadequate during times of low flow or when seasonal maintenance of the canal is undertaken, resulting in insufficient water supply. The inflow meter was not functional for an extended period exceeding 12 months.
	Raw water pumpstation/ gravity feed	8.0	
	Raw water pipeline	42.0	
	Inlet works	0.0	
4	**Chemical dosing and storage**		
	Flocculant	0.0	Due to deteriorating raw water quality over the years flocculant dosing (SudFloc) was introduced, however as the plant was not designed for dosing, effectiveness was not optimal. Flocculant was not being used since the beginning of January 2022 due to the collapse of the sand filters.
	Chlorine	8.0	Chlorine gas was not in use due to the national shortage. HTH tablets was left as the only means of treatment/disinfection. Sufficient HTH stock was available however means of dosing could not be accurately calculated.
5	**Flocculation**	0.0	The WTW was designed for flocculation dosing thus effectiveness was not optimal.
6	**Phase Separation**		
	Sand filtration	0.0	Both pressure sand filter modules were not operational and was being by-passed at the time of the inspection.
7	**Disinfection**	13.0	Chlorine gas was not in use due to the national shortage. HTH was being dosed informally in the final on-site reservoir. Due to the “makeshift” nature of dosing, contact time and dosing rate could not be determined. Free chlorine measurement was however frequently conducted.
8	**High lift pumpstation**	17.0	No stand-by pumpset available. Outflow meter no operational.
9	**Sludge treatment**	0.0	As the WTW was not designed with flocculation in mind no sludge treatment/handling facilities were available. Backwash water from the filters was released back into the Vaalharts canal downstream of the raw water off-take.
10	**Bulk pipeline from plant to command reservoir**	38.0	No leaks were observed, maintenance is typically reactive and not proactive, thus condition of the pipeline was unknown. Valve chamber was inspected and possible. Chamber flooded and manhole was not covered, and anyone can have access. Thus viewed as a risk.
11	**Command reservoir**	50.0	Command reservoir on-site, thus fenced, and secure. The reservoir and associated pump station will be the only functional infrastructure in use once the New Taung WTW is fully commissioned thus there are provisions for telemetry to be installed and connected for remote monitoring, as well installation of an outflow meter.
	Total	**18%**	

High risk areas OR Key Hardware Risks/ Defects

1. Raw water intake level insufficient for periods of low flow
2. Collapse of both filter modules
3. Effectiveness of disinfection (HTH dosing)
4. No flow measurement
5. No standby pumps

VROOM Refurbishment Cost Estimate

Civil Works	R325,600	18%
Mechanical Works	R1,270,500	71%
Electrical Works (Incl C&I)	R196,900	11%
Total VROOM Cost	**R1,793,000**	**100%**
R million / MLD		**1.28**

Regulatory Impression

The Bogosing WTW was in a state of complete disrepair. None of the unit treatment processes were operational. The main reason for the neglect observed at this plant is due to the construction of the new 11 Ml/day Taung WTW which was intended to have already been completed and commissioned and would result in the decommissioning of the Bogosing WTW. The Bogosing WTW site would consequently only serve as a pump station, supplying treated water to the area. Delays in the commissioning of the Taung WTW had forced the Bogosing WTW to remain in operation. At the time of the technical site assessment the Taung WTW was also visited and was partially operational. The construction of new WTW was completed with only minor issues remaining to be resolved. The official handover was imminent. The full operation of the new Taung WTW is expected to drastically improve water quality and assurance of supply to the Bogosing community. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	93.75%
Chemical Compliance	82.18%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

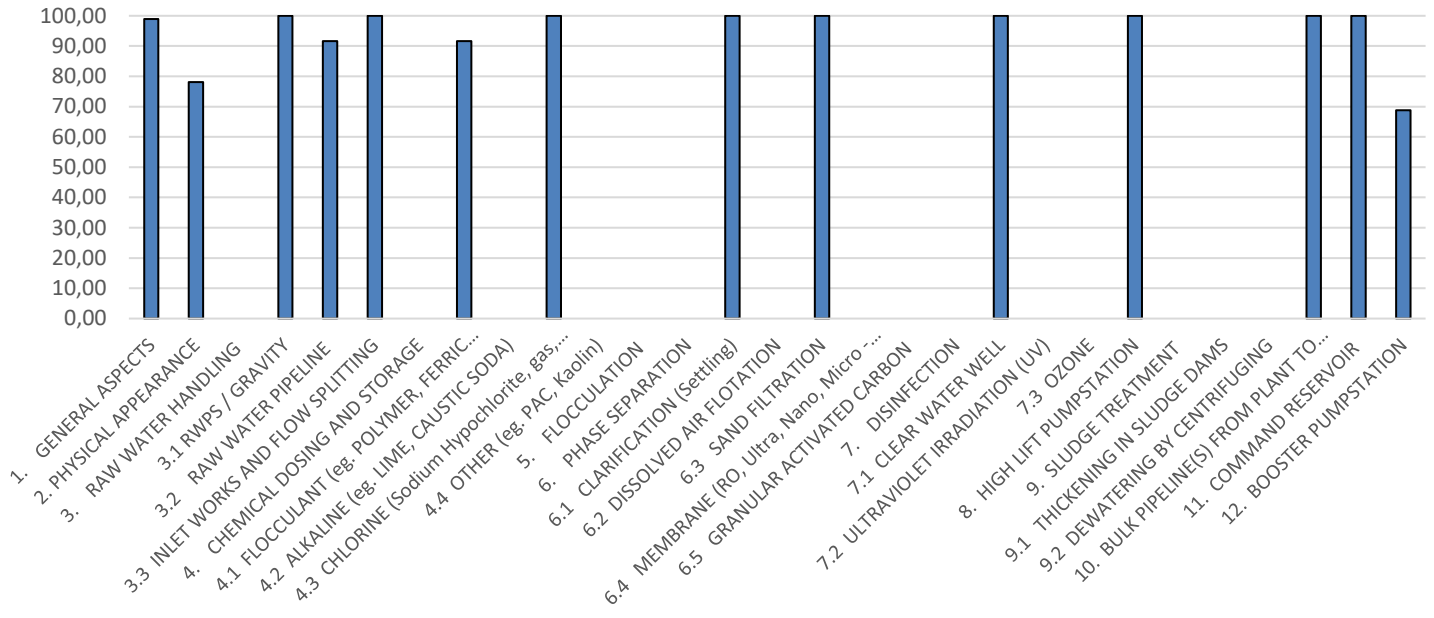
11.2 JB Marks Local Municipality

The Potchefstroom water treatment works was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

Potchefstroom TSA Score: 94%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram

Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	98.9	Classification certificate clearly displayed at administration building. Maintenance and Repairs and Operational log books available with relevant and up-to-date entries. The O&M/Procedure manual is done by Magalies Water and contains all relevant information and schedules. IMP available, up to date and displayed. All BD minimum requirements

Watch #	Process Unit Assessed	% TSA	Observations
			contained in IMP. Incident register completed and is up to date. Relevant contact details are visibly displayed. Turbidity, EC, and pH meter on site - all in working condition and calibrated. Jar testing frequency depends on raw water quality changes of turbidity. In cases of poor water quality, jar tests are conducted every 4 hours. Equipment is available on site and working. Process Controllers are well trained in the use of the Jar test equipment. Electricity consumption meter is accessible, and metering is done on a frequent basis. Meter is fully operational, and readings are recorded.
2	**Physical appearance of plant**	78.1	Facility is fenced with a gated entrance, fence in good condition and security during the night and over weekends. Roads is gravel but ease of access to the plant is available. There were no challenges in manoeuvring around the works and in accessing the plant. The site is neat and generally well kept. Grass is cut in some areas but other areas not. Paving is clean and generally void from grass. General housekeeping process can be optimized to improve the overall appearance of the treatment works. Rubble was visible around the works, and this should be removed to improve the overall appearance and tidiness of the treatment works. Workers have dedicated room for preparing lunches. Wash facilities are available. Ablution facilities are available. Condition of these facilities are poor and process controllers are not happy with the situation. New Process Controller facilities are in the Process of being built, but condition of current facilities are poor. Sufficient safety signs are visible at all relevant areas on the plant.
3	**Raw water handling**		
	Raw water pumpstation/ gravity fed	100.0	Screens are in place (2 manual and 1 automatic screen). Screens are cleaned on a regular basis (8 hourly) and solids are disposed at the dumpsite. Raw water flows into the works via gravitational flow through a canal.
	Raw water pipeline	91.7	Process Controller has the impression that leakages are minimal and regular pipeline inspections are undertaken and maintenance is continuous. Pipe networks have no cathodic protection. Old asbestos pipes are slowly being replaced with new PVC pipes. Flow meter was seen and its operational and in working condition. Flow records are captured once per shift and records are kept.
	Inlet works and flow splitting	100.0	Even flow splitting could be seen at the distribution structure. Flash mixing is occurring and dosing occur at the highest point of turbulence. Visual dripping of flocculant could be seen at, and dosing conditions can be monitored.
4	**Chemical dosing and storage**		
	Flocculant	97.7	Two dosing pumps are installed - both pumps are in working condition. The dosing pumps are configured for one to be in use and the other to serve as a standby pump. The area untidy, dirty and contains spillages. Housekeeping needs to take place at the works. Spillages can be contained within the dosing room. Ferric Chloride is being used to bring about the flocculation process. There is enough chemical to last for more than a month. The storage area is bunded and any spillages can be contained. An emergency wash is situated outside the dosing room. Wash area is fully operational.
	Chlorine	100.0	Four rotameters operational during audit - both flowing free. Two chlorinators are being used and four dosing units available. Standby available for each unit. Two scales are being used to monitor gas levels in the cylinders. Both are fully operational and automatic switch over is in place. Safety shower in place and working, mask available in safety box and each process controller has their own gas mask as well. Chlorine gas is being used and more than 30 days stock is available.
5	**Flocculation**	na	
6	**Phase Separation**		
	Clarification	100.0	Limited floc carry over was observed. Desludging of the units are done every 4 hours or as needed. The de-sludging takes place manually as needed. The weirs are in good condition and allow for an even overflow. No algae growth was visible in the launders obstructing flow of the water.
	Sand filtration	100.0	Five backwash pumps are installed and all in working condition, 2 are currently being used and 3 are on standby. Both air blowers are in working condition, 1 is currently being used and one is on standby. An even overflow at all the outlet boxes are seen which indicates good flow distribution. Backwashing frequency of every filter is every 8 hours. Media looks in good condition with no visible signs of cracks. No mounds or uneven distribution of media was seen. The filters gallery is in good condition - all handrails in place. Walls are hosed down after backwashing. Handrails were being painted at the time of the inspection.
7	**Disinfection**		
	Clear water well	100.0	The contact time in the on-site reservoir is more than 30 minutes. Chlorine is dosed at entry of filtered water into CWW. Flows through reservoir (baffled) and then measured at the end of the tank, just before being pumped away into the command reservoir.
8	**High lift pumpstation**	100.0	Two pumps are installed, and all are operational. The pumps switch on/off in sequence, with a 50% standby available. Electric flow meter was seen, and both were operational. Flow records captured and records are kept.
9	**Sludge treatment**	na	Not assessed
10	**Bulk pipeline from plant to command reservoir**	100.0	The main bulk line feeding the command reservoir is equipped with cathodic protection. Pipes are in good condition and minimal leakages are experienced. Old asbestos pipes are being replaced with PVC pipes.

Watch #	Process Unit Assessed	% TSA	Observations
11	**Command reservoir**	100.0	The 25 ML reservoir is gated, and the fence is in good condition. Security (24 Hours) is available at the reservoir. The structure is in a good condition. The process controller reported that the telemetry is operational and controlled. Flow meter is operational. The total flow is compared to the total flow pumped from the WTP on a weekly basis
12	**Booster pumpstation**	68.8	Three pumps are present and fully operational. An additional 2 pumps sent in for repairs. There's 50% standby available. Signage was not visible around the pump station. Building is not secure, and door is dilapidated and broken. Maintenance needs to be done. MCC were in good condition, but minor housekeeping could be done.
	Total	**93.7%**	

High risk areas OR Key Hardware Risks/ Defects

1. Minor housekeeping to be done around the works and grass cutting process to be optimised.
2. Cleaning and housekeeping needs to be done around the dosing pumps.
3. Backwashing needs to be made automatic to allow for timeous and reliable backwashing to take place.
4. Housekeeping needs to be done at the booster pumpstation and building should be made more secure, and door should be replaced.
5. Old asbestos pipes should be replaced with new PVC pipes.

VROOM Refurbishment Cost Estimate

Civil Works	R2,483,800	100%
Mechanical Works	R0	0%
Electrical Works (Incl C&I)	R0	0%
Total VROOM Cost	**R2,483,800**	**100%**
R million / MLD		**0.03**

Regulatory Impression

Potchefstroom water treatment works receives water from Mooiriver water system, it supplies the areas of Dassierand, Baillie Park, Ikageng, Promosa, Central CBD, South, Miederpark, Grimbreek Park, Ext 7, Ext 11, Sarafina, Muiskraal, Potchefstroom, Rysmierbult, the estimated population of 189,000. The WTW produces 73,000 Kl/d of water to these areas. The WTW is registered with the Department of Water and Sanitation and classified as a Class B, it is operated by competent personnel, outsourced to Korone Engineers for operations and maintenance contract which also includes electrical and mechanical maintenance. The WSA also has a functional internal maintenance capacity and technical team made up of technicians and technologists to assist with asset management and maintenance planning. Drinking water quality is monitored in accordance with SANS 241 and there is consistent submission of drinking water quality results to the Department regulatory information system (IRIS). Drinking water quality compliance is of high quality with microbiological compliance of 99.22% and chemical (acute) compliance of 98.3% and consumers may use the water with high level of confidence. A Water Safety Plan is in place and is updated regularly to cater for new risks identified and in addition it is linked to the IDP process and budget process to ensure that adequate budgets are provided for operations and maintenance of water related activities.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	99.22%
Chemical Compliance	98.30%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



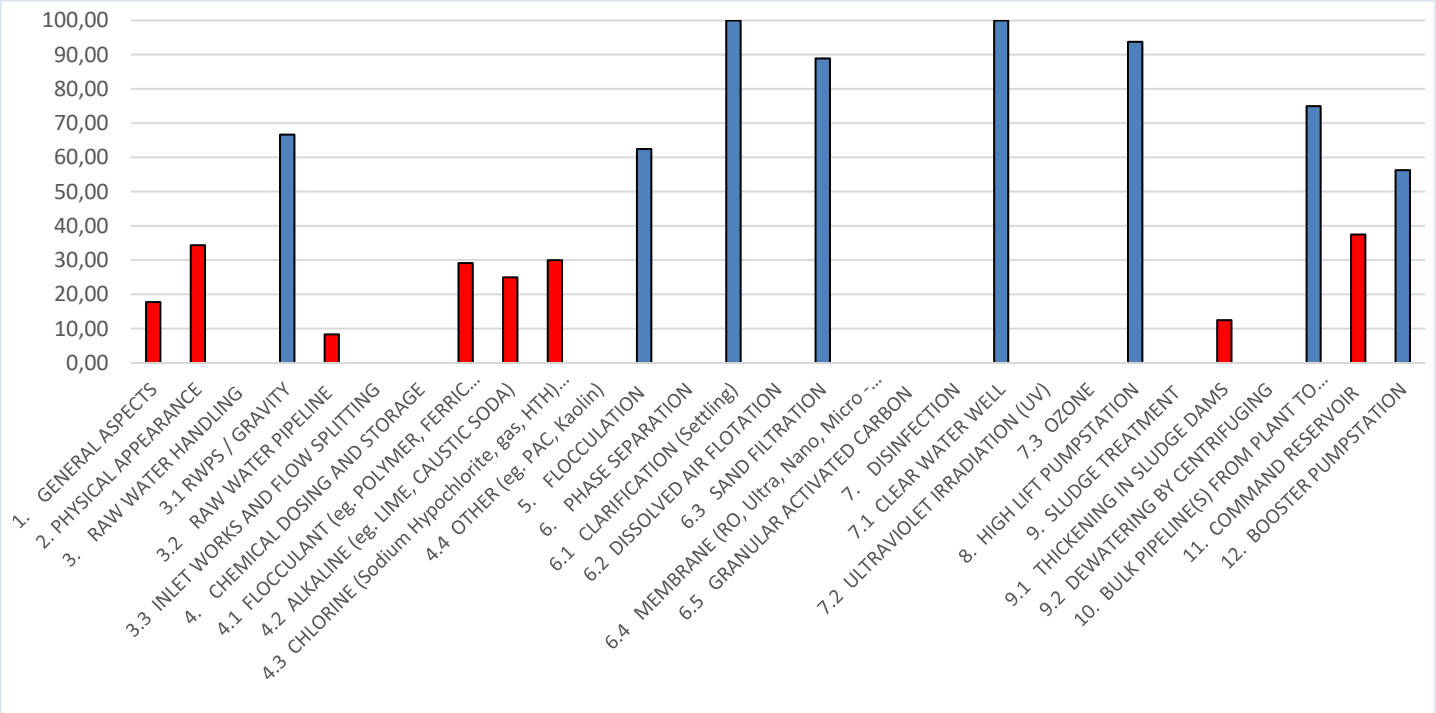
11.3 Kgetlengriver Local Municipality

The Koster water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

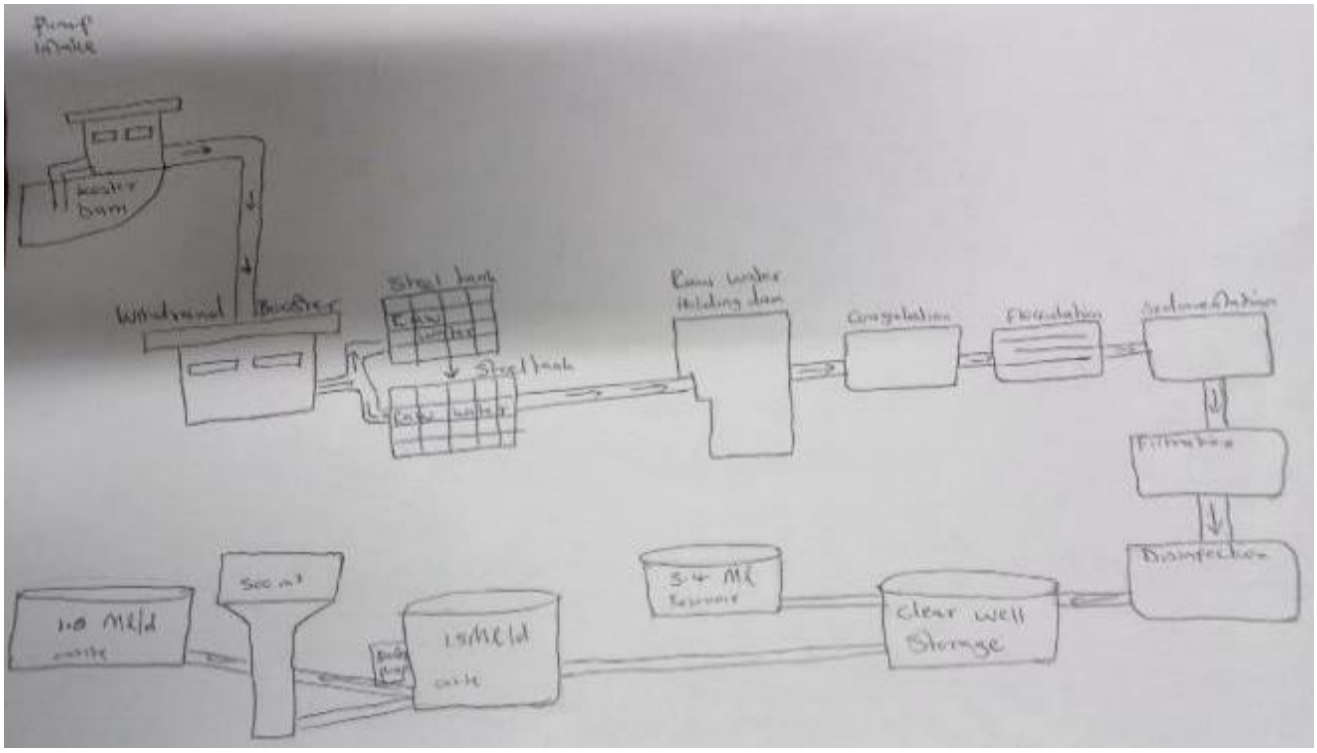
Koster WTW TSA Score: 44%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	17.8	Class C Water Treatment Works and Process Controllers certificates were displayed in the office. There is no maintenance and repairs logbook at the treatment works. Only turbidity is analysed on Mondays, Tuesdays, and Fridays. However, results were not resented, and the testing equipment is not calibrated.
2	**Physical appearance of plant**	34.4	The entrance is not signposted. The surrounding is reasonably clean but there is room for improvement. There was some vegetation observed. Facility is fenced and there is no access to animals and public. Major OHS contravention that needs intervention.
3	**Raw water handling**	8.3	There are 2 raw water pumpstations, one is situated at Koster dam, and it supply the Witrand pumpstation which feed into Koster WTW holding dam. The holding dam is equipped with 2 raw water pumps. The Process Controller expressed that there is a lot of leakages on the raw water pipeline. Currently there is a project to replace the pipeline. There is no incoming flow meter in place. Chemical dosing is not effective as the stirrers were not working and lime is dosed manually using a bucket.
	Raw water pumpstation/ gravity feed		
	Raw water pipeline		
	Inlet works		
4	**Chemical dosing and storage**		
	Flocculant	29.2	There is only 1 pump installed and in a working condition. There are no standby pumps in place. there is not enough available Sudfloc 3480 quantity to last for 30 days. The chemical storage area is bunded however, is not well maintained. There is no emergency shower and eyewash are installed at the water treatment works.
	Alkaline	25.0	There are two lime dosing pumps, and the dry feeders are not operational. Poor housekeeping in the lime storage room was observed. The water treatment doses 2 bags of lime daily and there were more than 60 bags onsite during the assessment.
	Chlorine	30.0	The chlorine gas dosing unit is not operational due to unavailability of chlorine gas. There are 2 dosing pumps, one on duty and standby, however, they were not operational. The chlorine gas stock was not available onsite since 23 January 2023. HTH was being dosed manually in the flocculation channel.
5	**Flocculation**	62.5	The flocs were visible at the end of the flocculation channel. There was agal attachment on the wall and there was visible scum on the surface.
6	**Phase Separation**		
	Clarification (settling)	100.0	There were minimum flocs on the clarifier and good settling was observed. Desludging takes place twice a day. The discharging holes are in good condition. The surface of the clarifiers is free of growth.
	Sand filtration	88.9	There are 4 sand filters in place. The flow is evenly distributed to the filter boxes. There are 4 backwash pumps installed and all were operational. 2 pumps on duty and 2 on standby. There are 3 compressors and 2 blowers, and they are all functional. There was evidence of air leakage observed on the nozzles in filter 3 and 4.
7	**Disinfection**		
	Clear water well	100.0	There are 3 onsite reservoirs which serves as contact tanks and the contact time is more than 30 minutes.
8	**High lift pumpstation**	56.3	There is 1 High lift pump installed and in working condition. There is no standby pump in-place.
9	**Sludge treatment**		
	Thickening in sludge dams	12.5	There are sludge dams onsite, and they are not well maintained as one of them is filled with reeds. Sludge dams have not been emptied in the past 5 years. There is 1 recycling pump, and it is operational.
10	**Bulk pipeline from plant to command reservoir**	75.0	The WSA has not done the pipeline inspection on the bulk pipeline, however constant leakages have been reported.
11	**Command reservoir**	37.5	The command reservoir is situated within the WTW premise. There is a security guard onsite and there is proper access control. The facility is fully fenced, and gate is lockable.
12	**Booster pumpstation**	56.3	There is tower reservoir which is equipped with 1 pump. There is no standby. There is well constructed pump house which is well ventilated. There was no signage and leakage were observed. MCC is in good condition
	Total	**44%**	

High risk areas OR Key Hardware Risks/ Defects

1. The flocculant and chlorine gas were not available at the plant and only HTH was available.
2. HTH is only dosed in the flocculation channel manually using a bucket and final water is not dosed and it poses a health risk to the consumers.
3. There is no sufficient operational water quality monitoring. Unavailability of calibration standards for turbidity and pH meters.
4. There is poor maintenance of electrical and mechanical equipment such as pumps, lime feeders and chlorine scales.

5. Lack of accountability between the WSA and WSP e.g. the WSP collects samples, but the results are not shared with the PCs or plant supervisor.

VROOM Refurbishment Cost Estimate

Civil Works	R34,950,300	94%
Mechanical Works	R1,962,400	5%
Electrical Works (Incl C&I)	R447,700	1%
Total VROOM Cost	**R37,360,400**	**100%**
R million / MLD		**6.23**

Regulatory Impression

DWS is concerned that the Kgetlengrivier Local Municipality has shown no improvement in this assessment cycle. Operational monitoring should be implemented, and records maintained on site. The plant supervisor should update the process controllers after reviewing the logbooks of outcomes and incidents. Testing equipment should be calibrated on regular basis to verify the accuracy of the results. The volume of water treated is not metered and there are several outflow meters at the outlets of onsite reservoir and the precise amount is unknown. For the compliance monitoring program, only four months of data were submitted to IRIS. The Municipality is urged to report the drinking water quality results regularly to the Department of Water and Sanitation on the IRIS to ensure continuous management of information. Poor housekeeping was observed at the plant and there are a lot of mechanical and electrical failures at the plant even though Magalies is appointed for the O & M of the plant. There was also shortage of flocculant and unavailability of chlorine gas. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	90.48%
Chemical Compliance	93.31%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





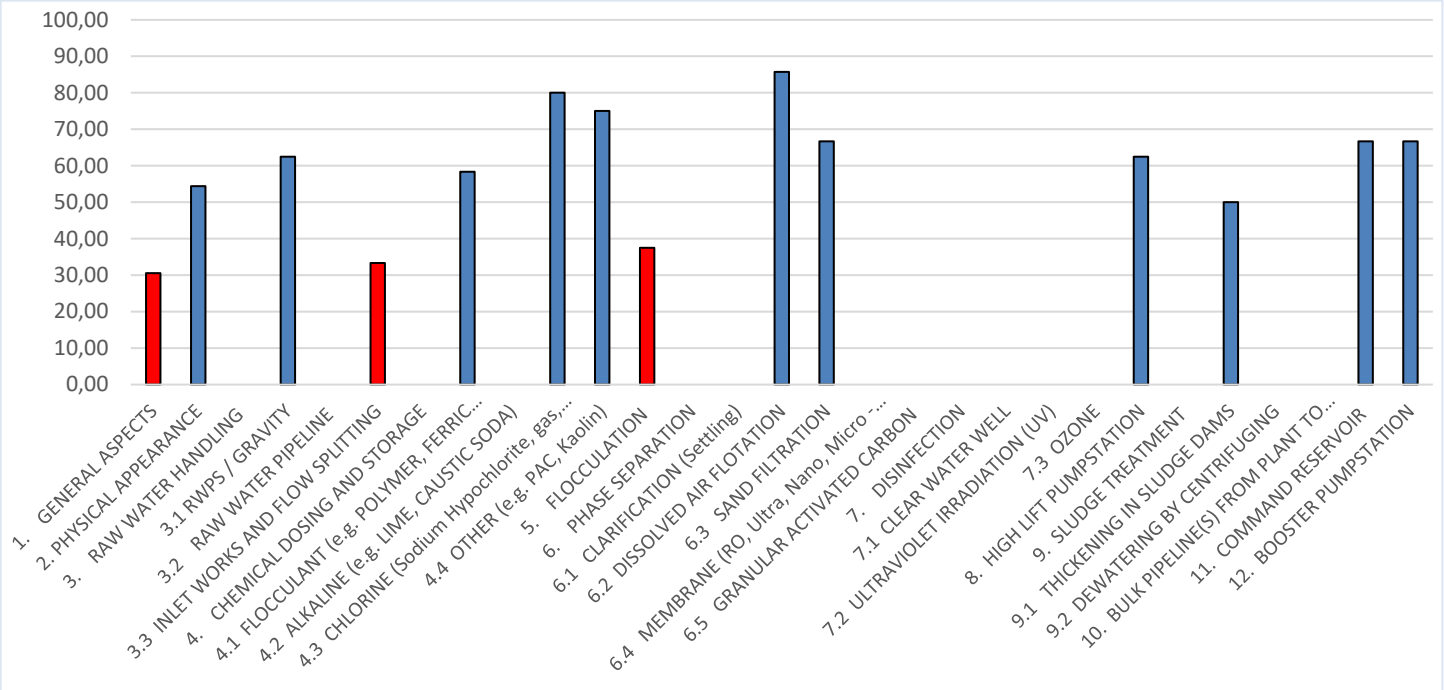

11.4 Madibeng Local Municipality

The Schoemansville water treatment works in Hartbeespoort was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

Schoemansville TSA Score: 57%

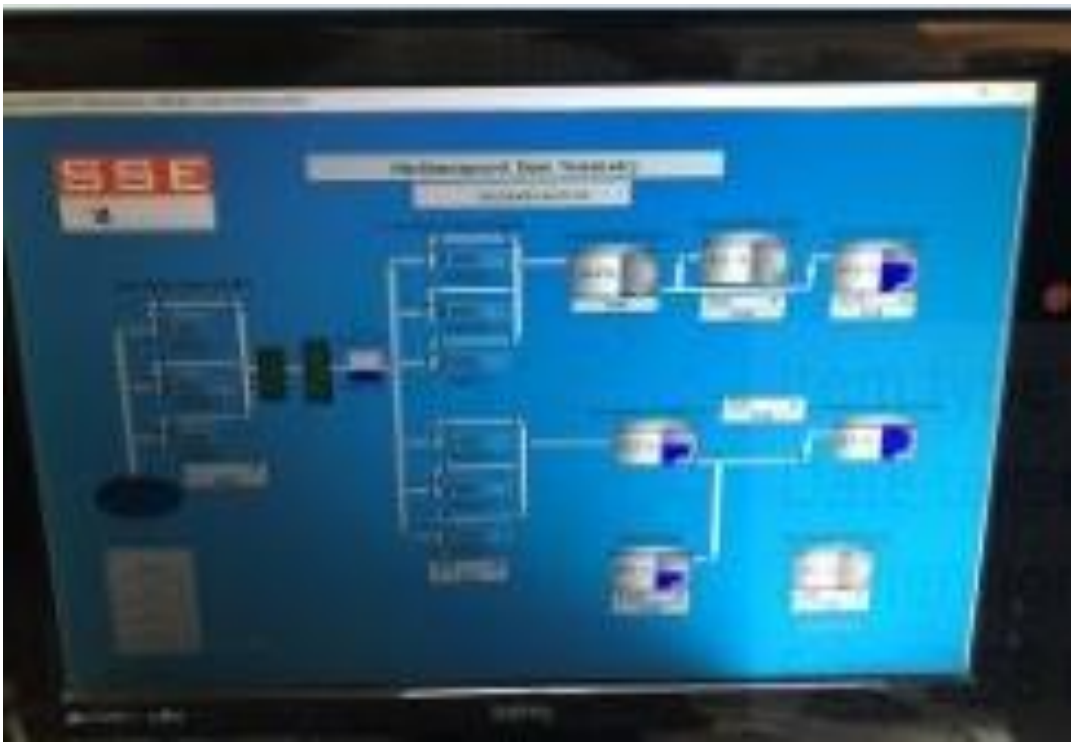
Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram

The Process Flow Diagram is not available, only the schematic display on the SCADA system.



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	30.6	Class B WTW. Operational logbook with daily entries available. Operation and Maintenance manual, maintenance and repairs logbook and Incident management procedures and contact list were not available. Process monitoring equipment is present but not calibrated. The jar tester is still in its box and never used.
2	**Physical appearance of plant**	54.3	Facility is fenced with security on site. The garden and terrain are not maintained. The structure and buildings of the plant seems to be solid, with the workers' bathroom in a fair condition. Roads are in a fair condition, but with grass growing through the pavement, this is not going to keep in future. Very few safety signs available.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	62.5	The inlet is managed by DWS. Two raw water pumps in use. The standby pump available but not connected to any pipeline.
	Raw water pipeline	0.0	The PC has no knowledge of the condition of the underground pipeline. The flow meter not working, and the flow rate/volume was not recorded, converted, and interpreted.
	Inlet works	33.3	Flash mixing was not effective as dosing was not done at the point of turbulence. The dosing pipe network are blocked, and a tube is used as a bypass to dose flocculent.
4	**Chemical dosing and storage**		
	Flocculant	58.3	Dosing area fair, but spills cannot be contained. Storage area was not bunded. Two pumps, both in working condition, with a 100% standby available. Emergency shower is close by, but without any water.
	Chlorine	80.0	Safety equipment NOT in a working condition. Doors to the chlorine dosing unit open, windows broken/PPE in office/little safety signs. Chlorine gas cylinders stored in an open storeroom. Two dosing pumps, both in working condition, with 100% standby available.
	Other (PAC, Kaolin, etc.)	75.0	There was sufficient PAC storage for more than 30 days. General housekeeping is poor. Two dosing units (dry feeders) installed but could not be verified as it was not in use during the site visit.
5	**Flocculation**		Civil condition good, but with scum accumulation. Flocs not clearly observed at the end of the channel.
6	**Phase Separation**		
	Dissolve air floatation (DAF)	85.7	Two recycle pumps installed and working, with 100% standby available. Two air compressors installed and working, with 100% standby available. Fine bubbles was observed and de-sludging is done once per day. The saturator was not serviced in the last 12 months.
	Sand filtration	66.7	General housekeeping was good. The filter media needs replacement. Block nozzles at Filter no 2 should be serviced. All backwash pumps installed were not in a working condition. 1 pump was out for service. Two air blowers installed and working with 100% standby available.
7	**Disinfection**		
	Clear water well	0.0	Chlorine contact time in not known. The size of the clear water well is unknown. The pipeline to the command reservoir is less than 1000 meters, making the contact time of 30 minutes unlikely.
8	**High lift pumpstation**	62.5	Three pumps available, two in use and a 30% standby available. Outflow is measured but none of the meters are calibrated. The flow rate is recorded daily but no data conversion is done.
9	**Sludge treatment**		
	Thickening in sludge dams	50.0	Three sludge dams in a good condition. The dams were cleaned in 2019, the fire department just flushes the sludge into the environment. The supernatant is not recycled.
10	**Bulk pipeline from plant to command reservoir**	Na	The condition of the bulk pipeline was not inspected.
11	**Command reservoir**	66.7	The command reservoir is in a good condition and the top is closed. The reservoir is not fenced. Telemetry is in place to monitor the level of the water. No information on flow measuring is available.
12	**Booster pumpstation**	66.7	There is only one pump available at the Cosmos pump station. The building is secure. The VSD was not assessed.
	Total	**57%**	

High risk areas OR Key Hardware Risks/ Defects

1. The chlorine dosing facility should be upgraded as a matter of urgency.
2. Service blocked filter nozzles and replaced the filter media.
3. The flocculant dosing lines to be unblocked to aid better dosing.
4. Introduce safe sludge handling procedures.

5. All monitoring equipment should be services / calibrated, with sufficient reagent available to monitor the treatment process.
6. Improve general housekeeping.

VROOM Refurbishment Cost Estimate

Civil Works	R775,500	19%
Mechanical Works	R3,364,900	81%
Electrical Works (Incl C&I)	R17,600	0%
Total VROOM Cost	**R4,158,000**	**100%**
R million / MLD		**0.41**

Regulatory Impression

The Schoemansville WTW is situated on the shore of the Hartbeespoort Dam, less than 100 meters from tourist attractions – the cable way, restaurant, hotel, guest houses; with the Hartbeespoort Snake and Animal Park and several residences well within a radius of 300 meters. Chlorine gas is used as disinfectant at the WTW. There is NO safety measures in place regarding the handling of chlorine. The chlorine dosing unit is not isolated, doors stand open, and windows are broken, full cylinders are stored in an open room. There are no functional gas leak detectors, no alarm / siren, no windsock, no marked assembly points. The WTW is in urgent need of general maintenance and housekeeping. All measuring equipment should be calibrated to aid the control of processes.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	95.19%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



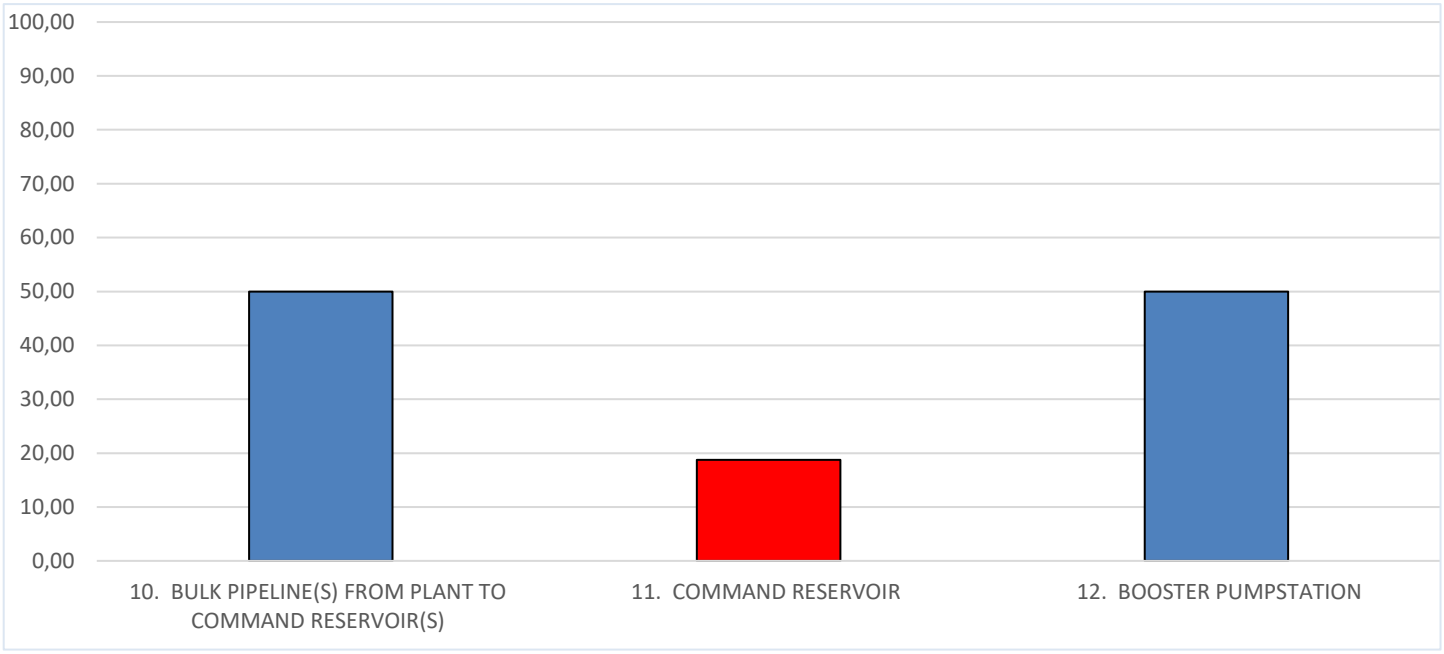

11.5 Maquassi Hills Local Municipality

The Leeudoringstad-Witpoort water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

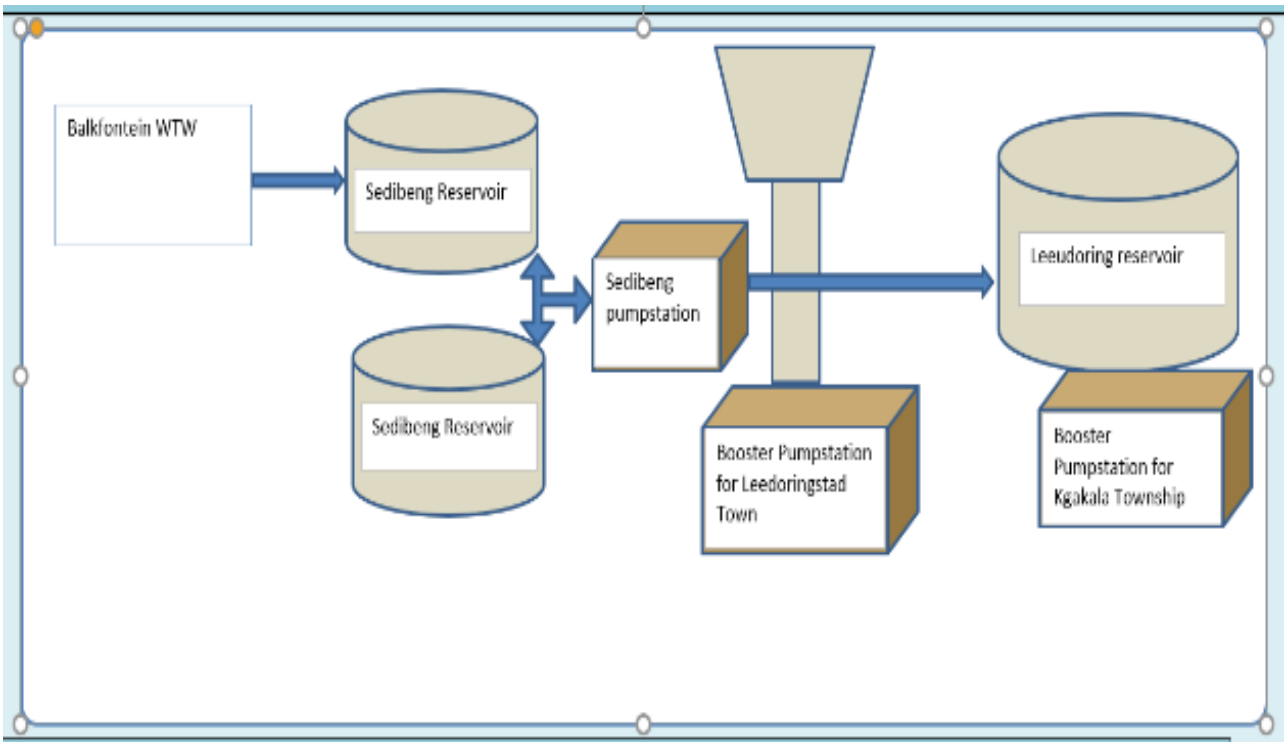
Leeudoringstad Reservoir and Pumpstation TSA Score: 36%

Performance Profile of the Water Distribution System

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
10	**Bulk pipeline from plant to command reservoir**	50.0	No major leaks or problems were reported for the pipeline from the works to the reservoirs. No proof provided.
11	**Command reservoir**	18.8	There is no telemetry at the reservoir only at the Sedibeng's facilities. There is no flow meter at the reservoir and the volume that is supplied to the consumer is unknown. The structure of the reservoir is intact, though needs to be maintained. The area around the reservoirs also needs to be maintained as it has overgrown vegetation which is a Health and safety hazard.
12	**Booster pumpstation**	50.0	There are 2 pumpstations at the reservoir, 1 is supplying Leeudoringstad town and 1 is supplying Kgakala township. Each is equipped with 2 pumps. Only 1 of each pump is working. There are no standby pumps. MCC for both pumpstations are in good condition. Signage not available.
	Total	**36%**	

High risk areas OR Key Hardware Risks/ Defects

1. Overgrown vegetation at the command reservoir is a safety hazard.
2. Pump leakage contribute significantly to the structural integrity of the pump house.
3. The lack of a backup generator during load shedding contributes to a water supply shortage.
4. There are no backup pumps, putting the water supply in jeopardy.
5. There is no planned project/maintenance for the booster pump station and the reservoir.

VROOM Refurbishment Cost Estimate

Civil Works	NA	%
Mechanical Works	NA	%
Electrical Works (Incl C&I)	NA	%
Total VROOM Cost	**NA**	**%**
R million / MLD		**NA**

Regulatory Impression

The Maquassi Hills Local Municipality has shown a complete lack of commitment to the Blue Drop certification program. The pumpstations need proper maintenance, and the pumps are operating without standby, jeopardizing the region's water supply. Due to water loss that was seen in the pumpstations and command reservoir, the municipality is constantly experiencing water shortages, which is causing riots. The surrounding area is overgrown with vegetation and it's a safety hazard to the personnel. There is also no signages available. The municipality do not have a Water Safety Plan as per SANS 241:2015 and WHO guidelines.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	97.81%
Chemical Compliance	98.48%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



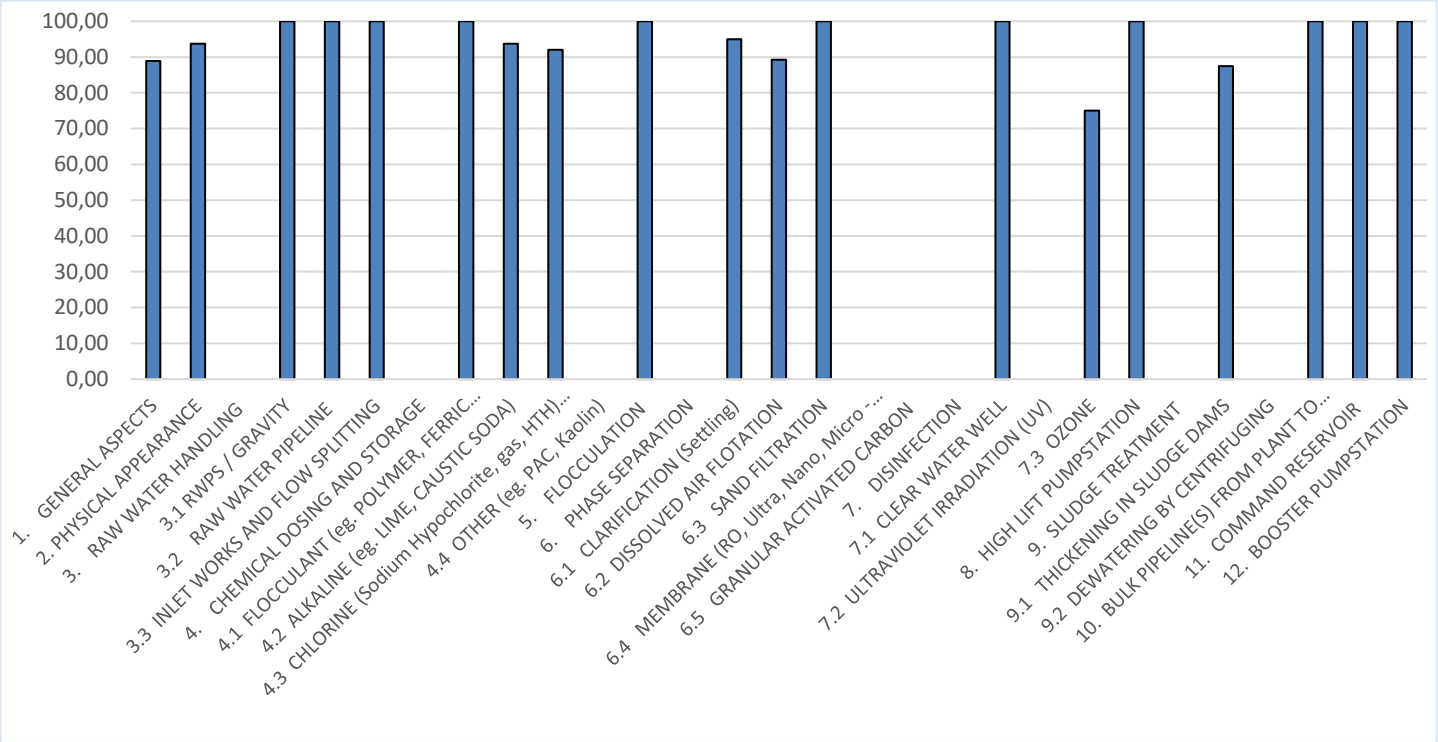

11.6 Matlosana Local Municipality

The Midvaal water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

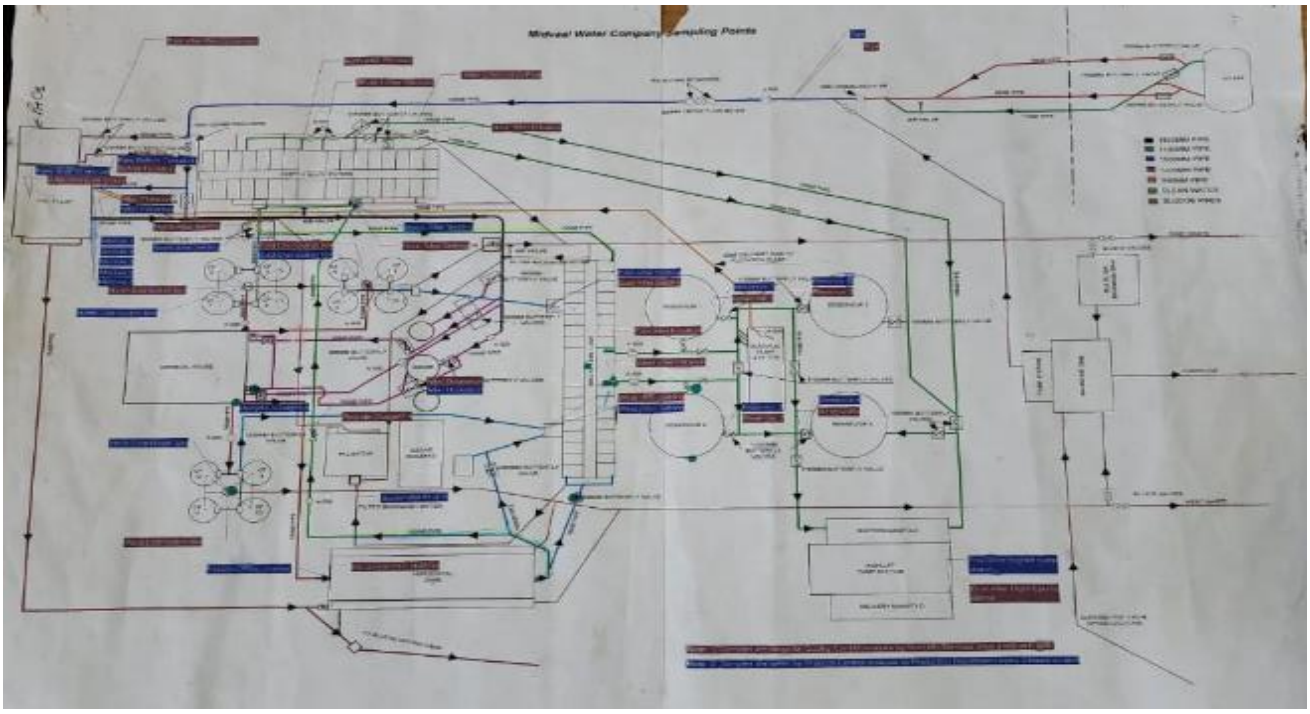
Midvaal Water WTW TSA Score: 95%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	88.9	Class A plant, logbooks in place, Maintenance team logbook is not available onsite. PFD displayed on the wall. Excellent signage at gate and the surrounding area.
2	**Physical appearance of plant**	94.0	The garden is well maintained, and the grass is cut. Good housekeeping observed. Fully fenced with proper access control. Personnel are satisfied with the working conditions.
3	**Raw water handling**		Raw water abstraction from Vaal River, there are 6 raw water pumps in total. 3 are from East and 3 from West. 2 duty and 4 on standby. The pumps are in good conditions and no leaks were observed. flocculant chemical in stock, good flash mixing conditions, 2 Inflow meters for East and West in place. Both are functional. Electrical panel and cabling in good condition.
	Raw water pumpstation/ gravity feed	100.0	
	Raw water pipeline		
	Inlet works		
4	**Chemical dosing and storage**		18 tone of poly Ultra floc 500, Ferric chloride. Ferric Sulphate and it is sufficient for 30 days. 14 pumps running and 8 standbys for pre and post dosing. Dosing area was neat and good housekeeping observed. There was one which was leaking however, it was repaired. Emergency shower at ground level and upper level next to the primary dosing point.
	Flocculant	100.0	
	Alkaline	94.0	2 silos equipped with 2 mixing pumps both are working. 1 duty and 1 standby. the slurry tanks are equipped with 4 stirrers, and all were working. The silos are used on a regular basis, and lime bags are used as a backup in the event of mechanical or electrical breakdowns. There is plenty of stock that last for 30 days. In 2021 an average of 52.8 tons/month and in 2022 an average of 62.9 tons/month was used.
	Chlorine	92.0	Two rotameters operational during audit - both flowing free. 4 chlorine cylinders were connected. 2 duty and 2 standbys. Safety shower in place and working, fans working, masks in safety box. Chlorinator was set on 6 kg/h for the east and western side. This is 3700 kg/month. WSI has 4 cylinders connected with automatic switch over. 4 of 925 kg spare cylinders on site. More than 30 days storage.
	Other (PAC, Kaolin, etc.)	na	There is no unit for PAC however, there are bags of PAC which are available onsite and are dosed when there is ordo and too many algae coming into the plant.
5	**Flocculation**	100.0	The flocs were visible at the end of the flocculation channel. The overall condition of the flocculation unit is good and has no visible sludge nor algae.
6	**Phase Separation**		No carry over observed, and channels were in good condition. De-sludge only once per day. automatic desludging every 45 min. The lauders were covered with algae that may prevent even and free flow. however, they are cleaned ever shift.
	Clarification (settling)	95.0	
	Dissolve air floatation (DAF)	89.0	There are 5 pumps in good condition. 1 standby. The pumps alternate every week. Two of the 3 available compressors serve as a standby. There are fine bubbles observed on the surface of the 5 DAF units. Marker level were high in all 4 DAF units which resulted in large, isolated bubbles. De sludging of the sludge layer is done once per shift. Floating materials had accumulated at the inlet of some of the DAF units. The next service date is the 14th of June 2023.
	Sand filtration	100.0	Two pumps installed and they alternate every week. 2 Air blowers installed. Even bubble distribution of air during backwash. Backwashing done Once per shift.
7	**Disinfection**	100.0	Contact time was reported to be 1h20 min by the process controllers.
	Clear water well		
	Ozone	75.0	There are 3 compressors, 1 was not operational. There other 2 are working on 1 duty and 1 standby. There are 3 ozonators, 2 working and 1 not working.
8	**High lift pumpstation**	100.0	There are 3 pumps installed and in working condition. 2 operational 1 standby basis. outflow meter in-place.
9	**Sludge treatment**		There are 3 sludge lagoons. Fair indication of reeds. One pond has just been cleared
	Thickening in sludge dams	88.0	
10	**Bulk pipeline from plant to command reservoir**	100.0	The bulk pipeline is in good condition. No leakages reported.
11	**Command reservoir**	100.0	Midvaal Water: The 10 Ml reservoir is gated, and the fence is in good condition. No security at the gate but there is an alarm installed triggered by movement. There is a telemetry is operational and controlled by the level sensor. The flow is verified through the SCADA system. The structure is in a good condition and the reservoir was covered.
12	**Booster pumpstation**	100.0	No comment
	Total	**95%**	

High risk areas OR Key Hardware Risks/ Defects

1. Marker level from the Saturator was causing a large, isolated bubble in the DAF unit.
2. There is a carryover of debris flowing to the DAF unit.
3. The maintenance logbook was not presented during the inspection.
4. The filter room, chemical room, and chlorine room are old infrastructure and paint was peeling off.
5. Midvaal Water and their delivery network are in a dangerous area of the zama zamas, and the risk of being attacked increases at night.

VROOM Refurbishment Cost Estimate

Civil Works	R46,200	1%
Mechanical Works	R3,572,800	99%
Electrical Works (Incl C&I)	R0	0%
Total VROOM Cost	**R3,619,000**	**100%**
R million / MLD		**0.01**

Regulatory Impression

The Department would like to commend the Midvaal Water Company in terms of the dedicated and competent teamwork and they highly organised. The plant and the surrounding are well maintained, and good housekeeping was also observed. Despite the poor raw water quality from the Vaal River, the plant produces an excellent quality drinking water to the consumers. The process controllers understand their duties and each unit process has a logbook in which the findings from each shift are recorded. Midvaal Water is also commended for its work on a pilot project to use chlorine dioxide as a disinfectant while NCP is experiencing a chlorine gas shortage. Although there are operational issues with the DAF and Ozone units, they are recognized, and a plan is in place to address them.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	99.03%
Chemical Compliance	98.74%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





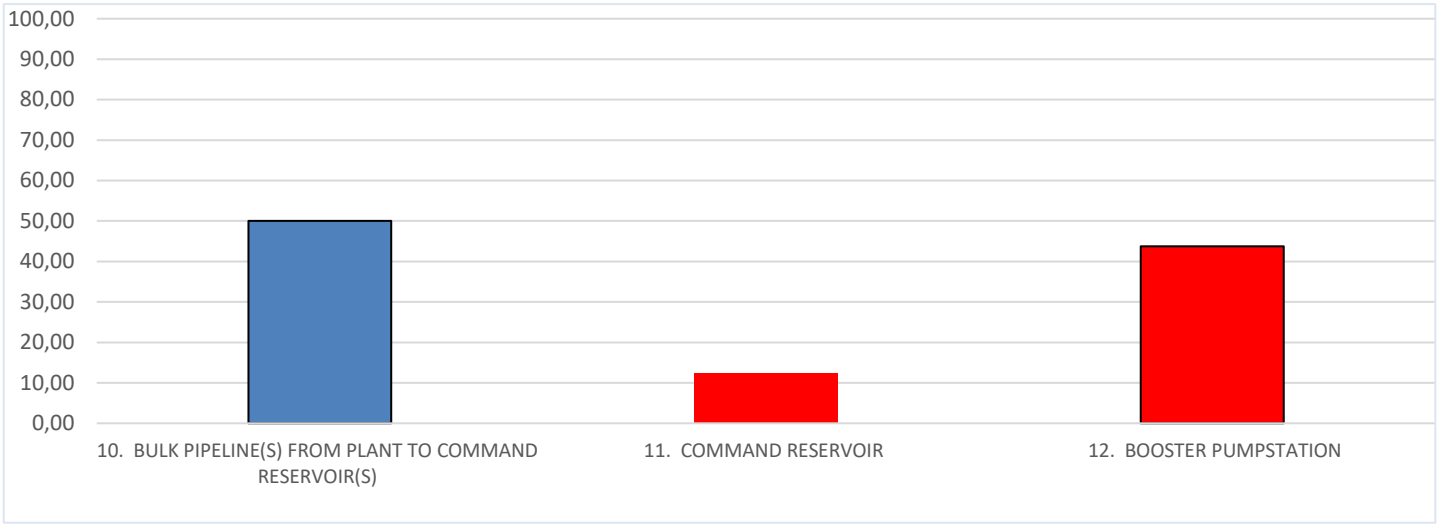
11.7 Moretele Local Municipality

The Mothibestad Booster Pumpstation and command reservoir was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

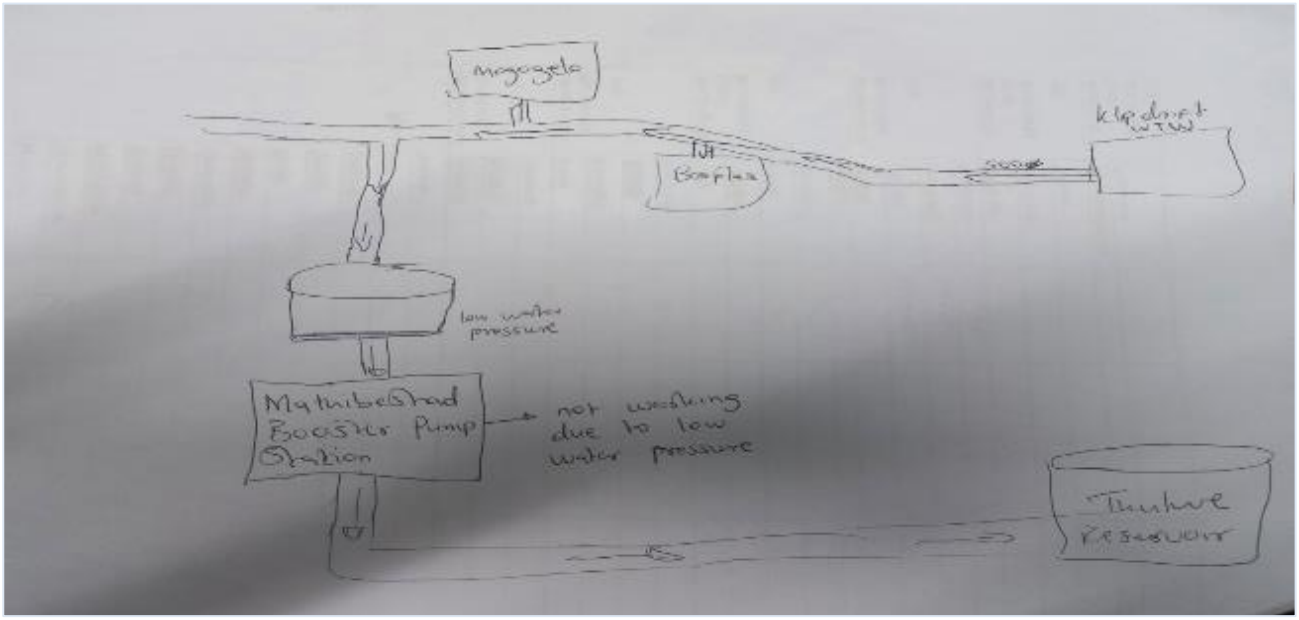
Mothibestad Booster Pumpstation and command reservoir TSA Score: 31%

Performance Profile of the Water Distribution System.

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
10	**Bulk pipeline from plant to command reservoir**	50.0	No major leaks or problems were reported for the pipeline from the works to the reservoirs. The incident register was not provided for the reticulation network from the municipality side.
11	**Command reservoir**	12.5	There is a security guard onsite and there is proper access control. The facility is fully fenced, and gate is lockable. The surrounding is not well maintained and was overgrown with vegetation. There is no telemetry, and the reservoir were not operational. The structure is intact however, due to unavailability of flow it could not be verified. The top of the reservoir was not assessed.

Watch #	Process Unit Assessed	% TSA	Observations
12	**Booster pumpstation**	43.8	Two pumps have been installed, but they are not operational due to low water pressure in the pipeline and leaking reservoir. There is well constructed pump house which is well ventilated. There was no signage. MCC are in good condition
	Total	**31%**	

High risk areas OR Key Hardware Risks/ Defects

1. There is no command reservoir and drinking water cannot be stored leading to shortage of water supply.
2. Booster Pumpstations were never operational since their construction.
3. All nine reservoirs at the reticulation network are empty and water is consumed directly from the pipes.
4. Network study or condition assessment has not been conducted for Temba Water Supply System.
5. Poor management of project which led to non-functional equipment.

VROOM Refurbishment Cost Estimate

Civil Works	NA	%
Mechanical Works	NA	%
Electrical Works (Incl C&I)	NA	%
Total VROOM Cost	**NA**	**%**
R million / MLD		**NA**

Regulatory Impression

There are 9 reservoirs in total within the jurisdiction of Moretele LM and reticulation network has a challenge with water demand and low pressure. There is no command reservoir and bulk water that is supplied by Magalies Water is not able to feed into all 9 reservoirs of the Moretele LM. All reservoirs were empty, and it contribute to water shortages. The civil structure of the inspected reservoir was in good conditions and no cracks were observed. The booster pump station is not operational due to low water pressure. Booster's pumps not functional and never operated since they were constructed. The manager Water and Sanitation reported that it is due to low water pressure. The municipality must repair the leak at the reservoir and cut. Microbiological compliance is 0%, raising serious concerns about the lack of microbiological drinking water quality data on IRIS and the subsequent risk to Moretele Local Municipality water supply system users. There is currently no Water Safety Plan in place. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	86.20%
Chemical Compliance	84.15%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





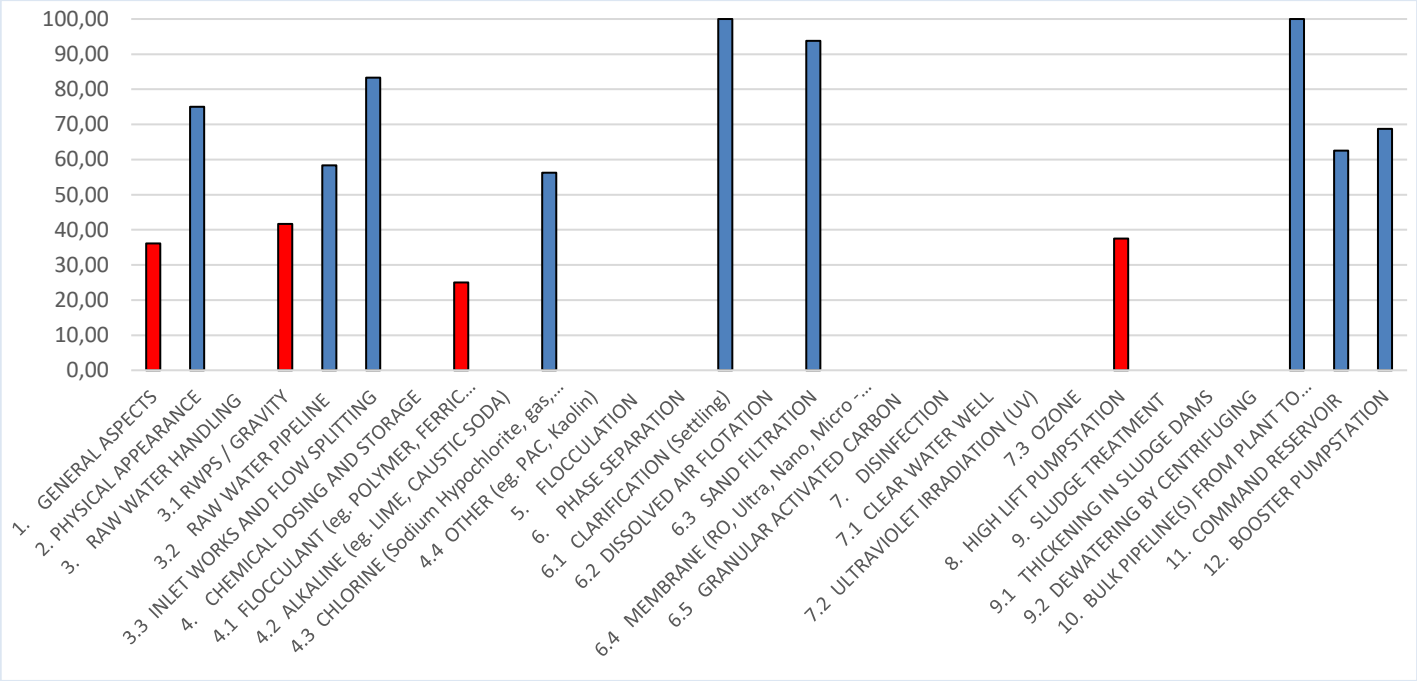
11.8 Moses Kotane Local Municipality

The Madikwe water treatment works was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

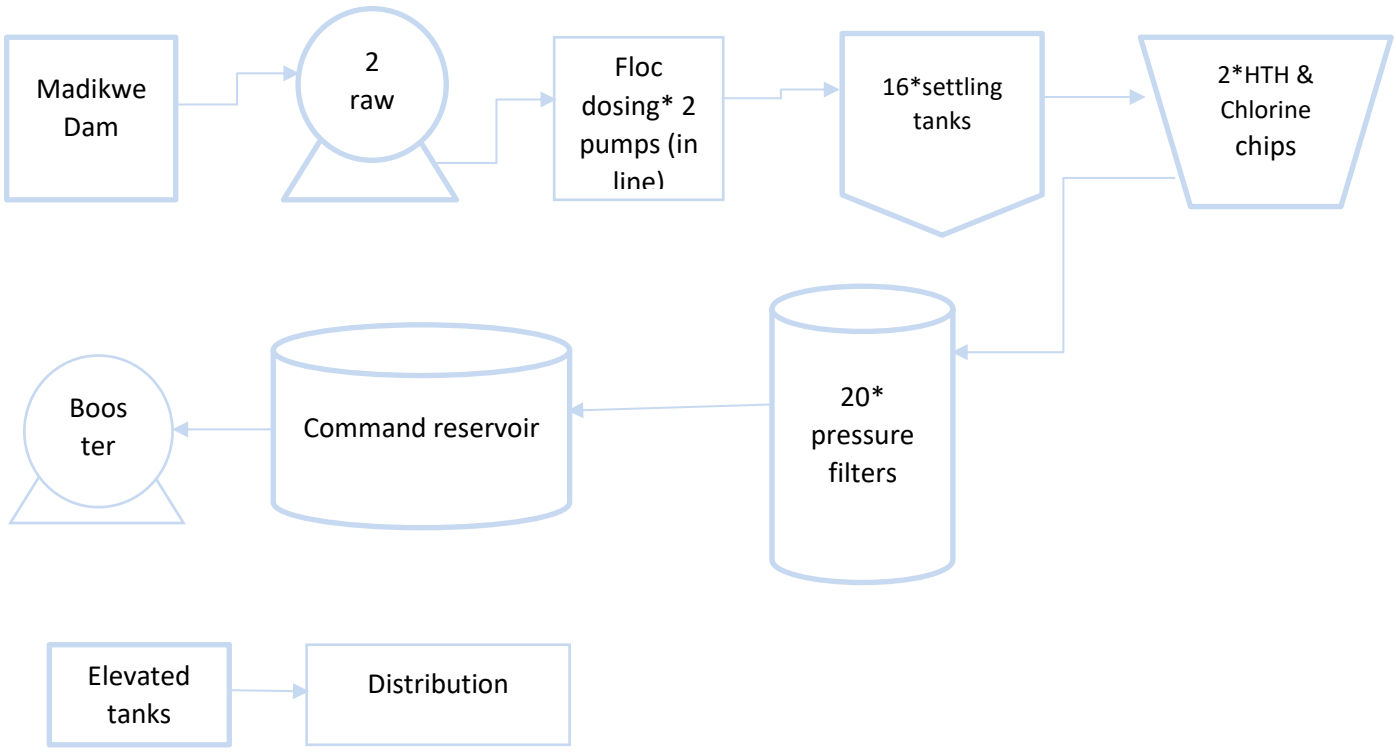
Madikwe TSA Score: 60%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	36.1	Class C works. There was no maintenance & repairs logbook on-site. Only flow is recorded for 21/22. Operational monitoring records were last updated in January 2020. O&M Manual not available at the time of the audit. IMP not in place. Multi-meter for pH, EC, TDS & Temp; Turbidity & Chlorine meter available but these instruments are defective and not in use. Jar testing equipment are available however they are also not in use.
2	**Physical appearance of plant**	75.0	Entrance is signposted with name of the WTW and dam. Site is fenced, with access control and security at the gate. WTW road is tarred and no gravel. The site is tidy and well kept. Garden and terrain are well kept. Grass is cut, there appears to be some minor damage at the entrance to the filter room, which makes the WTW looks untidy. Worker's bathroom is not in good condition, shower doors has fallen and needs to be attended to. Over and above, the bathroom available is shared between male and female workers. There are minimal safety signs at Madikwe WTW. WSA in the phase 2 of the WTW refurbishment must ensure that relevant safety signs are posted to relevant equipment/unit processes
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	41.7	Raw water pumps are not equipped with screens at the abstraction point. Three pumps installed to work on a 2+1 configuration. However, the standby pump is defective and out of service, for repairs.
	Raw water pipeline	58.3	Pipe network have not been assessed nor maintained against corrosion. Flow meter installed at the inlet of the WTW to measure raw water flows, however it has not been calibrated in the past 24 months. Flows are recorded and kept in the logbook.
	Inlet works	83.3	There is even flow split as the raw water is fed into two modules. Flocculant is dosed inline (inside the pipe infrastructure). Monitoring is not possible due to inline dosing mechanism as per the design of the WTW, however the pumps are set at various percentages (which ultimately works out volumetric flow rates, the PC have done pump/timer tests to know at a certain percentage pump setting represents a specific flow rate)
4	**Chemical dosing & storage**		
	Flocculant	25.0	Two pumps are installed working on a 1 duty and a standby arrangement. The standby pump can only be switched manually. The electrical wiring presents a hazard and a safety risk as the wires are exposed. The dosing area is not bunded and spillages cannot be contained. Insufficient stock available at the WTW. The storage area is not bunded and any spillages cannot be contained. There is no emergency wash near the dosing room.
	Chlorine	56.3	HTH and chlorine chips are used. The dry feeder is in a good working order. The WTW is equipped with two dosing dry feeders, resulting in a 100% standby availability. The are no safety equipment observed during the site assessment. The chlorine stored on site is shared amongst all the WTW operated by the WSA. Currently on site there are 14 buckets for this WTW, and this will last between 4-5 days.
5	**Flocculation**	na	
6	**Phase Separation**		
	Clarification (settling)	100.0	The works is equipped with 16 settling tanks. There is limited floc carryover of the flocs. Desludging is done once per shift and /or based on the quality of water. The settling tanks are equipped with discharge holes and are in good condition and allow for even flow.
	Sand filtration	93.8	20 pressure filters are installed but one (1) is out of order. Two back wash pumps are installed and in working condition. Each pressure filter bank is connected to one pump & no standby for each bank. The pumps are also used as high lift pumps to pump final water to the reservoirs <2 Km away. The filters are fitted with pressure gauge which is used a guide for backwashing procedure when it reached 200Kpa. Backwashing frequency of every filter is 24 hours. The housekeeping around the pressure filters filter is good and the area is free obstacles.
7	**Disinfection**		
	Clear water well	na	There is a huge design flaw in a sense that, chlorine is dosed before the pressure filters. This is unusual however there must be further investigation on whether this does not impact on efficacy of disinfection particularly residual chlorine in the network.
8	**High lift pumpstation**	37.5	Two pumps installed to function as high lift & backwash pumps. The pumps feed into the reservoirs. No standby pumps installed. There is a flow meter installed however is not in good working condition and flows are not recorded
9	**Sludge treatment**	na	
10	**Bulk pipeline from plant to command reservoir**	100.0	The network team is responsible for bulk pipeline management. Valves are intact, no signs of rust or leaks.
11	**Command reservoir**	62.5	Reservoir is secured and fenced with lockable gates. The reservoir is less than 2 km from the WTW and there are securities on site and some PC are staying at the WTW. Structure is leak free and closed at the top. There is a telemetry in place, though not yet connected to the Scada (to be included in the phase 2 refurbishment work), however there is a manual level indicator installed though not recorded. No flow measuring device in place.
12	**Booster pumpstation**	68.8	Three pumps are installed, only 2 working and on duty, 1 pump is out of order, currently no standby available. Building is secured, fenced and lockable gates. No signs were observed. MCC in place and in good condition.
	Total	**60%**	

High risk areas OR Key Hardware Risks/ Defects

1. One defective pump at the booster pumpstation needs to be fixed, this poses a huge risk for water supply should the pump on duty fail and the pump for raw water.
2. Calibration of meters.
3. Investigate chlorination prior to filtration.
4. Maintenance of the standby pump for raw water.
5. Maintenance of flocculant dosing pumps and attend to the electrical wires.

VROOM Refurbishment Cost Estimate

Civil Works	R0	0%
Mechanical Works	R354,200	80%
Electrical Works (Incl C&I)	R85,800	20%
Total VROOM Cost	**R440,000**	**100%**
R million / MLD		**0.17**

Regulatory Impression

Madikwe water treatment works receives water from Madikwe Dam, it supplies the areas of Madikwe Township, Vrede, Seshibitswe and Tlokweng villages with an estimated population of 19 959. The WTW produces 2600 Kl/d of water to these areas. The WTW is registered with the Department of Water and Sanitation and classified as a Class C, it is operated by competent personnel and supported by maintenance team through an outsourced contract for electrical and mechanical maintenance. The WSA does not have a fully functional internal maintenance capacity. Water quality is monitored in accordance with SANS 241 and is of high quality, with microbiological compliance of >99.9% and chemical (acute) compliance of >99.9%. Consumers may use the water with high level of confidence and there no Directives issued by the Regulator with respect to this system. The regulator is however, concerned that there is no adequate operational monitoring taking place, operational monitoring is an early warning system to inform operational personnel on risks associated with supply of clean drinking water and it needs to be given attention and operational monitoring equipment must be procured as a matter of urgency. Over and above, risk management for this water supply system is of a concern. A risk register that has been put in place by Moses Kotane LM needs to be formalised with all the role players and implemented in order to manage all the risk associated with water supply and mitigate against risk identified from the catchment up to a point of use. Of critical importance is the procurement of chemicals at all the WTW's owned and operated by Moses Kotane LM, the WSA need to ensure that bottlenecks in the supply chain management are addressed as a matter of urgency. Adequate operational budget needs to be prioritised and ensure availability of chemicals at all the sites.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	86.59%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



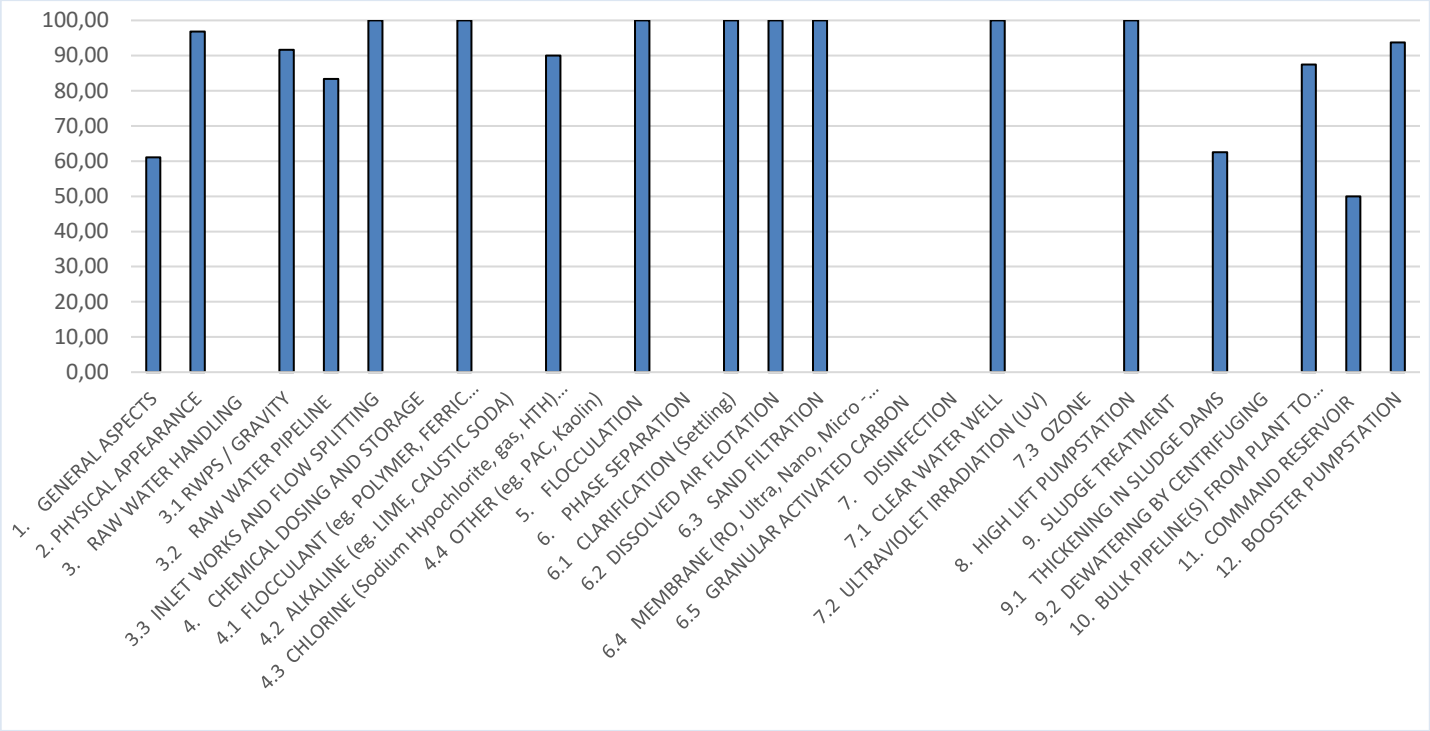

11.9 Ngaka Modiri Molema District Municipality

The Mmabatho water treatment works was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

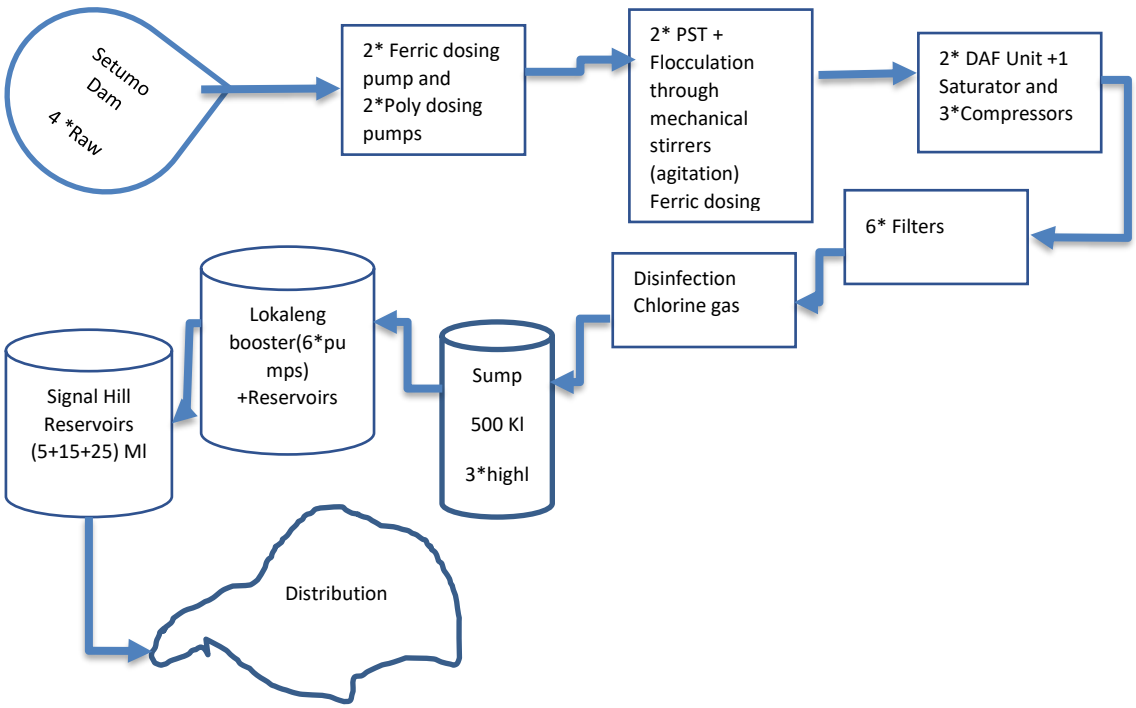
Mmabatho TSA Score: 88%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	61.1	Class C WTW. The certificate displayed is old, as it still refers to Department Water Affairs and Forestry. It needs to be replaced with the updated DWS certificate. There is a maintenance & repairs logbook on-site, which includes mechanical instruments that have been attended to. Operational logbook in place, with tests for pH, EC, Turbidity taken every 2 hours. O&M Manual not available at the time of the audit. IMP not in place. Multi meter for pH, EC, Temperature is available. Turbidity and Chlorine meters available but have been calibrated with standards that expired on 12/2022. Jar testing equipment are available however they are only used seasonally. Electricity meter, is not accessible to the WTW and reading are not recorded.
2	**Physical appearance of plant**	96.9	Entrance is signposted with name of the WTW. Site is fenced, with access control and security at the gate. WTW roads are tarred. The site is tidy and well kept. Garden and terrain are well kept, there is paving installed on site. Worker's bathroom is in good condition, equipped with hand wash facility and the workers have facility for having lunch, with microwave and sink. The site despite its age is still in good condition. There are relevant safety signs in unit processes and equipment.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	91.7	Raw water pump house was locked however it was reported by the PC on shift that, they are equipped with screens at the abstraction point. Four pumps installed to work on a 1+3 configuration. However, 1 pump is defective and out of service, for repairs as a result, there are only 2 standby pumps available.
	Raw water pipeline	83.3	Based on the observation and verbal report with the PC and based on the observation during the site assessment, there were no leakages observed. However, the pipe network is not equipped with cathodic protection and no regular maintenance is done. A magnetic flow meter installed and in working condition. Flow rates are recorded and kept in the logbook.
	Inlet works	100.0	Water is pumped from Setumo Dam and evenly split into the two settling tanks. The turbulence created as the water falls over the weir at the inlet provides enough energy for proper mixing of the dosing point of the poly electrolyte. Dripping of flocculant was visible at the inlet works.
4	**Chemical dosing and storage**		
	Flocculant	100.0	Two pumps are installed for Poly and 2 dosing pumps for ferric chloride. The pumps use 1+1 configuration, resulting in a 100% standby availability. The dosing area neat and can contain any spillages. Polyelectrolytes was used. There are 2 x 10 000 litres containers available- adequate capacity to last for more than 30 days. The storage area is bunded and any spillages can be contained. An emergency wash is available, near the dosing room.
	Chlorine	90.0	Chlorine gas is used. The chlorine dosing pumps are in good condition with all equipment working, Two chlorine cylinders were connected equipped with an automatic switch over system, to come into operation when a 1 cylinder is empty. There are fire extinguishers, the area is well ventilated in a sense that it is opened up and air flow from outside. However, ammonia and alarms are not available. Chlorinator was set on 4 kg/h post chlorine, which indicates 96kg/d. There are 2 x 925kg full cylinders which makes up 2850 Kg available. There is approximately 30 days of storage availability. In addition there is HTH on site.
5	**Flocculation**	100.0	The settling tanks design incorporates flocculation. It is equipped with mechanical mixers to promote agitation and can be set in various speeds. Each settling tank is fitted with 3 mixers and there are two settling tanks in operation. The is no scum visible however floc formation is observed through in the compartment fitted with mixers.
6	**Phase Separation**		
	Clarification (settling)	100.0	Floc carry-over was not visible at the weirs of the clarifiers. Two clarifiers are in place & operational. De-sludge is conducted once in two shifts. Each clarifier is fitted with operational de-sludge pump. The settling tanks are equipped with discharge holes and are in good condition and allow for even flow.
	Dissolve air floatation (DAF)	100.0	Three recycle pumps installed are in working condition. There are 50% standby for all the recycle pumps. When 2 are on duty and 1 is on standby. Three compressors are installed and in operation with a 100% standby available. Fine bubbles, dense and no individual large bubbles could be seen. Desludging is done once per week however de-scum is done twice per shift. The saturator was serviced in the last 12 months.
	Sand filtration	100.0	There are 6 sand filters installed and in working condition. Two back wash pumps are installed and in working condition. There are 3 compressors installed and in good working condition, with 100% percent standby. The sand filters are enclosed and connected by pipes. It is not possible to observe the flow. A backwash was performed and even bubble distribution during backwash is seen. Backwashing frequency of every filter is 24 hours. Filter media surface is smooth with no signs of cracks or mounds.

Watch #	Process Unit Assessed	% TSA	Observations
			The housekeeping around the sand filters is good and the area is free obstacles.
7	**Disinfection**		
	Clear water well	100.0	Chlorine gas is dosed on the outlet of the sand filter basins in the clear well, prior water enters the sump on-site. WTW normally operates at 680 kl/hr however currently operates at 380 kl/hr, based on the inflow, the sump has the capacity of 500 kl. therefore, the contact time is 78 minutes. Free chlorine is measured after sufficient contact time.
8	**High lift pumpstation**	100.0	Three pumps installed to function as high lift & 1 is out of service. Only two are in operation. They pump from the WTW final to Signal Hill reservoir. One pump is operated at a time giving a 100% standby available. Final flow meter is available and in good working condition. Flows are recorded.
9	**Sludge treatment**		
	Thickening in sludge dams	62.5	The plant has two Quiescent dams & one emergency storage, and the storage was full of sludge due to dysfunctional DAF sludge thickener. Quiescent dams/Sludge dams are emptied every 3 to 4 months. Quiescent dams are used as sludge dams. All three recycling pumps are in working condition with no standby pumps installed.
10	**Bulk pipeline from plant to command reservoir**	87.5	The raw water pipeline is free of leaks & PVC pipe is used. Plant feed to Lekaleng booster pump station thereafter final water is pumped into two reservoirs at Signal Hill from where it feeds into the reticulation system through gravity. Valves are in good working condition except for one minor valve leaks at the high lift pump station.
11	**Command reservoir**	50.0	The Signal Hill reservoirs secure in terms of gate & fence. There is one security personnel on-site. The reservoirs are structurally in a good condition and not leaking. They are properly closed with no risk of contamination. The telemetric system room at Signal Hill Reservoirs is out of order. Signal Hill Reservoirs are not fitted with final flow meter.
12	**Booster pumpstation**	93.8	Lokaleng Booster is fitted with six installed pumps, except one is not in working condition. More than 50% standby pump set arrangement is in place. The building is secure with insufficient ventilation, the facility is well fenced & no signage in place. Each pump has its own MCC, and all are in good condition & accessible.
	Total	**88%**	

High risk areas OR Key Hardware Risks/ Defects

1. One (1) pump at Lokaleng pump station
2. Signal hill reservoir telemetry
3. DAF Sludge Thickener.

VROOM Refurbishment Cost Estimate

Civil Works	R0	0%
Mechanical Works	R246,400	91%
Electrical Works (Incl C&I)	R24,200	9%
Total VROOM Cost	**R270,600**	**100%**
R million / MLD		**0.01**

Regulatory Impression

Mmabatho water treatment works receives water from Setumo Dam, it supplies the areas of Mafikeng and Mmabatho, Montshiwa villages with an estimated population of 140,000. The WTW produces 15,000 Kl/d of water to these areas and its further augmented by Mafikeng WTW, which is fed by boreholes and Molopo eye, which further adds 32,000 Kl/d into the system of Mmabatho and Mafikeng. Thus in total 47,000 Kl/d is supplied to all the town and nearby villages. The WTW is registered with the Department of Water and Sanitation and classified as a Class B, it is operated by competent personnel, outsourced to Magalies Water, and supported by maintenance team through an outsourced contract for electrical and mechanical maintenance. The WSA does not have a fully functional internal maintenance capacity. Water quality is monitored in accordance with SANS 241 and there is no consistent submission of drinking water quality results to the Department, as there are months where results are not loaded onto the Departmental regulatory system (IRIS). Water quality compliance is a concern, with microbiological compliance of 48.89% and chemical (acute) compliance of 95.7%. Consumers may use the water with low level of confidence based on the microbiological compliance.

The regulator is however, concerned that there are no adequate measures put in place to ensure compliance to drinking water quality particularly water safety plan or risk management. This is a plan to mitigate against risk associated with water supply but also considers risks at the catchment, treatment facility and the distribution network. Management of incidents is also of a concern to the regulator, as failures that are encountered are not adequately communicated to the consumer. Ngaka Modiri Molema DM must ensure that the Water Safety Plan is updated annually and implemented to ensure that management of all the risks identified are mitigated against and managed properly to ensure safety and security of supply. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	48.89%
Chemical Compliance	95.70%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



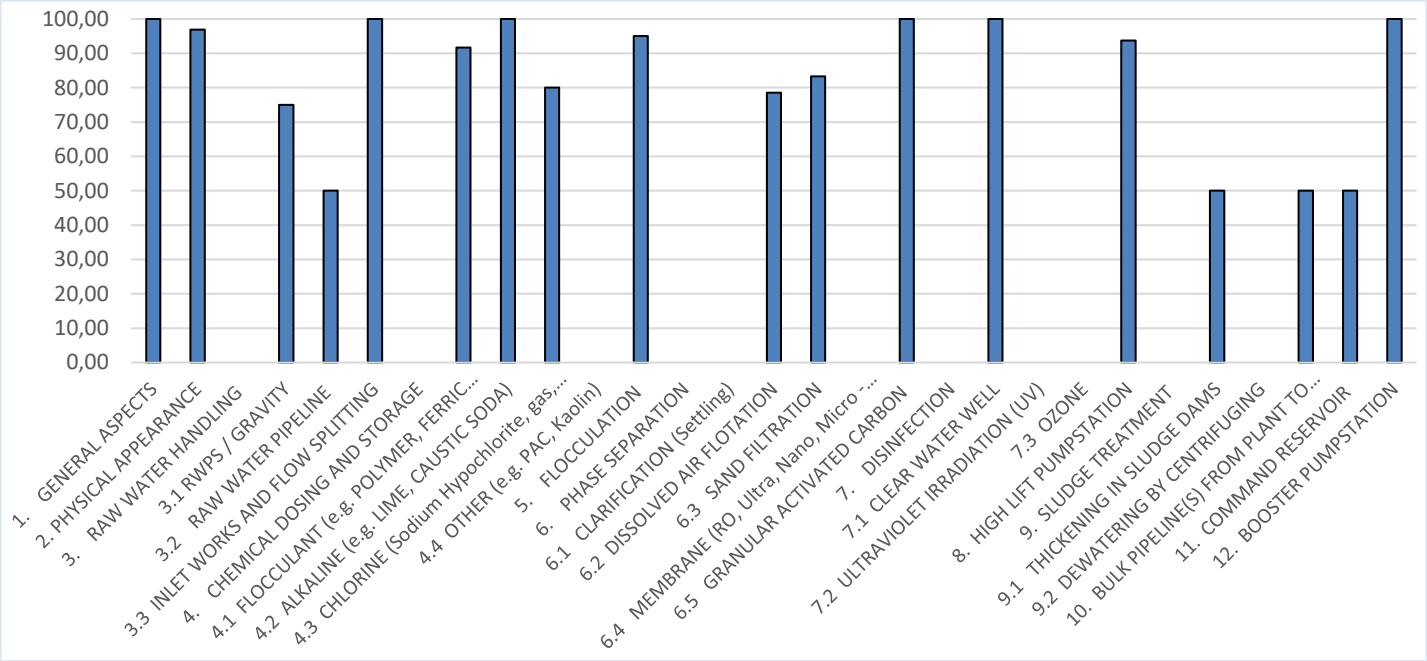
11.10 Rustenburg Local Municipality

The Bospoort water treatment works was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

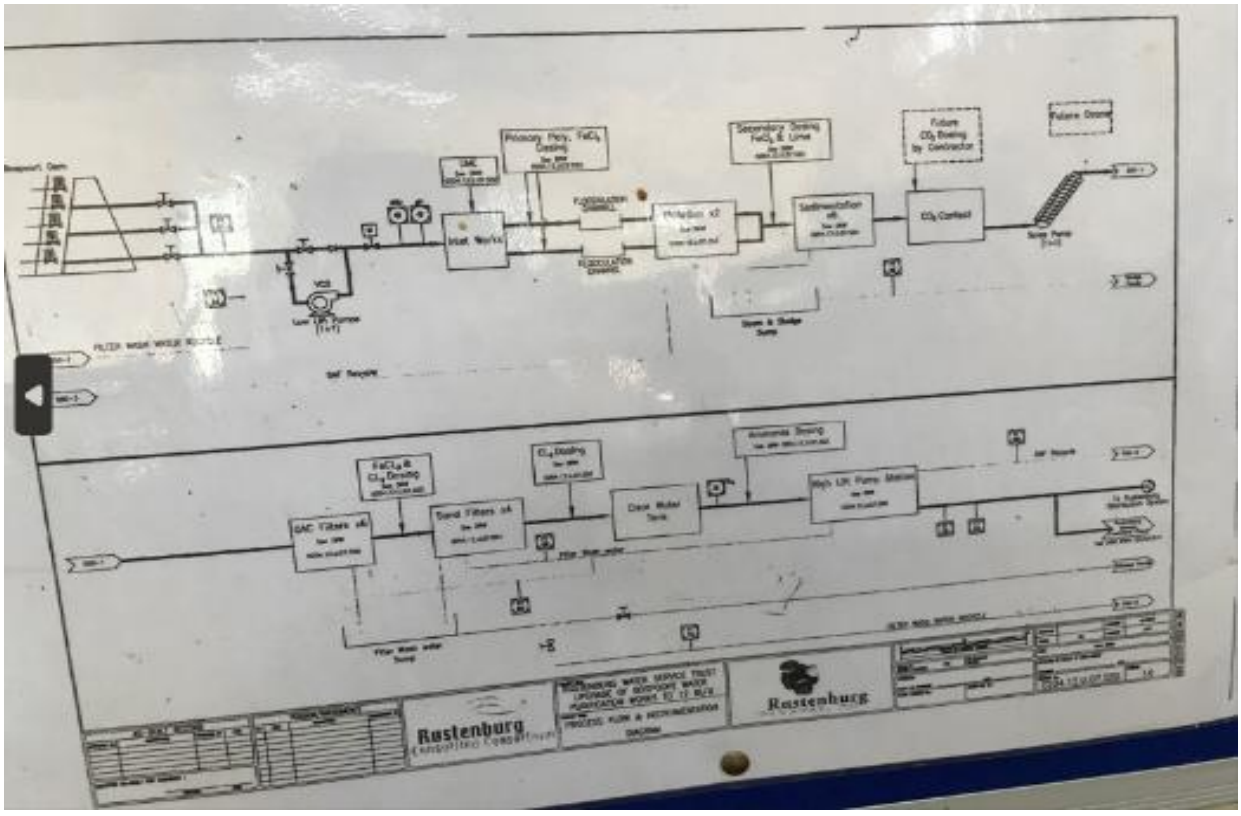
Bospoort TSA Score: 81%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	100.0	Class A plant, record keeping in place, IMP and PFD displayed. Monitoring equipment functional and calibrated.
2	**Physical appearance of plant**	96.9	Facility fully fenced with entrance signposted. Terrain, buildings, and facilities neat and tidy. Access road to the WTW maintained routinely. All relevant safety signs posted.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	75.0	Raw water is fed by gravity. A basket is available but difficult to remove and clean. Two emergency handpumps are available when the dam level is low.
	Raw water pipeline	50.0	The raw water pipeline belongs to DWS. It is short and rubber lined. The inflow meter was damaged by power failures. A new meter has been ordered.
	Inlet works	100.0	The onflow split evenly into two chambers. Dosing conditions at the inlet works can be monitored with effective flash mixing conditions.
4	**Chemical dosing and storage**		
	Flocculant	91.7	Dosing pumps in a working condition with a 50% standby. The dosing area is neat and bunded and spills can be contained. An emergency wash area is close by. Stock is recorded daily with a minimum level informing the order of new stock.
	Alkaline	100.0	Lime is stored in a silo with sufficient storage volume of 30 days. Two lime feeders available, one in use and one on standby.
	Chlorine	80.0	Chlorine gas is dosed using all three dosing pumps. No standby pumps available. Both scales are working and all safety equipment available and in a working condition.
5	**Flocculation**	95.0	The channels are in a good condition. Flocs are visible at the end of the flocculation process, with a little scum observed.
6	**Phase Separation**		
	Dissolve air floatation (DAF)	78.6	All recycle pumps in a working condition with 50% standby available. Both air compressors in use, no standby. The saturator is serviced annually. Fine bubbles were observed, with removal of the sludge layer scheduled for once per shift, more frequent depending on the sludge layer.
	Sand filtration	83.3	Filters in a good condition, with all handrails in place. The filter media is smooth and was replaced Jan/Feb 2021. Backwashing of filters done daily but more frequently with high turbidity results. Backwashing not observed - nozzles are inspected annually. All backwash pumps and air blowers working. No standby pumps, 100% standby air blowers.
	Granular activated carbon (GAC)	100.0	Filters in a good condition, with all handrails in place. Tests are conducted every 6 months and then the GAC is replaced not reactivated. Backwashing not observed - nozzles are inspected annually. Two backwash pumps working with no standby capacity.
7	**Disinfection**		
	Clear water well	100.0	Chlorine contact time in the CWW not sufficient, but the pipeline to town 25 km ensures sufficient contact time. Free chlorine done every 2 hours, before water leaves the plant to the command reservoirs.
8	**High lift pumpstation**	93.8	Four pumps all in working condition. With two pumps on standby. Magflow meter in place to measure the final outflow, recoded daily but not interpreted.
9	**Sludge treatment**		
	Thickening in sludge dams	50.0	Sludge dams not well maintained; it was last cleaned Jun to Aug 2022.
10	**Bulk pipeline from plant to command reservoir**	50.0	The pipeline is in a bad condition and needs to be replaced. Valves are inspected daily and serviced annually.
11	**Command reservoir**	50.0	The reservoirs are not fenced. Structures are in a good condition and closed at the top. Telemetry is in place but flow from the reservoirs is not measured.
12	**Booster pumpstation**	100.0	Building secure. Two pumps installed, working with one on standby. VSDs In good condition.
	Total	**81.4%**	

High risk areas OR Key Hardware Risks/ Defects

1. Intake pumps (hand pumps) and screens (basket difficult to remove and cleaned) not sustainable.
2. There are not sufficient standby pumps (dosing, recycle and backwash) and compressors available.
3. Water first flows through the GAC and only then to the sand filters. This process should be reversed for optimal polishing of the final product.
4. The sludge dams should be better maintained with regular cleaning of banks, etc.
5. Replace final water pipeline from WTW to command reservoirs.

VROOM Refurbishment Cost Estimate

Civil Works	R2,041,600	41%
Mechanical Works	R2,219,800	44%
Electrical Works (Incl C&I)	R777,700	15%
Total VROOM Cost	**R5,039,100**	**100%**
R million / MLD		**0.42**

Regulatory Impression

The Bospoort water treatment works is well maintained, with functional treatment processes, and competent staff. Water quality is monitored according to SANS 241 and is of poor quality. Supernatant of sludge are not recycled due to the high risk of protozoa. Maintenance of all units is of a very high standard with routine and reactive maintenance done as required. A standby generator available at the plant to negate the negative impact of Eskom load shedding.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	95.29%
Chemical Compliance	95.96%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

12. NORTHERN CAPE: MUNICIPAL DRINKING WATER SYSTEM'S FUNCTIONALITY

Background

Leading up to the release of the full Blue Drop report, the Regulator draws attention by publishing the *Blue Drop Watch Report*, which comprises of a technical overview of pipes, pumps, reservoirs, processes and water quality of water treatment plants and distribution networks. The Blue Drop Watch report is **not** the Blue Drop audit report, which will only be published once the verification and quality control processes by DWS have been satisfied, to ensure accurate and credible reporting of drinking water services across South Africa. The Watch Report seeks to keep the public and stakeholder updated and informed on the status of drinking water infrastructure, water quality, and the indicative cost to restore functionality.

The Blue Drop Watch Report is informed by the Technical Site Assessments (TSA), which were done at 1 to 2 systems per WSA/WSP, as part of the Blue Drop audit cycle. The purpose of the TSA is to verify the findings of the (desktop) audit with the status on the ground (physical inspections). The TSA score (%) reflects the condition of the raw water handling system (abstraction, pumps, pipe network), the water treatment plants (inlet works to disinfection and sludge treatment), delivery system (commend reservoirs, bulk pipe network and pumpstations) and distribution systems (pump and pipe networks). A high TSA score (100%) indicates that the infrastructure, equipment, and processes are in excellent condition, whilst a low TSA score (0%) indicates failure and dysfunctional process and infrastructure. The TSA inspections cover each process unit of the treatment facility, coupled with randomly selected checkpoints of the delivery and distribution network. The VROOM cost covers only the treatment facility, as too many variables exist to accurately estimate network refurbishment costs.

Results of the Technical Site Assessments

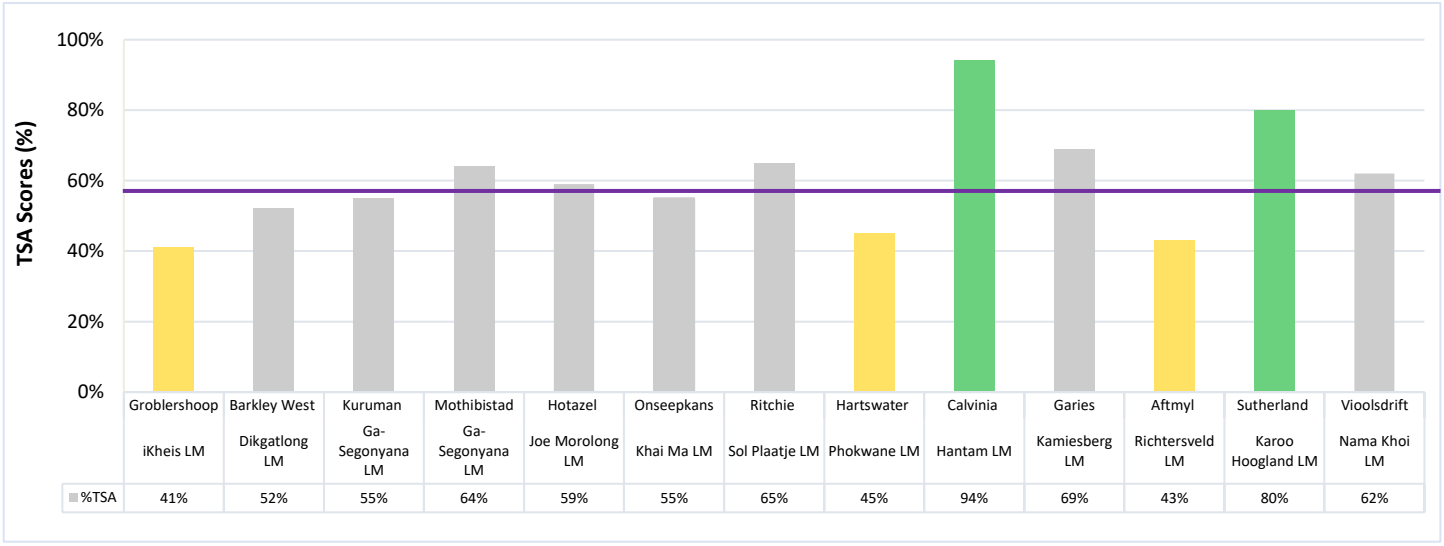
During the period December 2022 to February 2023, 27 water supply systems were inspected, offering a representative overview of systems owned and operated by municipalities, water boards and water service providers. The assessments covered 26 municipalities, as well as 1 Water Board. Detailed TSA reports with photographic evidence and VROOM costs have been generated to assess the condition and status of treatment facilities and gain insight into randomly selected pipe network and pumpstation across the water distribution networks. The table following summarises the TSA scores of the water supply systems that were assessed.

Table 51 - Northern Cape Summary of the all the TSA Water Supply Systems

#	Municipality (WSA)	TSA WSS	TSA WTW	WSP/ WB	%TSA
1	iKheis LM	Groblershoop	Groblershoop		41%
2	Dikgatlong LM	Barkley West	Barkley West		52%
3	Ga-Segonyana LM	Kuruman-Wrenchville	Kuruman (Old Reservoir System)		55%
4	Ga-Segonyana LM	Mothibistad-Mapoteng	Mothibistad		64%
5	Joe Morolong LM	Hotazel	Hotazel	Bloem water	59%
6	Khai Ma LM	Onseepkans (Melkbosrand)	Onseepkans/ Melkbosrand WTW		55%
7	Sol Plaatje LM	Ritchie	Ritchie		65%
8	Phokwane LM	Hartswater	Hartswater		45%
9	Hantam LM	Calvinia	Calvinia		94%
10	Kamiesberg LM	Garies	Garies		69%
11	Richtersveld LM	Port Nolloth-Alexander bay-Aftmyl	Aftmyl borehole system		43%
12	Karoo Hoogland LM	Sutherland	Sutherland Desalination Plant		80%
13	Nama Khoi LM	Vioolsdrift	Vioolsdrift		62%
14	David Kruiper LM	NC083: AH September (Upington)	AH September		84%
15	! Kai! Garib LM	Kakamas Bulk Water	Kakamas		34%
16	Renosterberg LM	Vanderkloof	Vanderkloof		42%
17	Siyathemba LM	Prieska	Flippie Holtzhausen		63%
18	Umsobomvu LM	Colesberg	Colesberg		56%
19	Emthanjeni LM	De Aar	De Aar Borehole		43%
20	Kareeberg LM	Carnarvon	Carnarvon Borehole		28%
21	Ubuntu LM	Victoria West	Victoria West Borehole/ Chlorine Dispenser		32%
22	Kgatelopele LM	Danielskuil	Danielskuil Borehole/ Reservoir		71%
23	Gamagara LM	Kathu	Kathu		57%

#	Municipality (WSA)	TSA WSS	TSA WTW	WSP/ WB	%TSA
24	Magareng LM	Warrenton	Warrenton		55%
25	Siyancuma LM	Douglas	Douglas		51%
26	Thembelihle LM	Hopetown	Hopetown		75%
27	Tsantsabane LM	Postmasburg	Vaal Gamagara	Bloem water	94%
	Totals		**27**	**2**	**58%**

An average of 58% was achieved for the 27 systems assessed, which means that infrastructure and processes are partially functional with an average performance. The best overall performance was found for Tsantsabane Bloem Water, followed by Hantam, David Kruiper and Karoo Hoogland. The water board provided one of the better performing systems. Lower performances were observed for Carnarvon Borehole and Victoria West Borehole.



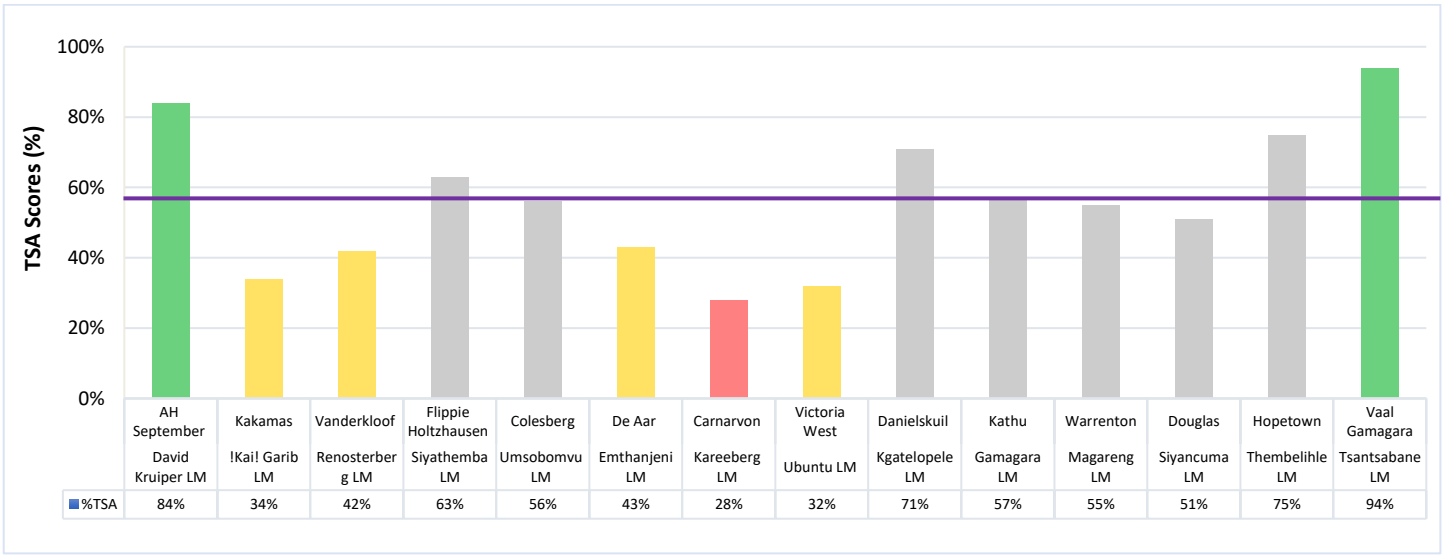


Figure 40 - NC TSA scores for all the BD Systems

95 – 100% Excellent
80-<95% Good
50-<80% Average
31-<50% Poor
0-<31% Critical state

The Regulator observed the predominant challenges and risks pertaining to the water supply system:

Facility management

- No notice board to display or no display of the PFD or other relevant notices and/or documents required on site

- Refurbishment or upgrade and/or construction of buildings or facilities, concrete structures, offices and/or process control room, staff ablutions; maintenance or replacement of perimeter/boundary fencing and/or access gate; Aging infrastructure
- No jar testing done, no or limited testing water quality testing equipment and/or lab chemicals, no calibration of meters
- Supply emergency showers or wash areas/ facilities
- Back-up power supply during load shedding
- Signage at entrance gate and safety signs across plant
- Housekeeping and tidying up of terrain, paintwork at treatment works, pumpstations, and reservoirs, clean-up sites after construction projects
- Road rehabilitation/ upgrade/ construction and road accessibility especially for the safe delivery of chemicals
- Staff safety and signage improvement
- Flooding at plant or at the various process units
- Illegal connections inside and outside the treatment works.

Water treatment system

- Flooded or dysfunctional borehole/s or not adequately protected
- Raw water pipe network and/or pumps at abstraction facility to be refurbished or upgraded or repaired
- No flow meters installed or dysfunctional flow meters (abstraction, WTW, and Command Reservoirs), and flow meters not calibrated
- Refurbishment or upgrade of one or more of the various process units (civil, mechanical, electrical and instrumentation)
- Dysfunctional or inefficient process units that have to be rectified, e.g. inlet works, flocculation, clarifiers, filters, etc
- Treatment chemicals, e.g. no bunding, limited stock, storage, dosing requirements
- No or limited no. standby pumps or dysfunctional pumps, e.g. flocculant and/or chemical dosing, backwashing, high lift, leaks, etc
- No or limited air blowers and/or compressors or dysfunctional blowers and compressors
- Sand filters, e.g. repairs required, sand to be replaced, sand volume
- Chlorination unit not operational or not fully operational, e.g. limited stock in place, no or limited standby units, no automatic switch over, no chlorine scales, no or limited safety signs and systems (alarms, fans, masks, detectors)
- Limited disinfection contact time in the clear water well or ineffective disinfection taking place
- Sludge dams/ponds or beds, e.g. none in place, not operation, maintenance (cleaning), dysfunctional sludge pumps and no or limited standby, no recycling taking place
- SCADA and telemetry systems, e.g. not in place, dysfunctional, limited or no understanding of the systems
- Supervisors and Process Controllers need plant-based process management training

Water distribution network

- Repair leakages in pipe network, valve boxes, and/or command reservoirs
- Replace final water pipeline from WTW to command reservoir/s
- No telemetry at reservoir and level indicator or not operational
- Install new fencing or repair fencing
- Vandalism and theft of pumps, valves, manholes, fencing and other mechanical and electrical assets

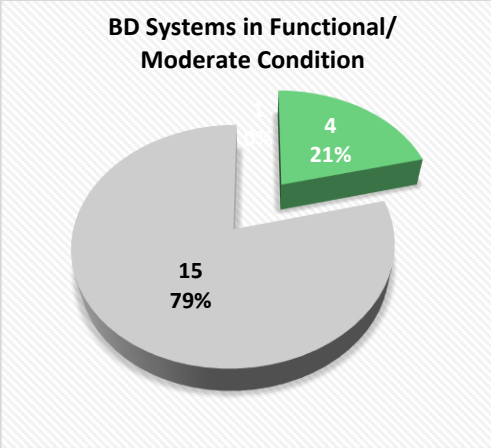
Systems Observed to be in Functional/Moderate Condition based on Technical Site Inspections

Water supply systems which succeeded to achieve ≥50% TSA score, are summarised as follows.

Table 52 - Provincial Summary of the TSA Water Treatment Systems in the Excellent to Average Performance Categories

Municipality (WSA)	WSP/ WB	TSA of ≥95-100% [Excellent]		TSA of ≥80-<95% [Good]		TSA of ≥50-<80% [Average]	
		Name of WTW	% TSA	Name of WTW	% TSA	Name of WTW	% TSA
Dikgatlong LM		None				Barkley West	52%
Ga-Segonyana LM						Kuruman (Old Reservoir System)	55%
Ga-Segonyana LM						Mothibistad	64%
Joe Morolong LM	Bloem water					Hotazel	59%
Khai Ma LM						Onseepkans (Melkbosrand)	55%
Sol Plaatje LM						Ritchie	65%
Hantam LM				Calvinia	94%		
Kamiesberg LM						Garies	69%
Karoo Hoogland LM				Sutherland	80%		

Municipality (WSA)	WSP/ WB	TSA of ≥95-100% [Excellent]		TSA of ≥80-<95% [Good]		TSA of ≥50-<80% [Average]	
		Name of WTW	% TSA	Name of WTW	% TSA	Name of WTW	% TSA
Nama Khoi LM						Vioolsdrift	62%
David Kruiper LM				AH September	84%		
Siyathemba LM						Flippie Holtzhausen	63%
Umsobomvu LM						Colesberg	56%
Kgatelopele LM						Danielskuil Borehole	71%
Gamagara LM						Kathu	57%
Magareng LM						Warrenton	55%
Siyancuma LM						Douglas	51%
Thembelihle LM						Hopetown	75%
Tsantsabane LM	Bloem water			Vaal Gamagara	94%		
Totals	**2**	**0**		**4**		**15**	



Of the 19 systems in the excellent to average performance categories it was found that:

- 4 systems (21%) were in good condition
- 15 systems (79%) were in average condition.

Figure 41 - No. BD Systems in Functional/ Moderate Condition

The best performing water supply systems, as indicated by the TSA scores, are summarised hereunder.

Table 53 - Provincial Summary of the Top Performing TSA Water Treatment Systems

#	WSA	WSP/ WB	WSS	%TSA
1	Tsantsabane LM	Bloem Water	Vaal Gamagara	94%
2	Hantam LM		Calvinia	94%
3	David Kruiper LM		AH September	84%
4	Karoo Hoogland LM		Sutherland	80%

The top three systems with the best condition are Vaal Gamagara managed by Bloem Water, Calvinia managed by Hantam, and AH September managed by David Kruiper (good 80-<95%).

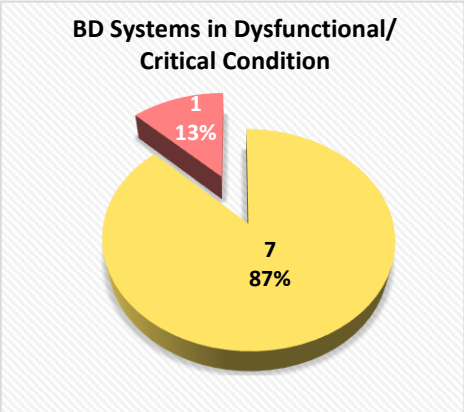
Systems Observed to be Dysfunctional/Critical Condition based on Technical Site Inspections

Drinking water supply systems which failed to achieve at least a TSA score of 50%, are identified as follows.

Table 54 - Provincial Summary of the TSA Water Supply Systems in the Poor and Critical Performance Categories

Municipality (WSA)	WSP/ WB	TSA of ≥31-<50% [Poor]		TSA of 0-<31% [Critical]	
		Name of WTW	% TSA	Name of WTW	% TSA
iKheis LM		Groblershoop	41%		
Phokwane LM		Hartswater	45%		
Richtersveld LM		Port Nolloth	43%		
! Kai! Garib LM		Kakamas	34%		
Renosterberg LM		Vanderkloof	42%		

Municipality (WSA)	WSP/ WB	TSA of ≥31-<50% [Poor]		TSA of 0-<31% [Critical]	
		Name of WTW	% TSA	Name of WTW	% TSA
Emthanjeni LM		De Aar Borehole	43%		
Kareeberg LM				Carnarvon Borehole	28%
Ubuntu LM		Victoria West Borehole	32%		
Totals		**7**		**1**	



Of the 8 systems in the poor and critical performance category it was found that:

- 7 systems were in poor condition
- 1 system was in critical state.

Figure 42 - No. BD Systems in Dysfunctional/ Critical Condition

Table 55 - Provincial Summary of the TSA Water Supply Systems in Critical Condition

#	Municipality (WSA)	WSP/ WB	WSS	%TSA
1	Kareeberg LM		Carnarvon Borehole	28%

Only one of the 27 systems assessed (3.7%) was found to be in a critical state.

VROOM Costs

The Very Rough Order of Measurement (VROOM) is an estimation of the funding required to restore existing treatment infrastructure to its original design capacity and operations, by addressing civil, mechanical, electrical and instrumentation defects. A singular VROOM cost is determined by assessing 1-2 treatment facilities per municipality and calculated as cost per system. The cost is derived through an algorithm that uses the Blue Drop Inspector's impression of the asset condition, the size and capacity of the asset, and the market/ industry cost indicators. The resultant VROOM cost is an estimation of the cost to repair, refurbish or replace dysfunctional treatment infrastructure. Subsequently, a singular VROOM cost is extrapolated, in relation to the total Blue Drop scores and systems' SIVs, to derive an aggregated VROOM score for all treatment plants in the WSI.

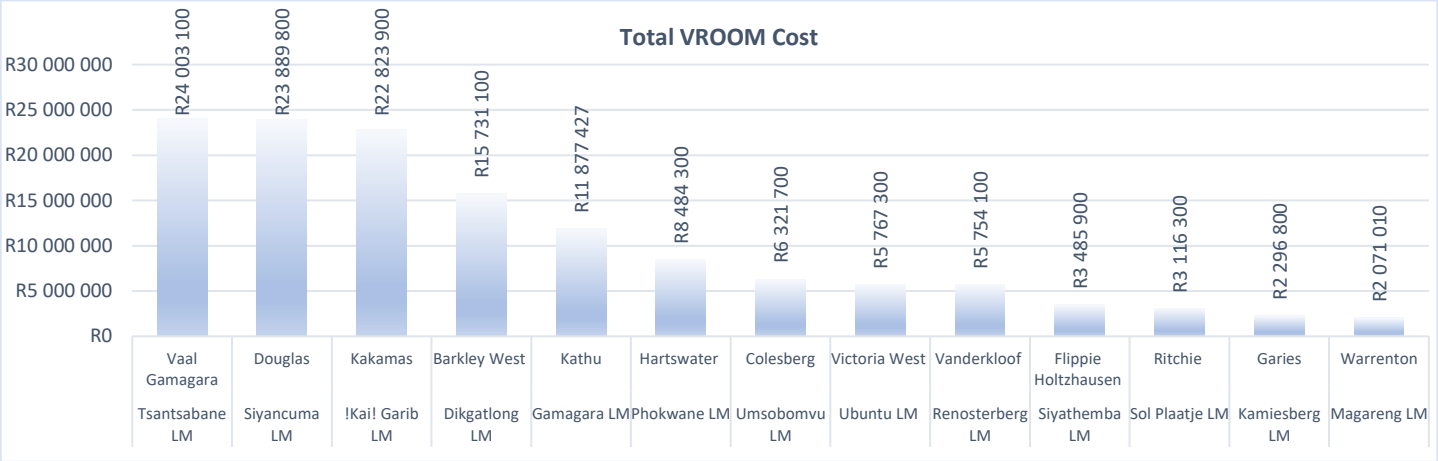
***Note:** VROOM does not constitute a specification, schedule of quantities or a definite refurbishment figure, but rather an indicative amount to inform a budget and hardware requirements. **Also,** the VROOM cost is specific to the treatment plant and does not attempt to cost the network delivery and distribution network, as it contains to many variables.*

The VROOM costs are summarised as following, noting these values comprises the cost of repairs of the SINGLE water treatment system assessed, NOT the extrapolated collective cost to repair all the treatment facilities in a WSI. The VROOM cost is made up by mechanical, electrical, and civil cost elements, which can be seen in the detailed TSA sections following in the report.

Table 56 - Provincial Summary of the VROOM Costing

Municipality (WSA)	TSA WSS	TSA WTW	WSP/ WB	Total VROOM Cost (Rand)
iKheis LM	Groblershoop	Groblershoop		R1,796,300
Dikgatlong LM	Barkley West	Barkley West		R15,731,100
Ga-Segonyana LM	Kuruman-Wrenchville	Kuruman (Old Reservoir System)		R1,631,300
Ga-Segonyana LM	Mothibistad-Mapoteng	Mothibistad		R551,100
Joe Morolong LM	Hotazel	Hotazel	Bloem Water	R59,400
Khai Ma LM	Onseepkans (Melkbosrand)	Onseepkans/ Melkbosrand WTW		R689,700
Sol Plaatje LM	Ritchie	Ritchie		R3,116,300
Phokwane LM	Hartswater	Hartswater		R8,484,300

Municipality (WSA)	TSA WSS	TSA WTW	WSP/ WB	Total VROOM Cost (Rand)
Hantam LM	Calvinia	Calvinia		R1,431,100
Kamiesberg LM	Garies	Garies		R2,296,800
Richtersveld LM	Port Nolloth-Alexander bay-Aftmyl	Aftmyl borehole system		R58,300
Karoo Hoogland LM	Sutherland	Sutherland Desalination Plant		R423,500
Nama Khoi LM	Vioolsdrift	Vioolsdrift		R717,200
David Kruiper LM	NC083: AH September (Upington)	AH September		R1,101,100
!Kai! Garib LM	Kakamas Bulk Water	Kakamas		R22,823,900
Renosterberg LM	Vanderkloof	Vanderkloof		R5,754,100
Siyathemba LM	Prieska	Flippie Holtzhausen		R3,485,900
Umsobomvu LM	Colesberg	Colesberg		R6,321,700
Emthanjeni LM	De Aar	De Aar Borehole		R232,100
Kareeberg LM	Carnarvon	Carnarvon Borehole		R623,700
Ubuntu LM	Victoria West	Victoria West Borehole/ Chlorine Dispenser		R5,767,300
Kgatelopele LM	Danielskuil	Danielskuil Borehole/ Reservoir		R92,400
Gamagara LM	Kathu	Kathu		R11,877,427
Magareng LM	Warrenton	Warrenton		R2,071,010
Siyancuma LM	Douglas	Douglas		R23,889,800
Thembelihle LM	Hopetown	Hopetown		R1,199,000
Tsantsabane LM	Postmasburg	Vaal Gamagara	Bloem Water	R24,003,100
Totals			**2**	**R146,228,937**



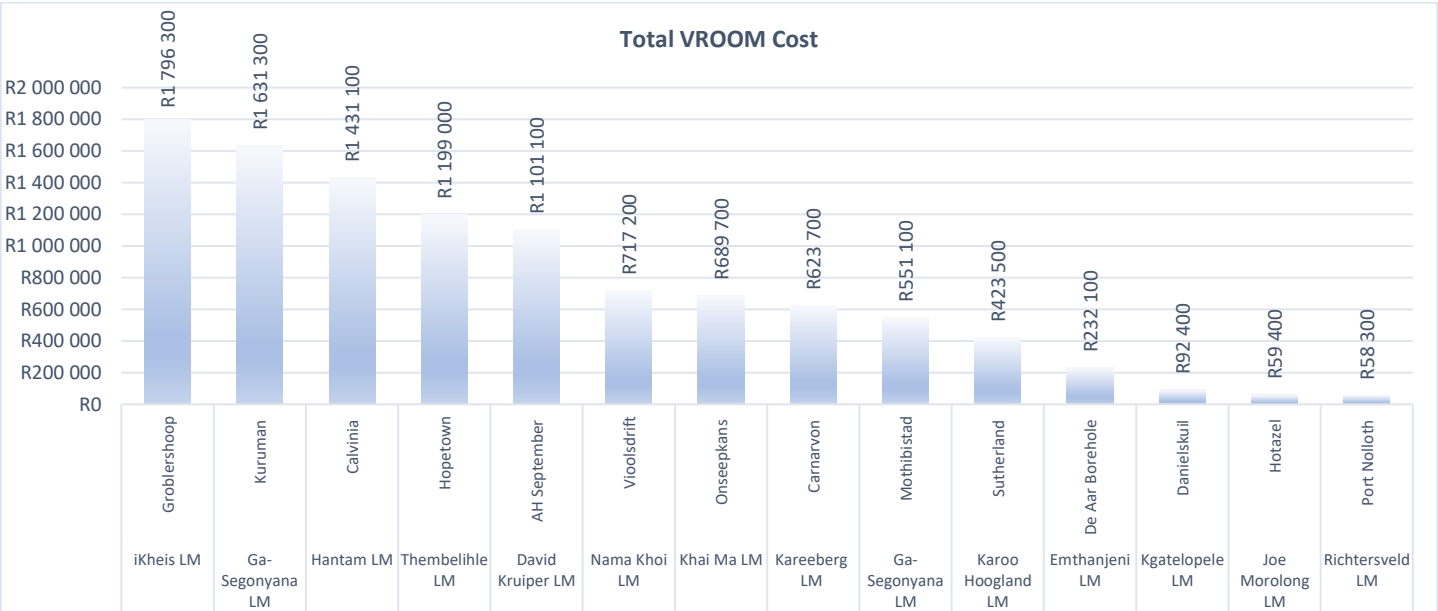


Figure 43 - Total VROOM Cost for the BD Systems Assessed

The associated VROOM costs for the 27 water supply systems assessed amounts to R146.2 million, with the bulk of investment needed for Vaal Gamagara Bloem Water (Tsantsabane), Douglas (Siyancuma) and Kakamas (! Kai! Garib).

Drinking Water Quality Status

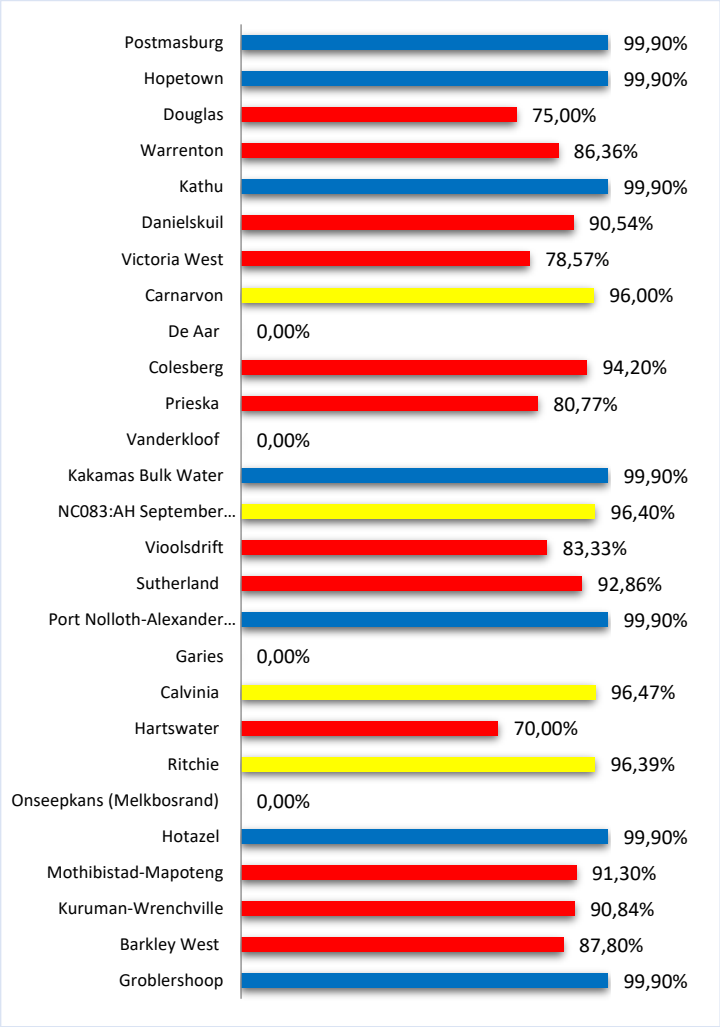
The Institutional Water Quality Compliance, as measured against SANS 241 standards, is reflected in the table below (IRIS, 28 March 2023).

Table 57 - Northern Cape Summary of the Drinking Water Quality Status of all the TSA Water Supply Systems

#	Municipality (WSA)	TSA WSS	TSA WTW	Microbiological Compliance	Chemical Compliance
1	iKheis LM	Groblershoop	Groblershoop	>99.90%	92.92%
2	Dikgatlong LM	Barkley West	Barkley West	87.80%	74.56%
3	Ga-Segonyana LM	Kuruman-Wrenchville	Kuruman (Old Reservoir System)	90.84%	97.78%
4	Ga-Segonyana LM	Mothibistad-Mapoteng	Mothibistad	91.30%	90.94%
5	Joe Morolong LM	Hotazel	Hotazel	>99.90%	99.03%
6	Khai Ma LM	Onseepkans (Melkbosrand)	Onseepkans/ Melkbosrand WTW	NI	NI
7	Sol Plaatje LM	Ritchie	Ritchie	96.39%	85.38%
8	Phokwane LM	Hartswater	Hartswater	70.00%	74.85%
9	Hantam LM	Calvinia	Calvinia	96.47%	95.90%
10	Kamiesberg LM	Garies	Garies	0.00%	0.00%
11	Richtersveld LM	Port Nolloth-Alexander bay-Aftmyl	Aftmyl borehole system	>99.90%	81.25%
12	Karoo Hoogland LM	Sutherland	Sutherland Desalination Plant	92.86%	85.00%
13	Nama Khoi LM	Vioolsdrift	Vioolsdrift	83.33%	80.25%
14	David Kruiper LM	NC083: AH September (Upington)	AH September	96.40%	86.96%
15	! Kai! Garib LM	Kakamas Bulk Water	Kakamas	>99.90%	67.86%
16	Renosterberg LM	Vanderkloof	Vanderkloof	NI	NI
17	Siyathemba LM	Prieska	Flippie Holtzhausen	80.77%	90.56%
18	Umsobomvu LM	Colesberg	Colesberg	94.20%	95.71%
19	Emthanjeni LM	De Aar	De Aar Borehole	NI	NI
20	Kareeberg LM	Carnarvon	Carnarvon Borehole	96.00%	88.14%
21	Ubuntu LM	Victoria West	Victoria West Borehole/ Chlorine Dispenser	78.57%	83.05%
22	Kgatelopele LM	Danielskuil	Danielskuil Borehole/ Reservoir	90.54%	99.24%
23	Gamagara LM	Kathu	Kathu	>99.90%	>99.90%
24	Magareng LM	Warrenton	Warrenton	86.36%	70.13%
25	Siyancuma LM	Douglas	Douglas	75.00%	85.29%
26	Thembelihle LM	Hopetown	Hopetown	>99.90%	96.97%
27	Tsantsabane LM	Postmasburg	Vaal Gamagara	>99.90%	97.55%

The TSA and water quality results depict a vastly different picture. The TSA shows 19 of the 27 water supply systems to be in the *excellent to average performance category*, and the water quality compliance shows that 78-86% of the systems *fail to produce compliant final water quality*. Out of 27 treatment plants, 7 (26%) systems achieve excellent microbiological quality. A total of 4 (15%) systems have poor microbiological water quality and 16 (59%) systems have a bad microbiological water quality status. The water in these systems poses a serious acute health risk to the community. WSAs with poor microbiological water quality status must be assessed to confirm status in all systems to ensure rectification measures are comprehensive to safeguard communities. The direct cause of microbiological failures can be linked to the TSA sub-watch Area 7, which has a low contribution to the overall TSA score. The failure to produce water that meets E. coli standards can be linked back to poor operations, defective infrastructure, dosing rates, absence of disinfection chemicals, lack of monitoring, or lack of operating and chemistry knowledge. WSIs that are not monitoring the final water quality at the outlet of the treatment plant or at specific end use points must develop a monitoring programme and resume with compliance monitoring as a matter of urgency.

Chemical compliance shows that 3 (11%) and 2 (7%) have excellent and good water quality, whilst the majority of systems fail to achieve chemical compliance. A total of 3 (12%) and 19 (70%) systems have a poor and bad chemical water quality status.



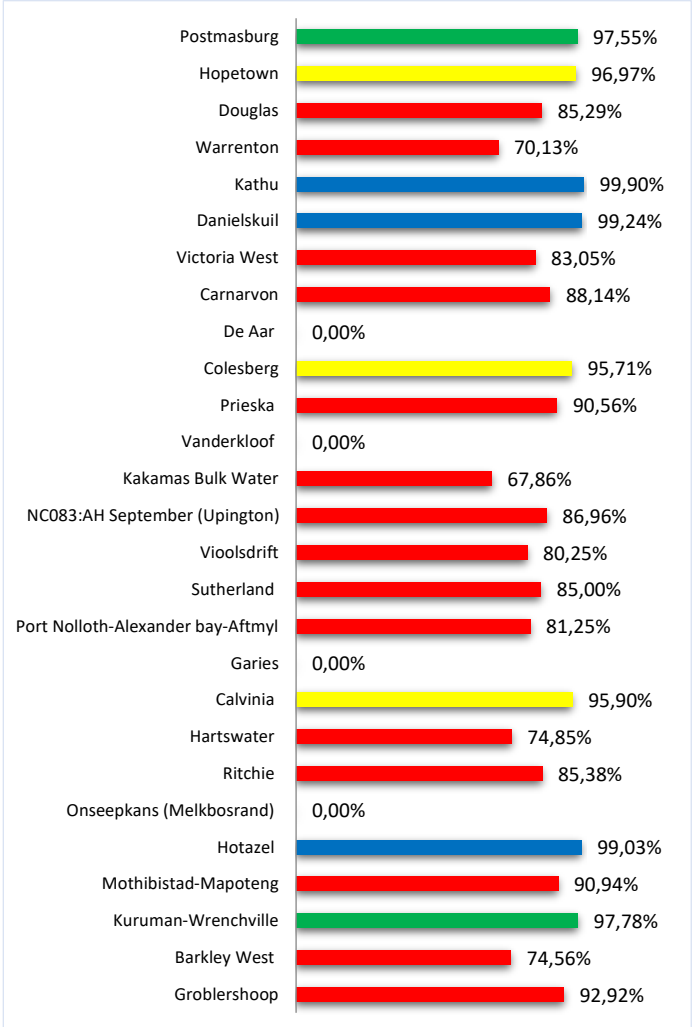


Figure 44 - NC Drinking Water Quality Status of all the TSA Water Supply Systems

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

Concluding Remarks

The Blue Drop Watch results stresses the importance of drinking water supply and quality to be a primary focus area of government. Already, the Department has developed the Water Services Improvement Programme for systems in critical state, and at systems where particular concerns were reported. Blue Drop performance trends will be used to determine repetitive poor performance, to inform a radical approach to ensure turnaround and compliance. This could include facilitating long term intervention by either a capacitated water board or any other suitable mode of water services support. The determination of the 'very rough order of estimates' (VROOM) was done to give an estimation of the capital requirement for the functionality restoration drive. This will be effected with the support from the National Treasury.

The Regulator will continue to monitor performance in terms of Section 62 of the Water Services Act and will engage together with CoGTA and SALGA, WSAs for corrective action plan development and implementation and offer support. Should these actions fail, the Department will consider civil action together with actions contemplated under section 63 of the Water Services Act (Act 108 of 1997) to ensure that Ministerial directives are issued with timeframes for implementation. Failure to respond will trigger remedial action be taken at cost of the non-complying entity or municipality. The Department will take steps to improve its capacity to respond more effectively in this duty, in ensuring visible and measurable improvement in drinking water services. The Department of Cooperative Governance and National Treasury will be engaged to explore ways of utilising conditional grants for the purpose of remedial rectification.

All Water Services Institutions are hereby urged to take note of their TSA status and commence with corrective measures. The full Blue Drop audit report will provide further material content to the overall management of drinking water services across South Africa, upon its release in July 2023.

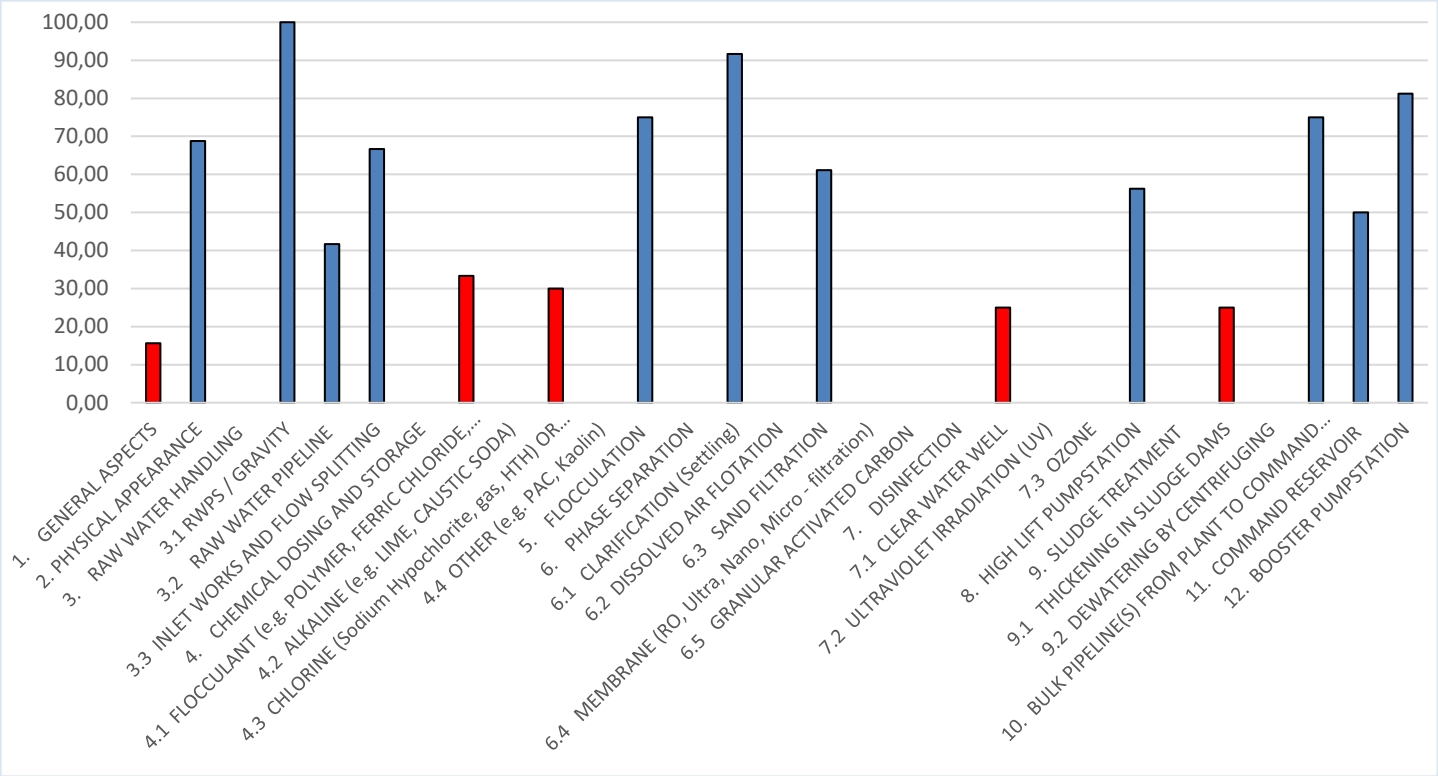
12.1 Dikgatlong Local Municipality

The Barkley West water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground and to estimate the restoration cost to full functionality.

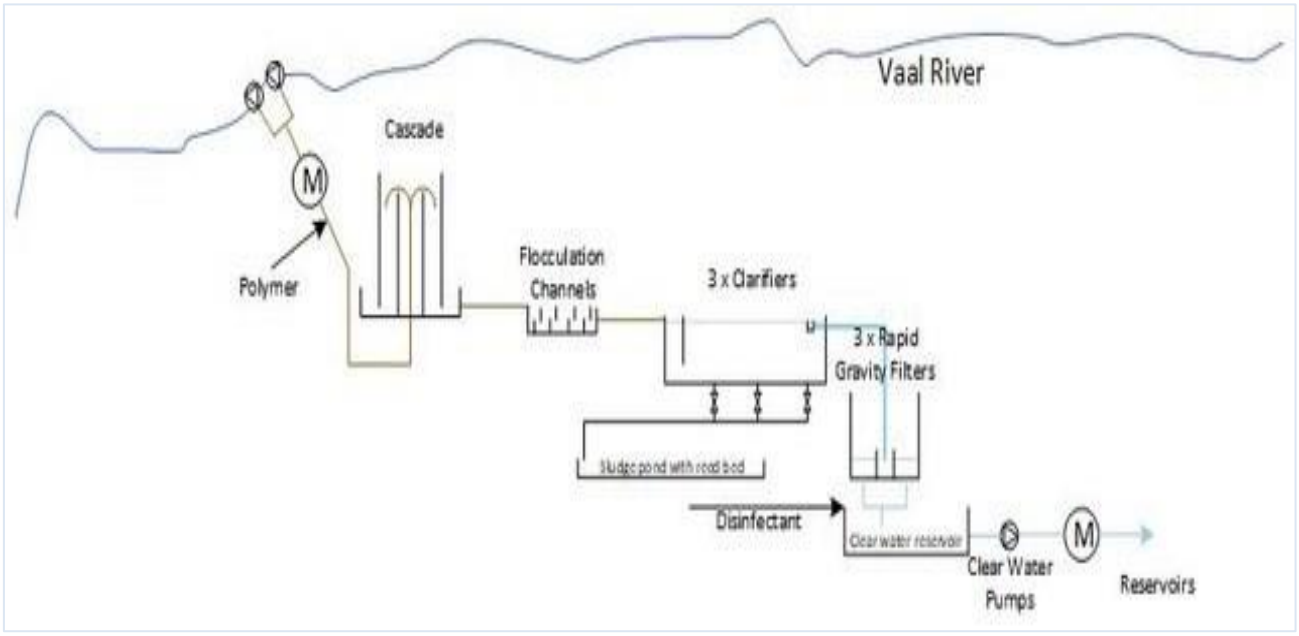
Barkley West TSA Score: 52%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	16.0	There is no O&M manual, instruments are not calibrated.
2	**Physical appearance of plant**	69.0	Signage to be renewed at the entrance to the water treatment works.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	100.0	
	Raw water pipeline	42.0	Inflow meters are not operational.
	Inlet works	67.0	Inflow not metered, inflow too high for the available infrastructure in operation. Floc channels are overflowing.
4	**Chemical dosing and storage**		
	Flocculant	33.0	The flocculant system has a single pump and is leaking. Drop tests are not conducted—no back calculation on the chemical stock.
	Alkaline	na	Lime dosing has never been commissioned and has fallen into total disrepair.
	Chlorine	30.0	The chlorine installation is unsafe, and staff has been trained, but no practical training or a site inspection as part of the training.
5	**Flocculation**	75%	Floc channels overflowing. No drop tests were conducted.
6	**Phase Separation**		
	Clarification (settling)	92.0	
	Sand filtration	61%	The filters are too small for the quantity of water, and the nozzles are broken. Media is full of cracks.
7	**Disinfection**		
	Clear water well	25.0	The clear water well is too small for 8 Ml/d, and chlorine residuals are not tested.
8	**High lift pumpstation**	56.0	One pump is removed for an extended period.
9	**Sludge treatment**		
	Thickening in sludge dams	25.0	A sludge lagoon is used. The date of the last cleaning is unknown. Supernatant flows back to the river.
10	**Bulk pipeline from plant to command reservoir**	75.0	No records of inspections on the bulk line manholes.
11	**Command reservoir**	50.0	Level indicators and flow meters require attention.
12	**Booster pumpstation**	81.0	Some maintenance required.
	Total	**52%**	

High risk areas OR Key Hardware Risks/ Defects

1. The water demand exceeds the actual design capacity. An assessment must be done to confirm the design capacity.
2. The flow measurement must be corrected for proper dosing control.
3. Chemical dosing must be based on required dosing, and back calculations must be carried out.
4. Chlorine room is unsafe and requires emergency work. Staff to be re-trained. Previous training was classroom based only.
5. Clarifier to be sealed and commissioned. Filter area to be enlarged.

VROOM Refurbishment Cost Estimate

Civil Works	R6,932,200	44%
Mechanical Works	R5,908,100	38%
Electrical Works (Incl C&I)	R2,890,800	18%
Total VROOM Cost	**R15,731,100**	**100%**
R million / MLD		**1.97**

Regulatory Impression

The Barkley West water treatment works were inspected to confirm the operation of the water system and the quality of water produced. The WSA indicated that the works have an 8 Ml/d capacity. The total clarifier area is about 270 m^2, while the filter area is about 45m^2. This gives a maximum throughput of about 5 Ml/d. The previous contract identified flow metering as the problem and fitted several flow meters, which are no longer operational, while the clarifier is leaking, and the filter area and nozzles are in poor condition. The chlorine room poses a huge health and safety risk and proofs that this type of training cannot be only classroom-based. Cylinders are standing loose, the room is not kept closed and locked, and no access control is practiced.

No tests are done to check for leaks or confirm that the room is safe for entry. The supervisor reported the total SIV as 500 m^3/d, which is a small percentage of the water demand for the supply area. During the investigation, it was found that the meter should be multiplied by 10. It indicates that some additional guidance is required following the leadership which has been implemented. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	87.80%
Chemical Compliance	74.56%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





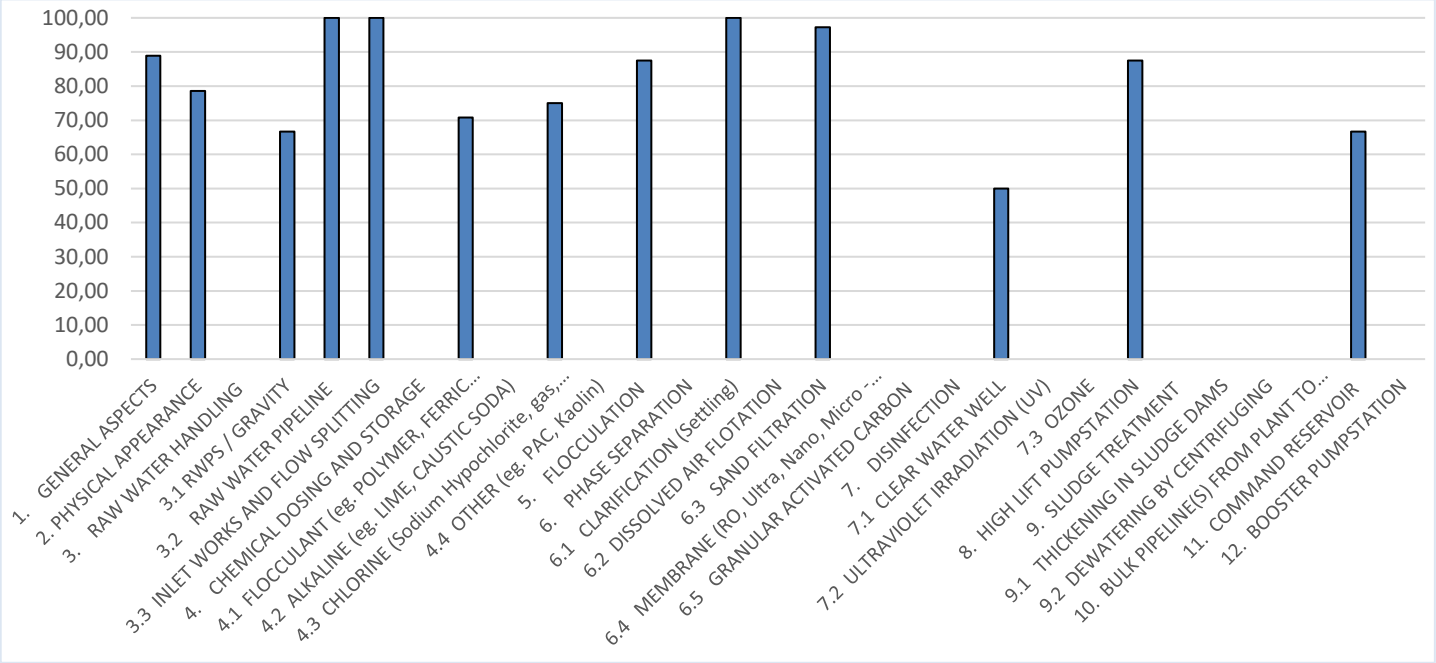

12.2 Dawid Kruiper Local Municipality

AH September water treatment works was inspected to assess its condition and functionality as part of the Blue Drop Audit. The AH September water treatment works is registered as a class B water works with the design capacity of 80 000 kl/d which is operated and managed by the Dawid Kruiper Local Municipality. The main purpose of the site inspection was to assess its condition and functionality to deliver tap water that should be compliant to SANS 241 and fit for human consumption.

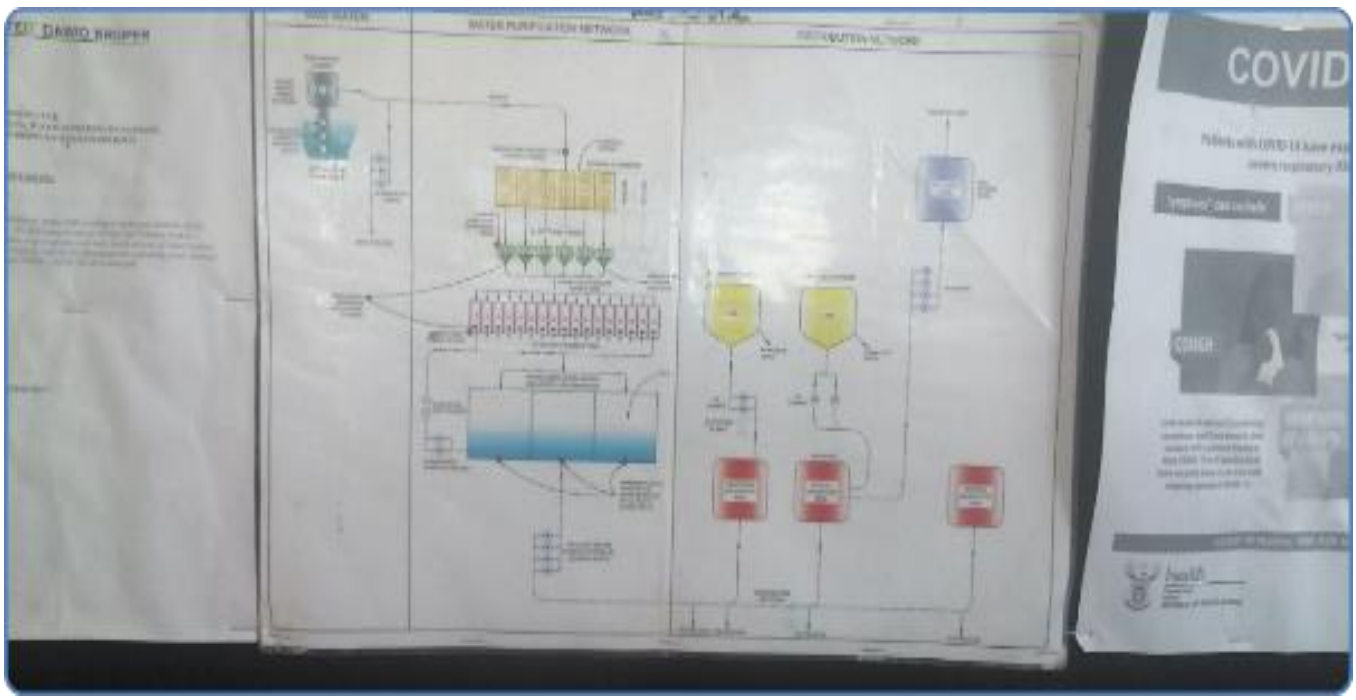
AH September TSA Score: 84%

Performance Profile of the Water Treatment Works

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and requires urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	89.0	The Employees' bathrooms and Kitchen or lunch facilities are in good condition. However, safety signage around the plant requires some improvement.
2	**Physical appearance of plant**	81.0	The garden was cleaned, and the trees were well pruned. Access and internal roads were well maintained. Water treatment chemicals could be easily delivered without obstruction.
3	**Raw water handling**		The two on duty pumps are in good working condition with no major leaks or noises. Four (4) raw water pumps are installed with two on duty and two pumps on standby. The 900 mm steel pipe raw water delivery line was in good condition. The Senior process controller indicated that there were no regular leaks or evidence of corrosion.
	Raw water pump station / gravity feed	67.0	
	Raw water pipeline	100.0	
	Inlet works	100.0	
4	**Chemical dosing and storage**		The six (6) dosing pumps are in good working condition without signs of wear. There is one spare pump in storage. Standby dosing pump capacity should be installed.
	Flocculant	71.0	
5	**Flocculation**	88.0	Good floc formation in the flocculation columns were observed. The flocculation columns were cleaned with no evidence of excessive scum, sludge, or algae.
6	**Phase Separation**		
	Clarification (settling)	100.0	There was no evidence of excessive floc carry over in all the tanks. Desludging took place twice per shift or more frequently based on the NTU results.
7	**Sand filtration**		All backwash pump was in good working condition with no excessive leaks and not running hot or noisy. There was 100% standby capacity installed for each section. 1 duty and 1 standby. There was good and even bubble distribution when backwashing was taking place. Nozzles were replaced between June and August 2022.
9	**Disinfection**		Free chlorine was measured at the right location. There are two sumps on-site, however the contact time should be determined.
	Clear water well	50.0	
11	**Command reservoir**	67.0	Telemetry in place and in working condition. Records of reservoir level were provided. The reservoir is not fenced, the old fence was stolen by community members.
	Total	**84%**	

High risk areas OR Key Hardware Risks/ Defects

1. Leaks around sand filters need to be repaired.
2. Standby coagulant dosing pumps need to be installed.
3. Stand by capacity for clear water pumps should be increased.
4. No command reservoirs, water was delivered to the storage reservoirs after the demand had been met.

VROOM Refurbishment Cost Estimate

Civil Works	R603,900	55%
Mechanical Works	R479,600	44%
Electrical Works (Incl C&I)	R17,600	2%
Total VROOM Cost	**R1,101,100**	**100%**
R million / MLD		**0.01**

Regulatory Impression

The technical staff has proven during the technical site inspection that AH September WTW was well operated, maintained and process controllers were competent to manage the plant to produce adequate treated water. The process controller together with the plant supervisor took the regulatory team through the works starting from the raw water abstraction point up to the point of delivery at the distribution system. The Blue Drop regulatory team noted that the general aspects and physical appearance of the water treatment works was excellent and the employee's ablution facilities, kitchen and lunch facilities were in good condition. Water quality was monitored according to SANS 241 requirements and was of high quality. Upington residents and neighbouring areas that receive water supplied by AH September WTW may use the tap water with high level of confidence. The Department identified that the municipality has conducted risk assessment where microbiological and chemical determinands were sampled as prescribed by SANS 241 and analysed for both raw water and final water. Most determinands samples were in compliant with the SANS 241 and that implied that AH September water treatment works was capable to remove all hazards from the raw water.

The Blue Drop regulatory team established that a Water Safety Planning process was in place, however Dawid Kruiper Local Municipality needed to include a dedicate assembled team that should be responsible for risks and mitigation measures identified and implementation thereof. In addition, the technical site assessment identified the following areas that need to be improved to enhance the drinking water quality management by the municipality:

- Improve issues identified on the condition assessment findings above, particularly install a standby chemical dosing pump to ensure that whenever required, it should be ready to be in-service.
- Technical assessment noted leaks around sand filters that need to be repaired.
- The security of the reservoirs should be improved to protect these facilities from vandalism and other social risks.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	96.40%
Chemical Compliance	86.96%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





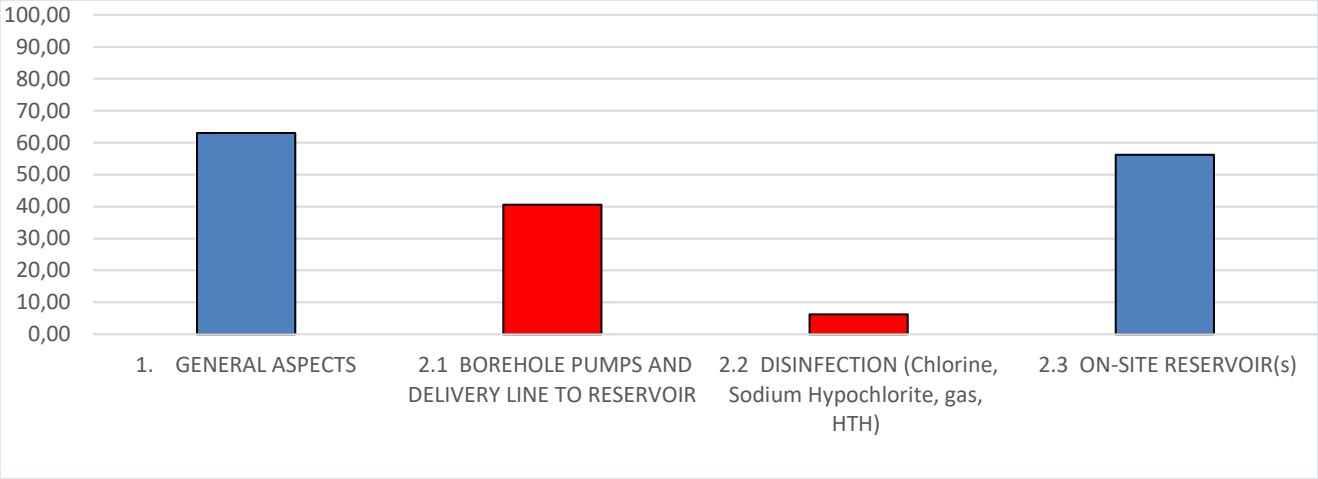

12.3 Emthanjeni Local Municipality

The De Aar water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality. De Aar water treatment system is registered and classified as class D and requires to be operated by process controller registered as class II and be supervised by class V. De Aar water scheme supply tap water to more than 26 000 population together with commercial industries within the town.

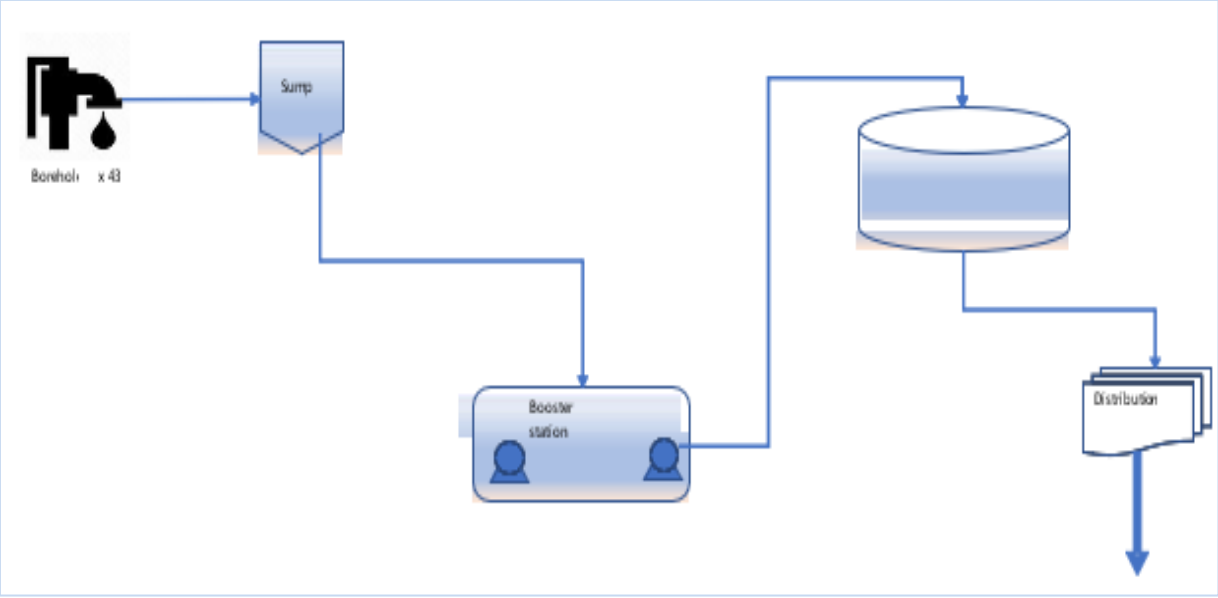
De Aar Treatment System TSA Score: 43%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and requires urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	63.0	The WSI provided an O&M manual for the boreholes, but the manual procedure was evidently not followed. The municipality indicated that free chlorine was monitored, and the results are also recorded including average daily flows, but no proof provided to confirm that practice. The boreholes are in private properties with controlled access to the boreholes. Some of the boreholes were caged while others are not caged. Access roads were in fair while other boreholes roods were in poor conditions were not easily accessible via light delivery vehicles.

Watch #	Process Unit Assessed	% TSA	Observations
2	**Technical**		
2.1	Borehole pumps and delivery line to reservoir	41.0	The raw water pipeline was mostly asbestos but in good condition with no serious leaks observed. Leaks were attended whenever were detected. Bulk maintenance team also regularly drove along the pipeline to check for leaks. The flow meters installed at each borehole. Working condition of those meters could not be verified due to load shedding at the time of assessment. The municipality indicated that flow readings were recorded, interpreted, and interpreted, however no proof provided.
2.2	Disinfection	6.0	There was a provision of chlorine gas dosing system at the booster station, however had been vandalised and no longer working. The municipality was using chlorine floaters at the reservoirs. Therefore, cannot accurately determine dosing rate and volume. There was no provision for spare chlorine. HTH cartridges was only purchased whenever required and no proof of recently purchase floaters was provided. There is no safety equipment around the dosing areas. There was no proof of chlorine stock at any of the on-site-reservoirs.
2.3	On-site reservoir	56.0	There was one reservoir West site in town had fence with a lockable gate. The other reservoir in the east site's fence and gate had been stollen. Telemetry was available and working at both reservoir sites and the pump station. There were no flow meters installed at both reservoir sites. One structure showed aging condition and signs of cracks. Other reservoirs structures were still intact, and no leaks observed
	Total	**43%**	

High risk areas OR Key Hardware Risks/ Defects

1. Poor disinfection practices
2. Asbestos bulk pipe network
3. Lack of flow meters at reservoirs.

VROOM Refurbishment Cost Estimate

Civil Works	R86,900	37%
Mechanical Works	R82,500	36%
Electrical Works (Incl C&I)	R62,700	27%
Total VROOM Cost	**R232,100**	**100%**
R million / MLD		**1.16**

Regulatory Impression

Emthanjeni Local Municipality has seemed to be in control of managing tap water supplied by De Aar borehole scheme, however the Department's regulatory team had a difficulty of assessing the documentation related to management of this water supply system. For instance, there was operation and maintenance manual in place but no sufficient proof that personnel run the borehole scheme as per the provided manual. The municipality did not submit drinking water quality results as per the requirements on the Integrated Regulatory System (IRIS) therefore the Department may not confirm whether tap water supplied by the municipality to De Aar residents was fit for human consumption or not. However, the Department noted during the Blue Drop assessment that there were some drinking water quality results in hardcopies but due to lack of dedicated personnel, those laboratory results were not captured on the IRIS. The Department has noted that there were no dedicated personnel who should be responsible for monitoring water quality, recording volume of water produced on the daily basis and ensuring that tap water is disinfected before reaching the consumers. According to IRIS, De Aar water scheme is classified as Class D therefore should be monitored by a process controller who is at least Class II however, none of personnel within the municipality was classified as class II. Management of water disinfection should be managed by appropriate process controllers and keep all records in terms of quality of water produce, amount of chlorine added, and volume of water supplied. The Department has also noted that mechanical competency proof not submitted therefore technical assessment could not established whether there is sufficient mechanical team to maintain De Aar water scheme. Over and above findings the Regulator recommends the following:

- This water treatment system requires Class II process controller and supervised by class V as per the Blue Drop standards.
- The municipality must confirm accurate yield capacity of all boreholes system and provide records of average daily flows as per the Blue Drop requirements.
- Municipality drinking water quality monitoring and laboratory analysis results should be uploaded on the IRIS.
- Full SANS 241 determinands should be monitored at least once per annum as part of risk assessment to determine the quality of water supplied to De Aar residents.

- The municipality should develop a water safety planning in which all condition assessments findings and high risks areas stated above will be addressed.
- The technical assessment has provided VROOM refurbishment cost estimate to assist municipality to approach relevant stakeholder to support the municipality with projects initiative to improve the condition of De Aar water supply system.

The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility. The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	NI
Chemical Compliance	NI

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





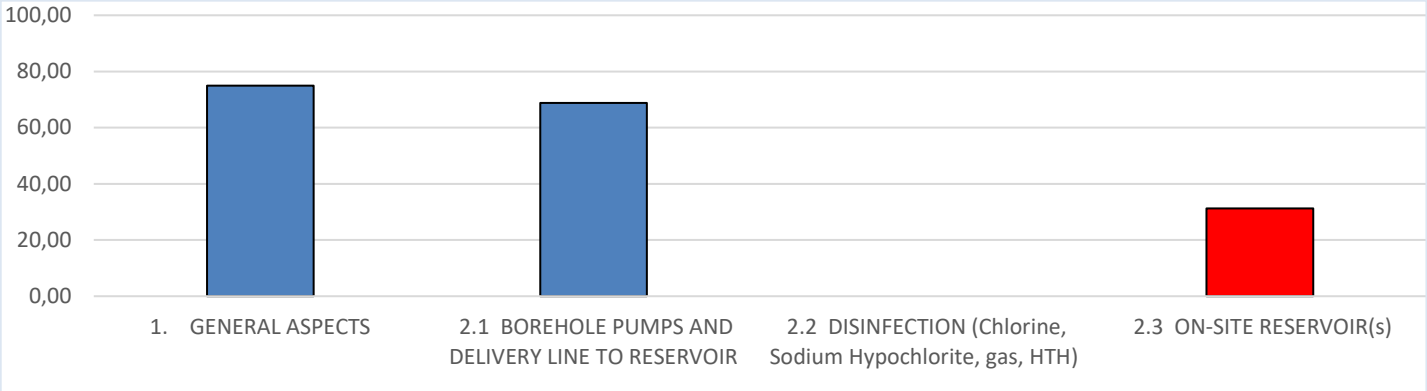

12.4 Ga-Segonyana Local Municipality

The Kuruman-Wrenchville water supply system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground and to estimate the restoration cost to full functionality.

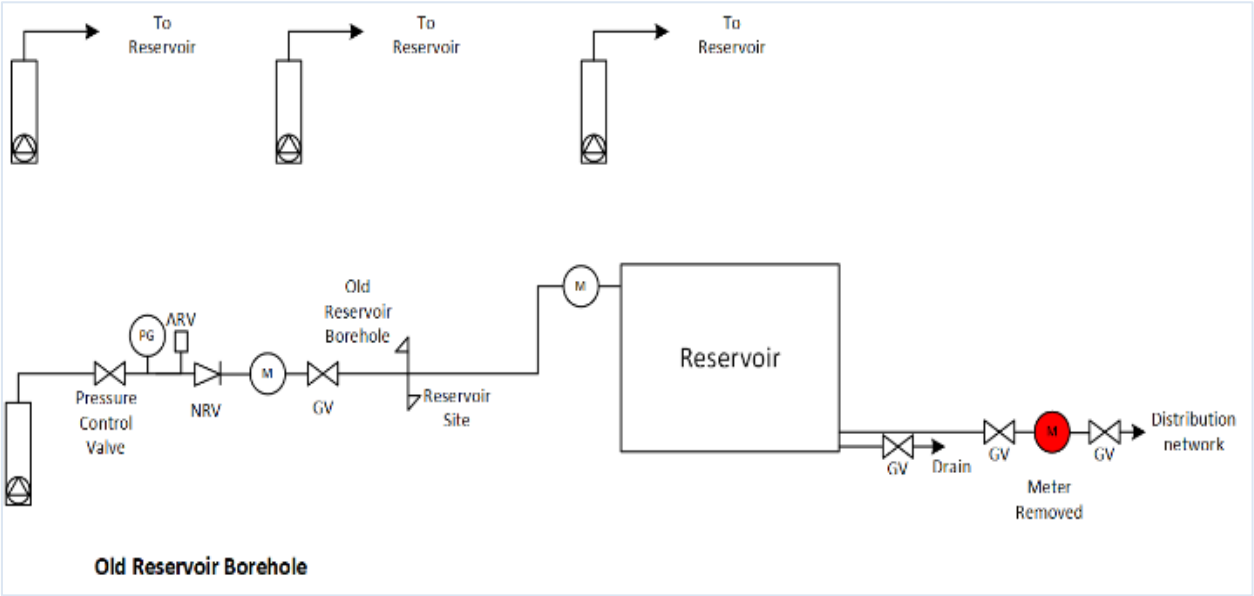
Kuruman (Old Reservoir System) TSA Score: 55%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	75.0	O&M Manual not yet finalised.
2	**Technical**		
2.1	Borehole pumps and delivery line to reservoir	69.0	Only 2 borehole pumps are operational.
2.2	Disinfection	0.0	No disinfection taking place. Still to be commissioned.
2.3	On-site reservoir	31.0	The existing reservoir has been reported to be leaking. A new system has been built and will be commissioned.
	Total	**55%**	

High risk areas OR Key Hardware Risks/ Defects

1. The safe yield and abstraction rate for most boreholes are unknown and some of the boreholes may be over pumped.

2. The newly constructed reservoir system must be commissioned, and the old concrete reservoir decommissioned.
3. The newly upgraded chlorine system must be commissioned and handed over for use by the municipality.

VROOM Refurbishment Cost Estimate

Civil Works	R132,000	8%
Mechanical Works	R746,900	46%
Electrical Works (Incl C&I)	R752,400	46%
Total VROOM Cost	**R1,631,300**	**100%**
R million / MLD		**0.07**

Regulatory Impression

The Old Reservoir system was inspected. The system has recently been upgraded and all were in good order. A small leak on the air valve was identified. No chlorine dosing is taking place, but a new system is ready for commissioning and handover to the municipality. The existing reservoir fence is being vandalised and the bulk flow meter has been vandalised. The reservoir will soon be decommissioned, and a new set of reservoirs being used. It is suspected that the existing reservoir might be leaking and is built in a dolomitic area. The housekeeping was outstanding at the pump station, while two others were vandalised. Similar protection will be installed on the other pump stations. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for chemical but not for micro. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	90.84%
Chemical Compliance	97.78%

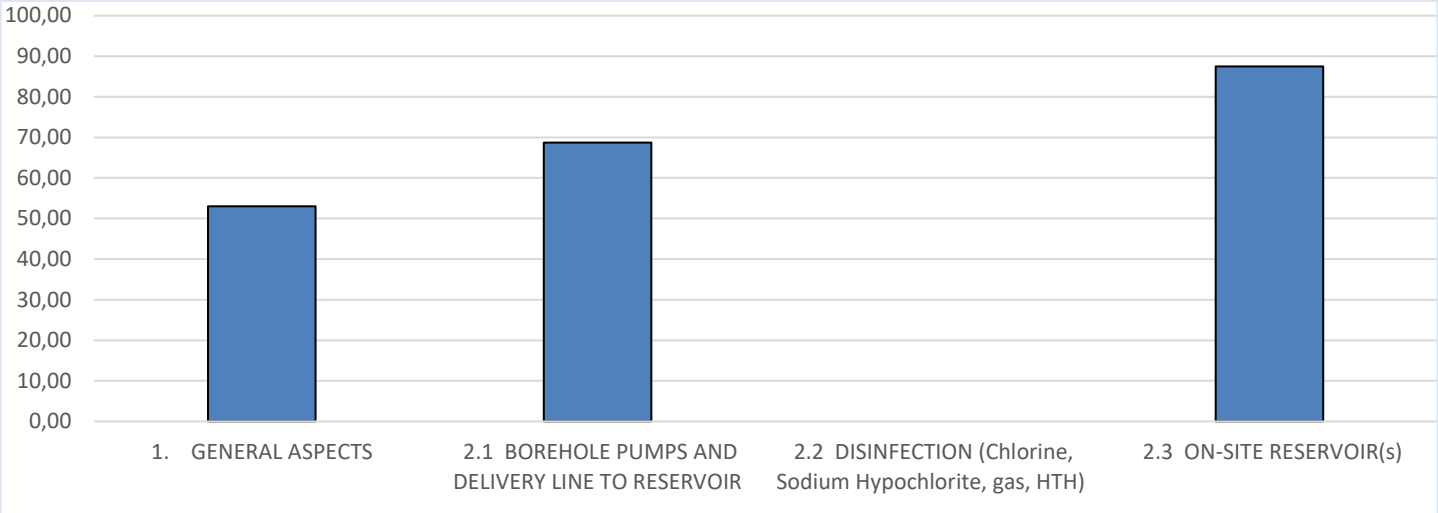
Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

The Kuruman-Wrenchville water supply system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground and to estimate the restoration cost to full functionality.

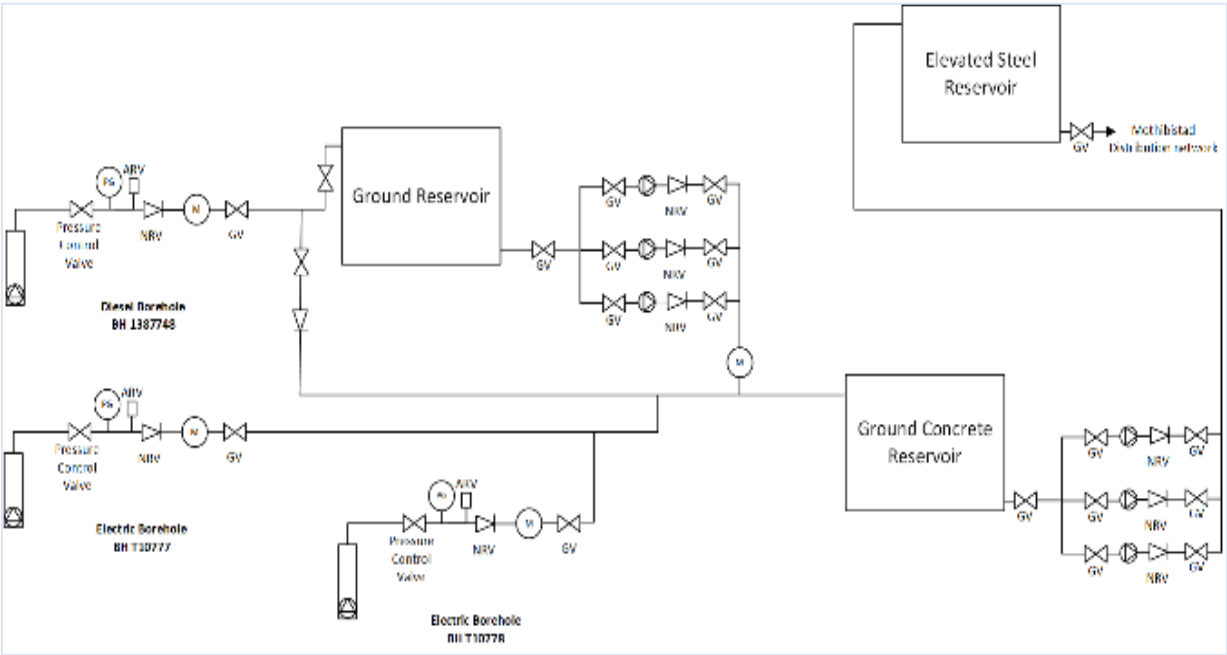
Mothibistad Borehole System TSA Score: 64%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	53%	One O&M manual available. Logbooks not being used.
2	**Technical**		
2.1	Borehole pumps and delivery line to reservoir	69%	Illegal connections are being made on system. Borehole readings are taken once per month while boreholes are not operated as per the available safe abstraction rates. Guards are not replaced over v-belts, making the installation unsafe.
2.2	Disinfection	0%	No disinfection taking place.
2.3	On-site reservoir	87%	Well operated reservoir/pumping system. Security guarding the area at night.
	Total	**64%**	

High risk areas OR Key Hardware Risks/ Defects

1. The safe yield and abstraction rate for most boreholes are unknown and some of the boreholes may be over pumped.
2. Guards are not replaced over v-belts, making the installation unsafe.
3. Water meters should be used to ensure abstraction rates are within the recommended range and that the safe yield of the boreholes is not exceeded.
4. Disinfection should be implemented.

VROOM Refurbishment Cost Estimate

Civil Works	R363,000	66%
Mechanical Works	R50,600	9%
Electrical Works (Incl C&I)	R137,500	25%
Total VROOM Cost	**R551,100**	**100%**
R million / MLD		**0.41**

Regulatory Impression

The Mothibistad system was inspected to compare the operation of the WSA/WSP. The diesel borehole and reservoir transfer pumps were in a good condition with a full-time security guard, while the other boreholes were not guarded. Safety at the boreholes is of a concern as the maintenance staff are not putting back the guards over the v-belts. Boreholes are operated on manual and the actual abstraction rates did not match those provided, indicating the readings taken is of no value. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	91.30%
Chemical Compliance	90.94%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

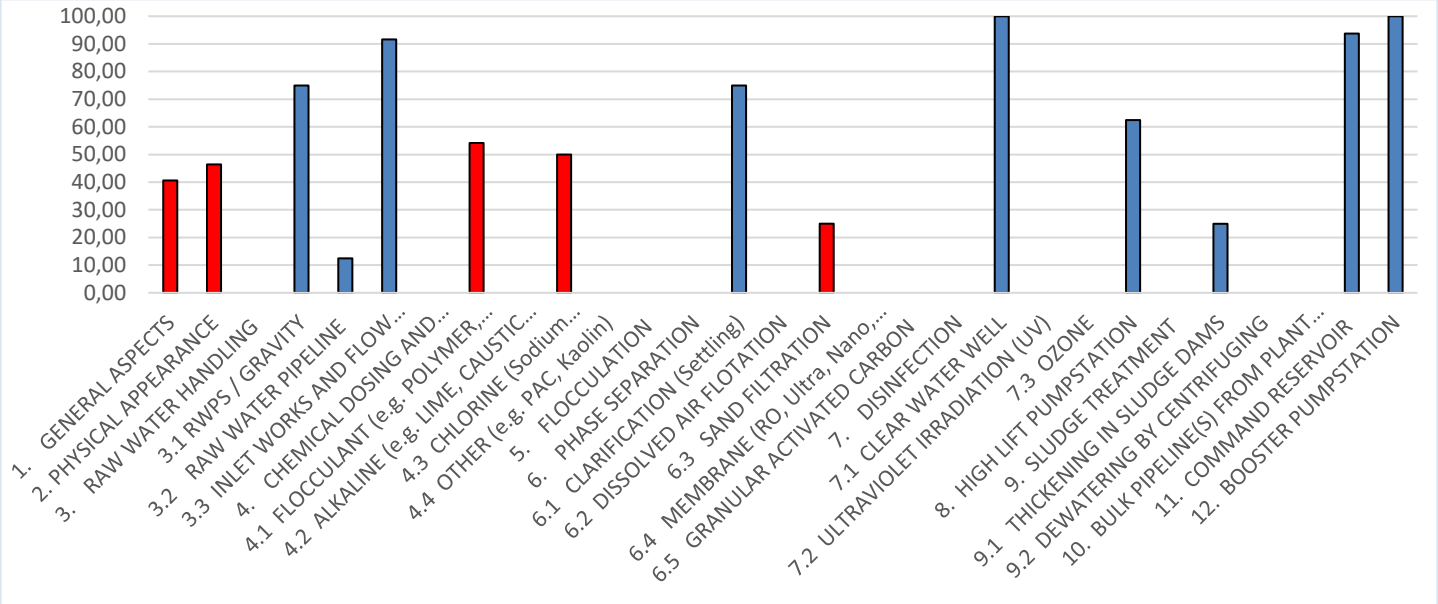
12.5 Gamagara Local Municipality

When the 2022 Blue Drop assessment team or auditors completes the documentation verification with a Water Services Authority, then the final step of the assessment or audit is to choose one or two Water Purification Plant of the Municipality for physical inspection. Kathu Water Purification Plant is one of the works that was chosen under Gamagara Local Municipality. The inspection was conducted on 24 January 2023.

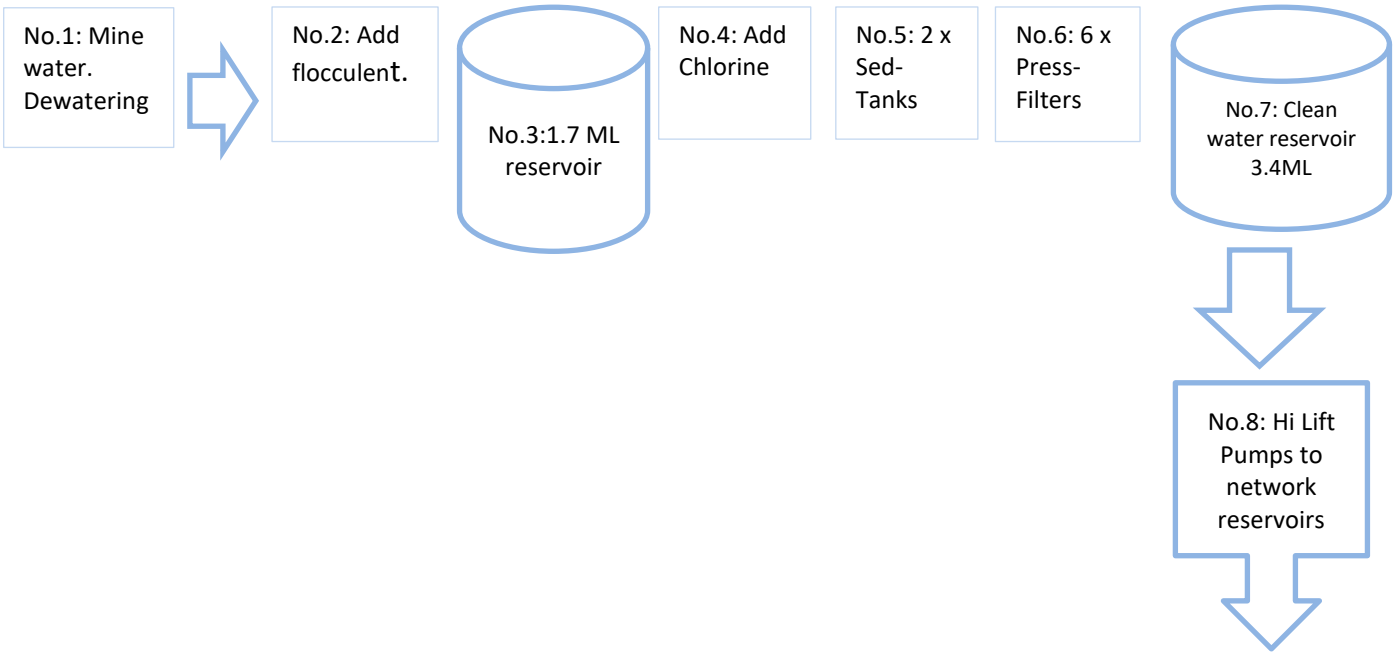
Kathu WTW TSA Score: 57%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram: Kathu Water Purification Plant



Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	41.0	This is a Class C plant certificate issued under Regulation 2384. The Municipality must update it and apply for revised one under Regulation 813. In addition, of the items checked under this item the following did not get full score and need attention of the Gamagara Local Municipality are the following: For operational monitoring only Free chlorine is checked the other parameters as turbidity; EC and pH not. The works does not have an operational monitoring logbook. The above are prescribed requirements under SANS 241.
2	**Physical appearance of plant**	46.0	Of the items inspected under Physical appearance: Key items that did not comply to Blue Drop standards is not displaying OHS signage e.g. gaseous chlorine dosing facility and gas cylinder bottles storage area as well at High Lift pump station; also the plant surroundings and premises the grass is not cut.
3	**Raw water handling**		The raw water comes from Mine dewatering activity and in the plant, it enters a round concrete reservoir (1.7 Ml) through a steel pipe and this reservoir is leaking and need attention of the Municipality. Also the steel pipe carrying the in-coming raw water there is visible wetness around it with reeds which is a sign of water / dampness. All the above mentioned need the attention of the Municipality.
	Raw water pumpstation / gravity feed	75.0	
	Raw water pipeline	13.0	
	Inlet works	92.0	
4	**Chemical dosing and storage**		Of the six items under this criterion, two need the attention of the Municipality, namely: The emergency wash area need to be installed at suitable point as well the 210L drum for the flocculent need to be kept under covered area with bund and the Municipality must look at the Data Safety Sheet for the chemicals in order to comply with handling and storage requirements. Also the gaseous chlorine room need to be investigated for OHS e.g. ventilation; air extraction; OHS signage as well the scaling of gaseous cylinders.
	Flocculent	54.0	
	Chlorine	50.0	
5	**Flocculation**	na	This item was not scored because the assessors could not climb to the top of the (1.7 Ml) concrete reservoir where the flocs would have been visible as well not able to climb to the top of the towered settling tanks to see the extension of flocculation. Therefore the Municipality need to take note and make it feasible to view floc formation (tests) at the plant.
6	**Phase Separation**	na	No phase separation
	Clarification (settling)	75.0	Of the items checked under this criterion: The one that did not meet the requirement is wastewater sludge (settled residues) of the settling tank that get disposed of to a vegetated area i.e. no sludge dams or management. No settling tanks. In addition, desludging is based on Turbidity operational tests in which the turbidity daily or per shift records are not kept. The 75% score does not reflect the above concern.
	Sand filtration	25.0	There are six (6) pressure filters and are currently by-passed or not in use awaiting refurbishment. However, the assessors noted the following items needed attention over and above the non-use of filters: Backwash pumps need attention i.e. no backwash pumps and its room including MCC look vandalised. Also the air blowers (two) of them they are full of dust and an artisan need to inspect them and see to them that they comply with machine and occupational requirements etc…. Both the backwash pumps and air-blowers work with the pressure filters and all these components need to be refurbished together during the Pressure Filtration Units refurbishment in which the Kathu WTW staff mentioned during inspection.
7	**Disinfection**		Only pre-chlorination is done. The Kathu WTW staff test for free chlorine onsite, and the chlorine test kit and consumables is available. In addition the onsite Clear Water reservoir gives an estimated retention time of at least eighteen hours (18 hours). The size of the reservoir is (3.4 ML) and the plant design capacity is (4.5ML per day).
	Clear water well	100.0	
8	**High Lift pump station**	62.5	Of the items assessed under this criterion: Only the out flow going water metered records are not available. It requires Magareng Local Municipality to prioritise meter verification and calibration at this plant. This item is quite important because drinking water quality treatment generally cannot exceed its design capacity without exposing the works to the risk of failure. Therefore flow records and evaluation is important.
10	**Bulk pipeline from plant to command reservoir**	na	This was not inspected
11	**Command reservoir**	93.7	This is a Tower reservoir fed from a ground reservoir of (6.4 ML). There is a booster pump station as well. The ONLY issue is possibly water leaks around this reservoir and need the Municipality to investigate and take necessary corrective measures.
11	**Booster pumpstation**	100.0	The booster pump station in Central Town of Kathu is in a secured site and has a generator. However, at the Township there is one booster pump station which has been vandalised and as a result the reservoir next to it is no longer in use. The 100% score only reflect to the booster pump station in Central Town of Kathu.
	Total	**57%**	

High risk areas OR Key Hardware Risks/ Defects

1. Kathu WTW need to register and be classified under Regulation 813.
2. All Process Control staff and Supervisor for Kathu WTW must be registered onto IRIS in terms of Regulation 813.
3. Kathu WTW need to comply with prescribed SANS 241 operational monitoring requirements.
4. The Municipality as a priority must check the gaseous chlorine room for compliance to OHS Act. The inspection must include other areas of the works.
5. The flocculent dosing point at Kathu WTW need to have a shelter to prevent the water treatment chemical from exposure to sunlight and the chemical safety data sheet should guide the process.
6. The plant must as a priority investigate the dewatering pipeline coming from the mine for possibly leakages because closer to the works there is visible reeds and dampness. Leak investigation must include the onsite (1.7 Ml) raw water reservoir.
7. The proposal by the Municipality to refurbish the existing (6 x pressure filters) is appreciated and it need to be expedited and should include filter supporting mechanical and electrical components as backwash pumps and air-blowers.
8. In the network, some of the reservoirs are partitioned to receive borehole untreated water for irrigation of gardens etc. not for human consumption and in Water Safety Planning review for Kathu area there should be a clear Water Quality Risk Assessment on how the Municipality is handling this based on SANS 241 requirements.
9. All flow meters from source water to the point of use reservoirs need to be verified. It is to make sure that the plant is not operated beyond the capacity as well for water balancing.

VROOM Refurbishment Cost Estimate

Civil Works	R6,754,118	57%
Mechanical Works	R3,065,021	26%
Electrical Works (Including C&I)	R2,058,288	17%
Total VROOM Cost	**R11,877,427**	**100%**
R million / MLD		**2.97**

Regulatory Impression

The Kathu Water Supply System is doing its best under the circumstances i.e. only one Process Control staff is registered and approved. It means amongst other things; the Municipality need to prioritise all the Blue Drop Criteria. Magareng Local Municipality must ensure that comprehensive, preventative drinking water quality management is practice according to Blue Drop requirements. In addition the Blue Drop requirements act as a support programme that ensures a sustainable water supply system. At Kathu Water Treatment Plant, the Technical Inspection Score of 57% need the Municipal attention. On a positive note, the Municipality is acknowledged for welcoming the 2022 Blue Drop team at their Office in January 2023.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	>99.90%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



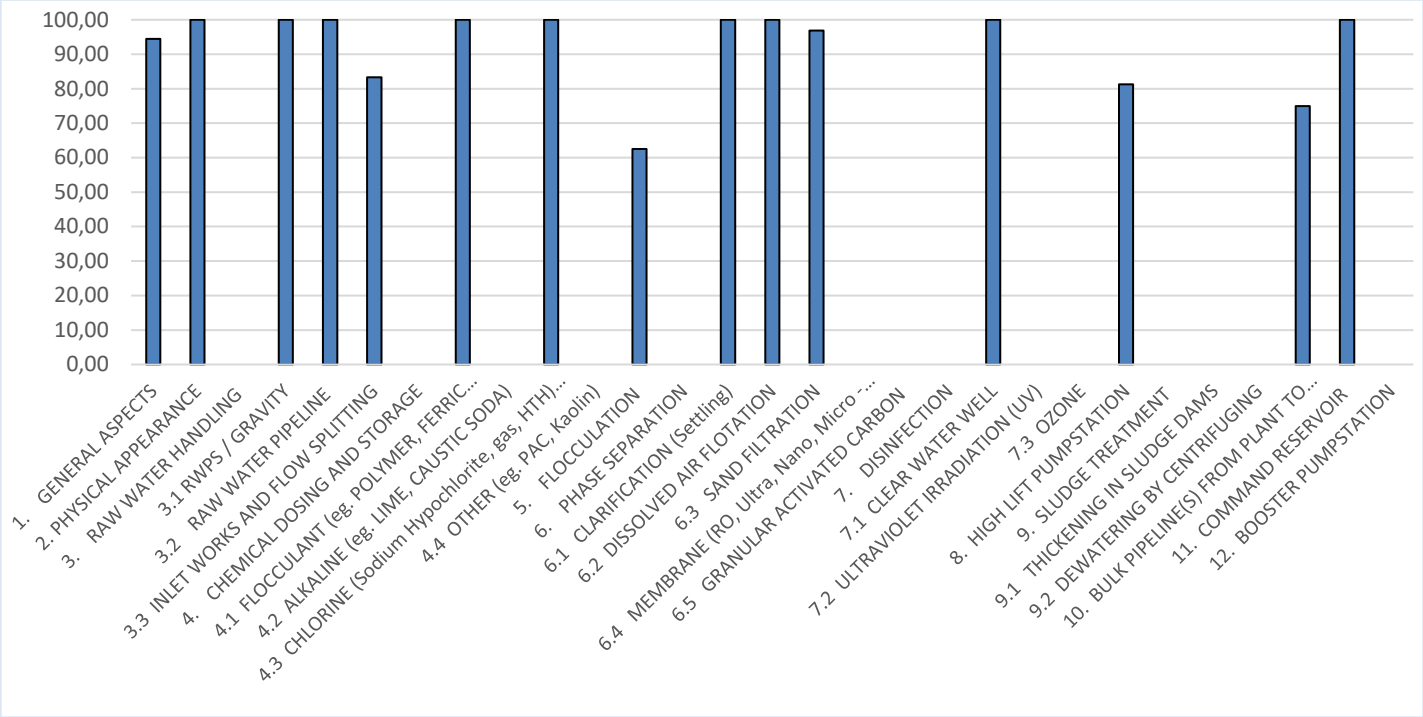

12.6 Hantam Local Municipality

The Calvinia water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

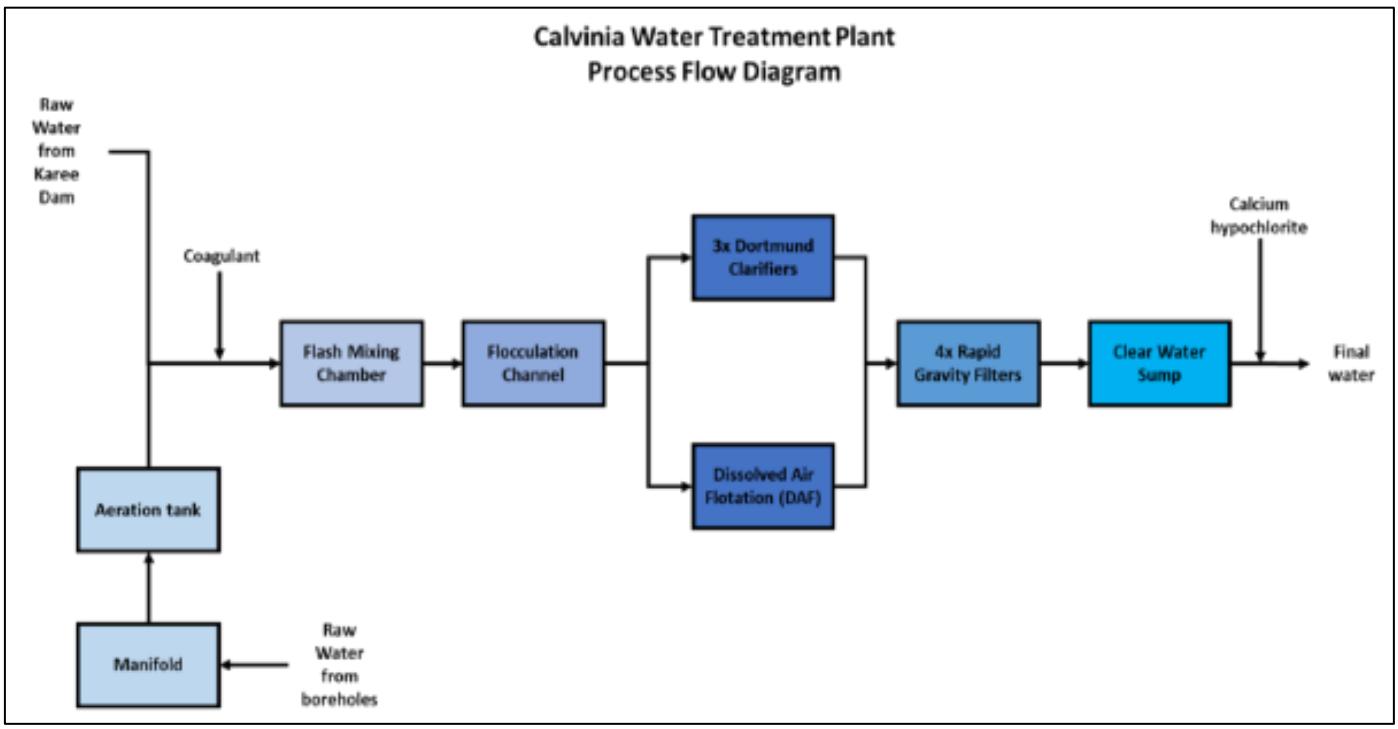
Calvinia WTP TSA Score: 94%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	94.4	Instrumentation and equipment were in a good condition. No additional equipment or infrastructure was required for this section.
2	**Physical appearance of plant**	100.0	Infrastructure was in a good condition. No additional equipment or infrastructure was required for this section.
3	**Raw water handling**		Mechanical equipment was in a good condition. No additional equipment or infrastructure was required for this section. The raw water pipeline was reportedly in a satisfactory condition, and no upgrading or replacement required. The flow meters were also in a good condition. Civil structure is required with steps where PCs can reach the coagulant dosing point.
	Raw water pumpstation / gravity feed	100.0	
	Raw water pipeline	100.0	
	Inlet works	83.3	
4	**Chemical dosing and storage**		Mechanical equipment was in a good condition. No additional equipment or infrastructure was required for the flocculant dosing facility.
	Flocculant	100.0	
5	**Flocculation**	62.5	The flocculation channels were structurally in a satisfactory condition. Cleaning of the channels should however be improved.
6	**Phase Separation**		The civil infrastructure (concrete works) of the sedimentation tank and the mechanical equipment was in a good condition. No additional equipment or infrastructure was required for the settling tanks. The civil infrastructure (DAF tank) and mechanical equipment was in a good condition. No additional equipment or infrastructure was required for the DAF unit. The civil infrastructure and mechanical equipment of the sand filters were in a good condition. No additional equipment or infrastructure was required.
	Clarification (settling) and DAF	100.0	
7	**Disinfection**		The civil infrastructure and chlorine dosing pumps were in a good condition. No additional equipment or infrastructure was required for the chlorination unit.
	Clear water well	100.0	
10	**Bulk pipeline from plant to command reservoir**	81.3	A standby clean water pump should be provided (mechanical equipment). A calibration certificate should also be provided for the existing pump.
11	**Command reservoir**	100.0	The command reservoir was in a structural good condition, with no apparent concrete integrity issues.
	Total	**94%**	

High risk areas OR Key Hardware Risks/ Defects

1. Concrete structure with steps to be provided for PCs to stand on when they check chemical dosages.
2. Standby clean water pump to be provided.
3. Sludge dam to be provided.

VROOM Refurbishment Cost Estimate

Civil Works	R1,356,300	95%
Mechanical Works	R8,800	1%
Electrical Works (Incl C&I)	R66,000	5%
Total VROOM Cost	**R1,431,100**	**100%**
R million / MLD		**0.36**

Regulatory Impression

The Calvinia WTP is a relatively new treatment system and is in a very good condition. The plant is well managed and operated by competent personnel, and the water quality well monitored. The operations are well controlled, using functional, calibrated monitoring equipment. Beaker tests are carried out when the raw water quality when alternating between borehole water and surface water or mixes thereof. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	96.47%
Chemical Compliance	95.90%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

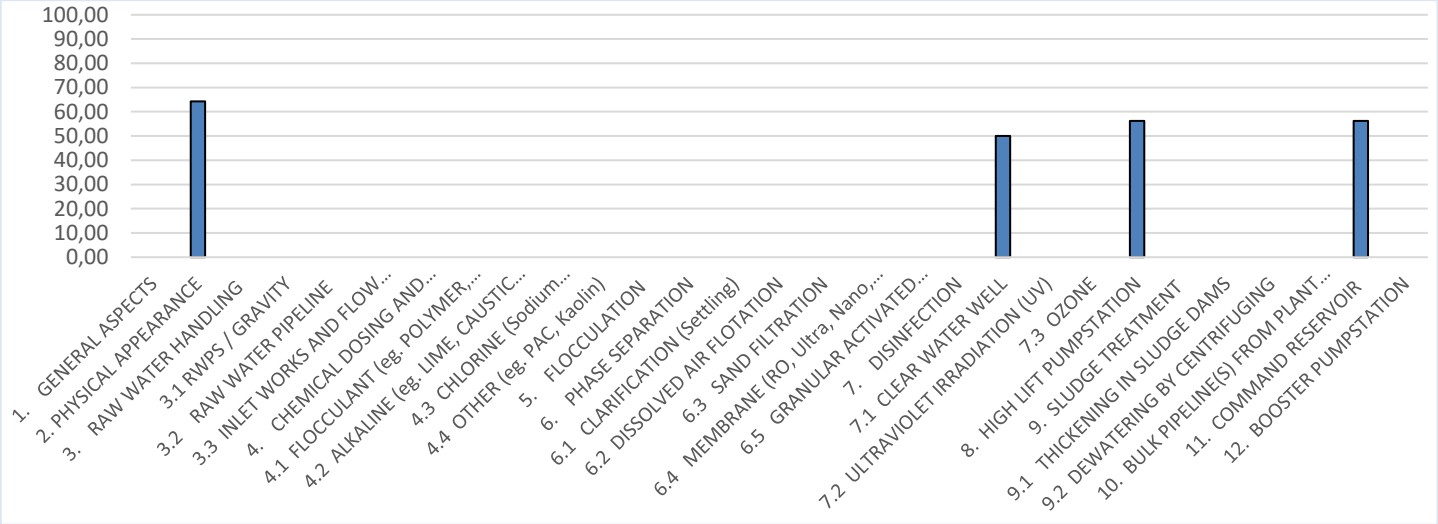
12.7 Joe Morolong Local Municipality

The Hotazel water supply system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground and to estimate the restoration cost to full functionality.

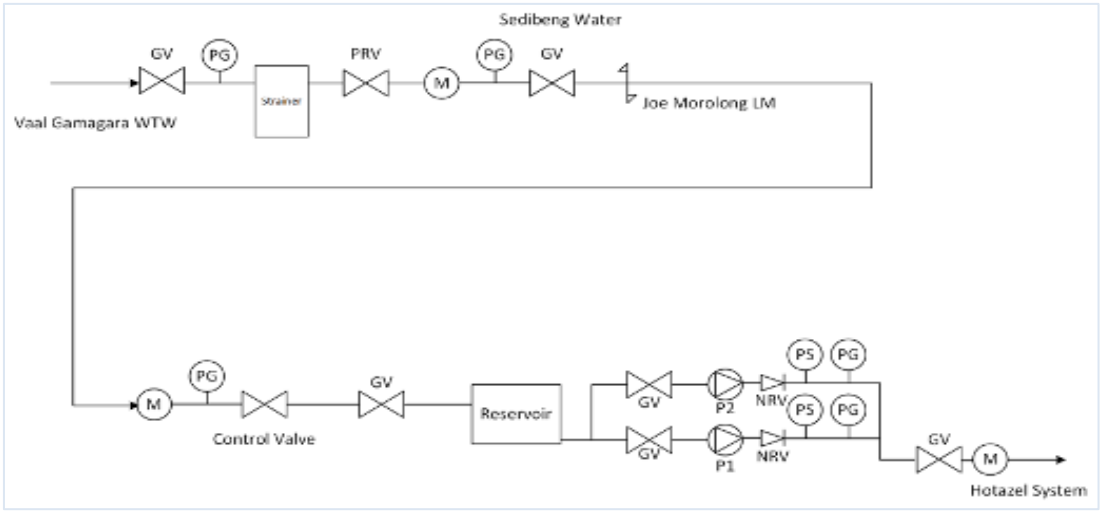
Hotazel Distribution System TSA Score: 59%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
2	**Physical appearance of plant**	64.0	The door on the secondary disinfection room has to be repaired and the room cleaned out.
7	**Disinfection**		
7.1	Clear water well	50.0	Free chlorine is not tested. No secondary disinfection.
8	**High lift pumpstation**	56.0	The flow metering device cannot be read due to the position of the reed switch. Position to be changed and meter readings taken to evaluate SIV.
11	**Command reservoir**	56.0	Flow meter not being read. The screens must be replaced, and some concrete repairs required.
	Total	**59%**	

High risk areas OR Key Hardware Risks/ Defects

1. The issue of the flow meter must be addressed. The municipal water meter reads a lot less than the flow meter from the WSP. The WSA has been advised on the method to be followed.
2. Chlorine residuals in the distribution network must be taken and secondary disinfection implemented when needed.
3. Secondary disinfection to be re-instated.
4. Screens on reservoir to be replaced to prevent insects entering the reservoir.
5. The leaking control valve on the reservoir inlet must be replaced as a matter of urgency.

VROOM Refurbishment Cost Estimate

Civil Works	R14,300	24%
Mechanical Works	R36,300	61%
Electrical Works (Incl C&I)	R8,800	15%
Total VROOM Cost	**R59,400**	**100%**
R million / MLD		**0.04**

Regulatory Impression

The Hotazel distribution has been inspected on 2 December 2022. The old Hotazel WTW has been decommissioned some time ago and was not inspected. The Hotazel system receives water from Sedibeng Water. The bulk supply has recently been upgraded and in a very good condition.

The quantity of water taken from the bulk supply exceeds the allocation and during the site inspection it was found that there are large differences between the bulk and the municipal (old bulk) meter. The WSA has been advised to check the supply by shutting their take-off and inspecting the flows. The control valve on the municipal side was leaking and require urgent intervention. No secondary disinfection was taken place. The system must be re-instated.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	99.03%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





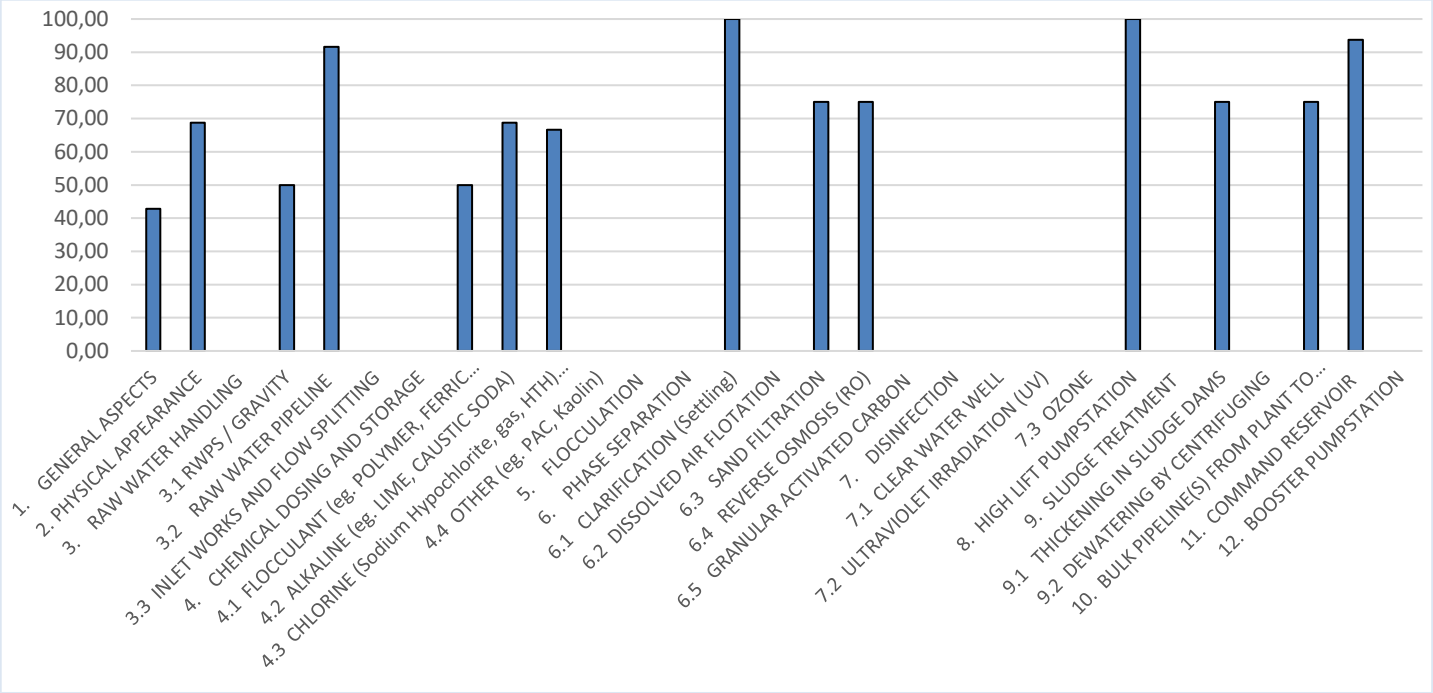

12.8 Kamiesberg Local Municipality

The Garies water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

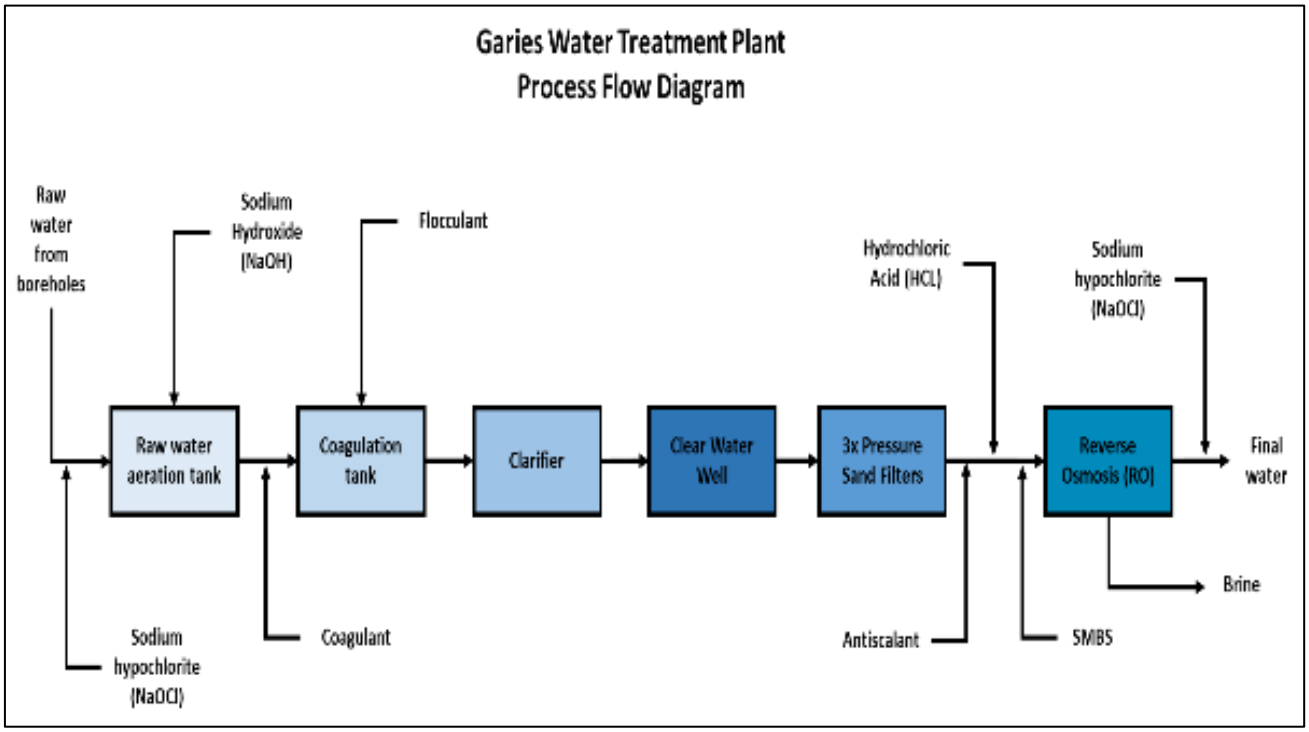
Garies WTP TSA Score: 69%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	42.8	The plant registration and classification certificate should be displayed on a wall in the office of the treatment plant. A maintenance schedule should be compiled for the treatment plant and an O&M logbook be made available in the office for use by the supervisors and PCs. A schedule of Incident Management Procedures should be compiled for the WTP. The corresponding contact list should be displayed on the wall in the operations room. Copies of metering calibration certificates should be kept at the plant operations room as well. Jar test equipment (beaker tests) should be provided at the plant for facilitating flocculant dosing adjustments when the raw water quality changes. The electricity consumption should be measured and recorded on an on-going basis.
2	**Physical appearance of plant**	68.8	A sign post should be provided on the entry gate to the plant. Facilities should be provided where the plant operation personnel can have their lunch and refreshments (coffee/ tea). The access road to the treatment plant should be scraped on a regular basis. Required safety signs should be provided throughout the treatment plant.
3	**Raw water handling**		Raw water standby pumps should be provided.
	Raw water pumpstation / gravity feed	50.0	
	Raw water pipeline	91.7	
	Inlet works	na	
4	**Chemical dosing and storage**		A standby dosing pump should be provided. Bund walls should also be provided around the chemical dosage area to contain any possible spillages.
	Flocculant Alkaline Chlorine	50.0 68.8 66.7	
5	**Flocculation**	na	A standby dosing pump should be provided. Bund walls should also be provided around the chemical dosage area to contain any possible spillages.
6	**Phase Separation**		A standby pump and blower should be provided for the sand filters. Standby feed and backwash pumps should be provided for the reverse osmosis (RO) system.
	Clarification (settling) Sand filtration Reverse osmosis (RO)	100.0 75.0 75.0	
7	**Disinfection**		A standby dosing pump for the hypochlorite dosing should be provided.
	Clear water well	na	
10	**Bulk pipeline from plant to command reservoir**	75.0	PC impression of treated water pipeline was that the pipes were in a satisfactory condition. No major leaks were reported.
11	**Command reservoir**	93.8	The command reservoir is located on the treatment plant premises. The area is gated and fences, both of which are in good condition. The structure is in good condition.
	Total	**69%**	

High risk areas OR Key Hardware Risks/ Defects

1. Provision of standby pumps. There is no redundancy on the treatment plant.
2. Provision of mess facilities for the plant personnel.
3. Improving the access road to the treatment plant.
4. The plant gate should be sign posted, and safety signs should also be put up at relevant places in the treatment plant.

VROOM Refurbishment Cost Estimate

Civil Works	R73,700	3%
Mechanical Works	R1,936,000	84%
Electrical Works (Incl C&I)	R287,100	13%
Total VROOM Cost	**R2,296,800**	**100%**
R million / MLD		**1.53**

Regulatory Impression

The Garies WTP is an advanced treatment plant using aeration, conventional treatment processes and reverse osmosis (RO). It is a relatively new plant that was commissioned in 2019, with Veolia Water the contractors for the RO system.

The company still maintains close contact with the municipality regarding the operation and maintenance of the treatment plant. The plant is well operated by competent personnel who understands the functioning and control requirements of the various unit treatment processes. The plant is in good condition and well maintained. The plant personnel undertake all the required operational water quality measurements and record keeping as suggested by Veolia Water. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	NI
Chemical Compliance	NI

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

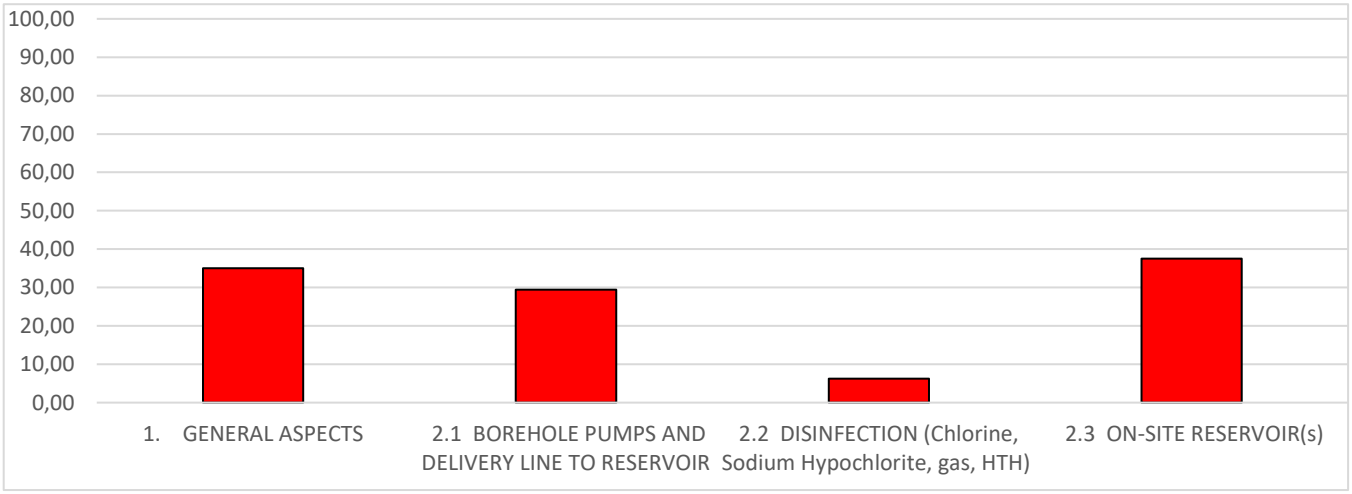
12.9 Kareeberg Local Municipality

The Carnarvon water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality. Carnarvon supplied water to approximately 6,100 population. Carnarvon water treatment system has been registered as class E therefore should be operated by process controller registered with the Department as class I and be supervised by class V.

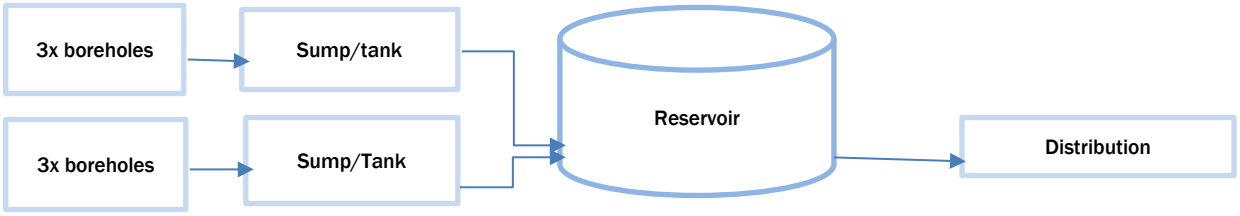
Kareeberg Borehole Scheme TSA Score: 28%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and required urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	35.0	The boreholes were well fenced and located inside corrugated iron structures. However, some front cover of the corrugated iron structures was broken and missing. No security lights were fitted at the boreholes. Gravel access roads were in fair condition for most of the boreholes and a light delivery vehicle could easily access the sites, but two boreholes were inaccessible after heavy rains. There is no proof of existence of operational and maintenance manual provided during inspection. WSI indicated that they do operational monitoring and record flow data but no evidence of such was provided.
2	**Technical**		
2.1	Borehole pumps and delivery line to reservoir	29.0	Each borehole was fitted with a flow meter, but some flow meters were not working at the time of assessment. WSI indicated that flow was recorded and compile monthly report, however proof was not provided to BD Inspector. Proof of leaks in the raw water pipeline was observed. Maintenance was more reactive than proactive.
2.2	Disinfection	6.0	The disinfection of water took place at the booster station tanks using HTH floaters, floater was added as and when required. However, no proof provided on when is HTH added to disinfect water. There was no provision for spare chlorine. WSI purchases chlorine tablets from local shops as and when required. No proof provided in the form of purchasing orders or paid receipts. There is no chlorine safety equipment at both dosing stations. No adequate storage. HTH tablets were only purchased as, and no proof of remaining stock provided.
2.3	On-site reservoir	38.0	The command reservoir was not fenced. Steel tanks located at each booster pump station were fenced with lockable gates. There was no telemetry in place. No evidence of manual

Watch #	Process Unit Assessed	% TSA	Observations
			reservoir level monitoring was provided. There is a flow meter installed from the main reservoir. The meter was in working condition. No evidence of recent meter calibration/verification. The main reservoir leaks were not observed, and structure was intact and closed at the top. The two steel tanks located at the booster stations were also closed on top but minor leaks were observed. Loxton road booster station needed to be cleaned heavy and solids staff were observed inside the tank.
	Total	**28%**	

High risk areas OR Key Hardware Risks/ Defects

1. Lack of telemetry
2. Poor disinfection practices
3. General maintenance and improve security at borehole schemes.
4. Appoint dedicate personnel to manage borehole schemes.

VROOM Refurbishment Cost Estimate

Civil Works	R289,300	46%
Mechanical Works	R137,700	22%
Electrical Works (Incl C&I)	R194,700	32%
Total VROOM Cost	**R623,700**	**100%**
R million / MLD		**0.78**

Regulatory Impression

The technical assessment has noted that Carnarvon boreholes microbiological and chemical chronic compliance was acceptable therefore complied with SANS 241. The Department commends Kareeberg Local Municipality together with Pixley Ka Seme District municipality for maintaining drinking water quality monitoring programme to ensure that the status of tap water quality is known. However, the technical assessment team has noted that chemical with acute risks required to be improved and be aligned with SANS 241 limits therefore posed health risks to the consumers. Kareeberg Local municipality as a water services authority is expected to investigate as there were six (6) borehole that supplied water to Carnarvon town and identified those which contributed to non-compliant and where possible should be isolated. The technical assessment has identified that the municipality lacks technical staff responsible to manage tap water within the municipality. There was no dedicated process controller as required by regulation 2834 to manage operation of borehole to ensure that tap water is adequately disinfected, keep treatment records and volumes of water produced by the boreholes. The municipality could not confirm a dedicated skilled process controller who should monitor quality of water on the daily basis. It should be noted that water was reported to be disinfected therefore it is a duty of the personnel to ensure that tap water is adequately treated to eliminate microbiological risks and maintained appropriate volume of disinfectant. Another area of concern was that the municipality does not have qualified and skilled maintenance team, the municipality has failed to submit maintenance records of water treatment infrastructure. The technical assessment has noted some leaks at one of the booster pump station and poor condition of Loxton reservoir was a cause for concern due to lack of regular cleaning. The Department recommends the following:

- The municipality needs to ensure availability of process controllers with relevant skills at Carnarvon borehole schemes.
- Risk assessment should be conducted and identify hazards that lead to non-compliance with SANS 241 and implement risk management.
- Develop a water safety planning process to address all condition assessment findings and high risk highlighted on the tables above.
- Improve skilled capacity of maintenance team and maintenance records should be kept for future technical assessment.
- The technical assessment has established VROOM refurbishment cost estimated to assist the municipality to approach relevant stakeholders to request budget to support initiative required to be taken to improve the condition of Carnarvon borehole scheme.

Kareeberg Local municipality need to commit to management of drinking water and put in place all measures stated above to ensure that tap water delivered by Carnarvon water supply system is safe for human consumption. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

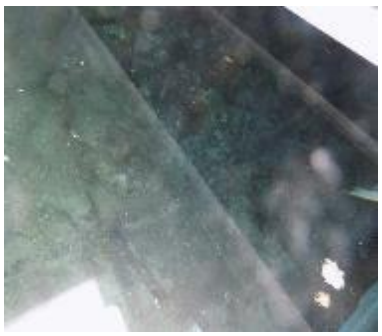
The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	96.00%
Chemical Compliance	88.14%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%







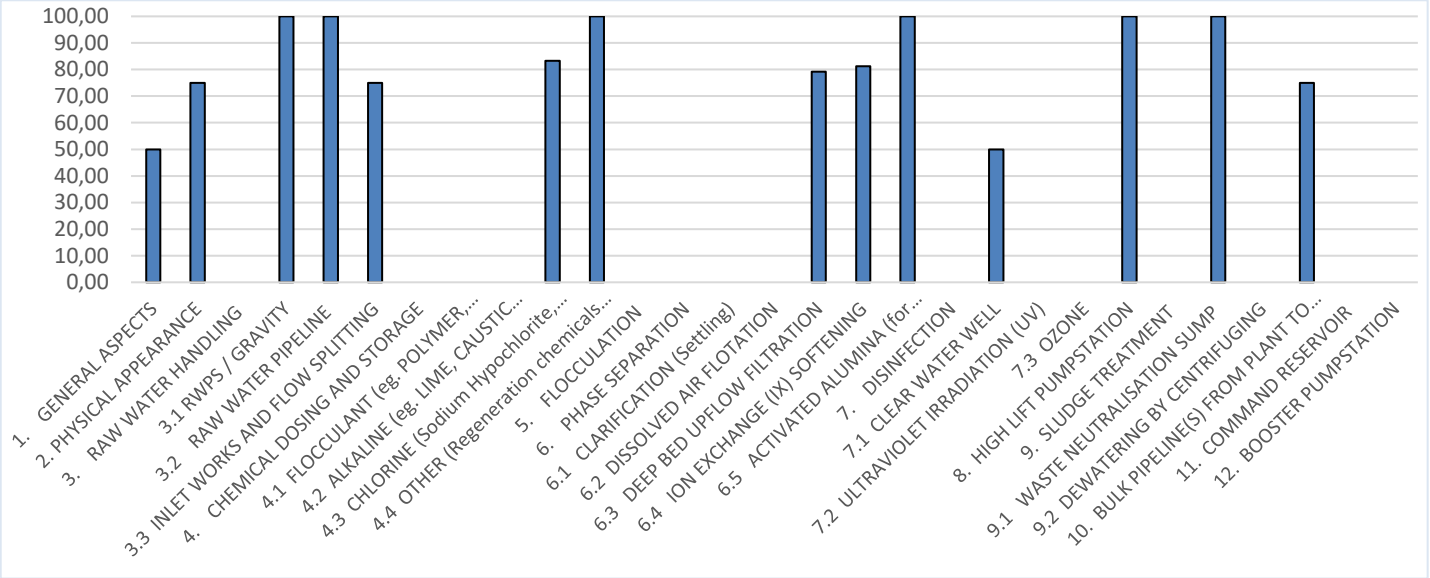

12.10 Karoo Hoogland Local Municipality

The Sutherland water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

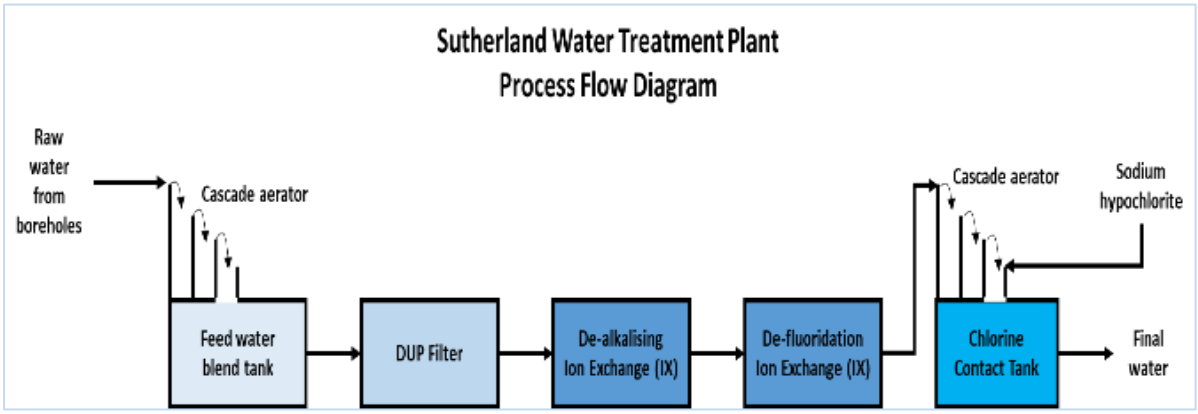
Sutherland WTP TSA Score: 80%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	50.0	Hand-held monitoring instruments should be provided to the PCs to measure pH, Turbidity, EC, and fluoride.
2	**Physical appearance of plant**	75.0	Access road to the WTP is a gravel road and crosses a rivulet which is not ideal for delivery trucks. The last portion of the road to the WTP is paved and in good condition. The entrance is gated and the WTP is fenced all around. The fence is in good condition. The plant should be signposted at the entrance.
3	**Raw water handling**		Installed pumps are operational and in good condition. No leakages on the raw water pipeline were reported. An inflow meter was installed and operational. The overflow plates of the aerator should be adjusted so that even flow over the plates is ensured.
	Rwps / gravity feed	100.0	
	Raw water pipeline	100.0	
	Inlet works	75.0	
4	**Chemical dosing and storage**		98% Sulphuric Acid is stored in a 25m³ Carbon Steel Painted Tank. 25% Sodium Hydroxide is stored in a 27m³ Chemical Polyethylene Tank. The level of the two chemical tanks is monitored and the low alarm will warn the operator that a chemical delivery is required, by turning red. There is thus sufficient storage for 30 days.
	Regeneration chemicals for ion exchange unit, namely	83.3 100.0	

Watch #	Process Unit Assessed	% TSA	Observations
	sulphuric acid & sodium hydroxide		
5	**Flocculation**	na	
6	**Phase Separation**		
	Deep Bed Upflow Filtration	79.2	3x backwash pumps installed and in working order.
	Ion Exchange (IX) Softening	81.3	Feed pumps installed and in good working condition. Laboratory testing of product samples will need to be carried out to assess whether the 50% IX bypass split is satisfactory to meet the potable water quality requirements. Chemical regeneration facility was in good order, with no spillages observed. Sufficient storage is available in the large outside tanks. The dosage pumps were operational.
	Activate Alumina (for fluoride removal)	100.0	The plant is only three years old, so no reactivation has been done to date.
7	**Disinfection**		Sodium hypochlorite dosages were checked with the PCs and calculations indicated that sufficient volume of the disinfectant is available for 30 days. However, this could not be checked.
	Clear water well	50.0	
10	**Bulk pipeline from plant to command reservoir**	75.0	PC impression of treated water pipeline was that the pipes were in a satisfactory condition. No major leaks were reported.
11	**Command reservoir**	-	No command reservoir on site. Two service reservoirs elevated on the small hills on either side of the plant. The service reservoirs were not inspected.
	Total	**80%**	

High risk areas OR Key Hardware Risks/ Defects

1. The condition of the access road should be improved.
2. No other hardware requirements.

VROOM Refurbishment Cost Estimate

Civil Works	R5,500	1%
Mechanical Works	R183,700	43%
Electrical Works (Incl C&I)	R234,300	55%
Total VROOM Cost	**R423,500**	**100%**
R million / MLD		**0.28**

Regulatory Impression

The Sutherland WTP is an advanced treatment plant designed for softening of the borehole feed water, as well as for fluoride removal. The treatment system uses the ion exchange and activated alumina processes for softening and fluoride removal, respectively. The plant was designed and built by Prentec (now part of DRA Global) and commissioned in 2019. The plant operational personnel were well trained in the day-to-day operation of the plant. The plant is largely automated and includes an upfront aeration step for stripping of hydrogen sulphide. The plant is functioning satisfactorily and is in a good condition but the same cannot be said for the DWQ compliance. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility. The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	92.86%
Chemical Compliance	85.00%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



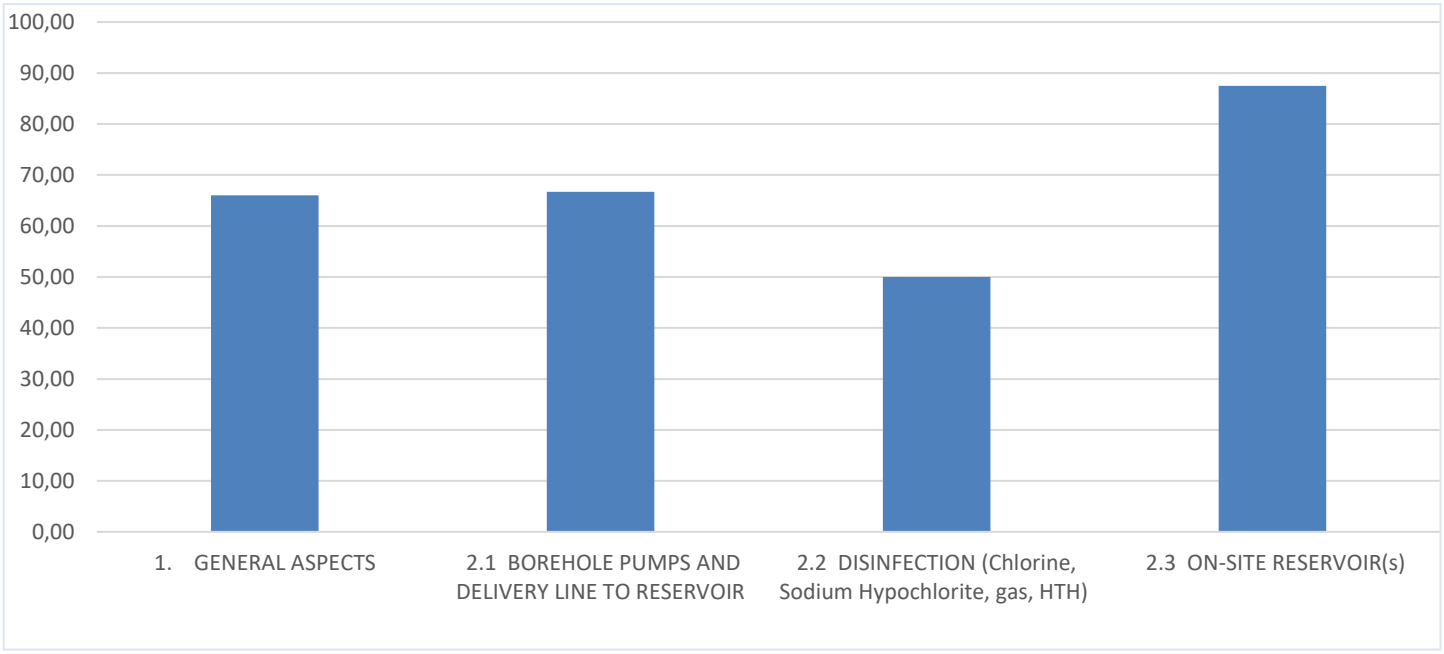

12.11 Kgatelopele Local Municipality

This supply system supplies drinking water to the community of Kgatelopele Local Municipality in Danielskuil. It is under the control of Kgatelopele Local Municipality. It was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality. And the inspection followed a documentation and verification of Danielskuil Supply System with the Municipal Staff at the Offices.

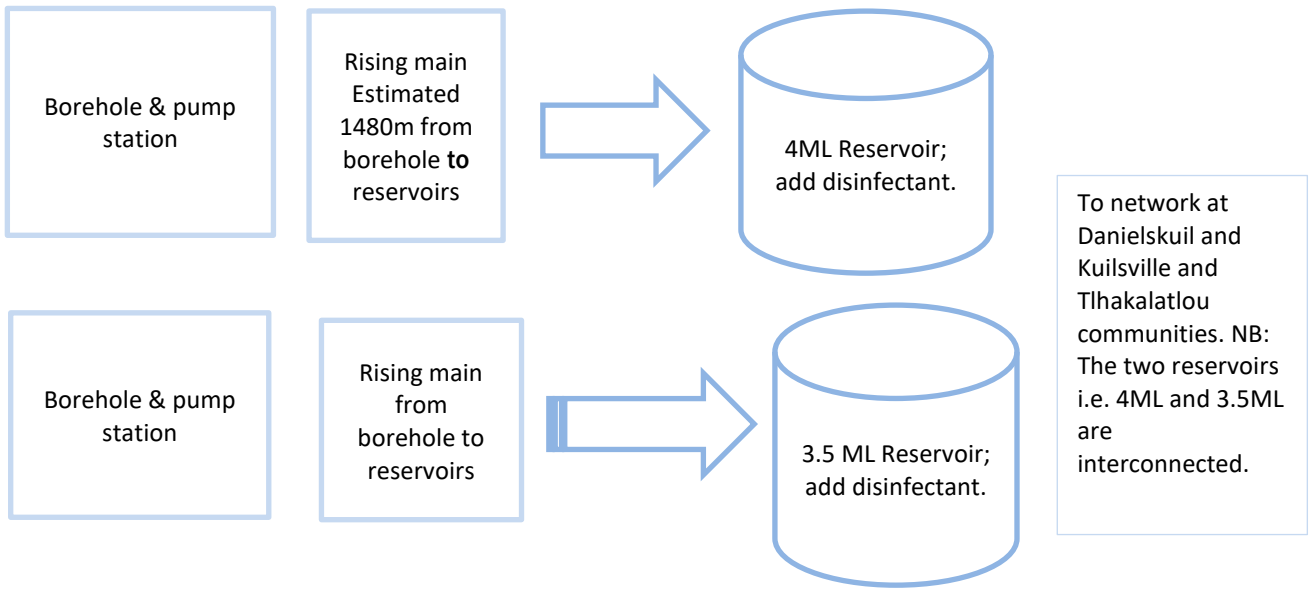
DANIELSKUIL BOREHOLES TSA Score: 71%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Areas of the supply system that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram: Danielskuil Supply System



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	72.0	Class E approved Boreholes Treatment System and O&M Manual of the boreholes not provided. Flow readings taken once a month and recorded on a notebook. Borehole pump house(s) provided with brick structure with Cages in place and private security firm contracted to secure some. In addition copper cables replaced with less value cable to deter thieves. MCC housed in lockable structures. Access roads are all gravel, but sufficient in terms of transporting borehole material as well for inspection of supply system by Kgatelopele Local Municipal Officials.
2.1	**Borehole pumps and delivery line to reservoirs**	79.2	All borehole(s) visited the submersible pumps and borehole area is well kept. The MCC controlling the borehole is in a secured pump house. For instance in one borehole. The 110mm galvanised pipe was seen in good condition and the Kgatelopele LM staff acknowledged that when there is a pipe water leak it get attended to promptly. Flow meter is installed at the rising main pumping to the reservoir(s), and it is operational, and readings taken monthly. However, proof of flow records were not provided.
2.2	**Disinfection (Chlorine Tablets)**	50.0	Chlorine chips are added in the reservoirs once per month using mounted chains. Because the disinfectant is dissipating easy, it is important that SANS 241 requirement are adhere to by Kgatelopele LM i.e. to sample weekly for microbiological water quality parameters as well do operational tests as free chlorine residual and turbidity at an acceptable frequency. The score is 50% because Kgatelopele LM did not comply to SANS 241 requirements for weekly sampling and reporting of data onto IRIS system in the assessment period July 2021 to June 2022 i.e. E. coli bacteria or faecal coliforms were only sampling every 52 days instead of weekly.
2.3	**Supply Reservoir(s)**	87.5	Both reservoirs i.e. 3.5 Ml concrete and 4 Ml steel panel are within a secured area. There was a Telemetry system, but it got vandalised and now staff check the levels manually during the day and stop start the pumps by hand. In each outlet of the two reservoirs there is a flow meter and readings are done monthly. Both reservoirs are closed at the top.
	Total	**71%**	

High risk areas OR Key Hardware Risks/ Defects

1. All flow meters need to be verified or calibrated. It is to ensure that the boreholes are not operated beyond capacity.
2. Vandalised telemetry system need to be re-instated and secured to assist with water supply management.
3. The flooded borehole(s) need to be reassessed through a Water Safety Planning process before use. It is to ensure the safety and acceptability of the drinking water system.
4. No staff dedicated for IRIS system and water quality. The Municipality must please identify staff to perform this function to ensure continuity of Water Services and Blue Drop.

VROOM Refurbishment Cost Estimate

Civil Works	R20,900	23%
Mechanical Works	R39,600	43%
Electrical Works (Including C&I)	R31,900	37%
Total VROOM Cost	**R92,400**	**100%**
R million / MLD		**0.36**

Regulatory Impression

The Danielskuil water system is maintained to basic standards and the Municipal Technical Team co-operates with Regulatory Officials. There were few 2022 Blue Drop documents/ verification proof BUT the actual water supply system of boreholes; pumps as well as storage reservoir for clean water looks neat. The regulatory issue is low level of compliance monitoring and not uploading of data onto IRIS. Kgatelopele Local Municipality is encouraged to utilise the Department of Water and Sanitation Regional Office or communicate with it more frequently for assistance to meet Blue Drop requirements. On a positive note, it is to acknowledge, the Municipal team that was led by the Engineering Director and also support the proposal that the Municipality will employ additional staff as well capacitate the existing staff on Blue Drop matters. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for chemical but not for micro. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	90.54%
Chemical Compliance	99.24%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



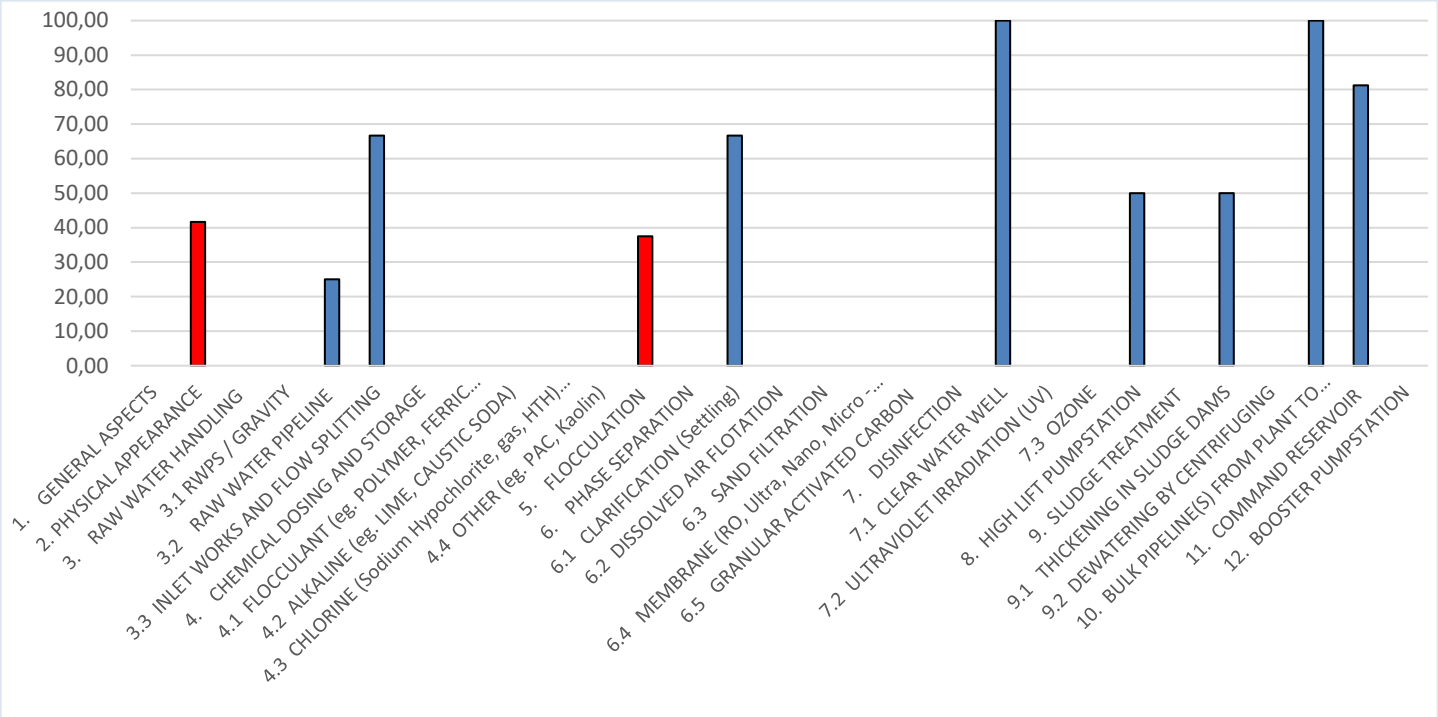

12.12 Khai Ma Local Municipality

The Onseepkans (Melkbosrand) water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground and to estimate the restoration cost to full functionality.

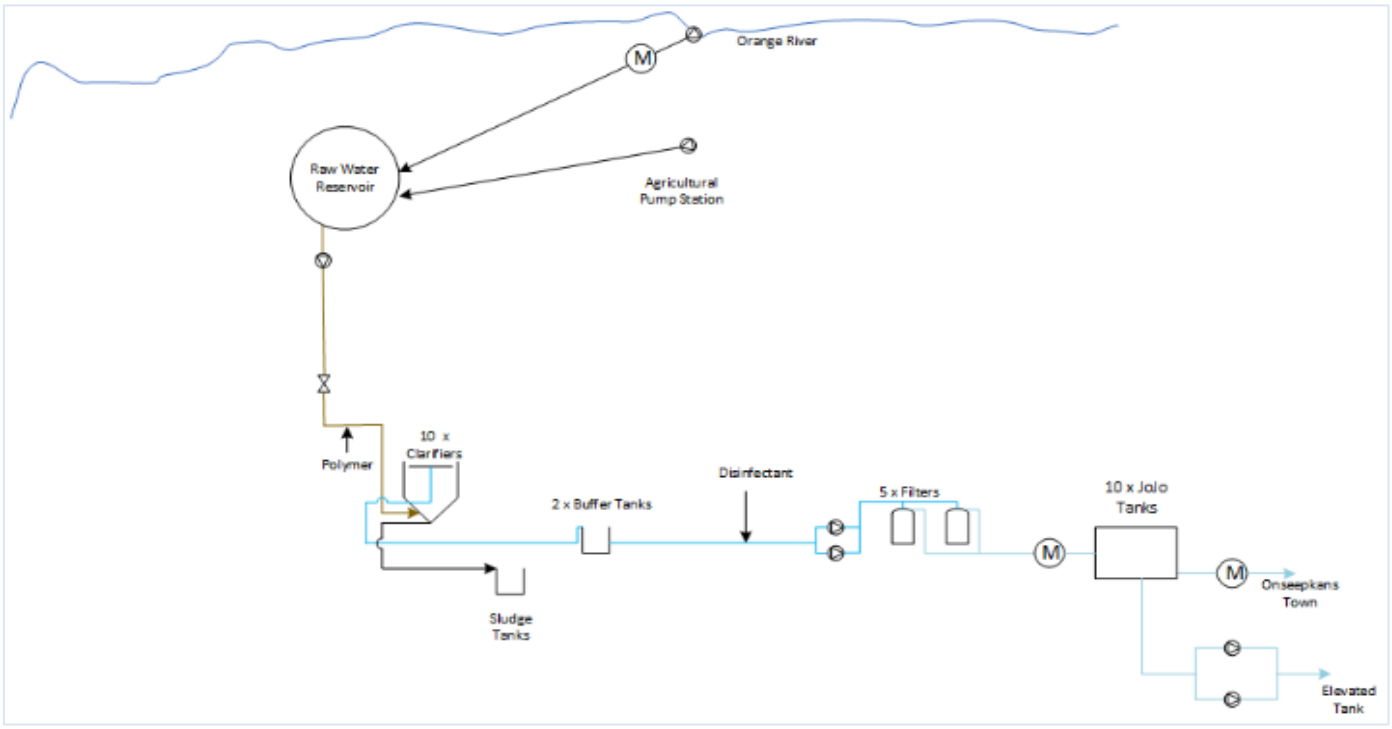
Onseepkans (Melkbosrand) TSA Score: 55%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	na	The plant could not be inspected as the plant was unmanned and locked.
2	**Physical appearance of plant**	42.0	The gate was closed, but not locked. The fence is not sufficient to keep animals from entering. Housekeeping is required. The recent repair contractor has left all the old and scrap material. The site must be tidied-up.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	na	Access was not possible due to recent floods and the pump has been removed from the river for the protection of the pump.
	Raw water pipeline	25.0	The above ground portion of the pipeline was observed and in a good condition. There are plans to improve the safety of the raw water pump during floods.
	Inlet works	67.0	Flows are split equally and mixed with an inline mixer. No provision is made for the monitoring of the actual dosing rate.
4	**Chemical dosing and storage**		
	Flocculant	na	Could not be inspected as the plant was unmanned at the time of the inspection and locked. A recent refurbishment has been completed.
	Chlorine	na	Could not be inspected as the plant was unmanned at the time of the inspection and locked. A recent refurbishment has been completed.
5	**Flocculation**	38.0	The quality in the flat-bottomed sedimentation tanks indicated good flocculation, but sampling points are suggested so that cascade tests could be conducted (closed system, flocculation cannot be viewed).
6	**Phase Separation**		
	Clarification (settling)	68.0	Clarification was inspected and found in a good condition.
	Sand filtration	na	Could not be inspected as the plant was unmanned at the time of the inspection and locked. A recent refurbishment has been completed.
7	**Disinfection**		
	Clear water well	100.0	Sufficient storage available. Chlorine residuals were available, but the plant has been provided with the necessary test equipment at the time of the refurbishment.
8	**High lift pumpstation**	50.0	Two pumps available, but only one connected. The flow is measured.
9	**Sludge treatment**		
	Thickening in sludge dams	50.0	Sludge is thickened in JoJo tanks and the supernatant is returned.
10	**Bulk pipeline from plant to command reservoir**	100.0	Reservoir at the plant and an elevated tank in area of supply.
11	**Command reservoir**	81.0	In good condition.
	Total	**55%**	

High risk areas OR Key Hardware Risks/ Defects

1. Raw water pumps at risk when river is in flood. The WSA is planning an alternative to allow for better protection of the abstraction point.
2. The flat-bottomed clarifiers require more frequent cleaning.
3. Illegal connections and more worrying those connected to the pumps inside the water treatment works.

VROOM Refurbishment Cost Estimate

Civil Works	R140,800	20%
Mechanical Works	R347,600	50%
Electrical Works (Incl C&I)	R201,300	29%
Total VROOM Cost	**R689,700**	**100%**
R million / MLD		**1.38**

Regulatory Impression

The Onseepkans (Melkbosrand) water treatment works, and supply system was inspected to evaluate the water treatment and water quality. The plant was unmanned and locked at the time of the inspection. The works has however been refurbished and functional as per the technical manager. No water quality results were available as part of the compliance monitoring program, to confirm this. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	NI
Chemical Compliance	NI

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





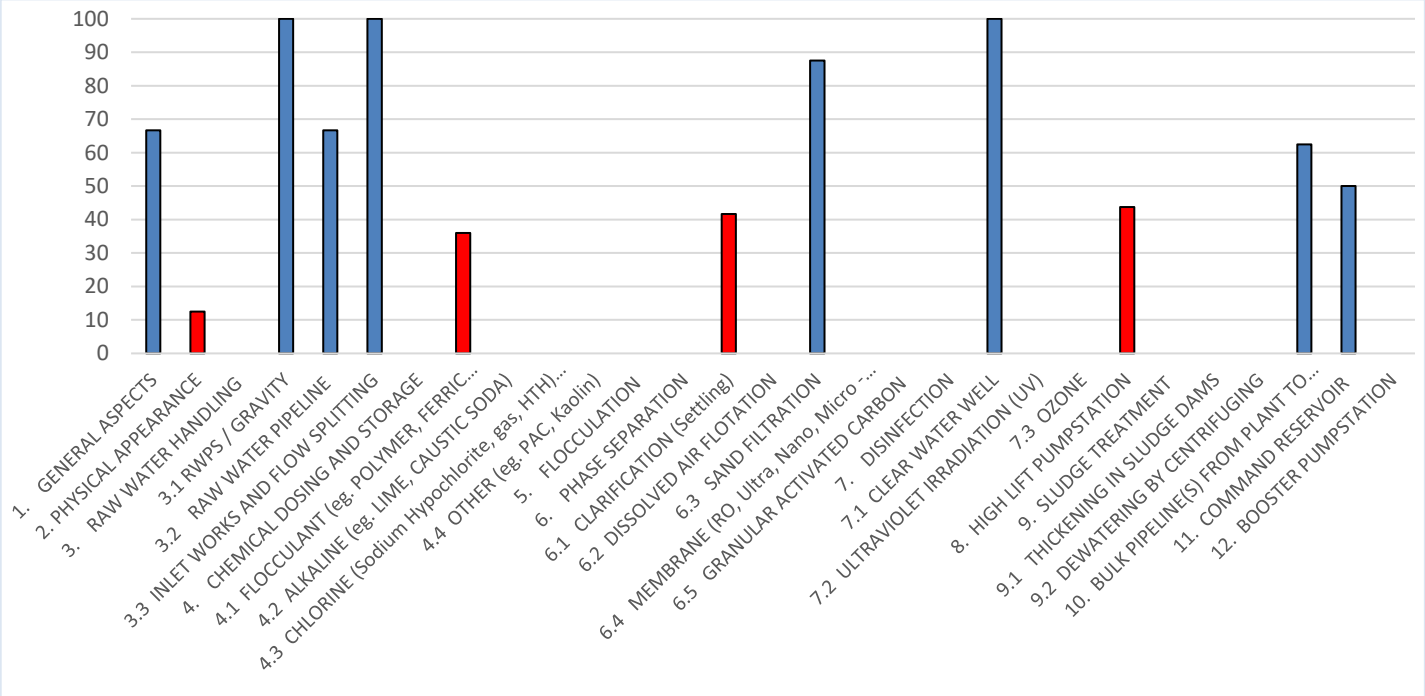

12.13 Kai Garib Local Municipality

The Kakamas water treatment works was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality. The Kakamas water treatment works was 6 400 kl/d and is registered as a class C plant and therefore requires process controllers with a class III certificate to operate and manage the water treatment processes.

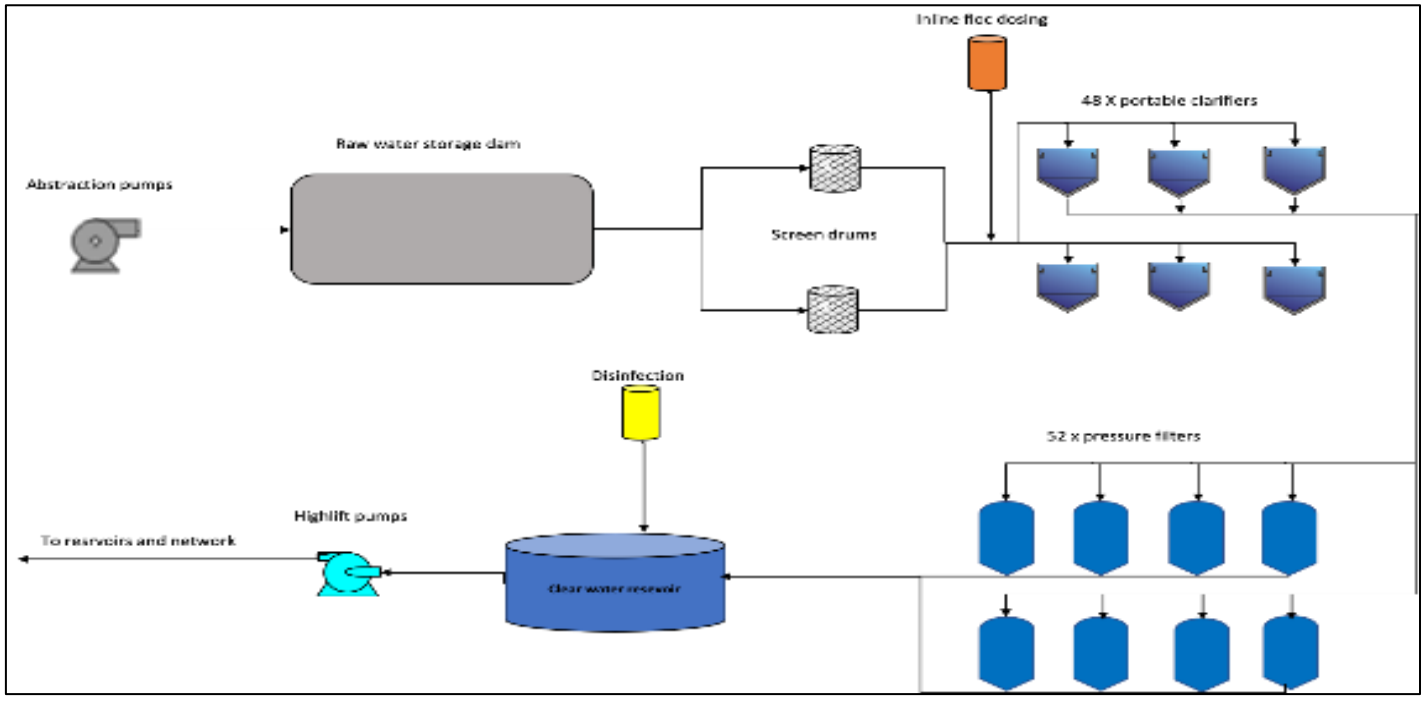
Kakamas WTW TSA Score: 34%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and requires urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	22.0	Class C plant certificate was displayed on the wall at the plant. The municipality should improve maintenance and repairs logbook records.
2	**Physical appearance of plant**	36.0	WTW was fenced and entrance was signposted displaying the name of the works and warnings. The Facility was characterised by overgrown vegetation and housekeeping was very poor.
3	**Raw water handling**		The raw water is abstracted from the Orange river. The Inspectors noted that one pump was installed. No standby capacity is in place. Raw and treated flow rates were not recorded and interpreted by the process controllers.
	Raw water pumpstation / gravity feed	58.0	
	Raw water pipeline	66.0	
	Inlet works	42.0	
4	**Chemical dosing and storage**		The two pumps were installed on 1 duty and 1 standby configuration. Therefore 100% standby was available.
	Flocculant	4.0	
5	**Flocculation**	63.0	The chemical dosing area was not neat, the electrical cables were not properly connected. There were no dedicated flocculation channels therefore the WTW relied on pipeline distance to the portable clarifiers for flocculation.
6	**Phase Separation**		
	Clarification (settling)	0.0	Floc accumulated in the portable clarifier tanks were observed and this led to excessive solid built up and solids carried over filters. The state of the clarifiers is very concerning.
7	Sand filtration	19.0	The pumps that are used for high lift to command reservoirs were used for backwashing. There was a provision for four pumps to be installed but only two were connected and operational while the remaining two pumps had been removed for repairs for long period therefore there were no standby pumps.
8	**Disinfection**		There was no information on the size of the tank and contact time was not calculated. Dosing also took place directly into the clear water tank. No disinfection was taking place during the technical assessment as the plant had run out of HTH stock.
	Clear water well	0.0	
10	**Command reservoir**	50.0	Reservoir was well fenced and had a lockable gate. Concrete structure was intact with no visible signs of leaks. No telemetry installed and outflow meter installed at the reservoir.
	Total	**34%**	

High risk areas OR Key Hardware Risks/ Defects

1. Clarifiers were in poor condition.
2. Flocculant dosing system requires urgent upgrade and the measurement of correct volumes.
3. Disinfectant dosing system requires urgent upgrade.
4. No standby pumps were available for raw water abstraction and high lift pump station.
5. No flocculation channel between holding dam and portable clarifiers.

VROOM Refurbishment Cost Estimate

Civil Works	R11,216,700	49%
Mechanical Works	R7,034,500	31%
Electrical Works (Incl C&I)	R4,572,700	20%
Total VROOM Cost	**R22,823,900**	**100%**
R million / MLD		**3.57**

Regulatory Impression

The Department identified that Kakamas water treatment works has limited capacity to deliver safe tap water to the residents of the town. The way in which the plant is operated and maintained confirms no guarantee that good quality water can be produced. The plant supervisor has adequate experience and competency and is working within the municipality for number of years, but the municipality is not providing the necessary support to ensure that safe water is delivered to the consumers. The DWS Blue Drop Assessment identified with concern several challenges and risks which, if not addressed by Kai Garib Local Municipality may lead to tap water being non-compliant with SANS 241. The Technical Assessment (TSA) conducted as part of the Blue Drop Assessment identified a lack of minimum requirements that will enhance the efficiency of water treatment processes.

The Technical Site Assessment identified the lack of basic equipment, such as jar test equipment to determine the appropriate dosage of chemicals and the operational monitoring equipment which should be used to monitor the quality of the water after treatment at the plant before reaching the consumer. Water to the consumer is thus supplied without sufficient chemical such as disinfection chemical etc. Another concerning is that the municipality did not conduct risk assessment and identify potential hazards associated with raw water quality and assess the capability of Kakamas water treatment works to remove or reduce hazards associated with raw water. For instance, chemical determinands were not analysed between raw water and final water to determine whether the plant was removing all chemical determinands as posed by the raw water. No samples of chemical results were shared to determine compliance with the SANS 241.

All the above issues are crucial to be present on-site to ensure that water produced at Kakamas water treatment works meet drinking water quality standard. Kai! Garib Local Municipality should consider the following, in addition to the issues raised above to enable to improve on the current situation.

- Focus on and prioritise the high risks identified above,
- Strengthen supply chain management to ensure that maintenance and chemical supply contracts are in place to support operation maintenance of water treatment works.
- The municipality must take note of the VROOM refurbishment cost estimate above and take appropriate action to upgrade the entire water treatment facility to enhance its condition to supply safe drinking water to Kakamas residents.
- Consider all condition assessment findings raised on the table above and develop a water safety plan, conduct risk assessment, and identify appropriate control measures to mitigate all risks identified that are associated within the water treatment works.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	67.86%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





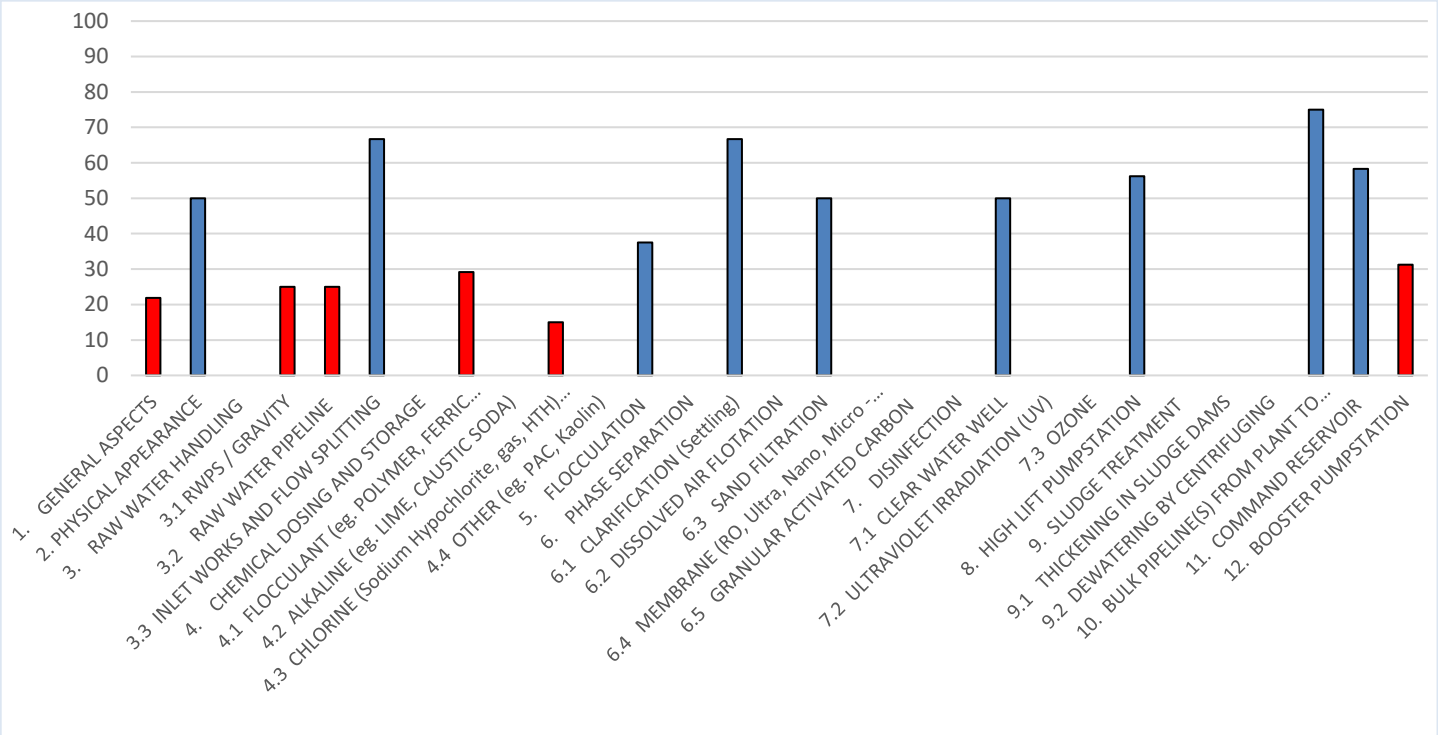

12.14 ! Kheis Local Municipality

The Groblershoop water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground and to estimate the restoration cost to full functionality.

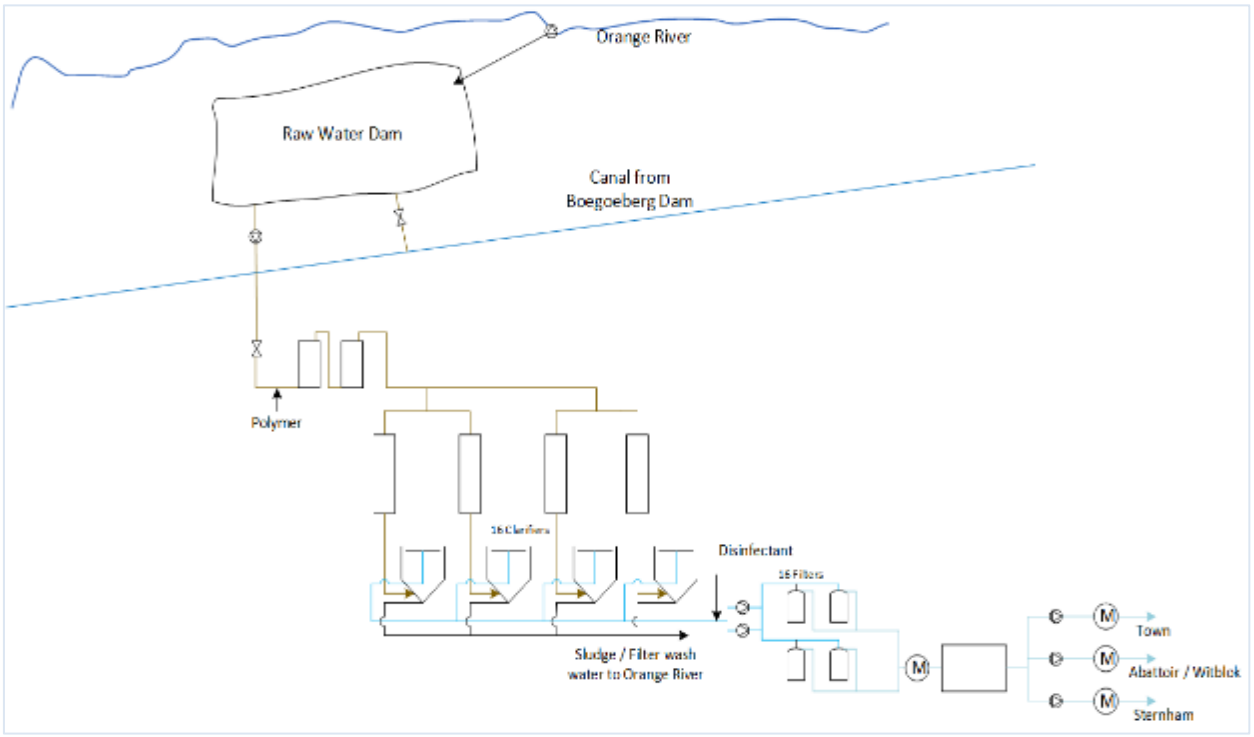
Groblershoop TSA Score: 41%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	22.0	Recordkeeping is limited with no control over the dosing.
2	**Physical appearance of plant**	50.0	The facility is fenced, housekeeping can improve and better installation of pumps.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	25.0	A single pump is provided with unsafe electrical connection.
	Raw water pipeline	25.0	Inflow meter not working while pipeline is sufficiently sized.
	Inlet works	67.0	Flow splits equally but no provision for the measurement of chemical dosing.
4	**Chemical dosing and storage**		
	Flocculant	29.0	Poor dosing control with dilutions to ensure dosing takes place, although not enough.
	Alkaline	na	
	Chlorine	15.0	Single dosing pump, no back calculation of dosing, no MSDS, etc.
	Other (PAC, Kaolin, etc.)	na	
5	**Flocculation**	38.0	No dosing points, some scum but a closed system so flocculation cannot be observed (package plant).
6	**Phase Separation**		
	Clarification (settling)	67.0	Several leaking tanks, desludging done daily but sludge discharged back into canal.
	Dissolve air floatation (DAF)	na	
	Sand filtration	50.0	Some leaks were observed on the piping. Filters washed too frequently due to poor dosing control and lack of funds to procure flocculant. Filter media levels unknown and never checked.
	Membrane	na	
	Granular activated carbon (GAC)	na	
7	**Disinfection**		
	Clear water well	50.0	Sufficient space for contact time but no tests to confirm disinfectant residual.
	Ultraviolet irradiation (UV)	na	
	Ozone	na	
8	**High lift pumpstation**	56.0	Pumps installed in small space making access difficult. Must pump sets consists only of a single pump and may result in water shortages when failures occur.
9	**Sludge treatment**		
	Thickening in sludge dams	na	
	Dewatering by centrifuging	na	
10	**Bulk pipeline from plant to command reservoir**	75.0	No major leaks were reported and inspected.
11	**Command reservoir**	58.0	Not fenced, some civil work to be done and vandalism tales place from time to time.
12	**Booster pumpstation**	31.0	Access was not possible as key was not available. No standby pump and vandalism takes place from time to time.
	Total	**41%**	

High risk areas OR Key Hardware Risks/ Defects

1. Raw water is supplied by a single raw water pump, putting the water supply at risk.
2. The water treatment works cannot supply the demand as there ongoing development. The works will require urgent upgrading.
3. The poor condition of the clarifiers and filters further contribute to water losses within the treatment process.
4. The high lift pumps are not in a good condition, and some require urgent repairs.
5. The lack of sufficient chemicals and dosing according to quantity left results in possible underdosing.

VROOM Refurbishment Cost Estimate

Civil Works	R721,600	40%
Mechanical Works	R677,600	38%
Electrical Works (Incl C&I)	R397,100	22%
Total VROOM Cost	**R1,796,300**	**100%**
R million / MLD		**1.80**

Regulatory Impression

The Groblershoop water treatment works, and supply system was inspected to evaluate the water treatment and water quality. The system is at risk with a single raw water pump, while the clarifiers and the filters are leaking, resulting in high water losses. The losses could not be calculated as the raw water meter is defective. Chemical dosing is adjusted, based on the quantity of flocculant available, resulting in water with very high turbidity. Disinfection is done by adding Calcium Hypochlorite, but no equipment is available for the measurement of chlorine residuals. The high lift pumps were upgraded and require some attention. The buildings are too small to allow proper access to the pumps.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	92.92%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





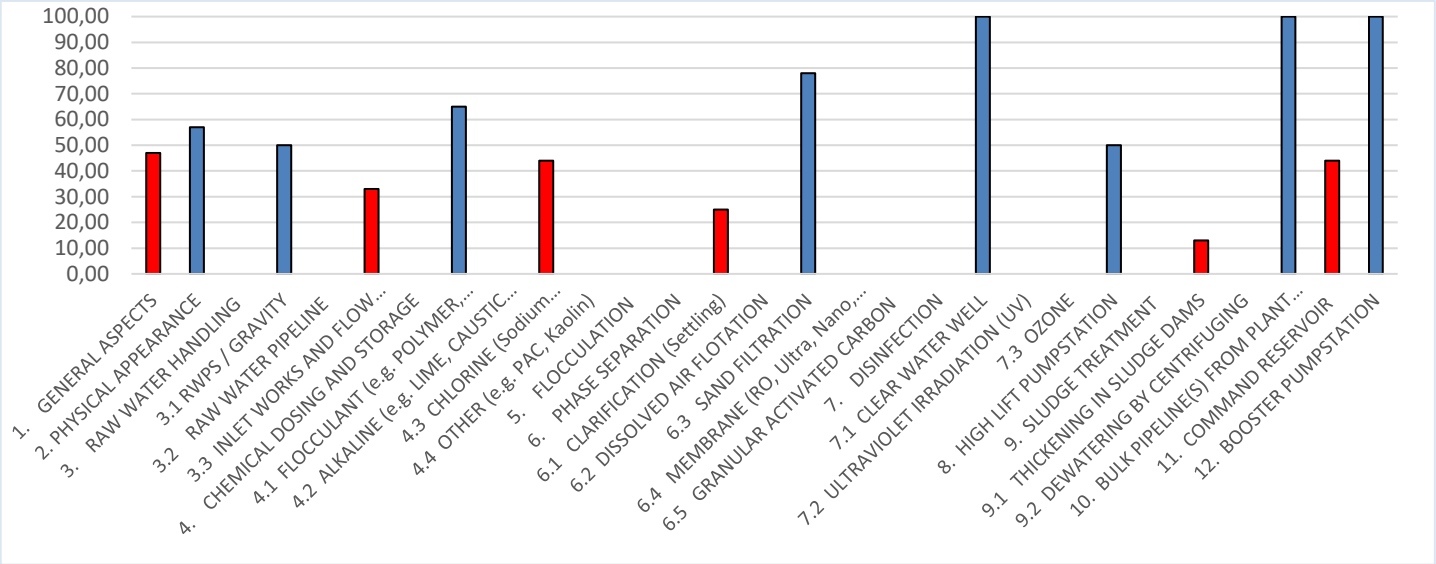

12.15 Magareng Local Municipality

This supply system supplies drinking water to the community of Magareng Local Municipality at Warrenton, Ikhutseng and Warrenvale. It was inspected on 01 February 2023 to assess the condition and functionality of the infrastructure and treatment processes on the ground as well estimate the cost of those items that were not in full operation.

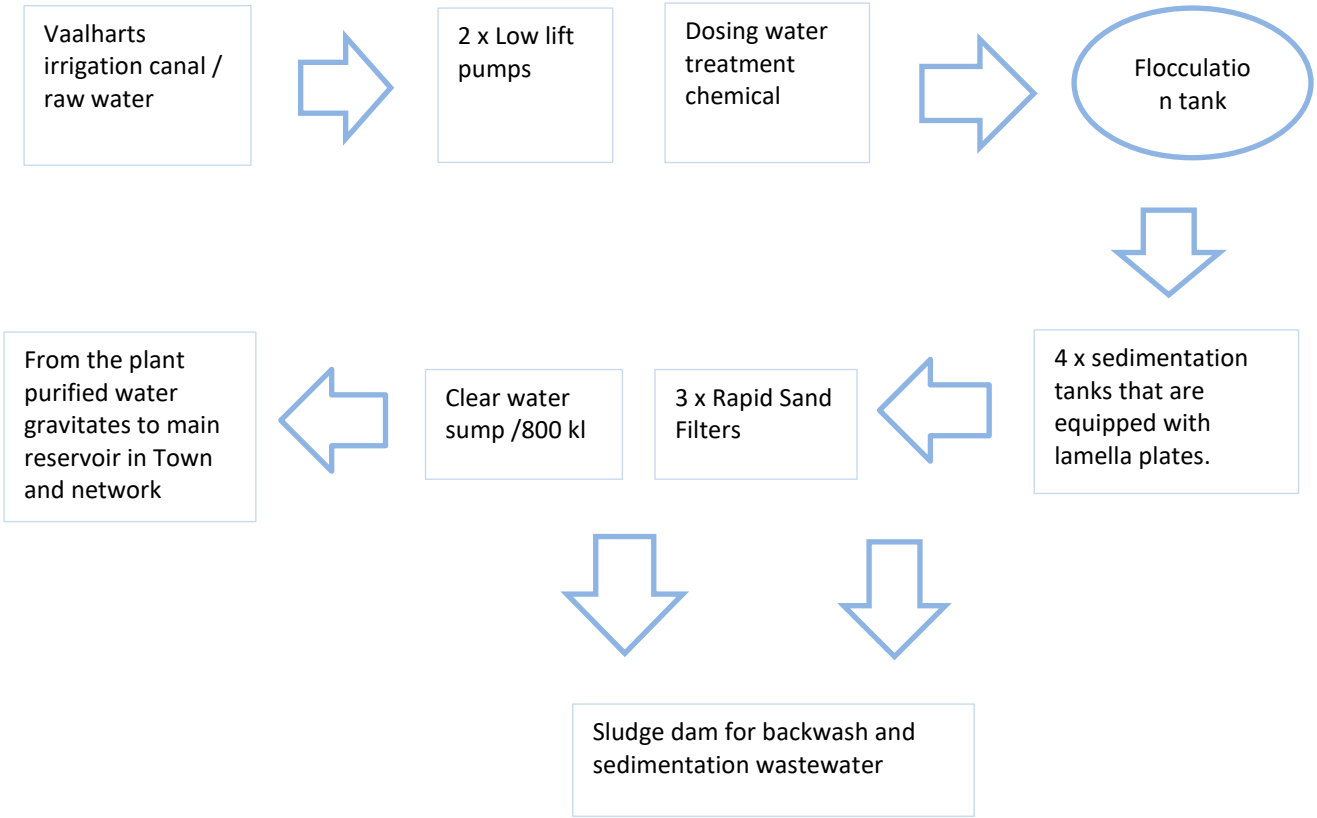
Warrenton TSA Score: 55%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram: Figure No.1 – flow diagram of Warrenton WTW



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	47.0	Class C plant, of the eight aspects checked under this criterion: The plant did not have the maintenance and repairs logbook; there was no copy of O&M manual; and Jar Testing is only done once a month by a private Laboratory which is contracted to the Municipality.
2	**Physical appearance of plant**	57.0	Of the aspects checked during the site visit, the following scored less than 50%: The WTW building, and concrete/cement pavement show cracks, and this could be an indication of unstable foundation or soil movement and this concern was mentioned by staff who also showed the assessors cracks in the toilet as well falling ceiling. This is the main concern under this aspect. And it is an OHS issue. In addition, which may make this site untidy is the unfinished construction areas within the premises with some of construction material left unattended.
3	**Raw water handling**		The two Low Lift pumps that lift raw water to the flocculation tank operate together and there is no standby. The Municipality need to get standby pump(s). In addition that need mention is that it is difficult to see flash mixing because it happens inside the raw water pipe enroute to the circular flocculation tank.
	Raw water pumpstation / gravity feed	50.0	
	Raw water pipeline	0.0	
	Inlet works	33.0	
4	**Chemical dosing and storage**		Duty and standby are installed and working. At the time of the inspect the plant had a chemical water treatment quantity of 5000L and the dosing pump was delivering 9L/hour and therefore at this current rate a 5000L would only last for 24 days. The Municipality need to frequently check the dosage according to Jar Test. It is recommended that instead of current monthly Jar Test, the frequency must be reviewed and not done ONLY monthly. In addition a water treatment plant with a design capacity of 8.4 ML per day, Sodium Hypochlorite solution feed may not be efficient and therefore the Municipality need to fix the gaseous chlorine facility which was meant for this purpose.
	Flocculant	65.0	
	Chlorine	44.0	
5	**Flocculation**	00.0	The flocculation tank for this plant (Warrenton) is not working and is currently by-passed. It means its purpose now is done by the sedimentation tanks. It is a concern and the flocculation tank need to be fixed.
6	**Phase Separation**		There are four compact sedimentation tanks equipped with lamella plates and these are now used both for flocculation and settling. It is a concern. The staff informed the assessors that desludging of the tank is difficult due to desludge pipes frequent blockages. The assessors during the visit noted algal filaments on the lamella plates. The issue of blocking outlet desludge pipes need investigation and the flocculation tank need to be fixed.
	Clarification (settling)	25.0	
	Sand filtration	78.0	There are three filters and the assessors noted media surface cracks and in the TSA an allowance under civil is made to assess the filter media including checking of filter nozzles.
7	**Disinfection**		A clear water sump of 800 Kl is provided, and it is satisfactory. The plant design capacity is 8400 cubic meters per day and the sump provides around 2 hours sufficient time. In addition the gravity pipe to the main network reservoir is about 2.5 Km and will also provide disinfectant contact time.
	Clear water well	100.0	
8	**Sludge treatment**	13.0	The onsite sludge dam is currently infested with reeds, and it need to be assessed for compliance to WRC: Sludge Management and Disposal guidelines.
9	**Bulk pipeline from plant to command reservoir**	100.0	The word from Process Control staff is that the gravity line for treated water is about 2.5 Km to the command reservoir and is satisfactory.
10	**Command reservoir**	44.0	The command reservoir THOUGH it is a huge rectangular concrete structure of (5.2 ML) is not fenced or under gated premises.
11	**Booster pumpstation**	100.0	Only one booster pump station was inspected, namely at Ikhutseng Community. This booster pump station is fairly new and is equipped with 1 x duty pump and 1 x standby pump. The pump house is fenced and has a lockable gate.
	Total	**55%**	

High risk areas OR Key Hardware Risks/ Defects

1. The Jar Test or floc formation test need to be performed regularly in order to accurately set the water treatment chemical dosage rate.
2. Due to the concern of soil movements that results of cracks to the plant building and “some” process units. The Municipality should get the services of a Geo-Technical Engineer to investigate and report. It is an OHS issue.
3. At the inlet works, additional low lift pump(s) to act as standby are required.
4. The flocculation tank that is broken and currently by-passed need to be fixed.
5. The desludge piping of the sedimentation tank need to be checked and fixed. The onsite staff have difficulties to desludge the sedimentation tanks.

6. The gaseous chlorine facility of this plant need to be re-commissioned. It is not efficient to use Sodium Hypochlorite solution is a plant of 8 400 cu.m per day. The issue is solubility.
7. The sludge dam need to comply to WRC: Sludge Management and Disposal Guidelines.
8. The Warrenton Water Purification Plant need to update its registration in terms of Regulation 813.

VROOM Refurbishment Cost Estimate

Civil Works	R1,413,195	68%
Mechanical Works	R509,886	25%
Electrical Works (Including C&I)	R147,929	7%
Total VROOM Cost	**R2,071,010**	**100%**
R million / MLD		**0.25**

Regulatory Impression

The staff at Warrenton Water Purification Plant is doing the best to operate it as efficiently as it is possibly and are commended, noting that there are many process units which are performing below capacity due to broken items. These are: (a). The flocculation tank is not working and is by passed. (b). The sedimentation tanks desludge mechanism is not working and it results in high turbidity going into the filters. (c). The plant building and process units have cracks which is linked to onsite soil movement, and this is an OHS issue. The Municipality should seek an assistance of a Water Engineer to identify all the problems including the above mentioned so that they are attended to. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	86.36%
Chemical Compliance	70.13%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



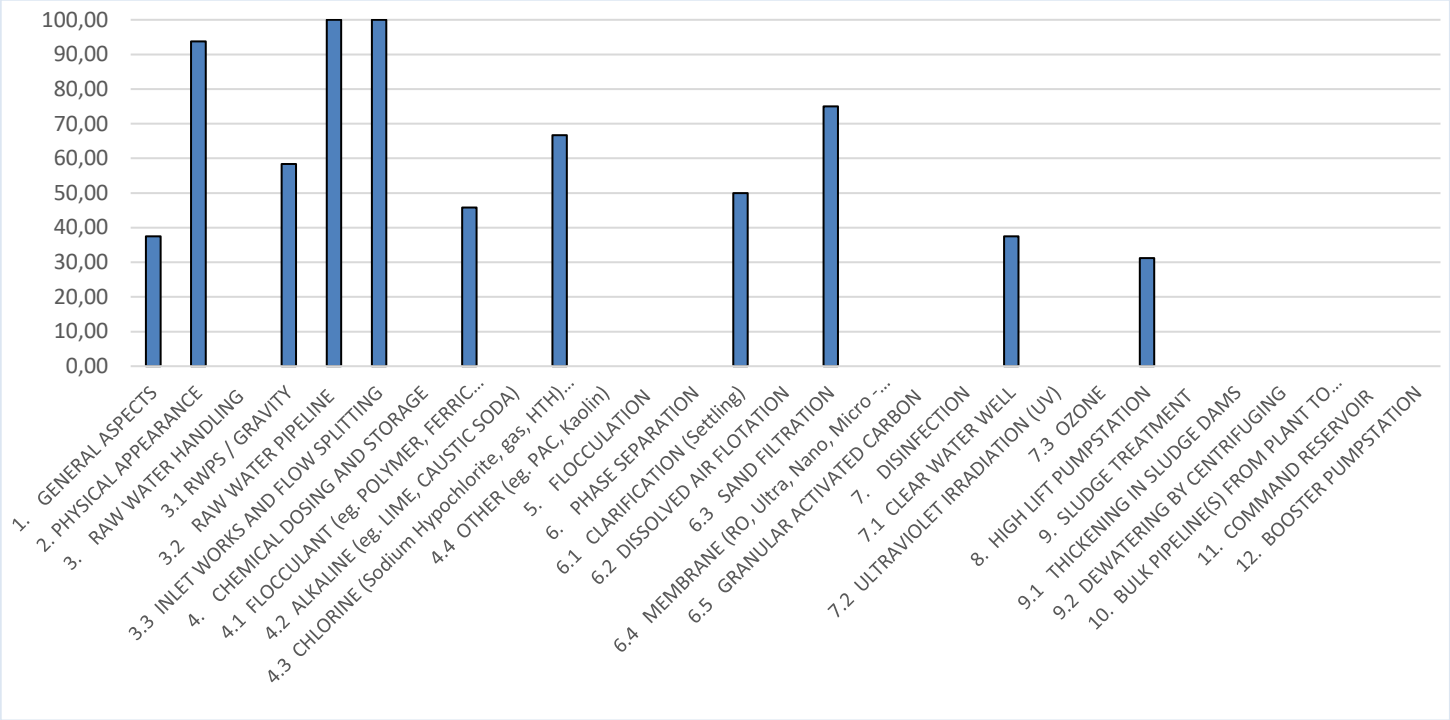
12.16 Nama Khoi Local Municipality

The Vioolsdrift water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

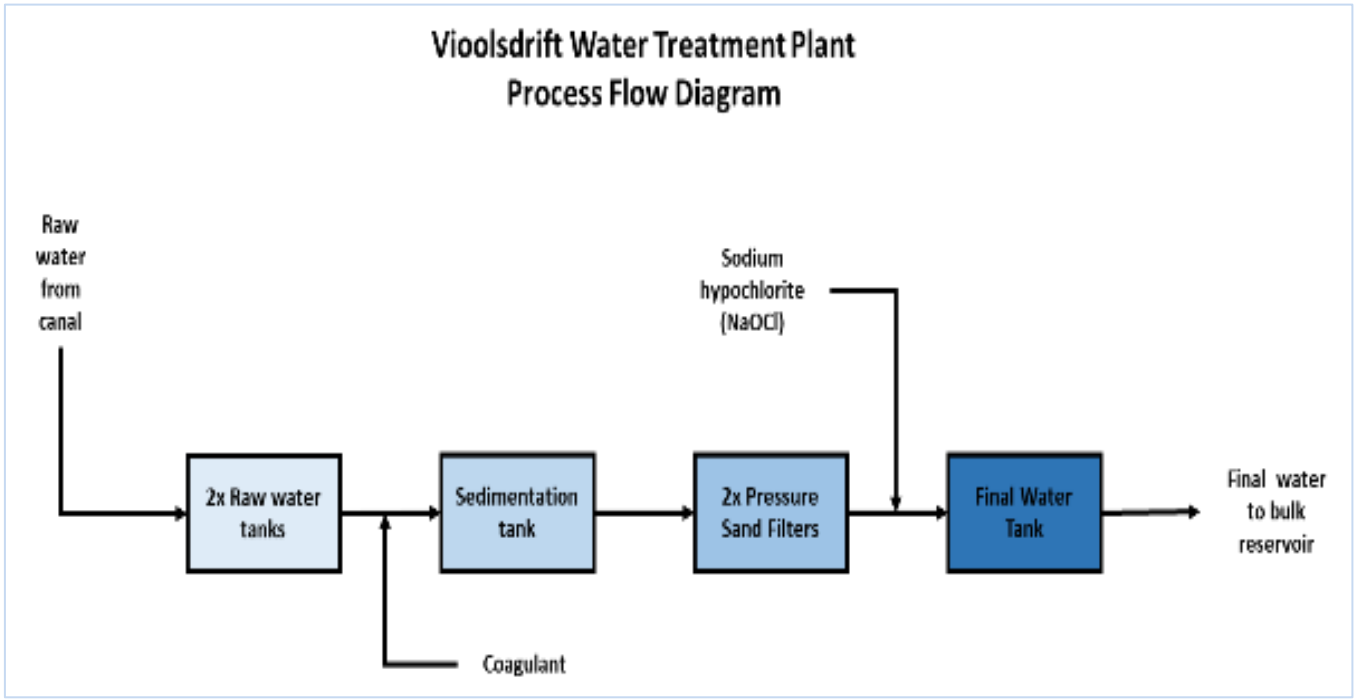
Vioolsdrift WTP TSA Score: 62%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	37.5	Jar test equipment should be purchased for the overall Nama Khoi LM, so that it can be used by a competent Senior Process Controller or Supervisor to establish the required dosages at any of the six water treatment plants of the municipality whenever it is required when the raw water quality changes substantially. The cost of the jar test equipment is R40,000
2	**Physical appearance of plant**	93.8	The fencing around the treatment plant should be upgraded and improved (civil infrastructure).
3	**Raw water handling**		Raw water is abstracted from the Orange River irrigation canal. There are no screens at the abstraction point. Screens should be provided at the abstraction point in the canal. A standby pump to be provided.
	Raw water pumpstation / gravity feed	58.3	
	Raw water pipeline	100.0	
	Inlet works	100.0	
4	**Chemical dosing and storage**		A standby coagulant dosing pump must be provided. A bund wall should be provided around the chemical dosage and storage area. An emergency wash area should be provided. A standby chlorine dosing pump must also be provided.
	Flocculant Chlorine	45.8 66.7	
5	**Flocculation**	na	There is no formal coagulation/flocculation chamber as the poly is dosed in-line. It is therefore a closed system.
6	**Phase Separation** Clarification (settling) Sand filtration	 50.0 75.0	Treatment plant is equipped with 2 x 10 000 l tanks were settling takes place. The settled water could not be observed for the presence of flocs. The tanks are desludge manually. Desludged frequency depends on raw water turbidity and is not fixed. Turbidity of raw water is only measured once per month during compliance monitoring. No operational monitoring of turbidity. A standby backwash pump for the sand filtration should be provided.
7	**Disinfection**		Final water is stored in 2 x 10 000 l water tanks on site. It was reported that these tanks provide sufficient contact time for the chlorine.
	Clear water well	37.5	
8	**High lift pumpstation**	31.3	Final water is pumped to the 240-kl elevated bulk reservoir for distribution to consumers. This is done by means of a 2.2 kW pump. The pump was in working conditions. A standby clean water pump must be provided. A flow meter must also be provided.
11	**Command reservoir**	na	There is no command reservoir onsite, only 2x final water tanks.
	Total	**62%**	

High risk areas OR Key Hardware Risks/ Defects

1. Standby pumps to be provided at all pumping locations.
2. Bund walls should be provided around the chemical handling areas.
3. An emergency washing (shower) station should be provided.

VROOM Refurbishment Cost Estimate

Civil Works	R33,000	5%
Mechanical Works	R523,600	73%
Electrical Works (Incl C&I)	R160,600	22%
Total VROOM Cost	**R717,200**	**100%**
R million / MLD		**1.43**

Regulatory Impression

The Vioolsdrift WTP is a small water treatment system located next to the Orange River at the RSA/Namibia border post. Although the plant appears unassuming and is located in an old building, the performance of the plant is satisfactory, but does experience problems with adjusting dosages when the water quality in the Orange River changes. It is recommended that jar test equipment be purchased for the overall Nama Khoi LM, so that it can be used by a competent Senior Process Controller or Supervisor to establish the required dosages at any of the six water treatment plants of the municipality whenever it is required when the raw water quality changes substantially. The cost of the jar test equipment is ca R40,000. There is not sufficient redundancy in the treatment plant, and standby pumps should be provided for all the pumping installations. The plant personnel are capable and motivated, and the plant was in a neat and tidy condition. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	83.33%
Chemical Compliance	80.25%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



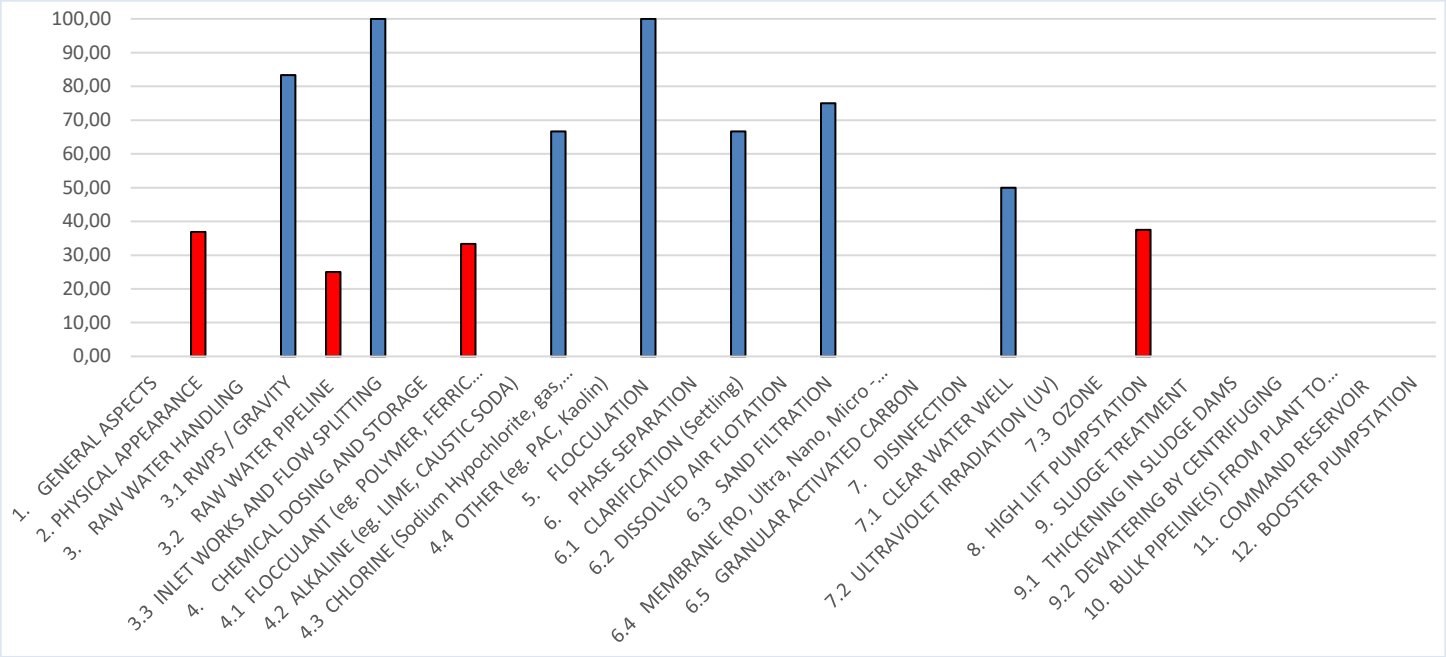

12.17 Phokwane Local Municipality

The Hartswater water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

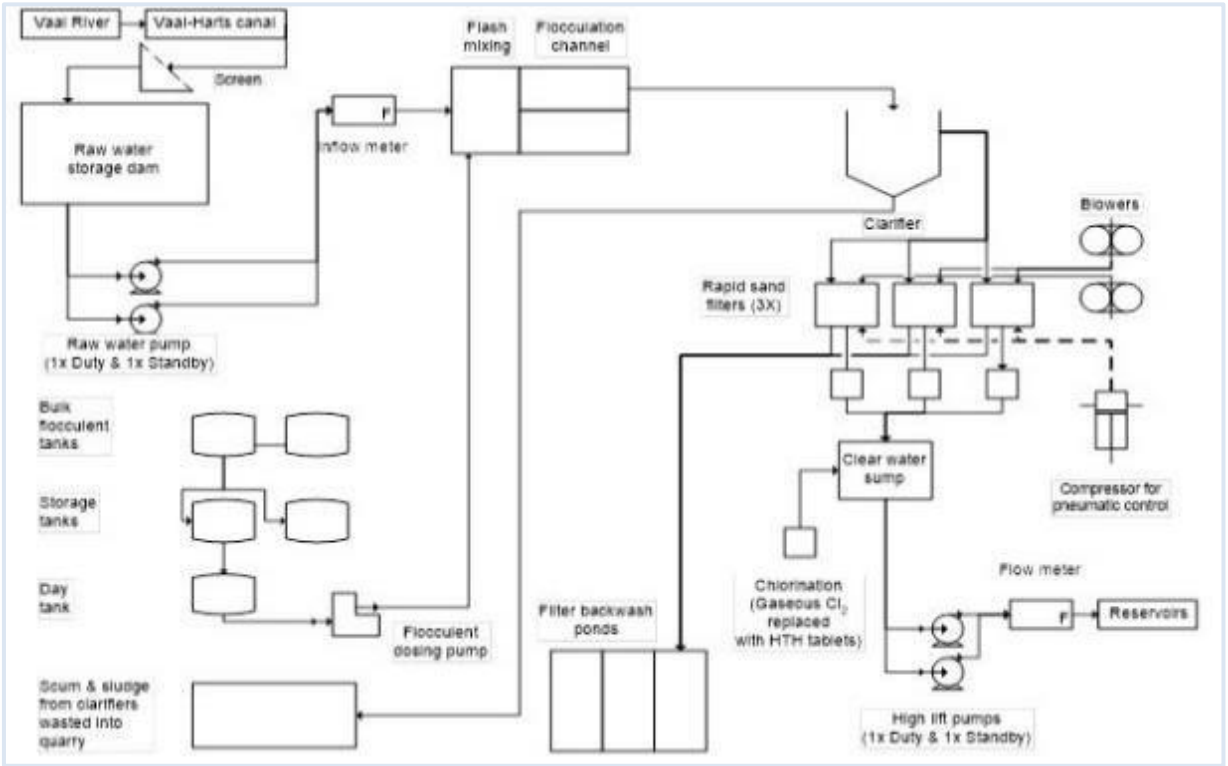
Hartswater WTW TSA Score: 45%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	0.0	Plant registration certificate issued in 2010 and not displayed. Operational logbooks are available, but entries are for only 3 days. More than one of each available of pH, EC, free chlorine, and turbidity meters, but all covered by dust and obviously never used.
2	**Physical appearance of plant**	36.9	Institutional information is displayed at entrance. The area is fenced with security at the gate. The area behind the raw water dam is not fenced. The site is not maintained with poor lighting provided. Facilities for Process Controllers are in unacceptable condition.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	83.3	Two raw water pumps are installed but only one is in working condition. Valves are leaking,
	Raw water pipeline	25.0	The pipeline was reported to be in good condition. No flow records are available as the flow meter has not been functional for about 5 years.
	Inlet works	100.0	There is a single raw water inlet. Dripping of the coagulant was observed with adequate turbulent conditions at the hydraulic jump installed at the end of the flash mixing unit
4	**Chemical dosing and storage**		
	Flocculant	33.3	Sudfloc is dosed. Adequate storage capacity is provided. The two storage areas are not bunded. Evidence of spillage was observed, and the area is not kept clean. Emergency shower and eye wash must be provided.
	Chlorine	66.7	A feeding system for the dosing of HTH tablets is installed. Adequate stock was available. Process Controllers are not issued with appropriate PPE
5	**Flocculation**	100.0	Good floc formation was observed, with no accumulation of scum or algal growth.
6	**Phase Separation**		
	Clarification (settling)	66.7	Launders were full, with weirs completely submerged and covered with algae. Where possible to observe no floc carry over was noted.
	Sand filtration	75.0	Filter media was replaced a year ago, but media is disturbed. Backwash is started manually due to PLC breakdown. All three filters backwash simultaneously once per shift and air was leaking into the filter outlet basins. Housekeeping is very poor.
7	**Disinfection**		
	Clear water well	50.0	The system provides for adequate free chlorine contact time. Free chlorine is not measured as consumables are not provided.
8	**High lift pumpstation**	37.5	Two pumps are installed, but only one is in working condition due to no power supply to the soft starter. Outflow meter not in working condition. MCCs are in poor condition.
9	**Sludge treatment**		
	Thickening in sludge dams	na	Sludge from settling tanks discharges to a quarry. The quarry was not inspected
10	**Bulk pipeline from plant to command reservoir**	0.0	Steel pipeline to the reservoir was reported to be leaking and in bad condition
11	**Command reservoir**	na	The reservoir was not inspected due to the unavailability of a responsible person. It was reported that that the fence was vandalised
12	**Booster pumpstation**	na	Due to the unavailability of responsible person the pump station was not inspected. It was reported that two pump sets are installed at the pump station, but only one is functional. The fence is also vandalised.
	Total	**45%**	

High risk areas OR Key Hardware Risks/ Defects

1. Safety of Process Controllers is at risk. The site is not maintained and posing safety risks. No emergency facilities and extremely poor condition of housing area (used for stay-over).
2. Duty high-lift pump and booster pump at Korhaan pump station need urgent repairs.
3. Challenges are experienced with filling of reservoirs.
4. Flow meters must be repaired /replaced urgently.
5. Flooding of sedimentation tanks to be investigated and corrected.
6. The simultaneous backwashing of filters, filter media disturbance and leaking valves to be attended.

VROOM Refurbishment Cost Estimate

Civil Works	R2,272,600	27%
Mechanical Works	R3,341,800	39%
Electrical Works (Incl C&I)	R2,869,900	34%
Total VROOM Cost	**R8,484,300**	**100%**
R million / MLD		**1.70**

Regulatory Impression

The WSA was not prepared for the visit by the DWS Blue Drop Inspectors and own arrangements had to be made to visit the plant. This also resulted in reservoirs and the booster pump station not being inspected. The site is in a dire condition; grass is not cut; equipment is covered in dust and spider webs and the facilities for Process Controllers are unacceptable. The moral of Process Controllers is low, and it was reported that no support is received from management. Although some equipment was still in working condition and the plant is in operation, it was evident that no maintenance is done. The WSA does not comply with Regulation 2834/813 for process controlling staff. No operational monitoring is done, despite equipment being available. There are no buffers and standards and consumables for measuring free chlorine have not been provided. Safety conditions at the plant must be attended to urgently; this includes PPE. Urgent intervention is required at the WSA. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	70.00%
Chemical Compliance	74.85%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





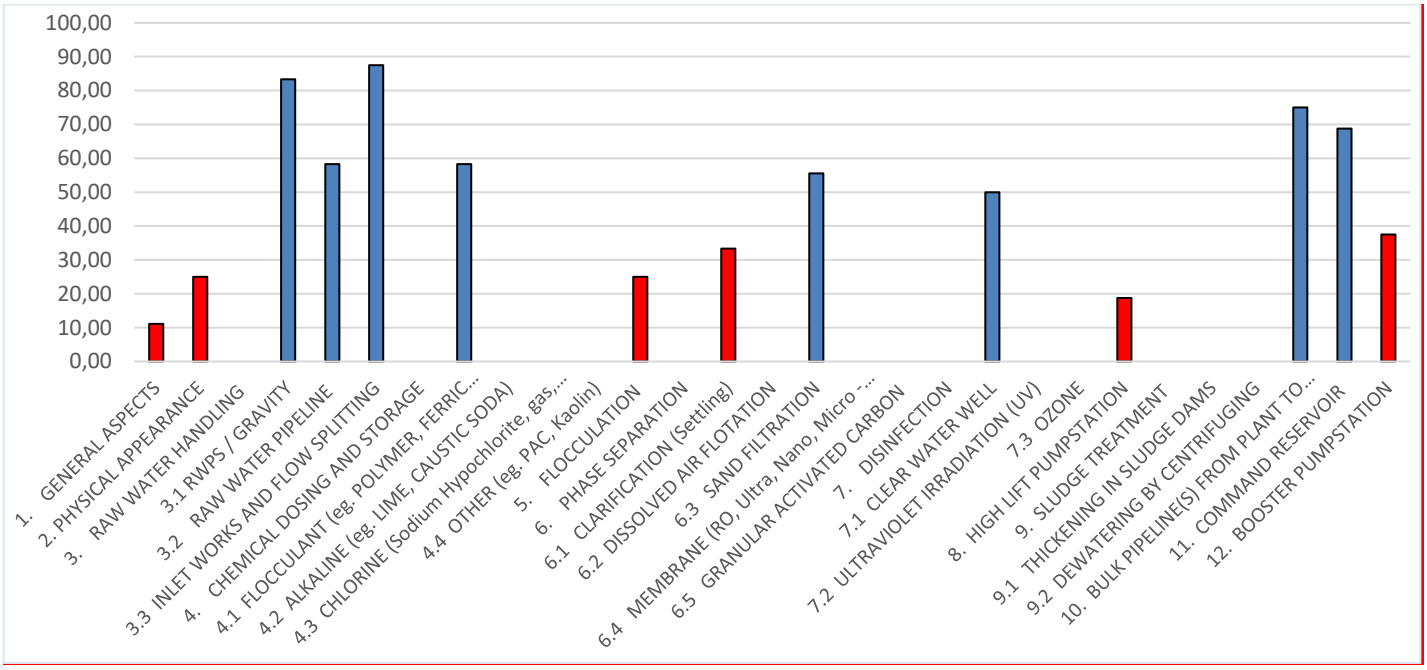
12.18 Renosterberg Local Municipality

Vanderkloof water treatment system abstract raw water from Orange river through Vanderkloof Dam and registered as class D works with the design capacity of 2 600 kl/d. The plant is operated and managed by Renosterberg local municipality together with Vanderkloof Tax-Payers Association. Process controllers required to operate the works should be registered as class II and be supervised by class V. The Blue Drop technical site assessment has taken place as part of the main Blue Drop Assessment and main purpose of technical site inspection was to determine the condition and functionality of water treatment works to supply safe tap water to Vanderkloof and Petrusville residents.

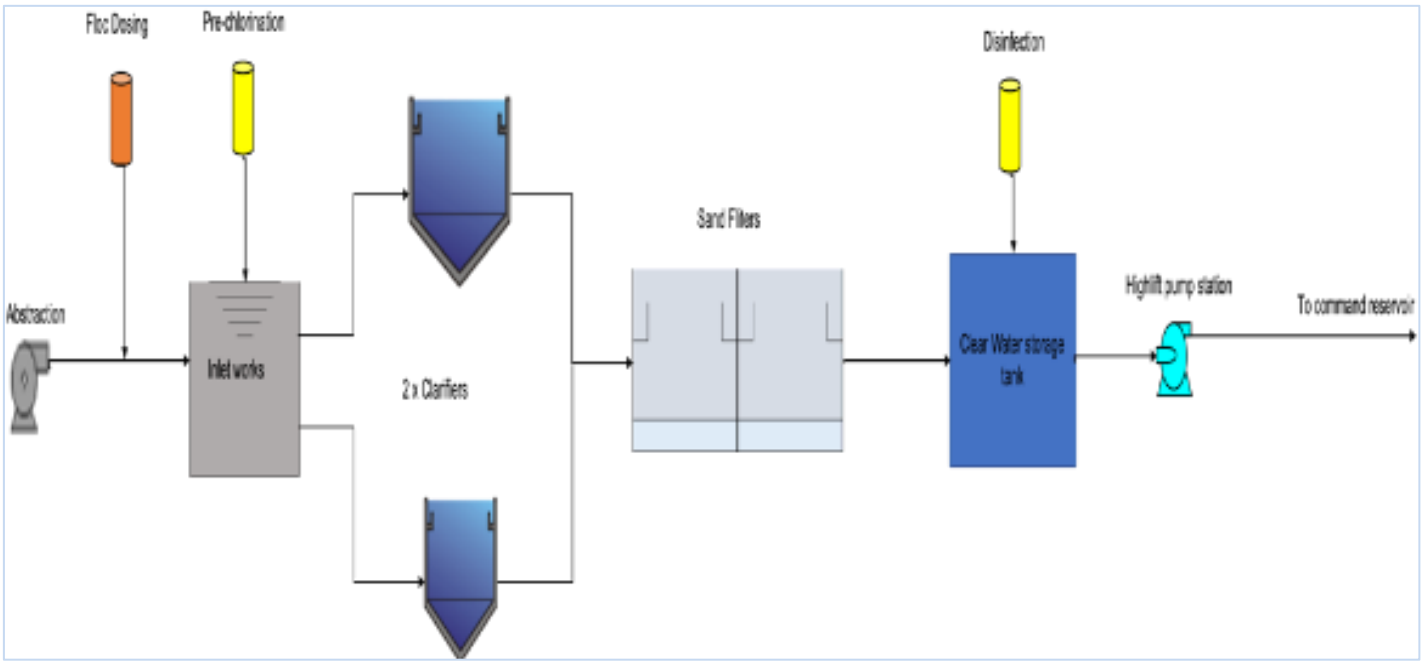
Vanderkloof WTW TSA Score: 42%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and required urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	11.0	The plant is registered on IRIS. However, the certificate was not displayed on-site as required. No maintenance and repairs logbook presented during the technical site assessment. The turbidity and free chlorine meters were available on-site but not condition therefore could be used by process controllers and had never been calibrated.
2	**Physical appearance of plant**	25.0	The entrance to the facility was not signposted. The facility was surrounded by overgrown vegetation and presents serious OHS risk to the personnel. The Process Controllers did not have challenges with workplace environment and had a good working relationship with the Acting Technical Manager. The observation from the BD inspectors was that there was lack of PPE and work equipment on-site.
3	**Raw water handling**		The process controller indicated that there was a strainer installed on the raw water suction pipes. There were four raw water pumps installed, however two were not operational and the other two were in good working condition. It should be noted that raw water pumps are owned and operated by the Department of Water and Sanitation. The raw water flow splitting took place at the inlet works and flow to each sedimentation tank could be adjusted by using sluice gates.
	Raw water pumpstation / gravity feed	83.0	
	Raw water pipeline	58.0	
	Inlet works	88.0	
4	**Chemical dosing and storage**		The two Grundfos 4 l/hr pumps were installed and both in good working order. However, Inspectors noted that the dosage control valves of the pumps were no longer working, process controllers could not control the dosing volume, and this needed an urgent attention by the municipality or Vanderkloof tax payers' association.
	Flocculant	58.0	
5	**Flocculation**	25.0	The WTW used clarify-flocculators and floc formation was very limited in the flocculation part of the tank. There was evidence of scum accumulation No evidence of algae or sludge settling observed.
6	**Phase Separation**		The floc carry-overs were observed. There was considerable floc carry-over was observed on one of the clarifiers which needed to be attended by the WSI.
	Clarification (settling)	33.0	The weirs were characterised by blockages from excessive solids accumulation and the launders were not regularly cleaned. There was evidence of cracks in the filter sand. Media replacement was required. Flocs carried over from clarifiers were observed
7	**Sand Filtration**		There were two backwash pumps, one was not working. Minor glad pegging issues observed on the pump that was working. There was one backwashing pump was operational no standby capacity was available.
8	**Disinfection**		The Clear water tank was located underground but its size was unknown. Free chlorine samples collected on the tap outside the building which was located after the clear water sump.
	Clear water well	50.0	
9	**Bulk pipeline from plant to command reservoir**	75.0	The acting Technical Director indicated that there were no major leaks in the bulk pipe network observed.
10	**Booster Station**	38.0	There were two pumps installed, however 1 was not operational therefore no standby pump. Leaks were observed around the gland pegging working pumps and the pump was generally not in good condition.
11	**Command reservoir**	69.0	The reservoir was well fenced with a lockable gate. There was no telemetry in place. There was a flow measuring devices at the reservoirs, but flow was not recorded.
	Total	**42%**	

High risk areas OR Key Hardware Risks/ Defects

1. Poor chlorine dosing system and type of disinfection used.
2. Poor booster pump station condition and MCC
3. Poor sand filter media that need to be replaced.
4. No standby back wash pump
5. Two high lift pumps were broken and nor repaired.

VROOM Refurbishment Cost Estimate

Civil Works	R344,300	6%
Mechanical Works	R4,808,100	84%
Electrical Works (Incl C&I)	R601,700	10%
Total VROOM Cost	**R5,754,100**	**100%**
R million / MLD		**2.87**

Regulatory Impression

The technical assessment regulatory team has informed that the municipality was placed on the administration before 2021 municipal election and Vanderkloof Tax Payer Association has been also awarded a court order during the same period to operate Vanderkloof water treatment works on behalf of the municipality. This implied that the municipality was no longer responsible of operating and maintenance of the water services facility and this was also due to declared bankrupt therefore could not operate and maintained water treatment system including distribution system. However, the legislative power was not completely taken away from the Renosterberg Local municipality as process controllers managing the water treatment works remained at the plant and continued to be the employees of the municipality while operating the water treatment works. However, the municipality was not responsible of purchasing of treatment chemical and maintenance is taken care of the Vanderkloof Taxpayer Association.

As the assessment of Vanderkloof continued under the authority of the municipality as a water services authority, the Blue Drop Inspector team has noted that Vanderkloof was properly fenced and gated together with command reservoirs has been secured and could not be accessed by unauthorised persons. The Blue Drop regulatory team has identified number of areas that required an improvement at Vanderkloof water treatment works. However, the municipality was also aware about some of the challenges as the conditional assessment report had been done and the report was submitted to the Inspector team to confirm that the municipality is in the process to address some of the challenges experienced by that water treatment infrastructure. The municipality has requested a service provider or an engineer to conduct the process audit or condition assessment to look at the status of the water treatment facility. Vanderkloof water treatment works require number of improvement and include the following:

- Two Grundfos pumps were operational however, dosage control valves were broken therefore chemical added into the water could not controlled and may result at chemical added into water either underdosing or overdosing by the process controllers and should be addressed as soon as possible.
- Maintenance of the water treatment works should be prioritised as most of the water treatment infrastructure such as backwashing pumps and two high lift pumps were broken and there were no plans in place to repair and returned them to service.
- Process controllers run water treatment works without operational monitoring testing equipment therefore could not determine whether treated water produced at the final would be safe to be used by the consumers.
- The municipality should attend to all condition assessment findings presented above with issues raised to improve the performance of water treatment works.
- The municipality should develop a water safety planning process in which all high risks indicated above to reduce al risks associated with the water treatment works.
- Use VROOM Refurbishment cost estimates as provided above to source more funding to assist the municipality to improve the condition of the water treatment works.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	NI
Chemical Compliance	NI

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





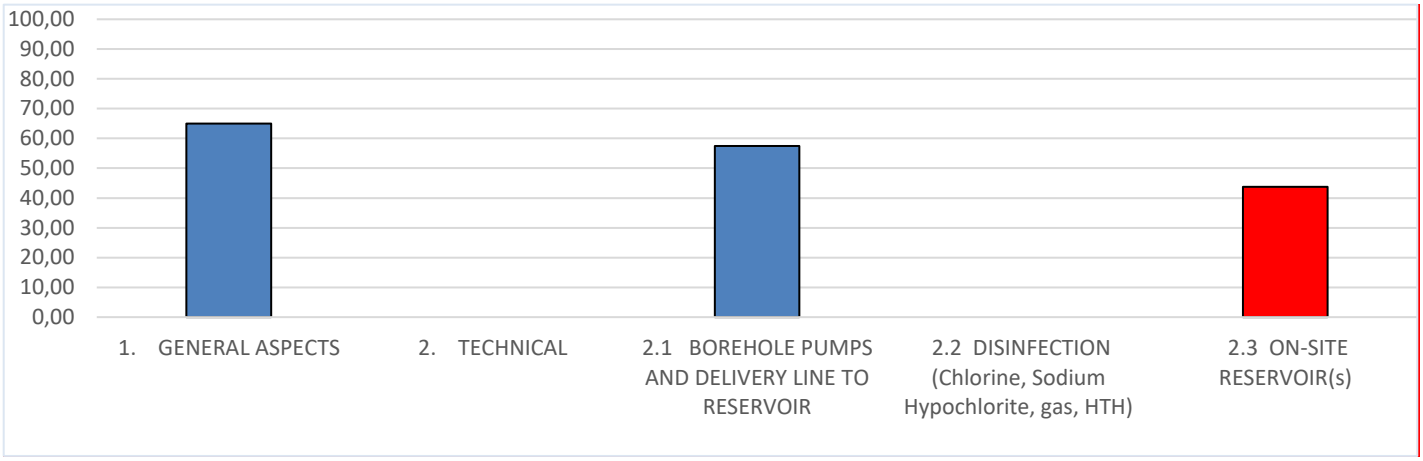

12.19 Richtersveld Local Municipality

The Port Nolloth Borehole System was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

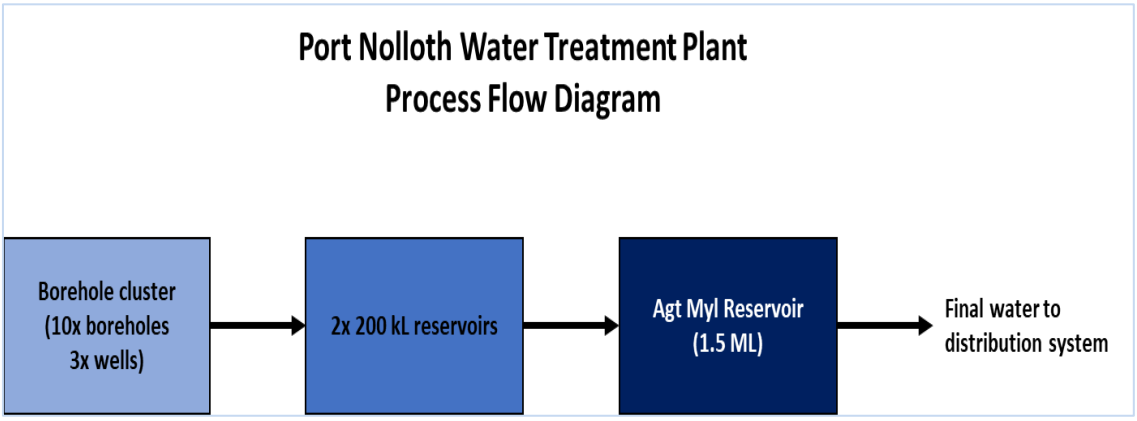
Port Nolloth Borehole System: 43%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	65.0	The chlorination system that the plant had in the past is still on the plant, but not installed and therefore not in operation. The existing chlorination system or a new chlorination system should be installed and commissioned as a matter of urgency. The VROOM for this is included in the relevant section later in the form.
2	**Technical**		
2.1	Borehole pumps and delivery line to reservoir	57.5	An inflow meter should be provided.
2.2	Disinfection	0.0	The treatment plant is currently not dosing chlorine. The equipment to do so is available. It was recommended by the inspectors that the municipality should be dosing chlorine to the final water as a matter of urgency. This is to ensure the safety of the drinking water delivered to the town.
2.3	On-site reservoir	43.8	A flow meter should be provided. The level sensor should be calibrated (and at a regular interval thereafter). A lockable manhole cover should be provided on top of the reservoir to replace the broken concrete slab.
	Total	**43%**	

High risk areas OR Key Hardware Risks/ Defects

1. Lack of a chlorination system and hence no chlorination of the drinking water supply. A chlorination system should be installed as a matter of urgency.
2. New inflow and outflow meters must be provided. The municipality currently has no real-time measurement and recording of drinking water flows to the town.

VROOM Refurbishment Cost Estimate

Civil Works	R0	0%
Mechanical Works	R47,300	81%
Electrical Works (Incl C&I)	R11,000	19%
Total VROOM Cost	**R58,300**	**100%**
R million / MLD		**0.12**

Regulatory Impression

The Port Nolloth Borehole Supply System is located at Aft Myl on the road to Steinkopf. The system comprises 13 boreholes that pump the abstracted water to a raw water reservoir. The water is then pumped to the command reservoir over a distance of around 1.4 km. The water used to be chlorinated prior to being pumped to the command reservoir, but this operation has been discontinued some time ago already, and the water is therefore not currently disinfected. It was pointed out to the municipality that the chlorination of the water be resumed as a matter of urgency. There are also no inflow or outflow meters at the system, and this should also be provided to ensure effective management of the drinking water provided to the town of Port Nolloth.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	81.25%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



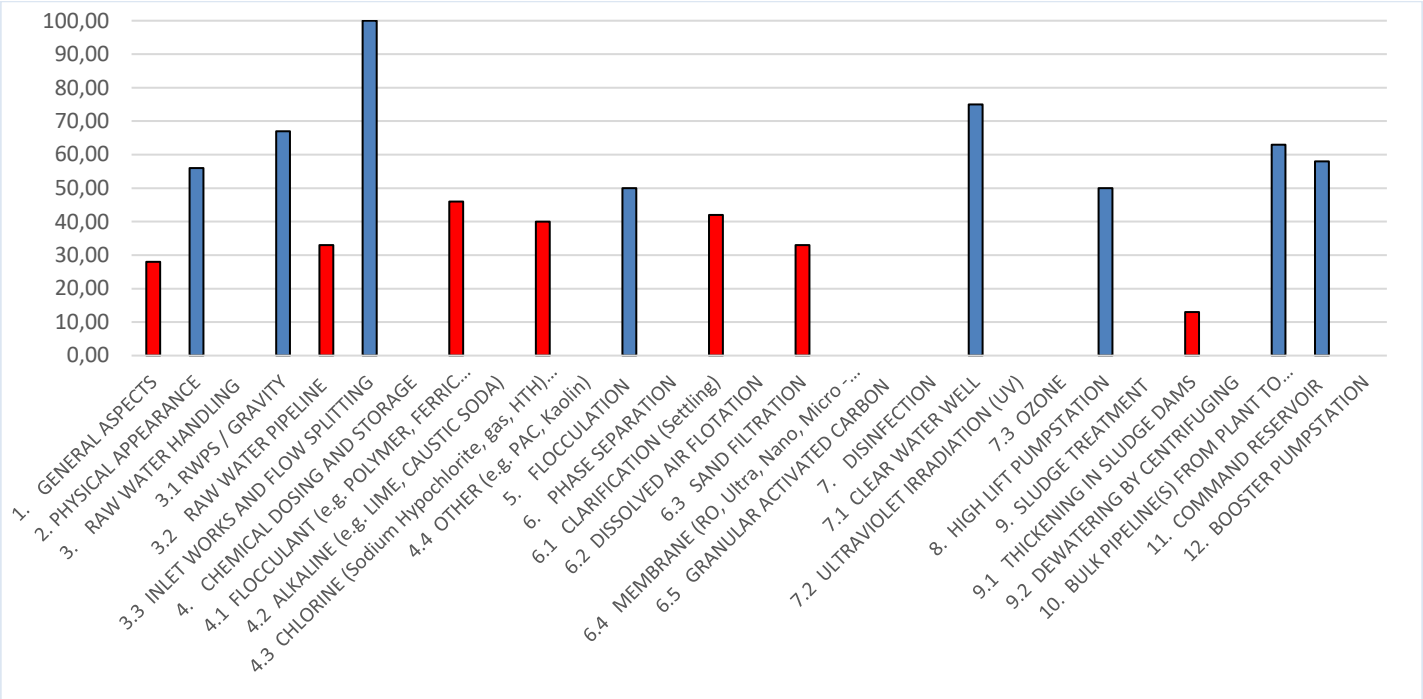

12.20 Siyancuma Local Municipality

The Douglas water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality. The inspection was conducted on 14 February 2023.

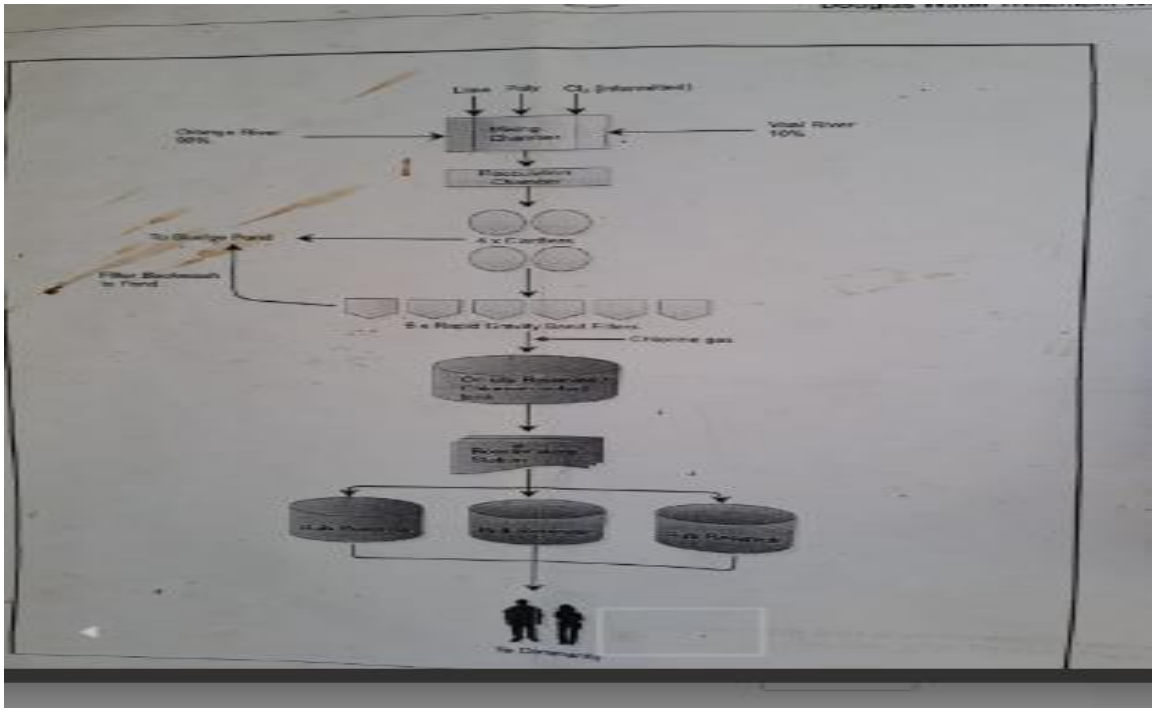
Douglas TSA Score: 51%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	28.0	Class C plant, Of the eight items adjudicated under General aspects only two got a full score, the balance not and these are: Operational monitoring is not done; no operational test kit is available; operational monitoring is not done; The O&M Manual is not available to the plant. The Eskom electricity pole with the meter is available but due to OHS, the assessors did not inspect it.
2	**Physical appearance of plant**	56.0	Eight items were inspected and the following need urgent attention of the Municipality, namely: The Office and the Kitchen are located together and the electrical box for it is open and live wiring is exposed and it poses a danger. The issue of concern is the exposed electric wiring and electrocution. All the above mentioned are OHS non-compliances which are a concern.
3	**Raw water handling**		In the pump station, two Low Lift pumps are installed to take the raw to the head of the plant. These the staff informed that the pumps work together or paired and there is no standby. The Municipality need to procure two standby Low Lift pumps for Douglas WTW. And an extension to the pump house may be required to house additional pumps. Also before the Low Lift pump station is a flow meter in a chamber and the meter is not working and this also need the attention of the Municipality. In addition there is a concern on dosing area neatness i.e. there is dirt around it and the dosing area is located next to the staircase of the building meaning staff and visitors pass though it to access the Office i.e. is a concern as well. All these issues need the attention of the Municipality.
	Raw water pumpstation / gravity feed	67.0	
	Raw water pipeline	33.0	
	Inlet works	100.0	
4	**Chemical dosing and storage**		Of the six (6) items checked, two need the urgent attention of the Municipality, namely: currently one duty dosing pump is available and a standby one must be confirmed the cleanness or neatness of the dosing area as well. With chlorine administration: Only one rotameter there is no standby; the 110 Kg gaseous chlorine scale is not working; and also because there is no operational tests done, the Municipality need to urgently implement operational monitoring tests as well confirm the correct chlorine dosing for Douglas Water Treatment Plant. The best practice for disinfection is that, monitoring of disinfectant residuals at the purification plant and throughout the network as well sampling for microbiological water quality parameters is essential to see if the dosage and water purification is effective. Douglas WTW does not do operational tests. At the time of the visit the rotameter was set at 2 Kg per hour and Municipality need to have checks to see if the disinfectant dosage is HIGH or low. Chlorination is one of the components in water purification which is important and safe guards against bacteriological contamination.
	Flocculant	46.0	
	Chlorine	40.0	
5	**Flocculation**	50.0	Pro floc–M160 is used. There were fine flocs visible at the clarifiers and because no operational test done it is difficult to gauge the Floc Formation and turbidity efficiency for Douglas WTW. In addition, there is visible algal growth on the walls of the floc channel and clarifiers.
6	**Phase Separation**	42.0	There are four circular clarifiers. Sludge removal is done once per shift i.e. it is three shifts, therefore three times over a 24-hour period. The effectiveness of the clarifiers as a removal of particles cannot be evaluated because this plant does not do operational tests as is regulatory required. In addition the staff reports that some desludge pipes are partially blocked and therefore need assessment to check efficiency for sludge removal.
	Clarification (settling)	-	. The assessor(s) noted in some clarifiers “partial exposed re-enforce steel”. This need an investigation; re-enforced steel holds the structure together and its failure may or will compromised the clarifiers.
	Sand filtration	33.0	There are six (6) filters, and the assessors want to highlight the following: The Municipality need to get the standby air-blower fixed. Because currently only 1 x duty air-blower and no standby. This plant uses air-blowers to backwash. According to the staff, backwashing is done based intuitively once per shift i.e. 3 x shifts then three times over 24-hour period.
7	**Disinfection**	40.0	It is difficult to measure contact time, however the rotameter reading was set at 2 Kg per hour. And among other things no operational monitoring is done at this plant.
	Clear water well	75.0	
8	**High Lift Pump station**	50.0	Two pumps i.e. 1 x duty and 1 x standby. Both pumps are working and are (KSB Type). Also the outlet meter the staff confirms that it is working, it is in a chamber and assessors did not get into the chamber and no meter record readings were shown to the assessors.
9	**Sludge treatment**	13.0	One dam infested with reeds is used to dispose of backwash and desludges wastewater. There is no record that the dam is lined to prevent seepage. Provision must be made by Siyancuma Local Municipality to evaluate this dam against National Water Act regulations or WRC management guidelines for sludge dams.
10	**Bulk pipeline from plant to command reservoir**	na	Not inspected
11	**Command reservoir**	58.0	The High Lift pumps at Douglas WTW pumps water to three (3) reservoirs which are located at Bongani Community. The three reservoirs are each 7.3 Ml and at the spot of location there is no fence and within 200m - 300m there is an informal settlement that may encroach the servitude.
12	**Booster pumpstation**	na	Not applicable
	Total	**51%**	

High risk areas OR Key Hardware Risks/ Defects

1. Operational monitoring at Douglas WTW is not done and there is no portable kit to do so. It includes not testing for disinfectant residual.
2. The O&M manual for the works or copy is not available at the plant.
3. At the Office of the Process Control staff the electric box is not closed, and wiring is exposed. It poses a hazard.
4. The raw water Low Lift pump station does not have standby. The two pumps installed operate in pair, hence no standby. It need attention of the Municipality.
5. The chemical water treatment dosing tank cover is a “gauze” which is dirty, and it is a health hazard. The water treatment dosing area or point is located at the entrance of the building next to the staircase and it is also a health hazard. The drinking water is “food” and it need to be at a health & hygiene compliant area. The Municipality must investigate and take necessary corrective action.
6. The clarification structure for all four clarifiers need to be checked by an Engineer because of exposed re-enforce steel. The desludges mechanism for all the clarifiers need to be verified because the staff mentioned that it is difficult to remove or desludges the clarifiers.
7. The dosing of chlorine is not based on operational monitoring or tests. The Municipality need to re-instate operational monitoring in terms of Blue Drop requirements.
8. All flow meters need to be verified. It is to ensure that the plant is not operated beyond capacity and water is balanced.
9. The sludge removal and disposal need to comply with Water Research Commission guidelines.

VROOM Refurbishment Cost Estimate

Civil Works	R19,921,000	83%
Mechanical Works	R2,794,000	12%
Electrical Works (Including C&I)	R1,174,800	5%
Total VROOM Cost	**R23,889,800**	**100%**
R million / MLD		**4.8**

Regulatory Impression

The Douglas Water Supply System, in the assessment period i.e. July 2021 to June 2022: In terms of SANS 241 mandatory requirements the water leaving the plant was supposed to be sampled weekly for E. coli bacteria or faecal coliforms and that is a minimum of 52 samples. The works only sampled for sixteen samples at a frequency of 23 days. It is a non-compliance issue. In addition, overall between July 2021 till June 2022 a total of seventy-eight (78) microbiological samples were taken at various compliance monitoring points by the Municipality and the compliance was seventy (75%) low. In terms of SANS 0241 the minimum acceptable compliance percentage of “Acute health microbiological risk water quality parameter” is (> 95%). Douglas Supply System did not meet the above-mentioned regulatory requirement. Consumers at Douglas Supply System may not be confident in the in this water. Also the high risks mentioned above must be taken together with the regulatory comment. It is to make sure that a water service is performed by Siyancuma Local Municipality as well Blue Drop requirements are adhered to. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	75.00%
Chemical Compliance	85.29%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

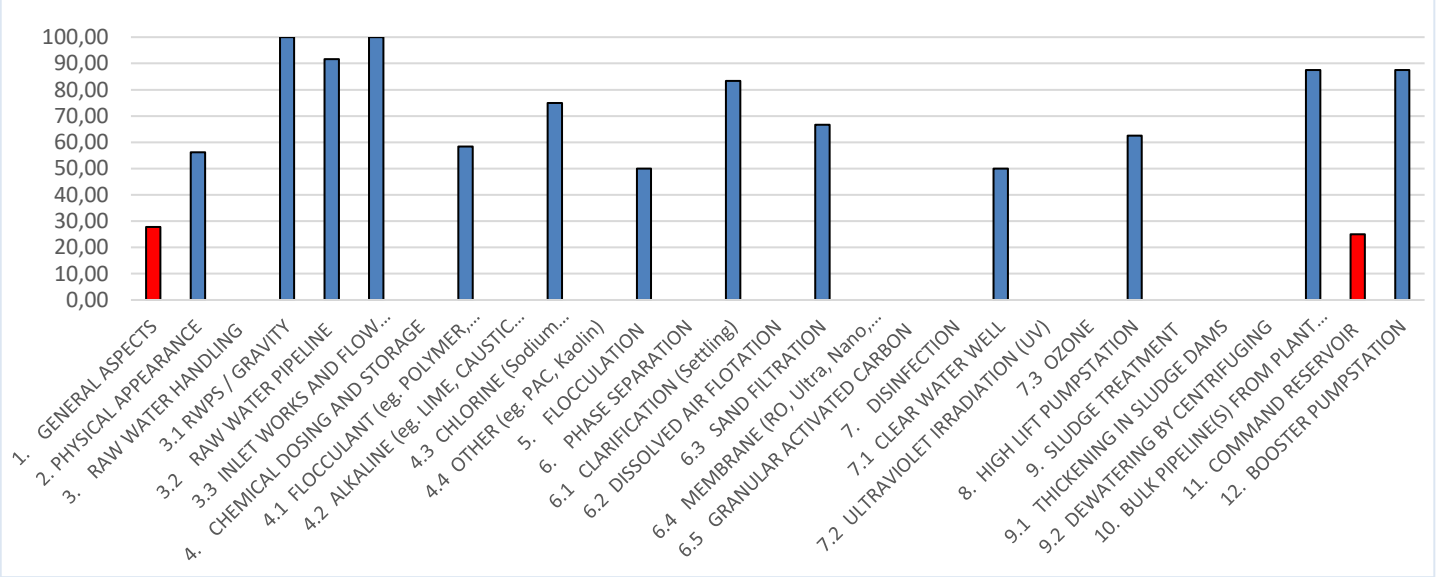
12.21 Siyathemba Local Municipality

The Flippie Holtzhausen water treatment system receives raw water from Orange river and registered as class C works with the design capacity of 15 000 kl/d. The plant is operated and managed by Siyathemba local municipality. The process controllers required to operate the water treatment works should be registered as class III and be supervised by class. The Flippie Holtzhausen water treatment system supplied water to a population of more than 12 000 and other commercial activities within the Prieska town. The Blue Drop technical site assessment has taken place as part of the main Blue Drop Assessment and the main purpose of technical site assessment was to determine the condition and functionality of water treatment works to supply safe tap water to Prieska residents. It should be noted that Siyathemba local municipality has additional two water supply systems which use borehole water schemes to supply water, however technical site assessment was not conducted to those systems but are included on the 2023 Blue Drop Assessment and Report.

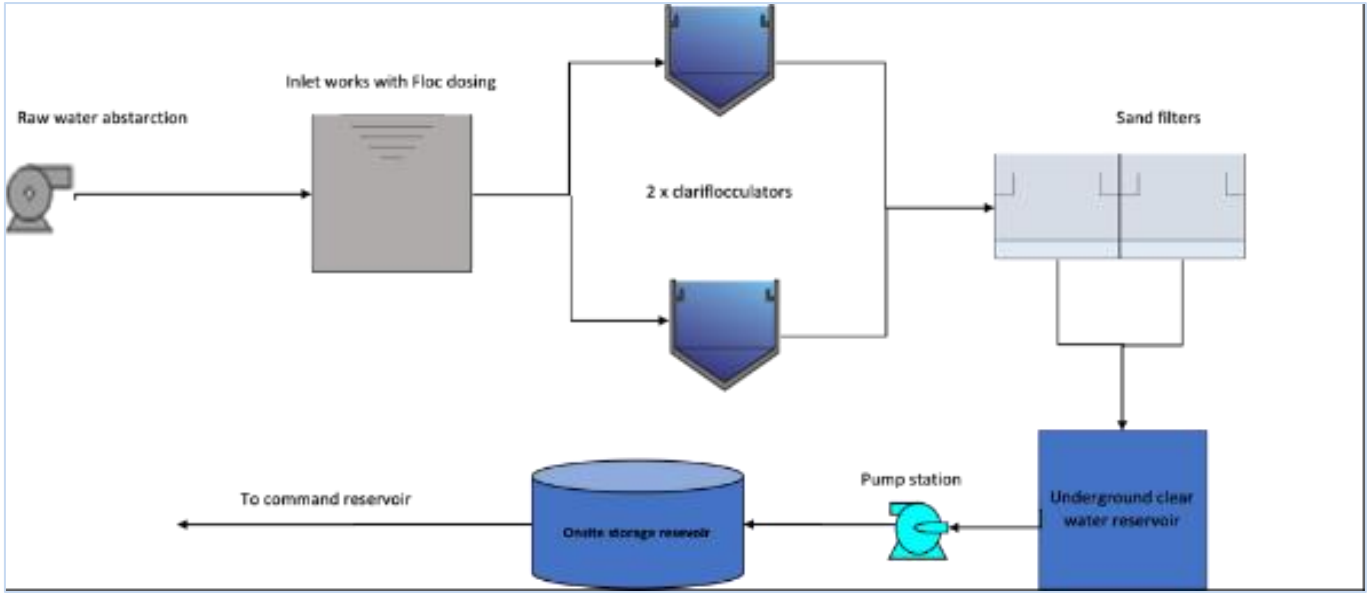
Flippie Holtzhausen WTW (Prieska) TSA Score: 63%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and required urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	28.0	The turbidity and free chlorine meters available on-site but proof of operation monitoring results was not provided. No Jar test equipment on-site to determine chemical dosage.
2	**Physical appearance of plant**	57.0	The entrance to the facility was signposted displaying the works name and access disclaimer. The WTW was fenced and gated, however overgrown vegetation was observed.
3	**Raw water handling**		The strainer installed on the raw water suction pipes. the Inflow meter was in good working condition. But there was no recent calibration or verification was provided as proof.
	Raw water pumpstation / gravity feed	100.0	
	Raw water pipeline	91.6	
	Inlet works	100.0	
4	**Chemical dosing and storage**		There was one Grundfos dosing pump installed and was in good working condition.
	Flocculant	58.0	
5	**Flocculation**	50.0	The WTW uses clari-flocculators which were in good condition, however but there was excessive growth of algae. The process controller indicated that was mostly experienced during summer season.
6	**Phase Separation**		The Floc carry-over was very minimal in both tanks and desludging equipment confirmed to be working.
	Clarification (settling)	83.0	The clarifier No 2 weirs had algal growth and some sections required some repairs. Filter valves were leaking and required to be repaired.
7	**Disinfection**		The clear water tank was located underground but its size was unknown. Contact time for disinfection was not determined. Free chlorine samples were collected in the on-site storage reservoir which was located after the clear water tank.
	Clear water well	50.0	
10	**Bulk pipeline from plant to command reservoir**	88.0	There was no evidence of leaks on the bulk pipeline. Pipe size and make was unknown.
11	**Command reservoir**	25.0	No fence and gate at the command reservoirs therefore security of command reservoirs should be improved.
	Total	**63%**	

High risk areas OR Key Hardware Risks/ Defects

1. Improve security at the command reservoirs.
2. Repair and install high lift standby pump.
3. Repair or replace standby backwash pump and blower.

VROOM Refurbishment Cost Estimate

Civil Works	R1,306,800	37%
Mechanical Works	R1,592,800	46%
Electrical Works (Incl C&I)	R586,300	17%
Total VROOM Cost	**R3,485,900**	**100%**
R million / MLD		**0.23**

Regulatory Impression

The Flippie Holtzhausen water treatment system was found to be in functional state and the condition of the plant showered that the plant was well maintained by the competent maintenance team within the municipality which included both mechanical and electrical department. Water quality samples were taken and analysed according to SANS 241 requirements. The municipality has conducted risk assessment where Siyathemba Local Municipality collected both raw water and treated water samples and analysed for full SANS 241 determinands which included samples of microbial, chemical acute, chronic, and aesthetic risks. The technical assessment established that by larger extent chemical determinands were compliant with the drinking water quality except microbiological quality. The risk assessment results showed that Flippie Holtzhausen water works was capable of removing all risks associated with raw water quality from orange river but the process controlling should be improved on the disinfection process to eliminate all microbiological risks and be compliant with SANS 241. The main function of water treatment works is to treat and supply water that meet all quality requirements.

The Blue Drop Inspector has identified areas that need improvement to enable the municipality to enhance drinking water quality management. The Technical assessment recommends the following:

- Subject process controllers responsible to operate Flippie Holtzausen water treatment works to relevant training to ensure that they meet minimum requirement as per the Blue Drop Audit requirements.
- Provide in-house training to process controllers on how to manage water treatment process to ensure that they make appropriate decisions independently without waiting for supervisor to give instruction when adjusting treatment processes.
- The municipality is requested to provide an action plan to all conditional assessment findings highlighted above and put reasonable timeframes on which all issues identified are addressed.
- Develop a water safety planning process in which all high risks areas identified above by the technical assessment will be addressed.
- The technical assessment has further provided VROOM estimated refurbishment cost which should assist the municipality when approaches relevant stakeholders to seek funding to address some of the conditional assessment findings and risks to improve the condition of Flippie Holtzausen water treatment works.
- Housekeeping, security, and access at command reservoirs should be prioritised by the municipality.

The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility. The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	80.77%
Chemical Compliance	90.56%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



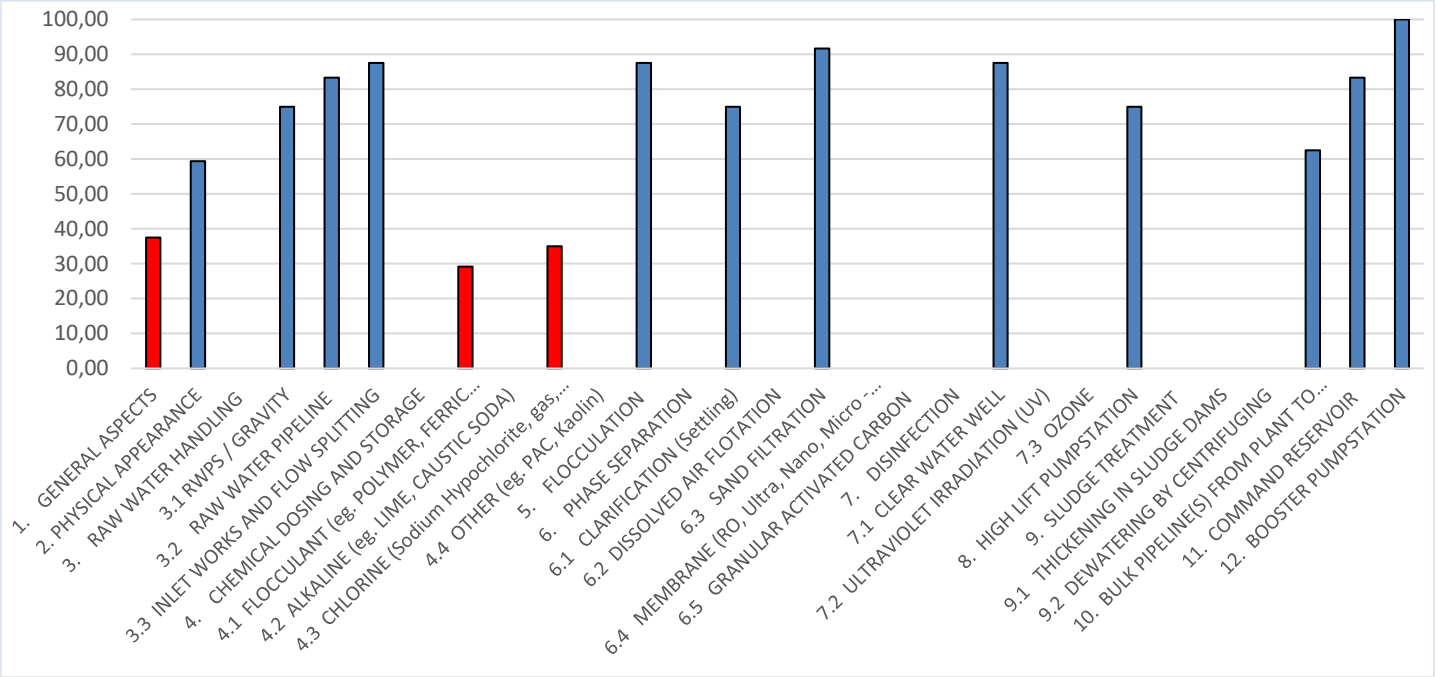

12.22 Sol Plaatje Local Municipality

The Ritchie water treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

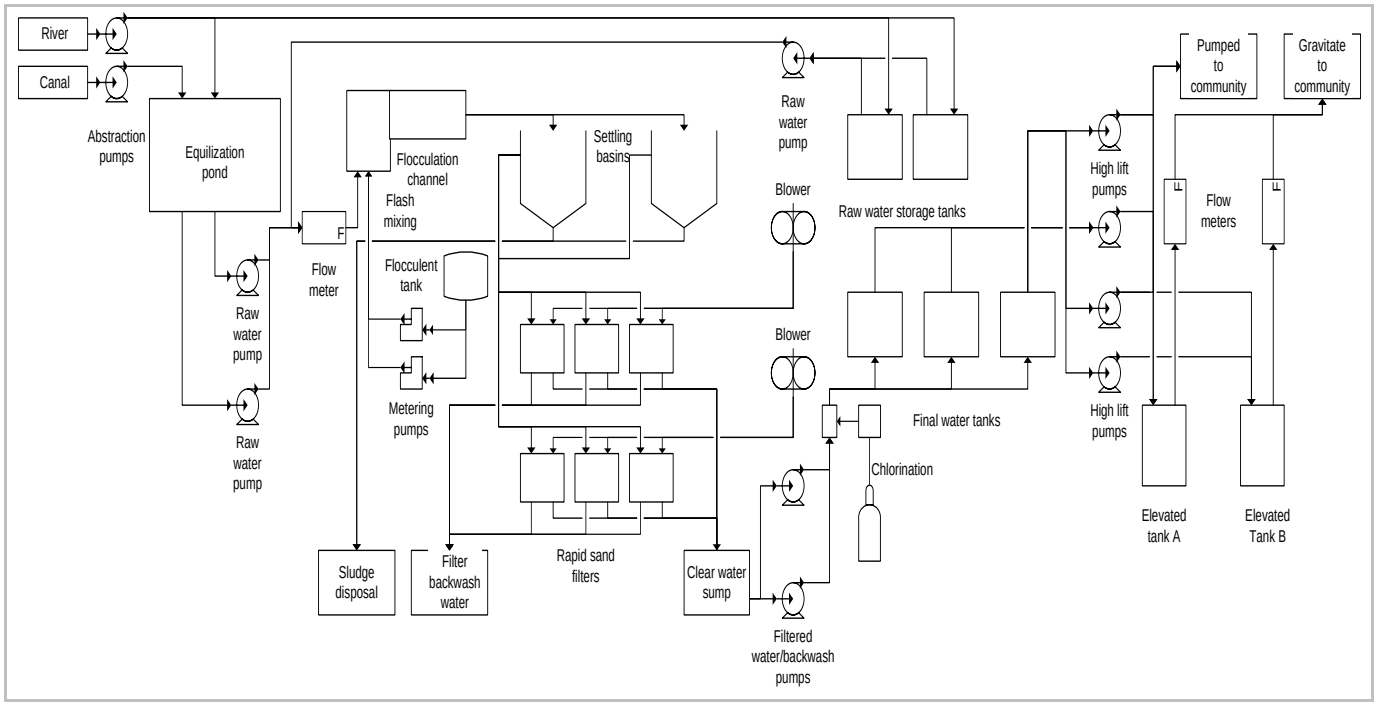
Ritchie Water Treatment Plant TSA Score: 65%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	37.5	Plant classified certificate is not displayed. Logbook is in place with all daily measurements, defects and observations recorded. Only a chlorine meter available on site.
2	**Physical appearance of plant**	59.4	No institutional information at entrance. Boundary fence in good condition with access control. Ablution facilities for employees need attention.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	75.0	Duty pumps installed at river and canal and functional; spare pumps kept in store.
	Raw water pipeline	83.3	Pipeline reported to be in good condition and adequately sized. Inspections are periodically conducted. Meter readings are recorded.
	Inlet works	87.5	Flow enters at a steep ramp, with hydraulic jump at the end - sufficient turbulence. Temporary dosing pipe, held down with a brick, to be replaced with a permanent structure.
4	**Chemical dosing and storage**		
	Flocculant	29.2	There is no standby dosing pump installed. The stock tank is in an elevated position and not bunded. There is no emergency shower available.
	Chlorine	35.0	No standby equipment available. The scale is functional, but no records presented. Safety at the chlorine room must be attended to urgently.
5	**Flocculation**	87.5	Except for some scum accumulation at the end of the channel, good floc formation was observed.
6	**Phase Separation**		
	Clarification (settling)	75.0	De-sludging is done twice per month, but no evidence to support this.
	Sand filtration	91.7	Backwash equipment functional with standby available. Filters are backwashed once per shift (2 per 24Hrs). Even bubble distribution was observed during backwash.
7	**Disinfection**		
	Clear water well	87.5	Adequate contact time: chlorine dosed prior to three ground level reservoirs.
8	**High lift pumpstation**	75.0	Two transfer pumps from clear water well to ground level reservoirs. Two pump sets with duty and standby each, all functional. Pumps can be used to pump directly into mains or to elevated reservoirs on site.
9	**Sludge treatment**		
	Thickening in sludge dams	0.0	There is no provision made for sludge handling. Sludge is discharged to the veld, together with filter backwash water.
10	**Bulk pipeline from plant to command reservoir**	62.5	A 7-year-old 800mm steel pipeline equipped with cathodic protection. Not aware of any leaks, although reported in WaSP. There are unauthorised connections on the line.
11	**Command reservoir**	83.3	Network is supplied from reservoirs on site, which are all secured. No leaks observed and in good condition.
12	**Booster pumpstation**	100.0	Two pump sets with duty and standby each, all functional. Pumps can be used to pump directly into mains or to elevated reservoirs on site.
	Total	**65%**	

High risk areas OR Key Hardware Risks/ Defects

1. Chlorine room and safety equipment
2. No operational monitoring implemented.
3. Chemical stock tank in un-bunded elevated position and not easily accessible by delivery trucks.
4. Sludge discharged into the veld.
5. No on-site operational laboratory and equipment (Only measuring free chlorine).

VROOM Refurbishment Cost Estimate

Civil Works	R2,580,600	83%
Mechanical Works	R421,300	13%
Electrical Works (Incl C&I)	R114,400	4%
Total VROOM Cost	**R3,116,300**	**100%**
R million / MLD		**0.64**

Regulatory Impression

The Ritchie water treatment plant is registered on the IRIS and classified as a Class C plant. The WSA however does not comply with regulatory requirements for process controlling staff. This needs to be attended to. The plant was found to be in a fair condition with all treatment processes functional. The lack of standby dosing equipment and operational monitoring equipment is of concern. The Water Safety Plan needs to be finalised and must be more specific with regards to identified hazards, risks, and control measures.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	96.39%
Chemical Compliance	85.38%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%







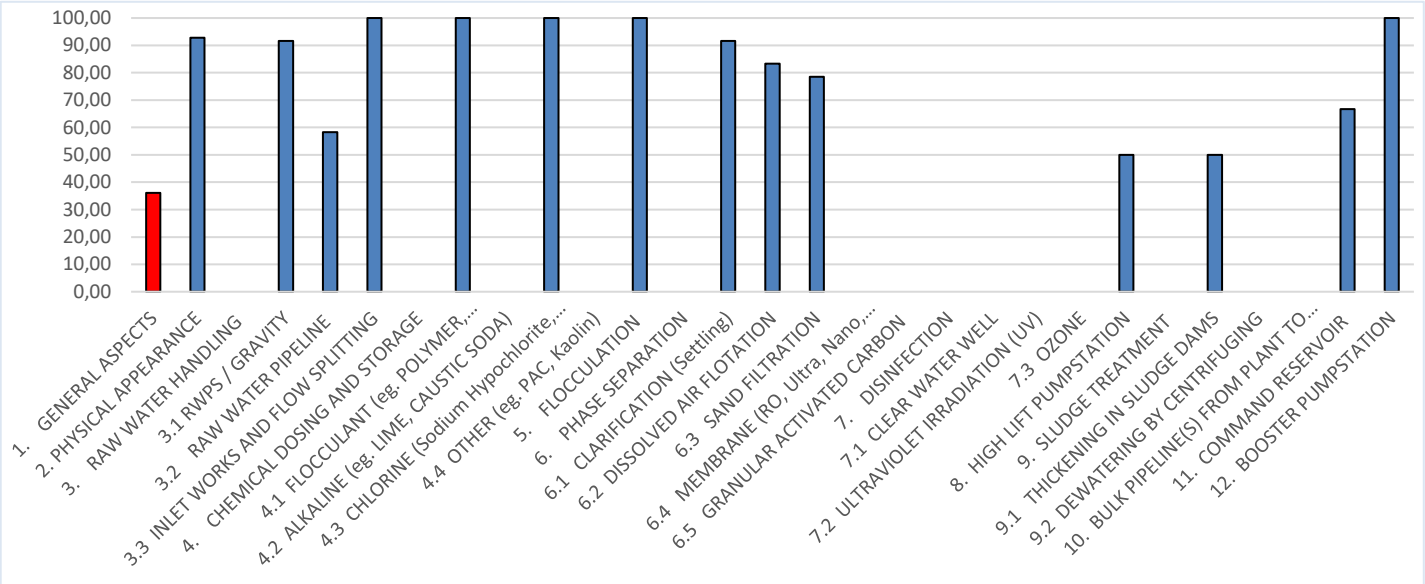
12.23 Thembelihle Local Municipality

When the 2022 Blue Drop assessment team or auditors completes the documentation verification with a Water Services Authority, then the final step of the assessment or audit is to choose one or two Water Purification Plant of the Municipality for physical inspection. Hopetown Water Purification Plant is one of the works that was chosen under Thembelihle Local Municipality. The inspection was conducted on 02 February 2023.

Hopetown TSA Score: 75%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram

None

Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	36.0	This is a Class C plant. Of the general aspects inspected, repairs logbook and process monitoring kit and process flow diagram were the main items that need the greatest attention.
2	**Physical appearance of plant**	93.0	Of the items inspected under Physical appearance: most of the aspects seem to be doing very good except for the neatness of the terrain.
3	**Raw water handling**		The raw water handling is generally good. Source is surface water (river), screens are in place. Fishing activities were observed at the source. The generator at the source was not working on the day of assessment. There is a raw water holding dam that was not in use during assessment because of the pump that was not functioning. The flow meter exists at the source; however, no records are taken by the municipality, readings taken by DWS. Only record what is pumped from the reservoir to the distribution.
	Raw water pumpstation / gravity feed	92.0	
	Raw water pipeline	58.0	
	Inlet works	100.0	
4	**Chemical dosing and storage**		Aquafloc 4030 is used. Floc dosing pumps are not functioning, therefore dose manually. The emergency shower is a bit far from the flocculation storage area. Chlorine gas is used, where a dosage of around 6kg/hr. is normally practiced. Dosing pumps are in a working condition - one duty and one on standby. Safety equipment exists and is appropriately stored. There is an SLA with a chemical provider. Enough chlorine is always maintained.
	Flocculant	100.0	
	Chlorine	100.0	
5	**Flocculation**	75.0	Regular removal of algae needs to be practiced.
6	**Phase Separation**		
	Clarification (settling)	92.0	The unit seems to be in a good condition except for the algal build up.
	Sand filtration	93.0	All necessary equipment, e.g., recycling pumps, air blowers, exist with backups, and they are all functional. There are four filter beds - which look like they need sand replacement. It was noted that sand has been ordered already. There are signs of algal growth within the filter beds. The filter beds are outside - exposed to all weather conditions.

Watch #	Process Unit Assessed	% TSA	Observations
7	**Disinfection**		The size of the on-site clear water sump is not known. And could not calculate the disinfectant contact time. Free Chlorine residual is also not monitored due to equipment that needs servicing.
	Clear water well	0.0	
8	**High Lift pump station**	50.0	Pumps are in a working condition with backups. There are no final water flow meters.
9	**Sludge Treatment**		
	Thickening in sludge dams	50.0	Sludge drying beds are used for drying sludge. Sludge pumps with their backups have not been in a working condition for over a month. Dry sludge is disposed of at a landfill site. Drying beds are in a good condition, no cracks nor leaks observed.
10	**Bulk pipeline from plant to command reservoir**	-	Not inspected.
11	**Command reservoir**	67.0	The site is fenced with a locked gate. Three steel tanks and one elevated steel tank are in use. The concrete reservoir on the ground and the other elevated steel tank are no longer in use. All in good condition - no cracks nor leaks observed.
12	**Booster pump station**	100.0	The booster pump station is within the same premises as the command reservoir. The pumps building is also locked. There are two pumps - one duty, one standby. Pumps are all working. and the standby is taken out for repairs.
	Total	**75%**	

High risk areas OR Key Hardware Risks/ Defects

1. The absence of a standby power facility leads to water being stagnant for longer periods of time. That could be one of the reasons for algal growth.
2. All operational monitoring tests e.g. pH, Turbidity should be serviced and utilised to improve operational monitoring.
3. Inlet flow records should be kept.
4. Chemical dosing pumps that are not functioning need to be addressed.

VROOM Refurbishment Cost Estimate

Civil Works	R137,500	12%
Mechanical Works	R388,300	32%
Electrical Works (Including C&I)	R673,200	56%
Total VROOM Cost	**R1,199, 000**	**100%**
R million / MLD		**0.23**

Regulatory Impression

The Hopetown water supply system is well operated by staff whom the assessors met and found them knowledgeable of the plant with good hospitality. The items which currently need the attention of the Local Municipality includes the chemical dosing pumps. In addition, operational monitoring is not taking place at the plant, yet there is monitoring equipment. Calibration of the equipment needs urgent attention. The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	96.97%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

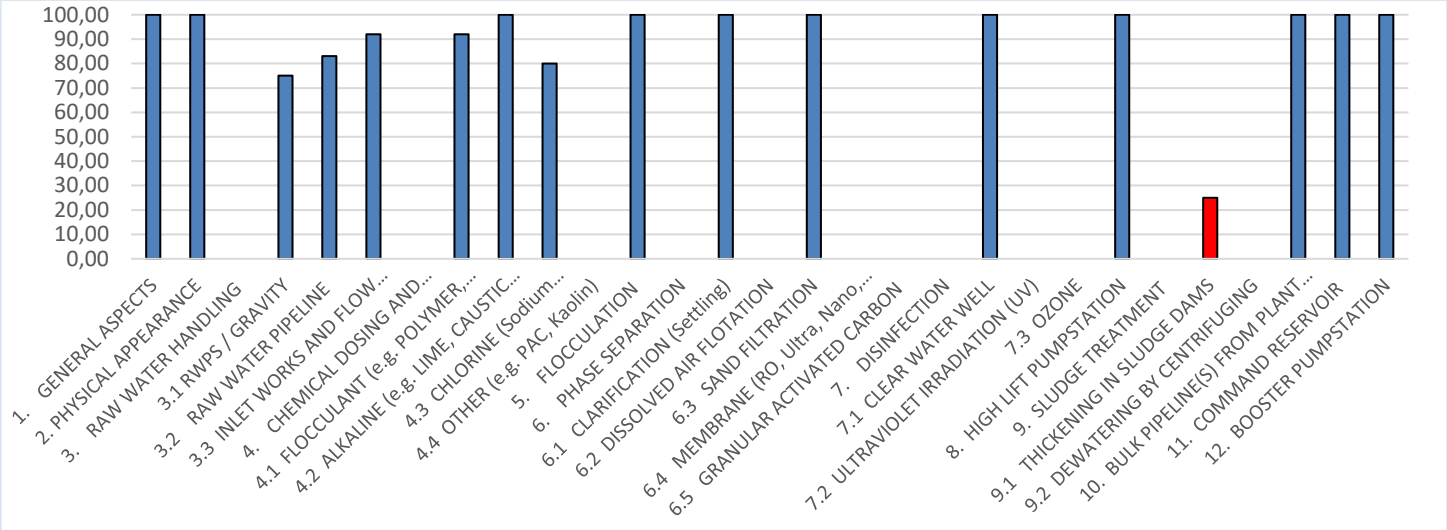
12.24 Tsantsabane Local Municipality

This Water Treatment Plant is under management of Sedibeng (Bloemwater) Water Board and supplies drinking water to the community of Tsantsabane Local Municipality at Postmasburg, Boithoko Community and New-Town Community. The plan was inspected on 16 February 2023 to assess the condition and functionality of the infrastructure and treatment processes on the ground as well estimate the cost of those items that were not in full operation.

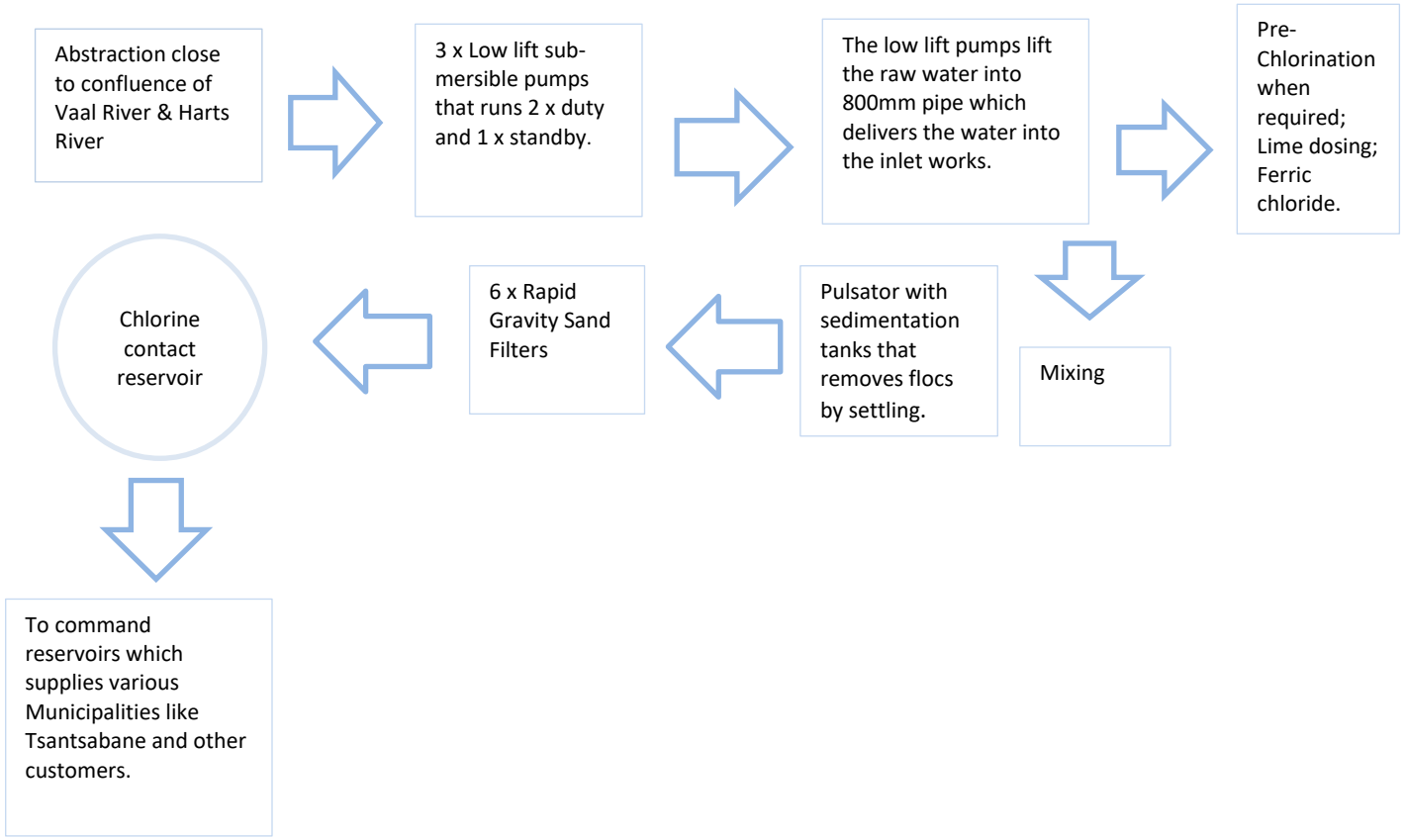
Vaal Gamagara TSA Score: 94%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	100.0	Class B plant, of the seven aspects checked under this criterion: The plant got full score in all of them.
2	**Physical appearance of plant**	100.0	Of the aspects checked during the site visit, the plant got full score in all of them. In addition, to mention but a few items i.e. Vaal Gamagara Water Treatment Plant and Scientific Services Section there is an in-house gymnasium that is available to staff for fitness etc and during the inspection the facility was opened, and staff demonstrated training activities. It is part of Health Awareness and Fitness.
3	**Raw water handling**		Of the three aspects checked against this item, the issue noted is that there are three Low Lift pumps and operate in a pair. There is therefore not 100% standby BUT 50%. And Vaal Gamagara WTW because its services bulk water to a large group of Municipalities in the Northern Cape a 100% Low Lift pumps should be procured. In addition, staff informed that the inlet points of raw water from the source does not have sieves to prevent foreign matter.
	Raw water pumpstation / gravity feed	75.0	
	Raw water pipeline	83.0	
	Inlet works	92.0	
4	**Chemical dosing and storage**		Of the aspects checked in this item: Only the water treatment chemical storage area scored 75% the others got full score. It is because of the bund wall not fully complying with required containment volume. However if a spill occurs it drains to a recovery sump. Of the chlorine dosage facility ONLY the scales for measuring /monitoring the quantity in the cylinder the scales are not working and the staff said instead or meantime they use the gage of rotameter as an indicator of an empty gaseous cylinder bottle.
	Flocculant	92.0	
	Alkaline (lime)	100.0	
	Chlorine	80.0	
5	**Flocculation**	100.0	The flocculation starting at pulsator to the sedimentation tanks in which flocs settled. All items scored full points.
6	**Phase Separation**		On this item, the three items checked, all scored obtained full marks.
	Clarification (settling)	100.0	
	Sand filtration	100.0	The sand filters i.e. 6 x Rapid Sand Filters were all acceptable and received full points.
7	**Disinfection**		On this visit, the clear water well of Vaal Gamagara WTW was satisfactory and it got full marks.
	Clear water well	100.0	
8	**Sludge treatment**	25.0	The backwash wastewater and sedimentation tank desludge is sent to a collection dam and this we were pointed to but did not inspect due to sudden heavy rain whilst onsite i.e. Vaal Gamagara Plant. However, reports uploaded onto IRIS concerns that the supernatant recycle pumps had not worked and not fixed yet. Therefore to score it 25%.
9	**Bulk pipeline from plant to command reservoir**	na	Did not inspect
10	**Command reservoir**	100.0	The command reservoirs were not inspected. However the assessors were able to view them onto the onsite Telemetry system in which the Vaal Gamagara WTW staff monitors them live. The names of command reservoirs are: High Lift Reservoir; Kneukel Reservoir; Trewill Reservoir and Clifton Reservoir.
H	**Booster pumpstation**	100.0	The booster pump stations were not inspected BUT viewed live onto onsite Telemetry: Beeshoek pump station to Kolomela Mine; Sishen pump station; Kathu pump station
	Total	**94%**	

High risk areas OR Key Hardware Risks/ Defects

1. Although three Low Lift pumps at raw water abstraction point are installed i.e. if the plant is compelled to run two pumps at a time, then the current 50% standby may not be enough. It should procure a 2nd pump in order to have a 100% standby.
2. The supernatant recycle pumps at sludge dams need to be re-instated. It is reported that they had not worked for some time now.

VROOM Refurbishment Cost Estimate

Civil Works	R1,725,900	7%
Mechanical Works	R19,594,300	82%
Electrical Works (Including C&I)	R2,682,900	11%
Total VROOM Cost	**R24,003,100**	**100%**
R million / MLD		**0.60**

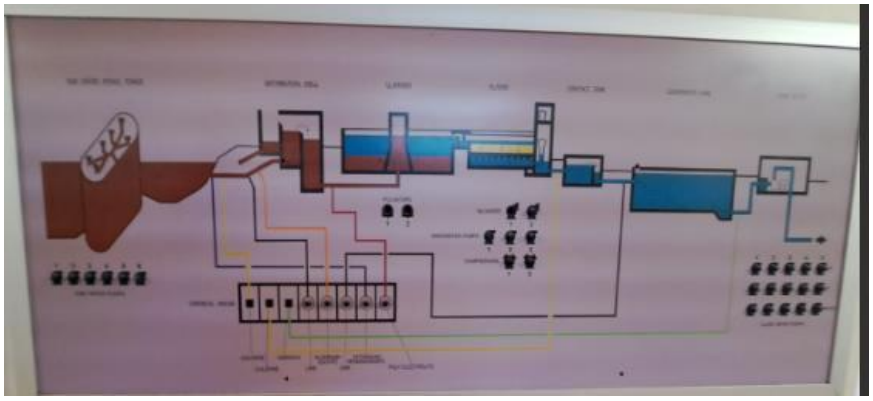
Regulatory Impression

The combined Water Purification Plant and Scientific Services Staff of Sedibeng (Bloem Water) as well Tsantsabane Local Municipality Officials at this site inspection were good to the assessors and this is acknowledged. It resulted in the 2022 Blue Drop team achieving the purpose of inspection. Vaal Gamagara Water Purification Works must attend to the items mentioned under defects in this report.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	97.55%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



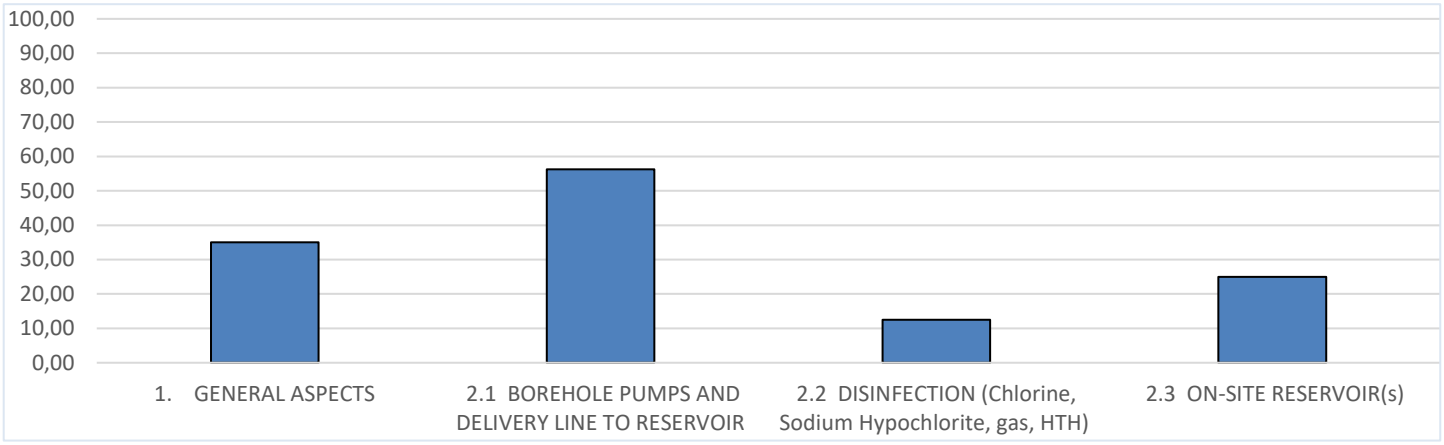
12.25 Ubuntu Local Municipality

The Victoria West borehole scheme was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality. This borehole scheme should have been classified as E and monitored by class I process controller and supervised by class V. The yield capacity of water produced as combined is 2980 kl/d and supply water to more than 10,000 population.

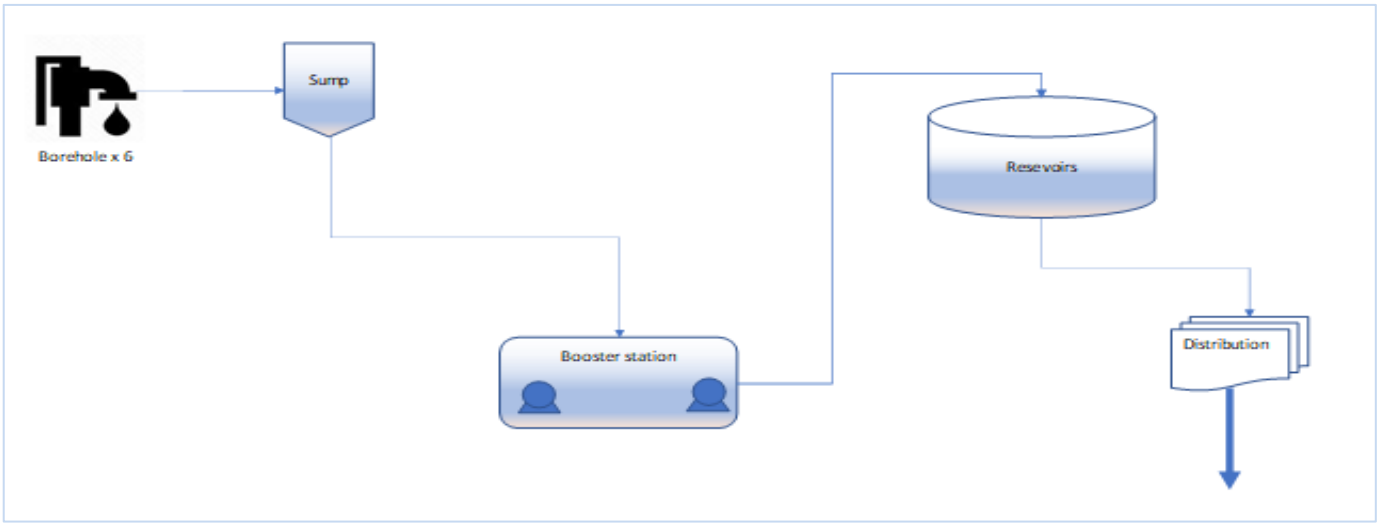
Victoria borehole scheme TSA Score: 32%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	35.0	There was no proof of existence of operation and maintenance manual provided. The boreholes had a short palisade fence available surrounding the boreholes but without a gate therefore no access restriction. Other boreholes did not have fence. No security lights installed at the boreholes. The MCC panel was located at the pump station with lockable. The gravel roads to access the boreholes were in fair condition with no major obstructions. Gravel roads to the main reservoirs were in poor condition and could not be accessed without 4x4 vehicle to deliver chemicals.
2	**Technical**		
2.1	Borehole pumps and delivery line to reservoir	56.0	The bulk line was mostly made of PVC with some sections of Asbestos. But no major leaks observed. The flow meters were installed at each of the boreholes. There was no calibration or verification done to flow meters as per the requirements. No proof of records of flow meter readings provided during the technical assessment.

Watch #	Process Unit Assessed	% TSA	Observations
2.2	Disinfection	13.0	Chlorine floaters were used for disinfection and two floaters last a week for each reservoir. Maintenance team was responsible for disinfection at the reservoir and only replace the floaters once finished. There was no provision for spare on-site. All stock was kept in store and only delivered when there was a need, but no proof of its availability was provided during the technical assessment. There was no safety equipment on-site.
2.3	On-site reservoir	25.0	Reservoir fence was completely vandalised, allowing for uncontrolled access to facility. There was no telemetry in place and there were no records that reservoir levels were monitored. There was no outflow meter from the reservoir.
	Total	**32%**	

High risk areas OR Key Hardware Risks/ Defects

1. Asbestos pipes still used in some sections of the pipeline.
2. Boreholes not adequately protected.
3. Inadequate maintenance

VROOM Refurbishment Cost Estimate

Civil Works	R5,732,100	99%
Mechanical Works	R29,700	1%
Electrical Works (Incl C&I)	R5,500	0%
Total VROOM Cost	**R5,767,300**	**100%**
R million / MLD		**1.94**

Regulatory Impression

The Department as a drinking water regulator is concerned with the way Victoria water borehole scheme is managed by Ubuntu Local Municipality. This inadequate management of Victoria West borehole scheme was also reflected by poor microbiological compliance recorded during the assessment period which was unsatisfactory. The microbiological results indicated that quality of water was compromised therefore the municipality should have improved their disinfection system to eliminate microbial risk or alternative issue a boil water notice to Victoria West residents until the source of contamination was resolved. The drinking water quality regulatory system called Integrated Regulatory Information System (IRIS) further reflect inadequate monitoring of chemical determinands as prescribed by SANS 241. The Department notes that Victoria West supplied tap water through ground water source therefore Ubuntu Local Municipality has a responsibility of monitoring quality of water to determine its fitness for human consumption as ground water could be vulnerable from potential chemical contaminants. Drinking water quality should meet microbiological, chemical, and aesthetic numerical limits as prescribed by SANS 241. The process controllers registered at Victoria West water scheme did not meet requirements therefore not competent and relevant to operate a borehole water scheme as required by the Blue Drop standards. The municipality should subject them to attend relevant training to improve their competency and be registered to be compliant with the Blue Drop standard. The Municipality has also failed to provide proof of competency of maintenance team hence maintenance records were not submitted to be evaluated. The Department recommends the following to address the identified shortcomings:

- Subject process controllers who are responsible for process control at Victoria West to relevant training to acquire relevant knowledge on how to manage water treatment system.
- Appoint a qualified maintenance personnel with relevant qualification to address al maintenance issues within the municipality.
- Municipality should ensure that disinfection is continuously applied, and residual chlorine remained in the system to guard against post contamination in the reticulation system.
- Monitoring programme should cover all determinands prescribed by SANS 241 and determinands which are likely to exceed the standard should inform the risk defined monitoring programme.
- The municipality should monitor the quality of water supply and where significant failures are detected; the municipality should issue a water advisory notice such as boil water notice if relevant, to ensure that residents take precautionary measure before consuming tap water.
- The municipality should develop a water safety plan in which conditional assessment findings and high risks identified on the above tables are addressed within a reasonable timeframe.
- The technical assessment has established a VROOM refurbishment cost estimates which be used by the municipality to request funding to address some of the areas which were raised on this technical assessment.

The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	78.57%
Chemical Compliance	83.05%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





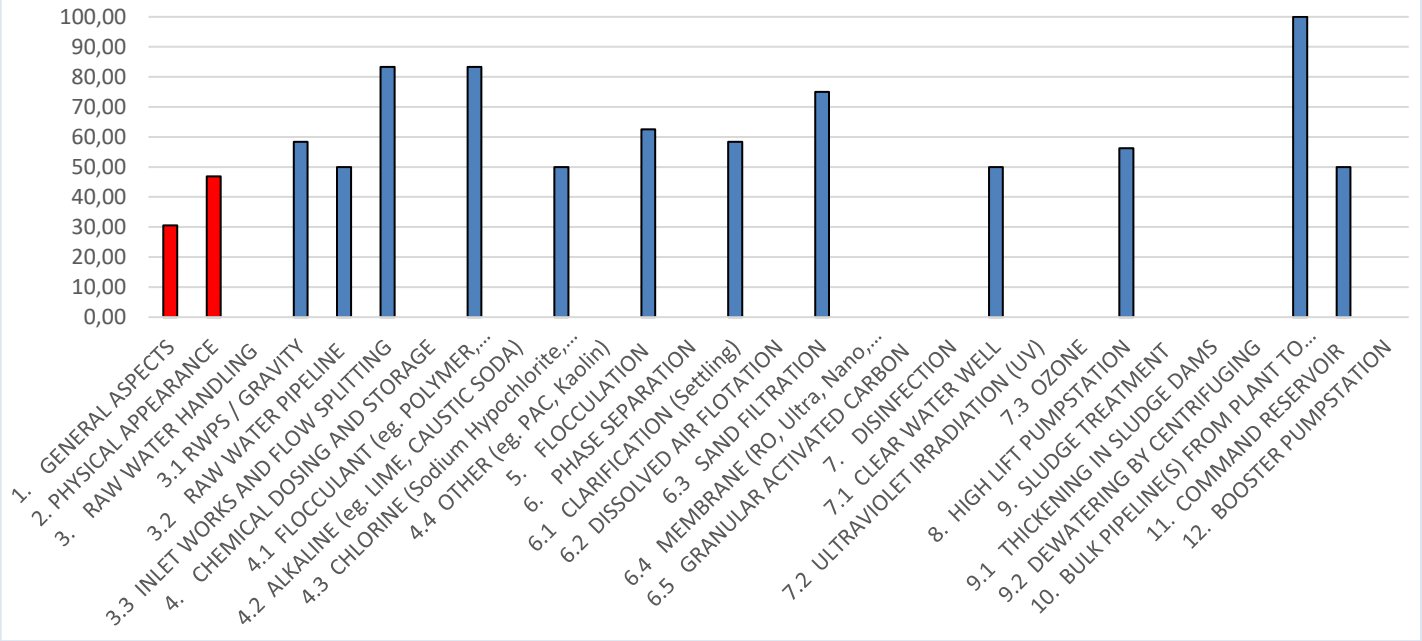
12.26 Umsobomvu Local Municipality

Colesberg water treatment system abstract water from Orange river and registered as class C works with the design capacity of 10 000 kl/d. The plant is operated and managed by Umsobomvu local municipality and required process controllers to operate the water works should be class III and class V supervisor. This water treatment works supply water to more than 23 000 population of Colesberg, Lowryville, Kuyasa and Towervallei. Umsobomvu municipality has other areas where supplied with water, but those water works were not subjected to technical assessment, however, were also included on the main Blue Drop assessment.

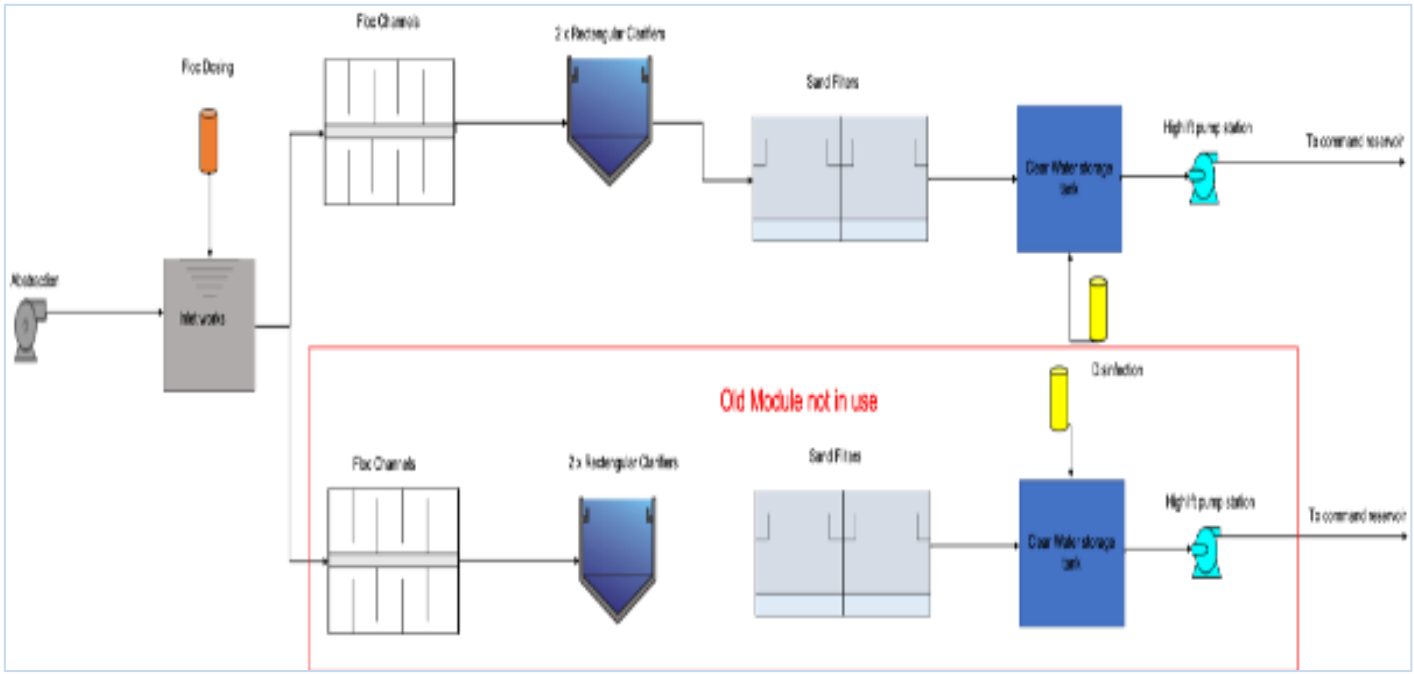
Colesberg WTW TSA Score: 56%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	31.0	The operational logbook was available and records activities. However, BD Inspector recommended that the supervisor should sign the logbook weekly. No maintenance and repairs Logbook and reports. There were monitoring equipment for pH, EC, NTU, free chlorine. Chlorine DPD solution not expired but NTU standards were expired in 2014. The Monitoring equipment was last calibrated in August 2021 and was due for calibration in August 2022.
2	**Physical appearance of plant**	47.0	The entrance was not sign posted but was available in the high lift pumphouse. The Water Treatment Facility was characterised by overgrown vegetation.
3	**Raw water handling**		The drum screens were available before the raw water pump station. Three raw water abstraction pumps were installed and were all in working condition. There were also three pumps installed at the raw water booster station. There was only two of these pumps were working and standby pump was not working. Maintenance team indicated that there were some existing leaks on the raw water line. The Inflow meter was installed and in working condition. No proof of calibration in recent years.
	Raw water pumpstation / gravity feed	58.0	
	Raw water pipeline	50.0	
	Inlet works	83.0	
4	**Chemical dosing and storage**		There was even flow splitting taking place after floc dosing into the two flocculation channels. Flocculation was taking place just before the partial flume. Improve mixing can be achieved if dosing takes place after the flume where there was great turbulence. There were 2 x Milton 10 l/hr dosing pumps were installed and in good working condition.
	Flocculant	83.0	
5	**Flocculation**	63.0	There were two parallel flocculation channels, flocs were observed at the end of each channel. There was no sludge settling but minor algae growth was observed and there was scum accumulation in both channels observed.
6	**Phase Separation**		
	Clarification (settling)	58.0	There were two rectangular tanks in operation. Floc carry-over was observed in both the tanks. De-sludging takes place once a shift and plant operates three shifts in a 24hr cycle. De-sludging equipment was confirmed to be working.
7	**Sand Filtration**	75.0	The two pumps installed were in good working condition. The two pumps were installed on a 1 duty and 1 standby However, there was one blower installed and in good working condition without a standby.
8	**Disinfection**		Clear water tank capacity was unknown, and the contact time was not determined. Free chlorine samples were collected (once a shift) from the kitchen tap or outflow pipe both were located after the contact tank. It is recommended that PCs should use one point to collect free chlorine samples.
	Clear water well	50.0	
	High Lift Pump Station	56.0	Two pumps installed. All pumps are in working condition and not running hot or noisy. The two pumps were all in use therefore the technical assessment established that there was no standby capacity. Final flow meter was available and in working condition. The meter has not been recently calibrated. Flow readings were recorded but not converted or interpreted therefore means that data generated may not be used by the WSI.
9	**Bulk pipeline from plant to command reservoir**	100.0	The maintenance team indicated that there were no major leaks on the pipe. No indication on whether the pipe was undersized. The Valve chamber was in a fair condition. Need to regularly check the valve to ensure it does not stick due to lack of usage.
10	**Command reservoir**	25.0	The reservoir was partially fenced on the side where there were valve chambers and flow meter. There was no telemetry in place, old telemetry had been vandalised. There was a flow meter in place and the meter was in working condition. No evidence of flow meter readings was available. The concrete structure is in good condition with no signs of leaks or excessive plant growth that could compromise structural integrity. The structure is also closed at the top.
	Total	**56%**	

High risk areas OR Key Hardware Risks/ Defects

1. Lack of standby dosing pump for chlorine.
2. Old module pumps are being stripped to repair other pumps therefore old module may not be functional when needed.
3. One filter in the new module not working for more than five years due to valve fault.
4. Replacement of sand in the old module filters since it has not been used in a long time.

VROOM Refurbishment Cost Estimate

Civil Works	R1,626,900	26%
Mechanical Works	R3,956,700	62%
Electrical Works (Incl C&I)	R738,100	12%
Total VROOM Cost	**R6,321,700**	**100%**
R million / MLD		**0.63**

Regulatory Impression

Umsobomvu Local Municipality has created conducive environment to ensure that treated water produced at Colesberg water treatment works meet SANS 241 compliance requirements. The technical assessment has established that at water works, there was sufficient treatment chemicals to treat water, process controllers were provided with the operational monitoring equipment to be used to monitor quality of water produced at the final point. The Colesberg water treatment works supplied water to the population of more than 23 000 therefore sound and proactive management is required to ensure that tap water supplied to residents is always safe for human consumption. However, technical site assessment team has noted that there were number of areas that need an improvement to enhance the management of Colesberg water treatment works. The technical assessment had established that Umsobomvu Local Municipality had taken microbiological samples to the laboratory for analysis and samples results had showed that some compliance results did not meet SANS 241 numerical limits. In addition, the municipality should prioritise to monitor chemical determinands as prescribed by SANS 241 and guarantee that tap water is safe from both chemical acute, chronic, and aesthetic. As those chemical determinands and submitted to regulatory system the Department may that chemical compliance had met SANS 241 numerical limits. Another finding was that process controllers should be provided with monitoring equipment which are from time to time calibrated as recommended to enable them to determine true reflection of quality of water produced at the water treatment works. Maintenance records should be improved as there were number of mechanical assets such as raw water pumps, backwashing pumps and air blowers which should be well maintained therefore the Department would like to be provided with all the service records. The technical assessment recommends the following:

- Develop a water safety planning process in which above highlighted high risks or defects areas are prioritised and addressed by the municipality.
- Vroom Refurbishment cost estimated has been provided to assist the municipality to draft a business plan and submit to the relevant stakeholders to source funds to prioritise those refurbishment projects.
- Develop an action plan to address all potential threats identified on the condition assessment findings highlighted on the table above.
- Improve security at all water supply infrastructure such as fencing and gate and improve access control to ensure the safety of both personnel and infrastructure.

Umsobomvu Local Municipality has legislative mandate to ensure that tap water supplied to its residents is safe therefore proof should be available to confirm its fitness for domestic use. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	94.20%
Chemical Compliance	95.71%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%




13. WESTERN CAPE: MUNICIPAL DRINKING WATER SYSTEM'S FUNCTIONALITY

Background

Leading up to the release of the full Blue Drop report, the Regulator draws attention by publishing the *Blue Drop Watch Report*, which comprises of a technical overview of pipes, pumps, reservoirs, processes and water quality of water treatment plants and distribution networks. The Blue Drop Watch report is **not** the Blue Drop audit report, which will only be published once the verification and quality control processes by DWS have been satisfied, to ensure accurate and credible reporting of drinking water services across South Africa. The Watch Report seeks to keep the public and stakeholder updated and informed on the status of drinking water infrastructure, water quality, and the indicative cost to restore functionality.

The Blue Drop Watch Report is informed by the Technical Site Assessments (TSA), which were done at 1 to 2 systems per WSA/WSP, as part of the Blue Drop audit cycle. The purpose of the TSA is to verify the findings of the (desktop) audit with the status on the ground (physical inspections). The TSA score (%) reflects the condition of the raw water handling system (abstraction, pumps, pipe network), the water treatment plants (inlet works to disinfection and sludge treatment), delivery system (commend reservoirs, bulk pipe network and pumpstations) and distribution systems (pump and pipe networks). A high TSA score (100%) indicates that the infrastructure, equipment, and processes are in excellent condition, whilst a low TSA score (0%) indicates failure and dysfunctional process and infrastructure. The TSA inspections cover each process unit of the treatment facility, coupled with randomly selected checkpoints of the delivery and distribution network. The VROOM cost covers only the treatment facility, as too many variables exist to accurately estimate network refurbishment costs.

Results of the Technical Site Assessments

During the period December 2022 to February 2023, 27 water supply systems were inspected, offering a representative overview of systems owned and operated by municipalities, water boards and water service providers. The assessments covered 25 municipalities, as well as 5 Water Boards and Water Service Providers. Detailed TSA reports with photographic evidence and VROOM costs have been generated to assess the condition and status of treatment facilities and gain insight into randomly selected pipe network and pumpstation across the water distribution networks. The table following summarises the TSA scores of the water supply systems that were assessed.

Table 58 - Western Cape Summary of the all the TSA Water Supply Systems

#	Municipality (WSA)	TSA WSS	TSA WTW	WSP/ WB	%TSA
1	Beaufort West LM	Beaufort West	Beaufort West		70%
2	Kannaland LM	Ladismith	Ladismith		72%
3	Knysna LM	Knysna and Desal	Knysna		79%
4	Laingsburg LM	Laingsburg Main Reservoir	Laingsburg Main Reservoir		74%
5	Mosselbay LM	Mosselbaai/ Grootbrak/ Kleinbrak	Kleinbrak		80%
6	Oudtshoorn LM	Dysselsdorp	Dysselsdorp	Klein Karoo RWSS	73%
7	Prince Albert LM	Prince Albert	Prince Albert		50%
8	Bitou LM	Plettenberg Bay	Plettenberg Bay		80%
9	George LM	George	George New		84%
10	Cederberg LM	Citrusdal	Citrusdal		51%
11	Hessequa LM	Riversdale	Riversdale		77%
12	Langeberg LM	Riversdale/ Ashton	Ashton		70%
13	Witzenberg LM	Citrusdal/ Ceres	Ceres		78%
14	Saldanha Bay LM	Saldanha Bay	Withoogte	WCDM Bulk Supplier	95%
15	Cape Agulhas LM	Bredasdorp	Bredasdorp		96%
16	Breede Valley LM	De Koppen (Fairyglen)	De Koppen		90%
17	Swellendam LM	Swellendam	Swellendam		68%
18	Matzikama LM	Vredendal	Vredendal		50%
19	Stellenbosch LM	Stellenbosch CBD	Paradyskloof		71%
20	Bergrivier LM	Piketberg	Piketberg		88%
21	City of Cape Town MM	Cape Town	Faure		98%
22	City of Cape Town MM	Cape Town	Steenbras		93%

#	Municipality (WSA)	TSA WSS	TSA WTW	WSP/ WB	%TSA
23	Drakenstein LM	Drakenstein (Paarl Mountain & Cape Town)	Welvanpas		96%
24	Theewaterskloof LM	Caledon	Ruensveld West	Overberg WB	82%
25	Overstrand LM	Greater Hermanus	Preekstoel	Overberg WB	94%
26	Theewaterskloof LM	Grabouw	Grabouw		82%
27	Swartland LM	Swartland	Swartland	WCDM Bulk Supplier	92%
	Totals		**27**	**5**	**79%**

An average of 79% was achieved for the 27 systems assessed, which means that infrastructure and processes are partially functional with an average (close to good) performance. The best overall performance was found for City of Cape Town, followed by Drakenstein, Cape Agulhas and Saldanha Bay. Two of the water boards and bulk suppliers provided some of the better performing systems. Lower performances were observed for Prince Albert, Vredendal and Citrusdal.

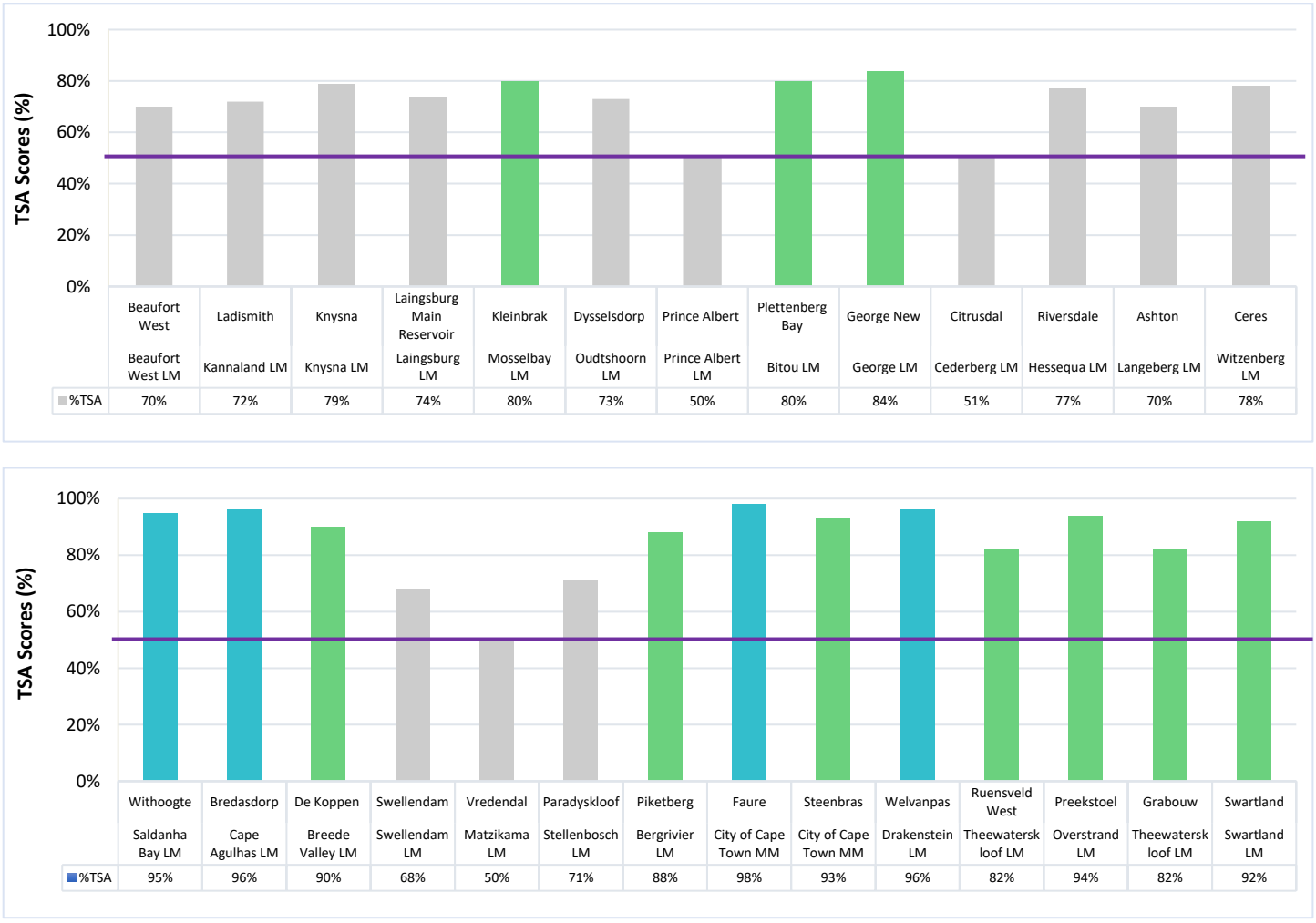


Figure 45 - WC TSA scores for all the BD Systems

95 – 100% Excellent
80-<95% Good
50-<80% Average
31-<50% Poor
0-<31% Critical state

The Regulator observed the predominant challenges and risks pertaining to the water supply system:

Facility management

- No notice board to display or no display of the PFD or other relevant notices and/or documents required on site
- Refurbishment or upgrade and/or construction of buildings or facilities, concrete structures, offices and/or process control room, staff ablutions; maintenance or replacement of perimeter/boundary fencing and/or access gate; Aging infrastructure
- No jar testing done, no or limited testing water quality testing equipment and/or lab chemicals, no calibration of meters
- Supply emergency showers or wash areas/ facilities
- Back-up power supply during load shedding
- Signage at entrance gate and safety signs across plant

- Housekeeping and tidying up of terrain, paintwork at treatment works, pumpstations, and reservoirs, clean-up sites after construction projects
- Road rehabilitation/ upgrade/ construction and road accessibility especially for the safe delivery of chemicals
- Staff safety and signage improvement
- Vandalism of buildings or facilities or fencing

Water treatment system

- Install cathodic protection on the raw and final water pipe network or metal components
- No flow meters installed or dysfunctional flow meters (abstraction, WTW, and Command Reservoirs), and flow meters not calibrated
- Refurbishment or upgrade of one or more of the various process units (civil, mechanical, electrical and instrumentation)
- Dysfunctional or inefficient process units that have to be rectified, e.g. inlet works, flocculation, clarifiers, filters, etc
- Treatment chemicals, e.g. no bunding, limited stock, storage, dosing requirements
- Retention time for flocculation in not sufficient
- No or limited no. standby pumps or dysfunctional pumps, e.g. flocculant and/or chemical dosing, backwashing, high lift, leaks, etc
- No or limited air blowers and/or compressors or dysfunctional blowers and compressors
- Sand filters, e.g. repairs required, sand to be replaced, sand volume
- The need to use the UV system for Iron removal is to be investigated
- Chlorination unit not operational or not fully operational, e.g. limited stock in place, no or limited standby units, no automatic switch over, no chlorine scales, no or limited safety signs and systems (alarms, fans, masks, detectors)
- Limited disinfection contact time in the clear water well or ineffective disinfection taking place
- Sludge dams/ponds or beds, e.g. none in place, not operation, maintenance (cleaning), dysfunctional sludge pumps and no or limited standby, no recycling taking place
- Vandalism and theft of pumps, buildings, valves, and other mechanical and electrical assets.

Water distribution network

- Repair leakages in pipe network, valve boxes, and/or command reservoirs
- Install new fencing or repair fencing
- Vandalism and theft of pumps, valves, manholes, fencing and other mechanical and electrical assets

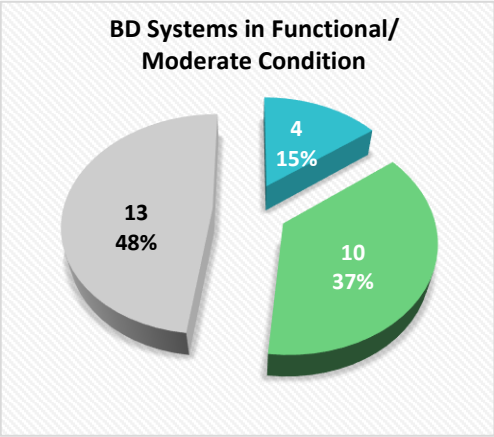
Systems Observed to be in Functional/Moderate Condition based on Technical Site Inspections

Water supply systems which succeeded to achieve ≥50% TSA score, are summarised as follows.

Table 59 - Provincial Summary of the TSA Water Treatment Systems in the Excellent to Average Performance Categories

Municipality (WSA)	WSP/ WB	TSA of ≥95-100% [Excellent]		TSA of ≥80-<95% [Good]		TSA of ≥50-<80% [Average]	
		Name of WTW	% TSA	Name of WTW	% TSA	Name of WTW	% TSA
Beaufort West LM						Beaufort West	70%
Kannaland LM						Ladismith	72%
Knysna LM						Knysna	79%
Laingsburg LM						Laingsburg Main Reservoir	74%
Mosselbay LM				Kleinbrak	80%		
Oudtshoorn LM	Klein Karoo RWSS					Dysselsdorp	73%
Prince Albert LM						Prince Albert	50%
Bitou LM				Plettenberg Bay	80%		
George LM				George New	84%		
Cederberg LM						Citrusdal	51%
Hessequa LM						Riversdale	77%
Langeberg LM						Ashton	70%
Witzenberg LM						Ceres	78%
Saldanha Bay LM	WCDM Bulk Supplier	Withoogte	95%				
Cape Agulhas LM		Bredasdorp	96%				
Breede Valley LM				De Koppen	90%		

Municipality (WSA)	WSP/ WB	TSA of ≥95-100% [Excellent]		TSA of ≥80-<95% [Good]		TSA of ≥50-<80% [Average]	
		Name of WTW	% TSA	Name of WTW	% TSA	Name of WTW	% TSA
Swellendam LM						Swellendam	68%
Matzikama LM						Vredendal	50%
Stellenbosch LM						Paradyskloof	71%
Bergrivier LM				Piketberg	88%		
City of Cape Town MM		Faure	98%				
City of Cape Town MM				Steenbras	93%		
Drakenstein LM		Welvanpas	96%				
Theewaterskloof LM	Overberg WB			Ruensveld	82%		
Overstrand LM	Overberg WB			Preekstoel	94%		
Theewaterskloof LM				Grabouw	82%		
Swartland LM	WCDM Bulk Supplier			Swartland	92%		
Totals	**5**	**4**		**10**		**13**	



Of the 27 systems in the excellent to average performance categories it was found that:

- 4 systems (15%) were in excellent good condition
- 10 systems (37%) were in good condition
- 13 systems (48%) were in average condition.

Figure 46 - No. BD Systems in Functional/ Moderate Condition

The best performing water supply systems, as indicated by the TSA scores, are summarised hereunder.

Table 60 - Provincial Summary of the Top Performing TSA Water Treatment Systems

#	WSA	WSP/ WB	TSA WTW	%TSA
1	City of Cape Town MM		Faure	98%
2	Cape Agulhas LM		Bredasdorp	96%
3	Drakenstein LM		Welvanpas	96%
4	Saldanha Bay LM	WCDM Bulk Supplier	Withoogte	95%
5	Overstrand LM	Overberg WB	Preekstoel	94%
6	City of Cape Town MM		Steenbras	93%
7	Swartland LM	WCDM Bulk Supplier	Swartland	92%
8	Breede Valley LM		De Koppen	90%
9	Bergrivier LM		Piketberg	88%
10	George LM		George New	84%
11	Theewaterskloof LM	Overberg WB	Ruensveld	82%
12	Tweewaterskloof LM		Grabouw	82%
13	Mosselbay LM		Kleinbrak	80%
14	Bitou LM		Plettenberg Bay	80%

The top four systems with the best condition are Faure managed by City of Cape Town, Bredasdorp managed by Cape Agulhas, Welvanpas managed by Drakenstein, and Withoogte managed by WCDM Bulk Water Suppliers (excellent 95-100%).

Systems Observed to be Dysfunctional/Critical Condition based on Technical Site Inspections

No drinking water supply systems where Technical Site Assessments were undertaken were observed to be in a dysfunctional or in a critical condition.

VROOM Costs

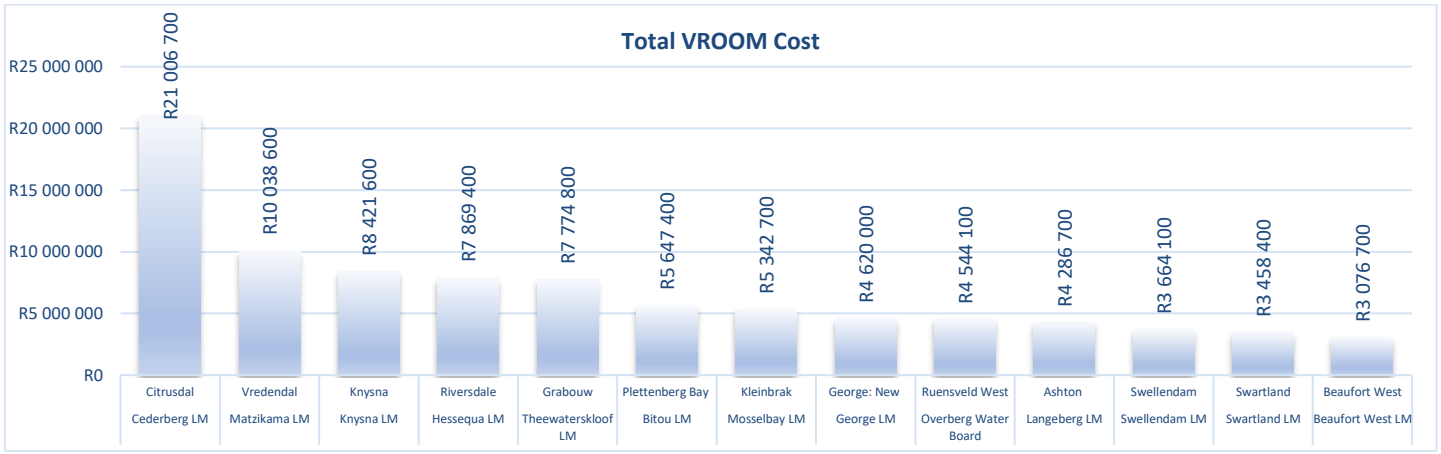
The Very Rough Order of Measurement (VROOM) is an estimation of the funding required to restore existing treatment infrastructure to its original design capacity and operations, by addressing civil, mechanical, electrical and instrumentation defects. A singular VROOM cost is determined by assessing 1-2 treatment facilities per municipality and calculated as cost per system. The cost is derived through an algorithm that uses the Blue Drop Inspector's impression of the asset condition, the size and capacity of the asset, and the market/ industry cost indicators. The resultant VROOM cost is an estimation of the cost to repair, refurbish or replace dysfunctional treatment infrastructure. Subsequently, a singular VROOM cost is extrapolated, in relation to the total Blue Drop scores and systems' SIVs, to derive an aggregated VROOM score for all treatment plants in the WSI.

Note: *VROOM does not constitute a specification, schedule of quantities or a definite refurbishment figure, but rather an indicative amount to inform a budget and hardware requirements.* ***Also,*** *the VROOM cost is specific to the treatment plant and does not attempt to cost the network delivery and distribution network, as it contains to many variables.*

The VROOM costs are summarised as following, noting these values comprises the cost of repairs of the SINGLE water treatment system assessed, NOT the extrapolated collective cost to repair all the treatment facilities in a WSI. The VROOM cost is made up by mechanical, electrical, and civil cost elements, which can be seen in the detailed TSA sections following in the report.

Table 61 - Provincial Summary of the VROOM Costing

Municipality (WSA)	TSA WSS	TSA WTW	WSP/ WB	Total VROOM Cost (Rand)
Beaufort West LM	Beaufort West	Beaufort West		R3,076,700
Kannaland LM	Ladismith	Ladismith		R1,061,500
Knysna LM	Knysna and Desal	Knysna		R8,421,600
Laingsburg LM	Laingsburg Main Reservoir	Laingsburg Main Reservoir		R2,318,800
Mosselbay LM	Mosselbaai/ Grootbrak/ Kleinbrak	Kleinbrak		R5,342,700
Oudtshoorn LM	Dysselsdorp	Dysselsdorp	Klein Karoo RWSS	R3,026,100
Prince Albert LM	Prince Albert	Prince Albert		R3,047,000
Bitou LM	Plettenberg Bay	Plettenberg Bay		R5,647,400
George LM	George	George New		R4,620,000
Cederberg LM	Citrusdal	Citrusdal		R21,006,700
Hessequa LM	Riversdale	Riversdale		R7,869,400
Langeberg LM	Riversdale/ Ashton	Ashton		R4,286,700
Witzenberg LM	Citrusdal/ Ceres	Ceres		R1,654,400
Saldanha Bay LM	Saldanha Bay	Withoogte	WCDM Bulk Supplier	R2,296,800
Cape Agulhas LM	Bredasdorp	Bredasdorp		R1,437,700
Breede Valley LM	De Koppen (Fairyglen)	De Koppen		R1,406,900
Swellendam LM	Swellendam	Swellendam		R3,664,100
Matzikama LM	Vredendal	Vredendal		R10,038,600
Stellenbosch LM	Stellenbosch CBD	Paradyskloof		R1,406,900
Bergrivier LM	Piketberg	Piketberg		R1,893,100
City of Cape Town MM	Cape Town	Faure		R1,503,700
City of Cape Town MM	Cape Town	Steenbras		R574,200
Drakenstein LM	Drakenstein (Paarl Mountain & Cape Town)	Welvanpas		R79,200
Theewaterskloof LM	Caledon	Ruensveld West	Overberg WB	R4,544,100
Overstrand LM	Greater Hermanus	Preekstoel	Overberg WB	R2,153,800
Theewaterskloof LM	Grabouw	Grabouw		R7,774,800
Swartland LM	Swartland	Swartland	WCDM Bulk Supplier	R3,458,400
Totals				**R113,611,300**



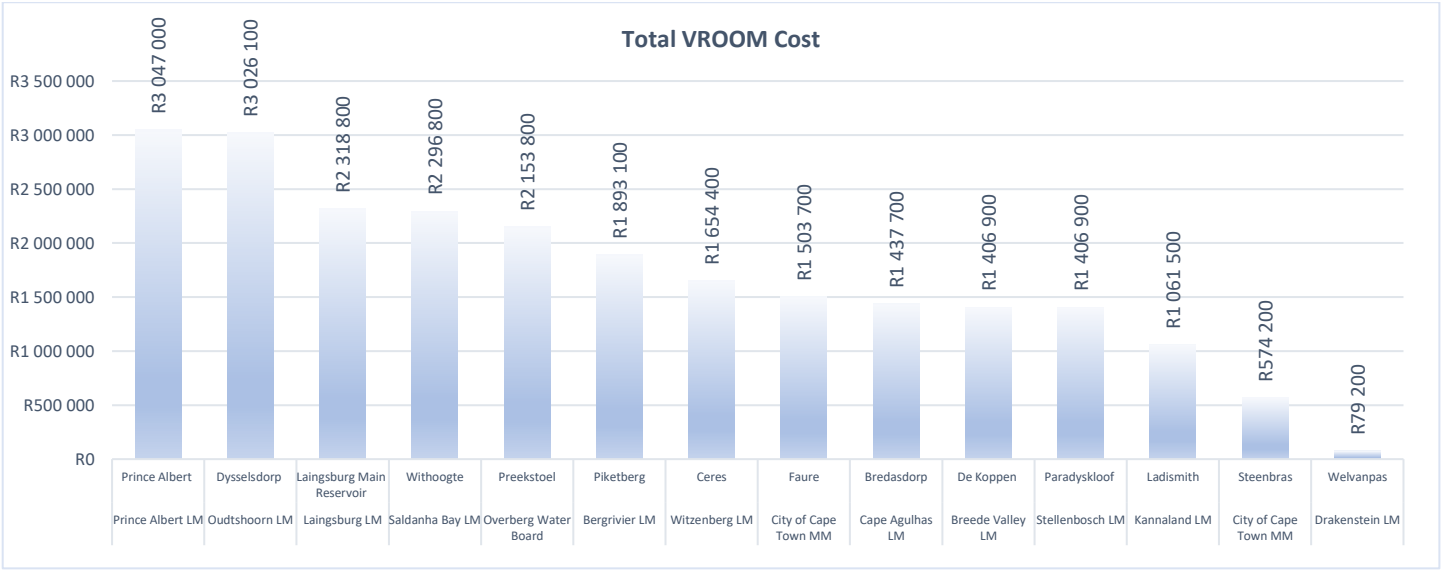


Figure 47 - Total VROOM Cost for the BD Systems Assessed

The associated VROOM costs for the 27 water supply systems assessed amounts to R113.6 million, with the bulk of investment needed for Citrusdal (Cederberg), Vredendal (Matzikama) and Laingsburg Main Reservoir (Laingsburg).

Drinking Water Quality Status

The Institutional Water Quality Compliance, as measured against SANS 241 standards, is reflected in the table below (IRIS, 28 March 2023).

Table 62 - Western Cape Summary of the Drinking Water Quality Status of all the TSA Water Supply Systems

#	Municipality (WSA)	TSA WSS	TSA WTW	Microbiological Compliance	Chemical Compliance
1	Beaufort West LM	Beaufort West	Beaufort West	>99.90%	99.23%
2	Kannaland LM	Ladismith	Ladismith	92.31%	>99.90%
3	Knysna LM	Knysna and Desal	Knysna	98.44%	91.97%
4	Laingsburg LM	Laingsburg Main Reservoir	Laingsburg Main Reservoir	95.65%	97.78%
5	Mosselbay LM	Mosselbaai/ Grootbrak/ Kleinbrak	Kleinbrak	99.72%	95.09%
6	Oudtshoorn LM	Dysselsdorp	Dysselsdorp	96.04%	88.25%
7	Prince Albert LM	Prince Albert	Prince Albert	94.32%	87.52%
8	Bitou LM	Plettenberg Bay	Plettenberg Bay	>99.90%	>99.90%
9	George LM	George	George New	>99.90%	99.22%
10	Cederberg LM	Citrusdal	Citrusdal	>99.90%	99.73%
11	Hessequa LM	Riversdale	Riversdale	>99.90%	88.12%
12	Langeberg LM	Riversdale/ Ashton	Ashton	92.19%	95.85%

#	Municipality (WSA)	TSA WSS	TSA WTW	Microbiological Compliance	Chemical Compliance
13	Witzenberg LM	Citrusdal/ Ceres	Ceres	>99.90%	95.26%
14	Saldanha Bay LM	Saldanha Bay	Withoogte	97.86%	96.55%
15	Cape Agulhas LM	Bredasdorp	Bredasdorp	>99.90%	94.97%
16	Breede Valley LM	De Koppen (Fairyglen)	De Koppen	94.68%	97.47%
17	Swellendam LM	Swellendam	Swellendam	96.00%	86.29%
18	Matzikama LM	Vredendal	Vredendal	>99.90%	95.67%
19	Stellenbosch LM	Stellenbosch CBD	Paradyskloof	99.22%	96.08%
20	Bergrivier LM	Piketberg	Piketberg	90.29%	93.52%
21	City of Cape Town MM	Cape Town	Faure	99.69%	99.33%
22	City of Cape Town MM	Cape Town	Steenbras	99.69%	99.33%
23	Drakenstein LM	Drakenstein (Paarl Mountain & Cape Town)	Welvanpas	98.73%	96.65%
24	Theewaterskloof LM	Caledon	Ruensveld West	>99.90%	91.65%
25	Overstrand LM	Greater Hermanus	Preekstoel	98.53%	99.68%
26	Theewaterskloof LM	Grabouw	Grabouw	>99.90%	88.05%
27	Swartland LM	Swartland	Swartland	98.25%	97.39%

The TSA and water quality results depict a different picture. The TSA shows 27 of the 27 (100%) water supply systems to be in the *excellent to average performance category*, and the water quality compliance shows that 29-59% of the systems *fail to produce compliant final water quality*.

Out of 27 treatment plants, 14 (53%) and 5 (18%) of systems achieve excellent and good microbiological quality. A total of 3 (11%) systems have poor microbiological compliance and 5 (18%) systems have bad microbiological water quality status. The water in these systems poses a serious acute health risk to the community. WSAs with poor microbiological water quality status must be assessed to confirm status in all systems to ensure rectification measures are comprehensive to safeguard communities. The direct cause of microbiological failures can be linked to the TSA sub-watch Area 7, which has a low contribution to the overall TSA score. The failure to produce water that meets E. coli standards can be linked back to poor operations, defective infrastructure, dosing rates, absence of disinfection chemicals, lack of monitoring, or lack of operating and chemistry knowledge. WSIs that are not monitoring the final water quality at the outlet of the treatment plant or at specific end use points must develop a monitoring programme and resume with compliance monitoring as a matter of urgency.

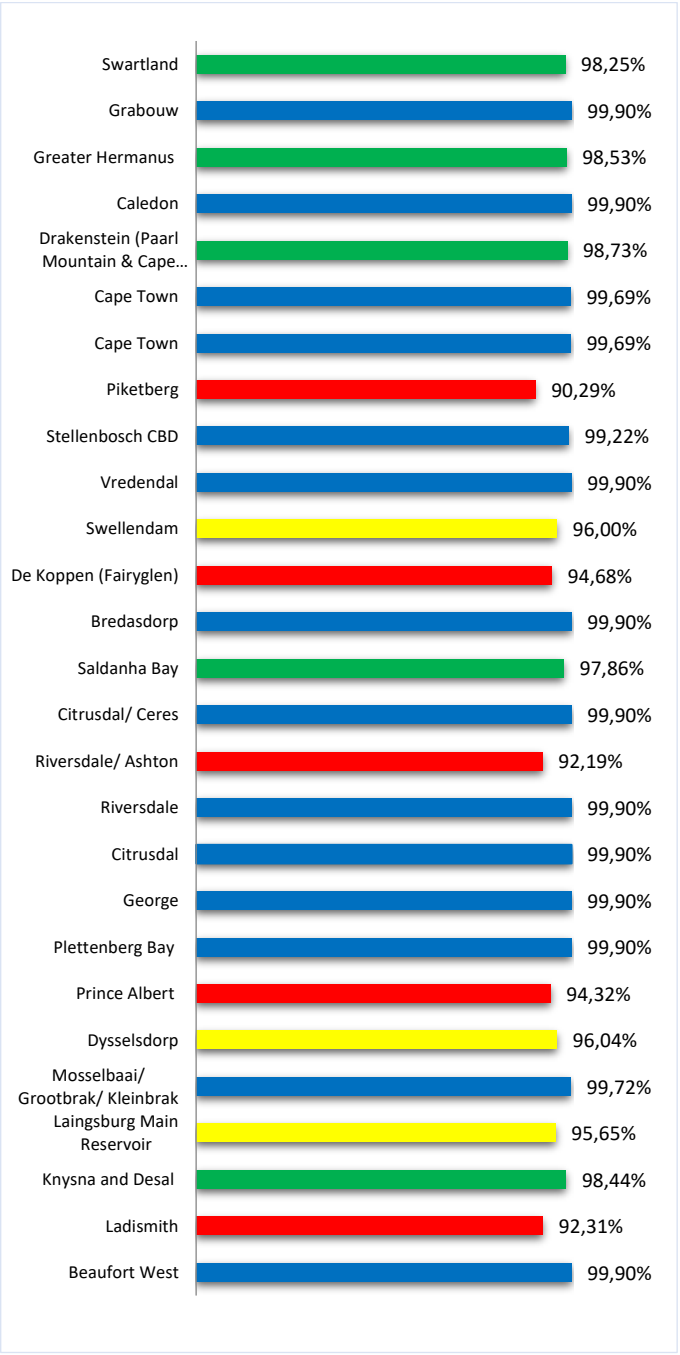
Chemical compliance shows that 8 (30%) and 3 (11%) have excellent and good water quality, whilst the majority of systems fail to achieve chemical compliance. A total of 7 (26%) and 9 (33%) systems have a poor and bad chemical water quality status.

Concluding Remarks

The Blue Drop Watch results stresses the importance of drinking water supply and quality to be a primary focus area of government. Already, the Department has developed the Water Services Improvement Programme for systems in critical state, and at systems where particular concerns were reported. Blue Drop performance trends will be used to determine repetitive poor performance, to inform a radical approach to ensure turnaround and compliance. This could include facilitating long term intervention by either a capacitated water board or any other suitable mode of water services support. The determination of the 'very rough order of estimates' (VROOM) was done to give an estimation of the capital requirement for the functionality restoration drive. This will be effected with the support from the National Treasury.

The Regulator will continue to monitor performance in terms of Section 62 of the Water Services Act and will engage together with CoGTA and SALGA, WSAs for corrective action plan development and implementation and offer support. Should these actions fail, the Department will consider civil action together with actions contemplated under section 63 of the Water Services Act (Act 108 of 1997) to ensure that Ministerial directives are issued with timeframes for implementation. Failure to respond will trigger remedial action be taken at cost of the non-complying entity or municipality. The Department will take steps to improve its capacity to respond more effectively in this duty, in ensuring visible and measurable improvement in drinking water services. The Department of Cooperative Governance and National Treasury will be engaged to explore ways of utilising conditional grants for the purpose of remedial rectification.

All Water Services Institutions are hereby urged to take note of their TSA status and commence with corrective measures. The full Blue Drop audit report will provide further material content to the overall management of drinking water services across South Africa, upon its release in July 2023.



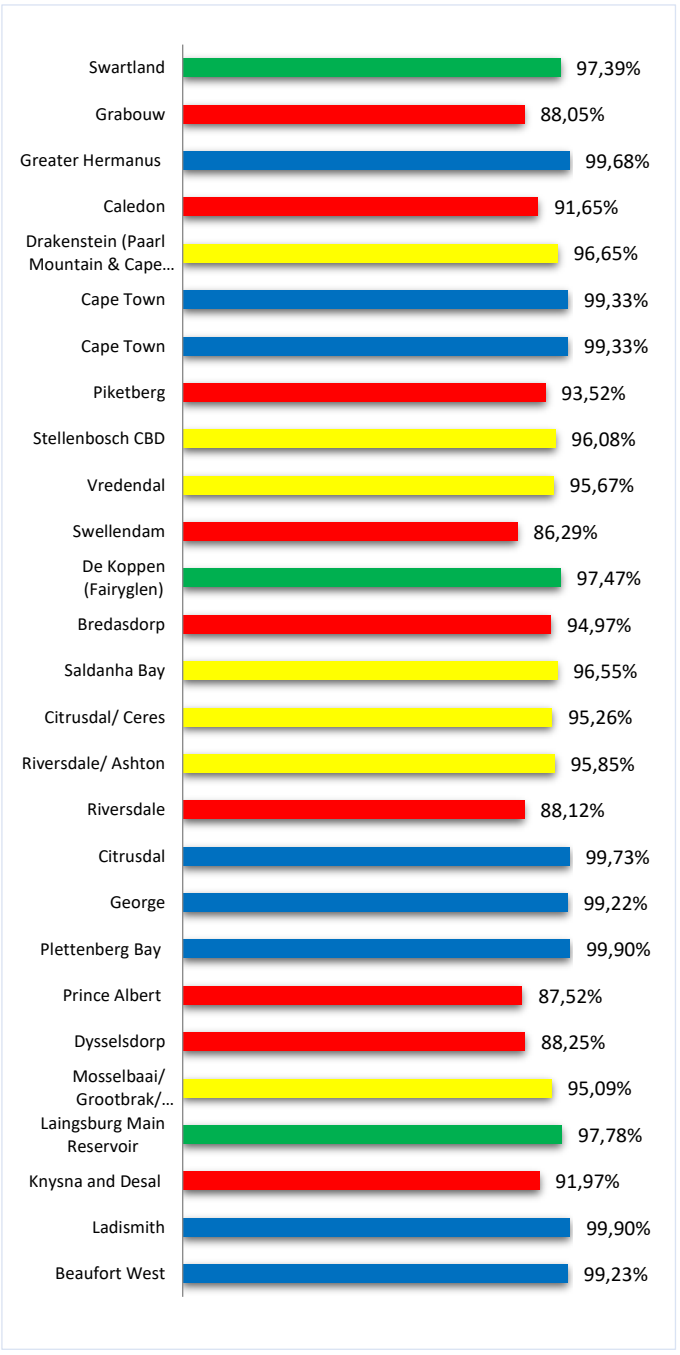


Figure 48 - WC Drinking Water Quality Status of all the TSA Water Supply Systems

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

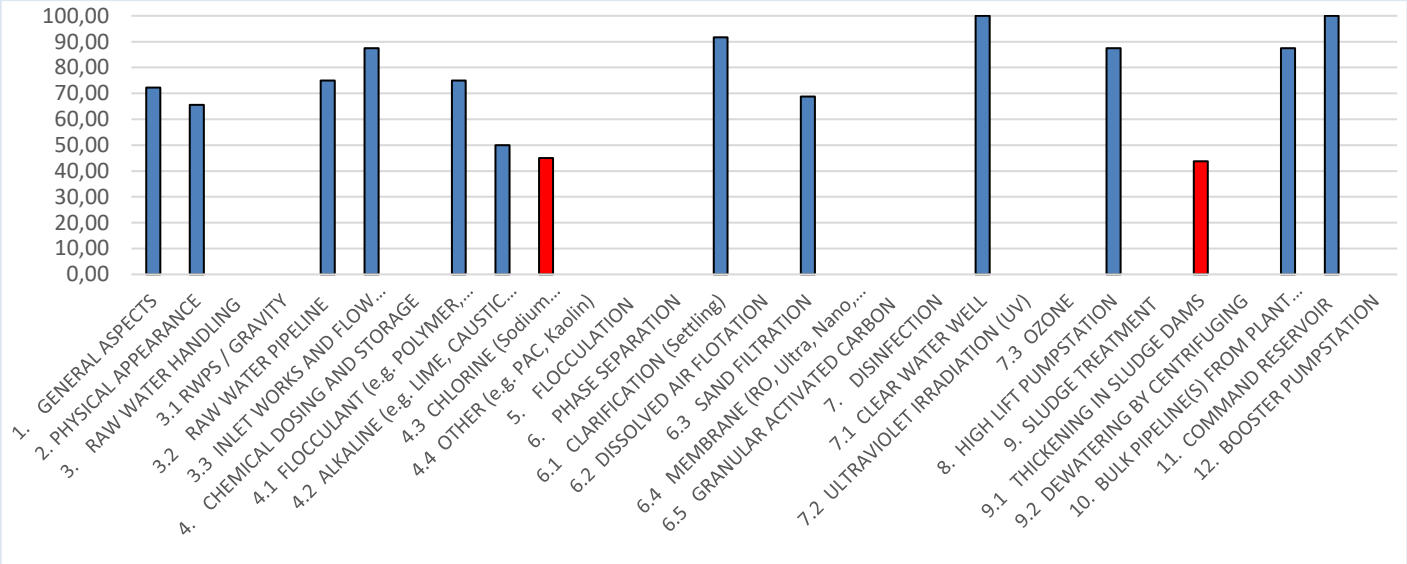
13.1 Beaufort West Local Municipality

The Beaufort West water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

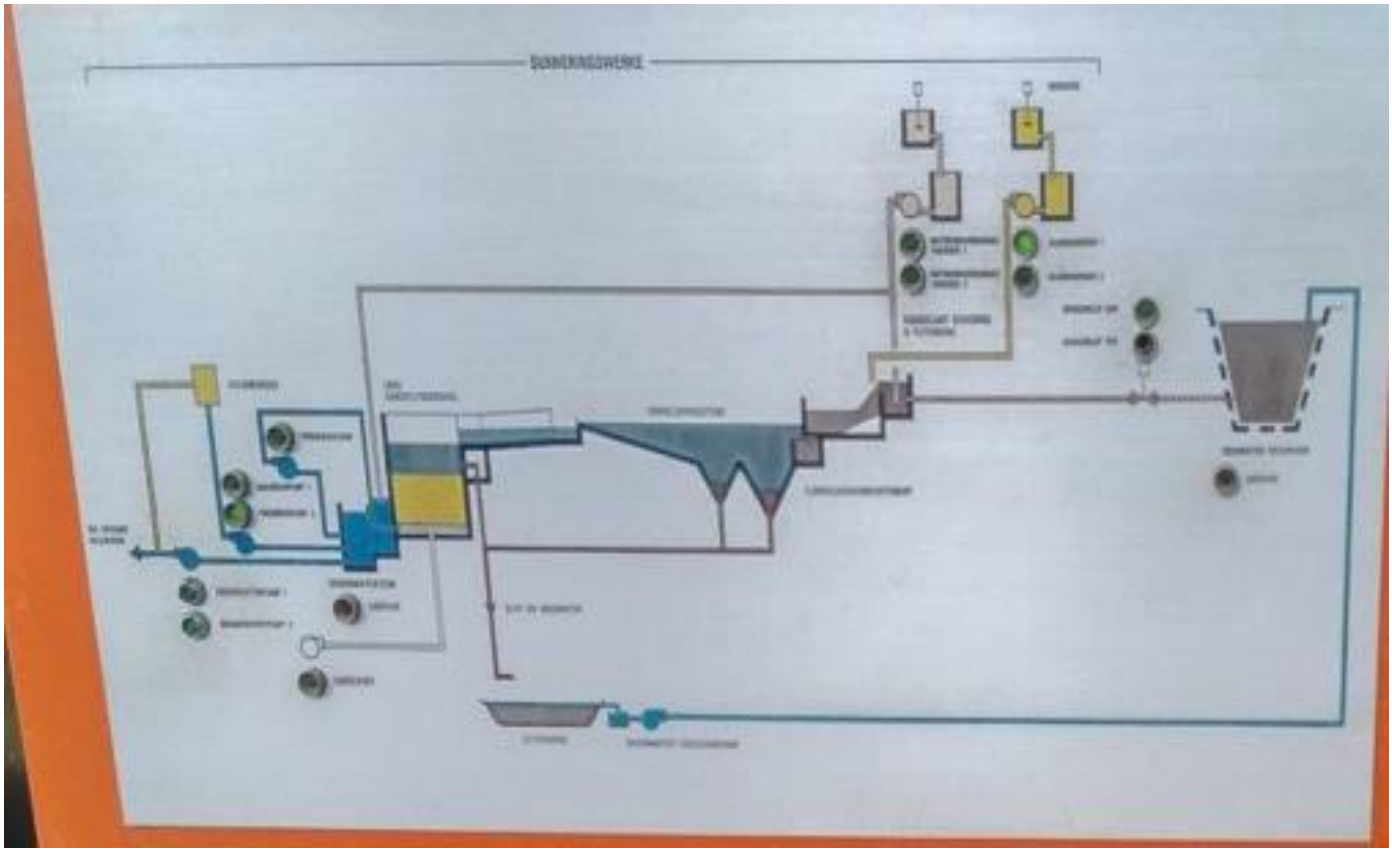
Beaufort West TSA Score: 70%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	72.2	Class C Works. Basic operational monitoring for turbidity and residual chlorine done by Process Controllers while Supervisor performs Electrical Conductivity and pH
2	**Physical appearance of plant**	65.6	Site is kept relatively tidy. Access road could be improved upon, especially as chlorine gas needs to be delivered to site.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	0.0	Gravity line from raw water dam
	Raw water pipeline	75.0	No problems reported, but as the line is quite old, maintenance could start becoming an issue in the not-too-distant future.
	Inlet works	87.5	Inlet in order with efficient coagulation taking place
4	**Chemical dosing and storage**		
	Flocculant	75.0	There are 2 mixing tanks (with stirrers) provided for making up Alum (from powder). Both tanks & mixers in good condition. Each tank feeds separate day-tank. Each day-tank has its own dosing pump.
	Alkaline	50.0	1 x Lime feeder on standby - lime dosing is not needed on a continuous basis.
	Chlorine	45.0	Chlorine needs to be manually changed whenever a cylinder is empty. The chlorine scale was out of order on the day of the inspection. Another concern is the fact that the chlorine dosing room setup does not isolate "gas area" from "control area" – this needs to be rectified and the entire installation made to meet chlorine safety standards
	Other (PAC, Kaolin, etc.)	na	PAC feeder on standby - not currently in use.
5	**Flocculation**	na	No floc channel - flocculation takes place directly in first section of sedimentation tanks.
6	**Phase Separation**		
	Clarification (settling)	91.6	Desludging taking place every 4 hours. Process Unit is good condition
	Sand filtration	68.7	Two filters on site. Backwashing done twice per day. Filters are in good order, but a second set of backwash equipment would be beneficial
7	**Disinfection**		
	Clear water well	100.0	Acceptable contact time in clearwater well. Additional contact time provided in on-site command reservoir.
8	**High lift pumpstation**	87.5	All in order. Signs or recent maintenance observed
9	**Sludge treatment**		
	Thickening in sludge dams	43.7	There are 2 x unlined sludge ponds provided. One is in good condition, but the 2nd one is overgrown and in need of cleaning.
10	**Bulk pipeline from plant to command reservoir**	87.5	Reservoir is on site
11	**Command reservoir**	100.0	There are 3 reservoirs on site - 1 with water from the conventional WTW (assessed here), 1 with water from boreholes and Reclamation Works with the 3rd one blending the water for distribution to the community.
12	**Booster pumpstation**	na	Gravity feed to town
	Total	**70%**	

High risk areas OR Key Hardware Risks/ Defects

1. Chlorine dosing facility to be updated and made compliant with safety standards.
2. Ensure key components are available for blower/ backwash pump maintenance.
3. Chemical dosing facility can be updated.
4. Clean out second sludge lagoon.
5. General building maintenance, i.e., paining is suggested.

VROOM Refurbishment Cost Estimate

Civil Works	R995,500	32%
Mechanical Works	R1,043,900	34%
Electrical Works (Incl C&I)	R1,037,300	34%
Total VROOM Cost	**R3,076,700**	**100%**
R million / MLD		**0.77**

Regulatory Impression

This basic conventional water treatment works is in a fair condition and produces water which complies to the SANS 241 standard. The works is somewhat dated, but functional. The largest amount of work required relates to optimising the chlorine dosing facility. In terms of Beaufort West Municipality's overall approach to the provision of safe potable water, the Regulator notes that the technical hands-on tasks required to perform this service is prioritised over the need to ensure that the documents, systems, and plans required during the Blue Drop Audit are in place. This lack of reproducible evidence (uploaded to the DWS IRIS system) does not directly relate to a lack of performance in ensuring the community is provided with clean, safe drinking water.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	99.23%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



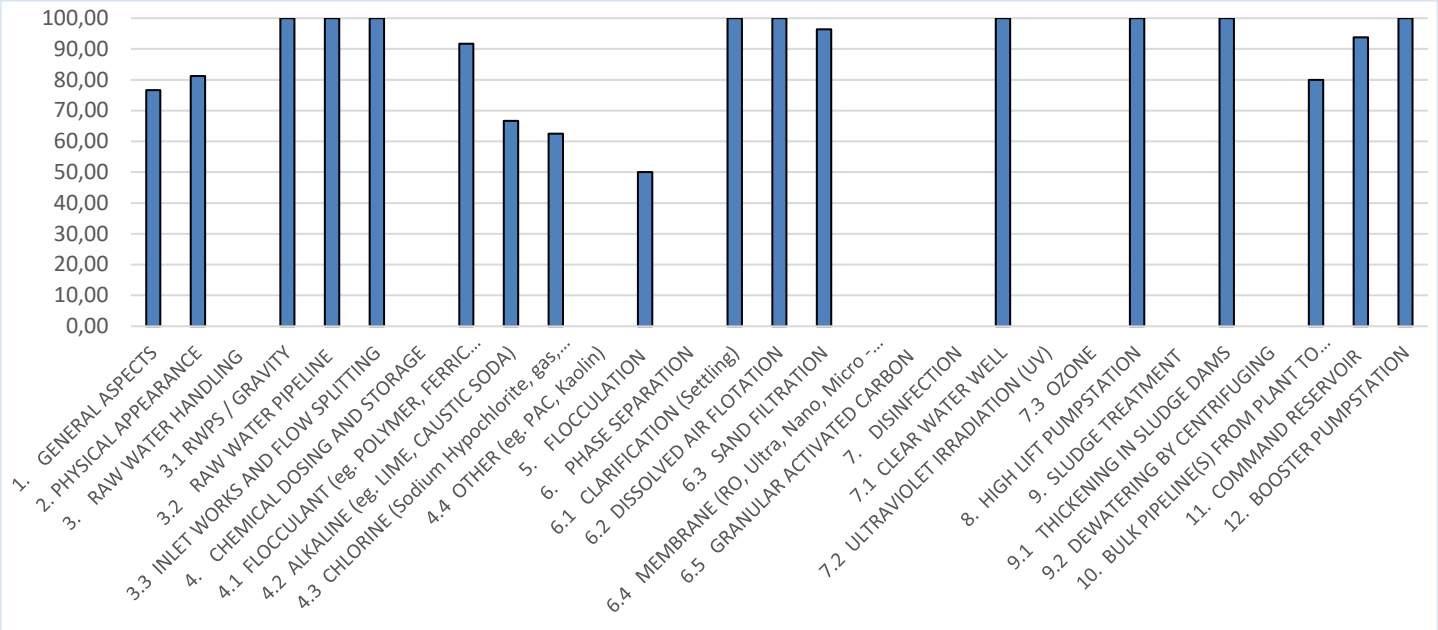

13.2 Berg River Local Municipality

The Piketberg water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

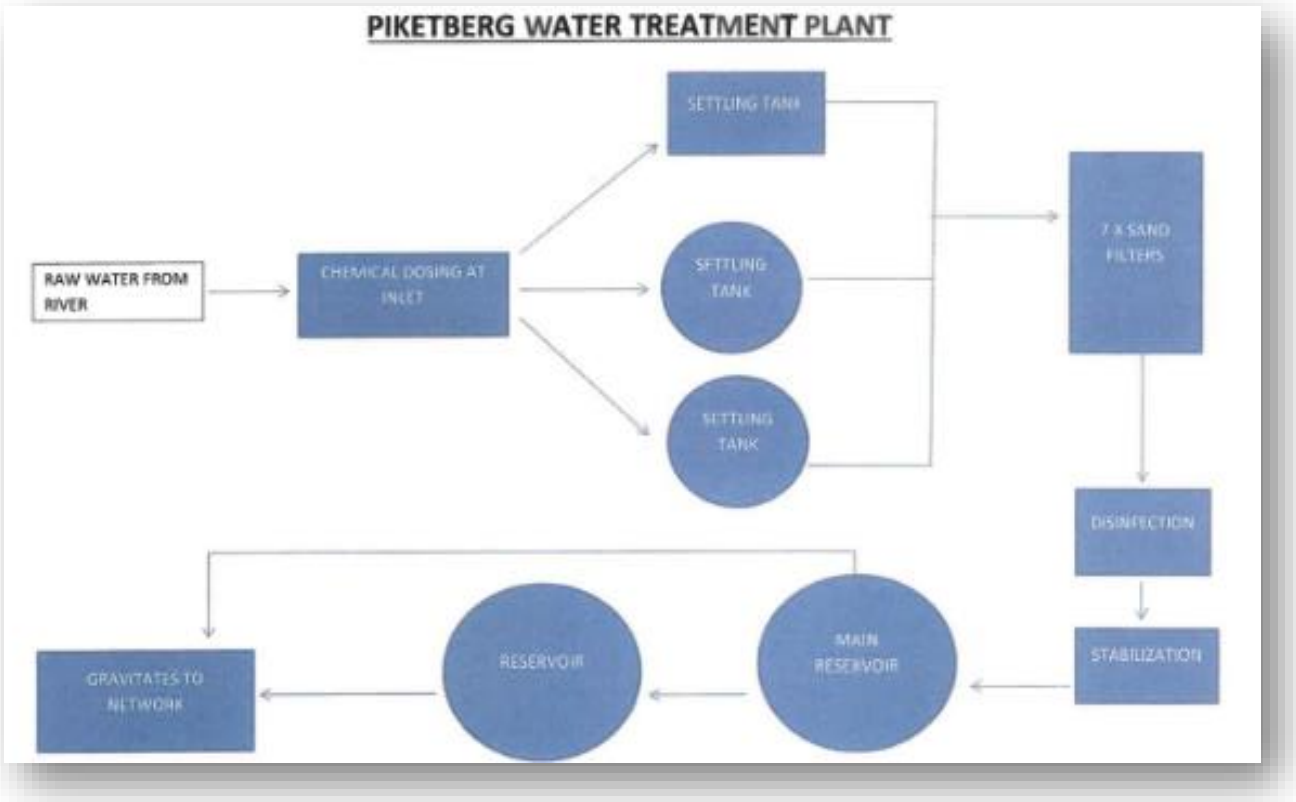
Piketberg WTW TSA Score: 88%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	76.7	Class C plant, O&M manual, and logbooks in place. Emergency contact numbers not displayed. Process flow diagram lacking detail. Monitoring equipment on site, proof of calibration. Electricity meter not accessible by process staff
2	**Physical appearance of plant**	81.3	Fenced, neat terrain, well maintained. Low workplace satisfaction. No OHS contraventions seen or reported
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	100.0	Raw water handling equipment in very good condition, 100& standby. Abstraction volumes recorded. Effective chemical dosing and flash mixing practice.
	Raw water pipeline	100.0	
	Inlet works	100.0	
4	**Chemical dosing and storage**		
	Flocculant	91.7	Sudfloc 3870 dosing, 100% standby on dosing units. Sufficient storage capacity, spillages at storage will not be contained. Emergency wash in place.
	Alkaline	66.7	Lime dosing. Excellent housekeeping. No standby for dosing unit.
	Chlorine	62.5	Chlorine gas dosing. No standby for dosing unit, monitoring of duty container not optimal. Room poorly ventilated, emergency wash area, PPE, and safety signage in place
5	**Flocculation**	50.0	No dedicated flocculation unit, insufficient retention time for flocculation. Floc formation visible in clarifier.
6	**Phase Separation**		Process operator staff highly knowledgeable and enthusiastic.
	Clarification (settling)	100.0	No visible floc carry-over, weirs in optimal condition. Desludging 3 times daily
	Sand filtration	96.4	Moore type filters, 100% standby on air blowers. Even flow splitting. Excessive backwash frequency (3 times daily), good bubble distribution. Cracks and mounds in filter media. Excellent housekeeping.
7	**Disinfection**		
	Clear water well	100.0	At 3.2 Ml/day, 0.75Ml storage on site provides 5.6 hours contact time. Chloring dosing at entry of CWW and free Cl_2 tested after the outlet of CWW.
8	**High lift pumpstation**	100.0	Two pumps installed, 100% standby, all in good working order. Flow measuring in place and logged.
9	**Sludge treatment**		
	Thickening in sludge dams	100.0	Sludge / wash water to dry beds, filtrate discharges into river. Dry sludge disposed of on site.
10	**Bulk pipeline from plant to command reservoir**	80.0	20-25 years old 350 mm GRP, in general good condition, minor breakages experience due to high pressures.
11	**Command reservoir**	93.8	Fenced and gated, signs of unauthorised entry. Telemetry in place and final flow measured and logged. Structure in good condition
12	**Booster pumpstation**	100.0	Building is fenced and secured with sufficient ventilation. Two pumps installed,100% standby, and in good condition. MCC in excellent condition.
	Total	**88%**	

High risk areas OR Key Hardware Risks/ Defects

1. No standby lime dosing unit.
2. No standby chlorinator (no automatic switchover).
3. Scales for chlorine tanks not working.
4. Retention time for flocculation in not sufficient.
5. Breakages occurring on Bulk Pipeline (350 mm diameter GRP) due to high pressure.

VROOM Refurbishment Cost Estimate

Civil Works	R696,300	37%
Mechanical Works	R1,140,700	60%
Electrical Works (Incl C&I)	R56,100	3%
Total VROOM Cost	**R1,893,100**	**100%**
R million / MLD		**0.60**

Regulatory Impression

The Piketberg water systems, which serves a population of approximately 13,400 people, has a well-functioning and well-maintained treatment plant and distribution system. The water quality, in accordance with SANS 241, to their consumers is lacking when it comes to microbiological acute health (90.29%), but in general delivers a good quality water. They have an outdated Water Safety Plan (last revised in 2017) and their capacity management and general administration is not to standard. Although the process controlling staff is highly knowledgeable and enthusiastic about their work, their workplace satisfaction is low, and training is lacking. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	90.29%
Chemical Compliance	93.52%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%







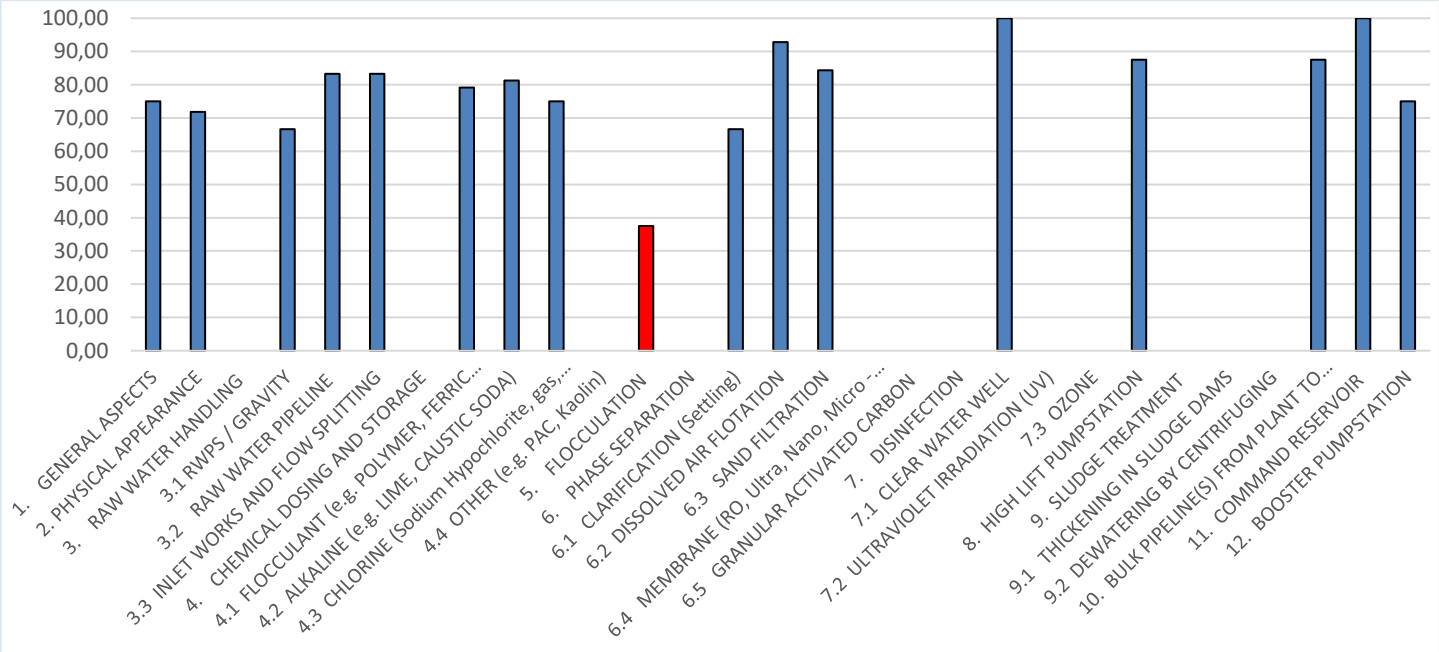

13.3 Bitou West Local Municipality

The Plettenberg Bay water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

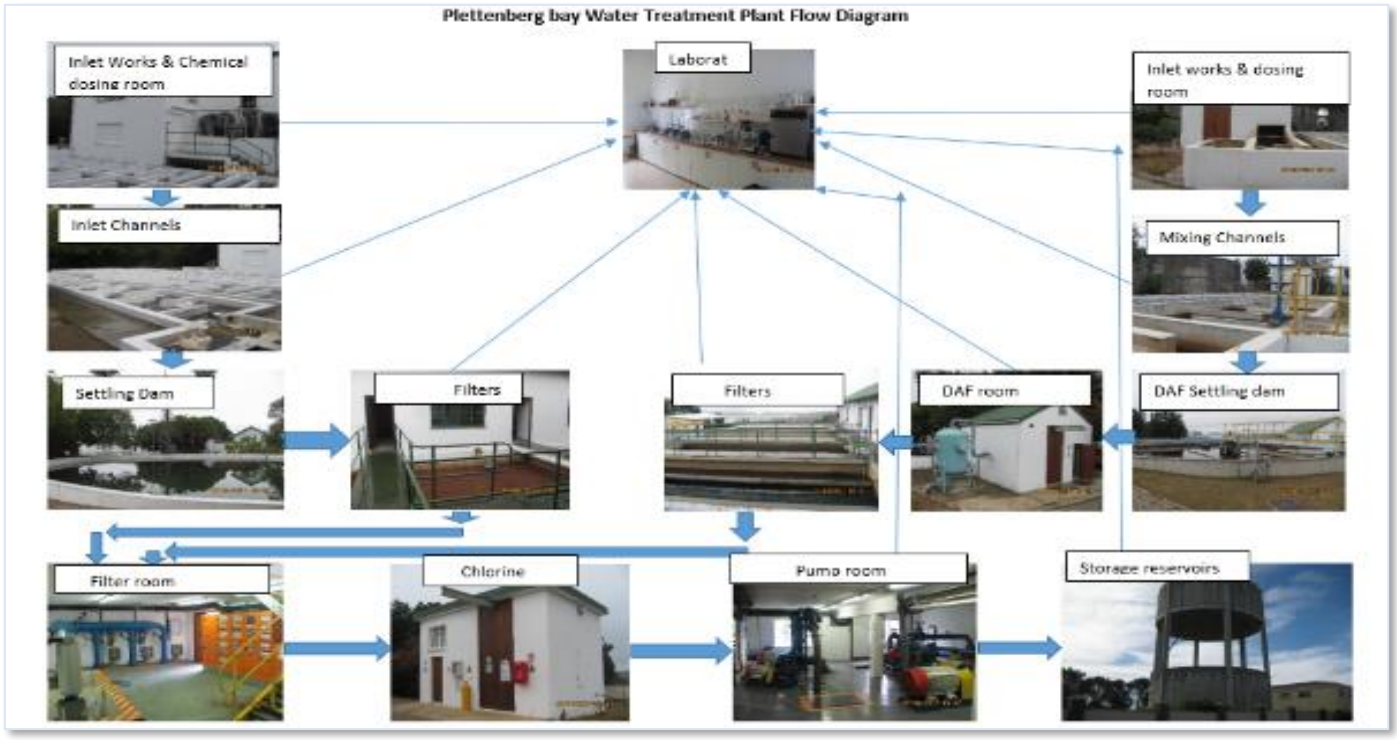
Plettenberg Bay TSA Score: 80%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	75.0	Most of the aspects required for process control are in place on the works, even though some of it needs to be formalised. The on-site laboratory is fully equipped.
2	**Physical appearance of plant**	71.8	The site is generally in a good condition with only a few minor rectifications required.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	66.6	Even though pumps are operational, servicing and refurbishment would prolong their lifespan.
	Raw water pipeline	83.3	General maintenance required to ensure longevity of the system.
	Inlet works	83.3	The inlet pipework allows flow to be directed to the conventional works or DAF plant. At the conventional works flow is divided between two channels - division is not equal and flowmeters are required to rectify this situation.
4	**Chemical dosing and storage**		
	Flocculant	79.1	Duty & Standby pumps are installed for all of the chemicals being does on site. The area where the flow bins of Aluminium Sodium Oxide is stored needs to be bunded
	Alkaline	81.2	Lime dosing in good order with 2 x Duty + 1 x Standby feeder in place at the conventional works. Only one feeder is however installed for the DAF module of the plant
	Chlorine	75.0	As this plant is within a residential area, options for the safe containment and treatment of a chlorine leak needs to be investigated and implemented - an air scrubber system could be considered. All safety equipment associated with this type of installation is to be provided.
5	**Flocculation**	37.5	The conventional works inlet splits flow between two separate floc channels - flocculation is much more pronounced at the end of the one channel, i.e., even though there is floc visible, there is an imbalance in flow division.
6	**Phase Separation**		
	Clarification (settling)	66.6	Desludging taking place every second week. New valves were being installed at the time of the inspection. There were however a few missing V-notches which are to be replaced.
	Dissolve air floatation (DAF)	92.8	The plant was "off" at the time of the inspection but was started for evaluation purposes – everything is in good working order.
	Sand filtration	84.3	There are currently 5 filters in use and a bank of 9 old filters which are redundant. Filtration is adequate. There is however only one blower installed - it is recommended that a second unit be added.
7	**Disinfection**		
	Clear water well	100.0	A fairly new unit with sufficient retention time.
8	**High lift pumpstation**	87.0	Fairly new installation. One pump was off site for maintenance purposes.
9	**Sludge treatment**		
	Thickening in sludge dams	na	Sludge collected in a sump after which it gravitates to the WWTW.
10	**Bulk pipeline from plant to command reservoir**	87.5	Reservoirs are located on site
11	**Command reservoir**	100.0	Everything in order with the 3 reservoirs that are on site
12	**Booster pumpstation**	75.0	Booster pumpstation in order
	Total	**80%**	

High risk areas OR Key Hardware Risks/ Defects

1. Flow measurement devices to be installed on the streams dividing to the two channels at the conventional works.
2. A second lime feeder at the DAF-section of the works is recommended.
3. Only 1 blower currently installed. Consider adding a second unit.
4. The 9 filters that are offline should be refurbished.
5. Safety around the chlorine installation to be reconsidered, especially as the plant is within a residential area.

VROOM Refurbishment Cost Estimate

Civil Works	R1,334,300	24%
Mechanical Works	R2,928,200	52%
Electrical Works (Incl C&I)	R1,384,900	25%
Total VROOM Cost	**R5,647,400**	**100%**
R million / MLD		**0.21**

Regulatory Impression

The Plettenberg Bay system provides water of outstanding quality to the consumers it serves. It is a well-run plant with only a few rectifications required to optimise operations. The team responsible for Blue Drop shows real commitment to the process.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	>99.90%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





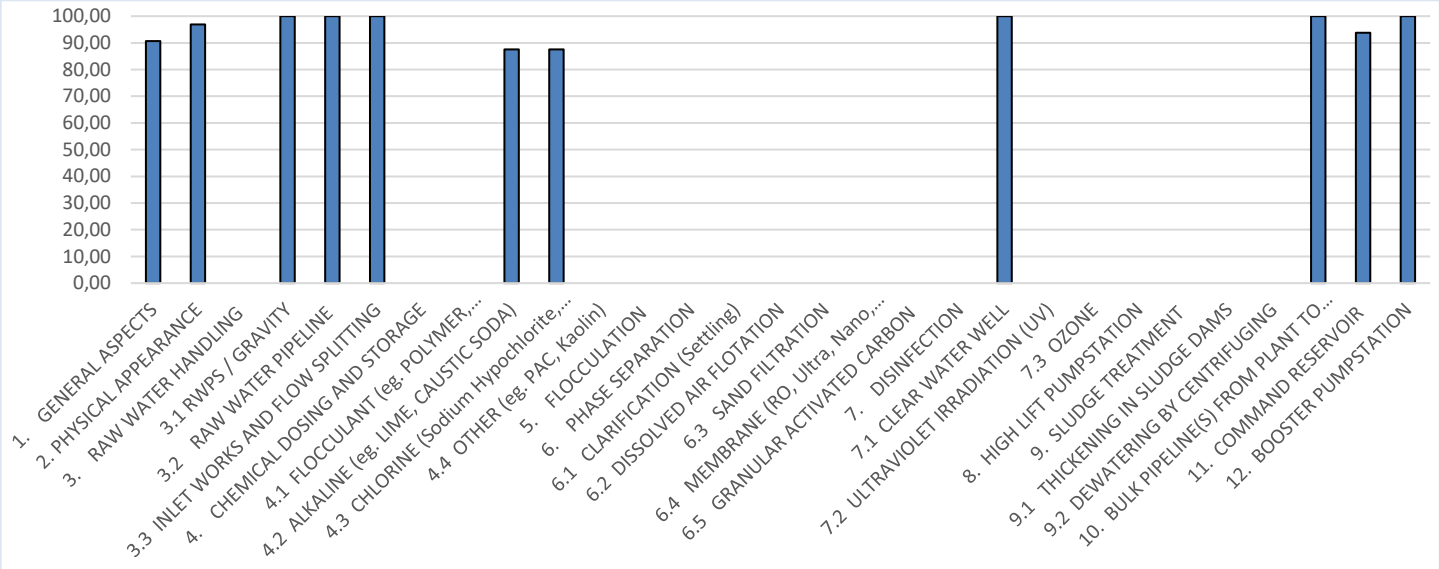

13.4 Breede Valley Local Municipality

The De Koppen (Fairy Glen) water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

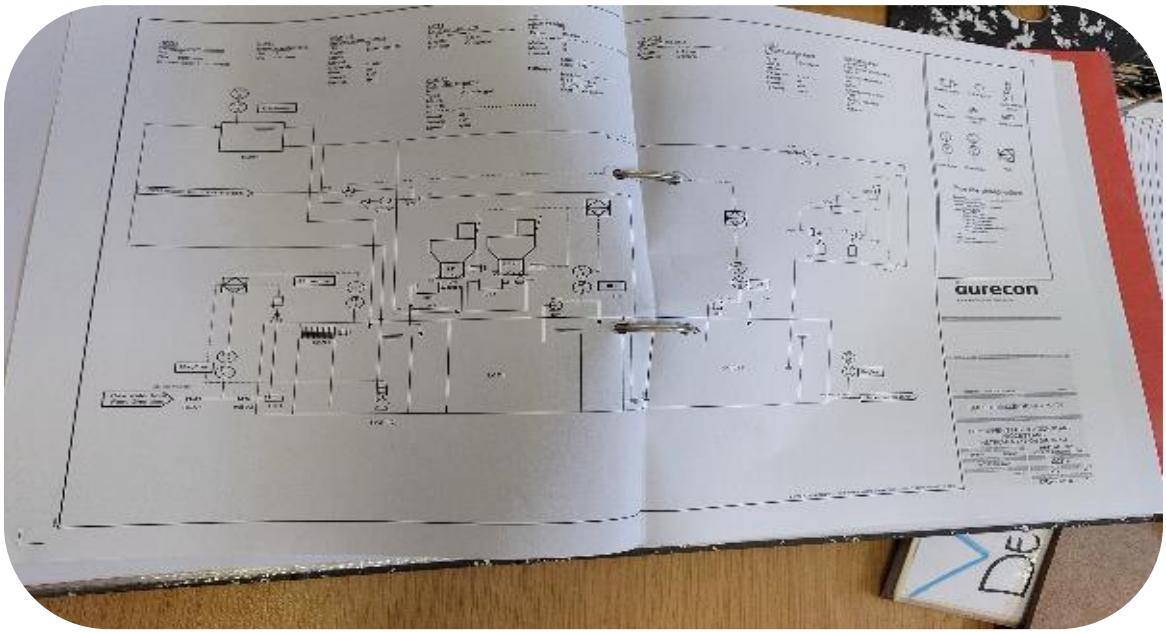
De Koppen TSA Score: 90%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	90.6	Class C plant, operational logbook in place with detailed daily entries, maintenance & repairs logbook available, O&M manual available. Process flow diagram available but should be displayed.
2	**Physical appearance of plant**	96.9	Fully fenced, excellent general housekeeping. Excellent, clean facilities available for employees. Buildings, mechanical and electrical equipment, access roads well maintained. Small sign at entrance. Larger more visible sign should be considered.

Watch #	Process Unit Assessed	% TSA	Observations
3	**Raw water handling**		
3.1	Raw water pumpstation/gravity fed	100.0	Abstraction from dam by gravity. Revolving screen in place.
3.2	Raw water pipeline	100.0	Pipeline in good condition. Installed flow meter and regular recording of flow rates.
3.3.	Inlet works and flow splitting	100.0	Single entrance with no splitting. Lime dosing equipment with standby.
4	**Chemical dosing and storage**		
4.2	Alkaline (Lime)	87.0	Lime dosing units in good condition. Storage of lime can be improved. Lime storage volume sufficient.
4.3	Chlorine (Gas)	87.0	Rotameter in good working condition. Chlorine dosing equipment in good condition. No standby dosing pump. Safety equipment adequate, but extractor fan required. Safety signs in place. Storage volume sufficient.
7	**Disinfection**	100.0	>30minutes contact time, free chlorine measurement done at the correct place.
10	**Bulk pipeline from plant to command reservoir**	100.0	Pipeline underground. No leaks reported. Valve chamber secure and neat.
11	**Command reservoir**	93.5	On-site reservoir, within plant perimeter. Telemetry in place-Remote monitoring. Cracks in concrete at bottom of reservoir.
12	**Booster pumpstation**	100.0	Booster pump station working, locked with alarm system. Duty/standby pump configuration.
	Total	**90%**	

High risk areas OR Key Hardware Risks/ Defects

1. Standby dosing pump required for final chlorination.
2. Concrete cracks on command reservoir need to be repaired.

VROOM Refurbishment Cost Estimate

Civil Works	R72,600	5%
Mechanical Works	R1,222,100	87%
Electrical Works (Incl C&I)	R112,200	8%
Total VROOM Cost	**R1,406,900**	**100%**
R million / MLD		**0.06**

Regulatory Impression

The De Koppen (Fairy Glen) water system is well maintained with the infrastructure and equipment in excellent condition. The staff seem competent; however, the WSA should ensure that process controllers and supervisory staff are registered with the DWS in the appropriate categories. A comprehensive process audit and WaSP are available, although the actions determined in the WaSP have not been properly implemented. The WSA should be commended for disclosing the water quality results to consumers on a monthly basis. The WSA should focus on a stricter chemical monitoring compliance and a more stringent microbiological quality compliance. The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for chemical but not for micro. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	94.68%
Chemical Compliance	97.47%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



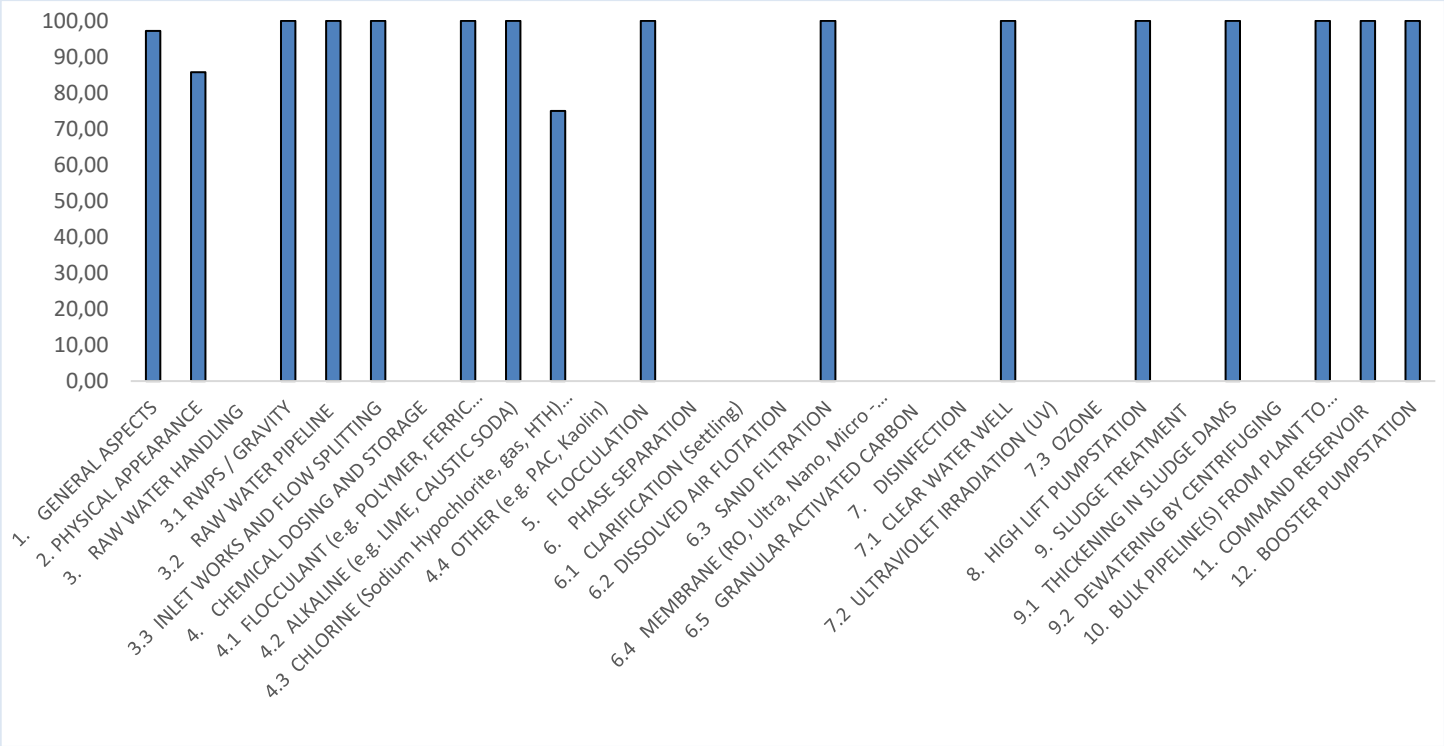
13.5 Cape Agulhas Local Municipality

The Bredasdorp water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

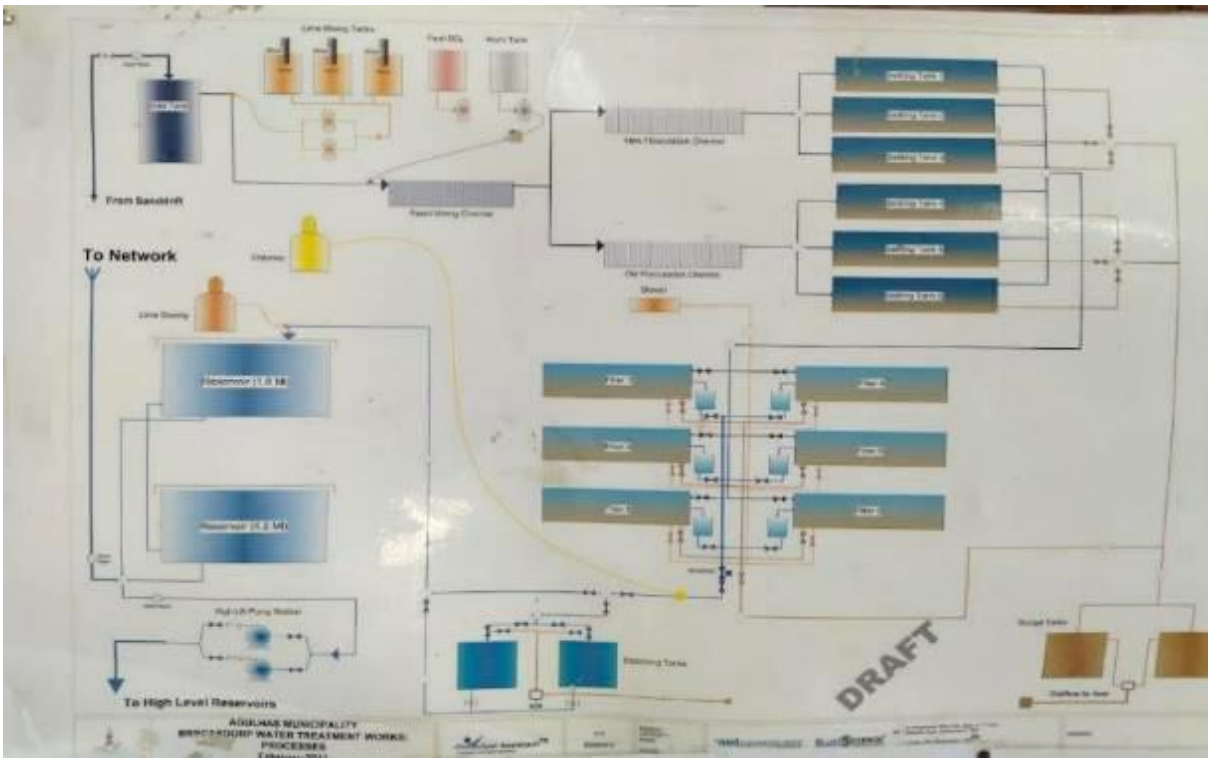
Bredasdorp WTW TSA Score: 96.3%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	86.7	Class B plant, O&M manual, and logbooks in place. Emergency contact numbers displayed. Process flow diagram displayed in laboratory and entrance. Monitoring equipment on site, proof of calibration. Electricity meter not accessible by process staff. No jar testing is done at the plant.
2	**Physical appearance of plant**	88.8	Fenced, entrance and neatly signposted. Some untidy aspects noted, while the road also needs to be upgraded. Ablution facilities for workers as well as areas to eat and prepare food is good. 100% workplace satisfaction reported. No OHS contraventions seen or reported
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	100.0	Raw water from boreholes in good condition, strainers in place at the plant. 200mm asbestos raw water pipeline in good condition and well maintained. Abstraction volumes recorded.
	Raw water pipeline	100.0	
	Inlet works	100.0	Chemicals clearly being dosed at flash mixer, good turbulence at hydraulic jump. Easy access.
4	**Chemical dosing and storage**		
	Flocculant	79.2	Alum dosing with Sodium Aluminate, well maintained. 100% standby on dosing units. No bunding for storage in place. Sufficient storage capacity with one month frequency for alum reported and 2 months delivery frequency for SA. Emergency wash in place but not in close proximity.
	Alkaline	97.5	Lime is dosed. Good housekeeping with two operational units, 100% standby. Sufficient storage area.
	Chlorine	90.0	Chlorine gas dosing unit installed and in working order. Backup Hypochlorite dosing system in place for emergency when gas is not available. Sufficient safety precautions in place. Storage area is lacking, but excess cylinders are stored at waste plant and brough to this pant when required.
5	**Flocculation**	100.0	Floc formation visible at end of unit, facility is clean
6	**Phase Separation**		
	Clarification (settling)	100.0	No visible floc carry-over, weirs are clean, and no debris collected. Daily desludging takes place. Some minor leaks against the side of the structure.
	Sand filtration	85.7	Well maintained facility, air distribution is good, media looks healthy, sufficient handrails. No backup for single air blower. Backwashing is performed by means of backwash tank, hence no pumps. Good distribution of settled water to the filters was seen.
7	**Disinfection**		
	Clear water well	100.0	At 8 Ml/day, the two reservoirs, reported to be more than 6 Ml in total provides almost a full day retention time. Chloring dosing at entry of CWW and free Cl_2 tested after the outlet of CWW.
8	**High lift pumpstation**	100.0	Two highlift pumps installed and operational, 100% standby. Flow measuring in place and logged.
9	**Sludge treatment**		
	Thickening in sludge dams	62.5	The two sludge dams seem to be fairly maintained with some reeds growing in them. Frequency of cleaning is low, and the process controller could not provide data on when it was last emptied. Supernatants decant to sewer system.
10	**Bulk pipeline from plant to command reservoir**	100.0	Not a lot of data was available in terms of type and size, however it was reported to be in good condition with sufficient capacity installed.
11	**Command reservoir**	100.0	2 reservoirs are fenced and gated, Telemetry in place and operational, and linked to Smart City application. Flows measured and logged. Both structures in good condition
12	**Booster pumpstation**	93.8	Building is fenced and secured with sufficient ventilation. Three pumps installed, 50% standby, and in good condition (one pump has been removed for maintenance purposes). MCC in good condition.
	Total	**91.4**	

High risk areas OR Key Hardware Risks/ Defects

1. Chemical storage area not able to contain spillages.
2. Storage capacity for chlorine gas on site can be provide.
3. Leakage repair work for settlement tanks.
4. Sludge thickening tanks to be desludge more regularly.

VROOM Refurbishment Cost Estimate

Civil Works	R730,400	51%
Mechanical Works	R707,300	49%
Electrical Works (Incl C&I)	R0	0%
Total VROOM Cost	**R1,437,700**	**100%**
R million / MLD		**0.18**

Regulatory Impression

The Bredasdorp water system serves the Bredasdorp and Waenhuiskrans regions with about 16,800 people. The plant is in a good condition and is operated by competent personnel which is reflected in a 100% workplace satisfaction rating provided following a discussion with the process controller. The Water Safety Plan is dated 2022 and upon enquiring the audit team, they demonstrated knowledge of all the risks highlighted in the report.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	94.97%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

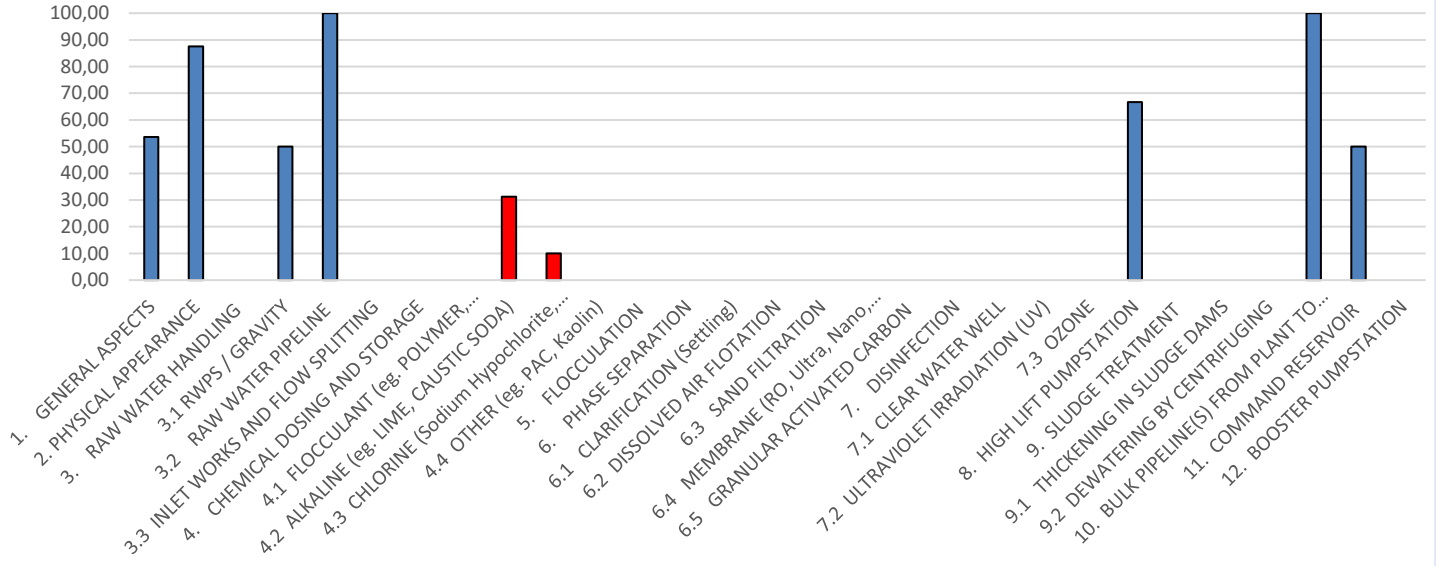
13.6 Cederberg Local Municipality

The Citrusdal water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

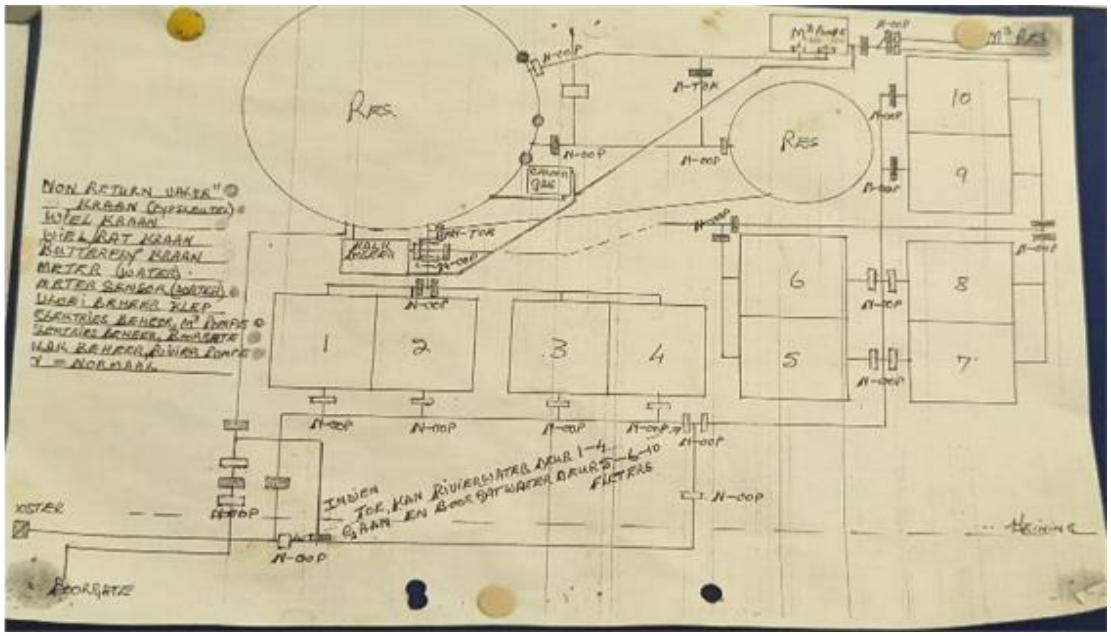
Citrusdal TSA Score: 51%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	39.2	Class D plant, operational logbook in place with limited information, maintenance & repairs logbook not available, process monitoring equipment not calibrated. Good signage at gate.
2	**Physical appearance of plant**	87.5	Fenced, general housekeeping and safety aspects can be improved. No designated areas for plant personnel.
3	**Raw water handling**		

Watch #	Process Unit Assessed	% TSA	Observations
	Raw water pumpstation / gravity feed	50.0	Borehole in use-gravity feed. Raw water abstraction from Olifants River only in winter, investigate pump size & pipe capacity to match the water supply demand during peak use periods, Flow meter in excellent condition.
	Raw water pipeline	100.0	
4	**Chemical dosing and storage**	41.2	Lime dosing administered manually. Chemical storage untidy.
7	**Disinfection**		No disinfection taking place. All disinfectants (Cl_2 and Sodium hypochlorite) out of stock for more than a week. No notices were issued to inform the community.
	Clear water well	0.0	
8	**High Lift Pump Station**	66.6	Standby capacity for the duty pumps is required. The pump seals were leaking, the switches were open, and wires exposed posing a safety hazard. The area around the pump station building was slippery and muddy- it needs some paving and steps on the slope.
10	**Bulk pipeline from plant to command reservoir**	100.0	Pipeline underground. Newly installed valves in good condition.
11	**Command reservoir**	50.0	2 onsite reservoirs in a poor state. Offsite reservoir said to be in good condition, gated and fenced.
	Total	**51%**	

High risk areas OR Key Hardware Risks/ Defects

1. Onsite reservoirs and sand filters need condition assessment and maintenance.
2. Lime handling needs to be addressed.
3. Stock control and safety equipment for chlorine need to be urgently investigated.
4. Standby capacity for dosing pumps and high-lift pump station needs to be addressed.

VROOM Refurbishment Cost Estimate

Civil Works	R5,561,600	26%
Mechanical Works	R10,073,800	48%
Electrical Works (Incl C&I)	R5,371,300	26%
Total VROOM Cost	**R21,006,700**	**100%**
R million / MLD		**2.53**

Regulatory Impression

The Citrusdal water system is not well maintained, with the structural integrity of some of the civil structures requiring a detailed assessment. The system is understaffed with some of the process controllers not registered despite having undergone water treatment-related training. The lack of internal scientific support is evident in the absence of Water Safety planning and the sub-standard water quality. Of great concern is the lack of water quality risk management preparedness demonstrated by the absence of incident management protocol and the failure to communicate adverse DWQ to consumers.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	99.73%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



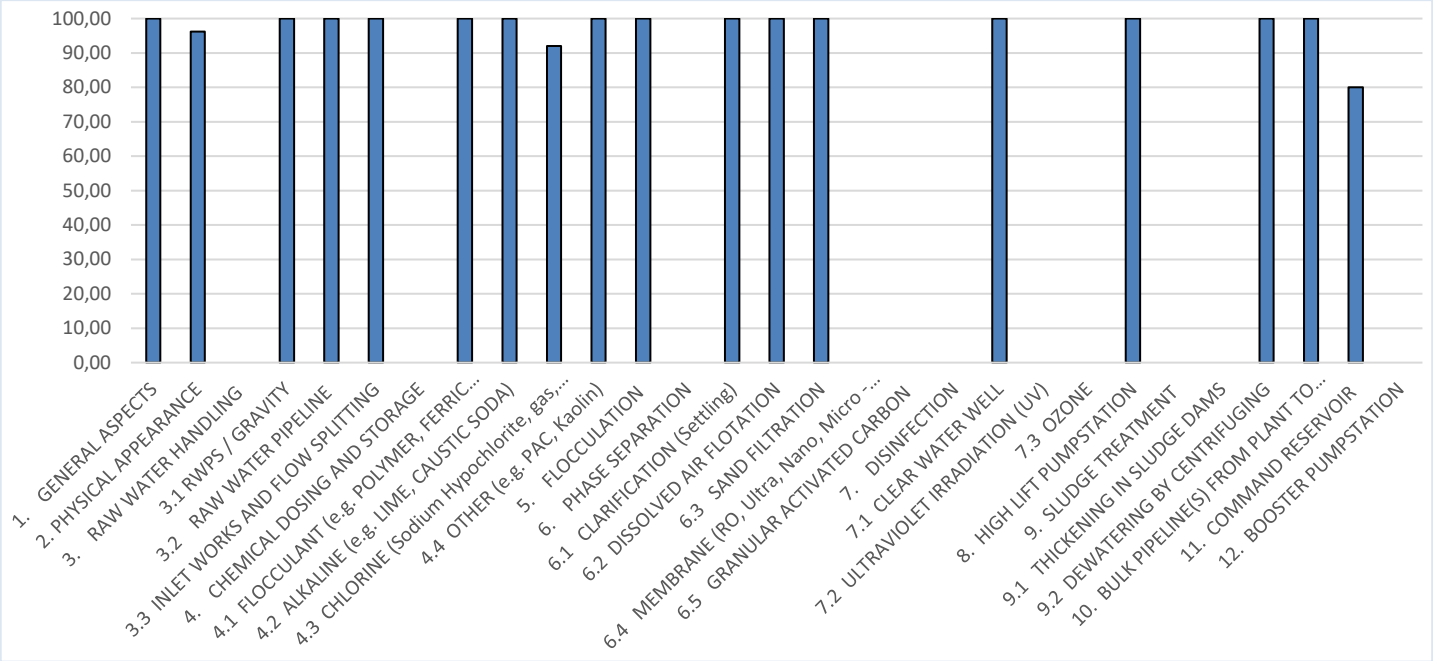

13.7 City of Cape Town Metropolitan Municipality

The Faure water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

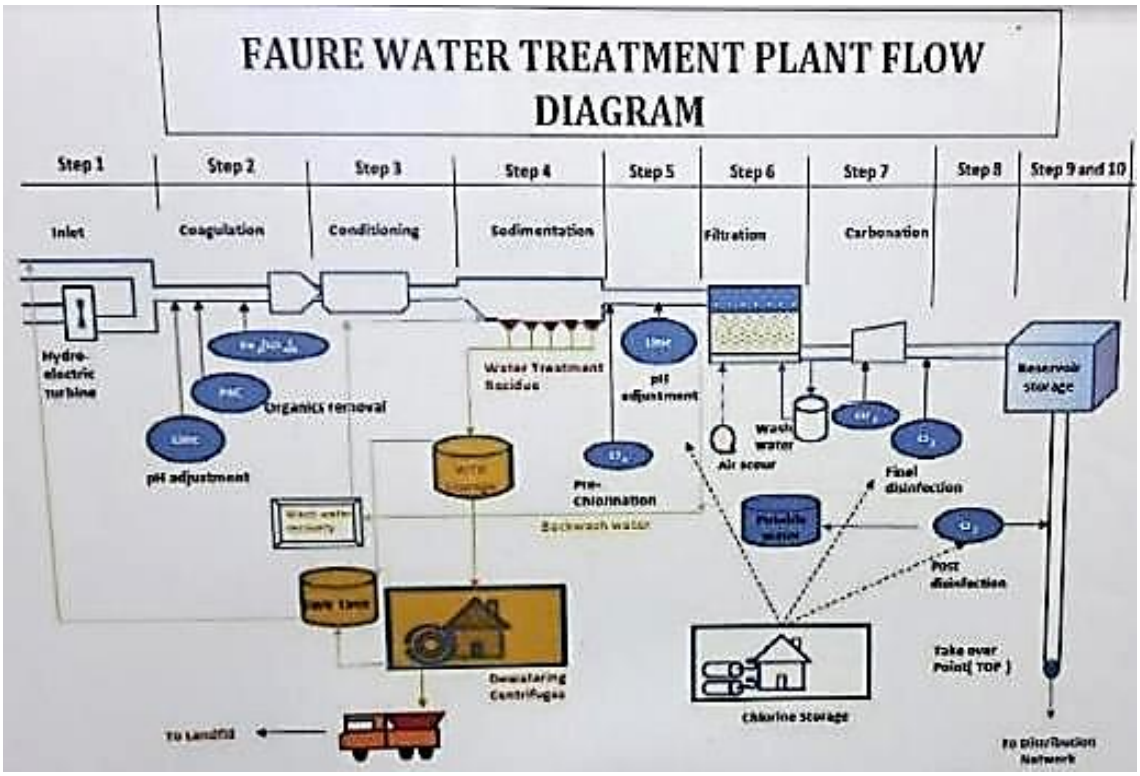
Faure WTW TSA Score: 98.0%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	100.0	Class A plant, O&M manual, and logbooks in place. Emergency contact numbers displayed. Process flow diagram neatly displayed. Monitoring equipment on site in good condition and calibration notices indicated. Jar testing done regularly on site.
2	**Physical appearance of plant**	96.3	Fenced with 24 hours security. Entrance is neat and clearly signposted. The plant is clean, roads in good condition and all staff facilities in good condition. Staff morale is good and reflected in a 70% satisfaction figure. Pre-Covid, staff functions were held, but not anymore. Staff feels a need for this to be reinstated. No OHS contraventions seen or reported
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	100.0	Seventy percent gravity feed from Theewaterskloofdam and 30% from Steenbras dam via Firland pumpstation. Four pumps, all 4 working. 550 kW each, Pipe is underground - no problems reported by the process controller on this aspect. Flow measured.
	Raw water pipeline	100.0	
	Inlet works	100.0	Flow splitting in 2 trains is done after the inlet situated at the turbines. Visual dripping of flocculant through a perforate pipe could be seen at the hydraulic jump
4	**Chemical dosing and storage**		
	Flocculant	100.0	Normally Ferric chloride is dosed, but currently doing a trial with Alum. The two trains each has 4 dosing pumps, therefore 8 in total. Two of them are currently in for repairs. Sufficient bunding for dosage. The storage tanks are from concrete and scoured regularly. Emergency wash in close proximity.
	Alkaline	100.0	Lime is used for stabilization. Good housekeeping with two operational units installed per silo per train. Sufficient storage area with 2 x 150 tonne silos are available to store lime on site.
	Chlorine	92.0	Three dosing points (pre, final when coming out of reservoir and post after filtration). Two chlorinators per dosing point - all in working condition. Storage area is adequate close proximity to suppliers is a benefit.
	PAC	100.0	PAC is dosed when the raw water quality dictates it, i.e. when tastes and odours occurs. Two dry feeders are in place for this - both operational. Sufficient storage with 2x150 ton storage silos in place.
5	**Flocculation**	100.0	Conditioning of flocs takes place in dedicated flocculation basins - neat and clean. Well-formed flocs were witnessed.
6	**Phase Separation**		
	Clarification (settling)	100.0	All concrete overflow weirs are in good condition and clear of debris or algal growth. These weirs are cleaned during every shutdown of a train. Daily sludge withdrawal is done.
	Sand filtration	100.0	Filter block is in good condition. This is the first declining rate filter setup in SA and makes use of an orifice in the outlet pipe of the filter to throttle the cleanest filter to not more than 1.5 times design filter rate. 100% backup for backwash pumps as well as the air blowers. Media in good condition, good backwash pattern witnessed.
7	**Disinfection**		
	Clear water well	100.0	At 500 Ml/d, the contact time for the 640 Ml reservoir is 31 hours. Chloring dosing at entry of CWW and free Cl_2 tested after the outlet of CWW.
8	**High lift pumpstation**	100.0	Water is gravity fed to the command reservoirs. Flow measuring in place and logged.
9	**Sludge treatment**		
	Dewatering By Centrifuging	100.0	There are two centrifuges - operating in a duty and standby configuration. Final sludge cake goes to Vissershok landfill site. a PLC controls all chemical dosages, flow rates, cleaning, and maintenance.
10	**Bulk pipeline from plant to command reservoir**	100.0	One 2.4m steel line leaves the plant to command reservoirs, amongst others the Winelands reservoir. Regular inspections are done on the line and leaks are kept to a minimum.
11	**Command reservoir**	80.0	Winelands reservoir fenced and with 24-hour security. Telemetry working and displayed on internal SCADA system. Control room records all flows from the reservoir. This reservoir is open to bird access.
	Total	**98%**	

High risk areas OR Key Hardware Risks/ Defects

1. Backup for disinfection dosing required in case of low supplies.

VROOM Refurbishment Cost Estimate

Civil Works	R1,503,700	100%
Mechanical Works	R0	0%
Electrical Works (Incl C&I)	R0	0%
Total VROOM Cost	**R1,503,700**	**100%**
R million / MLD		**0.003**

Regulatory Impression

The Faure plant serves Cape Town and surrounds and is part of an integrated system which can provide water via interlinking systems to various reservoirs. The plant is kept in a very good condition and relatively new and in excellent condition. High micro compliance of 98.7% is reported for this plant with a chemical compliance of 100%. No directives have been issued by the Regulator. The Water Safety Plan is dated June 2022 and upon enquiring the audit team, they demonstrated knowledge of all the risks highlighted in the report.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	99.69%
Chemical Compliance	99.33%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

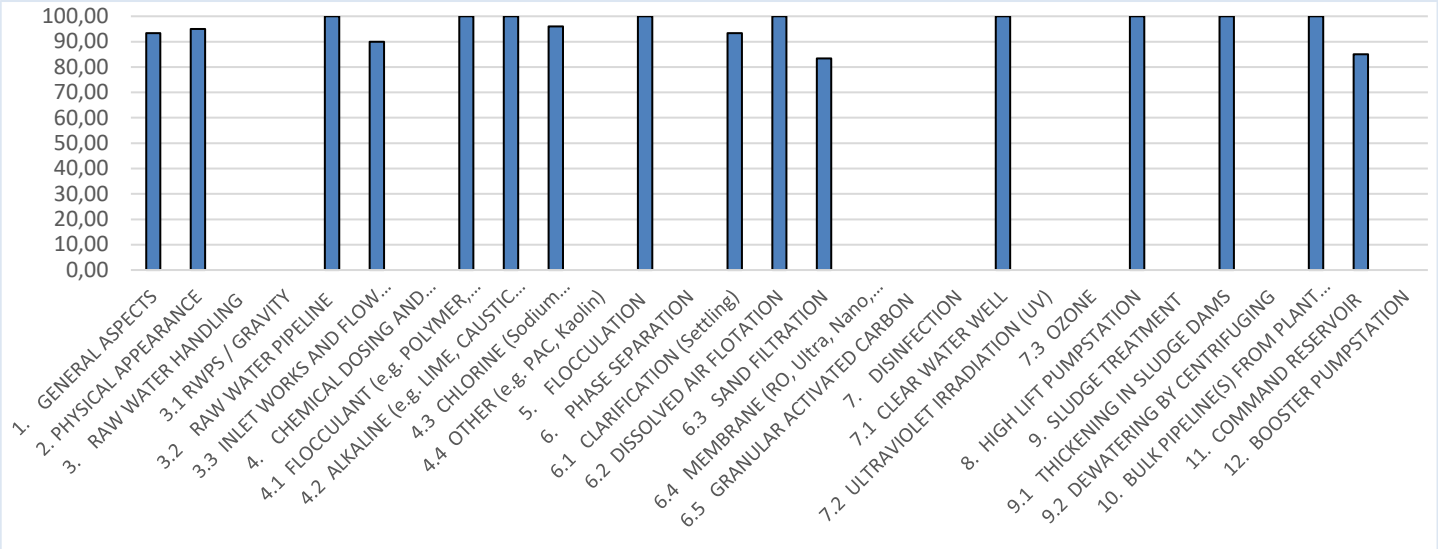


The Steenbras water supply system was inspected on the 19th of January 2023 to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

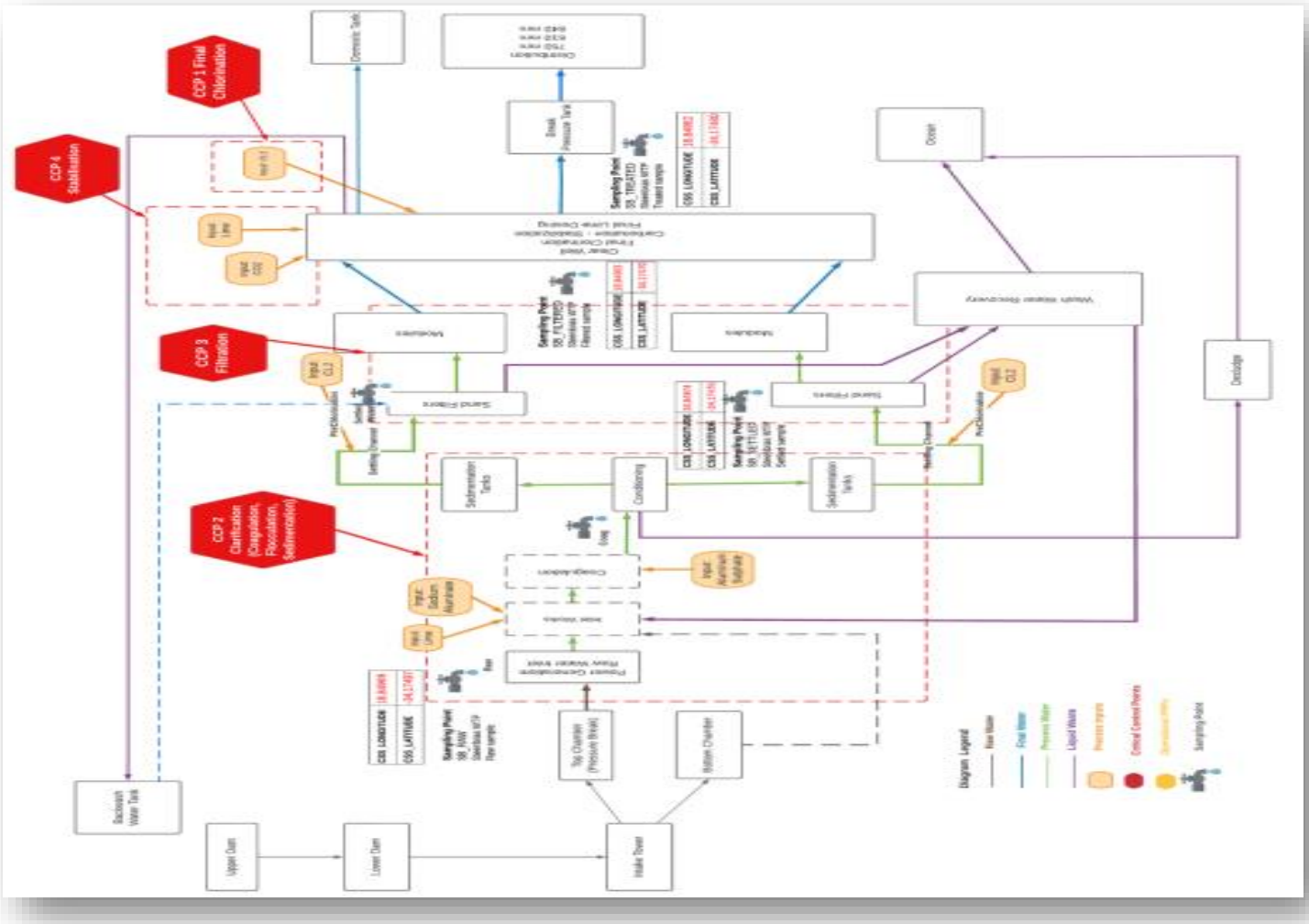
Steenbras WTW TSA Score: 95%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	93.3	Class B plant, O&M manual, and logbooks in place. Emergency contact numbers displayed. Monitoring equipment on site, proof of calibration. The plant generates all its own electricity from the turbines at the inlet works, consumption logged.
2	**Physical appearance of plant**	95.0	Entrance is clearly marked. Excellent security in place. State and tidiness of site is excellent. Roads are in very good condition. Relevant safety signs displayed and exceptional safety procedures in place, no OHS contraventions seen or reported. Average workplace satisfaction reported lack of recognition based on knowledge and experience.
3	**Raw water handling**		
	Raw water pipeline	100.0	Inlet screens reported as in place and cleaned regularly. All raw water is gravity fed. Pipeline reported in good condition, inflow meter readings logged and interpreted. Effective chemical dosing and flash mixing practice.
	Inlet works	90.0	
4	**Chemical dosing and storage**		
	Flocculant	100.0	Aluminium Sulphate and Sodium Aluminate dosing, two dosing units each (100% standby for both), good working order. Sufficient storage capacity provided. Spillages at dosing and storage areas will be contained. Dedicated emergency wash in place.
	Alkaline	100.0	Lime dosing. Very good housekeeping. Two dosing units (100% standby), good working order. Sufficient storage capacity provided
	Chlorine	96.0	Chlorine gas dosing. Pre- and post-filtration dosing, two dosing units each (100% standby for both), good working order. 2 x 1-ton cylinders connected at each dosing point, auto-switchover, and scales operational. Storage area for 12 x 1-ton cylinders, storage space provides capacity for approximately 28 days, very close proximity to delivery depot is an advantage. Leak detection, proper PPE, and safety signage in place.
5	**Flocculation**	75.0	Well-formed flocs visible in the canal feeding clarifiers were observed in flocculation channels (retention not optimal). Unit is very well maintained
6	**Phase Separation**		Process operator staff highly knowledgeable and takes pride in their work and are very enthusiastic. Internal mentorship and external training is exceptional.
	Clarification (settling)	93.3	Some floc carry-over, weirs in optimal condition. Desludging daily.
	Sand filtration	75.0	Three backwash pumps (50% standby), good working order. Plant designed to not make use of air scour. Backwash every filter daily. Smooth filter media with some cracks observed. Outlet flow not evenly distributed. Excellent housekeeping and safety.
7	**Disinfection**		
	Clear water well	100.0	At 150 Ml/day the 5.5 Ml CWW situated beneath the filters, designed with baffle walls to avoid short circuiting provides for 52 minutes contact time. Chloring dosing at entry of CWW and free Cl_2 tested after the outlet of CWW (gravity flow).
8	**High lift pumpstation**	100.0	All distribution is gravity fed. Flow measuring in place and logged.
9	**Sludge treatment**		
	Thickening in sludge dams	100.0	Wash-water and desludging to settling tank and supernatant recycled, de-sludging into the ocean (reported as per authorisation). Reported two recycle-pumps (100% standby) in good working order.
10	**Bulk pipeline from plant to command reservoir**	100.0	Three bulk lines leaves the plant (750, 810 and 840, all cast iron with lead joints. The 810 line is 100 yrs. old, and the 750 line is 60 yrs. old. Regular inspections are done on the final lines and leaks are kept to a minimum
11	**Command reservoir**	85.0	Fenced and gated with signboard, excellent 24h security in place. Telemetry and final flow meter operational. The open reservoir has been in operation for 140 years with excellent results, protected from most debris by the mountain but birds have access, and some debris can enter. Structure in excellent condition, reservoir is emptied and inspected on a regular basis.
	Total	**95%**	

High risk areas OR Key Hardware Risks/ Defects

No high-risk areas were observed, the biggest risk is shortages of chlorine gas, which is effecting the whole country, however it is mitigated at Steenbras by the installation of a backup hypochlorite dosing system. In spite of the plant being very old no hardware risks/ defects were observed due to exceptional maintenance.

VROOM Refurbishment Cost Estimate

Civil Works	R574,200	100%
Mechanical Works	-	0%
Electrical Works (Incl C&I)	-	0%
Total VROOM Cost	**R574,200**	**100%**
R million / MLD		**0.004**

Regulatory Impression

The Steenbras bulk supply systems has a very well-functioning treatment plant and distribution system. The plant is very old plant with old technology but produces excellent quality water and is remarkably maintained. The supply system distributes excellent quality water to their consumers with the whole of the City of Cape Town supply system (including Steenbras and 12 other plants) scoring above 99.7%, in accordance with SANS 241, for microbiological acute- and chemical acute and chronic health as well as non-health aesthetics. No directives have been issued by the Regulator. The capacity-, Risk- and technical management, from a TSA point of view, seems to be at an exceptional standard. The process controlling staff takes immense pride in their work and are highly knowledgeable, there are excellent in-house mentoring programs in place and regular external training is provided. The work place satisfaction is good, however interviewing a Class II process controller with 34 years' experience, it seems that recognition as senior based on this experience and knowledge is lacking.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	99.69%
Chemical Compliance	99.33%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%







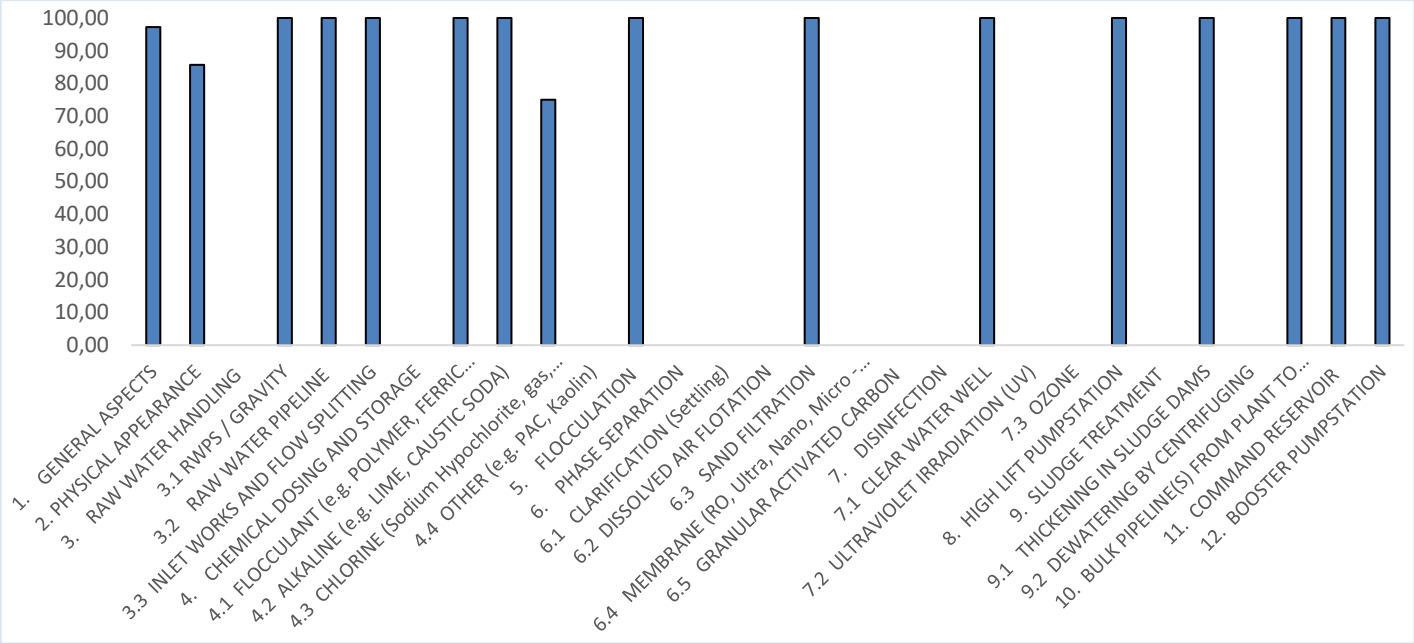

13.8 Drakenstein Local Municipality

The Welvanpas water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

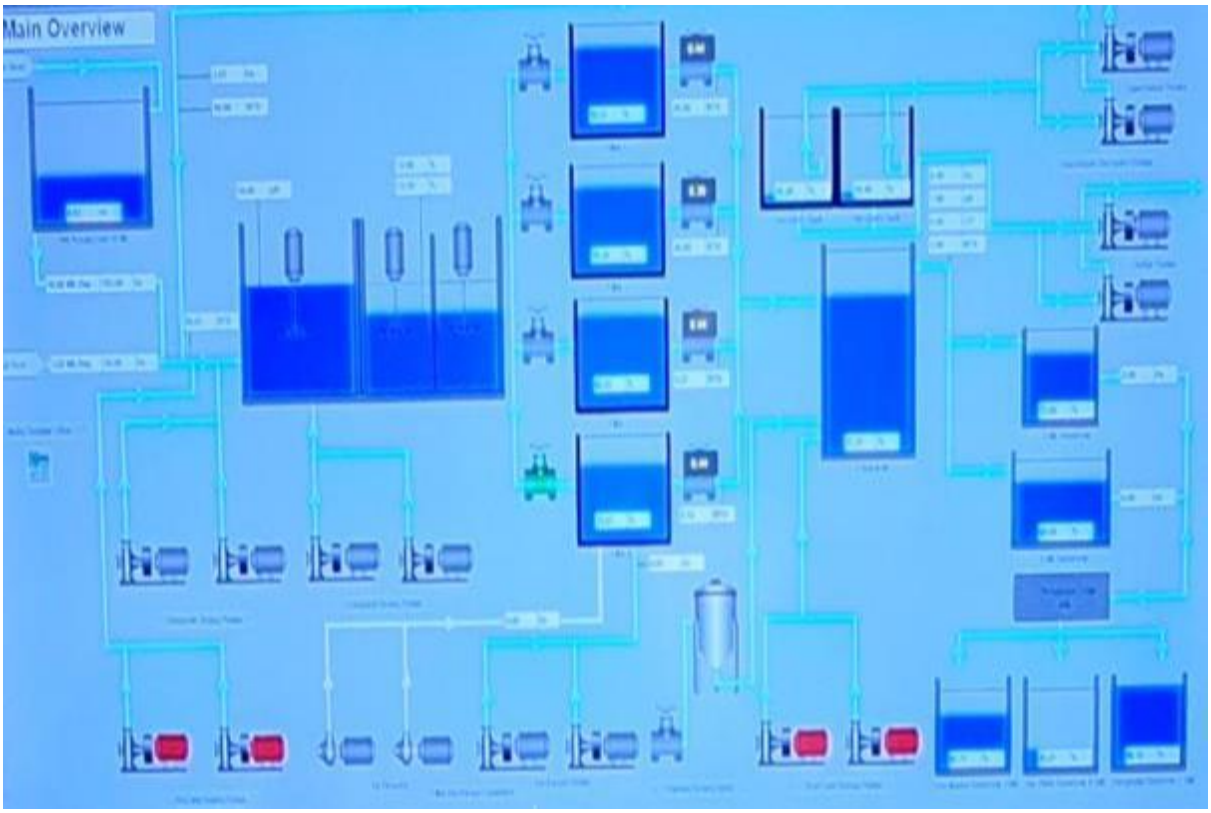
Welvanpas WTW TSA Score: 96%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	97.2	Class C plant, O&M manual, and logbooks in place. Emergency contact numbers displayed. Process flow diagram not displayed and only available on the SCADA. Monitoring equipment on site in good condition as well as the jar test equipment.
2	**Physical appearance of plant**	85.7	Fenced, entrance is neat but do not have a signpost. The plant is clean, notes that it was not in operation due to the seasonal nature of its operations. Road in good condition. Ablution facilities very good as well as the kitchen. No OHS contraventions seen or reported
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	100	Strainers in place at the plant – gravity fed with 450 mm line - pipeline in good condition and well maintained. Abstraction volumes recorded.
	Raw water pipeline	100	
	Inlet works	100	Chemicals clearly being dosed at mechanical flash mixer; plant was not operational and could not check mixing intensity.
4	**Chemical dosing and storage**		
	Flocculant	100	Zetafloc used for flocculant, well maintained. 100% standby on dosing units. Sufficient bunding for dosage and storage area. Emergency wash in close proximity.
	Alkaline	100	Lime is used for stabilization. Good housekeeping with three operational units, 100% standby on the four pumps to transfer to pre and post dosage. Sufficient storage area.
	Chlorine	75	Chip doser unit installed and in working order. Sufficient safety precautions in place. Storage area is adequate and only required to provide for backup for the single dosing unit.
5	**Flocculation**	100	Flocculation unit is in good condition, floc formation could not be witnessed due to plant not in operation.
6	**Phase Separation**		
	Clarification (settling)	na	This is a seasonal plant and was not in operation during the audit – units look good, but overflow could not be assessed.
	Sand filtration	100	Filter block is in good condition with safe access to all filters. Media seems to be smooth with no obvious cracks. Plant was not operational.
7	**Disinfection**		
	Clear water well	100	At 10 Ml/day, the two reservoirs (3 Ml plus 5 Ml) provide for 19.2 hours retention time. Chloring dosing at entry of CWW and free Cl_2 tested after the outlet of CWW.
8	**High lift pumpstation**	100	Water is gravity fed to the command reservoirs. Flow measuring in place and logged.
9	**Sludge treatment**		
	Thickening in sludge dams	100	Two sludge/ wash water holding tanks. Very well maintained, area is neat and easily accessible. Supernatant from tanks gets recycled back to the works. Two pumps are installed and in working order.
10	**Bulk pipeline from plant to command reservoir**	100	Not a lot of data was available in terms of type and size, however it was reported to be in good condition with sufficient capacity installed – confirmed during the audit conducted at the same site.
11	**Command reservoir**	100	2 reservoirs are fenced and gated on same area as the plant Telemetry in place and operational. Flows measured and logged. Both structures in good condition
12	**Booster pumpstation**	100	Building is fenced and secured with sufficient ventilation. Four pumps installed, 100% standby, and in good condition. MCC's in good condition and safely housed in pumpstation.
	Total	**96.3%**	

High risk areas OR Key Hardware Risks/ Defects

1. Standby unit/ Backup for disinfection dosing required.

VROOM Refurbishment Cost Estimate

Civil Works	-	0%
Mechanical Works	R79,200	100%
Electrical Works (Incl C&I)	-	0%
Total VROOM Cost	**R79,200**	**100%**
R million / MLD		**0.01**

Regulatory Impression

The Welvanpas water system serves the Simondium, Pearl Valley, Paarl, and Wellington regions together with water received from the Wemmershoek plant of the City of Cape Town. The plant is seasonal and only in operation during the winter months. The plant is relatively new and in excellent condition. High micro compliance of 98.7% was reported and no directives have been issued by the Regulator. The Water Safety Plan is dated 2022 and upon enquiring the audit team, they demonstrated knowledge of all the risks highlighted in the report.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not chemical (only just). The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	98.73%
Chemical Compliance	96.65%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

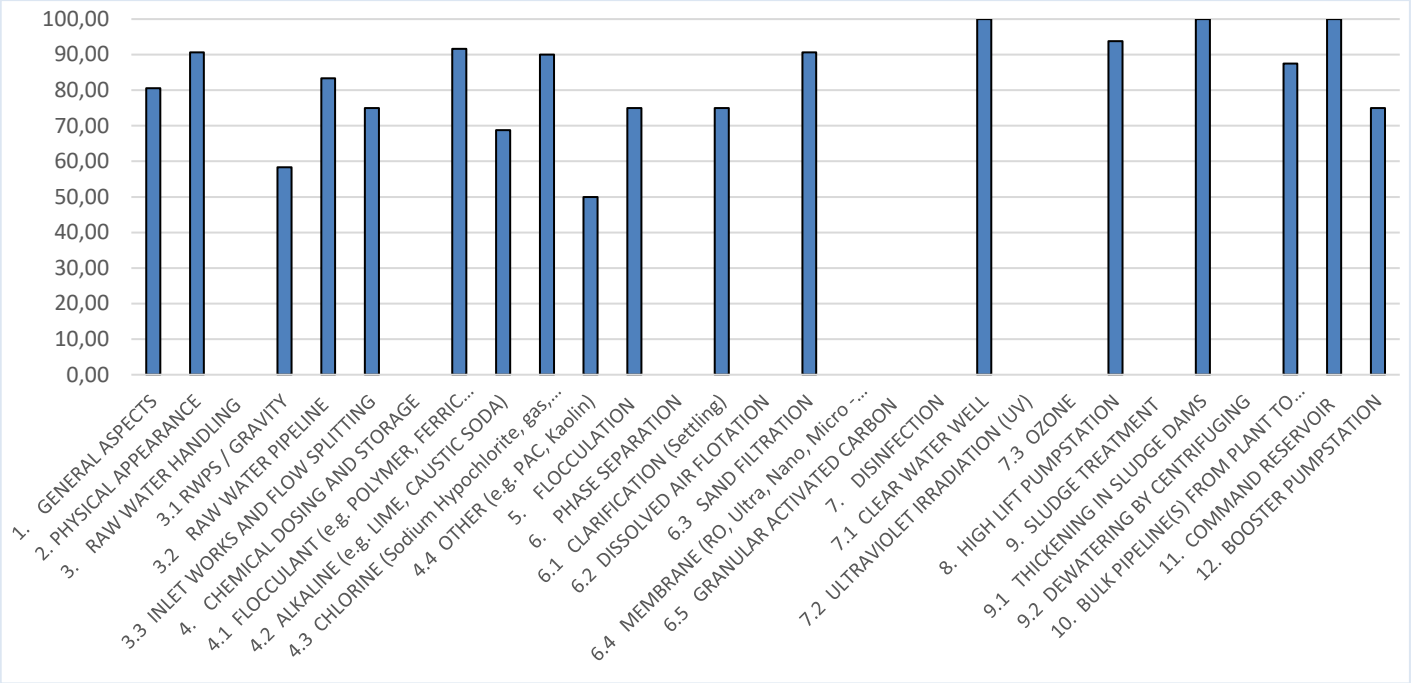
13.9 George Local Municipality

The George water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

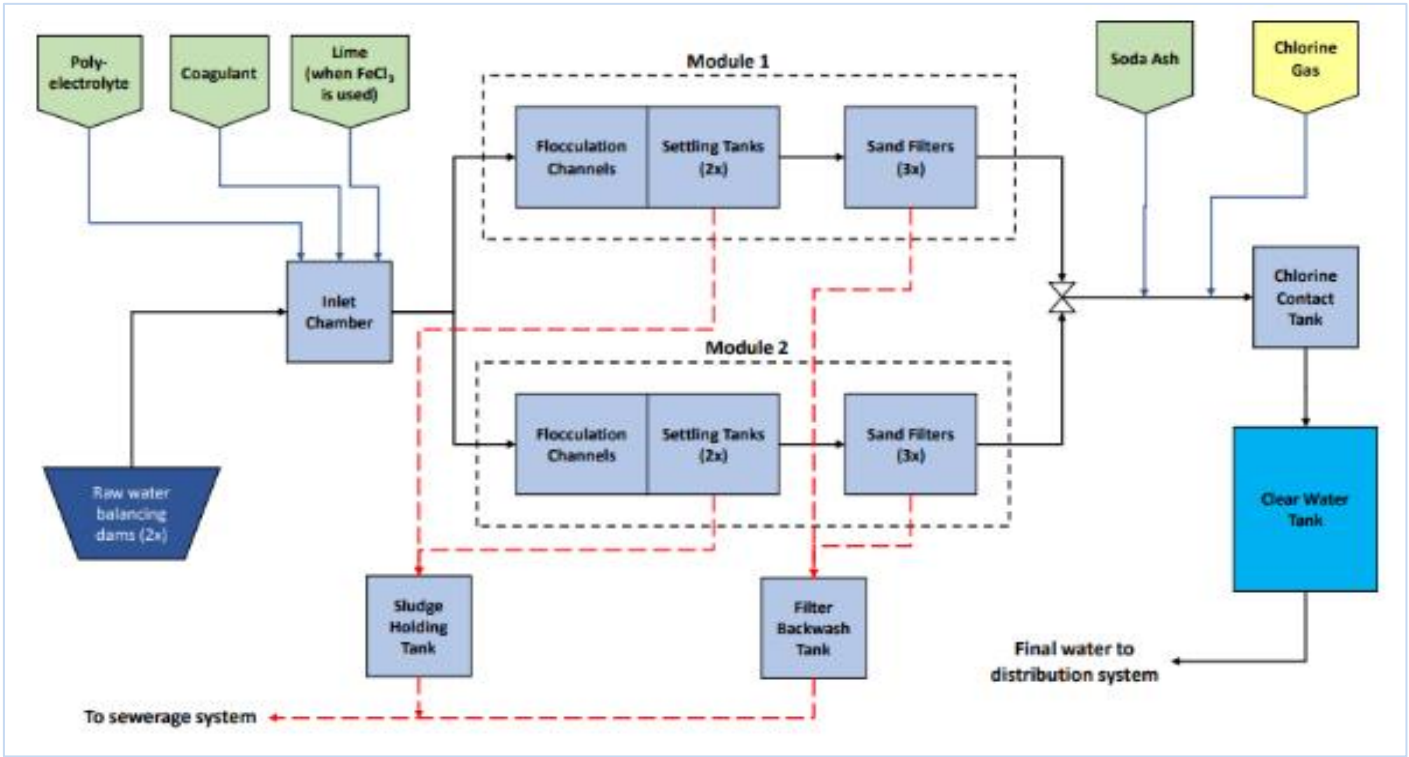
George: New TSA Score: 84%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	80.5	All the aspects required for good process control are covered.
2	**Physical appearance of plant**	90.6	The construction of a 2nd 20 Ml/d plant is underway. The overall impression of the plant is however quite positive.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	58.3	No screening in place. Raw water enters a raw water balancing dam where any foreign objects can physically be removed. The water then gravitates to the Works. There are plans in place to increase this capacity. All pumps pumping into raw water storage dam are in good working order.
	Raw water pipeline	83.3	Pipeline constructed when the Garden Route Dam was originally built (40 years ago) and maintenance could become more of a priority in the not-too-distant future.
	Inlet works	75.0	Even flow splitting in inlet structure. Flowmeters to the individual modules of the plant however need to be repaired.
4	**Chemical dosing and storage**		
	Flocculant	91.6	Tidy area where all the equipment is in a fully functional condition.
	Alkaline	68.7	Lime silos not in use anymore. Only a few 25 kg bags of lime on site as standby – the lime dosing equipment is however in order. Soda ash dosing is in order. Soda ash is dosed for pH control (pre-dosing) and for stabilisation (post dosing).
	Chlorine	90.0	There are 3 chlorinators on site: Pre-Chlorination East, Pre-Chlorination West, and Final Chlorination. These are dedicated lines and not easily interchangeable. Safety around the chlorine dosing installation is maintained to a very high standard.
	Other (PAC, Kaolin, etc.)	50.0	PAC is on standby. As this process unit will only be used when tastes / odours are detected, the installation is quite basic.
5	**Flocculation**	75.0	In a good overall condition. The channels are under cover. The electrical light is insufficient to observe floc in the channel, but if a sample is taken from the channel, floc is visible.
6	**Phase Separation**		
	Clarification (settling)	75.0	Settling is adequate and supernatant was clear. Tanks are desludged manually every 2 hours. Valves are located in an awkward space underneath the clarifiers.
	Sand filtration	90.6	Process in good working order. Daily backwashing taking place. Equipment are somewhat dated, and refurbishment could be considered as to ensure its sustained operation.
	Membrane	na	A mobile “package plant” is on site as temporary water augmentation measure. The plant is operated by a contractor. As it does not form part of the permanent installations at the works, it was not assessed. It is however worth noting that there is only backup equipment installed for key components of the plant.
7	**Disinfection**		
	Clear water well	100.0	Clearwater well in good condition and retention time is adequate for disinfection.
8	**High lift pumpstation**	93.7	Pumps are in a good working order. Water is pumped to "Old" Water Works (still a fully functional works) where it is blended with water from that plant.
9	**Sludge treatment**		
	Thickening in sludge dams	100.0	Concrete sumps where thickening occurs before supernatant is returned to plant and sludge discharged to WWTW. Everything in good condition.
10	**Bulk pipeline from plant to command reservoir**	87.5	Except for the age of the line, no concerns were expressed.
11	**Command reservoir**	100.0	On "Old WTW" (still operational) site. Reservoir is in good condition.
12	**Booster pumpstation**	75.0	Pumps are in good condition. Security are pumpstation remain a concern.
	Total	**84%**	

High risk areas OR Key Hardware Risks/ Defects

1. Individual flowmeters to East & West Modules of the plant needs to be repaired.
2. Lime dosing should be tidied up and prepared in case it needs to be used in future.
3. High-intensity lighting would facilitate visual observation of the flocculation process.
4. Settling tank desludge valves are quite awkward to operate.
5. Backwash equipment could be refurbished.

VROOM Refurbishment Cost Estimate

Civil Works	R883,300	19%
Mechanical Works	R2,246,200	49%
Electrical Works (Incl C&I)	R1,490,500	32%
Total VROOM Cost	**R4,620,000**	**100%**
R million / MLD		**0.23**

Regulatory Impression

George Local Municipality is on a very proactive journey of ensuring the adequate supply of water to the communities they serve, not only here and now, but also in the years to come. As part of these initiatives, a new 20 Ml per day plant is currently under construction. This endeavour is however not detracting from the efforts required to operate and maintain the existing works in line with best-practice principles.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	99.22%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

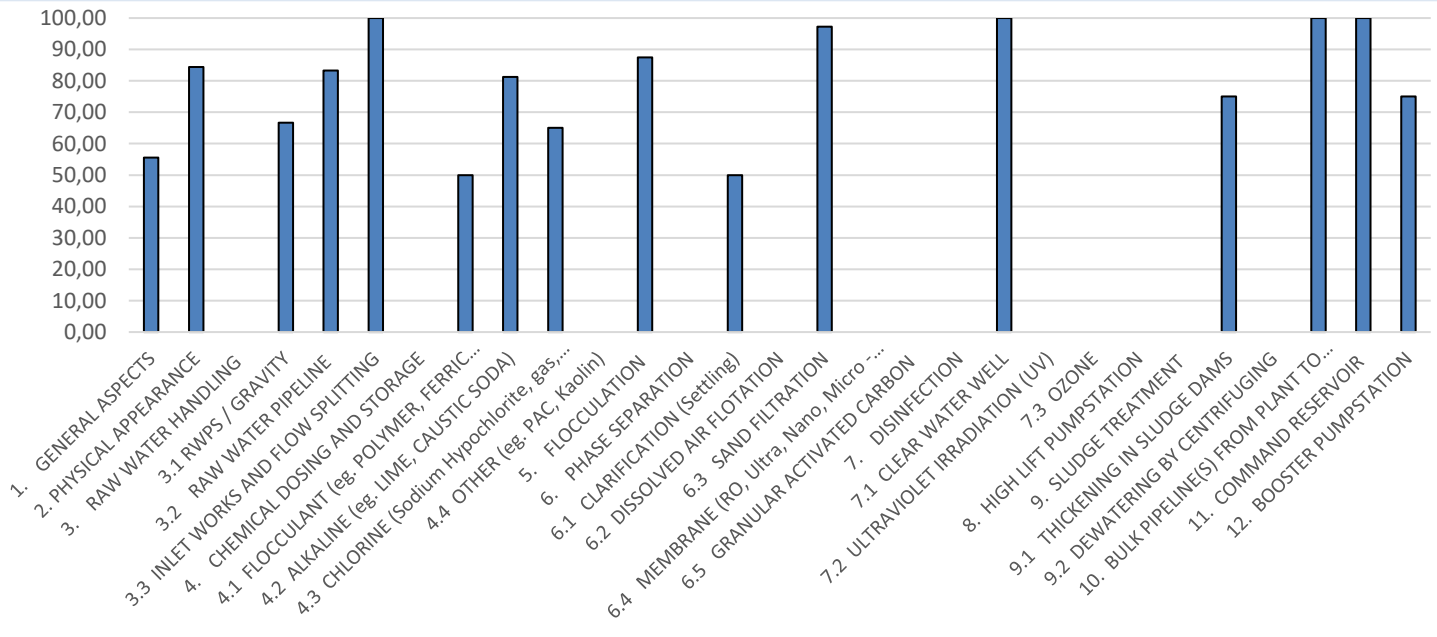
13.10 Hessequa Local Municipality

The Riversdale water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

Riversdale TSA Score: 77%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram

None

Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	55.5	Class C plant, operational logbook in place, maintenance & repairs logbook not available onsite, process monitoring equipment in excellent condition and calibrated.
2	**Physical appearance of plant**	84.3	Fenced, neat terrain. Good general housekeeping. No signage at gate. No dedicated kitchen for plant personnel.
3	**Raw water handling**		Raw water abstraction from Korentepoort River, investigate pump size & pipe capacity to match the water supply demand during peak use periods, both pumps and Flow meter in good condition.
3.1	Raw water pumpstation / gravity feed	66.6	
3.2.	Raw water pipeline	83.3	
3.3.	Inlet works and flow splitting	100.0	Single entrance with good flash mixing.
4	**Chemical dosing and storage**		Lime dosing administered manually. Chemical storage untidy.
4.1.	Flocculant	50.0	Spillage control of Zeta Floc lacking. Dosing pumps in good condition. Emergency shower needs to be installed.
4.2.	**Alkaline (Lime)**	81.2	Dry feeders in working condition. Lime handling and storage practices can be improved.
4.3.	**Chlorine**	65.0	Rotameters operational. Standby dosing pumps required. Minimisation of accidental exposure to chlorine needs to be looked into. Sufficient storage of disinfectant.
5	**Flocculation**	87.5	Good floc formation- White tile method employed for improved floc visibility. Good condition of the flocculation unit.
6	**Phase Separation**		
6.1	Clarification	50.0	Desludging of the units not conducted regularly. Weir plates severely corroded.
6.3.	Sand Filtration	97.2	Old backwash pump-blower combo at risk of being obsolete. All three filters in good condition. Even bubble distribution observed during backwash
7	**Disinfection**		>30min contact time. Chlorine is dosed in the pipe to the reservoir. Free chlorine measurement is done in the reservoir.
	Clear water well	100.0	

Watch #	Process Unit Assessed	% TSA	Observations
9	**Sludge Treatment**	75.0	Sludge dam not well maintained. Pollution prevention can be improved. Water not recycled.
10	**Bulk pipeline from plant to command reservoir**	100.0	Pipeline underground. Valves fully exposed- not housed in the chamber. Newly installed valves in good condition.
11	**Command reservoir**	100.0	Fenced and gated, in good condition. Telemetry in place and operational.
12	**Booster Pumpstation**	75.0	One of the two pumps was out for repairs. MCC in working condition and easily accessible.
	Total	**77%**	

High risk areas OR Key Hardware Risks/ Defects

1. Blowers and backwash pumps are too old and at risk of being obsolete.
2. No standby capacity for flocculant dosing pumps
3. Safety equipment is inadequate.
4. Weir plates are severely corroded. Cathodic protection for metal parts needs to be looked into.

VROOM Refurbishment Cost Estimate

Civil Works	R20,900	0%
Mechanical Works	R5,879,500	75%
Electrical Works (Incl C&I)	R1,969,000	25%
Total VROOM Cost	**R7,869,400**	**100%**
R million / MLD		**1.97**

Regulatory Impression

The Riversdale water system is reasonably maintained with competent process controllers. The system seems to be subjected to localised corrosion which may require further investigation to ensure suitable intervention is applied. The team is encouraged to build on the Water Safety Planning process that was previously initiated and implement the control measures for all the targeted risks. The health and safety of plant personnel must be fortified to create an environment conducive to excellent water quality provision.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	88.12%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

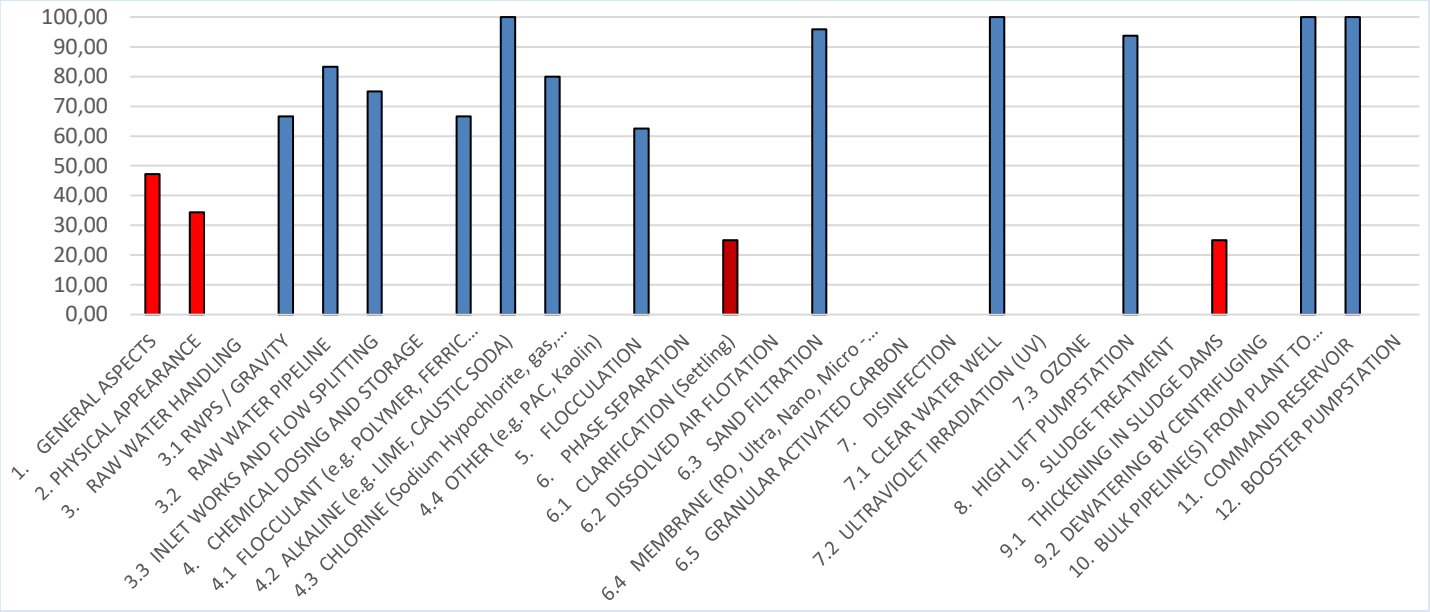
13.11 Kannaland Local Municipality

The Ladismith water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

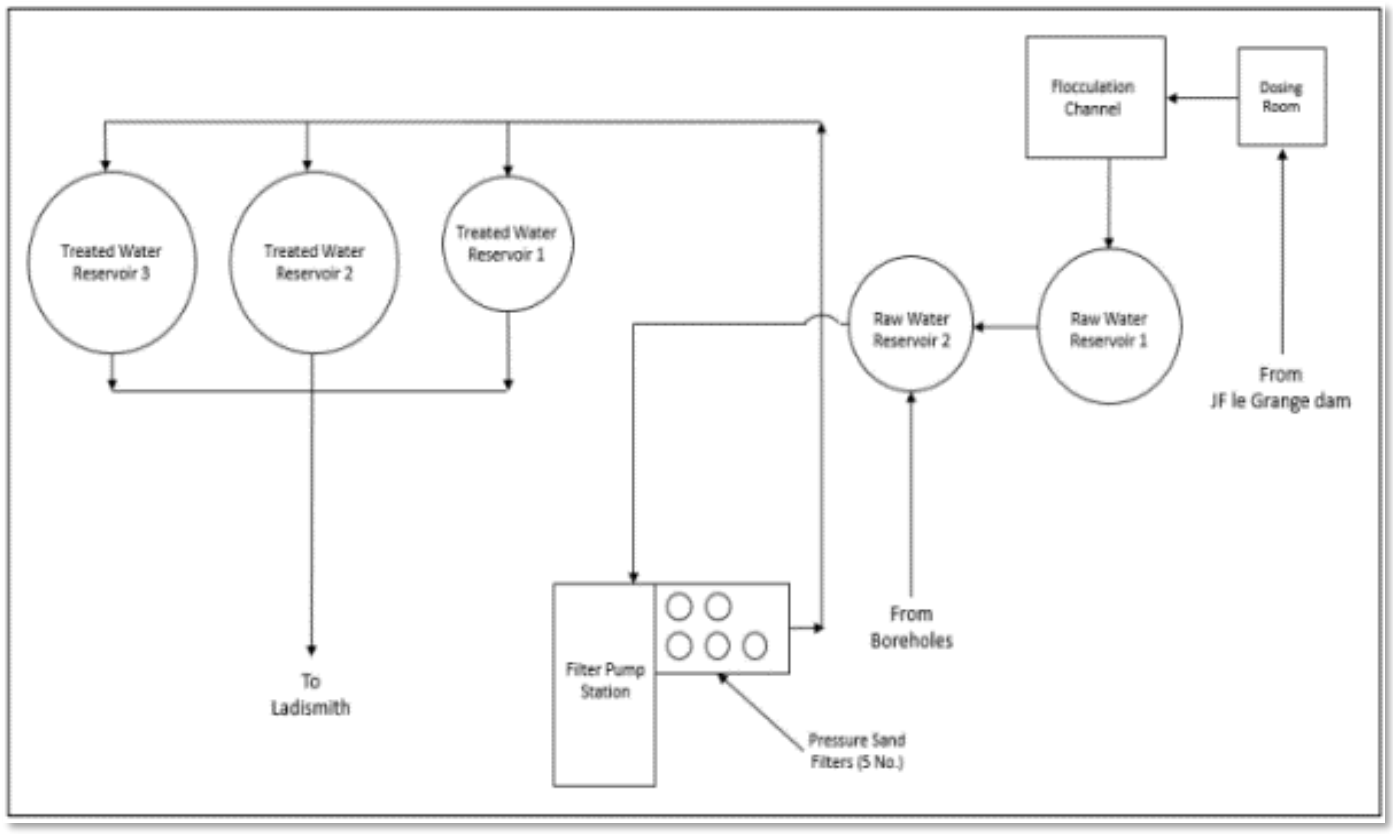
Ladismith TSA Score: 72%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	47.2	Basic operational control on site in order. Turbidity & Residual Chlorine being done, but Electrical Conductivity & pH needs to be added to operational monitoring.
2	**Physical appearance of plant**	34.3	Grounds are in an average condition. There are no dedicated facilities (incl. bathroom) on site, only an office which acts as multipurpose room.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	66.6	There are 2 x pump sets at JF le Grange Dam. These provide the majority of the water to the works. There are some boreholes pumping directly to Reservoir 2 – these augment the water supply.
	Raw water pipeline	83.3	No problems reported on this fairly new uPVC line.
	Inlet works	75.0	A coagulation / flocculation process was added to the works about 18 months ago and everything is still in very good condition.
4	**Chemical dosing and storage**		
	Flocculant	66.6	New installation. Some room for improvement includes providing bund walls for the area where flow bins are stored and adding an emergency shower / wash area.
	Alkaline	100.0	New installation – dosing equipment in very good condition. 25 L Sodium Hydroxide drums are neatly stored.
	Chlorine	80.0	Even though it is a new installation the corrosive nature of Sodium Hypochlorite increases the frequency of maintenance required.
5	**Flocculation**	62.5	Good floc formation. Pipework transferring flocculated water to settling tank (which is an old, converted reservoir) however causes floc to break up again.
6	**Phase Separation**		
	Clarification (settling)	25.0	Even though the old reservoir is providing an environment for settling to occur, more retrofitting would be required to really operate this unit as a settling tank - consider changing pipework to distribute inlet evenly, equipment for more frequent sludge removal. removal / replacement of roof, etc.
	Sand filtration	95.8	5x Newly added filters. Media in the 2 old / original filters was also recently replaced.
7	**Disinfection**		
	Clear water well	100.0	Water is pumped directly into the reservoir. The reservoir provides sufficient contact time for disinfection to occur.
8	**High lift pumpstation**	93.7	Water is pumped through filters into reservoir.
9	**Sludge treatment**		
	Thickening in sludge dams	25.0	Sludge allowed to enter Raw Water Storage dam.
10	**Bulk pipeline from plant to command reservoir**	100.0	Command reservoir is located on the WTW site
11	**Command reservoir**	100.0	Reservoir in a good condition.
12	**Booster pumpstation**	na	System is gravity fed.
	Total	**72%**	

High risk areas OR Key Hardware Risks/ Defects

1. Safety (signage and equipment, incl. shower) on site needs to be addressed.
2. Facilities for Process Controllers (bathrooms, etc) to be provided.
3. Change outlet pipework from flocculation chamber to eliminate floc break-up.
4. Even though the old reservoir is providing an environment for settling to occur, more retrofitting would be required to really operate this unit as a settling tank.
5. Roof needs to be replaced on Reservoir 2, which acts as mixing tank for water from Boreholes and Conventional Works before filtration.

VROOM Refurbishment Cost Estimate

Civil Works	R691,900	65%
Mechanical Works	R220,000	21%
Electrical Works (Incl C&I)	R149,600	14%
Total VROOM Cost	**R1,061,500**	**100%**
R million / MLD		**0.42**

Regulatory Impression

Even though the Kannaland Local Municipality is experiencing some challenges as it relates to leadership and management, it is encouraging to see the collaboration between the municipal officials and external staff tasked with assisting them. The fairly recent upgrades to the Ladismith WTW are evident of the team's commitment to enhancing service delivery, an attitude that is sure to serve them well on their Blue Drop journey. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for chemical but not for micro. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	92.31%
Chemical Compliance	>99.90%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

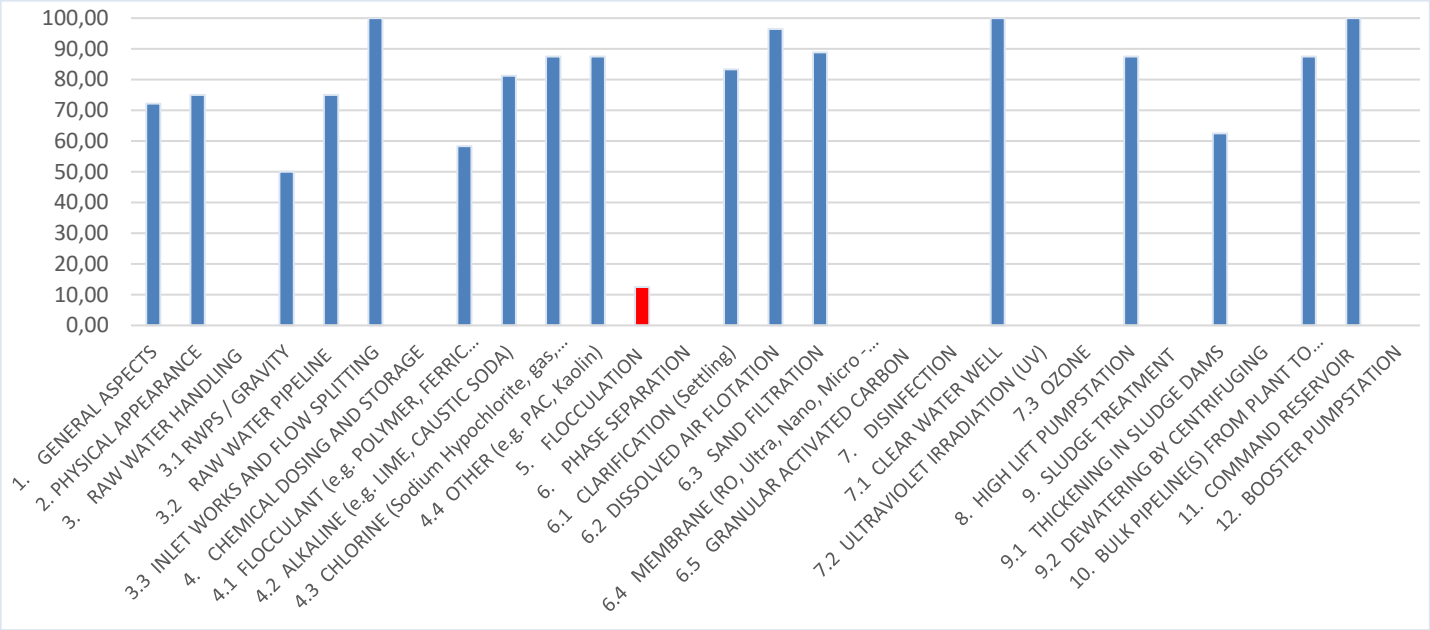
13.12 Knysna Local Municipality

The Knysna water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

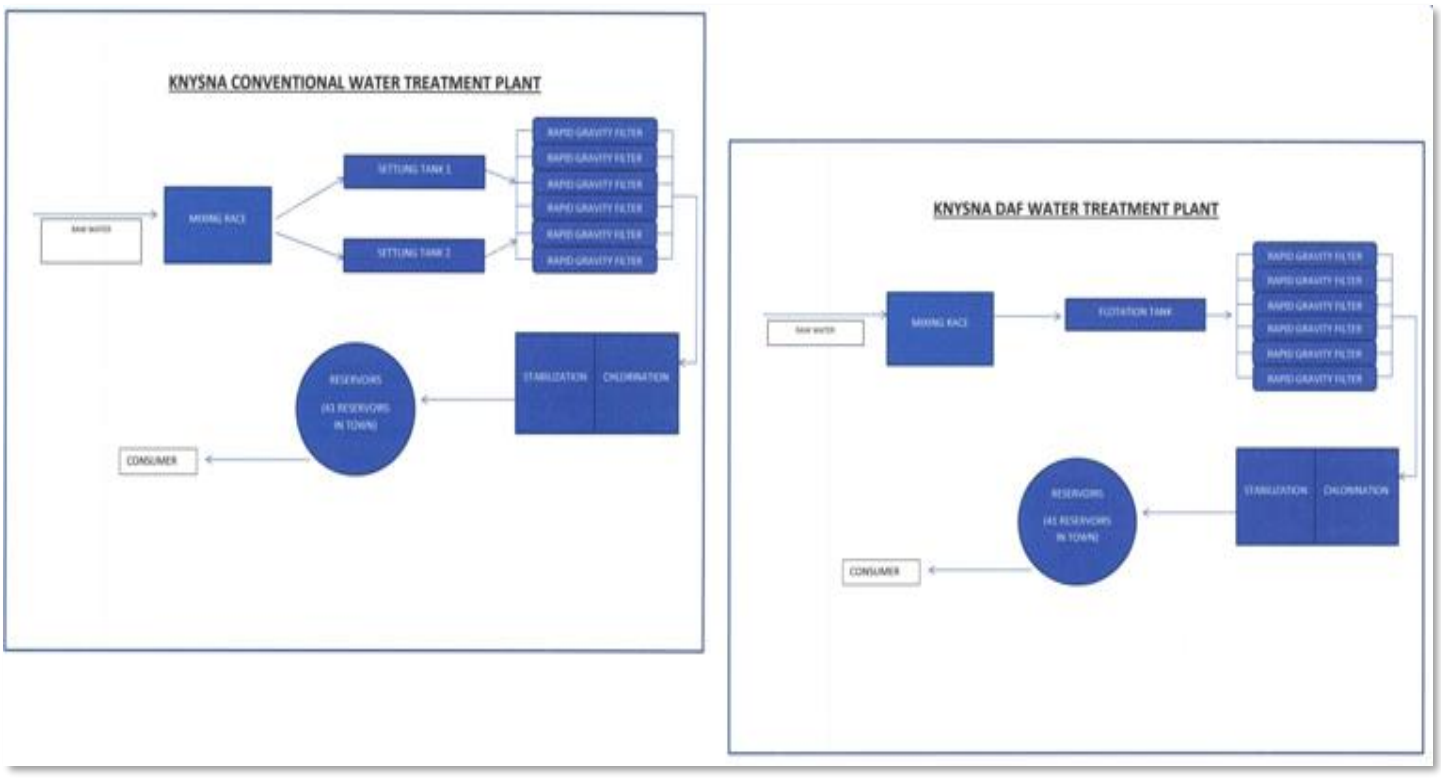
Knysna TSA Score: 79%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	72.2	The works is well-equipped and most of the aspects pertaining to good process control practices are in place. A fully equipped laboratory is on site and Process Controllers have access to their own equipment in control room. Process Controllers do however need a dedicated turbidity meter for their use as this parameter is currently only done by the lab
2	**Physical appearance of plant**	75.0	Buildings and offices are in a tidy condition and safety signage is very comprehensive. More effort is however required on groundskeeping.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	50.0	Even though pumps are in a good condition, servicing and refurbishment would prolong their lifespan.
	Raw water pipeline	75.0	A second line is being installed parallel to existing one as the original line is quite old.
	Inlet works	100.0	No flow splitting structure. Pipework allows flow to be directed to conventional works or DAF plant. Separate flowmeters allow flow to be balanced between the two sections of the Works.
4	**Chemical dosing and storage**		
	Flocculant	58.3	Dosing pumps in good working order. Some of the pumps however need to be serviced. The safety shower is located at the main control building, not close to chemical dosing room. A basin is available in the dosing room for emergency washing of face / eyes should splashing occur.
	Alkaline	81.2	Lime is no longer in use – it was replaced by soda ash dosing which is all in order. The chemical dosing room should however be tidied up and equipment that is no longer in use properly "mothballed".
	Chlorine	87.5	Gas dosing equipment currently on standby - 2 x "Klorman 8000" units were installed. These were however installed in the chlorine control / instrumentation room, an area without any ventilation. The chlorine fumes were quite intense and, even though masks can be used to enter the room, assisted ventilation needs to be installed.
	Other (PAC, Kaolin, etc.)	87.5	Bentonite feeders are in place. These are typically only used in November / December to aid flocculation.
5	**Flocculation**	12.5	Scum covers the largest part of the surface of the DAF Plant channel while the channel for the conventional works has been covered by boards. The boards were installed to prevent foreign material being thrown into the channels (incident during protect action years ago). The risk of the situation reoccurring needs to be investigated and a decision made as to the need for these coverings. A scum removal device / method of breaking up the scum in the DAF channel should also be investigated.
6	**Phase Separation**		
	Clarification (settling)	83.3	Desludging taking place every 4 hours. The valves are in the process of being repaired. Some of the reinforcing steelwork was visible on the walkway - this should be repaired.
	Dissolve air floatation (DAF)	96.4	In good working condition with continuous scum removal. Pumps and blowers in a good condition.
	Sand filtration	88.8	Each filter is backwashed twice a day. A backwash was performed during the sire audit - process performed very well. The filters were serviced with media and nozzles replaced toward the end of 2021.
7	**Disinfection**		
	Clear water well	100.0	In a very good condition. Sufficient contact time is provided.
8	**High lift pumpstation**	87.5	Gravity feed in reservoir.
9	**Sludge treatment**		
	Thickening in sludge dams	62.5	Sludge dams needs to be cleaned.
10	**Bulk pipeline from plant to command reservoir**	87.5	Minor repairs and maintenance required only.
11	**Command reservoir**	100.0	In good order.
	Total	**79%**	

High risk areas OR Key Hardware Risks/ Defects

1. Chemical dosing room to be tidied up and pumps serviced.
2. Scum on DAF floc channels to be dealt with.
3. Ventilation to be added to chlorine installation.
4. Concrete repairs at the settling tanks to be done before infrastructure deteriorates too much.
5. General housekeeping needs to be improved on.

VROOM Refurbishment Cost Estimate

Civil Works	R3,558,500	42%
Mechanical Works	R2,933,700	35%
Electrical Works (Incl C&I)	R1,929,400	23%
Total VROOM Cost	**R8,421,600**	**100%**
R million / MLD		**0.39**

Regulatory Impression

The team at Knysna showed a real commitment to the Blue Drop process. In terms of the condition of the Knysna WTW though, there seems to be an overall complacency with the way things are instead of a drive to keep on improving. The plant is however fully functional, and no major deficiencies were observed.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	98.44%
Chemical Compliance	91.97%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



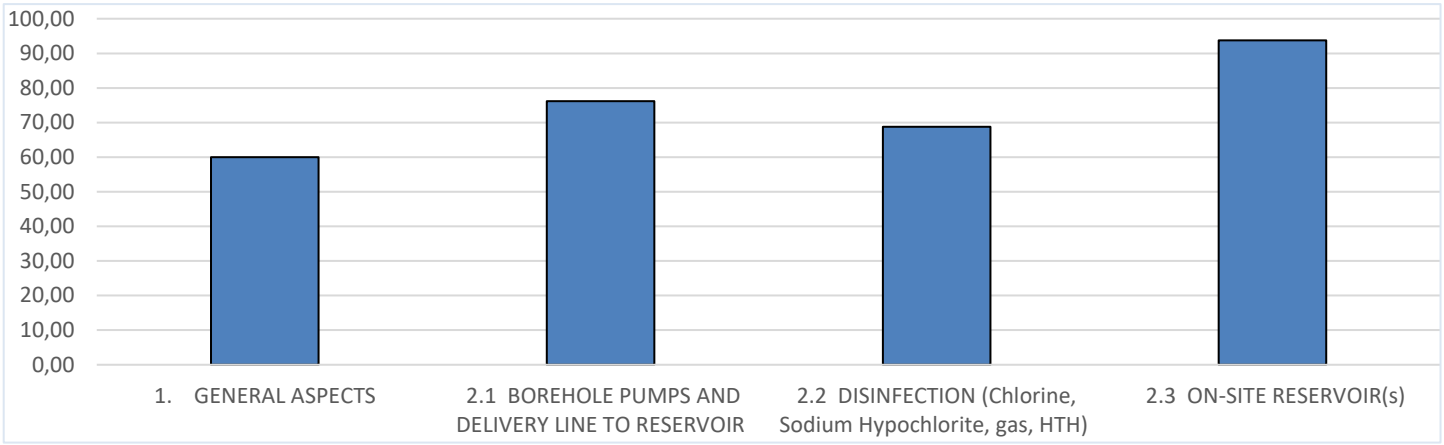

13.13 Laingsburg Local Municipality

The Laingsburg water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

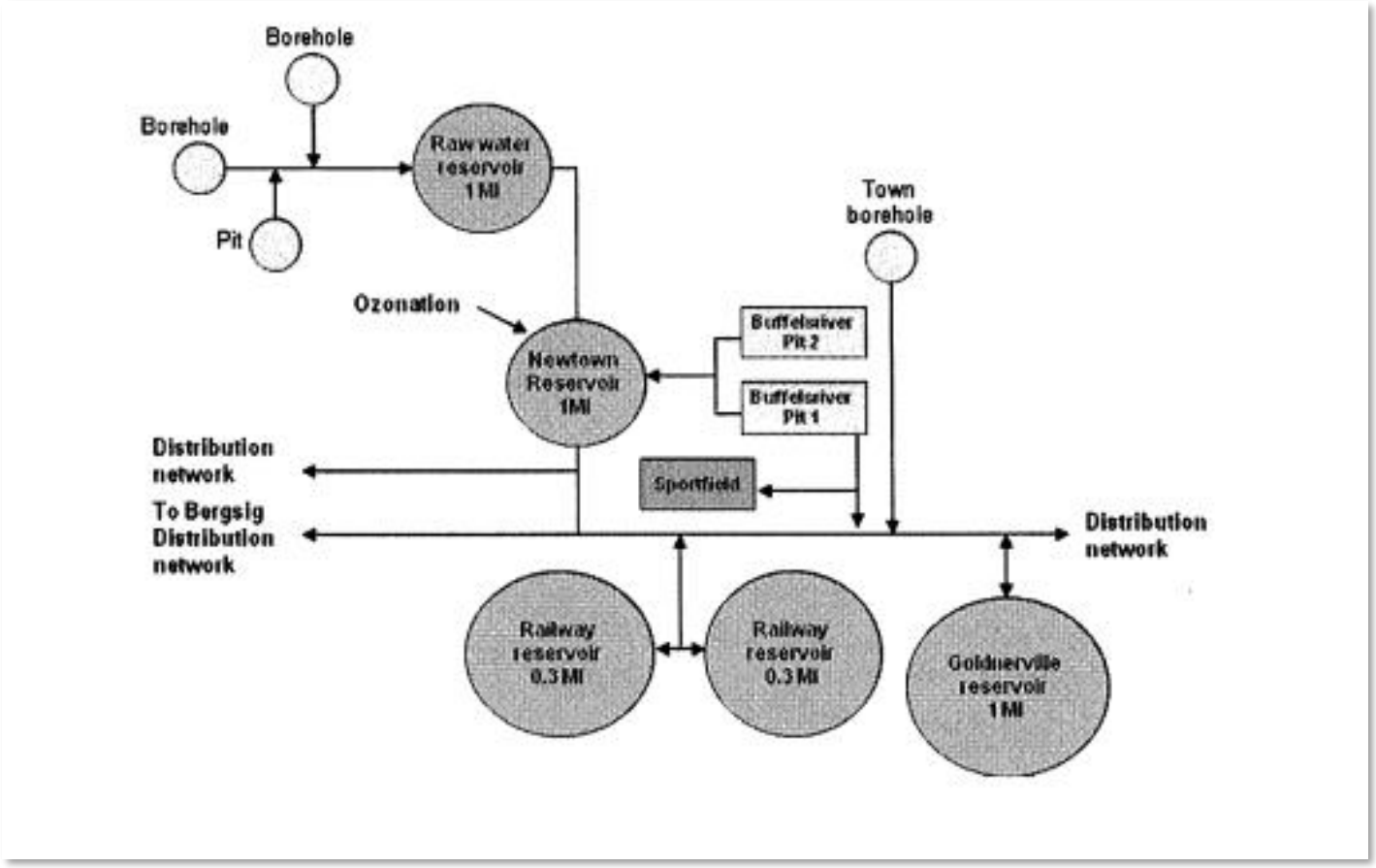
Laingsburg Main Reservoir TSA Score: 74%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	60.0	Flow, pH & Residual Chlorine recorded as part of operational monitoring – this list should be expanded on to meet SANS 241:2015: Table 1 requirements.
2	**Technical**		
2.1	Borehole pumps and delivery line to reservoir	76.1	Some of the boreholes have never been equipped – rectifying this will provide additional capacity. Even though some sections of the pipe are quite old, no problems were reported. Air-valves in good working order.
2.2	Disinfection	68.7	Chlorine gas used. Duty & Standby cylinders on site; only one chlorinator though. Chlorine scale is out of order. Even though safety equipment and signage are old, basic safety requirements are met
2.3	On-site reservoir	93.7	Fence repairs are an ongoing task. The last section of the access road should be upgraded, especially since chlorine gas needs to be transported to site
	Total	**74%**	

High risk areas OR Key Hardware Risks/ Defects

1. Equip all boreholes. Include level monitoring equipment to allow management of these resources.
2. Chlorine dosing facility to be upgraded to allow for monitoring of weight as well as automatic change-over when duty cylinder is empty.

VROOM Refurbishment Cost Estimate

Civil Works	R1,437,700	62%
Mechanical Works	R482,900	21%
Electrical Works (Incl C&I)	R398,200	17%
Total VROOM Cost	**R2,318,800**	**100%**
R million / MLD		**1.55**

Regulatory Impression

The Laingsburg system is a basic system that requires minimal operational input. This seems to have led to a situation where some of the plans, documents and systems that form part of managing a system according to Blue Drop principles have fallen to the wayside. That being said, water quality is being monitored and has a poor to good level of compliance.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for chemical but not for micro. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	95.65%
Chemical Compliance	97.78%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



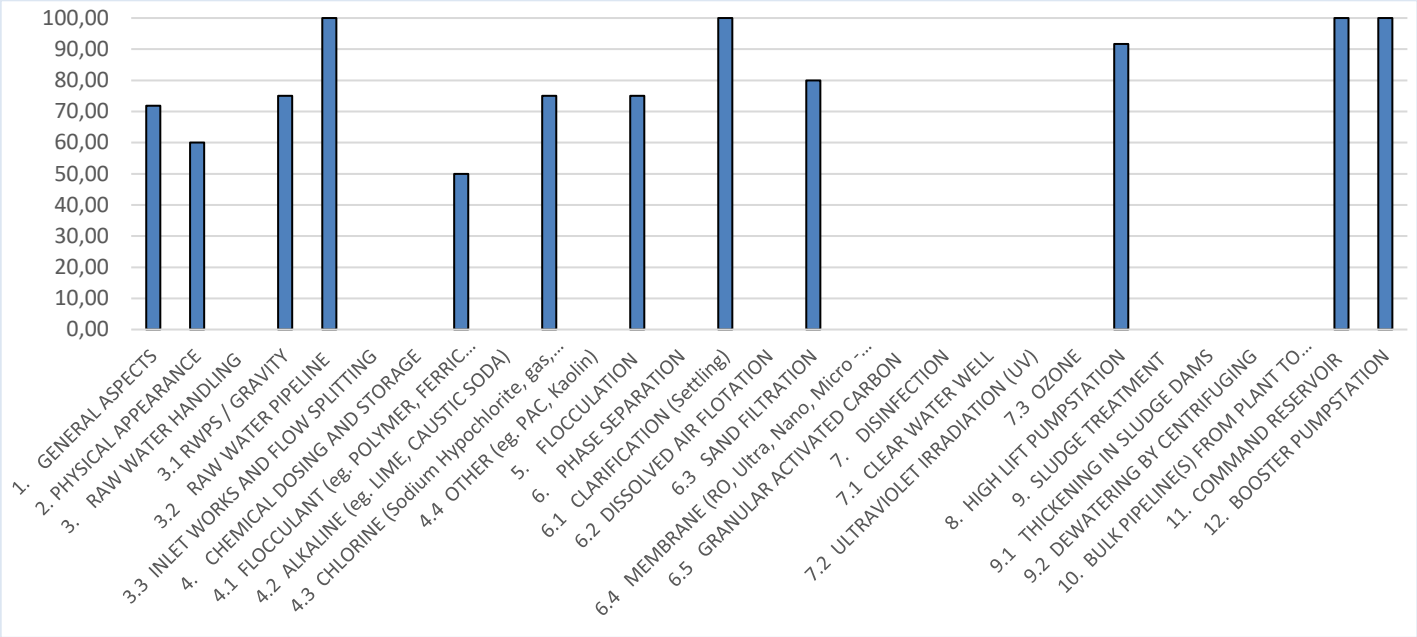

13.14 Langeberg Local Municipality

The Riversdale water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

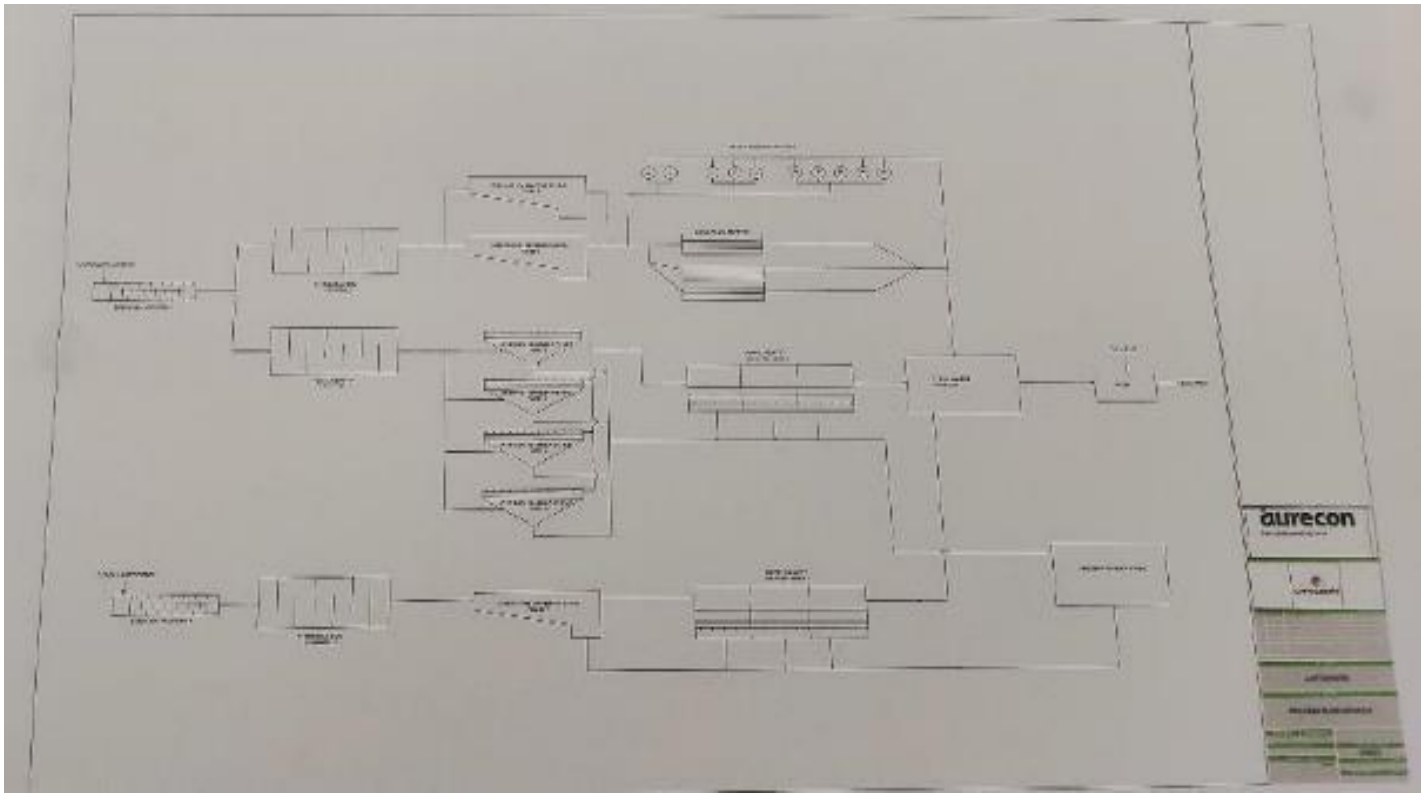
Ashton TSA Score: 70%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	71.8	Class B plant, logbooks in place, process monitoring equipment in good condition and calibrated. IMP not in place
2	**Physical appearance of plant**	60.0	Plant signposted, fenced, and gated. Access control and lighting required. Housekeeping and hygiene can improve. No dedicated kitchen for plant personnel.
3	**Raw water handling**		6 x duty Raw water abstraction from Breede River with one standby pump, investigate pump size & pipe capacity to match the water supply demand during peak use periods, all pumps and Flow meter in good condition. Flow recorded regularly per shift.
3.1	Raw water pumpstation / gravity feed	75.0	
3.2.	Raw water pipeline	100.0	
3.3.	Inlet works and flow splitting	na	The effectiveness of flash mixing and chemical dosing could not be assessed due to loadshedding.
4	**Chemical dosing and storage**		
4.1.	Flocculant	50.0	Spillage control of Ultra Floc lacking. Dosing pumps in good condition. Storage volume adequate. Emergency shower needs to be installed.
4.3.	**Chlorine**	75.0	Rotameters operational. 100% Standby for chlorine dosing pumps. Safety signage and some equipment available.2x 70kg cylinders available in storage. Minimisation of accidental exposure to chlorine needs to be investigated.
5	**Flocculation**	75.0	Floc formation could not be assessed. Good condition of both flocculation units.
6	**Phase Separation**		
6.1	Clarification	100.0	Desludging of the units conducted regularly. Weir plates in good condition.
6.3.	Sand Filtration	80.0	Two duty backwash pumps and 1 blower-no standby. All filters in good condition. Handrails required for structures at ground level.
7	**Disinfection**	0.0	Inadequate contact time. Chlorine is dosed after the onsite reservoir. Free chlorine not measured at the correct place.
9	**Sludge Treatment**	0.0	Sludge dam not well maintained. Recycling pumps clog frequently.
10	**Bulk pipeline from plant to command reservoir**	na	Pipeline underground.
11	**Command reservoir**	100.0	Onsite reservoir and in good condition. Telemetry in place and operational.
12	**Booster Pumpstation**	100.0	Two pumps in working condition. MCC in working condition and easily accessible.
	Total	**70%**	

High risk areas OR Key Hardware Risks/ Defects

1. Access control to the Storage dam
2. Safety signage overall in the plant, hand rails
3. Dosing of chlorine
4. Absence of security and inadequate lighting at night

VROOM Refurbishment Cost Estimate

Civil Works	R1,755,600	41%
Mechanical Works	R1,743,500	41%
Electrical Works (Incl C&I)	R787,600	18%
Total VROOM Cost	**R4,286,700**	**100%**
R million / MLD		**0.36**

Regulatory Impression

The Ashton water treatment system is only served by the internal electrical maintenance team which lacks in capacity to adequately execute the required maintenance work. The problem is further exacerbated by the lack of maintenance planning/scheduling created by the absence of maintenance engineers. Although the process controllers mostly comply with Regulation 2834, the WSI is encouraged to provide further training to the team to strengthen operational competency and improve compliance to draft Reg 813. While the Incident Management Protocol is in place, the risk register is lacking despite the WSI having excellent template which is regrettably used merely as a maintenance and repairs logbook. The team should adopt a risk-based approach by developing and implementing a water safety plan for Ashton system. The WSI is commended for subjecting the system to an annual condition assessment, however, the risks identified must be incorporated in the water safety planning process. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	92.19%
Chemical Compliance	95.85%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



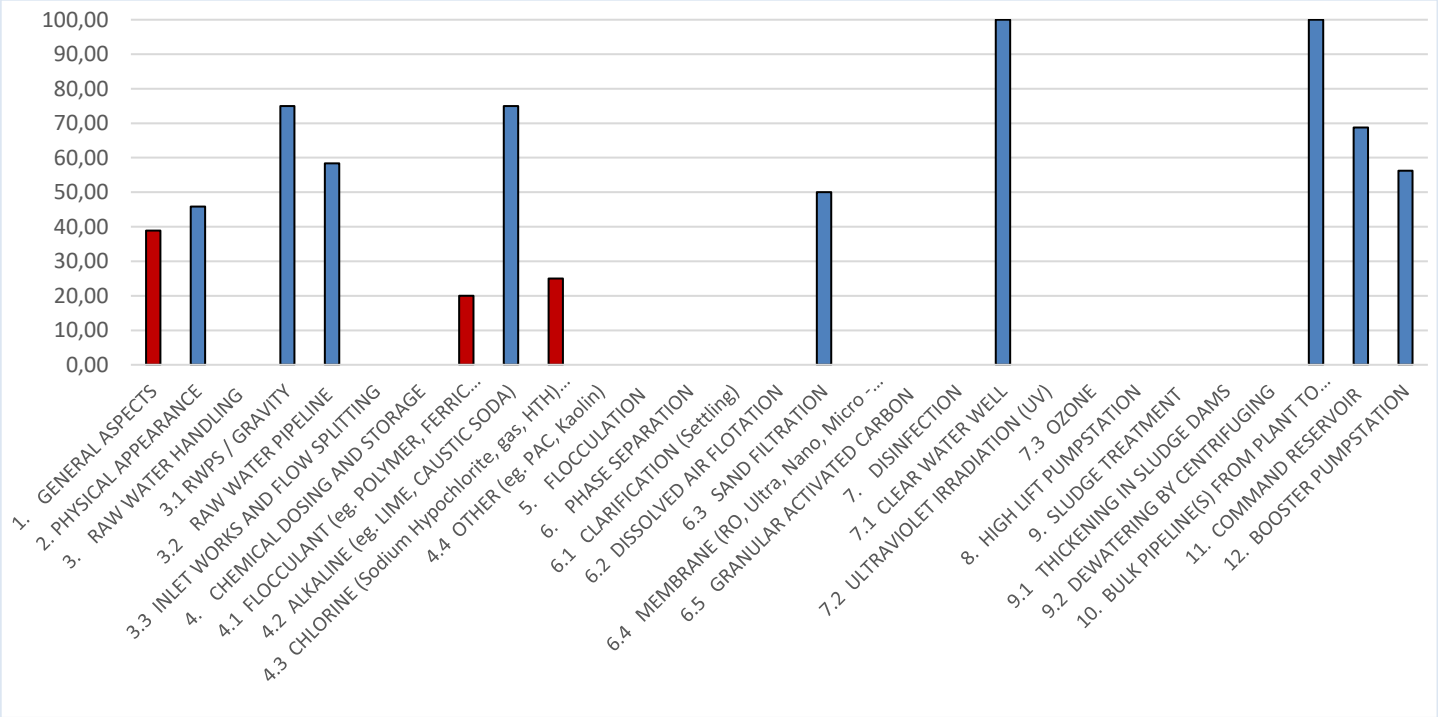
13.15 Matzikama Local Municipality

The Vredendal water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

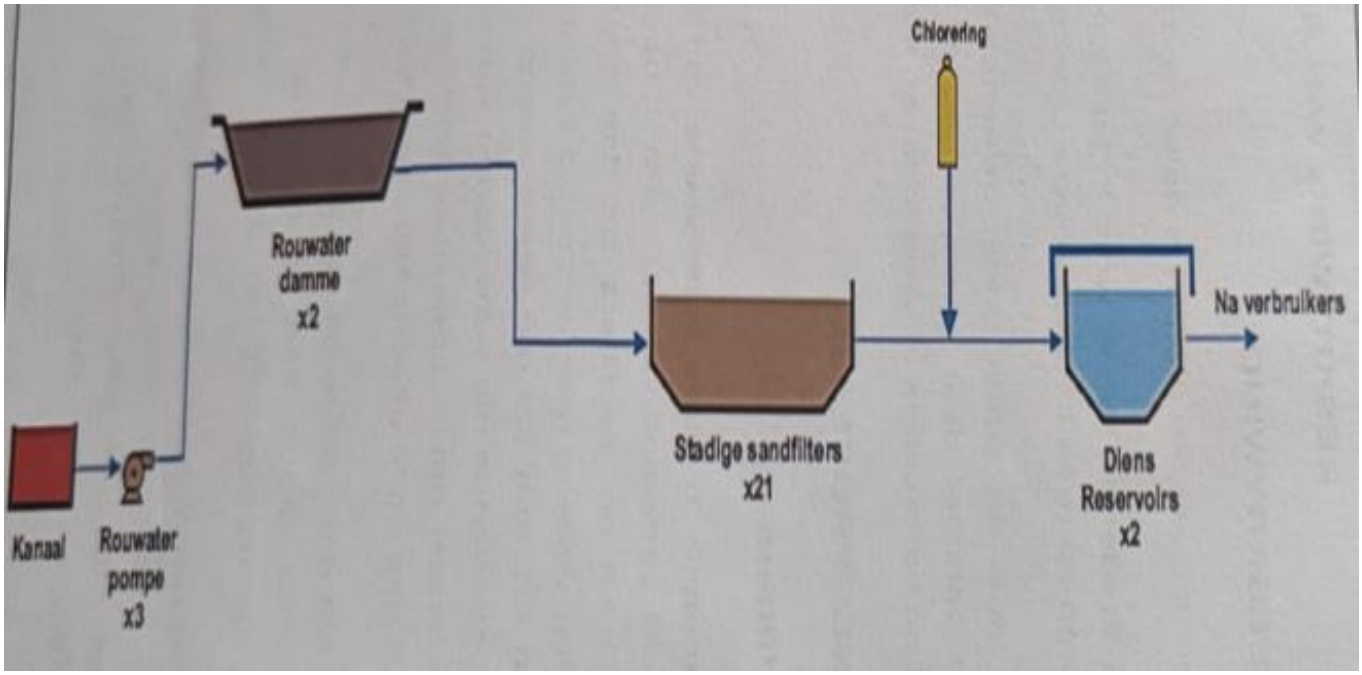
Vredendal TSA Score: 50%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	38.8	Class D plant, operational logbook in place with limited daily entries. Maintenance & repairs logbook not available. O&M manual available. IMPs not available. No process flow diagram displayed, only available in O&M manual. Analytical equipment functional and calibrated.
2	**Physical appearance of plant**	45.8	No entrance sign. Site fully fenced, but portions of fence stolen. Site generally neat, weeds growing in some places. No dedicated facilities available for employees. Ablution facilities dirty. Safety signs in place.
3	**Raw water handling**		
3.1	Raw water pumpstation/gravity fed	75.0	Screens in place, cleaned regularly. 3 pumps, 2 functional, 1 being repaired. Standby available.
3.2	Raw water pipeline	58.3	Corrosion issues on pipeline. Pipeline too small, needs to be upgraded. Raw water flow meter functional, not calibrated. Regular recording of flow rates.
4	**Chemical dosing and storage**		
4.1	Flocculant (polymer, ferric chloride, alum)	20.0	Flocculant dosed due to deteriorating water quality. Dosing pump functional. No standby. No proper chemicals storage area. Area not bunded. No emergency shower available.
4.2	Alkaline (Lime)	75.0	Lime dosed by hand into reservoir. Lime bags stored outside on the ground, no covered area. Dust masks available. Lime storage sufficient.
4.3	Chlorine (HTH)	25.0	Chlorine gas flowing, no standby dosing equipment. Alarm and detector available, but not working. Scale available, not working. Chlorine storage < 30 days.
6	**Phase separation**		
6.2	Sand filtration	50.0	Slow sand filtration. 8 out of 21 filters not functional. Weeds growing between filters. Flow not evenly distributed. No handrails, potential hazard. Valves need replacement/ refurbishment. Civils need refurbishment.
7	**Disinfection**	100.0	>30minutes contact time. Free chlorine measured.
8	**High lift pumpstation**		Water gravitates to command reservoirs. No high lift pumps.
10	**Bulk pipeline from plant to command reservoir**	100.0	Pipeline underground. No leaks reported.
11	**Command reservoir**	68.7	Covered concrete command reservoirs, within plant perimeter. Not secure. Fence stolen/vandalised. Level detection on SCADA. Final flow meter in place, not calibrated.
12	**Booster pumpstation**	56.2	Two booster pump stations. Station No. 1: duty/standby. Station No.2: only duty, standby pump not in place. Pumps functional. Pump building outside plant perimeter. Not fenced, not secure.
	Total	**50%**	

High risk areas OR Key Hardware Risks/ Defects

1. Deteriorating water quality from Clanwilliam Dam and Canal necessitates proper evaluation of treatment train to include flocculation, clarification and potentially DAF for algae removal.
2. All chemical handling, storage and dosing need addressing and designed with appropriate facilities.
3. Slow sand filters need to be refurbished and recommissioned since 8/21 were not operational.
4. Theft and vandalism of fencing a serious risk - security must be prioritised.

VROOM Refurbishment Cost Estimate

Civil Works	R6,072,000	61%
Mechanical Works	R3,036,000	30%
Electrical Works (Incl C&I)	R930,600	9%
Total VROOM Cost	**R10,038,600**	**100%**
R million / MLD		**1.23**

Regulatory Impression

The Vredendal water treatment plant is relatively old. The infrastructure is generally not in a good condition and significant maintenance and refurbishment work is required. The raw water pipeline is leaking due to corrosion and needs to be repaired and upgraded for additional capacity. Buildings need to be erected for the storage of chemicals, since chemicals are currently stored outside. There are currently no designated lunch facilities for the process controllers.

The site is generally neat and well kept, although weeds are growing between the slow sand filters. Only 8 out of 21 slow sand filters are functional, which is seriously affecting the available treatment capacity of the plant. The filter valves need to be refurbished or replaced and civil refurbishment work is required. Handrails should be installed around the slow sand filters. The process controller on site is very dedicated and passionate and the overall impression is that management is motivated to improve the situation. The WSA faces a major treatment challenge, due to deteriorating raw water quality in the Clanwilliam dam. The current process is no longer appropriate and coagulation/flocculation, clarification (alternatively dissolved air flotation) and back-washable filters are required as a minimum to treat raw water containing algae, organic material, and suspended solids. For this reason, the WSA should urgently undertake a full process audit and to implement the findings and recommendations. The WSA is encouraged to implement the recommendations of the WaSP.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	95.67%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

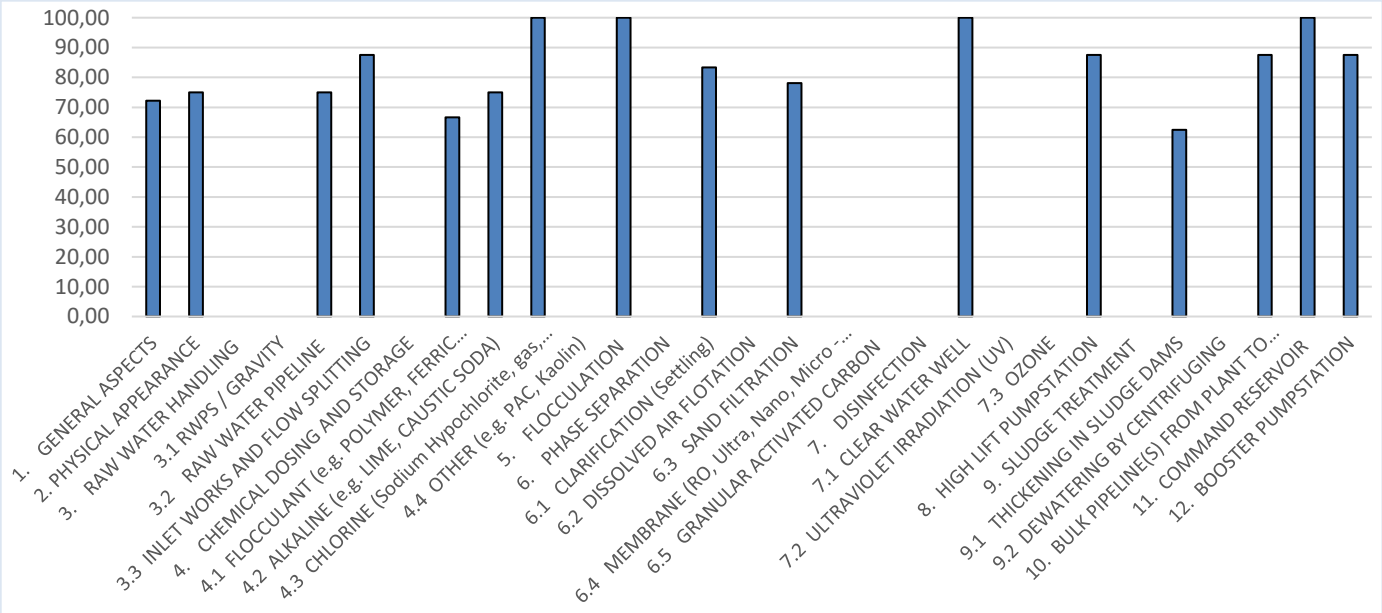
13.16 Mossel Bay Local Municipality

The Kleinbrak water treatment works, one of three works feeding into the Mosselbay water supply system, was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

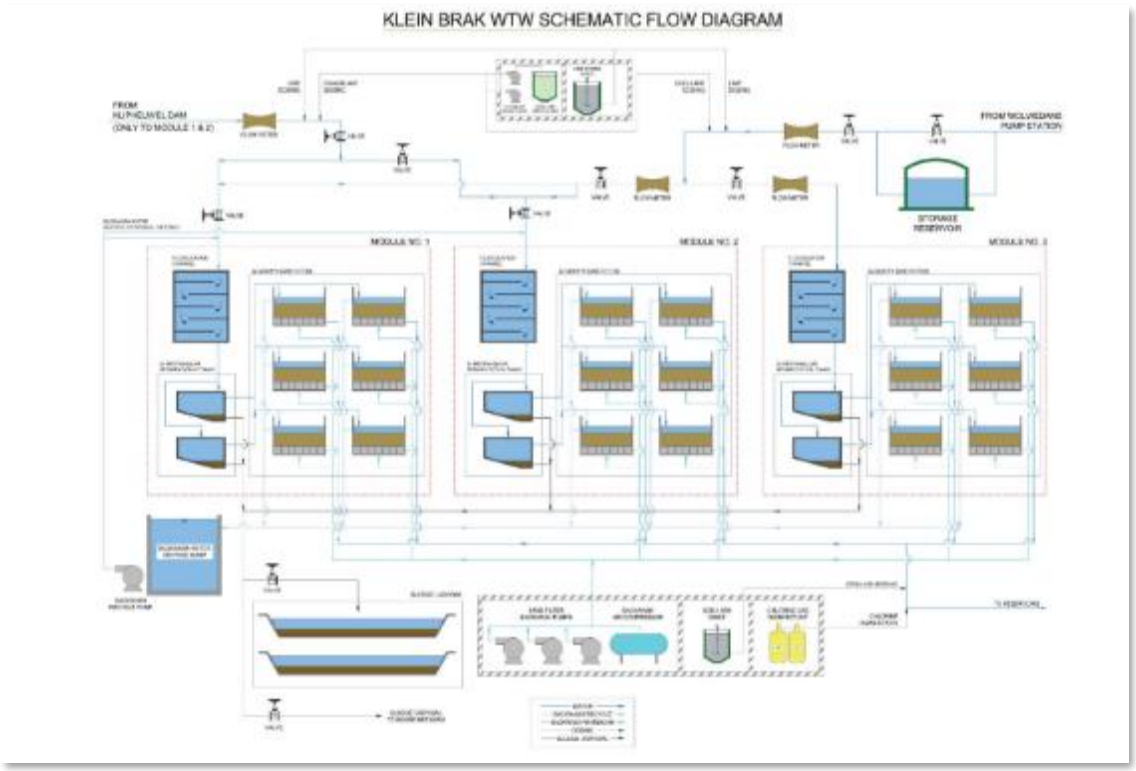
Kleinbrak TSA Score: 80%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	72.2	Most of the key aspects required for operational control of this type of works are in place. It is also commendable to see some modern upgrades, like inline turbidity measurement on each of the filters, installed
2	**Physical appearance of plant**	75.0	Minor repairs to buildings and some painting required. Overall however, a well-kept works
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	0.0	Gravity feed from Wolwedans Dam. Pumpstation at Klipheuwel is controlled by DWS. (WSA only checks and reports faults to DWS). DWS's response time is reason for concern
	Raw water pipeline	75.0	Occasional leaks do occur. Maintenance is however DWS's responsibility.
	Inlet works	87.5	No flow splitting structure installed. Pipework allows flow to be directed to the different modules on site. Flocculant dosing taking place into the pipework where static mixers are installed. Visible floc in the channels indicate that sufficient flash mixing does occur
4	**Chemical dosing and storage**		
	Flocculant	66.6	The dosing room should be upgraded to ensure the slippery floor is dealt with. A second safety shower/ emergency eye wash should also be provided closer to the dosing pumps.
	Alkaline	75.0	Lime feeders are in a functional condition but would benefit from refurbishment as to prolong its lifespan.
	Chlorine	100.0	Separate controllers/ injectors feeding different areas of the plant, i.e., no direct standby. This is however mitigated by the fact that not all of the Modules are functional at the same time and that pipework can therefore be changed to allow an unused part of the system to feed into the required line should a failure occur.
5	**Flocculation**	100.0	Flocculation channels are in a good condition.
6	**Phase Separation**		
	Clarification (settling)	83.3	Good clarification with minimal floc carry-over. Desludging done daily. Only minor repairs for the settler coverings (roofs) required.
	Sand filtration	78.1	Backwashing done every second day. Some of the concrete aggregate in the tanks is starting to show. There are also areas on the walkways where the concrete reinforcing is visible - minor concrete repair work required. The installation of a second blower is advisable
7	**Disinfection**		
	Clear water well	100.0	In a good condition with sufficient retention time
8	**High lift pumpstation**	87.5	In a good overall condition
9	**Sludge treatment**		
	Thickening in sludge dams	62.5	Sludge dams are overgrown with reeds and needs to be cleaned out
10	**Bulk pipeline from plant to command reservoir**	87.5	Even though there are no major concerns, the age of the pipeline needs to be noted and associated maintenance should be planned for
11	**Command reservoir**	100.0	In a good condition
12	**Booster pumpstation**	87.5	The booster pumpstation visited had a 2 x Duty + 1 x Standby arrangement. There were signs of recent maintenance that was performed
	Total	**80%**	

High risk areas OR Key Hardware Risks/ Defects

1. Dosing room floor to be covered with non-slip option.
2. Emergency eye wash facilities to be provided in strategic areas.
3. Lime feeder system needs to be refurbished.
4. Sludge lagoons to be cleaned out.
5. Provide for a second blower to be installed.

VROOM Refurbishment Cost Estimate

Civil Works	R1,271,600	24%
Mechanical Works	R2,467,300	46%
Electrical Works (Incl C&I)	R1,603,800	30%
Total VROOM Cost	**R5,342,700**	**100%**
R million / MLD		**0.12**

Regulatory Impression

Mosselbay Municipality is showing great commitment to ensuring the supply of high-quality potable water to consumers on a sustainable and consistent basis. The Regulator wishes to note and commend the WSA for having an updated Water Safety Plan in place and for the fact that a Plant & Process Audit was done in 2018, even when there were no official Blue Drop Audits happening at that point in time. When comparing the information contained in that Plant & Process Audit to the current condition of the Kleinbrak WTW, a slight deterioration is noted – this can however be rectified by minor repairs and a renewed effort to "go for gold".

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	99.72%
Chemical Compliance	95.09%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



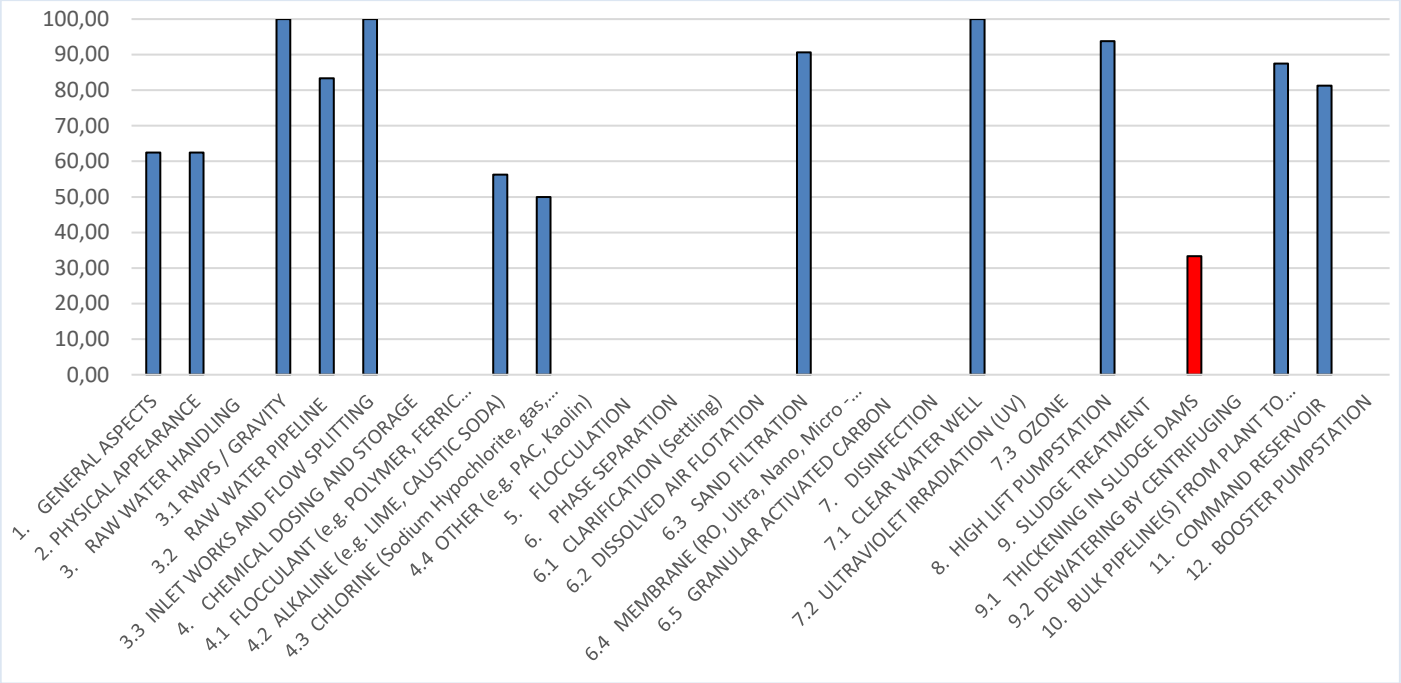

13.17 Oudtshoorn Local Municipality

The Dysselsdorp water supply/treatment system (Klein Karoo Rural Water Supply Scheme) was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

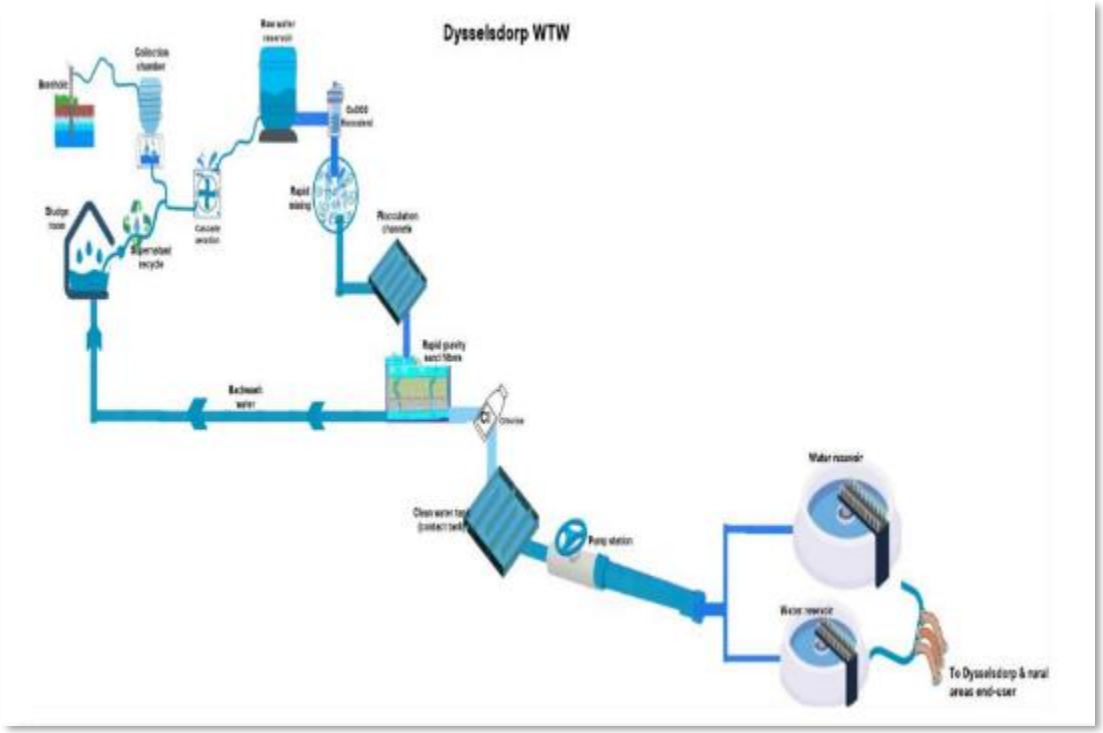
Dysselsdorp TSA Score: 73%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	62.5	Most of the documents and systems that need to be in place to efficiently operate a water treatment works are in place. Turbidity monitoring is however of concern – the plant receives only groundwater, but the in-line meters are out of order and the benchtop meter does not display turbidity values in decimals. The on-site testing of Fe & Mn, SO_4 and parameters linked to corrosivity of water is commendable.
2	**Physical appearance of plant**	62.5	The plant is in a fair state and only a few minor repairs are required.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	100.0	8 x Boreholes are available. The plant can produce sufficient volumes of water with only 5 in operation.
	Raw water pipeline	83.3	The wellfield ground level is located higher above sea level than the Works. The boreholes are however quite deep. Pressure control valves are installed and needs to be maintained.
	Inlet works	100.0	A cascade is installed at Inlet Works. Aeration provides adequate oxidation for Iron & Manganese removal.
4	**Chemical dosing and storage**		
	Alkaline	56.5	Repairs to the lime feeder vibrator is required. It is furthermore worth noting that only 1 feeder is installed.
	Chlorine	50.0	Dosing system in good working order. Civil works in chlorine dosing facility has been upgraded, but dosing equipment not yet. This is planned as a follow-up phase and will include all equipment required to make the installation compliant with chlorine safety standards.
5	**Flocculation**	na	No flocculation in place.
6	**Phase Separation**		
	Sand filtration	90.3	Newly upgraded pumps and blowers. Backwashing is controlled by a PLC.
7	**Disinfection**		
	Clear water well	100.0	In a very good condition.
8	**High lift pumpstation**	93.5	This part of the plant was also recently upgraded and is in a very good condition.
9	**Sludge treatment**		
	Thickening in sludge dams	33.3	Desludging takes place to 2 x unlined sludge ponds. One of these was empty and the other in a fair condition. It is however recommended that the ponds be lined.
10	**Bulk pipeline from plant to command reservoir**	87.0	In a good condition with no issues reported
11	**Command reservoir**	81.5	There are two reservoirs. The 1st one has no fencing, only a cage around the access ladder to prevent unauthorised access. The fencing around the 2nd reservoir was stolen
12	**Booster pumpstation**	na	Gravity feed only.
	Total	**73%**	

High risk areas OR Key Hardware Risks/ Defects

1. Inline monitoring, specifically for turbidity, is to be repaired.
2. A second lime feeder should be installed.
3. Chlorine equipment is to be replaced – this is already part of the WSA's planning.
4. The reservoirs should be secure to prevent unauthorised access.
5. Minor building repairs, such as painting, could be considered.

VROOM Refurbishment Cost Estimate

Civil Works	R993,300	33%
Mechanical Works	R1,356,300	45%
Electrical Works (Incl C&I)	R676,500	22%
Total VROOM Cost	**R3,026,100**	**100%**
R million / MLD		**0.50**

Regulatory Impression

The Oudtshoorn team seems to truly embrace the principles that form the basis of Blue Drop Certification. Even though there are still numerous challenges they need to deal with, their commitment to continuous improvement, as evident from their recent investment in the upgrading of the Dysselsdorp WTW, is commendable.

The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility. The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	96.04%
Chemical Compliance	88.25%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%





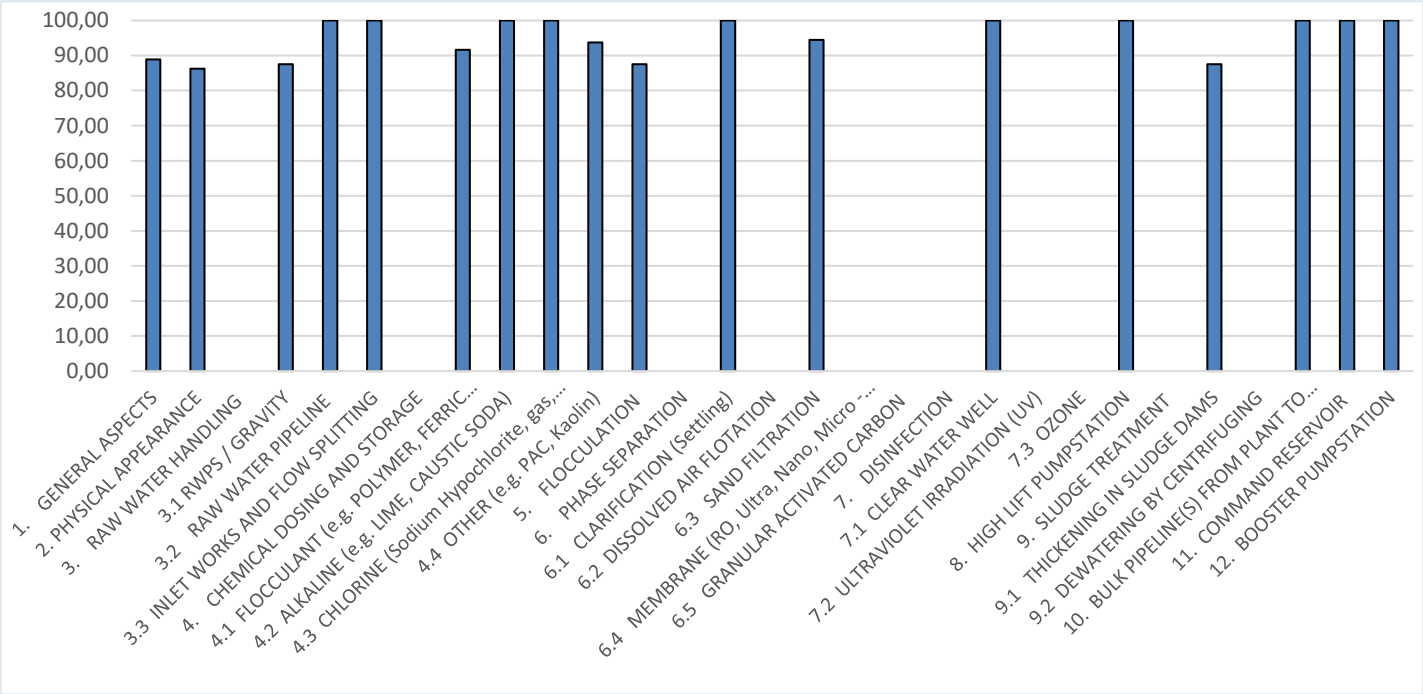

13.18 Overstrand Local Municipality

The Preekstoel water supply/treatment system is owned by the Overstand LM and operated by a private company, Veolia. This plant was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

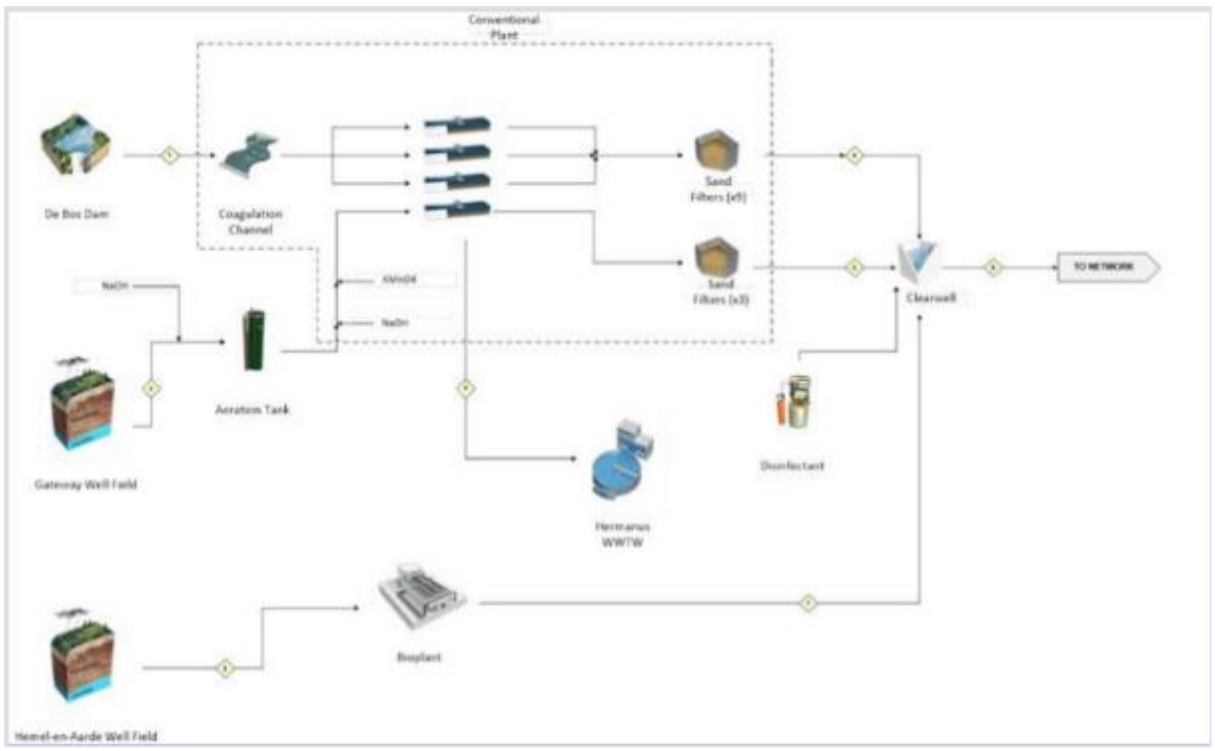
Preekstoel WTW TSA Score: 94%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	88.9	Class B plant, O&M manual, and logbooks in place. Emergency contact numbers displayed. Process flow diagram only on the SCADA system, not a hard copy displayed. Monitoring equipment on site, proof of calibration. Electricity meter not accessible by process staff. E-software on site to keep track on maintenance required and done.
2	**Physical appearance of plant**	86.2	Fenced, entrance and neatly signposted. Security can be improved at the gate, although it is noted that load shedding impacts on the electrically operated gate. Facilities for workers to eat and prepare food is lacking. 90% workplace satisfaction reported. No OHS contraventions seen or reported
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	87.5	Raw water from boreholes in fair condition, some corroded valves observed. Raw water pipeline in good condition and well maintained. Abstraction volumes recorded.
	Raw water pipeline	100.0	
	Inlet works	100.0	Chemicals clearly being dosed at flash mixer, good turbulence. Good facility.
4	**Chemical dosing and storage**		
	Flocculant	91.6	Alum dosing with Sodium Aluminate, well maintained. 100% standby on dosing units and well bunded for Alum but not the SA section. Sufficient storage capacity, and emergency wash in place.
	Alkaline	100.0	Caustic soda dosing. Good housekeeping with operational units, 100% standby and caustic delivery every 1.5 months.
	Chlorine	100.0	Chlorine gas dosing with standby unit and all operational. Sufficient storage space with and emergency wash area, PPE, and safety signage in place. Delivery is every 1.5 months.
	Potassium Permanganate	91.6	Potassium Permanganate powder, mixed onsite - replenished every 6 months. Dosed at sedimentation tank for oxidation process. No dedicated storage area for KMnO4, currently stored in delivery bay a distance from the mixing tanks.
5	**Flocculation**	87.5	Floc formation visible at end of unit, scum is accumulating on the surface.
6	**Phase Separation**		
	Clarification (settling)	100.0	No visible floc carry-over, weirs are clean, and no debris collected. Once every week desludging. PC noted that it was set on every 2 days, but once a week is sufficient and reduce water losses.
	Sand filtration	94.4	Well maintained facility, air distribution is good, media looks healthy, sufficient handrails. 100% backup for air blower and 5-% for backwash pumps. Slight uneven distribution to individual filters was seen and can be investigated.
7	**Disinfection**		
	Clear water well	100.0	At 11.2 Ml/day, 0.24Ml storage on site provides 26 minutes contact time. Chloring dosing at entry of CWW and free Cl_2 tested after the outlet of CWW.
8	**High lift pumpstation**	100.0	Gravity fed system. Flow measuring in place and logged.
9	**Sludge treatment**		
	Thickening in sludge dams	87.5	Sludge/ wash water sump is well maintained - sump is under capacity (return pumps under capacity) and therefore overflows into stormwater system
10	**Bulk pipeline from plant to command reservoir**	100.0	400mm Asbestos pipeline, maintenance team reported that it is in good condition with no reported leaks
11	**Command reservoir**	100.0	2 reservoirs are fenced and gated, Telemetry in place and operational. Flows measured and logged. Both structures in good condition
12	**Booster pumpstation**	100.0	Building is fenced and secured with sufficient ventilation. Two pumps installed,100% standby, and in good condition. MCC in good condition.
	Total	**94%**	

High risk areas OR Key Hardware Risks/ Defects

1. Recycle sump/ pumps under capacity.
2. Continuous breakdown of Sodium Aluminate dosing pump occurs – reason for this to be determined.
3. Storage area required for permanganate.
4. Unauthorised entry to plant to be prevented, even during loadshedding.

VROOM Refurbishment Cost Estimate

Civil Works	R1,384,900	64%
Mechanical Works	R768,900	36%
Electrical Works (Incl C&I)	R0	0%
Total VROOM Cost	**R2,153,800**	**100%**
R million / MLD		**0.06**

Regulatory Impression

The Preekstoel water system serves the greater Hermanus area with about 70,000 people. This plant as well as the other systems from Overstand LM is contracted out in terms of operation and maintenance to Veolia. It is clear from the audit, that a healthy relationship is in place between these two entities, resulting in a very good final water quality – 98.5% micro compliance and 100% for chemical compliance. The Water Safety Plan is now in its 4th revision and dated 2022. The team on site is well aware of what is listed in the safety plan on risks associated from the catchment to the reticulation system. Workplace satisfaction has been indicated as 90% with training identified as the only aspect to improve.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	98.53%
Chemical Compliance	99.68%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



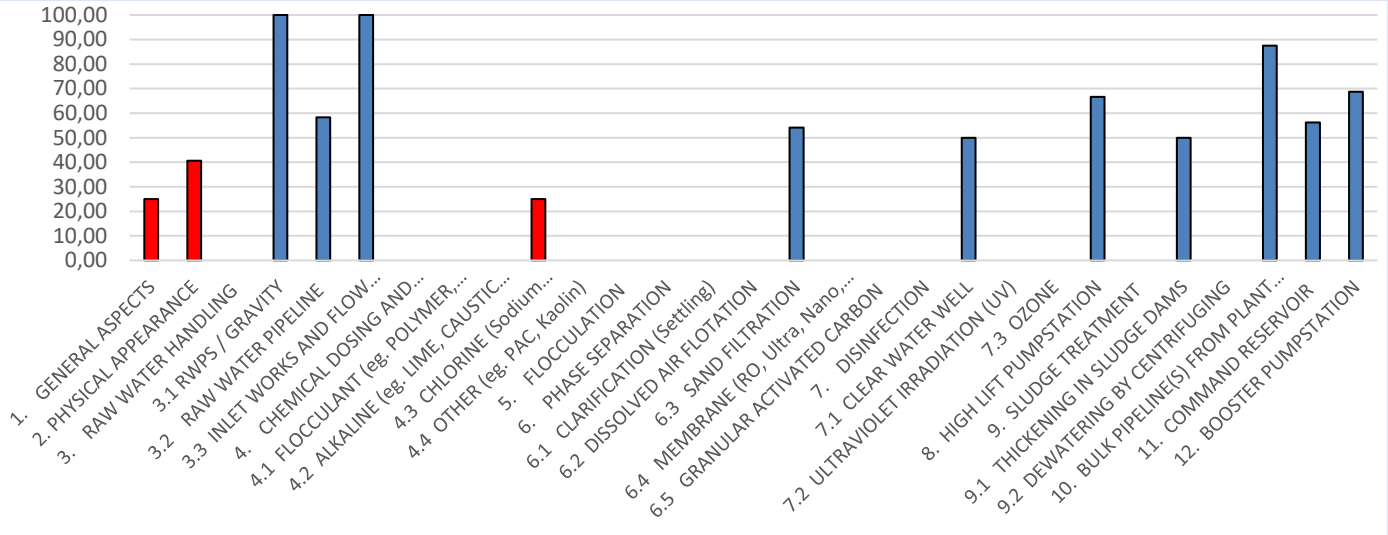

13.19 Prince Albert Local Municipality

The Prince Albert water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

Prince Albert TSA Score: 50%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram

None

Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	25.0	Plant is not manned on a continuous basis and many of the aspects typically associated with process control are therefore missing from site. The biggest concern in this regard would be the lack of any operational monitoring – not even residual chlorine levels are monitored.
2	**Physical appearance of plant**	40.6	The condition of the site reflects the fact that plant personnel spend a limited amount of time on site. The main area of improvement would be the updating of safety signage on site while groundskeeping requires some attention. Basic staff facilities are also lacking
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	100.0	9 x Boreholes + Small surface water allocation (gravity feed in channel) provides water to the works
	Raw water pipeline	58.3	Pipework is prone to damage during flooding and needs to be secured in a more sustainable manner
	Inlet works	100.0	The surface water allocation split to the works is in good order. This only augments the water from the boreholes
4	**Chemical dosing and storage**		
	Chlorine	25.0	The chlorine dosing facility (gas) has been removed from site. Chlorination is currently taking place "by hand" in an uncontrolled way. Chlorine dosing needs to be formalised by installing a Calcium Hypochlorite chip feeder and associated safety equipment.
5	**Flocculation**	na	
6	**Phase Separation**		
	Sand filtration	54.1	2 Sets of Filters installed - 1 after Iron Removal and 1 for blended water ("old" / original filters). No mechanical equipment installed for "old " filters. Backwash equipment for Iron Removal Plant limited and a standby set of equipment would benefit the installation
7	**Disinfection**		
	Clear water well	50.0	The lack of operational monitoring, especially as it pertains to residual chlorine, is a big concern

Watch #	Process Unit Assessed	% TSA	Observations
	Ultraviolet irradiation (UV)	0.0	UV system not in use. This system is intended to assist with the oxidation process during Iron removal - insufficient data is however available to confirm that the process can achieve the desired results without the UV system.
8	**High lift pumpstation**	66.6	No flow measurement in place
9	**Sludge treatment**		
	Thickening in sludge dams	50.0	Backwash water from Iron Removal Filters collected in sludge tanks. Supernatant is recycled while sludge is allowed to dry out.
10	**Bulk pipeline from plant to command reservoir**	87.5	Aging infrastructure will require more frequent maintenance
11	**Command reservoir**	56.2	One of the reservoir roofs needs to be repaired
12	**Booster pumpstation**	68.7	The pumps are in a locked pumpstation, but the area around the pumpstation and the accompanying reservoir is not secured.
	Total	**50%**	

High risk areas OR Key Hardware Risks/ Defects

1. Operational testing equipment to be obtained as a matter of urgency - not even residual chlorine can be measured.
2. Chlorine dosing equipment to be installed as a matter of urgency.
3. The need to use the UV system for Iron removal is to be investigated.
4. The on-site reservoir roof should be repaired.
5. The reservoir in town (from which the booster pumps pump) should be secured to prevent unauthorised access.

VROOM Refurbishment Cost Estimate

Civil Works	R1,798,500	59%
Mechanical Works	R697,400	23%
Electrical Works (Incl C&I)	R551,100	18%
Total VROOM Cost	**R3,047,000**	**100%**
R million / MLD		**2.77**

Regulatory Impression

There seems to be a lack of urgency around the provision of safe, potable water on a sustainable basis. This is evident from the lack of basic monitoring equipment, i.e., no residual chlorine measurements are being done, and the fact that disinfection is done ad-hoc by adding an uncontrolled amount of granular chlorine to the reservoir. It needs to be noted that compliance monitoring is done, and that compliance is quite good, including for microbiological parameters. Compliance is however based on a monthly grab sample, and this does not mitigate the risk posed by poor operational control. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	94.32%
Chemical Compliance	87.52%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



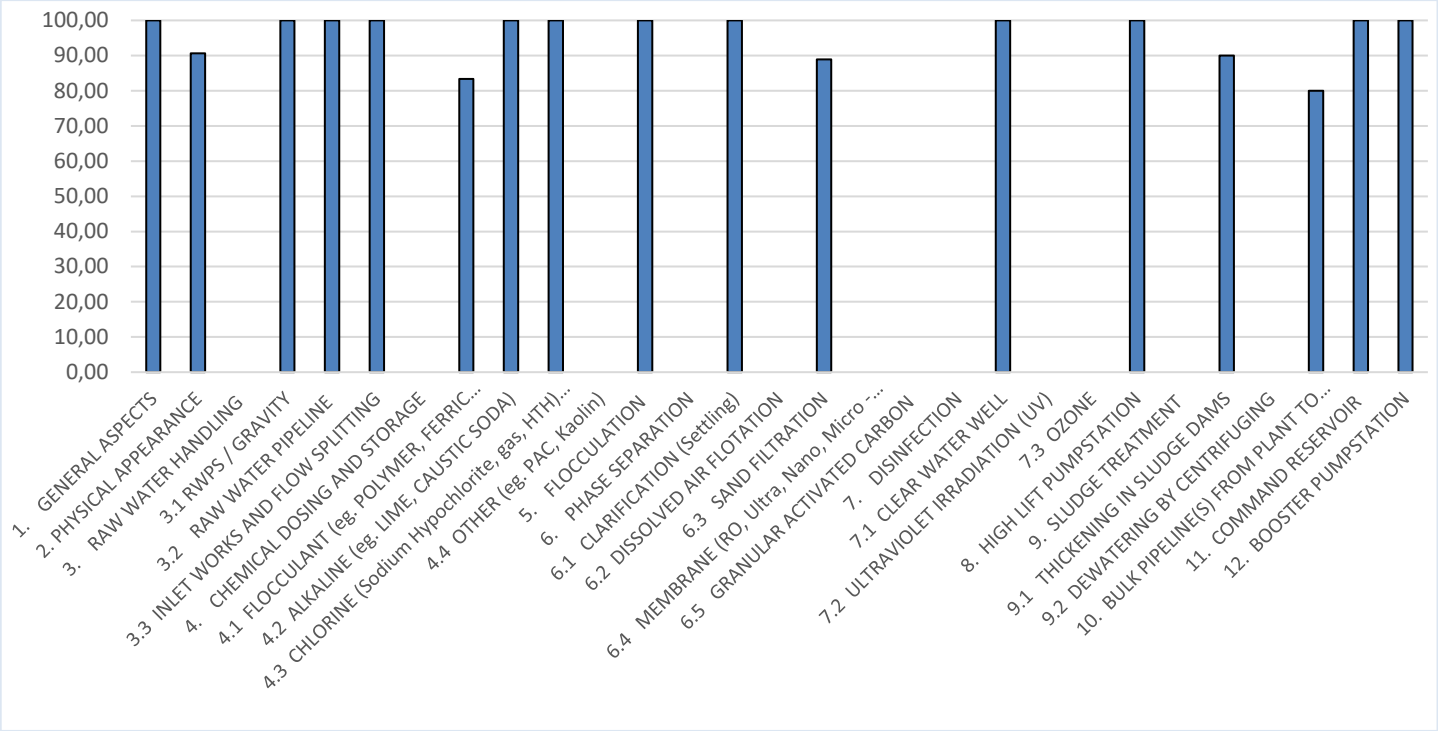

13.20 Saldanha Bay Local Municipality

The Withoogte bulk water supply system was inspected on the 7h of February 2023 to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

Withoogte WTW TSA Score: 95%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram

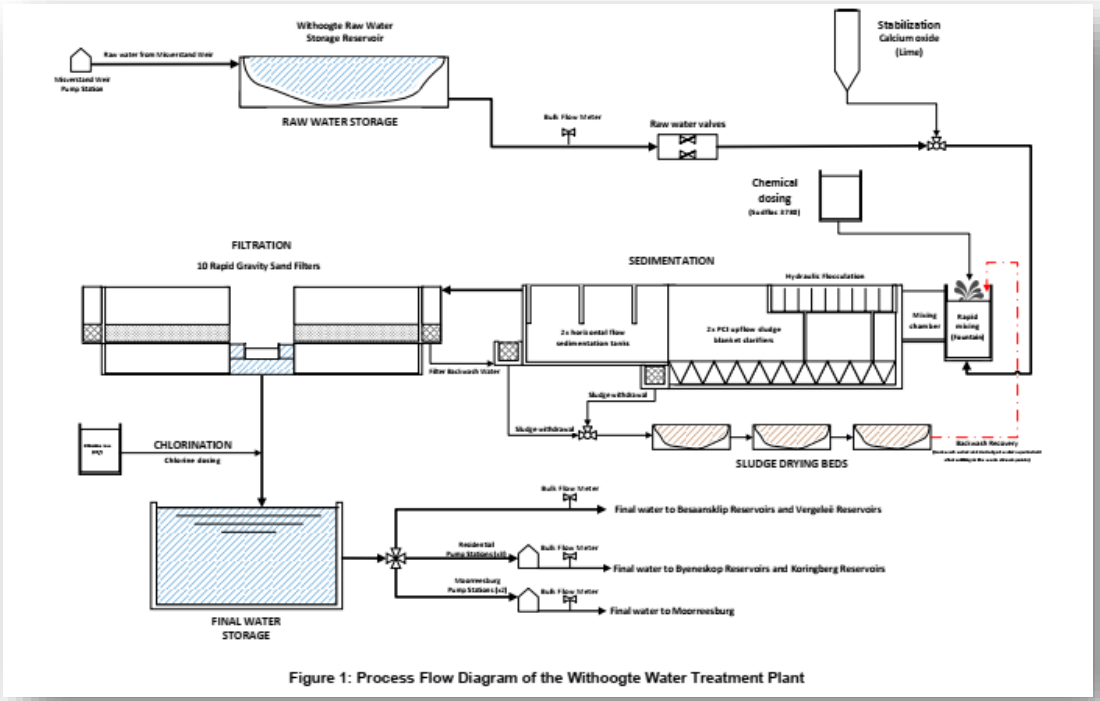


Figure 1: Process Flow Diagram of the Withoogte Water Treatment Plant

A: Raw water storage reservoir	E: Horizontal flow clarifiers	I: Final water reservoir
B: Lime stabilisation	F: Vertical flow clarifiers	J: Control Room/ Laboratory
C: Rapid mixing chamber	G: Gravity sand filters	K: Administrative Building
D: Flocculation channels	H: Chlorination room	L: Maintenance Buildings

Figure 2: Aerial view of the Withoogte Water Treatment Plant

Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	100.0	Class A plant, O&M manual, and logbooks in place. Emergency contact numbers displayed. Monitoring equipment on site, proof of calibration. WCDM inhouse electricians has access to electricity meter, consumption is logged
2	**Physical appearance of plant**	90.6	Fenced, neat terrain, well maintained. Entrance clearly marked. Relevant safety signs in place, no OSH contraventions seen or reported. Roads are in good condition. Average workplace satisfaction mainly due to lack of training.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	100.0	Inlet screens reported cleaned annually. Five raw water pumps all operational (3 pumps @ 3000m³/h, and 2 @ 800m³/h), different configurations possible, always at least 50% standby Pipeline (1.4 m dia. Ductile iron) reported in good condition, inflow meter readings logged and interpreted. Effective chemical dosing and flash mixing practice. Even flow splitting into two trains.
	Raw water pipeline	100.0	
	Inlet works	100.0	
4	**Chemical dosing and storage**		
	Flocculant	83.3	Sudfloc 3870 dosing, 100% standby on dosing units. Sufficient storage capacity for 3 months. Spillages at dosing and storage areas will be contained. No dedicated emergency wash in place.
	Alkaline	100.0	Lime dosing. Good housekeeping. Two dosing units (100% standby). Sufficient storage capacity for 4 months
	Chlorine	100.0	Chlorine gas dosing. Pre- and post-filtration dosing, four dosing units operational, 100 % standby for each dosing point. One duty and one standby 1-ton cylinders connected to units, auto-switchover, and scales operational. Storage area for 12 x 1-ton cylinders, dosing between 5400 – 6500 kg/month, sufficient storage provided Emergency air scrubber room and emergency wash area operational. PPE, and safety signage in place.
5	**Flocculation**	100.0	Well formed, small pin flocs were observed in flocculation channels. Unit is very well maintained
6	**Phase Separation**		Process operator staff highly knowledgeable and takes pride in their work.
	Clarification (settling)	100.0	No visible floc carry-over, weirs in optimal condition. Desludging up to 3 times daily.
	Sand filtration	88.8	Three backwash pumps installed, one out for maintenance, configuration of 50% standby for final rinse wash. Two blowers operational, 100% standby. Good even bubble distribution. Backwash every 30-50 hours. Smooth filter media with no cracks observed. Even flow distribution. Excellent housekeeping and safety.
7	**Disinfection**		
	Clear water well	100.0	At 72 Ml/day the two 12 Ml reservoirs on site provides 8 hours contact time. Chloring dosing at entry of CWW and free Cl_2 tested after the outlet of CWW (gravity flow).
8	**High lift pumpstation**	100.0	All distribution is gravity fed. Flow measuring in place and logged.
9	**Sludge treatment**		
	Thickening in sludge dams	90.0	Sludge / wash-water to sludge ponds, no recycling taking place. The area is overgrown with reeds inside ponds. Sludge dams are emptied and cleaned every 2 years
10	**Bulk pipeline from plant to command reservoir**	80.0	Several bulk lines to supply Swartland, Saldanha Bay and Bergrivier LM. Reported to be in good conditions, regular inspections are carried out.

Watch #	Process Unit Assessed	% TSA	Observations
11	**Command reservoir**	100.0	Fenced and gated with signboard. Telemetry and final flow meter operational. Structure in good condition, all access prevented
12	**Booster pumpstation**	100.0	Building is fenced and secured with sufficient ventilation. Two pumps installed,100% standby, and in good condition. MCC in excellent condition.
	Total	**95%**	

High risk areas OR Key Hardware Risks/ Defects

1. Chlorine shortages (a trail run of chlorine dioxide dosing was conducted with good results).
2. Backwash pump to be repaired and additional pump installed to provide 100% standby.
3. Increase security at raw water pumpstation to prevent vandalism.
4. Sludge ponds to be properly maintained and recycling to be re-instated.
5. Dedicated emergency wash area to be installed at flocculant storage point.

VROOM Refurbishment Cost Estimate

Civil Works	R504,900	22%
Mechanical Works	R1,791,900	78%
Electrical Works (Incl C&I)	R0	0%
Total VROOM Cost	**R2,296,800**	**100%**
R million / MLD		**0.03**

Regulatory Impression

The Withoogte bulk supply systems has a very well-functioning and excellently maintained treatment plant and distribution system. The supply system distributes excellent quality water to their costumers which includes Swartland, Saldanha Bay and Bergrivier Local Municipalities, with no reported failures, in accordance with SANS 241, for both microbiological acute-, chemical acute and chronic health determinants as well as non-health aesthetics. No directives have been issued by the Regulator. The capacity-, Risk- and technical management, from a TSA point of view, seems to be at a high standard. The process controlling staff takes great pride in their work and are highly knowledgeable, however the work place satisfaction is average mainly due to not enough training / growth opportunities. The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not for chemical (only just). The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	97.86%
Chemical Compliance	96.55%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%







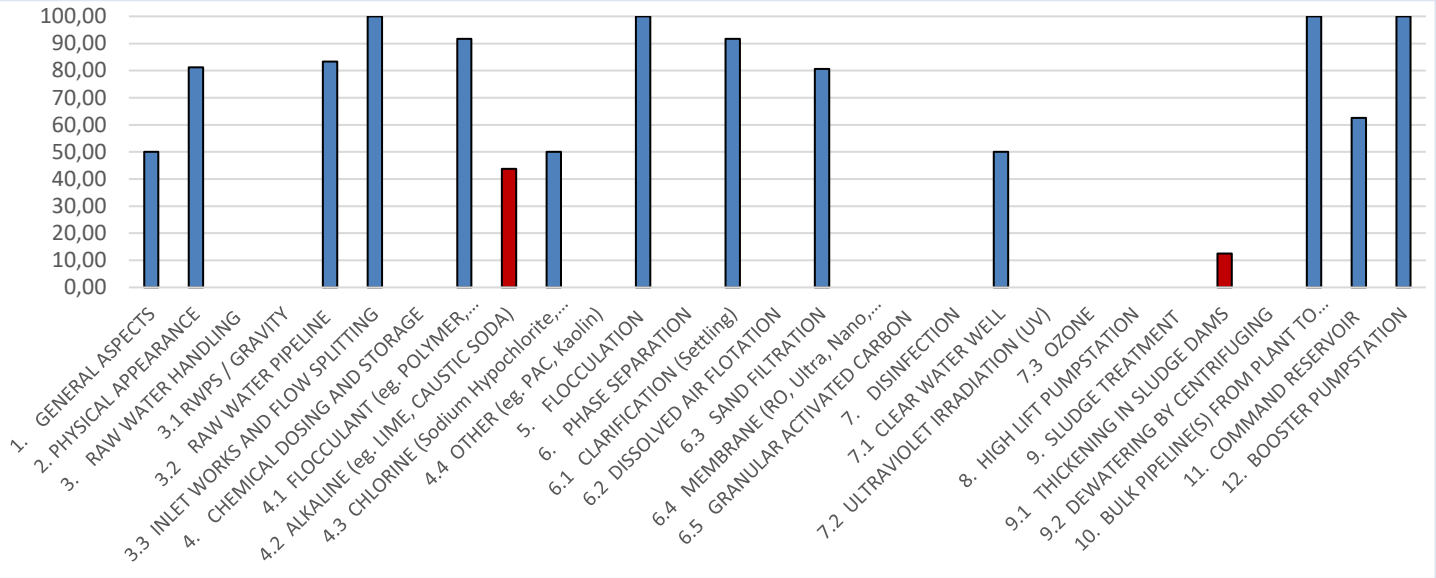
13.21 Stellenbosch Local Municipality

The Paradyskloof water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

Paradyskloof TSA Score: 71%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram

None

Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	50.0	Class C plant, operational logbook in place with limited daily entries. Maintenance & repairs logbook, O&M manual not available. IMPs available. No process flow diagram displayed, only available on SCADA. Analytical equipment not up to standard. Free chlorine not measured.
2	**Physical appearance of plant**	81.2	Fully fenced, site neat and well kept. Fence vandalised in places. Clean facilities available for employees. Buildings, mechanical and electrical equipment generally in good condition. Sign at entrance, some letters missing.
3	**Raw water handling**		
3.2	Raw water pipeline	83.3	Abstraction from Theewaterskloof dam by gravity. Pipeline in good condition. Installed flow meter (not calibrated), regular recording of flow rates.
3.3.	Inlet works and flow splitting	100.0	Good flow splitting. Good flash mixing. Coagulant dosing visible.
4	**Chemical dosing and storage**		
4.1	Flocculant (polymer, ferric chloride, alum)	91.6	Alum and sodium aluminate dosing pumps, duty/standby. Bunding provided. No emergency wash shower, only eye wash. Alum & sodium aluminate storage sufficient.
4.2	Alkaline (Lime)	43.7	Lime used for pre-and post-lime dosing. Pre-lime equipment not functional. No standby equipment for pre- and post-lime dosing. Bags stored off floor. Dust masks available. Lime storage sufficient.
4.3	Chlorine (HTH)	50.0	Calcium hypochlorite (HTH) chips for final disinfection. Dosing system functional. HTH storage seems <30 days.
5	**Flocculation**	100.0	Good flocculation unit. Flocs visible at outlet of flocculation unit.
6	**Phase separation**		
6.1	Clarification (settling)	91.6	Limited floc carry-over. Regular de-sludging taking place; however, sludge accumulation bottom of clarifiers and on lamella plates. Weir plates in excellent condition.
6.2	Sand filtration	80.5	Rapid gravity filtration. Filter gallery very neat. Filters in good condition. Standby backwash pumps and air blowers. Flow splitting not even, PLC issues. Filters not backwashed regularly.
7	**Disinfection**	50.0	>30minutes contact time. Serious concern that free chlorine measurement not done. Only E. Coli counts measured intermittently in various reservoirs.

Watch #	Process Unit Assessed	% TSA	Observations
8	**High lift pumpstation**	na	Water gravitates to command reservoirs. No high lift pumps.
9	**Sludge treatment**		
9.1	Thickening in sludge dams	12.5	Sludge dams not well maintained, not emptied in past 2 years. Water recycle pumps not working for over 1 year. Sludge dams to be maintained and water recycle pumps replaced.
10	**Bulk pipeline from plant to command reservoir**	100.0	Pipeline underground. No leaks reported.
11	**Command reservoir**	62.5	Covered concrete command reservoir, outside plant perimeter. Not secure. Fence stolen. Telemetry in place-Remote monitoring. Final flow meter in place, not calibrated
12	**Booster pumpstation**	100.0	Duty/standby booster pump station working.
	Total	**71%**	

High risk areas OR Key Hardware Risks/ Defects

1. The final chlorine disinfection is a significant risk. No free chlorine is measured on site. The plant personnel and management rely on the E. Coli counts in various reservoirs to be 0. This is not good practice.
2. There is no standby equipment for pH correction and chlorination.
3. The present sludge disposal and handling is not a long-term solution for proper sludge treatment and disposal. Sludge dams should be maintained, and water recycling pumps installed.
4. Fence at command reservoir should be replaced and security enhanced.

VROOM Refurbishment Cost Estimate

Civil Works	R72,600	5%
Mechanical Works	R1,222,100	87%
Electrical Works (Incl C&I)	R112,200	8%
Total VROOM Cost	**R1,406,900**	**100%**
R million / MLD		**0.06**

Regulatory Impression

The Paradyskloof water treatment plant is relatively new, and the infrastructure is generally in good condition and well maintained. The site is neat and well kept. The pre-lime station is not functional and should be refurbished as soon as possible. Standby equipment for pre- and post-lime dosing is also required. The overall impression is that the staff are competent and dedicated, although the supervisor needs to be formally registered. A serious concern is that free chlorine is not measured in the final treated water. The WSA relies on intermittent E. coli count measurements in various reservoirs to determine microbiological quality compliance. This is a major concern and the WSA should address this urgently. The WSA needs to maintain and empty the sludge storage dams regularly and replace the non-functional water recycling pumps. The lack of proper fencing and security at the command reservoir is also a concern. The fence should be replaced and security at the reservoir enhanced. Although a condition assessment report is available, there is no proof of defined actions or implementation of recommendations. The WSA is encouraged to undertake a full process audit and to implement the findings. This is important to improve the quality of operation. Operational and compliance monitoring is also lacking. The WSA is encouraged to implement the findings of the WaSP. The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	99.22%
Chemical Compliance	96.08%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%



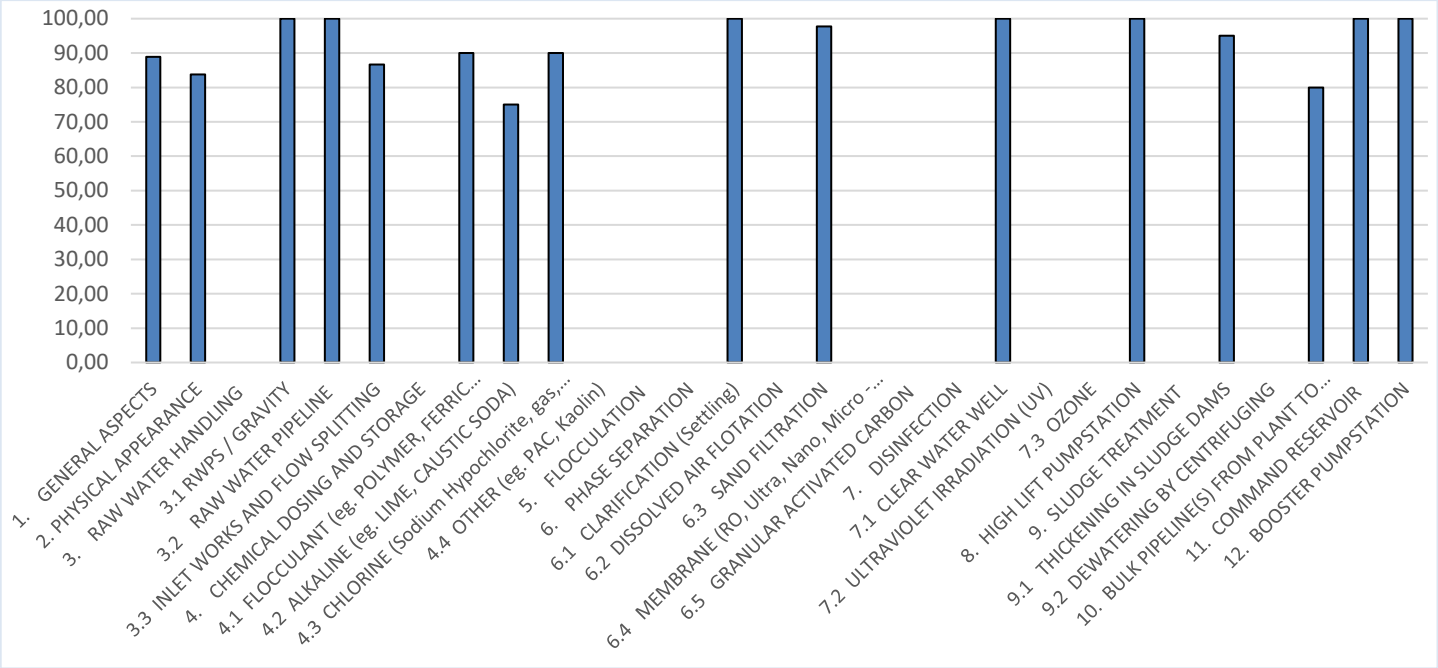

13.22 Swartland Local Municipality

The Swartland water supply system was inspected on the 18th of January 2023 to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

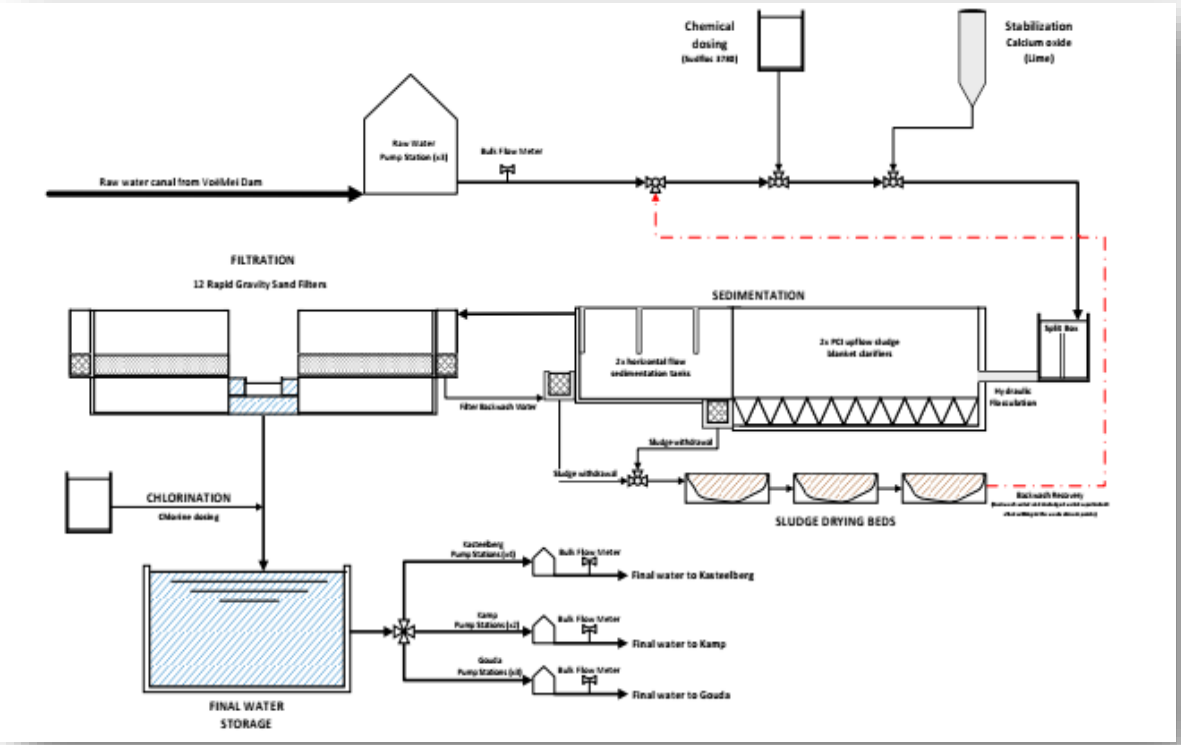
Swartland WTW TSA Score: 92%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	88.8	Class A plant, O&M manual, and logbooks in place. Emergency contact numbers displayed. Monitoring equipment on site, proof of calibration. Jar test performed weekly. WCDM inhouse electricians has access to electricity meter, consumption is logged
2	**Physical appearance of plant**	83.7	Fenced, neat terrain, well maintained. Entrance clearly marked. Relevant safety signs in place, no OSH contraventions seen or reported. Roads are in good condition. Worker's facilities are neat and clean, the lunch facility needs to be reinstated. Average workplace satisfaction mainly due to lack of training.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	100.0	Manually raked inlet screens are clean. Three raw water pumps (50% standby), good working order. Pipeline reported in good condition, inflow meter readings logged and interpreted. Visual dripping of chemical dosing confirmed, no sufficient turbulence for flash mixing. Even flow splitting into two trains.
	Raw water pipeline	100.0	
	Inlet works	86.6	
4	**Chemical dosing and storage**		
	Flocculant	90.0	Sudfloc 3870 dosing, two dosing pumps (100% standby), good working order. Sufficient storage capacity for 6 months. Spillages at dosing and storage areas will be contained. Dedicated emergency eyewash in place but no shower.
	Alkaline	75.0	Lime dosing. Very good housekeeping. One dosing units (no standby). Sufficient storage capacity for 6 months
	Chlorine	90.0	Chlorine gas dosing. Two dosing units (100% standby), good working order. One duty and one standby 1-ton cylinders connected to units, auto-switchover, and scales operational. Storage area for 2 x 1-ton cylinders, storage space provides capacity for approximately 42 days. Leak detection, proper PPE, Emergency wash area and safety signage in place.
5	**Flocculation**	na	No dedicated flocculation unit, flocculation takes place in pipe feeding clarifiers.
6	**Phase Separation**		Process operator staff highly knowledgeable and takes pride in their work.
	Clarification (settling)	100.0	No visible floc carry-over, weirs in optimal condition. Desludging up to 3 times daily.
	Sand filtration	97.7	Two backwash pumps (100% standby), good working order. Two blowers (100% standby), good working order. Good even bubble distribution. Backwash every 30-50 hours. Smooth filter media with no cracks observed. Even flow distribution at outlet boxes observed. Filter outlet boxes not properly cleaned or lined with white background, visual clarity cannot be properly judged, excellent housekeeping otherwise, no handrailing around filter but area is closed off and gated to only allow authorised access.
7	**Disinfection**		
	Clear water well	100.0	The CWW with contact channels under filters, capacity could not be confirmed. Chloring dosing at entry of CWW and free Cl_2 measured at sampling point provided at high lift pumpstation.
8	**High lift pumpstation**	100.0	Four pumps (100% standby), good working order. Flow measuring in place and logged.
9	**Sludge treatment**		
	Thickening in sludge dams	95.0	Four sludge ponds regularly cleaned. some reed growth in one pond. Two recycle pumps (100% standby), good working order.
10	**Bulk pipeline from plant to command reservoir**	80.0	Reported to be in good conditions.

Watch #	Process Unit Assessed	% TSA	Observations
11	**Command reservoir**	100.0	Fenced and gated with signboard. Telemetry and final flow meter operational. Structure in good condition, all access prevented.
12	**Booster pumpstation**	100.0	Building is fenced and secured with sufficient ventilation. Two pumps (100% standby), good working order. MCC in excellent condition.
	Total	**92%**	

High risk areas OR Key Hardware Risks/ Defects

1. Make provision to create a hydraulic jump for sufficient flash mixing and effective dosing at inlet.
2. Chlorine shortages (a trial run of chlorine dioxide dosing was conducted with good results).
3. Install lights at sludge dams.
4. Install additional dry feed lime dosing unit for 100% backup.
5. Install handrails around sand filters.

VROOM Refurbishment Cost Estimate

Civil Works	R1,183,600	34%
Mechanical Works	R2,274,800	66%
Electrical Works (Incl C&I)	R0	0%
Total VROOM Cost	**R3,458,400**	**100%**
R million / MLD		**0.12**

Regulatory Impression

The Swartland bulk supply systems has a very well-functioning and excellently maintained treatment plant and distribution system. The supply system distributes excellent quality water to their costumers which includes Swartland and Drakenstein Local Municipalities. The capacity-, Risk- and technical management, from a TSA point of view, seems to be at a high standard. The process controlling staff takes great pride in their work and are highly knowledgeable, however the work place satisfaction is average mainly due to not enough training/ growth opportunities.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	98.25%
Chemical Compliance	97.39%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%







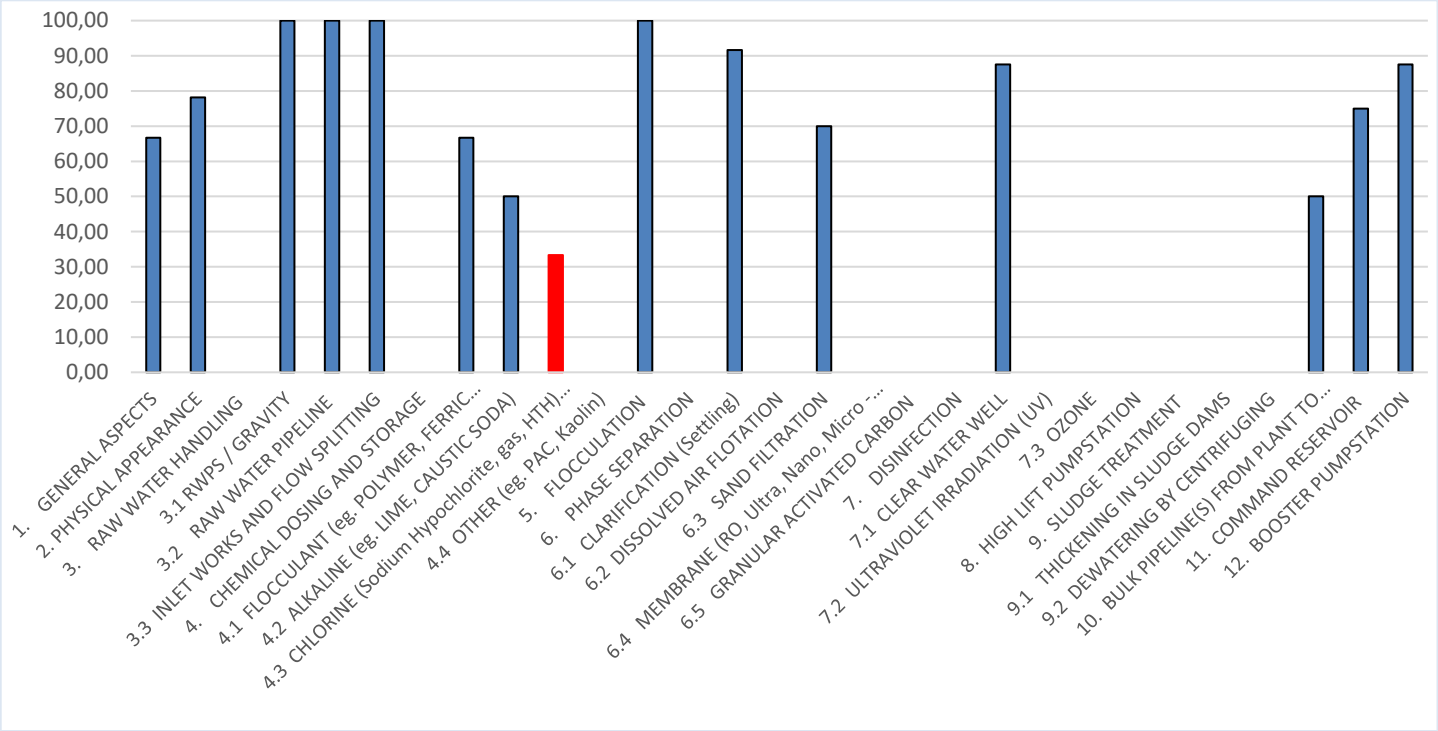

13.23 Swellendam Local Municipality

The Swellendam water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

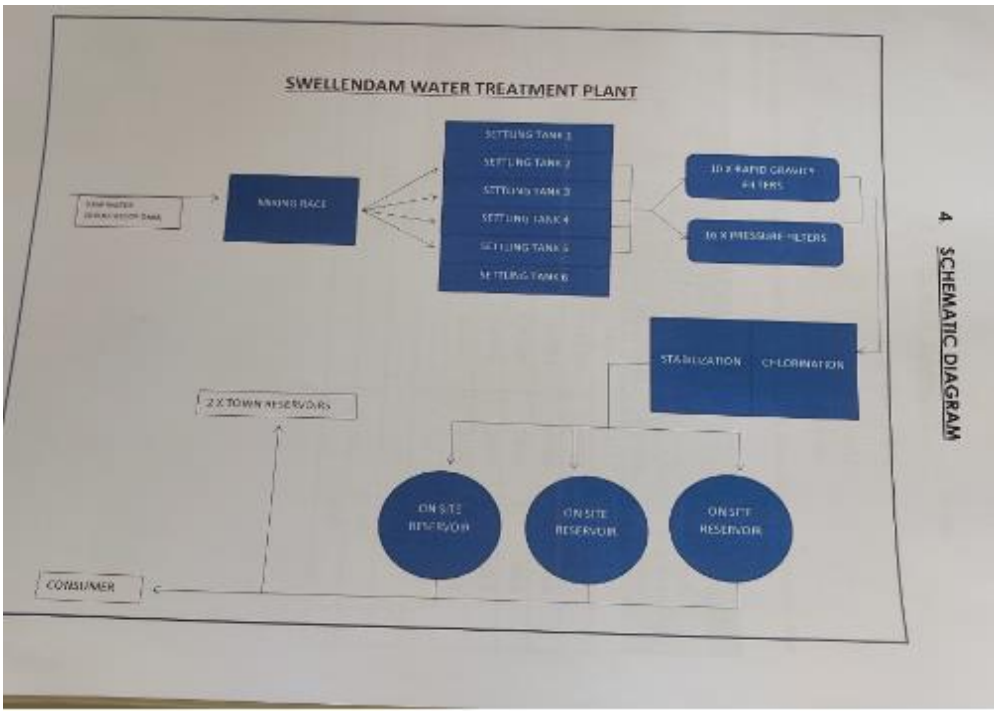
Swellendam TSA Score: 68%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	66.6	Class B plant, operational logbook in place with detailed daily entries. Maintenance & repairs logbook, O&M manual, and IMP not available. Process flow diagram available but should be displayed.
2	**Physical appearance of plant**	78.1	Fully fenced, site well kept, except for entrance area and chemical storage. Facilities available for employees. Buildings, mechanical and electrical equipment old, need maintenance and refurbishment. No sign at entrance.
3	**Raw water handling**		
3.1	Raw water pumpstation/gravity fed	100.0	Abstraction from Grootkloof dam by gravity to pump station. Pumped to works. Duty/standby pumps in working condition. No screen in place.
3.2	Raw water pipeline	100.0	Pipeline in good condition. Installed flow meter and regular recording of flow rates.
3.3	Inlet works and flow splitting	100.0	Single entrance with no splitting. Good flash mixing.
4	**Chemical dosing and storage**		
4.1	Flocculant (polymer, ferric chloride, alum)	66.6	Alum dosing pumps, duty/standby. Bunding inside building, no bunding outside. No emergency wash area. Alum storage sufficient.
4.2	Alkaline (Lime)	50.0	Soda ash dosed on trial basis. Bags stored off floor. No dust masks available.
4.3	Chlorine (Gas)	33.3	Sodium hypochlorite dosing pump working. No standby pump. No safety signs. Storage <30 days.
5	**Flocculation**	100.0	Good flocculation unit. Flocs visible at outlet of flocculation unit.
6	**Phase separation**		
6.1	Clarification (settling)	91.6	Limited floc carry-over. Regular de-sludging taking place. Weir plates corroding, some need to be replaced.
6.2	Sand filtration	70.0	Pressure and slow sand filtration. Backwash pump for pressure filters. No standby. Manual backwashing of pressure filters every 24 hours. Handrails required around slow sand filters. Potential hazard.
7	**Disinfection**	87.5	>30minutes contact time, free chlorine measurement done at the correct place. Permanent dosing pipework needs to be installed for chlorine dosing.
8	**High lift pumpstation**	0.0	Water gravitates to command reservoirs. No high lift pumps. No final water flow meter installed.
9	**Sludge treatment**		
9.1	Thickening in sludge dams	0.0	Clarifier sludge and filter backwash water disposed of in sludge ponds off-site. Not maintained and not emptied. Not acceptable. Proper sludge handling and storage facility required, also to recover excess water.
10	**Bulk pipeline from plant to command reservoir**	50.0	Pipeline underground. No leaks reported. No valve chamber.
11	**Command reservoir**	75.0	Fully enclosed concrete command reservoirs, within plant perimeter. Telemetry in place-Remote monitoring. No flow meter to measure final treated water.
12	**Booster pumpstation**	87.5	Duty/standby booster pump station working. No signage.
	Total	**68%**	

High risk areas OR Key Hardware Risks/ Defects

1. Standby dosing pump needs to be installed for final chlorination and proper dosing pipework should be installed to dose sodium hypochlorite into the final sump.
2. Chemical dosing and storage area should be properly refurbished, so that chemical spillages can be contained.
3. A proper sludge storage, handling and water recycling facility should be installed.
4. A final water meter should be installed so that the treated water outlet can be measured accurately.
5. The sodium hypochlorite inventory on site should be sufficient for at least 30 days.

VROOM Refurbishment Cost Estimate

Civil Works	R2,348,500	64%
Mechanical Works	R1,155,000	32%
Electrical Works (Incl C&I)	R160,600	4%
Total VROOM Cost	**R3,664,100**	**100%**
R million / MLD		**0.61**

Regulatory Impression

The Swellendam water system is relatively old, and some infrastructure needs refurbishment and maintenance. Except for the site entrance and the chemical storage and dosing area, the site is neat and well kept. The overall impression is that the staff are competent and dedicated. Safety is lacking in some areas; specifically, there are no handrails surrounding the slow sand filters and there is no proper signage in the sodium hypochlorite area. The final chlorination with sodium hypochlorite is not up to standard and this needs to be rectified. The WSA needs to install a proper sludge storage and handling facility; the existing facility is not in accordance with environmental regulations. Although a process audit document is available, there is no proof of defined actions or implementation of recommendations. This is important to improve the quality of operation. The WSA is encouraged to prepare a WaSP and IMPs as a matter of urgency. The non-compliance to SANS 241 with microbiological compliance poses a significant risk for community health in the WSA area of responsibility.

The regulator notes the following drinking water quality, which does not meet the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	96.00%
Chemical Compliance	86.29%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

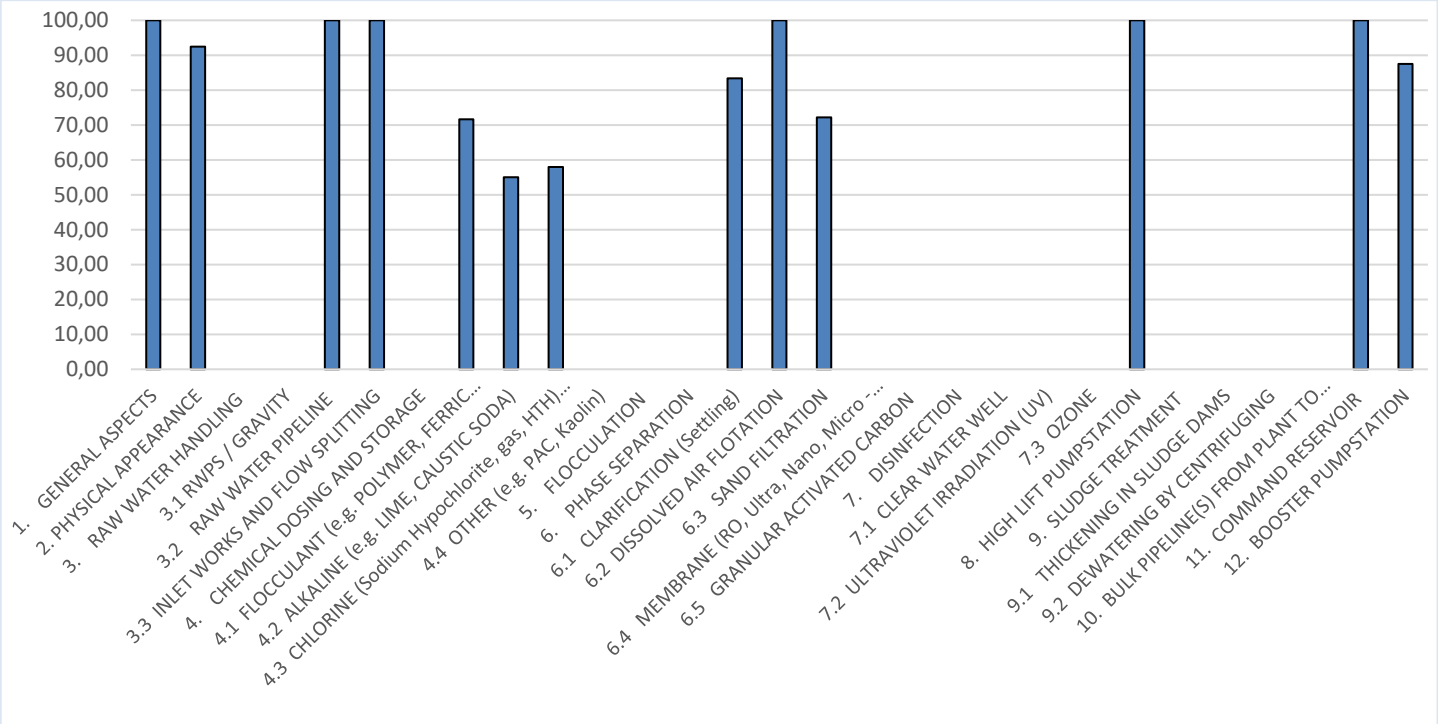
13.24 Theewaterskloof Local Municipality

The Grabouw water supply system was inspected on the 7h of February 2023 to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

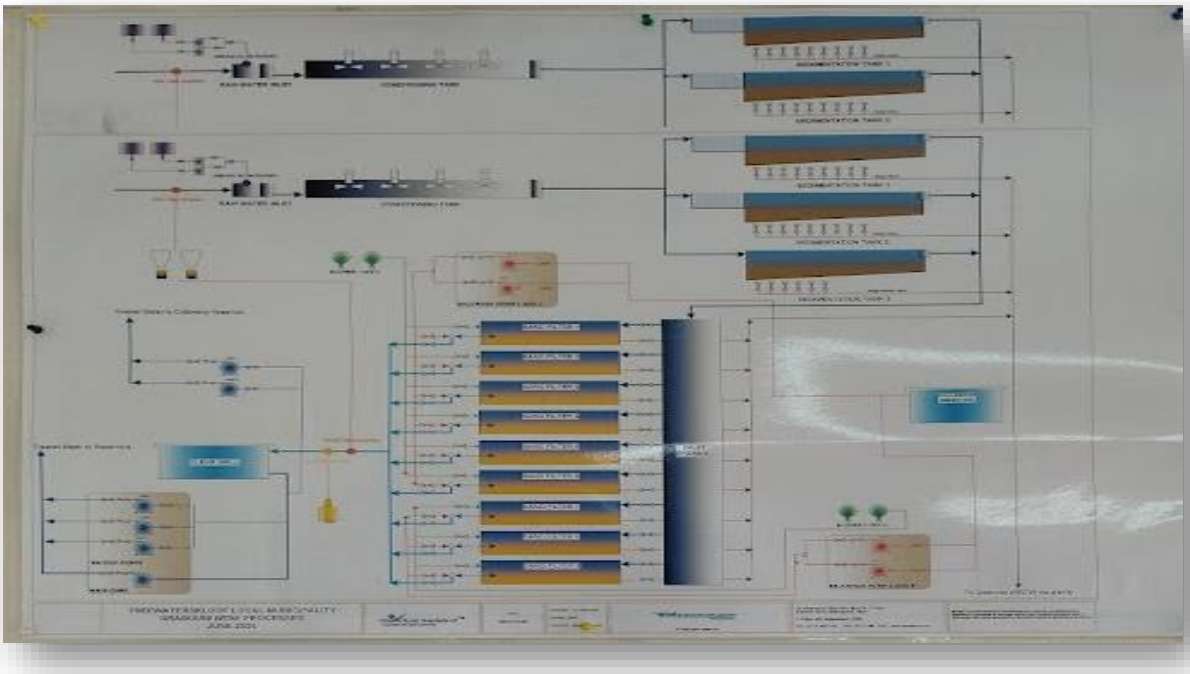
Grabouw WTW TSA Score: 82%

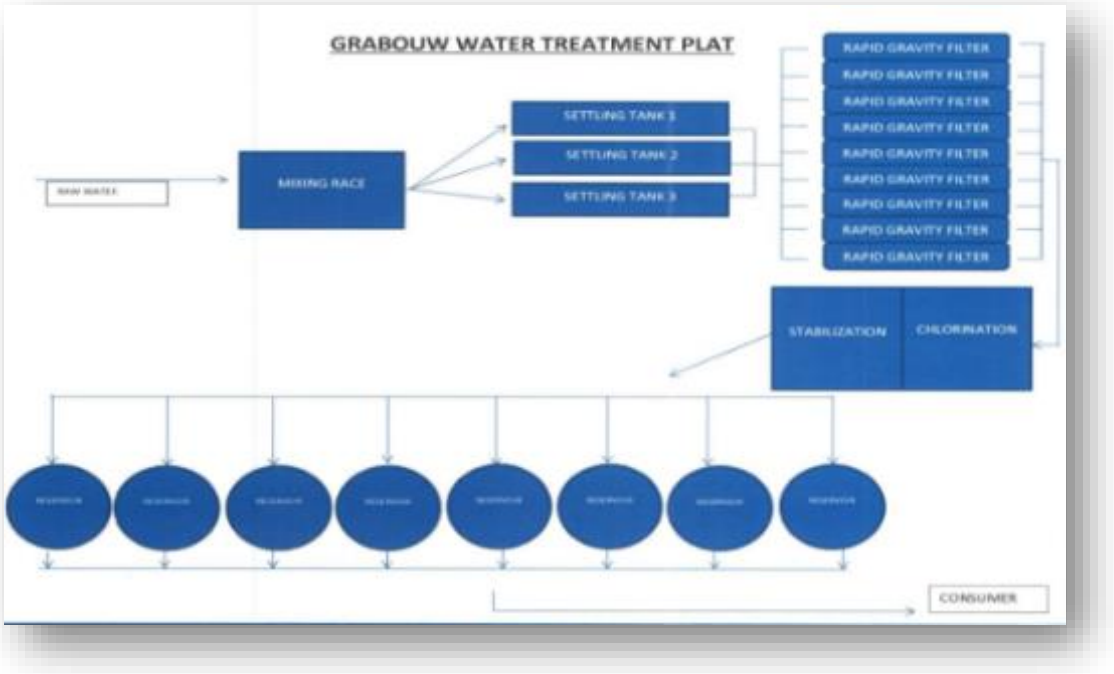
Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram





Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	100.0	Class B plant, O&M manual, and logbooks in place. Emergency contact numbers displayed. Monitoring equipment on site, proof of calibration. Jar test performed every 3 hours. Only ESKOM and inhouse electricians has access to electricity meter, consumption logged could not be confirmed
2	**Physical appearance of plant**	92.5	Fenced, neat terrain except for some areas with unkempt grass and rubble, generally well maintained. Entrance clearly marked. Relevant safety signs in place, no OSH contraventions seen or reported. Roads are in general good condition, some maintenance required. Excellent workplace satisfaction very good worker's facilities.
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	66.7	No inlet screens. Reported three pumps (50% standby) could not confirm whether in working order, 350mm MS pipe reported in good order with no breakages in the last 6 years, inflow meter readings logged and interpreted. Effective chemical dosing and flash mixing practice.
	Raw water pipeline	100.0	
	Inlet works	100.0	
4	**Chemical dosing and storage**		
	Flocculant	71.7	Aluminium Sulphate and Sodium Aluminate dosing, two dosing pumps each (100% standby for both), good working order. Sufficient storage capacity provided for both. Spillages at storage areas will be contained but not at dosing area. Dedicated emergency wash not available (stolen and not replaced).
	Alkaline	55.0	Lime dosing by means of a venturi created by motive water, only one unit installed. Area is messy. Two dosing units (100% standby). Sufficient storage capacity for 4 months
	Chlorine	48.0	Chlorine gas dosing. One dosing unit installed and operational (no standby or emergency backup). One 70kg cylinders connected to one unit, scale not in use (using pressure gage to monitor). Small storage area provides space for approximately 15 70kg cylinders (sufficient capacity. Emergency air scrubber room and emergency wash area operational. PPE, and safety signage in place.
5	**Flocculation**	100.0	Well-formed floc observed in flocculation channels. Unit is very well maintained
6	**Phase Separation**		Process operator staff highly knowledgeable and takes pride in their work.
	Clarification (settling)	83.3	No visible floc carry-over, weirs in optimal condition. Desludging once every 3 days.
	Sand filtration	65.6	Two backwash pumps (100% standby), good working order. Two blowers (100% standby), good working order. Poor bubble distribution. Backwash every 24 hours. Filter media in poor condition and only about 80mm thick at some filters. Poor flow distribution at outlet boxes, outlet boxes filled with sand and not properly cleaned. Filter gallery in good condition handrail in place.
7	**Disinfection**		
	Clear water well	na	The size of the clear water tank could not be provided. This is also not indicated in the process audit report. Was not assessed.
8	**High lift pumpstation**	100.0	Six pumps, Four pumps to Steenbras reservoir (100% standby), Two pumps to Colins reservoir (100% standby), all in good working order. Flow measuring in place and logged.
9	**Sludge treatment**		
	Thickening in sludge dams	na	Sludge / wash-water directly to sewer

Watch #	Process Unit Assessed	% TSA	Observations
10	**Bulk pipeline from plant to command reservoir**	na	Two lines exit the plant. The process controller was unsure about the condition. Both lines are underground and could not be assessed.
11	**Command reservoir**	100.0	Fenced and gated with 24h security. Telemetry and final flow meter operational. Both structures in good condition, all access prevented
12	**Booster pumpstation**	87.5	Building is fenced and secured with sufficient ventilation. Two pumps (100% standby), good working order. MCC in good condition but panels are open and easily accessible due to connection with backup generator.
	Total	**82%**	

High risk areas OR Key Hardware Risks/ Defects

1. The filters in need of urgent refurbishment of the floors with nozzles, replacement of media required.
2. Provide backup chlorinator and auto-switchover with new scale.
3. Roads need to be secured and kept in good condition to ensure chemicals can reach loading point.
4. Bunding at flocculant dosing required.
5. Emergency wash at flocculant dosing area as well as chlorine dosing area required.

VROOM Refurbishment Cost Estimate

Civil Works	R2,323,200	30%
Mechanical Works	R5,451,600	70%
Electrical Works (Incl C&I)	R0	0%
Total VROOM Cost	**R7,774,800**	**100%**
R million / MLD		**0.52**

Regulatory Impression

The Grabouw bulk supply systems has a functioning and generally well-maintained treatment plant and distribution system. The supply system distributes excellent quality water to the consumers with no reported failures for microbiological acute- and chemical acute health and only one failure for chemical chronic health determinants, in accordance with SANS 241. The process controlling staff takes great pride in their work and are highly knowledgeable, and the work place satisfaction is excellent. The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	88.05%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%







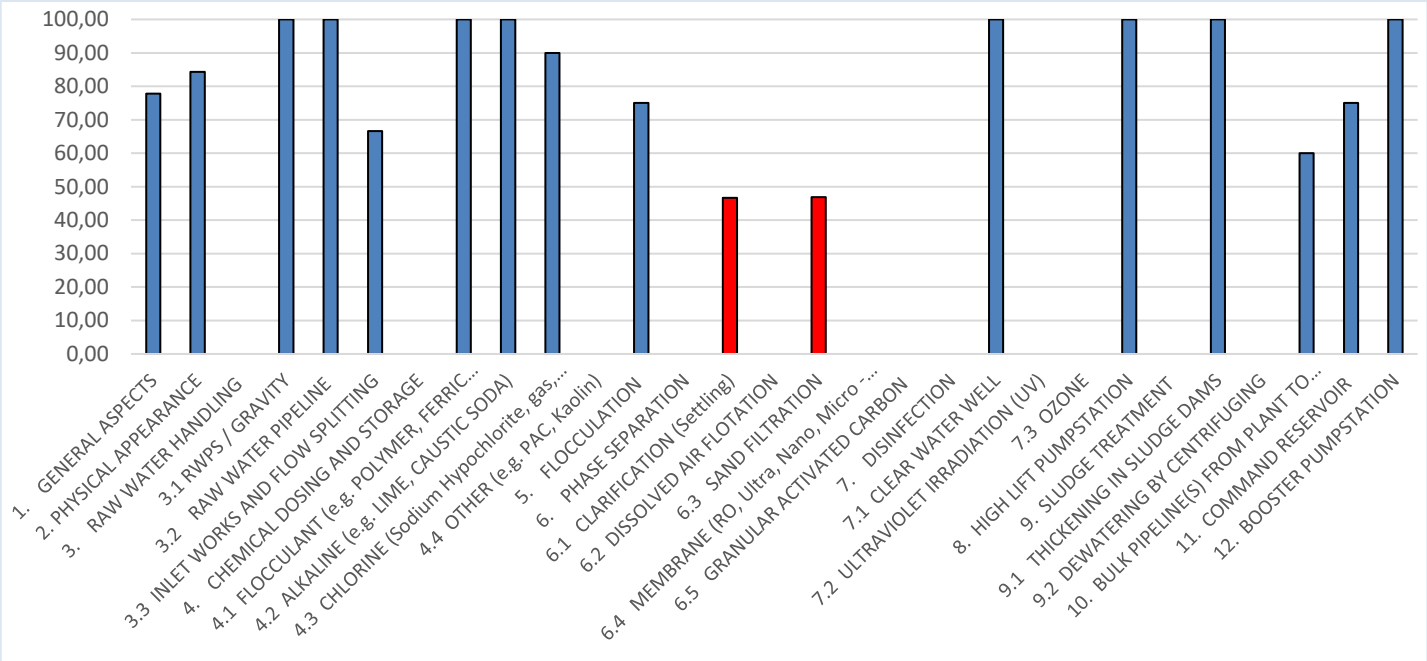



The Ruensveld West water supply/treatment system is one of 3 plants from Overberg Water and was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

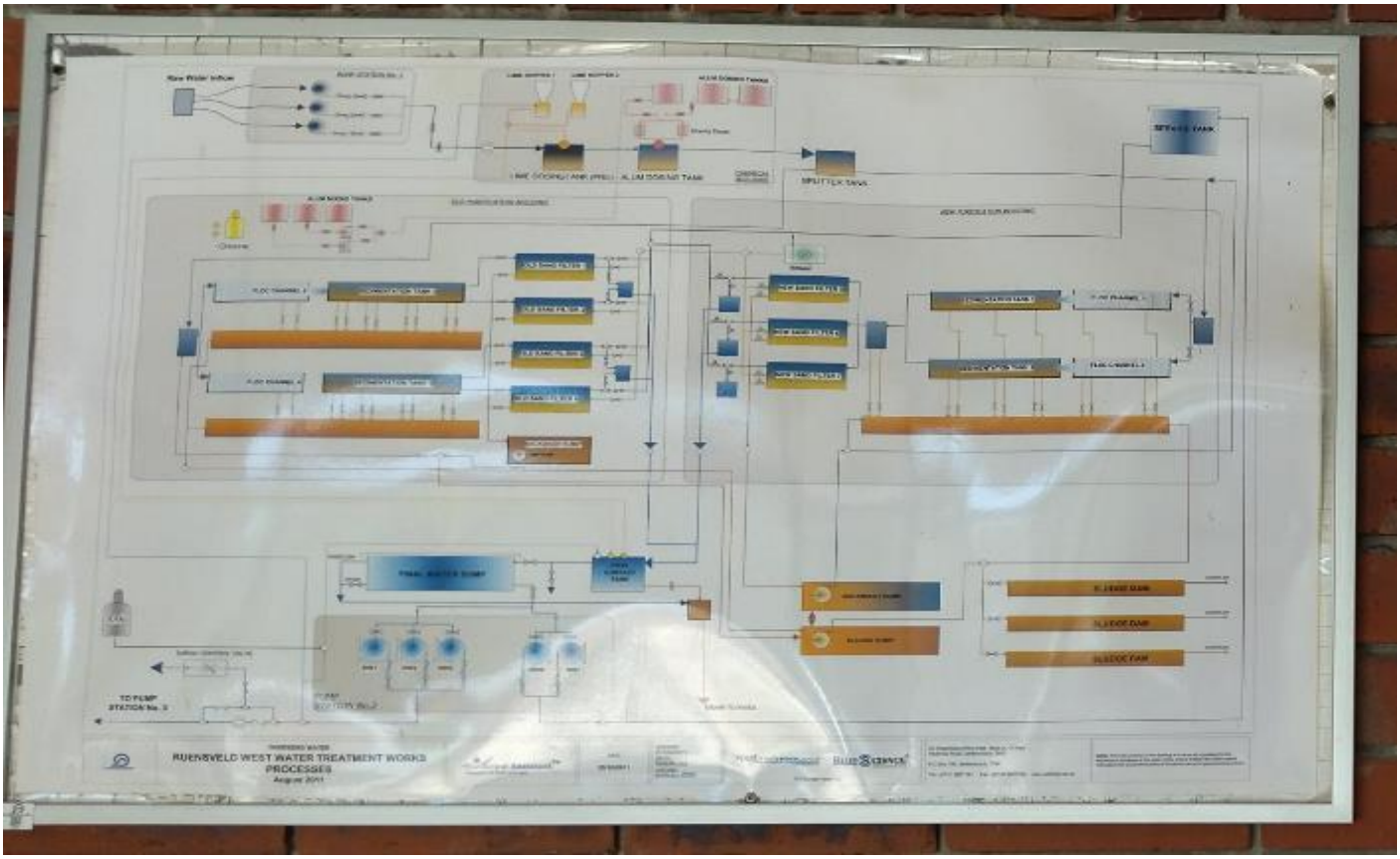
Ruensveld West WTW TSA Score: 82%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and needs urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	77.8	Class B plant, O&M manual, and logbooks in place. Emergency contact numbers not displayed. Process flow diagram in place. Monitoring equipment on site, proof of calibration. Electricity meter not accessible by process staff. No maintenance logs on site
2	**Physical appearance of plant**	84.3	Fenced, entrance not signposted, somewhat untidy terrain, roads in need of repair. 70% workplace satisfaction. No OSH contraventions seen or reported
3	**Raw water handling**		
	Raw water pumpstation/ gravity feed	100	Raw water handling equipment in fairly good condition, 50& standby. Abstraction volumes recorded. Pipeline well maintained.
	Raw water pipeline	100	
	Inlet works	66.7	No flash mixing in place, eventually good floc formation is seen.
4	**Chemical dosing and storage**		
	Flocculant	100	Alum dosing with make up on site, 100% standby on dosing units (transfer pumps), then gravity dosing. Sufficient storage capacity, spillages at storage can be contained. Emergency wash in place.
	Alkaline	100	Lime dosing. Good housekeeping with two working units, 100% standby and lime delivery every 4 months.
	Chlorine	90	Chlorine gas dosing with standby unit. No automatic change over device. Sufficient storage space with and emergency wash area, PPE, and safety signage in place
5	**Flocculation**	75	Floc formation visible at end of unit, scum is accumulating on the surface.
6	**Phase Separation**		
	Clarification (settling)	46.7	Plenty visible floc carry-over, weirs are holes in piping and growth is visible in them. Desludging 2 times daily
	Sand filtration	53.1	Capacity of WTW is halved due to 3 filters out of operation. Investigation by specialist into problems with filters required with urgent remediation/refurbishment required. Also new blowers are required as well as standby compressor. Huge water loss on site due to 3 times a day backwashing
7	**Disinfection**		
	Clear water well	100	At 9.5 Ml/day, 2Ml storage on site provides 5 hours contact time. Chloring dosing at entry of CWW and free Cl_2 tested after the outlet of CWW.
8	**High lift pumpstation**	100	Three pumps installed, 50% standby, all in good working order. Flow measuring in place and logged.
9	**Sludge treatment**		
	Thickening in sludge dams	100	Sludge / wash water to dry beds, filtrate discharges into river. Dry sludge disposed of on site.
10	**Bulk pipeline from plant to command reservoir**	60	400 mm asbestos line breaks every now and then and the applicable section is then replaced with GRP pipe.
11	**Command reservoir**	75	Fenced and gated, Telemetry has been vandalised. Flows measured and logged. Structure in good condition
12	**Booster pumpstation**	100	Building is fenced and secured with sufficient ventilation. Two pumps installed,100% standby, and in good condition. MCC in good condition.
	Total	**82%**	

High risk areas OR Key Hardware Risks/ Defects

1. Major problems at filters that needs to be investigated, probable refurbishment of filter system.
2. Install two blowers for air scouring of filters (duty + standby).
3. Disinfection backup system should chlorine gas not be available.
4. Paving of roads can be considered.
5. Moving the dosing point to a high mixing zone might improve flocculation.

VROOM Refurbishment Cost Estimate

Civil Works	R1,568,600	35%
Mechanical Works	R2,770,900	61%
Electrical Works (Incl C&I)	R204,600	5%
Total VROOM Cost	**R4,544,100**	**100%**
R million / MLD		**0.48**

Regulatory Impression

The Ruensberg West water system serves the towns of Klipdale (Lagulas LM) and Caledon (Theewaterskloof LM) and although the majority of the plant seems to be in fairly good condition, there is concern about the fact that the sand filters are not operating satisfactorily due to the outage of air blowers. They have an outdated Water Safety Plan (last revised in 2019) and it is indeed indicated in this plan that there is concern about the fact that only one air blower is in place. Monochloramines have been identified as a means to counter quick decay of chlorine the piping in the water safety plan. Workplace satisfaction has been indicated as 70% with training identified to be lacking.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	91.65%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

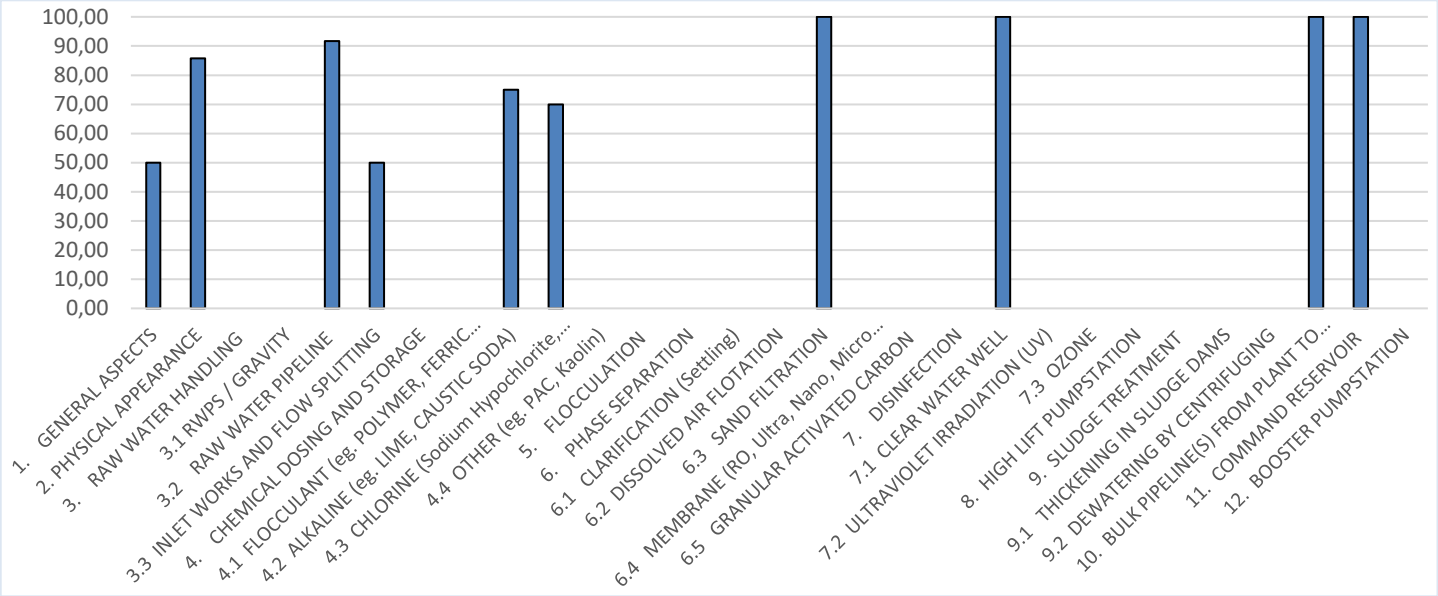
13.25 Witzenberg Local Municipality

The Ceres water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

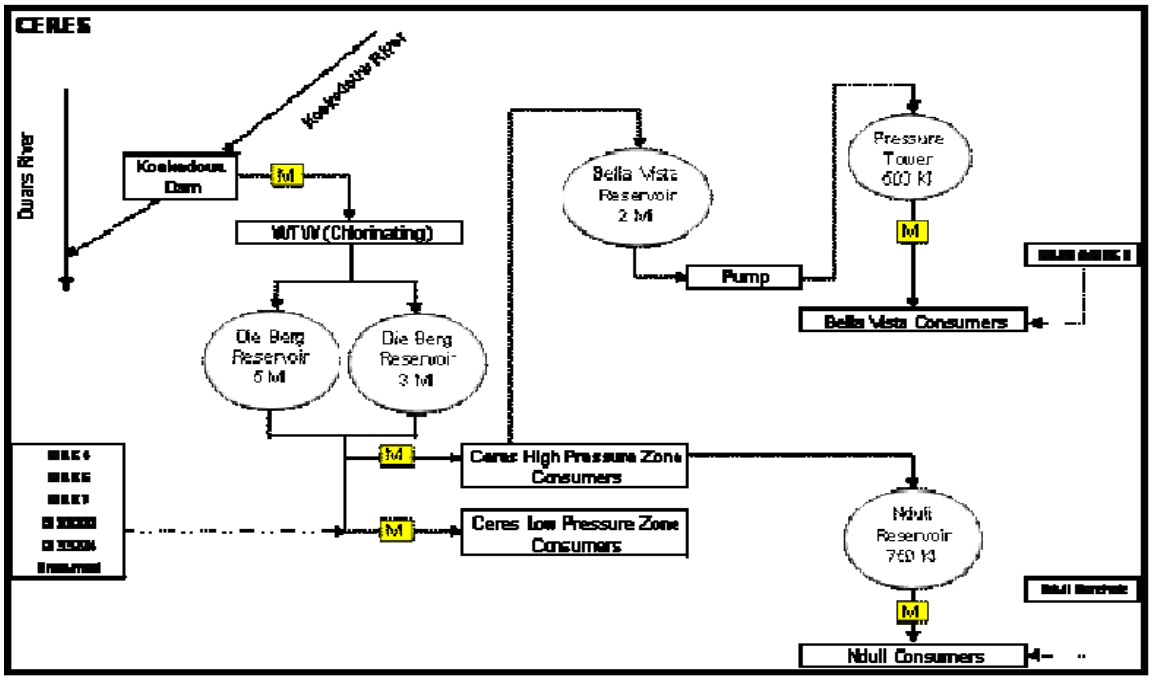
Ceres TSA Score: 78%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	50.0	Class D plant, operational logbook in place with limited information, maintenance & repairs logbook available, O&M manual available. EC and turbidity meter not available.

Watch #	Process Unit Assessed	% TSA	Observations
2	**Physical appearance of plant**	87.7	Good signage at gate. Fenced, general housekeeping and safety aspects can be improved. No designated areas for plant personnel including ablution facilities.
3.2	Raw water pipeline	91.6	Abstraction from Koekedouw dam. Pipeline in good condition with some loose lining
3.3.	Inlet works and flow splitting	50.0	Single entrance. Occasional Lime dosing, Chlorine chips dosed manually only during loadshedding
4	**Chemical dosing and storage**		
4.2	Alkaline (Lime)	75.0	Lime dosing unit in good condition. Chemical storage can be improved. Lime storage volume sufficient.
4.3	Chlorine (HTH & Gas)	70.0	The rotameter was in good working condition. HTH chips used as back-up during loadshedding. No standby dosing unit. Safety equipment inadequate. Storage volume sufficient.
6	**Phase Separation**		
6.3.	Sand Filtration	100.0	32 Pressure filters Operated according to the dam level, during site visit the filters were not operational as the dam level was high. Gravity backwash with raw water.
7	**Disinfection**	100.0	>30minutes contact time, Free chlorine measurement done at the correct place.
10	**Bulk pipeline from plant to command reservoir**	100.0	Pipeline underground. No leaks reported
11	**Command reservoir**	100.0	Underground onsite reservoirs in good condition, gated and fenced. Telemetry in place-Remote monitoring.
	Total	**78%**	

High risk areas OR Key Hardware Risks/ Defects

1. Standby capacity for dosing units
2. Ablution facilities and dedicated office space

VROOM Refurbishment Cost Estimate

Civil Works	R1,078,000	65%
Mechanical Works	R576,400	35%
Electrical Works (Incl C&I)	R0	0
Total VROOM Cost	**R1,654,400**	**100%**
R million / MLD		**0.04**

Regulatory Impression

The Ceres water system is well maintained despite its location. Although the staffing level is not adequate to comply with Regulation 813 requirements, the existing process controllers seem competent. However, the absence of ablution facilities and an office for plant personnel is rather disappointing and should be addressed. The review and implementation of the Water Safety Plan should be prioritised to ensure continuous improvement in the management of the Ceres water system.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards for micro but not chemical. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	95.26%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

14. SAN PARKS KRUGER NATIONAL PARK: DRINKING WATER SYSTEM'S FUNCTIONALITY

Background

On special request by Kruger National Parks, the DWS extended the Blue Drop audit to include a non-municipal entity, the San Parks as part of the national audit programme. The Kruger Park has been part of the Green Drop audit in 2021/22 and says to find value in the manner in which the programme assist San Parks to work systematically to Drop Certification status.

Results of the Technical Site Assessment

During the period December 2022 to February 2023, the Department of Water and Sanitation inspected Kruger National Parks (San Parks), comprising of 13 water supply systems. Detailed TSA reports with photographic evidence and VROOM costs have been generated to inspect the condition and status of treatment facilities and gain insight into randomly selected pipe network and pumpstation across the water distribution networks. A high TSA score (100%) indicates that the infrastructure, equipment, and processes are in excellent condition, whilst a low TSA score (0%) indicates failure and dysfunctional process and infrastructure. The TSA inspections covers the entire treatment facility and randomly selected checkpoints of the network and pumpstations. The VROOM cost covers only the treatment facility.

The summary of the TSA score/s of the water supply system that was inspected is as follows.

Table 63 – San Parks Kruger National Park Summary of the TSA Water Supply System

#	Non-Munic (WSA)	TSA WSS	TSA WTW	%TSA
1	DFFE San parks	Skukuza	Skukuza 1	78%

95 – 100% Excellent
80-<95% Good
50-<80% Average
31-<50% Poor
0-<31% Critical state

Systems Observed to be in Functional/Moderate Condition based on Technical Site Inspections

Water supply systems which succeeded to achieve ≥50% TSA score, are summarised as follows.

Table 64 - Provincial Summary of the TSA Water Treatment System in the Excellent to Average Performance Categories

Non-Munic (WSA)	TSA of ≥95-100% [Excellent]		TSA of ≥80-<95% [Good]		TSA of ≥50-<80% [Average]	
	Name of WTW	% TSA	Name of WTW	% TSA	Name of WTW	% TSA
DFFE San parks					Skukuza	78%

95 – 100% Excellent
80-<95% Good
50-<80% Average

The Skukuza 1 system inspected with 78% was found to be in average condition.

VROOM Costs

The Very Rough Order of Measurement (VROOM) is an estimation of the funding required to restore existing treatment infrastructure to its original design capacity and operations, by addressing civil, mechanical, and electrical and instrumental defects. A singular VROOM cost is determined by assessing 1-2 plants, to calculate a cost per system. The cost is derived through an algorithm that uses the Blue Drop Inspector's impression of the condition of the hardware, based on a model that considers the size of the hardware and the market/ industry cost indications, to estimate the cost to repair, refurbish or replace the dysfunctional infrastructure. The singular VROOM costs are extrapolated, in relation to the total Blue Drop scores and systems' SIVs, to derive an aggregated score for all treatment works within the WSI.

Note: *VROOM does not constitute a specification, schedule of quantities or a definite refurbishment figure, but rather an indicative amount to inform a budget and hardware requirements.*

The VROOM cost/s are summarised as following, noting these values comprises the cost of repairs of the SINGLE treatment system assessed, NOT the extrapolated collective cost to repair all the treatment facilities in a WSI.

Table 65 - Provincial Summary of the VROOM Costing

Non-Munic (WSA)	TSA WSS	TSA WTW	Total VROOM Cost (Rand)
DFFE San parks	Skukuza 1	Skukuza 1	R1,654,400

The VROOM cost for the Skukuza 1 water supply system assessed amounts to R1.654 million.

Drinking Water Quality Status

The Institutional Water Quality Compliance, as measured against SANS 241 standards, is reflected in the table below (IRIS, 28 March 2023).

Table 66 – San Parks Kruger National Park Summary of the Drinking Water Quality Status of the TSA Water Supply System

#	Non-Munic (WSA)	TSA WSS	TSA WTW	Microbiological Compliance	Chemical Compliance
1	DFFE San parks	Skukuza	Skukuza 1	>99.90%	97.78%

The drinking water quality for Skukuza 1 assessed satisfies the SANS 241:2015 drinking water standards for micro (excellent status) and chemical (good status).

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%

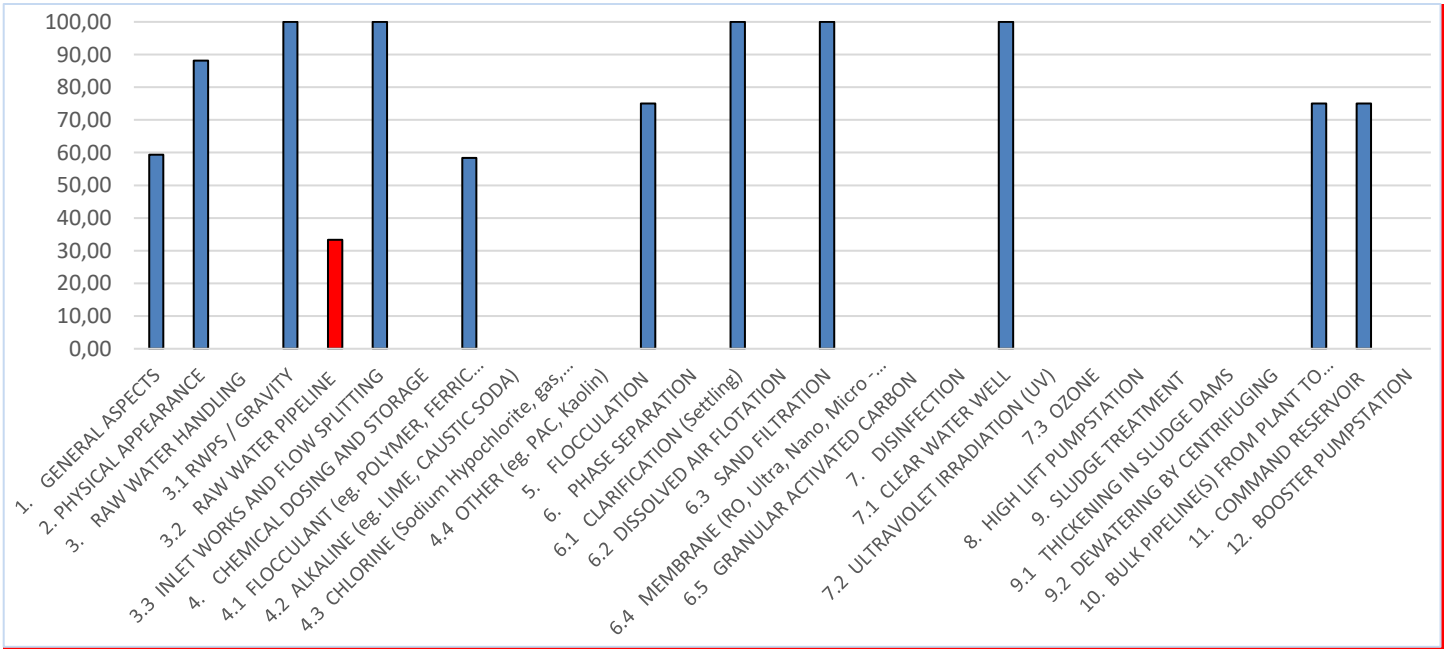
14.1 San Parks – Department of Forestry, Fisheries & Environment

The Skukuza water supply/treatment system was inspected to assess the condition and functionality of infrastructure and treatment processes on the ground, and to estimate the cost of restoration to full functionality.

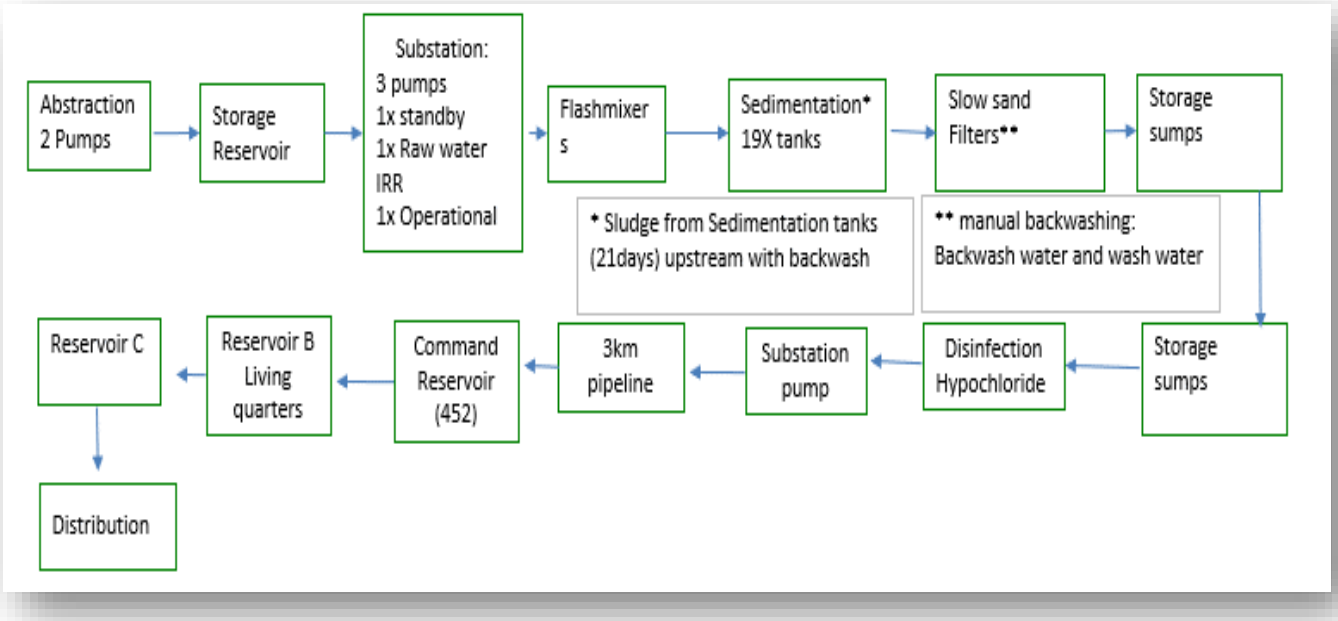
Skukuza 1 TSA Score: 78%

Performance Profile

The following process units were inspected and rated according to the % score on the y-axis. Process units that score <50% are marked in red and need urgent intervention.



Process Flow Diagram



Condition Assessment Findings

Watch #	Process Unit Assessed	% TSA	Observations
1	**General aspects**	59.4	Class C plant, logbooks in place, no display area noted for PFD or notices. Excellent signage at gate, with contact numbers of staff.
2	**Physical appearance of plant**	88.1	Fenced, neat terrain, good housekeeping, high workplace satisfaction, minor OSH corrections.
3	**Raw water handling**		Raw water abstraction from Sabie River, investigate pump size & pipe capacity to match the water supply demand during peak use periods, good flocculant chemical in stock, good flash mixing conditions, flow meter absent, electrical panel and cabling need attention.
	Raw water pumpstation/ gravity feed	100.0	
	Raw water pipeline	33.3	
	Inlet works	100.0	
4	**Chemical dosing and storage**		Duty and standby pump set in good condition, no spill control at flocculant, wash station is available.
	Flocculant	58.3	
5	**Flocculation**	75.0	Good floc formation and velocity, corrosion of concrete structures noted Which must be monitored over time.
6	**Phase Separation**		Desludging every 21 days, filters washed regularly, sludge to river, weirs in good condition, clear overflow, pH 7.0, Langelier 0.07, low Mn & Fe, TDS 110. Operators are knowledgeable with high pride in work.
	Clarification (settling)	100.0	Backwash 5 filters daily for 30 minutes, based on NTU of water, pumps in good condition.
7	**Disinfection**		At 1 Ml/d, contact time from dosing to the demand reservoir (3 km) is >30 min. Hypo chloride dosing, Cl_2 is tested at the outlet and recorded in the site logbook
	Clear water well	100.0	
10	**Bulk pipeline from plant to command reservoir**	75.0	Structures visibly in good condition, no leakages, maintenance as-when needed, no cathodic protection needed, valves rusted, scouring on as/when basis, no routine. Standard operating procedures may be improved.
11	**Command reservoir**	75.0	Fenced and gated, telemetry fitted on top of reservoir. New reservoirs in good condition.
	Total	**78%**	

High risk areas OR Key Hardware Risks/ Defects

1. Unbunded flocculant dosing point
2. Water leaks outside pump station
3. Insufficient raw water pump capacity during high demand.

VROOM Refurbishment Cost Estimate

Civil Works	R370,700	13%
Mechanical Works	R2,329,800	81%
Electrical Works (Incl C&I)	R166,100	6%
Total VROOM Cost	**R2,866,600**	**100%**
R million / MLD		**2.87**

Regulatory Impression

The Skukuza water system is well maintained, with functional treatment processes, and competent staff. Water quality is monitored according to SANS 241 and is of high quality. Consumers may use the water with high level of confidence. No Directives have been issued by the Regulator. A Water Safety Plan is in place but need more in-depth analysis and implementation.

The regulator notes the following drinking water quality, which meets the SANS 241:2015 drinking water standards. The Institutional Water Quality Compliance as of 29 March 2023 is:

Microbiological Compliance	>99.90%
Chemical Compliance	97.78%

Colour	Status	Percentage
	Bad	<95%
	Poor	95-97%
	Good	97-99%
	Excellent	>99%




15. CONCLUSION

The Blue Drop Watch Report gives comfort that a number of well operated and maintained water systems, with good water quality to the consumer, as seen as is evident from field work looking at the physical condition of drinking water infrastructure, high TSA scores, low VROOM estimates and SANS compliant water quality. True to its intent, the report also reveals the vulnerabilities and deficiencies that is seen from the field work, notably where water services are failing the residents of South Africa, and consumers are receiving poor water quality. Regretfully, the highest number of water supply systems fall within the latter category, putting the consumer at risk.

The three Watch Areas from this report give meaningful insight into the various aspects that can be concluded from a technical assessment review:

Watch Area 1 (TSA) provides technical insight into the treatment and distribution networks from a condition and process management perspective. Each system if different, and results ranges from most excellent performance (98%) to most critical condition (18%). These results highlight the impact of loadshedding events, theft and vandalism, discharge of sludge directly to rivers, and dysfunctional disinfection units, amongst others. The exceptional work by many water boards and WSPs is highlighted and need to be acknowledged, as they often counterbalance poor performing municipal systems with well performing bulk services.

Watch Area 2 (VROOM) provides insight into the magnitude of cost required to restore functionality of the existing infrastructure of the 151 systems inspected. The estimate of R1.5 billion will form the basis to further calculations to estimate the funds required to bring all WTW up to their original design standard, as will be reported in the Blue Drop Report 2023 upon its release mid-2023. Of particular concern to the Regulator and its funding partners, is that some systems received and spent grant funding, without evidence of such improvement in the field. A special intervention is underway to investigate such reports.

Watch Area 3 (water quality) is the most concerning finding from this report. It highlights that the majority of WTWs does not produce SANS 241 compliant water, irrespective of its TSA condition and performance. The impact of this finding would require a radical intervention by government to ensure that the required hardware, funds, competency, and chemicals are in place to supply safe water to consumers. The lack of water quality monitoring is alarming, as WSIs cannot operate and improve water services and quality if they do not know their basic status. The link between Watch Area 1 and 3 also shows that an average performing and partly functional treatment system will not produce SANS compliant water. High quality water will only be guaranteed if a plant is fully functional, well operated with the required operational know-how, and with all chemicals to deliver the desired output water.

The Department of Water and Sanitation trusts that this interim report, leading up to the publication of the full Blue Drop audit, will inform appropriate interventions by different stakeholders, with the collective aim to strengthen collaboration and enforcement measures to achieve functional systems and safe water to all consumers. Water Services Institutions are urged to take note of their TSA and DWQ status and commence with corrective measures.

16. ANNEXURES

List of TABLES

List of FIGURES