GREEN DROP

Western Cape

2022

" Water is Life, Sanitation is Dignity "

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

2030 NDP

green drop
CERTIFICATION
waste water service
REGULATION

FOREWORD by the HONOURABLE MINISTER

It gives me pleasure to present this 2022 Green Drop report. The President announced the relaunch of the Green Drop Certification programme in his State of the Nation Address, and we are pleased to have delivered on this commitment. We recognised that as a flagship project, this incentive-based regulation programme has the power to mobilise the wastewater sector on a path to improvement.

Wastewater management and sanitation are paramount to the dignity of our people and integrity of the environment and it is therefore important that we strive for excellence in these fields. Even though the Green Drop programme has been at the centre of much of the improvement in the sector over the years and has brought about change and reignited the passion amongst our wastewater specialists, the results of this report serves as a scientifically calculated indicator that there is still a mammoth task ahead of us.

It remains unacceptable that sewage spillages and failing wastewater treatment works are detrimentally impacting our environment as well as the livelihood and health of many of our communities on a daily basis in the year 2022. It is of great concern that there are so many systems with scores below 31%, indicating a dismal state of wastewater management, posing a risk to both environment and public health. I am therefore making the call to political, public, and private leadership to declare their commitment to use this report as the turning point towards sustainable improvement, because everyone can make a difference within their sphere of influence. I need to make it clear that action will be taken against those municipalities that flagrantly put the lives of our people and environment at risk. As Minister of Water and Sanitation, I am engaging the Minister of Cooperative Governance to ensure that as National Government we take drastic intervention measures towards the improvement of water services.

We will use this report as the baseline for the Water Services Improvement Programme (10-point plan) from where we will measure the sustainable turn-around which we aspire to.

However, we are proud of those municipalities who have displayed their commitment towards effective wastewater management, even in the absence of the Green Drop programme over the past few years. The Green Drop scores achieved prove that excellence in the field of wastewater management is a realistic possibility and will remain the performance target for all to plan towards.

A special congratulations to the leadership, management and staff of those systems that attained the prestigious Green Drop status.

We move forward knowing that we do not accept 'being good' as the norm for the South African wastewater industry instead, we endeavour towards excellence.

Minister for Water and Sanitation: Mr Senzo Mchunu

FOREWORD by the DEPUTY MINISTERS

It is a privilege to be part of the release of this Green Drop 2022 report, and I am encouraged by the few pockets of excellence that exist in the wastewater space in our country. It speaks volumes of those women and men who proudly conducted the important work they do in the background over the audit period. We will encourage Municipal Management and Leadership to support them to continue on their path to higher levels of excellence.

We will also call upon on all municipal leadership to note the results of the wastewater systems in their areas of responsibility; to take keen interest in ensuring improvement.

The reality of sewer spillages demands decisive leadership from all of us in order to protect our communities and safeguard our environment. It is going to take a team effort to ensure that future Green Drop reports will present all round improvement in the management of wastewater services.

Deputy Minister for Water and Sanitation: Ms Dikeledi Magadzi

This report should trigger a passion and commitment in all of us to transform our thinking of wastewater treatment systems. These plants demands the merging of scientific and engineering skills to ensure that we have the capability to treat used water to acceptable water quality standards, which allows the reuse of our precious resource.

However, the results of this report indicate that too many of our systems are not being managed according to expectations, resulting into a detrimental impact on our water resources. We cannot allow this to continue. The Green Drop Standards serve as a clear guide towards excellent wastewater management, and we would encourage all responsible to invest in upgrading your operational philosophies with clear objectives, to prevent sewer spillages, to treat effluent to acceptable standards, and to ensure effective sludge management.

I salute those who displayed commendable discipline and commitment towards protecting our environment by managing their wastewater systems according to the standards set by the Green Drop Certification Programme.

Deputy Minister for Water and Sanitation: Mr David Mahlobo

MESSAGE by the DIRECTOR-GENERAL

The Green and Blue Drop Programmes lie at the heart of our vision to provide "safe water for all, forever" and our mission to "effectively manage the nation's water resources to ensure equitable and sustainable socio-economic development and universal access to water". These programmes not only support achievement of our strategic objectives but also align with our effort towards the United Nation's Sustainable Development Goals for clean water and sanitation, and climate action. It is therefore reassuring that the number of WSIs achieving Green Drop Certification has not materially fallen off, despite the lag since the 2013 GD process.

This year's results may not have shown the progressive improvements that we saw in previous cycles, but I am confident that we will get back on the right trajectory. This year's assessment has provided us with a baseline and the platform to launch the turnaround. As in previous years, the programme was widely embraced and the general euphoria around the process tends to spark improvements in subsequent cycles. Despite the process being compulsory, participation was driven more from deeper institutional commitment to progress and achieve excellence using the audit process as a barometer for change.

We have received international acclaim in the past and it will be important to re-establish the programme as the international benchmark for incentive-based regulation. We continued to innovate over the years through strengthening the scorecard and other regulatory tools. This year, we were able to introduce the "Very Rough Order of Measurement" (VROOM) model as part of the Green Drop Technical Site Assessments. At a high level, the VROOM provides insights on the state of the key elements of the wastewater treatment infrastructure and provides an order of magnitude estimate of cost to return the infrastructure to a functional condition. It is this kind of valuable insight gained from the GD process that can inform a coordinated response by DWS and other sector players.

As a department, we have continued to build internal regulatory capacity. We trained 96 of lead and assistant inspectors who were deployed as part of the 2021 GD Audits and hope to have influenced the 995 WWTWs (850 WSAs, 115 DPW & 30 privates) through our consultative audit process. We are committed to making the process as seamless and painless as possible for all Water Services Institutions and will incorporate the lessons learnt into the process for the subsequent cycles. We would like to see the GD process embedded and outcomes informing the planning, budgeting and professionalisation of the wastewater sector.

I would also like to express my appreciation to all the WSIs leaders and their officials who participated in the process. It is only through our combined efforts that we can improve the state of wastewater management in the country.

Director-General for Water and Sanitation: Dr Sean Douglas Phillips

The history of water will be measured not by its quantity but its quality...
Institute for Water Quality Management, 1970's.

GREEN DROP REPORT 2022 INDEX

1. INTRODUCTION

The history of water will be measured not by its quantity but its quality...

Lucas van Vuuren
Institute for Water Quality Management, 1970's

Purpose and Intent of Green Drop Certification

Since its inception in 2008, the Green Drop regulation programme sought to identify and develop the core competencies that, if strengthened, would gradually and sustainably improve the standard of wastewater management in South Africa. The intention was to align the minimum requirements and best practice as a new Green Drop standard to raise the bar for wastewater management. The programme is therefore not based on the results of a limited number of random samples but evaluates the entire wastewater management services over a one-year audit period.

The Green Drop process is recognised as an international best practice and has received both local and international accolade. It is based on a consultative audit process that seeks to empower those responsible for wastewater management to deliver according to the set standards. It is also a transparent process, with clearly defined criteria that is geared to protect consumers from potentially unsustainable and unsafe services, as well as protecting the country's water resources.

The Green Drop audit criteria are designed to complement the efforts of other government and stakeholder programmes. They provide essential information to inform planning by sectoral partners, with the shared objective of achieving functional wastewater systems in the short term and excellence in wastewater management in the longer term.

The Green Drop audit process is intended to inspire a path that brings about sustainable compliant wastewater services through competent people, disciplined thought, and collective action which can be measured and reported to South African citizens every year.

Greatness is not a function of circumstance. Greatness, it turns out, is largely a matter of conscious choice, and discipline

Jim Collins

This report acknowledges those institutions that aim and plan for progress and greatness ...and rewards those that achieve it.

Incentive-based Regulation in South Africa

(Green Drop Certification)

Incentive-based regulation has gained significant momentum and support in the South African Water Sector, since its inception on 11 September 2008 (Minister of Water Affairs, National Municipal Indaba, Johannesburg). The concept was initially defined by two programmes: *Blue Drop Certification* for Drinking Water Quality Management Regulation; and *Green Drop Certification* for Wastewater Quality Management Regulation. *No Drop Certification* was added in 2014 that focused on water conservation and demand management in the municipal sector.

The Green Drop Wastewater Services Audit measures and compares the results of the performance of Water Service Institutions, and subsequently rewards (or penalises) the institution based on evidence of excellence (or failures) when measured against the defined standards. Benchmarks are used to help WSIs to identify gaps between their standard and industry norms. The report is designed to give comparative analysis and diagnostics to assist WSIs to focus on specific areas for improvement. Awareness of this performance is intended to hold WSIs to account, with pressure from consumers, media, politicians, business, and NGOs.

Each Green Drop audit cycle is marked by incremental change in the audit criteria, guided by the status and priorities of wastewater sector. It is therefore important for WSIs to note that merely maintaining the previous cycle's Green Drop evidence and performance will not warrant the same Green Drop score.

Risk-based Regulation in South Africa

(CRR profiles)

Whilst the *Green Drop assessment* focuses on the entire value chain (sewer collector, pumping, treatment, discharge) of the wastewater business within the municipalities (or other WSIs), the *Cumulative Risk assessment* focuses on the wastewater treatment function specifically. The latter approach allows the Regulator to have a database of the risk status and indicators for each treatment system in South Africa. As a 'sister' programme to Green Drop audits, risk-based regulation allows a WSI to identify and prioritise the critical risk areas within its wastewater treatment process and to take corrective measures to mitigate these. Risk analysis is done annually via the full Green Drop audit process, as well as in the alternate years via the Green Drop Progress Assessment (PAT) assessment. The results are published in the biennial Green Drop Report, as well as the Green Drop Progress (PAT) Report every alternate year.

The Department of Water and Sanitation integrates risk analysis as part of the audit process with the aim of quantifying, prioritising, and managing the risks to ensure targeted regulation of high-risk municipalities. The Wastewater Risk Abatement Plan (W_2RAP) is the tool whereby risks are identified and corrected, following a similar process of the reputed Water Safety Plan (WSP). A W_2RAP guideline is available to assist users (Water Research Commission, WRC TT 489/11).

Green Drop Scores

The main outputs from the Green Drop 2021 audit cycle are:

- A Green Drop audit score for each wastewater system assessed, which is aggregated into an organisational (overall) score, expressed as a percentage (%)
- A Cumulative Risk Rating for each wastewater treatment works, expressed as a percentage (%)
- Technical Site Assessment (TSA) score for selected collector and treatment systems inspected, expressed as a percentage (%)
- A collective VROOM cost for all treatment systems within each WSI, expressed in Rand.

Each indicator and its reference elements, can be described as follows:

- ***Green Drop Audit Score***: A Green Drop % is awarded to an individual wastewater system based on the results from the audit process which measures performance against 5 Key Performance Areas (KPA), plus a suite of bonuses and penalties. The individual audit scores aggregate as a single (weighted) institutional Green Drop audit score. The score is weighted against the design capacities of the individual treatment plants. This score serves as a Performance Indicator of the capacity, compliance, and good practice that the institution attains against the Green Drop Standards, which again have been derived from national and international standards. A wastewater system that achieves ≥90% Green Drop score, is regarded as excellent. A system that achieved <31% is regarded as a dysfunctional system which would require appropriate interventions. [**Note: The audit covers the sewer network and treatment systems. On-site sanitation is <u>not</u> part of the audit].**

  Institutions that achieve ≥90%, are Green Drop Certified in acknowledgement of excellence

- ***Green Drop Certified and Green Drop Contenders***: A wastewater system that achieves an overall ≥90% Green Drop score and ≥90% for microbiological and chemical effluent qualities, is regarded as excellent and is thereby ''Green Drop Certified". A system that achieves an overall ≥90% Green Drop score but did not meet the ≥90% final effluent quality standards, is a ''Green Drop Contender". In such case, the Green Drop score is adjusted to 89%.

- ***Green Drop PAT:*** The Green Drop Progress Assessment Tool is an instrument whereby the Department confirms and updates functional information and completes a risk assessment for each registered treatment works. The tool assesses risk via a weighted formula: CRR = (A x B) + C + D, whereby the four risk indicators are comprised of the treatment plant's design capacity, operational inflow, technical skills, and final effluent quality. The results are published in a biennial Green Drop Progress (PAT) Report in the alternate year to the full Green Drop Report and includes a historic comparison of the plants' risk movement since 2009 to the current PAT year.

- ***Cumulative Risk Rating:*** Risk is calculated for each system using a formula: **CRR = (A x B) + C + D**, w*here:*
  A = Hydraulic design capacity of the treatment plant in Ml/day
  B = Operational flow as % of the installed design capacity
  C = Number of non-compliant effluent quality parameters at point of discharge to receiving water body
  D = Number of technical skills gaps (supervision, operation, maintenance) in terms of Reg. 2834 & Draft Reg. 813.

Each risk element carries a different weight in proportion to the severity of the risk element (Annexure A).

CRR% deviation is calculated to show the variance between the baseline CRR and the maximum CRR value that could potentially be reached if all 4 risk indicators are in a critical state. *Example 1:* a 95% CRR %deviation value means the plant has only 5% space remaining before the system will reach its maximum critical state (100%) – this is an undesirable state. *Example 2:* a 25% CRR %deviation value means the plant holds a low and manageable risk position and that the 4 risk indicators are individually and collectively mitigated – this is a desirable state.

- ***Technical Site Inspection Score***: A physical inspection is done at 1 to 2 sites to confirm the findings of the desktop audit. These sites are chosen based on their size, technology, and audit findings to best represent the potential state of the remainder of the sewer networks and treatment works. The TSA percentage reflects the physical condition of the sewer collector network, pumping stations, treatment plant and point of discharge. The intention of the TSA is to verify the evidence presented and findings of the Green Drop audit by undertaking a physical inspection of the selected site/s. Such inspections consider the:
  - Appearance of the plant terrain and buildings
  - Condition of structures, equipment, and process units
  - Health and safety defects
  - Operational knowledge and monitoring
  - Workplace satisfaction.

  The scorecard (*right*) provides the scoring criteria used for each inspection point.

1	Ideal performance and fully functional
0.75	Fully functional, but with minor corrections to be made
0.5	Partially functional and average performance
0.25	Partial performance with major corrections to be made
0	Failure and poor performance
NA	In case of a process unit absent / not part of the plant design, assign NA = Not Applicable

- ***VROOM costing:*** The Very Rough Order of Measurement (VROOM) is an estimation of the funding required to restore existing infrastructure to its original design capacity and operations, by addressing civil, mechanical, and electrical defects. The cost is derived through an algorithm that uses the Green Drop Inspector's impression of the condition of the hardware, coupled with the system-specific design capacity and Green Drop score to derive an aggregated score for all treatment works within the organisation. The algorithm uses the refurbishment cost estimate of 1 to 2 systems and extrapolates it according to the other input values to arrive at an institutional cost, i.e. VROOM estimation. **NOTE: It 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.**

Further terminologies that support the above concepts are as follows:

- ***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..."

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

- ***Wastewater System***: A wastewater system is defined as the pipes, sewers, pumping stations and treatment works that collect, reticulate, and treat wastewater from residents, businesses, and industries before releasing or reusing the final treated effluent and biosolids.

  Two different scorecards are used during the audit process, depending on the treatment technology employed:
  - Basic system: This is typically a treatment works with entry level technology, limited/no mechanical components, such as evaporation ponds, oxidation ponds, maturation ponds, sludge lagoons, wetlands, and reedbeds. Basic systems are less complex, have less stricter requirements, and generally hold lesser risk to the environment and customer
  - Advanced system: This is typically a works that employs more advanced forms of technology and comprise of several electrical, mechanical and instrumentation components, such as screening, de-gritting, biological filters, activated sludge systems, extended aeration, membranes, filters, belt presses, anaerobic digesters, UV disinfection, and pump stations. Advanced systems are generally more complex, hold potentially higher risk to the receiving environment, and are subject to stricter legal standards.

- ***IRIS***: The Integrated Regulatory Information System (IRIS) is a web-based application used by the Department of Water & 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 wastewater systems, tracks historic system performance, and provides the platform to register wastewater treatment works and operations staff.

- ***Diagnostic:*** A suite of key diagnostic themes covers a number of strategic areas of importance to the South African water industry. Diagnostics allows deeper examination of the data and a better understanding of the causes of behaviours and patterns, in answering pressing questions of "why did it happen?" and guide recommendations on "what correction or intervention is needed?".

Green Drop Reporting

This Green Drop Report 2022 upholds the Minister's commitment to provide the water sector and its stakeholders with **ongoing, current, accurate, verified,** and **relevant** information on the status of wastewater services in South Africa. It follows on a series of Green Drop Reports from 2009 to 2013, by providing feedback and progress pertaining to the current status of municipal, public, and selected private and state-owned wastewater facilities.

The Green Drop Report 2022 provides information on three different levels:

1. ***System specific*** data and information pertaining to the performance of each sewer network and treatment system at WSI level
2. ***Province specific*** data and information that highlight the strengths, weaknesses, and historic trends for the respective WSIs within a Province (WSA) or Region (DPW)
3. ***National overview*** that collates the findings from a provincial, regional and system levels to give an aggregated national perspective of wastewater service performance. Historic trends are provided to gain insight into the success of provincial and national strategies to improve wastewater management and to inform future strategies and interventions.

> ***The final proof of greatness lies in being able to endure criticism without resentment.***
>
> *Elbert Hubbard*

2. GREEN DROP STANDARDS 2021

The Stockdale paradox:
Confront the brutal truth of the situation, yet at the same time, never give up hope.

The Green Drop Audits were conducted by 24 audit panels comprising of qualified wastewater professionals. Each panel consisted of a Lead Inspector and 1-2 Inspectors. All inspectors underwent rigorous training and were required to achieve a threshold examination score to quality for involvement in the audit process.

WSIs were supported and capacitated through the audit process. Provincial symposia, attended by WSIs from that province, were held prior to the audit to share information on the audit process and criteria. Information was also shared on the role of IRIS and introduction to the IRIS Helpdesk. WSIs were also notified in advance of the audit date, audit criteria and the required portfolio of evidence (PoE) for the audit to assist with their preparation. The period under review for the 2021 audit cycle was: 1 July 2020 to 30 June 2021.

The audit scorecard was designed to consider evidence against 5 Key Performance Areas (A-E). The Green Drop KPAs, weights, and standards are summarised in the section below. Each KPA and sub-criteria carry a different weighting and are based on the relative regulatory priorities. Annexure B provides guidance on the format and interpretation of the Report Card.

Green Drop 2021 Audit Period : 1 July 2020 – 30 June 2021

Green Drop Standards

KPA A: Capacity Management (15%)

A1) Registration of Wastewater Treatment Plant	The wastewater treatment facility is registered as per the requirements of Regulation 2834 or as per Green Drop Standard (Draft Regulation 813)
A2) Registration of Process Controllers and Supervisor	Process controllers and supervisors are classified as per Regulation 2834 or Draft Regulation 813 (Green Drop Standard). These requirements will apply for all shifts of a specific wastewater system.
A3) Maintenance Capacity	The wastewater system must be served by a competent maintenance team (internal or outsourced), executing the maintenance work according to an acceptable maintenance plan/schedule.
A4) Engineering Management Capacity	The WSI must ensure that a competent engineering specialist oversee wastewater treatment operations, maintenance, and general asset management.
A5) *(Advanced Systems Only)* **Scientific Capacity (Sampling and Laboratory Information Management)**	The WSI must ensure that a suitably qualified professional scientist oversee the implementation of the operational and compliance monitoring programme (sampling and analyses).

KPA B: Environmental Management (15%)

B1) Wastewater Risk Management	The WSI shall conduct a detailed environmental risk assessment for the entire sewer collection system, wastewater treatment (both effluent liquid and sludge) and identify adequate control measures to implement for each risk identified. This process should be collated in form of an implemented system specific Wastewater Risk Abatement Plan (W_2RAP) as per the Water Research Commission (WRC) guideline.
B2) Operational Monitoring	Each WWTW shall have an operational monitoring programme in place which informs the operational efficacy (as per the required frequency) of the treatment facility as per the Authorisation.
B3) Compliance Monitoring (Effluent)	Each WWTW shall have a compliance monitoring programme in place (implemented) which informs on the compliance with the site-specific Authorisation requirements (as per the required frequency, determinands and sampling sites) of the treatment facility as per the Authorisation.
B4) *(Advanced Systems Only)* **Sludge Classification and Monitoring**	Sludge management (including sludge monitoring) must be implemented as per the Authorisation requirements.

B5) Laboratory Credibility	All compliance monitoring samples must be analysed at a credible laboratory (either accredited according to SANAS requirements or participating in a Proficiency Testing scheme with acceptable z-scores) for the required determinands, with an acceptable turnaround time.

KPA C: Financial Management (20%)

C1) Wastewater Operations Cost Determination	The WSI must determine the actual operations and maintenance cost per wastewater scheme and express this in R/m^3. Specific cost drivers need to inform the budget, including energy.
C2) Energy Demand	WSI must have proof of Energy Efficiency Management by providing Specific Power Consumption (SPC), energy unit cost (R/kWh), and express energy treatment cost in (R/m^3)
C3) Operations & Maintenance Budget	WSI must provide an annual O&M budget per wastewater system (for sewer collection network and wastewater treatment system).
C4) Operations & Maintenance Expenditure	WSI must provide proof of the wastewater system O&M expenditure per annum (to be measured in relation to the original budget).
C5) *(Advanced Systems Only)* **Supply Chain Management of Services and Treatment Products**	There must be appropriate supply chain management processes in place to ensure continuous availability of treatment chemicals (and related consumables), maintenance and spares.

KPA D: Technical Management (20%)

D1) Wastewater Treatment Works Design Capacity Management	For each wastewater treatment works, there must be continuous monitoring of daily hydraulic and organic loading in terms of the Average Dry Weather Flow (ADWF) and Chemical Oxygen Demand (COD) and compared with the design capacity.
D2) Process Audit	A wastewater treatment facility must be subjected to an annual condition assessment and/or a Process Audit (conducted by a duly qualified professional person) to inform functionality of the infrastructure. Risk findings must be incorporated in the W_2RAP process.
D3) Sewer Main Inspection	The Sewer Collection System must be subjected to an annual asset condition assessment (conducted by a duly qualified professional person), which includes a sewer pump-station functionality assessment and wastewater flow balance. Risk findings must be incorporated in the W_2RAP process.
D4) Wastewater Asset Register	Wastewater Infrastructure must be included in the WSI Asset Register (as per AGSA requirements), detailing: a) relevant equipment and infrastructure b) asset description c) location d) condition e) remaining useful life f) replacement value.
D5) *(Advanced Systems Only)* **Bylaws and Enforcement (Local Regulation)**	Municipalities must have enforceable bylaws in place which will safeguard advanced wastewater treatment technologies from harmful influent which would pose a risk to biological treatment processes and receiving environment (where authorised decentralised systems are being used).

KPA E: Effluent and Sludge Compliance (30%)

E1) Monitoring Data Submission to DWS	A WSI must ensure that all Compliance Monitoring data is submitted on a monthly basis to the Department of Water and Sanitation on the required Regulatory System (IRIS).
E2) Water Use Authorisation	The Section 21 water use must be authorised in terms of the National Water Act (Act 36 of 1998)
E3) Effluent Quality Compliance	The effluent quality must comply to 90% (in total) with the authorised limits for the respective categories: a) 90% Microbiological Compliance b) 90% Chemical Compliance (c) 90% Physical Compliance

E4) *(Advanced Systems Only)* **Sludge Quality Compliance**	The solids/sludge must be classified as per WRC Sludge Guideline

Bonuses (Maximum of 15%)

F1) **Process Control Training**	Process controllers and supervisory staff must be subjected to relevant training over the past 24 months as from the date of audit. Cross-pollination and inhouse training will be acknowledged as non-accredited capacity building.
F2) **Stormwater Management**	The WSI must have a Stormwater Ingress Management Plan detailing how stormwater (and other extraneous flow e.g. groundwater) entry is quantified, managed, and monitored to prevent entry into sewer systems.
F3) **Water Demand Management**	WSI shall formulate and implement a Water Conservation and Water Demand Management Plan which provides a strategy and work plan that identify, quantify, monitor, and manage leakages and water losses of any kind that may create an artificial water demand due to higher hydraulic loading of wastewater collection and treatment infrastructure.
F4) Wastewater and Sewer Capital Projects planned for upgrades or refurbishment	An approved business plan for sewer and/or wastewater upgrades or refurbishment, with secured/confirmed funding.
F5) **Sludge Reuse**	Plant-specific initiatives that contribute to wastewater resource recovery and climate resilience objectives: energy efficiency, energy generation, beneficial use of sludge, effluent, nutrients, etc.
F6) **Additional Impact Monitoring**	Plant-specific monitoring of environmental or control sites/location, e.g. groundwater, up-stream / downstream impact monitoring, and soil analysis

Penalties (Maximum of 15%)

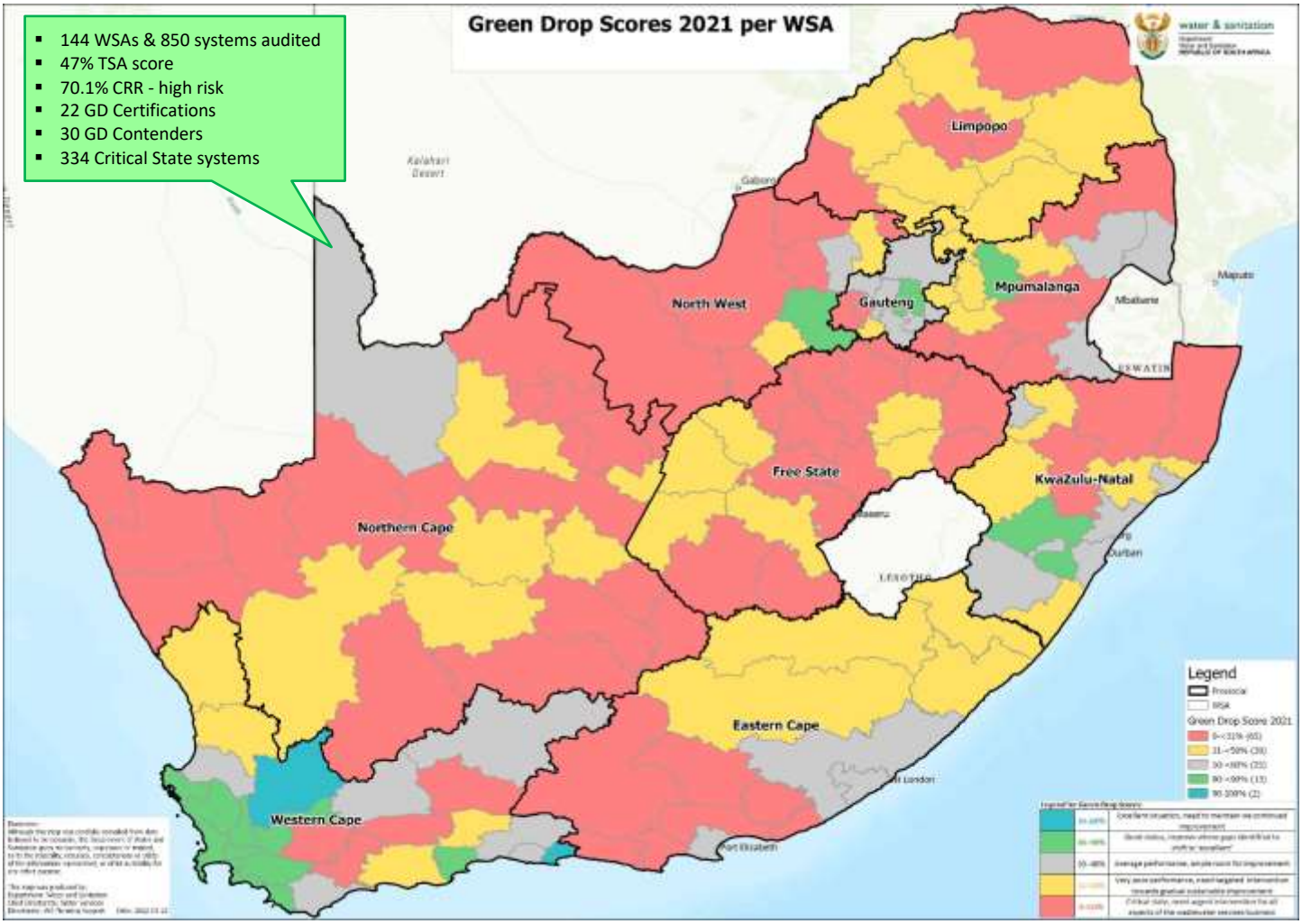
G1) Wastewater Treatment Works operating beyond hydraulic design capacity	See D1. *Note: If the plant operates above its installed capacity, but the effluent quality complies on ALL 3 categories, only 50% of the penalty will be applied.*
G2) **Any Sewer Collector & Pump-station dysfunctionality causing long term spillage**	See D3. *Note: Should a WSI have proof of a response to a reported spillage as per its own Incident Management Protocol, within 7 days, then the penalty will not apply. If evidence of a long-term spill is observed during the TSA check of the network, a penalty will be applied, and possibly replicated to other systems in this WSI jurisdiction (Inspector discretion).*
Disqualifier	H1) Withholding or falsifying information
	H2) Directive Status (Non reaction to a Directive issued by the Department)

A final **effluent quality disqualifier** is applied during the 2021 audit. Wastewater systems qualify for Green Drop Certification status when achieving an audit score of ≥90%. However, if such system fails to achieve ≥90% in microbiological and/or chemical compliance, the system would be disqualified from Certification and the score adjusted to 89%. The system will then be acknowledged as a Green Drop Contender. The adjustment will transfer to the institutional Green Drop score as well. The purpose of the disqualifier is to ensure that the credibility of the programme stays intact **in pursuit of excellence**. A system is only regarded as excellent if final effluent quality meets the excellence standards.

- ✖ Microbiological quality is selected for its importance in safeguarding the health of the downstream user and the integrity of the water resource. The presence of pathogens and bacteriological indicators in the final effluent implies that disinfection and nutrient removal operations of a treatment works are not optimised or functional.
- ✖ Chemical quality is selected for its negative impact on the water quality of the receiving waterways into which treatment works release final effluent. The presence of nitrogen and phosphate causes enrichment of inland and coastal waters. This leads to low-oxygen waters and dominance of certain algae and organisms, which leads to biodiversity losses, loss of fishery resources, seagrass, corals, and other aquatic life.

> ***"If you are going to achieve excellence in big things, you develop the habit in little matters. Excellence is not an exception, it is a prevailing attitude."***
>
> *Colin Powell*

3. NATIONAL PERFORMANCE OVERVIEW OF MUNICIPAL WASTEWATER MANAGEMENT



National Green Drop Report 2022

The National Green Drop Report 2022 is available from the Department of Water and Sanitation homepage. It can be accessed via www.dws.gov.za that will route the user to https://ws.dws.gov.za/IRIS/LatestResults.aspx

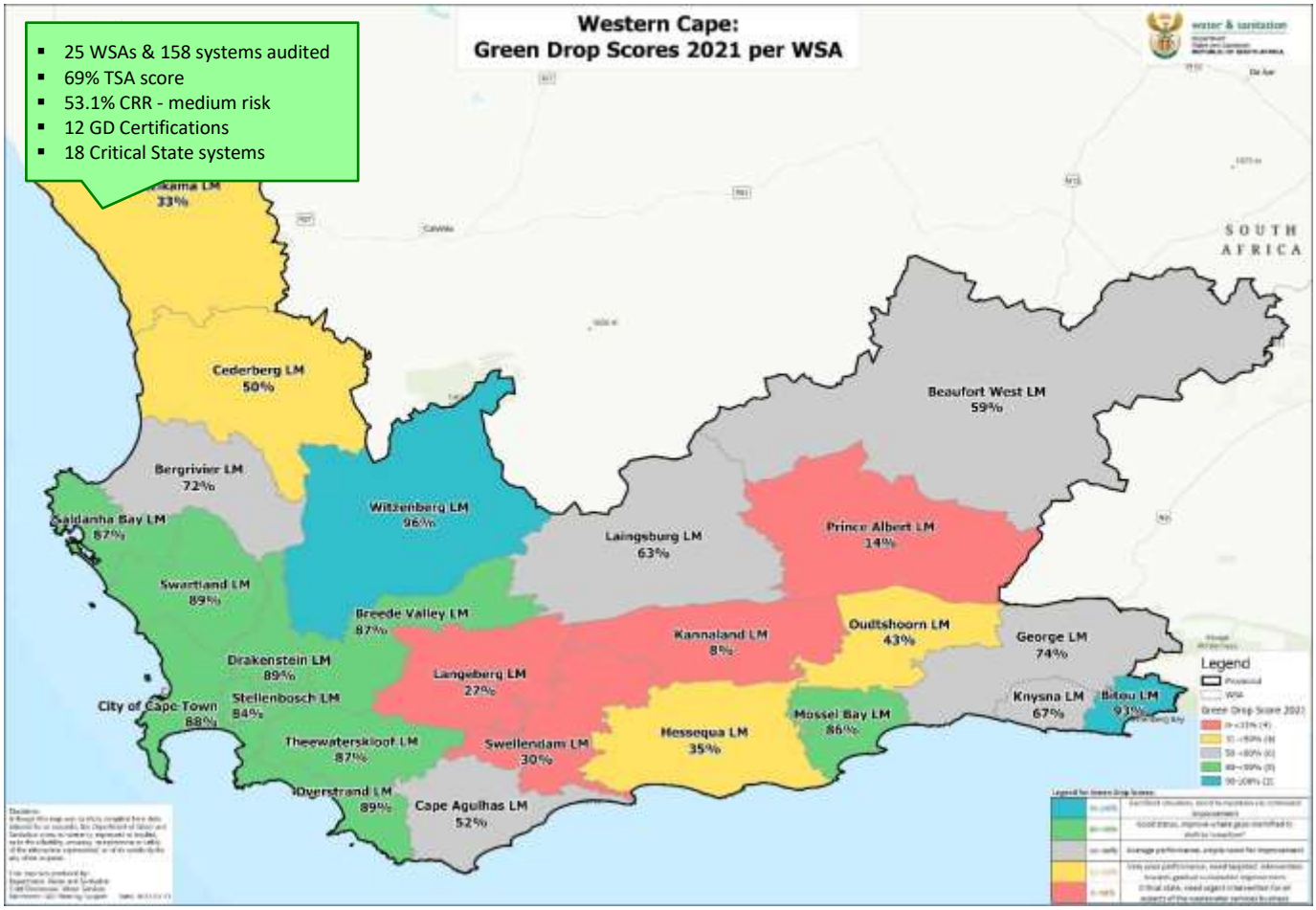
The Western Cape Green Drop Report 2022 is a sub-set of the national report and provides a provincial perspective with detailed results and findings of each WSI.

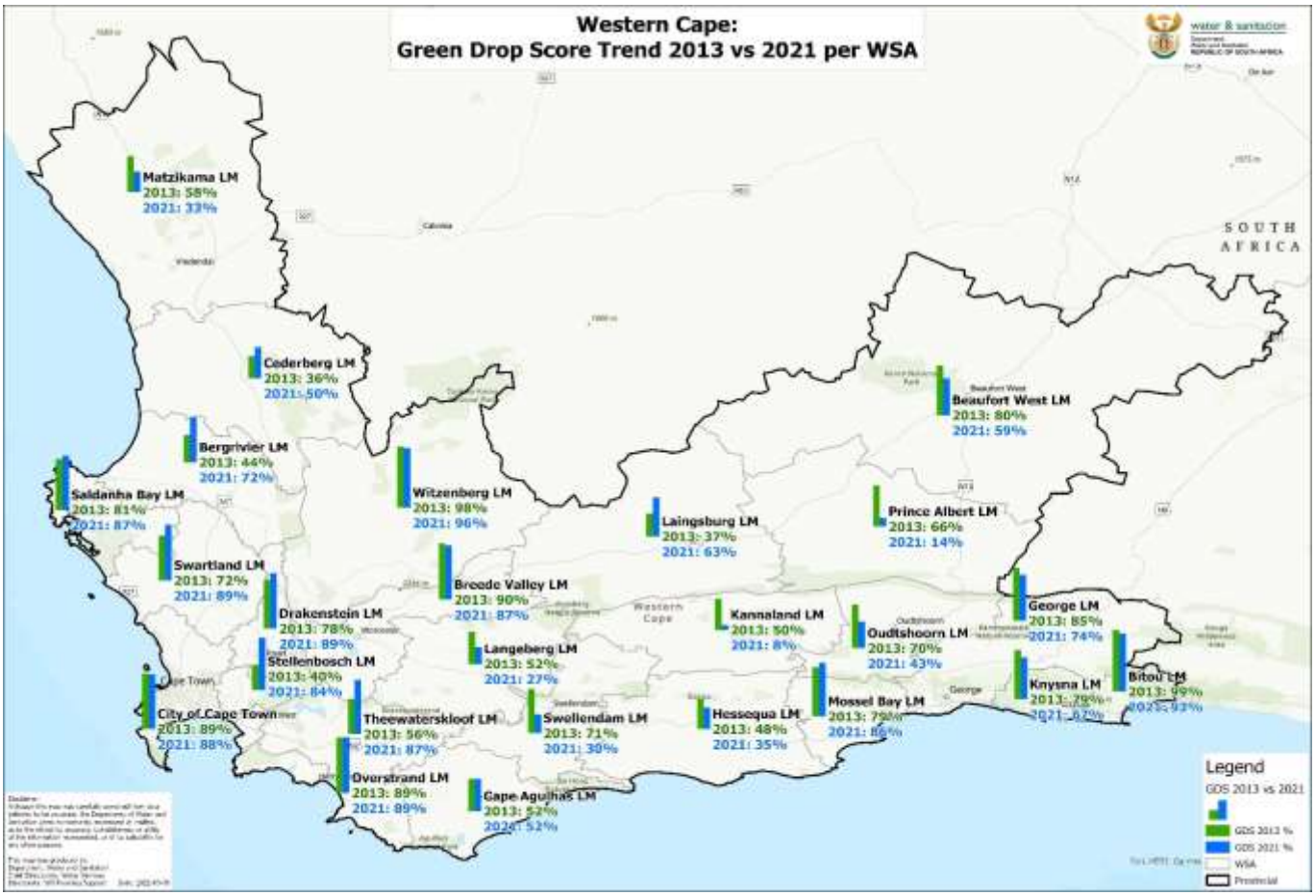
The national report also contains conclusions, recommendations, and way forward for the country and for provinces/regions as a collective.

We will use this report as the baseline for the Water Services Improvement Programme (10-point plan) from where we will measure the sustainable turn-around which we aspire to. We move forward knowing that we do not accept 'being good' as the norm for the South African wastewater industry instead, we endeavour towards excellence.

Minister for Water and Sanitation: Mr Senzo Mchunu

4. WESTERN CAPE PROVINCE: MUNICIPAL WASTEWATER MANAGEMENT PERFORMANCE





Provincial Synopsis

An audit attendance record of 100% affirms the Western Cape WSA's commitment to the Green Drop national incentive-based regulatory programme.

The Regulator determined that 12 wastewater systems scored a minimum of 90% when measured against the Green Drop standards for the audited period and thus qualified for the prestigious Green Drop Certification. This compares lower than the 26 systems being awarded Green Drop Status in 2013 but is recognised for its inherent value to establish an accurate, current baseline from where improvement can be driven, and excellence be incentivised. However, there are 21 GD Contenders to the GD Certification.

Nine (9) of the 25 WSAs improved on their 2013 scores. Fourteen (14) of the 25 WSAs relapsed to lower Green Drop scores compared to 2013 baselines. The remaining two municipalities maintained their GD scores from 2013 to 2021. Witzenberg is the best performing Water Services Authority in the Province, achieving 3 GD Certifications out of their 4 wastewater systems, with 80% technical site assessment score. The City of Cape Town achieved the highest number GD Certifications (4 of 26 systems) and the most GD Contenders to certification (8 of 26 systems). Bitou is the second-best performing municipality with a 93% GD score and 84% technical site assessment score, followed by Drakenstein with 89% GD score and 95% technical site assessment for the Wellington plant. Stellenbosch impressed with achieving the best overall progress from a 40% GD score in 2013 to an 84% GD score in 2021 – this is an excellent turnaround in service delivery over the past 8 years. Unfortunately eighteen (18) systems were identified in critical state, compared to nine (9) in 2013. The majority of these systems are managed by Matzikama, Kannaland, Swellendam and Prince Albert.

The WSA's overall Green Drop performance is characterised by particular strengths in technical capacity and capability at most municipalities, combined with risk management practices that are well embedded in the wastewater business. The predominant KPA that requires attention include effluent quality compliance and technical management aspects of the wastewater business.

The provincial Risk Ratio for treatment plants remained constant from 52.7% in 2013 to 53.1% in 2021 (0.4% movement), which suggests limited risk movement since 2013 in general. The most prominent risks were observed on the effluent and sludge non-compliance. Opportunities are presented in terms of reducing cost through process optimisation and improved energy efficiency, and beneficial use of sludge, nutrients, biogas, and other energy resources.

The Regulator is hopeful that the 2021 audits will set a baseline from where a positive trajectory for wastewater services and improved performance will follow. Municipalities are encouraged to start preparation for the 2023 Green Drop audit. The 2021 Green Drop status are summarised in Table 1, indicating several Green Drop Certifications, but also several systems in critical state.

Table 1 - 2021 Green Drop Summary

WSA Name	2013 GD Score (%)	2021 GD Score (%)	GD Certified ≥90%	GD Contenders (89%)	Critical State (<31%)
Witzenberg LM	98%	96%↓	Ceres, Op die berg, Tulbach		
Bitou LM	99%	93%↓	Plettenberg-Bitou, Kurland		
Drakenstein LM	78%	89%↑	Hermon	Paarl, Wellington, Saron, Gouda, Kliprug-Pearl Valley-Val de Vie	
Overstrand LM	89%	89%		Gansbaai, Stanford, Hermanus, Darling	
Swartland LM	72%	89%↑		Riebeeck Valley, Malmesbury-Abbotsdale	
City of Cape Town	89%	88%↓	Green Point Outfall, Houtbay, Philadelphia, Wesfleur Domestic	Athlone, Macassar-Strand, Kraaifontein, Mitchells Plain, Borcherd's Quarry, Potsdam-Milnerton, Melkbosstrand, Fisentekraal	
Breede Valley LM	90%	87%↓		Worcester	
Theewaterskloof LM	56%	87%↑			
Saldanha Bay LM	81%	87%↑	Hopefield		
Mossel Bay LM	79%	86%↑	Herbertsdale	Mossel Bay-Hartenbos	
Stellenbosch LM	40%	84%↑			
George LM	85%	74%↓			
Bergrivier LM	44%	72%↑			
Knysna LM	79%	67%↓			
Laingsburg LM	37%	63%↑			
Beaufort West LM	80%	59%↓			Murraysburg
Cape Agulhas LM	52%	52%			
Cederberg LM	36%	50%↑			
Oudtshoorn LM	70%	43%↓			
Hessequa LM	48%	35%↓			Garcia

WSA Name	2013 GD Score (%)	2021 GD Score (%)	GD Certified ≥90%	GD Contenders (89%)	Critical State (<31%)
Matzikama LM	58%	33%↓			Vredendal North, Strandfontein, Van Rhynsdorp, Rietpoort, Nuwerus
Swellendam LM	71%	30%↓			Buffelsjagsrivier, Barrydale, Klipperivier
Langeberg LM	52%	27%↓			Robertson
Prince Albert LM	66%	14%↓			Prince Albert, Klaarstroom, Leeugamka
Kannaland LM	50%	8%↓			Ladismith, Calitzdorp, Van Wyksdorp, Zoar
Totals	-	-	12	21	18

The Department of Water and Sanitation acknowledges the excellence in wastewater management achieved for the Green Drop Audit year of 2021.

Twelve (12) Green Drop Certificates are awarded in the Province to 4 systems in the City of Cape Town, 3 systems in the Witzenberg LM, 2 systems in the Bitou LM, and 1 system each in the Drakenstein LM, Saldanha LM and Mossel Bay LM:

Province	Green Drop Certified Systems	Acknowledgement of Contender Systems for Green Drop Certification
Western Cape	**Witzenberg LM** ○ Ceres ○ Op die berg ○ Tulbach **Bitou LM** ○ Plettenberg-Bitou ○ Kurland **Drakenstein LM** ○ Hermon **City of Cape Town** ○ Green Point Outfall ○ Houtbay ○ Philadelphia ○ Wesfleur Domestic **Saldanha Bay LM** ○ Hopefield **Mossel Bay LM** ○ Herbertsdale	✓ **Drakenstein LM** ○ Paarl ○ Wellington ○ Saron ○ Gouda ○ Kliprug-Pearl Valley-Val de Vie ✓ **City of Cape Town** ○ Athlone ○ Macassar-Strand ○ Kraaifontein ○ Mitchells Plain ○ Borcherd's Quarry ○ Potsdam-Milnerton ○ Melkbosstrand ○ Fisentekraal ✓ **Mossel Bay LM** ○ Mossel Bay-Hartenbos ✓ **Overstrand LM** ○ Gansbaai ○ Stanford ○ Hermanus ○ Darling ✓ **Swartland LM** ○ Riebeeck Valley ○ Malmesbury-Abbotsdale ✓ **Breede Valley LM** ○ Worcester

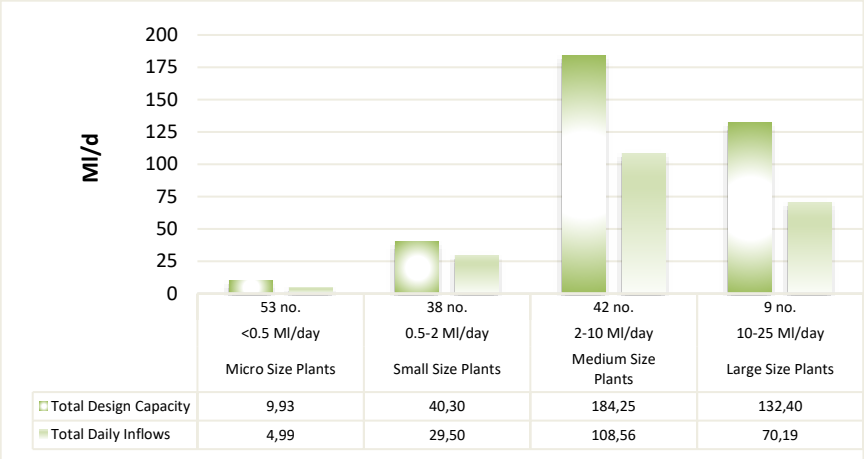
Background to Western Cape Wastewater Infrastructure

There are 25 WSAs, delivering wastewater services through a sewer network comprising of 158 wastewater treatment systems, 945 network pumpstations and 14,522 km outfall and main sewer pipelines. The sewer network excludes the pipelines of 8 municipalities who could not provide data. There is a total installed treatment capacity of 1,107.9 Ml/d, with most of this capacity (67%) residing in 12 macro-sized treatment plants.

Table 2 - Summary of WWTW capacity and flow distribution according to plant sizes

	Micro Size Plants	Small Size Plants	Medium Size Plants	Large Size Plants	Macro Size Plants	Unknown (NI)*	Total
	<0.5 Ml/day	0.5-2 Ml/day	2-10 Ml/day	10-25 Ml/day	>25 Ml/day		
No. of WWTW	53 (33%)	38 (24%)	42 (27%)	9 (6%)	12 (8%)	4 (2%)	158
Total Design Capacity (Ml/day)	9.93	40.30	184.25	132.40	741.00	4	1,107.9
Total Daily Inflow (Ml/day)	4.99	29.50	108.56	70.19	521.27	18	734.5
Use of Design Capacity (%)	50%	73%	59%	53%	70%	-	66%

** "Unknown" means the number of WWTWs with NI (No Information) on design capacity or daily inflow*



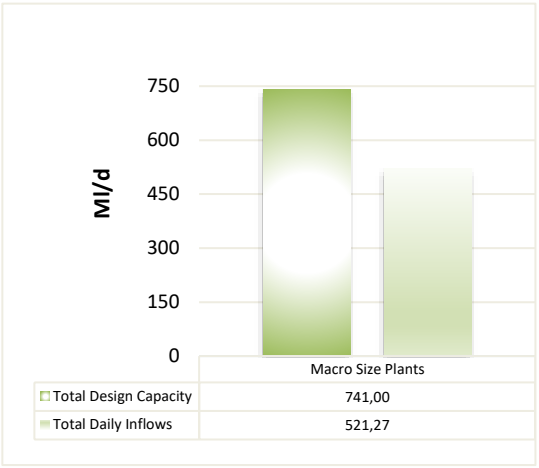


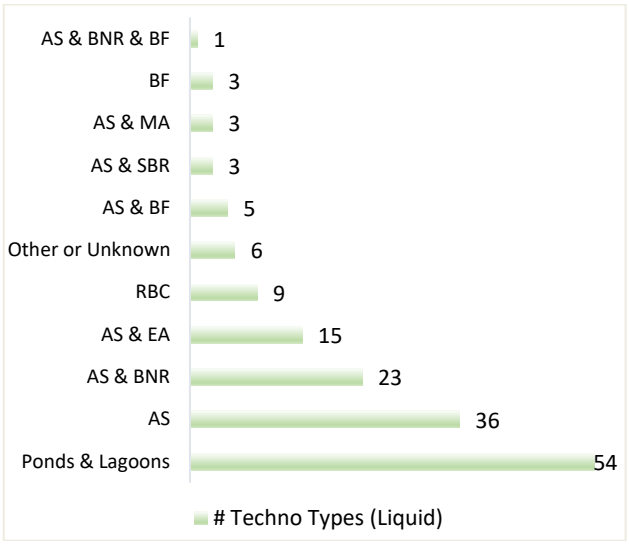
Figure 1 - Design capacities and operational inflow to micro to large sized WWTWs (a) and macro sized WWTWs

Based on the current operational flow of 734.5 Ml/d, the treatment facilities are operating at 66% of the total design capacity. The largest flow contributor is the City of Cape Town with 526.5 Ml/d and tapers off significantly to the 2nd highest contributor which is Drakenstein with 30.1 Ml/d. The figures of 66% suggests that 34% spare capacity is available to meet the medium-term demand. However, 18 of the 158 systems do not monitor their inflow. The spare capacity is therefore inaccurate and can only be confirmed once all WWTWs measure their inflow (Refer to Diagnostic 3). A theoretical surplus of 34% is 'available' for future demand. This capacity may be compromised at systems where some of the processes are non-operational due to dysfunctional equipment and/or structures. The VROOM Cost Diagnostic 7 reports on the refurbishment requirements to restore such capacity and functionality. The "available" capacity translates to 373.4 Ml/day, which would be sufficient to service an additional 1,555,833 to 2,333,750 persons (Red Book, 2019: 40-60% of 400 l/c/d).

The audit data shows that 17 systems with known design capacities are hydraulically overloaded. This figure will be higher as there are 18 systems that are not measuring their inflows and hence it is not possible to determine whether these systems are hydraulically overloaded as well. The systems with known design capacities, that are hydraulically overloaded, are as follows:

- City of Cape Town: 3 of 26 systems (Zandvliet, Gordons Bay, Klipheuwel)
- Breede Valley: 2 of 4 systems (Rawsonville, Touwsriver)
- Theewaterskloof: 1 of 8 systems (Riviersondererend)
- Stellenbosch: 1 of 5 systems (Pniel)
- Oudtshoorn: 1 of 3 systems (De Rust)
- Swartland: 1 of 7 systems (Koringberg)
- Hessequa: 3 of 10 systems (Melkhoutfontein, Riversdale, Slangrivier)
- Langeberg: 1 of 5 systems (Robertson)
- Mossel Bay: 1 of 7 systems (Grootbrak)
- Matzikama: 2 of 13 systems (Lutzville, Van Rhynsdorp)
- Knysna: 1 of 6 systems (Knysna ASP)

The predominant treatment technologies employed at KZN WWTWs comprise of ponds & lagoons, activated sludge and variations thereof (for effluent treatment), and belt press dewatering, solar/thermal drying beds (for sludge treatment). The next audit will need to verify sludge treatment technologies, as insufficient information ("None") is observed in this area.



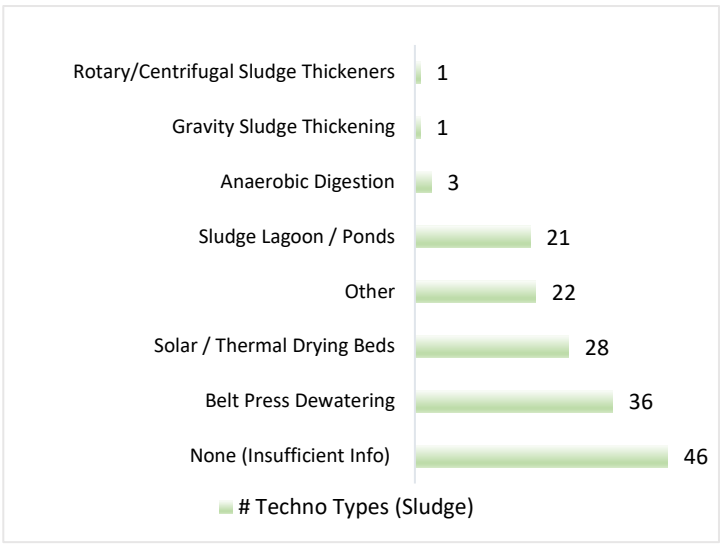


Figure 2 - Treatment technologies for wastewater effluent (a) and sludge (b)

Table 3 - Summary of Collection Network Pump Stations and Sewer Pipelines

WSA Name	# WWTWs	Pump Stations (#)	Sewer Pipelines (km)
City of Cape Town	26	346	9,597
Breede Valley	4	16	436
Theewaterskloof	8	13	215
Cederburg	7	22	83
Swellendam	4	3	NI
Stellenbosch	5	18	423
Witzenberg	4	22	214
Bitou	2	73	286
Cape Agulhas	4	6	129
Oudtshoorn	3	0	NI
Drakenstein	6	19	873
Swartland	7	20	315
Saldanha Bay	7	120	552
Overstrand	6	50	680
Hessequa	10	31	NI
Beaufort West	4	6	141
Kannaland	4	6	74
Laingsburg	2	3	22
Langeberg	5	21	NI
Prince Albert	3	2	NI
Bergrivier	5	61	140
Mossel Bay	7	87	342
Matzikama	13	0	NI
Knysna	6	0	NI
George	6	0	NI
Totals	**158**	**945**	**14,522**

The sewer network consists of the sewer mains and pumpstations as summarised in Table 3. City of Cape Town own and manage the bulk of the sewer collector infrastructure, approximately 9,597 km and 346 sewer pumpstations. Eight municipalities could not provide information on sewer pipelines, indicating asset management information limitations.

Provincial Green Drop Analysis

The 100% response from the 25 municipalities audited during the 2021 Green Drop process demonstrates a firm commitment to wastewater services in the Province.

Table 4 - Green Drop Comparative Analysis from 2009 to 2021

GREEN DROP COMPARATIVE ANALYSIS					
Performance Category	**2009**	**2011**	**2013**	**2021**	**Performance trend 2013 and 2021**
Incentive-based indicators					
Municipalities assessed (#)	20 (100 %)	27 (100%)	25 (100%)	25 (100%)	→
Wastewater systems assessed (#)	107	155	158	158	→
Average Green Drop score	47%	65%	69%	66%	↓

GREEN DROP COMPARATIVE ANALYSIS					
Performance Category	**2009**	**2011**	**2013**	**2021**	**Performance trend 2013 and 2021**
Incentive-based indicators					
Green Drop scores ≥50% (#)	46/107 (44%)	117/155 (75%)	123/158 (78%)	109/158 (69%)	↓
Green Drop scores <50% (#)	61/107 (56%)	38/155 (25%)	35/158 (22%)	49/158 (31%)	↓
Green Drop Certifications (#)	10	19	26	12	↓
Technical Site Inspection Score (%)	NA	65%	74%	69%	↓

NA = Not Applied *NI = No Information* *↑= improvement, ↓= regress, →= no change*

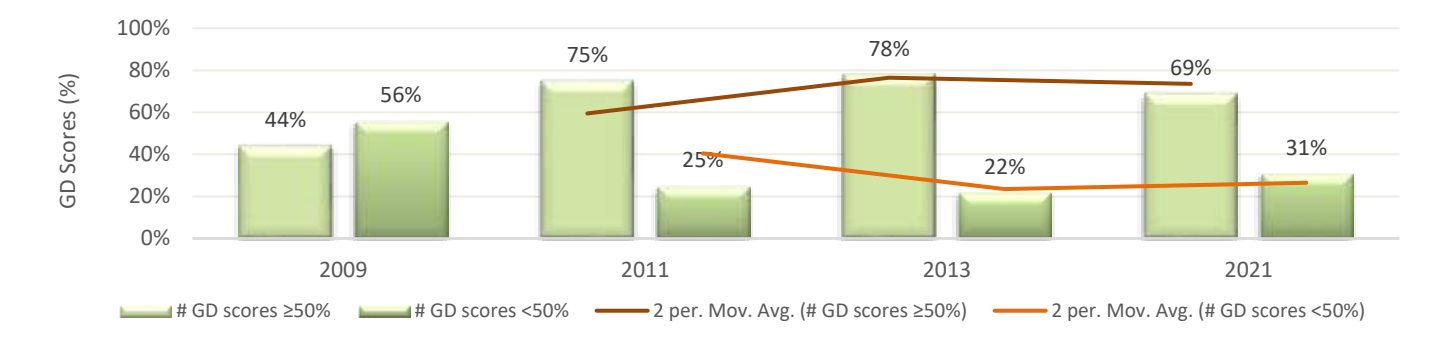


Figure 3 - Green Drop trend analysis over the period 2009 to 2021, indicating the percentage GD scores above and below 50%

The trend analysis indicates that:

- The number of systems audited has increased from 107 systems in 2009, when the first assessments were undertaken, to 158 systems in 2013 and 2021
- Despite an upward trend in previous GD average scores, 47% in 2009, 65% in 2011, 69% to 2013, there was a drop-off to 66% in 2021
- Similarly, the number of systems with GD scores of ≥50% increased between from 46 (44%) in 2009 to 123 (78%) in 2013 but decreased to 109 (69%) in 2021
- This trend was also mirrored in the Technical Site Assessment score, which had increased from 65% in 2011 to 74% in 2013 but decreased to 69% in 2021
- This trend was balanced by the number of systems with GD score of ≤50% decreasing from 61 (56%) in 2009 to 35 (22%) in 2013, followed by a regress to 49 (31%) in 2021
- The Green Drop Certifications decreased from 26 awards in 2013 to 12 awards in 2021
- An overall regressive performance pattern is noted from 2013 to 2021, which signal the benefit of repeat/regular audits to ensure continued improvement. Performance decreases when there are significant time lapses or irregular interaction.

The analysis for the period 2009, 2011, 2013 and 2021, indicates that many of the system scores are in the 50-80% (Average Performance) space, with the 80-90% (Good Performance) being the next largest category. The most concerning data point is that 18 systems are in critical state (<31%) compared to 9 systems in this space in 2013.

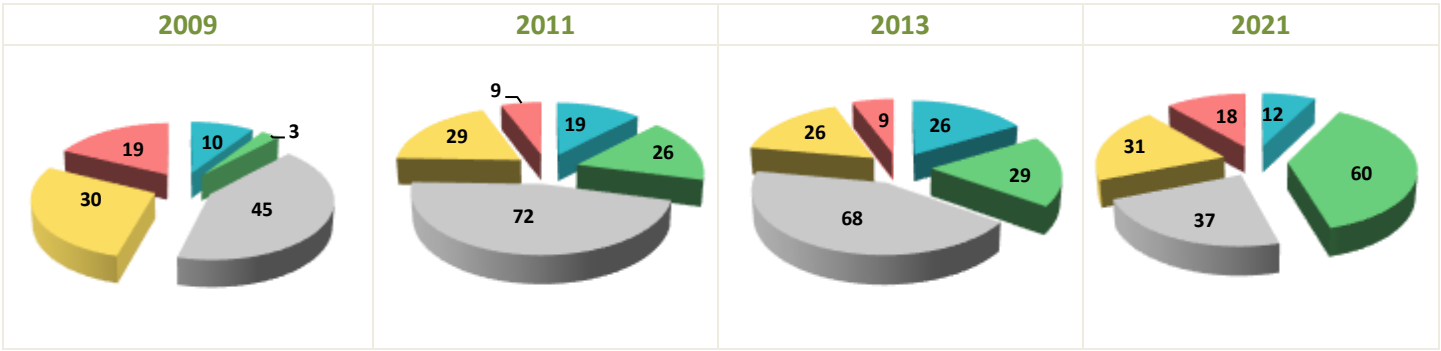


Figure 4 - No. WWTWs in the Green Drop score categories over the period 2009 to 2021 (graph legend to right)

In summary, trends over the years 2013 and 2021 indicate as follows:

- Systems in a 'poor state' increased from 26 systems in 2013 to 31 systems in 2021
- Systems in a 'critical state' increased from 9 in 2013 to 18 systems in 2021
- Systems in the 'excellent and good state' increased from 55 systems (35%) in 2013 to 72 systems (46%) in 2021.

Provincial Risk Analysis

Green Drop risk analysis (CRR) focuses on the treatment function specifically. It considers 4 risk indicators, i.e. design capacity, operational flow, technical capacity, and effluent quality. The CRR values do not factor risks associated with sanitation- or wastewater network and collector systems.

Table 5 - Cumulative Risk Comparative Analysis from 2009 to 2021

CUMULATIVE RISK COMPARATIVE ANALYSIS					
Performance Category	**2009**	**2011**	**2013**	**2021**	**Performance Trend 2013 to 2021**
Highest CRR	27	26	24	22	↑
Average CRR	12.4	11.9	9.7	9.9	↓
Lowest CRR	5	4	4	3	↑
Design Rating (A)	1.4	1.3	1.3	1.3	→
Capacity Exceedance Rating (B)	3.3	3.7	3.1	3.0	↑
Effluent Failure Rating (C)	6.2	4.7	3.5	3.9	↓
Technical Skills Rating (D)	1.7	2.5	2.2	2.0	↑
CRR% Deviation	**62.5**	**61.1**	**52.7**	**53.1**	↓

↑= improvement, ↓= regress, →= no change

Table 5 indicates a slight CRR% deviation from 2013 to 2021, which suggests little to no change in design capacity rating (A), a decrease in the capacity exceedance rating (B), an improvement in the technical expertise (D), and a regress in the final effluent quality (C). Individual systems, however, shows higher deviations and indicate specific risk categories, as highlighted under "***Regulator's Comment***". The CRR analysis in context of the Green Drop results suggests that further improvements should focus on 1) capacity exceedance at plants which are hydraulically overloaded or approaching its design lifespan, 2) effluent quality failures, especially for microbiological compliance, and 3) strengthening of technical skills and operational competency, especially related to sludge management.

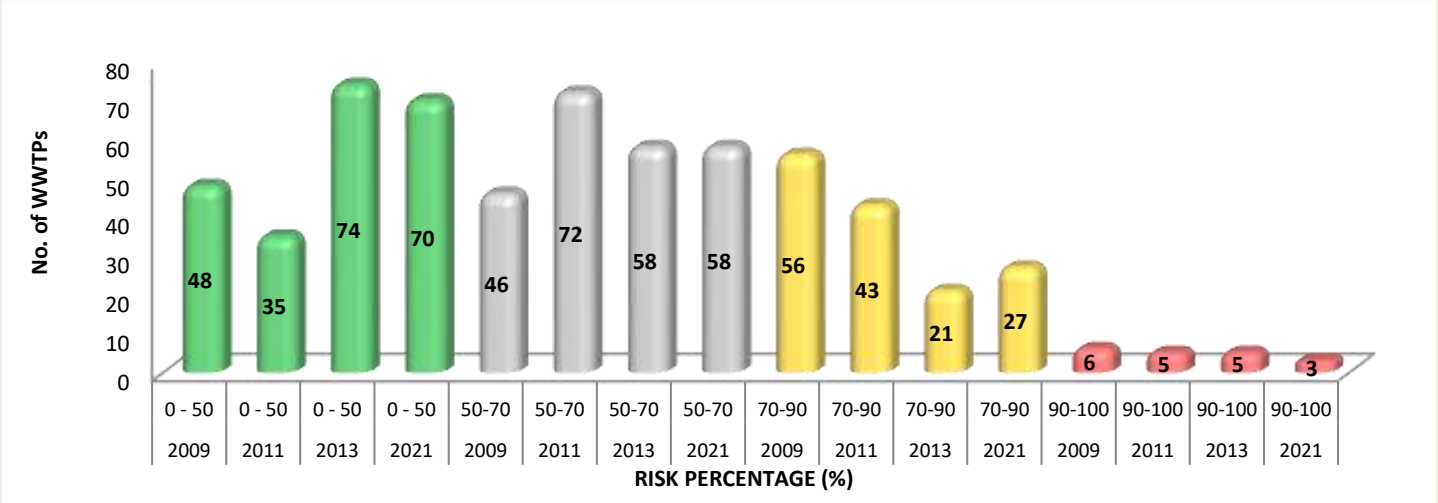


Figure 5 - a) WWTW Risk distribution and trends from 2009 to 2021; b) Colour legend

90 – 100% Critical risk WWTPs
70 - <90% High risk WWTPs
50-<70% Medium risk WWTPs
<50% Low risk WWTPs

Trend analysis of the CRR ratings for the period 2009 to 2021 reveals that:

- The most prominent movement in risk can be seen between 2011 and 2013, when a high number of plants moved from low to medium and high-risk positions, indicating a progressive state for the WWTWs
- The CRR improved from 2011 to 2013, at a time when W_2RAPs and risk-averse strategies were being imbedded in WSIs
- The 2021 assessment cycle highlighted slight regressive shifts with a decrease in low (74 to 70), an increase in high (21 to 27) but a decrease in critical risk WWTWs (5 to 3).

Regulatory Enforcement

Wastewater systems which failed to achieve the minimum Green Drop target of 31%, are placed under regulatory focus. The Regulator requires these municipalities to submit a detailed corrective action plan within 60 days of publishing of this report.

Seven (7) municipalities and eighteen (18) wastewater systems that received Green Drop scores below 31%, are to be placed under **regulatory surveillance**, in accordance with the Water Services Act (108 0f 1997). In addition, these municipalities will be compelled to ringfence water services grant allocation to rectify/restore wastewater collection and treatment shortcomings identified in this report.

Table 6 - WWTWs with <31% Green Drop scores

WSA Name	2021 Municipal GD Score	WWTWs with <31% score
Beaufort West LM	59%	Murraysburg
Hessequa LM	35%	Garcia
Matzikama LM	33%	Vredendal North, Strandfontein, Van Rhynsdorp, Rietpoort, Nuwerus
Swellendam LM	30%	Buffelsjagsrivier, Barrydale, Klipperivier
Langeberg LM	27%	Robertson
Prince Albert LM	14%	Prince Albert, Klaarstroom, Leeugamka
Kannaland LM	8%	Ladismith, Calitzdorp, Van Wyksdorp, Zoar

The following municipalities and their associated wastewater treatment plants are in high CRR risk positions, which means that some or all the risk indicators are in a precarious state, i.e. operational flow, technical capacity, and effluent quality. WWTWs in high risk and critical risk positions poses a serious risk to public health and the environment. The following municipalities will be required to assess their risk contributors and develop corrective measures to mitigate these risks.

Table 7 - %CRR/CRR_{max} scores and WWTWs in critical and high-risk space

WSA Name	2021 Average CRR/CRRmax % deviation	WWTWs in critical and high-risk space	
		Critical Risk (90-100%CRR)	High Risk (70-<90%CRR)
Swartland LM	49.7%		Chartsworth, Morreesburg, Koringberg
City of Cape Town Metro	50.2%		Grootspringfontein
Langeburg LM	54.1%		Robertson
Hessequa LM	56.5%		Gouritzmond, Heidelberg, Riversdale, Stilbaai
Oudtshoorn LM	59.5%		Dysseldorp, Oudtshoorn
Cape Agulhas LM	61.8%		Bredasdorp. Waenhuiskrans
Prince Albert LM	68.6%		Klaarstroom, Prince Albert
Cederberg LM	68.9%		Clanwilliam, Algeria, Graafwater
Matzikama LM	75.6%	Nuwerus, Rietpoort, Strandfontein	Bitterfontein, Koekenaap, Luttzville Wes, Lutzville, Vredendal North, Vredendal South
Kannaland LM	79.4%		Calitzdorp, Ladismith, Zoar

Good practice risk management requires that the W_2RAPs are informed by meaningful Process and Condition Assessments, supported by zealous implementation of corrective measures and ongoing monitoring of risk movement. The municipalities that are not reflected in the above table are commended for maintaining all their treatment facilities in low and moderate risk positions - an exemplary status.

Performance Barometer

The **Green Drop Performance Barometer** presents the individual Municipal Green Drop Scores, which essentially reflects the level of mastery that a municipality has achieved in terms of its overall municipal wastewater services business. The bar chart to follow indicates the GD scores for 2013 in comparison to GD 2021, from highest to lowest performing WSI. Witzenberg and Bitou are commended for maintaining their excellent status. In addition, 9 of the 25 municipalities from Drakenstein to Stellenbosch are in the good performance category. Drakenstein, Swartland, Theewaterskloof, Saldanha Bay, Mossel Bay and Stellenbosch are commended on improving their GD scores from poor and average performance to good performance especially a giant leap for Stellenbosch from 40% to 84%. In 2013, the Province had no municipalities in the critical state but now Swellendam, Langeberg, Prince Albert and Kannaland have relapsed to the critical state.

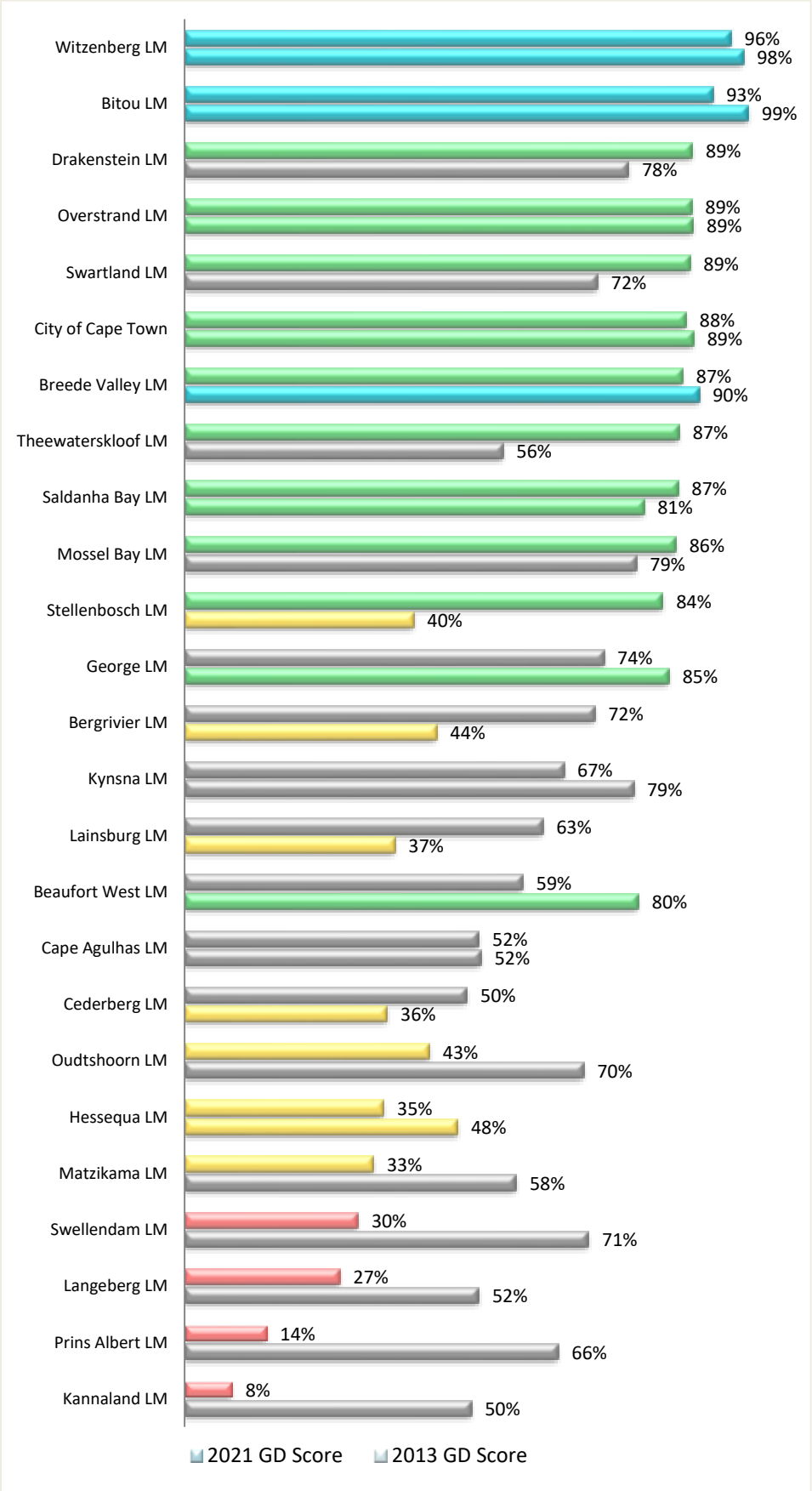


Figure 6 - a) Green Drop scores 2013 (bottom bar) and 2021 (top bar), with colour legend inserted

90 – 100% Excellent
80-<90% Good
50-<80% Average
30-<50% Poor
0-<31% Critical state

The **Cumulative Risk Log** expresses the level of risk that a municipality poses in respect its wastewater treatment facility. It is based on the ***individual Cumulative Risk Ratios***. Figure 7 presents the cumulative risks in ascending order – with the low-risk municipalities on the top and high-risk municipalities at the bottom. Twelve municipalities from Bitou LM to Swartland LM are commended for maintaining their systems in the low-risk space. The Matzikama and Kannaland wastewater systems are in high-risk positions. The analysis reveals that there are no critical risk municipalities in the Province.

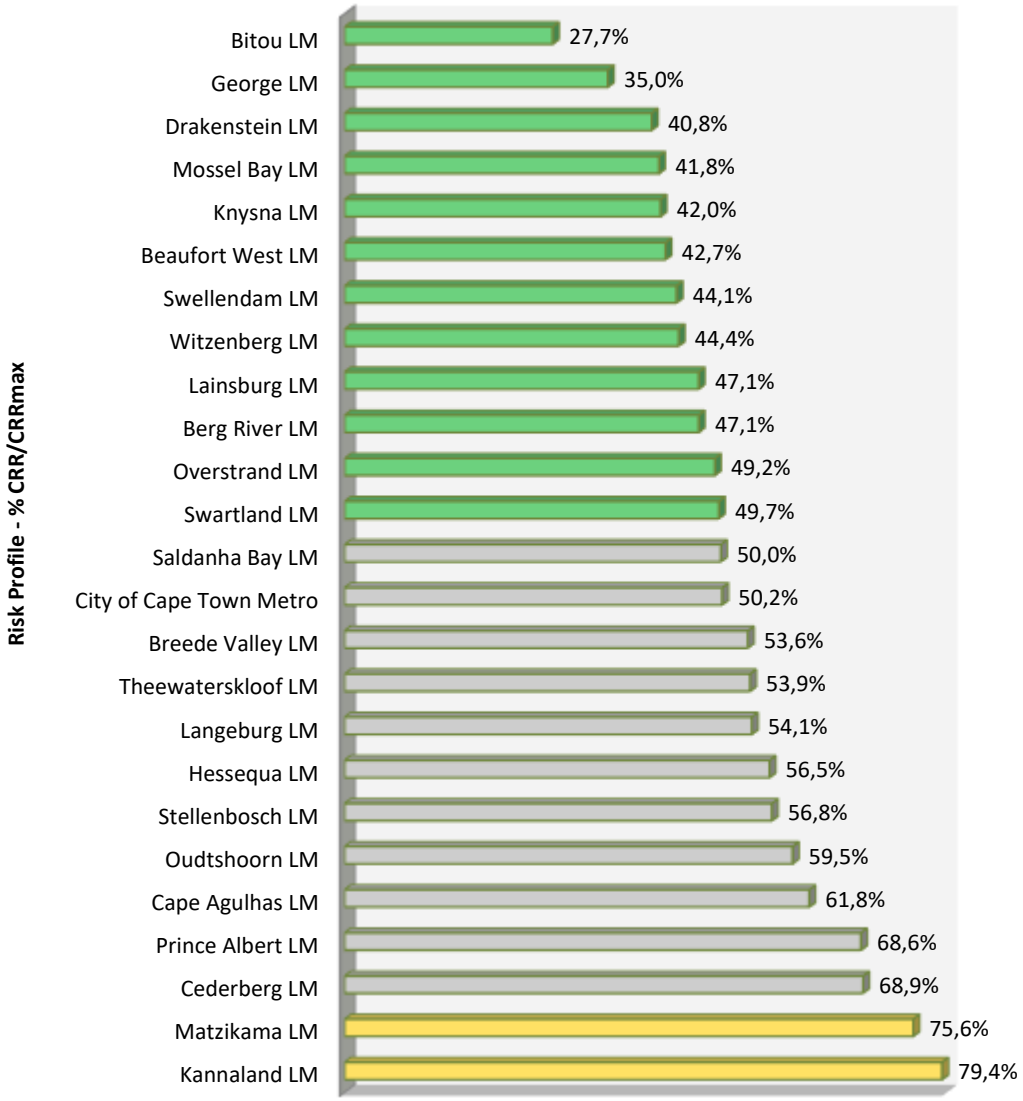


Figure 7 - a) %CRR/CRRmax Risk Performance Log 2021; b) Colour legend

90 – 100% Critical risk WWTPs
70 - <90% High risk WWTPs
50-<70% Medium risk WWTPs
<50% Low risk WWTPs

Provincial Best Performers

Witzenberg LM is the **BEST PERFORMING** municipality in the Province based on the following record of excellence:

- ✓ 96% Municipal Green Drop Score
- ✓ 2013 Green Drop Score of 98%
- ✓ Regression on the CRR risk profile from 35.6% in 2013 to 44.4% in 2021
- ✓ All plants (4 no.) in the low and medium risk positions
- ✓ Technical Site Assessment scores of 80% (Ceres)

Bitou LM is the 2nd best performing municipality:

- ✓ 93% Municipal Green Drop Score
- ✓ Both plants (2 no.) in low-risk positions
- ✓ TSA score of 84% (Plettenberg-Gansevallei)

Drakenstein LM is the 3rd best performing municipality:

- ✓ 89% Municipal Green Drop Score
- ✓ All plants (6 no.) in low and medium risk positions
- ✓ TSA of 95% (Wellington)

KPA Diagnostics

The Green Drop Audit process collects a vast amount of data that yield valuable insight on the state of the wastewater sector in each Province. These insights have been captured into 7 thematic areas or 'Diagnostics', as discussed below.

Table 8 - Summary of the key diagnostic themes and reference to the respective Green Drop KPAs

Diagnostic #	Diagnostic Description	Diagnostic Reference
1	**Green Drop KPA Analysis**	KPAs A-E
2	**Technical Competence**	KPA A, B & Bonus
3	**Treatment Capacity**	KPA D
4	**Wastewater Monitoring and Compliance**	KPA B & D & Bonus
5	**Energy Efficiency**	KPA C & Bonus
6	**Technical Site Assessments**	TSA
7	**Operation, Maintenance and Refurbishment of Assets**	KPA C, D & Bonus

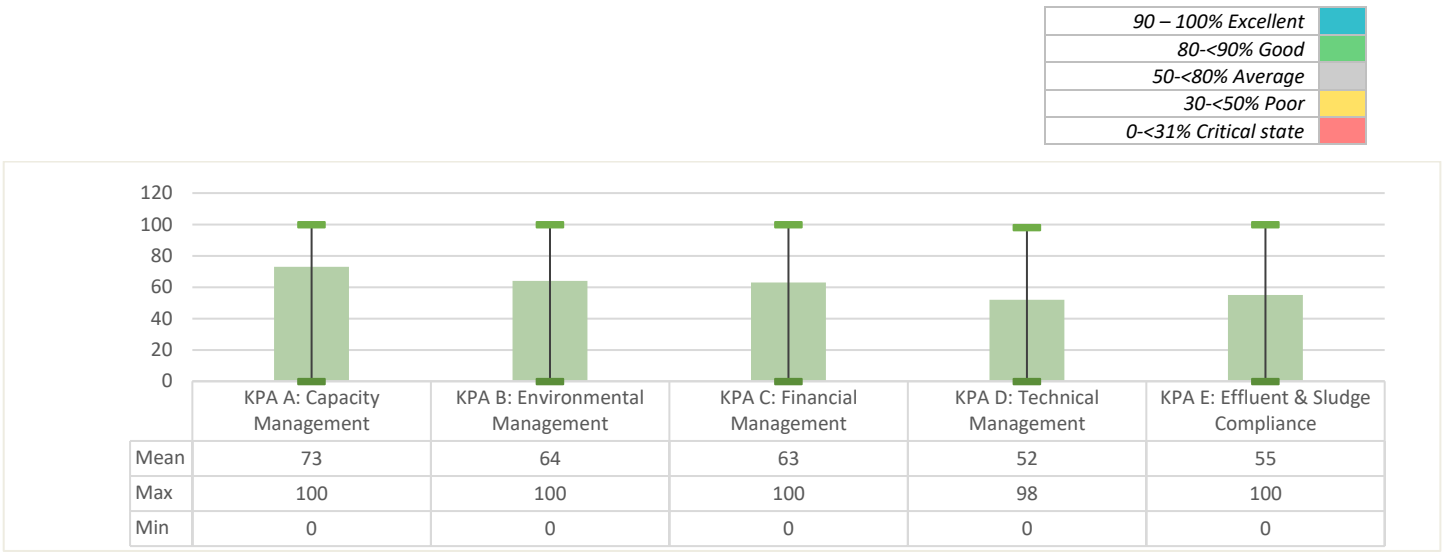
Diagnostic 1: Green Drop KPA Analysis

Aim: Analysis of technical skills, environmental plans, financial management, technical capacity, and regulatory compliance provides insight to the strengths and weaknesses that distinguish the Provinces' wastewater industry. These insights in return, may inform appropriate interventions and strategies to improve the individual KPAs and ultimately, collective KPA performance.

Findings: The WSAs are characterised by a variable KPA profile. A good KPA profile typically depicts a high mean GD score, coupled with a low Standard Deviation (SD) between the outer parameters (min and max). Similarly, a well performing system is one which has most/all systems in the >80% bracket and no systems in the <31% bracket.

Table 9 - Green Drop scores KPA profiles (graph legend included)

KPA #	Key Performance Area	*Weight*	Minimum GD Score (%)	Maximum GD Score (%)	Mean GD Score (%)	# Systems <31%	# Systems ≥80%
A	Capacity Management	*15%*	0%	100%	**73%**	12 (8%)	94 (59%)
B	Environmental Management	*15%*	0%	100%	**64%**	14 (9%)	70 (44%)
C	Financial Management	*20%*	0%	100%	**63%**	42 (27%)	85 (54%)
D	Technical Management	*20%*	0%	98%	**52%**	48 (30%)	51 (32%)
E	Effluent and Sludge Compliance	*30%*	0%	100%	**55%**	31 (20%)	30 (19%)



Note: The High and low lines represent the Min and Max range, and the shaded green represents the Mean (arithmetical average)

Figure 8 - Maximum, minimum, and mean Green Drop KPA scores

The KPA distribution indicates as follows:

- Capacity Management (KPA A) depicts the highest mean of 73%, highest maximum of 100%, and the consistent Standard Deviation (SD) of 100% for 4 of the 5 KPAs. These results indicate some strengths pertaining to the registration of WWTWs, maintenance plans and records, maintenance teams, and registered, qualified staff (process controllers, supervisors, scientists, technicians, engineers)
- Technical Management (KPA D) received the lowest mean of 52%, indicating a vulnerability in basic design information, inflow, outflow, meter reading credibility, process and condition assessments, site inspection reports, asset registers, asset values, bylaws, and enforcement
- This was followed by the Effluent and Sludge Quality Compliance (KPA E) that received the next lowest mean of 55%, indicating a deficiency in data management, IRIS upload, effluent quality compliance, and sludge quality compliance.

The GD bracket performance distribution echoes the above findings:

- ***KPA Score ≥80%:*** Capacity Management (KPA A) is by far the best performing KPA with 59% of systems achieving >80%, followed by Financial Management (KPA C) with 54%. Effluent and Sludge Compliance (KPA E) was the worst performing KPA with only 19% achieving >80%, followed by Technical Management (KPA D) with 32%
- ***KPA Score <31%:*** Technical Management (KPA D) represents the worst performing KPA with 30% of systems lying in the 0-31% bracket, followed by Financial Management (KPA C) with 27% and Effluent and Sludge Compliance (KPA E) with 20%.

Diagnostic 2: Technical Competence

Aim: This focus area assesses the human resources (technical) capacity to manage wastewater systems. Theory suggests a correlation between human resources capacity (sufficient number of appropriately qualified staff) and a municipality's performance- and operational capability. It is projected that high HR capacity would translate to compliant wastewater services and protection of scarce water resources.

Findings: According to regulations, wastewater plants are classified as Class A, B, C, D or E plants. Similarly, Process Controllers and Plant Supervisors are registered as Class I, II, III, IV, V or VI operators. High classed plants require a higher level of operators due to their complexity and strict regulatory standards. Technical compliance of PCs and Supervisors is determined against Green Drop standards, as defined by Reg. 2834 and draft Reg. 813 of the National Water Act 1998.

Table 10 - No. compliant versus shortfall in Supervisor and Process Controller staff

WSA Name	# WWTWs	# Compliant staff		# Staff Shortfall		Ratio*	WSA 2021 GD Score (%)
		Supervisor	PCs	Supervisor	PCs		
City of Cape Town	26	19	88	1	3	4.1	88%
Breede Valley	4	1	11	1	2	3	87%
Theewaterskloof	8	3	18	1	4	2.6	87%
Cederburg	7	0	4	1	6	0.6	50%
Swellendam	4	0	0	2	5	0	30%
Stellenbosch	5	3	8	1	6	2.2	84%
Witzenberg	4	1	10	0	0	2.8	96%
Bitou	2	2	7	0	1	4.5	93%
Cape Agulhas	4	1	3	1	4	1	52%
Oudtshoorn	3	1	0	1	9	0.3	43%
Drakenstein	6	4	9	0	3	2.2	89%
Swartland	7	2	11	1	4	1.9	89%
Saldanha Bay	7	3	14	0	3	2.4	87%
Overstrand	6	8	24	0	0	5.3	89%
Hessequa	10	1	14	2	6	1.5	35%
Beaufort West	4	2	5	0	1	1.8	59%
Kannaland	4	1	2	0	3	0.8	8%
Laingsburg	2	0	2	1	0	1	63%
Langeberg	5	0	3	2	8	0.6	27%
Prince Albert	3	1	3	0	0	1.3	14%

WSA Name	# WWTWs	# Compliant staff		# Staff Shortfall		Ratio*	WSA 2021 GD Score (%)
		Supervisor	PCs	Supervisor	PCs		
Bergrivier	5	1	0	0	8	0.2	72%
Mossel Bay	7	3	7	0	7	1.4	86%
Matzikama	13	1	9	2	8	0.8	33%
Knysna	6	2	7	0	7	1.5	67%
George	6	1	8	2	8	1.5	74%
Totals	**158**	**61**	**267**	**19**	**106**		

** The Ratio depicts the number of qualified staff divided by the number of WWTWs operated by this number of staff. E.g. Bitou has 9 qualified staff for 2 WWTWs, thus 9/2 = 4.5 ratio*

Note: "Compliant staff" means qualified and registered staff that meets the GD standard as required for a particular Class Works. "Staff shortfall" means staff that does not meet the GD standard for a particular Class of works (+1 for a shift) and/or staffing gaps exist at the respective WWTWs.

Competent human resources is a vital enabler to ensure efficient and sustainable management of treatment processes and infrastructure. For the WSAs in general, the operational capacity are found to be good, as illustrated by the high compliance figures below.

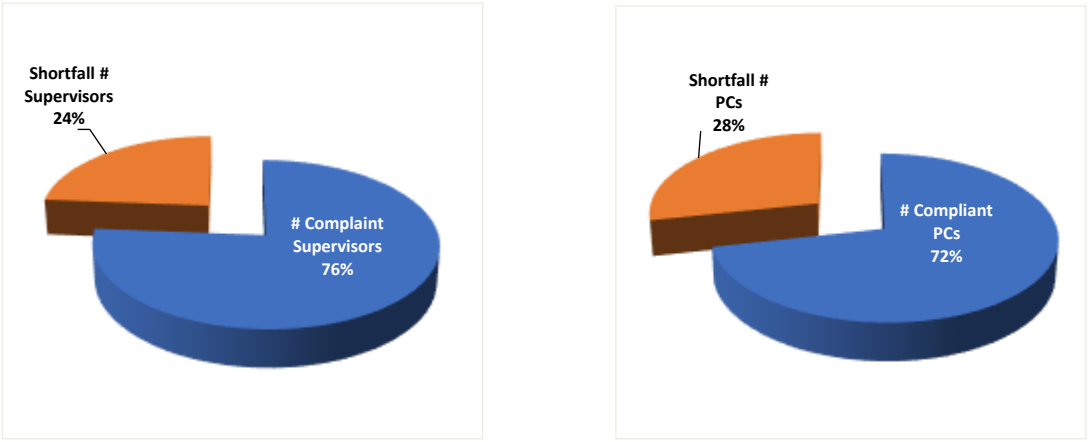


Figure 9 - Schematic illustration of compliant versus non-compliant Supervisors (a) and Process Controllers (b)

Plant Supervisors: The pie charts indicate that 76% (61 of 80) of Plant Supervisors complies with the Green Drop standard, with zero shortfall for 11 of the 25 municipalities. A 24% (19 of 80) shortfall is noted for Supervisors overall, with the highest shortfall seen at the Swellendam, Hessequa, Langeberg, Matzikama and George (2 no. each).

Process Controllers: Similarly, 72% (267 of 373) of the PC staff is complaint, with a zero shortfall for Witzenberg, Overstrand, Laingsburg and Prince Albert. There is a 28% (106 of 373) shortfall in PCs with the highest shortfalls: Oudtshoorn (9 no.); Langeberg, Bergrivier, Matzikama and George (8 no. each); and Mossel Bay and Knysna (7 no. each).

Green Drop standards require of Class A and B plants to employ dedicated Supervisors and Process Controllers per shift per Works, whereas Class C to E plants may consider sharing of staff across works. The introduction of shifts is necessary to ensure that expensive assets are not left unsupervised during night times, especially considering issues of operations and vandalism. Telemetry also reduces the requirement for on-site staff during night shifts, but any relaxations need to be resolved with DWS.

It is anticipated, but never tested before, that a correlation would exist between the competence of an operational team and the performance of a treatment plant, as measured by the GD score

Figure 10 shows high ratios for Overstrand, Bitou, City of Cape Town, Breede Valley, and low ratios from Kannaland to Swellendam (see graph to follow). Overall, the comparative bar chart confirms a high correlation between municipalities with high ratios and higher GD scores - from Overstrand 89% to Swartland 89% in the top part of the graph. Whereas lower ratios are associated with lower GD scores - from Prince Albert 14% to Swellendam 30%. Some anomalies are observed for systems that have high GD scores but lower ratios and vice versa.

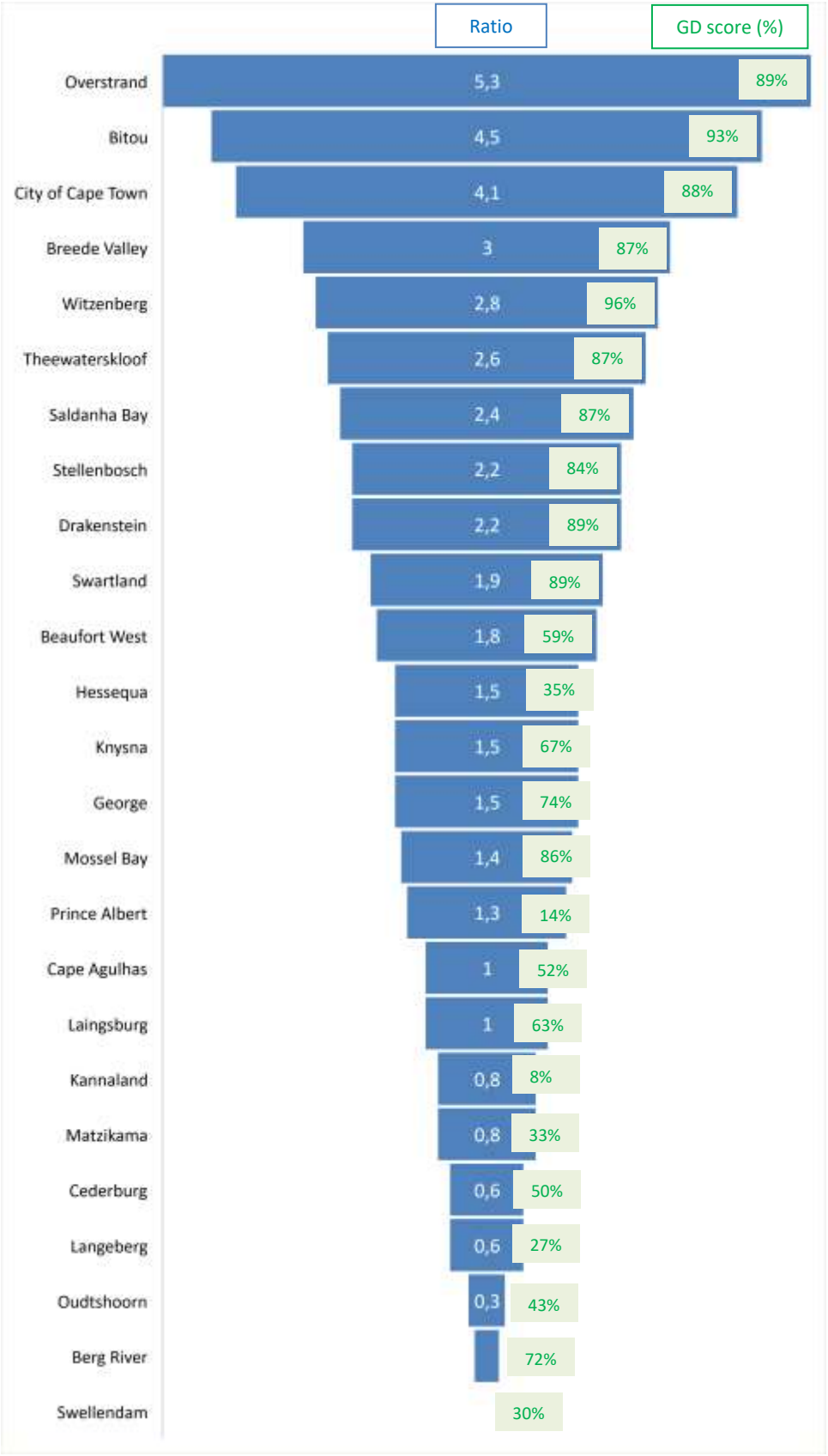


Figure 10 - Ratio of compliant operational staff to no. of WWTWs and Comparison of Ratios with GD scores

In addition to operational capacity, good management practice also requires access to qualified engineers, technicians, technologists, scientists, and maintenance capability. Such competencies could reside inhouse or accessible through term contracts and external specialists.

Table 11 - Summary of the maintenance capacity and no. of qualified and shortfall of Engineering, Technical and Scientific staff

WSA Name	# WWTW	Maintenance Arrangement	Qualified Technical Staff (#)				Technical Shortfall (#)	Qualified Scientists (#)	Scientists Shortfall (#)	Ratio*	WSA 2021 GD Score (%)
			Engineers	Technologists	Technicians	Total					
City of Cape Town	26	Internal + Term Contract	13	2	22	37	0	8	0	1.4	88%
Breede Valley	4	Internal + Specific Outsourcing	0	3	2	5	0	1	0	1.3	87%
Theewaterskloof	8	Internal + Term Contract	4	4	5	13	0	2	0	1.6	87%
Cederburg	7	Internal + Term Contract	1	0	3	4	0	2	0	0.6	50%
Swellendam	4	No Capacity	1	0	2	3	0	0	1	0.8	30%
Stellenbosch	5	Internal + Term Contract	2	1	1	4	0	2	0	0.8	84%
Witzenberg	4	Internal + Term Contract	1	1	5	7	0	2	0	1.8	96%
Bitou	2	Internal + Term Contract	1	0	1	2	0	1	0	1	93%
Cape Agulhas	4	Internal + Term Contract	0	0	1	1	1	1	0	0.3	52%
Oudtshoorn	3	Internal + Specific Outsourcing	1	1	0	2	0	0	1	0.7	43%
Drakenstein	6	Internal + Specific Outsourcing	1	1	1	3	0	1	0	0.5	89%
Swartland	7	Internal + Specific Outsourcing	1	6	2	9	0	3	0	1.3	89%
Saldanha Bay	7	4 Internal + Specific Outsourcing + 1 Internal + Term Contract + 2 Internal Team (Only)	0	1	1	2	0	1	0	0.3	87%
Overstrand	6	5 Internal + Specific Outsourcing + 1 Internal + Term Contract	7	2	5	14	0	3	0	2.3	89%
Hessequa	10	Internal + Specific Outsourcing	0	1	0	1	1	0	1	0.1	35%
Beaufort West	4	Internal + Term Contract	0	1	1	2	0	0	1	0.5	59%
Kannaland	4	Inadequate Capacity	0	0	0	0	2	0	1	0	8%
Laingsburg	2	Internal + Term Contract	0	0	0	0	2	0	0	0	63%
Langeberg	5	Internal + Specific Outsourcing	0	0	0	0	2	0	1	0	27%
Prince Albert	3	Inadequate Capacity	0	0	0	0	2	0	1	0	14%
Bergrivier	5	4 Internal + Specific Outsourcing + 1 Internal + Term Contract	3	1	1	5	0	2	0	1	72%
Mossel Bay	7	Internal + Term Contract	1	0	1	2	0	1	0	0.3	86%
Matzikama	13	Inadequate Capacity	0	3	1	4	0	0	1	0.3	33%
Knysna	6	Internal + Term Contract	0	2	0	2	0	2	0	0.3	67%
George	6	Internal + Term Contract	1	0	1	2	0	1	0	0.3	74%
Totals	**158**		**38**	**30**	**56**	**124**	**10**	**33**	**8**		

** The Ratio depicts the number of qualified technical staff divided by the number of WWTWs that have access to the staff*

Note 1: "Qualified Technical Staff" means staff appointed in positions to support wastewater services, and who has the required qualifications. "Technical Shortfall" is calculated based on a minimum requirement of at least 2 Engineers/Technologists/Technicians and at least one 1 Scientist per WSI.

Note 2: "Qualified Scientists" means professional registered scientists (SACNASP) appointed in positions to support wastewater services. "Scientist's shortfall" means that the WSA does not have at least one qualified, SACNASP registered scientist in their employ or contracted.

In terms of maintenance capacity, a reasonable contingent of qualified maintenance staff is in observed for at least 21 municipalities, with the current qualified maintenance staff from a collective of inhouse, contracted or outsourced personnel. The data indicates that:

- 21 of 25 municipalities have inhouse maintenance teams
- 15 of 25 municipalities have internal maintenance teams supplemented with term contracts
- 9 of 25 municipalities have internal maintenance teams supplement with specific outsourced services
- 4 of 25 municipalities have either no capacity or inadequate capacity.

In general, a strong case is noted in terms of access to qualified technical staff. The data indicates as follows:

- A total of 38 engineers, 30 technologists, 56 technicians (qualified) and 33 SACNASP registered scientists are assigned to the 25 municipalities, totalling 124 qualified staff
- A total shortfall of 18 persons is identified, consisting of 10 technical staff and 8 scientists
- Cape Agulhas, Hessequa, Kannaland, Langeberg, Laingsburg, Prince Albert and Kannaland have some shortfall in qualified technical staff
- 84% of the WWTWs has access to credible laboratories which complies with Green Drop standards.

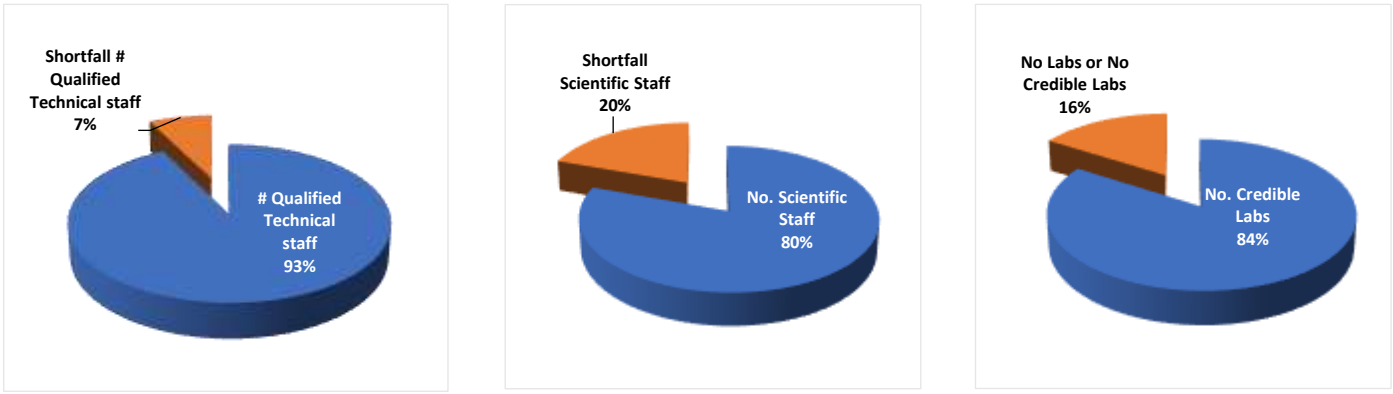


Figure 11 - Graphic illustration of the number and %: a) qualified engineering/technical staff; b) professional scientists; c) access to credible laboratory services that complies with Green Drop standards

Ratio analysis has been done to determine the number of qualified technical and scientific staff assigned per WWTW. It is expected, but never tested before, that a higher ratio would correspond with well-performing and maintained wastewater systems, as represented by the GD score.

The results shows a strong correlation between high ratios and high GD scores at 9 municipalities. i.e. from Overstrand 89% to Stellenbosch 84% in the top half of Figure 12. The only anomalies between the GD score and the ratio being that for Swellendam.

Similarly, a high correlation was found between lower ratios and lower Green Drop scores - from Cape Agulhas 52% to Prince Albert 14%, with anomalies between GD score and the ratios for Saldanha Bay, Mossel Bay, Knysna, George and Laingsburg. These results suggest that wastewater performance may be less sensitive towards engineering, technical and scientific staff, and more dependent on operational competencies (Superintendents and PCs).

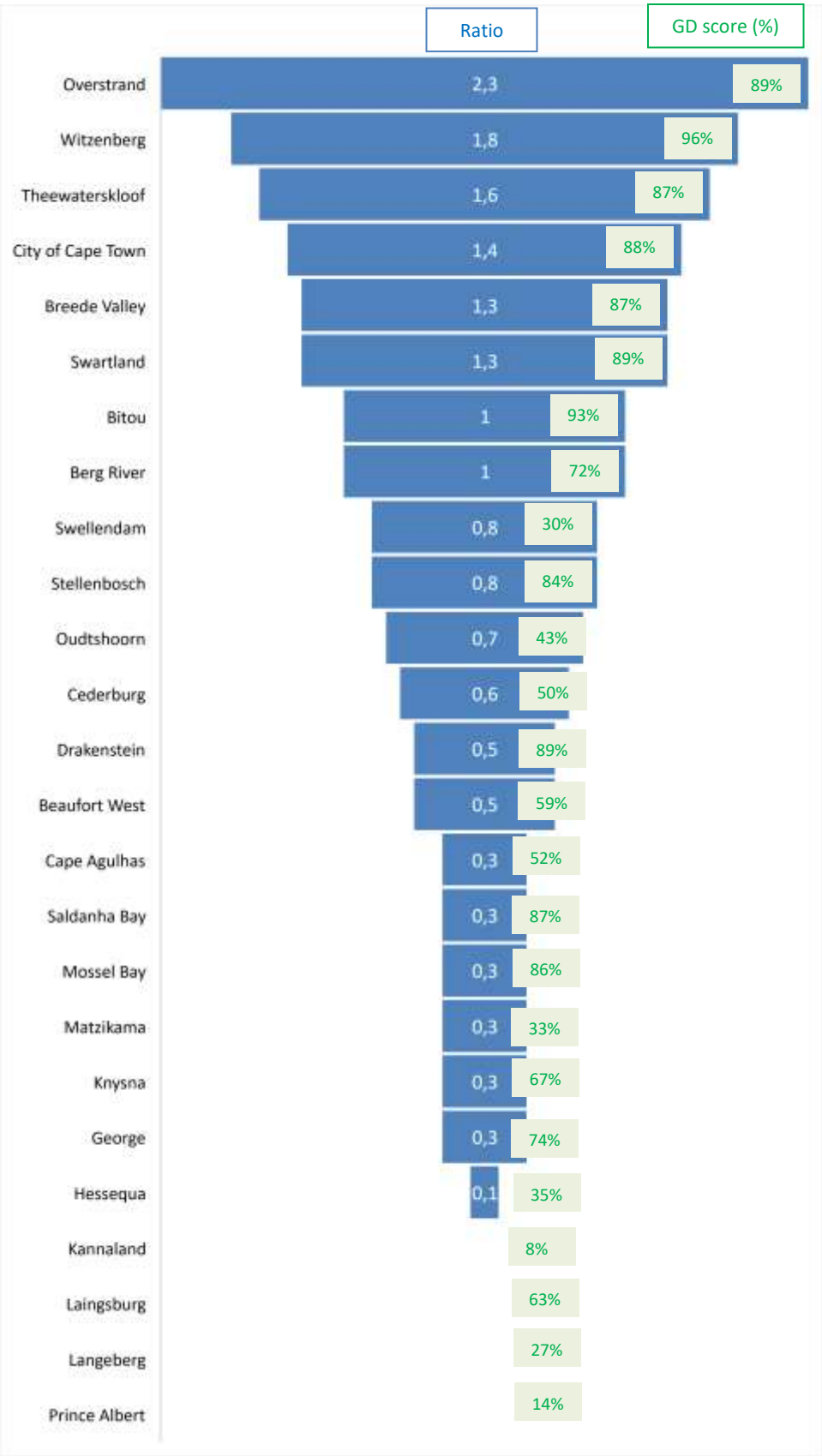


Figure 12 - Ratio of compliant technical staff to no. of WWTWs and Comparison of Ratios with GD scores

One manner of enhancing operational capacity is via dedicated training programmes. The Green Drop audit incentivise appropriate training of operational staff over a 2-year period prior to the audit date. The results are summarised as follows:

Table 12 - No. of WWTWs with operational staff sent on training over the past 2 years and vice versa

WSA Name	# of WWTW staff attending training over past 2 years	# of WWTW without training over past 2 years
City of Cape Town	26	0
Breede Valley	4	0
Theewaterskloof	6	2
Cederburg	3	4
Swellendam	0	4
Stellenbosch	5	0
Witzenberg	4	0
Bitou	2	0
Cape Agulhas	4	0
Oudtshoorn	3	0
Drakenstein	6	0
Swartland	4	3
Saldanha Bay	7	0
Overstrand	6	0
Hessequa	2	8
Beaufort West	0	4
Kannaland	2	2
Laingsburg	1	1
Langeberg	0	5
Prince Albert	0	3
Bergrivier	5	0
Mossel Bay	0	7
Matzikama	1	12
Knysna	6	0
George	3	3
Totals	**100 (63%)**	**58 (37%)**

Figure 13 - %WWTWs that have trained operational staff over the past two years

The training results confirmed that 100 (63%) of WWTWs operational staff attended training over the past 2 years. However, some training gaps persist which requires a concerted effort to strengthen training initiatives of Supervisors and Process Controllers. Recent training events focussed primarily on chlorine handling and NQF and need to be expanded to include operation of technology, sludge treatment and energy efficiency.

Diagnostic 3: Treatment Capacity

Aim: A capable treatment plant requires adequate design capacity and functional equipment to deliver a quality final water. If the plant capacity is exceeded by way of inflow volume or strength, a plant will not be capable to achieve its compliance standards. Capacity is typically exceeded when the demand exceeds the installed design capacity, or when processes or equipment is not operational or dysfunctional, or when the electrical supply cannot support the treatment infrastructure. This diagnostic assesses the status of plant capacity and operational flows to the plants.

Findings: Analysis of the hydraulic capacities and operational flows indicate a total design capacity of 1,107.9 Ml/d for the Province, with a total inflow of 734.5 Ml/day (considering that 18 systems are not measuring their inflows). Theoretically, this implies that 66% of the design capacity is used with 34% available to meet additional demand. However, the full 1,107.9 Ml/d day is not available as some infrastructure is dysfunctional, leaving 1,095.7 Ml/d available. All the municipalities indicate that they have installed capacity available.

All Western Cape WWTWs are operating within their design capacities, with the highest capacity use reported for Hessequa. Treatment systems with low % use (<50%) include Swellendam, Stellenbosch, Kannaland and Laingsburg, and this may have been affected by breakdown in sewer networks or pump stations whereby all sewage is not reaching the treatment. Cape Agulhas and Prince Albert provided no inflow data for all their systems, and this again will skew the overall Provincial data sets. The Green Drop audit requires a wastewater flow balance to identify and quantity possible losses from the network and/or ingress into the sewers. Many municipalities do not have flow balances that follows the wastewater trail from consumer to treatment plant.

Table 13 - Summary of WWTWs design and available capacities, inflows, % use design capacities, and inflows measured per WWTW

WSA Name	# WWTWs	Design Capacity (Ml/d)	Available Capacity (Ml/d)	Operational Flow (Ml/d)	Variance (Ml/d)	% Use Design Capacity	Inflow measured #
City of Cape Town	26	744.2	744.2	526.5	217.7	71%	25
Breede Valley	4	33.4	23.4	21.8	11.6	65%	4
Theewaterskloof	8	18.3	18.3	9.8	8.5	53%	8
Cederburg	7	9.9	9.9	5.0	4.8	51%	7
Swellendam	4	4.8	4.8	2.1	2.6	45%	3
Stellenbosch	5	44.0	44.0	21.3	22.7	49%	5
Witzenberg	4	14.9	14.9	9.3	5.6	62%	4
Bitou	2	9.5	9.5	5.2	4.3	55%	2
Cape Agulhas	4	4.7	4.7	NI	4.7	NI	NI
Oudtshoorn	3	11.2	11.2	6.9	4.3	62%	3
Drakenstein	6	55.4	55.4	30.1	25.3	54%	6
Swartland	7	15.4	14.4	8.9	6.5	58%	7
Saldanha Bay	7	17.7	17.7	10.3	7.4	58%	7
Overstrand	6	18.5	18.5	10.6	7.8	58%	6
Hessequa	10	7.2	7.2	6.5	0.7	90%	10
Beaufort West	4	5.7	4.3	3.0	2.7	53%	2
Kannaland	4	2.7	2.7	1.1	1.7	39%	2
Laingsburg	2	1.8	1.8	0.8	0.9	46%	2
Langeberg	5	13.7	13.7	9.9	3.8	72%	5
Prince Albert	3	0.8	0.8	NI	0.8	0%	NI
Bergrivier	5	7.1	7.1	4.8	2.3	68%	5
Mossel Bay	7	22.7	22.7	11.8	10.9	52%	7
Matzikama	13	5.5	5.5	4.5	1.0	83%	9
Knysna	6	9.0	9.1	7.5	1.4	84%	6
George	6	30.0	30.0	16.7	13.3	56%	5
Totals	**158**	**1,107.9**	**1,095.7**	**734.5**	**373.4**	**66%**	**140**

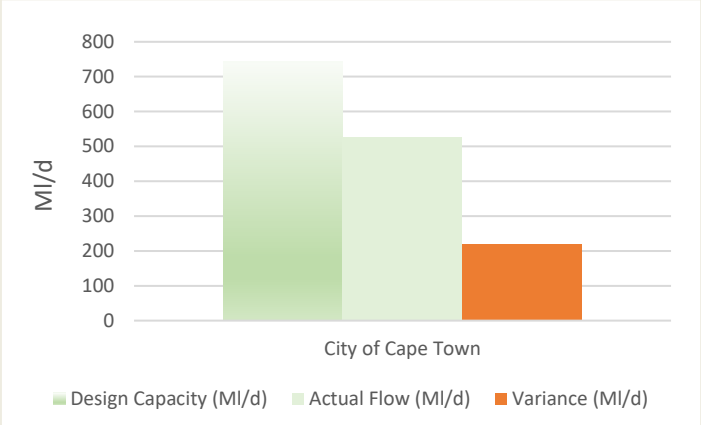
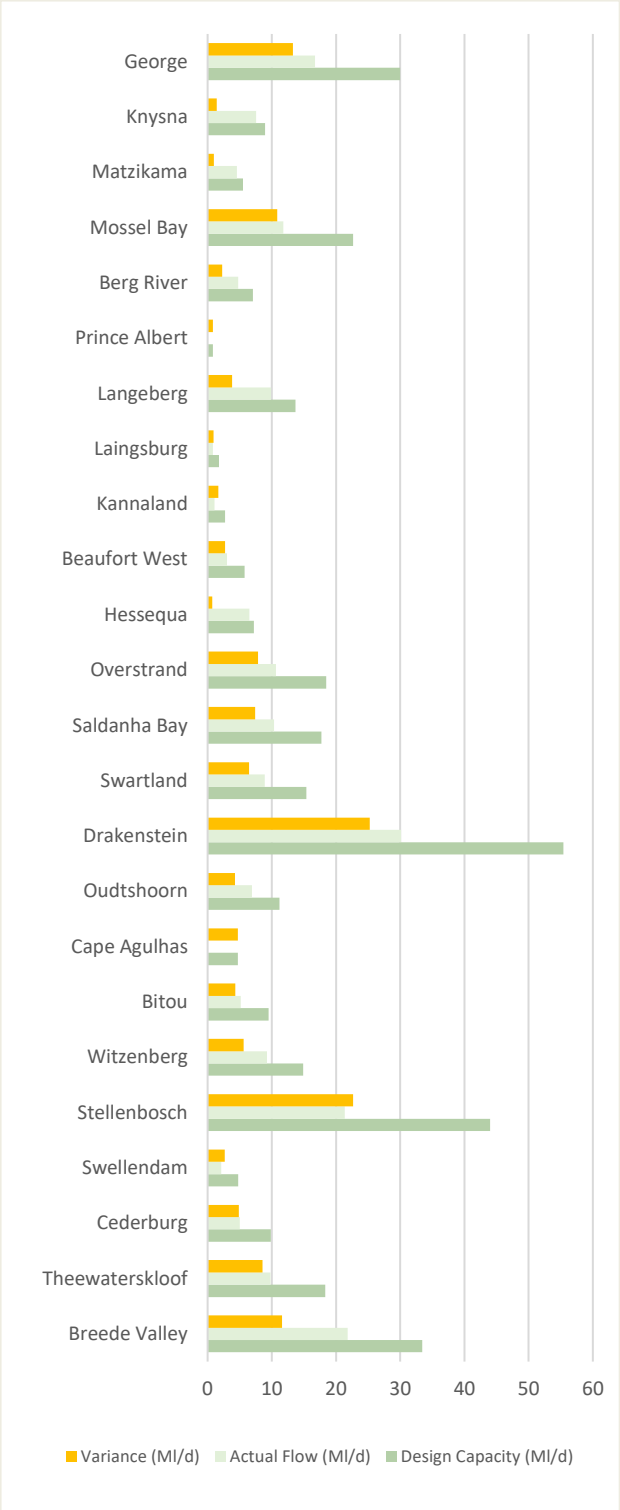


Figure 14 - WSA design capacity, actual flow, and variance in Ml/d for City of Cape Town (CoCT) only



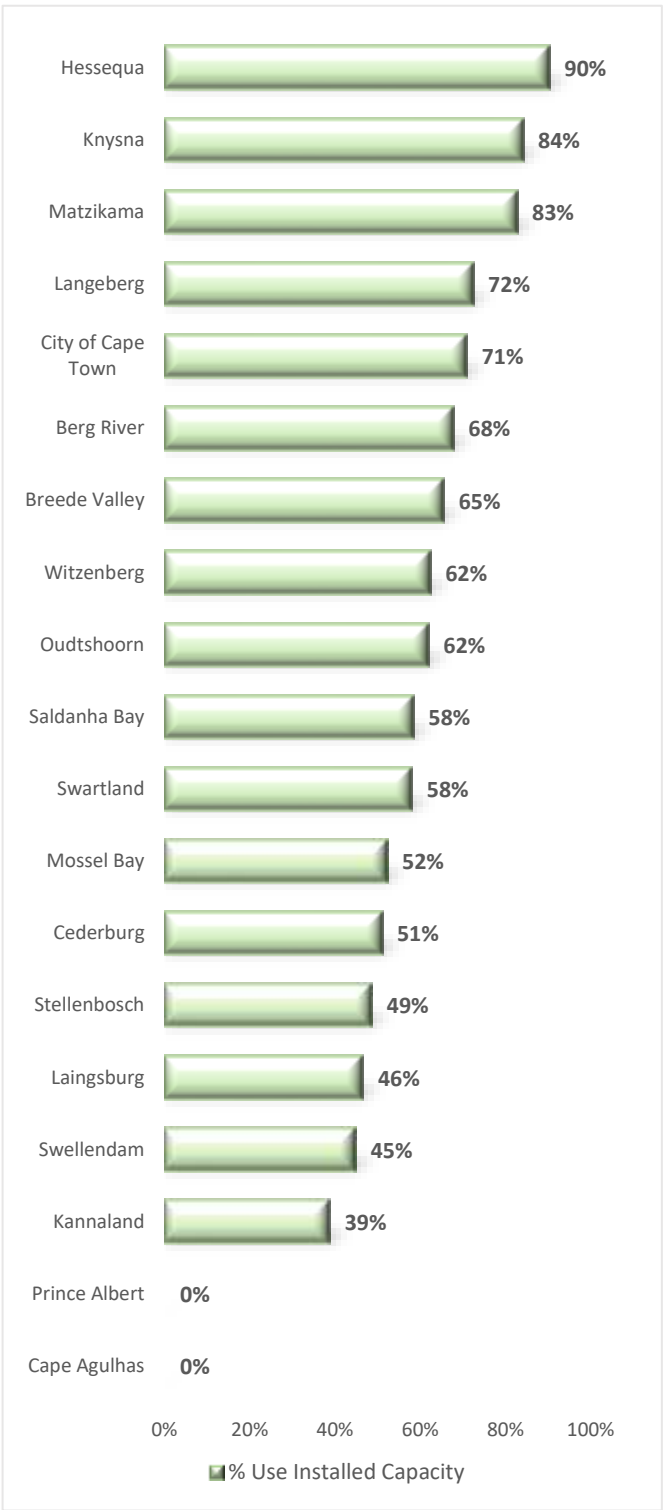


Figure 15 - (a) WSA design capacity, actual flow, and variance in Ml/d for WWTWs (excl. CoCT); (b) WSA % use of installed design capacity

The audit data shows that 17 systems with known design capacities are hydraulically overloaded. This figure will be higher as there are 18 systems that are not measuring their inflows and hence it is not possible to determine whether these systems are hydraulically overloaded as well. New housing and industrial developments planned in these drainage areas would not be able to proceed, without expansion of the capacity. The systems with known design capacities, that are hydraulically overloaded, are as follows:

- City of Cape Town: 3 of 26 systems (Zandvliet, Gordons Bay, Klipheuwel)
- Breede Valley: 2 of 4 systems (Rawsonville, Touwsriver)
- Theewaterskloof: 1 of 8 systems (Riviersondererend)
- Stellenbosch: 1 of 5 systems (Pniel)
- Oudtshoorn: 1 of 3 systems (De Rust)
- Swartland: 1 of 7 systems (Koringberg)
- Hessequa: 3 of 10 systems (Melkhoutfontein, Riversdale, Slangrivier)

- Langeberg: 1 of 5 systems (Robertson)
- Mossel Bay: 1 of 7 systems (Grootbrak)
- Matzikama: 2 of 13 systems (Lutzville, Van Rhynsdorp)
- Knysna: 1 of 6 systems (Knysna).

Lastly, Water Use Authorisations mandate municipalities to install meters and monitor inflows, whilst GD requires WSAs to report inflows on IRIS and to calibrate meters annually.

The audit results indicate that 89% (140 of 158) of municipalities monitor their inflow, with the balance of 18 WWTWs not monitoring their inflow. The latter are WWTWs linked to Cape Agulhas, Prince Albert, Swellendam, Beaufort West, Kannaland, Matzikama, and George. The majority of WSAs calibrate or verify their flow meters on an annual basis, which correspond with good practice standards.

Diagnostic 4: Wastewater Monitoring and Compliance

Aim: "*To measure is to know*" and "*To know is to manage*". The primary objective of a wastewater treatment plant is to produce final effluent and biosolids to a safe standard. This standard cannot be measured or managed if operational- and compliance monitoring is lacking. This diagnostic assesses the monitoring status and final effluent compliance against each WWTW's mandatory standards.

Findings: For operational monitoring, a satisfactory level of 90% is applied as the benchmark, to give weight to the importance of monitoring. For compliance monitoring, the audit evaluates the sampling point, sampling frequency, final effluent quality, biomonitoring, heavy metals, and any specific condition that the DWS may have included in the water use license. Final effluent quality compliance is calculated against the mandatory limits as listed under "Authorisation Status". A >90% compliance figure confirms high quality final effluent, whereas a <30% indicate poor effluent quality. The enforcement measures are summarised in the column to the far right and include NWA Notices and Directives issued, criminal cases opened, and court interdicts granted during the period 1 April 2019 to 30 June 2021.

Table 14 - Summary of the WSA operational and compliance monitoring status

WSA Name	# WWTW	Operational monitoring (KPA B2)		Compliance monitoring (KPA B3)	
		Satisfactory [GD score ≥90%]	Not Satisfactory [GD score <90%]	Satisfactory [GD score ≥90%]	Not Satisfactory [GD score <90%]
City of Cape Town	26	23	3	23	3
Breede Valley	4	2	2	4	0
Theewaterskloof	8	4	4	8	0
Cederburg	7	0	7	6	1
Swellendam	4	0	4	4	0
Stellenbosch	5	5	0	5	0
Witzenberg	4	4	0	4	0
Bitou	2	0	2	2	0
Cape Agulhas	4	1	3	4	0
Oudtshoorn	3	0	3	0	3
Drakenstein	6	5	1	5	1
Swartland	7	1	6	7	0
Saldanha Bay	7	7	0	7	0
Overstrand	6	6	0	6	0
Hessequa	10	0	10	1	9
Beaufort West	4	1	3	2	2
Kannaland	4	0	4	0	4
Laingsburg	2	0	2	0	2
Langeberg	5	0	5	5	0
Prince Albert	3	0	3	0	3
Bergrivier	5	0	5	3	2
Mossel Bay	7	4	3	6	1
Matzikama	13	0	13	13	0
Knysna	6	2	4	6	0
George	6	5	1	4	2
Totals	**158**	**70 (44%)**	**88 (56%)**	**125 (79%)**	**33 (21%)**

The performance recorded in Table 14 stems from performance data as measured against the Green Drop Standard expressed in KPAs B2 and B3. The data indicates that 70 of 158 plants (44%) are on par with good practice for operational monitoring of raw sewage and the respective units responsible for the processing effluent and sludge. The City of Cape Town, Stellenbosch, Witzenberg, Drakenstein, Saldanha Bay, Overstrand and George are doing exceptionally well.

Overall, a satisfactory monitoring of compliance parameters (79%) were observed, with lower satisfaction for operational sampling and analysis (44%). Compliance monitoring is a legal requirement and the only means to measure performance of a treatment facility. Operational monitoring is the cornerstone of day-to-day process adjustments and optimisation to ensure treatment is efficient and deliver qualify effluent/sludge that meet design expectations. Sludge monitoring is essential as poor sludge handling is the root cause of many WWTWs failing to meet final effluent standards. It is evident that monitoring gaps exist at many WWTWs.

The following table summarises the results of KPA E, which also carries the highest Green Drop scoring weight. Note that averages shown as '0%' under Effluent Compliance include actual 0% compliance plus systems with no information or insufficient data.

Table 15 - Summary of authorisation status, effluent compliance status, and directives/notices issued

WSA Name	Effluent Compliance									Enforce-ment Measures*
	Authorisation Status	Microbiological Compliance (%)			Chemical Compliance (%)			Physical Compliance (%)		
		Ave. (%)	# WWTWs >90%	# WWTWs <30%	Ave. (%)	# WWTWs >90%	# WWTWs <30%	Ave. (%)	# WWTWs >90%	# WWTWs <30%	
City of Cape Town	23 WULs; 3 GAs	84%	17	2	69%	8	2	76%	8	0	0
Breede Valley	2 WUL; 1 GA; 1 Permit	96%	4	0	70%	0	0	85%	2	0	0
Theewaterskloof	4 WULs; 2 GAs; 2 Permits	40%	0	2	43%	0	3	72%	1	0	0
Cederburg	2 WULs; 5 GAs	42%	1	3	21%	0	5	64%	3	2	0
Swellendam	1 WUL; 3 Unknown	75%	3	1	80%	2	0	99%	4	0	0
Stellenbosch	2 WULs; 3 GAs	43%	1	2	54%	0	0	66%	0	0	0
Witzenberg	2 GAs; 2 Permits	98%	4	0	82%	3	0	91%	2	0	0
Bitou	2 WULs; 3 GAs	100%	2	0	100%	2	0	100%	2	0	0
Cape Agulhas	1 Exempted; 1 Not authorised; 2 Unknown	77%	2	0	69%	1	0	65%	1	0	0
Oudtshoorn	1 Exempted; 1 GA; 1 Unknown	49%	1	1	33%	1	2	33%	1	2	0
Drakenstein	3 WULs; 3 GAs	76%	2	0	89%	4	0	90%	5	0	0
Swartland	1 WUL; 5 GAs; 1 Permit	53%	2	3	54%	3	3	65%	4	2	0
Saldanha Bay	2 WULs; 4 GAs; 1 Not authorised	74%	2	0	69%	1	0	74%	2	0	0
Overstrand	1 WUL; 5 GAs	85%	2	0	74%	1	0	76%	2	1	0
Hessequa	5 GAs; 4 Not authorised; 1 Unknown	49%	4	5	53%	4	4	60%	5	3	0
Beaufort West	4 GAs	73%	3	1	71%	2	1	64%	2	1	0
Kannaland	4 Not authorised	0%	0	4	0%	0	4	0%	0	4	1
Laingsburg	2 GAs	50%	1	1	70%	1	0	44%	0	0	0
Langeberg	4 GAs; 1 Not authorised	60%	1	1	83%	1	0	89%	4	0	0
Prince Albert	3 GAs	22%	0	2	43%	1	2	52%	0	0	0
Bergrivier	1 WUL; 4 Not authorised	51%	1	1	43%	0	2	72%	2	0	0
Mossel Bay	2 WULs; 5 GAs	84%	2	0	75%	3	0	92%	6	0	0
Matzikama	5 WULs; 8 GAs	65%	6	3	16%	0	10	50%	0	3	0
Knysna	2 Exempted; 1 WUL; 3 GAs	71%	2	0	86%	3	0	87%	4	0	1
George	2 WULs; 4 GAs	84%	5	1	94%	5	0	98%	6	0	0
Totals		**64%**	**68**	**33**	**62%**	**46**	**38**	**70%**	**66**	**18**	**2**

* The enforcement measures (notices or directives issued) are taken over a two-year financial period from July 2019 to June 2021

On average, the municipalities reached 64% for microbiological compliance monitoring, followed by 62% for chemical-, and 70% for physical compliance monitoring. For the microbiological compliance category, 68 of 158 systems achieved >90% and 33 of 158 systems fell below 30%. For the chemical compliance category, 46 of 158 systems achieved >90% and 38 systems fell below 30%. For the physical compliance category, 66 of 158 systems achieved >90% and 18 systems fell below 30%.

A total of 2 Directives/Notices have been issued to 2 municipalities, Knysna and Kannaland (1 no. each). These enforcement measures initiated by the Regulator require municipal leadership intervention and correction.

In terms of sludge compliance status, it is found that:

- 78 of the 158 plants (49%) classify their biosolids according to the WRC Sludge Guidelines, with the exception being of 8 of the 25 municipalities who do not classify their sludge
- 47 of the 158 plants (30%) monitor sludge streams with the exception of 13 of the 25 municipalities
- 42 of 158 plants (27%) have Sludge Management Plans in place with the exception of 13 of the 25 municipalities
- 11 of the 158 plants (7%) have sludge reuse projects in place – Breede Valley, Overstrand and Mossel Bay. On a positive note, the City of Cape Town is planning to install a centralised Biosolids beneficiation facility for methane gas and nutrient recovery as well as nutrient recovery and this will lead to a reduction in the carbon footprint.
- 45 of 158 plants (28%) use sludge mostly for agricultural purposes and landfills but also includes for commercial products and thermal sludge practice.

In closing of this diagnostic, the data confirms that 21 of the 25 (84%) municipalities have access to credible laboratories for compliance and operational analysis, which confirms that internal and/or contracted laboratories are accredited and/or have Proficiency Testing Schemes with suitable analytical methods and quality assurance.

Diagnostic 5: Energy Efficiency

Aim: The wastewater industry offers many opportunities to respond to climate change challenges by improving energy efficiency, reducing greenhouse gasses, and generating energy. The energy cost of sophisticated treatment technologies are in the order of 25-40% of the O&M budget (cited WRC 2021). This diagnostic investigates the status of energy efficiency management at a provincial and municipal level with an aim to motivate for improved operational wastewater treatment efficiency.

Findings: The audit results suggest a fairly good level of awareness of energy management in the Province. Several municipalities monitor SPC, energy tariffs, energy cost, and could account for the CO_2 footprint associated with the WWTWs. Also, some initiatives are in place to improve energy efficiency and energy generation.

Benchmark 1: Estimated energy intensity for large WWTW is in order of 0.258-0.485 kWh/m³

- 0.177 kWh/m³ for trickling filter
- 0.272 kWh/m³ for activated sludge
- 0.314 kWh/m³ for advanced treatment
- 0.412 kWh/m³ for advanced treatment with nitrification

Benchmark 2: Energy requirements per plant size

Plant capacity, Ml/d	<0.5	2	10	25	100
Trickling filter, kWh/m³	0.48	0.48	0.25	0.18	0.16
Activated sludge, kWh/m³	0.59	0.59	0.37	0.32	0.29

Tariffs are typically (depends on time of day and season use):

- Peak rate: 388.03 - 126.56 c/kWh
- Off-peak time: 63.81 - 55.28 c/kWh

Standard time: 117.57 - 87.12 c/kWh

(DMRE 2021, Feng, 2012, NEWRI, 2010)

Table 16 - Summary of actual Specific Power Consumption versus industry benchmarks

WSA	System Classification	WWTW	SPC (kWh/m³)		WSA	System Classification	WWTW	SPC (kWh/m³)
City of Cape Town	Basic	Oudekraal	2.85		Saldanha Bay	Advanced	Vredenburg	1.49
Theewaterskloof	Basic	Tesselaarsdal	2.56		City of Cape Town	Advanced	Melkbosstrand	1.23
Laingsburg	Basic	Matjiesfontein	1.94		City of Cape Town	Basic	Camps Bay	0.2
City of Cape Town	Basic	Klipheuwel	0.5		City of Cape Town	Advanced	Westfleur Industrial	3.4
Drakenstein	Basic	Hermon	1.5		City of Cape Town	Advanced	Westfleur Domestic	1.76
Mossel Bay	Advanced	Ruiterbos	0.86		Theewaterskloof	Advanced	Grabouw	0.73
Swartland	Basic	Kalbaskraal	0.02		Witzenberg	Advanced	Ceres	1.12
Mossel Bay	Advanced	Friemersheim Western Works	0.09		City of Cape Town	Basic	Hout Bay	0.07
Saldanha Bay	Advanced	Shellypoint	1.49		Bitou	Advanced	Plettenberg - Gansevallei	1.08
Overstrand	Basic	Pearly Beach	0.73		City of Cape Town	Advanced	Kraaifontein	1.44
Swartland	Basic	Chartsworth	0.05		Swartland	Advanced	Malmesbury	1.61
George	Basic	Herolds Bay	0.4		George	Advanced	Gwaing	0.93
Theewaterskloof	Basic	Greyton	1.54		Overstrand	Advanced	Hermanus	1.14
Witzenberg	Advanced	Op de Berg	1.07		City of Cape Town	Advanced	Scottsdene	1.3
City of Cape Town	Basic	Llandudno	0.56		City of Cape Town	Advanced	Wildevoëlsvlei	1.07
Bitou	Advanced	Kurland	1.2		George	Advanced	Outeniqua	1.52
Theewaterskloof	Basic	Riviersondereren d	0.06		Drakenstein	Advanced	Wellington	1.41

WSA	System Classification	WWTW	SPC (kWh/m³)		WSA	System Classification	WWTW	SPC (kWh/m³)
Theewaterskloof	Advanced	Genadendal	0.78		Mossel Bay	Advanced	Mossel Bay - Hartenbos	0.09
Drakenstein	Basic	Gouda	0.31		City of Cape Town	Basic	Fisantekraal	1.2
Saldanha Bay	Advanced	Hopefield	1.49		City of Cape Town	Advanced	Macassar	0.27
Overstrand	Advanced	Hawston	1.34		Drakenstein	Advanced	Paarl	0.9
Theewaterskloof	Advanced	Botriver	2.52		City of Cape Town	Advanced	Mitchell's plain	0.79
Overstrand	Advanced	Stanford	3.05		City of Cape Town	Advanced	Borcherd's Quarry	0.66
Saldanha Bay	Basic	Paternoster	1.49		City of Cape Town	Basic	Green Point	0.13
Swartland	Advanced	Moorreesburg	1.1		City of Cape Town	Advanced	Potsdam	1.08
Swartland	Advanced	Darling	1.46		City of Cape Town	Advanced	Zandvliet	0.66
Drakenstein	Advanced	Saron	1.54		City of Cape Town	Advanced	Belville	1.04
Laingsburg	Basic	Laingsburg	0.62		City of Cape Town	Advanced	Athlone	0.3
Saldanha Bay	Advanced	St Helena Bay	1.49		City of Cape Town	Advanced	Cape Flats	0.53
Swartland	Advanced	Riebeek valley	2.88		Saldanha Bay	Advanced	Vredenburg	1.49
Overstrand	Advanced	Kleinmond	0.53		City of Cape Town	Advanced	Melkbosstrand	1.23
Overstrand	Advanced	Gansbaai	1.14		City of Cape Town	Basic	Camps Bay	0.2
Drakenstein	Advanced	Pearl Valley	1.31		City of Cape Town	Advanced	Westfleur Industrial	3.4
Breede Valley	Advanced	De Doorns	3.6		City of Cape Town	Advanced	Westfleur Domestic	1.76
Witzenberg	Advanced	Tulbagh	2.8		Theewaterskloof	Advanced	Grabouw	0.73
George	Advanced	Kleinkrantz	1.53		Witzenberg	Advanced	Ceres	1.12
City of Cape Town	Advanced	Gordons Bay	0.59		City of Cape Town	Basic	Hout Bay	0.07
Theewaterskloof	Advanced	Caledon	1.14		Bitou	Advanced	Plettenberg Bay (Gansevallei)	1.08
Saldanha Bay	Advanced	Langebaan	1.49		City of Cape Town	Advanced	Kraaifontein	1.44
Witzenberg	Advanced	Wolseley	2.57		Swartland	Advanced	Malmesbury	1.61
Mossel Bay	Advanced	Pinnacle Point	1.66		George	Advanced	Gwaing	0.93
City of Cape Town	Advanced	Simons Town	0.05		Overstrand	Advanced	Hermanus	1.14
Saldanha Bay	Advanced	Saldanha	1.49		City of Cape Town	Advanced	Scottsdene	1.3

In terms of energy management, the data depicts the following:

- 6 of 25 municipalities conducted energy audits in the past 24 months – City of Cape Town, Theewaterskloof, Drakenstein, Swartland, Saldanha Bay and Overstrand
- System SPCs are calculated by City of Cape Town, Breede Valley, Swartland, Overstrand, Mossel Bay, Laingsburg
- City of Cape Town and Overstrand were able to account for CO_2 equivalents associated with energy efficiency. The City of Cape Town is planning to install a centralised biosolids beneficiation facility for methane gas and nutrient recovery.

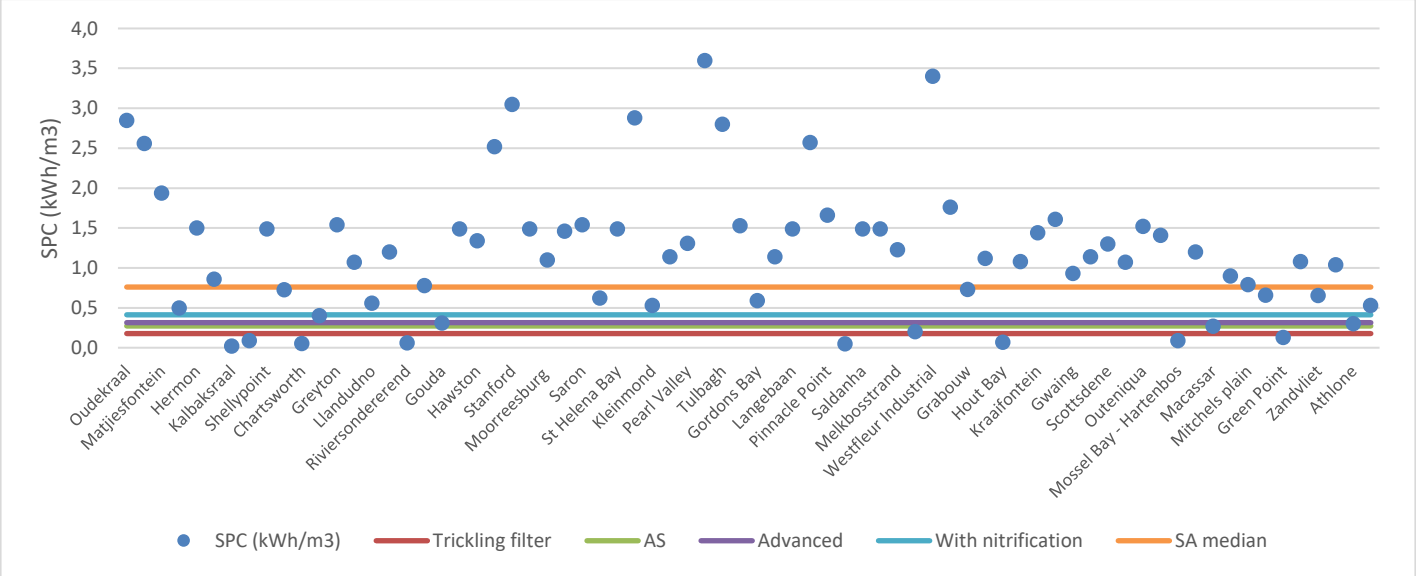


Figure 16 - WWTW Specific Power Consumption reported against industry benchmarks, sorted from low to high design capacity

In terms of energy efficiency, the data shows:

- Data has been received for 53 advanced systems and 19 basic systems
- No specific relation is observed between SPC and plant design capacity, as can be seen in Figure 16

- For advanced systems, SPCs ranged from 0.5-3.6 kWh/m^3, with an average SPC of 0.8 and median of 1.3 kWh/m^3. These values are well above the benchmark range of 0.27-0.41, and indicate that considerable opportunities exist for energy efficiency improvement
- For basic systems, SPCs ranged from 0.02-2.85 kWh/m^3, with an average SPC of 0.6 and median of 0.9 kWh/m^3. These values are well above the benchmark range of 0.177, and indicate that considerable opportunities exist for energy efficiency improvement
- 12 of 53 systems fell within the SPC industry benchmarks and the split per WWTW size is as follows:
    - Up to 2 Ml/d - 5 of 17 systems
    - 2 to 10 Ml/d - 3 of 17 systems
    - 10 to 25 Ml/d - 1 of 8 systems
    - 25 to 100 Ml/d - 3 of 10 systems
- City of Cape Town, Breede Valley, Swartland, Overstrand, Mossel Bay, Laingsburg had excellent knowledge of their energy tariffs (R/kWh) and energy cost (R/m^3)
- City of Cape Town and Overstrand demonstrated to have energy efficiency measures and/or plans in place.

The information collated suggests that many municipalities have established a specific report to monitor energy as part of the wastewater business, and that energy efficiency management is enjoying a good foothold in the Province. Improvement opportunities include the completion of energy audits for all systems, monitoring of SPCs by the municipalities who are not doing so already, improvement in energy efficiency, and exploring alternative energy sources such as methane and solar energy.

Diagnostic 6: Technical Site Assessments

Aim: The Green Drop process makes provision for the desktop audit being followed by a Technical Site Assessment (TSA) to verify the desktop evidence. The assessment includes physical inspection of the sewer network, pump stations, and treatment facility, coupled with asset condition checks to determine an approximate cost to restore existing infrastructure to functional status (VROOM).

Findings: The results of the TSAs are summarised in Table 17. A deviation of >10% between the GD and TSA score indicate a misalignment between the administrative aspects and the work on the ground. The Regulator regards a wastewater system with a TSA score of >80% as one that have an acceptable level of process control and functional equipment. 90% would represent an excellent plant that complies with most of the Green Drop TSA standards.

Table 17 - Summary of the WWTW Technical Site Assessments scores and hardware problems and %deviation between GD and TSA scores

WSA Name	TSA WWTW Name	WWTW GD Score (%)	%TSA	Key Hardware Problems	Difference between TSA and GD score
City of Cape Town	Borcherds Quarry	89%	91%	1. The PSTs are old, and work will be required on mechanical equipment and weirs; 2. FBA will always require fine monitoring to check for clogged units	2%
	Wesfleur Industrial	89%	96%	1. The air blowers for fine bubble aeration need to be reinstalled; 2. FBA will always require fine monitoring to check for clogged units	7%
Langeberg	Robertson	12%	38%	1. Automated screen out of order; 2. Grit removal unable to cope. Unlikely that channels can be cleaned; 3. Only 1 x Humus tank operational - other tanks overloaded 4. Maturation Ponds full of sludge; 5. Dewatering plant to be repaired	26%
Laingsburg	Laingsburg	63%	61%	1. Flow metering; 2. Aeration; 3. OSEC pump; 4. Irrigation pump; 5. Outlet meter.	2%
Kannaland	Ladismith	15%	49%	1. 2nd Auto Screen; 2. Refurb's being done; 3. Formalise discharge	34%
Prince Albert	Klaarstroom	15%	52%	1. Ponds to be lined; 2. Disinfection formalised; 3. 2nd Irrigation Pump needed	37%
Beaufort West	Beaufort West	64%	64%	1. Screening and compactor; 2. BNR, disinfection	0%
Drakenstein	Wellington	89%	95%	No major hardware issues	6%
Bergrivier	Piketberg	73%	66%	1. THEFT - entire reactor out of service - raw sewage discharge; 2. Screen out for repair; 3. Flow control dam return to HOW urgently required; 4. Out of service Mixers and standby equipment to be replaced; 5. Only one sludge return pump installed; 6. Flow balancing sluice gates	7%
Cederberg	Clanwilliam	51%	65%	1. Disinfection; 2. Flow metering & balancing; 3. Process knowledge & improved process control; 4. Characteristic monitoring of aeration reactor; 5. Chlorine gas safety training	14%
Matzikama	Vredendal South	32%	31%	1. RAS pumps dysfunctional; 2. Chlorine dosing (chlorinator) repair; 3. Aerator's dysfunctional; 4. Anaerobic dam and maturation high solids content	0%
Stellenbosch	Stellenbosch	84%	86%	1. Repair clarified scum baffle and install proper scum draw-off; 2. Work on SPC's; 3. A few more safety signs	2%
Witzenberg	Ceres	100%	80%	1. Chlorine dosing room; 2. Outlet flow metering; 3. Outlet dam wall; 4. Older structures may need upgrade in future; 5. Possible better lime dosing facility	20%

WSA Name	TSA WWTW Name	WWTW GD Score (%)	%TSA	Key Hardware Problems	Difference between TSA and GD score
Breede Valley	De Doorns	75%	54%	1. Need to get the 2 x 20% A/S modules reconfigured and commissioned; 2. Sludge recycle pumps need to be working; 3. Sludge wasting; 4. Chlorine gas disinfection	21%
Theewaterskloof	Grabouw	87%	61%	1. Urgently desludge maturation dams and repair; 2. Repair weirs of clarifiers; 3. Repair composting plant; 4. Replace sludge thickening; 5. Implement more regular desludging	26%
Swellendam	Klipperivier	31%	54%	1. Unlined sludge ponds; 2. None of the mixers are operational, with phased repair; 3. Lined solar drying pad required	23%
Cape Agulhas	Bredasdorp	50%	67%	1. Unlined sludge ponds; 2. Network pump station needs fencing; 3. Staff Facilities needs improvements	17%
Hessequa	Heidelberg	36%	68%	There are no serious hardware issues	32%
Mossel Bay	Mossel Bay	92%	80%	There were no major hardware risks	12%
George	Gwaing	71%	70%	1. Erosion at CCT; 2. Sludge Stockpile; 3. Cow in inlet, major safety risk in reticulation network	1%
Knysna	Sedgefield	73%	75%	1. Clarity in CCT is poor, sludge present in CCT consider secondary clarification; 2. Problems with disinfection evident from poor micro-bio results; 3. Establish FE measurement point after final polishing (maturation Ponds); 4. Securing of the network pump station	2%
Bitou	Plettenberg Bay	93%	84%	1. No Sludge management; 2. Storage of backup chlorine gas cylinders	9%
Oudtshoorn	Oudtshoorn	44%	55%	1. Feed to Biofilter; 2. Scum blanket in BNR System	11%
Swartland	Riebeek valley	89%	97%	1. Minor issues - new plant; 2. Scum withdrawal	8%
Overstrand	Hermanus	89%	74%	1. Settling tanks distribution box; 2. Lime storage in a industrial container; 3. Security	15%
Saldanha	Langebaan	85%	90%	1. Plant in excellent condition – no hardware defects; 2. Scum management at clarifiers	5%
Totals	**26**				**0% to 37%**

A total of 26 site assessments were conducted, with 1 to 2 inspections per municipality. Nine municipalities scored ≥80%, which is regarded to be a satisfactory site score. Three of the 26 systems had a TSA score of <50%, indicating that these systems fail to meet operational, asset functionality, and workplace safety standards.

An acceptably low difference between GD and TSA scores were observed for the majority of municipalities, except for Prince Albert (37%), Kannaland (34%), Hessequa (32%), Langeberg and Theewaterskloof (26% each). A low difference implies that the wastewater management aspects correlate with the condition of processes and infrastructure in the field.

Some focal points include:

- City of Cape Town, Drakenstein, Stellenbosch, Witzenberg, Mossel Bay, Bitou, Swartland and Saldanha had TSA scores ≥80%, which also include a close match to their respective GD scores with the exception of Witzenberg but still both scores ≥ 80%
- Prince Albert, Kannaland, Hessequa, Langeberg, Theewaterskloof, Witzenberg and Breede Valley had large deviations between their GD score and the TSA score (all ≥20%) with the highest deviation for Klaarstroom WWTW in Prince Albert. This does not reflect positively on the operation and functionality of the sewer network and treatment processes.

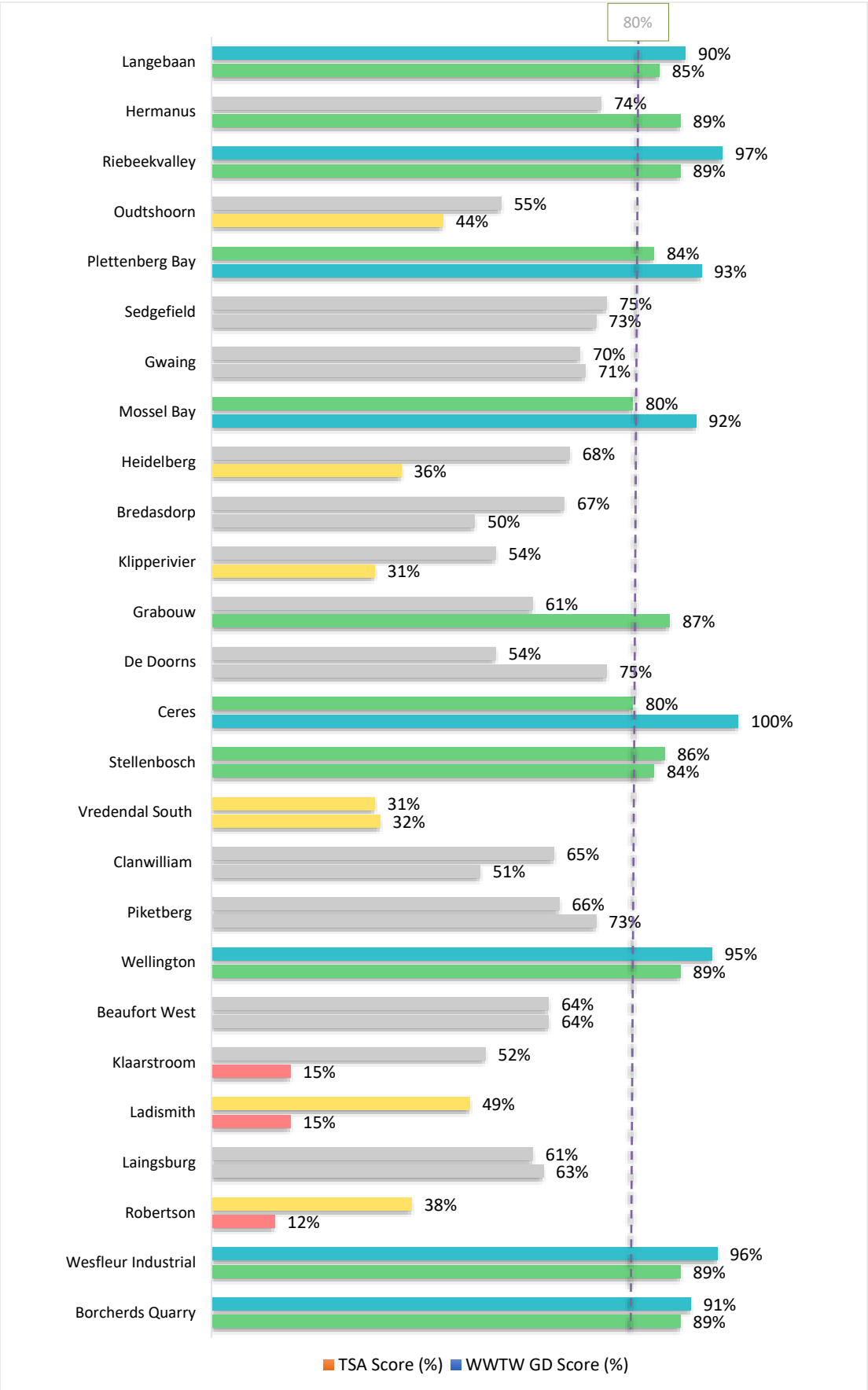


Figure 17 - Municipal GD (bottom bar) and TSA (top bar) score comparison (colour legends as for GD – blue excellent; red critical)

The VROOM cost presents a ''very rough order of measurement" cost to return a WWTWs functionality to its original design. For the Province, a total budget of R740 million is estimated, with the bulk of the work going towards restoration of mechanical equipment (52%).

Table 18 - VROOM cost split for civil, mechanical, and electrical and total VROOM cost estimate

WSA	Civil cost estimate	Mechanical cost estimate	Electrical & C&I cost estimate	Total VROOM cost
City of Cape Town	R52,202,614	R118,953,496	R0	R171,156,110
Langeberg	R5,646,592	R21,990,144	R7,435,264	R35,072,000
Laingsburg	R113,913	R87,256	R26,656	R227,825
Kannaland	R4,289,658	R4,260,608	R1,132,934	R9,683,200
Prince Albert	R42,200	R168,800	R0	R211,000
Beaufort West	R6,549,548	R2,726,463	R784,738	R10,060,750
Drakenstein	R0	R1,107,780	R0	R1,107,780
Bergrivier	R1,650,902	R10,398,536	R9,390,843	R21,440,280
Cederberg	R17,971,128	R4,209,811	R2,755,242	R24,822,000
Matzikama	R806,153	R17,417,154	R2,991,253	R21,214,560
Stellenbosch	R18,161,000	R9,809,800	R629,200	R28,600,000
Witzenberg	R20,845,956	R5,436,769	R3,754,675	R30,037,400
Breede Valley	R70,197,039	R117,241,370	R58,866,991	R246,305,400
Theewaterskloof	R13,232,444	R46,802,000	R28,773,905	R88,808,350
Swellendam	R1,389,000	R2,528,000	R0	R3,917,000
Cape Agulhas	R2,308,044	R3,832,224	R1,117,732	R7,258,000
Hessequa	R176,000	R1,187,000	R0	R1,363,000
Mossel Bay	R0	R1,005,804	R662,196	R1,668,000
George	R7,614,000	R1,709,000	R633,000	R9,956,000
Knysna	R19,000	R426,000	R186,000	R631,000
Bitou	R409,000	R1,669,000	R1,522,000	R3,600,000
Oudtshoorn	R764,000	R4,584,000	R738,000	R6,086,000
Swartland	R67,000	R709,000	R172,000	R948,000
Overstrand	R9,526,800	R530,400	R142,800	R10,200,000
Saldanha	R611,513	R3,376,613	R1,329,375	R5,317,500
Totals	**R234,593,504**	**R382,167,028**	**R123,044,804**	**R739,691,155**
% Distribution	**32%**	**52%**	**16%**	**100%**

The key hardware problems are listed in Table 17, with the most predominant defects observed in faulty or vandalised electrical cables, primary- and secondary sludge settling, disinfection, sludge pumps, sludge treatment, and power backup. Mechanical defects typically include dysfunctional aerators, sludge and effluent pumps, mixers, screens, degritters, and disinfection equipment. Vandalism and theft, long procurement lead times, lack of management involvement, lack of maintenance, and lack of budget are the main reasons for dysfunctional assets.

Diagnostic 7: Operation, Maintenance and Refurbishment of Assets

Aim: Insufficient financial resources are often cited as a root cause to dysfunctional or non-compliant wastewater systems. Knowledge and monitoring of fiscal spending are therefore a critical part of wastewater management. This diagnostic investigates the status of financial information as pertaining to O&M budgets and expenditure, asset figures, and capital funding.

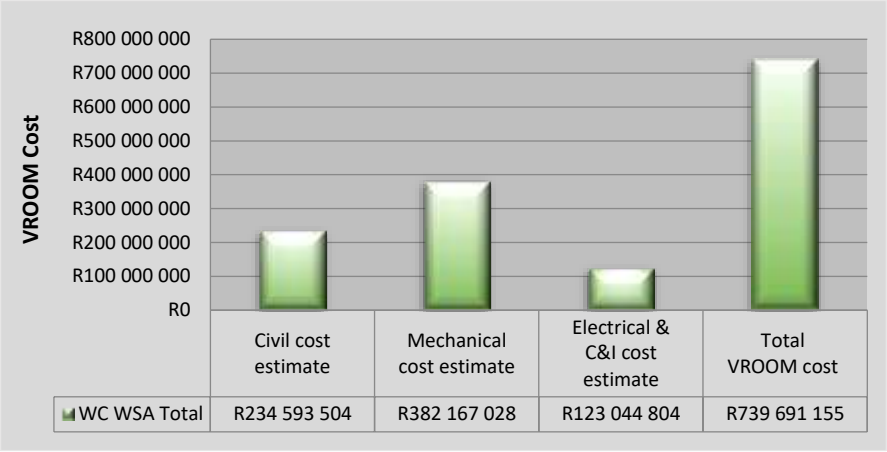
Findings: A substantial amount of financial information was presented during the audit process. Unfortunately, the evidence was presented in different formats, levels of detail, or absent for some municipalities. It was observed that municipal teams with financial officials present during the audits typically performed better, and also had a good understanding of the wastewater challenges experienced by their technical peers. Discrepancies observed included: generic or non-ringfenced budgets, contract lump sums for Service Providers presented as budgets, outdated or incomplete asset registers, some cost drivers are lacking (mostly electricity), etc. The Regulator grouped data into different certainty levels, as can be summarised at the end of this Diagnostic.

It must be noted that there were limitations with the financial and asset information. Not all WSAs submitted current information or complete financial data sets.

The result of each financial portfolio is discussed hereunder.

Vroom Cost Analysis

The VROOM costs breakdown is discussed under the TSA Diagnostic but is further illustrated as follows.



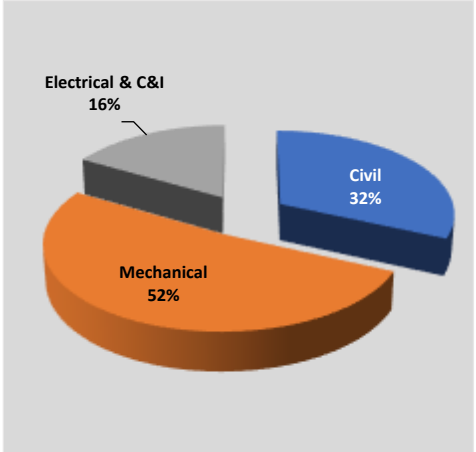


Figure 18 - Graphic illustration of the total cost estimated to restore functionality to existing assets (a), broken down to civil, mechanical, and electrical components

The total cost of R740 million is estimated to restore existing treatment works to their design capacity and functionality - consisting of R382 million for mechanical repairs, R123 million for electrical repairs, and R235 million for civil structures.

Table 19 indicates that a capital budget of R14.52 billion has been secured over 1-3 years to address infrastructural needs, which covers the R740 million VROOM refurbishment need and by implication, allows surplus for other capital projects. The R740 million estimated VROOM cost constitutes 8.8% of the total asset value of R8.4 billion. Furthermore, the WATCOST-SALGA figures provides for an annual 2.14% of the asset value required to maintain these assets. This constitutes an amount of R179 million required by the various WSA's annually to maintain the assets, while a once-off R740 million is required to restore existing assets.

Capital, O&M Budget and Actual, and Asset Value

The capital budgets, O&M budgets, O&M actual expenditure, and current asset values are summarised below.

Table 19 - Summary of the capital budgets, O&M budgets, O&M actual expenditure, and current asset values

WSA	Capital budget available	O&M budget (2020/21)	O&M expended (2020/21)	% Expended	Total Current Asset Value
City of Cape Town	R12,471,000,000	R1,457,609,560	R1,519,030,180	104%	R3,558,167,000
Langeberg	NI	R6,138,780	NI	NI	NI
Laingsburg	R3,410,180	R1,619,380	R1,438,390	89%	R3,378,580
Kannaland	R8,400,000	R6,549,080	NI	NI	R73,821,020
Prince Albert	NI	NI	NI	NI	R3,498,920
Beaufort West	R42,696,730	R7,017,760	R5,182,360	74%	R20,382,420
Drakenstein	R12,052,010	R190,294,000	R179,675,000	94%	R894,133,000
Bergrivier	R44,300,000	R20,800,000	R20,800,000	100%	R91,380,000
Cederberg	R20,275,000	R2,016,000	R478,000	24%	R38,478,000
Matzikama	R26,382,825	NI	NI	NI	NI
Stellenbosch	R1,147,000,000	R30,133,000	R23,155,000	77%	R942,663,000
Witzenberg	R9,760,000	R29,166,000	R26,858,000	92%	R114,669,400
Breede Valley	R28,200,000	R123,000,000	R119,000,000	97%	R422,946,000
Theewaterskloof	R59,028,000	R13,035,000	R12,882,000	99%	NI
Swellendam	NI	NI	NI	NI	NI
Cape Agulhas	R55,924,000	R19,559,000	R18,360,000	94%	NI
Hessequa	R39,170,300	NI	NI	NI	NI
Mossel Bay	R134,318,000	R16,230,330	R14,816,130	91%	NI
George	R270,600,000	NI	R99,423,380	NI	R150,567,342
Knysna	R1,674,000	NI	NI	NI	R180,434,920
Bitou	R7,700,000	R42,042,170	R16,620,200	40%	R117,081,000
Oudtshoorn	R11,293,000	R14,285,590	R12,597,850	88%	R29,954,480
Swartland	R64,576,000	R55,489,300	R50,615,520	91%	R329,107,000
Overstrand	R35,132,000	R95,106,980	R97,700,390	103%	R692,434,000
Saldanha	R24,758,280	R68,080,720	R55,111,950	81%	R713,722,000
Totals	**R14,517,650,325**	**R2,198,172,650**	**R2,273,744,350**	**103%**	**R8,376,818,082**

The Green Drop process provides a bonus (incentive) in cases where a municipality provide evidence of capital projects with secured funding since this is deemed as a definitive means of addressing wastewater services inadequacies. This incentive encourages wastewater infrastructure investment. A total capital budget of R14.52 billion has been reported for the refurbishment and upgrades of wastewater infrastructure for 22 of 25 municipalities over a 1-to-3-year fiscal period. The largest capital budget is observed for City of Cape Town (R12.5b), followed by Stellenbosch (R1.15b), George (R271m), and Mossel Bay (R134m).

For the 2020/21 fiscal year, the total O&M budget reported was R2.2 billion, of which R2.27 billion (103%) has been expended. The biggest budget is with the City of Cape Town that over-expended on their budget by 4%. Over-expenditure was also observed for with Overstrand (103%) which are not large deviations, but they are large budgets. Low expenditure was observed for Cederburg and Bitou. Prince Albert, Matzikama, Swellendam, Knysna and Hessequa provided no information. Partial financial info was observed for Langeberg, Kannaland and George.

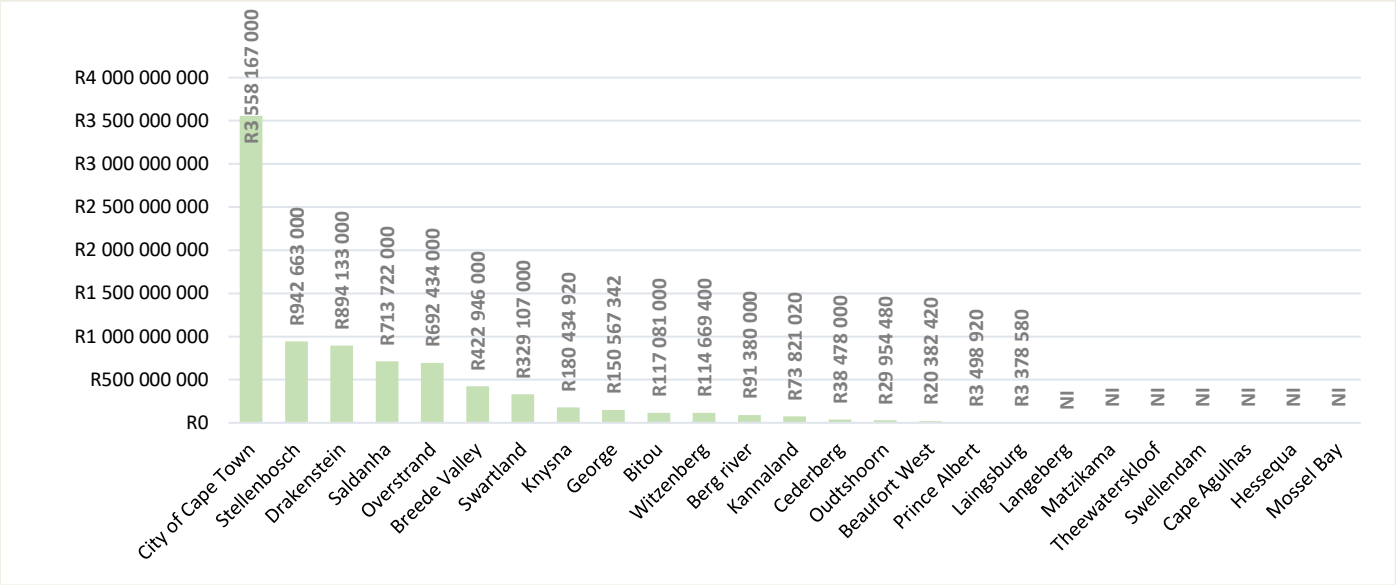


Figure 19 - Total current asset value reported by the municipalities

The total current asset value for wastewater infrastructure (networks, pumpstations, treatment plants) is reportedly R8.38 billion (excluding Langeburg, Matzikama, Theewaterskloof, Swellendam, Cape Agulhas, Hessequa and Mossel Bay with no information). The highest asset values are observed for City of Cape Town (R3.56b), followed by Stellenbosch (R943m), Drakenstein (R894m), Saldanha (R714m), and Overstrand (R692m).

O&M Cost Benchmarking

By combining the SALGA and WRC WATCOST models, an estimation of the maintenance cost required per asset type can be done, i.e. civil, buildings, pipelines, mechanical, electrical, and instrumentation. The maintenance benchmark departs from the basis that 15.75% of the asset value is required to maintain these assets.

Table 20 - SALGA-WRC annual maintenance budget guideline and cost estimation

Description	% of Current Asset Value	Asset Value Estimate	Modified SALGA Maintenance Guideline	Annual Maintenance Budget Guideline
Current Asset Value estimate	**100%**	**R8,376,818,082**	**15.75%**	**R179,263,907**
Broken down into:				
1. Civil Structures	46%	R3,853,336,318	0.50%	R19,266,682
2, Buildings	3%	R251,304,542	1.50%	R3,769,568
3. Pipelines	6%	R502,609,085	0.75%	R3,769,568
4. Mechanical Equipment	35%	R2,931,886,329	4.00%	R117,275,453
5. Electrical Equipment	8%	R670,145,447	4.00%	R26,805,818
6. Instrumentation	2%	R167,536,362	5.00%	R8,376,818
Totals	**100%**	**R8,376,818,082**	**15.75%**	**R179,263,907**
			Minus 20% P&Gs and 10% Installation	**R53,779,172**
			Total	**R125,484,735**

The model estimates that close to R180 million (2.14%) is required per year to maintain the assets valued at R8.38 billion. Notably, this maintenance estimate assumes that all *assets are functional*. The VROOM cost represents the monies needed to get assets functional, from which basis route maintenance could then focus on maintaining the assets.

Table 21 indicates the SALGA maintenance cost estimation in relation to the VROOM cost, O&M budget, and O&M actual expended.

Table 21 - O&M cost estimates by the SALGA and VROOM models versus actual budget and expenditure figures)

Cost Reference	O&M Cost Estimate	Period
Modified SALGA	R179,263,907	Annually, estimation
O&M Budget	R2,198,172,650.00	Actual for 2020/21
O&M Spend	R2,273,744,350.00	Actual for 2020/21
VROOM	R739,691,155.00	Once off estimation

The cost dynamics can be summarised as follows:

- The SALGA estimations for O&M budgets is 8% of the actual reported budgets for the 2020/21 fiscal year
- The actual O&M budget seems adequate when compare with the SALGA guideline
- The VROOM cost represents an estimation of the refurbishment cost to restore WWTWs functionality and design capacity.

Production Cost and Comparison

It is good business practice to monitor and manage the production costs of wastewater treatment in Rand/m^3 treated, and to compare such cost with industry norms. Published benchmarks is not currently available for typical treatment (production) costs, but significant cost increases are expected since 2013, given the variable input factors such as Covid, and cost of chemicals, transport, and electricity. From an economic perspective, it would be valuable to compare production cost budgeted with actual production costs. However, due to scarce information, it is not possible to provide insight as to possible shortfalls from an economic perspective.

Based on the limited data sets, no specific trend can be established between the cost to treat wastewater and the operational flow. The data does highlight some WWTWs with lower operational flow are mostly associated with higher production costs, e.g. Tesselaarsdal, Dwarskersbos, and Gouda. Some of the reported production costs seems excessive and need to be investigated by the respective Superintendents. Typically, larger plants with higher inflows benefit from economies of scale and would show a lower production cost compared to its low-flow counterparts. The main factors that influence costs would be staff, which is a fixed cost, and energy, chemical and repairs/maintenance costs, which is a variable cost which depends on the operational status of a plant.

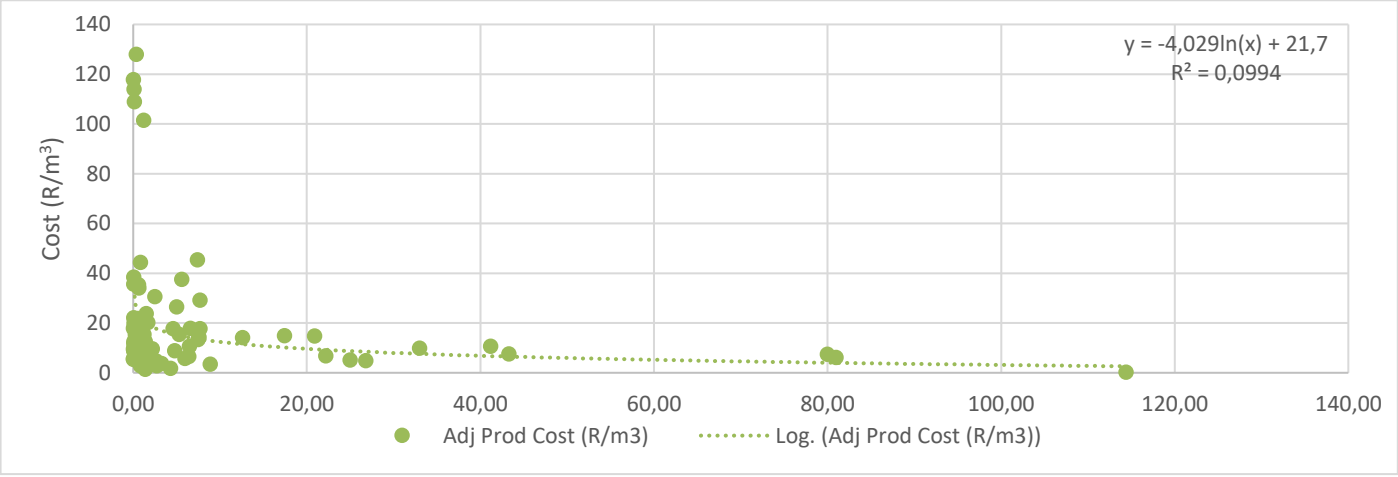


Figure 20 - Adjusted production cost (R/m^3) for wastewater treatment, sorted by operational capacity (inflow) per WWTW

The following plot shows that the production cost for treatment of wastewater ranges from R0.19 to R128 per m^3. The average cost to treat 1 m^3 of wastewater is R20.40 and median cost is R12.66, with the latter giving the more representative estimate of production cost. A logarithmic trendline was fitted to the reported values with a correlation coefficient of 31.6%. Using this fit, 9.94% (R^2) of the variation in the costs to treat wastewater in the Western Cape depends on the operational flow.

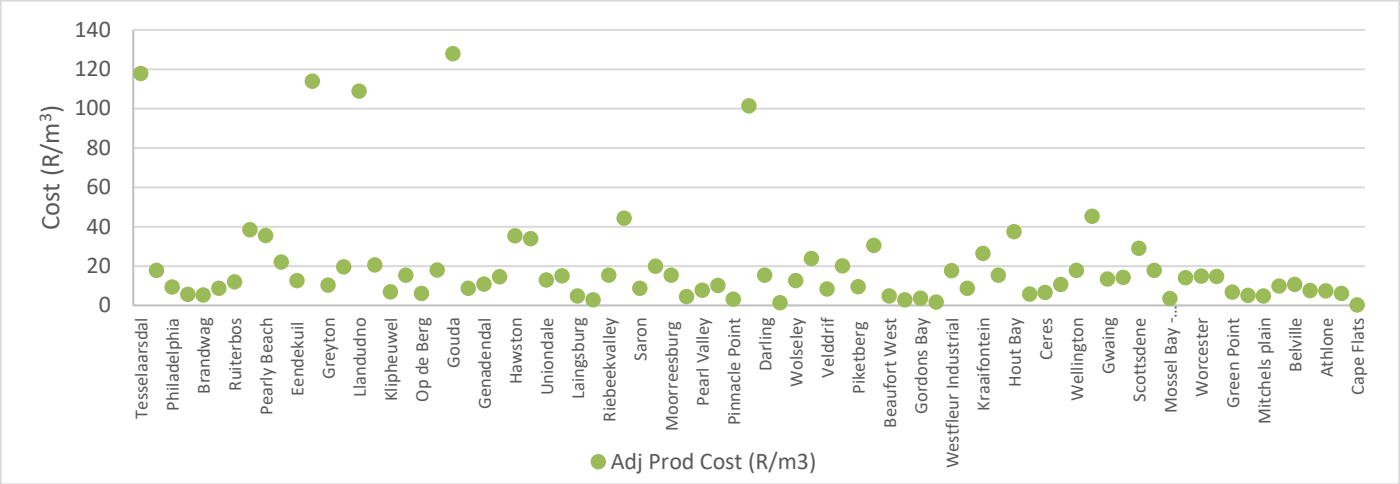


Figure 21 - Adjusted production cost (R/m³) for wastewater treatment, as a function of operational capacity (inflow)

The implication of these statistics combined with observations from the audits, is that a good number of municipalities have verified, accurate production costs, and is recognised as an invaluable parameter in the context of economic value and benefit. Given the lack of data by some municipalities, it is imperative that Superintendents start to monitor production (treatment) cost as a parameter within the fiscal reporting framework.

Data Certainty

Data certainty is expressed at different levels for the financial and asset figures reported within this Diagnostic. Certainty levels may differ from system to system, hence the repeat of some WSAs as the data provided for is variable or inconsistent or limited or non-existent (NI). Municipalities that were identified under the category ''High Certainty", presented consistent and verifiable evidence in the form of budgets, expenditure, asset registers, and unit costs.

Table 22 - Levels of certainty associated with financial and asset information reported by municipalities

Data Certainty	Description	WSA
No certainty	Absent data or no certainty in data presented - not ringfenced for WWTW & Network	Prince Albert, Matzikama, Swellendam, Hessequa
Low certainty	Minor or little certainty in the data - partially ringfenced for WWTW only or data as extreme outliers	Knysna, Langeberg, Kannaland, George, Breede Valley, Theewaterskloof, Cederburg, Cape Agulhas
Reasonable/good certainty	Reasonable to good level of certainty in the data - ringfenced for WWTW and/or Network and data falls within/close to expected parameters	Bitou, Laingsburg, Stellenbosch, Oudtshoorn, Swartland, Overstrand, Bergrivier, Mossel bay
High certainty	High level of certainty in the data - ringfenced for WWTW and Network and data falls within expected parameters	City of Cape Town, Witzenberg, Drakenstein, Saldanha, Beaufort West

DISCLAIMER

The '*Regulator's Comment*' that follows is verbatim provided by the Lead Inspector that audited the wastewater system.

4.1 Beaufort West Local Municipality

Water Service Institution	**Beaufort West Local Municipality**
Water Service Provider	Beaufort West Local Municipality

Municipal Green Drop Score	
2021 Green Drop Score	**59%↓**
2013 Green Drop Score	**80%**
2011 Green Drop Score	**90%**
2009 Green Drop Score	**43%**

VROOM Impression (Towards restoring functionality):

1. Screening washer / compactor
2. Aeration capacity
3. Disinfection station
4. Concrete spalling

VROOM Estimate:

- R10,060,750

Key Performance Area	**Weight**	**Beaufort West**	**Merweville**	**Nelspoort**	**Murraysburg**
A. Capacity Management	15%	74.0%	92.5%	92.5%	55.0%
B. Environmental Management	15%	60.5%	37.5%	25.0%	12.5%
C. Financial Management	20%	74.5%	68.1%	55.6%	0.0%
D. Technical Management	20%	60.0%	15.3%	15.3%	15.3%
E. Effluent & Sludge Compliance	30%	46.3%	100.0%	88.8%	18.8%
F. Bonus		25.5%	10.5%	10.5%	3.8%
G. Penalties		0.0%	-25.0%	-25.0%	-25.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		**64%**	**64%**	**56%**	**16%**
2013 Green Drop Score		**94%**	**89%**	**89%**	**12%**
2011 Green Drop Score		**91%**	**59%**	**88%**	**57%**
2009 Green Drop Score		**83%**	**20%**	**26%**	**0%**
System Design Capacity	Ml/d	4.659	0.39	0.2	0.5
Design Capacity Utilisation (%)		57%	NI	NI	77%
Resource Discharged into		Reclamation	No Discharge	No Discharge	Irrigation to Field – 400m from Buffelsrivier
Microbiological Compliance	%	92%	NMR	NMR	No monitoring
Chemical Compliance	%	84%	NMR	NMR	No monitoring
Physical Compliance	%	56%	NMR	NMR	No monitoring
Wastewater Risk Rating (CRR% of CRR_{max})		**Beaufort West**	**Merweville**	**Nelspoort**	**Murraysburg**
CRR (2011)	%	35.3%	23.5%	29.4%	NA
CRR (2013)	%	23.5%	58.8%	64.7%	94.1%
CRR (2021)	%	47.1%	35.3%	35.3%	52.9%

Regulator's Comment:

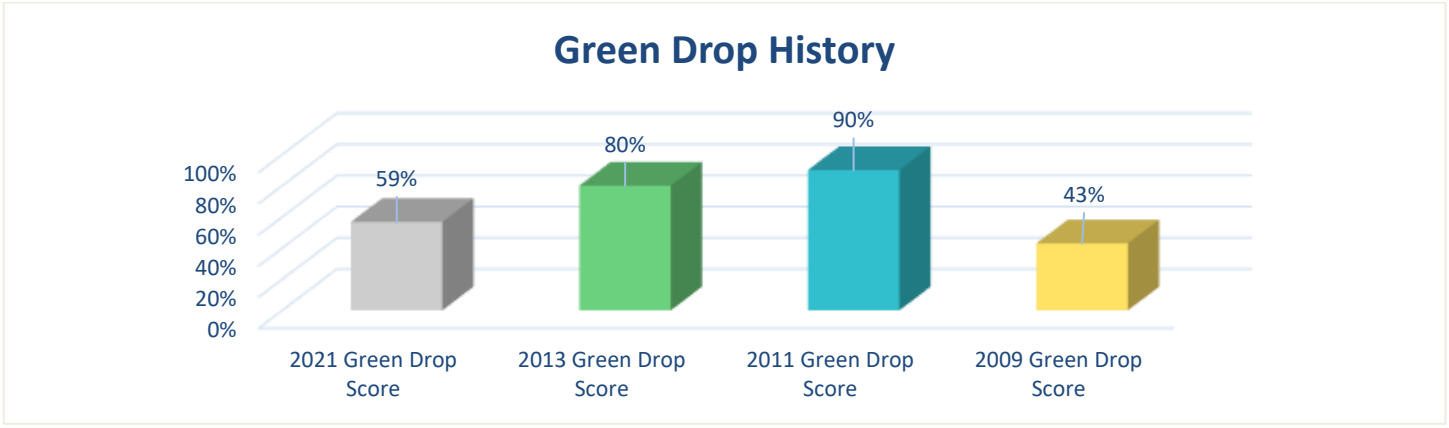
Beaufort West was represented by the Manager Technical Services, a senior clerk, as well as relevant officials as/when required to provide a wide-angle perspective on wastewater services. The team was well prepared and had evidence categorised based on the assessment criteria. The municipality achieved a 59% Green Drop score which is a regress from the 80% baseline in 2013 and 90% in 2011. However, the Regulator note that systems, processes, and qualified persons have been put in place, which bodes well to return to this excellent status by time of the next audit in 2023. Unfortunately, the Murraysburg system is a reason for concern and impacts negatively on the overall municipal score.

Areas for improvement include plans and systems linked to the Technical Management Category, like Process Audits and Sewer Mains Inspections, as well as implementing updated Wastewater Risk Abatement Plans. Flow metering and process monitoring remains a gap and contributed to a penalty for lack of inflow and outflow measurement. The Regulator would like to encourage the WSA to use the information from the current Green Drop audit as a baseline from which to move beyond compliance once again and into excellence. The Regulator is satisfied that 3 WWTWs reside in low risk space, and 1 plant in medium risk position.

Green Drop findings:

1. Plant Supervisor, and Process Controller registrations are in place at most of the systems with the WSA complying with the Green Drop standard (Draft Reg. 813)
2. Inhouse competencies of the Millwright could be verified, who oversees maintenance performed by Service Providers. The capacity of the Service Providers was considered before a contract was awarded
3. Engineering capacity is available inhouse and scientific capacity is currently provided by the external laboratories. The internal laboratory must assure that quality assurance, such as PTS and Z-scores, are in place for operational monitoring
4. Older versions of Wastewater Risk Abatement Plans are available. Even though these need to be updated, risk management principles still prevail within the municipality
5. Operational and compliance monitoring is in place for the Beaufort West system. Merweville and Nelspoort are considered as zero-effluent systems and some of the compliance monitoring requirements is waived. Monitoring at Murraysburg is however lacking
6. Financial information was provided. Murraysburg was however excluded from this as the system initially fell within another WSA's jurisdiction. Effort must be put to get this plant up to the same standard as the others
7. Flow measurement is in place for Beaufort West WWTW, but not for the remaining systems, predominantly due to the flows being too low to do accurate flow measurement. Alternative ways of monitoring may be implemented i.e., pump hours, etc. to ensure the plant is not hydraulically overloaded
8. No monitoring is in place at Merweville and Nelspoort, which are seen as zero-effluent systems. The same situation prevails at Murraysburg even though the final effluent is being irrigated
9. NMR requirements on final effluent need to be verified by way of Authorisations during the next audit to waive monitoring of these systems. However, good practice would still require monitoring of the raw and final effluent as a minimum
10. Beaufort West WWTW is producing effluent of an acceptable quality, noting that only microbiological quality achieved the excellence standard of >90%
11. A capital project is in place to address some of the gaps identified:
    - R42,696,730: Upgrade of the Beaufort West WWTW – funds not secured yet.

The Regulator is concerned about the overall poor state of wastewater services at the Murraysburg systems and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Beaufort West WWTW 64%

The ***Beaufort West WWTW*** was inspected to verify the Green Drop audit findings:

- The network and pumpstation was in good condition, with operations and maintenance attended to
- Screens were covered with GRP-plates as good practice
- Logbooks & systems were adequate, but Process Controllers should be encouraged to take more responsibility for their WWTW, start interpreting data collected and first order maintenance
- Minor building repairs were required. The staff facilities seem to be due for an update
- Upgrades to the Head of Works would include a screening washing system with compactor and/or conveyor
- The incinerator on site was in fair condition

- The biofilter section of the plant has been de-commissioned. Indications are, however, that the Activated Sludge Plant has sufficient capacity to deal with the current load
- A few signs of spalling concrete on reactor walkway were visible. This creates questions around condition of concrete on submerged sections
- Provision has been made for additional aerator to be installed. As the hydraulic capacity is in order the installation of another aerator would be a meaningful upgrade and will contribute to effluent quality improvement in the chemical category
- The corrosive nature of ferric was noted and need to be addressed as risk, i.e. tanks be replaced on a regular basis
- The chlorine dosing facility was functional but could be upgraded. The building is, by design, open while more modern trends are to contain chlorine gas, especially noting that one of the residential areas is expanding in the direction of the WWTW
- Only lagoons were in use for sludge handling
- Having a Water Reclamation Works linked to the system creates a certain expectation in terms of technology use on site and as such it would be fitting to start considering sludge as a resource as opposed to simply storing it for future disposal.

		
Plant is secured with fencing and access control	*Biofilter section of the plant has been de-commissioned. Indications are however that the Activated Sludge Plant has sufficient capacity to deal with the current load*	*Aeration capacity should be investigated and upgraded*

4.2 Bergrivier Local Municipality

Water Service Institution	**Bergrivier Local Municipality**
Water Service Provider	Bergrivier Local Municipality

Municipal Green Drop Score	
2021 Green Drop Score	**72%↑**
2013 Green Drop Score	**44%**
2011 Green Drop Score	**70%**
2009 Green Drop Score	**11%**

VROOM Impression (Towards restoring functionality):

1. Raw sewage spillage to surrounds
2. Cable theft and vandalism
3. Biological reactor not in operation
4. No screening – extended repair times
5. Mixers and standby equipment not in service
6. Only one sludge return pump functional

VROOM Estimate:

- R21,440,280

Key Performance Area	**Weight**	**Piketberg**	**Porterville**	**Velddrif**	**Eendekuil**	**Dwarskesbos**
A. Capacity Management	**15%**	66.0%	74.0%	66.0%	67.5%	57.5%
B. Environmental Management	**15%**	72.0%	72.0%	65.0%	66.3%	65.0%
C. Financial Management	**20%**	78.0%	78.0%	78.0%	72.5%	72.5%
D. Technical Management	**20%**	71.0%	71.0%	56.0%	41.2%	41.2%
E. Effluent & Sludge Compliance	**30%**	57.0%	72.0%	47.5%	53.8%	53.8%
F. Bonus		45.0%	49.0%	64.0%	49.0%	55.0%
G. Penalties		0.0%	0.0%	0.0%	0.0%	-25.0%
H. Disqualifiers		None	None	None	None	None
Green Drop Score (2021)		**73%**	**81%**	**66%**	**61%**	**59%**
2013 Green Drop Score		**49%**	**63%**	**41%**	**24%**	**49%**
2011 Green Drop Score		**74%**	**82%**	**58%**	**38%**	**73%**
2009 Green Drop Score		**11%**	**17%**	**5%**	**0%**	**11%**
System Design Capacity	**Ml/d**	3.15	1.5	1.992	0.14	0.294
Capacity Utilisation (% ADWF)		70%	47%	85%	64%	32%
Resource Discharged into		Irrigation	Irrigation	Golf course + sportsfields	Evaporation	Evaporation Ponds
Microbiological Compliance	**%**	44%	100%	44%	NMR	NMR
Chemical Compliance	**%**	77%	80%	31%	NMR	NMR
Physical Compliance	**%**	92%	94%	70%	NMR	NMR
Wastewater Risk Rating (CRR as %CRR_{max})		**Piketberg**	**Porteville**	**Velddrif**	**Eendekuil**	**Dwarskesbos**
CRR (2011)	**%**	58.8%	41.2%	58.8%	52.9%	52.9%
CRR (2013)	**%**	58.8%	41.2%	58.8%	76.5%	76.5%
CRR (2021)	**%**	58.8%	47.1%	64.7%	35.3%	29.4%

Regulator's Comment:

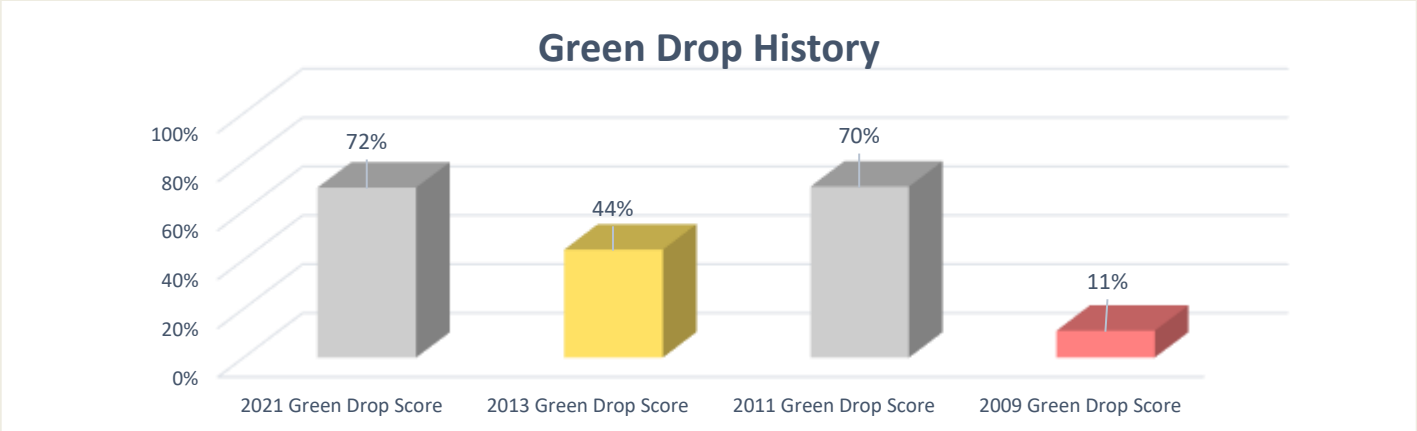
Bergrivier Local Municipality delivered an impressive performance with a Green Drop score improvement from 44% in 2013 to 72% in 2021. This is exceptional and the teams are congratulated for the impressive turnaround. The Regulator commends the municipality for their dedication and preparedness during both audit events. The auditors were impressed by the diligence of this team, considering the challenges that impact on service delivery. The municipality has divided responsibilities to the respective area managers which appears to be a practical and efficient arrangement.

The Porterville WWTW is in process of upgrading and refurbishing, and it is expected that this system may achieve Green Drop status in the 2023 audit cycle. The risk rating of all WWTWs has consistently been in moderate and low CRR space, with the only negative risk indicator being the Supervisors and Process Controllers not being registered. A concerted effort must be taken to register and upload these certificates on IRIS. Further areas for improvement include the implementation of the W_2RAP, conducting process audits on the advanced systems, improving sludge management plans and monitoring, and ensure that flow meters are calibrated. It is claimed that the Eendekuil and Dwarskersbos WWTWs are evaporation ponds and must therefore be confirmed as such in the Authorisation by DWS, which will be beneficial when scoring effluent quality. Effluent qualities should target >90% for microbiological, chemical, and physical compliance, to work towards Green Drop Certification in 2023. The Regulator is confident that this target is

achievable by this accomplished Bergrivier team, should they act on the recommendations provided herein. The Department is pleased to note that all WWTWs are in low risk- and medium risks positions. By implementing the recommendations contained hereunder, Bergrivier would be a candidate for Green Drop Certification in 2023.

Green Drop findings:

1. None of the five (5) treatment plants' Process Controllers or Supervisors are registered on IRIS
2. There are no inhouse scientists employed within the municipality, although this gap is addressed via the outsourcing of analytical services
3. None of the WWTWs have Sludge Management Plans or dedicated sludge stream (operational) monitoring in place
4. Documents are in place and of good quality, but proof of implementation need to be readily available for most of the sections that were assessed, which prevented higher scoring during the assessments
5. Non-complaint effluent quality compliance at all treatment works is a concern
6. Calibration of the meters is not conducted timeously which places doubt on the credibility of flow records
7. Bonus scores were not fully used, including training, water balances, wastewater balances, impact monitoring, and beneficial use of biosolids and energy efficiency initiatives
8. Capital budgets had been secured for capital projects for replacement, upgrades, and addition of new unit process at some of the WWTWs and associated infrastructure:
    - R6,500,000: Piketberg WWTW upgrades through WSIG funding
    - R5,800,000: Porterville WWTW upgrades through WSIG funding
    - R2,000,000: Veldrif WWTW upgrades through WSIG funding
    - R15,000,000: Eendekuil WWTW upgrades through WSIG funding
    - R15,000,000: Dwarskesbos WWTW upgrades through WSIG funding.



Site Inspection report

Piketberg WWTW 66%

The ***Piketberg WWTW*** was inspected to verify the Green Drop audit findings:

- During the time of audit assessment, the inlet works mechanical screw was out for repairs for a period of 2 weeks
- Two activated sludge modules, one new module and one aged module, are in place. The older module was not functional for 3 months prior to the audit, due to cable theft/vandalism
- Two secondary clarifiers were both in good condition, however scum removal was inefficient and contribute to sub-standard final effluent quality
- Two sludge ponds and one maturation dam were in fair condition, with good establishment of reedbeds
- Disinfection via chlorine dosing was offline due to vandalism and theft
- The plant generally appeared to be in good appearance, infrastructure mostly functional and groundskeeping well executed
- Process optimisation and mechanical refurbishments would be beneficial to improve the performance of the plant and the final effluent and sludge quality
- Energy efficiency initiatives and measurement would raise the standard of the plant and contribute to the professional status of the technical staff
- Theft if a major problem, but limited anti-vandalism strategies seems to be in place – this needs to be captured in the revised W_2RAP, along with issues of potential flooding, droughts, climate impact, and pandemic situations
- The practice whereby raw sewage is being diverted to the sludge ponds, due to stolen equipment and the second reactor is of major concern and must be addressed as a priority
- There were no serious defects noted on the sewer network and pumpstations.

		
Electrical panels in good condition, all pumps functional without any downtime in 6 months	*Flow meters and grit channels operational. Mechanical screen out for repairs, manual screen overloaded*	*Operational monitoring taking place*

		
Aerators in new reactor functional, not in older module due to cable theft	*Dam receiving overflows is not in good condition. Sluice gates stolen and sludge build up noticed*	*Chlorination room vandalised and stripped, not functional*

4.3 Bitou West Local Municipality

Water Service Institution	**Bitou Local Municipality**
Water Service Provider	Bitou Local Municipality

Municipal Green Drop Score	
2021 Green Drop Score	**93%↓**
2013 Green Drop Score	**99%**
2011 Green Drop Score	**96%**
2009 Green Drop Score	**78%**

VROOM Impression (Towards restoring functionality):

1. There were no major hardware risks
2. The TSA site (Gansevallei) was in excellent condition.

Vroom Estimate:

- R3,600,000

Key Performance Area	**Weight**	**Kurland**	**Plettenberg Bay (Gansevallei)**
A. Capacity Management	15%	90.0%	90.0%
B. Environmental Management	15%	82.0%	82.0%
C. Financial Management	20%	94.0%	94.0%
D. Technical Management	20%	76.5%	83.0%
E. Effluent & Sludge Compliance	30%	90.0%	90.0%
F. Bonus		46.5%	46.5%
G. Penalties		0.0%	0.0%
H. Disqualifiers		None	None
Green Drop Score (2021)		**91%**	**93%**
2013 Green Drop Score		**99%**	**99%**
2011 Green Drop Score		**96%**	**97%**
2009 Green Drop Score		**78%**	**79%**
System Design Capacity	Ml/d	0.5	9
Design capacity utilisation (%)		76%	53%
Resource Discharged into		Salt River	Bitou River into Keurbooms Estuary
Microbiological Compliance	%	100%	100%
Chemical Compliance	%	100%	100%
Physical Compliance	%	99%	100%
Wastewater Risk Rating (CRR % of CRR_{max})		**Kurland**	**Plettenberg Bay (Gansevallei)**
CRR (2011)	%	17.6%	22.7%
CRR (2013)	%	35.3%	22.7%
CRR (2021)	%	23.5%	31.8%

Regulator's Comment:

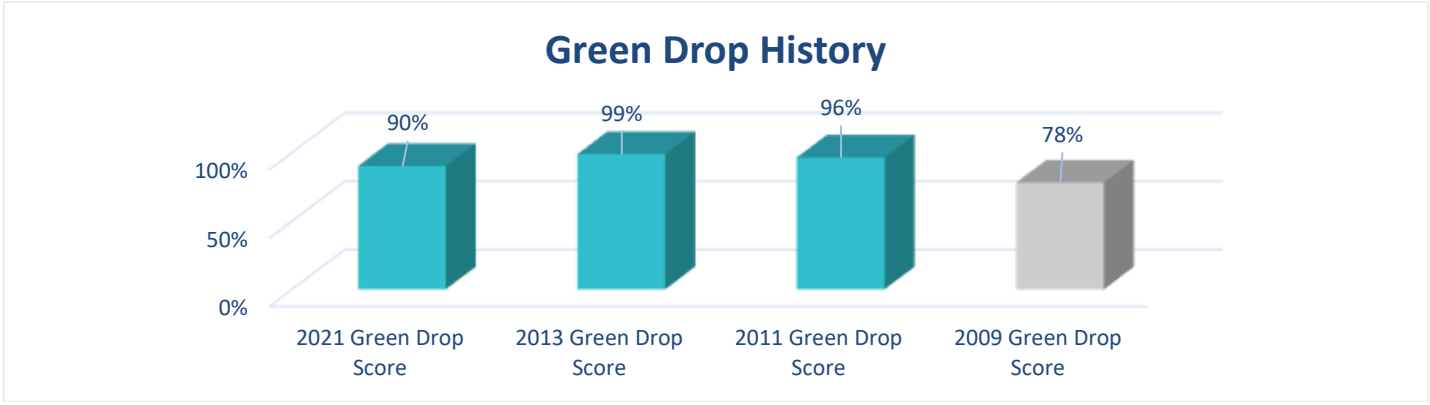
The Bitou Local Municipality team was very well prepared, as was evident from the early start of the meeting where the team organised the attendance of all role players, the various venues, and the site visits in a focussed and practical manner. The team is congratulated for the excellent performance achieved for both systems, with an overall Green Drop score of 93%. Both the Kurland and Gansevallei systems obtaining Green Drop Certification status and take its place as two of the best systems in South Africa. This score held firm against the 99% score of 2013, noting the introduction of more stringent audit requirements in 2021, especially in terms of sludge- and energy management. Regulator is encouraged to witness the excellent capacity, financial and environmental management of the municipality. The wastewater treatment plants are operating well and applies good business principles. Management should however be aware of the risks regarding sludge management that may have a detrimental effect on the environment and should be focussed on for improvement in the next audit. The auditors found that there was an overall holistic and seamless approach to wastewater management that is embraced across the entire organisation. The CRR risk ratings substantiate the audit findings and present a statistical trend of diligent risk mitigation since 2011 with all systems in low-risk positions without interruption since 2009. This consistency is a rare find and the team must keep up this excellent performance. Most markedly is that the effluent is of an excellent

standard with 100% compliance across all categories. Bitou LM is aware of challenges with plans already in place to rectify these issues (including sludge management). Energy efficiency and production cost benchmarking is also encouraged to raise professionalism.

The WSA is congratulated with its commitment to the Green Drop programme and continues to command recognition and excellence in wastewater services from wastewater peers across South Africa. The 2021 Green Drop results places Bitou at the top performers in South Africa. Well done.

Green Drop findings:

1. Capacity, financial, and environmental management of all systems are well managed and sufficient human and financial resources are in place to manage and operate its systems
2. Improvement is required in the Technical Management KPA category, specifically pertaining to asset register and its use to inform the maintenance programme. Improvement in this area can also be achieved by ensuring that wastewater flow balances form part of sewer mains inspection
3. Both plants complied with all 3 effluent quality categories. Extend this monitoring to ensure compliance with additional requirements such as biomonitoring, toxicology and impact monitoring
4. While neither of the plants conducted energy efficiency audits, excellent data was being captured regarding energy efficiency which can be further built upon
5. The WWTWs sludge was being classified but no recent Sludge Management Plans were in place
6. There is an awareness from the LM when upgrades are required, and business plans are being submitted for upgrades and refurbishments and this was linked to the W_2RAP process.



Technical Site Assessment

Gansevallei WWTW 84%

The **Gansevallei *WWTW*** was inspected to verify the Green Drop audit findings:

- The sewer network was generally in a good condition
- The plant was well fenced, and grounds impeccably maintained
- All documentation and logbooks were available on-site and well populated
- All unit processes were in good functional condition and no major hardware risks were identified
- Sludge management and disposal can be improved as sludge was being disposed to large clay-lined sludge ponds
- Storage of backup chlorine gas cylinders would be required, as cylinders were stored in the open.

		
Some algae present on the settling tanks	*Chlorine gas stored in the open*	*Sludge is stabilised in clay-lined ponds*

4.4 Breede Valley Local Municipality

Water Service Institution	**Breede Valley Local Municipality**
Water Service Provider	Breede Valley Local Municipality

Municipal Green Drop Score	
2021 Green Drop Score	**87%↓**
2013 Green Drop Score	**90%**
2011 Green Drop Score	**78%**
2009 Green Drop Score	**33%**

VROOM Impression (Towards restoring functionality):

1. 40% of the De Doorns plant is non-operational
2. Sludge recycle pumps dysfunctional
3. Chlorine gas is not operational.

VROOM Estimate:

- R246,305,400

Key Performance Area	**Weight**	**Worcester**	**De Doorns**	**Rawsonville**	**Touwsriver**
A. Capacity Management	**15%**	82.0%	82.0%	92.0%	82.0%
B. Environmental Management	**15%**	73.0%	67.0%	56.0%	64.0%
C. Financial Management	**20%**	100.0%	100.0%	90.0%	90.0%
D. Technical Management	**20%**	87.0%	69.5%	61.0%	57.0%
E. Effluent & Sludge Compliance	**30%**	81.0%	50.0%	65.0%	60.0%
F. Bonus		72.0%	36.0%	63.0%	33.0%
G. Penalties		0.0%	0.0%	-50.0%	-50.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		**90%->89%**	**75%**	**71%**	**66%**
2013 Green Drop Score		**91%**	**87%**	**87%**	**84%**
2011 Green Drop Score		**78%**	**79%**	**79%**	**67%**
2009 Green Drop Score		**50%**	**28%**	**26%**	**26%**
System Design Capacity	**Ml/d**	30	2.34	0.24	0.84
Design capacity utilisation (%)		58%	87%	154%	235%
Resource Discharged into		Breede River (95%) – Irrigation (5%)	Golf course irrigation -50% and re-use via UF - 50%	Smalblaar river	Donkies River
Microbiological Compliance	**%**	96%	90%	98%	100%
Chemical Compliance	**%**	71%	73%	58%	79%
Physical Compliance	**%**	92%	78%	95%	73%
Wastewater Risk Rating (CRR % of CRR_{max})		**Worcester**	**De Doorns**	**Rawsonville**	**Touwsriver**
CRR (2011)	**%**	48.2%	52.9%	41.2%	47.1%
CRR (2013)	**%**	51.9%	47.1%	41.2%	41.2%
CRR (2021)	**%**	55.6%	47.1%	58.8%	52.9%

Regulator's Comment:

Breede Valley Local Municipality achieved a commendable 87% Green Drop score, with Worcester Green Drop Certification missed only because of the chemical not achieving more than 90%. The municipality has an enthusiastic and dedicated team who came well prepared to the audits. The kind of attitude shown by the team is applauded and set an example for South Africa wastewater services as a whole.

Areas of further improvement would be to increase the uptake of risk management principles and concepts, i.e., updated W_2RAP (outdated from 2014) and proof of implementation of the conditional assessment. Worcester WWTW complied with 2 compliance categories, namely microbiological and physical, which suggest focus on meeting chemical quality parameters. Penalties were applied for 2 systems that exceeded its design capacity, which also contributed to final effluent qualities not meeting excellence standards.

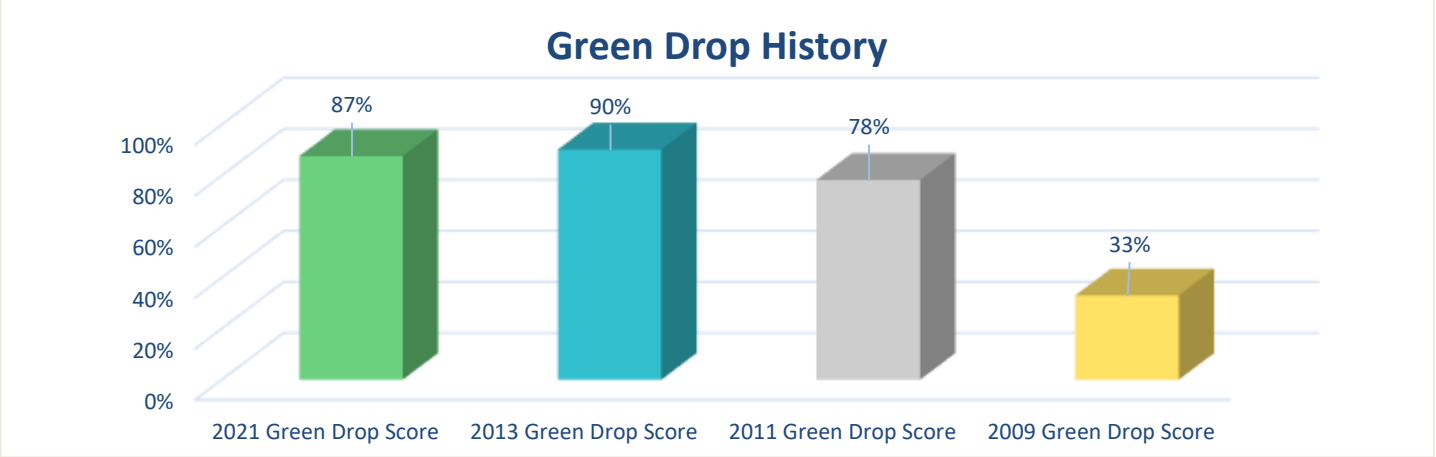
The municipal team is praised for attaining 90-100% for its budget, expenditure, and asset management processes, as evidence of the accountable way the public monies are applied, managed and reported. Also notable is the effective management of industrial trade effluent discharge to the works, as well as ringfenced revenue collection for WWTW maintenance and plant specific needs. This good

practice demonstrates excellency and progressive initiative by the municipality. The Regulator is encouraged by Worcester WWTW that uses its reduced capacity to save energy and offset against the current capacity savings. The design capacity is 30 Ml/d, with an operational flow of 17.5 Ml/d allows for the balance to induce energy efficiency and savings.

The Breede Valley laboratory is a further example of excellent conduct and scientific services, and is acknowledged for its competent team and top-class equipment, which provide credible data within a short turnaround time to the operational staff. The Regulator notes the high compliance or both compliance and operational monitoring of the wastewater treatment.

Green Drop findings:

1. Process Controllers are registered on the DWS regulatory systems, however, most of these are still under review or incomplete on IRIS. Process Controllers that have left the municipality are still registered and need to be removed from the IRIS profile. The Process Controllers for the Worcester system exceeds the draft Regulation 813 requirements
2. No evidence in the form of qualifications was provided for the inhouse or outsourced engineers
3. Worcester and De Doorns WWTW were found to have adequate evidence of operational monitoring data and electrical metering whereas Rawsonville and Touwsriver lack in this section
4. Both Touwsriver and Rawsonville WWTW are operating above capacity. However, the Rawsonville WWTW still shows compliance for micro and physical determinants of >90%. Compliance with chemical standards would have waived the penalty
5. None of the four plants are in high or critical risks positions
6. Budget had been secured for capital projects for replacement, upgrades, and addition of new unit process at some of the WWTWs and associated infrastructure:
    a. R2,200,000: Worcester WWTW equipment upgrades and new sewer connections
    b. R26,000,000: Rawsonvillle WWTW upgrades due to overloading - upgrade plan via MIG (R6m MIG and R20m internal), a is tender has been published to upgrade the WWTW by 900 kl.



Site Inspection report

De Doorns WWTW 54%

The ***De Doorns WWTW*** was inspected to verify the Green Drop audit findings:

- The work is designed for 2.3 ML/d and consists of a 1.38 Ml/d activated sludge plant and 2 x 0.5 Ml/d orbital ditch plants. The two orbital ditch plants are out of operation due to maintenance issues and the full flow is transferred to the activated sludge plant. This module is thereby found be overloaded, which would impact negatively on effluent quality
- The inlet works has a mechanical sieve-screen, a grit chamber and splitter box and was found to be functional and cleaned daily by the process operators
- There are two secondary clarifiers, i.e., one is for the activated sludge section of the works (in operation) and one for the orbital ditches (not in operation)
- There are two newly constructed sludge ponds and one maturation pond dam and one irrigation dam which pumps full out-flow to the golf-course for irrigation
- Disinfection by chlorine dosing was not functional due to maintenance, and defaulted to manually dosing of chlorine tablets
- Inlet flow metering was not taking place during the time of site inspection and that only the outlet is measured. This was due to ultrasonic flowmeter broken/not working
- There were no measurements or records of incoming electrical power

- The 2 systems (passive ditches) that contribute 40% to the works capacity need to be adapted/modified and operationalise as soon as possible. Once completed, some relief will be attained in handling the incoming flow volumes
- The treatment works had no process monitoring equipment on site (only at Worcester WWTW)
- Despite the problems relating to maintenance and non-functional side of the works, the plant is generally in a fair condition and Process Controllers are doing a sterling job in managing the day-to-day operations and housekeeping.

		
Activated sludge plant is hydraulically overloaded whilst orbal ditches are busy with repairs and maintenance	*One of the 2 clarifiers are operational*	*Manual dosing of chlorine is taking place during maintenance of Cl_2 system*

4.5 Cape Agulhas Local Municipality

Water Service Institution	**Cape Agulhas Local Municipality**
Water Service Provider	Cape Agulhas Local Municipality

Municipal Green Drop Score	
2021 Green Drop Score	**52%→**
2013 Green Drop Score	**52%**
2011 Green Drop Score	**34%**
2009 Green Drop Score	**0%**

VROOM Impression (Towards restoring functionality):

1. Bredasdorp WWTW was recently upgraded and commissioned in early 2021 - the plant infrastructure and equipment are in excellent condition
2. Flow monitoring
3. Network pump stations must be securely fenced
4. Unlined sludge ponds
5. Staff facilities needs improvement

VROOM Estimate:

- R7,258,000

Key Performance Area	Weight	Bredasdorp	Napier	Struisbaai	Waenhuiskrans-Arniston
A. Capacity Management	15%	77.0%	73.8%	77.0%	87.0%
B. Environmental Management	15%	49.5%	71.9%	50.5%	49.5%
C. Financial Management	20%	47.0%	46.3%	47.0%	37.0%
D. Technical Management	20%	58.5%	35.3%	37.5%	36.8%
E. Effluent & Sludge Compliance	30%	15.0%	81.3%	35.0%	15.0%
F. Bonus		38.5%	59.5%	37.0%	37.0%
G. Penalties		0.0%	-25.0%	-25.0%	-25.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		**50%**	**66%**	**48%**	**42%**
2013 Green Drop Score		**53%**	**50%**	**50%**	**53%**
2011 Green Drop Score		**38%**	**32%**	**18%**	**12%**
2009 Green Drop Score		**0%**	**0%**	**0%**	**0%**
System Design Capacity	Ml/d	3.6	0.55	0.37	0.2
Design Capacity Utilisation (%)		NI	NI	NI	NI
Resource Discharged into		Kars river (Droë River)	No discharge	Discharge into dunes	Soak away/Dunes
Microbiological Compliance	%	42%	NMR	100%	67%
Chemical Compliance	%	50%	NMR	71%	54%
Physical Compliance	%	42%	NMR	64%	53%
Wastewater Risk Rating (CRR% of CRR_{max})		**Bredasdorp**	**Napier**	**Struisbaai**	**Waenhuiskrans-Arniston**
CRR (2011)	%	47.1%	47.1%	52.9%	52.9%
CRR (2013)	%	52.9%	52.9%	64.7%	52.9%
CRR (2021)	%	70.6%	41.2%	64.7%	70.6%

Regulator's Comment:

The Cape Agulhas Municipality was well-prepared for the Green Drop audit as was evident from the start of the meeting, noting the attendance of all role players, several venues, and site visits in a focussed and practical manner. The team is commended in attaining fair performance as reflected by a municipal Green Drop score of 52% which has been sustained from 2013. This must be seen against the backdrop of continuously more stringent requirements of the Green Drop programme.

The Regulator is encouraged by the good performance shown in Capacity Management (KPA A) - as all plants were classified and suitably supervised and a maintenance contract is in place to ensure that electrical and mechanical equipment is maintained. Improvement in this area can be made by ensuring that Process Controllers are available and suitably qualified in accordance with the Department's regulatory requirements. Operational monitoring to inform process optimisation and associated record keeping and data management, particularly with regard to flow measurement, should also be prioritised. The wastewater treatment plants are operating within fair business practice. Improvement should be directed to the use of specific drivers of operational costs for the WWTW and network systems, the use of asset condition to inform budget and maintenance plans, and beneficial use initiatives. Management should be aware of the risks regarding the sludge management that may have a detrimental effect on the environment.

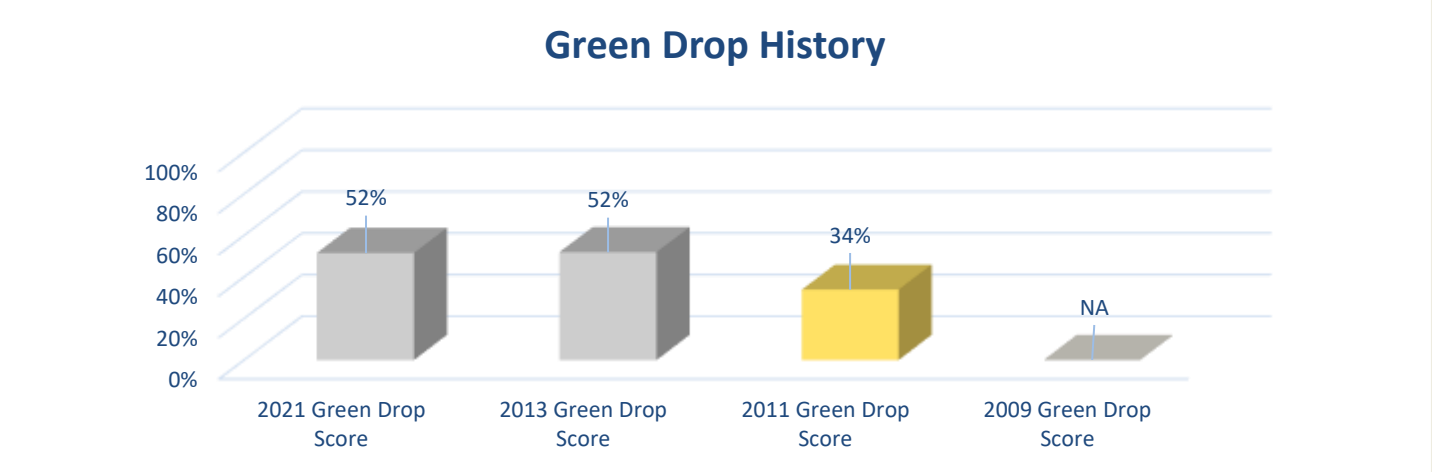
The various systems' performances are largely differentiated at the effluent and sludge compliance KPA. The municipality is commended for ensuring that effluent compliance data is uploaded consistently on a monthly basis. It must however be ensured that all systems have valid water use authorisations in place. NMR claims must also be included in the authorisations by time of the next audit in 2023.

The Napier system had the highest Green Drop Score and was the only system to move from a medium to a low-risk rating. This was largely as it is a non-discharging pond system. The Struisbaai system maintained its risk rating at 64.7%, while the Bredasdorp and Waenhuiskrans systems moved from a medium to high-risk space. The Bredasdorp WWTW was recently upgraded and commissioned early in 2021. It is thus expected that effluent quality will show significant improvement and the resultant CRR for this system will move into a lower risk space. The Waenhuiskrans system however requires intervention as it obtained the lowest Green Drop score and the highest risk rating. Final effluent quality must be improved in this system and general operational aspects could be improved. A basic, generic W_2RAP was in place but it is advised that this be updated more detailed so that a focussed risk-based management approached can be implemented going forward which can ensure improvement across all KPAs.

Municipal leadership and the wastewater teams are acknowledged for its commitment to the Green Drop programme and the plans to improve in future. The Regulator is hopeful to see a Green Drop performance that exceed the 70% in the next audit season.

Green Drop findings:

1. Capacity management of all systems are well managed and sufficient human resources are in place to manage and operate its systems
2. KPA C - Environmental Management needs attention and the municipality should analyse its costs components of the networks, including the pumpstations, in order to determine specific drivers for its system
3. Production costs must be determined and benchmarked with same technology and plant sizes
4. The importance of stormwater management must be elevated to management level and coordinated with the Roads and Stormwater Engineer. The same for water losses and water demand management.
5. The need for proper recordkeeping (process monitoring, flow measurement and maintenance logging) is vital for the municipality to better manage operations, implement process optimisation and plan for future demand
6. The use of the Process Audit and W_2RAP tools are encouraged
7. None of the plants conducted energy efficiency audits, thereby no SPCs are being determined or benchmarked
8. Good data is being captured regarding energy efficiency, it just needs more refinement
9. None of the WWTWs sludge was being classified and no Sludge Management Plans were in place
10. Two of the four plants are in high-risk positions
11. The recent upgrade of Bredasdorp WWTW indicates that the LM is moving the right direction: R35 924 000 (completed 2017). In addition, the following is planned:
    - R20,000,000: Upgrade of the Napier WWTW – WSIG funds.



Technical Site Assessment

Bredasdorp WWTW 67%

The **Bredasdorp *WWTW*** was inspected to verify the Green Drop audit findings:

- The sewer network was generally in a good condition and maintained a reasonable flow during the assessment
- The pump station inspected needs to be fenced and security upgraded
- Process Controller staffing needed attention

- Housekeeping are very good, but some facilities required attention
- Operational monitoring and record keeping must be improved
- The new plant has just been commissioned and as such the mainstream processes and infrastructure area in very good condition
- Sludge was being stored/dried in unlined sludge ponds and therefore needs close monitoring, including impact on the environment (groundwater resources).

		
Good operational working of secondary settlers	*All mechanical equipment at the plant is in good working condition*	*Sludge is treated in unlined sludge ponds*

4.6 Cederberg Local Municipality

Water Service Institution	**Cederberg Local Municipality**
Water Service Provider	Cederberg Local Municipality

Municipal Green Drop Score	
2021 Green Drop Score	**50%↑**
2013 Green Drop Score	**36%**
2011 Green Drop Score	**63%**
2009 Green Drop Score	**3%**

VROOM Impression (Towards restoring functionality):

1. Disinfection system at Clanwilliam – structural, chemical, and electrical defects
2. Flow metering is dysfunctional
3. Lacking process knowledge & improved process control – staff training

VROOM Estimate:

- R24,822,000

Key Performance Area	Weight	Clanwilliam	Citrusdal	Lambertsbay	Elandsbay
A. Capacity Management	15%	84.0%	84.0%	84.0%	80.0%
B. Environmental Management	15%	59.0%	60.0%	57.0%	73.8%
C. Financial Management	20%	51.0%	51.0%	51.0%	38.8%
D. Technical Management	20%	60.5%	40.5%	40.5%	29.4%
E. Effluent & Sludge Compliance	30%	12.0%	44.0%	24.0%	11.3%
F. Bonus		24.0%	37.5%	7.5%	15.0%
G. Penalties		0.0%	-25.0%	0.0%	0.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		**51%**	**55%**	**48%**	**42%**
2013 Green Drop Score		**52%**	**40%**	**41%**	**24%**
2011 Green Drop Score		**63%**	**67%**	**66%**	**57%**
2009 Green Drop Score		**3%**	**3%**	**3%**	**3%**
System Design Capacity	Ml/d	3	2.3	3	0.5
Design Capacity Utilisation (%)		70%	22%	53%	50%
Resource Discharged into		20% to Jan Diesel (80% irrigated)	Boontjies River	Irrigation	Jakkels River (100% irrigated)
Microbiological Compliance	%	Insufficient data set	18%	69%	58%
Chemical Compliance	%	Insufficient data set	61%	23%	0%
Physical Compliance	%	Insufficient data set	100%	81%	75%
Wastewater Risk Rating (CRR% of CRR_{max})		**Clanwilliam**	**Citrusdal**	**Lambertsbay**	**Elandsbay**
CRR (2011)	**%**	82.4%	35.3%	35.5%	70.6%
CRR (2013)	**%**	58.8%	64.7%	82.4%	64.7%
CRR (2021)	**%**	82.4%	52.9%	64.7%	64.7%

Key Performance Area	Weight	Algeria	Wupperthal	Graafwater
A. Capacity Management	15%	55.0%	67.5%	67.5%
B. Environmental Management	15%	68.8%	68.8%	43.8%
C. Financial Management	20%	20.0%	38.8%	38.8%
D. Technical Management	20%	5.9%	14.7%	14.7%
E. Effluent & Sludge Compliance	30%	48.4%	64.4%	10.3%
F. Bonus		7.5%	7.5%	7.5%
G. Penalties		0.0%	0.0%	0.0%
H. Disqualifiers		None	None	None
Green Drop Score (2021)		**39%**	**51%**	**32%**
2013 Green Drop Score		**18%**	**10%**	**27%**
2011 Green Drop Score		**0%**	**0%**	**57%**
2009 Green Drop Score		**0%**	**0%**	**3%**
System Design Capacity	Ml/d	0.05	0.5	0.5
Design Capacity Utilisation (%)		20%	50%	60%
Resource Discharged into		Rondegat river	Grootvis river	None (full irrigation use)

Key Performance Area	Weight	Algeria	Wupperthal	Graafwater
Microbiological Compliance	%	60%	100%	Insufficient data set
Chemical Compliance	%	50%	0%	Insufficient data set
Physical Compliance	%	90%	50%	Insufficient data set
Wastewater Risk Rating (CRR% of CRR_{max})		**Algeria**	**Wupperthal**	**Graafwater**
CRR (2011)	%	NA	100.0%	35.5%
CRR (2013)	%	88.2%	100.0%	52.9%
CRR (2021)	%	70.6%	64.7%	82.4%

Regulator's Comment:

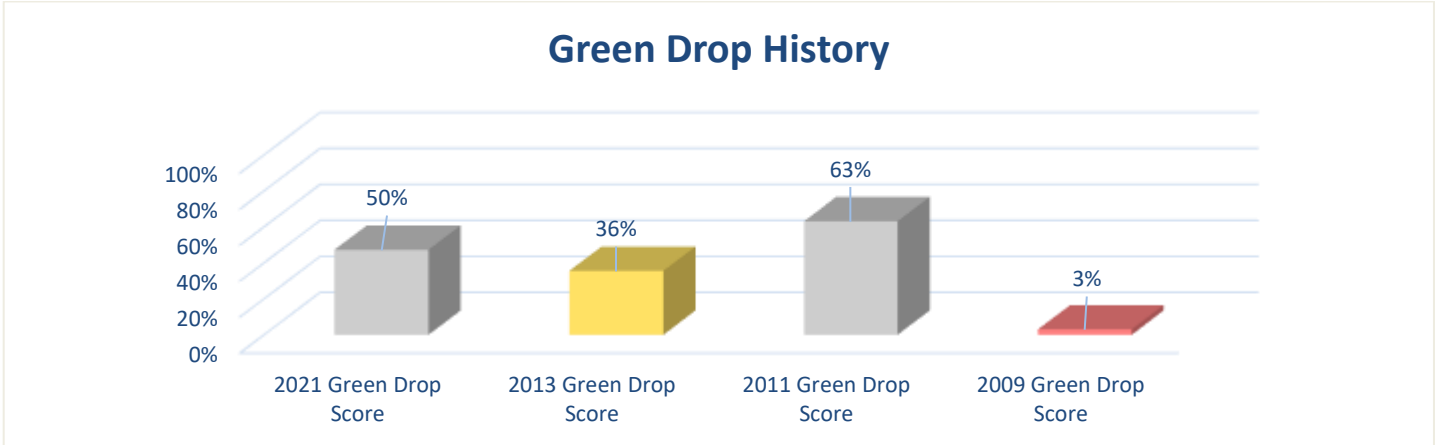
Cederberg Local Municipality has shown an impressive improvement in its overall Green Drop score from 36% to 50% in 2021. This is primarily attributed to by a cohesive team of dedicated municipal officials, despite challenging circumstances. Cederberg is congratulated for this remarkable improvement. The Regulator noted that the staff capacity is stretched, hence, not all required audit information was provided. Notably, none of the systems have risk abatement plans developed over the last few years, which compromises a risk-informed budget and action plan.

Citrusdal works has recently been upgraded, however, the WSA failed to present all evidence to convince the Regulator that the PMU report contains crucial information about the works. The visited WWTW appeared well managed in the field, but administration and monitoring aspects were lacking. The budget and expenditure reports presented during the assessment audit was unclear and difficult to interpret for each of the systems. Production cost and energy cost drivers need attention. Priority needs to be given to the classification of Process Controllers for all works.

Lack of basic data such as design capacities and organic loading was also noted. A thorough process audit (per unit process) and risk abatement planning process will likely resolve this gap, coupled with modelling of the available capacity (hydraulic and organic). Regrettably, as result of these gaps, three of the seven WWTWs are in high-risk positions and need to be prioritised for risk intervention. The Regulator is satisfied with the progress trend, and hopeful that this pattern will continue to break the 70% Green Drop mark in 2023.

Green Drop findings:

1. None of the systems have fully compliant Process Controllers in place
2. No inhouse scientists are employed within the municipality – this may compromises the day-to-day operations at the treatment plants and need to be investigated
3. No active sludge management planning or monitoring are taking place
4. None of the 7 systems achieved compliance against their effluent quality limits – this may be more a function of lacking Process Control and scientific skills than that of infrastructure deficiencies
5. Poor effluent compliance of all the treatment works is a concern, with zero of the systems complying with the collective three (3) effluent quality categories
6. Three of the seven WWTWs are in high-risk positions and need to be prioritised for risk intervention
7. Budget had been secured for capital projects for replacement and upgrades at selected WWTWs:
    a. R960,000: Clanwilliam covid 19 project - access to sanitation
    b. R13,315,000: Citrusdal new WWTW MIG allocated but total project cost R57,711,531 MIG Portion: R6,000,000 MIG Balance: R 19,704,567. Estimated cost to complete WWTW: R23,223,176. R3,572,151 spent in 2019/20
    c. R6,000,000: Lambertsbay WWTWs upgrade in planning stage.



Site Inspection report

Clanwilliam WWTW 67%

The ***Clanwilliam WWTW*** was inspected to verify the Green Drop audit findings:

- The inlet works with hand-rake screens, grit chamber and flow splitter box was in satisfactory condition and well managed with screenings removed daily
- The flume metering system was dysfunctional and incoming flow was not measured
- Two activated sludge modules (oxidation ditch type), one older and one recently refurbished, were both in good condition
- MLSS for the older reactor was not optimal and would compromise nutrient removal
- The two clarifiers were in good condition with overflow weirs and launders relatively clean and appeared well managed. Sludge recycle to the reactors took place, but no ratios were calculated or used to optimise the plant
- Electrical gear inside the chlorine dosing room was in poor condition
- Treated effluent was discharged to a maturation pond with 1125 m^3 storage capacity
- Disinfection was done by means of floating chlorine tablets as the chlorine gas system was dysfunctional – this was evident from the poor microbiological compliance that is seen at final sampling point
- The maturation pond has internal division walls with a plug flow configuration - short-circuiting was evident as result of broken channel walls.

		
Inlet works equipment is in good condition	*Activated sludge system is functional with RAS in place, but MLSS is not optimised*	*Final effluent channels are compromised by structural defects and Cl_2 system not functional*

4.7 City of Cape Town Metropolitan Municipality

Water Service Institution	**City of Cape Town Metro**
Water Service Providers	Cape Town Metro WSSA (Zandvliet & Fisantekraal)

Municipal Green Drop Score	
2021 Green Drop Score	**88%↓**
2013 Green Drop Score	**89%**
2011 Green Drop Score	**87%**
2009 Green Drop Score	**82%**

VROOM Impression (Towards restoring functionality):

1. All major equipment is in good working condition
2. Regular operational monitoring enhanced with the adding of several flowmeters
3. Corrosion of concrete
4. Clogging of fine bubble aerators
5. Chlorination and dosing
6. Vandalism

VROOM Estimate:

- R171,156,110

Key Performance Area	Weight	Westfleur Domestic	Westfleur Industrial	Philadelphia	Groot Springfontein
A. Capacity Management	15%	100.0%	100.0%	100.0%	100.0%
B. Environmental Management	15%	100.0%	100.0%	93.8%	65.0%
C. Financial Management	20%	100.0%	100.0%	82.5%	82.5%
D. Technical Management	20%	91.3%	91.3%	83.8%	38.2%
E. Effluent & Sludge Compliance	30%	90.0%	40.0%	100.0%	7.5%
F. Bonus		79.8%	79.8%	51.8%	49.8%
G. Penalties		0.0%	0.0%	0.0%	-25.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		**100%**	**89%**	**96%**	**62%**
2013 Green Drop Score		**89%**	**81%**	**85%**	**82%**
2011 Green Drop Score		**93%**	**88%**	**82%**	**41%**
2009 Green Drop Score		**97%**	**97%**	**0%**	**0%**
System Design Capacity	Ml/d	8	6	0.086	NI
Design Capacity Utilisation (%)		95%	77%	52%	NI
Resource Discharged into		Donkergat river to Atlantis artificial aquifer	Donkergat river to Atlantis artificial aquifer	Evaporation pond	Ponds - no effluent
Microbiological Compliance	%	91%	68%	NMR	No monitoring
Chemical Compliance	%	97%	62%	100%	No monitoring
Physical Compliance	%	99%	60%	78%	No monitoring
Wastewater Risk Rating (CRR % of CRR_{max})		**Westfleur Domestic**	**Westfleur Industrial**	**Philadelphia**	**Groot Springfontein**
CRR (2011)	%	40.9%	54.5%	41.2%	47.1%
CRR (2013)	%	45.5%	40.9%	35.3%	23.5%
CRR (2021)	%	36.4%	59.1%	29.4%	82.4%

Key Performance Area	Weight	Potsdam	Macassar	Mitchell's Plain	Cape Flats
A. Capacity Management	15%	100.0%	100.0%	100.0%	100.0%
B. Environmental Management	15%	100.0%	100.0%	87.0%	86.0%
C. Financial Management	20%	85.0%	100.0%	100.0%	85.0%
D. Technical Management	20%	91.3%	91.3%	91.3%	64.5%
E. Effluent & Sludge Compliance	30%	46.0%	40.0%	60.0%	40.0%
F. Bonus		89.8%	89.8%	59.8%	82.3%
G. Penalties		0.0%	0.0%	0.0%	0.0%

Key Performance Area	Weight	Potsdam	Macassar	Mitchell's Plain	Cape Flats
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		90%->89%	90%->89%	89%->89%	85%
2013 Green Drop Score		91%	92%	82%	96%
2011 Green Drop Score		86%	97%	85%	80%
2009 Green Drop Score		76%	90%	97%	97%
System Design Capacity	Ml/d	47	28	36	200
Design Capacity Utilisation (%)		92%	89%	74%	57%
Resource Discharged into		Diep river	Eerste rivier	Sea - onto beach	Zeekoevlei canal and then ocean
Microbiological Compliance	%	9%	67%	96%	35%
Chemical Compliance	%	74%	25%	71%	61%
Physical Compliance	%	75%	49%	89%	80%
Wastewater Risk Rating (CRR % of CRR_{max})		Potsdam	Macassar	Mitchell's Plain	Cape Flats
CRR (2011)	%	48.1%	40.6%	55.6%	54.1%
CRR (2013)	%	46.9%	40.7%	48.2%	43.2%
CRR (2021)	%	59.3%	59.3%	48.1%	56.8%

Key Performance Area	Weight	Zandvliet	Gordons Bay	Belville	Kraaifontein
A. Capacity Management	15%	100.0%	92.0%	100.0%	100.0%
B. Environmental Management	15%	100.0%	100.0%	90.0%	97.0%
C. Financial Management	20%	85.0%	85.0%	85.0%	100.0%
D. Technical Management	20%	92.5%	88.3%	91.3%	80.0%
E. Effluent & Sludge Compliance	30%	60.0%	60.0%	40.0%	75.0%
F. Bonus		89.8%	49.8%	89.8%	59.8%
G. Penalties		-75.0%	-50.0%	0.0%	0.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		85%	86%	89%	93%->89%
2013 Green Drop Score		92%	89%	78%	95%
2011 Green Drop Score		92%	93%	85%	81%
2009 Green Drop Score		76%	76%	65%	74%
System Design Capacity	Ml/d	72	3.06	75	9
Design Capacity Utilisation (%)		113%	107%	55%	56%
Resource Discharged into		Kuils River	Sir Lowry's Pass River	Kuilsrivier	Mosselbank River
Microbiological Compliance	%	100%	96%	82%	91%
Chemical Compliance	%	34%	66%	39%	76%
Physical Compliance	%	51%	58%	54%	98%
Wastewater Risk Rating (CRR % of CRR_{max})		Zandvliet	Gordons Bay	Belville	Kraaifontein
CRR (2011)	%	56.3%	41.2%	68.8%	68.2%
CRR (2013)	%	43.8%	58.8%	59.4%	40.9%
CRR (2021)	%	68.8%	64.7%	59.4%	40.9%

Key Performance Area	Weight	Klipheuwel	Fisantekraal	Borcherd's Quarry	Melkbosstrand
A. Capacity Management	15%	100.0%	100.0%	100.0%	100.0%
B. Environmental Management	15%	96.3%	100.0%	100.0%	95.0%
C. Financial Management	20%	100.0%	100.0%	100.0%	100.0%
D. Technical Management	20%	76.5%	86.5%	87.3%	91.3%

Key Performance Area	Weight	Klipheuwel	Fisantekraal	Borcherd's Quarry	Melkbosstrand
E. Effluent & Sludge Compliance	30%	58.8%	62.5%	60.0%	60.0%
F. Bonus		89.8%	89.8%	89.8%	89.8%
G. Penalties		-50.0%	0.0%	0.0%	0.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		**88%**	**93%->89%**	**92%->89%**	**92%->89%**
2013 Green Drop Score		86%	NA	74%	90%
2011 Green Drop Score		91%	NA	86%	93%
2009 Green Drop Score		74%	NA	76%	90%
System Design Capacity	Ml/d	0.075	24	38	5.4
Design Capacity Utilisation (%)		113%	53%	55%	46%
Resource Discharged into		Mosselbank River	Mosselbank River	Salt River	Kleine Zoute River
Microbiological Compliance	%	100%	21%	96%	91%
Chemical Compliance	%	34%	91%	24%	72%
Physical Compliance	%	51%	71%	47%	64%
Wastewater Risk Rating (CRR of CRR_{max})		**Klipheuwel**	**Fisantekraal**	**Borcherd's Quarry**	**Melkbosstrand**
CRR (2011)	%	63.6%	NA	66.7%	31.8%
CRR (2013)	%	41.2%	NA	70.4%	50.0%
CRR (2021)	%	52.9%	51.9%	59.3%	31.8%

Key Performance Area	Weight	Scottsdene	Green Point	Hout Bay	Camps Bay
A. Capacity Management	15%	100.0%	75.0%	75.0%	75.0%
B. Environmental Management	15%	88.0%	96.3%	96.3%	96.3%
C. Financial Management	20%	85.0%	100.0%	100.0%	100.0%
D. Technical Management	20%	91.3%	73.5%	73.5%	73.5%
E. Effluent & Sludge Compliance	30%	40.0%	100.0%	100.0%	62.5%
F. Bonus		89.8%	42.3%	42.3%	42.3%
G. Penalties		0.0%	0.0%	0.0%	0.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		**89%**	**93%**	**93%**	**87%**
2013 Green Drop Score		94%	91%	77%	90%
2011 Green Drop Score		83%	92%	91%	92%
2009 Green Drop Score		74%	76%	74%	76%
System Design Capacity	Ml/d	12.5	40	9	6
Design Capacity Utilisation (%)		62%	56%	62%	28%
Resource Discharged into		Bottelary river	Ocean	Ocean	Ocean
Microbiological Compliance	%	86%	NMR	NMR	NMR
Chemical Compliance	%	80%	99%	97%	91%
Physical Compliance	%	90%	96%	97%	91%
Wastewater Risk Rating (CRR % of CRR_{max})		**Scottsdene**	**Green Point**	**Hout Bay**	**Camps Bay**
CRR (2011)	%	31.8%	37.0%	72.7%	59.1%
CRR (2013)	%	40.9%	44.4%	59.1%	36.4%
CRR (2021)	%	54.6%	44.4%	45.5%	40.9%

Key Performance Area	Weight	Oudekraal	Llandudno	Simons Town	Wildevoëlsvlei
A. Capacity Management	15%	75.0%	75.0%	100.0%	100.0%

Key Performance Area	Weight	Oudekraal	Llandudno	Simons Town	Wildevoëlsvlei
B. Environmental Management	15%	100.0%	100.0%	62.0%	92.0%
C. Financial Management	20%	81.3%	81.3%	100.0%	100.0%
D. Technical Management	20%	52.4%	55.9%	51.5%	82.5%
E. Effluent & Sludge Compliance	30%	62.5%	84.4%	50.0%	40.0%
F. Bonus		42.3%	42.3%	49.8%	80.8%
G. Penalties		0.0%	0.0%	0.0%	0.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		**82%**	**87%**	**81%**	**89%**
2013 Green Drop Score		86%	86%	72%	96%
2011 Green Drop Score		79%	93%	82%	96%
2009 Green Drop Score		97%	97%	76%	76%
System Design Capacity	Ml/d	0.03	0.5	5	14.5
Design Capacity Utilisation (%)		10%	26%	24%	51%
Resource Discharged into		Ocean	Ocean	Ocean	Wildevoelvlei
Microbiological Compliance	%	100%	100%	100%	77%
Chemical Compliance	%	80%	73%	41%	58%
Physical Compliance	%	84%	99%	67%	80%
Wastewater Risk Rating (CRR % of CRR_{max})		**Oudekraal**	**Llandudno**	**Simons Town**	**Wildevoëlsvlei**
CRR (2011)	%	35.3%	17.6%	47.1%	40.9%
CRR (2013)	%	64.7%	47.1%	70.6%	36.4%
CRR (2021)	%	52.9%	35.3%	40.9%	50.0%

Key Performance Area	Weight	Millerspoint	Athlone
A. Capacity Management	15%	100.0%	100.0%
B. Environmental Management	15%	76.0%	92.0%
C. Financial Management	20%	100.0%	100.0%
D. Technical Management	20%	68.5%	79.3%
E. Effluent & Sludge Compliance	30%	74.0%	45.0%
F. Bonus		42.3%	79.8%
G. Penalties		0.0%	0.0%
H. Disqualifiers		None	None
Green Drop Score (2021)		**88%**	**90%->89%**
2013 Green Drop Score		86%	84%
2011 Green Drop Score		78%	90%
2009 Green Drop Score		74%	69%
System Design Capacity	Ml/d	0.006	105
Design Capacity Utilisation (%)		50%	76%
Resource Discharged into		Ocean	Vygekraal River
Microbiological Compliance	%	100%	70%
Chemical Compliance	%	100%	41%
Physical Compliance	%	98%	53%
Wastewater Risk Rating (CRR % of CRR_{max})		**Millerspoint**	**Athlone**
CRR (2011)	%	35.3%	70.3%
CRR (2013)	%	29.4%	64.9%
CRR (2021)	%	17.6%	62.2%

Regulator's Comment:

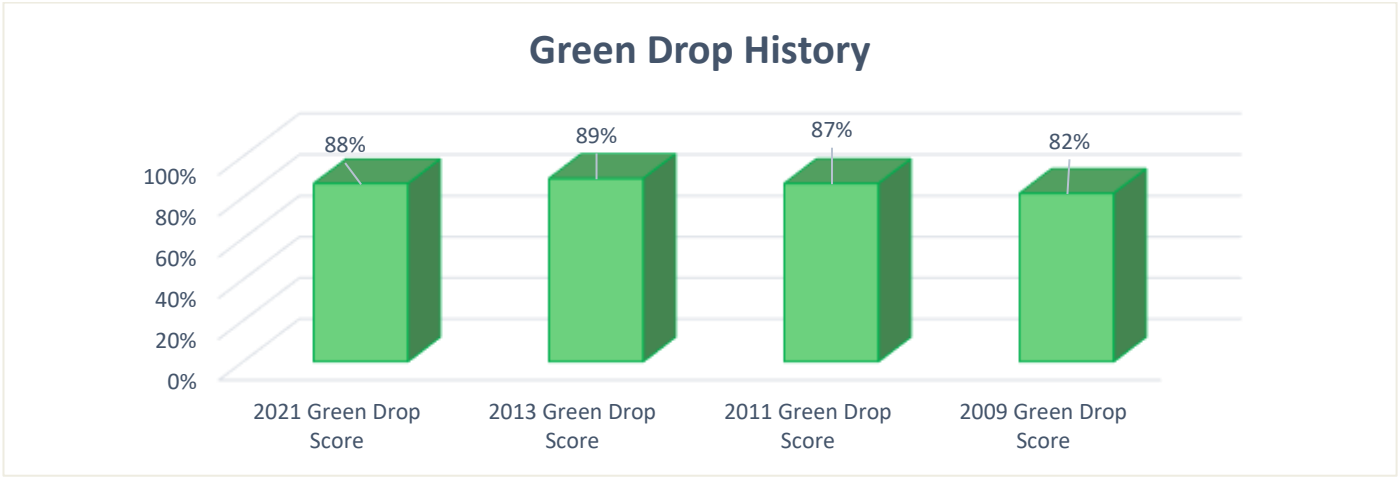
The City of Cape Town Metro operates the bulk of its wastewater treatment plants inhouse, with two plants being operated by WSSA as service provider. The WSA was very well prepared, and impressed the Inspectorate with the quality and amount of information uploaded on the IRIS system. Attendance of both audit events was excellent and showed a strong and cohesive team. Operations at the plant are backed by a well-diversified team at head office consisting of a number of engineering and scientific staff, as well as an inhouse accredited laboratory. The CoCT is congratulated with a solid performance once again where their overall 2013 score of 89% was maintained at 88%. This must be seen against the backdrop of continuously more stringent requirements of the Green Drop programme, especially with regard to sludge- and energy management in 2021. The manner in which the WSA is embracing the Green Drop programme is commended. The City uses tools such as The W_2RAP and Process Audits to escalate issues to a risk matrix, from where resources area informed and improvements made. The Regulator notes the professionalism of the team and management systems and applaud municipal leadership for their attention to wastewater services.

The various systems' performances are only differentiated at the effluent and sludge compliance sections, which indicates a holistic approach in management. It is noted that 3 out of the 26 systems are operating above their design capacity, which activated penalties. Cognisance is, however, taken of the long-term business plan whereby the City is embarking on pipeline projects to extend and upgrade several plants. In this regard, the planning of the centralised biosolids beneficiation facility for treatment of the majority of the City's generated sludge will be closely followed as an example of appropriate technologies. It is also encouraging to see the trend of newer technologies such as membrane bioreactors, ultraviolet disinfection, and fine bubble aeration being employed, while the reuse of final effluent is also gaining momentum. Notable, all new projects seems to be considering energy efficiency and staff skills levels required to operate the technologies.

The investment of the WSA in its human capital is evident by the amount of training being done, even during the covid period. The hard work and commitment to the Green Drop programme is subsequently reflected in the award of 4 Green Drop Certificates in 2022. A further 8 WWTWs were eligible for GD Certification and are acknowledged as candidates to certification. Unfortunately, the microbiological and/or chemical final effluent qualities fell short of the excellence mark of 90% and Green Drop status was therefore forfeited and 89% achieved. The Regulator draws attention to the high Green Drop scores (>80%) that has consistently been achieved since 2009, which is the mark of sustainable wastewater management. The Department trusts that the City will break the overall 90% excellence target during the 2023 audit cycle and wishes the City all the best.

Green Drop findings:

1. Capacity Management and Environmental Management of all systems are in place and sufficient and qualified human resources ensures good operations at all wastewater systems (KPA A and B)
2. A number of systems can improve their scores once clarity is reached between DWS and the WSA on how to interpret the individual authorisation discharge levels. In this regard, electrical conductivity levels on final water should be clarified and stated unambiguously
3. Environmental monitoring plays an important part in the City's management of their WWTWs and in many instances the additional monitoring of the environment is done to monitor the impact of sewage discharge
4. An effort should be made to increase the performance of the Groot Springfontein and Simon Town systems to reflect the same performance as the rest of the systems
5. The use of the Process Audit and W_2RAP tools was evident at most systems and continuation of this practice is encouraged
6. None of the 26 WWTWs in critical risk positions. All the plants are in low and medium risk positions except for one plant in the high-risk position. This is no small feat for 26 systems.
7. A number of capital projects are in place supported by business plans:
    - R66,900,000: Westfleur, aeration and blower replacement plan is envisaged up to 2024 R63.6m is planned for investing plus R3.3m to install CCTV at the plant
    - R1,700,000,000: Potsdam WWTW upgrade and extensions to 100 Ml/day capacity over next 6 years - R1.7 billion. Membrane bioreactor to be added. Planned for industrial reuse and irrigation.
    - R800,000,000: Upgrade of Macassar to 34 Ml/day
    - R2,900,000,000: Cape Flats biosolids handling facility to import 140 dry tonnes sludge per day from other plants - per day. Complete new inlet works - screen, degritting
    - R5,200,000,000: Zandvliet extension to 90 Ml/day, plus another 2 x 30 Ml/day from 2027 onwards. Current inlet works is 450 Ml/day. Small version of biosolids facility planned for the site
    - R156,000,000: Bellville upgrade in 2022-2025 to 160 Ml/day
    - R32,000,000: Klipheuwel pumpstation
    - R266,000,000: Short term upgrade of ponds and process interventions at Fisantekraal
    - R268,000,000: Process upgrades at Borcherds' Quarry
    - R480,000: Planned works was completed at Melkbosstrand, planning for new CCTV and mobile belt press
    - R10,400,000: Planned works was completed at Scottsdene, planning for new CCTV and mobile belt press
    - R1,000,000,000: Construct a new blower house, at Macassar, refurbish the reactors, new inlet works and adding mechanical dewatering. Planning to install UF/UV in future - 50 Ml/day extension planned.



Technical Site Assessment

Wesfleur WWTW (Industrial module) 96%

The **Wesfleur (Industrial)** ***WWTW*** was inspected to verify the Green Drop audit findings:

- The sewer network is vast and covers a total distance of 9597 km. As per TSA sewer inspection report, the SEWSAN software is used and correlated with MyCity flowmeters to monitor water leaks/ingress. Some 14% increase in flows are found during periods of high rainfall. The single manhole inspected reflected the possibility of water ingress
- The one sewer pumpstation inspected was secured by means of 24-hour security with dog patrol. The CoCT has a detailed critical pumpstation register which is updated regularly to reflect current conditions
- Flow diagrams, plant and Process Controller classifications were neatly displayed in a well-maintained office and facilities area. Washing machines were available on site for cleaning of clothing of personnel
- Operational monitoring was done on a regular basis and the presence of a number of flowmeters ensure good operations and informed decision making for any process changes
- Process Controller interviews provided for a 9/10 score, indicating a highly motivated staff with good morale and specific emphasis was placed on career development. A good working environment was observed with pride and dedication to duty
- All major unit processes were functional, clean and in working condition, with only the chlorination system needing to be addressed in terms of reliability of dosing
- Sludge treatment at the site is by means of drying beds only. Large areas are available to apply this method, however, periods of continues rainfall impacts on operations and needs to be managed carefully.

		
The plant is characterised by a number of flowmeters to gain more control over the operations of the works.	*A typical red coloured tint to the final treated industrial water leaving the clarifier on its way to the maturation ponds.*	*Effective operations and regular maintenance on all major equipment is seen at the plant*

The personnel at Wesfleur is congratulated for a well operated plant. Inspections at the nearby pumpstation demonstrated a secured, well-maintained facility.

Technical Site Assessment

Borcherd's Quarry WWTW 91%

The **Borcherd's Quarry *WWTW*** was inspected to verify the Green Drop audit findings:

- As per GD-sewer inspection report, some 14% increase in flows are found during periods of high rainfall. The single manhole inspected indicated a manhole in good condition with rings sealed and cover intact
- The one sewer pumpstation inspected is secured by means of 24-hour security and one pump was out for maintenance during the inspection. The CoCT has a detailed critical pumpstation register which is updated regularly to reflect current conditions
- Flow diagrams, plant and Process Controller classifications were neatly displayed in well-maintained offices. The ablution facilities and eating areas were tidy and well equipped. Washing machines were available on site for cleaning of clothing of personnel
- Operational monitoring was done on a frequent basis, while regular maintenance could be seen on site and also indicated in the permit to work offices and registers
- Process Controller interviews provided for a 10/10 score. Personnel is well looked after and has a good morale. Only area of improvement is the provision of PPE equipment. This plant provides an excellent and stimulating work environment
- All major unit processes were functional, clean and in working condition, while only the chlorination system at the end of the treatment process needed to be addressed in terms of reliability of the dosing. Cognisance is taken of the impact of vandalism
- Sludge treatment at the site was impressive and is done by belt presses. The system worked well, and monitoring of sludge trucked Vissershoek landfill is done.

The plant uses fine bubble aeration in the bioreactors and in general a good distribution of air could be seen.

A well operated belt press system ensures a dry sludge which is taken away at regular intervals to the landfill site.

Minor corrosion on the concrete was seen in some areas and need to be addressed.

The facility has a dedicated area where night soil is delivered on a continuous basis, emptied, and treated, while empty containers are cleaned and recycled back for reuse. This facility provides work for casual workers.

4.8 Drakenstein Local Municipality

Water Service Institution	**Drakenstein Local Municipality**
Water Service Providers	Bulk Water Provider City of Cape Town (Drinking Water)
	Bulk Water Provider West Coast DM (Drinking Water)

Municipal Green Drop Score	
2021 Green Drop Score	**89%↑**
2013 Green Drop Score	**78%**
2011 Green Drop Score	**80%**
2009 Green Drop Score	**0%**

VROOM Impression (Towards restoring functionality):
1. No major infrastructure
2. All works in good condition

VROOM Estimate:
- R1,107,780

Key Performance Area	Weight	Paarl	Wellington	Hermon	Gouda
A. Capacity Management	15%	91.0%	98.0%	87.5%	92.5%
B. Environmental Management	15%	94.0%	94.0%	79.4%	96.3%
C. Financial Management	20%	95.5%	83.5%	75.6%	86.9%
D. Technical Management	20%	81.3%	80.3%	76.8%	76.8%
E. Effluent & Sludge Compliance	30%	62.0%	77.0%	100.0%	62.5%
F. Bonus		82.8%	82.8%	73.8%	73.8%
G. Penalties		0.0%	0.0%	0.0%	0.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		**91%-89%**	**92%->89%**	**93%**	**91%->89%**
2013 Green Drop Score		**78%**	**75%**	**91%**	**80%**
2011 Green Drop Score		**85%**	**66%**	**70%**	**77%**
2009 Green Drop Score		**0%**	**0%**	**0%**	**0%**
System Design Capacity	Ml/d	35	16	0.092	0.797
Design Capacity Utilisation (%)		60%	41%	48%	46%
Resource Discharged into		Bergrivier	Bergrivier	No Discharge	Natural Water Course
Microbiological Compliance	%	46%	60%	NMR	100%
Chemical Compliance	%	68%	92%	NMR	84%
Physical Compliance	%	90%	94%	NMR	58%
Wastewater Risk Rating (CRR% of CRR_{max})		**Paarl**	**Wellington**	**Hermon**	**Gouda**
CRR (2011)	%	48.1%	63.6%	29.4%	29.4%
CRR (2013)	%	51.9%	86.4%	41.2%	47.1%
CRR (2021)	%	55.6%	36.4%	23.5%	47.1%

Key Performance Area	Weight	Saron	Pearl Valley
A. Capacity Management	15%	91.0%	98.0%
B. Environmental Management	15%	94.0%	94.0%
C. Financial Management	20%	95.5%	83.5%
D. Technical Management	20%	81.3%	80.3%
E. Effluent & Sludge Compliance	30%	62.0%	77.0%
F. Bonus		82.8%	82.8%
G. Penalties		0.0%	0.0%
H. Disqualifiers		None	None
Green Drop Score (2021)		**94%->89%**	**93%->89%**

Key Performance Area	Weight	Saron	Pearl Valley
2013 Green Drop Score		**79%**	**79%**
2011 Green Drop Score		**80%**	**82%**
2009 Green Drop Score		**0%**	**0%**
System Design Capacity	Ml/d	1.5	2
Design Capacity Utilisation (%)		69%	58%
Resource Discharged into		Klein Bergrivier	Bergrivier
Microbiological Compliance	**%**	67%	83%
Chemical Compliance	**%**	98%	92%
Physical Compliance	**%**	100%	97%
Wastewater Risk Rating (CRR% of CRR_{max})		**Saron**	**Pearl Valley**
CRR (2011)	%	58.8%	52.9%
CRR (2013)	%	70.6%	64.7%
CRR (2021)	%	35.3%	47.1%

Regulator's Comment:

Drakenstein Local Municipality is commended for delivering a sterling performance in wastewater management, as is evident from the Green Drop score of 89%. The legacy of professional excellence is left behind by Ronald Brown and the new team continues without missing a stride. The technical team shows pride in their work and that is evident from the systems put into place in the management and operation of the networks and treatment works. The technical team provided a well-informed audit PoE and have successfully progressed to ensuring an almost paperless system in preparation for the audits. The audit team was also welcomed by top management, which supports and enables the team to drive excellence. The progress from the Green Drop 2013 baseline of 79% to 89% is applauded.

The Wellington works impressed with a high Green Drop score and a matching 95% on the technical site assessment. The almost completely automated works has sufficient backup to operate during loadshedding as well. The works is built on the site of an existing works however the process units have been upgraded and also replaced with new technology. The Pearl Valley system network is mostly privately operated, and the municipality should seek to understand the management, operation, and planning of the network and pumpstation that are privately operated.

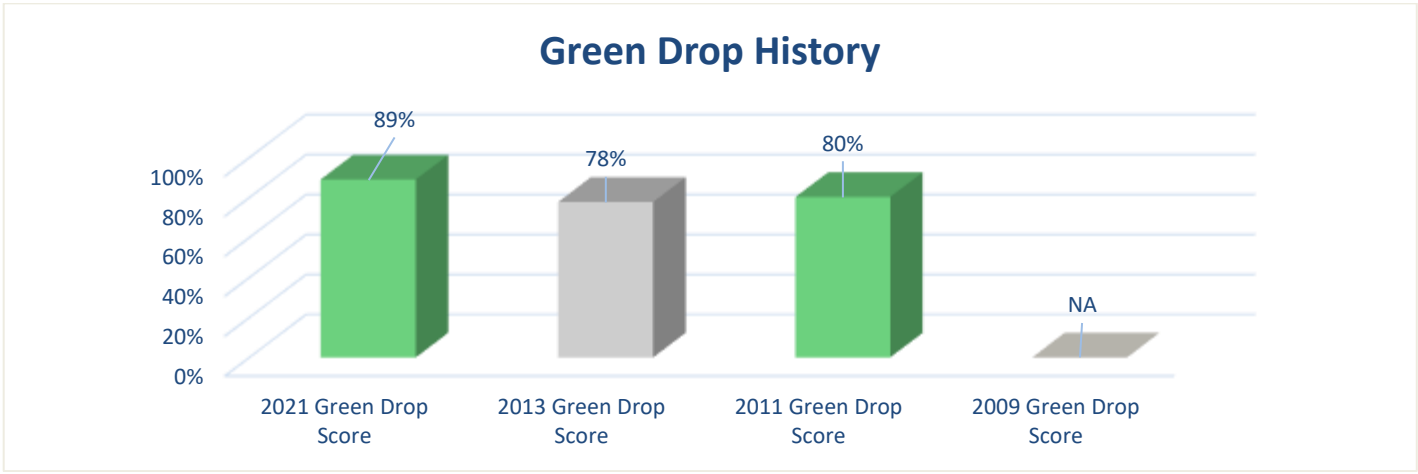
Further to the confirmation audits the municipality was able to rectify the monitoring and analysis results captured on IRIS and going forward the municipality is encouraged to ensure that cross checking is taking place more frequently so that the Department is able to monitor and track these systems accordingly. Although having a large team of scientists the municipality has only one Professional Scientist and the municipality should seek to get their other personnel registered accordingly. The final outlet quality of the Paarl and Gouda systems needs attention which will also bring them in line for Green Drop status.

Drakenstein is awarded with one (1) Green Drop Certificate to the Hermon system. The remainder 5 systems were also Certificate candidates but forfeited this status due to microbiological and/or chemical compliance not meeting the excellence status (90%). There are minor areas of improvements in the different criteria which is captured below. The Regulator is hopeful that this proficient municipality will achieve Green Drop status for all systems during the 2023 audit cycle and wishes Drakenstein all the best.

Green Drop findings:

1. The Process Controllers under review need to be finalised to be in line with the current IRIS registration process
2. Although having risk management in place the municipality needs to update the W_2RAP documents across all systems
3. Calibration of flow meters needs immediate attention, and the municipality must take this as a priority going forward
4. In addition, the department would like to see how the recently completed audits will be implemented across all systems and how the recommendations and actions will be brought into the update of the W_2RAPs
5. As mentioned above the municipality needs to put cross checking protocols in place with regards the uploading of data to IRIS
6. No plants are in the critical or high-risk positions
7. Several capital projects were implemented during 2020/21 to address gaps identified by Drakenstein. A total budget of R12,297,056 was available, of which R12,054,523.00 was expended for upgrades to bulk, treatment, and network upgrades, as well as replacement programmes, backlog eradication and machinery and equipment – internal funding plus grant funds.
8. Detailed business plans and approvals were submitted in evidence:
    - R8,692,000: upgrade the Paarl WWTW
    - R2,155,000: upgrade the Wellington WWTW

- R25,493: upgrade the Hermon WWTW
- R164,028: upgrade the Gouda WWTW
- R455,687: upgrade the Saron WWTW
- R561,596: upgrade the Pearly Valley WWTW.



Technical Site Assessment

Wellington WWTW 95%

The ***Wellington WWTW*** was inspected to verify the Green Drop audit findings:

The later works was built on the older plant footprint, so the old unit processes are still existing but not operational, including biological trickling filters, sludge beds, digesters, etc. The works is semi-automated, and functionality is primarily done via a Scada system, which design and operation was found to be impressive. The new works' infrastructure is in very good condition with regards civil, mechanical and electrical components. Microbiological compliance is an ongoing challenge for the treatment works, however, physical and chemical qualities are above 90% compliance. No sludge treatment is taken place and all sludge to transferred to Paarl WWTWs for processing.

- The network and pumpstations were in a good condition and the larger pumpstations had permanent staff assigned
- The works was very clean and tidy and the office on the works allows for good worker satisfaction and also provides an inducive and stimulating working environment
- Process Controller facilities need minor maintenance, and the works should try and get these to the same conditions as the main offices
- The Department would have liked to see more signage around the works in terms of safety and process.

		
Excellent terrain maintenance, faultless housekeeping of the entire plant – high worker satisfaction and inducive work environment	*Infrastructure overall in good condition – electrical, mechanical and civil structures with functional SCADA control*	*Activated sludge system is operational, with all operational controls in place – laboratory data used to optimise processes by knowledgable staff.*

4.9 George Local Municipality

Water Service Institution	**George Local Municipality**
Water Service Provider	George Local Municipality

Municipal Green Drop Score	
2021 Green Drop Score	**74%↓**
2013 Green Drop Score	**85%**
2011 Green Drop Score	**91%**
2009 Green Drop Score	**94%**

VROOM Impression (Towards restoring functionality):

1. No major hardware risks
2. Erosion at chlorine contact channel
3. Sludge stockpiled in an unlined area
4. Cow found in in inlet, major safety risk in reticulation network

VROOM Estimate:

- R9,956,000

Key Performance Area	Weight	Gwaing	Harlem	Herolds Bay	Kleinkrantz
A. Capacity Management	15%	78.0%	76.0%	97.5%	88.0%
B. Environmental Management	15%	34.0%	34.0%	36.3%	30.0%
C. Financial Management	20%	94.0%	84.0%	92.5%	94.0%
D. Technical Management	20%	57.5%	42.5%	40.6%	56.5%
E. Effluent & Sludge Compliance	30%	65.0%	80.0%	100.0%	80.0%
F. Bonus		38.5%	21.0%	28.5%	21.0%
G. Penalties		0.0%	-25.0%	0.0%	0.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		**71%**	**64%**	**80%**	**74%**
2013 Green Drop Score		**91%**	**83%**	**95%**	**90%**
2011 Green Drop Score		**95%**	**15%**	**65%**	**88%**
2009 Green Drop Score		**83%**	**0%**	**0%**	**100%**
System Design Capacity	Ml/d	11	0.17	0.3	2.5
Design Capacity Utilisation (%)		68%	NI	44%	27%
Resource Discharged into		Gwaing River	Irrigation	No discharge	Infiltration into dunes
Microbiological Compliance	%	19%	NMR	NMR	100%
Chemical Compliance	%	96%	100%	NMR	96%
Physical Compliance	%	99%	100%	NMR	97%
Wastewater Risk Rating (CRR% of CRR_{max})		**Gwaing**	**Harlem**	**Herolds Bay**	**Kleinkrantz**
CRR (2011)	%	40.9%	88.2%	23.5%	29.4%
CRR (2013)	%	40.9%	41.2%	29.4%	29.4%
CRR (2021)	%	40.9%	41.2%	23.5%	29.4%

Key Performance Area	Weight	Outeniqua	Uniondale
A. Capacity Management	15%	86.0%	78.0%
B. Environmental Management	15%	34.0%	32.0%
C. Financial Management	20%	94.0%	84.0%
D. Technical Management	20%	53.5%	47.5%
E. Effluent & Sludge Compliance	30%	65.0%	80.0%
F. Bonus		76.0%	21.0%
G. Penalties		0.0%	0.0%
H. Disqualifiers		None	None
Green Drop Score (2021)		**76%**	**69%**
2013 Green Drop Score		**80%**	**80%**
2011 Green Drop Score		**89%**	**1%**

Key Performance Area	Weight	Outeniqua	Uniondale
2009 Green Drop Score		**100%**	**0%**
System Design Capacity	Ml/d	15	1
Design Capacity Utilisation (%)		51%	70%
Resource Discharged into		Skaapkop River	Unknown seasonal stream to irrigation dam
Microbiological Compliance	%	93%	91%
Chemical Compliance	%	75%	98%
Physical Compliance	%	96%	97%
Wastewater Risk Rating (CRR% of CRR_{max})		**Outeniqua**	**Uniondale**
CRR (2011)	%	45.5%	100.0%
CRR (2013)	%	50.0%	35.3%
CRR (2021)	%	45.5%	29.4%

Regulator's Comment:

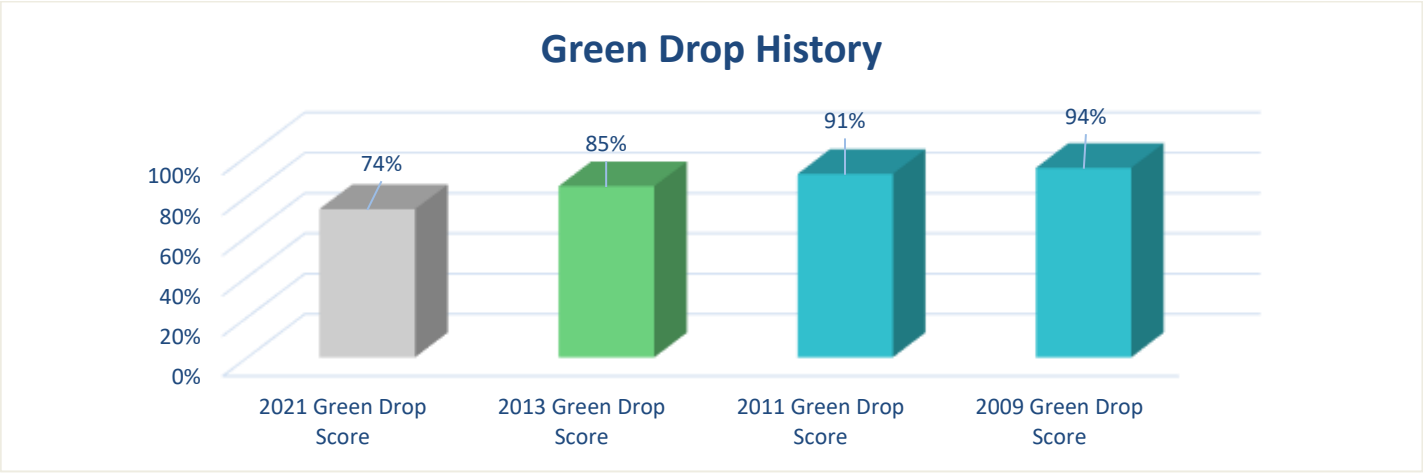
The George Municipality team were well prepared for the 2021 Green Drop Audit and displayed a good effort in ensuring compliance with the Green Drop criteria, particularly since most of the team had not been exposed to the audit process before. The overall municipal performance has shown a decline from 85% (2013) to 74% (2021). This must be seen against the backdrop of continuously more stringent requirements of the Green Drop programme, the new team members who are unfamiliar with the audit standards, and the rapidly expansion of George. Maintenance team capacity and financial management as well as operational and compliance monitoring programmes was found to be at a very high standard with only minor improvements to be made. The overall management of the wastewater business is commendable and performance in this regard is reflected in the relatively good final effluent quality at most plants. All the systems obtained low risk ratings – well done. Microbiological compliance at Gwaing WWTW is a concern that needs to be addressed.

The biggest decline noted was the discontinuation of the W_2RAP process. The W_2RAPs for the respective systems and associated risk registers was seemingly last updated in 2015. The weighting of this requirement has increased from prior audits and thus the lack of implementation during the audit year has adversely impacting on performance. In addition to this, new scoring components relating to sludge management and sewer network inspections and maintenance also scored poorly. Sludge management across all systems is a concern that requires a concerted effort to address, this was reiterated during the technical site audit where the poor state of sludge management was physically observed. The municipality will benefit from reinstating and updating the W_2RAP process to identify, prioritise and systematically address the highest risks associated with the respective systems to ensure improvement. The Regulator is looking forward to the 2023 audits and hope to see George breaking the 85% Green Drop mark once again.

Green Drop findings:

1. Maintenance capacity of all systems was well managed, process controller compliance with regulatory requirements however required attention
2. W_2RAPs were outdated and no recent risk registers were available
3. Operational and compliance monitoring programmes were in place for all systems with minor shortcomings related to compliance with Water use authorisation/licence monitoring requirements noted
4. The internal municipal laboratory is used for compliance and environmental monitoring, and although the laboratory took part in a proficiency testing scheme, Z-scores were poor. Intervention to ensure sufficient laboratory services capacity and credibility is required
5. Financial management information in terms of costing and expenditure was provided per WWTW, but the overall approved budgets were only provided for the whole wastewater unit. Production cost per system needs attention
6. Energy efficiency data was readily available, however none of the plants conducted energy efficiency audits thereby potentially forfeiting some optimisation and cost reduction benefits
7. Flow measurement data was available for all systems except Harlem
8. All WWTWs were operating within their design capabilities and management of this is well planned for
9. Process audits were conducted for all WWTWs, but not proof of implementation of the recommendations highlighted was provided – these findings should be used to update the risk plans
10. No proof of network inspections and condition assessments was provided, wastewater balances should be prioritised
11. Good and updated asset registers were available but no proof of its linkage to preventative maintenance plans was provided
12. Bylaws and proof of enforcement was available
13. Inflow and final effluent data was uploaded on IRIS on a monthly basis
14. All WWTWs had valid water use authorisations/licences in place

15. Three (3) of the 6 plants complied with all 3 effluent quality categories, others did well as they complied with two categories and one system does not discharge into the environment
16. The WWTWs sludge was last classified in 2019 with no recent Sludge Management Plans in place
17. Outeniqua WWTW was in the process of being upgraded:
    - R270,000,000 (MIG and municipal funded): upgrade of WWTW with additional 10 Ml to cater for development and growth in the area. Completion of upgrades expected in February 2023.



Technical Site Assessment

Gwaing WWTW 70%

The **Gwaing *WWTW*** was inspected to verify the Green Drop audit findings:

- Sections of sewer network and pump station inspected were in good condition, but no evidence of maintenance logbooks was available for assessment
- Access control was practiced at the WWTW, and the site was adequately sign-posted. The site was generally well-maintained and facilities in good condition although additional safety signage throughout the plant is recommended
- Plant classification certificate, operational logbooks and O&M manuals were available on-site
- Operational monitoring equipment was available on-site, in good condition and being used
- Process flow diagrams and incident management protocols were not displayed
- A dead cow was found at the inlet works during the audit, which presents a major safety risk in reticulation network
- All unit processes were functional and no major hardware risks were observed
- Extensive erosion following excessive stormwater events was noted at the chlorine contact tank area, there are initiatives in place to address this risk
- Sludge disposal is a major concern as dried sludge is excessively stockpiled on-site on an unlined surface.

		
Clear effluent at the settling tanks	*Excessive erosion at the chlorine contact tank*	*Sludge is dewatered with belt presses but stockpiled on an unlined area*

4.10 Hessequa Local Municipality

Water Service Institution	**Hessequa Local Municipality**
Water Service Provider	Hessequa Local Municipality

Municipal Green Drop Score	
2021 Green Drop Score	**35%↓**
2013 Green Drop Score	**48%**
2011 Green Drop Score	**49.7%**
2009 Green Drop Score	**0%**

VROOM Impression (Towards restoring functionality):

1. No serious hardware issues
2. Record keeping lacking
3. Fencing

VROOM Estimate:

- R1,363,000

Key Performance Area	Weight	Albertinia	Garcia	Gouritzmond	Heidelberg
A. Capacity Management	15%	58.0%	58.0%	60.0%	58.0%
B. Environmental Management	15%	52.0%	47.0%	55.0%	52.5%
C. Financial Management	20%	21.5%	20.0%	1.9%	21.5%
D. Technical Management	20%	30.5%	27.5%	24.7%	28.5%
E. Effluent & Sludge Compliance	30%	16.0%	16.0%	32.5%	16.0%
F. Bonus		3.8%	3.8%	41.3%	33.8%
G. Penalties		0.0%	0.0%	0.0%	0.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		**32%**	**31%**	**39%**	**36%**
2013 Green Drop Score		**48%**	**63%**	**43%**	**44%**
2011 Green Drop Score		**51%**	**58%**	**36%**	**45%**
2009 Green Drop Score		**0%**	**0%**	**0%**	**0%**
System Design Capacity	Ml/d	0.7	0.05	0.15	2
Design Capacity Utilisation (%)		93%	40%	97%	49%
Resource Discharged into		Irrigating to Golf Course	Irrigated	Seasonal overflow into Gouritz	Duidenhoks River
Microbiological Compliance	%	89%	100%	100%	71%
Chemical Compliance	%	59%	100%	69%	63%
Physical Compliance	%	36%	84%	31%	63%
Wastewater Risk Rating (CRR% of CRR_{max})		**Albertinia**	**Garcia**	**Gouritzmond**	**Heidelberg**
CRR (2011)	%	70.6%	47.1%	47.1%	64.7%
CRR (2013)	%	58.8%	58.8%	58.8%	70.6%
CRR (2021)	%	64.7%	47.1%	82.4%	70.6%

Key Performance Area	Weight	Jongensfontein	Melkhoutfontein	Riversdale	Slangrivier
A. Capacity Management	15%	60.0%	60.0%	68.0%	60.0%
B. Environmental Management	15%	55.0%	55.0%	46.5%	55.0%
C. Financial Management	20%	0.0%	0.0%	21.5%	0.0%
D. Technical Management	20%	24.7%	24.7%	28.5%	24.7%
E. Effluent & Sludge Compliance	30%	70.0%	70.0%	16.0%	70.0%
F. Bonus		33.8%	3.8%	33.8%	3.8%
G. Penalties		0.0%	-37.5%	-25.0%	-50.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		**48%**	**38%**	**33%**	**36%**
2013 Green Drop Score		**42%**	**46%**	**57%**	**42%**
2011 Green Drop Score		**37%**	**38%**	**65%**	**40%**

Key Performance Area	Weight	Jongensfontein	Melkhoutfontein	Riversdale	Slangrivier
2009 Green Drop Score		**0%**	**0%**	**0%**	**0%**
System Design Capacity	Ml/d	0.15	0.15	1.695	0.15
Design Capacity Utilisation (%)		85%	101%	160%	155%
Resource Discharged into		No discharge	No discharge	Goukou River	No discharge
Microbiological Compliance	%	NMR	NMR	88%	NMR
Chemical Compliance	%	NMR	NMR	75%	NMR
Physical Compliance	%	NMR	NMR	62%	NMR
Wastewater Risk Rating (CRR% of CRR_{max})		**Jongensfontein**	**Melkhoutfontein**	**Riversdale**	**Slangrivier**
CRR (2011)	%	52.9%	52.9%	88.2%	52.9%
CRR (2013)	%	64.7%	47.1%	82.4%	58.8%
CRR (2021)	%	35.3%	41.2%	70.6%	47.1%

Key Performance Area	Weight	Stilbaai	Witsand
A. Capacity Management	15%	56.0%	70.0%
B. Environmental Management	15%	52.5%	55.0%
C. Financial Management	20%	21.5%	1.9%
D. Technical Management	20%	28.5%	24.7%
E. Effluent & Sludge Compliance	30%	16.0%	70.0%
F. Bonus		15.8%	3.8%
G. Penalties		0.0%	0.0%
H. Disqualifiers		None	None
Green Drop Score (2021)		**34%**	**44%**
2013 Green Drop Score		**46%**	**51%**
2011 Green Drop Score		**56%**	**39%**
2009 Green Drop Score		**0%**	**0%**
System Design Capacity	Ml/d	2.014	0.16
Design Capacity Utilisation (%)		71%	35%
Resource Discharged into		Irrigating to golf course	No discharge
Microbiological Compliance	%	100%	NMR
Chemical Compliance	%	98%	NMR
Physical Compliance	%	33%	NMR
Wastewater Risk Rating (CRR% of CRR_{max})		**Stilbaai**	**Witsand**
CRR (2011)	%	76.5%	52.9%
CRR (2013)	%	64.7%	64.7%
CRR (2021)	%	76.5%	29.4%

Regulator's Comment:

The Hessequa Municipality has displayed a positive attitude during the 2021 Green Drop Audit and has welcomed the return of the programme. The overall performance remains lacking as reflected by the decline in score from 48% in 2013 to 35% in 2021. The municipality was unable to provide an appropriate portfolio of evidence across all Key Performance Areas. Along with the decline in Green Drop scores, four WWTWs are in high risk positions as seen by the Cumulative Risk Ratings. Garcia and the four non-discharging pond systems have obtained ratings in the low-risk space. The NMR status will need to be confirmed by means of Authorisations in the 2023 audit cycle, for the inspectors to extend leniency in this requirement.

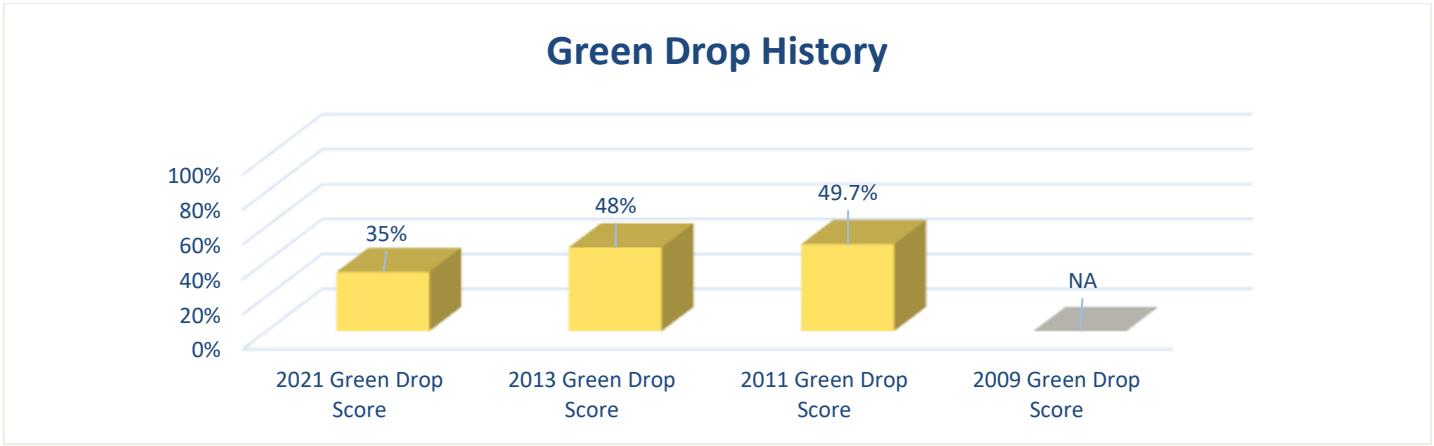
The municipality must attend to the registration of all Process Controllers and ensure that the operational staff is in line with the regulatory requirements. Operational monitoring programmes must also be reviewed as no proof of unit process monitoring was available – without which, Process Controllers have little data available to make the necessary adjustments to optimise treatment. Operational monitoring must include the liquid and sludge streams. Scores were further adversely impacted by the inconsistent availability of final effluent compliance monitoring data on IRIS.

In general, the municipality would benefit from conducting a comprehensive risk assessment as part of the W_2RAP process to prioritise high risks and assign appropriate mitigation measures to systematically reduce risks and work toward improvement. Compilation of Process Audits to assess the treatment capacity and efficacy at the respective WWTWs and provide recommendations for optimisation is also advised. It is however essential to ensure management commitment to implement recommendations and to put a monitoring and reporting on progress in place. One of the highest risks identified during the audit was the lack of an appropriate structure to effectively manage and supervise wastewater treatment operations.

The municipality is encouraged to make full use of the Green Drop audit results and comments work toward improvement in preparation for the 2023 audit cycle. A good starting point would be to consult the Green Drop Standards chapter in this report and to formulate a Green Drop Improvement Plan against these criteria.

Green Drop findings:

1. Capacity management was fair across all systems, with sufficient internal and external maintenance capacity displayed – maintenance schedules/plans must however be improved along with implementation and associated record keeping
2. Process Controller classifications were not finalised and could not be verified against associated organograms and/or shift rosters
3. Generic and incomplete wastewater risk registers were presented for all systems which must be updated and built upon to compile comprehensive W_2RAPs
4. Operational monitoring was not adequate as no process monitoring was being undertaken to inform daily process adjustments
5. Compliance monitoring is done by an accredited lab, however results were not consistently uploaded on IRIS
6. No Sludge Management Plans were available
7. Sludge was classified at some plants, however, was not being disposed or used in accordance with best/good practices, i.e. the WRC Sludge Guidelines
8. Information to support the financial management KPA relating to costing, budgets and expenditure for wastewater treatment, maintenance and operations was not available
9. None of the systems conducted energy assessments or practiced energy optimisation
10. Flow measurement information was insufficient – daily flow records with calculated averages, peak flows and minimum night flows was not available
11. No proof of calibration of meters was presented
12. No Process Audits had been conducted
13. Bylaws are available and covered the required aspects but there was no proof of enforcement
14. No water use authorisations for all systems were presented – this will be a prerequisite at the next audit, in order to confirm the NMR requirements
15. None of the plants complied with final effluent quality requirements – effluent was either poor across all categories or there was insufficient data available to substantiate good compliance.
16. Four of the 10 plants are in high-risk positions.



Technical Site Assessment

Heidelberg WWTW 68%

The **Heidelberg *WWTW*** was inspected to verify the Green Drop audit findings:

- The sewer network was generally in a good condition and the pump station attended needs to be fenced (gate stolen)

- The MCC was operational and in good condition, no records of downtime on equipment were presented
- There were no serious hardware issues at the pumpstation or treatment plant
- The site was very clean and tidy, complemented by neat staff facilities
- Safety signage was in good order
- Classification certificates, logbooks, SCADA and O&M Manuals were available
- Operational monitoring required improvement, noting that some of the records were removed for the audit
- Screenings were not monitored, grit channels and operation in good order
- Flow monitoring is recorded and converted correctly
- Raw sewage is not being monitored
- Sludge bulking and scum formation on BNR reactor evident, but excellent floc formation and earthy smell present
- All aerators and recycle pumps were functional and a good turnaround observed on maintenance queries
- Clarification and sludge withdrawal in good order, with clean weirs and launders. SVI testing in place
- Chlorine contact channels were not clean and would contribute to non-compliant effluent quality
- The sludge is being treated in sludge drying beds with functional underdrains
- Sand replacement and weed control need attention.

		
Good operational working of secondary settlers	*All mechanical equipment at the plant is in good working condition*	*Sludge is treated in sludge beds, needs to remove weeds*

4.11 Kannaland Local Municipality

Water Service Institution	**Kannaland Local Municipality**
Water Service Provider	Kannaland Local Municipality

Municipal Green Drop Score	
2021 Green Drop Score	**8%↓**
2013 Green Drop Score	**50%**
2011 Green Drop Score	**49%**
2009 Green Drop Score	**15%**

VROOM Impression (Towards restoring functionality):

1. Ladismith WWTW was refurbished at the time of the TSA
2. Vandalism
3. MCC room
4. Screening ineffective
5. Outlet channel not provided

VROOM Estimate:

- R9,683,200

Key Performance Area	**Weight**	**Calitzdorp**	**Ladismith**	**Van Wyksdorp**	**Zoar**
A. Capacity Management	15%	40.0%	32.0%	2.5%	15.0%
B. Environmental Management	15%	0.0%	0.0%	0.0%	0.0%
C. Financial Management	20%	23.8%	19.0%	23.8%	23.8%
D. Technical Management	20%	11.8%	12.0%	14.7%	11.8%
E. Effluent & Sludge Compliance	30%	0.0%	0.0%	0.0%	0.0%
F. Bonus		0.0%	45.0%	0.0%	0.0%
G. Penalties		-25.0%	-12.5%	-25.0%	-50.0%
H. Disqualifiers		None	None	None	Notice
Green Drop Score (2021)		**8%**	**15%**	**3%**	**1%**
2013 Green Drop Score		**66%**	**50%**	**NA**	**44%**
2011 Green Drop Score		**21%**	**63%**	**NA**	**40%**
2009 Green Drop Score		**10%**	**23%**	**NA**	**18%**
System Design Capacity	Ml/d	0.32	1.2	0.4	0.8
Design Capacity Utilisation (%)		NI	75%	38%	NI
Resource Discharged into		Nels River	Knuy River	Irrigate to Sportsfield	Huis River
Microbiological Compliance	%	No monitoring	No monitoring	No monitoring	Insufficient data set
Chemical Compliance	%	No monitoring	No monitoring	No monitoring	No monitoring
Physical Compliance	%	No monitoring	No monitoring	No monitoring	No monitoring
Wastewater Risk Rating (CRR% of CRR_{max})		**Calitzdorp**	**Ladismith**	**Van Wyksdorp**	**Zoar**
CRR (2011)	%	47.1%	47.1%	**NA**	88.2%
CRR (2013)	%	70.6%	82.4%	**NA**	70.6%
CRR (2021)	%	88.2%	82.4%	58.8%	88.2%

Regulator's Comment:

The Kannaland team was well represented, and the audit team was welcomed by the Municipal Manager in person. This hands on leadership bodes well as indication of management's commitment to wastewater management and service delivery in Kannaland. The team was well prepared. IRIS was not populated, however, hard copies of the required evidence were prepared and indexed. Unfortunately, Kannaland Local Municipality obtained a very low Green Drop score of 8%, due to the lack of documented evidence, including those related to compliance and good practice. Urgent intervention is required to turn the situation around, as the municipality has the discipline, attitude and potential to raise its performance.

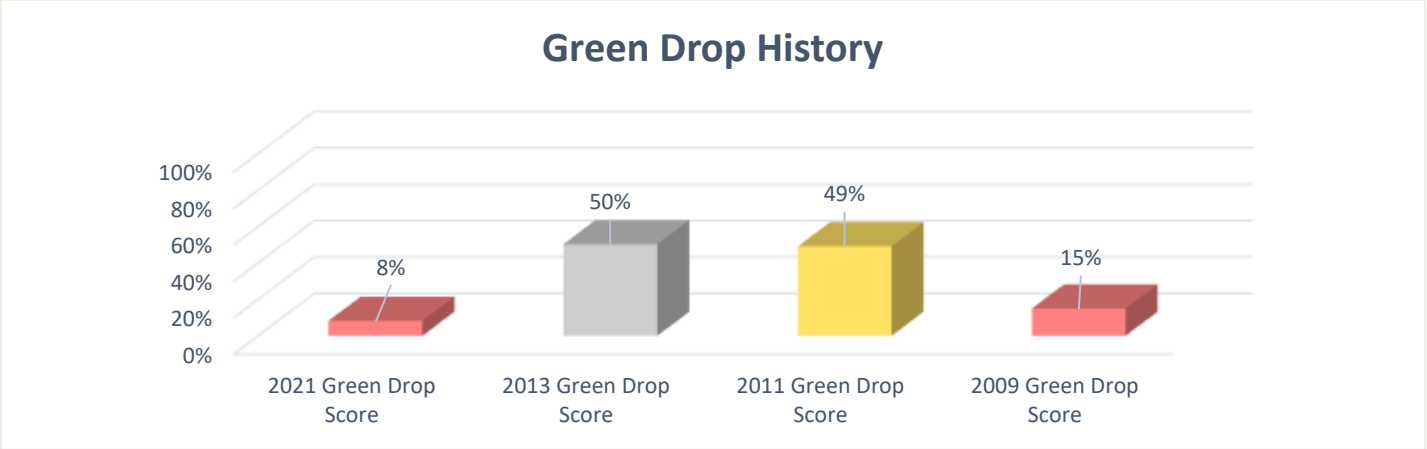
The major concern is a complete lack of monitoring, both in terms of quality and quantities of wastewater, underscored by a lack in qualified and registered technical, engineering, and scientific staff. Notably, the audit process was followed by firm attempts to implement a monitoring program - a commendable step in the right direction. Linked to the implementation of a monitoring program, the need to follow a Wastewater Risk Abatement Planning process cannot be over-emphasised as this ultimately guides monitoring and other site-management aspects.

The low audit score coupled with three WWTWs in high CRR risk positions places the municipality on the Regulator's priority list for interventions. A good starting point would be to appoint a small team of technical experts and to consult the Green Drop Standards chapter in this report and to formulate a Green Drop Improvement Plan against these criteria.

Green Drop findings:

1. The registration of Supervisors and Process Controllers is an ongoing process with some of the systems showing partial compliance with Reg. 2834, while the other systems are still working toward compliance. Compliance to draft Reg. 813 is the next phase in this process
2. Technical skills related to maintenance services within the WSA are very limited and contractors are routinely used to perform both mechanical and electrical maintenance. No proof of their capacity was however provided. The lack of maintenance schedules and logbooks also needs to be addressed
3. No operational or compliance monitoring is being done and Risk Management Processes, as detailed in a Wastewater Risk Abatement Plan, not followed
4. Basic financial information was presented. Attention must be given to develop ringfenced budgets and expenditures, in order to report production costs (R per m^3 treated)
5. Assets registers are critically important
6. Limited flow data was provided. Where flow is measured, such information is not being used to influence operations on site or to calculate energy or production cost
7. No effluent quality monitoring implies a scenario where compliance is nullified
8. Capital projects have been identified to address the defects identified:
    - R8,400,000: Upgrade of chlorine dosing station at Ladismith (signed off Nov 2020), followed by cleaning of maturation ponds, humus tank, biofilter media replacement at Ladismith (underway – funding not secured).

The Regulator is concerned about the overall poor state of wastewater services at all systems and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Ladismith WWTW 49%

The ***Ladismith WWTW*** was inspected to verify the Green Drop audit findings:

- The overall appearance of the site was acceptable. The control room and associated facilities had been vandalised and a few repairs are required
- Only one automated screen was in place with limited operational flexibility during repair work
- The condition of the PST, as evident from the wear on the bridge driver wheel, was disappointing. Although the PST will be refurbished, the lack of maintenance will not sustain new assets in years to come
- Active biomass was noticed the biofilter media, with visual good quality effluent
- The maturation ponds were also being cleanout out at the time of the TSA
- There is a brand-new chlorine dosing station that forms part of this plant. All the relevant safety equipment is available.
- The anaerobic digester was being filled twice a day with supernatant being withdrawn on an ad-hoc basis. The digester is not heated or mixed. Operational control and performance monitoring was absent and training on AD is required

- Digested sludge were discharged to the drying beds and seems to be stable with relatively short drying times being achieved.

		
Infrastructure is corroded, no preventative maintenance plans or logbooks in place	*Good quality effluent emerging from the biofilter*	*Construction underway during site inspection*

4.12 Knysna Local Municipality

Water Service Institution	**Knysna Local Municipality**
Water Service Provider	Knysna Local Municipality

Municipal Green Drop Score	
2021 Green Drop Score	**67%↓**
2013 Green Drop Score	**79%**
2011 Green Drop Score	**61%**
2009 Green Drop Score	**76%**

VROOM Impression (Towards restoring functionality):

1. Securing of the network pump station, recent vandalism observed
2. No major hardware risks on this WWTW
3. Clarity in chlorine contact tank was poor, sludge was present
4. Problems with disinfection
5. Establish FE measurement point after final polishing (maturation ponds)

VROOM Estimate:

- R631,000

Key Performance Area	**Weight**	**Knysna ASP**	**Sedgefield**	**Belvidere**	**Rheenendal**
A. Capacity Management	15%	86.0%	80.0%	86.0%	76.0%
B. Environmental Management	15%	76.0%	75.5%	72.0%	66.0%
C. Financial Management	20%	67.0%	67.0%	67.0%	67.0%
D. Technical Management	20%	68.5%	62.8%	62.8%	59.8%
E. Effluent & Sludge Compliance	30%	42.0%	62.0%	75.5%	77.5%
F. Bonus		47.0%	44.0%	35.0%	31.0%
G. Penalties		-37.5%	0.0%	-25.0%	0.0%
H. Disqualifiers		Pre-Directive	None	None	None
Green Drop Score (2021)		**64%**	**73%**	**72%**	**73%**
2013 Green Drop Score		**80%**	**75%**	**70%**	**82%**
2011 Green Drop Score		**57%**	**54%**	**56%**	**54%**
2009 Green Drop Score		**79%**	**0%**	**0%**	**70%**
System Design Capacity	Ml/d	6	1.5	0.3	0.7
Design Capacity Utilisation (%)		107%	36%	16%	47%
Resource Discharged into		Knysna estuary	Infiltration in dunes	Irrigation	Homtini to Goukamma River
Microbiological Compliance	%	48%	58%	100%	100%
Chemical Compliance	%	88%	61%	100%	92%
Physical Compliance	%	67%	92%	100%	72%
Wastewater Risk Rating (CRR% of CRR_{max})		**Knysna ASP**	**Sedgefield**	**Belvidere**	**Rheenendal**
CRR (2011)	%	50.0%	64.7%	58.8%	52.9%
CRR (2013)	%	50.0%	41.2%	47.1%	35.3%
CRR (2021)	%	63.6%	47.1%	23.5%	41.2%

Key Performance Area	**Weight**	**Brenton on Sea**	**Karatara**
A. Capacity Management	15%	80.0%	86.0%
B. Environmental Management	15%	72.0%	68.0%
C. Financial Management	20%	67.0%	67.0%
D. Technical Management	20%	55.8%	60.8%
E. Effluent & Sludge Compliance	30%	75.0%	45.5%
F. Bonus		35.0%	34.0%
G. Penalties		-25.0%	0.0%
H. Disqualifiers		None	None
Green Drop Score (2021)		**70%**	**66%**
2013 Green Drop Score		**87%**	**89%**

Key Performance Area	Weight	Brenton on Sea	Karatara
2011 Green Drop Score		**59%**	**53%**
2009 Green Drop Score		**75%**	**77%**
System Design Capacity	Ml/d	0.3	0.17
Design Capacity Utilisation (%)		47%	46%
Resource Discharged into		Infiltration into dunes	Huis River
Microbiological Compliance	%	46%	75%
Chemical Compliance	%	95%	80%
Physical Compliance	%	92%	97%
Wastewater Risk Rating (CRR% of CRR_{max})		**Brenton on Sea**	**Karatara**
CRR (2011)	%	44.1%	41.2%
CRR (2013)	%	29.4%	35.3%
CRR (2021)	%	41.2%	35.3%

Regulator's Comment:

The Knysna Local Municipality were well prepared and displayed a good effort to ensure that all available required information was provided and aligned to the 2021 Green Drop criteria. The decline in the overall score from 79% (2013) to 67% (2021) is regrettably and would require a practical turnaround plan to restore the former good performance. This score must also be seen against the backdrop of continuously more stringent requirements of the Green Drop programme. With the exception of the Knysna WWTW, the Regulator is encouraged to see that all systems maintained low risk ratings. The availability of competent maintenance teams, ensuring the functionality and condition of treatment and collector system infrastructure, and general asset management is commendable. Process Controllers are available at respective WWTWs, however, require a review to ensure compliance with the regulatory standards. The municipality is applauded for the effort applied in providing financial management information relating to costing of wastewater system treatment and operations, as well as the provision of energy utilisation. This information should be used to inform O&M budgets, including energy cost as a critical cost driver.

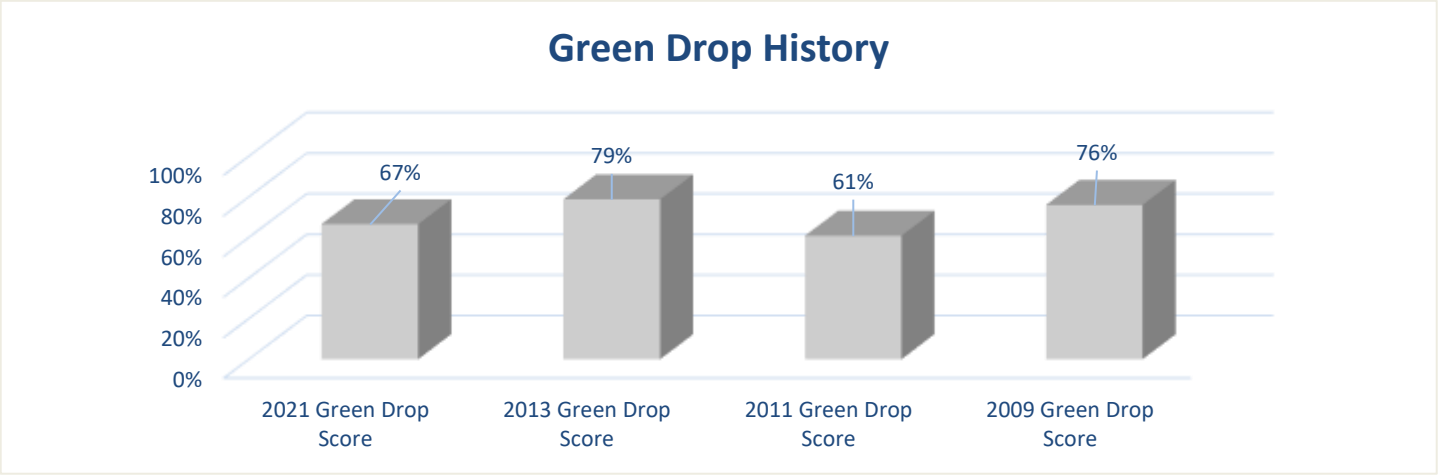
W_2RAPs were in place for all systems however risk registers need to be updated. Process audits were also available for all systems, but insufficient evidence was provided to prove implementation of the recommendations made. It would greatly benefit the municipality to integrate the two processes and ensure that implementation plans are in place. Continuous monitoring is required to track and systematically reduce the highest risks. Knysna will benefit from performance improvement related to optimised operations and treatment efficacy via addressing the core issues resulting in poor final effluent quality.

The Regulator is satisfied with all plants maintaining low risk status since 2011, and encourage Knysna to break the 80% Green Drop barrier in 2023.

Green Drop findings:

1. Process Controller staff at most plants do not comply with the regulatory requirements
2. Maintenance competencies were both internally and externally assessed for the maintenance of treatment and collector system infrastructure. The maintenance team was found to be well equipped and capable of keeping infrastructure in a goof functional state
3. W_2RAPs were in place for all systems, however risk registers were outdated, and proof implementation of systematic risk reduction measures linked to the W_2RAP was not provided
4. Operational monitoring programmes are in place, but on-site monitoring can be improved
5. Compliance monitoring programmes were excellent and in line with water use authorisation conditions
6. Sludge is being classified and beneficially used through an agreement with an external user. This is largely in place for Knysna and Sedgefield
7. Sludge management plans need to be updated and should include all systems
8. Good financial information in terms of costing and energy utilisation was provided, however, detailing of budget and expenditure per plant will increase the Financial Management KPA score significantly
9. Evidence for the Technical Management and Effluent Compliance KPAs was challenging in terms of proofing implementation
10. Flow measurement was in place for all systems and records were up to date. Proof of flow meter calibration and minimum night flow measurement was not available for all systems.
11. The Belvidere WWTW complied with all three effluent quality categories, while four WWTWs complied with at least one category

12. Knysna WWTW did not comply with any effluent category and must be prioritised for further intervention as it was also operating at 107% of its hydraulic design capacity
13. Zero of the plants conducted energy efficiency audits.



Technical Site Assessment

Sedgefield WWTW 75%

The **Sedgefield *WWTW*** was inspected to verify the Green Drop audit findings:

- Securing of the network pump station is required as recent vandalism was observed and no security measures, even fencing, was in place
- Pump station was however in a good condition, well-maintained and with adequate stand-by equipment available
- The WWTW site was securely fenced and sign-posted
- Required documentation was available on-site and displayed where necessary
- Grounds and facilities, including monitoring equipment were in good condition
- Inlet works was well-maintained, although mechanical rake screen was not functional
- There were no major hardware risks on this WWTW, all unit processes and associated equipment was functional, but– excessive scum observed on the surface of the reactor
- Effluent clarity in the chlorine contact channel was poor, separate secondary clarification optimisation may need to be considered
- Problems with disinfection evident from poor microbiological results and may be related to the above observation
- Final effluent point after maturation ponds should be established to get a true reflection of efficacy of the entire treatment chain.

		
Pump station and MCC in good condition but not secured	*Process monitoring equipment and facility on-site in good condition*	*Poor clarity in chlorine contact tank*

4.13 Laingsburg Local Municipality

Water Service Institution	**Laingsburg Local Municipality**
Water Service Provider	Laingsburg Local Municipality

Municipal Green Drop Score	
2021 Green Drop Score	**63%↑**
2013 Green Drop Score	**37%**
2011 Green Drop Score	**56%**
2009 Green Drop Score	**77%**

VROOM Impression (Towards restoring functionality):

1. Floating aerators - in the process of being replaced
2. Standby pumps absent

VROOM Estimate:

- R227,825

Key Performance Area	**Weight**	**Laingsburg**	**Matjiesfontein**
A. Capacity Management	15%	72.5%	72.5%
B. Environmental Management	15%	55.0%	53.8%
C. Financial Management	20%	96.9%	93.8%
D. Technical Management	20%	8.2%	13.5%
E. Effluent & Sludge Compliance	30%	57.8%	57.8%
F. Bonus		30.0%	16.5%
G. Penalties		0.0%	0.0%
H. Disqualifiers		None	None
Green Drop Score (2021)		**63%**	**60%**
2013 Green Drop Score		**37%**	**NA**
2011 Green Drop Score		**56%**	**NA**
2009 Green Drop Score		**77%**	**NA**
System Design Capacity	Ml/d	1.7	0.053
Design Capacity Utilisation (%)		45%	91%
Resource Discharged into		Irrigation (Lucerne)	Irrigation (Sportsfield)
Microbiological Compliance	%	100%	0%
Chemical Compliance	%	48%	92%
Physical Compliance	%	33%	54%
Wastewater Risk Rating (CRR% of CRR_{max})		**Laingsburg**	**Matjiesfontein**
CRR (2011)	%	70.6%	NA
CRR (2013)	%	58.8%	NA
CRR (2021)	%	52.9%	41.2%

Regulator's Comment:

Lainsgburg Local Municipality was represented by technical officials, the engineer tasked with sanitation services and the Infrastructure Manager. The team was well prepared and had sufficient and indexed information available to ensure a smooth audit process. Laingsburg achieved a Green Drop score of 63%, which is a remarkable and highly commendable improvement from the 2013 baseline of 37%. Well done. The Regulator commends the WSA for achieving good scores in the Financial Management and Capacity Management KPAs, and for taking the opportunity to calculate Specific Power Consumption figures as part of the consultative audit process – this bodes well for energy efficiency initiatives. No penalties were applied as the treatment works operate within their design capacity. Bonusses were granted for training, capital works and water loss management.

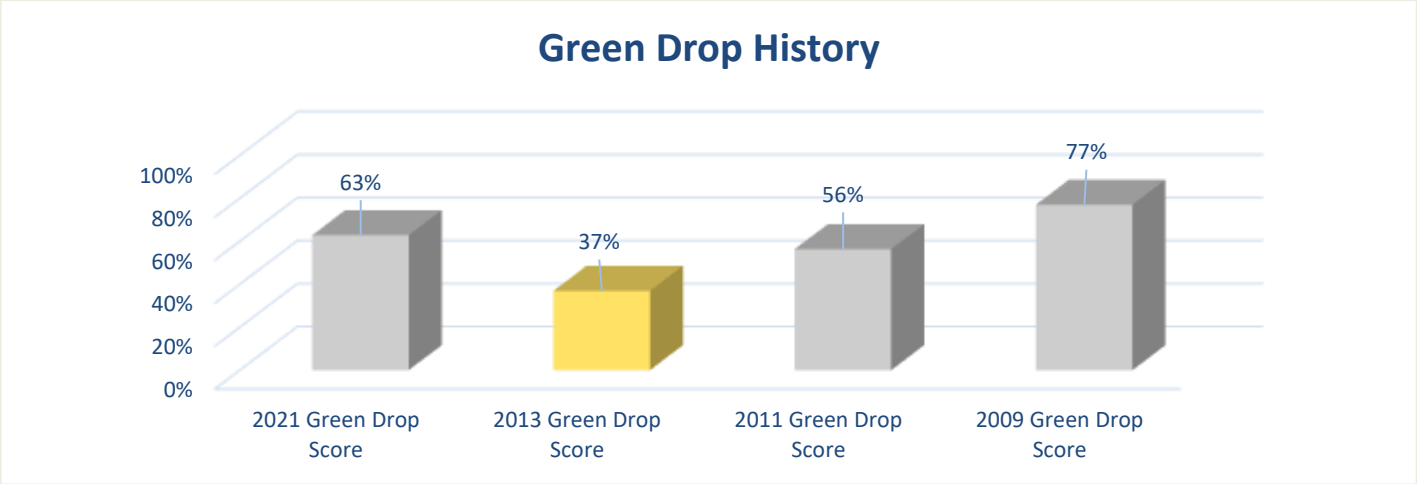
Opportunities for improvement lie primarily in the Technical Management Category with Plant & Process Audits, Sewer Mains Inspections and Asset Registers that need to be prioritised. Updating and implementation of a Wastewater Risk Abatement Plan is strongly recommended, as this forms the basis of further planning. The largest score sacrifice was in the area of final effluent compliance and sludge management. The overall score could improve considerable if these aspects are being addressed in the 2023

audit. Effluent quality carries a high weight in the overall score, and it would benefit Laingsburg to focus attention and improve operational skills towards this objective.

The Regulator encourages Laingsburg Local Municipality to strive towards further improvement in wastewater services in order to not only meet, but exceed, good practice principles and set a benchmark for smaller rural municipalities in South Africa. The municipality certainly has the potential, will and expertise to achieve this high expectation.

Green Drop findings:

1. Process Controllers are registered and comply with draft Reg. 813. The IRIS system initially prevented the supervisory staff to be linked to the specific sites, but the Inspectorate can confirm that this issue was later resolved
2. The competencies of the internal team responsible for mechanical maintenance could not be verified. Electrical maintenance is outsourced, and those qualifications were provided. Scheduling of maintenance and record keeping in this regard is still lacking
3. Engineering capacity was confirmed. As these are basic systems, scientific competencies were not assessed but Laingsburg is encouraged to bring such expertise on board
4. Even though these are basic systems, operational monitoring still needs to be done in line with good practice for pond systems. These requirements should be highlighted during the risk-assessment process that forms part of the W_2RAP
5. Financial information was presented, including data relating to energy consumption
6. Flow measurement is in place, but data is not used to influence operations
7. Plant & Process Audit information was lacking, and Asset Registers are not meeting expectations
8. Effluent compliance is sub-standard with none of the 2 WWTWs meeting excellence standards for microbiological, chemical, and physical categories. Effluent is irrigated; hence SAR and heavy metals loads are important measurables
9. Capital projects are in place to address some of the deficiencies identified:
    - R3,160,180: Replace floating aerators – funding source unknown, bid document in place
    - R25,000: Extension of sewer network – planned, CRR funding to be confirmed.



Technical Site Assessment

Laingsburg Ponds 61%

The ***Laingsburg Pond System*** was inspected to verify the Green Drop audit findings:

- The network was in good condition with covers in place, and blockages attended to with 12 hours. No regular inspections take place
- The pumpstation was in good condition with stand by and duty pump configurations, the site was secure
- The pond system terrain was in good condition and well maintained
- Primary Ponds have concrete lining while downstream ponds lined with HDPE. The 1st set of Secondary Ponds have provision for floating aerators – concrete ramp provided
- Flow meter functional and mechanical meter installed on discharge pump line
- Flow records were taken monthly, screenings were not recorded, and no operational records were presented
- Offices and facilities for operational staff needs to be updated
- A lot of debris was evident on the walkways of these ponds
- The remaining ponds are in a good condition
- The replacement of a number of floating aerators is underway

- As this area is quite arid, vegetation on and around the site is limited
- Sodium hypochlorite is used for disinfection with dosing directly to the pump line.

		
Debris is discharged on side of ponds, visually not appealing	*Ponds are lined and in good condition*	*Replacement of floating aerators underway*

4.14 Langeberg Local Municipality

Water Service Institution	**Langeberg Local Municipality**
Water Service Provider	Langeberg Local Municipality

Municipal Green Drop Score	
2021 Green Drop Score	**27%↓**
2013 Green Drop Score	**52%**
2011 Green Drop Score	**43%**
2009 Green Drop Score	**50%**

VROOM Impression (Towards restoring functionality):

1. Robertson WWTW hydraulically overloaded
2. Upgrade of works is imminent, but long overdue
3. RAS pump failure
4. Biofilter structural defects; Clarifier defects
5. Maturation ponds over-saturated with sludge
6. Buildings, vandalism, theft

VROOM Estimate:

- R35,072,000

Key Performance Area	**Weight**	**Ashton**	**Bonnievale**	**McGregor**	**Montagu**	**Robertson**
A. Capacity Management	15%	36.0%	32.0%	15.0%	22.0%	32.0%
B. Environmental Management	15%	55.0%	55.0%	55.0%	55.0%	54.5%
C. Financial Management	20%	19.0%	19.0%	23.8%	19.0%	19.0%
D. Technical Management	20%	11.0%	11.0%	5.9%	11.0%	11.0%
E. Effluent & Sludge Compliance	30%	61.0%	61.0%	88.8%	61.0%	15.0%
F. Bonus		0.0%	0.0%	0.0%	0.0%	0.0%
G. Penalties		0.0%	-25.0%	0.0%	0.0%	-62.5%
H. Disqualifiers		None	None	None	None	None
Green Drop Score (2021)		**36%**	**32%**	**41%**	**34%**	**12%**
2013 Green Drop Score		**47%**	**65%**	**69%**	**50%**	**47%**
2011 Green Drop Score		**40%**	**50%**	**51%**	**44%**	**37%**
2009 Green Drop Score		**49%**	**49%**	**52%**	**49%**	**49%**
System Design Capacity	Ml/d	3.1	2.5	0.3	3.5	4.3
Design Capacity Utilisation (%)		42%	31%	77%	63%	125%
Resource Discharged into		Sarahs River to Cogmanskloof to Breede River	Breede River	Irrigated	Kligna River	Breede River
Microbiological Compliance	%	75%	42%	92%	8%	8%
Chemical Compliance	%	81%	88%	100%	67%	67%
Physical Compliance	%	92%	92%	100%	67%	67%
Wastewater Risk Rating (CRR as %CRR_{max})		**Ashton**	**Bonnievale**	**McGregor**	**Montagu**	**Robertson**
CRR (2011)	%	52.9%	47.1%	58.8%	58.8%	64.7%
CRR (2013)	%	64.7%	29.4%	35.3%	58.8%	74.7%
CRR (2021)	%	58.8%	52.9%	41.2%	47.1%	70.6%

Regulator's Comment:

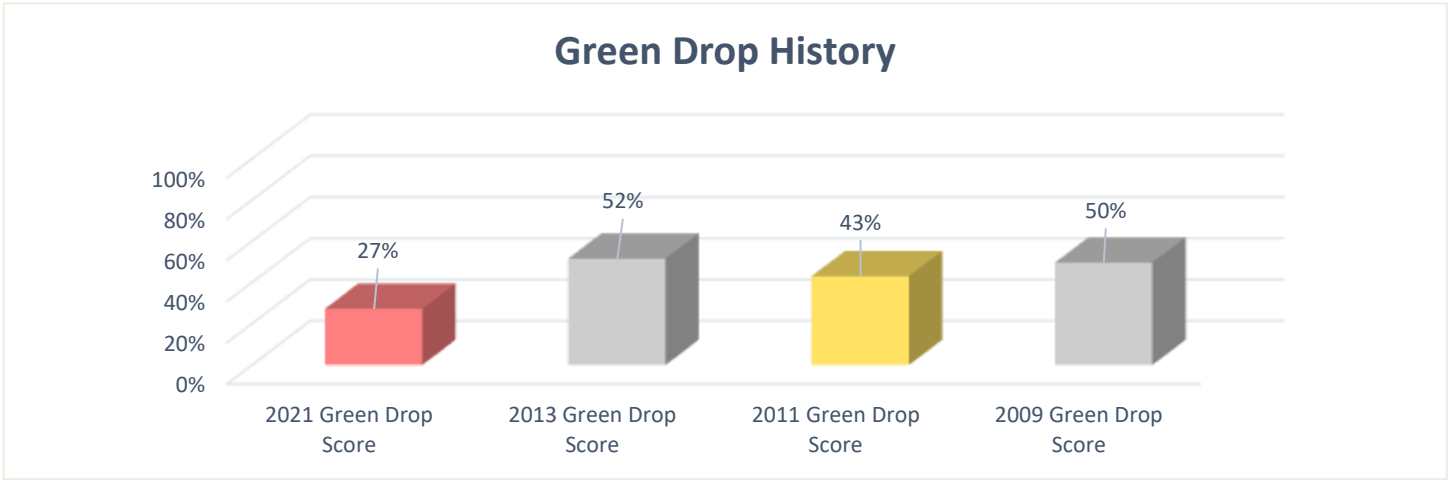
Langeberg Local Municipality impressed with a good representation of senior officials, which resonates well in terms of firm management commitment. Regrettably, preparations for the audit were not on par with the Inspectorate expectations, and IRIS uploads or hard copies of evidence were not fully available. The Green Drop Score of 27% places the municipality in the unappealing position of critical performance. The poor performance of the Robertson system contributed significantly to the overall low score. Robertson WWTW is due for upgrade and plans are in place, which is commendable. However, new infrastructure alone will not bring about the desired change – plans, systems and procedures needs to be developed and implemented to ensure the upgraded plant meets compliance and good practice standards. Langeberg follows a long history of average to sub-standard performance, and the 2023 audit cycle will bring a new opportunity to rectify this situation. Municipal leadership will need to pull all stops to ensure that the municipality raise its performance by addressing each of the Green Drop Standards outlined in this report.

The Regulator takes a balanced view by observing the low and medium risk CRR positions of 4 of the 5 plants with the exception of Robertson in a high-risk position, notable as result of the reasonable to good effluent quality compliance, with McGregor meeting excellence standards, with Ashton and Bonnievale also doing very well. It is thus evident that the effluent quality is already scoring high on the Regulator's scoresheet, but the administration need to match this performance. The municipal sub-standard scores thereby does not relate to major root cause failures but is rather one where a large number of small changes will affect a significant improvement in the future Green Drop scores. DWS encourages leadership to focus on these incremental improvements and to target a Green Drop score of >50% in the 2023 audit.

Green Drop findings:

1. The Supervisors and majority of Process Controllers are unregistered and do not comply with Reg. 2834 or draft Reg. 813
2. No engineer or scientific competencies could be verified via qualification certificates
3. Electrical maintenance is done inhouse while mechanical maintenance is outsourced - maintenance schedules and logbooks are lacking for all systems
4. Raw and final monitoring is done by external laboratory, with on-site operational monitoring lacking
5. Financial information was provided, however, lacking ring-fenced budgets, expenditure records, and actual cost determinations with sufficient cost drivers
6. Flow figures were provided, noting that all flowmeters were either out of order or erroneous for a large part of the year under review. Flow data is not interpreted or used to influence operations and need to be addressed via training and/or appointment of qualified operational/supervisory staff
7. Plant & Process Audits, Sewer Inspections and Asset Registers are absent from the technical management portfolio of evidence. Daily sewer network inspections are in place, but no proof provided via checklists, photos, or rating systems
8. Most of the treatment plants lacks water use authorisations to guide the frequency, determinants and associated limits that would render a plant compliant at discharge of effluent.
9. Based on an evaluation against general limits, the plants are predominantly non-compliant, with the exception of the McGregor Ponds which has low (irrigation) limits
10. Zero of the five (5) systems had capital plans to address the defects identified, most concerning of all is the hydraulic overload of the Robertson WWTWs. However, no evidence of business plans of funding sources could be provided.

The Regulator is concerned about the overall poor state of wastewater services at the Roberson system and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Robertson WWTW 39%

The ***Robertson WWTW*** was inspected to verify the Green Drop audit findings:

- The network and pumpstation was in an acceptable condition
- However, one of the pumpstations was dysfunctional and raw sewage was allowed to accumulate in a dedicated natural depression. Even though this depression allows sewage to be diverted back to another pumpstation without entering the surface water, this area needs to be formalised if it is to be used on a regular basis

- Operational monitoring systems were not formalised and Process Controllers did not interact with the data collected on site. Process Controller training in operations would be beneficial. PCs can also do more with respect to the terrain neatness and 1st order maintenance
- The terrain was not kept tidy and grounds maintenance was lacking
- Plant facilities for the staff (breakroom, bathroom, etc.) was available, but unkempt
- The mechanical and grit channel sluice gates needed repairs and maintenance was severely lacking at the Head of Works
- A new flow meter was recently installed. A data-logger could be considered to monitor flow on a continuous basis, depending on PC skills levels. Site walk through is however, still a good manner to ensure operation checks and recording of flows
- The biofilter section of the plant is due for refurbishment, to include the cleaning of the PST's and repairing the biofilter's leaking distributer arms. The biofilter underdrains need to be kept clean and free of vegetation
- Only one humus tank was operational
- Desludging of settling tanks and clarifiers were inadequate and contribute to high solids carry-over to final effluent channels, high chlorine demand and non-compliant effluent quality
- The Activated Sludge section of the plant was in better condition compared with the biofilter module. Unfortunately, both RAS-pumps allegedly failed just prior to the TSA, which resulted in sludge carry-over the clarifier v-notches and the aeration basin not containing viable biomass
- The maturation ponds were filled with sludge, resulting in regular solids carry-over. The final effluent quality would be impacted by the negligent state of these ponds
- The disinfection equipment was in a reasonable condition. The building needs to be secured even further as to prevent theft and vandalism - latest report incident involved the roof of the building being removed
- The anaerobic digester was filled twice a day and supernatant withdrawn on an ad-hoc basis. The digester is not mixed or heated – operational monitoring of the AD can be improved
- Both digested sludge and WAS was discharged to the drying beds. The mechanical sludge drying equipment needs to be repaired as to improve sludge age control of the Activated Sludge module
- Plans related to the upgrade of this works has already been submitted.

		
Uneven distribution of settled sewage on biofilter media	*RAS pumps down leading to unoptimal biomass in activated sludge basis*	*Matruation ponds saturated with sludge – high pollution risk*

4.15 Matzikama Local Municipality

Water Service Institution	**Matzikama Local Municipality**
Water Service Provider	Matzikama Local Municipality

Municipal Green Drop Score	
2021 Green Drop Score	**33%↓**
2013 Green Drop Score	**58%**
2011 Green Drop Score	**66%**
2009 Green Drop Score	**0%**

VROOM Impression (Towards restoring functionality):

1. RAS pumps dysfunctional - urgent
2. Chlorine dosing (chlorinator) repair
3. Aerator's dysfunctional
4. Anaerobic dam and maturation high solids content

VROOM Estimate:

- R21,214,560

Key Performance Area	Weight	Doringbaai	Bitterfontein	Klawer	Koekenaap
A. Capacity Management	15%	65.0%	65.0%	54.0%	52.5%
B. Environmental Management	15%	55.0%	55.0%	52.5%	55.0%
C. Financial Management	20%	9.4%	9.4%	27.5%	9.4%
D. Technical Management	20%	44.1%	30.0%	25.5%	30.0%
E. Effluent & Sludge Compliance	30%	62.5%	30.0%	44.0%	37.5%
F. Bonus		0.0%	30.0%	15.0%	0.0%
G. Penalties		0.0%	0.0%	0.0%	0.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		**45%**	**39%**	**40%**	**35%**
2013 Green Drop Score		**77%**	**4%**	**77%**	**76%**
2011 Green Drop Score		**64%**	**0%**	**64%**	**62%**
2009 Green Drop Score		**0%**	**0%**	**0%**	**0%**
System Design Capacity	Ml/d	0.26	0.096	0.9	0.2
Design Capacity Utilisation (%)		38%	63%	46%	50%
Resource Discharged into		Irrigation	Irrigation	NI	Irrigation
Microbiological Compliance	%	99.9%	No monitoring	93%	83%
Chemical Compliance	%	25%	No monitoring	7%	25%
Physical Compliance	%	66,67%	No monitoring	69%	64%
Wastewater Risk Rating (CRR% of CRR_{max})		**Doringbaai**	**Bitterfontein**	**Klawer**	**Koekenaap**
CRR (2011)	%	58.8%	76.5%	35.3%	35.3%
CRR (2013)	%	41.2%	94.1%	52.9%	52.9%
CRR (2021)	%	64.7%	82.4%	58.8%	76.5%

Key Performance Area	Weight	Lutzville West	Lutzville	Strandfontein	Van Rhynsdorp
A. Capacity Management	15%	65.0%	52.5%	65.0%	56.0%
B. Environmental Management	15%	55.0%	55.0%	55.0%	46.0%
C. Financial Management	20%	9.4%	9.4%	9.4%	27.5%
D. Technical Management	20%	30.0%	30.0%	0.0%	10.5%
E. Effluent & Sludge Compliance	30%	62.5%	62.5%	37.5%	44.0%
F. Bonus		0.0%	0.0%	0.0%	0.0%
G. Penalties		0.0%	-50.0%	-25.0%	-50.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		**43%**	**33%**	**25%**	**27%**
2013 Green Drop Score		**77%**	**65%**	**73%**	**71%**
2011 Green Drop Score		**63%**	**63%**	**64%**	**64%**
2009 Green Drop Score		**0%**	**0%**	**0%**	**0%**
System Design Capacity	Ml/d	0.123	0.3	NI	0.7
Design Capacity Utilisation (%)		NI	133%	NI	108%
Resource Discharged into		Irrigation	Irrigation	Irrigation	Irrigation
Microbiological Compliance	%	95%	92%	77%	100%

Key Performance Area	Weight	Lutzville West	Lutzville	Strandfontein	Van Rhynsdorp
Chemical Compliance	%	0%	46%	31%	96%
Physical Compliance	%	97%	56%	54%	79%
Wastewater Risk Rating (CRR% of CRR_{max})		Lutzville West	Lutzville	Strandfontein	Van Rhynsdorp
CRR (2011)	%	17.6%	41.2%	52.9%	52.9%
CRR (2013)	%	35.3%	58.8%	41.2%	58.8%
CRR (2021)	%	76.5%	70.6%	94.1%	58.8%

Key Performance Area	Weight	Vredendal North	Vredendal South	Ebenhaezer	Nuwerus	Rietpoort
A. Capacity Management	15%	56.0%	43.4%	65.0%	27.5%	27.5%
B. Environmental Management	15%	46.0%	46.0%	55.0%	55.0%	55.0%
C. Financial Management	20%	27.5%	27.5%	9.4%	9.4%	9.4%
D. Technical Management	20%	25.5%	15.5%	30.0%	8.8%	8.8%
E. Effluent & Sludge Compliance	30%	24.0%	24.0%	37.5%	11.3%	11.3%
F. Bonus		0.0%	30.0%	0.0%	0.0%	0.0%
G. Penalties		-5.0%	0.0%	-25.0%	-25.0%	-25.0%
H. Disqualifiers		None	None	None	None	None
Green Drop Score (2021)		**30%**	**32%**	**31%**	**14%**	**14%**
2013 Green Drop Score		**79%**	**85%**	**77%**	**6%**	**NA**
2011 Green Drop Score		**77%**	**68%**	**63%**	**0%**	**NA**
2009 Green Drop Score		**0%**	**0%**	**0%**	**0%**	**NA**
System Design Capacity	Ml/d	1.66	1	0.257	NI	NI
Design Capacity Utilisation (%)		100%	96%	36%	NI	NI
Resource Discharged into		Irrigation	Irrigation	No discharge	No discharge	No discharge
Microbiological Compliance	%	55%	50%	100%	0%	No monitoring
Chemical Compliance	%	42%	56%	13%	9%	No monitoring
Physical Compliance	%	58%	47%	64%	27%	No monitoring
Wastewater Risk Rating (CRR% of CRR_{max})		Vredendal North	Vredendal South	Ebenhaezer	Nuwerus	Rietpoort
CRR (2011)	%	58.8%	58.8%	47.1%	100.0%	NA
CRR (2013)	%	58.8%	52.9%	47.1%	91.1%	NA
CRR (2021)	%	70.6%	76.5%	52.9%	100.0%	100.0%

Regulator's Comment:

Matzikama Local Municipality was represented by new team members comprising of the Infrastructure Manager and Technician. Although the team participated well and received the Green Drop auditors positively, the documentation and evidence were mostly lacking. As result, the municipal Green Drop score decreased significantly from 58% to 33%.

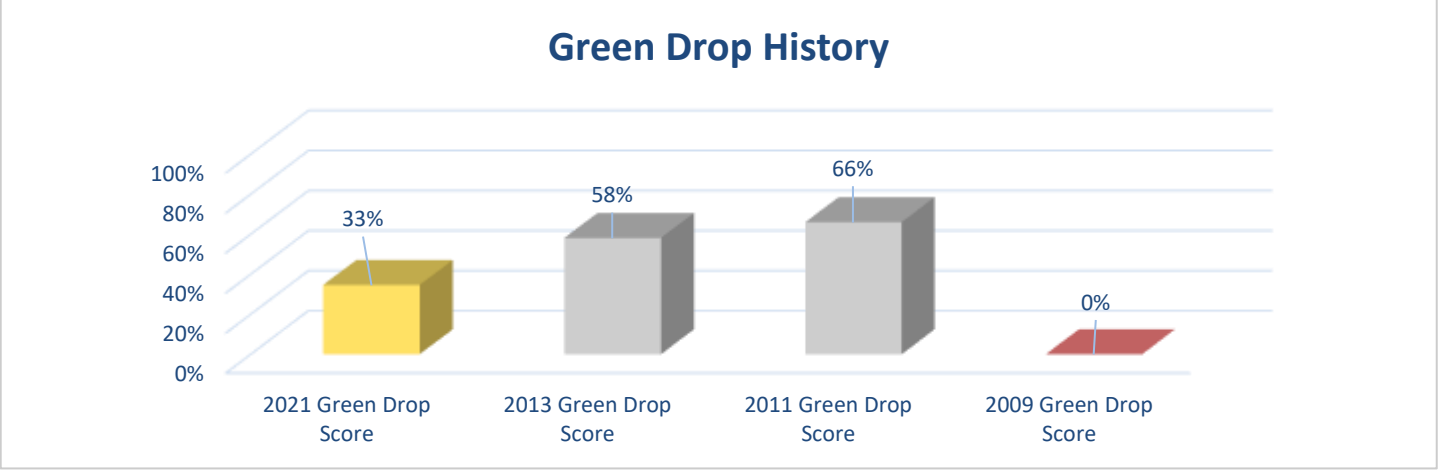
The poorest performance is noted in the focus area dealing with Financial Capacity, with most systems scoring on the lower scale of 10%. This KPA can be addressed by putting asset registers, ringfenced budgets and expenditure and production costs in place. Operational staff competencies varied from plant to plant but found some traction. Maintenance capacity is very low with qualified personnel and systems not in place. Engineering and technical capacity are well represented, although scientists present a gap, which is filled by the outsourced laboratory.

Positive observations include the commitment of the municipality to monitor the final effluent and address the issues raised during the consultative audit process. Matzikama needs to ensure that the sampling programme is registered on IRIS to reflect all the data points and determinants monitored. Process audits are in place, although outdated (2016) and not implemented. Risk plans and registers are not in place and a risk-averse approach to wastewater management has not been institutionalised. Furthermore, the municipality has financial constraints which prohibits some of the planned services from taking place. As results of these constraints and lack of evidence, five (5) out of the 13 wastewater systems are rated to be in the GD critical state. Three (3) WWTWs are in critical CRR state, and 6 in high-risk state. The municipality is encouraged to use the Green Drop criteria to map a turnaround plan to correct each aspect over time, assigning to specific staff and monitor progress on a monthly basis. A W_2RAP should be developed and implemented as part of this process, as it encompasses all regulatory and good practices to move Matzikama out of the critical space and restore the >50% Green Drop score during the 2023 audit.

Green Drop findings:

1. Two (2) of the 13 systems are not registered on IRIS i.e., Nuwerus and Rietpoort
2. Samples are being taken consistently for all 13 systems are sampled at least monthly for external lab analysis – well done
3. Some final effluent constituents are not monitored as specified in the General Authorisation and need to be added
4. Asset register can be improved by highlighting the total value for wastewater assets
5. WSA compiled a comprehensive operational monitoring program for all systems, however there were no entries on IRIS to demonstrate that the programme is implemented
6. Sludge management need to be addressed at all systems
7. The team is over stretched and has no capacity
8. Process controllers are lacking and not all classified, which deducted scores in the Capacity Management section
9. Process audits are outdated or almost outdated, and are not used to inform a W_2RAP
10. Budget had been secured for capital projects for replacement, upgrades, and addition of new unit process at some of the WWTWs and associated infrastructure:
    - R7,700,000: Bitterfontein WWTW CAPEX funding through WSIG
    - R6,894,000: Vredendal North WWTW CAPEX funding through WSIG
    - R11,788,825: Vredendal South WWTW CAPEX funding through WSIG.

The Regulator is concerned about the overall poor state of wastewater services at the Strandfontein, Van Rhysdorp, Vredendal North, Nuwerus and Rietpoort wastewater systems and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Site Inspection report

Vredendal North WTWW 30%

The ***Vredendal North WWTW*** was inspected to verify the Green Drop audit findings:

- The network pumpstation was in process of being upgraded during the inspection. One pump was operational, sewage spillages were evident in the surrounding area which has not been cleaned
- The treatment plant is a 1.65 Ml/day activated sludge technology, that was upgraded/refurbished in 2011 - the civil infrastructure was generally in a satisfactory condition
- Operational shortfalls contributed to compliance not being achieved
- No analytical equipment and facilities were available on site for basic operational testing
- The Return Activated Sludge (RAS) pumps have been removed for repairs several months before the site assessment
- Various mechanical equipment has been dysfunctional, e.g., only 1 out of 4 aerators were operational
- The plant is located next to the landfill site, which creates several nuisance and hazards that hampers good groundskeeping
- At the time of site visit, the plant was not functional due to loadshedding, and all processes could not be assessed
- No back-up generator is in place to drive the essential process units. The main pumpstation has a generator in place.

		
Spillages from manhole in sewer network, not cleaned	*Three of 4 aerators are not functional, long lead times before equipment is repaired. No operational control*	*Scum withdrawal system not functional. Poor sludge settleability with pockets rising to surface*

4.16 Mossel Bay Local Municipality

Water Service Institution	**Mossel Bay Local Municipality**
Water Service Provider	Mossel Bay Local Municipality

Municipal Green Drop Score	
2021 Green Drop Score	**86%↑**
2013 Green Drop Score	**79%**
2011 Green Drop Score	**89%**
2009 Green Drop Score	**12%**

VROOM Impression (Towards restoring functionality):

1. There were no major hardware risks
2. The site was in excellent condition.

VROOM Estimate:

- R1,668,000

Key Performance Area	Weight	Brandwag	Friemersheim Western Works	Grootbrak	Herbertsdale
A. Capacity Management	15%	90.0%	94.0%	84.0%	90.0%
B. Environmental Management	15%	92.5%	85.0%	75.0%	95.0%
C. Financial Management	20%	59.4%	90.5%	67.5%	59.4%
D. Technical Management	20%	89.4%	72.3%	77.3%	90.6%
E. Effluent & Sludge Compliance	30%	92.5%	66.0%	40.0%	100.0%
F. Bonus		11.8%	34.8%	26.8%	26.8%
G. Penalties		0.0%	0.0%	-50.0%	0.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		**87%**	**85%**	**63%**	**91%**
2013 Green Drop Score		**75%**	**83%**	**82%**	**73%**
2011 Green Drop Score		**45%**	**91%**	**83%**	**49%**
2009 Green Drop Score		**NA**	**8%**	**11%**	**1%**
System Design Capacity	Ml/d	0.128	0.18	1	0.126
Design Capacity Utilisation (%)		38%	61%	140%	48%
Resource Discharged into		No discharge	Unknown Spruit to Moordkuil River	Irrigation to land	No discharge
Microbiological Compliance	%	NMR	83%	58%	NMR
Chemical Compliance	%	NMR	52%	63%	NMR
Physical Compliance	%	NMR	97%	61%	NMR
Wastewater Risk Rating (CRR% of CRR_{max})		**Brandwag**	**Friemersheim Western Works**	**Grootbrak**	**Herbertsdale**
CRR (2011)	%	35.3%	58.8%	35.5%	35.5%
CRR (2013)	%	52.9%	41.2%	47.1%	58.8%
CRR (2021)	%	23.5%	47.1%	64.7%	17.6%

Key Performance Area	Weight	Mossel Bay – Hartenbos	Pinnacle Point	Ruiterbos
A. Capacity Management	15%	94.0%	84.0%	84.0%
B. Environmental Management	15%	82.6%	76.0%	78.5%
C. Financial Management	20%	90.5%	75.5%	75.5%
D. Technical Management	20%	86.5%	77.3%	62.3%
E. Effluent & Sludge Compliance	30%	81.0%	70.0%	66.0%
F. Bonus		66.8%	34.8%	34.8%
G. Penalties		0.0%	-25.0%	0.0%
H. Disqualifiers		None	None	None
Green Drop Score (2021)		**92%->89%**	**79%**	**79%**
2013 Green Drop Score		**79%**	**81%**	**80%**

Key Performance Area	Weight	Mossel Bay – Hartenbos	Pinnacle Point	Ruiterbos
2011 Green Drop Score		**91%**	**83%**	**77%**
2009 Green Drop Score		**33%**	**19%**	**3%**
System Design Capacity	Ml/d	17.4	3.7	0.12
Design Capacity Utilisation (%)		51%	32%	62%
Resource Discharged into		Hartenbos River	Irrigation (Golf course)	Paardekraal river
Microbiological Compliance	%	85%	75%	83%
Chemical Compliance	%	90%	69%	50%
Physical Compliance	%	100%	92%	94%
Wastewater Risk Rating (CRR% of CRR_{max})		**Mossel Bay – Hartenbos**	**Pinnacle Point**	**Ruiterbos**
CRR (2011)	**%**	50.0%	41.2%	29.4%
CRR (2013)	**%**	54.6%	41.2%	23.5%
CRR (2021)	**%**	45.5%	47.1%	47.1%

Regulator's Comment:

The Mossel Bay team was well prepared for the 2021 Green Drop Audit and is commended for the good performance across all systems. The overall Green Drop score has improved from the 79% baseline in 2013 to 86% in 2021. This must be seen against the backdrop of continuously more stringent requirements of the Green Drop programme, which makes the result even more outstanding. Mossel Bay Municipality is further congratulated for achieving Green Drop status for the Herbertsdale system. The wastewater system is operating and managed well as a business; however, improvement is sought in some areas to get all systems to same level of excellence. Six of the eight systems obtained risk ratings in a low-risk space. The Groot Brak and Friemersheim systems, however, obtained risk ratings in the medium risk space, which indicate that some intervention may be required. The lack of available treatment capacity at Groot Brak in particular is of concern.

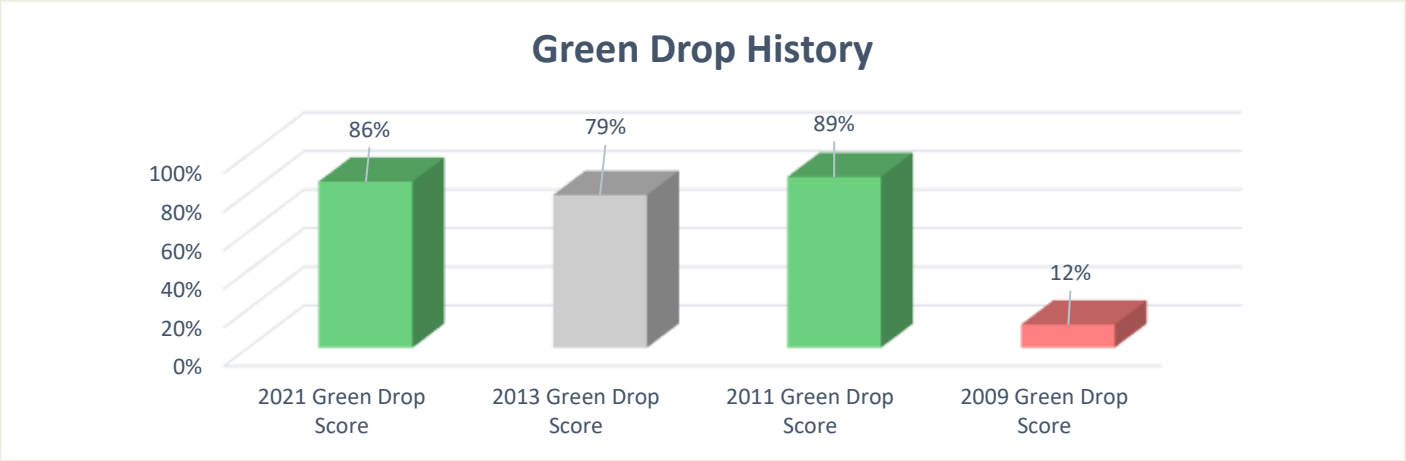
The municipality has done well in ensuring that adequate technical capacity is available to manage all systems. Maintenance teams proved to be well-equipped however documenting implementation of preventative maintenance, including sewer network and pump station maintenance can be improved. Process Controller compliance with the regulatory requirements requires attention. The municipality will benefit from working toward ensuring that more dedicated supervisory capacity is available particularly at the plants with more advanced technologies. This will aid to ensure that operational monitoring and implementation of the necessary process adjustments are affected to optimise treatment. This is vital as none of the systems managed to obtain 90% compliance with all three effluent quality categories. Implementation of recommendations made in the Process Audits should also be addressed and may assist with improving final effluent quality. The municipality is commended on maintaining and implementing the W_2RAP process as a core approach in management its wastewater systems. Efforts to provide system specific operation and maintenance costing, budgets and associated expenditure information are acknowledged, and the Mosselbay is encouraged to build on this to work toward more cost-effective treatment and collector system operations.

The WSA is congratulated on its dedication and accomplishment to achieve Green Drop standards, and it pleases the Regulator to confirm that one (1) Green Drop Certificate is awarded for Herbertsdale. A further 1 WWTWs were eligible for GD Certification (Mossel Bay Hartenbos), however, the non-compliance with microbiological final effluent quality disqualified the system from achieving the desired *excellence* status. DWS is hopeful that this status will be achieved during the 2023 audits and wishes Mossel Bay all the best.

Green Drop findings:

1. Capacity management of all systems is well managed and sufficient human resources were in place to manage and operate most its systems
2. W_2RAPs were in place for all systems, and it was evident that a risk-based management approach had been adopted throughout the wastewater business
3. Operational monitoring was in place for all systems but with shortcomings as not all monitoring programmes were aligned with best practices for the specific technology types
4. Compliance monitoring was implemented for all systems with minor shortcomings in terms of meeting the stipulated monitoring requirements indicated in respective water use authorisations
5. Final effluent analysis was conducted by the internal laboratory, which compares its analytical results with an accredited laboratory on a monthly basis

6. A good effort was made to provide the required site-specific financial management information, however O&M budgets for the sewer network and associated pump stations could not be provided per system (ringfenced). This would also compromise the calculate of production costs per WWTWs
7. None of the plants conducted energy efficiency audits, but good data was being captured regarding energy efficiency for some plants
8. Treatment capacity was well managed with flow data monitored and available for all systems – inflow and outflow meters were also regularly calibrated
9. Groot Brak WWTW is a concern as it was operating at 140% of its design capacity
10. Process audits were available for all plants except Ruiterbos, but evidence of implementation of recommendations was not provided for four of the eight systems
11. Pump station maintenance and risk management was well demonstrated but condition assessments of sewer networks were not available
12. Final effluent compliance data was being uploaded on IRIS on a monthly basis
13. All systems had water use authorisations or licenses in place
14. None of the systems complied with all three effluent quality categories – four of the six discharging systems complied with at least one category
15. The WWTWs sludge was classified – sludge management was largely coordinated from the Mossel Bay – Hartenbos WWTW whereby sludge was transported to the WWTW and collected for composting and used for agricultural purposes
16. The Sludge Management Plan was outdated and did not contain the required elements – it is advised that this be reviewed.



Technical Site Assessment

Mossel Bay - Hartenbos WWTW 80%

The **Hartenbos *WWTW*** was inspected to verify the Green Drop audit findings:

- The sewer network was generally found to be in a good condition
- The pump station visited was in good condition although vandalism remains a concern
- Sufficient stand-by equipment was available
- The WWTW was well secured and maintained, including grounds maintenance and staff facilities
- The inlet works was recently upgraded and thus in excellent condition
- There was no evidence of measurement of screenings disposal
- Flow measurement devices were in place and in working order, including inflow, outflow, sludge recycle and wasting
- No verification means in place to ensure that all wastewater reaches the WWTW – no wastewater flow balances presented during the audit
- There were no major hardware risks on this WWTW – reactor was functioning well with all mechanical equipment in good working condition
- Clarifiers were in good working condition, but overflow channels and weirs required cleaning
- Chlorine gas is used for disinfection – process was well managed and a clear overflow observed
- Aerators in aerobic sludge digesters were operational
- No sludge stream monitoring or performance evaluation was taking place
- Dewatering facility (belt press) was in good working condition, sludge drying beds were available on stand-by.

		
Some algae present on the settling tanks	*All mechanical equipment at the plant is in good working condition*	*Sludge is dewatered with belt presses*

4.17 Oudtshoorn Local Municipality

Water Service Institution	**Oudtshoorn LM**
Water Service Provider	Oudtshoorn LM

Municipal Green Drop Score	
2021 Green Drop Score	**43%↓**
2013 Green Drop Score	**70%**
2011 Green Drop Score	**41%**
2009 Green Drop Score	**0%**

VROOM Impression (Towards restoring functionality):
1. Feed to Biofilter
2. Scum blanket in BNR System

VROOM Estimate:
- R6,086,000

Key Performance Area	**Weight**	**Dysseldorp**	**De Rust**	**Oudtshoorn**
A. Capacity Management	15%	62.0%	77.5%	62.0%
B. Environmental Management	15%	20.0%	12.5%	18.0%
C. Financial Management	20%	55.0%	5.0%	69.0%
D. Technical Management	20%	36.8%	16.8%	48.8%
E. Effluent & Sludge Compliance	30%	17.3%	88.8%	12.0%
F. Bonus		33.3%	21.3%	33.3%
G. Penalties		-25.0%	-25.0%	0.0%
H. Disqualifiers		None	None	None
Green Drop Score (2021)		**37%**	**44%**	**44%**
2013 Green Drop Score		**63%**	**44%**	**71%**
2011 Green Drop Score		**44%**	**28%**	**42%**
2009 Green Drop Score		**0%**	**0%**	**0%**
System Design Capacity	Ml/d	2	0.2	9
Design Capacity Utilisation (%)		35%	130%	66%
Resource Discharged into		Olifants	No discharge	Olifants
Microbiological Compliance	%	46%	NMR	Insufficient data set
Chemical Compliance	%	Insufficient data set	NMR	Insufficient data set
Physical Compliance	%	Insufficient data set	NMR	Insufficient data set
Wastewater Risk Rating (CRR% of CRR_{max})		**Dysseldorp**	**De Rust**	**Oudtshoorn**
CRR (2011)	%	58.8%	47.1%	63.6%
CRR (2013)	%	35.3%	52.9%	68.1%
CRR (2021)	%	70.6%	35.3%	72.7%

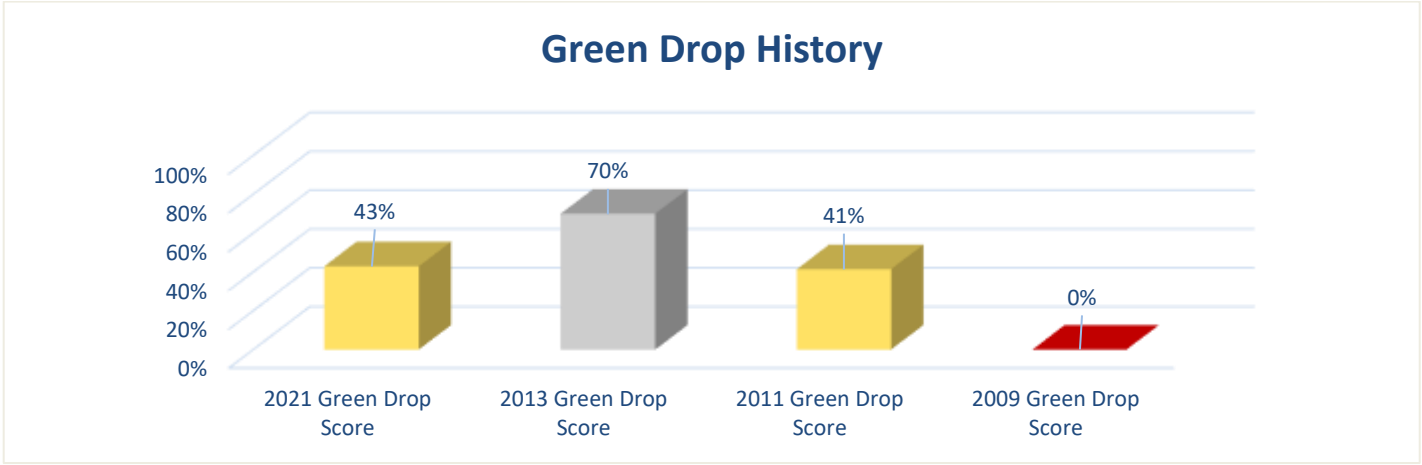
Regulator's Comment:

The Oudtshoorn municipality maintained a positive attitude throughout the audit process, welcoming the return of the programme and valuing its importance. Unfortunately, the overall Green Drop score has decreased from 70% (2013) to 43% (2021), which indicate that significant traction has been lost since 2013. This regress may be considered against the backdrop of continuously more stringent requirements of the Green Drop programme, for which the municipality was not fully prepared. The information provided during the audit largely did not match the requirements and it is recommended that the wastewater and financial teams work together to formulate a cohesive turnaround plan that addresses each of the audit requirements and compile a portfolio of evidence well in advance of the 2023 audit cycle. The Regulator notes that the works have recently been refurbished or are in the process of completion, and trust that this will bring about progress and compliance.

Aspects for immediate attention would include record-keeping across the board but focussed on 'plan to improvement'. Operational and compliance monitoring programmes must be reviewed to ensure alignment with optimal practices for the respective technology types. It is also imperative that operational and compliance monitoring is conducted consistently. More importantly, knowledge transfer and upskilling must be prioritised to ensure that operational control takes place against the design expectations and monitored / corrected if not compliant with mandatory standards.

Green Drop findings:

1. Capacity management of all systems are fairly managed particularly in terms of maintenance capacity, supervision, and management
2. Process Controllers are available at the respective sites, but not compliant with numbers and classes as per regulatory requirements
3. Environmental, Financial, Technical and Effluent Management KPAs needs attention – improving record-keeping across the board will assist in improving performance
4. Costs components of the networks, including the pumpstations in conjunction with treatment facilities, must be evaluated to identify specific drivers for the wastewater systems and use these when motivating budget.
5. Cost determination for Oudtshoorn WWTW was comprehensively calculated and provided during the audit – it is advised that a similar approach be followed for the other systems
6. Budget and expenditure could not be determined for De Rust based on the information provided, which also compromised production cost calculation
7. The importance of stormwater management must be elevated to the senior engineer responsible for roads and stormwater
8. The use of the Process Audit and W_2RAP tools are encouraged, and proof of implementation of the recommendations should be recorded
9. None of the 3 plants complied with all 3 effluent quality categories
10. Zero of the plants conducted energy efficiency audits
11. No data is being captured regarding energy efficiency
12. The WWTWs sludge is not being classified and there are no Sludge Management Plans in place
13. Although monthly flow averages were presented during the audit, this was not backed up by daily flow measurement records and thus could not be verified
14. Two of the three plants are in high-risk positions
15. The Dysselsdorp WWTW and Oudtshoorn WWTWs have recently been refurbished.



Technical Site Assessment

Oudtshoorn WWTW 58%

The **Oudtshoorn *WWTW*** was inspected to verify the Green Drop audit findings:

- The sewer network and pump stations were generally in a good condition
- WWTW was secure and well-fenced
- All unit processes were functional, although the biofilter module was old it was functional it had been recently refurbished
- The flow velocity to one of the biofilters was too high and overflow was observed
- Even flow distribution on the biofilter was noted but limited biofilm growth
- Investigation into reducing the scum on surface - possible introduction of mixers to assist in the process should be conducted
- The bioreactor contained excessive scum, making it difficult to observe the process visually – scum believed to be the result of abattoir discharges and must be resolved soonest
- One aerator was out of operation
- Clarifiers were in operation, scum accumulation also a problem at the clarifiers with the sludge blanket not being visible
- Overflow had poor clarity and contained floc
- Chlorine gas is used for disinfection – chlorine building, and operation was in good condition with appropriate signage and safety equipment
- Contact channel was clean but effluent quality visibly not optimal

- Drying beds were in good condition but no sludge management in place as sludge was just stockpiled on-site
- Overall, the plant was in good condition, but operational monitoring and associated interventions was poor or could not be substantiated, which is essential for appropriate process adjustments and optimisation to be implemented
- Record keeping in general requires urgent attention

		
Excessive scum in the reactor affecting final effluent quality	*Network pump stations were in excellent condition*	*Drying beds were in clean and in good condition, with functional drains*

4.18 Overstrand Local Municipality

Water Service Institution	**Overstrand Local Municipality**
Water Service Provider	Veolia Water

Municipal Green Drop Score	
2021 Green Drop Score	**89%→**
2013 Green Drop Score	**89%**
2011 Green Drop Score	**89%**
2009 Green Drop Score	**63%**

VROOM Impression (Towards restoring functionality):

1. Flow distribution to SSTs
2. Lime storage facility
3. Security
4. Scum control

VROOM Estimate:

- R10,200,000

Key Performance Area	**Weight**	**Gansbaai**	**Hawston**	**Hermanus**	**Kleinmond**
A. Capacity Management	15%	100.0%	100.0%	100.0%	100.0%
B. Environmental Management	15%	91.0%	85.0%	85.0%	86.0%
C. Financial Management	20%	98.0%	98.0%	98.0%	78.0%
D. Technical Management	20%	97.5%	97.5%	97.5%	93.5%
E. Effluent & Sludge Compliance	30%	70.0%	50.0%	85.0%	64.0%
F. Bonus		94.0%	94.0%	94.0%	94.0%
G. Penalties		0.0%	0.0%	0.0%	0.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		**96%->89%**	**89%**	**96%->89%**	**88%**
2013 Green Drop Score		**92%**	**90%**	**91%**	**78%**
2011 Green Drop Score		**76%**	**88%**	**92%**	**83%**
2009 Green Drop Score		**66%**	**57%**	**66%**	**66%**
System Design Capacity	Ml/d	2	1	12	2
Design Capacity Utilisation (%)		43%	61%	54%	76%
Resource Discharged into		Irrigation – Sports complex	Maturation Pond into Wetland	Ocean	Reed- bed/wetland area linked to sea
Microbiological Compliance	%	68%	80%	87%	91%
Chemical Compliance	%	86%	74%	98%	51%
Physical Compliance	%	95%	62%	100%	88%
Wastewater Risk Rating (CRR% of CRR_{max})		**Gansbaai**	**Hawston**	**Hermanus**	**Kleinmond**
CRR (2011)	%	31.0%	33.0%	35.0%	44.0%
CRR (2013)	%	35.3%	29.0%	45.0%	47.0%
CRR (2021)	%	41.2%	52.9%	36.4%	47.1%

Key Performance Area	**Weight**	**Pearly Beach**	**Stanford**
A. Capacity Management	15%	100.0%	100.0%
B. Environmental Management	15%	98.8%	92.0%
C. Financial Management	20%	97.5%	98.0%
D. Technical Management	20%	97.1%	97.5%
E. Effluent & Sludge Compliance	30%	62.5%	50.0%
F. Bonus		56.0%	94.0%
G. Penalties		-25.0%	0.0%
H. Disqualifiers		None	None
Green Drop Score (2021)		**88%**	**90%->89%**

Key Performance Area	Weight	Pearly Beach	Stanford
2013 Green Drop Score		NA	**93%**
2011 Green Drop Score		NA	**83%**
2009 Green Drop Score		NA	**61%**
System Design Capacity	Ml/d	0.259	1.2
Design Capacity Utilisation (%)		31%	89%
Resource Discharged into		An aquifer	Constructed reed bed to Klein River
Microbiological Compliance	%	100%	82%
Chemical Compliance	%	58%	78%
Physical Compliance	%	27%	82%
Wastewater Risk Rating (CRR% of CRR_{max})		**Pearly Beach**	**Stanford**
CRR (2011)	%	NA	44.0%
CRR (2013)	%	NA	29.0%
CRR (2021)	%	52.9%	64.7%

Regulator's Comment:

Overstrand Local Municipality and WSP Veolia delivered a sterling performance that was awarded with an overall 89% Green Drop score.The municipality continues to maintain a remarkable record of 89% over 10 years, marked by a highlight committed, competent team. In addition, Gansbaai, Hermanus and Stanford were serious contenders for Green Drop Certification, which regrettably had to be waived due to not achieving excellent standards (>90%) on their final microbiological and/or chemical qualities. The WSA should be able to attain Certification status in 2023 if this matter can be resolved.

The Regulator is impressed with the level of preparation and professional conduct during the audit, represented by managers in various roles, supported by Veolia Water. All required information was loaded onto IRIS for various KPAs prior which ensure a seamless preliminary assessment. The team then used the main audit and verification audit events to maximise their scores by providing clarification and further evidence on sludge classification (landfilling), stormwater- and water demand management and capital projects. The striking performance and sustained services are not surprising if noting the strength of the engineering, technical, scientific, and laboratory competence, supported by committed senior management and municipal leadership. Perfect score (100%) were achieved for KPA Capacity Management for the expertise, supported by comprehensive operation, maintenance, and monitoring plans and records, including financials and energy management. Human capacity is optimised via the adoption of automation and telemetry. This aspect must be taken up with the Regulator to align with capacity requirements to ensure that any risks associated with such innovations are managed. Flow monitoring is in place for inflow and outflow, and online monitoring for night flows (Myciti) is in place. Energy optimisation via LED is standard procedure and CO_2 equivalents are calculated to monitor the benefit. Well done. These best practices set a high standard for wastewater services in South Africa.

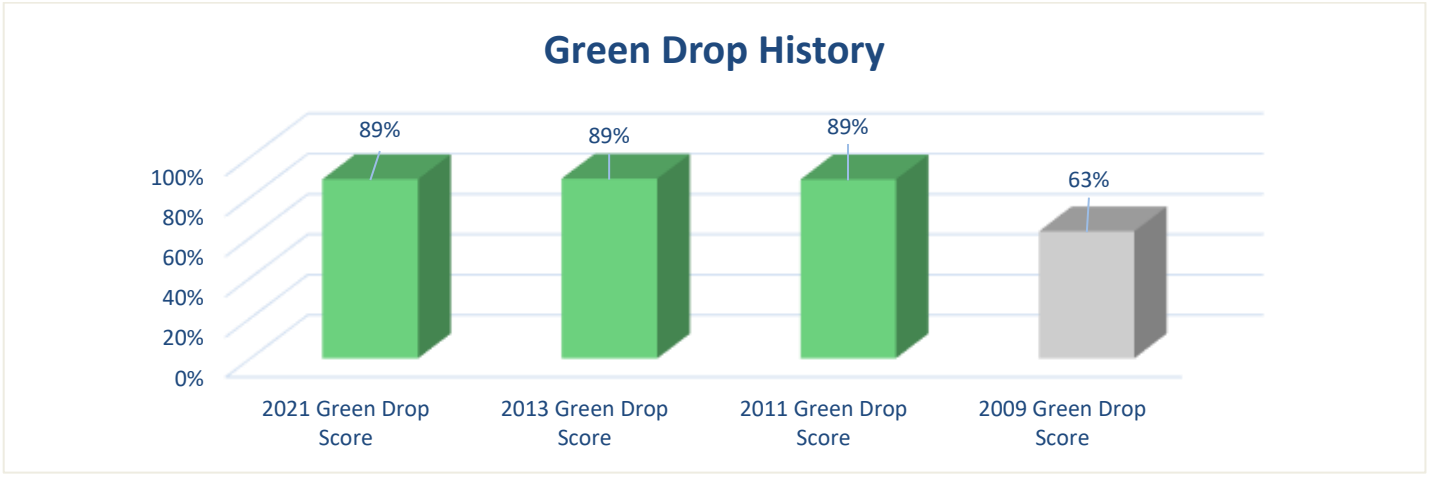
In a nutshell, the municipality performance exceptionally well in all KPA areas (>90%), with the exception of Effluent and Sludge Compliance. Areas for improvement include the laboratory turn-around time, monitoring of dedicated sludge streams and performance evaluation against design expectations, flow meter calibration/verification, sludge classification according to the WRC guidelines (noting new landfill regulations).

The adoption of site specific W_2RAP process is an encouraging; notably that risk management is informed and influenced by a process audit, sewer master plan and supported by budget for implementation. Improvement should focus on having (independent) Risk Reviews every 6 months to monitor (quantify) risk movement. The Regulator congratulates Overstrand and hope the 2023 audit cycle will result in an exponential improvement until Green Drop excellence is achieved for all six (6) systems.

Green Drop findings:

1. All WWTW achieved a full score for capacity management, thereby verifying the availability of registered and qualified process controllers, maintenance teams (inhouse and outsourced services), engineering, technical (technicians and technologists) and scientific expertise tied to wastewater management and asset planning
2. W_2RAPs are in place and implemented, and its impact monitored though operational monitoring and compliance monitoring
3. All systems presented financial evidence viz. allocated budgets and expenditure, treatment cost (R/m^3 treated), energy costs (R/kWh), and contracts for external services
4. Six (6) of 6 WWTWs logged full records for compliance monitoring, including biomonitoring

5. Operational monitoring with online meters for most process streams are implemented. Gaps are still noted with regard to sludge monitoring of dedicated streams, e.g. in and output from settlers and thickeners, anaerobic digesters, belt presses, drying beds, etc.
6. High quality reports were presented for process audits, sewage inspection reports, sewer master planning
7. Bylaws are updated and enforced
8. 12 months of data uploaded on IRIS for all 6 WWTWs, supported by relevant site-specific water use authorisation and general authorisations
9. Sludge classification for landfill disposal is done, but not complemented by WRC classification – the latter not only intending to guide disposal but also to monitor the quality of biosolids produced by the site
10. No penalties and no directives were issued for any systems
11. No plants in the critical or high-risk positions
12. Capital projects are part of a three-year plan, with 2021 projects listed as follows:
    - R6,700,000: Sewer network extension in Gansbaai WWTWs and associated infrastructure
    - R16,154,000: Hawston WWTW refurbishment on civil and mechanical equipment's for various unit processes.
    - R8,836,000: Hermanus WWTW refurbishments and associated infrastructure
    - R1,645,000: Kleinmond WWTW refurbishment and associated infrastructure
    - R1,797,000: Stanford WWTW refurbishment and associated infrastructure.



Technical Site Assessment

Hermanus WWTW 74%

The ***Hermanus WWTW*** was inspected to verify the Green Drop audit findings:

- The network and pumpstation was in good condition, noticed for routine maintenance and adequate response to sewage blockages
- Trespassing seems to be a risk at the WWTW, compounded by land invasion close to the site. Neighbours to the WWTW resort to jumping over the fence to access their residence. Overstrand has plans to raise the wall to secure the facility and mitigate security risks
- Plant infrastructure is aging; however, its lifespan is extended via preventative maintenance strategies. All equipment is functional
- The site office displays certificates for PCs and WWTW – a satisfactory working environment is observed
- Operational monitoring, daily logbook or maintenance records were in place
- Safety signs were displayed at various unit processes i.e., chlorination, belt presses, lime storage, reactors, etc.
- Parts of the site was untidy and not evident of good groundskeeping - used as storage whilst network upgrades/refurbishments underway. Good housekeeping was evident at the maturation ponds
- Sludge drying beds were not well kept and used only during emergency. Belt presses are used for primary sludge handling
- Veolia Water developed a reactor control- and sludge management plan
- All required documents were presented on site including comprehensive O&M manual with manufacturers specs, PFD and model of plant, and record of all maintenance issues (job cards, works orders, tracking of outstanding jobs).

		
Reactor audit and optimisation studies in pursuit of best practice	*MLSS, DO and sludge age maintained at optimal levels by process controllers*	*Flow distribution uneven and deliver high flows to 1 of 4 clarifiers. Work done during TSA to rectify this design defect.*

4.19 Prince Albert Local Municipality

Water Service Institution	**Prince Albert Local Municipality**
Water Service Provider	Prince Albert Local Municipality

Municipal Green Drop Score	
2021 Green Drop Score	**14%↓**
2013 Green Drop Score	**66%**
2011 Green Drop Score	**68%**
2009 Green Drop Score	**18%**

VROOM Impression (Towards restoring functionality):

1. Upgrades to Klaarstroom Ponds almost completed at the time of TSA
2. Irrigation pumps
3. Disinfection lacking

VROOM Estimate:

- R211,000

Key Performance Area	Weight	Klaarstroom	Leeu Gamka	Prince Albert
A. Capacity Management	15%	2.5%	15.0%	20.0%
B. Environmental Management	15%	51.3%	51.3%	48.8%
C. Financial Management	20%	0.0%	0.0%	0.0%
D. Technical Management	20%	19.1%	0.0%	0.0%
E. Effluent & Sludge Compliance	30%	16.9%	41.9%	16.9%
F. Bonus		9.0%	9.0%	9.0%
G. Penalties		-25.0%	-25.0%	-25.0%
H. Disqualifiers		None	None	None
Green Drop Score (2021)		**15%**	**20%**	**13%**
2013 Green Drop Score		**42%**	**61%**	**69%**
2011 Green Drop Score		**56%**	**60%**	**73%**
2009 Green Drop Score		**0%**	**0%**	**53%**
System Design Capacity	Ml/d	0.061	0.16	0.623
Design Capacity Utilisation (%)		NI	NI	NI
Resource Discharged into		Irrigation	Irrigation	Irrigation
Microbiological Compliance	%	0%	0%	67%
Chemical Compliance	%	14%	92%	23%
Physical Compliance	%	50%	50%	56%
Wastewater Risk Rating (CRR% of CRR_{max})		**Klaarstroom**	**Leeu Gamka**	**Prince Albert**
CRR (2011)	%	47.1%	88.2%	35.3%
CRR (2013)	%	47.1%	41.2%	35.3%
CRR (2021)	%	70.6%	58.8%	76.5%

Regulator's Comment:

Prince Albert Local Municipality was represented by the Senior Clerk responsible for water and wastewater services. Her commitment and knowledge around the Green Drop audit process and wastewater services is commendable, however, the lack of support and involvement from senior management raises alarm. Similarly, no support or evidence was presented by colleagues from the financial, procurement, asset management and stormwater departments, leaving an incoherent impression of Prince Albert as an organisation. Prince Albert Municipality finds itself in the Critical Green Drop category with an overall score of 14%, which would warrant urgent and appropriate intervention by municipal leadership.

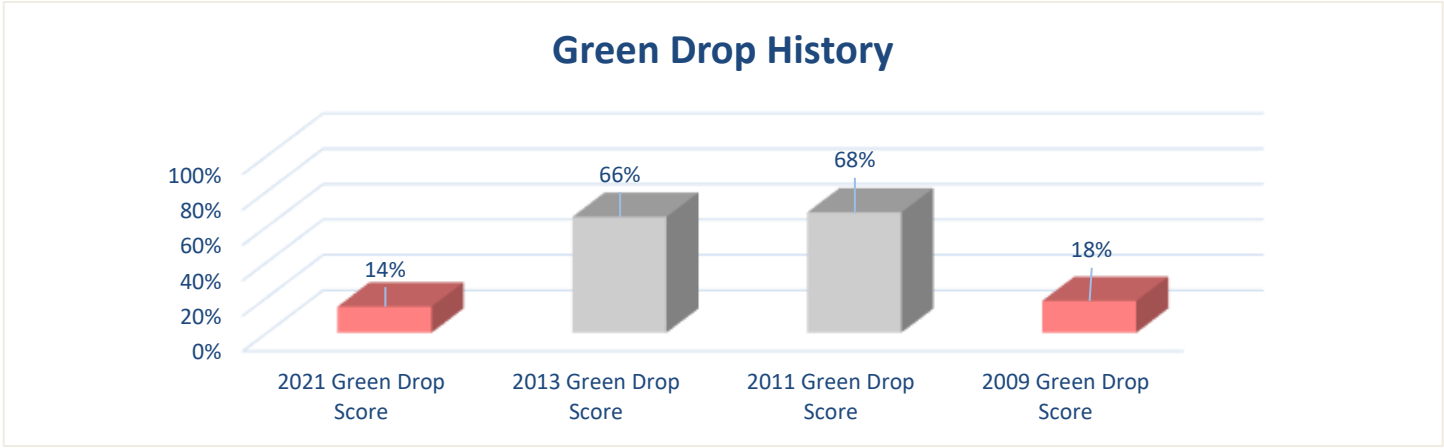
Opportunities for improvement is vast, and a number of good practice and compliance aspects are not in place. Corrective measures in Technical Management, i.e. Process Audits, Sewer Mains Inspections and Asset Registers would contribute to improved scores during Updating and implementation of a Wastewater Risk Abatement Plan is instrumental to any turnaround that the municipality would contemplate. The lowest score was attributed to the lack of financial information, i.e. budgets, expenditure, systems costs and contracts to support goods and services.

On the positive side, the Regulator is encouraged by the refurbishment of the Klaarstroom Pond System, following many concerns raised during the 2013 Green Drop audits. Furthermore, generators seems to be installed, albeit no evidence of such installations have been presented. The low Green Drop score places Prince Albert on the list of priorities for regulatory enforcement.

Green Drop findings:

1. None of the three (3) WWTWs had Plant Registration Certificates in place
2. The majority of the Process Controllers do not comply with either Reg. 2834 or draft Reg. 813
3. No maintenance competencies could be verified via qualifications. The same applies for technical and engineering staff. Scientific competencies were not evaluated, as all systems are ''basic'' level technologies and scientific expertise was not seen to be required
4. Preventative maintenance practices are non-existent, and a run-to-failure strategy seem to exist. Even though pond technology is known for its low maintenance requirements, pumpstations needs to be maintained and workplans and schedules need to direct the work
5. Risk management practices were lacking
6. Compliance monitoring is largely in place and only a few minor adjustments to operational monitoring is required
7. Support from the finance office seems to be lacking and no information was presented in this regard
8. Flow meters are said to be in place, but no verifiable flow data was provided
9. No condition assessments or Process Audits were conducted, and no Asset Register was provided. The Technical Report done for the upgrades at Klaarstoom was favourably considered in this regard
10. The treatment plants do not comply with effluent quality standards. The Klaarstroom Pond System holds potential to comply once fully functional
11. Two of the plants are in high-risk positions
12. No capital funds or projects were presented for any of the systems, thereby forfeiting valuable bonus points.

The Regulator is concerned about the overall poor state of wastewater services at all systems and the consequential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Klaarstroom Ponds 51%

The ***Klaarstroom Pond System*** was inspected to verify the Green Drop audit findings:

- The pumpstation site was unkept and untidy. Only one pump was functional. The installation of a backup generator was underway
- There was no office building or similar facilities on site. Operational logbooks and associated documentation was kept off site
- The treatment plant terrain was signposted, fenced and tidy. As construction was recently completed and given the fact that the area is naturally quite dry, there was no grass or other vegetation on site
- The head of works is newly constructed
- It was noticed that only some of the ponds are lined. Some ponds have a concrete band to provide protection against erosion
- Reeds are still being established on site
- The final pond was empty at time of the assessment
- There is only one irrigation pump installed, and a second pump should be considered

- There is no indication of final effluent disinfection.

		
Pumpstation in poor condition, 1 pump functional, no signage	*Newly constructed site, ponds are lined, reeds still to be established*	*Arid terrain, but tidy overall. No disinfection noted*

4.20 Saldanha Bay Local Municipality

Water Service Institution	**Saldanha Bay Local Municipality**
Water Service Provider	Saldanha Bay Local Municipality

Municipal Green Drop Score	
2021 Green Drop Score	**87%↑**
2013 Green Drop Score	**81%**
2011 Green Drop Score	**39%**
2009 Green Drop Score	**59%**

VROOM Impression (Towards restoring functionality):

1. Plant in excellent condition – no hardware defects
2. Scum management/control at clarifiers

VROOM Estimate:

- R5,317,500

Key Performance Area	**Weight**	**Hopefield**	**St Helena Bay**	**Langebaan**	**Paternoster**
A. Capacity Management	15%	92.0%	92.0%	88.0%	92.5%
B. Environmental Management	15%	85.0%	91.0%	85.0%	98.8%
C. Financial Management	20%	82.0%	82.0%	82.0%	77.5%
D. Technical Management	20%	81.0%	79.0%	79.0%	75.3%
E. Effluent & Sludge Compliance	30%	100.0%	50.0%	50.0%	62.5%
F. Bonus		70.0%	60.0%	80.0%	39.0%
G. Penalties		0.0%	0.0%	0.0%	0.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		**96%**	**84%**	**85%**	**85%**
2013 Green Drop Score		**81%**	**76%**	**80%**	**59%**
2011 Green Drop Score		**42%**	**34%**	**36%**	**32%**
2009 Green Drop Score		**56%**	**0%**	**73%**	**40%**
System Design Capacity	Ml/d	0.9	1.825	3.5	1.3
Design Capacity Utilisation (%)		50%	82%	54%	29%
Resource Discharged into		Irrigation to parks/ fields	Flood irrigation/ adjacent farm	Golf course	NI
Microbiological Compliance	%	92%	75%	75%	83%
Chemical Compliance	%	96%	68%	68%	83%
Physical Compliance	%	97%	64%	75%	92%
Wastewater Risk Rating (CRR% of CRR_{max})		**Hopefield**	**St Helena Bay**	**Langebaan**	**Paternoster**
CRR (2011)	%	83.0%	89.0%	89.0%	72.0%
CRR (2013)	%	35.0%	47.0%	41.0%	59.0%
CRR (2021)	%	23.5%	64.7%	64.7%	35.3%

Key Performance Area	**Weight**	**Saldanha**	**Shellypoint**	**Vredenburg**
A. Capacity Management	15%	92.0%	92.0%	92.0%
B. Environmental Management	15%	85.0%	85.0%	85.0%
C. Financial Management	20%	82.0%	82.0%	82.0%
D. Technical Management	20%	79.0%	79.0%	79.0%
E. Effluent & Sludge Compliance	30%	61.0%	40.0%	50.0%
F. Bonus		69.0%	60.0%	80.0%
G. Penalties		0.0%	0.0%	0.0%
H. Disqualifiers		None	None	None
Green Drop Score (2021)		**88%**	**83%**	**86%**
2013 Green Drop Score		**80%**	**75%**	**84%**

Key Performance Area	Weight	Saldanha	Shellypoint	Vredenburg
2011 Green Drop Score		**39%**	**30%**	**45%**
2009 Green Drop Score		**76%**	**58%**	**57%**
System Design Capacity	**Ml/d**	5	0.2	5
Design Capacity Utilisation (%)		52%	75%	67%
Resource Discharged into		Bok river	evaporated ponds	irrigation golf grounds
Microbiological Compliance	**%**	100%	42%	50%
Chemical Compliance	**%**	77%	52%	43%
Physical Compliance	**%**	83%	56%	53%
Wastewater Risk Rating (CRR% of CRR_{max})		**Saldanha**	**Shellypoint**	**Vredenburg**
CRR (2011)	**%**	83.0%	83.0%	94.0%
CRR (2013)	**%**	53.0%	35.0%	41.0%
CRR (2021)	**%**	50.0%	52.9%	58.8%

Regulator's Comment:

Saldanha Bay LM impressed with a sterling performance, rewarded by a commendable increase in the overall Green Drop score of 87% from a baseline of 81% in 2013. The WSA was well represented, from the initial assessment that took place at the municipal offices to the second (confirmation) assessment that took place virtually. The WSA was represented by the technical team, however with the support by other units - finance, supply chain and PMU. The municipality is further congratulated for achieving one Green Drop Certificate for the excellent performance by the Hopefield system (94%). Had it not been for the effluent quality compliance, more systems would have achieved Certification which would have placed Saldanha on the top performers list in South Africa. The Regulator encourages the municipality to strive for this accolade in the 2023 audit cycle.

Saldanha Bay LM performed very well with regards to capacity management, as was evident in terms of a qualified team of technicians, engineers, and scientists within the organisation. Monitoring is taking place for operational and compliance samples and analysis thereof, but more attention could be given to dedicated sludge stream monitoring and optimisation of such unit processes. Samples are analysed at an accredited (contracted) laboratory.

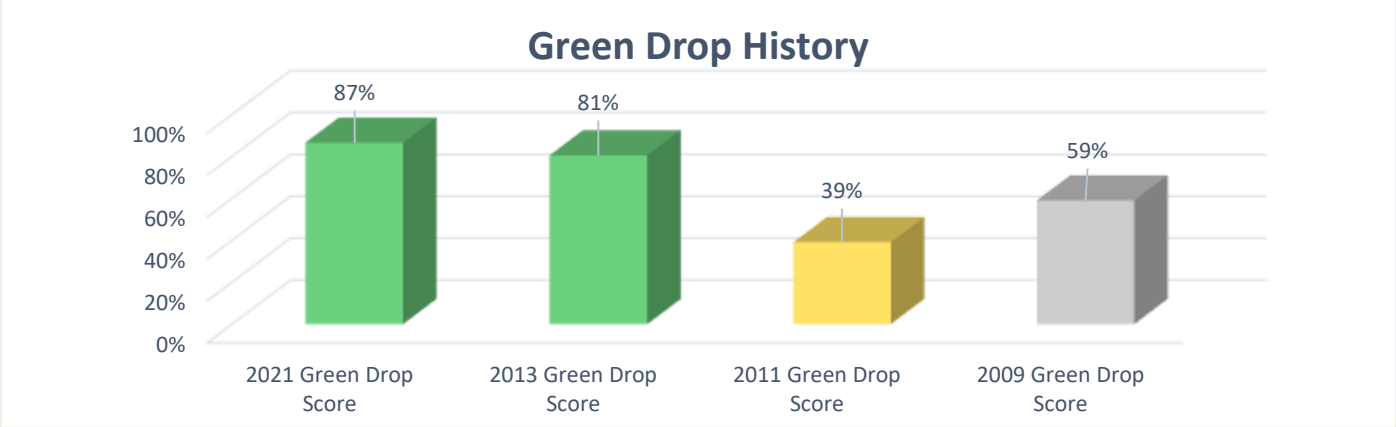
The adoption of site specific W_2RAP process established a solid basis for further work and improvement, as this will offer ongoing insight to manage risks associated with wastewater services and to inform the budget and asset condition assessments. Flow monitoring is done for inflow and outflow supported by records presented during the assessment.

Audit scores were sacrificed in terms of sludge management plans, system specific asset registers, under expenditure on budget, non-ringfenced budget and expenditure, environmental impact monitoring, and sludge application according to WRC Sludge Guidelines, and stormwater ingress management for selected systems only.

Green Drop findings:

1. Most of the WWTW achieved a full score for capacity management, availability of process controllers, maintenance teams (inhouse and outsourced services) and evidence of maintenance work planned and done
2. Team comprise technical (technicians and technologists) and scientific competencies to ensure proper wastewater management and asset management and planning, supported by engineer in the PMU
3. W_2RAP in place and implemented, tied to operational- and compliance monitoring
4. Good reporting on financial information for allocated budgets and expenditure thereof, evidence of contracts for external services provided
5. Seven of 7 plants monitor flow and have water use authorisations in place per site
6. Calibration of meters must be prioritised and budgeted for on an annual basis, coupled with night flows monitoring (tied to water conservation planning
7. Process audits are available, but it lacks implementation, it is paramount that findings and recommendations of the process audit are prioritised for the 2022/23 budgets
8. Evidence of updated bylaws and enforcement thereof with regular inspections of restaurants and commercial properties
9. 12 months of data uploaded on IRIS
10. Sludge monitoring is done and classification for use by farmers
11. Bonuses were maximised by the presentation of generic stormwater management plans, process controllers training, capital investment projects, and general asset management and longevity
12. No penalties and no directives were issued for any system
13. No plants in critical or high-risk positions

14. Budget had been secured for capital projects for replacement, upgrades, and addition of new unit process at some of the WWTWs and associated infrastructure:
    - R17,800,000: Sewer rerouting to Langebaan WWTWs and WWTW upgrades
    - R2,000,000: Shellypoint WWTW upgrade
    - R5,000,000: Vredenburg WWTW refurbishments and associated infrastructure.



Technical Site Assessment

Langebaan WWTW 90%

The ***Langebaan WWTW*** was inspected to verify the Green Drop audit findings:

- The network and pumpstation was in good condition, there was routine maintenance, adequate response to sewage blockages and remote monitoring by telemetry
- The plant is well secured, sign posted and have security onsite
- Plant infrastructure was well maintained with maintenance plan currently in place, equipment was in working order
- Staff office is present on site, display of certificates for PCs and WWTW observed
- Operational monitoring, daily logbook or maintenance records were in place and complying with good practice
- Safety signs were displayed at various unit processes like chlorination, reactors, drying beds, and other relevant areas
- Inflow meters were in place, however, lacks annual verification or calibration
- Sludge drying beds were fully functional and well maintained however, lacks dedicated sludge monitoring and performance analysis by comparing with design expectation of sludge processing units
- Good housekeeping was seen at the maturation ponds.

		
Mechanical screens (automated with sufficient back up), good terrain maintenance	*Flume with ultrasonic inflow meter, flows used to inform operations and decisions*	*Excessive scum formation on clarifiers*

4.21 Stellenbosch Local Municipality

Water Service Institution	**Stellenbosch Local Municipality**
Water Service Provider	Stellenbosch Local Municipality

Municipal Green Drop Score	
2021 Green Drop Score	**84%↑**
2013 Green Drop Score	**40%**
2011 Green Drop Score	**71%**
2009 Green Drop Score	**53%**

VROOM Impression (Towards restoring functionality):

1. Clarifier scum baffles and scum draw-off needed to improve operations
2. Safety signs

VROOM Estimate:

- R28,600,000

Key Performance Area	**Weight**	**Stellenbosch**	**Wemmers hoek**	**Pniel**	**Klapmuts**	**Raithby**
A. Capacity Management	15%	92.0%	92.0%	92.0%	94.0%	80.0%
B. Environmental Management	15%	92.5%	92.5%	92.5%	92.5%	78.5%
C. Financial Management	20%	81.0%	81.0%	81.0%	81.0%	81.0%
D. Technical Management	20%	87.0%	79.5%	87.0%	75.5%	79.5%
E. Effluent & Sludge Compliance	30%	46.0%	46.0%	66.0%	37.0%	21.0%
F. Bonus		67.5%	67.5%	67.5%	75.0%	67.5%
G. Penalties		0.0%	0.0%	-50.0%	0.0%	0.0%
H. Disqualifiers		None	None	None	None	None
Green Drop Score (2021)		**84%**	**83%**	**83%**	**82%**	**73%**
2013 Green Drop Score		**41%**	**37%**	**40%**	**39%**	**32%**
2011 Green Drop Score		**72%**	**70%**	**58%**	**72%**	**62%**
2009 Green Drop Score		**55%**	**47%**	**52%**	**59%**	**52%**
System Design Capacity	Ml/d	35	5	1.35	2.5	0.15
Design Capacity Utilisation (%)		46%	52%	117%	44%	41%
Resource Discharged into		Veldwachters River	Bergrivier (Sensitive)	Dwars River	Klapmuts River	Raithby River
Microbiological Compliance	%	9%	0%	92%	54%	58%
Chemical Compliance	%	54%	31%	52%	80%	54%
Physical Compliance	%	61%	54%	66%	69%	80%
Wastewater Risk Rating (CRR% of CRR_{max})		**Stellenbosch**	**Wemmers hoek**	**Pniel**	**Klapmuts**	**Raithby**
CRR (2011)	%	74.1%	58.8%	64.7%	58.8%	47.1%
CRR (2013)	%	81.8%	76.5%	82.4%	94.1%	76.5%
CRR (2021)	%	55.6%	63.6%	58.8%	41.2%	64.7%

Regulator's Comment:

Stellenbosch Local municipality has delivered a sterling performance during the 2021 audit cycle, as is evident from an 84% Green Drop score. This marks a progressive upwards movement from the 2013 baseline score of 40%. The Regulator noted the change being brought about by a highly committed and qualified team, coupled by systematic improvements made over several years since the last Green Drop assessments. Four (4) of the 5 systems have scored >80%, and all 5 systems reside in medium- and low risk CRR positions.

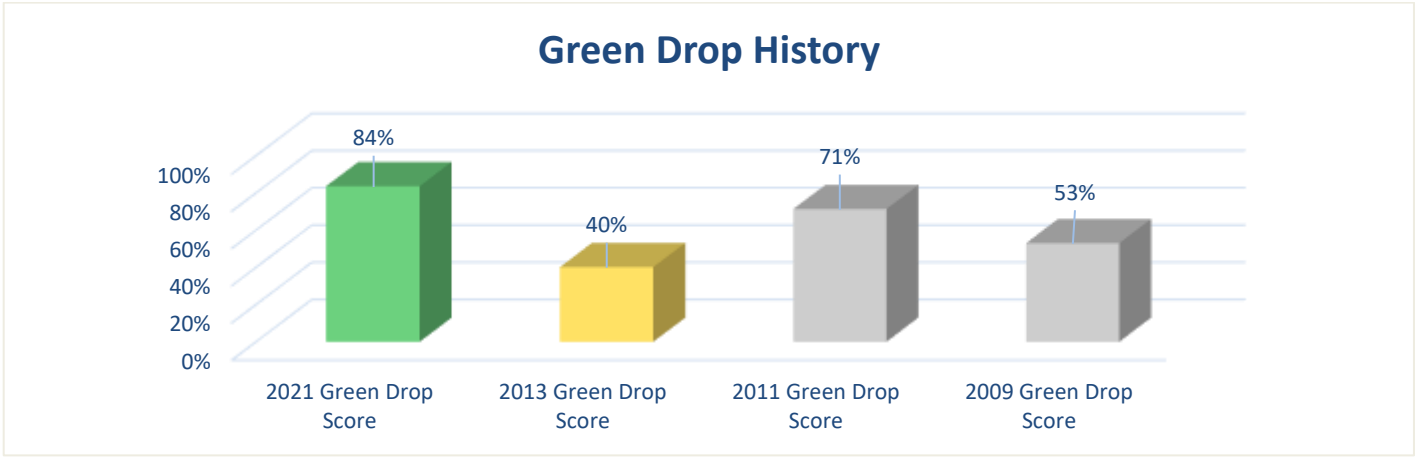
An outstanding feature by Stellenbosch has been the persistent refurbishments and amendments to the Stellenbosch WWTW (the largest size plant). Senior management commitment and attention to their staff's needs seems to make a markable difference and is evident in terms of financial and technical support to the staff and systems. Nevertheless, further improvements can be made to move the municipality to Green Drop Certification status in 2023, if they are addressed. These include but are not limited to finalisation of pending authorisations for the works that are still outstanding, implementing plans for using the generated and classified sludge to the benefit of the municipality.

Linking process audits/conditional assessment findings of the works to the respective W_2RAPs and provide practical implementation plan of all the risks identified.

Stellenbosch is appraised for its high standard and modern equipped laboratory that is used for inhouse operational monitoring and river health monitoring. The laboratory renders a professional scientific service to all WWTWs of the municipality. Furthermore, the municipality has a fully-fledged pollution control unit department that focuses on all the industrial discharges and thereby enforcing bylaws. Stellenbosch sets an example for professionalisation of wastewater services and the Regulator is pleased to acknowledge Stellenbosch for its service and performance, notably in the office and in the field, as can been seen by the 84% Green Drop score and 80% TSA score for the Stellenbosch system. Well done.

Green Drop findings:

1. More than 90% has been achieved against KPAs A and B for all systems, expect Raithby
2. Pniel exceeds its design capacity, all other WWTWs are well below
3. Work is required to classify and allocate Process Controllers to specific systems, or define their allocations across different systems
4. Zero out of 5 WWTWs complied with all effluent quality categories (i.e., Microbiological, Chemical and Physical) – this was the single reason for not achieving Green Drop excellence status. The good microbiological compliance by Pniel is acknowledged.
5. Energy efficiency management is not practiced; hence, recommendations were made to tap in with existing initiatives by SALGA, DMRE, GIZ and WISA
6. Most of the licenses/permits are outdated and engagement with DWS must be intensified to resolve this before the next audit
7. Wemmershoek WWTW is currently undergoing planned upgrades and it is expected to resolve the effluent compliance issues
8. No plants in the high or critical risk positions
9. Bonusses have been maximised by offering additional evidence, only one penalty applied for the Pniel system
10. Budget had been secured for capital projects for replacement, upgrades, and addition of new unit process at some of the WWTWs and associated infrastructure:
    a. R989,000: Stellenbosch WWTW upgrades through internal funding and capital replacement reserves
    b. R90,000,000: Wemmershoek WWTW upgrades through internal funding and capital replacement reserves
    c. R47,000,000: Pniel WWTW upgrades through internal funding and capital replacement reserves
    d. R16,000,000: Klapmuts WWTW upgrades through internal funding and capital replacement reserves
    e. R5,000,000: Raithby WWTW upgrades through internal funding and capital replacement reserves.



Site Inspection report

Stellenbosch WWTW 80%

The **Stellenbosch *WWTW*** was inspected to verify the Green Drop audit findings:

- The plant's installed and design capacity is 35 Ml/day and consist of: 27 Ml/d MBR (submerged membrane bioreactor) plant (new plant commissioned in 2019) and 8 Ml/d conventional activated sludge plant (old plant but recently refurbished and amended configuration)
- A combined inlet works (mechanical screens, vortex degritters and flow measurement) provides preliminary treatment for both parts of the works (new and old). There is no primary settlement, but there are fine screens for the new works to protect the submerged membranes. The final effluent streams are again blended, and disinfection is via UV

- The flow to the plant is only 16 Ml/d which has decreased since the recent water restrictions and COVID (less students at Stellenbosch university). The works appear to be in very good condition and despite a few minor teething problems, appears to be well operated
- The discharge requirements are 'special limits' which is currently under dispute with DWS, in particular the UV disinfection, noting that the receiving river is a under general limit conditions
- Good quality sludge was produced, as product of aerobic digestion and belt presses. The sludge is taken to the landfill site which will have to be reviewed in future under new legislation
- The MBR plant and aerobic digestion is (inherently) power intensive and the works SPC and energy efficiency could potentially be further optimised
- The works has a Dissolved Air Flotation unit that is currently not utilised.

The terrain in very neat, with committed and proud staff, Activated sludge process is well managed and monitored by a top laboratory

Secondary clarification delivers a quality overflow and sludge underflow. Belt presses are functional and evident of excellent housekeeping

Screening and grit removal in functional. Scum management strategies need to be implemented.

4.22 Swartland Local Municipality

Water Service Institution	**Swartland Local Municipality**
Water Service Provider	Swartland Local Municipality

Municipal Green Drop Score	
2021 Green Drop Score	**89%↑**
2013 Green Drop Score	**72%**
2011 Green Drop Score	**73%**
2009 Green Drop Score	**75%**

VROOM Impression (Towards restoring functionality):

1. Plant in excellent condition
2. Scum removal on secondary clarifiers

VROOM Estimate:

- R948,000

Key Performance Area	Weight	Chartsworth	Darling	Kalbaskraal	Moorreesburg
A. Capacity Management	15%	77.5%	94.0%	77.5%	94.0%
B. Environmental Management	15%	88.8%	89.0%	87.5%	81.0%
C. Financial Management	20%	100.0%	100.0%	100.0%	100.0%
D. Technical Management	20%	82.4%	90.0%	88.2%	90.0%
E. Effluent & Sludge Compliance	30%	37.5%	81.0%	37.5%	41.0%
F. Bonus		58.0%	65.5%	28.0%	65.5%
G. Penalties		0.0%	0.0%	0.0%	0.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		**85%**	**95%->89%**	**83%**	**87%**
2013 Green Drop Score		**60%**	**71%**	**68%**	**69%**
2011 Green Drop Score		**62%**	**73%**	**69%**	**71%**
2009 Green Drop Score		**0%**	**75%**	**0%**	**73%**
System Design Capacity	Ml/d	0.27	1.5	0.157	1.5
Design Capacity Utilisation (%)		91%	83%	48%	73%
Resource Discharged into		Swart River	Groen River	Non-discharge	Sand River
Microbiological Compliance	%	17%	71%	NMR	Insufficient data set
Chemical Compliance	%	0%	96%	NMR	Insufficient data set
Physical Compliance	%	61%	98%	NMR	Insufficient data set
Wastewater Risk Rating (CRR% of CRR_{max})		**Chartsworth**	**Darling**	**Kalbaskraal**	**Moorreesburg**
CRR (2011)	%	72.0%	72.0%	72.0%	61.0%
CRR (2013)	%	59.0%	53.0%	35.0%	53.0%
CRR (2021)	%	70.6%	29.4%	23.5%	76.5%

Key Performance Area	Weight	Riebeek valley	Malmesbury	Koringberg
A. Capacity Management	15%	98.0%	94.0%	80.0%
B. Environmental Management	15%	85.0%	85.0%	87.5%
C. Financial Management	20%	100.0%	100.0%	87.5%
D. Technical Management	20%	90.0%	90.0%	88.2%
E. Effluent & Sludge Compliance	30%	81.0%	81.0%	26.3%
F. Bonus		35.5%	35.5%	28.0%
G. Penalties		0.0%	0.0%	-50.0%
H. Disqualifiers		None	None	None
Green Drop Score (2021)		**92%->89%**	**92%->89%**	**70%**
2013 Green Drop Score		**62%**	**76%**	**69%**
2011 Green Drop Score		**64%**	**74%**	**64%**

Key Performance Area	Weight	Riebeek valley	Malmesbury	Koringberg
2009 Green Drop Score		**0%**	**77%**	**0%**
System Design Capacity	Ml/d	1.9	10	0.03
Design Capacity Utilisation (%)		44%	53%	273%
Resource Discharged into		Krom river and irrigation	Diep River	Brak River
Microbiological Compliance	%	81%	100%	Insufficient data set
Chemical Compliance	%	95%	87%	Insufficient data set
Physical Compliance	%	98%	100%	Insufficient data set
Wastewater Risk Rating (CRR% of CRR_{max})		**Riebeek valley**	**Malmesbury**	**Koringberg**
CRR (2011)	%	67.0%	83.0%	56.0%
CRR (2013)	%	59.0%	71.0%	53.0%
CRR (2021)	%	23.5%	36.4%	88.2%

Regulator's Comment:

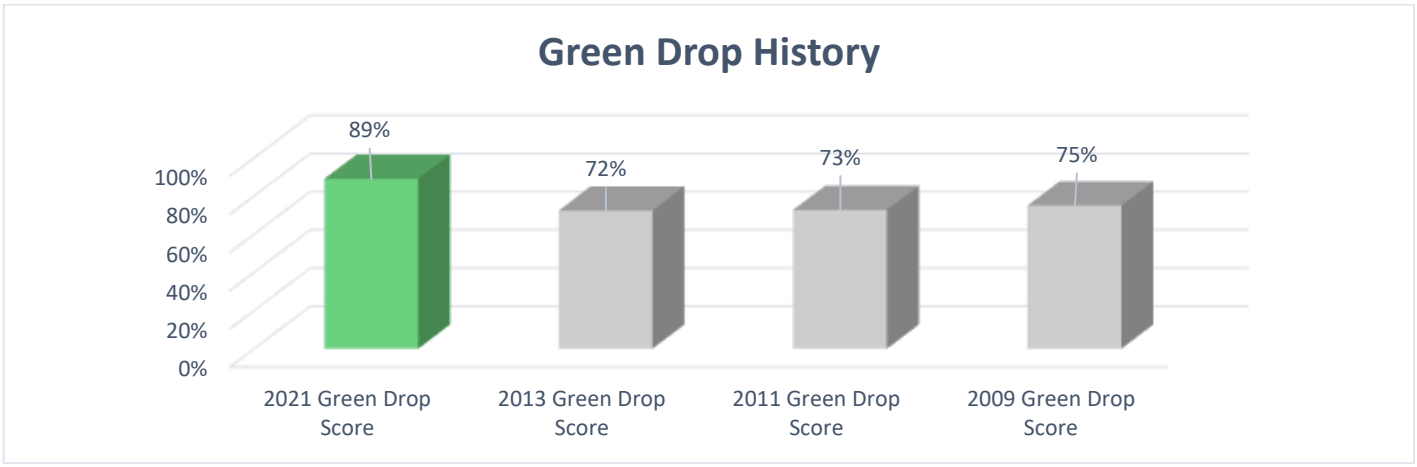
Swartland LM delivered a sterling performance and improved from its 2013 baseline of 72% to a 2021 GD score of 89%. The team was well prepared for the assessment and displayed enthusiasm in their approach towards the audit. The WSA was represented by a technical team and supported by their consulting engineers. Notably the aspect of financial management and an ability to reflect on cost of treatment is commendable, this aspect account to a lion share of the GD Criteria for the year under review. The WSA was able to get a full score on this aspect even though it is a new requirement. The WSA is also praised for presenting Water Services Audit, which raises the level of accountability and best practice in South Africa.

There are areas that need attention such as the effluent compliance, which also account for the highest percentage of the overall audit score. Improved performance in this aspect will be able to sustain the WSAs performance and take it into an upward trajectory. Environmental Management is one particular area where Swartland can improve substantially, in particular dedicated monitoring of sludge streams, as well as desludging schedules at the oxidation pond facilities. Sampling of control boreholes needs to be implemented in order to have a fit for purpose impact monitoring programme. With respect to Capacity Management, the adoption of automation and control is commended for advanced systems, however, need to be discussed with DWS to ensure that all the risk associated with such interventions are aligned with regulatory processes.

Swartland has three (3) potential Green Drop Certified systems, which regrettably cannot be confirmed as the microbiological and/or chemical compliance was below the 90% excellent mark – thereby reducing the audit score to 89% default. The Regulator trust that the municipality will achieve >90% for all the effluent quality criteria in future and earn its Green Drop status in 2023. Well done to the Swartland LM water and wastewater team on the excellent performance and management of wastewater services.

Green Drop findings:

1. Process control staff partially compliant, noting the aid of automation and telemetry
2. External Service providers competency could not be verified
3. W_2RAP is in place and implemented and further backed by compliance monitoring presented
4. Financial information was largely available, including budgets and expenditure, evidence of contracts for external services
5. Lack of calibrated flow meters for the inlet and outlet meters
6. Good sewage inspection and process audit reports
7. Updated bylaws and enforcement thereof with regular inspections of restaurants and commercial properties. WSA encouraged to keep records of enforcement records for future references
8. 12 months of data uploaded on IRIS and supported by availability of general authorisation and Water Use Licenses
9. Generic stormwater management plan and water demand management plan – but lacking wastewater balances
10. No penalties and no directives were issued for any system
11. Three of the 7 plants are in high-risk positions
12. Budget had been secured for capital projects for replacement, upgrades, and addition of new unit process at some of the WWTWs and associated infrastructure:
    - R5,000,000: Multiyear project at Chartsworth WWTWs
    - R22,740,000: Darling WWTW for a construction of a sludge handling facility
    - R41,802,000: Construction of a new works at Moorreesburg WWTW.



Technical Site Assessment

Riebeek valley WWTW 97%

The **Riebeek Valley *WWTW*** was inspected to verify the Green Drop audit findings:

- The network and pumpstation was in good condition, routine maintenance was in place and response to sewage blockages and records were kept
- Plant was in very good condition: equipped with an office on site, there was display of certificates, plans, and other certificates
- Operational monitoring, daily logbook or maintenance records were kept on site
- The site was tidy and well kept
- Flow meters were in place and correctly converted, but not calibrated
- All process units were in working order with the exception of the scum withdrawal at the SST
- The screens and the grit removal were automated and maintenance records were kept for verification
- The WWTW employs high end technology, operated using SCDA controllers and HMI system – this functionality is maintained as result of highly competent Process Controllers
- The belt presses were well maintained, flocculants were stored in a suitable area with all safety signs and MSDS
- There was a proper facility for chemical disinfection - with safety signs, ventilation, and the required monitoring and management systems.

		
Mechanical screens functional and well maintained – good record keeping	*Flume with ultrasonic meter for inlet flow monitoring, verifying 44% of design capacity*	*Aeration basin with all aerators in working order – excellent biomass. Highly competent Process Controllers*

4.23 Swellendam Local Municipality

Water Service Institution	**Swellendam Local Municipality**
Water Service Provider	Swellendam Local Municipality

Municipal Green Drop Score	
2021 Green Drop Score	**30%↓**
2013 Green Drop Score	**76%**
2011 Green Drop Score	**29%**
2009 Green Drop Score	**0%**

VROOM Impression (Towards restoring functionality):

1. Sludge ponds are unlined
2. All the mixers are dysfunctional - phased repair
3. Solar drying pad to receive dewatered sludge required
4. Contact channel requires cleaning.

VROOM Estimate:

- R3,917,000

Key Performance Area	**Weight**	**Klipperivier**	**Barrydale**	**Buffeljagsrivier**	**Suurbraak**
A. Capacity Management	15%	40.0%	27.5%	25.0%	25.0%
B. Environmental Management	15%	20.0%	23.8%	23.8%	23.8%
C. Financial Management	20%	0.0%	0.0%	0.0%	0.0%
D. Technical Management	20%	14.5%	0.0%	8.2%	7.1%
E. Effluent & Sludge Compliance	30%	62.0%	62.5%	81.3%	81.3%
F. Bonus		0.0%	0.0%	0.0%	0.0%
G. Penalties		0.0%	-25.0%	-25.0%	0.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		**31%**	**23%**	**30%**	**33%**
2013 Green Drop Score		**76%**	**76%**	**65%**	**64%**
2011 Green Drop Score		**48%**	**29%**	**29%**	**36%**
2009 Green Drop Score		**0%**	**0%**	**0%**	**0%**
System Design Capacity	Ml/d	4.07	0.16	0.168	0.38
Design capacity utilisation (%)		48%	NI	17%	46%
Resource Discharged into		Klipperivier	Irrigation to land	No discharge	Irrigation to land
Microbiological Compliance	%	0%	100%	NMR	100%
Chemical Compliance	%	89%	33%	NMR	100%
Physical Compliance	%	97%	100%	NMR	100%
Wastewater Risk Rating (CRR% of CRR_{max})		**Klipperivier**	**Barrydale**	**Buffeljagsrivier**	**Suurbraak**
CRR (2011)	%	76.5%	70.6%	29.4%	76.5%
CRR (2013)	%	47.1%	47.1%	52.9%	47.1%
CRR (2021)	%	47.1%	58.8%	35.3%	35.3%

Regulator's Comment:

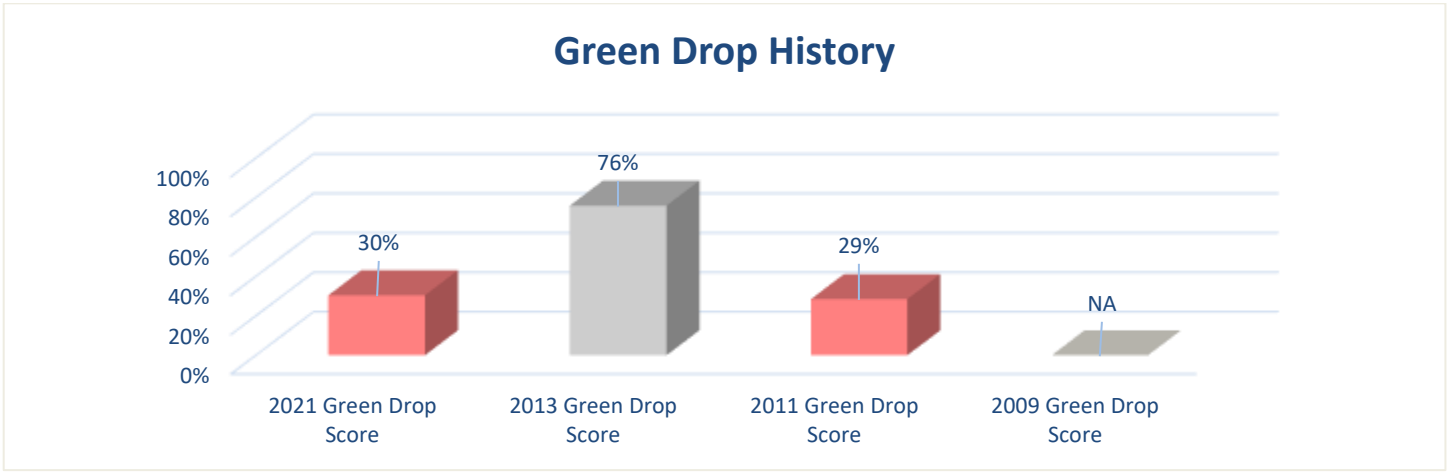
The Swellendam LM is responsible for operations and maintenance at all its treatment plants. The team was not well prepared and data and evidence provision was a challenge. As a result, the municipality has scored poorly across all Key Performance Areas, with the exception of effluent quality particularly for the Buffeljagsrivier and Suurbrak systems, which delivered a high quality final effluent. The lack of indexed and organised Portfolio of evidence undermined the good work that is taking place in service delivery, and Swellendam is urged to address this going forward. The municipality is commended for its minimal environmental impact as 3 of the four systems do not discharge and is largely used for irrigation or is evaporated, as is reflected in the low CRRs assigned to these systems. The municipality is encouraged to initiate a comprehensive wastewater risk abatement plan and process audit to further address critical risks such as sub-standard microbiological compliance and failure to meet ortho-phosphate limits at the Klipperivier WWTW. Process Controller compliance at the respective plants must also be prioritised.

It is evident that the municipality is capable of scoring much better and is thus urged to timeously provide the correct required information for the next Green Drop Audit. The best start would be to consult the Green Drop Standards chapter in the report and assign a competent team to develop and implement a turnaround plant that respond to each of these criteria. The critical scores achieved for three systems place Swellendam on the list of priority interventions for enforcement in the province.

Green Drop findings:

1. Data provision is required to adequately provide comment under the different categories
2. With exception of Klipperivier, none of the other plants were classified
3. Process Controllers were not registered and or classified on IRIS, and as a result none of the plants had the required Process Controller staff complements
4. No information on internal or external maintenance teams used was provided
5. Inflow measurement was practiced at all plants except Barrydale where not inflow meter was available, there was however no evidence of meter calibration provided
6. No information was provided under the Financial Management KPA for all systems
7. There was no W_2RAP or process audit available
8. Compliance monitoring was consistent, and data uploaded on IRIS on a monthly basis, however no information was provided on the laboratory used or the data credibility
9. No plants in the high or critical risk positions
10. No capital projects are planned and no budgets are allocated.

The Regulator is concerned about the poor state of wastewater services within all systems and the consequential potential impact on respective water resources. It is thus required that the WSI submit a detailed corrective action plan within 60 days of publishing of this report. The plan must map the activities, responsible persons, timelines, and expected improvements as outlined in the Regulatory Comment. The plan will be considered against the Regulatory Comment and recommended for approval by a national regulation committee.



Technical Site Assessment

Klipperivier WWTW 54%

The **Klipperivier *WWTW*** was inspected to verify the Green Drop audit findings:

- The sewer network was generally in a good condition, but the pump station has recently been burgled
- Vandalism in general is a critical risk as cable theft has resulted in a dysfunctional MCC at the pump station as well as overall damage to the building
- WWTW maintenance logbooks were available on-site, an indication that a maintenance team is available, but this information was not provided during the audit
- On-site operational monitoring equipment was available on-site but no proof that it was being used as there were no operational logbooks/records available
- The WWTW wasw generally in a fair condition, however there was all the mixers were no available resulting in dead zones in the reactor
- Some standby pumps were also not available
- Only one of the two clarifiers were operational
- The scum baffle at the clarifier in operation was missing and resulted in floc carryover to the contact channel which may adversely impact disinfection
- The overflow weirs required cleaning as there was excessive algae growth noted
- The contact channel required cleaning
- There was no extra chlorine stock available on-site
- The dewatering plant was functional at the time of the inspection, but unlined sludge ponds were also being used which needs to be addressed. being treated in unlined sludge ponds and therefore needs attention

- Some of the dewatered sludge was placed in an unlined area.

		
Good operational working of secondary settlers	*Several mechanical equipment at the plant is dysfunctional and compromise operations and compliance*	*Sludge is treated in unlined sludge ponds. Poor terrain maintenance noted*

4.24 Theewaterskloof Local Municipality

Water Service Institution	**Theewaterskloof LM**
Water Service Provider	Theewaterskloof LM

Municipal Green Drop Score	
2021 Green Drop Score	**87%↑**
2013 Green Drop Score	**56%**
2011 Green Drop Score	**66%**
2009 Green Drop Score	**30%**

VROOM Impression (Towards restoring functionality):

1. Maturation dams sludged up and need repair
2. Weirs of clarifiers in poor condition
3. Composting plant compromised
4. Sludge thickening dysfunctional
5. Desludging practices not on standard.

VROOM Estimate:

- R88,808,350

Key Performance Area	Weight	Caledon	Botriver	Grabouw	Riviersonder=erend
A. Capacity Management	**15%**	100.0%	100.0%	100.0%	100.0%
B. Environmental Management	**15%**	100.0%	100.0%	100.0%	92.5%
C. Financial Management	**20%**	100.0%	100.0%	100.0%	100.0%
D. Technical Management	**20%**	92.5%	92.5%	94.5%	88.8%
E. Effluent & Sludge Compliance	**30%**	50.0%	50.0%	46.0%	62.5%
F. Bonus		61.0%	60.0%	52.5%	52.5%
G. Penalties		0.0%	-25.0%	0.0%	-50.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		**88%**	**87%**	**87%**	**84%**
2013 Green Drop Score		**65%**	**70%**	**43%**	**64%**
2011 Green Drop Score		**68%**	**58%**	**68%**	**52%**
2009 Green Drop Score		**30%**	**30%**	**30%**	**30%**
System Design Capacity	**Ml/d**	3.5	1.05	8.5	0.7
Design capacity utilisation (%)		78%	24%	51%	119%
Resource Discharged into		Bas River	Botriver	Kogel Dam via Palmiet River	Irrigation only
Microbiological Compliance	**%**	33%	31%	75%	67%
Chemical Compliance	**%**	28%	57%	62%	64%
Physical Compliance	**%**	46%	67%	69%	96%
Wastewater Risk Rating (CRR % of CRR_{max})		**Caledon**	**Botriver**	**Grabouw**	**Riviersonder=erend**
CRR (2011)	**%**	76.5%	64.7%	64.7%	58.8%
CRR (2013)	**%**	58.8%	35.3%	52.9%	35.3%
CRR (2021)	**%**	58.8%	58.8%	54.5%	64.7%

Key Performance Area	Weight	Genadendal	Villiersdorp	Greyton	Tesselaarsdal
A. Capacity Management	**15%**	100.0%	100.0%	87.5%	87.5%
B. Environmental Management	**15%**	96.0%	100.0%	87.5%	92.5%
C. Financial Management	**20%**	100.0%	100.0%	100.0%	100.0%
D. Technical Management	**20%**	92.5%	92.5%	67.1%	75.9%
E. Effluent & Sludge Compliance	**30%**	41.0%	50.0%	51.3%	43.8%
F. Bonus		40.0%	68.5%	47.5%	27.5%
G. Penalties		0.0%	-25.0%	0.0%	0.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		**83%**	**87%**	**80%**	**78%**
2013 Green Drop Score		**65%**	**60%**	**25%**	**NA**

Key Performance Area	Weight	Genadendal	Villiersdorp	Greyton	Tesselaarsdal
2011 Green Drop Score		**59%**	**61%**	**58%**	**NA**
2009 Green Drop Score		**0%**	**30%**	**0%**	**NA**
System Design Capacity	**Ml/d**	0.721	3.5	0.3	0.04
Design capacity utilisation (%)		56%	33%	33%	53%
Resource Discharged into		Botriver	Elandskloof river to Theewaterskloof dam	Irrigation	Kleinrivier
Microbiological Compliance	**%**	17%	33%	42%	20%
Chemical Compliance	**%**	33%	87%	14%	0%
Physical Compliance	**%**	80%	75%	80%	60%
Wastewater Risk Rating (CRR % of CRR_{max})		**Genadendal**	**Villiersdorp**	**Greyton**	**Tesselaarsdal**
CRR (2011)	**%**	41.2%	41.2%	47.1%	NA
CRR (2013)	**%**	23.5%	52.9%	88.2%	NA
CRR (2021)	**%**	58.8%	35.3%	58.8%	41.2%

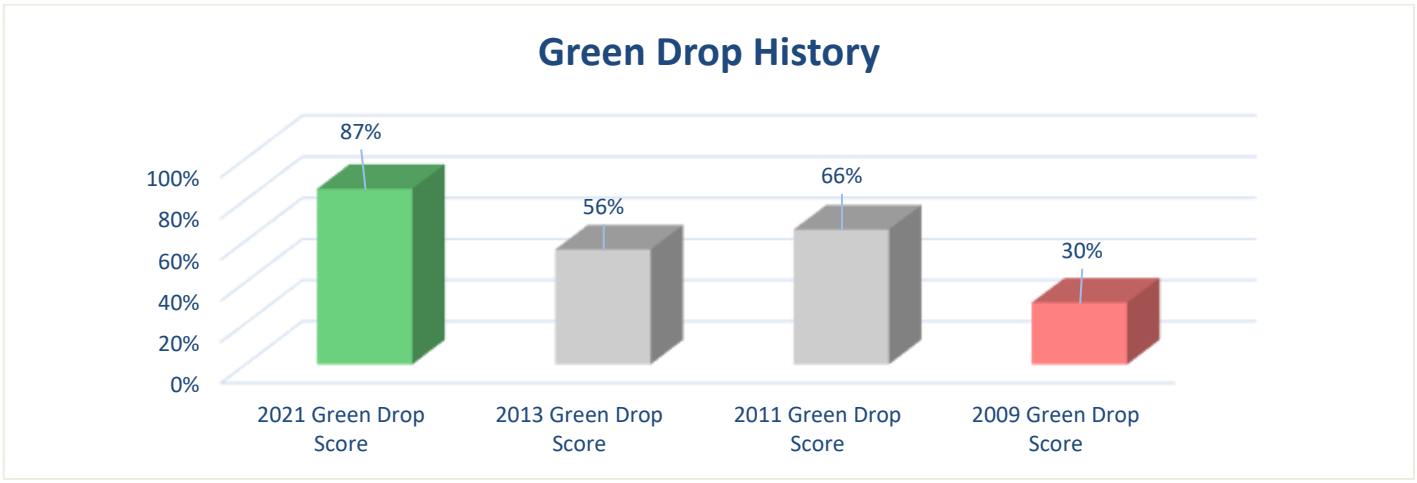
Regulator's Comment:

The Green Drop audit team enjoyed a stimulating and positive interaction with the Theewaterskloof municipal officials. The team came well prepared and able to provide most information. Theewaterskloof is a good example of an institution who uses Green Drop standards to steer and support a deeper mission for excellent wastewater services delivery which is at the core of their function. Despite COVID challenges, the municipality continued to impress the Regulator by responding excellently to the Green Drop requirements, one example being that sampling and monitoring was conducted throughout the year as part of essential services.

One of the main crucial elements that stands between the WSA and Green Drop Certification would be final effluent compliance that were meeting the authorisation standards. Typical shortcomings of effluent non-compliance were noted at Grabouw treatment works during the site visit assessment. Most systems also receive very low flows, and this impact need to be investigated in terms of optimising C:N:P loads to the plants. The Green Drop score of 87% is well deserved and the Regulator have no doubt that this exemplary team will attain GD certification in 2023. This is a vast improvement from 57% obtained in 2013. The municipality obtained scores of more than 80% for 6 of the systems. Well done.

Green Drop findings:

1. An up to standard O&M manual is in place with very useful information (even includes a copy of the bylaws)
2. Operational monitoring for some of the systems require improvements or to be structured more clearly
3. Municipality is commended for linking the Process audit and risks identified in risk abatement plan with proper implementation
4. The WSA provided sound financial management reports for all the systems.
5. Theewaterskloof LM performed well in Capacity Management, environmental management, and financial management, this is a commendable effort
6. No plants situated in the high or critical risk positions
7. Budget had been secured for capital projects for replacement, upgrades, and addition of new unit process at some of the WWTWs and associated infrastructure:
    - R25,528,000: Caledon WWTWs upgrade through MIG funding, this is still a business plan and is not yet approved.
    - R1,900,000: Botriver WWTW feasibility and business plan for upgrades of the WWTWs.
    - R28,000,000: Villiersdorp WWTW feasibility and business plan for upgrades of the WWTWs, business plan and is not yet approved.

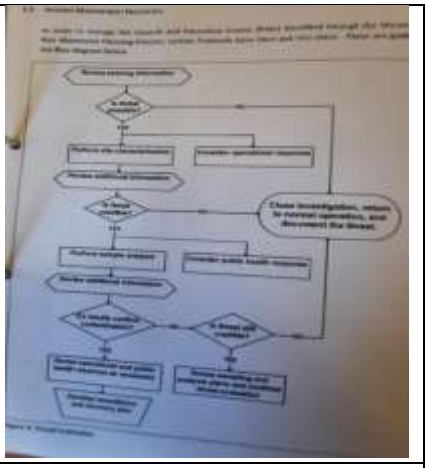


Site Inspection report

Grabouw WWTW 61%

The ***Grabouw WWTW*** was inspected to verify the Green Drop audit findings:

- The Grabouw WWTW is an 8.5 Ml/d works, the works is relatively old with some additions to increase its capacity
- Screens and grit chambers were observed to be generally old and could be optimised via selective upgrade/refurbishment
- Scum baffles, blockages and centre stilling well at the clarifiers urgently needs to be addressed to avoid carry-over of sludge that is causing problems downstream in the treatment process
- The wastewater treatment works is situated adjacent to municipal solid waste plant, which makes site tidiness problematic
- The reactors are run as an 'extended aeration' plant and sludge wasting / management is problematic
- Belt press has been out of commission for a long time (few years), and it was never replaced - this was due to theft and vandalism
- The final clarifiers (on the old plant) did not have scum baffles and the newer additions scum management was not well controlled - this is likely to contribute to final effluent compliance
- During the time of site visits assessment, the final discharge had a significant number of solids and sludge carry-over in the final effluent due to the maturation dams being full of sludge and one dam-wall broken
- All structures were operational, but some infrastructure (walls) could be improved upon to increase security
- General housekeeping and terrain maintenance need attention to match the good Green Drop scores attained.

		
Grit removal functional, but terrain upkeeping needs attention	*High levels of solids carry over compromises disnfection*	*Alll structures are operational, paperwork in order – however, the plant is old and need refurbishment*

4.25 Witzenberg Local Municipality

Water Service Institution	**Witzenberg Local Municipality**
Water Service Provider	Witzenberg Local Municipality

Municipal Green Drop Score	
2021 Green Drop Score	**96%↓**
2013 Green Drop Score	**98%**
2011 Green Drop Score	**90%**
2009 Green Drop Score	**67%**

VROOM Impression (Towards restoring functionality):

1. Vandalism
2. Chlorine dosing
3. Outlet dam wall collapsed
4. Aging infrastructure.

VROOM Estimate:

- R30,037,400

Key Performance Area	**Weight**	**Ceres**	**Tulbagh**	**Wolseley**	**Op de Berg**
A. Capacity Management	15%	92.0%	100.0%	96.0%	100.0%
B. Environmental Management	15%	100.0%	100.0%	92.0%	100.0%
C. Financial Management	20%	100.0%	100.0%	100.0%	100.0%
D. Technical Management	20%	92.0%	95.0%	95.0%	95.0%
E. Effluent & Sludge Compliance	30%	93.0%	80.5%	41.0%	93.0%
F. Bonus		92.0%	84.5%	74.5%	84.5%
G. Penalties		0.0%	0.0%	-25.0%	0.0%
H. Disqualifiers		None	None	None	None
Green Drop Score (2021)		**100%**	**97%**	**86%**	**98%**
2013 Green Drop Score		**99%**	**95%**	**95%**	**94%**
2011 Green Drop Score		**93%**	**84%**	**84%**	**81%**
2009 Green Drop Score		**74%**	**60%**	**60%**	**74%**
System Design Capacity	Ml/d	8.5	2.46	3.6	0.31
Capacity Utilisation (% ADWF ito Design Capacity)		75%	48%	39%	81%
Resource Discharged into		Dwars River	Bergrivier	Wetland	Klein Vlei River
Microbiological Compliance	%	100%	100%	92%	100%
Chemical Compliance	%	100%	92%	42%	94%
Physical Compliance	%	100%	86%	81%	97%
Wastewater Risk Rating (CRR % of CRR_{max})		**Ceres**	**Tulbagh**	**Wolseley**	**Op de Berg**
CRR (2011)	%	40.9%	29.1%	41.2%	58.8%
CRR (2013)	%	36.4%	35.3%	29.4%	41.2%
CRR (2021)	%	36.4%	41.2%	64.7%	35.3%

Regulator's Comment:

Witzenberg Local Municipality is congratulated for once again, delivering a sterling performance during the 2021 audit requirements. The Green Drop score of 96% and 3 Green Drop Certificates attest to the excellent standard and professional service by an expert team. The municipality has maintained the highest standards of professionalism and ongoing high quality service delivery, which resonate not only with Green Drop expectations but is seen as a daily respect to the environment and the residents of Witzenberg. The Regulator acknowledges and thanks the municipal officials for their preparedness, enthusiasm, and dedication, which places Witzenberg as one of the top performers in South Africa and comparable with the best in the world.

Areas of improvement have already been identified by the municipality during the audit, as they have a crystal understanding of the future of wastewater services and used the consultative audits to verify their vision and plans. The audit team was impressed by the diligence in loading accurate information onto IRIS prior to audits assessments and having all sites ready for inspections. It was no surprise to find a solid correlation between the desktop audit score (99%) and the technical inspection score (80%) for the Ceres WWTW (largest facility). Although aging infrastructure was observed, the plant is maintained and operating in a manner that maximises performance and still managed to achieve legal compliance. Performance on this level is not only a product of subject

expertise and diligent implementation on the ground, but also attest to the municipal leadership and setting an enabling, stimulating environment for the wastewater professionals to do their best. Well done.

Green Drop findings:

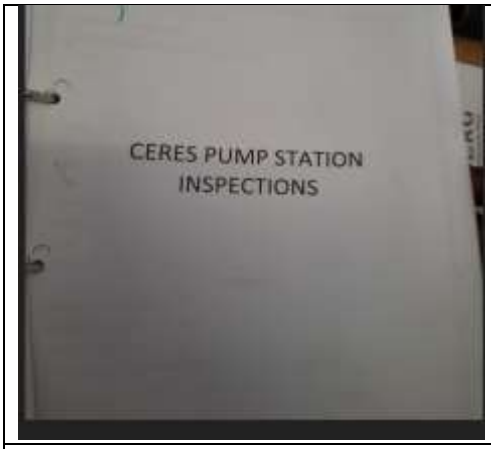
1. Maximum scores were obtained for most of the audit sections which is excellent
2. Scores were compromised by the Process Controllers compliance criteria for 2 of 4 plants
3. Most of the licenses/permits are outdated, noting that engagement is ongoing with the DWS to update these
4. Wolseley WWTW is the only system that did not have sludge classification during the assesses period
5. Budget had been secured for capital projects for replacement, upgrades, and addition of new unit process at all of the WWTWs and associated infrastructure:
    - R7,537,000: Ceres WWTW for security upgrades, bulk sewer pipeline and WWTW upgrades funded through WSA internal funds
    - R1,982,986: Wolseley WWTW upgrade and security upgrades, plant and equipment upgrades funded through WSA internal funds
    - R114,360: Op Die Berg WWTW for security upgrades and plant and equipment replacements funded through WSA internal funds
    - R127,322: Tulbagh WWTW for security upgrades and plant and equipment replacements funded through WSA internal funds.

Site Inspection report

Ceres WWTW 80%

The ***Ceres WWTW*** was inspected to verify the Green Drop audit findings:

1. The works design capacity is 8.5 Ml/day and has relatively old infrastructure (reactor basins) but is functioning adequately. Upgrade of an additional clarifier (good condition) improved the settled effluent and sludge quality
2. The works receive high-COD effluent from industry (fruit processors) and has large anaerobic dams upstream (with surface aeration) for flow and COD balancing which assist with load management
3. The works is well operated and maintained, with the exception of the chlorine dosing facility, which is continuously being vandalised and equipment stolen. New security measures and replacement of the unit is underway
4. The compliance from the works is good and operational monitoring is being done to optimise the performance of the aged infrastructure
5. Networks and pump stations were found to be in generally in good condition, however, vandalism is setting back efforts to replace stolen signs and safety signage
6. Equipment was fully functional including equipment: mechanical screens, 2x grit channels, flow meters, activated sludge reactor fitted with 4 aerators, and 2x SSTs complete with functional centre columns, clarifier bridge, scum skimming, sludge scraper and suction lift tubes with adjustable bung valves, scum box and decanting valve mechanisms
7. Sludge drying beds were functional and operated on a 24-hour basis
8. The generator is situated inside the pumpstation, which creates darkness on the walls coming from fumes - an external exhaust port will be beneficial to address the problem
9. Laboratory services by a dedicated team of scientists and analysts are part of the successes achieved by this works.

		
Updated and frequent network and pumpstation inspections support a planned maintenance philosphy whereby aged assets is kept in optimal condition	*Efficient clarification of effluent resulting in clear overflow and solids clarification with optimised TS content*	*Laboratory is a critical enabler and part of a professional wastewater team*

Witzenberg Municipality – a True Top Performer.
A well-managed sewage transfer pump station on the outskirts of Ceres. All records of monitoring and management schedules are kept on site and clearly updated.

5. CONCLUSION

The National Green Drop Report 2022 provides recommendations and guidance for the way forward and can be access via the DWS homepage.

In summary, the way forward would entail sustainable improvement of the South African wastewater sector via:

The Department of Water and Sanitation as Regulator of the water sector will use this Green Drop Report as the performance baseline for the municipal wastewater fraternity, to inform appropriate regulatory intervention with the objective to facilitate improvement. This will include the development of a Water Services Improvement Programme, which will include the 10-point plan towards informing sustainable intervention with the objective of ensuring a turnaround in the Municipal Water Services sector.

The results of this report demands that wastewater services be a primary focus area of the said programme in targeted areas. Green Drop Performance trends will be used to determine repetitive poor performance (which have led to significant environmental damage over a period of time), to inform a more drastic approach towards ensure turn around. This could include facilitating long term intervention by either a capacitated water board or any other suitable mode of sanitation services support.

National Government will ensure that grant funding allocated to the water sector will be allocated with the objective of restoring functionality of existing wastewater infrastructure according to the findings of this report. 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 National Treasury.

The Regulator will improve the implementation of Section 19 of the National Water Act (Act 36 of 1998) to ensure that 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 more effective in this duty. There are engagements with the Department of Cooperative Governance as well as National Treasury to explore ways of utilising conditional grants for the purpose of remedial intervention.

The Department welcomes the participation of ESKOM, SASOL and other private sector partners in the Green Drop Process and will take guide from this to ensure that a more inclusive regulatory process be explored for the next audit season. The Green Drop Certification programme will thus become mandatory for all wastewater treatment systems, including the private sector.

Water Services Institutions are hereby encouraged to commence immediately with the preparation for the next Green Drop audit process.

For 2022, Green Drop awards and acknowledgement are attributed to the Western Cape as follows:

GREEN DROP AWARDS and RECOGNITION	
GD Certifications to Municipalities	Western Cape Municipalities (12 total): ✓ Witzenberg LM (Ceres 100%, Op die berg 98%, Tulbach 97% – 3 no. WWTWs) ✓ Bitou LM (Plettenberg-Bitou 93%, Kurland 91% – 2 no. WWTWs) ✓ Drakenstein LM (Hermon 92% – 1 no. WWTW) ✓ City of Cape Town Metro (Green Point Outfall 93.5%, Houtbay 93.5%, Philadelphia 96%, Wesfleur Domestic 100% – 4 no. WWTWs) ✓ Saldanha Bay (Hopefield 96% – 1 no. WWTW) ✓ Mossel Bay LM (Herbertsdale 91% – 1 no. WWTW)
GD Contenders to Municipalities [All 89% GD scores]	Western Cape [21 total]: ✓ Drakenstein LM (Paarl, Wellington, Saron, Gouda, Kliprug-Pearl Valley-Val de Vie – 5 no. WWTWs) ✓ City of Cape Town metro (Athlone, Macassar-Strand, Kraaifontein, Mitchells Plain, Borcherd's Quarry, Potsdam-Milnerton, Melkbosstrand, Fisentekraal – 8 no. WWTWs) ✓ Mossel Bay LM (Mossel Bay-Hartenbos – 1 no. WWTW) ✓ Overstrand LM (Gansbaai, Stanford, Hermanus, Darling – 4 no. WWTWs) ✓ Swartland LM (Riebeeck Valley, Malmesbury-Abbotsdale – 2 no. WWTWs) ✓ Breede Valley LM (Worcester – 1 no. WWTW)

RECOGNITION OF TEAMS & INSTITUTIONS				
Awards	**Criteria**	**Winner**	**2nd runner up**	**3rd runner up**
Best Performing Municipalities	%GD score - WSI	Witzenberg LM (96%) - WC	Bitou LM (93%) - WC	Drakenstein LM, Overstrand LM, Swartland LM (All 89%) – WC
Best Performing Systems	%GD score - system	Wesfleur Domestic (Atlantis) (99.7%)	Ceres (99.6%) Witzenberg LM - WC	-

RECOGNITION OF TEAMS & INSTITUTIONS				
		City of Cape Town - WC		
Best Technical Site Assessment score	% TSA score	Riebeeck Valley (97%) Swartland LM - WC	Wesfleur Industrial (96%) - City of Cape Town - WC	Wellington (95%) - Drakenstein LM - WC
Best Progress from 2013 - 2021	Highest % GD score increase 2013 – 2021	Stellenbosch LM - WC (40% to 84%)	-	-
Best Provincial Risk Managers	Western Cape	Bitou LM	George LM	Drakenstein LM
Best Risk Positions	Lowest CRR systems	Millerspoint, City of Cape Town, WC Herbertsdale, Mossel Bay LM, WC	-	Kurland, Bitou LM, WC Hermon, Drakenstein LM, WC Herolds Bay, George LM, WC Belvidere, Knysna LM, WC Brandwag, Mossel Bay LM, WC Hopefield, Saldanha Bay LM, WC Kalbaskraal, Swartland LM, WC Riebeek valley, Swartland LM, WC

RECOGNITION OF INDIVIDUALS and GREEN DROP CHAMPIONS		
Recognition	**Name and Designation**	**Award**
Drakenstein LM: All Systems	Mr. Geoffrey Bredenkamp and Mr Jurie Jumart	True Green Drop Champions who is the epitome of pride and excellence in wastewater management - true professionals

"It always seems impossible until it's done."
Nelson Mandela

Ceres inhouse laboratory stocked with equipment and chemicals – they aim for a fully optimised plant, brought about by scientific knowledge and diligent monitoring. The worker's at this plant is highly enthusiastic – this is a most desirable place to work!
External laboratory (AL Abbott) is valued for their process monitoring analytical support, a highly organised and coherent team. Well done with your excellence status.

Stay clear of the grit classifier outlet at Grabouw pumpstation! Well done Sir – you impressed with a good score for your remarkable fervour and grit quality.

Tom Robbins coaches that *curiosity, especially intellectual inquisitiveness, is what separates the truly alive from those who are merely going through the motions.*

Some finger pointing, head scratching and explanation on the process flows and energy monitoring – what a lively discussion by James Beukes and his inquisitive team

Bergrivier Municipality. Possibly the most desirable workplace in the world. Friendly, knowledgeable staff. An absolute pleasure to audit. Thank you for your service and dedication, team.	Bitou Municipality continues to impress with consistent performance and a capable team. The excellent mixed liquor suspended solids is just one of many highlights of the Gansevallei WWTW. Excellence well deserved.

ANNEXURE A: CALCULATIONS TABLE

PARAMETER	DESCRIPTION	CALCULATION	REFERENCE
Green Drop Scores	A GD % is awarded to an individual WWTW based on audit results considered against 5 KPAs. The individual audit scores aggregate as a single (weighted) GD audit score for the WSI. The score is weighted against the design capacities of the individual WWTWs.	1) System GD score (%) = Sum (Audit scores x KPA sub weights) for each of the 5 KPAs Example: KPA sub weight = 15% of 100% for all 5 KPAs; KPA A sub-weights are 20% each for sub-KPAs A1 to A5 as per GD Requirements in the scorecard KPA A = (100% x 0.2) + (100% x 0.2) +(90% x 0.2) + (100% x 0.2) + (100% x 0.2) = 98% Contribution of KPA A to the overall GD score = (98% x 0.15) = 14.7% (out of 15%) 2) WSI GD score (%) = Sum ((System design capacity / Total design capacity) x System GD score) Example (WSA - 2 Systems): WSA GD score = ((200 Ml/d / 255 Ml/d) x 66.4%) + ((55 Ml/d / 255 Ml/d) x 86.6% = 70.7%	Introductory Provincial and National Chapters
Cumulative Risk Rating	CRR and %CRR/CRRmax The CRR value is based on 4 (weighted) risk indicators, i.e. the design capacity, ADWF, # final effluent failures and technical skills status at each WWTW. The risk weights are summarised in the section following this table. The %CRR/CRRmax provides the variance of a CRR value against the maximum CRR value that could potentially be reached if all 4 risk indicators are in critical state	1) CRR = (A x B) + C + D) where A = Design capacity rating, B = Capacity exceedance rating, C = Final effluent failures rating, D = Technical skills rating Example: CRR = (2 x 3) + 6 + 2 = 14 ; CRR max = (2 x 5) + 8 + 4 = 22 ; %CRR/CRRmax = (14/22) x 100 = 63.6% 2) WSA %CRR/CRRmax = Mean (arithmetical average) %CRR/CRRmax calculated for each WSA Example (3 systems): WSA %CRR/CRRmax = Mean(64.9% + 40.6% + 59.1%) / 3 = 54.9%	Introductory Provincial and National Chapters
Technical Site Assessments	The TSA % reflects the physical condition of the sewer collector network, pumping stations, treatment plant and point of discharge. The intention of the TSA is to verify the evidence and findings presented during the GD audit through the physical inspections of randomly selected sites	Multiple TSA scores per WSA: Combined TSA score = System design capacity divided by total TSA design capacity and multiplied by TSA score Example (2 TSA scores) = (200 Ml/d / 350 Ml/d) x 71% + (150 Ml/d / 350 Ml/d) x 59% = 66%	GD scorecards
	TSA and GD score comparison	% Deviation (TSA & GD score) = % score difference Example: TSA score = 44% and GD score = 38% = 6% deviation or difference	Diagnostic 6
Green Drop KPA Analysis	Mean GD score (&) for KPA A to E	Mean (arithmetical average) = Mean (Range of values) Example: Mean (32% + 68% + 94%) / 3 = 65%	Diagnostic 1
Technical Competence	Ratios to do a comparative analysis “Qualified Technical Staff” - staff appointed in positions to support wastewater services, and who has the required qualifications. “Technical shortfall” means the number of staff who are in technical support positions. “Qualified Scientists” - professional registered scientists (SACNASP) appointed in positions to support wastewater services. “Scientist’s shortfall” means the number of scientists in scientific positions that are professional registered and qualified in technical support positions but not qualified. “Shortfall” is calculated based on a minimum requirement of at least 2 Engineers/Technologists/Technicians and at least one 1 Scientist per WSI.	Ratio - A : B (2 elements) or A : B : C (3 elements) etc Example 1: WWTW staff - No. Supervisors : No PC = 1 : 3 (based on 2 shifts) Example 2: If WSI has no qualified technical staff, the shortfall would be 2 qualified technical staff; Similarly, If WSI has 1 qualified technical staff, the shortfall would be 1 qualified technical staff Example 3: If WSI has no qualified scientific staff, the shortfall would be 1 qualified scientist; Similarly, If WSI has 1 qualified scientist, the shortfall would be zero	Diagnostic 2

PARAMETER	DESCRIPTION	CALCULATION	REFERENCE
Treatment Capacity	Future average wastewater flows (minimum and maximum options) based on future population growths using 2021 Statistical figure of 2.5%	Red Book: Water consumption (q) = 400 l/c/day; wastewater flow (qw) = 60-80% of water consumption. Anticipated flow Qw = P*q*qw (P-population) Example: 219.4 Ml/d spare capacity. 40-60% goes to plant: 0.4*219.4-160l/c/d to 240 l/c/d; Available capacity can service: 219.4 x 1,000,000/160 = 1,371,250 persons (for 40% flow) and 219.4 x 1,000,000/240 = 914,166 persons (for 60% flow)	Diagnostic 3
Wastewater Monitoring and Compliance	%Mean of each of the 3 no. final effluent categories (Microbiological, Chemical and Physical)	1) Mean (arithmetical average) = Mean (Range of values) Example: Mean (24% + 71% + 91%) / 3 = 62% 2) % Compliance = #Compliant samples / Total #Samples tested *100 Example: %Compliance = 42 samples comply with 75mg/l COD / 50 samples tested = 84% compliance for COD	Diagnostic 4
Energy Efficiency	Median used for Actual SPC and Energy Cost (R/m^3) due to asymmetrical/ skewed data sets and because of outliers that do not represent credible figures or values	Median = +Median (Range of values) Example (Actual SPC in kW/m^3): Median = (1.02 + 1418 + 0.51 + 0.36) = 0.77	Diagnostic 5
	Typical industry benchmark figures (range as per the wastewater technology types (effluent) per WSI) and Energy Unit Cost/Tariff (R/kWh) (From: WRC 2021 Energy Report)	Range = Range (A to B) or Range (A to C), etc Example (Industry benchmarks for type of WW technology in kWh/m^3) where WSI has Activated Sludge & BNR and Biofilters: Range (BF & AS BNR) = 0.177-0.412	
Operation & Maintenance & Refurbishment of Assets	O&M Cost Benchmarking using: - WRC WATCOST model: calculated breakdown of assets into civil, buildings, pipelines, mechanical, electrical, instrumentation. - SALGA model: calculate annual maintenance cost per asset type based on benchmark of 15.75% of asset value -Production cost by a specific WWTW to treat inflow expressed in R/m^3 -Shortfall is the gap between the budgeted production cost budgeted and actual cost expressed in R/m^3	1) Current asset value (100% = Civil structures (46%) + Buildings (3%) + Pipelines (6%) + Mechanical equipment (35%) + Electrical equipment (8%) + Instrumentation (2%) 2) Modified SALGA maintenance guideline: 15.5% = Civil structures (0.5%) + Buildings (1.5%) + Pipelines (0.75%) + Mechanical equipment (4%) + Electrical equipment (4%) + Instrumentation (5%) Example (Civil structures) = (0.46 x R20,000,000) X 0.005) = R46,000 3) System O&M cost = System Expenditure (R) / Operational Flow (Ml/d) * 1000 Example: R13,1m / 9.6 Ml/d *1000 = R1.36/m^3 4) Shortfall = Budget Cost – Actual Cost Example: R3,90/m^3 - R1.36/m^3 = R2.54	Diagnostic 7
	Median used for O&M Budget (R/m^3), O&M Actual (R/m^3) and Shortfall (R/m^3) *Note: asymmetrical/skewed data sets, outliers, data credible issues*	Median = +Median (Range of values) Example: (O&M Budget (R/m^3)): Median = (2.03 + 13,476.00 + 6.98 + 7.77 + 3.67) = 6.98	
VROOM	Estimation of cost required to restore existing infrastructure to its original design capacity and operational functionality by addressing civil, mechanical, and electrical failures or defects. The cost is derived from an algorithm that uses the GD Inspector's impression of the condition of the hardware, coupled with the system-specific design capacity and GD score to derive an aggregated score for all systems within the WSI. The aggregated score is based on an algorithm that uses the refurbishment cost estimate of 1-2 systems and extrapolates it according to the other systems size and GD scores to arrive at a VROOM estimation cost	With reference to the earlier 'Technical Site Assessments' parameter: The following is extracted from the TSA scorecard and inserted into the WSA Summary Dashboard of the GD scorecard: (1) VROOM cost ratio in R million per Ml/d (2) % cost estimates for Civil and Mechanical Estimated refurbishment requirement = VROOM cost ratio (R million per Ml/d) x total WSA systems design capacity x 10^6 Example: VROOM Cost = R1.87 (from TSA scorecard) x 1058 Ml/d (Total design capacity from WSI Information Sheet) x 10^6 = R1,978,460,000	GD scorecards Diagnostic 7

CRR Risk Weighting: Risk is defined and calculated by the following formulae:

Cumulative Risk Rating (CRR) = (A x B) + C + D

Where:
A = Hydraulic design capacity of the treatment plant in Ml/day
B = Operational flow as % of the installed design capacity
C = Number of non-compliant effluent quality parameters at point of discharge to receiving water body
D = Number of technical skills gaps (supervision, operation, maintenance) in terms of Reg. 2834 & Draft Reg. 813.

Each risk element carries a different weight in proportion to the severity of the risk element (refer to Annexure A):

A: Design Capacity (Ml/d)		WF
Design Capacity Rating	> 400	7
	201 to 400	6
	101 to 200	5
	51 to 100	4
	21 to 50	3
	20 to 5	2
	<5	1

B: Design Capacity Exceedance (%)		WF
Capacity Exceedance Rating	> 151 %	5
	101 - 150 %	4
	51 - 100 %	3
	1 - 50 %	2
	0 - 10 %	1
	< 0 %	0

C: Technical Skills Compliance		WF
Technical Skills Rating	Superintendent + Process Controllers + Maintenance Team	1
	Superintendent + Maintenance Team but no Process Controllers	2
	Process Controllers + Maintenance Team but no Superintendent	
	Process Controllers + Superintendent but no Maintenance Team	
	Superintendent but no Maintenance Team & no Process Controllers	3
	Process Controllers but no Maintenance Team & no Superintendent	
	Maintenance Team but no Superintendent & no Process Controllers	
	No Superintendent + No Process Controllers + No Maintenance Team	4

D: No of Non-Compliant Parameters	WF
Effluent Failure Rating	8
	7
	6
	5
	4
	3
	2
	1
	0

Risk indicator D for effluent quality (8x):
- Microbiological: Faecal coliform or *Escherichia coli*
- Physical: pH, EC, SS
- Chemical: COD, NH_3-N, NO_3-N, O-PO_4

ANNEXURE B: GUIDE TO READING THE REPORT CARD

The following is an example of a typical report card that appears in the Green Drop Report 2022. Results are provided in colour coded format – each colour has a specific meaning and performance reference.

Water Service Institution	**Name**
Water Service Provider/s	Name

WSI Green Drop Score	
2021 Green Drop Score	**82%↑**
2013 Green Drop Score	**64%**
2011 Green Drop Score	**45%**
2009 Green Drop Score	**26%**

The WSI Green Drop score is a **Performance Indicator** of the overall wastewater business of the organisation. See colour legends below.
Arrows: Depict the current Green Drop status of the plant. A ↑ arrow shows improvement, ↓ shows digress, → shows unchanged situation

VROOM Impression: List of dysfunctional hardware **VROOM Estimation:** Extrapolated Rand value to restore functionality	**Breakdown of VROOM**		
	Civil	0%	R0
	Mechanical	71%	R4,270,280
	Electrical	29%	R1,769,720

Estimated refurbishment cost and key hardware defects are listed. The VROOM breakdown is summarised in the Provincial Summary under the 'Cost Diagnostic".

Key Performance Area	**Weight**	**System X**
A. Capacity Management	15%	100%
B. Environmental Management	15%	86%
C. Financial Management	30%	72%
D. Technical Management	20%	76%
E. Effluent & Sludge Compliance	30%	70%
F. Bonus		78%
G. Penalties		0%
H. Disqualifiers		None
Green Drop Score (2021)		**82%**
2013 Green Drop Score		**64%**
2011 Green Drop Score		**45%**
2009 Green Drop Score		**26%**
System Design Capacity	Ml/d	28
Design Capacity Utilisation (%)		77%
Resource Discharged into		Mhlongo River
Microbiological Compliance	%	91%
Chemical Compliance	%	96%
Physical Compliance	%	100%
Wastewater Risk Rating (CRR% of CRR_{max})		**System X**
CRR (2011)	%	76%
CRR (2013)	%	63%
CRR (2021)	%	45%

Note: Design capacity refers to Average Dry Weather Flow (ADWF)

Colour codes	**Appropriate action by institution**
90-100%	Excellent situation, need to maintain via continued improvement
80-<90%	Good status, improve where gaps identified to shift to 'excellent'
50-<80%	Average performance, ample room for improvement
31-<50%	Very poor performance, need targeted turnaround interventions
0-<31%	Critical state, need urgent intervention for all aspects of the wastewater services business

A system is disqualified from GD Certification if it defaulted to respond to a Notice/Directive

The final Green Drop score - same colour legends as above

Operational flow as calculated as % of the design capacity (ADWF)*

Effluent quality compliance compared to mandatory limits as audited under KPA E. A system is disqualified from Green Drop Certification if microbiological and/or chemical compliance <90%

CRR% indicates the risk of each treatment plant. A higher value reflects a high-risk state (undesirable). A lower value reflects a lower risk state.

CRR% Deviation	
	90 – 100% Critical risk WWTP
	70 - <90% High Risk WWTP
	50-<70% Medium risk WWTP
	<50% Low Risk WWTP

ANNEXURE C: ACRONYMS

ACRONYM	DESCRIPTION	ACRONYM	DESCRIPTION
AD	Anaerobic Digester	**MM**	Municipal Manager
ADWF	Average Dry Weather Flow	**NA**	Not Assessed or Not Applied
AS	Activated Sludge	**NH_3**	Ammonia
AS(P)	Activated Sludge (Plant)	**NI**	No information
AS(R)	Activated Sludge (Reactor)	**NO_2/NO_3**	Nitrites/Nitrates
BF	Biofilter	**NMR**	No Monitoring Required
BNR	Biological Nutrient Reactor	**NQF**	National Qualifications Framework
CCT	Chlorine Contact Tank	**O&M**	Operation and Maintenance
CCTV	Closed Circuit Television	**OHS**	Occupational Health and Safety
CFO / CEO	Chief Financial / Executive Officer	**PA**	Process Audit
CHP	Combined Heat and Power	**PC**	Process Controller
C:N:P	Carbon Nitrogen Phosphorus ratio	**PFD**	Process Flow Diagram
CO_2 eq	Carbon Dioxide equivalent	**PMU**	Project Management Unit
CoCT	City of Cape Town	**O-PO_4**	(Ortho) phosphate
COD	Chemical Oxygen Demand	**PPE**	Personal Protective Equipment
COGTA	Cooperative Governance and Traditional Affairs	**PS**	Pump Station
CRR	Cumulative Risk Rating	**PST**	Primary Settling Tank
DAF	Diffused Air Flotation	**PTS**	Participatory Testing Scheme
DBSA	Development Bank of South Africa	**QFS**	Quality Filtration Systems
DFFE	Department of Forestry, Fisheries and Environment	**RAS**	Return Activated Sludge
DM	District Municipality	**RBC**	Rotating Biological Contactor
DMRE	Department of Mineral Resources & Energy	**RBIG**	Regional Bulk Infrastructure Grant
DO	Dissolved Oxygen	**RR**	Risk Register
DPW	Department of Public Works	**SABS**	South African Bureau of Standards
DWS	Department of Water and Sanitation	**SACNASP**	South African Council for Natural Scientific Professions
EA	Extended Aeration	**SALGA**	South African Local Government Association
EC	Electrical Conductivity	**SAP**	Systems, Applications and Products
EPWP	Expanded Public Works Programme	**SAPS**	South African Police Service
FE	Final Effluent	**SBR**	Sequence Batch Reactor
GA	General Authorisation	**SCADA**	Supervisory Control and Data Acquisition
GD	Green Drop	**SLA**	Service Level Agreement
GDC	Green Drop Certification	**SMP**	Sludge Management Plan
GDIP	Green Drop Implementation Plan	**SPC**	Specific Power Consumption
GIZ	German Agency for International Cooperation	**SS**	Suspended Solids
GWSA	Green Water Services Audit	**SSC/SST**	Secondary Sludge Clarifier / Settler
HOD	Head of Department	**SVI**	Sludge Volume Index
IMP	Incident Management Protocol	**TSA**	Technical Site Assessment
IMQS	Infrastructure Management Quality System	**UF/UV**	Ultra-Filtration/ Ultra Violet
IRIS	Integrated Regulatory Information System	**USDG**	Urban Settlements Development Grant
IT	Information Technology	**VROOM**	Very Rough Order of Measurement
KPA / I	Key Performance Area / Indicator	**W_2RAP**	Wastewater Risk Abatement Plan
kl	kilo litre	**WAS**	Waste Activated Sludge
km	kilo metre	**WCDM**	Water Conservation Demand Management
kWh	kilo Watt hour	**WF**	Weighting Factor
LM	Local Municipality	**WISA**	Water Institute of South Africa
MA	Mechanical Aeration	**WQ**	Water Quality
MBR	Membrane Biological Reactor	**WRC**	Water Research Commission
MCC	Motor Control Centre	**WSA**	Water Services Authority
MEC	Member of the Executive Council	**WSP**	Water Services Provider
MIG	Municipal Infrastructure Grant	**WSI**	Water Services Institution
MISA	Municipal Infrastructure Support Agent	**WSIG**	Water Services Infrastructure Grant
Ml	Mega litre	**WUL**	Water Use Licence
Ml/d	Mega litres per day	**WWTP/W**	Wastewater Treatment Plant/Works

ACRONYM	DESCRIPTION	ACRONYM	DESCRIPTION
MLSS	Mixed Liquor Suspended Solids		
PROVINCES/REGIONS			
WC	Western Cape		

ANNEXURE D: LIST OF TABLES

ANNEXURE E: LIST OF FIGURES